Draft
Environmental Impact Report

SCH# 2025071048

Volume 3

Appendix B through Appendix D4

Discovery Solar PV and Storage Project

Discovery Solar PV and Storage Project by Discovery Solar Storage, LLC (PP24408); ZCC No. 56, Map 197; ZCC No. 71, Map 198; ZCC No. 29, Map 214; ZCC No. 16, Map 215; CUP No. 22 Map 197; CUP No. 47, Map 198; CUP No. 50, Map 214; CUP No. 51, Map 214; CUP No. 19, Map 215; ZV No. 20, Map 197; ZV No. 36, Map 198; ZV No. 15, Map 214; ZV No. 3, Map 215; GPA No. 18, Map 197 (Circulation); GPA No. 5, Map 198 (Circulation); GPA No. 10, Map 214 (Circulation); GPA No. 7, Map 215 (Circulation); Multiple Vesting Tentative Parcel Maps (VTPM)

Kern County
Planning and Natural Resources Department
Bakersfield, California

January 2026

This page intentionally left blank.

Appendices—Volume 3

NOTE TO REVIEWER OF ELECTRONIC FILES:

To assist you in reviewing this electronic document, "bookmarks" and/or "links" have been provided for easier navigation between sections. When available, bookmarks are located in the panel to the left. Links are highlighted in **BLUE** in the Table of Contents. Clicking on either the bookmarks or links will take you to the selected item. This document may consist of multiple linked PDF files. If saving this document to your computer, you must save all corresponding files to a directory on your hard drive to maintain the manner in which these PDF documents are linked.

Appendix B: 10-Year Farming History Memorandum

Appendix C: Air Quality

Appendix C1: Air Quality and Greenhouse Gas Technical Report

Appendix C2: Miscellaneous Air Quality Attachments

Appendix D: Biological Resource Reports

Appendix D1: Biological Resources Summary Technical Report

Appendix D2: Botanical Inventory Report

Appendix D3: Mojave Desert Tortoise Survey Report

Appendix D4: Burrowing Owl Survey Report

This page intentionally left blank.

Appendix B
10-Year Farming History Memorandum

This page intentionally left blank.

TETRA TECH

Memo

To: Amy Fuller, Senior Permitting Director

From: Paula Fell, Senior Environmental Planner, Tetra Tech

Cc: Jennifer Merrick, Project Director, Tetra Tech

Date: June 6, 2025

Subject: 10-Year Farming History Memorandum for the Discovery Solar PV and Storage Project

1.0 INTRODUCTION

The purpose of this memorandum is to provide the previous 10-year farming history for the Discovery Solar PV and Storage Project (Project) proposed by Discovery Solar PV and Storage, LLC (Applicant). The Project is located on approximately 7,700 acres in an unincorporated area of southeastern Kern County, California, at the northern edge of the Antelope Valley and southwest of the community of Mojave (Project site; **Figure 1)**. Based on the evaluation provided below, the Project site has not been actively farmed within the last 10 years, and the area is designated as Nonagricultural or Natural Vegetation, Grazing Land, and Vacant or Disturbed Land per the California Department of Conservation Farmland Mapping and Monitoring Program (FMMP).

2.0 PROJECT DESCRIPTION AND LOCATION

The Project includes development of a photovoltaic (PV) solar facility and associated infrastructure necessary to generate up to 1,400 megawatts (MW) of renewable electrical energy with up to 8 gigawatt-hours of energy storage capacity (approximately 1,000 MW) on an approximately 7,700-acre Project site in an unincorporated area of southeastern Kern County, California (**Figure 1**). PV solar panels, a power collection system, including medium-voltage lines that connect the solar facilities, inverters, a switchyard, foundations, and transformers will be installed onsite. Associated Project infrastructure includes an operations and maintenance facility, telecommunication facilities, energy storage system(s), up to three onsite collector substations, interconnection and transmissions systems, and temporary laydown yards. The Project may be constructed in multiple phases.

The Project will interconnect to the existing Windhub Substation, which is owned and operated by Southern California Edison (SCE). The interconnection will be via a newly constructed 230-kilovolt (kV) generation tie line (gen-tie) that will extend north from the Project site towards the Windhub Substation from on-site collector substations. A portion of the Project 230-kV gen-tie would be co-located within an existing gen-tie corridor (controlled by the Applicant and/or its affiliates). A high-voltage switchyard located immediately north of the Union Pacific Railroad (UPRR) rail line will also be constructed.

The Project is located in an unincorporated area in southeastern Kern County, on generally undeveloped and privately owned land, along the northern edge of the Antelope Valley. The Project site is located approximately 6 miles southwest of the unincorporated community of Mojave, approximately 9 miles southeast of the City of Tehachapi, and approximately 8 miles northwest of the unincorporated community of

Rosamond. State Route (SR)-58 is north of the Project site, SR-14 is east of the Project site, and Tehachapi Willow-Springs Road runs between the Project site's boundaries (**Figure 1**). A network of existing named and unnamed dirt roads traverses the Project site. While the Los Angeles Department of Water and Power (LADWP) aqueduct roughly bisects the Project site, it is not included within the Project site (**Figures 2** and **3**). On-site, adjacent, and nearby uses include renewable energy development, rural residential development, livestock grazing, heavy industrial and mining uses, and undeveloped lands. Elevations across the Project site are relatively flat, ranging from approximately 2,520 to 2,750 feet above mean sea level. The Project site is located within the U.S. Geological Survey (USGS) *Monolith, Willow Springs,* and *Soledad Mountain* 7.5-Minute Topographic Quadrangle Maps.

3.0 FARMING HISTORY

No farming has occurred within the last 10 years on the Project site (between the years 2014 and 2024), based on review of historic publicly available aerial imagery dating back to 2014 (Google Earth 2025). Aerial imagery of the Project site for the years 2014, 2018, 2020, and 2024 is shown in **Figures 4, 5, 6,** and **7**, respectively. In addition, the Kern County Department of Agricultural and Measurement Standards published permit and use data from the years 2019 through 2023 (last updated August 2023) that indicates that there were no agricultural-related permits issued for the Project site since at least 2019 (Kern County 2025).

4.0 FARMLAND

4.1 California Department of Conservation Farmland Mapping and Monitoring Program

The California Department of Conservation Farmland Mapping and Monitoring Program California Important Farmland Finder (California Department of Conservation 2025) designates the Project site as Nonagricultural or Natural Vegetation, Grazing Land, and Vacant or Disturbed Land on the Kern County Farmland Designation Map, as shown on **Figure 8**. No land within the Project site is designated as Important Farmland.

4.2 Agricultural Preserves and Williamson Act Contacts

Approximately 5,213 acres (about 68 percent) of the Project site are within the boundary of Kern County Agricultural Preserve Number 24 (**Figure 9**). Lying within an agricultural preserve is a prerequisite for placement under a Williamson Act contact. However, none of the land within the Project site is subject to a Williamson Act land use contract. Although 5,213 acres of Kern County Agricultural Preserve are within the Project site, the County has indicated that a Petition for Exclusion is not required as solar facilities are permitted on lands zoned for A (Exclusive Agriculture), as described further below.[1]

[1] Direction from Terrance Smalls, County of Kern Supervising Planner, provided to Amy Fuller, Terra-Gen Senior Permitting Director, and Chris Noddings, Tetra Tech Project Manager, on February 27, 2024.

5.0 CONCLUSION

In conclusion, the Project site has not been actively farmed within the last 10 years, and the site is designated Nonagricultural or Natural Vegetation, Grazing Land, and Vacant or Disturbed Land per the FMMP. No management measures are recommended to address impacts to agriculture.

5.1 Conflict with Existing Zoning or a Williamson Act Contract

The Project site consists of the following zoning districts: A (Exclusive Agriculture), A-1 (Limited Agriculture), Estate (E), and Platted Lands (PL). Many Project parcels also contain one or multiple of the following combining districts: Floodplain (PF), Floodplain Secondary (FPS), Wind Energy (WE), and Residential Suburban (RS). Solar facilities are not a permitted or conditionally permitted use within zone districts E and PL. As such, the Project has applied to rezone portions of the Project site to A, apart from those parcels that are already in the A zoning district. The Project also includes a request to eliminate the RS Combining Zone District for all parcels within the Project site. No zone changes are proposed for the other combining zone districts (FP, FPS, and WE), or for portions of any parcel located outside of the Project site.

According to the Kern County Zoning Ordinance Section 19.12.030 G, solar energy electrical generators, when not accessory to a permitted or conditionally permitted use, are permitted within the A Zone District upon approval of a Conditional Use Permit. The Project site also is included within Kern County Agricultural Preserve Number 24 boundary, as is the standard practice in Kern County for any land that is zoned A (Exclusive Agriculture). Solar facilities are permitted on lands zoned for A (Exclusive Agriculture) subject to a CUP. The Project site is not designed Prime Farmland, Unique Farmland, or Farmland of Statewide Importance, and there are no active agricultural uses on the Project site or immediately adjacent to the Project site. The nearest active agricultural site based on Google Earth imagery is approximately 1.64 miles south from the Project site. However, other land uses such as rural residential development and undeveloped, vacant land separate the active agriculture sites from the Project site. Other nearby uses within the Project vicinity include renewable energy development, livestock grazing, and heavy industrial and mining uses. The Project would not result in indirect impacts on active agricultural lands that could occur with the conversion of the site from agricultural uses to non-agricultural uses. This type of impact is mainly due to compatibility issues with the adjacent agricultural land still in production. These types of compatibility issues may include nuisance effects to a site from noise, dust, odors, and drift of agricultural chemicals. For incompatible adjacent uses, the adjacent agriculture uses could experience restrictions on the use of agricultural chemicals, complaints regarding noise and dust, and vandalism and pilfering of crops. These conflicts could potentially result in increased costs to the agricultural operation and encourage conversion of additional agricultural lands to urban uses. The Project would not result in this type of indirect impact; operation and maintenance activities associated with solar facilities are minimal. Therefore, the Project would not displace or impair current or reasonably foreseeable agricultural operations and would not create pressure on off-site properties for conversion to nonagricultural uses.

The Project site does not include any parcels under a Williamson Act contract and would not affect adjacent properties under Williamson Act land use contracts southwest of the Project site. Therefore, the Project would

not conflict with any Williamson Act contracts. Kern County has also expressed that a Petition for Exclusion for the areas of the Project site that are located within an Agricultural Preserve is not required.

6.0 REFERENCES

California Department of Conservation. 2025. California Important Farmland Finder. Available: https://maps.conservation.ca.gov/DLRP/CIFF/ (accessed January 28, 2025).

Google Earth. 2025. 34°58'46.74"N, 118°17'30.70"W, elevation 3105 feet. Available online at: https://earth.google.com (accessed January 28, 2025).

Kern County. 2025. Agricultural and Measurement Standards. Kern County Spatial Data. Available online at: http://www.kernag.com/gis/gis-data.asp (accessed January 28, 2025).

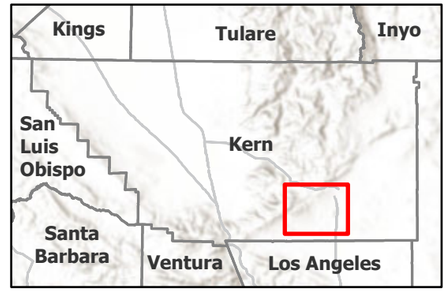
FIGURES

This page intentionally left blank.

Discovery Solar PV and Storage Project

Kern County, CA

Figure 1. Regional Overview



Windhub High-voltage Substation (Existing)

Watercourse

Proposed Project Features

Project Site

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

*Already approved under separate projects.

N

Miles

0 0.75 1.5 3

Scale is 1:116,800 when printed at 11"x17"

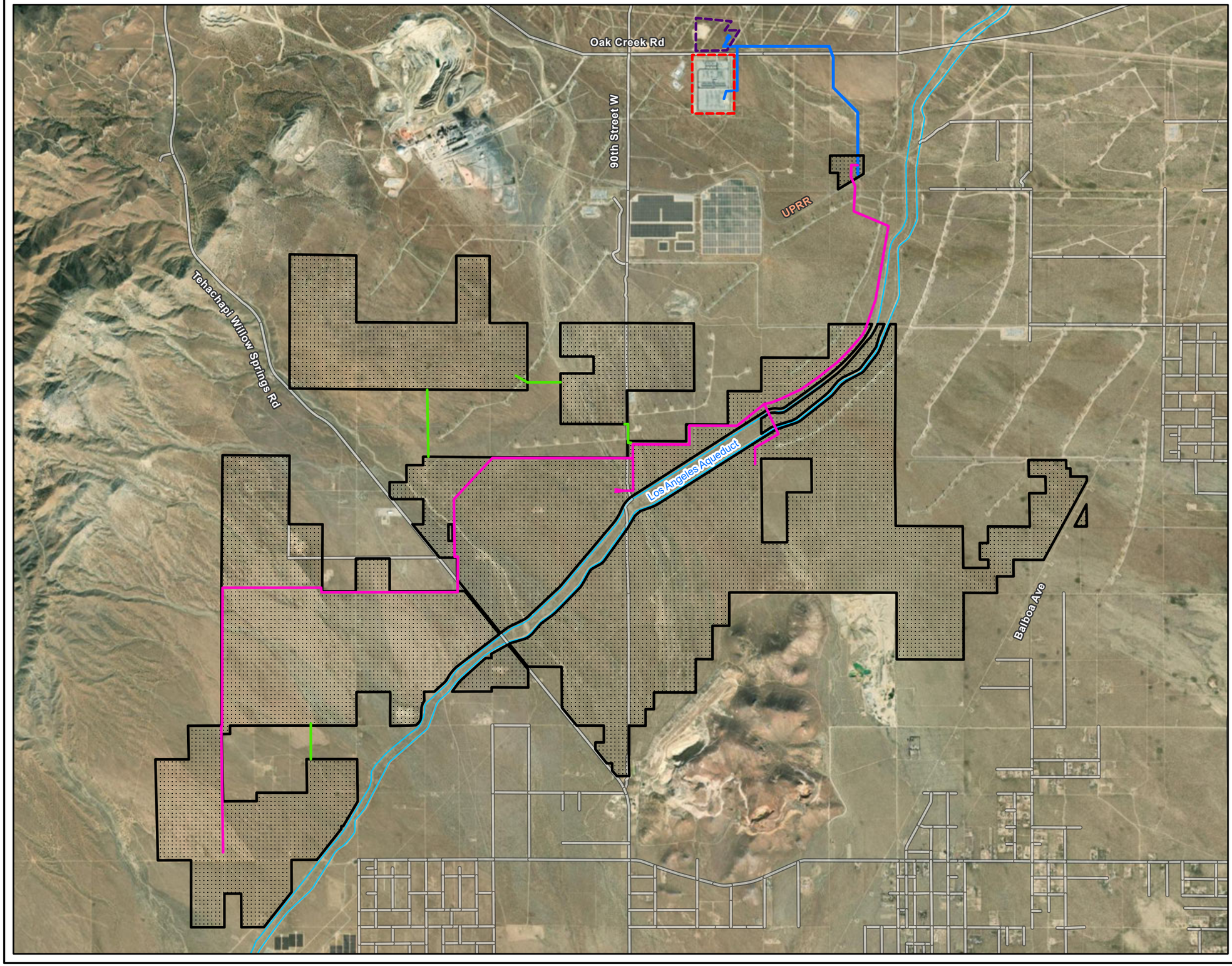
Not for Construction

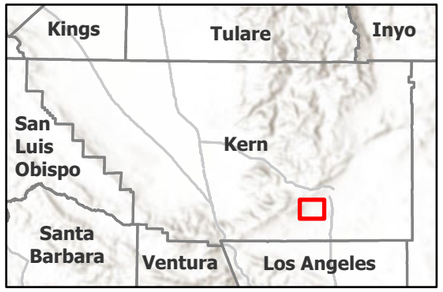
Document Path: \\esri\projects\esriprojects\PDX\projects\194_PROJECTS\TERRA_GEN\194_1403_0001_Discovery\PROJECTS\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 2. Project Location





- Windhub High-voltage Substation (Existing)
- Roads
- Watercourse

Proposed Project Features

- Project Site
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

Scale is 1:45,000 when printed at 11"x17"

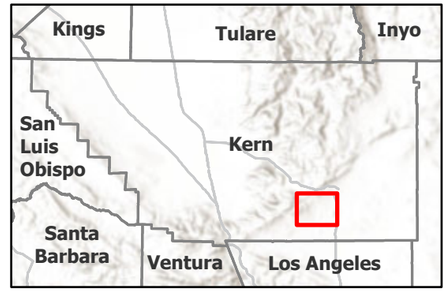
Not for Construction

Document Path: \\cess70\gis1\Cess\Projects\PGR\projects\194_PROJECTS\TERRA_GEN\194_1405_0001_Discovery\PROJECT\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 3. USGS Topographic Map



Windhub High-voltage Substation (Existing)

Proposed Project Features

- Project Site
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

*Already approved under separate projects.

N

0 0.5 1 2 Miles

Scale is 1:75,000 when printed at 11"x17"

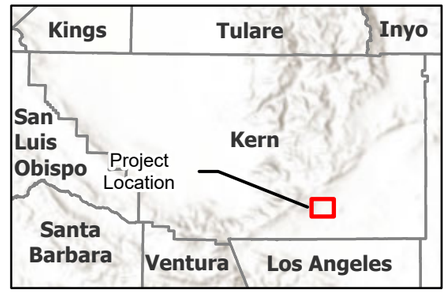
Not for Construction

Document Path: \\cess7\Projects\Projects\PGR\projects\194_PROJECT\SITERA_GEN\194_1402_001_Discovery\PRO\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 4. Aerial Imagery (2014)



Project Site

Data Source: National Agriculture Imagery Program

N

0 0.25 0.5 1 Miles

Scale is 1:40,000 when printed at 11"x17"

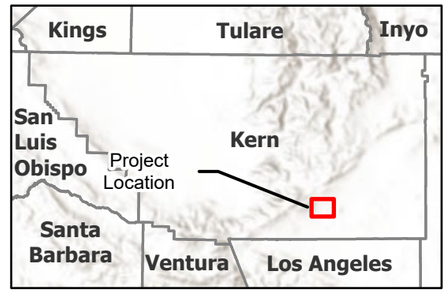
Not for Construction

Document Path: K:\ess70\gis\CaseProjects\POR\projects\194_PROJECT\SITE\RA_GEN\194_1405_0001_DiscoveryPROFarmHistory_Figs.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 5. Aerial Imagery (2018)



Project Site

Data Source: National Agriculture Imagery Program

N

0 0.25 0.5 1 Miles

Scale is 1:40,000 when printed at 11"x17"

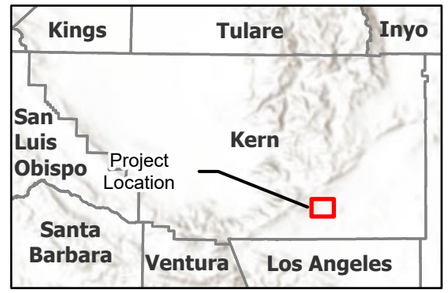
Not for Construction

Document Path: K:\ess70\gis\CaseProjects\POR\projects\194_PROJECT\SITE\RA_GEN\194_1402_0001_DiscoveryPROFarmHistory_Figs.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 6. Aerial Imagery (2020)



Project Site

Data Source: National Agriculture Imagery Program

N

0 0.25 0.5 1 Miles

Scale is 1:40,000 when printed at 11"x17"

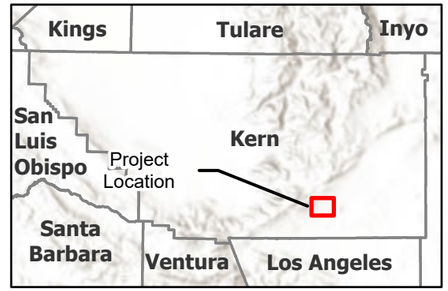
Not for Construction

Document Path: \\cesc7\Gis\Projects\PON\projects\194_PROJECTSTERRA_GEN\194_1403_001_Discovery\PROFarmHistory_Figs.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 7. Aerial Imagery (2024)



Project Site

Data Source: ESRI

N

0 0.25 0.5 1 Miles

Scale is 1:40,000 when printed at 11"x17"

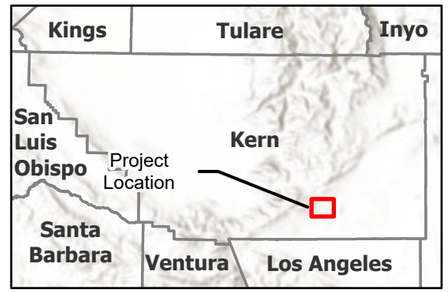
Not for Construction

Document Path: \\oses\GIS\Projects\PDR\projects\194_PROJECTS\TERRA_GEN\194_1405_0001_Discovery\PROD\Farmhistory_Figs.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 8. Farmland Designation



Project Site

Important Farmland

- Grazing Land
- Vacant or Disturbed Land
- Nonagricultural or Natural Vegetation

Data Sources: California Department of Conservation, ESRI

N

0 0.25 0.5 1 Miles

Scale is 1:40,000 when printed at 11"x17"

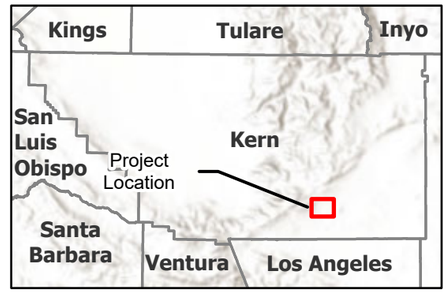
Not for Construction

Document Path: \\cesi\projects\PDR\projects\194_PROJECTS\TERRA_GEN\194_1403_0001_Discovery\PROP\FarmHistory_Figs.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 9. Agricultural Preserve



Project Site

Kern County Agricultural Preserve 24

Data Sources: Kern County GIS, ESRI

N

0 0.25 0.5 1 Miles

Scale is 1:40,000 when printed at 11"x17"

Not for Construction

Document Path: K:\ess70\gis\ProjectsPDR\projects\194_PROJECTS\TERRA_GEN\194_1403_0001_DiscoveryPROFarmHistory_Figs.aprx

This page intentionally left blank.

Appendix C
Air Quality

This page intentionally left blank.

Appendix C1
Air Quality and Greenhouse Gas Technical Report

This page intentionally left blank.

Air Quality and Greenhouse Gas Technical Report

Discovery Solar PV and Storage Project
Kern County, California

October 2025

Prepared for

Discovery Solar PV and Storage, LLC
11455 El Camino Real # 160
San Diego, CA 92130

Prepared by

TETRA TECH
5383 Hollister Avenue, Suite 130
Santa Barbara, CA 93111

This page intentionally left blank.

EXECUTIVE SUMMARY

The Project includes development of a photovoltaic (PV) solar facility and associated infrastructure necessary to generate up to 1,400 megawatts (MW) of renewable electrical energy with up to 8 gigawatt-hours of energy storage capacity (approximately 1,000 MW) on an approximately 7,700-acre Project site in an unincorporated area of southeastern Kern County, California (Figure 1). PV solar panels, a power collection system including medium-voltage lines that connect the solar facilities, inverters, foundations, and transformers will be installed onsite. Associated Project infrastructure includes an operations and maintenance facility, telecommunication facilities, energy storage system(s), up to three onsite collector substations, a 230-Kv switchyard, and temporary laydown yards. The proposed project also includes a generation-tie (Gen-tie) line to connect the Project to the existing Windhub Substation. The Project may be constructed in multiple phases.

The air quality analysis presented in this report evaluates potential air quality impacts associated with the proposed Project. For the purpose of this analysis, Project construction is conservatively assumed to begin in Q4 2025, although the actual commencement of construction may potentially occur after this timeframe. Evaluating impacts for an earlier construction year is considered to be conservative, since modeling results for later years can potentially incorporate lower emission factors based on new regulations and modeling advancements. The Applicant will submit a Fugitive Dust Control Plan and implement diesel emission reduction measures during construction and decommissioning. The Project is anticipated to be operational by 2028. Emissions from the Project are calculated and compared to the Eastern Kern Air Pollution Control District's (EKACPD) significance thresholds. This report also provides estimates of greenhouse gas emissions from the combustion of fossil fuels, primarily associated with equipment used in the construction of the proposed facility.

In summary, this air quality and greenhouse gas analysis concludes that emissions during long-term operation of the Project and mitigated short-term construction emissions would not exceed the CEQA significant emissions thresholds established by the Eastern Kern Air Pollution Control District.

This page intentionally left blank.

Table of Contents

1.0 INTRODUCTION 1

2.0 PROJECT DESCRIPTION AND LOCATION 1

3.0 ENVIRONMENTAL SETTING 2

3.1 Climate and Topography 2

3.2 Ambient Air Quality 2

3.2.1 Criteria Air Pollutants 2

3.2.2 Greenhouse Gases 3

3.2.3 Valley Fever 5

3.3 Sensitive Receptors 6

4.0 REGULATORY SETTING 6

4.1 Federal Regulations 8

4.1.1 Criteria Air Pollutants 8

4.1.2 Hazardous Air Pollutants 9

4.1.3 Greenhouse Gases 9

4.2 State Regulations 11

4.2.1 Criteria Air Pollutants 11

4.2.2 Toxic Air Contaminants 12

4.2.3 Valley Fever 13

4.2.4 Greenhouse Gases 13

4.3 Regional and Local Regulations 16

4.3.1 Eastern Kern Air Pollution Control District 16

4.3.2 Kern County 18

5.0 REGIONAL AND LOCAL AIR QUALITY CONDITIONS 21

5.1 EKAPCD Attainment Status 21

5.2 Local Ambient Air Quality 22

6.0 METHODOLOGY AND SIGNIFICANCE CRITERIA 23

6.1 Thresholds of Significance 23

6.1.1 California Environmental Quality Act Guidelines 23

6.1.2 Criteria Pollutants 24

6.1.3 Air Toxics 25

6.1.4 Greenhouse Gases 25

6.2 Methodology 25

6.2.1 Project-related Emissions 25
6.2.2 Air Quality Impact Assessment 29
6.2.3 Health Risk Assessment 29
7.0 RESULTS 30
7.1 Project-related Emissions 30
7.1.1 Construction and Decommissioning 30
7.1.2 Operations 32
7.2 Air Quality Impact Assessment 32
7.3 Health Risk Assessment 33
8.0 DISCUSSION AND RECOMMENDATIONS 33
8.1 Air Quality Impacts 33
Would the project conflict with or obstruct implementation of the applicable air quality plan? 33
Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard? 35
Would the project expose sensitive receptors to substantial pollutant concentrations? 36
Would the project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people? 37
8.2 Greenhouse Gas Impacts 37
Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment? 37
Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases? 39
9.0 EMISSIONS REDUCTION METHODS 40
9.1 Best Management Practices 40
9.2 Management Measures 42
10.0 REFERENCES 43

Tables

Table 1. State and National Ambient Air Quality Standards 7
Table 2. EKAPCD Attainment Status 21
Table 3. Local Ambient Air Quality Monitoring Data for the Years 2021-2023 22
Table 4. Air Quality Thresholds of Significance 24

Table 5. Significant Impact Levels 24
Table 6. Construction Schedule 27
Table 7. Construction Equipment and Vehicle Trips Per Phase 27
Table 8A. Estimated Annual Construction Criteria Pollutant Emissions 30
Table 8B. Estimated Maximum Daily Construction Criteria Air Pollutant Emissions 31
Table 8C. Projected Annual Decommissioning Criteria Air Pollutant Emissions1 31
Table 8D. Projected Maximum Daily Decommissioning Criteria Air Pollutant Emissions 32
Table 9A. Estimated Annual Operational Criteria Pollutant Emissions 32
Table 9B. Estimated Maximum Daily Operational Criteria Air Pollutant Emissions 32
Table 10. 24-hour PM_{10} and $PM_{2.5}$ Construction-Related Mitigated Emissions 33
Table 11. HRA for Mitigated Construction Emissions 33
Table 12A. Construction GHG Emissions 38
Table 12B. Project Lifetime GHG Emissions 38

Figures

Figure 1. Regional Overview
Figure 2. Project Location
Figure 3. USGS Topographic Map

Appendices

Appendix A: Air Pollutant Summary
Appendix B: Detailed CalEEMod Reports and Supporting Calculations
Appendix C: Dispersion Modeling
Appendix D: Health Risk Assessment
Appendix E: Cumulative Projects

Acronyms and Abbreviations

AB	Assembly Bill
APCD	Air Pollution Control District
APN	Assessor's Parcel Number
Applicant	Discovery Solar PV and Storage, LLC
AQMD	Air Quality Management District
AQMP	Air Quality Management Plan
BAU	business as usual
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAFE	Corporate Average Fuel Economy
CalEEMod	California Emissions Estimator Model
CalEPA	California Environmental Protection Agency
CARB	California Air Resources Board
CCAA	California Clean Air Act
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
CH_4	methane
CI	*Coccidioides immitus*
CO	carbon monoxide
CO_2	carbon dioxide
CO_{2e}	CO_2 equivalent
DPM	Diesel Particulate Matter
EKAPCD	Eastern Kern Air Pollution Control District
EPA	U.S. Environmental Protection Agency
gen-tie	generation tie line
GHG	greenhouse gas
GPS	Global Positioning System
GWP	Global Warming Potential
HAP	hazardous air pollutant
HFC	hydrofluorocarbon

HRA	Health Risk Assessment
KCOG	Kern Council of Government
kV	kilovolt
LADWP	Los Angeles Department of Water and Power
LOS	Level of Service
MEIR	Maximally Exposed Individual Resident
MEIW	Maximally Exposed Individual Worker
mph	miles per hour
MPO	Metropolitan Planning Organization
MT	metric ton
MW	megawatt
MY	model year
NAAQS	National Ambient Air Quality Standards
NHTSA	National Highway Traffic Safety Administration
NIOSH	National Institute for Occupational Safety and Health
NO	nitric oxide
NO_2	nitrogen dioxide
N_2O	nitrous oxide
NO_X	nitrogen oxides
O_3	ozone
OEHHA	Office of Environmental Health Hazard Assessment
PFC	perfluorocarbon
PM	particulate matter
PM_{10}	particulate matter less than 10 microns in diameter
$PM_{2.5}$	particulate matter less than $_{2.5}$ microns in diameter
PMI	Point of Maximum Impact
ppb	part per billion
Project	Discovery Solar PV and Storage Project
PV	photovoltaic
quad	quadrangle
Registry	California Climate Action Registry
ROG	reactive organic gases

RPS	Renewable Portfolio Standard
RTPA	Regional Transportation Planning Agency
RTP/SCS	Regional Transportation Plan and Sustainable Communities Strategy
SAFE	Safer Affordable Fuel-Efficient
SB	Senate Bill
SCE	Southern California Edison
SF_6	sulfur hexafluoride
SIL	Significant Impact Level
SIP	State Implementation Plan
SO_2	sulfur dioxide
SR	State Route
TAC	Toxic Air Contaminants
UPRR	Union Pacific Railroad
USGS	U.S. Geological Survey
VOC	volatile organic compound

1.0 INTRODUCTION

Tetra Tech, Inc., was retained by Discovery Solar PV and Storage, LLC (Applicant) to conduct an Air Quality and Greenhouse Gas (GHG) assessment for the proposed Discovery Solar PV and Storage Project (Project). This report presents the methodology, results, and recommendations from the air quality and GHG analysis conducted for the Project.

2.0 PROJECT DESCRIPTION AND LOCATION

The Project includes development of a photovoltaic (PV) solar facility and associated infrastructure necessary to generate up to 1,400 megawatts (MW) of renewable electrical energy with up to 8 gigawatt-hours of energy storage capacity (approximately 1,000 MW) on an approximately 7,700-acre Project site located in an unincorporated area of southeastern Kern County, California (Figure 1). PV solar panels, a power collection system including medium-voltage lines that connect the solar facilities, inverters, , foundations, and transformers will be installed onsite. Associated Project infrastructure includes an operations and maintenance facility, telecommunication facilities, energy storage system(s), up to three onsite collector substations, a 230-kV switchyard, interconnection and transmission systems, and temporary laydown yards. The Project may be constructed in multiple phases.

The Project will interconnect to the existing Windhub Substation, which is owned and operated by Southern California Edison (SCE). The interconnect will be via a newly constructed 230-kilovolt (kV) generation tie line (gen-tie) that will extend north from the Project site towards the Windhub Substation from onsite collector substations. A portion of the Project 230-kV gen-tie would be co-located within an existing gen-tie corridor (controlled by the Applicant and/or its affiliates). A high-voltage switch yard located immediately north of the Union Pacific Railroad (UPRR) rail line will also be constructed.

The Project is located in an unincorporated area in southeastern Kern County, on generally undeveloped and privately owned land, along the northern edge of the Antelope Valley. The Project site is located approximately 6 miles southwest of the unincorporated community of Mojave, approximately 9 miles southeast of the City of Tehachapi, and approximately 8 miles northwest of the unincorporated community of Rosamond. State Route (SR)-58 is north of the Project site, SR-14 is east of the Project site, and Tehachapi Willow-Springs Road runs between the Project site's boundaries (Figure 1). A network of existing named and unnamed dirt roads traverse the Project site. While the Los Angeles Department of Water and Power (LADWP) aqueduct roughly bisects the Project site, it is not included within the Project site (Figures 2 and 3). Onsite, adjacent, and nearby land uses include renewable energy development, rural residential development, livestock grazing, heavy industrial and mining uses, and undeveloped lands. Elevations across the Project site are relatively flat, ranging from approximately 2,970 to 3,760 feet above mean sea level. The Project site is located within the U.S. Geological Survey (USGS) *Monolith, Willow Springs, and Soledad Mountain* 7.5-Minute Topographic Quadrangle (quad) Maps.

3.0 ENVIRONMENTAL SETTING

3.1 Climate and Topography

The Project site is under the jurisdiction of the Eastern Kern Air Pollution Control District (EKAPCD), and is located on the western edge of the Mojave Desert, with surrounding mountain ranges that contain a limited number of passes that serve as transport corridors for pollutants, including Tehachapi Pass, connecting the western Mojave Desert to the southern San Joaquin Valley, and Soledad and Cajon Passes, connecting to the South Coast Air Basin (EKAPCD 2023). Elevations across the Project site are relatively flat, ranging from approximately 2,970 to 3,760 feet above mean sea level.

The region is characterized by hot and dry summers, with temperatures that exceed 95 degrees Fahrenheit for 60 to 70 days per year between June and September with almost no precipitation. Relative humidity is also very low with average humidity below 10 percent in the hottest part of the day (EKAPCD 2023).

3.2 Ambient Air Quality

3.2.1 Criteria Air Pollutants

The Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants: oxides of nitrogen (NO_X), ozone (O_3), particulate matter (PM), carbon monoxide (CO), sulfur dioxide (SO_2), and lead (Pb. EPA calls these "criteria" air pollutants because it regulates them by developing health-based (primary) or environmentally based (secondary) standards. Additionally, California Ambient Air Quality Standards (CAAQS) have been established for the criteria air pollutants. California law continues to mandate CAAQS, although attainment of the NAAQS has precedence over attainment of the CAAQS due to federal penalties for failure to meet federal attainment deadlines (CARB 2024a). California law does not require that CAAQS be met by specified dates as is the case with NAAQS. Rather, it requires incremental progress toward attainment (CARB 2024a).

The six criteria air pollutants, along with three other pollutants of interest, are summarized below.

Nitrogen Oxides (NO_X) are a group of gaseous nitrogen compounds that are precursors to the formation of ozone and particulate matter. Nitrogen dioxide (NO_2) and nitric oxide (NO) result primarily from the combustion of fossil fuels with ambient air. NAAQS and CAAQS have been established specifically for NO_2, but not for other NO_X compounds.

Ozone (O_3) is a secondary pollutant that is formed from the reaction of NO_X and volatile organic compound (VOC) precursors in the presence of sunlight. Ozone exists naturally in the stratosphere, shielding Earth from harmful ultraviolet radiation. However, at ground-level, ozone causes adverse health effects and is a major component of smog. High concentrations have been tied to respiratory ailments and cardiovascular disease, as well as damage to natural ecosystems, agricultural crops, and materials such as rubber, paint, and plastics.

Reactive organic gases (ROG)[1] are composed of hydrocarbon compounds that contribute to the formation of smog through atmospheric chemical reactions. ROG are emitted from fuel combustion and industrial and agricultural processes. A number of ROG compounds are listed under California's Assembly Bill (AB) 2588 air toxics provisions.

Particulate Matter (PM) comprises solid particles and liquid droplets, made up of acids, organic chemicals, metals, and soil or dust particles. Particles that are 10 micrometers in aerodynamic diameter or smaller (PM_{10}) are a potential human health concern because they can enter the lungs (i.e., inhalable PM), which can affect the heart and cause adverse health effects. They can be emitted directly to the atmosphere as well as formed in the atmosphere by chemical reactions among precursors. PM_{10} can be further categorized based on particle size:

- **Fine particles** are 2.5 micrometers in aerodynamic diameter or smaller ($PM_{2.5}$) and are generally emitted by combustion sources like motor vehicles, power generation facilities, industrial processes, and wood burning.
- **Inhalable coarse particles ($PM_{2.5}$-PM_{10})** are between 2.5 and 10 micrometers in aerodynamic diameter. Sources of emissions include roads (both unpaved and paved), farming activities, and windblown dust as well as combustion sources.

Carbon Monoxide (CO) is an odorless, colorless gas formed by the incomplete combustion of fuels. The main source of CO is on-road motor vehicles. Therefore, CO problems tend to be localized in urban areas rather than across the entire air basin. The combination of motor vehicle fleet turnover and progressively more stringent automotive emission controls over time have resulted in CO emissions declining for decades.

Sulfur Dioxide (SO_2) is a colorless gas formed by the combustion of fossil fuels that contain sulfur. The mandated use of low-sulfur fuel has reduced the emissions of this pollutant over time.

Lead is a metal that is a natural constituent of air, water, and the biosphere. Sources of lead emissions include ore and metals processing and piston-engine aircraft operating on leaded aviation fuel. Other sources are waste incinerators, utilities, and lead-acid battery manufacturers. Leaded motor vehicle gasoline, previously a major source of airborne lead was phased out as result of EPA's regulatory effort to reduce ambient concentrations.

A complete description of all air pollutants and their associated health effects are included in Appendix A, Air Pollutant Summary.

3.2.2 Greenhouse Gases

Certain gases in the earth's atmosphere, classified as GHGs, play a critical role in determining the earth's surface temperature. A GHG is any gas in the atmosphere that absorbs infrared radiation. As solar radiation enters the earth's atmosphere, a portion of the radiation is absorbed by the earth's

[1] CARB defines both VOC and ROG as "any compound of carbon excluding CO, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate," with the exception that VOCs are compounds that participate in atmospheric photochemical reactions (CARB 2009). For the purposes of this analysis, ROG and VOC are considered comparable in terms of mass emissions. ROG is henceforth used in this report.

surface, and a portion is reflected back through the atmosphere into space. The absorbed radiation is eventually emitted from the earth into the atmosphere, not as solar radiation, but as infrared radiation. Most solar radiation passes through GHGs; infrared radiation is selectively absorbed or "trapped" by GHGs as heat and then reradiated back toward the earth's surface, warming the lower atmosphere and the earth's surface. This phenomenon, known as the "greenhouse effect," is beneficial for maintaining a habitable climate on the earth. As the atmospheric concentrations of GHGs rise, however, the average temperature of the lower atmosphere gradually increases, thereby increasing the potential for indirect effects such as a decrease in precipitation as snow, a rise in sea level, and changes to plant and animal species and habitat.

Whereas pollutants with localized air quality effects have relatively short atmospheric lifetimes (about one day), GHGs have long atmospheric lifetimes (one year to several thousand years). GHGs persist in the atmosphere long enough to be dispersed globally. Although the exact lifetime of any particular GHG molecule depends on multiple variables and cannot be pinpointed, scientific evidence reveals that more carbon dioxide (CO_2) is emitted into the atmosphere than is sequestered by ocean uptake, vegetation, and other forms of sequestration. Of the total annual human-caused CO_2 emissions, approximately 54 percent is sequestered through ocean uptake, uptake by northern hemisphere forest regrowth, and other terrestrial sinks within a year, whereas the remaining 46 percent of human-caused CO_2 emissions remains stored in the atmosphere. The atmospheric lifetime of CO_2 is variable because it is readily exchanged in the atmosphere due to its solubility in water. The atmospheric lifetime of methane (CH_4) is about 12 years and the atmospheric lifetime of nitrous oxide (N_2O) is approximately 120 years.

The quantity of GHGs that it takes to ultimately result in climate change is not known precisely, although scientific evidence strongly indicates no single project would be expected to contribute measurably to a noticeable incremental change in the global average temperature. GHGs are emitted by natural processes and human activities. Natural GHG sources include decomposition of dead organic matter; respiration of bacteria, plants, animals, and fungus; evaporation from oceans; and volcanic outgassing. Human activities known to emit GHGs include industrial manufacturing, utilities, transportation, residential, and agricultural activities. The principal GHGs are CO_2, CH_4, N_2O, sulfur hexafluoride (SF_6), perfluorocarbons (PFCs), and hydrofluorocarbons (HFCs), as listed below.

Carbon dioxide: CO_2 enters the atmosphere through the burning of fossil fuels (oil, natural gas, and coal), solid waste, trees and wood products, and chemical reactions (e.g., the manufacture of cement). CO_2 is also removed from the atmosphere (or "sequestered") when it is absorbed by plants as part of the biological carbon cycle.

Methane: CH_4 is emitted during the production and transport of coal, natural gas, and oil. CH_4 emissions also result from livestock and agricultural practices and the decay of organic waste in municipal solid waste landfills.

Nitrous oxide: N_2O is emitted during agricultural and industrial activities and during combustion of fossil fuels and solid waste.

Fluorinated gases: HFCs, PFCs, and SF_6 are synthetic, powerful climate-change gases emitted from a variety of industrial processes. Fluorinated gases are often used as substitutes for ozone-depleting

substances (i.e., chlorofluorocarbons, hydrochlorofluorocarbons, and halons). These gases are typically emitted in minute quantities, but because they are potent climate-change gases, they are sometimes referred to as high Global Warming Potential (GWP) gases.

Sulfur hexafluoride: SF_6 is a colorless, odorless, nontoxic, nonflammable gas. SF_6 is most commonly used as an electrical insulator in high-voltage equipment that transmits and distributes electricity, including equipment such as electrical circuit breakers that may be used for the Project. The California Climate Action Registry (Registry) lists SF_6 as a potential source of fugitive emissions from electrical transmission and distribution equipment. Fugitive emissions are unintentional leaks from equipment such as joints, seals, and gaskets.

The Intergovernmental Panel on Climate Change developed the GWP concept to compare the ability of each GHG to trap heat in the atmosphere relative to another gas. The GWP of a GHG is defined as the ratio of the time-integrated radiative forcing from the instantaneous release of one kilogram of a trace substance relative to that of one kilogram of a reference gas. The reference gas used is CO_2. Therefore, GWP-weighted emissions are measured in metric tons (MT) of CO_2 equivalent (CO_2e). It was assumed that the GWP for CH_4 is 25 (which means that emissions of 1 MT of CH_4 are equivalent to emissions of 25 MT of CO_2), the GWP for N_2O is 298, and the GWP for SF_6 is 22,800 based on the Intergovernmental Panel on Climate Change Fourth Assessment Report (IPCC 2007). These GWPs are also codified by the EPA in 40 Code of Federal Regulations (CFR) 98.

3.2.3 Valley Fever

Valley Fever is an infection caused by inhalation of *Coccidioides immitus* (*C. immitus* or CI) fungus spores, mostly found in the Central Valley and Central Coast regions of California. The spores lie dormant in the soil until they are disturbed by wind, vehicles, or other ground-disturbing activities and become airborne. Agricultural workers, construction workers, and other people who are exposed to wind and dust outdoors are most prone to contracting Valley Fever. Infections can result in mild influenza-like symptoms, such as fever, cough, chest pain, muscle or joint aches, night sweats, and rash. Rarely, in more serious cases, it can infect the brain, joints, bone, skin or other organs, or cause death.

In California, the number of reported Valley Fever cases has greatly increased in recent years with the number of cases tripling from 2015 to 2019 (CDC 2022). The number of Valley Fever cases in the United States has also been steadily increasing over the past few years with a rate of 18 cases per 100,000 people in 2020, and about 20 cases per 100,000 people in 2021 (CDPH 2022).

Currently, no vaccine is available to prevent this infection, but antifungal medications are available for treatment, particularly for severe disease. Further, there is no effective way to detect and monitor CI growth patterns in the soil. Thus, controlling the growth of the fungus in the environment to reduce the risk to individuals is currently not a viable option. Even if the fungus is present in the soil, earth-moving activities may not result in an increased incidence of Valley Fever. Propagation of CI is dependent on climatic conditions, with the potential for growth and surface exposure highest following early seasonal rains and long dry spells.

3.3 Sensitive Receptors

Sensitive receptors are segments of the population most susceptible to poor air quality (i.e., children, the elderly, and those with pre-existing serious health problems related to respiratory distress). Land uses often identified as sensitive receptors include schools, parks, playgrounds, daycare centers, nursing homes, hospitals, and residential communities. The city of Mojave is located approximately 6 miles northeast of the Project site. Sensitive receptors in Mojave and their approximate distances from the Project site are as follows:

- Joshua Middle School located 4.4 miles from the Project boundary;
- Mojave High School located 5.5 miles from the Project boundary; and
- Mojave East Park located 5.4 miles from the Project boundary.

Additionally, several scattered residences are in the vicinity of the Project site. The closest residences on land not controlled by the Applicant are approximately 325 feet east of Assessor's Parcel Number (APN) 474-083-07, on APN 474-082-09. Additionally, for the purpose of conducting the Health Risk Assessment (HRA), offsite worker receptors were identified for the Project. Receptors used in the analysis are described in later sections.

4.0 REGULATORY SETTING

Ambient air quality standards are the levels of air quality considered safe, with an adequate margin of safety, to protect public health and welfare. They are designed to protect those people most susceptible to respiratory distress (i.e., sensitive receptors), such as asthmatics, the elderly, very young children, people already weakened by other disease or illness, and people engaged in strenuous work or exercise. Healthy adults can tolerate occasional exposure to air pollutant concentrations considerably above these minimum standards before adverse effects are observed.

The following discussion describes the regulatory authority of the federal, state, and local jurisdictions. The federal CAA, the California Clean Air Act (CCAA), and the Air Quality Management Plans (AQMPs) prepared and adopted by the EKAPCD regulate air quality in the air basin. Federal and state standards are shown in Table 1.

Table 1. State and National Ambient Air Quality Standards

Pollutant	Averaging Time	CAAQS[1]		NAAQS[2]		
		Concentration[3]	Method[4]	Primary[3, 5]	Secondary[3, 6]	Method[7]
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m^3)	Ultraviolet Photometry	—	Same as Primary Standard	Ultraviolet Photometry
	8 Hour	0.070 ppm (137 µg/m^3)		2008: 0.075 ppm (147 µg/m^3) 2015: 0.070 ppm (137 µg/m^3)		
Respirable Particulate Matter (PM_{10})	24 Hour	50 µg/m^3	Gravimetric or Beta Attenuation	150 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	20 µg/m^3		—		
Fine Particulate Matter ($PM_{2.5}$)	24 Hour	—	—	35 µg/m^3	Same as Primary Standard	Inertial Separation and Gravimetric Analysis
	Annual Arithmetic Mean	12 µg/m^3	Gravimetric or Beta Attenuation	9.0 µg/m^3	15.0 µg/m^3	
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m^3)	Non-Dispersive Infrared Photometry (NDIR)	35 ppm (40 mg/m^3)	—	Non-Dispersive Infrared Photometry (NDIR)
	8 Hour	9.0 ppm (10mg/m^3)		9 ppm (10 mg/m^3)	—	
	8 Hour (Lake Tahoe)	6 ppm (7 mg/m^3)		—	—	
Nitrogen Dioxide (NO2)[8]	1 Hour	0.18 ppm (339 µg/m^3)	Gas Phase Chemiluminescence	100 ppb (188 µg/m^3)	—	Gas Phase Chemiluminescence
	Annual Arithmetic Mean	0.030 ppm (57 µg/m^3)		0.053 ppm (100 µg/m^3)	Same as Primary Standard	
Sulfur Dioxide (SO_2)[9]	1 Hour	0.25 ppm (655 µg/m^3)	Ultraviolet Fluorescence	75 ppb (196 µg/m^3)	—	Ultraviolet Fluorescence; Spectrophotometry (Pararosaniline Method)
	3 Hour	—		—	0.5 ppm (1300 µg/m^3)	
	24 Hour	0.04 ppm (105 µg/m^3)		0.14 ppm (365 µg/m^3)[9]	—	
	Annual Arithmetic Mean	—		0.30 ppm (for certain areas)[9]	—	
Lead (Pb)[10, 11]	30 Day Average	1.5 µg/m^3	Atomic Absorption	—	—	—
	Calendar Quarter	—		0.15 µg/m^3	Same as Primary Standard	High Volume Sampler and Atomic Absorption
Visibility Reducing Particles[12]	8 Hour	See footnote 12	Beta Attenuation and Transmittance through Filter Tape	No National Standards		
Sulfates (SO_4)	24 Hour	25 µg/m^3	Ion Chromatography			

Pollutant	Averaging Time	CAAQS[1/]		NAAQS[2/]		
		Concentration[3/]	Method[4/]	Primary[3/, 5/]	Secondary [3/, 6/]	Method[7/]
Hydrogen Sulfide	24 Hour	0.03 ppm (42 µg/m^3)	Ultraviolet Fluorescence			
Vinyl Chloride[10]	24 Hour	0.01 ppm (26 µg/m^3)	Gas Chromatography			

Source: CARB 2024b and EPA 2025a

1/ California standards for ozone, carbon monoxide (except Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, suspended particulate matter (PM_{10}, and $PM_{2.5}$) and visibility reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

2/ National standards (other than ozone, particulate matter, and those based on annual arithmetic mean) are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight-hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 µg/m^3 is equal to or less than one. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard. Contact the EPA for further clarification and current national policies.

3/ Concentration expressed first in units in which it was promulgated. Equivalent units given in parentheses are based upon a reference temperature of 25 °C and a reference pressure of 760 torr. The torr (symbol: Torr) is a non-SI unit of pressure with the ratio of 760 to 1 standard atmosphere, chosen to be roughly equal to the fluid pressure exerted by a millimeter of mercury, i.e., a pressure of 1 Torr is approximately equal to one millimeter of mercury. Most measurements of air quality are to be corrected to a reference temperature of 25 °C and a reference pressure of 760 torr; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

4/ Any equivalent procedure which can be shown to the satisfaction of the California Air Resources Board (CARB) to give equivalent results at or near the level of the air quality standard may be used.

5/ National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect public health.

6/ National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

7/ Reference method as described by the EPA. An “equivalent method” of measurement may be used but must have a “consistent relationship to the reference method” and must be approved by the EPA.

8/ To attain the 1-hour national standard, the 3-year average of the annual 98th percentile of the 1-hour daily maximum concentrations at each site must not exceed 100 parts per billion (ppb). Note that the national 1-hour standard is in units of parts per billion. California standards are in units of parts per million (ppm). To directly compare the national 1-hour standard to the California standards the units can be converted from ppb to ppm. In this case, the national standard of 100 ppb is identical to 0.100 ppm.

9/ On June 2, 2010, a new 1-hour SO_2 standard was established and the existing 24-hour and annual primary standards were revoked. To attain the 1-hour national standard, the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations at each site must not exceed 75 ppb. The 1971 SO_2 national standards (24-hour and annual) remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

10/ CARB has identified lead and vinyl chloride as 'toxic air contaminants' with no threshold level of exposure for adverse health effects that are determined. These actions allow implementing control measures at levels below the ambient concentrations specified for these pollutants.

11/ The national standard for lead was revised on October 15, 2008 to a rolling 3-month average. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

12/ In 1989, the ARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are "extinction of 0.23 per kilometer" and "extinction of 0.07 per kilometer" for the statewide and Lake Tahoe Air Basin standards, respectively.

4.1 Federal Regulations

4.1.1 Criteria Air Pollutants

The federal CAA (42 United States Code Sections 7401-7675) is a comprehensive federal law that regulates air emissions from area, stationary, and mobile sources and requires the adoption of the NAAQS to protect public health and welfare from the effects of air pollution. The federal CAA Amendments of 1990 required that the EPA review all NAAQS with respect to health impacts and propose modifications or new rules as appropriate. In addition, the amendments of the 1990 federal CAA are associated with the attainment and maintenance of air quality standards, permits and enforcement, toxic air pollutants, acid deposition, stratospheric ozone protection, and motor vehicles and fuels.

NAAQS are currently assigned to SO_2, CO, NO_2, O_3, PM_{10}, $PM_{2.5}$, and lead. These pollutants are designated criteria pollutants. Standards are classified as primary and secondary. Primary standards are designed to protect public health, including sensitive individuals, such as children and the elderly, whereas secondary standards are designed to protect public welfare, such as visibility and crop or material damage. Standards currently in effect are shown in Table 1.

4.1.2 Hazardous Air Pollutants

The 1977 federal CAA amendments required the EPA to identify national emission standards for hazardous air pollutants (HAPs) to protect public health and welfare. HAPs include certain VOCs, pesticides, herbicides, and radionuclides that present a tangible hazard, based on scientific studies of exposure to humans and other mammals. The 1990 federal CAA amendments, which expanded the control program for HAPs, identified 189 substances and chemical families as HAPs. Over the years, the list has been modified. Currently, there are 187 federally regulated HAPs.

4.1.3 Greenhouse Gases

The principal air quality regulatory mechanism at the federal level is the CAA and, in particular, the 1990 amendments to the CAA and the NAAQS that it establishes. There are no federal regulations that set ambient air quality standards for GHGs. However, on April 2, 2007, the U.S. Supreme Court ruled that CO_2 is an air pollutant as defined under the CAA, and that the EPA has the authority to regulate emissions of GHGs. Responding to the mounting issue of climate change, the EPA has taken actions to regulate, monitor, and potentially reduce GHG emissions.

On December 7, 2009, the EPA issued an endangerment finding that current and projected concentrations of the six GHGs in the atmosphere (CO_2, CH_4, N_2O, SF_6, HFCs, and PFCs) threaten the public health and welfare of current and future generations. The Endangerment Finding is based on Section 202(a) of the CAA, which states that the Administrator (of the EPA) should regulate and develop standards for "emission[s] of air pollution from any class or classes of new motor vehicles or new motor vehicle engines, which in [its] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." The rule addresses Section 202(a) in two distinct findings. The first addresses whether the concentrations of the six key GHGs (CO_2, CH_4, N2O, HFCs, PFCs, and SF_6) in the atmosphere threaten the health and welfare of current and future generations. The second addresses whether the combined emissions of GHGs from new motor vehicles and motor vehicle engines contribute to atmospheric concentrations of GHGs and, therefore, the threat of climate change.

The Administrator found that atmospheric concentrations of GHGs endanger the public health and welfare within the meaning of Section 202(a) of the CAA. The evidence supporting this finding consists of human activity resulting in "high atmospheric levels" of GHG emissions, which are most likely responsible for increases in average temperatures and other climatic changes. Furthermore, the observed and projected results of climate change (e.g., higher likelihood of heat waves, wildfires, droughts, sea level rise, and higher intensity storms) are a threat to public health and welfare. Therefore, GHGs were found to endanger the public health and welfare of current and future generations.

The Administrator also found that GHG emissions from new motor vehicles and motor vehicle engines are contributing to air pollution, which is endangering public health and welfare. The EPA's final findings respond to the 2007 U.S. Supreme Court decision that GHGs fit within the CAA definition of air pollutants. The findings do not in and of themselves impose any emission reduction requirements, but rather allow the EPA to define the GHG standards proposed earlier in 2009 for new light-duty vehicles as part of the joint rulemaking with the U.S. Department of Transportation.

Various subsequent federal rulemakings limit GHG emissions from fossil fuel-fired power plants through the EPA's major stationary source permitting program and through the EPA's New Source Performance Standards. These rulemakings have been subject to court challenges and political intervention, such that applicants for air permits are required to evaluate the current status of the regulatory requirements. These GHG rules do not apply to the activities associated with the Project.

4.1.3.1 Mandatory Greenhouse Gas Reporting Rule

On September 22, 2009, the EPA issued a final rule for mandatory reporting of GHGs from large GHG emissions sources in the U.S. (40 CFR 98). This Reporting Program requires facilities that emit 25,000 MT CO_2e or more of GHG to report their GHG emissions to the EPA to inform future policy decisionmakers. These publicly available data allow the reporters to track their own emissions, compare them to similar facilities, and help identify cost-effective opportunities to reduce emissions in the future. Reporting is at the facility level, except that certain suppliers of fossil fuels and industrial GHGs along with vehicle and engine manufacturers report at the corporate level. An estimated 85 percent of the total U.S. GHG emissions, from approximately 10,000 facilities, are covered by this final rule.

4.1.3.2 Regulations for Greenhouse Gas Emissions from Passenger Cars and Trucks

In April 2010, the EPA and the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) established a national program consisting of new standards for model year (MY) 2012 through 2016 light-duty vehicles that will reduce GHG emissions and improve fuel economy. The EPA finalized the first-ever national GHG emissions standards under the CAA, and NHTSA has finalized the Corporate Average Fuel Economy (CAFE) standards under the Energy Policy and Conservation Act. The new standards were applicable to new passenger cars, light-duty trucks, and medium-duty passenger vehicles, covering MY 2012 through 2016. They require these vehicles to meet an estimated combined average emissions level of 250 grams of CO_2 per mile in MY 2016 under EPA's GHG program, and 34.1 miles per gallon in MY 2016 under NHTSA's CAFE program and represent a harmonized and consistent national program (EPA and NHTSA 2010).

In August 2012, the EPA and NHTSA issued final rules extending the national program to improve fuel economy for MY 2017 through 2025. These standards require vehicles to meet an estimated combined average emissions level of 163 grams of CO_2 per mile in MY 2025 under EPA's GHG program, and 49.6 miles per gallon in MY 2025 under NHTSA's CAFE program (EPA and NHTSA 2012). In August 2018, the ''Safer Affordable Fuel-Efficient" (SAFE) Vehicles Rule was proposed for MY 2021–2026 passenger cars and light trucks. This rule went into effect on June 29, 2020, thereby setting new CO_2 standards for MY 2021 and later (85 *Federal Register* 40901).

In December 2021, following Executive Order 13990 (Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis), the EPA further revised the GHG emissions standards under CAA section 202(a) for light-duty vehicles for MY 2023 and later to adopt the more stringent SAFE rule standards in each MY from 2023 through 2026 (86 *Federal Register* 74434).

On April 18, 2024, the EPA published a final rule, Multi-Pollutant Emissions Standards for Model Years 2027 and Later Light-Duty and Medium-Duty Vehicles, that sets new, more protective standards to further reduce harmful air pollutant emissions from light-duty and medium-duty vehicles starting with MY 2027 (89 *Federal Register* 27842).

4.1.3.3 Greenhouse Gas Emissions Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles

In 2011, the EPA and NHTSA announced fuel economy and GHG standards for medium- and heavy-duty trucks for MY 2014–2018 (76 *Federal Register* 57106–57513). The standards for CO_2 emissions and fuel consumption are tailored to three main vehicle categories: combination tractors, heavy-duty pickup trucks and vans, and vocational vehicles. According to the EPA, this regulatory program will reduce GHG emissions and fuel consumption for the affected vehicles by 6 to 23 percent over the 2010 baselines. In August 2016, the EPA and NHTSA announced the adoption of the phase two program related to the fuel economy and GHG standards for medium- and heavy-duty trucks. The phase two program will apply to vehicles with MY 2018 through 2027 for certain trailers, and MY 2021 through 2027 for semi-trucks, large pick-up trucks, vans, and all types of sizes of buses and work trucks. The final standards are expected to lower CO_2 emissions by approximately 1.1 billion MT and reduce oil consumption by up to 2 billion barrels over the lifetime of the vehicles sold under the program (81 *Federal Register* 73478).

4.2 State Regulations

4.2.1 Criteria Air Pollutants

The CCAA, passed by the California Legislature and signed into law by the Governor in 1988, assigns state-specific ambient air quality standards that had originally been established in part in 1959 by the California Department of Public Health. The California standards are, in most cases, more stringent than federal standards. The goal of the CCAA is to attain state air quality standards by the earliest practical date. Because California established Ambient Air Quality Standards several years before the federal action and because of unique air quality problems introduced by the restrictive dispersion meteorology in much of California, there can be a considerable difference between CAAQS and NAAQS. Those standards currently in effect in California are shown on Table 1.

After further review of the relationship between fine particulate matter and human health effects, the California Air Resources Board (CARB) adopted new state standards on June 20, 2002, for $PM_{2.5}$. No specific control programs are in place to achieve the more stringent standard. However, it does represent an air quality goal intended to dramatically reduce the adverse health effects from fine-particle air pollution.

4.2.1.1 State Implementation Plans

The federal CAA requires all states to submit a State Implementation Plan (SIP) to the EPA. SIPs are not single documents. They are a compilation of new and previously submitted plans, programs (such as monitoring, modeling, permitting, etc.), district rules, state regulations, and federal controls. Many of California's SIPs and attainment plans rely on the same core set of control strategies such as emission standards for cars and heavy trucks, fuel regulations, and limits on emissions from consumer products. State law designates CARB as the lead agency for all purposes related to SIPs and attainment plans. Local air districts and other agencies prepare SIP elements and submit them to CARB for review and approval. CARB forwards those revisions to the EPA for approval and publication in the Federal Register.

The law also requires submission of attainment plans for areas that are designated nonattainment with respect to the NAAQS. These attainment plans are comprehensive plans that describe how a Federal nonattainment area will attain and maintain the particular NAAQS standard(s) it does not conform to. Once the area is redesignated as attainment for the NAAQS in question, a maintenance area classification is required for a period of twenty years to provide assurance the area will continue to be in attainment, and SIPs must be submitted under this maintenance area classification.

4.2.2 Toxic Air Contaminants

The state Air Toxics Program was established in 1983 under AB 1807 (Tanner). The California Toxic Air Contaminants (TAC) list identifies more than 700 pollutants; carcinogenic and noncarcinogenic toxicity criteria have been established for a subset of these pollutants pursuant to the California Health and Safety Code. In accordance with AB 2728, the state list includes the federal HAPs. The Air Toxics "Hot Spots" Information and Assessment Act of 1987 (AB 2588) seeks to identify and evaluate risk from air toxics sources. TAC emissions from individual facilities are quantified and prioritized. "High-priority" facilities are required to perform a health risk assessment, and if specific thresholds are exceeded, facilities are required to communicate the results to the public in the form of notices and public meetings.

Diesel particulate matter (DPM), a mixture of solid particles in diesel engine exhaust, is classified as a carcinogen and TAC in California. Long-term exposure to DPM poses the highest cancer risk of any toxic air contaminant evaluated by the Office of Environmental Health Hazard Assessment (OEHHA). CARB estimates that about 70 percent of the cancer risk that the average Californian faces from breathing toxic air pollutants stems from DPM. Exposure to DPM is highest near roads and freeways, truck loading and unloading operations, and diesel-powered machinery operations. Exposure to diesel exhaust in general can have immediate health effects such as irritation to the eyes, nose, throat, and lungs. It can also cause coughs, headaches, light-headedness, and nausea (OEHHA 2023).

In 2000, CARB approved a comprehensive Diesel Risk Reduction Plan to reduce diesel emissions from both new and existing diesel-fueled vehicles and engines. The regulation is anticipated to result in an 80 percent decrease in statewide diesel health risk in 2020 compared with the diesel risk in 2000. In 2020, CARB adopted the Advanced Clean Truck Regulations that requires truck manufacturers to transition from diesel trucks and vans to electric zero-emission trucks beginning in 2024. By 2045, every new truck sold in California will be zero-emission.

Additional regulations apply to new trucks and diesel fuel, including the On-Road Heavy Duty Diesel Vehicle (In-Use) Regulation, On-Road Heavy Duty (New) Vehicle Program, In-Use Off-Road Diesel Vehicle Regulation, and New Off-Road Compression-Ignition (Diesel) Engines and Equipment program. These regulations and programs have timetables by which manufacturers must comply and existing operators must upgrade their diesel-powered equipment. Several Airborne Toxic Control Measures reduce diesel emissions, including In-Use Off-Road Diesel-Fueled Fleets (13 California Code of Regulations [CCR] 2449 et seq.) and In-Use On-Road Diesel-Fueled Vehicles (13 CCR 2025).

4.2.2.1 California Health and Safety Code Section 41700

Section 41700 of the Health and Safety Code states that a person shall not discharge from any source whatsoever quantities of air contaminants or other material that cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public; or that endanger the comfort, repose, health, or safety of any of those persons or the public; or that cause, or have a natural tendency to cause, injury or damage to business or property. Section 41700 also applies to sources of objectionable odors.

4.2.3 Valley Fever

In 2019, Section 6709 was added to the AB 203 California Labor Code. This legislation requires employers to provide effective Valley Fever awareness and prevention training on an annual basis for all construction employees at risk of prolonged exposure to dust in Fresno, Kern, Kings, Madera, Merced, Monterey, San Joaquin, San Luis Obispo, Santa Barbara, Tulare, and Ventura Counties. Additionally, the training must be provided before an employee begins work that is reasonably anticipated to cause exposure due to substantial dust disturbance.

4.2.4 Greenhouse Gases

4.2.4.1 California Air Resources Board

The CARB is responsible for the coordination and oversight of State and local air pollution control programs in California. Various Statewide and local initiatives to reduce California's contribution to GHG emissions have raised awareness about climate change and its potential for severe long-term adverse environmental, social, and economic effects. In the United States, transportation, industrial operations, and utility usages consist over 75 percent of all GHGs emitted.

The State legislature has enacted a series of bills that constitute the most aggressive program to reduce GHGs of any state in the nation. Some legislation, such as the landmark AB 32 and California Global Warming Solutions Act of 2006, was specifically enacted to address GHG emissions.

4.2.4.2 Assembly Bill 32 (California Global Warming Solutions Act of 2006)

The California Global Warming Solutions Act of 2006 (AB 32; California Health and Safety Code Division 25.5, Sections 38500 to 38599) establishes regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and establishes a cap on statewide GHG emissions. AB 32 requires the state to create an opportunity for interested parties to comment on the scoping plan

by conducting public workshops which are required in regions with low-income communities and minority populations. AB 32 required that statewide GHG emissions be reduced to 1990 levels by 2020. In 2016, statewide GHG emissions fell below the levels recorded in 1990, 4 years ahead of schedule.

4.2.4.3 California Air Resources Board Scoping Plan

To achieve the goals of AB 32, CARB adopted a Scoping Plan (CARB 2022) establishing an overall framework for the measures that would be adopted to reduce California's GHG emissions. CARB determined that achieving the 1990 emissions level would require a reduction of GHG emissions of approximately 29 percent below what would otherwise occur in 2020 in the absence of new laws and regulations. The Scoping Plan evaluates opportunities for sector-specific reductions, integrates early actions and additional GHG reduction measures by both CARB and the State's Climate Action Team, identifies additional measures to be pursued as regulations, and outlines an adopted role of a cap-and-trade program.

In 2016, the Legislature passed Senate Bill (SB) 32, which codifies a 2030 GHG emissions reduction target of 40 percent below 1990 levels. With SB 32, the Legislature passed companion legislation, AB 197, which provides additional direction for developing the Scoping Plan. On December 14, 2017, CARB adopted a second update to the Scoping Plan. The 2017 Scoping Plan details how the State will reduce GHG emissions to meet the 2030 target set by Executive Order B-30-15 and codified by SB 32. Other objectives listed in the 2017 Scoping Plan are to provide direct GHG emissions reductions; support climate investment in disadvantaged communities; and support the Clean Power Plan and other federal actions.

CARB's 2022 Scoping Plan for Achieving Carbon Neutrality (2022 Scoping Plan; CARB 2022) was adopted December 15, 2022. The Plan sets a path to achieve targets for carbon neutrality and reduce anthropogenic GHG emissions by 85 percent below 1990 levels by 2045 in accordance with AB 1279. To achieve the targets of AB 1279, the 2022 Scoping Plan relies on existing and emerging fossil fuel alternatives and clean technologies, as well as carbon capture and storage. Specifically, the 2022 Scoping Plan focuses on zero-emission transportation; phasing out use of fossil gas use for heating homes and buildings; reducing chemical and refrigerants with high GWP; providing communities with sustainable options for walking, biking, and public transit; displacement of fossil-fuel fired electrical generation through use of renewable energy alternatives (e.g., solar arrays and wind turbines); and scaling up new options such as green hydrogen.

4.2.4.4 Executive Order B-55-18 and Senate Bill 100 (100 Percent Clean Energy Act of 2018)

SB 100, also known as the California Renewables Portfolio Standard Program: Emissions of Greenhouse Gases, was approved by the California legislature and signed by Governor Brown in September 2018. SB 100, also known as the 100 Percent Clean Energy Act of 2018, declares that CARB should plan for 100 percent total retail sales of electricity in California to come from eligible renewable energy resources and zero-carbon resources by the end of 2045. SB 100 also set interim goals, accelerating the Renewable Portfolio Standard (RPS) requirement to 50 percent from renewable energy sources by 2026 and 60 percent by 2030. SB 100 also requires that retail sellers and

local publicly owned electric utilities procure a minimum quantity of electricity products from eligible renewable energy resources so that the total kilowatt hours of those products sold to their retail end-use customers achieve 44 percent of retail sales by December 31, 2024, 52 percent by December 31, 2027, and 60 percent by December 31, 2030. In addition to targets under AB 32 and SB 32, Executive Order B-55-18 establishes a carbon neutrality goal for the state of California by 2045, and sets a goal to maintain net negative emissions thereafter. The Executive Order directs the California Natural Resources Agency, California Environmental Protection Agency (CalEPA), the Department of Food and Agriculture, and CARB to include sequestration targets in the Natural and Working Lands Climate Change Implementation Plan consistent with the carbon neutrality goal.

4.2.4.5 Assembly Bill 1279 (California Crisis Act)

In 2022, California passed AB 1279 (California Crisis Act), which introduced a statewide policy to achieve net zero GHG emissions by 2045 and maintain net negative GHG emissions thereafter. Furthermore, AB 1279 ensures that by 2045, statewide anthropogenic GHG emissions are reduced to at least 85 percent below the 1990 levels. This bill would require the state board to work with relevant state agencies to ensure that updates to the scoping plan identify and recommend measures to achieve these policy goals and to identify and implement a variety of policies and strategies that enable CO_2 removal solutions and carbon capture, utilization, and storage technologies in California, as specified.

4.2.4.6 Executive Order S-3-05

In June 2005, Executive Order S-3-05 set forth a series of target dates by which statewide emissions of GHGs would be progressively reduced, as follows:

- By 2010, reduce GHG emissions to 2000 levels;
- By 2020, reduce GHG emissions to 1990 levels; and
- By 2050, reduce GHG emissions to 80 percent below 1990 levels.

The Executive Order directed the secretary of CalEPA to coordinate a multi-agency effort to reduce GHG emissions to the target levels. The secretary will also submit biannual reports to the governor and the California Legislature describing the progress made toward the emissions targets, the impacts of global climate change on California's resources, and mitigation and adaptation plans to combat these impacts.

In 2006, this goal was further reinforced with the passage of AB 32, the Global Warming Solutions Act of 2006. As stated previously, AB 32 sets the same overall GHG emissions reduction goals while further mandating that the CARB create a plan (Scoping Plan), which includes market mechanisms, and implement rules to achieve real, quantifiable, cost-effective reductions of GHGs.

4.2.4.7 Executive Order S-14-08 and Executive Order S-21-09

Executive Order S-14-08 expands the State's Renewable Energy Standard to 33 percent renewable power by 2020. Additionally, Executive Order S-21-09 (2009) directs CARB to adopt regulations requiring that 33 percent of electricity sold in the state come from renewable energy by 2020.

Executive Order S-21-09 directs CARB to adopt regulations to increase California's RPS to 33 percent by 2020. This builds upon SB 1078 (2002), which established the California RPS program, requiring 20 percent renewable energy by 2017, and SB 107 (2006), which advanced the 20 percent deadline to 2010, a goal which was expanded to 33 percent by 2020 in the 2005 Energy Action Plan II.

4.2.4.8 Executive Order B-30-15, Senate Bill 32, and Assembly Bill 197 (Statewide Interim GHG Targets)

California Executive Order B-30-15 (April 29, 2015) set an "interim" statewide emission target to reduce GHG emissions to 40 percent below 1990 levels by 2030 and directed state agencies with jurisdiction over GHG emissions to implement measures pursuant to statutory authority to achieve this 2030 target and the 2050 target of 80 percent below 1990 levels. Specifically, the Executive Order directed CARB to update the Scoping Plan to express this 2030 target in MT. AB 197 (September 8, 2016) and SB 32 (September 8, 2016) codified into statute the GHG emissions reduction targets of at least 40 percent below 1990 levels by 2030 as detailed in Executive Order B-30-15. AB 197 also requires additional GHG emissions reporting that is broken down to sub-county levels and requires CARB to consider the social costs of emissions impacting disadvantaged communities.

4.3 Regional and Local Regulations

The CARB coordinates and oversees both state and federal air pollution control programs in California and has divided the state into 15 air basins. Significant authority for air quality control within each basin has been given to local Air Pollution Control Districts (APCD) or Air Quality Management Districts (AQMD) that regulate stationary source emissions and develop local nonattainment plans. The Project is located in Kern County within the Mojave Desert Air Basin, which is under the jurisdiction of the EKAPCD. The EKAPCD is the regional agency responsible for the regulation and enforcement of federal, state, and local air pollution control regulations. Other regional agencies that coordinate emission reduction strategies with the EKAPCD include the Kern County Planning and Natural Resources Department and the Kern Council of Governments.

4.3.1 Eastern Kern Air Pollution Control District

4.3.1.1 Criteria Air Pollutants

The EKAPCD has developed the following plans to attain state and federal standards for ozone and particulate matter:

- 8-Hour Ozone. On July 27, 2017, the EKAPCD adopted an attainment plan designed to address all required elements of "Serious" nonattainment pursuant to the 75 parts per billion (ppb) O_3 NAAQS. The adopted O_3 plan identified emission control measures and associated emission reductions necessary to demonstrate attainment by 2021. Unfortunately, the District did not achieve attainment of the 75-ppb standard by July 15, 2021, and was reclassified to "Severe" nonattainment (now required to attain by July 2027). In 2015, the federal 8-hour O_3 NAAQS was revised to 70 ppb. The current plan, adopted in 2023, addresses all required plan elements, emissions reductions, and control measures necessary to demonstrate attainment of the 2008 and 2015 8-hour O_3 NAAQS by 2033 (EKAPCD 2023).

- $PM_{10.}$ EKAPCD adopted the Indian Wells Valley Second PM_{10} Maintenance Plan on May 7, 2020 (EKAPCD 2020). The plan addresses EKAPCD's efforts to achieve or maintain attainment with respect to both the annual and 24-hour PM_{10} standards, since both standards were included in the Amended 2003 PM_{10} Plan that EPA approved into the SIP. EPA has since revoked the annual PM_{10} standard effective December 18, 2006 (71 *Federal Register* 61144).

The EKAPCD implements air quality plans by adopting and enforcing rules and regulations. Stationary sources within the jurisdiction are regulated by the EKAPCD's permit authority and through its review and planning activities. Unlike stationary source projects, which encompass very specific types of equipment, process parameters, throughputs, and controls, air emissions sources from land use development projects are primarily mobile sources (i.e., construction equipment and motor vehicles) and area sources (small dispersed stationary and other non-mobile sources), including exempt sources (i.e., no permit required) such as consumer products, landscaping equipment, furnaces, and water heaters. Mixed-use land development projects may include nonexempt sources, including devices such as stationary internal combustion engines (i.e., backup power generators), small to large boilers, gas stations, or asphalt batch plants.

Notwithstanding nonexempt stationary sources, which would be permitted on a case-by-case basis, the following EKAPCD regulations generally apply to land use development projects:

<u>Regulation II – Permits</u>

- Rule 201 establishes permitting requirements for stationary sources, including the Project's backup generators. The EKAPCD also adopted rules requiring commercial solar facilities to obtain Authority to Construct and Permit to Operate approval under Rule 201 to address fugitive dust emissions. Under Rule 201, these projects would be required to submit a Fugitive Dust Emissions Control Plan in accordance with Rule 402. In addition, the EKAPCD is requiring a Fugitive Dust Emissions Monitoring Plan through which each facility will install upwind and downwind particulate matter air monitoring. The monitoring will be used to demonstrate compliance with the District Rules and Regulations.
- Rule 208.2. Criteria for Finding of No Significant Environmental Impact (California Environmental Quality Act [CEQA]). This Rule establishes criteria by which a project under review by EKAPCD be found to have no potential for causing a significant environmental impact, and, thus, be granted a general rule exemption pursuant to Section 15061(b)(3) of the State CEQA Guidelines.

<u>Regulation IV – Prohibitions</u>

- Rule 401. Visible Emissions. The purpose of this rule is to prohibit the emissions of visible air contaminants to the atmosphere.
- Rule 402. Fugitive Dust. The purpose of this rule is to prevent, reduce, and mitigate ambient concentrations of anthropogenic fugitive dust emissions to an amount sufficient to attain and maintain the NAAQS and CAAQS. Under this rule, owners/ operators of a commercial solar facility must submit a fugitive dust emission control plan prior to commencement of any earthmoving activity and operations.

Additionally, the EKAPCD has adopted the *Guidelines for Implementation of the California Environmental Quality Act (CEQA) of 1970, as Amended* (EKAPCD 1999). The purpose of the guidelines is to set forth the definitions, procedures, and forms for use by the EKAPCD to implement CEQA and to supplement State CEQA guidelines. The guidelines also establish the thresholds for specific pollutants, emissions above which are considered significant (EKAPCD 1999). These thresholds are discussed in later sections of this report.

4.3.1.2 Greenhouse Gases

The EKAPCD adopted the *Addendum to CEQA Guidelines Addressing GHG Emission Impacts for Stationary Source Projects When Serving as Lead CEQA Agency* in March 2012. The Policy establishes and details the process of evaluating new or modified stationary source GHG emissions impacts on global climate change for purposes of CEQA. This Policy is to be used when EKAPCD has discretionary approval authority over new stationary source projects and serves as lead CEQA review agency when determining GHG emissions significance (EKAPCD 2012a). Although EKAPCD is not the lead agency for this Project, the Kern County Planning and Natural Resources Department's guidelines point to the CEQA significance thresholds adopted by the district.

The Kern Council of Governments (KCOG) is the Metropolitan Planning Organization (MPO) for the Kern Region as designated by the federal government, and the Regional Transportation Planning Agency (RTPA) as designated by the State of California. It is responsible for developing and updating a variety of transportation plans and for allocating the federal and state funds to implement them. KCOG adopted the 2022 *Regional Transportation Plan/Sustainable Communities Strategy* (RTP/SCS), which serves as a 24-year blueprint that establishes a set of regional transportation goals, policies, and actions intended to guide development of the planned multimodal transportation systems in Kern County (KCOG 2022).

4.3.2 Kern County

The Kern County General Plan, adopted in September 2009, is a comprehensive policy document with planned land use maps and related information that are designed to give long-range guidance to those County officials making decisions affecting the growth and resources of the unincorporated Kern County jurisdiction (Kern County Planning Department 2009). The policies and implementation measures applicable to the Project are discussed below. Applicable policies from this plan are also discussed below (Kern County 2003). The Soledad Mountain-Elephant Butte Specific Plan is also applicable to the Project. However, this plan does not include any applicable goals, policies, or implementation measures.

4.3.2.1 Criteria Air Pollutants

Kern County General Plan

Land Use, Open Space, and Conservation Element: Section 1.10.2, Air Quality

Policies

Policy 18 The air quality implications of new discretionary land use proposals shall be considered in approval of major developments. Special emphasis will be placed on minimizing air quality degradation in the desert to enable effective military operations and in the valley region to meet attainment goals.

Policy 19 In considering discretionary projects for which an Environmental Impact Report must be prepared pursuant to the California Environmental Quality Act, the appropriate decision making body, as part of its deliberations, will ensure that: (a) All feasible mitigation to reduce significant adverse air quality impacts have been adopted; and (b) The benefits of the proposed project outweigh any unavoidable significant adverse effects on air quality found to exist after inclusion of all feasible mitigation. This finding shall be made in a statement of overriding considerations and shall be supported by factual evidence to the extent that such a statement is required pursuant to the California Environmental Quality Act.

Policy 20 The County shall include fugitive dust control measures as a requirement for discretionary projects and as required by the adopted rules and regulations of the San Joaquin Valley Unified Air Pollution Control District and the Kern County Air Pollution Control District on ministerial permits.

Policy 21 The County shall support air districts' efforts to reduce PM10 and PM2.5 emissions.

Policy 22 Kern County shall continue to work with the San Joaquin Valley Unified Air Pollution Control District and the Kern County Air Pollution Control District toward air quality attainment with federal, State, and local standards.

Implementation Measures

Measure F All discretionary permits shall be referred to the appropriate air district for review and comment.

Measure G Discretionary development projects involving the use of tractor-trailer rigs shall incorporate diesel exhaust reduction strategies including, but not limited to:
a. Minimizing idling time.
b. Electrical overnight plug-ins.

Measure J The County should include PM_{10} control measures as conditions of approval for subdivision maps, site plans, and grading permits.

Additionally, the Kern County Planning and Natural Resources Department has developed *Guidelines for Preparing an Air Quality Impact Assessment for Use in Environmental Impact Reports* to assist with

the preparation of the air quality assessments for use as a technical document in Environmental Impact Reports (Kern County Planning Department 2006).

Kern County Best Management Practices for Dust Management

In 2013, solar developers and planners from Los Angeles and Kern Counties began a series of meetings to discuss the best management practices for protecting air quality and minimizing construction impacts from solar projects. The process incorporated feedback from the Mojave Air and Space Port, members of the Mojave Chamber of Commerce, Rosamond Municipal Advisory Council, and numerous other community leaders. Subsequent to these meetings, Kern County developed a new approach to best control fugitive dust emissions and improve air quality in the high desert. The County's approach recognizes that effective dust control management must be site-specific and cannot be "one size fits all" because standard methods do not adequately meet the challenges of such a unique environment as the Mojave Desert region. An effective strategy has to be based on soil conditions, topography, adjacent land uses, and wind direction.

Conditions imposed on the new solar projects in Kern County are more extensive and rigorous than ever before. These include:

- Development of a site-specific Dust Control Plan that considers ongoing community stakeholder input, to the extent feasible and practicable.
- Use of Global Positioning System (GPS) or lasers to level posts, generally avoiding grading except when elevation changes exceed design requirements.
- When grading is unavoidable, it is to be phased and done with the application of approved chemical dust palliatives that stabilize the earth.
- Use of dust suppression measures during road surface preparation activities, including grading and compaction.
- Final road surfaces must be stabilized to achieve a measurable threshold friction velocity (TFV; the wind speed at which erosion starts) equal to or greater than 100 centimeters per second.
- If ground is cleared, plant roots must be left in place where possible.
- Expanded onsite watering processes.
- Installation of wind barrier fencing or screening.
- Vehicle speed for all construction vehicles shall not exceed 15 miles per hour (mph) on any unpaved (i.e., without asphalt) surface at the construction site.
- All trucks hauling dirt, sand, soil, or other loose materials shall be covered or shall maintain at least 2 feet of freeboard.
- Sending mailings to residents within 1,000 feet of a project site.

Kern County is also carefully monitoring all solar construction activities to ensure that all mitigation measures are followed and are adequate to minimize dust-related health concerns.

4.3.2.2 Greenhouse Gases

Energy Element: Section 5.4.5, Solar Energy Development

Policies

Policy 1 The County shall encourage domestic and commercial solar energy uses to conserve fossil fuel and improve air quality.

Policy 3 The County should permit solar energy development in the desert and valley planning regions that does not pose significant environmental or public health and safety hazards.

Policy 4 The County should encourage solar development in the desert and valley regions previously disturbed and discourage development of energy projects on undisturbed land supporting State or federally protected plant and wildlife species.

Implementation Measures

Measure A The County shall continue to maintain, and update as necessary, provisions in the Kern County Zoning Ordinance to provide adequate development standards for commercial solar energy development.

Measure B The County should work with affected State and federal agencies and interest groups to establish consistent policies for solar energy development.

5.0 REGIONAL AND LOCAL AIR QUALITY CONDITIONS

5.1 EKAPCD Attainment Status

In an effort to protect human health and welfare, the CARB and EPA have established Ambient Air Quality Standards. Areas are considered in "attainment" if standards are met and "nonattainment" if they are not met. For ozone, nonattainment status is further classified as marginal, moderate, serious, severe, or extreme. For PM_{10} and $PM_{2.5}$, nonattainment status is further classified as moderate or serious.

At the federal level, the EKAPCD is designated as a severe nonattainment area for the 8-hour ozone standard. At the state level, the region is designated as a nonattainment area for the 1-hour ozone standard, 8-hour ozone standard, and the PM_{10} standards. The attainment classifications for the criteria pollutants are presented in Table 2.

Table 2. EKAPCD Attainment Status

Pollutant	Designation/Classification	
	Federal Standards	State Standards
Ozone (1-Hour)	No Federal Standard	Nonattainment
Ozone (8-Hour)	Nonattainment/ Severe	Nonattainment
NO_2	Attainment/Unclassified	Attainment
CO	Attainment/Unclassified	Unclassified
PM_{10}	Attainment/Unclassified	Nonattainment
$PM_{2.5}$	Attainment/Unclassified	Unclassified
SO_2	Attainment/Unclassified	Attainment

Pollutant	Designation/Classification	
	Federal Standards	State Standards
Lead	Attainment/Unclassified	Attainment
Hydrogen Sulfide	No Federal Standard	Unclassified
Sulfates	No Federal Standard	Attainment
Visibility Reducing Particles	No Federal Standard	Unclassified
Vinyl Chloride	No Federal Standard	Attainment

Source: EKAPCD 2025, CARB 2023.

5.2 Local Ambient Air Quality

An extensive network of air monitoring stations, operated by CARB and the U.S. National Park Service, measure concentrations of air pollutants to determine attainment status as well as generate air quality forecasts.

The closest monitor measuring ozone concentrations is the Arvin-Di Giorgio monitoring station, located approximately 32 miles northwest of the Project site. For $PM_{2.5}$, the closest monitor is the Bakersfield-Airport monitoring station located approximately 45 miles northwest of the Project site. For NO_2, the closest monitor is the Edison monitoring station located approximately 40 miles northwest of the Project site. For PM_{10}, the closest monitor is the Bakersfield-Golden State Highway monitoring station located approximately 50 miles northwest of the Project site. Finally, for CO, the Bakersfield-Muni monitoring station is the closest, located approximately 44 miles northwest of the Project site. Although there are no monitoring stations within the project vicinity that have available measurements for SO_2, data from the Los Angeles-North Main Street monitoring station (located approximately 70 miles south of the Project site) was used. The locations of the closest monitors chosen for this analysis do not necessarily reflect the exact Project site conditions (i.e., generally undeveloped land). Most of the monitors are located in nearby towns where monitoring data recorded are expected to show higher concentrations of criteria pollutants. Therefore, these monitoring locations are considered to be conservatively representative of the air quality in the immediate vicinity of the Project. Table 3 summarizes the most recent air quality data from 2021 through 2023 with the number of days exceeding the ambient air quality standards.

Table 3. Local Ambient Air Quality Monitoring Data for the Years 2021-2023

Averaging Period	2021	2022	2023
Ozone (O_3) – Arvin-Di Giorgio, California Monitoring Station (AQS Site ID: 06-019-5002)			
1-hour Maximum Concentration (ppm)	0.106	0.110	0.109
Number of days exceeding CAAQS = **0.09 ppm**	10	16	7
8-hour Maximum Concentration	0.095	0.091	0.095
Number of days exceeding CAAQS = **0.070 ppm**	48	66	45
Number of days exceeding NAAQS = **0.070 ppm**	48	66	45
Nitrogen Dioxide (NO_2) – Edison, California Monitoring Station (AQS Site ID: 06-029-0007)			
1-hour Maximum Concentration (ppb)	41.5	33.3	41.7
Number of days exceeding CAAQS = **180 ppb**	0	0	0
Number of days exceeding NAAQS = **100 ppb**	0	0	0

Averaging Period	2021	2022	2023
Annual Average Concentration (ppm) (**53 ppb NAAQS**)	5	5	4
Carbon Monoxide (CO) – Bakersfield-Muni, California Monitoring Station (AQS Site ID: 06-029-2012)			
1-hour Maximum Concentration (ppm)	2.8	1.5	1.6
Number of days exceeding CAAQS = **20 ppm**	0	0	0
Number of days exceeding NAAQS = **35 ppm**	0	0	0
8-hour Maximum Concentration (ppm)	1.3	0.9	0.9
Number of days exceeding CAAQS = **9 ppm**	0	0	0
Number of days exceeding NAAQS = **9 ppm**	0	0	0
Inhalable Particulate Matter (PM_{10}) – Bakersfield-Golden State Highway, California Monitoring Station (AQS Site ID: 06-029-0010)			
24-hour Maximum Concentration (µg/m^3)	175.0	64.7	236.3
Number of days exceeding CAAQS = **50 µg/m^3**	25	178	146
Number of days exceeding NAAQS = **150 µg/m^3**	1	0	1
Annual Average Concentration (µg/m^3) (**20 µg/m^3 CAAQS**)	*	*	*
Fine Particulate Matter ($PM_{2.5}$) – Bakersfield-Airport (Planz), California Monitoring Station (AQS Site ID: 06-029-0016)			
24-hour Maximum Concentration (µg/m^3)	70.5	55.6	58.8
Number of days exceeding NAAQS = **35 µg/m^3**	17	13	3
Annual Average Concentration (µg/m^3) (**12 µg/m^3 NAAQS**)1/	20	16.1	12.4
Sulfur Dioxide (SO_2) – Los Angeles-North Main Street, California Monitoring Station (AQS Site ID: 06-037-1103)			
1-hour Maximum Concentration (ppb)2/	2.2	6.5	7.7
Number of days exceeding NAAQS = **75 ppb**	0	0	0
24-hour Maximum Concentration (ppb)	1.2	1.2	2.3
Number of days exceeding NAAQS = **14 ppb**	0	0	0
Annual Average Concentration (ppb) (**30 ppb**)	0.39	0.26	0.17

Notes: µg/m^3 – microgram per cubic meter; CAAQS – California Ambient Air Quality Standards; NAAQS – National Ambient Air Quality Standards; ppb – parts per billion; ppm – parts per million.

1/ Revised effective May 6, 2024 (89 *Federal Register* 16202, Reconsideration of the National Ambient Air Quality Standards for Particulate Matter)

2/ A 3-hour average secondary SO_2 NAAQS of 0.5 ppm is not to be exceeded more than once per year. 3-hour average concentrations of SO_2 were not readily available for the monitor. However, because the maximum 1-hour average concentrations are less than the 3-hour NAAQS, the area is meeting the 3-hour secondary NAAQS.

* Insufficient data available to determine the value.

Sources: CARB 2024c and EPA 2025b

6.0 METHODOLOGY AND SIGNIFICANCE CRITERIA

6.1 Thresholds of Significance

6.1.1 California Environmental Quality Act Guidelines

The Kern County CEQA Implementation Document and Kern County Environmental Checklist (updated in May 2019) identify the following criteria, as established in Appendix G of the State CEQA Guidelines, to determine if a project could potentially have a significant adverse effect related to air quality. A project is considered to have a significant air quality impact if it will:

- Conflict with or obstruct implementation of the applicable air quality plan.

- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under applicable federal or state ambient air quality standards.
- Expose sensitive receptors to substantial pollutant concentrations.
- Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

6.1.2 Criteria Pollutants

As stated previously, the Kern County Planning and Natural Resources Department has developed the *Guidelines for Preparing an Air Quality Impact Assessment for Use in Environmental Impact Reports* to assist with the preparation of the air quality assessments for use as a technical document in Environmental Impact Reports (Kern County Planning Department 2006). Additionally, the EKAPCD has adopted the *Guidelines for Implementation of the California Environmental Quality Act (CEQA) of 1970, as Amended*. These guidelines establish the thresholds for specific pollutants, emissions above which are considered significant (EKAPCD 1999).

The adopted emissions-based thresholds for criteria pollutants are shown in Table 4. Projects that produce emissions that exceed the adopted thresholds shall be considered significant for a project level and/or cumulatively for impacts to air quality (Kern County 2006).

Table 4. Air Quality Thresholds of Significance

Pollutant	EKAPCD Annual Threshold (tpy)[1/]	EKAPCD Daily Threshold (lb/day)[2/]
ROG	25	137
NO_X	25	137
PM_{10}	15	--

Notes: tpy – ton per year; lb/day – pound per day; ROG – reactive organic gases; NO_x – oxides of nitrogen; PM_{10} – particulate matter less than 10 microns in diameter
"--" means no threshold has been established.
1/ Kern County Planning Department 2006
2/ EKAPCD 1999

The Kern County Planning and Natural Resources Department also recommends performing a SCREEN3 or AERMOD modeling of maximum 24-hour average concentration of primary PM_{10}, $PM_{2.5}$ and odorous compounds at the Project boundary, with comparison to NAAQS. The respective Significant Impact Levels (SILs) reflect the threshold for which a project's emissions would not cause or significantly contribute to a violation of the NAAQS, and therefore no additional analysis is necessary for that pollutant and averaging period. Applicable SILs for impact analysis are presented in Table 5.

Table 5. Significant Impact Levels

Pollutant	Averaging Period	Rank for SIL Assessment	SIL (µg/m³)
PM_{10}	24-hour	HIH[1/]	5
$PM_{2.5}$	24-hour	HIH (5-year Average)	1.2

Notes: µg/m3 – microgram per cubic meter: $PM_{2.5}$ – particulate matter less than 2.5 microns in diameter; PM_{10} – particulate matter less than 10 microns in diameter; SIL – Significant Impact
1/ Highest first High

In addition to the annual emissions mass thresholds described in Table 4, the Kern County Planning and Natural Resources Department recommends performing a CO hotspot analysis for the following project conditions:

- Level of Service (LOS) of an intersection or roadway is identified as LOS E or worse;
- Signalization and/or channelization is added to an intersection; and
- Sensitive receptors such as residences, schools, hospitals, etc. are located in the vicinity of the affected intersection or signalization.

An LOS E roadway is characterized by unstable traffic flow at or near capacity levels with poor levels of comfort and convenience. A LOS F roadway is characterized by forced traffic flow in which the amount of traffic approaching a point exceeds the amount that can be served. LOS F is characterized by stop-and-go waves, poor travel times, low comfort and convenience, and increased accident exposure.

6.1.3 Air Toxics

The Kern County Planning and Natural Resources Department's *Guidelines for Preparing an Air Quality Impact Assessment for Use in Environmental Impact Reports* recommends completing an HRA as part of the preparation of the Air Quality Assessment to analyze the acute, chronic, and carcinogenic health risks of pollutants, including TACs that would be emitted during project operations. For this purpose, the thresholds established by EKAPCD's Rule 208.2 were used. The following are the TAC significance thresholds:

- Carcinogens: Maximally exposed individual risk equals or exceeds 1 in 1 million.
- Non-Carcinogens, Acute: Hazard Index equals or exceeds 0.2 for the maximally exposed individual.
- Non-Carcinogens, Chronic: Hazard Index equals or exceeds 0.2 for the maximally exposed individual.

6.1.4 Greenhouse Gases

The EKAPCD has established significance thresholds for determining individual and cumulative significance of project-specific GHG emissions on climate change when issuing permits for new stationary source projects. According to this, a project that emits less than 25,000 tons per year of GHGs would be determined to have a less than significant individual or cumulatively considerable impact on GHG emissions and would not require further CEQA review (EKAPCD 2012a).

6.2 Methodology

6.2.1 Project-related Emissions

Potential air quality and global climate change impacts associated with the Project are related to emissions during construction and subsequent operation of the Project. Emissions were estimated using the California Emissions Estimator Model (CalEEMod; Version 2022.1.1.21). The model contains data specific to each California air basin. The model quantifies direct emissions from construction and operations (including vehicle use), as well as indirect emissions, such as GHG emissions from energy

use, solid waste disposal, vegetation planting and/or removal, and water use. For calculation of on-road (off-site) mobile sources, CalEEMod uses the EMFAC 2021 emissions model.

6.2.1.1 Construction

The principal sources of pollutants during construction would be earth-moving activities, construction equipment, trucks bringing materials to and from the Project site, and construction crew commuting vehicles. The construction processes are anticipated to occur over a period of approximately 34 months, beginning in the fourth quarter of 2025. Project construction would consist of several phases (Table 6), with an overlap between most phases.

The first phase would include mobilization followed by site preparation, which would consist of mowing, excavation, and grading of the Project site. Conventional grading would be performed throughout the site but minimized to the maximum extent possible to reduce unnecessary soil movement that may result in dust. Cut and fill will be balanced on the site, and no import or export of soils would occur. Site preparation would be consistent with County best management practices and EKAPCD rules for dust control. Dust-minimizing techniques would be employed, such as maintaining natural vegetation where possible, using a mow-and-roll vegetation clearance strategy, placing wind control fencing, applying water, and applying dust suppressants. Water for dust control and other construction needs would be sourced from two proposed wells (or any potential existing onsite wells) located on the Project site or trucked to the Project site. The second phase would involve trenching for placement of underground electrical and communication lines to connect the solar arrays with the inverters and the inverters to the substation, and construction of the 230-Kv switchyard. The third phase would involve installation of the PV system that would include support structures and associated electrical equipment and cabling, and construction of the 230-Kv gen-tie. This would be followed by the next phase that would involve installation of the energy storage system. The final phase would consist of testing and commissioning.

Power required for construction activities, such as temporary construction trailers, would be provided via portable/backup generators or temporary local distribution. Generators used onsite for construction, for backup power supply, or for emergency fire protection would abide by CARB and EKAPCD regulations. Construction would primarily occur during daylight hours, Monday through Friday between 6:00 a.m. and 6:00 p.m. as required to meet the construction schedule. It was assumed that construction equipment would operate for 5 days per week during Project construction.

The onsite construction workforce is expected to peak at approximately 660 individuals who will be onsite at any given time. It is anticipated that the construction workforce would generally commute to the Project site each day from local communities and report to designated construction laydown areas prior to the beginning of each workday. Construction staff not drawn from the local labor pool would stay in local hotels in Rosamond, Mojave, Lancaster, Tehachapi, or other local communities.

The Project would also include hauling, vendor, and onsite trucks that would be used for transporting materials onsite and/or offsite during construction. Vehicle use of area roadways resulting from transporting materials and workers to and from the Project site would decrease significantly following the 34-month construction period.

Construction scenario assumptions, including phasing, equipment, and vehicle trips, were based on information provided by the Applicant.

Table 6 shows the construction schedule and Table 7 shows the construction equipment and vehicle trips.

Table 6. Construction Schedule

Phase	Description	Duration (Days)
1	Site Mobilization	65
2	Site Preparation	131
3	Underground Work	87
4	System Installation and Gen-Tie Construction	545
5	Energy Storage System	327
6	Testing and Commissioning	523
7	General Management	741

Table 7. Construction Equipment and Vehicle Trips Per Phase

Construction Phase	Equipment			Daily Worker Vehicle Trips[1/]	Daily Vendor Trips[1/]	Total Haul Truck Trips[1/]	Onsite Truck Trips[1/2/]
	Equipment Type	Quantity	Usage Hours				
Site Mobilization	--	--	--	30	--	--	--
Site Preparation and Grading	Skid Steer Loaders	6	8	60	72	48	22
	Graders	3	8				
	Rubber Tired Dozers	3	8				
	Rollers	6	8				
	Tractors/Loaders/Backhoes	2	8				
Underground Work	Excavators	3	8	24	72	48	20
	Other Material Handling Equipment (screening machine)	2	8				
	Rollers	2	8				
	Forklifts	3	8				
	Tractors/Loaders/Backhoes	4	8				
System Installation and Gen-Tie Construction	Forklifts	12	8	958	72	48	44
	Skid Steer Loaders	18	8				
	Tractors/Loaders/Backhoes	6	8				
	Other Construction equipment (Pile drivers)	16	8				
	Generator Sets	3	8				
	ATVs[3/]	40	8				
	Cranes	1	8				
Energy Storage System	Cranes	1	8	210	72	48	--
	Graders	1	8				
	Forklifts	1	8				

Construction Phase	Equipment			Daily Worker Vehicle Trips[1/]	Daily Vendor Trips[1/]	Total Haul Truck Trips[1/]	Onsite Truck Trips[1/2/]
	Equipment Type	Quantity	Usage Hours				
	Skid Steer Loaders	2	8				
Testing and Commissioning	--	--	--	60	72	48	20
General Management	--	--	--	100	--	--	--

Notes:
1/ Number reflects daily one-way trips.
2/ Number includes water trucks and pickup trucks.
3/ All-terrain vehicles (ATVs) are represented by gasoline-fueled Skid Steer Loaders due to unavailability of ATV-specific data in CalEEMod.

6.2.1.2 Operations

Once constructed, the Project would operate 7 days per week, 365 days per year. It is anticipated that approximately six permanent, full-time employees would be needed to maintain the facility. Typical operations and maintenance activities that would occur at the Project site during operation include, but are not limited to, liaison and remote monitoring; administration and reporting; semi-annual and annual services; remote operations of inverters and battery energy storage systems; site security and management; additional communication protocol; repair and maintenance of solar facilities, battery storage facilities, collector substations, electrical transmission lines, and other Project facilities; battery storage facility supplemental phasing and/or augmentation; mowing and vegetation control; and periodic panel washing. Panel washing is anticipated to require site visits on the order of once to twice per year, consisting of a crew of up to ten individuals. Assuming one or two solar panel wash cycles per year plus typical operations and maintenance activities, the annual water usage is expected to be approximately 20 acre-feet of water. This amount includes the water necessary for Project operations, fire suppression, and site maintenance. Maintenance trucks would be utilized to perform routine maintenance, including but not limited to equipment testing, monitoring, repair, routine procedures to ensure service continuity, and standard preventive maintenance. Power for operations and maintenance activities would be provided by the Project's electrical generation, supplied by the local power provider or via portable/backup generators.

Operational emissions were estimated using CalEEMod to include emissions from water use, offroad equipment, and mobile sources. Emergency backup generators for the Project's substations or the battery energy storage systems may be required. If required, there would be up to six 500-kilowatt diesel generators, each need to be exercised for maintenance and testing purposes. Stationary emissions from portable/backup generators are expected to meet the emission standards for CARB certified Tier 4 engines. Emission factors used to quantify emissions from the emergency backup generators are provided in Appendix B. Operational assumptions were based on information provided by the Applicant.

6.2.1.3 Decommissioning

At the end of the proposed project's anticipated operational life of up to approximately 35 years, the project proponent would determine whether the project site should be decommissioned and deconstructed or if it would seek an extension of its operation and the appropriate permitting

pathways. Based on the expectation that equipment and vehicles used for decommissioning would be similar to those used for construction of the Project, decommissioning emissions are conservatively assumed to be the same as construction emissions. Decommissioning emissions presented in the analysis do not take into account any future improvement in technology, which would likely result in reduced emissions.

6.2.2 Air Quality Impact Assessment

Air quality impacts from DPM (represented by exhaust PM_{10}) were assessed using AERMOD v23132. Construction equipment emissions were simulated as multiple area sources covering the Project site. The modeling inputs are summarized below:

- AERMOD was executed with the EPA regulatory default option.
- Five years of meteorological data (2012, 2016, 2017, 2019, and 2020) comprising Edwards Air Force Base, California, surface observations with concurrent upper air data from Miramar, California, were obtained from CARB (2024d) in AERMOD-ready processed format. This meteorological data set was used to estimate pollutant concentrations by the refined AERMOD modeling to best represent an annual average predicted concentration that can occur considering varying hourly meteorology over a 5-year period.
- Receptor elevations were determined by using National Elevation Data processed with the AERMAP v18181 terrain preprocessor. Fenceline receptors were placed at 25-meter intervals to identify potential impacts at the Project boundary.
- Since particulate emissions are primarily from construction fugitive dust emissions, the representative area sources were characterized to have a release height of zero meter for the $PM_{2.5}$ and PM_{10} modeling runs. The initial vertical dimension was assumed to be 2.37 meters (EPA 2012). Annual mitigated construction equipment emissions were determined from CalEEMod and assigned to the area source. The HROFDAY factor in AERMOD was used to reflect the construction schedule (6:00 a.m.–6:00 p.m. Monday through Friday).

AERMOD dispersion modeling output files are provided in Appendix C.

6.2.3 Health Risk Assessment

An HRA was conducted for Project construction emissions using HARP2 (v22118) based on values from AERMOD. Therefore, the discussion of dispersion modeling input parameters in the Air Quality Impact Assessment (Section 6.2.2) above also applies to the HRA, with a few exceptions, as discussed in this section. As per the OEHHA Risk Assessment Guidance (OEHHA 2015), it is recommended to include the following types of receptors in HRAs:

- Point of Maximum Impact (PMI),
- Maximally Exposed Individual Resident (MEIR),
- Maximally Exposed Individual Worker (MEIW), and
- Sensitive Receptors (e.g., schools, day care centers, elder care centers, hospitals, etc.).

The PMI is expected to occur at the Project boundary due to the near-surficial release height of the vehicle exhaust. Discrete receptors were identified to represent MEIRs and MEEWs. As stated previously, a few sensitive receptors were identified within the Project vicinity. Additionally, a flagpole height of 1.8 meters was used to represent the breathing zone of a person. The area source was characterized to have a release height of 2.55 meters with an initial vertical dimension of 2.37 meters (EPA 2012). The AERMOD dispersion modeling output file is provided in Appendix C.

The OEHHA default values for fraction at home, breathing rates, etc., were used for exposure calculations in HARP2. Since operational activities would be limited to routine inspection and maintenance, which would have negligible emissions, no quantitative HRA was performed. Electronic HARP2 files are provided in Appendix D.

7.0 RESULTS

This section describes the results of the air quality analysis, dispersion modeling, and HRA.

7.1 Project-related Emissions

7.1.1 Construction and Decommissioning

Each construction phase has the potential to generate the following: (1) fugitive dust emissions resulting from soil disturbance activity; (2) emissions of air pollutants from fuel combustion in construction equipment; and (3) emissions of air pollutants from fuel combustion in vehicles used for worker commute, equipment deliveries, and material hauling.

Based on the methodology described previously, the annual and daily Project construction emissions with comparison to applicable thresholds are provided in Table 8A and Table 8B. Emissions with and without Tier 4 mitigation and dust control reductions are presented. Detailed emission calculations are provided in Appendix B. Mitigation measures for dust control applied in CalEEMod for this analysis include:

- Watering of exposed surfaces up to 3 times per day,
- Watering of unpaved construction roads up to 2 times per day, and
- Implementation of vehicle speed on unpaved roads (assumes a CalEEMod default speed of 25 mph).

As shown below, the annual unmitigated PM_{10} emissions would exceed the EKAPCD threshold. However, with the incorporation of Tier 4 engines for off-road equipment rated greater than 25 horsepower and dust control measures, annual PM_{10} emissions would fall below the established threshold. Unmitigated construction maximum daily NO_x emissions would also exceed the daily threshold, but as stated above, usage of Tier 4 engines for off-road equipment would reduce the emissions to less than the EKAPCD threshold.

Table 8A. Estimated Annual Construction Criteria Pollutant Emissions

Project Emissions	Emissions (tons)					
	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
Unmitigated						
2025	0.50	4.64	50.6	0.011	11.8	2.0

Project Emissions	Emissions (tons)					
	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
2026	2.02	18.3	302	0.050	48.7	8.1
2027	1.52	13.8	275	0.040	43.6	6.9
2028	0.05	0.39	0.62	0.002	4.42	0.5
Tier 4 & Dust Control Reductions						
2025	0.25	2.43	50.6	0.011	3.20	0.49
2026	1.32	11.3	302	0.050	13.5	2.01
2027	1.09	9.17	275	0.040	12.1	1.70
2028	0.05	0.39	0.62	0.002	1.26	0.16
EKAPCD Threshold (tons/year)	***25***	***25***	**--**	**--**	***15***	**--**
Threshold Exceeded?	**No**	**No**	**--**	**--**	**No**	**--**

CO – carbon monoxide; NOx – nitrogen oxides; PM_{10} – particulate matter less than 10 microns in diameter; $PM_{2.5}$ – particulate matter less than 2.5 microns in diameter; ROG – reactive organic gas; SO_x – sulfur oxides

Table 8B. Estimated Maximum Daily Construction Criteria Air Pollutant Emissions

Project Emissions	Emissions (lbs/day)					
	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
Unmitigated	21	195	2,377	0.52	518	85
Tier 4 & Dust Control Reductions	12	111	2,377	0.52	170	41
EKAPCD Threshold (lbs/day)	***137***	***137***	**--**	**--**	**--**	**--**
Threshold Exceeded?	**No**	**No**	**--**	**--**	**--**	**--**

CO – carbon monoxide; NOx – nitrogen oxides; PM_{10} – particulate matter less than 10 microns in diameter; $PM_{2.5}$ – particulate matter less than 2.5 microns in diameter; ROG – reactive organic gas; SO_x – sulfur oxides

Table 8C presents the projected annual emissions from decommissioning of the Project with and without Tier 4 mitigations and dust control measures applied.. Table 8D presents the projected daily emissions from decommissioning of the Project, with and without Tier 4 mitigations and dust control measures applied. Decommissioning emissions are based on the emission values that were estimated for construction. Potential calendar years cannot yet be assigned to decommissioning emissions since the actual timing of those activities is not known. To facilitate comparison of decommissioning emissions to the EKAPCD annual thresholds, the total construction emissions were scaled by a ratio of 12/34, which represents the emissions that could occur in a single 12-month period (out of the total 34-month construction period).

Table 8C. Projected Annual Decommissioning Criteria Air Pollutant Emissions1

Project Emissions	Emissions					
	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
Unmitigated	1.44	13.12	221.66	0.04	38.28	6.17
Tier 4 & Dust Control Reductions	0.96	8.22	221.66	0.04	10.61	1.54
EKAPCD Threshold (tons/year)	**25**	**25**	**--**	**--**	**15**	**--**
Threshold Exceeded?	**No**	**No**	**--**	**--**	**No**	**--**

[1] Project decommissioning is projected to be approximately the same time in duration as construction. To facilitate comparison to the EKAPCD Annual Thresholds, total construction emissions were scaled by a factor of 12 months to 34 months.

Table 8D. Projected Maximum Daily Decommissioning Criteria Air Pollutant Emissions

Project Emissions	Emissions					
	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
Unmitigated	21	195	2,377	0.52	518	85
Tier 4 & Dust Control Reductions	12	111	2,377	0.52	170	41
EKAPCD Threshold (lbs/year)	***137***	***137***	--	--	--	--
Threshold Exceeded?	**No**	**No**	--	--	**No**	--

CO – carbon monoxide; NOx – nitrogen oxides; PM_{10} – particulate matter less than 10 microns in diameter; $PM_{2.5}$ – particulate matter less than 2.5 microns in diameter; ROG – reactive organic gas; SO_x – sulfur oxides

7.1.2 Operations

Table 9A and Table 9B present the estimated annual and maximum daily operational emissions in pounds per day with a comparison to EKAPCD thresholds. Operational emissions would not exceed EKAPCD thresholds. Detailed emissions calculations are provided in Appendix B.

Table 9A. Estimated Annual Operational Criteria Pollutant Emissions

Project Emissions	Emissions (tons)					
	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
Offroad, Mobile and Energy	0.18	0.74	0.98	0.004	0.04	0.03
Stationary	0.06	0.13	1.16	0.002	0.007	--
Total	0.24	0.87	2.14	0.006	0.05	0.03
EKAPCD Threshold (tons/year)	***25***	***25***	--	--	***15***	--
Threshold Exceeded?	**No**	**No**	--	--	**No**	--

CO – carbon monoxide; NOx – nitrogen oxides; PM_{10} – particulate matter less than 10 microns in diameter; $PM_{2.5}$ – particulate matter less than 2.5 microns in diameter; ROG – reactive organic gas; SO_x – sulfur oxides

Table 9B. Estimated Maximum Daily Operational Criteria Air Pollutant Emissions

Project Emissions	Emissions (lbs/day)					
	ROG	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$
Offroad, Mobile & Energy	4.75	24.40	30.60	0.124	0.97	0.82
Stationary	1.26	2.65	23.15	0.043	0.13	--
Total	6.00	27.05	53.75	0.17	1.10	0.82
EKAPCD Threshold (lbs/day)	***137***	***137***	--	--	--	--
Threshold Exceeded?	**No**	**No**	--	--	--	--

CO – carbon monoxide; NOx – nitrogen oxides; PM_{10} – particulate matter less than 10 microns in diameter; $PM_{2.5}$ – particulate matter less than 2.5 microns in diameter; ROG – reactive organic gas; SO_x – sulfur oxides

7.2 Air Quality Impact Assessment

The Air Quality Impact Assessment results for maximum 24-hour average concentrations of primary $PM_{2.5}$ and PM_{10} construction-related mitigated emissions are provided in Table 10. As shown, predicted impacts at the Project boundary for both pollutants are below their respective SILs. AERMOD results and input files are provided in Appendix C.

Table 10. 24-hour PM_{10} and $PM_{2.5}$ Construction-Related Mitigated Emissions

Pollutant	PM_{10}	$PM_{2.5}$
Modeled Emissions (µg/m³)	1.3	0.12
SIL (µg/m³)	*5*	*1.2*
Above the SIL?	**No**	**No**

µg/m³ – microgram per cubic meter; PM_{10} – particulate matter less than 10 microns in diameter; $PM_{2.5}$ – particulate matter less than 2.5 microns in diameter; SIL – Significant Impact Level

7.3 Health Risk Assessment

The HRA results quantified using the HARP2 model are summarized in Table 11, which includes cancer and chronic risk (as characterized by the Hazard Index at the PMI, MEIRs, and MEIWs). Detailed results and HARP2 files are provided in Appendix D.

Table 11. HRA for Mitigated Construction Emissions

Maximum Impact Receptor	Cancer Risk (Persons per Million)	Chronic Hazard Index	Receptor Coordinates (UTM NAD 83 Zone 10)		Distance to Project Boundary (miles)
			Easting (meters)	Northing (meters)	
PMI	1.04	0.0007	383649.41	3873133.75	*
MEIR-5	0.44	0.0003	378486	3871853	<0.1
MEIR-6	0.52	0.0004	379354	3871868	0.1
MEIR-7	0.51	0.0004	378889	3870319	<0.1
MEIW-2	0.002	<0.0001	385248	3868276	1.5
MEIW-4	0.002	<0.0001	392883	3879921	5.4
MEIW-7	0.004	0.0001	385203	3870036	0.5
Sensitive Receptor-1	0.05	<0.0001	391577	3879168	4.4
Sensitive Receptor-2	0.03	<0.0001	393648	3878855	5.5
Sensitive Receptor-3	0.03	<0.0001	393618	3879292	5.4
EKAPCD Rule 208.2 threshold	***1***	***0.1***	**--**	**--**	**--**

*PMI occurs at Project Boundary

MEIR – Maximally Exposed Individual Resident; MEIW – Maximally Exposed Individual Worker; NAD83 – North American Datum of 1983; PMI – point of maximum impact; UTM – Universal Transverse Mercator

8.0 DISCUSSION AND RECOMMENDATIONS

8.1 Air Quality Impacts

Would the project conflict with or obstruct implementation of the applicable air quality plan?

A project is nonconforming with an air quality plan if it conflicts with or delays implementation of any applicable attainment or maintenance plan. A project is conforming if it complies with all applicable EKAPCD rules and regulations, complies with all proposed control measures, and is consistent with the growth forecasts in the applicable plan. Projects that do not increase dwelling unit density, do not increase vehicle trips, and do not increase vehicle miles traveled are also deemed to comply with the applicable air quality plan. The EKAPCD has prepared several air quality attainment plans to achieve

particulate matter standards. Although the Project is not located within the Indian Wells Valley, the PM_{10} Maintenance Plan was used as a guideline for evaluating potential impacts. As shown in Table 10, the Project's PM_{10} will not exceed the SIL, and as such will conform to the EKAPCD's attainment plans. Additionally, through implementation of best management practices and **MM AQ-2**, the Project would also comply with applicable EKAPCD rules and regulations, such as Rule 402, which is discussed in Section 4.3. As per this rule, the Applicant will submit a Fugitive Dust Control Plan prior to the commencement of any earth-moving activity. As discussed in Section 4.3, the adopted ozone attainment plan identifies emission control measures and associated emission reductions necessary to demonstrate attainment of the 2015 ozone NAAQS by 2033. The plan discusses Reasonably Available Control Measures required to meet the attainment goal. California regulations for off-road equipment include not only increasingly stringent emission standards for new off road diesel engines, but also in-use requirements and idling restrictions. Through implementation of **MM AQ-2**, Project construction would be consistent with this plan.

Project construction would not result in a long-term increase in the number of trips or increase the overall vehicle miles traveled in the area. Worker vehicle trips, vendor trucks, and haul trucks would be generated during the proposed construction activities but would decrease significantly after construction is completed. The additional jobs required for the Project would be well within the annual growth projection presented in the KCOG's 2022 Regional Transportation Plan and Sustainable Communities Strategy.

During the longer-term operational phase, the Project would have routine inspection and maintenance activities that would result in emissions. However, as shown in Table 9A and Table 9B, the increase in emissions would not exceed any significance threshold. Based on this, Project operations are not expected to generate significant dust or particulate matter. Therefore, operation of the solar facility would be consistent with the EKAPCD's attainment plans.

Although the equipment and vehicles used for decommissioning the Project are unknown at this time, the analysis assumes that it will be similar to those used for construction. Therefore, decommissioning activities are also not expected to result in a long-term increase in the number of trips or the overall vehicle miles traveled in the area.

Additionally, although traffic associated with the Project site may increase during construction and decommissioning, this would decrease significantly after the work is complete. Moreover, the workforce is expected to come from the existing construction labor pool in Kern County. The Project is in a sparsely populated area and is unlikely to result in challenges to traffic flow. There are no intersections or roadways identified as LOS E or worse associated with the Project. There would be no signalization or channelization added to an intersection as part of this Project. Therefore, with implementation of the management measures mentioned above, the Project would not conflict with or obstruct implementation of applicable EKAPCD rules and regulations.

Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard?

As stated previously, the Kern County Planning and Natural Resources Department has established annual significance thresholds to address pollution sources associated with general construction activities, such as the operation of on-site construction equipment, fugitive dust from site grading activities, and travel by construction workers. In addition to these thresholds, the EKAPCD also recommends the use of daily emissions thresholds for the evaluation of potential impacts on localized ambient air quality. With the exception of PM_{10}, unmitigated construction annual and daily emissions will be below the established EKAPCD thresholds (Table 8A and Table 8B). With the use of best management practices, **MM AQ-1**, and **MM AQ-2**, PM_{10} emissions would also be below the established EKAPCD annual threshold. As previously discussed, the Project's operational phase would not result in a net increase in emissions that would exceed any significance threshold. Decommissioning emissions are also expected to be below the EKAPCD annual thresholds with the implementation of **MM AQ-1** and **MM AQ-2**.

Air pollution is largely a cumulative impact. The nonattainment status of regional pollutants is a result of past and present development, and the EKPACD develops and implements plans for future attainment of ambient air quality standards.

The Kern County Planning and Natural Resources Department has determined that projects exceeding the project-specific significance thresholds are considered to be cumulatively considerable. In other words, the established significance thresholds take into account the cumulative impact of a project that adds emissions to the air basin. Based on these considerations, project-level thresholds of significance for criteria pollutants are relevant in the determination of whether the project's individual emissions would have a cumulatively significant impact on air quality. As discussed previously, with implementation of management measures, Project construction activities would not generate emissions that exceed EKAPCD thresholds and modeled ambient impacts will be below EPA's SILs for PM_{10} and $PM_{2.5}$.

Additionally, as noted previously, the proposed Project is consistent with the applicable air quality plans and EKAPCD rules and regulations. The Project would not conflict with existing land uses or result in population growth, long-term increase in the number of trips or increase the overall vehicle miles traveled in the area. Each cumulative project would need to conform to all applicable EKAPCD plans, rules and regulations, and land uses set forth in the air quality plan. This determination is made on a project-by-project basis and a combination of impacts with other cumulative projects that could potentially lead to cumulative impacts is not expected. Project construction would also not expose sensitive receptors to an incremental increase in cancer risk greater than one in one million or a hazard index greater than 0.1. Although cancer risk at the PMI would slightly exceed the one in one million threshold, actual risk would likely be lower as explained in the section below. Each cumulative project would be required to complete an individual impact analysis to determine significance with respect to the EKPACD thresholds and implement mitigation measures if necessary. In order for an individual project to greatly impact the regional concentrations of pollutants, the Project would likely

need to exceed EKAPCD significance thresholds by a significant margin, which is unlikely with individual project implementation of mitigation measures, as applicable.

The Project would not result in a significant impact due to odors as it does not include any uses identified as being associated with odors in CARB's Air Quality and Land Use Handbook (CARB 2005). Additionally, the Project is not located near any uses that are sensitive to odors and no other high odor producing use is near enough to the Project to create cumulative odor impacts.

Project operation would not have cumulatively considerable operational impacts because the Project's operational emissions would not exceed the EKAPCD's significance thresholds. Operational emissions will be minimal and would occur intermittently for Project maintenance. A list of approved and proposed renewable development projects within Kern County is provided in Appendix E.

Therefore, with implementation of the management measures mentioned above, the Project would not result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in non-attainment under an applicable federal or state ambient air quality standard.

Would the project expose sensitive receptors to substantial pollutant concentrations?

The Project proposes to develop and operate a solar energy facility that may have the potential to affect nearby sensitive receptors. The greatest potential for exposure to air pollutants would occur during construction and decommissioning, when the ground would be disturbed from grading and delivery of materials. The use of combustion equipment in Project construction and decommissioning activities could result in elevated concentrations of DPM, which could lead to health impacts for nearby sensitive receptors.

As stated previously, EKAPCD identifies significance thresholds for TAC that are based on localized impacts. These include a maximum incremental lifetime cancer risk greater than 1 in 1 million, and a chronic and acute hazard index (i.e., ratio of concentrations to Reference Exposure Levels) of 0.1 or more. The primary TAC emitted from construction activities is diesel PM (as PM_{10}). An HRA was performed to estimate the potential cancer and chronic risk (characterized by a hazard index) at the maximally exposed receptors. Acute risk was not evaluated since OEHHA has not established an acute Reference Exposure Level for DPM. Results of the HRA are presented in Table 11.

Based on the results, cancer risk is expected to be below the one in 1 million EKAPCD threshold for all Sensitive Receptors, MEIRs, and MEIWs. Chronic risk (characterized by Hazard Index) is also expected to be below 0.1 for all receptors. Cancer risk at the PMI is also expected to be below 1 in 1 million.

Although cancer and chronic risk during decommissioning were not evaluated, the health impacts are conservatively assumed to be similar to construction emissions. Therefore, cancer risk is expected to be below the one in 1 million EKAPCD threshold for all Sensitive Receptors during decommissioning. Similarly, chronic risk is expected to be less than the EKAPCD threshold of 0.1 for all Sensitive Receptors.

As stated previously, worker vehicle trips, vendor trucks, and haul trucks would be generated during the proposed construction and decommissioning activities but would decrease significantly after work is completed. Therefore, Project construction and decommissioning would not result in

significant CO emissions. The Project is located in a sparsely populated area and is unlikely to result in challenges to traffic flow. Additionally, the Traffic Impact Analysis conducted for the Project indicates that the study area roadways operate well below capacity at LOS D or better under existing and future year conditions with or without the Project. Therefore, CO hotspots, which generally occur when vehicles are idling at highly congested intersections, would not result in significant CO emissions and a CO hotspot analysis is not necessary.

Construction and decommissioning activities that cause fugitive dust can expose workers and nearby sensitive receptors to CI fungus spores that cause Valley Fever. There are currently no recommended thresholds of significance for Valley Fever. However, the Project would include best management practices to provide workers with training in procedures to minimize activities that may result in the release of airborne CI spores and would pay a one-time fee of $3,200 to the Kern County Public Health Services Department public awareness programs for Valley Fever. Additionally, **MM AQ-2** will include preparation of a Fugitive Dust Control Plan. With implementation of this management measure, dust from Project construction and decommissioning would not add significantly to the existing human exposure level to CI spores, including for construction workers.

Project construction and decommissioning is not expected to generate dust or emissions related to visibility. However, implementation of measures as per the Fugitive Dust Control Plan outlined in **MM AQ-2** would further limit dust emission impacts to visibility.

Operational emissions would be minimal and would occur intermittently for Project maintenance. The Project would not expose sensitive receptors to substantial pollutant concentrations. Traffic associated with operations would be negligible and would not result in CO hotspots at intersections.

Therefore, with implementation of the management measure mentioned above, the Project would not expose sensitive receptors to substantial pollutant concentrations.

Would the project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

During Project-related construction and decommissioning activities, various diesel-powered vehicles and equipment could create minor odors. These odors are not likely to be noticeable beyond the immediate vicinity and would be temporary and short-lived. Long-term odors are associated typically with industrial projects involving use of chemicals, solvents, petroleum products, and other strong-smelling elements used in manufacturing processes. Odors also are associated with such uses as sewage treatment facilities and landfills. The Project involves no elements related to these types of uses.

8.2 Greenhouse Gas Impacts

Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

Project construction emissions were calculated and compared to the EKAPCD annual significance thresholds. The GHG emissions from the construction phase of the Project would be well below EKAPCD's significance threshold of 25,000 tons per year of CO_2e (22,678 MT per year of CO_2e), as

shown in Table 12A. Due to the short-term nature of construction activity, the resulting emissions contribute a relatively small portion of the overall lifetime of the project GHG emissions. Therefore, construction emissions were amortized over a 35-year project lifetime and addressed as part of the operational GHG emissions.

Table 12A. Construction GHG Emissions

Year	GHG Emissions (MT/year)			
	CO_2	CH_4	N_2O	CO_2e[1]
2025	1,386	0.04	0.09	1,414
2026	6,581	0.14	0.43	6,717
2027	5,277	0.11	0.35	5,388
2028	340	<0.01	0.04	352
			Total	**13,871**

1/ Equivalent CO_2e Emissions = Construction GHG Emissions x Global Warming Equivalent Factor

Table 12B. Project Lifetime GHG Emissions

Annual	CO_2	CH_4	N_2O	CO_2e[1]
	Emissions (Metric tons)			
Operational GHG Emissions	388	0.23	0.01	397
Stationary	209	0.01	0.002	209
Total	416	**0.23**	**0.01**	**606**
Amortized Construction GHG Emissions	***396***			
Projected Amortized Decommissioning GHG Emissions	***396***			
Total Operational GHG Emissions + Amortized Construction and Decommissioning GHG Emissions	***1,399***			
EKAPCD Threshold[2]	***22,678***			

1/ Equivalent CO_2e Emissions = Construction GHG Emissions x Global Warming Equivalent Factor

2/ 25,000 tons per year = 22,678 metric tons per year

As shown in Table 12B, estimated annual Project-operational GHG emissions would be approximately 606 MT CO_2e per year as a result of Project operation. The sum of the estimated maximum annual operational emissions, the amortized construction emissions, and the projected amortized decommissioning emissions, would be approximately 1,399 MT CO_2e per year. As shown, the total annual emissions would not exceed the GHG significance threshold of 22,678 MT CO_2e per year.

In addition, because the Project is intended to generate electricity from a renewable source of energy, it would not result in substantial GHG emissions due to the burning of fossil fuels once in operation. The Project would produce renewable energy over the anticipated operational 35-year life of the Project. This energy would displace the GHG emissions that would otherwise be produced by existing business-as-usual (BAU) power generation resources (including natural gas, coal, and renewable combustion resources). The Project would generate up to 1,400 MW of solar electricity as well as provide up to 8 gigawatt-hours of energy storage. While the Project has an anticipated operational life of 35 years, the default is to estimate displaced emissions over a 30-year project lifetime. Based on the CalEEMod Electric Utility GHG Emission factors for SCE, which serves Kern County and an assumed capacity factor of 35 percent, the Project would potentially displace approximately 1,039,709 MT of

CO_2e of GHGs annually that would otherwise be emitted to produce an equivalent amount of energy from fossil fuel sources. Over the operational life of the Project, the total potentially displaced emissions would be approximately 36,389,801 MT CO_2e. Such a reduction would assist in the attainment of the State's goal to reduce GHG emissions.

Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

The proposed Project would comply with the strategies recommended by the State, EPA, and the Climate Change Scoping Plan. CARB's 2022 Scoping Plan for Achieving Carbon Neutrality (CARB 2022) was prepared to address climate legislation passed since the last scoping plan, which was prepared in 2017. The Scoping Plan addresses AB 1279, SB 905, SB 1065, SB 1075, and other legislation and executive orders addressing GHG reductions in various manufacturing sectors and managing natural lands. According to the Scoping Plan, the estimated resources needed to meet future energy demand is approximately 72 gigawatts of utility solar and 37 gigawatts of battery storage by 2045. The Scoping Plan also acknowledges that both solar and battery storage projects over the period 2022–2035 will need to increase from the current proposed projects. The proposed Project and other similar projects are essential to achieving this target. Additionally, the proposed project is expected to displace regionwide and Statewide emissions of GHGs over the expected life of the proposed Project.

The proposed Project would also assist California Investor-Owned utilities in meeting their obligations under California's RPS Program and assist California in meeting the GHG emissions reduction goal of 40 percent below 1990 levels by 2030. Specifically, by adding a 1,400-MW PV solar facility with up to 8 gigawatt-hours of energy storage to the grid, the proposed Project would assist the State and regulated utility providers to generate a greater portion of energy from renewable sources consistent with the 2030 and 2045 RPS, including the targets established under SB 100.

The 2022 RTP/SCS incorporates local land use projections and circulation networks in city and county general plans. The proposed Project would not conflict with the goals and policies of the 2022 RTP/SCS. The Project is anticipated to have permanent staff traveling to the facility starting in 2028. On intermittent occasions, workers may be required for repairs or replacement of equipment and other specialized maintenance. Based on this, the Project is not expected to impact local transportation or land use during operation. Furthermore, the additional jobs estimated by the Project would be well within the annual growth projection for the KCOG 2022 RTP/SCS. Therefore, the Project would also be consistent with KCOG's 2022 RTP/SCS.

As discussed previously, the Kern County General Plan is a comprehensive policy document with planned land use maps and related information that are designed to give long-range guidance to those County officials making decisions affecting the growth and resources of the unincorporated Kern County. As a solar energy facility with battery storage capability, the proposed Project would provide reliable and affordable energy to the County while contributing to sustainable energy production and would therefore be consistent with the Energy Element: Section 5.4.5, Solar Energy Development.

The plan consistency analysis demonstrates that the Project would be consistent with applicable plans, policies, regulations, and GHG reduction actions and strategies and would not conflict with any

applicable plan, policy, or regulation of an agency adopted for the purpose of reducing emissions of GHGs.

9.0 EMISSIONS REDUCTION METHODS

This section identifies best management practices and management measures that are expected to be implemented during Project construction, where feasible, consistent with the Applicant's standard construction practices.

9.1 Best Management Practices

The following best management practices would be implemented as part of Project design to help minimize the Project's air emissions and are consistent with the recommendations of both EKAPCD's Rule 402 and *Suggested Air Pollutant Mitigation Measures for Construction Sites for Eastern Kern APCD* (EKAPCD 2012b):

- The Project shall comply with applicable rules and regulations set forth by the East Kern Air Pollution Control District.
- Construction activities:
  - Water trucks will be present and in use at the construction site. Portions of the site subject to blowing dust will be watered as necessary to ensure proper control of blowing dust for the duration of the Project, but no less than twice daily.
  - Disturbed areas will be minimized as best as possible.
  - Stockpiles of soil and other loose materials will be stabilized by watering to prevent wind-blown fugitive dust.
  - Earth-moving activities including clearing, grading, bulldozing, and excavation will cease during periods of sustained wind speeds (averaged over one hour) greater than 20 mph if working material is easily windblown or causes dust plumes with 20 percent opacity or greater impacting public roads, occupied structures, or neighboring property.
  - Public streets and medians soiled or littered due to Project construction activities will be cleaned and swept as needed during the work week, or as otherwise directed by Kern County's Department of Public Works.
  - Trucks hauling soil, sand, and other loose materials will be covered with tarpaulins or other effective covers.
  - The construction contractor will be solely responsible for dust control measures and for obtaining all required permits and approvals, if any.
  - When needed and acceptable to the local fire department, weed control will be accomplished by mowing instead of discing.
  - Unpaved roads will be treated with a soil stabilizer, as applicable.
- Vehicular activities:
  - Vehicle speeds will be limited to 15 mph onsite.

  - Access to the site will be by means of an apron from adjoining surfaced roadways. The apron will be surfaced or treated with dust palliatives. If soils cling to the wheels of vehicles, a device will be placed on the exiting roadway to remove most of the soil on vehicle wheels.
  - All employees and contractors will comply with California idling restrictions for compression engines and use ultra-low sulfur diesel fuel.
  - The construction contractor will properly maintain and tune all internal combustion engine powered equipment.
- **Written Notices**: Prior to commencement of onsite construction activities (i.e., fence construction, mobilization of construction equipment, initial grading), including decommissioning, the Project proponent shall provide written notice to the public through mailing a notice to parcels within 1,000 feet of the Project site, no sooner than 15 days prior to construction activities. The notices shall include the construction schedule, a telephone number and email address where complaints and questions can be registered. Additionally, a minimum of one sign, legible at a distance of 50 feet, shall also be posted at the construction site or adjacent to the nearest public access to the main construction entrances throughout construction activities which include the construction schedule (updated as needed) and a telephone number where complaints can be registered. Documentation that the public notice has been sent and the sign has been posted shall be provided to the Kern County Planning and Natural Resources Department.
- **Construction Coordinator:** Prior to the issuance of grading or building permits, the Project proponent shall establish a "construction coordinator" and submit written documentation which includes their phone number, email address and mailing address. The construction coordinator shall be responsible for the following:
  - Responding to local complaints about construction activities. The construction coordinator shall determine the cause of the construction complaint and shall be required to implement reasonable measures such that the complaint is resolved.
  - Ensuring appropriate construction notices have been made available to the public and that appropriate construction signs have been installed.
  - Maintaining an ongoing up-to-date log of construction related complaints (i.e., blowing dust, inability to access parcels, etc.) during Project construction activities. The log shall include the nature of the complaint and the measures that were undertaken to address the concerns. Upon request, the construction coordinator shall provide the log to the Planning and Natural Resources Department no later than three business days from request.
- **Minimize Exposure to Potential Valley Fever–Containing Dust:** To minimize personnel and public exposure to potential Valley Fever–containing dust onsite and offsite, the following control measures shall be implemented during Project construction:
  - Equipment, vehicles, and other items shall be thoroughly cleaned of dust before they are moved offsite to other work locations.

- Wherever possible, grading and trenching work shall be phased so that earth-moving equipment is working well ahead or downwind of workers on the ground.
- The area immediately behind grading or trenching equipment shall be sprayed with water before ground workers move into the area.
- In the event that a water truck runs out of water before dust is sufficiently dampened, ground workers being exposed to dust shall leave the area until a truck can resume water spraying.
- To the greatest extent feasible, heavy-duty earth-moving vehicles shall be closed cab and equipped with a HEP-filtered air system.
- Workers shall receive training in procedures to minimize activities that may result in the release of airborne CI spores, to recognize the symptoms of Valley Fever, and shall be instructed to promptly report suspected symptoms of work-related Valley Fever to a supervisor. Evidence of training shall be provided to the Kern County Planning and Natural Resources Department.
- A Valley Fever informational handout shall be provided to onsite construction personnel. The handout shall, at a minimum, provide information regarding the symptoms, health effects, preventative measures, and treatment. Additional information and handouts can be obtained by contacting the Kern County Public Health Services Department.
- Onsite personnel shall be trained on the proper use of personal protective equipment, including respiratory equipment. National Institute for Occupational Safety and Health (NIOSH)–approved respirators shall be provided to on-site personnel, upon request. When exposure to dust is unavoidable, provide appropriate NIOSH-approved respiratory protection to affected workers, if necessary. If respiratory protection is deemed necessary, employers must develop and implement a respiratory protection program in accordance with California \ Occupational Safety and Health Administration's Respiratory Protection standard (8 CCR 5144).

- Prior to the issuance of grading permits, a one-time fee shall be paid to the Kern County Public Health Services Department in the amount of $3,200 for Valley Fever public awareness programs.

9.2 Management Measures

The Project would implement the following management measures to address potentially significant impacts associated with construction:

MM AQ-1, Implement Diesel Emission-Reduction Measures During Construction, and Decommissioning: To control NO_x and PM emissions during construction, the Project proponent/operator and/or its contractor(s) shall implement the following measures during construction of the Project, subject to verification by the County:

- Onsite off-road equipment and on-road vehicles shall meet the recent California Air Resources Board engine emission standards or alternatively fueled equipment, such as compressed

natural gas, liquefied natural gas, or electric, as appropriate. Off-road equipment engines over 25 horsepower shall be equipped with EPA Tier 4 engines, if feasible.

- Equipment shall be maintained in accordance with the manufacturer's specifications.
- Construction-related equipment, including heavy-duty equipment, motor vehicles, and portable equipment, shall be turned off when not in use for extended periods of time.
- Notification shall be provided to trucks and vehicles in loading or unloading queues that their engines shall be turned off when not in use for more than 5 minutes. Engine idling of equipment shall be minimized.
- Construction equipment shall not operate longer than eight cumulative hours per day.
- Construction vehicles shall be equipped with proper emissions control equipment and kept in good and proper running order to substantially reduce NOX emissions.
- On-road and off-road diesel equipment shall use diesel particulate filters (or the equivalent) if permitted under manufacturer's guidelines.

MM AQ-2, Implement Fugitive Dust Control Plan During Construction and Decommissioning: To control fugitive PM emissions during construction, prior to the issuance of grading or building permits the Project proponent shall prepare a comprehensive Site Specific Fugitive Dust Control Plan for review and approval by the Kern County Planning and Natural Resources Department. The plan shall include Eastern Kern Air Pollution Control District-recommended measures, including but not limited to, the following:

- Identify a comprehensive grading schedule for the entire Project site. When feasible, grading activities shall be phased and minimized to those areas necessary for Project access and installation of solar panels and other areas of infrastructure associated with the solar facility**.**
- The Site-Specific Fugitive Dust Control Plan shall identify, in addition to those measures required by the air district, measures being undertaken during construction activities and operational activities to ensure fugitive dust being blown off site is minimized. Measures may include, but are not limited to:
  - Use of water trucks as required for the expected level of winds in the area.
  - Use of dust suppressant (i.e., soil binders or mulch).
  - Construction of dust screening in appropriate locations around the Project site (i.e., fence slats or mesh screening).
  - A copy of the approved Site-Specific Fugitive Dust Control Plan shall be kept at the site construction office and measures included in the Site-Specific Fugitive Dust Control Plan shall be included on Grading Plans issued for the Project by the Kern County Public Works Department.

10.0 REFERENCES

CARB (California Air Resources Board). 2005. Air Quality and Land Use Handbook: A Community Health Perspective. Available online at ARB's Community Health: 2005-04-00 ARB's Air Quality and Landuse Handbook: A Community Health Perspective

CARB. 2009. Definitions of VOC and ROG. Available online at https://airknowledge.gov/ILT/PERM140/Current/CI/04PERM140_Handout2.pdf

CARB. 2022. 2022 Scoping Plan for Achieving Carbon Neutrality. Available online at https://ww2.arb.ca.gov/sites/default/files/2022-12/2022-sp.pdf

CARB. 2024a. California Ambient Air Quality Standards (CAAQS). Available online at https://ww2.arb.ca.gov/resources/california-ambient-air-quality-standards

CARB. 2024b. Table of Ambient Air Quality Standards. Available online at https://ww2.arb.ca.gov/sites/default/files/2024-08/AAQS%20Table_ADA_FINAL_07222024.pdfCARB. 2024c. iAdam Air Quality Data Statistics- Top 4 Summary. Available Online at https://www.arb.ca.gov/adam/topfour/topfour1.php

CARB. 2024d. HARP AERMOD Meteorological Files. Available online at https://ww2.arb.ca.gov/resources/documents/harp-aermod-meteorological-files

CDC (Centers for Disease Control and Prevention). 2022 Valley Fever (Coccidioidomycosis) Statistics. Available online at https://www.cdc.gov/valley-fever/php/statistics/?CDC_AAref_Val=https://www.cdc.gov/fungal/diseases/coccidioidomycosis/statistics.html

CDPH (California Department of Public Health). 2022. Epidemiologic Summary of Valley Fever (Coccidioidomycosis) in California, 2020-2021. Available online at https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/CocciEpiSummary2020-2021.pdf

EKAPCD (Eastern Kern County Air Pollution Control District). 1999. Guidelines for Implementation of the California Environmental Quality Act (CEQA) of 1970, as Amended. Available online at http://kernair.org/Documents/CEQA/CEQA_Guidelines%20%26%20Charts.pdf

EKAPCD. 2012a. Addendum to CEQA Guidelines Addressing GHG Emission Impacts for Stationary Source Projects When Serving as Lead CEQA Agency. Available online at http://www.kernair.org/Documents/CEQA/EKAPCD%20CEQA%20GHG%20Policy%20Adopted%203-8-12.pdf

EKAPCD. 2012b. Suggested Air Pollutant Mitigation Measures for Construction Sites for Eastern Kern APCD. Available online at http://www.kernair.org/Documents/CEQA/Construction_Mitigation%2005-06.pdf.

EKAPCD. 2020. Indian Wells Valley Second PM_{10} Maintenance Plan. Available online at http://www.kernair.org/Documents/Announcements/Attainment/IWV_PM-10%202nd_Maintenance_Plan-2020.pdf.

EKAPCD. 2023. 2023 Ozone Attainment Plan For The 2008 & 2015, 8-Hour Ozone National Ambient Air Quality Standards (NAAQS). Available online at http://www.kernair.org/Documents/Rules/2023%20Attainment%20Plan/EKAPCD_2023_Ozone_Plan_Adopted_5-4-23.pdf.

EKAPCD. 2025. Eastern Kern Attainment Status (Current). Available online at http://www.kernair.org/Documents/Announcements/Attainment/EKAPCD%20Attainment%20Status%202023.pdf

EPA (U.S Environmental Protection Agency). 2012. Haul Road Workgroup Final Report Submission to EPA-OAQPS. Available online at https://www.epa.gov/sites/default/files/2020-10/documents/haul_road_workgroup-final_report_package-20120302.pdf

EPA. 2025a. Current NAAQS Table. Available online at https://www.epa.gov/criteria-air-pollutants/naaqs-table

EPA.2025b. Outdoor Air Quality Data- Monitor Values Report. Available Online at https://www.epa.gov/outdoor-air-quality-data/monitor-values-report

EPA and NHTSA (National Highway Traffic Safety Administration). 2010. Final Rulemaking to Establish Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. Available online at https://nepis.epa.gov/Exe/ZyPDF.cgi/P1006W9S.PDF?Dockey=P1006W9S.PDF

EPA and NHTSA. 2012. Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards. Available online at https://nepis.epa.gov/Exe/ZyPDF.cgi/P100F1E5.PDF?Dockey=P100F1E5.PDF

IPCC (Intergovernmental Panel on Climate Change). 2007. IPCC Fourth Assessment Synthesis of Scientific-Technical Information Relevant to Interpreting Article 2 of the UN Framework Convention on Climate Change. Available online at https://www.ipcc.ch/report/ar4/syr/

KCOG (Kern Council of Government). 2022. 2022 Regional Transportation Plan/Sustainable Communities Strategy. Available online at https://www.kerncog.org/wp-content/uploads/2022/12/2022_RTP.pdf

Kern County. 2003. Mojave Specific Plan. October 2033. Available online at https://psbweb.kerncounty.com/planning/pdfs/SPs/mojave_SP.pdf

Kern County Planning and Natural Resources Department. 2006. Guidelines for Preparing an Air Quality Assessment for Use in Environmental Impact Reports. Available online at http://www.kernair.org/Documents/CEQA/AirQualityAssessmentPreparationGuidelines.pdf

Kern County Planning and Natural Resources Department. 2009. General Plan. Kern County. Available online at https://psbweb.kerncounty.com/planning/pdfs/kcgp/KCGP_Complete.pdf

OEHHA (Office of Environmental Health Hazard Assessment). 2015. Guidance Manual for Preparation of Health Risk Assessments. Available online at https://oehha.ca.gov/media/downloads/crnr/2015guidancemanual.pdf

OEHHA. 2023. Health Effects of Diesel Exhaust. Available online at https://oehha.ca.gov/media/downloads/calenviroscreen/indicators/diesel4-02.pdf

SCAQMD (South Coast Air Quality Management District). 2008. Draft Guidance Document – Interim CEQA Greenhouse Gas (GHG) Significance Threshold. Available online at

https://www.aqmd.gov/docs/default-source/ceqa/handbook/greenhouse-gases-(ghg)-ceqa-significance-thresholds/ghgattachmente.pdf

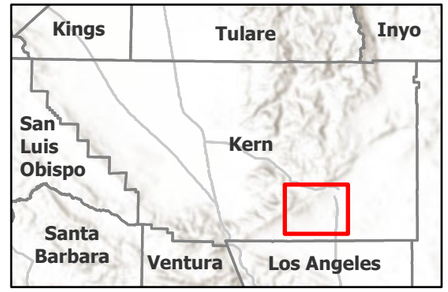
FIGURES

This page intentionally left blank.

Discovery Solar PV and Storage Project

Kern County, CA

Figure 1. Regional Overview



Windhub High-voltage Substation (Existing)

Watercourse

Proposed Project Features

Project Site

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

*Already approved under separate projects.

N

Miles

0 0.75 1.5 3

Scale is 1:116,800 when printed at 11"x17"

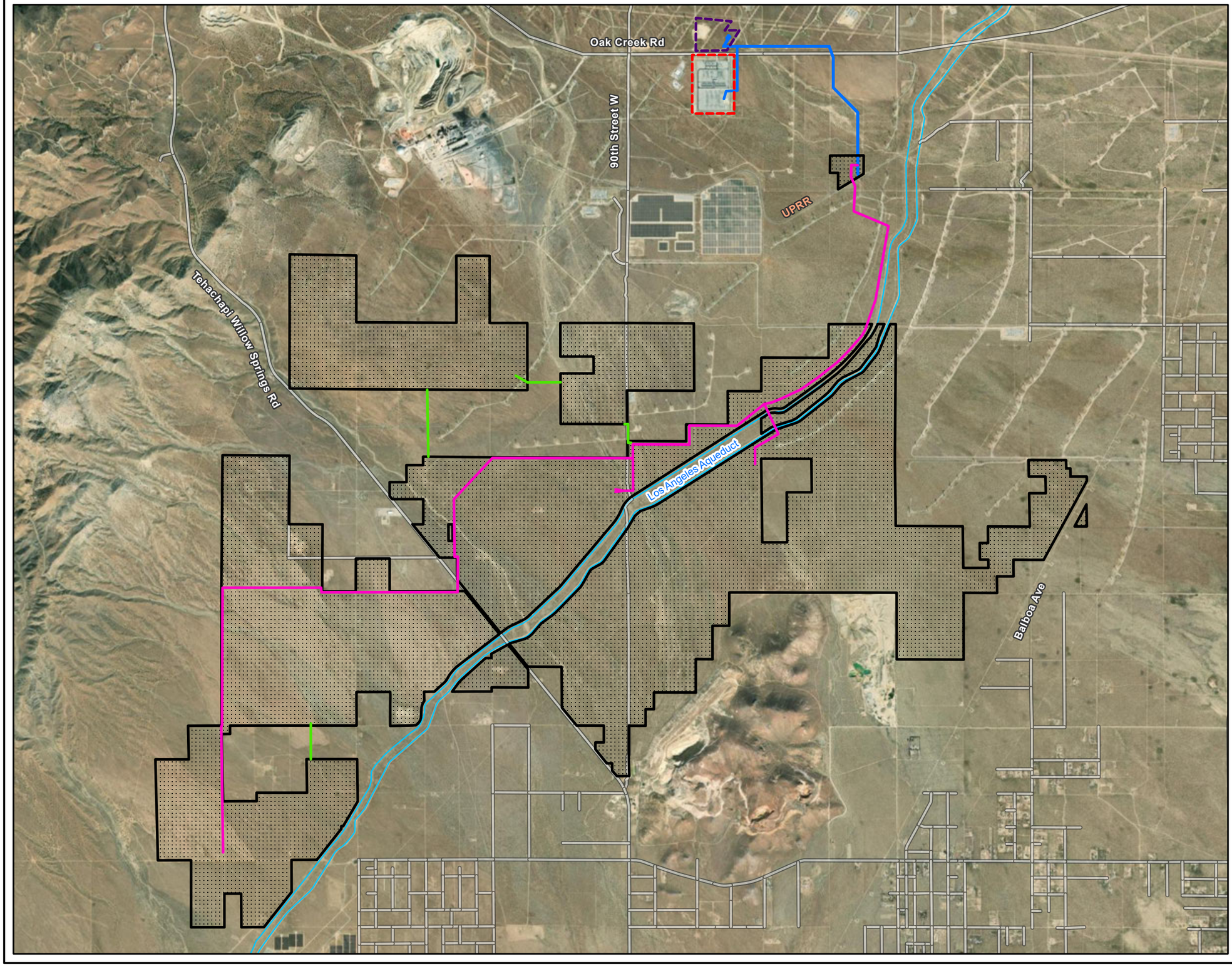
Not for Construction

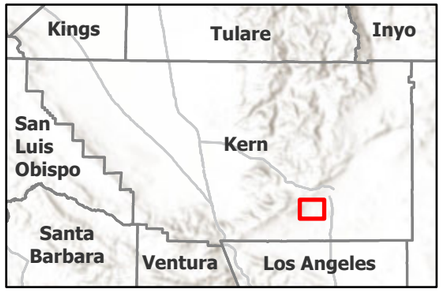
Document Path: \\esri\projects\esriprojects\PDX\projects\194_PROJECTS\TERRA_GEN\194_1403_0001_Discovery\PROJECTS\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 2. Project Location





- Windhub High-voltage Substation (Existing)
- Roads
- Watercourse

Proposed Project Features

- Project Site
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

Scale is 1:45,000 when printed at 11"x17"

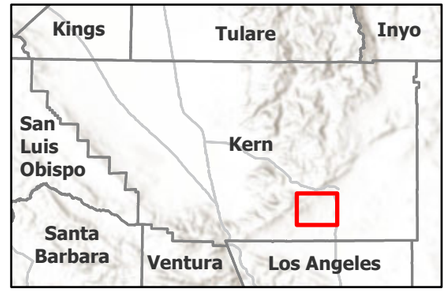
Not for Construction

Document Path: \\cess70\gis1\Cess\Projects\PGR\projects\194_PROJECTS\TERRA_GEN\194_1405_0001_Discovery\PROJECT\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 3. USGS Topographic Map



Windhub High-voltage Substation (Existing)

Proposed Project Features

- Project Site
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

*Already approved under separate projects.

N

0 0.5 1 2 Miles

Scale is 1:75,000 when printed at 11"x17"

Not for Construction

Document Path: \\cess7\Projects\Projects\PGR\projects\194_PROJECT\SITERA_GEN\194_1402_001_Discovery\PRO\TERRA_GEN_BIO_FIGS_V2.aprx

This page intentionally left blank.

APPENDIX A: AIR POLLUTANT SUMMARY

This page intentionally left blank.

Air Pollutant Summary

The following is a general description of the physical and health effects for air pollutants that could be emitted from the project or are known in the area. Unless otherwise indicated, the information provided below is a direct excerpt from the Kern County Planning Department's Guidelines (Kern County Planning Department 2006)

A-1. OZONE

Ozone occurs in two layers of the atmosphere. The layer surrounding the earth's surface is the troposphere. Here, ground level or "bad" ozone is an air pollutant that damages human health, vegetation, and many common materials. It is a key ingredient of urban smog. The troposphere extends to a level about 10 miles up, where it meets the second layer, the stratosphere. The stratospheric or "good" ozone layer extends upward from about 10 to 30 miles and protects life on earth from the sun's harmful ultraviolet rays (UV-B).

"Bad" ozone is what is known as a photochemical pollutant. It needs reactive organic gases (ROG), oxides of nitrogen (NOx), and sunlight. ROG and NOx are emitted from various sources throughout Kern County. In order to reduce ozone concentrations, it is necessary to control the emissions of these ozone precursors.

Significant ozone formation generally requires an adequate amount of precursors in the atmosphere and several hours in a stable atmosphere with strong sunlight.

Ozone is a regional air pollutant. It is generated over a large area and is transported and spread by wind. Ozone, the primary constituent of smog, is the most complex, difficult to control, and pervasive of the criteria pollutants. Unlike other pollutants, ozone is not emitted directly into the air by specific sources. Ozone is created by sunlight acting on other air pollutants (called precursors), specifically NOX and ROG. Sources of precursor gases to the photochemical reaction that form ozone number in the thousands. Common sources include consumer products, gasoline vapors, chemical solvents, and combustion products of various fuels.

Originating from gas stations, motor vehicles, large industrial facilities, and small businesses such as bakeries and dry cleaners, the ozone forming chemical reactions often take place in another location, catalyzed by sunlight and heat. High ozone concentrations can form over large regions when emissions from motor vehicles and stationary sources are carried hundreds of miles from their origins. Approximately 50 million people lived in counties with air quality levels above U. S. EPA's health-based national air quality standard in 1994. The highest levels of ozone were recorded in Los Angeles. High levels also persist in other Northeast.

While the ozone in the upper atmosphere absorbs harmful ultraviolet light, ground-level ozone is damaging to the tissues of plants, animals, and humans, as well as to a wide variety of inanimate materials such as plastics, metals, fabrics, rubber, and paints. Societal costs from ozone damage include increased medical costs, the loss of human and animal life, accelerated replacement of industrial equipment, and reduced crop yields.

Health Effects

While ozone in the upper atmosphere protects Earth from harmful ultraviolet radiation, high concentrations of ground-level ozone can adversely affect the human respiratory system. Many respiratory ailments, as well as cardiovascular disease, are aggravated by exposure to high ozone levels. Ozone also damages natural ecosystems such as forests and foothill communities, and damages agricultural crops and some man-made materials, such as rubber, paint, and plastics. High levels of ozone may negatively impact immune systems, making people more susceptible to respiratory illnesses including bronchitis and pneumonia. Ozone also accelerates aging and exacerbates pre-existing asthma and bronchitis and, in cases of high concentrations, can lead to the development of asthma in active children. Active people, both children and adults, appear to be more at risk from ozone exposure than those with a low level of activity. Additionally, the elderly and those with respiratory disease are also considered sensitive populations for ozone.

People who work or play outdoors are at a greater risk for harmful health effects from ozone. Children and adolescents are also at greater risk, as they are more likely than adults to spend time engaged in vigorous activities. Research indicates that children under 12 years of age spend nearly twice as much time outdoors daily than adults. Teenagers spend at least twice as much time as adults in active sports and outdoor activities. Also, children inhale more air per pound of body weight than adults, and they breathe more rapidly than adults. Children are less likely than adults to notice their own symptoms and avoid harmful exposures.

Ozone is a powerful oxidant – it can be compared to household bleach, which can kill living cells (such as germs or human skin cells) upon contact. Ozone can damage the respiratory tract, causing inflammation and irritation, and it can induce symptoms such as coughing, chest tightness, shortness of breath, and worsening of asthma symptoms. Ozone in sufficient doses increases the permeability of lung cells, rendering them more susceptible to toxins and microorganisms. Exposure to levels of ozone above the current ambient air quality standard leads to lung inflammation and lung tissue damage, and a reduction in the amount of air inhaled into the lungs. Recent evidence has, for the first time, linked the onset of asthma to exposure to elevated ozone levels in exercising children.

Elevated ozone concentrations also reduce crop and timber yields, damage native plants, and damage materials such as rubber, paints, fabric, and plastics.

A-2. REACTIVE ORGANIC GASES AND VOLATILE ORGANIC COMPOUNDS

Hydrocarbons are organic gases that are formed solely of hydrogen and carbon. There are several subsets of organic gases including Volatile Organic Compounds (VOC) and ROG.

ROG includes all hydrocarbons except those exempted by the California Air Resources Board (CARB). Therefore, ROG is a set of organic gases based on state rules and regulations. VOC is similar to ROG in that it includes all organic gases except those exempted by federal law. The list of compounds exempt from the definition of VOC is presented by the San Joaquin Valley Air Pollution Control District (SJVAPCD) in SJVAPCD Rule 1102. Both VOC and ROG are emitted from incomplete combustion of hydrocarbons or other carbon-based fuels. Combustion engine exhaust, oil refineries, and oil-fueled

power plants are the primary sources of hydrocarbons. Another source of hydrocarbons is evaporation from petroleum fuels, solvents, dry cleaning solutions, and paint.

Health Effects

The primary health effects of hydrocarbons result from the formation of ozone and its related health effects (see ozone health effects discussion above). High levels of hydrocarbons in the atmosphere can interfere with oxygen intake by reducing the amount of available oxygen through displacement. There are no separate federal or California ambient air quality standards for ROG. Carcinogenic forms of ROG are considered toxic air contaminants (TACs). An example is benzene, which is a carcinogen. The health effects of individual ROGs are described under the TAC heading below.

A-3. CARBON MONOXIDE

Carbon monoxide (CO) is emitted by mobile and stationary sources as a result of incomplete combustion of hydrocarbons or other carbon-based fuels. CO is an odorless, colorless, poisonous gas that is highly reactive.

CO is a byproduct of motor vehicle exhaust, which contributes more than two-thirds of all CO emissions nationwide. In cities, automobile exhaust can cause as much as 95 percent of all CO emissions. These emissions can result in high concentrations of CO, particularly in local areas with heavy traffic congestion. Other sources of CO emissions include industrial processes and fuel combustion in sources such as boilers and incinerators. Despite an overall downward trend in concentrations and emissions of CO, some metropolitan areas still experience high levels of CO.

Health Effects

CO enters the bloodstream and binds more readily to hemoglobin than oxygen, reducing the oxygen carrying capacity of blood, thus reducing oxygen delivery to organs and tissues. The health threat from CO is most serious for those who suffer from cardiovascular disease. Healthy individuals are also affected, but only at higher levels of exposure.

CO binds strongly to hemoglobin, the oxygen-carrying protein in blood, and thus reduces the blood's capacity for carrying oxygen to the heart, brain, and other parts of the body. Exposure to CO can cause chest pain in heart patients, headaches, and reduced mental alertness. At high concentrations, CO can cause heart difficulties in people with chronic diseases and can impair mental abilities. Exposure to elevated CO levels is associated with visual impairment, reduced work capacity, reduced manual dexterity, poor learning ability, difficulty performing complex tasks, and in prolonged, enclosed exposure, death.

The adverse health effects associated with exposure to ambient and indoor concentrations of CO are related to concentration of carboxyhemoglobin (COHb) in the blood. Health effects observed may include early onset of cardiovascular disease, behavioral impairment; decreased exercise performance of young healthy men, reduced birth weight, Sudden Infant Death Syndrome (SIDS), and increased daily mortality rate.

Most of the studies evaluating adverse health effects of CO on the central nervous system examine high-level poisoning. Such poisoning results in symptoms ranging from common flu and cold symptoms (shortness of breath on mild exertion, mild headaches, and nausea) to unconsciousness and death. Hexter and Goldsmith report an association between daily death rate and exposure to ambient CO in Los Angeles County, California. They postulate a concentration of 20.2 parts per million (ppm; the highest daily concentration recorded during a 4-year period) contributed 11 out of 159 deaths. Additional studies conducted in Los Angeles, California and Sao Paulo, Brazil also suggest a relationship between daily death rates and CO concentrations.

A-3. NITROGEN OXIDES

NOx is a family of highly reactive gases that are a primary precursor to the formation of ground-level ozone and react in the atmosphere to form acid rain. NOX is emitted from the use of solvents and combustion processes in which fuel is burned at high temperatures, principally from motor vehicle exhaust and stationary sources such as electric utilities and industrial boilers. A brownish gas, nitrogen dioxide (NO_2) is a strong oxidizing agent that reacts in the air to form corrosive nitric acid, as well as toxic organic nitrates.

Health Effects

NOx is an ozone precursor that combines with ROG to form ozone. See the ozone section above for a discussion of the health effects of ozone.

Direct inhalation of NOx can also cause a wide range of health effects. NO_X can irritate the lungs, cause lung damage, and lower resistance to respiratory infections such as influenza. Short-term exposures (e.g., less than 3 hours) to low levels of NO_2 may lead to changes in airway responsiveness and lung function in individuals with preexisting respiratory illnesses. These exposures may also increase respiratory illnesses in children. Long-term exposures to NO_2 may lead to increased susceptibility to respiratory infection and may cause irreversible alterations in lung structure. Other health effects associated with NO_X are an increase in the incidence of chronic bronchitis and lung irritation. Chronic exposure to NO_2 may lead to eye and mucus membrane aggravation, along with pulmonary dysfunction. NO_X can cause fading of textile dyes and additives, deterioration of cotton and nylon, and corrosion of metals due to production of particulate nitrates. Airborne NO_X can also impair visibility. NO_X is a major component of acid deposition in California. NOX may affect both terrestrial and aquatic ecosystems. NO_X in the air is a potentially significant contributor to a number of environmental effects such as acid rain and eutrophication in coastal waters.

Eutrophication occurs when a body of water suffers an increase in nutrients that reduce the amount of oxygen in the water, producing an environment that is destructive to fish and other animal life.

NO_2 is toxic to various animals as well as to humans. Its toxicity relates to its ability to combine with water to form nitric acid in the eye, lung, mucus membranes, and skin. Studies of the health impacts of NO_2 include experimental studies on animals, controlled laboratory studies on humans, and observational studies.

In animals, long-term exposure to NO_X increases susceptibility to respiratory infections, lowering their resistance to such diseases as pneumonia and influenza. Laboratory studies show susceptible humans, such as asthmatics, exposed to high concentrations of NO_2 can suffer lung irritation and potentially lung damage.

Epidemiological studies have also shown associations between NO_2 concentrations and daily mortality from respiratory and cardiovascular causes and with hospital admissions for respiratory conditions.

NO_X contributes to a wide range of environmental effects directly and when combined with other precursors in acid rain and ozone. Increased nitrogen inputs to terrestrial and wetland systems can lead to changes in plant species composition and diversity. Similarly, direct nitrogen inputs to aquatic ecosystems such as those found in estuarine and coastal waters can lead to eutrophication (a condition that promotes excessive algae growth, which can lead to a severe depletion of dissolved oxygen and increased levels of toxins harmful to aquatic life). Nitrogen, alone or in acid rain, also can acidify soils and surface waters.

Acidification of soils causes the loss of essential plant nutrients and increased levels of soluble aluminum that are toxic to plants. Acidification of surface waters creates conditions of low pH and levels of aluminum that are toxic to fish and other aquatic organisms. NO_X also contributes to visibility impairment.

A-4. PARTICULATE MATTER

Particulate matter pollution consists of very small liquid and solid particles floating in the air. Some particles are large or dark enough to be seen as soot or smoke. Others are so small they can be detected only with an electron microscope. Particulate matter is a mixture of materials that can include smoke, soot, dust, salt, acids, and metals. Particulate matter also forms when gases emitted from motor vehicles and industrial sources undergo chemical reactions in the atmosphere. PM_{10} refers to particles less than or equal to 10 microns in aerodynamic diameter. $PM_{2.5}$ refers to particles less than or equal to 2.5 microns in aerodynamic diameter and are a subset of PM_{10}.

In the western United States, there are sources of PM_{10} in both urban and rural areas. PM_{10} and $PM_{2.5}$ are emitted from stationary and mobile sources, including diesel trucks and other motor vehicles, power plants, industrial processing, wood burning stoves and fireplaces, wildfires, dust from roads, construction, landfills, and agriculture, and fugitive windblown dust. Because particles originate from a variety of sources, their chemical and physical compositions vary widely.

Health Effects

PM_{10} and $PM_{2.5}$ particles are small enough – about 1/7th the thickness of a human hair, or smaller – to be inhaled into, and lodge in, the deepest parts of the lung, evading the respiratory system's natural defenses. Health problems begin as the body reacts to these foreign particles.

Acute and chronic health effects associated with high particulate levels include the aggravation of chronic respiratory diseases, heart and lung disease, and coughing, bronchitis, and respiratory illnesses in children. Recent mortality studies have shown a statistically significant direct association

between mortality and daily concentrations of particulate matter in the air. Non-health-related effects include reduced visibility and soiling of buildings. PM_{10} can increase the number and severity of asthma attacks, cause or aggravate bronchitis and other lung diseases, and reduce the body's ability to fight infections. PM_{10} and $PM_{2.5}$ can aggravate respiratory disease, and cause lung damage, cancer, and premature death.

Although particulate matter can cause health problems for everyone, certain people are especially vulnerable to adverse health effects of PM_{10}. These "sensitive populations" include children, the elderly, exercising adults, and those suffering from chronic lung disease such as asthma or bronchitis. Of greatest concern are recent studies that link PM_{10} exposure to the premature death of people who already have heart and lung disease, especially the elderly. Acidic PM_{10} can also damage manmade materials and is a major cause of reduced visibility in many parts of the U.S.

Premature deaths linked to particulate matter are now at levels comparable to deaths from traffic accidents and second-hand smoke. One of the most dangerous pollutants, fine particulate matter (e.g., from diesel exhaust and fireplace soot) not only bypasses the body's defense mechanisms and becomes embedded in the deepest recesses of the lung, but also can disrupt cellular processes.

Population based studies in hundreds of cities in the U.S. and around the world have demonstrated a strong link between elevated particulate levels and premature deaths, hospital admissions, emergency room visits, and asthma attacks. Long-term studies of children's health conducted in California have demonstrated that particulate pollution may significantly reduce lung function growth in children.

Attaining the California particulate matter standards would annually prevent about 6,500 premature deaths, or 3 percent of all deaths. These premature deaths shorten lives by an average of 14 years. This is roughly equivalent to the same number of deaths (4,200 – 7,400) linked to second-hand smoke in the year 2000. In comparison, motor vehicle crashes cause 3,200 deaths and homicides were responsible for 2,000 deaths. Attaining the California particulate matter and ozone standards would annually prevent

4,000 hospital admissions for respiratory disease, 3,000 hospital admissions for cardiovascular disease, and 2,000 asthma-related emergency room visits. Exposure to diesel particulate matter (DPM) causes about 250 excess cancer cases per year in California.

A recent study provides evidence that exposure to particulate air pollution is associated with lung cancer. This study found that residents who live in an area that is severely impacted by particulate air pollution are at risk of lung cancer at a rate comparable to non-smokers exposed to second-hand smoke. This study also found an approximately 16 percent excess risk of dying from lung cancer due to fine particulate air pollution.

Another study shows that individuals with existing cardiac disease can be in a potentially life-threatening situation when exposed to high levels of ultrafine air pollution. Fine particles can penetrate the lungs and may cause the heart to beat irregularly or can cause inflammation, which could lead to a heart attack.

Currently, 61 percent of California's population live in areas that exceed the federal $PM_{2.5}$ air standard, while 89 percent live in areas that exceed California's $PM_{2.5}$ air standard.

A-5. OTHER POLLUTANTS

Sulfur Dioxide

Sulfur dioxide (SO_2) is a colorless, irritating gas with a "rotten egg" smell formed primarily by the combustion of sulfur-containing fossil fuels. Historically, in the late 1970's in the San Joaquin Valley Air Basin (SJVAB) portion of Kern County, SO_2 was a pollutant of concern but with the successful application of regulations, the levels have been reduced significantly. In fact, the latest data from CARB demonstrates that the highest 1-hour concentration for SO_2 was 0.011 ppm. With the California Ambient Air Quality Standard (CAAQS) being 0.25 ppm, SO_2 concentrations in the SJVAB are only about 4 percent of the standard.

Health Effects

High concentrations of SO_2 can result in temporary breathing impairment for asthmatic children and adults who are active outdoors. Short-term exposures of asthmatic individuals to elevated SO_2 levels during moderate activity may result in breathing difficulties that can be accompanied by symptoms such as wheezing, chest tightness, or shortness of breath. Other effects that have been associated with longer- term exposures to high concentrations of SO_2, in conjunction with high levels of particulate matter, include aggravation of existing cardiovascular disease, respiratory illness, and alterations in the lungs' defenses.

SO_2 also is a major precursor to $PM_{2.5}$, which is a significant health concern, and a main contributor to poor visibility. (See also the discussion of health effects of particulate matter above.)

SO_2 not only has a bad odor, but it can irritate the respiratory system. Exposure to high concentrations for short periods of time can constrict the bronchi and increase mucous flow, making breathing difficult. SO_2 can also:

- Immediately irritate the lung and throat at concentrations greater than 6 ppm in many people.
- Impair the respiratory system's defenses against foreign particles and bacteria, when exposed to concentrations less than 6 ppm for longer time periods.
- Enhance the harmful effects of ozone. (Combinations of the two gases at concentrations occasionally found in the ambient air appear to increase airway resistance to breathing.)

SO_2 tends to have more toxic effects when acidic pollutants, liquid or solid aerosols, and particulates are also present. (In the 1950's and 1960's, thousands of excess deaths occurred in areas where SO_2 concentrations exceeded 1 ppm for a few days and other pollutants were also high.) Effects are more pronounced among mouth breathers (e.g., people who are exercising or who have head colds). These effects include:

- Health problems, such as episodes of bronchitis requiring hospitalization associated with lower-level acid concentrations.

- Self-reported respiratory conditions, such as chronic cough and difficulty breathing, associated with acid aerosol concentrations. (Asthmatic individuals are especially susceptible to these effects. The elderly and those with chronic respiratory conditions may also be affected at lower concentrations than the general population.)
- Increased respiratory tract infections, associated with longer term, lower-level exposures to SO_2 and acid aerosols.
- Subjective symptoms, such as headaches and nausea, in the absence of pathological abnormalities, due to long-term exposure.

SO_2 easily injures many plant species and varieties, both native and cultivated. Some of the most sensitive plants include various commercially valuable pines, legumes, red and black oaks, white ash, alfalfa and blackberry. The effects include:

- Visible injury to the most sensitive plants at exposures as low as 0.12 ppm for 8 hours.
- Visible injury to many other plant types of intermediate sensitivity at exposures of 0.30 ppm for 8 hours.
- Positive benefits from low levels, in a very few species growing on sulfur deficient soils.

Increases in SO_2 concentrations accelerate the corrosion of metals, probably through the formation of acids. (SO_2 is a major precursor to acidic deposition.) Sulfur oxides may also damage stone and masonry, paint, various fibers, paper, leather, and electrical components.

Increased SO_2 concentrations also contribute to impaired visibility. Particulate sulfate, much of which is derived from SO_2 emissions, is a major component of the complex total suspended particulate mixture.

Sulfates

Sulfates are particulate products of combustion of sulfur-containing fossil fuels. When sulfur oxide or SO_2 is exposed to oxygen, it precipitates out into sulfates (SO_3 or SO_4). Data collected in Kern County identify levels of sulfates that are significantly less than the applicable health standards.

Sulfates (SO -2) are the fully oxidized ionic form of sulfur. Sulfates occur in combination with metal and/or hydrogen ions.

In California, emissions of sulfur compounds occur primarily from the combustion of petroleum-derived fuels (e.g., gasoline and diesel fuel) that contain sulfur. This sulfur is oxidized to SO_2 during the combustion process and subsequently converted to sulfate compounds in the atmosphere. The conversion of SO_2 to sulfates takes place comparatively rapidly and completely in urban areas of California due to regional meteorological features.

Health Effects

CARB's sulfates standard is designed to prevent aggravation of respiratory symptoms. Effects of sulfate exposure at levels above the standard include a decrease in ventilatory function, aggravation of asthmatic symptoms, and an increased risk of cardio-pulmonary disease. Sulfates are particularly

effective in degrading visibility, and, due to the fact that they are usually acidic, can harm ecosystems and damage materials and property.

Lead

Lead is a metal that is a natural constituent of air, water, and the biosphere. Lead is neither created nor destroyed in the environment, so it essentially persists forever. Lead was used until recently to increase the octane rating in auto fuel. Since gasoline-powered automobile engines were a major source of airborne lead through the use of leaded fuels and the use of leaded fuel has been mostly phased out, the ambient concentrations of lead have dropped dramatically.

Health Effects

Exposure to lead occurs mainly through inhalation of air and ingestion of lead in food, water, soil, or dust. It accumulates in the blood, bones, and soft tissues and can adversely affect the kidneys, liver, nervous system, and other organs. Excessive exposure to lead may cause neurological impairments such as seizures, mental retardation, and behavioral disorders. Even at low doses, lead exposure is associated with damage to the nervous systems of fetuses and young children, resulting in learning deficits and lowered IQ. Recent studies also show that lead may be a factor in high blood pressure and subsequent heart disease. Lead can also be deposited on the leaves of plants, presenting a hazard to grazing animals and humans through ingestion.

Hydrogen Sulfide

Hydrogen sulfide (H2S) is associated with geothermal activity, oil and gas production, refining, sewage treatment plants, and confined animal feeding operations.

Health Effects

Exposure to low concentrations of H2S may cause irritation to the eyes, nose, or throat. It may also cause difficulty in breathing for some asthmatics. Exposure to higher concentrations (above 100 ppm), can cause olfactory fatigue, respiratory paralysis, and death. Brief exposures to high concentrations of H2S (greater than 500 ppm) can cause a loss of consciousness. In most cases, the person appears to regain consciousness without any other effects. However, in many individuals, there may be permanent or long term effects such as headaches, poor attention span, poor memory, and poor motor function. No health effects have been found in humans exposed to typical environmental concentrations of H2S (0.00011 – 0.00033 ppm). Deaths due to breathing in large amounts of H2S have been reported in a variety of different work settings, including sewers, animal processing plants, waste dumps, sludge plants, oil and gas well drilling sites, and tanks and cesspools.

Visibility-reducing Particles

This standard is a measure of visibility. CARB does not yet have a measuring method with enough accuracy or precision to designate areas in the State as attainment or nonattainment. As such, the entire State is labeled unclassified.

Vinyl Chloride

Vinyl chloride monomer is a sweet smelling, colorless gas at ambient temperature. Landfills, publicly owned treatment works, and polyvinyl chloride (PVC) production are the major identified sources of vinyl chloride emissions in California. PVC can be fabricated into several products such as PVC pipes, pipefittings, and plastics. In humans, epidemiological studies of occupationally exposed workers have linked vinyl chloride exposure to development of a rare cancer, liver angiosarcoma, and have suggested a relationship between exposure and lung and brain cancers. There are currently no adopted ambient air standards for vinyl chloride.

Health Effects

Short-term exposure to vinyl chloride has been linked with the following acute health effects:

- Acute exposure of humans to high levels of vinyl chloride via inhalation in humans has resulted in effects on the central nervous system, such as dizziness, drowsiness, headaches, and giddiness.
- Vinyl chloride is reported to be slightly irritating to the eyes and respiratory tract in humans. Acute exposure to extremely high levels of vinyl chloride has caused loss of consciousness, lung and kidney irritation, and inhibition of blood clotting in humans and cardio arrhythmias in animals.
- Tests involving acute exposure of mice have shown vinyl chloride to have high acute toxicity from inhalation exposure.

Long-term exposure to vinyl chloride concentrations has been linked with the following chronic health effects:

- Liver damage may result in humans from chronic exposure to vinyl chloride, through both inhalation and oral exposure.
- A small percentage of individuals occupationally exposed to high levels of vinyl chloride in air have developed a set of symptoms termed "vinyl chloride disease," which is characterized by Raynaud's phenomenon (fingers blanch and numbness and discomfort are experienced upon exposure to the cold), changes in the bones at the end of the fingers, joint and muscle pain, and scleroderma-like skin changes (thickening of the skin, decreased elasticity, and slight edema).
- Central nervous system effects (including dizziness, drowsiness, fatigue, headache, visual and/or hearing disturbances, memory loss, and sleep disturbances) as well as peripheral nervous system symptoms (peripheral neuropathy, tingling, numbness, weakness, and pain in fingers) have also been reported in workers exposed to vinyl chloride.

Several reproductive/developmental health effects from vinyl chloride exposure have been identified. They include:

- Several case reports suggest that male sexual performance may be affected by vinyl chloride. However, these studies are limited by lack of quantitative exposure information and possible cooccurring exposure to other chemicals.
- Several epidemiological studies have reported an association between vinyl chloride exposure in pregnant women and an increased incidence of birth defects, while other studies have not reported similar findings.
- Epidemiological studies have suggested an association between men occupationally exposed to vinyl chloride and miscarriages in their wives' pregnancies although other studies have not supported these findings.

Long-term exposure to vinyl chloride has also been identified as a cancer risk. Inhaled vinyl chloride has been shown to increase the risk of a rare form of liver cancer (angiosarcoma of the liver) in humans. Animal studies have shown that vinyl chloride, via inhalation, increases the incidence of angiosarcoma of the liver and cancer of the liver.

Toxic Air Contaminants

Hazardous air pollutants (HAP) is a term used by the federal Clean Air Act that includes a variety of pollutants generated or emitted by industrial production activities. Called TAC under the California Clean Air Act, ten have been identified through ambient air quality data as being the most substantial health risk in California. Direct exposure to these pollutants has been shown to cause cancer, birth defects, damage to brain and nervous system and respiratory disorders. The California Air Resources Board provides emission inventories for only the larger Air Basins.

TACs do not have ambient air quality standards. Since no safe levels of TACs can be determined, there are no air quality standards for TACs, with the exception of lead, sulfates, vinyl chloride, and hydrogen sulfide. Instead, TAC impacts are evaluated by calculating the health risks associated with a given exposure. The requirements of the Air Toxic "Hot Spots" Information and Assessment Act (Assembly Bill [AB] 2588) apply to facilities that use, produce, or emit toxic chemicals. Facilities that are subject to the toxic emission inventory requirements of AB 2588 must prepare and submit toxic emission inventory plans and reports, and periodically update those reports.

Health Risks – Acetaldehyde

Acetaldehyde is both directly emitted into the atmosphere and formed in the atmosphere from photochemical oxidation. Sources include combustion processes such as exhaust from mobile sources and fuel combustion from stationary internal combustion engines, boilers, and process heaters.

Acetaldehyde is classified as a federal HAP and as a California TAC. Acetaldehyde is a carcinogen that also causes chronic non-cancer toxicity in the respiratory system. Symptoms of chronic intoxication of acetaldehyde in humans resemble those of alcoholism.

The primary acute effect of inhalation exposure to acetaldehyde is irritation of the eyes, skin, and respiratory tract in humans. At higher exposure levels, erythema, coughing, pulmonary edema, and

necrosis may also occur. Acute inhalation of acetaldehyde resulted in a depressed respiratory rate and elevated blood pressure in experimental animals.

Tests involving acute exposure of rats, rabbits, and hamsters have demonstrated acetaldehyde to have low acute toxicity from inhalation and moderate acute toxicity from oral or dermal exposure.

Health Risks – Benzene

Approximately 84 percent of the benzene emitted in California comes from motor vehicles, including evaporative leakage and unburned fuel exhaust. Currently, the benzene content of gasoline is less than one percent.

Benzene is highly carcinogenic and occurs throughout California. Benzene also has non-cancer health effects. Brief inhalation exposure to high concentrations can cause central nervous system depression. Acute effects include central nervous system symptoms of nausea, tremors, drowsiness, dizziness, headache, intoxication, and unconsciousness.

Neurological symptoms of inhalation exposure to benzene include drowsiness, dizziness, headaches, and unconsciousness in humans. Ingestion of large amounts of benzene may result in vomiting, dizziness, and convulsions in humans. Exposure to liquid and vapor may irritate the skin, eyes, and upper respiratory tract in humans. Redness and blisters may result from dermal exposure to benzene.

Chronic inhalation of certain levels of benzene causes disorders in the blood in humans. Benzene specifically affects bone marrow (the tissues that produce blood cells). Aplastic anemia, excessive bleeding, and damage to the immune system (by changes in blood levels of antibodies and loss of white blood cells) may develop. Increased incidence of leukemia (cancer of the tissues that form white blood cells) has been observed in humans occupationally exposed to benzene.

Health Risks – 1,3-Butadiene

The majority of 1,3-butadiene emissions come from incomplete combustion of gasoline and diesel fuels. Mobile sources account for 83 percent of total statewide emissions. Area-wide sources, such as agricultural waste burning and open burning, contribute approximately 13 percent of statewide emissions.

1,3-Butadiene has been identified as a carcinogen in California. Butadiene vapors cause neurological effects at very high levels such as blurred vision, fatigue, headache, and vertigo. Dermal exposure of humans to 1,3-butadiene causes a sensation of cold, followed by a burning sensation, which may lead to frostbite.

One epidemiological study reported that chronic (long-term) exposure to 1,3-butadiene via inhalation resulted in an increase in cardiovascular diseases, such as rheumatic and arteriosclerotic heart diseases, while other human studies have reported effects on the blood. A large epidemiological study of synthetic rubber industry workers demonstrated a consistent association between 1,3-butadiene exposure and occurrence of leukemia. Several epidemiological studies of workers in styrene-butadiene rubber factories have shown an increased incidence of respiratory, bladder, stomach, and lymphato-hematopoietic cancers. However, these studies are not sufficient to determine a causal association between

1,3-butadiene exposure and cancer due to possible exposure to other chemicals and other confounding factors.

Health Risks – Carbon Tetrachloride

The primary sources of carbon tetrachloride in California include chemical and allied product manufacturers and petroleum refineries.

In California, carbon tetrachloride has been identified as a carcinogen. Carbon tetrachloride is also a central nervous system depressant and mild eye and respiratory tract irritant. EPA has classified carbon tetrachloride as a Group B2, probable human carcinogen.

Acute inhalation and oral exposures to high levels of carbon tetrachloride have been observed primarily to damage the liver (swollen, tender liver, changes in enzyme levels, and jaundice) and kidneys (nephritis, nephrosis, proteinurea) of humans. Depression of the central nervous system has also been reported.

Symptoms of acute exposure in humans include headache, weakness, lethargy, nausea, and vomiting. Delayed pulmonary edema (fluid in lungs) has been observed in humans exposed to high levels of carbon tetrachloride by inhalation and ingestion, but this is believed to be due to injury to the kidney rather than direct action of carbon tetrachloride on the lung. Chronic inhalation or oral exposure to carbon tetrachloride produces liver and kidney damage in humans and animals.

Health Risks – Chromium, Hexavalent

Chromium plating and other metal finishing processes are the primary sources of hexavalent chromium emissions in California. In California, hexavalent chromium has been identified as a carcinogen. There is epidemiological evidence that exposure to inhaled hexavalent chromium may result in lung cancer. The principal acute effects are renal toxicity, gastrointestinal hemorrhage, and intravascular hemolysis.

The respiratory tract is the major target organ for hexavalent chromium following inhalation exposure in humans. Other effects noted from acute inhalation exposure to very high concentrations of hexavalent chromium include gastrointestinal and neurological effects, while dermal exposure causes skin burns in humans. Chronic inhalation exposure to hexavalent chromium in humans results in effects on the respiratory tract, with perforations and ulcerations of the septum, bronchitis, decreased pulmonary function, pneumonia, asthma, and nasal itching and soreness reported. Chronic human exposure to high levels of hexavalent chromium by inhalation or oral exposure may produce effects on the liver, kidney, gastrointestinal and immune systems, and possibly the blood.

Health Risks – 1,4-Dichlorobenzene

The primary sources of 1,4-dichlorobenzene include consumer products such as non-aerosol insect repellents and solid/gel air fresheners. These sources contribute 99 percent of statewide 1,4-dichlorobenzene emissions.

In California, 1,4-dichlorobenzene has been identified as a carcinogen. Acute exposure to 1,4-dichlorobenzene via inhalation in humans results in irritation to the eyes, skin, and throat. In addition,

long-term inhalation exposure may affect the liver, skin, and central nervous system in humans (e.g., cerebellar ataxia, dysarthria, weakness in limbs, and hyporeflexia).

Health Risks – Formaldehyde

Formaldehyde is both directly emitted into the atmosphere and formed in the atmosphere as a result of photochemical oxidation. Formaldehyde is a product of incomplete combustion. One of the primary sources of formaldehyde is vehicular exhaust. Formaldehyde is also used in resins, can be found in many consumer products as an antimicrobial agent, and is used in fumigants and soil disinfectants.

The major toxic effects caused by acute formaldehyde exposure via inhalation are eye, nose, and throat irritation and effects on the nasal cavity. Other effects seen from exposure to high levels of formaldehyde in humans are coughing, wheezing, chest pains, and bronchitis. Chronic exposure to formaldehyde by inhalation in humans has been associated with respiratory symptoms and eye, nose, and throat irritation. Animal studies have reported effects on the nasal respiratory epithelium and lesions in the respiratory system from chronic inhalation exposure to formaldehyde. Occupational studies have noted statistically significant associations between exposure to formaldehyde and increased incidence of lung and nasopharyngeal cancer. This evidence is considered to be "limited," rather than "sufficient," due to possible exposure to other agents that may have contributed to the excess cancers.

EPA considers formaldehyde to be a probable human carcinogen (cancer-causing agent) and has ranked it in EPA's Group B1. In California, formaldehyde has been identified as a carcinogen.

Health Risks – Methylene Chloride

Methylene chloride is used as a solvent, a blowing and cleaning agent in the manufacture of polyurethane foam and plastic manufacture, and as a solvent in paint stripping operations. Paint removers account for the largest use of methylene chloride in California.

Case studies of methylene chloride poisoning during paint stripping operations have demonstrated that inhalation exposure to extremely high levels can be fatal to humans. Acute inhalation exposure to high levels of methylene chloride in humans has resulted in effects on the central nervous system (CNS) including decreased visual, auditory, and psychomotor functions, but these effects are reversible once exposure ceases. Methylene chloride also irritates the nose and throat at high concentrations. The major effects from chronic inhalation exposure to methylene chloride in humans are effects on the central nervous system, such as headaches, dizziness, nausea, and memory loss. In addition, chronic exposure can lead to bone marrow, hepatic, and renal toxicity.

EPA considers methylene chloride to be a probable human carcinogen and has ranked it in EPA's Group B2. California considers methylene chloride to be carcinogenic.

Health Risks – Perchloroethylene

Perchloroethylene is used as a solvent, primarily in dry cleaning operations. Perchloroethylene is also used in degreasing operations, paints and coatings, adhesives, aerosols, specialty chemical production, printing inks, silicones, rug shampoos, and laboratory solvents.

In California, perchloroethylene has been identified as a carcinogen. Perchloroethylene vapors are irritating to the eyes and respiratory tract. Following chronic exposure, workers have shown signs of liver toxicity, as well as kidney dysfunction, and neurological disorders.

Health Risks – Diesel Particulate Matter

DPM is emitted from both mobile and stationary sources. In California, on-road diesel fueled engines contribute approximately 24 percent of the statewide total, with an additional 71 percent attributed to other mobile sources such as construction and mining equipment, agricultural equipment, and transport refrigeration units. Stationary sources contribute about 5 percent of total DPM.

Diesel exhaust and many individual substances contained in it (including arsenic, benzene, formaldehyde, and nickel) have the potential to contribute to mutations in cells that can lead to cancer. Long-term exposure to diesel exhaust particles poses the highest cancer risk of any TAC evaluated by the California Office of Environmental Health Hazard Assessment (OEHHA). CARB estimates that about 70 percent of the cancer risk that the average Californian faces from breathing toxic air pollutants stems from diesel exhaust particles.

In its comprehensive assessment of diesel exhaust, OEHHA analyzed more than 30 studies of people who worked around diesel equipment, including truck drivers, railroad workers, and equipment operators. The studies showed these workers were more likely to develop lung cancer than workers who were not exposed to diesel emissions. These studies provide strong evidence that long-term occupational exposure to diesel exhaust increases the risk of lung cancer. Using information from OEHHA's assessment, CARB estimates that diesel-particle levels measured in California's air in 2000 could cause 540 "excess" cancers (beyond what would occur if there were no diesel particles in the air) in a population of 1 million people over a70-year lifetime. Other researchers and scientific organizations, including the National Institute for Occupational Safety and Health, have calculated cancer risks from diesel exhaust that are similar to those developed by OEHHA and CARB.

Exposure to diesel exhaust can have immediate health effects. Diesel exhaust can irritate the eyes, nose, throat, and lungs, and it can cause coughs, headaches, lightheadedness and nausea. In studies with human volunteers, diesel exhaust particles made people with allergies more susceptible to the materials to which they are allergic, such as dust and pollen. Exposure to diesel exhaust also causes inflammation in the lungs, which may aggravate chronic respiratory symptoms and increase the frequency or intensity of asthma attacks.

Diesel engines are a major source of fine-particle pollution. The elderly and people with emphysema, asthma, and chronic heart and lung disease are especially sensitive to fine-particle pollution. Numerous studies have linked elevated particle levels in the air to increased hospital admissions, emergency room visits, asthma attacks, and premature deaths among those suffering from respiratory problems. Because children's lungs and respiratory systems are still developing, they are

also more susceptible than healthy adults to fine particles. Exposure to fine particles is associated with increased frequency of childhood illnesses and can also reduce lung function in children. In California, diesel exhaust particles have been identified as a carcinogen.

Health Risks – Asbestos

Asbestos occurs naturally in ultramafic rock (which includes serpentine). When this material is disturbed in connection with construction, grading, quarrying, or surface mining operations, asbestos-containing dust can be generated. The most common type of asbestos is chrysotile, but other types are also found in California (CARB 2024) The major health effects associated with asbestos exposure are:

- lung cancer
- mesothelioma, a rare form of cancer that is found in the thin lining of the lung, chest and the abdomen and heart
- asbestosis, a serious progressive, long-term, non-cancer disease of the lungs

Disease symptoms may take many years to develop following exposure, and asbestos related conditions can be difficult to identify.

A-6. VALLEY FEVER

Valley Fever is an infection caused by inhalation of Coccidioides immitus (C. immitus or CI) fungus spores, mostly found in the Central Valley and Central Coast regions of the California. The spores lie dormant in the soil until they are disturbed by wind, vehicles, or other ground-disturbing activities and become airborne. Agricultural workers, construction workers, and other people who are exposed to wind and dust outdoors are most prone to contracting Valley Fever. Infections can result in mild influenza-like symptoms, such as fever, cough, chest pain, muscle or joint aches, night sweats, and rash. Rarely, in more serious cases, it can infect the brain, joints, bone, skin or other organs, or cause death.

Health Effects

Most people (about 6 in 10) infected with Valley fever have no symptoms, and their bodies will fight off the infection naturally. People who do get sick usually develop symptoms 1−3 weeks after breathing in the fungus. Valley fever usually infects the lungs, and some people can develop respiratory symptoms or pneumonia. Symptoms include fatigue, cough, chest pain, headaches, etc.,(CDPH 2021). Approximately 5 to 10% of people who get Valley fever will develop serious or long-term problems in their lungs. In about 1% of people, the infection spreads from the lungs to other parts of the body. This could include the central nervous system, skin, or bones and joints (CDC 2024).

REFERENCES

CARB (California Air Resources Board). 2024. Asbestos Airborne Toxic Control Measure For Construction, Grading, Quarrying, And Surface Mining Operations. Accessed August 2024. Available online at https://ww2.arb.ca.gov/sites/default/files/2020-01/regadv0702.pdf

CDC (U.S. Centers for Disease Control and Prevention). 2024. Symptoms of Valley Fever. April 2024. Available online at https://www.cdc.gov/valley-fever/signs-symptoms/index.html

CDPH (California Department of Public Health). 2021. Valley Fever Fact Sheet. Available online at https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/ValleyFeverFactSheet.pdf

Kern County Planning Department. 2006. Guidelines For Preparing An Air Quality Assessment For Use In Environmental Impact Reports. Available online at http://www.kernair.org/Documents/CEQA/AirQualityAssessmentPreparationGuidelines.pdf

This page intentionally left blank.

APPENDIX B: DETAILED CALEEMOD REPORTS AND SUPPORTING CALCULATIONS

This page intentionally left blank.

Discovery Solar Storage Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

2.4. Operations Emissions Compared Against Thresholds

2.5. Operations Emissions by Sector, Unmitigated

3. Construction Emissions Details

3.1. Site Preparation (2025) - Unmitigated

3.3. Site Preparation (2026) - Unmitigated

3.5. Site Mobilization (2025) - Unmitigated

3.7. System Installation and Gen-Tie Construction (2025) - Unmitigated

3.9. System Installation and Gen-Tie Construction (2026) - Unmitigated

3.11. System Installation and Gen-Tie Construction (2027) - Unmitigated

3.13. Energy Storage System (2026) - Unmitigated

3.15. Energy Storage System (2027) - Unmitigated

3.17. Testing and Commissioning (2026) - Unmitigated

3.19. Testing and Commissioning (2027) - Unmitigated

3.21. Testing and Commissioning (2028) - Unmitigated

3.23. Underground Work (2025) - Unmitigated

3.25. Underground Work (2026) - Unmitigated

3.27. General Management (2025) - Unmitigated

3.29. General Management (2026) - Unmitigated

3.31. General Management (2027) - Unmitigated

3.33. General Management (2028) - Unmitigated

4. Operations Emissions Details

4.1. Mobile Emissions by Land Use

4.1.1. Unmitigated

4.2. Energy

4.2.1. Electricity Emissions By Land Use - Unmitigated

4.2.3. Natural Gas Emissions By Land Use - Unmitigated

4.3. Area Emissions by Source

4.3.1. Unmitigated

4.4. Water Emissions by Land Use

4.4.1. Unmitigated

4.5. Waste Emissions by Land Use

4.5.1. Unmitigated

4.6. Refrigerant Emissions by Land Use

4.6.1. Unmitigated

4.7. Offroad Emissions By Equipment Type

4.7.1. Unmitigated

4.8. Stationary Emissions By Equipment Type

4.8.1. Unmitigated

4.9. User Defined Emissions By Equipment Type

4.9.1. Unmitigated

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.9. Operational Mobile Sources

5.9.1. Unmitigated

5.10. Operational Area Sources

5.10.1. Hearths

5.10.1.1. Unmitigated

5.10.2. Architectural Coatings

5.10.3. Landscape Equipment

5.11. Operational Energy Consumption

5.11.1. Unmitigated

5.12. Operational Water and Wastewater Consumption

5.12.1. Unmitigated

5.13. Operational Waste Generation

5.13.1. Unmitigated

5.14. Operational Refrigeration and Air Conditioning Equipment

5.14.1. Unmitigated

5.15. Operational Off-Road Equipment

5.15.1. Unmitigated

5.16. Stationary Sources

5.16.1. Emergency Generators and Fire Pumps

5.16.2. Process Boilers

5.17. User Defined

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Discovery Solar Storage
Construction Start Date	10/1/2025
Operational Year	2027
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	5.00
Precipitation (days)	24.6
Location	95th St W, Tehachapi, CA 93561, USA
County	Kern-Mojave Desert
City	Unincorporated
Air District	Kern County APCD
Air Basin	Mojave Desert
TAZ	2912
EDFZ	9
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.30

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
User Defined Industrial	7,700	User Defined Unit	7,700	8,000	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

No measures selected

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	23.0	20.0	172	2,377	0.45	6.40	367	373	5.76	41.7	47.5	—	64,360	64,360	1.93	3.74	101	65,626
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	24.2	21.0	195	2,370	0.52	7.08	472	479	6.38	52.5	58.8	—	71,905	71,905	1.95	4.74	2.98	73,360
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	12.6	11.1	100	1,654	0.27	3.51	243	246	3.14	26.7	29.8	—	39,750	39,750	0.86	2.58	30.5	40,570
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.31	2.02	18.3	302	0.05	0.64	44.3	45.0	0.57	4.87	5.45	—	6,581	6,581	0.14	0.43	5.05	6,717
Exceeds (Annual)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Threshold	—	25.0	25.0	—	—	—	—	15.0	—	—	—	—	—	—	—	—	—	—
Unmit.	—	No	No	—	—	—	—	Yes	—	—	—	—	—	—	—	—	—	—

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily - Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2026	23.0	20.0	172	2,377	0.45	6.40	367	373	5.76	41.7	47.5	—	64,360	64,360	1.93	3.74	101	65,626
2027	16.0	14.2	121	2,318	0.37	3.99	351	355	3.54	38.0	41.6	—	54,794	54,794	1.07	3.66	93.0	56,005
2028	0.93	0.90	8.07	12.6	0.04	0.12	107	107	0.12	11.2	11.3	—	7,833	7,833	0.03	0.99	17.0	8,145
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	23.2	20.1	187	2,355	0.46	7.08	468	475	6.38	51.6	58.0	—	62,433	62,433	1.95	3.85	2.64	63,632
2026	24.2	21.0	195	2,370	0.52	6.98	472	479	6.30	52.5	58.8	—	71,905	71,905	1.61	4.74	2.98	73,360
2027	15.4	13.5	123	2,290	0.37	3.99	351	355	3.54	38.0	41.6	—	52,943	52,943	1.09	3.67	2.41	54,067
2028	0.84	0.81	8.57	9.45	0.04	0.12	107	107	0.12	11.2	11.3	—	7,620	7,620	0.04	0.99	0.44	7,918
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	3.19	2.75	25.5	277	0.06	0.97	58.3	59.3	0.88	6.56	7.44	—	8,412	8,412	0.26	0.52	5.76	8,580
2026	12.6	11.1	100	1,654	0.27	3.51	243	246	3.14	26.7	29.8	—	39,750	39,750	0.86	2.58	30.5	40,570
2027	9.46	8.32	75.7	1,507	0.22	2.47	220	223	2.19	23.8	26.0	—	31,874	31,874	0.69	2.10	23.8	32,541
2028	0.28	0.27	2.12	3.38	0.01	0.03	24.2	24.2	0.03	2.57	2.60	—	2,053	2,053	0.01	0.25	2.08	2,129
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	0.58	0.50	4.65	50.6	0.01	0.18	10.6	10.8	0.16	1.20	1.36	—	1,393	1,393	0.04	0.09	0.95	1,420
2026	2.31	2.02	18.3	302	0.05	0.64	44.3	45.0	0.57	4.87	5.45	—	6,581	6,581	0.14	0.43	5.05	6,717
2027	1.73	1.52	13.8	275	0.04	0.45	40.2	40.7	0.40	4.34	4.74	—	5,277	5,277	0.11	0.35	3.93	5,388
2028	0.05	0.05	0.39	0.62	< 0.005	0.01	4.41	4.42	0.01	0.47	0.47	—	340	340	< 0.005	0.04	0.34	352

2.4. Operations Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	5.60	4.75	24.4	30.6	0.12	0.86	0.10	0.97	0.79	0.03	0.82	12.5	13,516	13,529	1.83	0.15	0.41	13,618
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	5.53	4.68	24.4	30.2	0.12	0.86	0.10	0.96	0.79	0.03	0.82	12.5	13,505	13,518	1.83	0.15	0.01	13,607
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.12	0.98	4.06	5.40	0.02	0.14	0.07	0.21	0.13	0.02	0.15	12.5	2,334	2,347	1.38	0.05	0.13	2,397
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.20	0.18	0.74	0.98	< 0.005	0.03	0.01	0.04	0.02	< 0.005	0.03	2.07	386	388	0.23	0.01	0.02	397

2.5. Operations Emissions by Sector, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Sector	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.07	0.07	0.08	0.55	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	—	129	129	< 0.005	0.01	0.41	132
Area	0.23	0.23	< 0.005	0.35	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.43	1.43	< 0.005	< 0.005	—	1.44
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—	—	—	—	12.5	54.7	67.2	1.28	0.03	—	108
Waste	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Off-Road	5.29	4.45	24.3	29.7	0.12	0.86	—	0.86	0.79	—	0.79	—	13,331	13,331	0.54	0.11	—	13,377
Total	5.60	4.75	24.4	30.6	0.12	0.86	0.10	0.97	0.79	0.03	0.82	12.5	13,516	13,529	1.83	0.15	0.41	13,618

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.07	0.06	0.08	0.45	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	—	120	120	< 0.005	0.01	0.01	122
Area	0.17	0.17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—	—	—	—	12.5	54.7	67.2	1.28	0.03	—	108
Waste	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Off-Road	5.29	4.45	24.3	29.7	0.12	0.86	—	0.86	0.79	—	0.79	—	13,331	13,331	0.54	0.11	—	13,377
Total	5.53	4.68	24.4	30.2	0.12	0.86	0.10	0.96	0.79	0.03	0.82	12.5	13,505	13,518	1.83	0.15	0.01	13,607
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.05	0.05	0.06	0.34	< 0.005	< 0.005	0.07	0.07	< 0.005	0.02	0.02	—	87.2	87.2	< 0.005	0.01	0.13	88.9
Area	0.20	0.20	< 0.005	0.17	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	0.71	0.71	< 0.005	< 0.005	—	0.71
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—	—	—	—	12.5	54.7	67.2	1.28	0.03	—	108
Waste	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Off-Road	0.87	0.73	4.00	4.88	0.02	0.14	—	0.14	0.13	—	0.13	—	2,191	2,191	0.09	0.02	—	2,199
Total	1.12	0.98	4.06	5.40	0.02	0.14	0.07	0.21	0.13	0.02	0.15	12.5	2,334	2,347	1.38	0.05	0.13	2,397
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.01	0.01	0.01	0.06	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	14.4	14.4	< 0.005	< 0.005	0.02	14.7
Area	0.04	0.04	< 0.005	0.03	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	0.12	0.12	< 0.005	< 0.005	—	0.12
Energy	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—	—	—	—	2.07	9.05	11.1	0.21	0.01	—	18.0
Waste	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Off-Road	0.16	0.13	0.73	0.89	< 0.005	0.03	—	0.03	0.02	—	0.02	—	363	363	0.01	< 0.005	—	364
Total	0.20	0.18	0.74	0.98	< 0.005	0.03	0.01	0.04	0.02	< 0.005	0.03	2.07	386	388	0.23	0.01	0.02	397

3. Construction Emissions Details

3.1. Site Preparation (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	6.42	5.39	49.1	52.3	0.08	2.19	—	2.19	2.01	—	2.01	—	8,738	8,738	0.35	0.07	—	8,768
Dust From Material Movement	—	—	—	—	—	—	5.52	5.52	—	2.67	2.67	—	—	—	—	—	—	—
Onsite truck	0.02	0.02	0.65	0.34	< 0.005	0.01	113	113	0.01	11.3	11.3	—	307	307	< 0.005	0.05	0.01	321
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.16	0.97	8.84	9.42	0.01	0.39	—	0.39	0.36	—	0.36	—	1,573	1,573	0.06	0.01	—	1,579
Dust From Material Movement	—	—	—	—	—	—	0.99	0.99	—	0.48	0.48	—	—	—	—	—	—	—
Onsite truck	< 0.005	< 0.005	0.11	0.06	< 0.005	< 0.005	19.0	19.0	< 0.005	1.90	1.90	—	55.0	55.0	< 0.005	0.01	0.04	57.7
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Roa Equipment	0.21	0.18	1.61	1.72	< 0.005	0.07	—	0.07	0.07	—	0.07	—	260	260	0.01	< 0.005	—	261
Dust From Material Movement	—	—	—	—	—	—	0.18	0.18	—	0.09	0.09	—	—	—	—	—	—	—
Onsite truck	< 0.005	< 0.005	0.02	0.01	< 0.005	< 0.005	3.47	3.47	< 0.005	0.35	0.35	—	9.11	9.11	< 0.005	< 0.005	0.01	9.55
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.31	0.28	0.30	3.41	0.00	0.00	0.73	0.73	0.00	0.17	0.17	—	712	712	0.04	0.03	0.08	721
Vendor	0.09	0.08	3.81	1.19	0.02	0.05	0.69	0.74	0.05	0.19	0.24	—	2,699	2,699	< 0.005	0.43	0.15	2,827
Hauling	0.07	0.07	4.02	0.85	0.02	0.06	0.87	0.93	0.06	0.24	0.31	—	3,296	3,296	< 0.005	0.53	0.18	3,453
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.05	0.06	0.68	0.00	0.00	0.13	0.13	0.00	0.03	0.03	—	132	132	0.01	0.01	0.25	134
Vendor	0.02	0.02	0.68	0.21	< 0.005	0.01	0.12	0.13	0.01	0.03	0.04	—	485	485	< 0.005	0.08	0.44	509
Hauling	0.01	0.01	0.73	0.15	< 0.005	0.01	0.15	0.17	0.01	0.04	0.05	—	593	593	< 0.005	0.09	0.55	622
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.12	0.00	0.00	0.02	0.02	0.00	0.01	0.01	—	21.8	21.8	< 0.005	< 0.005	0.04	22.2
Vendor	< 0.005	< 0.005	0.12	0.04	< 0.005	< 0.005	0.02	0.02	< 0.005	0.01	0.01	—	80.4	80.4	< 0.005	0.01	0.07	84.2
Hauling	< 0.005	< 0.005	0.13	0.03	< 0.005	< 0.005	0.03	0.03	< 0.005	0.01	0.01	—	98.2	98.2	< 0.005	0.02	0.09	103

3.3. Site Preparation (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	6.07	5.10	45.5	50.8	0.08	1.99	—	1.99	1.83	—	1.83	—	8,741	8,741	0.35	0.07	—	8,771
Dust From Material Movement	—	—	—	—	—	—	5.52	5.52	—	2.67	2.67	—	—	—	—	—	—	—
Onsite truck	0.03	0.02	0.60	0.33	< 0.005	0.01	113	113	0.01	11.3	11.3	—	298	298	< 0.005	0.05	0.53	313
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	6.07	5.10	45.5	50.8	0.08	1.99	—	1.99	1.83	—	1.83	—	8,741	8,741	0.35	0.07	—	8,771
Dust From Material Movement	—	—	—	—	—	—	5.52	5.52	—	2.67	2.67	—	—	—	—	—	—	—
Onsite truck	0.02	0.02	0.64	0.34	< 0.005	0.01	113	113	0.01	11.3	11.3	—	300	300	< 0.005	0.05	0.01	314
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.08	0.91	8.10	9.05	0.01	0.35	—	0.35	0.33	—	0.33	—	1,557	1,557	0.06	0.01	—	1,562
Dust From Material Movement	—	—	—	—	—	—	0.98	0.98	—	0.48	0.48	—	—	—	—	—	—	—
Onsite truck	< 0.005	< 0.005	0.11	0.06	< 0.005	< 0.005	18.8	18.8	< 0.005	1.88	1.88	—	53.2	53.2	< 0.005	0.01	0.04	55.8

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.20	0.17	1.48	1.65	< 0.005	0.06	—	0.06	0.06	—	0.06	—	258	258	0.01	< 0.005	—	259
Dust From Material Movement	—	—	—	—	—	—	0.18	0.18	—	0.09	0.09	—	—	—	—	—	—	—
Onsite truck	< 0.005	< 0.005	0.02	0.01	< 0.005	< 0.005	3.44	3.44	< 0.005	0.34	0.34	—	8.82	8.82	< 0.005	< 0.005	0.01	9.23
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.32	0.29	0.25	4.52	0.00	0.00	0.73	0.73	0.00	0.17	0.17	—	784	784	0.03	0.03	2.89	797
Vendor	0.10	0.09	3.54	1.15	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,635	2,635	< 0.005	0.41	5.29	2,764
Hauling	0.08	0.07	3.74	0.83	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,221	3,221	< 0.005	0.50	6.66	3,378
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.29	0.26	0.28	3.13	0.00	0.00	0.73	0.73	0.00	0.17	0.17	—	698	698	0.01	0.03	0.07	706
Vendor	0.09	0.08	3.74	1.19	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,640	2,640	< 0.005	0.41	0.14	2,763
Hauling	0.07	0.07	3.94	0.85	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,224	3,224	< 0.005	0.50	0.17	3,375
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.05	0.05	0.62	0.00	0.00	0.13	0.13	0.00	0.03	0.03	—	128	128	< 0.005	0.01	0.22	130
Vendor	0.02	0.02	0.66	0.21	< 0.005	0.01	0.12	0.13	0.01	0.03	0.04	—	470	470	< 0.005	0.07	0.41	492
Hauling	0.01	0.01	0.70	0.15	< 0.005	0.01	0.16	0.17	0.01	0.04	0.05	—	574	574	< 0.005	0.09	0.51	601
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.11	0.00	0.00	0.02	0.02	0.00	0.01	0.01	—	21.2	21.2	< 0.005	< 0.005	0.04	21.5
Vendor	< 0.005	< 0.005	0.12	0.04	< 0.005	< 0.005	0.02	0.02	< 0.005	0.01	0.01	—	77.8	77.8	< 0.005	0.01	0.07	81.5
Hauling	< 0.005	< 0.005	0.13	0.03	< 0.005	< 0.005	0.03	0.03	< 0.005	0.01	0.01	—	95.0	95.0	< 0.005	0.01	0.08	99.5

3.5. Site Mobilization (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Dust From Material Movement	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Dust From Material Movement	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Dust From Material Movement	—	—	—	—	—	—	0.00	0.00	—	0.00	0.00	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.15	0.14	0.15	1.70	0.00	0.00	0.37	0.37	0.00	0.09	0.09	—	356	356	0.02	0.01	0.04	360
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.02	0.03	0.34	0.00	0.00	0.06	0.06	0.00	0.02	0.02	—	65.2	65.2	< 0.005	< 0.005	0.12	66.2
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	< 0.005	0.01	0.06	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	10.8	10.8	< 0.005	< 0.005	0.02	11.0
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.7. System Installation and Gen-Tie Construction (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	8.48	7.31	92.4	2,208	0.22	4.00	—	4.00	3.52	—	3.52	—	17,593	17,593	0.72	0.14	—	17,653
Onsite truck	0.05	0.04	1.30	0.69	< 0.005	0.01	227	227	0.01	22.6	22.6	—	613	613	< 0.005	0.10	0.03	642

Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.98	0.84	10.7	255	0.03	0.46	—	0.46	0.41	—	0.41	—	2,031	2,031	0.08	0.02	—	2,038
Onsite truck	0.01	0.01	0.15	0.08	< 0.005	< 0.005	24.4	24.4	< 0.005	2.44	2.44	—	70.6	70.6	< 0.005	0.01	0.06	74.0
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.18	0.15	1.95	46.5	< 0.005	0.08	—	0.08	0.07	—	0.07	—	336	336	0.01	< 0.005	—	337
Onsite truck	< 0.005	< 0.005	0.03	0.01	< 0.005	< 0.005	4.45	4.46	< 0.005	0.44	0.44	—	11.7	11.7	< 0.005	< 0.005	0.01	12.2
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	4.88	4.41	4.84	54.4	0.00	0.00	11.7	11.7	0.00	2.74	2.74	—	11,361	11,361	0.60	0.45	1.31	11,511
Vendor	0.09	0.08	3.81	1.19	0.02	0.05	0.69	0.74	0.05	0.19	0.24	—	2,699	2,699	< 0.005	0.43	0.15	2,827
Hauling	0.07	0.07	4.02	0.85	0.02	0.06	0.87	0.93	0.06	0.24	0.31	—	3,296	3,296	< 0.005	0.53	0.18	3,453
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.57	0.51	0.60	6.97	0.00	0.00	1.33	1.33	0.00	0.31	0.31	—	1,351	1,351	0.07	0.05	2.52	1,371
Vendor	0.01	0.01	0.44	0.14	< 0.005	0.01	0.08	0.08	0.01	0.02	0.03	—	311	311	< 0.005	0.05	0.28	326
Hauling	0.01	0.01	0.47	0.10	< 0.005	0.01	0.10	0.11	0.01	0.03	0.04	—	380	380	< 0.005	0.06	0.35	399
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.10	0.09	0.11	1.27	0.00	0.00	0.24	0.24	0.00	0.06	0.06	—	224	224	0.01	0.01	0.42	227
Vendor	< 0.005	< 0.005	0.08	0.02	< 0.005	< 0.005	0.01	0.02	< 0.005	< 0.005	0.01	—	51.5	51.5	< 0.005	0.01	0.05	54.0
Hauling	< 0.005	< 0.005	0.08	0.02	< 0.005	< 0.005	0.02	0.02	< 0.005	0.01	0.01	—	63.0	63.0	< 0.005	0.01	0.06	66.0

3.9. System Installation and Gen-Tie Construction (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	8.09	6.98	89.1	2,208	0.22	3.68	—	3.68	3.23	—	3.23	—	17,592	17,592	0.72	0.14	—	17,653
Onsite truck	0.06	0.05	1.21	0.66	< 0.005	0.01	227	227	0.01	22.6	22.6	—	597	597	< 0.005	0.09	1.07	626
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	8.09	6.98	89.1	2,208	0.22	3.68	—	3.68	3.23	—	3.23	—	17,592	17,592	0.72	0.14	—	17,653
Onsite truck	0.05	0.04	1.29	0.68	< 0.005	0.01	227	227	0.01	22.6	22.6	—	600	600	< 0.005	0.09	0.03	628
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	5.78	4.99	63.6	1,577	0.16	2.63	—	2.63	2.31	—	2.31	—	12,566	12,566	0.51	0.10	—	12,609
Onsite truck	0.04	0.03	0.90	0.48	< 0.005	0.01	151	151	0.01	15.1	15.1	—	427	427	< 0.005	0.07	0.33	447
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.06	0.91	11.6	288	0.03	0.48	—	0.48	0.42	—	0.42	—	2,080	2,080	0.08	0.02	—	2,088

Onsite truck	0.01	0.01	0.16	0.09	< 0.005	< 0.005	27.6	27.6	< 0.005	2.75	2.75	—	70.7	70.7	< 0.005	0.01	0.05	74.1
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	5.13	4.68	4.01	72.1	0.00	0.00	11.7	11.7	0.00	2.74	2.74	—	12,525	12,525	0.53	0.45	46.2	12,719
Vendor	0.10	0.09	3.54	1.15	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,635	2,635	< 0.005	0.41	5.29	2,764
Hauling	0.08	0.07	3.74	0.83	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,221	3,221	< 0.005	0.50	6.66	3,378
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	4.67	4.19	4.44	50.0	0.00	0.00	11.7	11.7	0.00	2.74	2.74	—	11,139	11,139	0.21	0.45	1.20	11,279
Vendor	0.09	0.08	3.74	1.19	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,640	2,640	< 0.005	0.41	0.14	2,763
Hauling	0.07	0.07	3.94	0.85	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,224	3,224	< 0.005	0.50	0.17	3,375
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	3.35	3.01	3.43	40.0	0.00	0.00	8.23	8.23	0.00	1.93	1.93	—	8,194	8,194	0.15	0.32	14.3	8,307
Vendor	0.07	0.06	2.66	0.84	0.01	0.04	0.50	0.54	0.04	0.14	0.17	—	1,884	1,884	< 0.005	0.29	1.63	1,973
Hauling	0.05	0.05	2.81	0.60	0.02	0.05	0.63	0.67	0.05	0.17	0.22	—	2,302	2,302	< 0.005	0.36	2.05	2,411
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.61	0.55	0.63	7.29	0.00	0.00	1.50	1.50	0.00	0.35	0.35	—	1,357	1,357	0.02	0.05	2.36	1,375
Vendor	0.01	0.01	0.48	0.15	< 0.005	0.01	0.09	0.10	0.01	0.02	0.03	—	312	312	< 0.005	0.05	0.27	327
Hauling	0.01	0.01	0.51	0.11	< 0.005	0.01	0.11	0.12	0.01	0.03	0.04	—	381	381	< 0.005	0.06	0.34	399

3.11. System Installation and Gen-Tie Construction (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	7.61	6.57	85.2	2,208	0.22	3.29	—	3.29	2.87	—	2.87	—	17,591	17,591	0.72	0.14	—	17,652
Onsite truck	0.06	0.05	1.19	0.66	< 0.005	0.01	227	227	0.01	22.6	22.6	—	583	583	< 0.005	0.09	0.99	611
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	7.61	6.57	85.2	2,208	0.22	3.29	—	3.29	2.87	—	2.87	—	17,591	17,591	0.72	0.14	—	17,652
Onsite truck	0.05	0.04	1.28	0.68	< 0.005	0.01	227	227	0.01	22.6	22.6	—	585	585	< 0.005	0.09	0.03	613
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	5.02	4.33	56.2	1,456	0.14	2.17	—	2.17	1.89	—	1.89	—	11,601	11,601	0.47	0.09	—	11,641
Onsite truck	0.04	0.03	0.82	0.44	< 0.005	0.01	139	139	0.01	13.9	13.9	—	385	385	< 0.005	0.06	0.28	404
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.92	0.79	10.3	266	0.03	0.40	—	0.40	0.35	—	0.35	—	1,921	1,921	0.08	0.02	—	1,927
Onsite truck	0.01	0.01	0.15	0.08	< 0.005	< 0.005	25.4	25.4	< 0.005	2.54	2.54	—	63.7	63.7	< 0.005	0.01	0.05	66.8
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	4.88	4.45	3.60	66.5	0.00	0.00	11.7	11.7	0.00	2.74	2.74	—	12,273	12,273	0.17	0.45	42.1	12,454
Vendor	0.10	0.09	3.49	1.14	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,571	2,571	< 0.005	0.41	4.91	2,699
Hauling	0.08	0.07	3.68	0.81	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,142	3,142	< 0.005	0.50	6.17	3,299
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	4.45	3.98	4.03	46.3	0.00	0.00	11.7	11.7	0.00	2.74	2.74	—	10,918	10,918	0.19	0.45	1.09	11,058
Vendor	0.09	0.08	3.69	1.17	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,576	2,576	< 0.005	0.41	0.13	2,699
Hauling	0.07	0.07	3.87	0.83	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,146	3,146	< 0.005	0.50	0.16	3,296
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	2.97	2.67	2.66	34.0	0.00	0.00	7.60	7.60	0.00	1.78	1.78	—	7,414	7,414	0.14	0.30	12.0	7,518
Vendor	0.07	0.06	2.40	0.76	0.01	0.03	0.46	0.49	0.03	0.13	0.16	—	1,697	1,697	< 0.005	0.27	1.40	1,780
Hauling	0.05	0.05	2.54	0.54	0.01	0.04	0.58	0.62	0.04	0.16	0.20	—	2,073	2,073	< 0.005	0.33	1.76	2,174
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.54	0.49	0.48	6.21	0.00	0.00	1.39	1.39	0.00	0.32	0.32	—	1,228	1,228	0.02	0.05	1.99	1,245
Vendor	0.01	0.01	0.44	0.14	< 0.005	0.01	0.08	0.09	0.01	0.02	0.03	—	281	281	< 0.005	0.05	0.23	295
Hauling	0.01	0.01	0.46	0.10	< 0.005	0.01	0.11	0.11	0.01	0.03	0.04	—	343	343	< 0.005	0.05	0.29	360

3.13. Energy Storage System (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.07	0.90	8.50	10.8	0.02	0.37	—	0.37	0.34	—	0.34	—	2,200	2,200	0.09	0.02	—	2,208

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.07	0.90	8.50	10.8	0.02	0.37	—	0.37	0.34	—	0.34	—	2,200	2,200	0.09	0.02	—	2,208
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.64	0.54	5.08	6.42	0.01	0.22	—	0.22	0.20	—	0.20	—	1,313	1,313	0.05	0.01	—	1,318
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.12	0.10	0.93	1.17	< 0.005	0.04	—	0.04	0.04	—	0.04	—	217	217	0.01	< 0.005	—	218
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	1.12	1.03	0.88	15.8	0.00	0.00	2.57	2.57	0.00	0.60	0.60	—	2,746	2,746	0.12	0.10	10.1	2,788
Vendor	0.10	0.09	3.54	1.15	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,635	2,635	< 0.005	0.41	5.29	2,764
Hauling	0.08	0.07	3.74	0.83	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,221	3,221	< 0.005	0.50	6.66	3,378
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	1.02	0.92	0.97	11.0	0.00	0.00	2.57	2.57	0.00	0.60	0.60	—	2,442	2,442	0.05	0.10	0.26	2,473
Vendor	0.09	0.08	3.74	1.19	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,640	2,640	< 0.005	0.41	0.14	2,763
Hauling	0.07	0.07	3.94	0.85	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,224	3,224	< 0.005	0.50	0.17	3,375
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.61	0.55	0.63	7.32	0.00	0.00	1.51	1.51	0.00	0.35	0.35	—	1,501	1,501	0.03	0.06	2.61	1,522
Vendor	0.06	0.05	2.22	0.70	0.01	0.03	0.42	0.45	0.03	0.11	0.14	—	1,574	1,574	< 0.005	0.25	1.36	1,649
Hauling	0.05	0.04	2.35	0.50	0.01	0.04	0.52	0.56	0.04	0.14	0.18	—	1,923	1,923	< 0.005	0.30	1.71	2,015
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.11	0.10	0.11	1.34	0.00	0.00	0.28	0.28	0.00	0.06	0.06	—	248	248	< 0.005	0.01	0.43	252
Vendor	0.01	0.01	0.40	0.13	< 0.005	0.01	0.08	0.08	0.01	0.02	0.03	—	261	261	< 0.005	0.04	0.23	273
Hauling	0.01	0.01	0.43	0.09	< 0.005	0.01	0.10	0.10	0.01	0.03	0.03	—	318	318	< 0.005	0.05	0.28	334

3.15. Energy Storage System (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.03	0.87	7.97	10.7	0.02	0.34	—	0.34	0.31	—	0.31	—	2,201	2,201	0.09	0.02	—	2,209
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	1.03	0.87	7.97	10.7	0.02	0.34	—	0.34	0.31	—	0.31	—	2,201	2,201	0.09	0.02	—	2,209
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.31	0.26	2.37	3.19	0.01	0.10	—	0.10	0.09	—	0.09	—	655	655	0.03	0.01	—	657
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.06	0.05	0.43	0.58	< 0.005	0.02	—	0.02	0.02	—	0.02	—	108	108	< 0.005	< 0.005	—	109
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	1.07	0.98	0.79	14.6	0.00	0.00	2.57	2.57	0.00	0.60	0.60	—	2,690	2,690	0.04	0.10	9.22	2,730
Vendor	0.10	0.09	3.49	1.14	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,571	2,571	< 0.005	0.41	4.91	2,699
Hauling	0.08	0.07	3.68	0.81	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,142	3,142	< 0.005	0.50	6.17	3,299
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.98	0.87	0.88	10.2	0.00	0.00	2.57	2.57	0.00	0.60	0.60	—	2,393	2,393	0.04	0.10	0.24	2,424
Vendor	0.09	0.08	3.69	1.17	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,576	2,576	< 0.005	0.41	0.13	2,699
Hauling	0.07	0.07	3.87	0.83	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,146	3,146	< 0.005	0.50	0.16	3,296

Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.29	0.26	0.26	3.36	0.00	0.00	0.75	0.75	0.00	0.18	0.18	—	733	733	0.01	0.03	1.19	743
Vendor	0.03	0.03	1.08	0.34	0.01	0.02	0.21	0.22	0.02	0.06	0.07	—	765	765	< 0.005	0.12	0.63	803
Hauling	0.02	0.02	1.15	0.24	0.01	0.02	0.26	0.28	0.02	0.07	0.09	—	935	935	< 0.005	0.15	0.79	981
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.05	0.05	0.05	0.61	0.00	0.00	0.14	0.14	0.00	0.03	0.03	—	121	121	< 0.005	< 0.005	0.20	123
Vendor	0.01	< 0.005	0.20	0.06	< 0.005	< 0.005	0.04	0.04	< 0.005	0.01	0.01	—	127	127	< 0.005	0.02	0.10	133
Hauling	< 0.005	< 0.005	0.21	0.04	< 0.005	< 0.005	0.05	0.05	< 0.005	0.01	0.02	—	155	155	< 0.005	0.02	0.13	162

3.17. Testing and Commissioning (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.03	0.02	0.55	0.30	< 0.005	< 0.005	103	103	< 0.005	10.3	10.3	—	271	271	< 0.005	0.04	0.49	284
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.02	0.59	0.31	< 0.005	< 0.005	103	103	< 0.005	10.3	10.3	—	273	273	< 0.005	0.04	0.01	285
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.01	0.01	0.27	0.15	< 0.005	< 0.005	46.1	46.1	< 0.005	4.60	4.60	—	130	130	< 0.005	0.02	0.10	137
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	< 0.005	< 0.005	0.05	0.03	< 0.005	< 0.005	8.41	8.41	< 0.005	0.84	0.84	—	21.6	21.6	< 0.005	< 0.005	0.02	22.6
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.32	0.29	0.25	4.52	0.00	0.00	0.73	0.73	0.00	0.17	0.17	—	784	784	0.03	0.03	2.89	797
Vendor	0.10	0.09	3.54	1.15	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,635	2,635	< 0.005	0.41	5.29	2,764
Hauling	0.08	0.07	3.74	0.83	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,221	3,221	< 0.005	0.50	6.66	3,378
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.29	0.26	0.28	3.13	0.00	0.00	0.73	0.73	0.00	0.17	0.17	—	698	698	0.01	0.03	0.07	706
Vendor	0.09	0.08	3.74	1.19	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,640	2,640	< 0.005	0.41	0.14	2,763
Hauling	0.07	0.07	3.94	0.85	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,224	3,224	< 0.005	0.50	0.17	3,375
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.14	0.13	0.14	1.68	0.00	0.00	0.35	0.35	0.00	0.08	0.08	—	344	344	0.01	0.01	0.60	349
Vendor	0.05	0.04	1.78	0.56	0.01	0.02	0.34	0.36	0.02	0.09	0.12	—	1,265	1,265	< 0.005	0.20	1.09	1,325
Hauling	0.04	0.03	1.89	0.40	0.01	0.03	0.42	0.45	0.03	0.12	0.15	—	1,545	1,545	< 0.005	0.24	1.38	1,618
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.02	0.03	0.31	0.00	0.00	0.06	0.06	0.00	0.01	0.01	—	57.0	57.0	< 0.005	< 0.005	0.10	57.8
Vendor	0.01	0.01	0.33	0.10	< 0.005	< 0.005	0.06	0.07	< 0.005	0.02	0.02	—	209	209	< 0.005	0.03	0.18	219
Hauling	0.01	0.01	0.34	0.07	< 0.005	0.01	0.08	0.08	0.01	0.02	0.03	—	256	256	< 0.005	0.04	0.23	268

3.19. Testing and Commissioning (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.03	0.02	0.54	0.30	< 0.005	< 0.005	103	103	< 0.005	10.3	10.3	—	265	265	< 0.005	0.04	0.45	278

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.02	0.58	0.31	< 0.005	< 0.005	103	103	< 0.005	10.3	10.3	—	266	266	< 0.005	0.04	0.01	279
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.02	0.40	0.22	< 0.005	< 0.005	68.6	68.6	< 0.005	6.85	6.86	—	190	190	< 0.005	0.03	0.14	199
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	< 0.005	< 0.005	0.07	0.04	< 0.005	< 0.005	12.5	12.5	< 0.005	1.25	1.25	—	31.4	31.4	< 0.005	0.01	0.02	32.9
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.31	0.28	0.23	4.16	0.00	0.00	0.73	0.73	0.00	0.17	0.17	—	769	769	0.01	0.03	2.63	780
Vendor	0.10	0.09	3.49	1.14	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,571	2,571	< 0.005	0.41	4.91	2,699
Hauling	0.08	0.07	3.68	0.81	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,142	3,142	< 0.005	0.50	6.17	3,299
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.28	0.25	0.25	2.90	0.00	0.00	0.73	0.73	0.00	0.17	0.17	—	684	684	0.01	0.03	0.07	693
Vendor	0.09	0.08	3.69	1.17	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,576	2,576	< 0.005	0.41	0.13	2,699
Hauling	0.07	0.07	3.87	0.83	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,146	3,146	< 0.005	0.50	0.16	3,296
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.20	0.18	0.18	2.31	0.00	0.00	0.52	0.52	0.00	0.12	0.12	—	503	503	0.01	0.02	0.81	510
Vendor	0.07	0.06	2.60	0.82	0.01	0.04	0.50	0.54	0.04	0.14	0.17	—	1,838	1,838	< 0.005	0.29	1.51	1,927
Hauling	0.05	0.05	2.75	0.58	0.02	0.05	0.63	0.67	0.05	0.17	0.22	—	2,246	2,246	< 0.005	0.36	1.90	2,355
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.04	0.03	0.03	0.42	0.00	0.00	0.09	0.09	0.00	0.02	0.02	—	83.3	83.3	< 0.005	< 0.005	0.13	84.4

Vendor	0.01	0.01	0.48	0.15	< 0.005	0.01	0.09	0.10	0.01	0.02	0.03	—	304	304	< 0.005	0.05	0.25	319
Hauling	0.01	0.01	0.50	0.11	< 0.005	0.01	0.11	0.12	0.01	0.03	0.04	—	372	372	< 0.005	0.06	0.31	390

3.21. Testing and Commissioning (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.03	0.02	0.53	0.30	< 0.005	< 0.005	103	103	< 0.005	10.3	10.3	—	258	258	< 0.005	0.04	0.41	271
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.02	0.57	0.31	< 0.005	< 0.005	103	103	< 0.005	10.3	10.3	—	259	259	< 0.005	0.04	0.01	272
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.01	0.01	0.13	0.07	< 0.005	< 0.005	23.1	23.1	< 0.005	2.31	2.31	—	62.2	62.2	< 0.005	0.01	0.04	65.2
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	< 0.005	< 0.005	0.02	0.01	< 0.005	< 0.005	4.22	4.22	< 0.005	0.42	0.42	—	10.3	10.3	< 0.005	< 0.005	0.01	10.8
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.27	0.27	0.20	3.88	0.00	0.00	0.73	0.73	0.00	0.17	0.17	—	754	754	0.01	0.03	2.39	765
Vendor	0.10	0.09	3.41	1.14	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,504	2,504	< 0.005	0.39	4.52	2,626
Hauling	0.08	0.07	3.59	0.81	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,060	3,060	< 0.005	0.48	5.69	3,209

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.25	0.24	0.23	2.68	0.00	0.00	0.73	0.73	0.00	0.17	0.17	—	671	671	0.01	0.03	0.06	680
Vendor	0.09	0.08	3.61	1.17	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,509	2,509	< 0.005	0.40	0.12	2,627
Hauling	0.07	0.07	3.78	0.83	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,063	3,063	< 0.005	0.48	0.15	3,207
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.06	0.05	0.72	0.00	0.00	0.17	0.17	0.00	0.04	0.04	—	166	166	< 0.005	0.01	0.25	169
Vendor	0.02	0.02	0.86	0.28	< 0.005	0.01	0.17	0.18	0.01	0.05	0.06	—	603	603	< 0.005	0.09	0.47	632
Hauling	0.02	0.02	0.91	0.20	0.01	0.02	0.21	0.23	0.02	0.06	0.07	—	737	737	< 0.005	0.12	0.59	772
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.13	0.00	0.00	0.03	0.03	0.00	0.01	0.01	—	27.5	27.5	< 0.005	< 0.005	0.04	27.9
Vendor	< 0.005	< 0.005	0.16	0.05	< 0.005	< 0.005	0.03	0.03	< 0.005	0.01	0.01	—	99.9	99.9	< 0.005	0.02	0.08	105
Hauling	< 0.005	< 0.005	0.17	0.04	< 0.005	< 0.005	0.04	0.04	< 0.005	0.01	0.01	—	122	122	< 0.005	0.02	0.10	128

3.23. Underground Work (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.75	1.47	13.5	20.3	0.03	0.53	—	0.53	0.49	—	0.49	—	3,021	3,021	0.12	0.02	—	3,032
Onsite truck	0.02	0.02	0.59	0.31	< 0.005	< 0.005	103	103	< 0.005	10.3	10.3	—	279	279	< 0.005	0.04	0.01	292

Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.21	0.18	1.61	2.43	< 0.005	0.06	—	0.06	0.06	—	0.06	—	361	361	0.01	< 0.005	—	362
Onsite truck	< 0.005	< 0.005	0.07	0.04	< 0.005	< 0.005	11.5	11.5	< 0.005	1.15	1.15	—	33.2	33.2	< 0.005	0.01	0.03	34.8
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.04	0.03	0.29	0.44	< 0.005	0.01	—	0.01	0.01	—	0.01	—	59.7	59.7	< 0.005	< 0.005	—	59.9
Onsite truck	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	2.09	2.09	< 0.005	0.21	0.21	—	5.49	5.49	< 0.005	< 0.005	< 0.005	5.76
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.12	0.11	0.12	1.36	0.00	0.00	0.29	0.29	0.00	0.07	0.07	—	285	285	0.01	0.01	0.03	288
Vendor	0.09	0.08	3.81	1.19	0.02	0.05	0.69	0.74	0.05	0.19	0.24	—	2,699	2,699	< 0.005	0.43	0.15	2,827
Hauling	0.07	0.07	4.02	0.85	0.02	0.06	0.87	0.93	0.06	0.24	0.31	—	3,296	3,296	< 0.005	0.53	0.18	3,453
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.02	0.18	0.00	0.00	0.03	0.03	0.00	0.01	0.01	—	35.0	35.0	< 0.005	< 0.005	0.07	35.5
Vendor	0.01	0.01	0.45	0.14	< 0.005	0.01	0.08	0.09	0.01	0.02	0.03	—	322	322	< 0.005	0.05	0.29	337
Hauling	0.01	0.01	0.48	0.10	< 0.005	0.01	0.10	0.11	0.01	0.03	0.04	—	393	393	< 0.005	0.06	0.36	412
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.03	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	5.79	5.79	< 0.005	< 0.005	0.01	5.88
Vendor	< 0.005	< 0.005	0.08	0.03	< 0.005	< 0.005	0.01	0.02	< 0.005	< 0.005	0.01	—	53.3	53.3	< 0.005	0.01	0.05	55.9
Hauling	< 0.005	< 0.005	0.09	0.02	< 0.005	< 0.005	0.02	0.02	< 0.005	0.01	0.01	—	65.1	65.1	< 0.005	0.01	0.06	68.3

3.25. Underground Work (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.66	1.40	12.9	20.3	0.03	0.46	—	0.46	0.42	—	0.42	—	3,021	3,021	0.12	0.02	—	3,031
Onsite truck	0.02	0.02	0.59	0.31	< 0.005	< 0.005	103	103	< 0.005	10.3	10.3	—	273	273	< 0.005	0.04	0.01	285
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.20	0.17	1.56	2.46	< 0.005	0.06	—	0.06	0.05	—	0.05	—	367	367	0.01	< 0.005	—	368
Onsite truck	< 0.005	< 0.005	0.07	0.04	< 0.005	< 0.005	11.7	11.7	< 0.005	1.16	1.16	—	33.0	33.0	< 0.005	0.01	0.03	34.5
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.04	0.03	0.29	0.45	< 0.005	0.01	—	0.01	0.01	—	0.01	—	60.7	60.7	< 0.005	< 0.005	—	60.9
Onsite truck	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	2.13	2.13	< 0.005	0.21	0.21	—	5.46	5.46	< 0.005	< 0.005	< 0.005	5.72
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.12	0.11	0.11	1.25	0.00	0.00	0.29	0.29	0.00	0.07	0.07	—	279	279	0.01	0.01	0.03	283
Vendor	0.09	0.08	3.74	1.19	0.02	0.05	0.71	0.76	0.05	0.19	0.24	—	2,640	2,640	< 0.005	0.41	0.14	2,763
Hauling	0.07	0.07	3.94	0.85	0.02	0.06	0.89	0.95	0.06	0.24	0.31	—	3,224	3,224	< 0.005	0.50	0.17	3,375
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.17	0.00	0.00	0.04	0.04	0.00	0.01	0.01	—	34.9	34.9	< 0.005	< 0.005	0.06	35.4
Vendor	0.01	0.01	0.45	0.14	< 0.005	0.01	0.08	0.09	0.01	0.02	0.03	—	320	320	< 0.005	0.05	0.28	335
Hauling	0.01	0.01	0.48	0.10	< 0.005	0.01	0.11	0.11	0.01	0.03	0.04	—	391	391	< 0.005	0.06	0.35	410
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.03	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	5.77	5.77	< 0.005	< 0.005	0.01	5.85
Vendor	< 0.005	< 0.005	0.08	0.03	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	—	53.0	53.0	< 0.005	0.01	0.05	55.5
Hauling	< 0.005	< 0.005	0.09	0.02	< 0.005	< 0.005	0.02	0.02	< 0.005	0.01	0.01	—	64.7	64.7	< 0.005	0.01	0.06	67.8

3.27. General Management (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.51	0.46	0.51	5.68	0.00	0.00	1.22	1.22	0.00	0.29	0.29	—	1,186	1,186	0.06	0.05	0.14	1,202
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.09	0.08	0.10	1.13	0.00	0.00	0.22	0.22	0.00	0.05	0.05	—	220	220	0.01	0.01	0.41	223
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.02	0.21	0.00	0.00	0.04	0.04	0.00	0.01	0.01	—	36.4	36.4	< 0.005	< 0.005	0.07	36.9
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.29. General Management (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.54	0.49	0.42	7.53	0.00	0.00	1.22	1.22	0.00	0.29	0.29	—	1,307	1,307	0.06	0.05	4.82	1,328
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.49	0.44	0.46	5.21	0.00	0.00	1.22	1.22	0.00	0.29	0.29	—	1,163	1,163	0.02	0.05	0.12	1,177
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.35	0.31	0.36	4.17	0.00	0.00	0.86	0.86	0.00	0.20	0.20	—	855	855	0.02	0.03	1.49	867
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	0.06	0.06	0.07	0.76	0.00	0.00	0.16	0.16	0.00	0.04	0.04	—	142	142	< 0.005	0.01	0.25	144
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.31. General Management (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.51	0.46	0.38	6.94	0.00	0.00	1.22	1.22	0.00	0.29	0.29	—	1,281	1,281	0.02	0.05	4.39	1,300
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.46	0.42	0.42	4.83	0.00	0.00	1.22	1.22	0.00	0.29	0.29	—	1,140	1,140	0.02	0.05	0.11	1,154
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.34	0.30	0.30	3.84	0.00	0.00	0.86	0.86	0.00	0.20	0.20	—	838	838	0.02	0.03	1.36	850
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.06	0.06	0.05	0.70	0.00	0.00	0.16	0.16	0.00	0.04	0.04	—	139	139	< 0.005	0.01	0.22	141
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

3.33. General Management (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.45	0.44	0.33	6.46	0.00	0.00	1.22	1.22	0.00	0.29	0.29	—	1,257	1,257	0.02	0.04	3.99	1,275
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.41	0.40	0.38	4.46	0.00	0.00	1.22	1.22	0.00	0.29	0.29	—	1,118	1,118	0.02	0.05	0.10	1,133
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.17	0.17	0.16	2.11	0.00	0.00	0.51	0.51	0.00	0.12	0.12	—	485	485	0.01	0.02	0.72	491
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.03	0.03	0.38	0.00	0.00	0.09	0.09	0.00	0.02	0.02	—	80.2	80.2	< 0.005	< 0.005	0.12	81.4
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.1. Mobile Emissions by Land Use

4.1.1. Unmitigated

Mobile source emissions results are presented in Sections 2.6. No further detailed breakdown of emissions is available.

4.2. Energy

4.2.1. Electricity Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00

4.2.3. Natural Gas Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
User Defined Industrial	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
User Defined Industrial	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
User Defined Industrial	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00

4.3. Area Emissions by Source

4.3.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Source	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.17	0.17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Architect Coatings	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.06	0.06	< 0.005	0.35	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.43	1.43	< 0.005	< 0.005	—	1.44
Total	0.23	0.23	< 0.005	0.35	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.43	1.43	< 0.005	< 0.005	—	1.44
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.17	0.17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	0.17	0.17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Consumer Products	0.03	0.03	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	0.00	0.00	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.01	0.01	< 0.005	0.03	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	0.12	0.12	< 0.005	< 0.005	—	0.12
Total	0.04	0.04	< 0.005	0.03	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	0.12	0.12	< 0.005	< 0.005	—	0.12

4.4. Water Emissions by Land Use

4.4.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—	—	—	—	12.5	54.7	67.2	1.28	0.03	—	108
Total	—	—	—	—	—	—	—	—	—	—	—	12.5	54.7	67.2	1.28	0.03	—	108
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—	—	—	—	12.5	54.7	67.2	1.28	0.03	—	108
Total	—	—	—	—	—	—	—	—	—	—	—	12.5	54.7	67.2	1.28	0.03	—	108
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—	—	—	—	2.07	9.05	11.1	0.21	0.01	—	18.0
Total	—	—	—	—	—	—	—	—	—	—	—	2.07	9.05	11.1	0.21	0.01	—	18.0

4.5. Waste Emissions by Land Use

4.5.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

User Defined Industrial	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00

4.6. Refrigerant Emissions by Land Use

4.6.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.7. Offroad Emissions By Equipment Type

4.7.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Highway Trucks	5.29	4.45	24.3	29.7	0.12	0.86	—	0.86	0.79	—	0.79	—	13,331	13,331	0.54	0.11	—	13,377
Total	5.29	4.45	24.3	29.7	0.12	0.86	—	0.86	0.79	—	0.79	—	13,331	13,331	0.54	0.11	—	13,377
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Highway Trucks	5.29	4.45	24.3	29.7	0.12	0.86	—	0.86	0.79	—	0.79	—	13,331	13,331	0.54	0.11	—	13,377
Total	5.29	4.45	24.3	29.7	0.12	0.86	—	0.86	0.79	—	0.79	—	13,331	13,331	0.54	0.11	—	13,377
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Highway Trucks	0.16	0.13	0.73	0.89	< 0.005	0.03	—	0.03	0.02	—	0.02	—	363	363	0.01	< 0.005	—	364
Total	0.16	0.13	0.73	0.89	< 0.005	0.03	—	0.03	0.02	—	0.02	—	363	363	0.01	< 0.005	—	364

4.8. Stationary Emissions By Equipment Type

4.8.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.9. User Defined Emissions By Equipment Type

4.9.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Sequestered	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Site Preparation	Site Preparation	10/1/2025	4/1/2026	5.00	131	—
Site Mobilization	Site Preparation	10/1/2025	12/30/2025	5.00	65.0	—
System Installation and Gen-Tie Construction	Building Construction	11/3/2025	12/3/2027	5.00	545	—
Energy Storage System	Building Construction	3/2/2026	6/1/2027	5.00	327	—
Testing and Commissioning	Building Construction	5/1/2026	5/2/2028	5.00	523	—
Underground Work	Building Construction	11/1/2025	3/3/2026	5.00	87.0	—
General Management	Building Construction	10/1/2025	8/2/2028	5.00	741	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Site Preparation	Skid Steer Loaders	Diesel	Average	6.00	8.00	71.0	0.37
Site Preparation	Graders	Diesel	Average	3.00	8.00	148	0.41
Site Preparation	Rubber Tired Dozers	Diesel	Average	3.00	8.00	367	0.40

Site Preparation	Rollers	Diesel	Average	6.00	8.00	36.0	0.38
Site Preparation	Tractors/Loaders/Backhoes	Diesel	Average	2.00	8.00	84.0	0.37
System Installation and Gen-Tie Construction	Forklifts	Diesel	Average	12.0	8.00	82.0	0.20
System Installation and Gen-Tie Construction	Skid Steer Loaders	Diesel	Average	18.0	8.00	71.0	0.37
System Installation and Gen-Tie Construction	Tractors/Loaders/Backhoes	Diesel	Average	6.00	8.00	84.0	0.37
System Installation and Gen-Tie Construction	Other Construction Equipment	Diesel	Average	16.0	8.00	82.0	0.42
System Installation and Gen-Tie Construction	Generator Sets	Diesel	Average	3.00	8.00	7.00	0.74
System Installation and Gen-Tie Construction	Skid Steer Loaders	Gasoline	Average	40.0	8.00	19.0	0.58
System Installation and Gen-Tie Construction	Cranes	Diesel	Average	1.00	8.00	367	0.29
Energy Storage System	Cranes	Diesel	Average	1.00	8.00	367	0.29
Energy Storage System	Graders	Diesel	Average	1.00	8.00	148	0.41
Energy Storage System	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
Energy Storage System	Skid Steer Loaders	Diesel	Average	2.00	8.00	71.0	0.37
Underground Work	Excavators	Diesel	Average	3.00	8.00	36.0	0.38
Underground Work	Other Material Handling Equipment	Diesel	Average	2.00	8.00	93.0	0.40
Underground Work	Rollers	Diesel	Average	2.00	8.00	36.0	0.38

Underground Work	Forklifts	Diesel	Average	3.00	8.00	82.0	0.20
Underground Work	Tractors/Loaders/Backhoes	Diesel	Average	4.00	8.00	84.0	0.37

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Site Preparation	—	—	—	—
Site Preparation	Worker	60.0	17.3	LDA,LDT1,LDT2
Site Preparation	Vendor	72.0	10.6	HHDT
Site Preparation	Hauling	48.0	20.0	HHDT
Site Preparation	Onsite truck	22.0	3.50	HHDT
System Installation and Gen-Tie Construction	—	—	—	—
System Installation and Gen-Tie Construction	Worker	958	17.3	LDA,LDT1,LDT2
System Installation and Gen-Tie Construction	Vendor	72.0	10.6	HHDT
System Installation and Gen-Tie Construction	Hauling	48.0	20.0	HHDT
System Installation and Gen-Tie Construction	Onsite truck	44.0	3.50	HHDT
Energy Storage System	—	—	—	—
Energy Storage System	Worker	210	17.3	LDA,LDT1,LDT2
Energy Storage System	Vendor	72.0	10.6	HHDT
Energy Storage System	Hauling	48.0	20.0	HHDT
Energy Storage System	Onsite truck	0.00	—	HHDT
Testing and Commissioning	—	—	—	—
Testing and Commissioning	Worker	60.0	17.3	LDA,LDT1,LDT2

Testing and Commissioning	Vendor	72.0	10.6	HHDT
Testing and Commissioning	Hauling	48.0	20.0	HHDT
Testing and Commissioning	Onsite truck	20.0	3.50	HHDT
Underground Work	—	—	—	—
Underground Work	Worker	24.0	17.3	LDA,LDT1,LDT2
Underground Work	Vendor	72.0	10.6	HHDT
Underground Work	Hauling	48.0	20.0	HHDT
Underground Work	Onsite truck	20.0	3.50	HHDT
General Management	—	—	—	—
General Management	Worker	100	17.3	LDA,LDT1,LDT2
General Management	Vendor	0.00	10.6	HHDT,MHDT
General Management	Hauling	0.00	20.0	HHDT
General Management	Onsite truck	—	—	HHDT
Site Mobilization	—	—	—	—
Site Mobilization	Worker	30.0	17.3	LDA,LDT1,LDT2
Site Mobilization	Vendor	0.00	10.6	HHDT,MHDT
Site Mobilization	Hauling	0.00	20.0	HHDT
Site Mobilization	Onsite truck	0.00	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (cy)	Material Exported (cy)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
Site Preparation	—	—	500	0.00	—
Site Mobilization	—	—	0.00	0.00	—

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	3	74%	74%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
User Defined Industrial	0.00	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2025	0.00	532	0.03	< 0.005
2026	0.00	532	0.03	< 0.005
2027	0.00	532	0.03	< 0.005
2028	0.00	532	0.03	< 0.005

5.9. Operational Mobile Sources

5.9.1. Unmitigated

Land Use Type	Trips/Weekday	Trips/Saturday	Trips/Sunday	Trips/Year	VMT/Weekday	VMT/Saturday	VMT/Sunday	VMT/Year
Total all Land Uses	12.0	0.00	0.00	3,129	144	0.00	0.00	37,543

5.10. Operational Area Sources

5.10.1. Hearths

5.10.1.1. Unmitigated

5.10.2. Architectural Coatings

Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)
0	0.00	0.00	0.00	—

5.10.3. Landscape Equipment

Season	Unit	Value
Snow Days	day/yr	0.00
Summer Days	day/yr	180

5.11. Operational Energy Consumption

5.11.1. Unmitigated

Electricity (kWh/yr) and CO2 and CH4 and N2O and Natural Gas (kBTU/yr)

Land Use	Electricity (kWh/yr)	CO2	CH4	N2O	Natural Gas (kBTU/yr)
User Defined Industrial	0.00	532	0.0330	0.0040	0.00

5.12. Operational Water and Wastewater Consumption

5.12.1. Unmitigated

Land Use	Indoor Water (gal/year)	Outdoor Water (gal/year)
User Defined Industrial	6,517,000	0.00

5.13. Operational Waste Generation

5.13.1. Unmitigated

Land Use	Waste (ton/year)	Cogeneration (kWh/year)
User Defined Industrial	0.00	—

5.14. Operational Refrigeration and Air Conditioning Equipment

5.14.1. Unmitigated

Land Use Type	Equipment Type	Refrigerant	GWP	Quantity (kg)	Operations Leak Rate	Service Leak Rate	Times Serviced

5.15. Operational Off-Road Equipment

5.15.1. Unmitigated

Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Off-Highway Trucks	Diesel	Average	10.0	8.00	376	0.38

5.16. Stationary Sources

5.16.1. Emergency Generators and Fire Pumps

Equipment Type	Fuel Type	Number per Day	Hours per Day	Hours per Year	Horsepower	Load Factor

5.16.2. Process Boilers

Equipment Type	Fuel Type	Number	Boiler Rating (MMBtu/hr)	Daily Heat Input (MMBtu/day)	Annual Heat Input (MMBtu/yr)

5.17. User Defined

Equipment Type	Fuel Type

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	29.1	annual days of extreme heat
Extreme Precipitation	1.85	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	4.04	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	1	0	0	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	0	0	0	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	1	1	1	2
Sea Level Rise	N/A	N/A	N/A	N/A

Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	1	1	1	2
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	82.7
AQ-PM	5.13
AQ-DPM	7.47
Drinking Water	96.7
Lead Risk Housing	12.0
Pesticides	84.1
Toxic Releases	22.0
Traffic	31.1
Effect Indicators	—
CleanUp Sites	58.2
Groundwater	63.6

Haz Waste Facilities/Generators	73.3
Impaired Water Bodies	0.00
Solid Waste	92.1
Sensitive Population	—
Asthma	68.8
Cardio-vascular	83.6
Low Birth Weights	72.1
Socioeconomic Factor Indicators	—
Education	39.2
Housing	18.5
Linguistic	0.26
Poverty	63.3
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	72.39830617
Employed	43.57756961
Median HI	48.47940459
Education	—
Bachelor's or higher	19.11972283
High school enrollment	26.43397921
Preschool enrollment	83.44668292
Transportation	—
Auto Access	74.57975106
Active commuting	43.14128064

Social	—
2-parent households	83.11305017
Voting	89.1954318
Neighborhood	—
Alcohol availability	80.68779674
Park access	9.085076351
Retail density	1.077890414
Supermarket access	18.2599769
Tree canopy	80.46965225
Housing	—
Homeownership	77.86475042
Housing habitability	98.34466829
Low-inc homeowner severe housing cost burden	97.45925831
Low-inc renter severe housing cost burden	95.72693443
Uncrowded housing	91.95431798
Health Outcomes	—
Insured adults	74.51559091
Arthritis	0.0
Asthma ER Admissions	44.4
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	15.7
Cognitively Disabled	29.3
Physically Disabled	43.7

Heart Attack ER Admissions	4.0
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	49.7
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	11.4
SLR Inundation Area	0.0
Children	79.8
Elderly	22.5
English Speaking	96.1
Foreign-born	6.7
Outdoor Workers	60.8
Climate Change Adaptive Capacity	—
Impervious Surface Cover	96.8
Traffic Density	21.9
Traffic Access	0.0
Other Indices	—
Hardship	38.8
Other Decision Support	—
2016 Voting	83.3

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	62.0
Healthy Places Index Score for Project Location (b)	65.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Land Use	Provided by Applicant.
Construction: Construction Phases	Provided by Applicant
Construction: Off-Road Equipment	Provided by Applicant.
Construction: Trips and VMT	Provided by Applicant.
Operations: Water and Waste Water	Provided by Applicant
Operations: Off-Road Equipment	Provided by Applicant.
Construction: Dust From Material Movement	Provided by Applicant. Cut & Fill will be balanced on site.
Construction: Off-Road Equipment EF	Skid Steer Loader PM, ROG & NOx factors are from CARB 2017 Off-Road Diesel, Propane, & Gasoline Emission Factors.

Operations: Architectural Coatings	Not Applicable

Discovery Solar Storage (Mitigated) Detailed Report

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

1.2. Land Use Types

1.3. User-Selected Emission Reduction Measures by Emissions Sector

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

2.2. Construction Emissions by Year, Unmitigated

2.3. Construction Emissions by Year, Mitigated

2.4. Operations Emissions Compared Against Thresholds

2.5. Operations Emissions by Sector, Unmitigated

2.6. Operations Emissions by Sector, Mitigated

3. Construction Emissions Details

3.1. Site Preparation (2025) - Unmitigated

3.2. Site Preparation (2025) - Mitigated

3.3. Site Preparation (2026) - Unmitigated

3.4. Site Preparation (2026) - Mitigated

3.5. Site Mobilization (2025) - Unmitigated

3.6. Site Mobilization (2025) - Mitigated

3.7. System Installation and Gen-Tie Construction (2025) - Unmitigated

3.8. System Installation and Gen-Tie Construction (2025) - Mitigated

3.9. System Installation and Gen-Tie Construction (2026) - Unmitigated

3.10. System Installation and Gen-Tie Construction (2026) - Mitigated

3.11. System Installation and Gen-Tie Construction (2027) - Unmitigated

3.12. System Installation and Gen-Tie Construction (2027) - Mitigated

3.13. Energy Storage System (2026) - Unmitigated

3.14. Energy Storage System (2026) - Mitigated

3.15. Energy Storage System (2027) - Unmitigated

3.16. Energy Storage System (2027) - Mitigated

3.17. Testing and Commissioning (2026) - Unmitigated

3.18. Testing and Commissioning (2026) - Mitigated

3.19. Testing and Commissioning (2027) - Unmitigated

3.20. Testing and Commissioning (2027) - Mitigated

3.21. Testing and Commissioning (2028) - Unmitigated

3.22. Testing and Commissioning (2028) - Mitigated

3.23. Underground Work (2025) - Unmitigated

3.24. Underground Work (2025) - Mitigated

3.25. Underground Work (2026) - Unmitigated

3.26. Underground Work (2026) - Mitigated

3.27. General Management (2025) - Unmitigated

3.28. General Management (2025) - Mitigated

3.29. General Management (2026) - Unmitigated

3.30. General Management (2026) - Mitigated

3.31. General Management (2027) - Unmitigated

3.32. General Management (2027) - Mitigated

3.33. General Management (2028) - Unmitigated

3.34. General Management (2028) - Mitigated

4. Operations Emissions Details

4.1. Mobile Emissions by Land Use

4.1.1. Unmitigated

4.1.2. Mitigated

4.2. Energy

4.2.1. Electricity Emissions By Land Use - Unmitigated

4.2.2. Electricity Emissions By Land Use - Mitigated

4.2.3. Natural Gas Emissions By Land Use - Unmitigated

4.2.4. Natural Gas Emissions By Land Use - Mitigated

4.3. Area Emissions by Source

4.3.1. Unmitigated

4.3.2. Mitigated

4.4. Water Emissions by Land Use

4.4.1. Unmitigated

4.4.2. Mitigated

4.5. Waste Emissions by Land Use

4.5.1. Unmitigated

4.5.2. Mitigated

4.6. Refrigerant Emissions by Land Use

4.6.1. Unmitigated

4.6.2. Mitigated

4.7. Offroad Emissions By Equipment Type

4.7.1. Unmitigated

4.7.2. Mitigated

4.8. Stationary Emissions By Equipment Type

4.8.1. Unmitigated

4.8.2. Mitigated

4.9. User Defined Emissions By Equipment Type

4.9.1. Unmitigated

4.9.2. Mitigated

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

4.10.4. Soil Carbon Accumulation By Vegetation Type - Mitigated

4.10.5. Above and Belowground Carbon Accumulation by Land Use Type - Mitigated

4.10.6. Avoided and Sequestered Emissions by Species - Mitigated

5. Activity Data

5.1. Construction Schedule

5.2. Off-Road Equipment

5.2.1. Unmitigated

5.2.2. Mitigated

5.3. Construction Vehicles

5.3.1. Unmitigated

5.3.2. Mitigated

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

5.5. Architectural Coatings

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

5.6.2. Construction Earthmoving Control Strategies

5.7. Construction Paving

5.8. Construction Electricity Consumption and Emissions Factors

5.9. Operational Mobile Sources

5.9.1. Unmitigated

5.9.2. Mitigated

5.10. Operational Area Sources

5.10.1. Hearths

5.10.1.1. Unmitigated

5.10.1.2. Mitigated

5.10.2. Architectural Coatings

5.10.3. Landscape Equipment

5.10.4. Landscape Equipment - Mitigated

5.11. Operational Energy Consumption

5.11.1. Unmitigated

5.11.2. Mitigated

5.12. Operational Water and Wastewater Consumption

5.12.1. Unmitigated

5.12.2. Mitigated

5.13. Operational Waste Generation

5.13.1. Unmitigated

5.13.2. Mitigated

5.14. Operational Refrigeration and Air Conditioning Equipment

5.14.1. Unmitigated

5.14.2. Mitigated

5.15. Operational Off-Road Equipment

5.15.1. Unmitigated

5.15.2. Mitigated

5.16. Stationary Sources

5.16.1. Emergency Generators and Fire Pumps

5.16.2. Process Boilers

5.17. User Defined

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

5.18.1.2. Mitigated

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

5.18.1.2. Mitigated

5.18.2. Sequestration

5.18.2.1. Unmitigated

5.18.2.2. Mitigated

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

6.2. Initial Climate Risk Scores

6.3. Adjusted Climate Risk Scores

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

7.2. Healthy Places Index Scores

7.3. Overall Health & Equity Scores

7.4. Health & Equity Measures

7.5. Evaluation Scorecard

7.6. Health & Equity Custom Measures

8. User Changes to Default Data

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Discovery Solar Storage (Mitigated)
Construction Start Date	10/1/2025
Operational Year	2027
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	5.00
Precipitation (days)	24.6
Location	95th St W, Tehachapi, CA 93561, USA
County	Kern-Mojave Desert
City	Unincorporated
Air District	Kern County APCD
Air Basin	Mojave Desert
TAZ	2912
EDFZ	9
Electric Utility	Southern California Edison
Gas Utility	Southern California Gas
App Version	2022.1.1.26

1.2. Land Use Types

Land Use Subtype	Size	Unit	Lot Acreage	Building Area (sq ft)	Landscape Area (sq ft)	Special Landscape Area (sq ft)	Population	Description
User Defined Industrial	7,700	User Defined Unit	7,700	8,000	0.00	—	—	—

1.3. User-Selected Emission Reduction Measures by Emissions Sector

Sector	#	Measure Title
Construction	C-5	Use Advanced Engine Tiers
Construction	C-10-C	Water Unpaved Construction Roads
Construction	C-11	Limit Vehicle Speeds on Unpaved Roads

2. Emissions Summary

2.1. Construction Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Unmit.	20.0	172	6.40	367	373	5.76	41.7	47.5
Mit.	11.7	96.0	2.19	112	114	1.92	16.4	18.3
% Reduced	42%	44%	66%	69%	69%	67%	61%	62%
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Unmit.	21.0	195	7.08	472	479	6.38	52.5	58.8
Mit.	11.5	111	2.37	140	143	2.09	19.5	21.6
% Reduced	45%	43%	67%	70%	70%	67%	63%	63%
Average Daily (Max)	—	—	—	—	—	—	—	—
Unmit.	11.1	100	3.51	243	246	3.14	26.7	29.8
Mit.	7.22	62.0	1.47	72.8	74.2	1.27	9.72	11.0
% Reduced	35%	38%	58%	70%	70%	59%	64%	63%
Annual (Max)	—	—	—	—	—	—	—	—
Unmit.	2.02	18.3	0.64	44.3	45.0	0.57	4.87	5.45
Mit.	1.32	11.3	0.27	13.3	13.5	0.23	1.77	2.01

% Reduced	35%	38%	58%	70%	70%	59%	64%	63%
Exceeds (Annual)	—	—	—	—	—	—	—	—
Threshold	25.0	25.0	—	—	15.0	—	—	—
Unmit.	No	No	—	—	Yes	—	—	—
Mit.	No	No	—	—	No	—	—	—

2.2. Construction Emissions by Year, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily - Summer (Max)	—	—	—	—	—	—	—	—
2026	20.0	172	6.40	367	373	5.76	41.7	47.5
2027	14.2	121	3.99	351	355	3.54	38.0	41.6
2028	0.90	8.07	0.12	107	107	0.12	11.2	11.3
Daily - Winter (Max)	—	—	—	—	—	—	—	—
2025	20.1	187	7.08	468	475	6.38	51.6	58.0
2026	21.0	195	6.98	472	479	6.30	52.5	58.8
2027	13.5	123	3.99	351	355	3.54	38.0	41.6
2028	0.81	8.57	0.12	107	107	0.12	11.2	11.3
Average Daily	—	—	—	—	—	—	—	—
2025	2.75	25.5	0.97	58.3	59.3	0.88	6.56	7.44
2026	11.1	100	3.51	243	246	3.14	26.7	29.8
2027	8.32	75.7	2.47	220	223	2.19	23.8	26.0
2028	0.27	2.12	0.03	24.2	24.2	0.03	2.57	2.60
Annual	—	—	—	—	—	—	—	—
2025	0.50	4.65	0.18	10.6	10.8	0.16	1.20	1.36
2026	2.02	18.3	0.64	44.3	45.0	0.57	4.87	5.45
2027	1.52	13.8	0.45	40.2	40.7	0.40	4.34	4.74

2028	0.05	0.39	0.01	4.41	4.42	0.01	0.47	0.47

2.3. Construction Emissions by Year, Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Year	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily - Summer (Max)	—	—	—	—	—	—	—	—
2026	11.7	96.0	2.19	112	114	1.92	16.4	18.3
2027	10.3	79.7	1.98	104	106	1.71	13.4	15.1
2028	0.90	8.07	0.12	29.5	29.7	0.12	3.49	3.61
Daily - Winter (Max)	—	—	—	—	—	—	—	—
2025	10.6	101	2.22	136	138	1.94	18.5	20.4
2026	11.5	111	2.37	140	143	2.09	19.5	21.6
2027	9.61	81.6	1.98	104	106	1.71	13.4	15.1
2028	0.81	8.57	0.12	29.5	29.7	0.12	3.49	3.61
Average Daily	—	—	—	—	—	—	—	—
2025	1.37	13.3	0.27	17.3	17.5	0.24	2.46	2.70
2026	7.22	62.0	1.47	72.8	74.2	1.27	9.72	11.0
2027	5.99	50.2	1.25	64.8	66.1	1.07	8.24	9.31
2028	0.27	2.12	0.03	6.89	6.92	0.03	0.85	0.87
Annual	—	—	—	—	—	—	—	—
2025	0.25	2.43	0.05	3.15	3.20	0.04	0.45	0.49
2026	1.32	11.3	0.27	13.3	13.5	0.23	1.77	2.01
2027	1.09	9.17	0.23	11.8	12.1	0.20	1.50	1.70
2028	0.05	0.39	0.01	1.26	1.26	0.01	0.15	0.16

2.4. Operations Emissions Compared Against Thresholds

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Un/Mit.	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Unmit.	4.73	24.3	0.86	0.01	0.87	0.79	< 0.005	0.79
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Unmit.	4.66	24.3	0.86	0.01	0.87	0.79	< 0.005	0.79
Average Daily (Max)	—	—	—	—	—	—	—	—
Unmit.	0.60	2.02	0.07	0.01	0.08	0.07	< 0.005	0.07
Annual (Max)	—	—	—	—	—	—	—	—
Unmit.	0.11	0.37	0.01	< 0.005	0.01	0.01	< 0.005	0.01

2.5. Operations Emissions by Sector, Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Sector	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Mobile	0.05	0.02	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005
Area	0.23	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Energy	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—
Waste	—	—	—	—	—	—	—	—
Off-Road	4.45	24.3	0.86	—	0.86	0.79	—	0.79
Total	4.73	24.3	0.86	0.01	0.87	0.79	< 0.005	0.79
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Mobile	0.05	0.02	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005
Area	0.17	—	—	—	—	—	—	—
Energy	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—

Waste	—	—	—	—	—	—	—	—
Off-Road	4.45	24.3	0.86	—	0.86	0.79	—	0.79
Total	4.66	24.3	0.86	0.01	0.87	0.79	< 0.005	0.79
Average Daily	—	—	—	—	—	—	—	—
Mobile	0.03	0.02	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005
Area	0.20	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Energy	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—
Waste	—	—	—	—	—	—	—	—
Off-Road	0.37	2.00	0.07	—	0.07	0.07	—	0.07
Total	0.60	2.02	0.07	0.01	0.08	0.07	< 0.005	0.07
Annual	—	—	—	—	—	—	—	—
Mobile	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Area	0.04	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Energy	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—
Waste	—	—	—	—	—	—	—	—
Off-Road	0.07	0.36	0.01	—	0.01	0.01	—	0.01
Total	0.11	0.37	0.01	< 0.005	0.01	0.01	< 0.005	0.01

2.6. Operations Emissions by Sector, Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Sector	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Mobile	0.05	0.02	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005
Area	0.23	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Energy	0.00	0.00	0.00	—	0.00	0.00	—	0.00

Water	—	—	—	—	—	—	—	—
Waste	—	—	—	—	—	—	—	—
Off-Road	4.45	24.3	0.86	—	0.86	0.79	—	0.79
Total	4.73	24.3	0.86	0.01	0.87	0.79	< 0.005	0.79
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Mobile	0.05	0.02	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005
Area	0.17	—	—	—	—	—	—	—
Energy	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—
Waste	—	—	—	—	—	—	—	—
Off-Road	4.45	24.3	0.86	—	0.86	0.79	—	0.79
Total	4.66	24.3	0.86	0.01	0.87	0.79	< 0.005	0.79
Average Daily	—	—	—	—	—	—	—	—
Mobile	0.03	0.02	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005
Area	0.20	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Energy	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—
Waste	—	—	—	—	—	—	—	—
Off-Road	0.37	2.00	0.07	—	0.07	0.07	—	0.07
Total	0.60	2.02	0.07	0.01	0.08	0.07	< 0.005	0.07
Annual	—	—	—	—	—	—	—	—
Mobile	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Area	0.04	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Energy	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Water	—	—	—	—	—	—	—	—
Waste	—	—	—	—	—	—	—	—
Off-Road	0.07	0.36	0.01	—	0.01	0.01	—	0.01
Total	0.11	0.37	0.01	< 0.005	0.01	0.01	< 0.005	0.01

3. Construction Emissions Details

3.1. Site Preparation (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	5.39	49.1	2.19	—	2.19	2.01	—	2.01
Dust From Material Movement	—	—	—	5.52	5.52	—	2.67	2.67
Onsite truck	0.02	0.65	0.01	113	113	0.01	11.3	11.3
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.97	8.84	0.39	—	0.39	0.36	—	0.36
Dust From Material Movement	—	—	—	0.99	0.99	—	0.48	0.48
Onsite truck	< 0.005	0.11	< 0.005	19.0	19.0	< 0.005	1.90	1.90
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.18	1.61	0.07	—	0.07	0.07	—	0.07
Dust From Material Movement	—	—	—	0.18	0.18	—	0.09	0.09
Onsite truck	< 0.005	0.02	< 0.005	3.47	3.47	< 0.005	0.35	0.35
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.28	0.30	0.00	0.73	0.73	0.00	0.17	0.17

Vendor	0.08	3.81	0.05	0.69	0.74	0.05	0.19	0.24
Hauling	0.07	4.02	0.06	0.87	0.93	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.05	0.06	0.00	0.13	0.13	0.00	0.03	0.03
Vendor	0.02	0.68	0.01	0.12	0.13	0.01	0.03	0.04
Hauling	0.01	0.73	0.01	0.15	0.17	0.01	0.04	0.05
Annual	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.00	0.02	0.02	0.00	0.01	0.01
Vendor	< 0.005	0.12	< 0.005	0.02	0.02	< 0.005	0.01	0.01
Hauling	< 0.005	0.13	< 0.005	0.03	0.03	< 0.005	0.01	0.01

3.2. Site Preparation (2025) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.98	14.7	0.16	—	0.16	0.16	—	0.16
Dust From Material Movement	—	—	—	5.52	5.52	—	2.67	2.67
Onsite truck	0.02	0.65	0.01	28.6	28.6	0.01	2.86	2.86
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.18	2.65	0.03	—	0.03	0.03	—	0.03
Dust From Material Movement	—	—	—	0.99	0.99	—	0.48	0.48
Onsite truck	< 0.005	0.11	< 0.005	4.80	4.80	< 0.005	0.48	0.48
Annual	—	—	—	—	—	—	—	—

Off-Road Equipment	0.03	0.48	0.01	—	0.01	0.01	—	0.01
Dust From Material Movement	—	—	—	0.18	0.18	—	0.09	0.09
Onsite truck	< 0.005	0.02	< 0.005	0.88	0.88	< 0.005	0.09	0.09
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.28	0.30	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.08	3.81	0.05	0.69	0.74	0.05	0.19	0.24
Hauling	0.07	4.02	0.06	0.87	0.93	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.05	0.06	0.00	0.13	0.13	0.00	0.03	0.03
Vendor	0.02	0.68	0.01	0.12	0.13	0.01	0.03	0.04
Hauling	0.01	0.73	0.01	0.15	0.17	0.01	0.04	0.05
Annual	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.00	0.02	0.02	0.00	0.01	0.01
Vendor	< 0.005	0.12	< 0.005	0.02	0.02	< 0.005	0.01	0.01
Hauling	< 0.005	0.13	< 0.005	0.03	0.03	< 0.005	0.01	0.01

3.3. Site Preparation (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	5.10	45.5	1.99	—	1.99	1.83	—	1.83

Dust From Material Movement	—	—	—	5.52	5.52	—	2.67	2.67
Onsite truck	0.02	0.60	0.01	113	113	0.01	11.3	11.3
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	5.10	45.5	1.99	—	1.99	1.83	—	1.83
Dust From Material Movement	—	—	—	5.52	5.52	—	2.67	2.67
Onsite truck	0.02	0.64	0.01	113	113	0.01	11.3	11.3
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.91	8.10	0.35	—	0.35	0.33	—	0.33
Dust From Material Movement	—	—	—	0.98	0.98	—	0.48	0.48
Onsite truck	< 0.005	0.11	< 0.005	18.8	18.8	< 0.005	1.88	1.88
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.17	1.48	0.06	—	0.06	0.06	—	0.06
Dust From Material Movement	—	—	—	0.18	0.18	—	0.09	0.09
Onsite truck	< 0.005	0.02	< 0.005	3.44	3.44	< 0.005	0.34	0.34
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.29	0.25	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.09	3.54	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.74	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.26	0.28	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.08	3.74	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.94	0.06	0.89	0.95	0.06	0.24	0.31

Average Daily	—	—	—	—	—	—	—	—
Worker	0.05	0.05	0.00	0.13	0.13	0.00	0.03	0.03
Vendor	0.02	0.66	0.01	0.12	0.13	0.01	0.03	0.04
Hauling	0.01	0.70	0.01	0.16	0.17	0.01	0.04	0.05
Annual	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.00	0.02	0.02	0.00	0.01	0.01
Vendor	< 0.005	0.12	< 0.005	0.02	0.02	< 0.005	0.01	0.01
Hauling	< 0.005	0.13	< 0.005	0.03	0.03	< 0.005	0.01	0.01

3.4. Site Preparation (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.98	14.7	0.16	—	0.16	0.16	—	0.16
Dust From Material Movement	—	—	—	5.52	5.52	—	2.67	2.67
Onsite truck	0.02	0.60	0.01	28.6	28.6	0.01	2.86	2.86
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.98	14.7	0.16	—	0.16	0.16	—	0.16
Dust From Material Movement	—	—	—	5.52	5.52	—	2.67	2.67
Onsite truck	0.02	0.64	0.01	28.6	28.6	0.01	2.86	2.86
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.18	2.62	0.03	—	0.03	0.03	—	0.03
Dust From Material Movement	—	—	—	0.98	0.98	—	0.48	0.48

Onsite truck	< 0.005	0.11	< 0.005	4.75	4.75	< 0.005	0.47	0.48
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.03	0.48	0.01	—	0.01	0.01	—	0.01
Dust From Material Movement	—	—	—	0.18	0.18	—	0.09	0.09
Onsite truck	< 0.005	0.02	< 0.005	0.87	0.87	< 0.005	0.09	0.09
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.29	0.25	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.09	3.54	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.74	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.26	0.28	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.08	3.74	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.94	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.05	0.05	0.00	0.13	0.13	0.00	0.03	0.03
Vendor	0.02	0.66	0.01	0.12	0.13	0.01	0.03	0.04
Hauling	0.01	0.70	0.01	0.16	0.17	0.01	0.04	0.05
Annual	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.00	0.02	0.02	0.00	0.01	0.01
Vendor	< 0.005	0.12	< 0.005	0.02	0.02	< 0.005	0.01	0.01
Hauling	< 0.005	0.13	< 0.005	0.03	0.03	< 0.005	0.01	0.01

3.5. Site Mobilization (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T

Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Dust From Material Movement	—	—	—	0.00	0.00	—	0.00	0.00
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Dust From Material Movement	—	—	—	0.00	0.00	—	0.00	0.00
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Dust From Material Movement	—	—	—	0.00	0.00	—	0.00	0.00
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.14	0.15	0.00	0.37	0.37	0.00	0.09	0.09
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Worker	0.02	0.03	0.00	0.06	0.06	0.00	0.02	0.02
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Worker	< 0.005	0.01	0.00	0.01	0.01	0.00	< 0.005	< 0.005
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.6. Site Mobilization (2025) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Dust From Material Movement	—	—	—	0.00	0.00	—	0.00	0.00
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Dust From Material Movement	—	—	—	0.00	0.00	—	0.00	0.00
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Dust From Material Movement	—	—	—	0.00	0.00	—	0.00	0.00
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.14	0.15	0.00	0.37	0.37	0.00	0.09	0.09
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Worker	0.02	0.03	0.00	0.06	0.06	0.00	0.02	0.02
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—

Worker	< 0.005	0.01	0.00	0.01	0.01	0.00	< 0.005	< 0.005
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.7. System Installation and Gen-Tie Construction (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	7.31	92.4	4.00	—	4.00	3.52	—	3.52
Onsite truck	0.04	1.30	0.01	227	227	0.01	22.6	22.6
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.84	10.7	0.46	—	0.46	0.41	—	0.41
Onsite truck	0.01	0.15	< 0.005	24.4	24.4	< 0.005	2.44	2.44
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.15	1.95	0.08	—	0.08	0.07	—	0.07
Onsite truck	< 0.005	0.03	< 0.005	4.45	4.46	< 0.005	0.44	0.44
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	4.41	4.84	0.00	11.7	11.7	0.00	2.74	2.74
Vendor	0.08	3.81	0.05	0.69	0.74	0.05	0.19	0.24
Hauling	0.07	4.02	0.06	0.87	0.93	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—

Worker	0.51	0.60	0.00	1.33	1.33	0.00	0.31	0.31
Vendor	0.01	0.44	0.01	0.08	0.08	0.01	0.02	0.03
Hauling	0.01	0.47	0.01	0.10	0.11	0.01	0.03	0.04
Annual	—	—	—	—	—	—	—	—
Worker	0.09	0.11	0.00	0.24	0.24	0.00	0.06	0.06
Vendor	< 0.005	0.08	< 0.005	0.01	0.02	< 0.005	< 0.005	0.01
Hauling	< 0.005	0.08	< 0.005	0.02	0.02	< 0.005	0.01	0.01

3.8. System Installation and Gen-Tie Construction (2025) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	3.38	49.9	1.63	—	1.63	1.36	—	1.36
Onsite truck	0.04	1.30	0.01	57.2	57.2	0.01	5.71	5.72
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.39	5.77	0.19	—	0.19	0.16	—	0.16
Onsite truck	0.01	0.15	< 0.005	6.15	6.16	< 0.005	0.62	0.62
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	1.05	0.03	—	0.03	0.03	—	0.03
Onsite truck	< 0.005	0.03	< 0.005	1.12	1.12	< 0.005	0.11	0.11
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—

Worker	4.41	4.84	0.00	11.7	11.7	0.00	2.74	2.74
Vendor	0.08	3.81	0.05	0.69	0.74	0.05	0.19	0.24
Hauling	0.07	4.02	0.06	0.87	0.93	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.51	0.60	0.00	1.33	1.33	0.00	0.31	0.31
Vendor	0.01	0.44	0.01	0.08	0.08	0.01	0.02	0.03
Hauling	0.01	0.47	0.01	0.10	0.11	0.01	0.03	0.04
Annual	—	—	—	—	—	—	—	—
Worker	0.09	0.11	0.00	0.24	0.24	0.00	0.06	0.06
Vendor	< 0.005	0.08	< 0.005	0.01	0.02	< 0.005	< 0.005	0.01
Hauling	< 0.005	0.08	< 0.005	0.02	0.02	< 0.005	0.01	0.01

3.9. System Installation and Gen-Tie Construction (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	6.98	89.1	3.68	—	3.68	3.23	—	3.23
Onsite truck	0.05	1.21	0.01	227	227	0.01	22.6	22.6
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	6.98	89.1	3.68	—	3.68	3.23	—	3.23
Onsite truck	0.04	1.29	0.01	227	227	0.01	22.6	22.6
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	4.99	63.6	2.63	—	2.63	2.31	—	2.31
Onsite truck	0.03	0.90	0.01	151	151	0.01	15.1	15.1

Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.91	11.6	0.48	—	0.48	0.42	—	0.42
Onsite truck	0.01	0.16	< 0.005	27.6	27.6	< 0.005	2.75	2.75
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	4.68	4.01	0.00	11.7	11.7	0.00	2.74	2.74
Vendor	0.09	3.54	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.74	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	4.19	4.44	0.00	11.7	11.7	0.00	2.74	2.74
Vendor	0.08	3.74	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.94	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	3.01	3.43	0.00	8.23	8.23	0.00	1.93	1.93
Vendor	0.06	2.66	0.04	0.50	0.54	0.04	0.14	0.17
Hauling	0.05	2.81	0.05	0.63	0.67	0.05	0.17	0.22
Annual	—	—	—	—	—	—	—	—
Worker	0.55	0.63	0.00	1.50	1.50	0.00	0.35	0.35
Vendor	0.01	0.48	0.01	0.09	0.10	0.01	0.02	0.03
Hauling	0.01	0.51	0.01	0.11	0.12	0.01	0.03	0.04

3.10. System Installation and Gen-Tie Construction (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—

Off-Road Equipment	3.33	49.5	1.59	—	1.59	1.32	—	1.32
Onsite truck	0.05	1.21	0.01	57.2	57.2	0.01	5.71	5.72
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	3.33	49.5	1.59	—	1.59	1.32	—	1.32
Onsite truck	0.04	1.29	0.01	57.2	57.2	0.01	5.71	5.72
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	2.38	35.3	1.14	—	1.14	0.94	—	0.94
Onsite truck	0.03	0.90	0.01	38.1	38.1	0.01	3.81	3.81
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.43	6.45	0.21	—	0.21	0.17	—	0.17
Onsite truck	0.01	0.16	< 0.005	6.95	6.95	< 0.005	0.69	0.70
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	4.68	4.01	0.00	11.7	11.7	0.00	2.74	2.74
Vendor	0.09	3.54	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.74	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	4.19	4.44	0.00	11.7	11.7	0.00	2.74	2.74
Vendor	0.08	3.74	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.94	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	3.01	3.43	0.00	8.23	8.23	0.00	1.93	1.93
Vendor	0.06	2.66	0.04	0.50	0.54	0.04	0.14	0.17
Hauling	0.05	2.81	0.05	0.63	0.67	0.05	0.17	0.22
Annual	—	—	—	—	—	—	—	—

Worker	0.55	0.63	0.00	1.50	1.50	0.00	0.35	0.35
Vendor	0.01	0.48	0.01	0.09	0.10	0.01	0.02	0.03
Hauling	0.01	0.51	0.01	0.11	0.12	0.01	0.03	0.04

3.11. System Installation and Gen-Tie Construction (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	6.57	85.2	3.29	—	3.29	2.87	—	2.87
Onsite truck	0.05	1.19	0.01	227	227	0.01	22.6	22.6
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	6.57	85.2	3.29	—	3.29	2.87	—	2.87
Onsite truck	0.04	1.28	0.01	227	227	0.01	22.6	22.6
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	4.33	56.2	2.17	—	2.17	1.89	—	1.89
Onsite truck	0.03	0.82	0.01	139	139	0.01	13.9	13.9
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.79	10.3	0.40	—	0.40	0.35	—	0.35
Onsite truck	0.01	0.15	< 0.005	25.4	25.4	< 0.005	2.54	2.54
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	4.45	3.60	0.00	11.7	11.7	0.00	2.74	2.74
Vendor	0.09	3.49	0.05	0.71	0.76	0.05	0.19	0.24

Hauling	0.07	3.68	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	3.98	4.03	0.00	11.7	11.7	0.00	2.74	2.74
Vendor	0.08	3.69	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.87	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	2.67	2.66	0.00	7.60	7.60	0.00	1.78	1.78
Vendor	0.06	2.40	0.03	0.46	0.49	0.03	0.13	0.16
Hauling	0.05	2.54	0.04	0.58	0.62	0.04	0.16	0.20
Annual	—	—	—	—	—	—	—	—
Worker	0.49	0.48	0.00	1.39	1.39	0.00	0.32	0.32
Vendor	0.01	0.44	0.01	0.08	0.09	0.01	0.02	0.03
Hauling	0.01	0.46	0.01	0.11	0.11	0.01	0.03	0.04

3.12. System Installation and Gen-Tie Construction (2027) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	3.30	49.0	1.55	—	1.55	1.28	—	1.28
Onsite truck	0.05	1.19	0.01	57.2	57.2	0.01	5.71	5.72
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	3.30	49.0	1.55	—	1.55	1.28	—	1.28
Onsite truck	0.04	1.28	0.01	57.2	57.2	0.01	5.71	5.72
Average Daily	—	—	—	—	—	—	—	—

Off-Road Equipment	2.17	32.3	1.02	—	1.02	0.85	—	0.85
Onsite truck	0.03	0.82	0.01	35.2	35.2	0.01	3.51	3.52
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.40	5.90	0.19	—	0.19	0.15	—	0.15
Onsite truck	0.01	0.15	< 0.005	6.42	6.42	< 0.005	0.64	0.64
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	4.45	3.60	0.00	11.7	11.7	0.00	2.74	2.74
Vendor	0.09	3.49	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.68	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	3.98	4.03	0.00	11.7	11.7	0.00	2.74	2.74
Vendor	0.08	3.69	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.87	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	2.67	2.66	0.00	7.60	7.60	0.00	1.78	1.78
Vendor	0.06	2.40	0.03	0.46	0.49	0.03	0.13	0.16
Hauling	0.05	2.54	0.04	0.58	0.62	0.04	0.16	0.20
Annual	—	—	—	—	—	—	—	—
Worker	0.49	0.48	0.00	1.39	1.39	0.00	0.32	0.32
Vendor	0.01	0.44	0.01	0.08	0.09	0.01	0.02	0.03
Hauling	0.01	0.46	0.01	0.11	0.11	0.01	0.03	0.04

3.13. Energy Storage System (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T

Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.90	8.50	0.37	—	0.37	0.34	—	0.34
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.90	8.50	0.37	—	0.37	0.34	—	0.34
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.54	5.08	0.22	—	0.22	0.20	—	0.20
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.10	0.93	0.04	—	0.04	0.04	—	0.04
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	1.03	0.88	0.00	2.57	2.57	0.00	0.60	0.60
Vendor	0.09	3.54	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.74	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.92	0.97	0.00	2.57	2.57	0.00	0.60	0.60
Vendor	0.08	3.74	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.94	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.55	0.63	0.00	1.51	1.51	0.00	0.35	0.35
Vendor	0.05	2.22	0.03	0.42	0.45	0.03	0.11	0.14

Hauling	0.04	2.35	0.04	0.52	0.56	0.04	0.14	0.18
Annual	—	—	—	—	—	—	—	—
Worker	0.10	0.11	0.00	0.28	0.28	0.00	0.06	0.06
Vendor	0.01	0.40	0.01	0.08	0.08	0.01	0.02	0.03
Hauling	0.01	0.43	0.01	0.10	0.10	0.01	0.03	0.03

3.14. Energy Storage System (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.29	2.52	0.08	—	0.08	0.08	—	0.08
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.29	2.52	0.08	—	0.08	0.08	—	0.08
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.17	1.50	0.05	—	0.05	0.05	—	0.05
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.03	0.27	0.01	—	0.01	0.01	—	0.01
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—

Worker	1.03	0.88	0.00	2.57	2.57	0.00	0.60	0.60
Vendor	0.09	3.54	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.74	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.92	0.97	0.00	2.57	2.57	0.00	0.60	0.60
Vendor	0.08	3.74	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.94	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.55	0.63	0.00	1.51	1.51	0.00	0.35	0.35
Vendor	0.05	2.22	0.03	0.42	0.45	0.03	0.11	0.14
Hauling	0.04	2.35	0.04	0.52	0.56	0.04	0.14	0.18
Annual	—	—	—	—	—	—	—	—
Worker	0.10	0.11	0.00	0.28	0.28	0.00	0.06	0.06
Vendor	0.01	0.40	0.01	0.08	0.08	0.01	0.02	0.03
Hauling	0.01	0.43	0.01	0.10	0.10	0.01	0.03	0.03

3.15. Energy Storage System (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.87	7.97	0.34	—	0.34	0.31	—	0.31
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.87	7.97	0.34	—	0.34	0.31	—	0.31
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.26	2.37	0.10	—	0.10	0.09	—	0.09
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	0.43	0.02	—	0.02	0.02	—	0.02
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.98	0.79	0.00	2.57	2.57	0.00	0.60	0.60
Vendor	0.09	3.49	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.68	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.87	0.88	0.00	2.57	2.57	0.00	0.60	0.60
Vendor	0.08	3.69	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.87	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.26	0.26	0.00	0.75	0.75	0.00	0.18	0.18
Vendor	0.03	1.08	0.02	0.21	0.22	0.02	0.06	0.07
Hauling	0.02	1.15	0.02	0.26	0.28	0.02	0.07	0.09
Annual	—	—	—	—	—	—	—	—
Worker	0.05	0.05	0.00	0.14	0.14	0.00	0.03	0.03
Vendor	< 0.005	0.20	< 0.005	0.04	0.04	< 0.005	0.01	0.01
Hauling	< 0.005	0.21	< 0.005	0.05	0.05	< 0.005	0.01	0.02

3.16. Energy Storage System (2027) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.28	2.47	0.08	—	0.08	0.07	—	0.07
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.28	2.47	0.08	—	0.08	0.07	—	0.07
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.08	0.73	0.02	—	0.02	0.02	—	0.02
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.13	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.98	0.79	0.00	2.57	2.57	0.00	0.60	0.60
Vendor	0.09	3.49	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.68	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.87	0.88	0.00	2.57	2.57	0.00	0.60	0.60
Vendor	0.08	3.69	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.87	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.26	0.26	0.00	0.75	0.75	0.00	0.18	0.18

Vendor	0.03	1.08	0.02	0.21	0.22	0.02	0.06	0.07
Hauling	0.02	1.15	0.02	0.26	0.28	0.02	0.07	0.09
Annual	—	—	—	—	—	—	—	—
Worker	0.05	0.05	0.00	0.14	0.14	0.00	0.03	0.03
Vendor	< 0.005	0.20	< 0.005	0.04	0.04	< 0.005	0.01	0.01
Hauling	< 0.005	0.21	< 0.005	0.05	0.05	< 0.005	0.01	0.02

3.17. Testing and Commissioning (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.55	< 0.005	103	103	< 0.005	10.3	10.3
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.59	< 0.005	103	103	< 0.005	10.3	10.3
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.01	0.27	< 0.005	46.1	46.1	< 0.005	4.60	4.60
Annual	—	—	—	—	—	—	—	—
Onsite truck	< 0.005	0.05	< 0.005	8.41	8.41	< 0.005	0.84	0.84
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.29	0.25	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.09	3.54	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.74	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.26	0.28	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.08	3.74	0.05	0.71	0.76	0.05	0.19	0.24

Hauling	0.07	3.94	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.13	0.14	0.00	0.35	0.35	0.00	0.08	0.08
Vendor	0.04	1.78	0.02	0.34	0.36	0.02	0.09	0.12
Hauling	0.03	1.89	0.03	0.42	0.45	0.03	0.12	0.15
Annual	—	—	—	—	—	—	—	—
Worker	0.02	0.03	0.00	0.06	0.06	0.00	0.01	0.01
Vendor	0.01	0.33	< 0.005	0.06	0.07	< 0.005	0.02	0.02
Hauling	0.01	0.34	0.01	0.08	0.08	0.01	0.02	0.03

3.18. Testing and Commissioning (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.55	< 0.005	26.0	26.0	< 0.005	2.60	2.60
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.59	< 0.005	26.0	26.0	< 0.005	2.60	2.60
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.01	0.27	< 0.005	11.6	11.6	< 0.005	1.16	1.16
Annual	—	—	—	—	—	—	—	—
Onsite truck	< 0.005	0.05	< 0.005	2.12	2.12	< 0.005	0.21	0.21
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.29	0.25	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.09	3.54	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.74	0.06	0.89	0.95	0.06	0.24	0.31

Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.26	0.28	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.08	3.74	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.94	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.13	0.14	0.00	0.35	0.35	0.00	0.08	0.08
Vendor	0.04	1.78	0.02	0.34	0.36	0.02	0.09	0.12
Hauling	0.03	1.89	0.03	0.42	0.45	0.03	0.12	0.15
Annual	—	—	—	—	—	—	—	—
Worker	0.02	0.03	0.00	0.06	0.06	0.00	0.01	0.01
Vendor	0.01	0.33	< 0.005	0.06	0.07	< 0.005	0.02	0.02
Hauling	0.01	0.34	0.01	0.08	0.08	0.01	0.02	0.03

3.19. Testing and Commissioning (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.54	< 0.005	103	103	< 0.005	10.3	10.3
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.58	< 0.005	103	103	< 0.005	10.3	10.3
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.40	< 0.005	68.6	68.6	< 0.005	6.85	6.86
Annual	—	—	—	—	—	—	—	—
Onsite truck	< 0.005	0.07	< 0.005	12.5	12.5	< 0.005	1.25	1.25
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—

Worker	0.28	0.23	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.09	3.49	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.68	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.25	0.25	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.08	3.69	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.87	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.18	0.18	0.00	0.52	0.52	0.00	0.12	0.12
Vendor	0.06	2.60	0.04	0.50	0.54	0.04	0.14	0.17
Hauling	0.05	2.75	0.05	0.63	0.67	0.05	0.17	0.22
Annual	—	—	—	—	—	—	—	—
Worker	0.03	0.03	0.00	0.09	0.09	0.00	0.02	0.02
Vendor	0.01	0.48	0.01	0.09	0.10	0.01	0.02	0.03
Hauling	0.01	0.50	0.01	0.11	0.12	0.01	0.03	0.04

3.20. Testing and Commissioning (2027) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.54	< 0.005	26.0	26.0	< 0.005	2.60	2.60
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.58	< 0.005	26.0	26.0	< 0.005	2.60	2.60
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.40	< 0.005	17.3	17.3	< 0.005	1.73	1.73
Annual	—	—	—	—	—	—	—	—

Onsite truck	< 0.005	0.07	< 0.005	3.16	3.16	< 0.005	0.32	0.32
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.28	0.23	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.09	3.49	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.68	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.25	0.25	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.08	3.69	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.87	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.18	0.18	0.00	0.52	0.52	0.00	0.12	0.12
Vendor	0.06	2.60	0.04	0.50	0.54	0.04	0.14	0.17
Hauling	0.05	2.75	0.05	0.63	0.67	0.05	0.17	0.22
Annual	—	—	—	—	—	—	—	—
Worker	0.03	0.03	0.00	0.09	0.09	0.00	0.02	0.02
Vendor	0.01	0.48	0.01	0.09	0.10	0.01	0.02	0.03
Hauling	0.01	0.50	0.01	0.11	0.12	0.01	0.03	0.04

3.21. Testing and Commissioning (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.53	< 0.005	103	103	< 0.005	10.3	10.3
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.57	< 0.005	103	103	< 0.005	10.3	10.3

Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.01	0.13	< 0.005	23.1	23.1	< 0.005	2.31	2.31
Annual	—	—	—	—	—	—	—	—
Onsite truck	< 0.005	0.02	< 0.005	4.22	4.22	< 0.005	0.42	0.42
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.27	0.20	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.09	3.41	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.59	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.24	0.23	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.08	3.61	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.78	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.06	0.05	0.00	0.17	0.17	0.00	0.04	0.04
Vendor	0.02	0.86	0.01	0.17	0.18	0.01	0.05	0.06
Hauling	0.02	0.91	0.02	0.21	0.23	0.02	0.06	0.07
Annual	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.00	0.03	0.03	0.00	0.01	0.01
Vendor	< 0.005	0.16	< 0.005	0.03	0.03	< 0.005	0.01	0.01
Hauling	< 0.005	0.17	< 0.005	0.04	0.04	< 0.005	0.01	0.01

3.22. Testing and Commissioning (2028) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—

Onsite truck	0.02	0.53	< 0.005	26.0	26.0	< 0.005	2.60	2.60
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.02	0.57	< 0.005	26.0	26.0	< 0.005	2.60	2.60
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.01	0.13	< 0.005	5.83	5.83	< 0.005	0.58	0.58
Annual	—	—	—	—	—	—	—	—
Onsite truck	< 0.005	0.02	< 0.005	1.06	1.06	< 0.005	0.11	0.11
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.27	0.20	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.09	3.41	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.59	0.06	0.89	0.95	0.06	0.24	0.31
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.24	0.23	0.00	0.73	0.73	0.00	0.17	0.17
Vendor	0.08	3.61	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.78	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.06	0.05	0.00	0.17	0.17	0.00	0.04	0.04
Vendor	0.02	0.86	0.01	0.17	0.18	0.01	0.05	0.06
Hauling	0.02	0.91	0.02	0.21	0.23	0.02	0.06	0.07
Annual	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.00	0.03	0.03	0.00	0.01	0.01
Vendor	< 0.005	0.16	< 0.005	0.03	0.03	< 0.005	0.01	0.01
Hauling	< 0.005	0.17	< 0.005	0.04	0.04	< 0.005	0.01	0.01

3.23. Underground Work (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	1.47	13.5	0.53	—	0.53	0.49	—	0.49
Onsite truck	0.02	0.59	< 0.005	103	103	< 0.005	10.3	10.3
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.18	1.61	0.06	—	0.06	0.06	—	0.06
Onsite truck	< 0.005	0.07	< 0.005	11.5	11.5	< 0.005	1.15	1.15
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.03	0.29	0.01	—	0.01	0.01	—	0.01
Onsite truck	< 0.005	0.01	< 0.005	2.09	2.09	< 0.005	0.21	0.21
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.11	0.12	0.00	0.29	0.29	0.00	0.07	0.07
Vendor	0.08	3.81	0.05	0.69	0.74	0.05	0.19	0.24
Hauling	0.07	4.02	0.06	0.87	0.93	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.01	0.02	0.00	0.03	0.03	0.00	0.01	0.01
Vendor	0.01	0.45	0.01	0.08	0.09	0.01	0.02	0.03
Hauling	0.01	0.48	0.01	0.10	0.11	0.01	0.03	0.04
Annual	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.00	0.01	0.01	0.00	< 0.005	< 0.005
Vendor	< 0.005	0.08	< 0.005	0.01	0.02	< 0.005	< 0.005	0.01

Hauling	< 0.005	0.09	< 0.005	0.02	0.02	< 0.005	0.01	0.01

3.24. Underground Work (2025) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.33	4.45	0.06	—	0.06	0.06	—	0.06
Onsite truck	0.02	0.59	< 0.005	26.0	26.0	< 0.005	2.60	2.60
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.04	0.53	0.01	—	0.01	0.01	—	0.01
Onsite truck	< 0.005	0.07	< 0.005	2.89	2.89	< 0.005	0.29	0.29
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.10	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Onsite truck	< 0.005	0.01	< 0.005	0.53	0.53	< 0.005	0.05	0.05
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.11	0.12	0.00	0.29	0.29	0.00	0.07	0.07
Vendor	0.08	3.81	0.05	0.69	0.74	0.05	0.19	0.24
Hauling	0.07	4.02	0.06	0.87	0.93	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.01	0.02	0.00	0.03	0.03	0.00	0.01	0.01
Vendor	0.01	0.45	0.01	0.08	0.09	0.01	0.02	0.03

Hauling	0.01	0.48	0.01	0.10	0.11	0.01	0.03	0.04
Annual	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.00	0.01	0.01	0.00	< 0.005	< 0.005
Vendor	< 0.005	0.08	< 0.005	0.01	0.02	< 0.005	< 0.005	0.01
Hauling	< 0.005	0.09	< 0.005	0.02	0.02	< 0.005	0.01	0.01

3.25. Underground Work (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	1.40	12.9	0.46	—	0.46	0.42	—	0.42
Onsite truck	0.02	0.59	< 0.005	103	103	< 0.005	10.3	10.3
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.17	1.56	0.06	—	0.06	0.05	—	0.05
Onsite truck	< 0.005	0.07	< 0.005	11.7	11.7	< 0.005	1.16	1.16
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.03	0.29	0.01	—	0.01	0.01	—	0.01
Onsite truck	< 0.005	0.01	< 0.005	2.13	2.13	< 0.005	0.21	0.21
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.11	0.11	0.00	0.29	0.29	0.00	0.07	0.07
Vendor	0.08	3.74	0.05	0.71	0.76	0.05	0.19	0.24

Hauling	0.07	3.94	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.00	0.04	0.04	0.00	0.01	0.01
Vendor	0.01	0.45	0.01	0.08	0.09	0.01	0.02	0.03
Hauling	0.01	0.48	0.01	0.11	0.11	0.01	0.03	0.04
Annual	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.00	0.01	0.01	0.00	< 0.005	< 0.005
Vendor	< 0.005	0.08	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01
Hauling	< 0.005	0.09	< 0.005	0.02	0.02	< 0.005	0.01	0.01

3.26. Underground Work (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Road Equipment	0.33	4.45	0.06	—	0.06	0.06	—	0.06
Onsite truck	0.02	0.59	< 0.005	26.0	26.0	< 0.005	2.60	2.60
Average Daily	—	—	—	—	—	—	—	—
Off-Road Equipment	0.04	0.54	0.01	—	0.01	0.01	—	0.01
Onsite truck	< 0.005	0.07	< 0.005	2.94	2.94	< 0.005	0.29	0.29
Annual	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.10	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Onsite truck	< 0.005	0.01	< 0.005	0.54	0.54	< 0.005	0.05	0.05
Offsite	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.11	0.11	0.00	0.29	0.29	0.00	0.07	0.07
Vendor	0.08	3.74	0.05	0.71	0.76	0.05	0.19	0.24
Hauling	0.07	3.94	0.06	0.89	0.95	0.06	0.24	0.31
Average Daily	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.00	0.04	0.04	0.00	0.01	0.01
Vendor	0.01	0.45	0.01	0.08	0.09	0.01	0.02	0.03
Hauling	0.01	0.48	0.01	0.11	0.11	0.01	0.03	0.04
Annual	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	0.00	0.01	0.01	0.00	< 0.005	< 0.005
Vendor	< 0.005	0.08	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01
Hauling	< 0.005	0.09	< 0.005	0.02	0.02	< 0.005	0.01	0.01

3.27. General Management (2025) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.46	0.51	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Worker	0.08	0.10	0.00	0.22	0.22	0.00	0.05	0.05
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.00	0.04	0.04	0.00	0.01	0.01
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.28. General Management (2025) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.46	0.51	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Worker	0.08	0.10	0.00	0.22	0.22	0.00	0.05	0.05
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.00	0.04	0.04	0.00	0.01	0.01
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.29. General Management (2026) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.49	0.42	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.44	0.46	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Worker	0.31	0.36	0.00	0.86	0.86	0.00	0.20	0.20
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Worker	0.06	0.07	0.00	0.16	0.16	0.00	0.04	0.04
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.30. General Management (2026) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Annual	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.49	0.42	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.44	0.46	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Worker	0.31	0.36	0.00	0.86	0.86	0.00	0.20	0.20
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Worker	0.06	0.07	0.00	0.16	0.16	0.00	0.04	0.04
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.31. General Management (2027) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—

Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.46	0.38	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.42	0.42	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Worker	0.30	0.30	0.00	0.86	0.86	0.00	0.20	0.20
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Worker	0.06	0.05	0.00	0.16	0.16	0.00	0.04	0.04
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.32. General Management (2027) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—

Daily, Summer (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.46	0.38	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.42	0.42	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Worker	0.30	0.30	0.00	0.86	0.86	0.00	0.20	0.20
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Worker	0.06	0.05	0.00	0.16	0.16	0.00	0.04	0.04
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.33. General Management (2028) - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.44	0.33	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.40	0.38	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Worker	0.17	0.16	0.00	0.51	0.51	0.00	0.12	0.12
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Worker	0.03	0.03	0.00	0.09	0.09	0.00	0.02	0.02
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

3.34. General Management (2028) - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Location	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Onsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Worker	0.44	0.33	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Worker	0.40	0.38	0.00	1.22	1.22	0.00	0.29	0.29
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—
Worker	0.17	0.16	0.00	0.51	0.51	0.00	0.12	0.12
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Annual	—	—	—	—	—	—	—	—
Worker	0.03	0.03	0.00	0.09	0.09	0.00	0.02	0.02
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.1. Mobile Emissions by Land Use

4.1.1. Unmitigated

Mobile source emissions results are presented in Sections 2.6. No further detailed breakdown of emissions is available.

4.1.2. Mitigated

Mobile source emissions results are presented in Sections 2.5. No further detailed breakdown of emissions is available.

4.2. Energy

4.2.1. Electricity Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—

Total	—	—	—	—	—	—	—	—

4.2.2. Electricity Emissions By Land Use - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.2.3. Natural Gas Emissions By Land Use - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	0.00	0.00	0.00	—	0.00	0.00	—	0.00

Total	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—
User Defined Industrial	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	—	0.00	0.00	—	0.00

4.2.4. Natural Gas Emissions By Land Use - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Annual	—	—	—	—	—	—	—	—
User Defined Industrial	0.00	0.00	0.00	—	0.00	0.00	—	0.00
Total	0.00	0.00	0.00	—	0.00	0.00	—	0.00

4.3. Area Emissions by Source

4.3.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Source	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—

Consumer Products	0.17	—	—	—	—	—	—	—
Architectural Coatings	0.00	—	—	—	—	—	—	—
Landscape Equipment	0.06	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Total	0.23	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Consumer Products	0.17	—	—	—	—	—	—	—
Architectural Coatings	0.00	—	—	—	—	—	—	—
Total	0.17	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
Consumer Products	0.03	—	—	—	—	—	—	—
Architectural Coatings	0.00	—	—	—	—	—	—	—
Landscape Equipment	0.01	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Total	0.04	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005

4.3.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Source	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Consumer Products	0.17	—	—	—	—	—	—	—
Architectural Coatings	0.00	—	—	—	—	—	—	—
Landscape Equipment	0.06	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Total	0.23	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Daily, Winter (Max)	—	—	—	—	—	—	—	—

Consumer Products	0.17	—	—	—	—	—	—	—
Architectural Coatings	0.00	—	—	—	—	—	—	—
Total	0.17	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
Consumer Products	0.03	—	—	—	—	—	—	—
Architectural Coatings	0.00	—	—	—	—	—	—	—
Landscape Equipment	0.01	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005
Total	0.04	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005

4.4. Water Emissions by Land Use

4.4.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.4.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.5. Waste Emissions by Land Use

4.5.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—

Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.5.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
User Defined Industrial	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.6. Refrigerant Emissions by Land Use

4.6.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—

Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.6.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.7. Offroad Emissions By Equipment Type

4.7.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Off-Highway Trucks	4.45	24.3	0.86	—	0.86	0.79	—	0.79
Total	4.45	24.3	0.86	—	0.86	0.79	—	0.79
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Highway Trucks	4.45	24.3	0.86	—	0.86	0.79	—	0.79
Total	4.45	24.3	0.86	—	0.86	0.79	—	0.79

Annual	—	—	—	—	—	—	—	—
Off-Highway Trucks	0.07	0.36	0.01	—	0.01	0.01	—	0.01
Total	0.07	0.36	0.01	—	0.01	0.01	—	0.01

4.7.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Off-Highway Trucks	4.45	24.3	0.86	—	0.86	0.79	—	0.79
Total	4.45	24.3	0.86	—	0.86	0.79	—	0.79
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Off-Highway Trucks	4.45	24.3	0.86	—	0.86	0.79	—	0.79
Total	4.45	24.3	0.86	—	0.86	0.79	—	0.79
Annual	—	—	—	—	—	—	—	—
Off-Highway Trucks	0.07	0.36	0.01	—	0.01	0.01	—	0.01
Total	0.07	0.36	0.01	—	0.01	0.01	—	0.01

4.8. Stationary Emissions By Equipment Type

4.8.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—

Total	—	—	—	—	—	—	—	—

4.8.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.9. User Defined Emissions By Equipment Type

4.9.1. Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.9.2. Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Equipment Type	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T

Daily, Summer (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.10.2. Above and Belowground Carbon Accumulation by Land Use Type - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

Annual	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—

Removed	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—

4.10.4. Soil Carbon Accumulation By Vegetation Type - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Vegetation	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.10.5. Above and Belowground Carbon Accumulation by Land Use Type - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Land Use	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
Total	—	—	—	—	—	—	—	—

4.10.6. Avoided and Sequestered Emissions by Species - Mitigated

Criteria Pollutants (lb/day for daily, ton/yr for annual) and GHGs (lb/day for daily, MT/yr for annual)

Species	ROG	NOx	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T
Daily, Summer (Max)	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—
Annual	—	—	—	—	—	—	—	—
Avoided	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
Sequestered	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Site Preparation	Site Preparation	10/1/2025	4/1/2026	5.00	131	—
Site Mobilization	Site Preparation	10/1/2025	12/30/2025	5.00	65.0	—
System Installation and Gen-Tie Construction	Building Construction	11/3/2025	12/3/2027	5.00	545	—
Energy Storage System	Building Construction	3/2/2026	6/1/2027	5.00	327	—
Testing and Commissioning	Building Construction	5/1/2026	5/2/2028	5.00	523	—
Underground Work	Building Construction	11/1/2025	3/3/2026	5.00	87.0	—
General Management	Building Construction	10/1/2025	8/2/2028	5.00	741	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Site Preparation	Skid Steer Loaders	Diesel	Average	6.00	8.00	71.0	0.37
Site Preparation	Graders	Diesel	Average	3.00	8.00	148	0.41
Site Preparation	Rubber Tired Dozers	Diesel	Average	3.00	8.00	367	0.40
Site Preparation	Rollers	Diesel	Average	6.00	8.00	36.0	0.38
Site Preparation	Tractors/Loaders/Backhoes	Diesel	Average	2.00	8.00	84.0	0.37
System Installation and Gen-Tie Construction	Forklifts	Diesel	Average	12.0	8.00	82.0	0.20
System Installation and Gen-Tie Construction	Skid Steer Loaders	Diesel	Average	18.0	8.00	71.0	0.37
System Installation and Gen-Tie Construction	Tractors/Loaders/Backhoes	Diesel	Average	6.00	8.00	84.0	0.37

System Installation and Gen-Tie Construction	Other Construction Equipment	Diesel	Average	16.0	8.00	82.0	0.42
System Installation and Gen-Tie Construction	Generator Sets	Diesel	Average	3.00	8.00	7.00	0.74
System Installation and Gen-Tie Construction	Skid Steer Loaders	Gasoline	Average	40.0	8.00	19.0	0.58
System Installation and Gen-Tie Construction	Cranes	Diesel	Average	1.00	8.00	367	0.29
Energy Storage System	Cranes	Diesel	Average	1.00	8.00	367	0.29
Energy Storage System	Graders	Diesel	Average	1.00	8.00	148	0.41
Energy Storage System	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
Energy Storage System	Skid Steer Loaders	Diesel	Average	2.00	8.00	71.0	0.37
Underground Work	Excavators	Diesel	Average	3.00	8.00	36.0	0.38
Underground Work	Other Material Handling Equipment	Diesel	Average	2.00	8.00	93.0	0.40
Underground Work	Rollers	Diesel	Average	2.00	8.00	36.0	0.38
Underground Work	Forklifts	Diesel	Average	3.00	8.00	82.0	0.20
Underground Work	Tractors/Loaders/Backhoes	Diesel	Average	4.00	8.00	84.0	0.37

5.2.2. Mitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Site Preparation	Skid Steer Loaders	Diesel	Tier 4 Final	6.00	8.00	71.0	0.37
Site Preparation	Graders	Diesel	Tier 4 Final	3.00	8.00	148	0.41
Site Preparation	Rubber Tired Dozers	Diesel	Tier 4 Final	3.00	8.00	367	0.40

Site Preparation	Rollers	Diesel	Tier 4 Final	6.00	8.00	36.0	0.38
Site Preparation	Tractors/Loaders/Backhoes	Diesel	Tier 4 Final	2.00	8.00	84.0	0.37
System Installation and Gen-Tie Construction	Forklifts	Diesel	Tier 4 Final	12.0	8.00	82.0	0.20
System Installation and Gen-Tie Construction	Skid Steer Loaders	Diesel	Average	18.0	8.00	71.0	0.37
System Installation and Gen-Tie Construction	Tractors/Loaders/Backhoes	Diesel	Tier 4 Final	6.00	8.00	84.0	0.37
System Installation and Gen-Tie Construction	Other Construction Equipment	Diesel	Tier 4 Final	16.0	8.00	82.0	0.42
System Installation and Gen-Tie Construction	Generator Sets	Diesel	Average	3.00	8.00	7.00	0.74
System Installation and Gen-Tie Construction	Skid Steer Loaders	Gasoline	Average	40.0	8.00	19.0	0.58
System Installation and Gen-Tie Construction	Cranes	Diesel	Tier 4 Final	1.00	8.00	367	0.29
Energy Storage System	Cranes	Diesel	Tier 4 Final	1.00	8.00	367	0.29
Energy Storage System	Graders	Diesel	Tier 4 Final	1.00	8.00	148	0.41
Energy Storage System	Forklifts	Diesel	Tier 4 Final	1.00	8.00	82.0	0.20
Energy Storage System	Skid Steer Loaders	Diesel	Average	2.00	8.00	71.0	0.37
Underground Work	Excavators	Diesel	Tier 4 Final	3.00	8.00	36.0	0.38
Underground Work	Other Material Handling Equipment	Diesel	Tier 4 Final	2.00	8.00	93.0	0.40
Underground Work	Rollers	Diesel	Tier 4 Final	2.00	8.00	36.0	0.38

Underground Work	Forklifts	Diesel	Tier 4 Final	3.00	8.00	82.0	0.20
Underground Work	Tractors/Loaders/Backhoes	Diesel	Tier 4 Final	4.00	8.00	84.0	0.37

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Site Preparation	—	—	—	—
Site Preparation	Worker	60.0	17.3	LDA,LDT1,LDT2
Site Preparation	Vendor	72.0	10.6	HHDT
Site Preparation	Hauling	48.0	20.0	HHDT
Site Preparation	Onsite truck	22.0	3.50	HHDT
System Installation and Gen-Tie Construction	—	—	—	—
System Installation and Gen-Tie Construction	Worker	958	17.3	LDA,LDT1,LDT2
System Installation and Gen-Tie Construction	Vendor	72.0	10.6	HHDT
System Installation and Gen-Tie Construction	Hauling	48.0	20.0	HHDT
System Installation and Gen-Tie Construction	Onsite truck	44.0	3.50	HHDT
Energy Storage System	—	—	—	—
Energy Storage System	Worker	210	17.3	LDA,LDT1,LDT2
Energy Storage System	Vendor	72.0	10.6	HHDT
Energy Storage System	Hauling	48.0	20.0	HHDT
Energy Storage System	Onsite truck	0.00	—	HHDT
Testing and Commissioning	—	—	—	—
Testing and Commissioning	Worker	60.0	17.3	LDA,LDT1,LDT2

Testing and Commissioning	Vendor	72.0	10.6	HHDT
Testing and Commissioning	Hauling	48.0	20.0	HHDT
Testing and Commissioning	Onsite truck	20.0	3.50	HHDT
Underground Work	—	—	—	—
Underground Work	Worker	24.0	17.3	LDA,LDT1,LDT2
Underground Work	Vendor	72.0	10.6	HHDT
Underground Work	Hauling	48.0	20.0	HHDT
Underground Work	Onsite truck	20.0	3.50	HHDT
General Management	—	—	—	—
General Management	Worker	100	17.3	LDA,LDT1,LDT2
General Management	Vendor	0.00	10.6	HHDT,MHDT
General Management	Hauling	0.00	20.0	HHDT
General Management	Onsite truck	—	—	HHDT
Site Mobilization	—	—	—	—
Site Mobilization	Worker	30.0	17.3	LDA,LDT1,LDT2
Site Mobilization	Vendor	0.00	10.6	HHDT,MHDT
Site Mobilization	Hauling	0.00	20.0	HHDT
Site Mobilization	Onsite truck	0.00	—	HHDT

5.3.2. Mitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Site Preparation	—	—	—	—
Site Preparation	Worker	60.0	17.3	LDA,LDT1,LDT2
Site Preparation	Vendor	72.0	10.6	HHDT
Site Preparation	Hauling	48.0	20.0	HHDT
Site Preparation	Onsite truck	22.0	3.50	HHDT
System Installation and Gen-Tie Construction	—	—	—	—

System Installation and Gen-Tie Construction	Worker	958	17.3	LDA,LDT1,LDT2
System Installation and Gen-Tie Construction	Vendor	72.0	10.6	HHDT
System Installation and Gen-Tie Construction	Hauling	48.0	20.0	HHDT
System Installation and Gen-Tie Construction	Onsite truck	44.0	3.50	HHDT
Energy Storage System	—	—	—	—
Energy Storage System	Worker	210	17.3	LDA,LDT1,LDT2
Energy Storage System	Vendor	72.0	10.6	HHDT
Energy Storage System	Hauling	48.0	20.0	HHDT
Energy Storage System	Onsite truck	0.00	—	HHDT
Testing and Commissioning	—	—	—	—
Testing and Commissioning	Worker	60.0	17.3	LDA,LDT1,LDT2
Testing and Commissioning	Vendor	72.0	10.6	HHDT
Testing and Commissioning	Hauling	48.0	20.0	HHDT
Testing and Commissioning	Onsite truck	20.0	3.50	HHDT
Underground Work	—	—	—	—
Underground Work	Worker	24.0	17.3	LDA,LDT1,LDT2
Underground Work	Vendor	72.0	10.6	HHDT
Underground Work	Hauling	48.0	20.0	HHDT
Underground Work	Onsite truck	20.0	3.50	HHDT
General Management	—	—	—	—
General Management	Worker	100	17.3	LDA,LDT1,LDT2
General Management	Vendor	0.00	10.6	HHDT,MHDT
General Management	Hauling	0.00	20.0	HHDT
General Management	Onsite truck	—	—	HHDT
Site Mobilization	—	—	—	—
Site Mobilization	Worker	30.0	17.3	LDA,LDT1,LDT2

Site Mobilization	Vendor	0.00	10.6	HHDT,MHDT
Site Mobilization	Hauling	0.00	20.0	HHDT
Site Mobilization	Onsite truck	0.00	—	HHDT

5.4. Vehicles

5.4.1. Construction Vehicle Control Strategies

Non-applicable. No control strategies activated by user.

5.5. Architectural Coatings

Phase Name	Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (cy)	Material Exported (cy)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
Site Preparation	—	—	500	0.00	—
Site Mobilization	—	—	0.00	0.00	—

5.6.2. Construction Earthmoving Control Strategies

Control Strategies Applied	Frequency (per day)	PM10 Reduction	PM2.5 Reduction
Water Exposed Area	3	74%	74%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
User Defined Industrial	0.00	0%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2025	0.00	532	0.03	< 0.005
2026	0.00	532	0.03	< 0.005
2027	0.00	532	0.03	< 0.005
2028	0.00	532	0.03	< 0.005

5.9. Operational Mobile Sources

5.9.1. Unmitigated

Land Use Type	Trips/Weekday	Trips/Saturday	Trips/Sunday	Trips/Year	VMT/Weekday	VMT/Saturday	VMT/Sunday	VMT/Year
Total all Land Uses	12.0	0.00	0.00	3,129	12.3	0.00	0.00	4,510

5.9.2. Mitigated

Land Use Type	Trips/Weekday	Trips/Saturday	Trips/Sunday	Trips/Year	VMT/Weekday	VMT/Saturday	VMT/Sunday	VMT/Year
Total all Land Uses	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN

5.10. Operational Area Sources

5.10.1. Hearths

5.10.1.1. Unmitigated

5.10.1.2. Mitigated

5.10.2. Architectural Coatings

Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)

0	0.00	0.00	0.00	—

5.10.3. Landscape Equipment

Season	Unit	Value
Snow Days	day/yr	0.00
Summer Days	day/yr	180

5.10.4. Landscape Equipment - Mitigated

Season	Unit	Value
Snow Days	day/yr	0.00
Summer Days	day/yr	180

5.11. Operational Energy Consumption

5.11.1. Unmitigated

Electricity (kWh/yr) and CO2 and CH4 and N2O and Natural Gas (kBTU/yr)

Land Use	Electricity (kWh/yr)	CO2	CH4	N2O	Natural Gas (kBTU/yr)
User Defined Industrial	0.00	532	0.0330	0.0040	0.00

5.11.2. Mitigated

Electricity (kWh/yr) and CO2 and CH4 and N2O and Natural Gas (kBTU/yr)

Land Use	Electricity (kWh/yr)	CO2	CH4	N2O	Natural Gas (kBTU/yr)
User Defined Industrial	0.00	532	0.0330	0.0040	0.00

5.12. Operational Water and Wastewater Consumption

5.12.1. Unmitigated

Land Use	Indoor Water (gal/year)	Outdoor Water (gal/year)
User Defined Industrial	6,517,000	0.00

5.12.2. Mitigated

Land Use	Indoor Water (gal/year)	Outdoor Water (gal/year)
User Defined Industrial	6,517,000	0.00

5.13. Operational Waste Generation

5.13.1. Unmitigated

Land Use	Waste (ton/year)	Cogeneration (kWh/year)
User Defined Industrial	0.00	—

5.13.2. Mitigated

Land Use	Waste (ton/year)	Cogeneration (kWh/year)
User Defined Industrial	0.00	—

5.14. Operational Refrigeration and Air Conditioning Equipment

5.14.1. Unmitigated

Land Use Type	Equipment Type	Refrigerant	GWP	Quantity (kg)	Operations Leak Rate	Service Leak Rate	Times Serviced

5.14.2. Mitigated

Land Use Type	Equipment Type	Refrigerant	GWP	Quantity (kg)	Operations Leak Rate	Service Leak Rate	Times Serviced

5.15. Operational Off-Road Equipment

5.15.1. Unmitigated

Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Off-Highway Trucks	Diesel	Average	10.0	8.00	376	0.38

5.15.2. Mitigated

Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Off-Highway Trucks	Diesel	Average	10.0	8.00	376	0.38

5.16. Stationary Sources

5.16.1. Emergency Generators and Fire Pumps

Equipment Type	Fuel Type	Number per Day	Hours per Day	Hours per Year	Horsepower	Load Factor

5.16.2. Process Boilers

Equipment Type	Fuel Type	Number	Boiler Rating (MMBtu/hr)	Daily Heat Input (MMBtu/day)	Annual Heat Input (MMBtu/yr)

5.17. User Defined

Equipment Type	Fuel Type

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1.2. Mitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.1.2. Mitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

5.18.2.2. Mitigated

Tree Type	Number	Electricity Saved (kWh/year)	Natural Gas Saved (btu/year)

6. Climate Risk Detailed Report

6.1. Climate Risk Summary

Cal-Adapt midcentury 2040–2059 average projections for four hazards are reported below for your project location. These are under Representation Concentration Pathway (RCP) 8.5 which assumes GHG emissions will continue to rise strongly through 2050 and then plateau around 2100.

Climate Hazard	Result for Project Location	Unit
Temperature and Extreme Heat	29.1	annual days of extreme heat
Extreme Precipitation	1.85	annual days with precipitation above 20 mm

Sea Level Rise	—	meters of inundation depth
Wildfire	4.04	annual hectares burned

Temperature and Extreme Heat data are for grid cell in which your project are located. The projection is based on the 98th historical percentile of daily maximum/minimum temperatures from observed historical data (32 climate model ensemble from Cal-Adapt, 2040–2059 average under RCP 8.5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Extreme Precipitation data are for the grid cell in which your project are located. The threshold of 20 mm is equivalent to about ¾ an inch of rain, which would be light to moderate rainfall if received over a full day or heavy rain if received over a period of 2 to 4 hours. Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.
Sea Level Rise data are for the grid cell in which your project are located. The projections are from Radke et al. (2017), as reported in Cal-Adapt (Radke et al., 2017, CEC-500-2017-008), and consider inundation location and depth for the San Francisco Bay, the Sacramento-San Joaquin River Delta and California coast resulting different increments of sea level rise coupled with extreme storm events. Users may select from four scenarios to view the range in potential inundation depth for the grid cell. The four scenarios are: No rise, 0.5 meter, 1.0 meter, 1.41 meters
Wildfire data are for the grid cell in which your project are located. The projections are from UC Davis, as reported in Cal-Adapt (2040–2059 average under RCP 8.5), and consider historical data of climate, vegetation, population density, and large (> 400 ha) fire history. Users may select from four model simulations to view the range in potential wildfire probabilities for the grid cell. The four simulations make different assumptions about expected rainfall and temperature are: Warmer/drier (HadGEM2-ES), Cooler/wetter (CNRM-CM5), Average conditions (CanESM2), Range of different rainfall and temperature possibilities (MIROC5). Each grid cell is 6 kilometers (km) by 6 km, or 3.7 miles (mi) by 3.7 mi.

6.2. Initial Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A
Extreme Precipitation	1	0	0	N/A
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	1	0	0	N/A
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	0	0	0	N/A
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores do not include implementation of climate risk reduction measures.

6.3. Adjusted Climate Risk Scores

Climate Hazard	Exposure Score	Sensitivity Score	Adaptive Capacity Score	Vulnerability Score
Temperature and Extreme Heat	N/A	N/A	N/A	N/A

Extreme Precipitation	1	1	1	2
Sea Level Rise	N/A	N/A	N/A	N/A
Wildfire	1	1	1	2
Flooding	N/A	N/A	N/A	N/A
Drought	N/A	N/A	N/A	N/A
Snowpack Reduction	1	1	1	2
Air Quality Degradation	N/A	N/A	N/A	N/A

The sensitivity score reflects the extent to which a project would be adversely affected by exposure to a climate hazard. Exposure is rated on a scale of 1 to 5, with a score of 5 representing the greatest exposure.
The adaptive capacity of a project refers to its ability to manage and reduce vulnerabilities from projected climate hazards. Adaptive capacity is rated on a scale of 1 to 5, with a score of 5 representing the greatest ability to adapt.
The overall vulnerability scores are calculated based on the potential impacts and adaptive capacity assessments for each hazard. Scores include implementation of climate risk reduction measures.

6.4. Climate Risk Reduction Measures

7. Health and Equity Details

7.1. CalEnviroScreen 4.0 Scores

The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Exposure Indicators	—
AQ-Ozone	82.7
AQ-PM	5.13
AQ-DPM	7.47
Drinking Water	96.7
Lead Risk Housing	12.0
Pesticides	84.1
Toxic Releases	22.0
Traffic	31.1
Effect Indicators	—

CleanUp Sites	58.2
Groundwater	63.6
Haz Waste Facilities/Generators	73.3
Impaired Water Bodies	0.00
Solid Waste	92.1
Sensitive Population	—
Asthma	68.8
Cardio-vascular	83.6
Low Birth Weights	72.1
Socioeconomic Factor Indicators	—
Education	39.2
Housing	18.5
Linguistic	0.26
Poverty	63.3
Unemployment	—

7.2. Healthy Places Index Scores

The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

Indicator	Result for Project Census Tract
Economic	—
Above Poverty	72.39830617
Employed	43.57756961
Median HI	48.47940459
Education	—
Bachelor's or higher	19.11972283
High school enrollment	26.43397921
Preschool enrollment	83.44668292
Transportation	—

Auto Access	74.57975106
Active commuting	43.14128064
Social	—
2-parent households	83.11305017
Voting	89.1954318
Neighborhood	—
Alcohol availability	80.68779674
Park access	9.085076351
Retail density	1.077890414
Supermarket access	18.2599769
Tree canopy	80.46965225
Housing	—
Homeownership	77.86475042
Housing habitability	98.34466829
Low-inc homeowner severe housing cost burden	97.45925831
Low-inc renter severe housing cost burden	95.72693443
Uncrowded housing	91.95431798
Health Outcomes	—
Insured adults	74.51559091
Arthritis	0.0
Asthma ER Admissions	44.4
High Blood Pressure	0.0
Cancer (excluding skin)	0.0
Asthma	0.0
Coronary Heart Disease	0.0
Chronic Obstructive Pulmonary Disease	0.0
Diagnosed Diabetes	0.0
Life Expectancy at Birth	15.7

Cognitively Disabled	29.3
Physically Disabled	43.7
Heart Attack ER Admissions	4.0
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	49.7
Physical Health Not Good	0.0
Stroke	0.0
Health Risk Behaviors	—
Binge Drinking	0.0
Current Smoker	0.0
No Leisure Time for Physical Activity	0.0
Climate Change Exposures	—
Wildfire Risk	11.4
SLR Inundation Area	0.0
Children	79.8
Elderly	22.5
English Speaking	96.1
Foreign-born	6.7
Outdoor Workers	60.8
Climate Change Adaptive Capacity	—
Impervious Surface Cover	96.8
Traffic Density	21.9
Traffic Access	0.0
Other Indices	—
Hardship	38.8
Other Decision Support	—

2016 Voting	83.3

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	62.0
Healthy Places Index Score for Project Location (b)	65.0
Project Located in a Designated Disadvantaged Community (Senate Bill 535)	No
Project Located in a Low-Income Community (Assembly Bill 1550)	No
Project Located in a Community Air Protection Program Community (Assembly Bill 617)	No

a: The maximum CalEnviroScreen score is 100. A high score (i.e., greater than 50) reflects a higher pollution burden compared to other census tracts in the state.
b: The maximum Health Places Index score is 100. A high score (i.e., greater than 50) reflects healthier community conditions compared to other census tracts in the state.

7.4. Health & Equity Measures

No Health & Equity Measures selected.

7.5. Evaluation Scorecard

Health & Equity Evaluation Scorecard not completed.

7.6. Health & Equity Custom Measures

No Health & Equity Custom Measures created.

8. User Changes to Default Data

Screen	Justification
Land Use	Provided by Applicant.
Construction: Construction Phases	Provided by Applicant
Construction: Off-Road Equipment	Provided by Applicant.
Construction: Trips and VMT	Provided by Applicant.
Operations: Water and Waste Water	Provided by Applicant
Operations: Off-Road Equipment	Provided by Applicant.
Construction: Dust From Material Movement	Provided by Applicant. Cut & Fill will be balanced on site.

Construction: Off-Road Equipment EF	Skid Steer Loader PM, ROG & NOx factors are from CARB 2017 Off-Road Diesel, Propane, & Gasoline Emission Factors.
Operations: Architectural Coatings	Not Applicable

Backup Generator Emissions

Engine Fuel Type	Diesel	
Engine Make	TBD	
Engine Model	TBD	
Rated Power	500	kW
Rated Power	670	bhp
Diesel Heat Content	138,000	Btu/gal
Engine Heat Input	4.69	MMBtu/hr
Fuel Consumption	34.0	gal/hr
Operating Hours	100	hr/yr
No. of engines	6	

Pollutant	Emission Factors		Potential Emissions		
	g/kW-hr	kg/MMBtu	lb/hr	lb/day [5]	TPY[6]
NOx [1]	0.40	-	0.441	2.646	0.132
CO [1]	3.50	-	3.858	23.149	1.157
PM [1]	0.02	-	0.022	0.132	0.007
NMHC [1]	0.19	-	0.209	1.257	0.063
SO_2 [2]	-	6.9E-04	0.007	0.043	0.002
CO_2 [3]	-	73.96	766.6	4600	230.0
N_2O [3]	-	6.00E-04	0.006	0.037	0.002
CH_4 [3]	-	3.00E-03	0.031	0.187	0.009
CO_2e [4]	-	-	-	4615	230.8
GHG Metric Tonnes [7]					
CO_2					208.6
N_2O					0.002
CH_4					0.008
CO_2e					209.3

Notes:

[1] Emissions (g/kW-hr) from EPA Nonroad Compression-Ignition Engines: Exhaust Emission Standards.

[2] Assuming 15 ppm Sulfur in fuel and emission factor from AP-42 Table 3.4.-1 ($1.01S_1$ lb/MMBtu, where S_1 = % sulfur in fuel oil)

[3] Emission factors (kg/MMBtu) based on 40 CFR Subchapter C Part 98 Table C-1 and C-2.

[4] Global Warming Potentials from 40 CFR Subchapter C Part 98 Table A-1

[5] Daily emissions assume each engine could operate up to one hour per day'

[6] Annual operation hours are based on 6 units operating upto 100 hours per year

[7] 1 Ton = 0.907185 Metric Ton

APPENDIX C: DISPERSION MODELING

This page intentionally left blank.

Results Summary

Discovery Solar- 24HR PM10
Met data- KEDW (2012, 2016, 2017, 2019, 2020)

PM10 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	1.31138	ug/m^3	382047.85	3872648.29	963.22	0.00	963.22	11/27/2012, 24
24-HR	2ND	1.10116	ug/m^3	383664.42	3872386.57	945.30	0.00	945.30	11/27/2012, 24
24-HR	6TH	0.90530	ug/m^3	383649.41	3873133.75	955.00	0.00	955.00	1/1/2016, 24
PERIOD		0.13780	ug/m^3	383241.29	3873534.70	965.02	0.00	965.02	

Results Summary

Discovery Solar- 24HR PM2.5
Met data- KEDW (2012, 2016, 2017, 2019, 2020)

PM-2.5 NAAQS - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	0.11849	ug/m^3	383241.29	3873534.70	965.02	0.00	965.02	
24-HR	8TH	0.07392	ug/m^3	382020.53	3873123.05	969.42	0.00	969.42	

APPENDIX D: HEALTH RISK ASSESSMENT

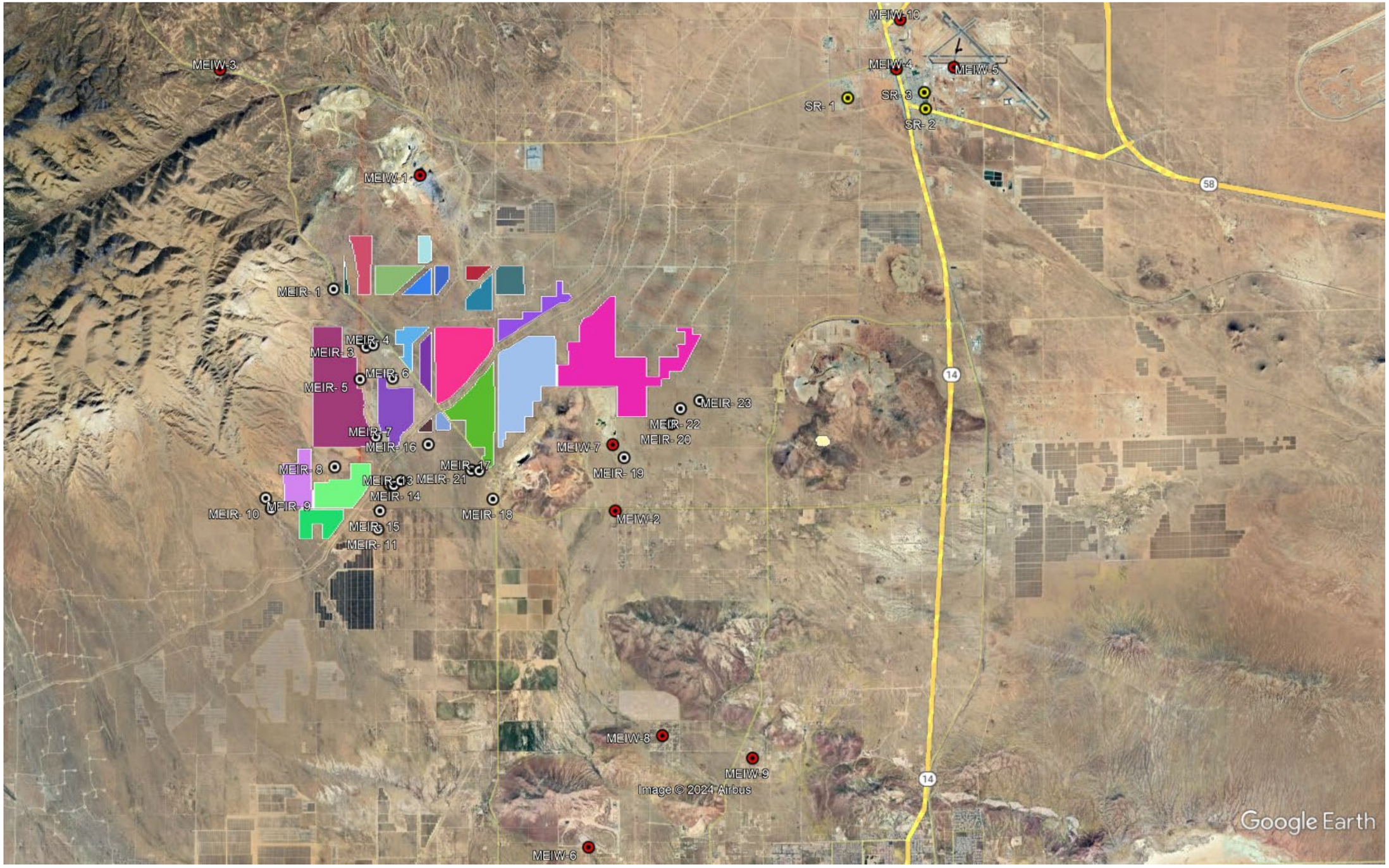
This page intentionally left blank.

Appendix D
Discovery Solar PV and Storage Project

HRA Results-PMI, MEIR & Sensitive Receptors

Index	Receptor	Receptor Type	X-Coord. [m]	Y-Coord. [m]	Concentration (ug/m$^{3)}$	Inhalation Risk	Hazard Index
1	PMI	Fenceline	383649.4	3873133.7	0.00365	1.04E-06	7.30E-04
2	MEIR 1	Residence	377808	3874253	0.00046	1.31E-07	9.20E-05
3	MEIR 2	Residence	378534	3872863	0.00065	1.86E-07	1.30E-04
4	MEIR 3	Residence	378656	3872706	0.00073	2.08E-07	1.46E-04
5	MEIR 4	Residence	378846	3872763	0.00076	2.17E-07	1.52E-04
6	MEIR 5	Residence	378486	3871853	0.00155	4.42E-07	3.10E-04
7	MEIR 6	Residence	379354	3871868	0.00182	5.20E-07	3.64E-04
8	MEIR 7	Residence	378889	3870319	0.0018	5.14E-07	3.60E-04
9	MEIR 8	Residence	377782	3869531	0.00116	3.31E-07	2.32E-04
10	MEIR 9	Residence	375933	3868723	0.00042	1.20E-07	8.40E-05
11	MEIR 10	Residence	376076	3868441	0.00048	1.37E-07	9.60E-05
12	MEIR 11	Residence	378915	3867867	0.0004	1.14E-07	8.00E-05
13	MEIR 12	Residence	379234	3869036	0.00072	2.06E-07	1.44E-04
14	MEIR 13	Residence	379348	3869024	0.00066	1.88E-07	1.32E-04
15	MEIR 14	Residence	379543	3869144	0.00065	1.86E-07	1.30E-04
16	MEIR 15	Residence	378974	3868350	0.00053	1.51E-07	1.06E-04
17	MEIR 16	Residence	380286	3870098	0.00092	2.63E-07	1.84E-04
18	MEIR 17	Residence	381426	3869404	0.0006	1.71E-07	1.20E-04
19	MEIR 18	Residence	381990	3868628	0.00036	1.03E-07	7.20E-05
20	MEIR 19	Residence	385500	3869687	0.00029	8.28E-08	5.80E-05
21	MEIR 20	Residence	386770	3870566	0.0003	8.56E-08	6.00E-05
22	MEIR 21	Residence	381634	3869384	0.00063	1.80E-07	1.26E-04
23	MEIR 22	Residence	387018	3870971	0.00034	9.71E-08	6.80E-05
24	MEIR 23	Residence	387536	3871179	0.0003	8.56E-08	6.00E-05
25	SR 1	School	391577	3879168	0.00018	5.14E-08	3.60E-05
26	SR 2	Park	393648	3878855	0.00015	2.50E-08	3.00E-05
27	SR 3	School	393618	3879292	0.00015	2.50E-08	3.00E-05
28	MEIW 1	Worker	379680	3877786	0.00013	1.41E-09	2.60E-05
29	MEIW 2	Worker	385248	3868276	0.00019	2.06E-09	3.80E-05
30	MEIW 3	Worker	374843	3880122	2.00E-05	2.17E-10	4.00E-06
31	MEIW 4	Worker	392883	3879921	0.00016	1.74E-09	3.20E-05
32	MEIW 5	Worker	394417	3879953	0.00013	1.41E-09	2.60E-05
33	MEIW 6	Worker	384433	3859351	6.00E-05	6.51E-10	1.20E-05
34	MEIW 7	Worker	385203	3870036	0.00036	3.91E-09	7.20E-05
35	MEIW 8	Worker	386436	3862295	6.00E-05	6.51E-10	1.20E-05
36	MEIW 9	Worker	388831	3861667	5.00E-05	5.42E-10	1.00E-05
37	MEIW 10	Worker	392999	3881235	0.00015	1.63E-09	3.00E-05

This page intentionally left blank.


MEIW-10
MEIW-3
MEIW-4
MEIW-5
SR- 3
SR- 1
SR- 2
MEIW-1
58
MEIR- 1
MEIR- 4
MEIR- 3
MEIR- 6
MEIR- 5
14
MEIR- 23
MEIR- 22
MEIR- 7
MEIR- 20
MEIR- 16
MEIW-7
MEIR- 17
MEIR- 19
MEIR- 8
MEIR- 13
MEIR- 21
MEIR- 14
MEIR- 9
MEIR- 10
MEIR- 18
MEIW-2
MEIR- 15
MEIR- 11
MEIW-8
MEIW-9
Image © 2024 Airbus
14
Google Earth
MEIW-6

This page intentionally left blank.

HARP2 - HRACalc (dated 22118) 8/19/2024 9:44:25 AM - Output Log

GLCs loaded successfully
Pollutants loaded successfully
****
RISK SCENARIO SETTINGS

Receptor Type: Worker
Scenario: All
Calculation Method: Derived

****
EXPOSURE DURATION PARAMETERS FOR CANCER

Start Age: -0.25
Total Exposure Duration: 3

Exposure Duration Bin Distribution
3rd Trimester Bin: 0.25
0<2 Years Bin: 2
2<9 Years Bin: 1
2<16 Years Bin: 0
16<30 Years Bin: 0
16 to 70 Years Bin: 0

****
PATHWAYS ENABLED

NOTE: Inhalation is always enabled and used for all assessments. The remaining pathways are only used for cancer and noncancer chronic assessments.

Inhalation: True
Soil: True
Dermal: True
Mother's milk: True
Water: False
Fish: False
Homegrown crops: False
Beef: False
Dairy: False
Pig: False
Chicken: False
Egg: False

****
INHALATION

Daily breathing rate: Moderate8HR

Worker Adjustment Factors
Worker adjustment factors enabled: NO

Fraction at time at home
3rd Trimester to 16 years: OFF
16 years to 70 years: ON

****
SOIL & DERMAL PATHWAY SETTINGS

Deposition rate (m/s): 0.05
Soil mixing depth (m): 0.01
Dermal climate: Mixed

****
TIER 2 SETTINGS

```
Tier2 adjustments were used in this assessment.  Please see the input file for details.
Tier2 - What was changed: ED or start age changed|
Calculating cancer risk
Cancer risk saved to: C:\Users\s.sridharan\Documents\CEQA\Discovery Solar\HRA\DiscoverySolarMEIRCancerRisk.csv
Calculating chronic risk
Chronic risk saved to: C:\Users\s.sridharan\Documents\CEQA\Discovery Solar\HRA\DiscoverySolarMEIRNCChronicRisk.csv
Calculating acute risk
Acute risk saved to: C:\Users\s.sridharan\Documents\CEQA\Discovery Solar\HRA\DiscoverySolarMEIRNCAcuteRisk.csv
HRA ran successfully

```

HARP2 - HRACalc (dated 22118) 8/15/2024 7:36:21 AM - Output Log

GLCs loaded successfully
Pollutants loaded successfully
****
RISK SCENARIO SETTINGS

Receptor Type: Worker
Scenario: All
Calculation Method: HighEnd

****
EXPOSURE DURATION PARAMETERS FOR CANCER

Start Age: 16
Total Exposure Duration: 3

Exposure Duration Bin Distribution
3rd Trimester Bin: 0
0<2 Years Bin: 0
2<9 Years Bin: 0
2<16 Years Bin: 0
16<30 Years Bin: 3
16 to 70 Years Bin: 0

****
PATHWAYS ENABLED

NOTE: Inhalation is always enabled and used for all assessments. The remaining pathways are only used for cancer and noncancer chronic assessments.

Inhalation: True
Soil: True
Dermal: True
Mother's milk: False
Water: False
Fish: False
Homegrown crops: False
Beef: False
Dairy: False
Pig: False
Chicken: False
Egg: False

****
INHALATION

Daily breathing rate: Moderate8HR

Worker Adjustment Factors
NOTE: The worker adjustment factors below are only used for cancer assessments. However, the GLC adjustment factor is also applied to 8-hr noncancer chronic assessments.
Worker adjustments factors enabled: YES
GLC adjustment factor: 1.4
Exposure frequency: 250

Fraction at time at home
3rd Trimester to 16 years: OFF
16 years to 70 years: OFF

****
SOIL & DERMAL PATHWAY SETTINGS

Deposition rate (m/s): 0.05
Soil mixing depth (m): 0.01
Dermal climate: Mixed

```
**********
TIER 2 SETTINGS

Tier2 adjustments were used in this assessment.  Please see the input file for details.
Tier2 - What was changed: ED or start age changed|
Calculating cancer risk
Cancer risk saved to: C:\Users\s.sridharan\Documents\CEQA\Discovery
Solar\HRA\DiscoverySolarMEIWCancerRisk.csv
Calculating chronic risk
Chronic risk saved to: C:\Users\s.sridharan\Documents\CEQA\Discovery
Solar\HRA\DiscoverySolarMEIWNCChronicRisk.csv
Calculating acute risk
Acute risk saved to: C:\Users\s.sridharan\Documents\CEQA\Discovery
Solar\HRA\DiscoverySolarMEIWNCAcuteRisk.csv
HRA ran successfully

```

HARP2 - HRACalc (dated 22118) 8/19/2024 9:46:12 AM - Output Log

GLCs loaded successfully
Pollutants loaded successfully
****
RISK SCENARIO SETTINGS

Receptor Type: Resident
Scenario: All
Calculation Method: HighEnd

****
EXPOSURE DURATION PARAMETERS FOR CANCER

Start Age: 5
Total Exposure Duration: 3

Exposure Duration Bin Distribution
3rd Trimester Bin: 0
0<2 Years Bin: 0
2<9 Years Bin: 3
2<16 Years Bin: 0
16<30 Years Bin: 0
16 to 70 Years Bin: 0

****
PATHWAYS ENABLED

NOTE: Inhalation is always enabled and used for all assessments. The remaining pathways are only used for cancer and noncancer chronic assessments.

Inhalation: True
Soil: True
Dermal: True
Mother's milk: True
Water: False
Fish: False
Homegrown crops: False
Beef: False
Dairy: False
Pig: False
Chicken: False
Egg: False

****
INHALATION

Daily breathing rate: LongTerm24HR

Worker Adjustment Factors
NOTE: The worker adjustment factors below are only used for cancer assessments. However, the GLC adjustment factor is also applied to 8-hr noncancer chronic assessments.
Worker adjustments factors enabled: YES
GLC adjustment factor: 2
Exposure frequency: 250

Fraction at time at home
3rd Trimester to 16 years: OFF
16 years to 70 years: OFF

****
SOIL & DERMAL PATHWAY SETTINGS

Deposition rate (m/s): 0.05
Soil mixing depth (m): 0.01
Dermal climate: Mixed

```
65
66  **********
67  TIER 2 SETTINGS
68
69  Tier2 adjustments were used in this assessment.  Please see the input file for details.
70  Tier2 - What was changed: ED or start age changed|
71  Calculating cancer risk
72  Cancer risk saved to: C:\Users\s.sridharan\Documents\CEQA\Discovery
    Solar\HRA\DiscoverySolarSRCancerRisk.csv
73  Calculating chronic risk
74  Chronic risk saved to: C:\Users\s.sridharan\Documents\CEQA\Discovery
    Solar\HRA\DiscoverySolarSRNCChronicRisk.csv
75  Calculating acute risk
76  Acute risk saved to: C:\Users\s.sridharan\Documents\CEQA\Discovery
    Solar\HRA\DiscoverySolarSRNCAcuteRisk.csv
77  HRA ran successfully
78
```

APPENDIX E: CUMULATIVE PROJECTS

This page intentionally left blank.

Cumulative Projects

No.	Project Name/Case ID	Project Location	Project Description	Case Type	Request	Project Site APN	Approx Acreage	Project Status
1-MILE RADIUS SOLAR PROJECTS								
1	Apollo Solar (Syracuse Site)	Southeast corner of Backus Road and 100th Street West, Northeast corner of Backus Road and 100th Street West	Unspecified solar facility	CUP, GPA	CUP 39, CUP 41, GPA 5, Map 214	374-011-06; multiple	163.65	Approved
2	Apollo Solar (Tours Site)	Southeast corner of Backus Road and 100th Street West, Northeast corner of Backus Road and 100th Street West	Unspecified solar facility	CUP, GPA	CUP 38, GPA 5, Map 214	374-011-06; multiple	158.83	Approved
3	Apollo Solar (Sunbow Site)	Southeast corner of Backus Road and 100th Street West, Northeast corner of Backus Road and 100th Street West	Unspecified solar facility	CUP	CUP 37, Map 214	374-011-06; multiple	164.91	Approved
1-MILE RADIUS NON-SOLAR PROJECTS								
4	NB + C	11253 Tehachapi-Willow Springs Rd, Tehachapi, CA	Satellite ground station	CUP	CUP	474-052-206	9.55	In Review
5	Windstar Upper and Lower BESS	12490 90th Street West, Mojave, CA	102 MW, 480 MW(h) energy storage facility	BESS for existing wind farm	CUP, Map 197 & 198	237-054-20; 237-211-17	274.00	In Review
6-MILE RADIUS SOLAR PROJECTS								
6	Organics Energy Solar	N/A	N/A	SPA, CUP, PD	SPA 27, Map 213; CUP 69, Map 213; PD 4, Map 213	N/A	119.64	Processing
7	Bullhead Solar	9678 Dawn Road, Rosamond, CA	270 MW, 1080 MW(h) solar facility	GPA, ZCC, CUP	GPA, ZCC, CUP; Map 214, 215, 231, 232	315-080-36; multiple	1343.00	Approved
8	Bullhead II Solar	N/A	50 MW, 200 MW(h) storage facility	N/A	N/A	N/A	544.00	Processing
9	Sanborn Solar Project	South of SR 58 and east of SR 14	300 MW solar facility and up to 3 gigawatt hours (GWh) of energy storage capacity	SPA, ZCC, CUP	SPA 30, Map 196; ZCC 56, Map 196; ZCC 2, Map 212; ZCC 59, Map 213; CUP 45, Map 196; CUP 5, Map 212; CUP 66, Map 213	428-030-20; multiple	2006.00	In Construction
10	Mid-American Gunite dba MAG Energy	N/A	1,477 kW Commercial Solar	CUP	CUP, Map 213	429-102-14	156.36	Applied
6-MILE RADIUS NON-SOLAR PROJECTS								
11	Pacific Steel Mojave Micro Mill	506 Sopp Rd, Mojave, CA	Steel micro mill manufacturing facility	GPA, ZCC, PD, ZV, CUP	CUP 71, Map 213; CUP 72, MAP 213; GPA 3, Map 213; PD 3, Map 213; ZCC 62, Map 213; ZV 24, Map 213; ZV 25, Map 213	431-010-024; multiple	174.00	Approved
12	Private Developer	2000 Inyo St, Mojave, CA	Residential	TPM	TPM to divide a 22,611 sf (net) parcel of record into an 8,514 sf (net) parcel and a 14,097 sf (net) parcel for residential use	236-192-019	0.2	Applied
13	Private Developer	2000 Inyo St, Mojave, CA	Residential	TPM	TPM to divide a 22,611 sf (net) parcel of record into an 8,514 sf (net) parcel and a 14,097 sf (net) parcel for residential use	236-192-027	0.32	Applied

No.	Project Name/Case ID	Project Location	Project Description	Case Type	Request	Project Site APN	Approx Acreage	Project Status
14	NVH Mojave, LLC	16825 Highway 14, Mojave, CA	N/A	LLA	LLA 43-22 proposing an adjustment of lot lines resulting in a 3.64 ac parcel	236-060-026, 236-060-349	3.64	Processing
15	Western Natural Resources	East side of SR 14, south of SR 58	N/A	LLA	LLA 8-23 proposing an adjustment of lot lines resulting in a 79.02 ac parcel and a 198.17 ac parcel	427-020-177; multiple	198.17	In Review
16	High Desert Estates, Inc.	N/A	N/A	TM	TTR 6545	236-080-081; multiple	40.00	Applied
17	Private Developer	East side of 35th Street West between Favorito Avenue and Beaudette Avenue	N/A	LLA	LLA 10-24 proposing an adjustment of lot lines to combine two parcels resulting in a 20.54-acre (gross) parcel	471-082-016; 471-082-024	20.54	In Review
18	Airstreams Renewables, Inc. by Scott Quintana, LAV Pinnacle Engineering.	N/A	Modification - Dormitory Bldg Veterans Training Facility	PD	PD 2, Map 167	224-120-14	N/A	Applied
19	Private Developer	N.A	Construction Materials Recycling Facility	CUP	CUP, Map 213	429-010-02	N/A	Closed
20	Kern County Planning and Natural Resources	435 Panama Rd, Bakersfield, CA	Kern County Housing Element Implementation 2022	ZCC	ZCC 20, Map 196	236-360-186	0.92	Approved
21	Kern County Planning and Natural Resources	435 Panama Rd, Bakersfield, CA	Kern County Housing Element Implementation 2022	ZCC	ZCC 159, Map 231	252-161-492	2.51	Approved
22	Kern County Planning and Natural Resources	435 Panama Rd, Bakersfield, CA	Kern County Housing Element Implementation 2022	ZCC	ZCC 65, Map 213	430-030-106	6.97	Approved
23	Kern County Public Works Department	N/A	Expand landfill operations	GPA, ZCC, CUP	GPA from 8.5 to 3.4 and 3.4.1; ZCC from A-1 to A; CUP Mod (CUP 28, Map 196, CUP 7, Map 213)	428-181-044; multiple	22.23	Applied
24	RenuEnergy Inc	N/A	Unspecified solar facility	CUP	CUP for commercial solar	N/A	45.00	Applied
25	Private Developer	N/A	CUP for cargo container	CUP	CUP for cargo container	315-011-189, multiple	0.17	Applied
26	Antelope Valley Engineering	15764 Sierra Hy, Mojave, CA	Building expansion	PD	Modification to PD 8 Map 196-17 to allow for building expansion	236-251-013, 236-251-112	0.7	Applied
27	Joseph Bonadiman & Associates Inc	N/A	N/A	ZCC	Zone Change from R-1 to MP	427-080-098	9.71	In Review
28	N/A	N/A	CUP for mobile home not meeting age requirements	CUP	CUP, Map 214	345-261-044	2.49	In Review
29	Idaho Asphalt Supply	1673 Purdy Ave, Mojave	Addition of rail spur and roadway for renewable diesel railcar to the transloading area.	PD	Modification to PD Plan #14, Map 196	427-020-42	N/A	In Review
SOLAR PROJECTS WITHIN AIR BASIN								
30	Edwards Air Force Base Solar	Northwest corner of Edwards Air Force Base, at the intersection of Lone Butte Road and East Trotter Avenue	600 MW solar facility on Edwards Air Force Base	Franchise Agreement	Franchise Agreement, Map 231	244-250-02; multiple	12754	Approved
31	Galaxy Solar PV and Storage Project	Appx. 6 miles southeast of Mojave, 8 miles northeast of Rosamond, 8	1000 MW, 4000 MW(h) solar and storage facility	GPA, ZCC, CUP, ZV, Vesting Tentative Parcel Maps	GPA No. 7, Map 212; ZCC No. 5, Map 195; ZCC No. 4, Map 212; ZCC No. 5, Map 212; CUP No. 4, Map 195; CUP No. 5, Map 195; CUP No. 7, May 197;	235-102-05; multiple	3400	Processing

No.	Project Name/Case ID	Project Location	Project Description	Case Type	Request	Project Site APN	Approx Acreage	Project Status
		miles northwest of Edwards Air Force Base			CUP No. 24, Map 197; CUP No. 8, Map 212; ZV No. 1, Map 195; ZV No. 2, Map 212; ZV No. 21, Map 197; GPA No. 5, Map 195 (Circulation); GPA No. 6, Map 212 (Circulation); Vesting Tentative Parcel Maps (Multiple)			
32	AVEP Solar Project (Chaparral, Rabbitbrush and Tumbleweed Solar)	South of Dawn Road, west of 95th Street West, north Avenue A, and east of 130th Street West	375 MW solar facility	ZCC, CUP, SPA	ZCC 45, Map 232; CUP 48, Map 232; SPA 1, Map 231-18; ZCC 3, Map 231-18; SPA 2, Map 231-18; SPA 25, Map 232; SPA 27, Map 232; ZCC 40, Map 232; ZCC 41, Map 232; CUP 33, CUP 34, CUP 35, CUP 36, Map 232; SPA 26, Map 232; SPA 28, Map 232	359-183-02; multiple	2052.15	In Construction
33	Jade Energy Storage	N/A	100 MW, 400 MW(h) solar storage facility	ZCC, CUP	ZCC, CUP, Map 233	N/A	9	Processing
34	Radiant BMT Solar	N/A	Unspecified solar facility	CUP	CUP, Map 134	N/A	37	Processing
35	Graff Solar	N/A	N/A	N/A	N/A	N/A	80	Processing
36	East Bowman Solar Storage	N/A	5 MW, 5 MW(h) solar facility	N/A	N/A	N/A	N/A	Preliminary
37	Euismod Energy Storage Project	N/A	1,175 MW, 9,400 MW(h) energy storage facility	N/A	N/A	N/A	119	Processing
38	Sanborn 2.0 Solar	Appx. 17 miles southeast of Tehachapi, 1 mile south of Mojave, and 10 miles north of Rosamond.	1000 MW, 4000 MW(h) solar facility	CUP	CUP 60 and CUP 61, Map 196	235-202-025; multiple	1200	In Construction
39	Raceway 2.0	Western extent of the Mojave Desert near Rosamond, between Rosamond Mojave Desert near Rosamond, between Rosamond Boulevard and Avenue A, and between 70th Street West and 90th Street West	291 MW solar renewable electrical energy and/or energy storage capacity	SPA, ZCC, CUP	SPA 33, 34, 35, 36, 37, 38, 39, Map 231; ZCC 154, 155, 156, Map 231; CUP 116, CUP 117, CUP 118, CUP 119, Map 231; CUP 4, SPA 3, Map 231-20; SPA 5, ZCC 3, CUP 3, SPA 7, ZCC 4, SPA 6, CUP 4, Map 231-21; SPA 5, ZCC 3, CUP 7, SPA 6, Map 231-28	374-011-04; multiple	1330	Near Complete
40	Big Beau Solar Project	Southeast portion of Kern County approximately 12 miles southwest of SR-58 and approximately 9 miles east of SR-14	128 MW solar facility and up to 60 MW energy storage capacity	GPA, ZCC, CUP	GPA 4, Map 215; ZCC 13, Map 215; CUP 13, Map 215; CUP 14, Map 215; CUP 15, Map 215; SPA 32, Map 232; ZCC 44, Map 232; CUP 41, Map 232; CUP 42; Map 232; CUP 43, Map 232	474-131-03; multiple	2562.03	Complete
41	Camino Solar Project	North of Rosamond Blvd at 170th Street West	44 MW solar facility	CUP	CUP 7, Map 216	476-061-09; multiple	383	In Construction
42	Gaskell West (2016)	South of Holiday Ave, west of 225th St, north of Avenue A	125 MW solar facility	CUP	CUP 1, Map 234-25; CUP 3, Map 234-26; CUP 4, Map 234-26; CUP 1, Map 234-27; CUP 3, Map 234; CUP 2, Map 234-27; CUP 1, Map 234-34; CUP 5, Map 234; CUP 3, Map 234-34	254-551-08; multiple	1463	In Construction
43	RB Inyokern Solar Project	East of North Brown Road and Inyokern Road intersection	Unspecified solar facility	CUP, SPA	CUP 23, Map 47; CUP 27, Map 47; SPA 4, Map 47	352-085-05; multiple	170	In Construction
44	Enterprise Solar	Western edge of the Antelope Valley, Appx. 2 miles south of Mojave, 2 miles southwest of California City, 1 mile north of Edwards Air Force Base, and eight miles north of Rosamond	600 MW solar facility and up to 1000 MW battery storge	GPA, ZCC, CUP	GPA 4, ZCC 3, CUP 2, Map 195; GPA 34, ZCC 60, CUP 62, Map 196; GPA 3, GPA 4, SPA 5, ZCC 3, CUP 6, Map 212; CUP 1, Map 196-20	235-132-131; multiple	2200	In Compliance
45	Rosamond CSD Solar	South of Rosamond Boulevard to the north, east of 90th Street West, North of West Avenue A, east of 170th Street West	Unspecified solar project	CUP	CUP 36, Map 230	261-120-05; multiple	247.58	Approved

Appendix E
Discovery Solar PV and Storage Project

No.	Project Name/Case ID	Project Location	Project Description	Case Type	Request	Project Site APN	Approx Acreage	Project Status
46	Bellefield Solar Project	Altus Ave and SR-58	750 MW solar facility and (up to) 2,000 MW-hour energy storage system	GPA, ZCC, CUP, SPA	GPA 2, Map 195; ZCC 2, Map 195; CUP 1, Map 195; ZCC 57, Map 196; CUP 57, Map 196; GPA 3, Map 195; SPA 31, Map 196	428-010-11; multiple	8375.9	In Construction
48	Windhub Solar Project	6 miles west of SR-14, 5 miles south of SR-58, east of 90th St West	80 MW, 320 MW(h) solar facility	CUP	CUP 17, Map 197; CUP 18, Map 197	237-350-02; multiple	307.5	Partially Complete
50	Gettysburg Solar	Southwest corner of Rosamond and 70th Street West	30 MW, 120 MW(h) solar facility	SPA, ZCC, CUP	SPA 8, Map 231-21; ZCC 5, Map 231-21; CUP 5, Map 231-21; CUP 6, Map 231-21; SPA 9, Map 231-21	374-011-06; multiple	158	In Compliance
51	Eland 1 Solar	South of Munsey Road, east and west of Neuralia Road, east of SR 14, and north and south of Phillips Road	500 MW solar facility	GPA, ZCC, CUP	GPA 9, Map 152; GPA 1, Map 152-28; ZCC 11, Map 152; ZCC 12, Map 152; ZCC 13, Map 152; ZCC 1, Map 152-28; CUP 23, Map 152; CUP 24, Map 152; CUP 25, Map 152; CUP 26, Map 152; CUP 3, Map 152-28	469-030-01; multiple	61.31	In Construction
52	Kudu Solar Project	Unincorporated Kern County and City of California City	500 MW solar facility and 600 MW energy storage system	ZCC, CUP, GPA	ZCC 14, Map 152; CUP 28, Map 152; GPA 10, Map 152	470-020-19; multiple	1954.94	In Construction

Appendix C2
Miscellaneous Air Quality Attachments

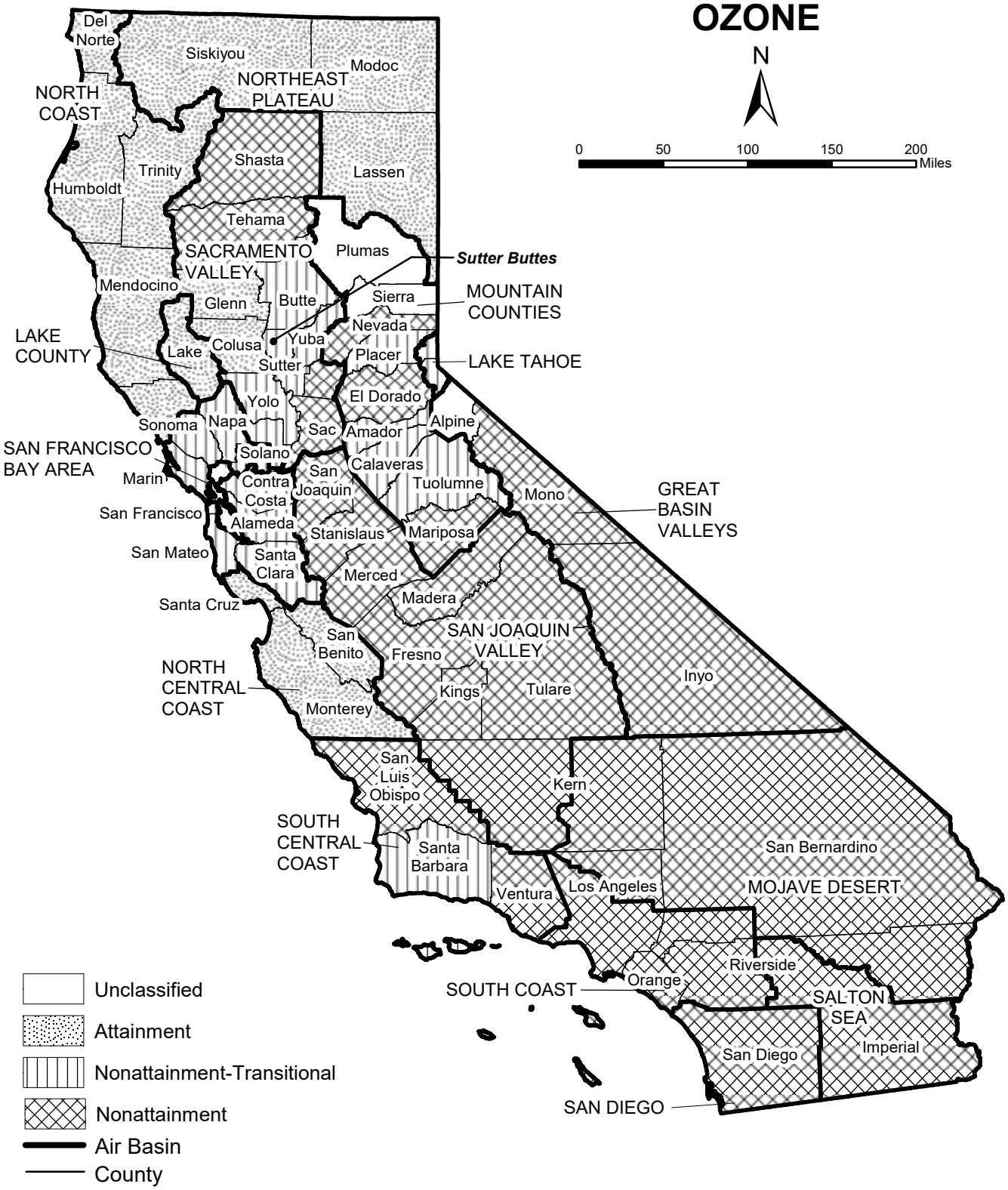
This page intentionally left blank.

2023
Area Designations for State Ambient Air Quality Standards
NITROGEN DIOXIDE



Last Updated: November 2023
Air Quality Planning and Science Division, CARB

2023
Area Designations for State Ambient Air Quality Standards
OZONE



Last Updated: November 2023
Air Quality Planning and Science Division, CARB

2023
Area Designations for State Ambient Air Quality Standards
CARBON MONOXIDE



Last Updated: November 2023
Air Quality Planning and Science Division, CARB

2023
Area Designations for State Ambient Air Quality Standards
SULFUR DIOXIDE



Last Updated: November 2023
Air Quality Planning and Science Division, CARB

2023
Area Designations for State Ambient Air Quality Standards
PM10



Last Updated: November 2023
Air Quality Planning and Science Division, CARB

2023
Area Designations for State Ambient Air Quality Standards
PM2.5



Last Updated: November 2023
Air Quality Planning and Science Division, CARB

2023
Area Designations for State Ambient Air Quality Standards
HYDROGEN SULFIDE



Last Updated: November 2023
Air Quality Planning and Science Division, CARB

2023
Area Designations for State Ambient Air Quality Standards
LEAD



Last Updated: November 2023
Air Quality Planning and Science Division, CARB

2023
Area Designations for State Ambient Air Quality Standards
SULFATES



Last Updated: November 2023
Air Quality Planning and Science Division, CARB

2023
Area Designations for State Ambient Air Quality Standards
VISIBILITY REDUCING PARTICLES



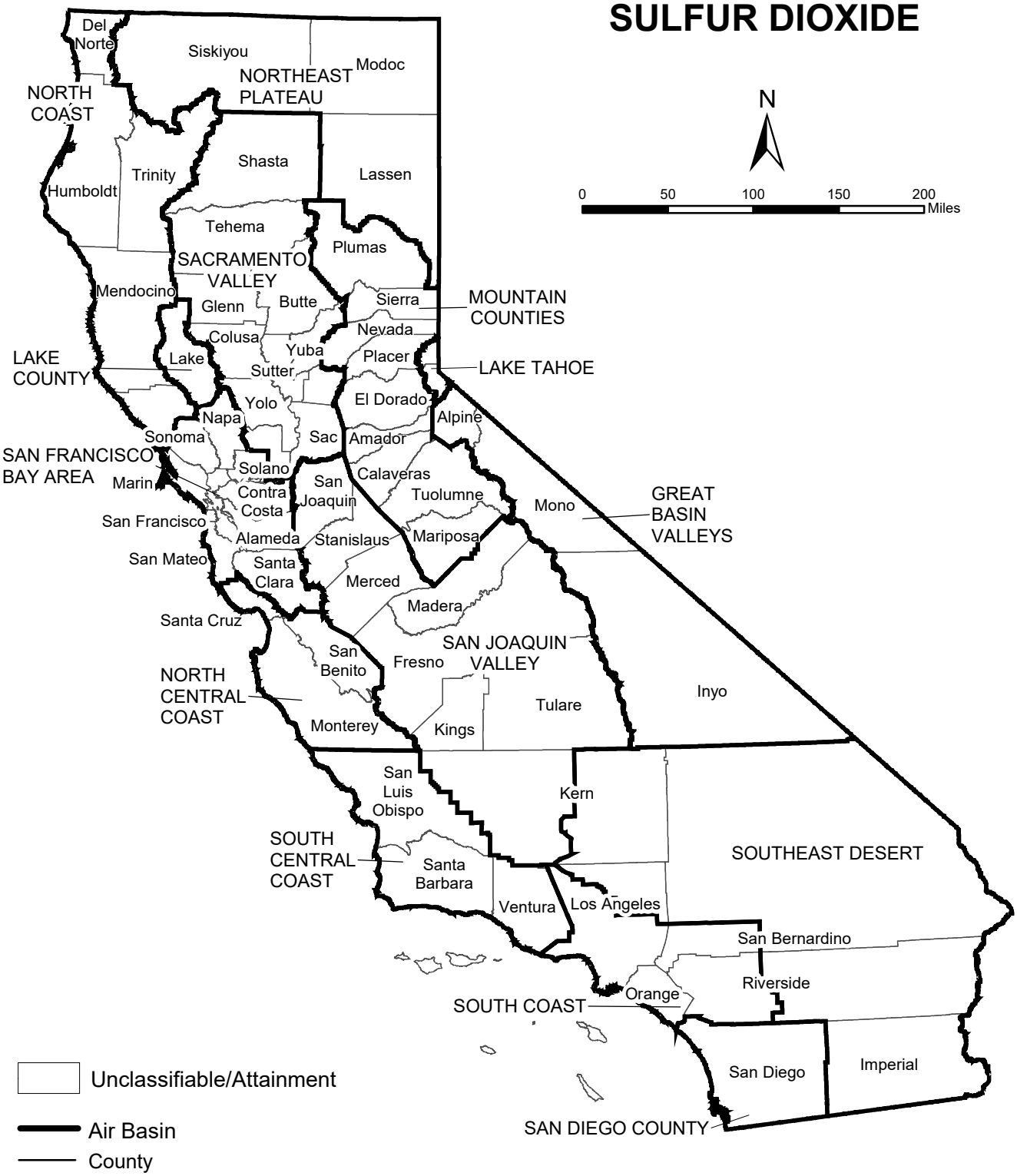
Last Updated: November 2023
Air Quality Planning and Science Division, CARB

Area Designations for National Ambient Air Quality Standards NITROGEN DIOXIDE



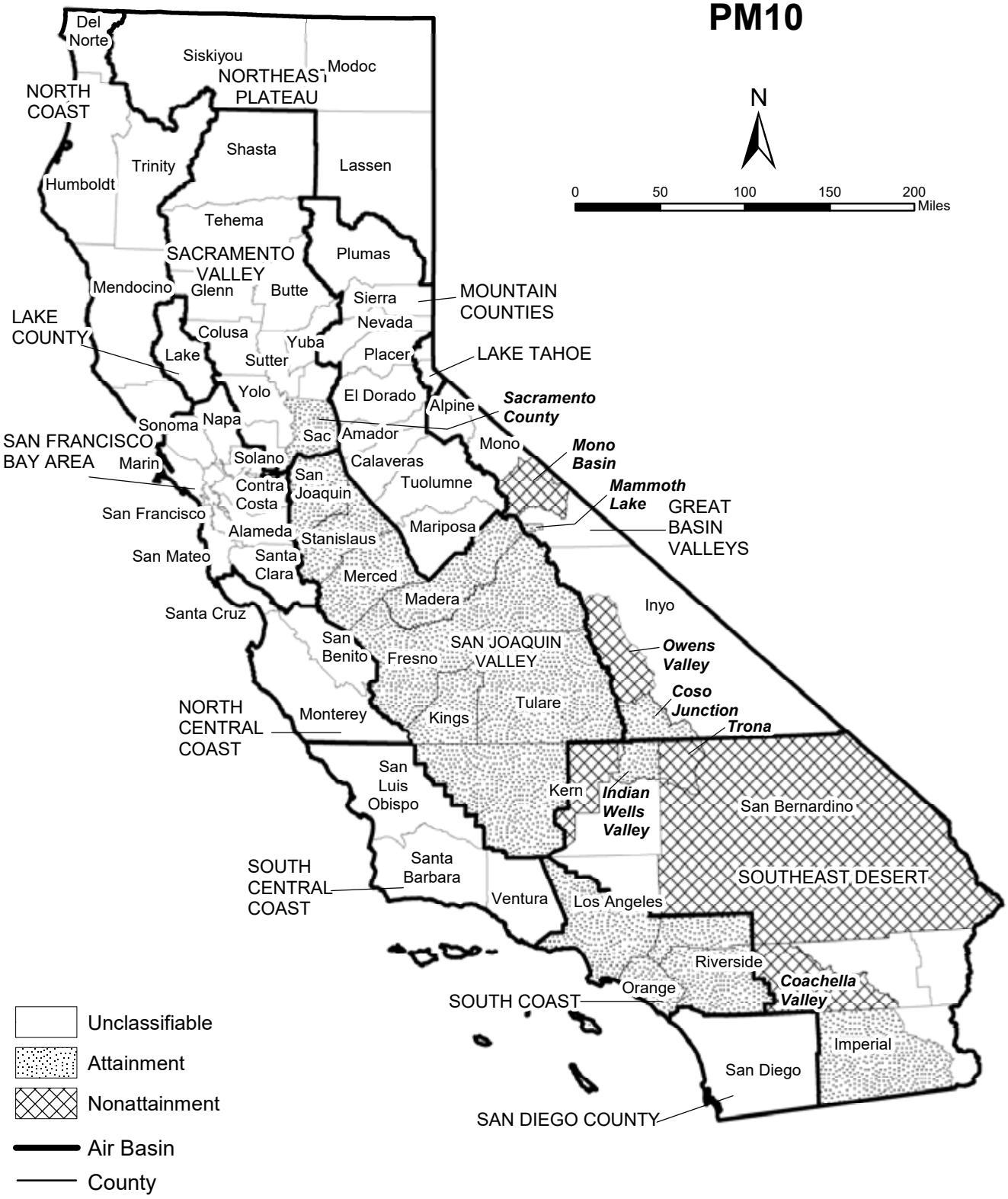
Last Reviewed: November 2023
Air Quality Planning and Science Division

Area Designations for National Ambient Air Quality Standards SULFUR DIOXIDE



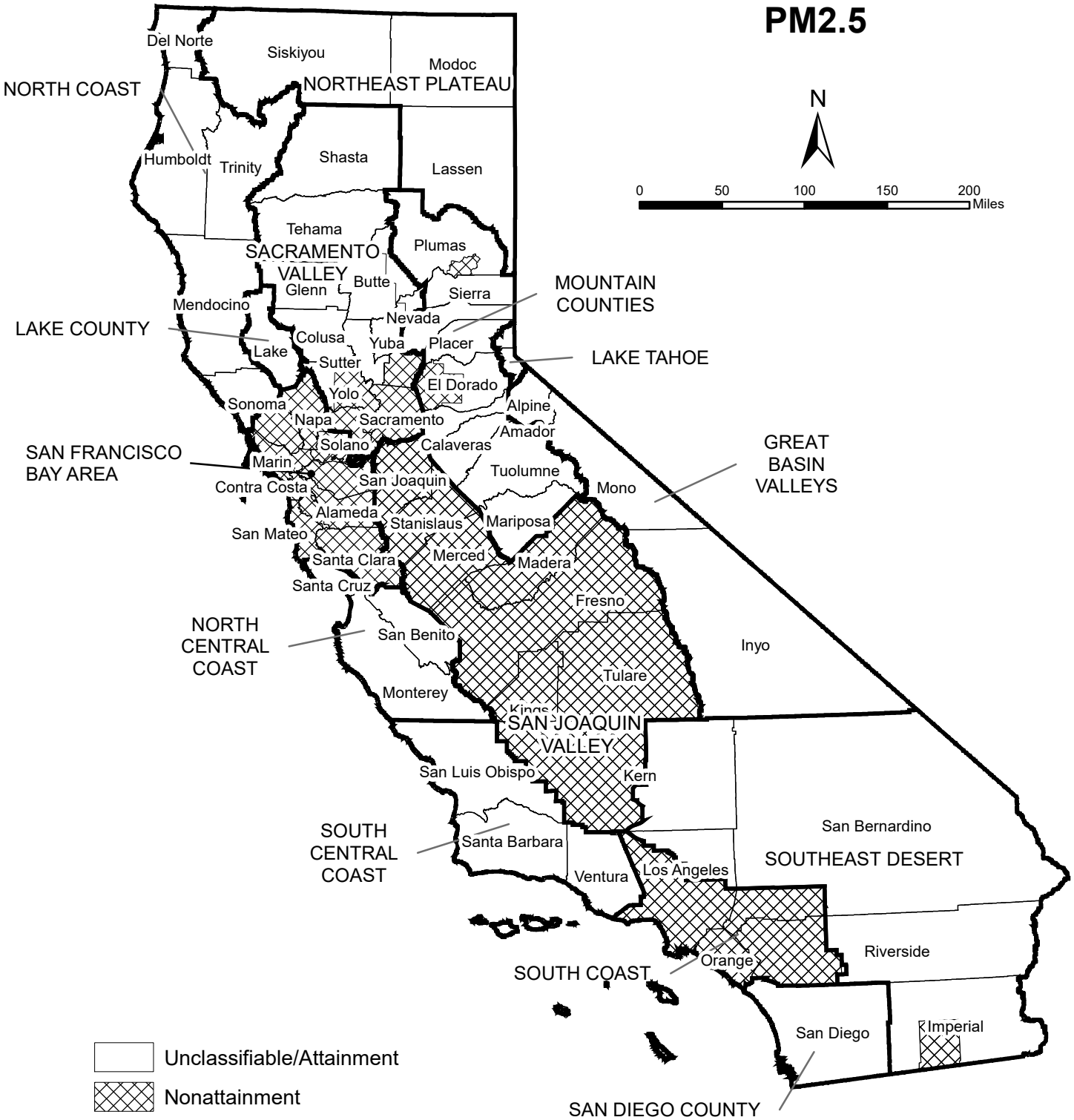
Last Reviewed: November 2023
Air Quality Planning and Science Division

Area Designations for National Ambient Air Quality Standards PM10



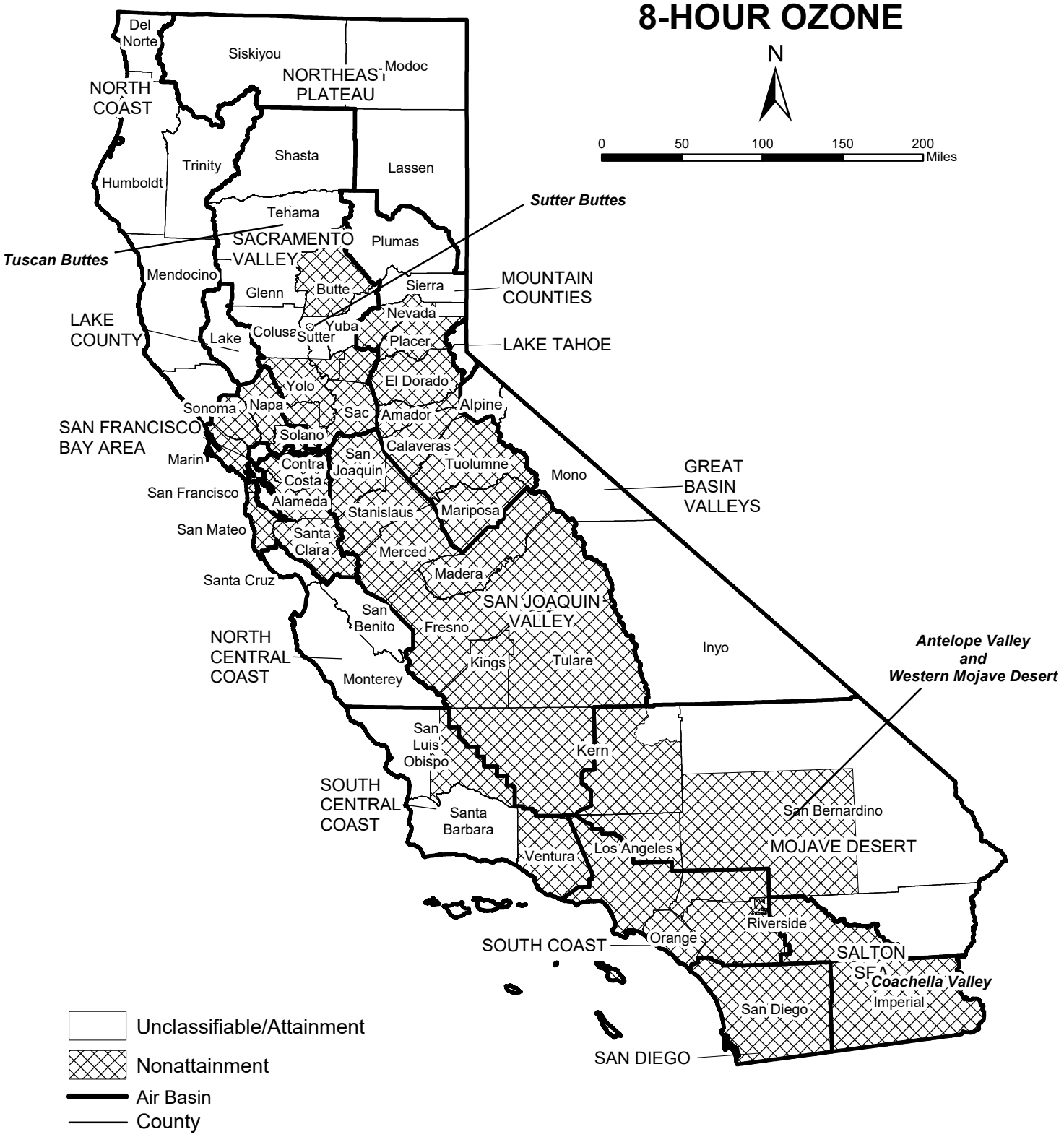
Last Reviewed: November 2023
Air Quality Planning and Science Division

Area Designations for National Ambient Air Quality Standards PM2.5



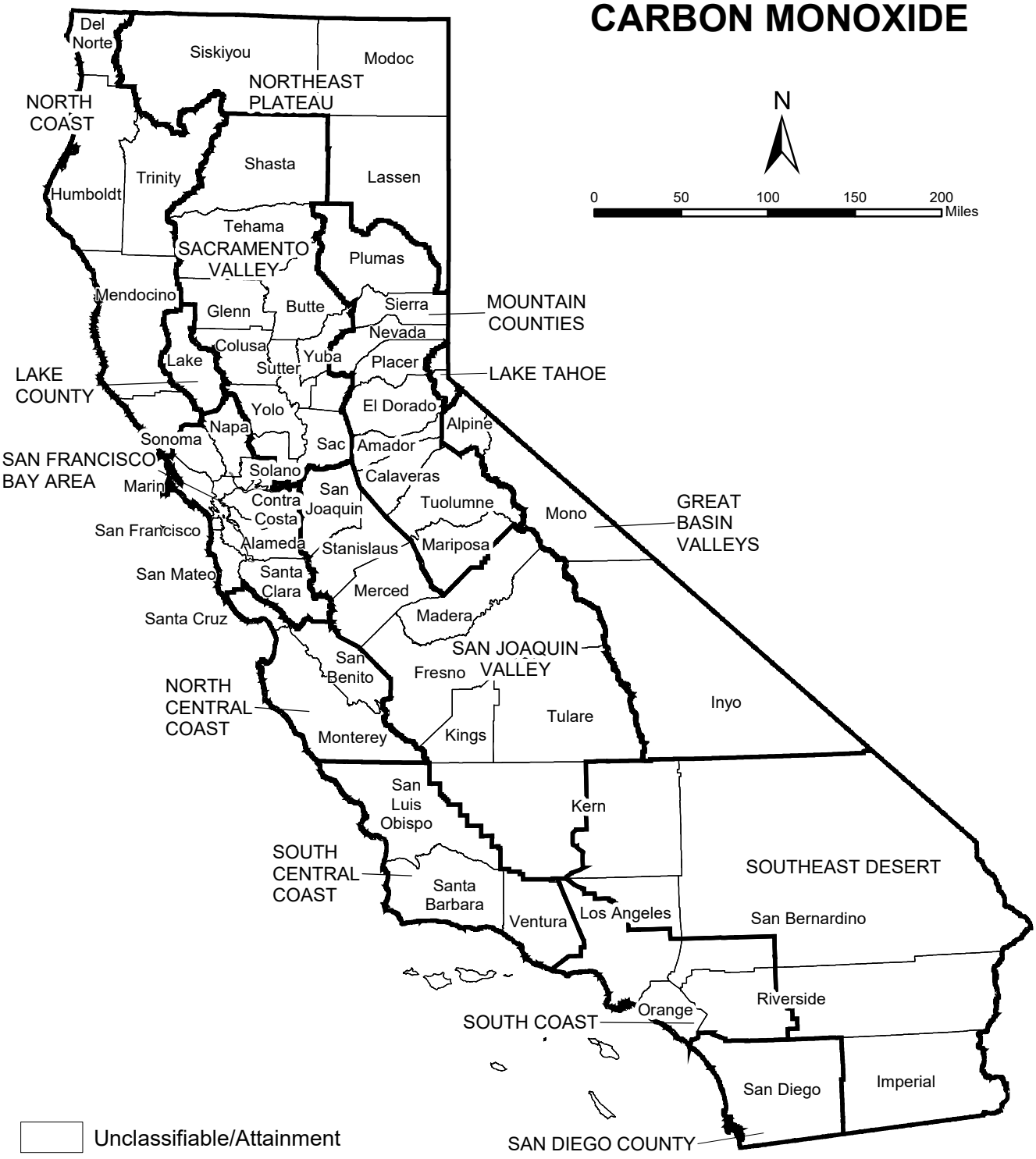
Last Reviewed: November 2023
Air Quality Planning and Science Division

Area Designations for National Ambient Air Quality Standards 8-HOUR OZONE



Last Reviewed: November 2023
Map reflects the 2015 8-hour ozone standard of 0.070 ppm
Air Quality Planning and Science Division, CARB

Area Designations for National Ambient Air Quality Standards CARBON MONOXIDE



Last Reviewed: November 2023
Air Quality Planning and Science Division

Area Designations for National Ambient Air Quality Standards LEAD



Last Reviewed: November 2023
Air Quality Planning and Science Division

District Prioritization Scores and Risk Threshold Values

	Prioritization Score Threshold						Notification Level		Risk Reduction Audit & Plan	
District	Cancer		Non-Cancer Chronic		Non-Cancer Acute		Cancer(1)	Non-Cancer(2)	Cancer(1)	Non-Cancer(2)
	High	Low	High	Low	High	Low				
Amador	>=10	<=1	>=10	<=1	>=10	<=1	>=10	>=1	>=10	>=1
Antelope Valley	10	1	10	1	10	1	10	1	100	10
Bay Area	>=10	<1	>=10	<1	>=10	<1	10	>1	100	10
Butte	100	1	100	1	100	1	10	>=1	none	none
Calaveras	none	none	none	none	none	none	10	none	10	none
Colusa	>10	<1	>10	<1	>10	<1	>10	>1	>10	>1
El Dorado	none	none	none	none	none	none	none	none	none	none
Feather River	100	<1	100	<1	100	<1	10	1	none	none
Great Basin Unified	10	1	10	1	10	1	none	none	none	none
Glenn	10	1	10	1	10	1	10	1	none	none
Imperial	10	1	10	1	10	1	10	1	none	none
Kern	10	<1	10	<1	10	<1	10	1	100	5

Lake	10	1	10	1	10	1	none	none	20	none
Lassen	100	10	100	10	100	10	none	none	none	none
Monterey Bay Unified	>10	>10	>10	>10	>10	>10	10	>1	10	>1
Mendocino	10	1	10	1	10	1	10	1	none	none
Modoc	none	none	none	none	none	none	none	none	none	none
Mojave	10	1	10	1	10	1	10	1	100	10
Mariposa	none	none	none	none	none	none	none	none	none	none
North Coast Unified	50	10	50	10	50	10	10	1	none	none
Northern Sierra	10	1	10	1	10	1	none	none	none	none
Northern Sonoma	10	1	10	1	10	1	10	1	100	10
Placer	10	1	10	1	10	1	>=10	>=1	>=10	>=1
Sacramento	10	1	10	1	10	1	>=10	>=1	10	>1
San Diego	100	1	10	1	10	1	10	1	100	1
San Joaquin Valley	10	1	10	1	10	1	10	>1	100	>5
San Luis Obispo	>=10	>=10	>=10	>=10	>=10	>=10	>=10	>=1	>=10	>=1
Santa Barbara	10	1	10	1	10	1	10	>1	10	1
Shasta	100	1	100	1	100	1	10	1	10	1

Siskiyou	>100	<1	>100	<1	>100	<1	10	1	100	5
South Coast	10	1	10	1	10	1	>=10	>1; lead THI >.5	>25	>3
Tehama	100	1	100	1	100	1	none	none	none	none
Tuolumne	50	10	50	10	50	10	10	>1	10	>1
Ventura	10	1	10	1	10	1	10	>=1	none	none
Yolo-Solano	10	1	10	1	10	1	10	1	none	none

(1) Cancer Risk (Definition)

(2) Non-Cancer Acute or Chronic Hazard Index (Definition)

This page last reviewed on August 1, 2008

"Hot Spots" Program

Eastern Kern Air Pollution Control District Policy

Addendum to CEQA Guidelines Addressing GHG Emission Impacts For Stationary Source Projects When Serving As Lead CEQA Agency

Board Adopted
March 8, 2012

This Page Intentionally Left Blank

Table of Contents

I. PURPOSE 1

II. BACKGROUND 1
A) State GHG Reduction Program 1
B) Federal GHG Reduction Program 3
C) GHG CEQA Review 3
D) SJVAPCD GHG CEQA Policy 3

III. DETERMINING PROJECT SIGNIFICANCE 4

IV. ESTABLISHING BAU AND BASELINE 5

V. ESTABLISHING BPS 6
A) Process for Establishing BPS 6
B) Process Steps for BPS Developed by EKAPCD 6
C) Process Steps for Incorporating BPS by Reference 7

VI. COMPLIANCE WITH GHG OFFSET 8

VII. ALTERNATE STRATEGY FOR REDUCTIONS 8

Appendix A: Definitions A-1

Appendix B: Adopted Best Performance Standards B-1

I. PURPOSE

This Policy establishes and details the process of evaluating new or modified stationary source Greenhouse Gas (GHG) emissions impacts on global climate change (climate change) for purposes of the California Environmental Quality Act (CEQA). This Policy is to be used when the Eastern Kern Air Pollution Control District (EKAPCD) has discretionary approval authority over new stationary source projects and serves as lead CEQA review agency when determining GHG emissions significance.

Project-Specific CEQA significance for GHG Emissions will be assessed as follows:

A. If project is exempt from CEQA due to either a statutory or categorical exemption, no further analysis under CEQA is required.

B. Project-Specific GHG Emissions must be quantified if the project is not exempt from CEQA.

C. Project is considered to have a less than significant impact on GHG emissions if it meets one of the following conditions:

1. Project-Specific GHG emissions are less than 25,000 tons per year (tpy);

2. Project demonstrates to EKAPCD that it is in compliance with state GHG reduction plan such as AB 32or future federal GHG reduction plan if it is more stringent than state plan;

3. Project GHG emissions will be mitigated to a less than significant impact if GHGs can be reduced by at least 20% below Business-As-Usual (BAU) through implementation of one or more of the following strategies:

(a) Compliance with a Best Performance Standard (BPS) as set forth in Section VI of this Policy;

(b) Compliance with GHG Offset as detailed in Section VI of this Policy;

(c) Compliance with an Alternative GHG Reduction Strategy as discussed in Section VII of this Policy.

D. If none of the above is met the project will be deemed significant and an Environmental Impact Report (EIR) will be required.

II. BACKGROUND

A. State GHG Reduction Program

California is the twelfth largest emitter of GHGs in the world and second largest emitter in the United States. In recognizing the need to reduce California's GHGs, Assembly

Speaker Fabian Nunez, and Assembly Member Fran Pavley introduced Assembly Bill 32, California Global Warming Solutions Act of 2006 (AB 32) to the State Legislature in early 2006. The legislation clearly designates the California Air Resources Board (ARB) as the leading agency for developing a plan to address GHG emissions in California. Governor Schwarzenegger signed AB 32 into law on September 27, 2006.

AB 32 states that climate change poses a threat to California's economy, public health, natural resources, and environment, and states the necessity of federal and international action to effectively combat global warming. AB 32 is the first law to limit GHG emissions at the state level and is considered to be the most comprehensive, economy-wide climate change policy in the nation by committing to lower California's GHG emission levels to 11% below business as usual to 1990 levels by 2020, 25% below 1990 levels by 2025, and 80% below 1990 levels by 2050.

As the designated lead state agency responsible for establishing and implementing all aspects of AB 32, ARB has development a Scoping Plan designed to achieve the statutory GHG reduction goals. In December 2008, ARB released a Scoping Plan that recommended a mix of GHG emission reduction strategies designed to meet the targets established in AB 32 that included compliance requirements, a market-based cap-and-trade program, and other GHG reduction incentives. The 2008 Scoping Plan was challenged under CEQA and in August 2011 ARB approved a Supplement to the AB 32 Scoping Plan that updated emission projections in light of the economic downturn. The updated projections in the 2011 Scoping Plan estimates 2020 BAU GHG emissions of 506 million metric tons (MMT) of CO2 equivalents (CO2e). This would require a reduction of 80 MMT of CO2e, which equates to a 16% statewide reduction (20% reductions from Industrial Sources) in order to meet the 1990 GHG levels by 2020. The original 2008 Scoping Plan estimated that 2020 BAU GHG emissions would be 596 MMT of CO2e, and projected that 174 MMT of CO2e (27.3% state-wide) reductions were required in order to meet 1990 levels by 2020

The Scoping Plan relies in part on the Cap-and-Trade Program (Program) in order to meet the GHG reduction targets. The first phase of the Program will be initiated on January 1, 2013 and will include 600 facilities, which produce 85% of the GHG emissions throughout California's economy. The Program requires listed sources to reduce GHGs in accordance with emission levels established for each facility. Under the Program GHGs will be represented and traded by allowances with each allowance representing one ton of CO2e. Each year allowances in the program will be reduced until the 1990 emission levels are reached in 2020.

On December 22, 2011, ARB adopted the allowance allocation requirements for the Cap-and-Trade Program. Allowances are calculated based upon the type of industry, the fuel efficiency standard set for the industry and the actual GHG emissions in the base year. The rule includes a chart of the annual GHG allowances beginning in 2013 and ending in 2020 when the 1990 BAU levels must be met. The allowance budget decreases for the first two years (2013 and 2014), dramatically increases with the second phase in 2015 when additional GHG sources are required to enter the Program and then decreases steadily by slightly over 12 million tons per year to meet the 2020 target.

B. Federal GHG Reduction Program

There is currently no federal GHG reduction program. If a federal program is adopted in the future that is more stringent than the state GHG reduction program then EKAPCD will revise this policy to include it.

C. GHG CEQA Review

Lead agencies are required to establish specific procedures for administering its responsibilities under CEQA. These requirements include orderly project evaluation and preparation of environmental documents. On April 13, 2009, the Governor's Office of Planning and Research sent proposed amendments of the CEQA Guidelines to the Secretary of the Resources Agency for promulgation. The amendments require lead agencies to determine new stationary source project GHG emissions significance on climate change.

EKAPCD staff anticipates that most projects within its jurisdiction will be subject to CEQA review for GHG emission impacts by other lead agencies and only a few projects each year will be subject to review by EKAPCD acting as lead agency. These projects are anticipated to be large industrial projects or modifications to existing industrial projects that do not require conditional use permits from a land-use agency or a permit from the California Energy Commission. Smaller industrial projects that EKAPCD serves as lead CEQA review agency would be below the significance threshold for GHGs.

EKAPCD staff has reviewed various methods of addressing GHG emissions through the CEQA process and recommends EKAPCD should follow an approach compatible with San Joaquin Valley Air Pollution Control District (SJVAPCD)'s approach. Due to geography Kern County is divided into two air districts. EKAPCD has the Eastern portion and the western portion is included in the SJVAPCD. By following a CEQA GHG review process similar to SJVAPCD's, EKAPCD will maintain substantial consistency throughout Kern County.

D. SJVAPCD GHG CEQA Policy

SJVAPCD's Governing Board adopted a Climate Change Action Plan (CCAP) that directed their APCO to develop guidance to assist SJVAPCD staff, valley businesses, land–use agencies, and other permitting agencies in addressing GHG emissions as part of the CEQA process. SJVAPCD prepared a staff report titled, *Addressing Greenhouse Gas Emissions under the California Environmental Quality Act* to support their CEQA GHG policy. The staff report provides a summary of background information on climate change, the current regulatory environment surrounding GHG emissions, and the various concepts in addressing the potential impacts of climate change. The report also evaluates different approaches for estimating impacts and summarizes potential GHG emission reduction measures.

This policy incorporates SJVAPCD's staff report, *Addressing Greenhouse Gas Emissions under the California Environmental Quality Act* by reference as an additional support document for EKAPCD's CEQA GHG review approach and methodology for approved BPS as detailed in Appendix B of this Policy.

III. DETERMINING PROJECT SIGNIFICANCE

CEQA encourages lead agencies to develop and publish thresholds of significance for use in determining the significance of environmental impacts. EKAPCD proposes the following process for determining individual and cumulative significance of project specific GHG emissions on climate change when issuing permits for new stationary source projects:

A. Project subject to a CEQA statutory exemption or subject to a CEQA categorical exemption that does not otherwise have significant individual and cumulative effects on GHG emissions would not require further CEQA review.

B. Project that is not exempt from CEQA would require quantification of Project-Specific GHG Emissions to determine annual GHG emissions.

C. Project that emits less than 25,000 tons per year (tpy) of GHGs would be determined to have a less than significant individual or cumulatively considerable impact on GHG emissions and would not require further CEQA review.

   EKAPCD believes a 25,000 tpy threshold is appropriate for determining that a project will have no significant or cumulatively considerable impact because:

   1. 25,000 tpy is the EKAPCD GHG reporting requirement as stated in Section VI.B of EKAPCD Rule 201.3, Federally Enforceable Limits on Potential to Emit. ARB and EPA have determined that a 25,000 metric ton per year (mtpy) threshold is appropriate for GHG reporting because it would encompasses facilities whose GHG emissions may be subject to regulation. (See 74 Fed. Reg. 56260, 56273 (Oct. 30, 2009)); and

   2. 25,000 tpy is less than the threshold ARB uses for industrial source applicability as the first phase of the AB 32 Cap-and Trade Program and is therefore slightly more stringent than the Cap-and-Trade Program. (See ARB, Cap-and-Trade Instructional Guidance, Cap-and-Trade regulation Applicability Guidance (Jan. 2012)).

D. Project with Project-Specific GHG Emissions equal to or greater than 25,000 tpy will be assessed for CEQA significance as follows:

   1. Project subject to a state or federal GHG emission reduction plan or program that can demonstrate to EKAPCD that the project will be in compliance with such plan or program would be determined less than significant. State or federal GHG reduction plans or programs must be specified in law. For example, if a project

will be covered by the Cap-and-Trade Program, which is designed to require reductions in GHG emissions consistent with the statutory goals set forth in AB 32, the project would be in compliance with a state GHG emission reduction program and under this Policy the project would be determined to have a less than significant or cumulatively considerable impact on GHG emissions. The APCO will consider each project's compliance with state or federal GHG reduction plans or programs on a project-by-project basis.

2. Project that implements one or more of the following strategies that achieve at least a combined 20% reduction in GHG emissions compared to BAU will be determined to be less than significant:

   (a) BPS as set forth in Section VI of this Policy;

   (b) Offsets as defined in Section III of this Policy;

   (c) Alternative GHG Reduction Strategies as defined in Section III and discussed in Section VII of this Policy.

   EKAPCD believes that a 20% reduction in GHGs compared to BAU is appropriate because it reflects the Industrial Sector target listed in the Final Supplement to the AB 32 Scoping Plan Functional Equivalent Document released August 19, 2011 and is more conservative than the 16% overall reduction set forth in the Scoping Plan.

E. Project that is not exempt from CEQA, not subject to an adopted state or federal GHG reduction plan, or cannot demonstrate that Project-Specific GHG Emissions will be reduced at least 20% below BAU will require preparation of an EIR.

IV. ESTABLISHING BAU AND BASELINE

In executing its legislative mandate to establish emission reduction targets which would achieve 1990 GHG emission levels by the year 2020, ARB used its emission inventory to establish a three-year average for GHG emissions occurring by sector during the baseline period of 2002-2004. This three-year average baseline emissions inventory was projected to the year 2020 using assumptions about potential growth, and assuming no change in the existing business practices. ARB has determined that a 20% reduction from the Industrial Sector's BAU is necessary in order to achieve 1990 GHG emissions level by 2020.

BAU as established by ARB is a projected emissions inventory and does not represent actual business or operational practices generating GHG emissions. To translate BAU into an emissions generating activity, EKAPCD staff will establish emission factors per unit of activity for each class and category using the Baseline as defined in Appendix A of this policy.

Example: an emissions factor for a combustion process could be expressed as pounds of GHG emissions generated per cubic feet of gas consumed or pounds of GHG emissions generated per unit of production.

GHG emission reductions would be determined by establishing a GHG emissions factor per unit of activity for the proposed project and comparing it to the emissions factor established for the baseline period.

The percent reduction in GHG emissions would be calculated using the following methodology:

$$\% \text{ Reduction in GHGs} = \frac{\text{(Baseline GHG factor) - (Proposed project GHG factor)}}{\text{Baseline GHG factor}} \times 100\%$$

V. ESTABLISHING BPS

Use of BPS streamlines the significance determination process by pre-quantifying the emission reductions that would be achieved by a specific GHG emission reduction measure and pre-approving the use of such a measure to reduce project-related GHG emissions. Establishing BPS also streamlines the CEQA review process by providing EKAPCD staff, project proponents, and the public with clear guidance on how to reduce GHG emission impacts. Thus, if a project proponent incorporates GHG reduction measures during the initial project design phase that reduces Project-Specific GHG emissions by at least 20% the project would be considered mitigated to less than significant.

A. Process for Establishing BPS

BPS will be the most effective Achieved-in-Practice means of reducing or limiting GHG emissions from a GHG emissions source. EKAPCD will develop and approve BPS for specific classes and categories of stationary sources for use within the District, or adopt a BPS that has been developed, approved and implemented by another air district, ARB, or CAPCOA. To ensure a BPS reflects the most current available technology periodic reviews will be conducted and approved BPS will be revised as necessary. Revisions to BPS only apply to future projects and do not apply retroactively to projects already permitted or approved.

B. Process Steps for BPS Developed by EKAPCD

EKAPCD will implement the following process for developing a BPS:

1. Establish Baseline GHG emissions factor per unit of activity for the proposed equipment or operation identified within a specific class and category.

2. For the specific equipment or operation being proposed within a specific class and category, list all technologically feasible GHG emissions reduction measures, including equipment selection, design elements and best management practices, that

do not result in an increase in criteria pollutant emissions compared to the proposed equipment or operation.

3. For all technologically feasible GHG emission reduction measures identified in Step 2, identify all GHG reduction measures determined to be Achieved-in-Practice. In determining Achieved-in-Practice, consider the extent to which grants or other financial subsidies influence economic feasibility.

4. For each Achieved-in-Practice GHG emission reduction measure identified in Step 3:

   (a) Quantify the potential GHG emission reduction, as compared to the Baseline GHG emissions factor per unit of activity; and

   (b) Express the potential GHG emission reduction as a percent of Baseline GHG emissions factor per unit of activity.

5. Rank all Achieved-in-Practice GHG emission reduction measures by order of percent GHG emissions reduction.

6. Deem the Achieved-in-Practice GHG emissions reduction measure(s) with the highest percent reduction in GHG emissions as the EKAPCD approved BPS for the respective class and category of equipment or operation being proposed.

7. Public notice for proposed BPS will be provided through a workshop notice posted on the EKAPCD website and hard copies mailed to stakeholders and other interested parties no less than 3 weeks before the workshop. If the BPS affects a large number of sources or significant public participation is anticipated an official public notice will be released at least 30 days prior to the workshop. An electronic copy of proposed BPS will be made available on the EKAPCD's website and hard copy will be made available in the EKAPCD's administrative office prior to the workshop.

8. Hold a public workshop to present proposed BPS to stakeholders and other interested parties.

9. Provide 30-day question, comment, and suggestion period on proposed BPS.

10. The final draft of a proposed BPS will be presented to EKAPCD's Governing Board for adoption. Once the Board adopts the BPS it will become part of the EKAPCD's GHG CEQA policy.

C. Process Steps for Incorporating BPS by Reference

BPS located in Appendix B have been developed, approved, and implemented by SJVAPCD and are adopted by reference into this Policy. Any other or future SJVAPCD BPS must be approved by the APCO prior to being implemented in EKAPCD. Furthermore, the APCO may adopt a BPS by reference for specific equipment or operation that has been developed, approved, and implemented by another air district, CAPCOA, ARB, or EPA. In such cases EKAPCD staff will review and evaluate the

BPS. The APCO must approve the BPS prior to its use within the District. A BPS that is adopted by reference is not required to undergo the public review process.
BPS must demonstrate that it achieves quantifiable GHG emission reductions in order to be approved for use within the District. EKAPCD may rely on the findings of a BPS developed, approved, or implemented by another agency, including but not limited to, GHG emissions quantification or percent of GHG reductions achieved by the BPS.

VI. COMPLIANCE WITH GHG OFFSET

Project proponents may propose a reduction or removal of GHG emissions occurring elsewhere to compensate for, or offset an increase in GHG emissions resulting from the project. Individual projects can be developed to achieve the reduction of emissions from activities not otherwise regulated, covered under an emissions cap, or resulting from government incentives. Any offset must be real, permanent, quantifiable, verifiable, enforceable, and subject to APCO approval.

VII. ALTERNATE STRATEGY FOR REDUCTIONS

Implementation of strategies to achieve AB 32 emission reduction targets is anticipated to drive technology development, potentially obsolescing or improving established standards over time.

Project proponents may propose other technologies, equipment designs, or operational/maintenance practices in lieu of an adopted BPS or if no BPS is available. An alternative GHG reduction strategy must demonstrate that Project-Specific GHG Emissions would be reduced or mitigated by at least 20% compared to BAU. The APCO will evaluate and approve the proposed alternative GHG emission reduction strategy if it is found to be appropriate for the project.

Remainder of Page Intentionally Left Blank

This Page Intentionally Left Blank

APPENDIX A
DEFINITIONS

A. Achieved-in-Practice: Any equipment, technology, practice or operation available in the United States that has been installed and operated or used at stationary source site for a reasonable period of time sufficient to demonstrate that the equipment, technology, practice or operation is reliable when operated in a manner that is typical for the process. In determining whether equipment, technology, practice or operation is Achieved-in-Practice, the EKAPCD will consider the extent to which grants, incentives or other financial subsidies influence the economic feasibility of its use.

B. Alternate Strategies for Reductions: Technologies, equipment designs, or operation/maintenance practices proposed by a project sponsor in lieu of an adopted BPS if no BPS is available, where the project sponsor can demonstrate that Project-Specific GHG Emissions would be reduced by at least 20% compared to BAU.

C. APCO: Air Pollution Control Officer, or his designee.

D. Approved Alternate Technology: Any EKAPCD approved, Non-Achieved-in-Practice GHG emissions reduction measure equal to or exceeding the GHG emission reduction percentage for a specific BPS.

E. Baseline: Three year average (2002-2004) of GHG emissions for a type of equipment or operation within an identified class and category, expressed as annual GHG emissions per unit. The percent reduction in GHG emissions is calculated using the following methodology:

$$\% \text{ Reduction in GHGs} = \frac{\text{(2002-2004 baseline GHG factor) - (Proposed project GHG factor)}}{\text{2002-2004 baseline GHG factor}} \times 100\%$$

F. Best Performance Standard (BPS): For a specific Class and Category, the most effective, EKAPCD approved, and Achieved-In-Practice means of reducing or limiting GHG emissions from a GHG emissions source, which is also economically feasible per the definition of Achieved-in-Practice. BPS includes equipment type, equipment design, and operational and maintenance practices for the identified service, operation, or emissions unit class and category.

G. Business-As-Usual (BAU): Emissions for a type of equipment or operation within an identified class and category projected for the year 2020, assuming no change in GHG emissions per unit of activity as established for the baseline period.

H. Category: EKAPCD approved subdivision within a “class” as identified by unique operational or technical aspects.

I. Class: Broadest EKAPCD approved division of stationary GHG sources based on fundamental type of equipment or industrial classification of the source operation.

J. GHG Offset: Reduction, removal, or avoidance of GHG emissions that is used to compensate for GHG emissions that occur elsewhere, subject to approval of APCO.

K. Metric Ton per Year (mtpy): Tonne = 2,204.6 pounds (1000 kg).

L. Project-Specific GHG Emissions: Emissions resulting from a specific operation or process, e.g. fuel combustion emissions from a boiler. Project-Specific GHG Emissions will be quantified in accordance with established Clean Air Act permit requirements or through methodology approved by the APCO on a project-specific basis.

M. Ton Per Year (tpy): United States short ton = 2000 lb (907.2 kg).

APPENDIX B
ADOPTED BEST PERFORMANCE STANDARDS

This appendix contains a list of Best Performance Standards (BPS) approved for use with in the Eastern Kern Air Pollution Control District (EKAPCD).

The following list of BPS is adopted by reference from the San Joaquin Valley Air Pollution Control District:

- Fossil Fuel-Fired Boilers, Steam Generators & Process Heaters With Firing Capacity > 5 MMBtu/hour (HHV): (SJVAPCD Final Staff Report, Addressing Greenhouse Gas Emissions Impacts under The California Environmental Quality Act, December 17, 2009);

- Non-Emergency Onsite Electric Power Generation with Fossil Fuel Combustion > 5 MMBtu/hour Or With Fossil Fuel-Fired Mechanical Driver > 50 bhp: (SJVAPCD Final Staff Report, Addressing Greenhouse Gas Emissions Impacts under The California Environmental Quality Act, December 17, 2009);

- Non-Emergency Mechanical Equipment Driver (requirement in lieu of reciprocating IC engines > 50 hp and combustion turbines > 3 MMBtu/hour excluding combustion turbines in cogeneration service): (SJVAPCD Final Staff Report, Addressing Greenhouse Gas Emissions Impacts under The California Environmental Quality Act, December 17, 2009);

- Cogeneration – Topping Cycle Plants (not including Combined Cycle units): (SJVAPCD BPS, Effective November 1, 2011);

- Landfill Operations: (SJVAPCD Final Staff Report, Addressing Greenhouse Gas Emissions Impacts under The California Environmental Quality Act, December 17, 2009);

- Direct-Fired Combustion Heat Transfer Equipment (Dryers, Kilns, etc): (SJVAPCD Final Staff Report, Addressing Greenhouse Gas Emissions Impacts under The California Environmental Quality Act, December 17, 2009).

Appendix

San Joaquin Valley Air Pollution Control District and South Coast Air Quality Management District *Sierra Club v. County of Fresno* Amicus Curiae Briefs

SUPREME COURT COPY

CASE NO. S219783

IN THE SUPREME COURT OF CALIFORNIA

SIERRA CLUB, REVIVE THE SAN JOAQUIN, and
LEAGUE OF WOMEN VOTERS OF FRESNO,
Plaintiffs and Appellants

v.

COUNTY OF FRESNO,
Defendant and Respondent

FRIANT RANCH, L.P.,
Real Party in Interest and Respondent

SUPREME COURT
FILED
APR 13 2015
Frank A. McGuire Clerk
Deputy

After a Decision by the Court of Appeal, filed May 27, 2014
Fifth Appellate District Case No. F066798

Appeal from the Superior Court of California, County of Fresno
Case No. 11CECG00726

APPLICATION FOR LEAVE TO FILE AMICUS CURIAE BRIEF OF SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT IN SUPPORT OF DEFENDANT AND RESPONDENT, COUNTY OF FRESNO AND REAL PARTY IN INTEREST AND RESPONDENT, FRIANT RANCH, L.P.

CATHERINE T. REDMOND (State Bar No. 226957)
261 High Street
Duxbury, Massachusetts 02332
Tel. (339) 236-5720
Catherinetredmond22@gmail.com

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
Annette Ballatore-Williamson, District Counsel (State Bar. No. 192176)
1990 E. Gettysburg Avenue
Fresno, California 93726
Tel. (559) 230-6033
Annette.Ballatore-Williamson@valleyair.org

Counsel for San Joaquin Valley Unified Air Pollution Control District

CASE NO. S219783

IN THE SUPREME COURT OF CALIFORNIA

SIERRA CLUB, REVIVE THE SAN JOAQUIN, and
LEAGUE OF WOMEN VOTERS OF FRESNO,
Plaintiffs and Appellants

v.

COUNTY OF FRESNO,
Defendant and Respondent

FRIANT RANCH, L.P.,
Real Party in Interest and Respondent

After a Decision by the Court of Appeal, filed May 27, 2014
Fifth Appellate District Case No. F066798

Appeal from the Superior Court of California, County of Fresno
Case No. 11CECG00726

APPLICATION FOR LEAVE TO FILE AMICUS CURIAE BRIEF OF SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT IN SUPPORT OF DEFENDANT AND RESPONDENT, COUNTY OF FRESNO AND REAL PARTY IN INTEREST AND RESPONDENT, FRIANT RANCH, L.P.

CATHERINE T. REDMOND (State Bar No. 226957)
261 High Street
Duxbury, Massachusetts 02332
Tel. (339) 236-5720
Catherinetredmond22@gmail.com

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
Annette Ballatore-Williamson, District Counsel (State Bar. No. 192176)
1990 E. Gettysburg Avenue
Fresno, California 93726
Tel. (559) 230-6033
Annette.Ballatore-Williamson@valleyair.org

Counsel for San Joaquin Valley Unified Air Pollution Control District

APPLICATION

Pursuant to California Rules of Court 8.520(f)(1), proposed Amicus Curiae San Joaquin Valley Unified Air Pollution Control District hereby requests permission from the Chief Justice to file an amicus brief in support of Defendant and Respondent, County of Fresno, and Defendant and Real Parties in Interest Friant Ranch, L.P. Pursuant to Rule 8.520(f)(5) of the California Rules of Court, the proposed amicus curiae brief is combined with this Application. The brief addresses the following issue certified by this Court for review:

> Is an EIR adequate when it identifies the health impacts of air pollution and quantifies a project's expected emissions, or does CEQA further require the EIR to *correlate* a project's air quality emissions to specific health impacts?

As of the date of this filing, the deadline for the final reply brief on the merits was March 5, 2015. Accordingly, under Rule 8.520(f)(2), this application and brief are timely.

1. Background and Interest of San Joaquin Valley Unified Air Pollution Control District

The San Joaquin Valley Unified Air Pollution Control District ("Air District") regulates air quality in the eight counties comprising the San Joaquin Valley ("Central Valley"): Kern, Tulare, Madera, Fresno, Merced, San Joaquin, Stanislaus, and Kings, and is primarily responsible for attaining air quality standards within its jurisdiction. After billions of dollars of investment by Central Valley businesses, pioneering air quality regulations, and consistent efforts by residents, the Central Valley air basin has made historic improvements in air quality.

The Central Valley's geographical, topographical and meteorological features create exceptionally challenging air quality

conditions. For example, it receives air pollution transported from the San Francisco Bay Area and northern Central Valley communities, and the southern portion of the Central Valley includes three mountain ranges (Sierra, Tehachapi, and Coastal) that, under some meteorological conditions, effectively trap air pollution. Central Valley air pollution is only a fraction of what the Bay Area and Los Angeles produce, but these natural conditions result in air quality conditions that are only marginally better than Los Angeles, even though about ten times more pollution is emitted in the Los Angeles region. Bay Area air quality is much better than the Central Valley's, even though the Bay Area produces about six times more pollution. The Central Valley also receives air pollution transported from the Bay Area and northern counties in the Central Valley, including Sacramento, and transboundary anthropogenic ozone from as far away as China.

Notwithstanding these challenges, the Central Valley has reduced emissions at the same or better rate than other areas in California and has achieved unparalleled milestones in protecting public health and the environment:

- In the last decade, the Central Valley became the first air basin classified by the federal government under the Clean Air Act as a "serious nonattainment" area to come into attainment of health-based National Ambient Air Quality Standard ("NAAQS") for coarse particulate matter (PM10), an achievement made even more notable given the Valley's extensive agricultural sector. Unhealthy levels of particulate matter can cause and exacerbate a range of chronic and acute illnesses.
- In 2013, the Central Valley became the first air basin in the country to improve from a federal designation of "extreme" nonattainment to

actually attain (and quality for an attainment designation) of the 1-hour ozone NAAQS; ozone creates "smog" and, like PM10, causes adverse health impacts.

- The Central Valley also is in full attainment of federal standards for lead, nitrogen dioxide, sulfur dioxide, and carbon monoxide.
- The Central Valley continues to make progress toward compliance with its last two attainment standards, with the number of exceedences for the 8-hour ozone NAAQS reduced by 74% (for the 1997 standard) and 38% (for the 2008 standard) since 1991, and for the small particulate matter (PM2.5) NAAQS reduced by 85% (for the 1997 standard) and 61% (for the 2006 standard).

Sustained improvement in Central Valley air quality requires a rigorous and comprehensive regulatory framework that includes prohibitions (e.g., on wood-burning fireplaces in new residences), mandates (e.g., requiring the installation of best available pollution reduction technologies on new and modified equipment and industrial operations), innovations (e.g., fees assessed against residential development to fund pollution reduction actions to "offset" vehicular emissions associated with new residences), incentive programs (e.g., funding replacements of older, more polluting heavy duty trucks and school buses)[1], ongoing planning for continued air quality improvements, and enforcement of Air District permits and regulations.

The Air District is also an expert air quality agency for the eight counties and cities in the San Joaquin Valley. In that capacity, the Air District has developed air quality emission guidelines for use by the Central

[1] San Joaquin's incentive program has been so successful that through 2012, it has awarded over $ 432 million in incentive funds and has achieved 93,349 tons of lifetime emissions reductions. *See* SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT, 2012 PM2.5 PLAN, 6-6 (2012) *available at* http://www.valleyair.org/Workshops/postings/2012/12-20-12PM25/FinalVersion/06%20Chapter%206%20Incentives.pdf.

Valley counties and cities that implement the California Environment Quality Act (CEQA).[2] In its guidance, the Air District has distinguished between toxic air contaminants and criteria air pollutants.[3] Recognizing this distinction, the Air District's CEQA Guidance has adopted distinct thresholds of significance for *criteria* pollutants (i.e., ozone, PM2.5 and their respective precursor pollutants) based upon scientific and factual data which demonstrates the level that can be accommodated on a cumulative basis in the San Joaquin Valley without affecting the attainment of the applicable NAAQS.[4] For *toxic air* pollutants, the District has adopted different thresholds of significance which scientific and factual data demonstrates has the potential to expose sensitive receptors (i.e., children, the elderly) to levels which may result in localized health impacts.[5]

The Air District's CEQA Guidance was followed by the County of Fresno in its environment review of the Friant Ranch project, for which the Air District also served as a commenting agency. The Court of Appeal's holding, however, requiring correlation between the project's criteria

---

[2] *See, e.g.*, SAN JOAQUIN VALLEY AIR POLLUTION CONTROL DISTRICT, PLANNING DIVISION, GUIDE FOR ASSESSING AND MITIGATING AIR QUALITY IMPACTS (2015), *available at* http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf ("CEQA Guidance").

[3] Toxic air contaminants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as birth defects. There are currently 189 toxic air contaminants regulated by the United States Environmental Protection Agency ("EPA") and the states pursuant to the Clean Air Act. 42 U.S.C. § 7412. Common TACs include benzene, perchloroethylene and asbestos. *Id.* at 7412(b).

In contrast, there are only six (6) criteria air pollutants: ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead. Although criteria air pollutants can also be harmful to human health, they are distinguishable from toxic air contaminants and are regulated separately. For instance, while criteria pollutants are regulated by numerous sections throughout Title I of the Clean Air Act, the regulation of toxic air contaminants occurs solely under section 112 of the Act. Compare 42 U.S.C. §§ 7407 – 7411 & 7501 – 7515 with 42 U.S.C. § 7411.

[4] See, e.g., CEQA Guidance at http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf, pp. 64-66, 80.

[5] See, e.g., CEQA Guidance at http://www.valleyair.org/transportation/GAMAQI_3-19-15.pdf, pp. 66, 99-101.

pollutants and local health impacts, departs from the Air District's Guidance and approved methodology for assessing criteria pollutants. A close reading of the administrative record that gave rise to this issue demonstrates that the Court's holding is based on a misunderstanding of the distinction between toxic air contaminants (for which a local health risk assessment is feasible and routinely performed) and criteria air pollutants (for which a local health risk assessment is not feasible and would result in speculative results).[6] The Air District has a direct interest in ensuring the lawfulness and consistent application of its CEQA Guidance, and will explain how the Court of Appeal departed from the Air District's long-standing CEQA Guidance in addressing criteria pollutants and toxic air contaminants in this amicus brief.

2. How the Proposed Amicus Curiae Brief Will Assist the Court

As counsel for the proposed amicus curiae, we have reviewed the briefs filed in this action. In addition to serving as a "commentary agency" for CEQA purposes over the Friant Ranch project, the Air District has a strong interest in assuring that CEQA is used for its intended purpose, and believes that this Court would benefit from additional briefing explaining the distinction between criteria pollutants and toxic air contaminants and the different methodologies employed by local air pollution control agencies such as the Air District to analyze these two categories of air pollutants under CEQA. The Air District will also explain how the Court of Appeal's opinion is based upon a fundamental misunderstanding of these two different approaches by requiring the County of Fresno to correlate the project's *criteria* pollution emissions with *local* health impacts. In doing

---

[6] CEQA does not require speculation. *See, e.g., Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal.*, 6 Cal. 4th 1112, 1137 (1993) (upholding EIR that failed to evaluate cumulative toxic air emission increases given absence of any acceptable means for doing so).

so, the Air District will provide helpful analysis to support its position that at least insofar as criteria pollutants are concerned, CEQA does not require an EIR to correlate a project's air quality emissions to specific health impacts, because such an analysis is not reasonably feasible.

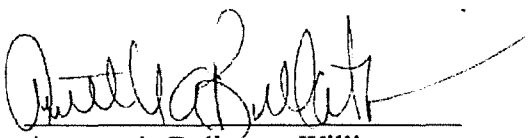
Rule 8.520 Disclosure

Pursuant to Cal. R. 8.520(f)(4), neither the Plaintiffs nor the Defendant or Real Party In Interest or their respective counsel authored this brief in whole or in part. Neither the Plaintiffs nor the Defendant or Real Party in Interest or their respective counsel made any monetary contribution towards or in support of the preparation of this brief.

CONCLUSION

On behalf of the San Joaquin Valley Unified Air Pollution Control District, we respectfully request that this Court accept the filing of the attached brief.

Dated: April 2, 2015



Annette A. Ballatore-Williamson
District Counsel
Attorney for Proposed Amicus Curiae

SAN JOAQUIN VALLEY UNIFIED
AIR POLLUTION CONTROL
DISTRICT

CASE NO. S219783

IN THE SUPREME COURT OF CALIFORNIA

SIERRA CLUB, REVIVE THE SAN JOAQUIN, and
LEAGUE OF WOMEN VOTERS OF FRESNO,
Plaintiffs and Appellants

v.

COUNTY OF FRESNO,
Defendant and Respondent

FRIANT RANCH, L.P.,
Real Party in Interest and Respondent

After a Decision by the Court of Appeal, filed May 27, 2014
Fifth Appellate District Case No. F066798

Appeal from the Superior Court of California, County of Fresno
Case No. 11CECG00726

AMICUS CURIAE BRIEF OF SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT IN SUPPORT OF DEFENDANT AND RESPONDENT, COUNTY OF FRESNO AND REAL PARTY IN INTEREST AND RESPONDENT, FRIANT RANCH, L.P.

CATHERINE T. REDMOND (State Bar No. 226957)
261 High Street
Duxbury, Massachusetts 02332
Tel. (339) 236-5720
Catherinetredmond22@gmail.com

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT
Annette A. Ballatore-Williamson, District Counsel (State Bar. No. 192176)
1990 E. Gettysburg Avenue
Fresno, California 93726
Tel. (559) 230-6033
Annette.Ballatore-Williamson@valleyair.org
Counsel for San Joaquin Valley Unified Air Pollution Control District

TABLE OF CONTENTS

APPLICATION.....1

1. Background and Interest of San Joaquin Valley Unified Air Pollution Control District.....1

2. How the Proposed Amicus Curiae Brief Will Assist the Court 5

CONCLUSION.....6

I. INTRODUCTION 1

II. THE COURT OF APPEAL ERRED IN FINDING THE FRIANT RANCH EIR INADEQUATE FOR FAILING TO ANALYZE THE SPECIFIC HUMAN HEALTH IMPACTS ASSOCIATED CRITERIA AIR POLLUTANTS.....3

A, Currently Available Modeling Tools are not Equipped to Provide a Meaningful Analysis of the Correlation between an Individual Development Project's Air Emissions and Specific Human Health Impacts.....4

B. The Court of Appeal Improperly Extrapolated a Request for a Health Risk Assessment for Toxic Air Contaminants into a Requirement that the EIR contain an Analysis of Localized Health Impacts Associated with Criteria Air Pollutants 11

III. CONCLUSION.....15

CERTIFICATE OF WORD COUNT.....17

TABLE OF AUTHORITIES

CASES

Bakersfield Citizens for Local Control v. City of Bakersfield (2004) 124 Cal.App.4th 1184, 1199, 22 Cal.Rptr.3d 203 15

Citizens for Responsible Equitable Environmental Development v. City of San Diego, (2011) 196 Cal.App.4th 515, 527 129 Cal.Rptr.3d 512, 521 14

Kings County Farm Bureau v. City of Hanford (1990) 221 Cal.App.3d 692, 717 n. 8. 10

Sierra Club v. City of Orange (2008) 163 Cal.App.4th 523, 535, 78 Cal.Rptr.3d 1, 13 14

Sierra Club v. City of Orange, 163 Cal.App.4th at 536 15

Sierra Club v. County of Fresno (2014) 172 Cal.Rptr.3d 271, 306 12

Sierra Club, supra, 172 Cal.Rptr.3d at 303; AR 4554 8

FEDERAL STATUTES

United States Environmental Protection Agency ("EPA") Clean Air Act. 42 U.S.C. § 7412 1,2,5,6

42 U.S.C. § 7412 1

U.S.C. §§ 7407 – 7411 1

U.S.C. §§ 7501 – 7515 1

42 U.S.C. § 7411 1

42 U.S.C. § 7412(b) 1,2

42 U.S.C. § 7409(b)(1) 2, 6

CALIFORNIA STATUTES

California Environmental Quality Act ("CEQA") ..... *passim*

OTHER AUTHORITIES

United States Environmental Protection Agency,
Ground-level Ozone: Basic Information,
available at: http://www.epa.gov/airquality/ozonepollution/basic.html
(visited March 10, 015).....4

San Joaquin Valley Air Pollution Control District 2007 Ozone Plan,
Executive Summary p. ES-6, available at:
http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Ozone_2007_
Adopted/03%20Executive%20Summary.pdf (visited March 10, 2015).....5

United States Environmental Protection Agency, *Particulate Matter:*
Basic Information, available at:
http://www.epa.gov/airquality/particlepollution/basic.html
(visited March 10, 2015).....5

United States Environmental Protection Agency, *Table of*
National Ambient Air Quality Standards, available at:
http://www.epa.gov/air/criteria.html#3 (visited March 10, 2015) 6

San Joaquin Valley Unified Air Pollution Control District 2013
Plan for the Revoked 1-Hour Ozone Standard, Ch. 2 p. 2-16,
available at: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan
2013/02Chapter2ScienceTrendsModeling.pdf (visited March 10, 2015.....6

Ch. 2 p. 2-19 (visited March 12, 2015); *San Joaquin Valley Unified*
Air Pollution Control District 2008 PM2.5 Plan,
Appendix F, pp. F-2 – F-5, available at:
http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Final_Adopted
_PM2.5/20%20Appendix%20F.pdf (visited March 19, 2015).....6

San Joaquin Valley Unified Air Pollution Control District Rule 2201 §§ 2.0;
3.3.9; 4.14.1, available at:
http://www.valleyair.org/rules/currntrules/Rule22010411.pdf
(visited March 19, 2015).....7

San Joaquin Valley Unified Air Pollution Control District Guide to
Assessing and Mitigating Air Quality Impacts, (March 19, 2015) p. 22,
available at:
http://www.valleyair.org/transportation/CEQA%20Rules/GAMAQI%20Jan
%202002%20Rev.pdf (visited March 30, 2015).....7

San Joaquin Valley Unified Air Pollution Control District Environmental Review Guidelines (Aug. 2000) p. 4-11, available at: http://www.valleyair.org/transportation/CEQA%20Rules/ERG%20Adopted%20_August%202000_.pdf (visited March 12, 2015).....8

San Joaquin Valley Unified Air Pollution Control District 2007 Ozone Plan, Appendix B pp. B-6, B-9, available at: http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Ozone_2007_Adopted/19%20Appendix%20B%20April%202007.pdf (visited March 12, 2015).....9

I. INTRODUCTION.

The San Joaquin Valley Unified Air Pollution Control District ("Air District") respectfully submits that the Court of Appeal erred when it held that the air quality analysis contained in the Environmental Impact Report ("EIR") for the Friant Ranch development project was inadequate under the California Environmental Quality Act ("CEQA") because it did not include an analysis of the correlation between the project's criteria air pollutants and the potential adverse human health impacts. A close reading of the portion of the administrative record that gave rise to this issue demonstrates that the Court's holding is based on a misunderstanding of the distinction between toxic air contaminants and criteria air pollutants.

Toxic air contaminants, also known as hazardous air pollutants, are those pollutants that are known or suspected to cause cancer or other serious health effects, such as birth defects. There are currently 189 toxic air contaminants (hereinafter referred to as "TACs") regulated by the United States Environmental Protection Agency ("EPA") and the states pursuant to the Clean Air Act. 42 U.S.C. § 7412. Common TACs include benzene, perchloroethylene and asbestos. *Id.* at 7412(b).

In contrast, there are only six (6) criteria air pollutants: ozone, particulate matter, carbon monoxide, nitrogen oxides, sulfur dioxide and lead. Although criteria air pollutants can also be harmful to human health,

they are distinguishable from TACs and are regulated separately. For instance, while criteria pollutants are regulated by numerous sections throughout Title I of the Clean Air Act, the regulation of TACs occurs solely under section 112 of the Act. *Compare* 42 U.S.C. §§ 7407 – 7411 & 7501 – 7515 *with* 42 U.S.C. § 7411.

The most relevant difference between criteria pollutants and TACs for purposes of this case is the manner in which human health impacts are accounted for. While it is common practice to analyze the correlation between an individual facility's TAC emissions and the expected localized human health impacts, such is not the case for criteria pollutants. Instead, the human health impacts associated with criteria air pollutants are analyzed and taken into consideration when EPA sets the national ambient air quality standard ("NAAQS") for each criteria pollutant. 42 U.S.C. § 7409(b)(1). The health impact of a particular criteria pollutant is analyzed on a regional and not a facility level based on how close the area is to complying with (attaining) the NAAQS. Accordingly, while the type of individual facility / health impact analysis that the Court of Appeal has required is a customary practice for TACs, it is not feasible to conduct a similar analysis for criteria air pollutants because currently available computer modeling tools are not equipped for this task.

It is clear from a reading of both the administrative record and the Court of Appeal's decision that the Court did not have the expertise to fully

appreciate the difference between TACs and criteria air pollutants. As a result, the Court has ordered the County of Fresno to conduct an analysis that is not practicable and not likely yield valid information. The Air District respectfully requests that this portion of the Court of Appeal's decision be reversed.

II. THE COURT OF APPEAL ERRED IN FINDING THE FRIANT RANCH EIR INADEQUATE FOR FAILING TO ANALYZE THE SPECIFIC HUMAN HEALTH IMPACTS ASSOCIATED CRITERIA AIR POLLUTANTS.

Although the Air District does not take lightly the amount of air emissions at issue in this case, it submits that the Court of Appeal got it wrong when it required Fresno County to revise the Friant Ranch EIR to include an analysis correlating the criteria air pollutant emissions associated with the project with specific, localized health-impacts. The type of analysis the Court of Appeal has required will not yield reliable information because currently available modeling tools are not well suited for this task. Further, in reviewing this issue de novo, the Court of Appeal failed to appreciate that it lacked the scientific expertise to appreciate the significant differences between a health risk assessment commonly performed for toxic air contaminants and a similar type of analysis it felt should have been conducted for criteria air pollutants.

///

///

A. Currently Available Modeling Tools are not Equipped to Provide a Meaningful Analysis of the Correlation between an Individual Development Project's Air Emissions and Specific Human Health Impacts.

In order to appreciate the problematic nature of the Court of Appeals' decision requiring a health risk type analysis for criteria air pollutants, it is important to understand how the relevant criteria pollutants (ozone and particulate matter) are formed, dispersed and regulated.

Ground level ozone (smog) is not directly emitted into the air, but is formed when precursor pollutants such as oxides of nitrogen (NOx) and volatile organic compounds (VOCs) are emitted into the atmosphere and undergo complex chemical reactions in the process of sunlight.[1] Once formed, ozone can be transported long distances by wind.[2] Because of the complexity of ozone formation, a specific tonnage amount of NOx or VOCs emitted in a particular area does not equate to a particular concentration of ozone in that area. In fact, even rural areas that have relatively low tonnages of emissions of NOx or VOCs can have high levels of ozone concentration simply due to wind transport.[3] Conversely, the San Francisco Bay Area has six times more NOx and VOC emissions per square mile than the San Joaquin Valley, but experiences lower

---

[1] *See* United States Environmental Protection Agency, *Ground-level Ozone: Basic Information*, available at: http://www.epa.gov/airquality/ozonepollution/basic.html (visited March 10, 2015).
[2] *Id.*
[3] *Id.*

concentrations of ozone (and better air quality) simply because sea breezes disperse the emissions.[4]

Particulate matter ("PM") can be divided into two categories: directly emitted PM and secondary PM.[5] While directly emitted PM can have a localized impact, the tonnage emitted does not always equate to the local PM concentration because it can be transported long distances by wind.[6] Secondary PM, like ozone, is formed via complex chemical reactions in the atmosphere between precursor chemicals such as sulfur dioxides (SOx) and NOx.[7] Because of the complexity of secondary PM formation, the tonnage of PM-forming precursor emissions in an area does not necessarily result in an equivalent concentration of secondary PM in that area.

The disconnect between the *tonnage* of precursor pollutants (NOx, SOx and VOCs) and the *concentration* of ozone or PM formed is important because it is not necessarily the tonnage of precursor pollutants that causes human health effects, but the concentration of resulting ozone or PM. Indeed, the national ambient air quality standards ("NAAQS"), which are statutorily required to be set by the United States Environmental Protection

---

[4] *San Joaquin Valley Air Pollution Control District 2007 Ozone Plan*, Executive Summary p. ES-6, available at: http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Ozone_2007_Adopted/03%20Executive%20Summary.pdf (visited March 10, 2015).

[5] United States Environmental Protection Agency, *Particulate Matter: Basic Information*, available at: http://www.epa.gov/airquality/particlepollution/basic.html (visited March 10, 2015).

[6] *Id.*

[7] *Id.*

Agency ("EPA") at levels that are "requisite to protect the public health," 42 U.S.C. § 7409(b)(1), are established as concentrations of ozone or particulate matter and not as tonnages of their precursor pollutants.[8]

Attainment of a particular NAAQS occurs when the concentration of the relevant pollutant remains below a set threshold on a consistent basis throughout a particular region. For example, the San Joaquin Valley attained the 1-hour ozone NAAQS when ozone concentrations remained at or below 0.124 parts per million Valley-wide on 3 or fewer days over a 3-year period.[9] Because the NAAQS are focused on achieving a particular concentration of pollution region-wide, the Air District's tools and plans for attaining the NAAQS are regional in nature.

For instance, the computer models used to simulate and predict an attainment date for the ozone or particulate matter NAAQS in the San Joaquin Valley are based on regional inputs, such as regional inventories of precursor pollutants (NOx, SOx and VOCs) and the atmospheric chemistry and meteorology of the Valley.[10] At a very basic level, the models simulate future ozone or PM levels based on predicted changes in precursor

---

[8] See, e.g., United States Environmental Protection Agency, *Table of National Ambient Air Quality Standards*, available at: http://www.epa.gov/air/criteria.html#3 (visited March 10, 2015).

[9] *San Joaquin Valley Unified Air Pollution Control District 2013 Plan for the Revoked 1-Hour Ozone Standard*, Ch. 2 p. 2-16, available at: http://www.valleyair.org/Air_Quality_Plans/OzoneOneHourPlan2013/02Chapter2ScienceTrendsModeling.pdf (visited March 10, 2015).

[10] *Id.* at Ch. 2 p. 2-19 (visited March 12, 2015); *San Joaquin Valley Unified Air Pollution Control District 2008 PM2.5 Plan*, Appendix F, pp. F-2 – F-5, available at: http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Final_Adopted_PM2.5/20%20Appendix%20F.pdf (visited March 19, 2015).

emissions Valley wide.[11] Because the NAAQS are set levels necessary to protect human health, the closer a region is to attaining a particular NAAQS, the lower the human health impact is from that pollutant.

The goal of these modeling exercises is not to determine whether the emissions generated by a particular factory or development project will affect the date that the Valley attains the NAAQS. Rather, the Air District's modeling and planning strategy is regional in nature and based on the extent to which *all* of the emission-generating sources in the Valley (current and future) must be controlled in order to reach attainment.[12]

Accordingly, the Air District has based its thresholds of significance for CEQA purposes on the levels that scientific and factual data demonstrate that the Valley can accommodate without affecting the attainment date for the NAAQS.[13] The Air District has tied its CEQA significance thresholds to the level at which stationary pollution sources permitted by the Air District must "offset" their emissions.[14] This "offset"

---

[11] *Id.*

[12] Although the Air District does have a dispersion modeling tool used during its air permitting process that is used to predict whether a particular project's directly emitted PM will either cause an exceedance of the PM NAAQS or contribute to an existing exceedance, this model bases the prediction on a worst case scenario of emissions and meteorology and has no provision for predicting any associated human health impacts. Further, this analysis is only performed for stationary sources (factories, oil refineries, etc.) that are required to obtain a New Source Review permit from the Air District and not for development projects such as Friant Ranch over which the Air District has no preconstruction permitting authority. *See* San Joaquin Valley Unified Air Pollution Control District Rule 2201 §§ 2.0; 3.3.9; 4.14.1, available at: http://www.valleyair.org/rules/currntrules/Rule2201041l.pdf (visited March 19, 2015).

[13] *San Joaquin Valley Unified Air Pollution Control District Guide to Assessing and Mitigating Air Quality Impacts*, (March 19, 2015) p. 22, available at: http://www.valleyair.org/transportation/CEQA%20Rules/GAMAQI%20Jan%202002%20Rev.pdf (visited March 30, 2015).

[14] *Id.* at pp. 22, 25.

level allows for growth while keeping the cumulative effects of all new sources at a level that will not impede attainment of the NAAQS.[15] In the Valley, these thresholds are 15 tons per year of PM, and 10 tons of NOx or VOC per year. *Sierra Club, supra*, 172 Cal.Rptr.3d at 303; AR 4554. Thus, the CEQA air quality analysis for criteria pollutants is not really a localized, project-level impact analysis but one of regional, "cumulative impacts."

Accordingly, the significance thresholds applied in the Friant Ranch EIR (15 tons per year of PM and 10 tons of NOx or VOCs) are not intended to be indicative of any localized human health impact that the project may have. While the health effects of air pollution are of primary concern to the Air District (indeed, the NAAQS are established to protect human health), the Air District is simply not equipped to analyze whether and to what extent the criteria pollutant emissions of an individual CEQA project directly impact human health in a particular area. This is true even for projects with relatively high levels of emissions of criteria pollutant precursor emissions.

For instance, according to the EIR, the Friant Ranch project is estimated to emit 109.52 tons per year of ROG (VOC), 102.19 tons per year of NOx, and 117.38 tons per year of PM. Although these levels well

---

[15] [15] *San Joaquin Valley Unified Air Pollution Control District Environmental Review Guidelines* (Aug. 2000) p. 4-11, available at: http://www.valleyair.org/transportation/CEQA%20Rules/ERG%20Adopted%20_August%202000_.pdf (visited March 12, 2015).

exceed the Air District's CEQA significance thresholds, this does not mean that one can easily determine the concentration of ozone or PM that will be created at or near the Friant Ranch site on a particular day or month of the year, or what specific health impacts will occur. Meteorology, the presence of sunlight, and other complex chemical factors all combine to determine the ultimate concentration and location of ozone or PM. This is especially true for a project like Friant Ranch where most of the criteria pollutant emissions derive not from a single "point source," but from area wide sources (consumer products, paint, etc.) or mobile sources (cars and trucks) driving to, from and around the site.

In addition, it would be extremely difficult to model the impact on NAAQS attainment that the emissions from the Friant Ranch project may have. As discussed above, the currently available modeling tools are equipped to model the impact of *all* emission sources in the Valley on attainment. According to the most recent EPA-approved emission inventory, the NOx inventory for the Valley is for the year 2014 is 458.2 tons per day, or 167,243 tons per year and the VOC (or ROG) inventory is 361.7 tons per day, or 132,020.5 tons per year.[16] Running the photochemical grid model used for predicting ozone attainment with the

---

[16] *San Joaquin Valley Unified Air Pollution Control District 2007 Ozone Plan*, Appendix B pp. B-6, B-9,
available at:
http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Ozone_2007_Adopted/19%20Appendix%20B%20April%202007.pdf (visited March 12, 2015).

emissions solely from the Friant Ranch project (which equate to less than one-tenth of one percent of the total NOx and VOC in the Valley) is not likely to yield valid information given the relative scale involved.

Finally, even once a model is developed to accurately ascertain local increases in concentrations of photochemical pollutants like ozone and some particulates, it remains impossible, using today's models, to correlate that increase in concentration to a specific health impact. The reason is the same: such models are designed to determine regional, population-wide health impacts, and simply are not accurate when applied at the local level.

For these reasons, it is not the norm for CEQA practitioners, including the Air District, to conduct an analysis of the localized health impacts associated with a project's criteria air pollutant emissions as part of the EIR process. When the accepted scientific method precludes a certain type of analysis, "the court cannot impose a legal standard to the contrary." *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 717 n. 8. However, that is exactly what the Court of Appeal has done in this case. Its decision upends the way CEQA air quality analysis of criteria pollutants occurs and should be reversed.

///

///

///

B. The Court of Appeal Improperly Extrapolated a Request for a Health Risk Assessment for Toxic Air Contaminants into a Requirement that the EIR contain an Analysis of Localized Health Impacts Associated with Criteria Air Pollutants.

The Court of Appeal's error in requiring the new health impact analysis for criteria air pollutants clearly stems from a misunderstanding of terms of art commonly used in the air pollution field. More specifically, the Court of Appeal (and Appellants Sierra Club et al.) appear to have confused the health risk analysis ("HRA") performed to determine the health impacts associated with a project's toxic air contaminants ("TACs"), with an analysis correlating a project's criteria air pollutants (ozone, PM and the like) with specific localized health impacts.

The first type of analysis, the HRA, is commonly performed during the Air District's stationary source permitting process for projects that emit TACs and is, thus, incorporated into the CEQA review process. An HRA is a comprehensive analysis to evaluate and predict the dispersion of TACs emitted by a project and the potential for exposure of human populations. It also assesses and quantifies both the individual and population-wide health risks associated with those levels of exposure. There is no similar analysis conducted for criteria air pollutants. Thus, the second type of analysis (required by the Court of Appeal), is not currently part of the Air District's process because, as outlined above, the health risks associated

with exposure to criteria pollutants are evaluated on a regional level based on the region's attainment of the NAAQS.

The root of this confusion between the types of analyses conducted for TACs versus criteria air pollutants appears to stem from a comment that was presented to Fresno County by the City of Fresno during the administrative process.

In its comments on the draft EIR, the City of Fresno (the only party to raise this issue) stated:

> [t]he EIR must disclose the human health related effects of the Project's air pollution impacts. (CEQA Guidelines section 15126.2(a).) The EIR fails completely in this area. The EIR should be revised to disclose and determine the significance of TAC impacts, and of human health risks due to exposure to Project-related air emissions.

(AR 4602.)

In determining that the issue regarding the correlation between the Friant Ranch project's criteria air pollutants and adverse health impacts was adequately exhausted at the administrative level, the Court of Appeal improperly read the first two sentences of the City of Fresno's comment in isolation rather than in the context of the entire comment. *See Sierra Club v. County of Fresno* (2014) 172 Cal.Rptr.3d 271, 306. Although the comment first speaks generally in terms of "human health related effects" and "air pollution," it requests only that the EIR be revised to disclose "the significance of TACs" and the "human health risks due to exposure."

The language of this request in the third sentence of the comment is significant because, to an air pollution practitioner, the language would only have indicated only that a HRA for TACs was requested, and not a separate analysis of the health impacts associated with the project's criteria air pollutants. Fresno County clearly read the comment as a request to perform an HRA for TACs and limited its response accordingly. (AR 4602.)[17] The Air District submits that it would have read the City's comment in the same manner as the County because the City's use of the terms "human health risks" and "TACs" signal that an HRA for TACs is being requested. Indeed, the Air District was also concerned that an HRA be conducted, but understood that it was not possible to conduct such an analysis until the project entered the phase where detailed site specific information, such as the types of emission sources and the proximity of the sources to sensitive receptors became available. (AR 4553.)[18] The City of Fresno was apparently satisfied with the County's discussion of human health risks, as it did not raise the issue again when it commented on the final EIR. (AR 8944 – 8960.)

---

[17] Appellants do not challenge the manner in which the County addressed TACs in the EIR. (Appellants' Answer Brief p. 28 fn. 7.)

[18] Appellants rely on the testimony of Air District employee, Dan Barber, as support for their position that the County should have conducted an analysis correlating the project's criteria air pollutant emissions with localized health impacts. (Appellants Answer Brief pp. 10-11; 28.) However, Mr. Barber's testimony simply reinforces the Air District's concern that a risk assessment (HRA) be conducted once the actual details of the project become available. (AR 8863.) As to criteria air pollutants, Mr. Barber's comments are aimed at the Air District's concern about the amount of emissions and the fact that the emissions will make it "more difficult for Fresno County and the Valley to reach attainment which means that the health of Valley residents maybe [sic] adversely impacted." Mr. Barber says nothing about conducting a separate analysis of the localized health impacts the project's emissions may have.

The Court of Appeal's holding, which incorrectly extrapolates a request for an HRA for TACs into a new analysis of the localized health impacts of the project's criteria air pollutants, highlights two additional errors in the Court's decision.

First, the Court of Appeal's holding illustrates why the Court should have applied the deferential substantial evidence standard of review to the issue of whether the EIR's air quality analysis was sufficient. The regulation of air pollution is a technical and complex field and the Court of Appeal lacked the expertise to fully appreciate the difference between TACs and criteria air pollutants and tools available for analyzing each type of pollutant.

Second, it illustrates that the Court likely got it wrong when it held that the issue regarding the criteria pollutant / localized health impact analysis was properly exhausted during the administrative process. In order to preserve an issue for the court, '[t]he "exact issue" must have been presented to the administrative agency....' [Citation.] *Citizens for Responsible Equitable Environmental Development v. City of San Diego*, (2011) 196 Cal.App.4th 515, 527 129 Cal.Rptr.3d 512, 521; *Sierra Club v. City of Orange* (2008) 163 Cal.App.4th 523, 535, 78 Cal.Rptr.3d 1, 13. "'[T]he objections must be sufficiently specific so that the agency has the

opportunity to evaluate and respond to them.' [Citation.]" *Sierra Club v. City of Orange*,163 Cal.App.4th at 536.[19]

As discussed above, the City's comment, while specific enough to request a commonly performed HRA for TACs, provided the County with no notice that it should perform a new type of analysis correlating criteria pollutant tonnages to specific human health effects. Although the parties have not directly addressed the issue of failure to exhaust administrative remedies in their briefs, the Air District submits that the Court should consider how it affects the issues briefed by the parties since "[e]xhaustion of administrative remedies is a jurisdictional prerequisite to maintenance of a CEQA action." *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1199, 22 Cal.Rptr.3d 203.

III. CONCLUSION

For all of the foregoing reasons, the Air District respectfully requests that the portion of the Court of Appeal's decision requiring an analysis correlating the localized human health impacts associated with an individual project's criteria air pollutant emissions be reversed.

---

[19] *Sierra Club v. City of Orange*, is illustrative here. In that case, the plaintiffs challenged an EIR approved for a large planned community on the basis that the EIR improperly broke up the various environmental impacts by separate project components or "piecemealed" the analysis in violation of CEQA. In evaluating the defense that the plaintiffs had failed to adequately raise the issue at the administrative level, the Court held that comments such as *"the use of a single document for both a project-level and a program-level EIR [is] 'confusing',"* and *"[t]he lead agency should identify any potential adverse air quality impacts that could occur from all phases of the project and all air pollutant sources related to the project,"* were too vague to fairly raise the argument of piecemealing before the agency. *Sierra Club v. City of Orange*, 163 Cal.App.4th at 537.

correlating the localized human health impacts associated with an individual project's criteria air pollutant emissions be reversed.

Respectfully submitted,

Dated: April 2, 2015

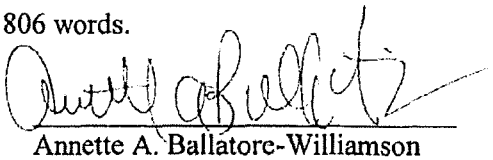
Catherine T. Redmond
Attorney for Proposed Amicus Curiae

SAN JOAQUIN VALLEY
UNIFIED
AIR POLLUTION CONTROL
DISTRICT

CERTIFICATE OF WORD COUNT

Pursuant to Rule 8.204 of the California Rules of Court, I hereby certify that this document, based on the Word County feature of the Microsoft Word software program used to compose and print this document, contains, exclusive of caption, tables, certificate of word count, signature block and certificate of service, 3806 words.

Dated: April 2, 2015



Annette A. Ballatore-Williamson
District Counsel (SBN 192176)

Sierra Club et al, v. County of Fresno, et al
Supreme Court of California Case No.: S219783
Fifth District Court of Appeal Case No.: F066798
Fresno County Superior Court Case No.: 11CECG00726

PROOF OF SERVICE

I am over the age of 18 years and not a p[arty to the above-captioned action; that my business address is San Joaquin Valley Unified Air Pollution Control District located at 1990 E. Gettysburg Avenue, Fresno, California 93726.

On April 2, 2015, I served the document described below:

APPLICATION FOR LEAVE TO FILE AMICUS CURIAE BRIEF OF SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT IN SUPPORT OF DEFENDANT AND RESPONDENT, COUNTY OF FRESNO

On all parties to this action at the following addresses and in the following manner:

PLEASE SEE ATTACHED SERVICE LIST

(XX) **(BY MAIL)** I caused a true copy of each document(s) to be laced in a sealed envelope with first-class postage affixed and placed the envelope for collection. Mail is collected daily at my office and placed in a United State Postal Service collection box for pick-up and delivery that same day.

( ) **(BY ELECTRONIC MAIL)** I caused a true and correct scanned image (.PDF file) copy to be transmitted via electronic mail transfer system in place at the San Joaquin Valley Unified Air Pollution Control District ("District"), originating from the undersigned at 1990 E. Gettysburg Avenue, Fresno, CA, to the address(es) indicated below.

( ) **(BY OVERNIGHT MAIL)** I caused a true and correct copy to be delivered via Federal Express to the following person(s) or their representative at the address(es) listed below.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that I executed this document on April 2, 2015, at Fresno, California.

Esthela Soto

SERVICE LIST

Sierra Club et al, v. County of Fresno, et al
Supreme Court of California Case No.: S219783
Fifth District Court of Appeal Case No.: F066798
Fresno County Superior Court Case No.: 11CECG00726

Sara Hedgpeth-Harris, Esq. LAW OFFICE OF SARA HEDGPETH-HARRIS 2125 Kern Street, Suite 301 Fresno, California 93721 Telephone: (559) 233-0907 Facsimile: (559) 272-6046 Email: sara.hedgpethharris@shh-law.com	Attorney for Plaintiffs and Appellants, Sierra Club, et al
Daniel C. Cederborg, Esq. Bruce B. Johnson, Jr., Esq. OFFICE OF THE FRESNO COUNTY COUNSEL 2220 Tulare Street, Suite 500 Fresno, California 93721 Telephone: (559) 600-3479 Facsimile: (559) 600-3480 Email: bjohnson@co.fresno.ca.us	Attorneys for Defendant and Respondent, County of Fresno
Bryan N. Wagner, Esq. WAGNER & WAGNER 7110 N. Fresno Street, Suite 340 Fresno, California 93720 Telephone: (559) 224-0871 Facsimile: (559) 224-0885 Email: bryan@wagnerandwagner.com	Attorneys for Real Party in Interest/Respondent Friant Ranch, L.P.
Clerk of the Court Superior Court of California County of Fresno 1130 'O' Street Fresno, California 93721 Telephone: (559) 457-1900	
Clerk of the Court Fifth District Court of Appeal 2424 Ventura Street Fresno, California 93721 Telephone: (559) 445-5491	

R. Tyson Sohagim, Esq. THE SOHAGI LAW GROUP 11999 San Vicente Blvd., Suite 150 Los Angeles, California 90049 Telephone: (310) 475-5700 Facsimile: (310) 475-5707 Email: tsohagi@sohagi.com	Attorney for Amici Curiae; League of California Cities, and the California State Association of Counties
Marcia L. Scully, Esq. General Counsel METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA Post Office Box 54153 Los Angeles, California 90054 Telephone: (213) 217-6115	Attorney for Amicus Curiae, The Metropolitan Water District of Southern CA
Amy Minteer, Esq. CHATEN-BROWN & CARSTENS LLP 2200 Pacific Coast Highway, Suite 318 Hermosa Beach, California 90254 Telephone: (310) 798-2400 Facsimile: (310) 798-2402 Email: ACM@CBCEarthlaw.com	Attorney for Amici Curiae, Association of Irritated Residents, Medical Advocates for Healthy Air, and Coalition for Clean Air
Shanda M. Beltran, Esq. General Counsel BUILDING INDUSTRY LEGAL DEFENSE FOUNDATION 17744 Sky Park Cr., Suite 170 Irvine, California 92614 Telephone: (949) 553-9500 Facsimile: (949) 769-8943 Email: sbeltran@biasc.org	Attorney for Amicus Curiae, Building Industry Legal Defense Foundation
Gene Talmadge, President CALIFORNIA ASSOCIATION OF ENVIRONMENTAL PROFESSIONALS 40747 Baranda Court Palm Desert, California 92260 Telephone: (760) 340-4499 Facsimile: (760) 674-2479	Attorney for Amicus Curiae, California Association of Environmental Professionals
Jennifer L. Hernandez, Esq. HOLLAND & KNIGHT LLP 50 California Street, Suite 2800 San Francisco, California 94111	On behalf of Amicus Curiae, CEQA Research Council

Telephone: (415) 743-6927 Facsimile: (415) 743-6910 Email: Jennifer.hernandez@hklaw.com	

S219783

IN THE SUPREME COURT OF C ALIFORNIA

SIERRA CLUB, REVIVE THE SAN JOAQUIN, and
LEAGUE OF WOMEN VOTERS OF FRESNO,

Plaintiffs and Appellants,

v.

COUNTY OF FRESNO,

Defendant and Respondent,

and,

FRIANT RANCH, L.P.,

Real Party in Interest and Respondent.

SUPREME COURT
FILED
APR 13 2015
Frank A. McGuire Clerk
Deputy

After a Published Decision by the Court of Appeal, filed May 27, 2014
Fifth Appellate District Case No. F066798

Appeal from the Superior Court of California, County of Fresno
Case No. 11CECG00726
Honorable Rosendo A. Pena, Jr.

APPLICATION OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT FOR LEAVE TO FILE BRIEF OF *AMICUS CURIAE* IN SUPPORT OF NEITHER PARTY AND *[PROPOSED]* BRIEF OF *AMICUS CURIAE*

Kurt R. Wiese, General Counsel (SBN 127251)
*Barbara Baird, Chief Deputy Counsel (SBN 81507)
SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
21865 Copley Drive, Diamond Bar, CA 91765
Telephone: 909-396-2302; Facsimile: 909-396-2961
Email: bbaird@aqmd.gov
Counsel for [Proposed] Amicus Curiae,
SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

RECEIVED
APR - 6 2015
CLERK SUPREME COURT

TABLE OF CONTENTS

APPLICATION FOR LEAVE TO FILE *amicus curiae* brief..... App-1

HOW THIS BRIEF WILL ASSIST THE COURT App-1

STATEMENT OF INTEREST OF *AMICUS CURIAE* App-3

CERTIFICATION REGARDING AUTHORSHIP & FUNDING App-4

BRIEF OF AMICUS CURIAE 1

SUMMARY OF ARGUMENT 1

ARGUMENT 2

I. RELEVANT FACTUAL AND LEGAL FRAMEWORK. 2

A. Air Quality Regulatory Background 2

B. The SCAQMD's Role Under CEQA 6

II. THIS COURT SHOULD NOT SET A HARD-AND-FAST RULE CONCERNING THE EXTENT TO WHICH AN EIR MUST CORRELATE A PROJECT'S EMISSION OF POLLUTANTS WITH RESULTING HEALTH IMPACTS..... 8

III. THE QUESTION OF WHETHER AN EIR CONTAINS SUFFICIENT ANALYSIS TO MEET CEQA'S REQUIREMENTS IS A MIXED QUESTION OF FACT AND LAW GOVERNED BY TWO DIFFERENT STANDARDS OF REVIEW. 16

A. Standard of Review for Feasibility Determination and Sufficiency as an Informative Document 16

B. Friant Ranch's Rationale for Rejecting the Independent Judgment Standard of Review is Unsupported by Case Law. 23

IV. COURTS MUST SCRUPULOUSLY ENFORCE THE REQUIREMENTS THAT LEAD AGENCIES CONSULT WITH AND OBTAIN COMMENTS FROM AIR DISTRICTS 26

CONCLUSION 29

TABLE OF AUTHORITIES

State Cases

Association of Irritated Residents v. County of Madera (2003)
107 Cal App.4th 1383 ..... 1, 9

Bakersfield Citizens for Local Control v. City of Bakersfield (2004)
124 Cal.App.4th 1184 ..... 9, 22

Berkeley Keep Jets Over the Bay v. Board of Port Commissioners
(2007) 91 Cal.App.4th 1344 ..... 21, 28

Center for Biological Diversity v. County of San Bernardino (2010)
185 Cal.App.4th 866. 20

Citizens of Goleta Valley v. Bd. of Supervisors (1990)
52 Cal.3d 553 8-9

County of Amador v. El Dorado County Water Agency (1999)
76 Cal.App.4th 931 23

Crocker National Bank v. City and County of San Francisco (1989)
49 Cal.3d 881 18

Ebbetts Pass Forest Watch v. California Dept. of Forestry & Fire
Protection (2008) 43 Cal.4th 936 21

Fall River Wild Trout Foundation v. County of Shasta, (1999)
70 Cal.App.4th 482 ..... 27, 28

Gray v. County of Madera (2008)
167 Cal.App.4th 1099 25

Laurel Heights Improvement Assn. v.
Regents of the Univ of Cal. ("*Laurel Heights I*")
(1988) 47 Cal.3d 376 ..... 1, 8, 19, 20, 21, 22

Natural Res. Def. Council v SCAQMD,
Los Angeles Superior Court No. BS110792 12

Neighbors for Smart Rail v. Exposition Metro Line (2013)
57 Cal.4th 439 ..... 15, 20

State Cases (cont'd)

Orange County Air Pollution Control District v. Public Util. Com. (1971) 4 Cal.3d 945 27

Save Our Peninsula Comm. v. Monterey County Bd. of Supervisors (2001) 87 Cal.App.4th 99 19

Schenck v. County of Sonoma (2011) 198 Cal.App.4th 949 ..... 26, 27

Sierra Club v. County of Fresno (2014) 226 Cal.App.4th 704 (superseded by grant of review) 172 Cal.Rptr.3d 271 ..... 9, 23

Sierra Club v. State Bd. Of Forestry (1994) 7 Cal.4th 1215 28

Uphold Our Heritage v. Town of Woodside (2007) 147 Cal.App.4th 587 20

Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova (2007) 40 Cal.4th 412 ..... 1, 17, 19, 24, 25, 26

Western Oil & Gas Assn. v. Monterey Bay Unified APCD (1989) 49 Cal.3d 408 5

California Statutes

Health & Saf. Code § 39666 5
Health & Saf. Code § 40000 3
Health & Saf. Code § 40001 3
Health & Saf. Code § 40410 3
Health & Saf. Code §§ 40460, et seq 4
Health & Saf. Code § 41508 5
Health & Saf. Code §§ 42300, et seq 5
Health & Saf. Code § 44320 5
Health & Saf. Code § 44322 5
Health & Saf. Code § 44360 5
Pub. Resources Code § 20180.3 27
Pub. Resources Code § 21061 19
Pub. Resources Code § 21061.1 16

California Statutes (cont'd)

Pub. Resources Code § 21080 6
Pub. Resources Code § 21080.5 6
Pub. Resources Code § 21083.1 26
Pub. Resources Code § 21100 27
Pub. Resources Code § 21104 ..... 6, 7 26
Pub. Resources Code §§ 21150-21154 7
Pub. Resources Code § 21151.8 25
Pub. Resources Code § 21153 ..... 6, 7, 26

California Regulations

Cal. Code Regs., tit. 14, §§ 15000, et seq. ("CEQA Guidelines")

CEQA Guidelines § 15050 6
CEQA Guidelines § 15051 ..... 1, 6
CEQA Guidelines § 15073 6
CEQA Guidelines § 15086 6
CEQA Guidelines § 15088.5 28
CEQA Guidelines § 15096 6
CEQA Guidelines § 15126.2 25
CEQA Guidelines § 15131 26
CEQA Guidelines § 15144 ..... 19, 24
CEQA Guidelines § 15151 ..... 9, 18, 19
CEQA Guidelines § 15204 ..... 1, 9, 21
CEQA Guidelines § 15251 6
CEQA Guidelines § 15366 7
CEQA Guidelines § 15381 6

Cal. Code Regs., tit. 17, § 60104 3

Federal Statutes

42 U.S.C. § 7401; CAA § 101 4
42 U.S.C. § 7408; CAA § 108 3
42 U.S.C. § 7409; CAA § 109 4
42 U.S.C. § 7410; CAA § 110 ..... 4, 5
42 U.S.C. § 7412; CAA § 112 5
42 U.S.C. § 7502; CAA § 172 ..... 5, 13
42 U.S.C. § 7503; CAA § 173 ..... 5, 13
42 U.S.C. § 7511a; CAA § 182 13
42 U.S.C. § 7521; CAA § 202 4
42 U.S.C. § 7543; CAA § 209 4
42 U.S.C. § 7547; CAA § 213 4

Rules

SCAQMD Rule 1303 7
SCAQMD Rule 1401 ..... 5, 8, 9

Other

Association of Environmental Professionals, 2015 CEQA Statute and Guidelines (2015) (Appendix G, "Environmental Checklist Form." 24

CARB, *Health Impacts Analysis: PM Premature Death Relationship* 14

CARB, *Health Impacts Analysis: PM Mortality Relationship* 16

CARB, Resolution 98-35, Aug. 27, 1998 8

SCAQMD, *Air Quality Analysis Handbook* 13

SCAQMD, *Final 2012 AQMP (Feb. 2013)* 3, 11

SCAQMD, *Final Subsequent Mitigated Negative Declaration for: Warren E&P, Inc. WTU Central Facility, New Equipment Project (certified July 19, 2011)* 14-15

SCAQMD Governing Board Agenda, February 4, 2011, Agenda Item 26, *Assessment for: Re-adoption of Proposed Rule 1315 – Federal New Source Review Tracking System,* 12

SCAQMD Governing Board Agenda, April 3, 2015, Agenda Item 16, Attachment A 7

SCAQMD, Health Risk Assessment Summary form 10

SCAQMD, *Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics "Hot Spots" Information and Assessment Act (AB2588)* 10

U.S. EPA, Ground Level Ozone 11

U.S. EPA, *Guideline on Ozone Monitoring Site Selection* (Aug. 1998) EPA-454/R-98-002 § 5.1.2 11

U.S. EPA, *Health Effects of Ozone in the General Population,* Figure 9, ... 11

U.S. EPA, National Ambient Air Quality Standards (NAAQS) 4

U.S. EPA, Particulate Matter (PM) 4

TO THE HONORABLE CHIEF JUSTICE AND JUSTICES OF THE SUPREME COURT:

APPLICATION FOR LEAVE TO FILE *AMICUS CURIAE* BRIEF

Pursuant to Rule 8.520(f) of the California Rules of Court, the South Coast Air Quality Management District (SCAQMD) respectfully requests leave to file the attached *amicus curiae* brief. Because SCAQMD's position differs from that of either party, we request leave to submit this amicus brief in support of neither party.

HOW THIS BRIEF WILL ASSIST THE COURT

SCAQMD's proposed amicus brief takes a position on two of the issues in this case. In both instances, its position differs from that of either party. The issues are:

1) Does the California Environmental Quality Act (CEQA) require an environmental impact report (EIR) to correlate a project's air pollution emissions with specific levels of health impacts?
2) What is the proper standard of review for determining whether an EIR provides sufficient information on the health impacts caused by a project's emission of air pollutants?

This brief will assist the Court by discussing the practical realities of correlating identified air quality impacts with specific health outcomes. In short, CEQA requires agencies to provide detailed information about a project's air quality impacts that is sufficient for the public and decisionmakers to adequately evaluate the project and meaningfully understand its impacts. However, the level of analysis is governed by a rule of reason; CEQA only requires agencies to conduct analysis if it is reasonably feasible to do so.

With regard to health-related air quality impacts, an analysis that correlates a project's air pollution emissions with specific levels of health impacts will be feasible in some cases but not others. Whether it is feasible depends on a variety of factors, including the nature of the project and the nature of the analysis under consideration. The feasibility of analysis may also change over time as air districts and others develop new tools for measuring projects' air quality related health impacts. Because SCAQMD has among the most sophisticated air quality modeling and health impact evaluation capability of any of the air districts in the State, it is uniquely situated to express an opinion on the extent to which the Court should hold that CEQA requires lead agencies to correlate air quality impacts with specific health outcomes.

SCAQMD can also offer a unique perspective on the question of the appropriate standard of review. SCAQMD submits that the proper standard of review for determining whether an EIR is sufficient as an informational document is more nuanced than argued by either party. In our view, this is a mixed question of fact and law. It includes determining whether additional analysis is feasible, which is primarily a factual question that should be reviewed under the substantial evidence standard. However, it also involves determining whether the omission of a particular analysis renders an EIR insufficient to serve CEQA's purpose as a meaningful, informational document. If a lead agency has not determined that a requested analysis is infeasible, it is the court's role to determine whether the EIR nevertheless meets CEQA's purposes, and courts should not defer to the lead agency's conclusions regarding the legal sufficiency of an EIR's analysis. The ultimate question of whether an EIR's analysis is "sufficient" to serve CEQA's informational purposes is predominately a question of law that courts should review de novo.

This brief will explain the rationale for these arguments and may assist the Court in reaching a conclusion that accords proper respect to a lead agency's factual conclusions while maintaining judicial authority over the ultimate question of what level of analysis CEQA requires.

STATEMENT OF INTEREST OF *AMICUS CURIAE*

The SCAQMD is the regional agency primarily responsible for air pollution control in the South Coast Air Basin, which consists of all of Orange County and the non-desert portions of the Los Angeles, Riverside, and San Bernardino Counties. (Health & Saf. Code § 40410; Cal. Code Regs., tit. 17, § 60104.) The SCAQMD participates in the CEQA process in several ways. Sometimes it acts as a lead agency that prepares CEQA documents for projects. Other times it acts as a responsible agency when it has permit authority over some part of a project that is undergoing CEQA review by a different lead agency. Finally, SCAQMD also acts as a commenting agency for CEQA documents that it receives because it is a public agency with jurisdiction by law over natural resources affected by the project.

In all of these capacities, SCAQMD will be affected by the decision in this case. SCAQMD sometimes submits comments requesting that a lead agency perform an additional type of air quality or health impacts analysis. On the other hand, SCAQMD sometimes determines that a particular type of health impact analysis is not feasible or would not produce reliable and informative results. Thus, SCAQMD will be affected by the Court's resolution of the extent to which CEQA requires EIRs to correlate emissions and health impacts, and its resolution of the proper standard of review.

CERTIFICATION REGARDING AUTHORSHIP AND FUNDING

No party or counsel in the pending case authored the proposed amicus curiae brief in whole or in part, or made any monetary contribution intended to fund the preparation or submission of the brief. No person or entity other than the proposed *Amicus Curiae* made any monetary contribution intended to fund the preparation or submission of the brief.

Respectfully submitted,

DATED: April 3, 2015

SOUTH COAST AIR QUALITY
MANAGEMENT DISTRICT
KURT R. WIESE, GENERAL COUNSEL
BARBARA BAIRD, CHIEF DEPUTY COUNSEL

By: Barbara Baird
Barbara Baird
Attorneys for [proposed] Amicus Curiae
SOUTH COAST AIR QUALITY
MANAGEMENT DISTICT

BRIEF OF AMICUS CURIAE

SUMMARY OF ARGUMENT

The South Coast Air Quality Management District (SCAQMD) submits that this Court should not try to establish a hard-and-fast rule concerning whether lead agencies are required to correlate emissions of air pollutants with specific health consequences in their environmental impact reports (EIR). The level of detail required in EIRs is governed by a few, core CEQA (California Environmental Quality Act) principles. As this Court has stated, "[a]n EIR must include detail sufficient to enable those who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project." (*Laurel Heights Improvement Assn. v. Regents of the Univ of Cal.* (1988) 47 Cal.3d 376, 405 ["*Laurel Heights I*"]) Accordingly, "an agency must use its best efforts to find out and disclose all that it reasonably can." (*Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 428 (quoting CEQA Guidelines § 15144)[1].). However, "[a]nalysis of environmental effects need not be exhaustive, but will be judged in light of what is reasonably feasible." (*Association of Irritated Residents v. County of Madera* (2003) 107 Cal.App.4th 1383, 1390; CEQA Guidelines §§ 15151, 15204(a).)

With regard to analysis of air quality related health impacts, EIRs must generally quantify a project's pollutant emissions, but in some cases it is not feasible to correlate these emissions to specific, quantifiable health impacts (e.g., premature mortality; hospital admissions). In such cases, a general description of the adverse health impacts resulting from the pollutants at issue may be sufficient. In other cases, due to the magnitude

---

[1] The CEQA Guidelines are found at Cal. Code Regs., tit. 14 §§ 15000, *et seq.*

or nature of the pollution emissions, as well as the specificity of the project involved, it may be feasible to quantify health impacts. Or there may be a less exacting, but still meaningful analysis of health impacts that can feasibly be performed. In these instances, agencies should disclose those impacts.

SCAQMD also submits that whether or not an EIR complies with CEQA's informational mandates by providing sufficient, feasible analysis is a mixed question of fact and law. Pertinent here, the question of whether an EIR's discussion of health impacts from air pollution is sufficient to allow the public to understand and consider meaningfully the issues involves two inquiries: (1) Is it feasible to provide the information or analysis that a commenter is requesting or a petitioner is arguing should be required?; and (2) Even if it is feasible, is the agency relying on other policy or legal considerations to justify not preparing the requested analysis? The first question of whether an analysis is feasible is primarily a question of fact that should be judged by the substantial evidence standard. The second inquiry involves evaluating CEQA's information disclosure purposes against the asserted reasons to not perform the requested analysis. For example, an agency might believe that its EIR meets CEQA's informational disclosure standards even without a particular analysis, and therefore choose not to conduct that analysis. SCAQMD submits that this is more of a legal question, which should be reviewed de novo as a question of law.

ARGUMENT

I. RELEVANT FACTUAL AND LEGAL FRAMEWORK.

A. Air Quality Regulatory Background

The South Coast Air Quality Management District (SCAQMD) is one of the local and regional air pollution control districts and air quality

management districts in California. The SCAQMD is the regional air pollution agency for the South Coast Air Basin, which consists of all of Orange County and the non-desert portions of Los Angeles, Riverside, and San Bernardino Counties. (Health & Saf. Code § 40410, 17 Cal. Code Reg. § 60104.) The SCAQMD also includes the Coachella Valley in Riverside County (Palm Springs area to the Salton Sea). (SCAQMD, *Final 2012 AQMP (Feb. 2013)*, http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan; then follow "chapter 7" hyperlink; pp 7-1, 7-3 (last visited Apr. 1, 2015).) The SCAQMD's jurisdiction includes over 16 million residents and has the worst or nearly the worst air pollution levels in the country for ozone and fine particulate matter. (SCAQMD, *Final 2012 AQMP (Feb. 2013)*, http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan; then follow "Executive Summary" hyperlink p. ES-1 (last visited Apr. 1, 2015).)

Under California law, the local and regional districts are primarily responsible for controlling air pollution from all sources except motor vehicles. (Health & Saf. Code § 40000.) The California Air Resources Board (CARB), part of the California Environmental Protection Agency, is primarily responsible for controlling pollution from motor vehicles. (*Id.*) The air districts must adopt rules to achieve and maintain the state and federal ambient air quality standards within their jurisdictions. (Health & Saf. Code § 40001.)

The federal Clean Air Act (CAA) requires the United States Environmental Protection Agency (EPA) to identify pollutants that are widely distributed and pose a threat to human health, developing a so-called "criteria" document. (42 U.S.C. § 7408; CAA § 108.) These pollutants are frequently called "criteria pollutants." EPA must then establish "national ambient air quality standards" at levels "requisite to protect public health",

allowing "an adequate margin of safety." (42 U.S.C. § 7409; CAA § 109.) EPA has set standards for six identified pollutants: ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter (PM), and lead. (U.S. EPA, National Ambient Air Quality Standards (NAAQS), http://www.epa.gov/air/criteria.html (last updated Oct. 21, 2014).)[2]

Under the Clean Air Act, EPA sets emission standards for motor vehicles and "nonroad engines" (mobile farm and construction equipment, marine vessels, locomotives, aircraft, etc.). (42 U.S.C. §§ 7521, 7547; CAA §§ 202, 213.) California is the only state allowed to establish emission standards for motor vehicles and most nonroad sources; however, it may only do so with EPA's approval. (42 U.S.C. §§ 7543(b), 7543(e); CAA §§ 209(b), 209(c).) Sources such as manufacturing facilities, power plants and refineries that are not mobile are often referred to as "stationary sources." The Clean Air Act charges state and local agencies with the primary responsibility to attain the national ambient air quality standards. (42 U.S.C. § 7401(a)(3); CAA § 101(a)(3).) Each state must adopt and implement a plan including enforceable measures to achieve and maintain the national ambient air quality standards. (42 U.S.C. § 7410; CAA § 110.) The SCAQMD and CARB jointly prepare portion of the plan for the South Coast Air Basin and submit it for approval by EPA. (Health & Saf. Code §§ 40460, et seq.)

The Clean Air Act also requires state and local agencies to adopt a permit program requiring, among other things, that new or modified "major" stationary sources use technology to achieve the "lowest achievable emission rate," and to control minor stationary sources as

---

[2] Particulate matter (PM) is further divided into two categories: fine particulate or $PM_{2.5}$ (particles with a diameter of less than or equal to 2.5 microns) and coarse particulate (PM_{10}) (particles with a diameter of 10 microns or less). (U.S. EPA, Particulate Matter (PM), http://www.epa.gov/airquality/particlepollution/ (last visited Apr. 1, 2015).)

needed to help attain the standards. (42 U.S.C. §§ 7502(c)(5), 7503(a)(2), 7410(a)(2)(C); CAA §§ 172(c)(5), 173(a)(2), 110(a)(2)(C).) The air districts implement these permit programs in California. (Health & Saf. Code §§ 42300, et seq.)

The Clean Air Act also sets out a regulatory structure for over 100 so-called "hazardous air pollutants" calling for EPA to establish "maximum achievable control technology" (MACT) for sources of these pollutants. (42 U.S.C. § 7412(d)(2); CAA § 112(d)(2).) California refers to these pollutants as "toxic air contaminants" (TACs) which are subject to two state-required programs. The first program requires "air toxics control measures" for specific categories of sources. (Health & Saf. Code § 39666.) The other program requires larger stationary sources and sources identified by air districts to prepare "health risk assessments" for impacts of toxic air contaminants. (Health & Saf. Code §§ 44320(b), 44322, 44360.) If the health risk exceeds levels identified by the district as "significant," the facility must implement a "risk reduction plan" to bring its risk levels below "significant" levels. Air districts may adopt additional more stringent requirements than those required by state law, including requirements for toxic air contaminants. (Health & Saf. Code § 41508; *Western Oil & Gas Assn. v. Monterey Bay Unified APCD* (1989) 49 Cal.3d 408, 414.) For example, SCAQMD has adopted a rule requiring new or modified sources to keep their risks below specified levels and use best available control technology (BACT) for toxics. (SCAQMD, *Rule 1401-New Source Review of Toxic Air Contaminants*, http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/regulation-xiv; then follow "Rule 1401" hyperlink (last visited Apr. 1, 2015).)

B. The SCAQMD's Role Under CEQA

The California Environmental Quality Act (CEQA) requires public agencies to perform an environmental review and appropriate analysis for projects that they implement or approve. (Pub. Resources Code § 21080(a).) The agency with primary approval authority for a particular project is generally the "lead agency" that prepares the appropriate CEQA document. (CEQA Guidelines §§ 15050, 15051.) Other agencies having a subsequent approval authority over all or part of a project are called "responsible" agencies that must determine whether the CEQA document is adequate for their use. (CEQA Guidelines §§ 15096(c), 15381.) Lead agencies must also consult with and circulate their environmental impact reports to "trustee agencies" and agencies "with jurisdiction by law" including "authority over resources which may be affected by the project." (Pub. Resources Code §§ 21104(a), 21153; CEQA Guidelines §§ 15086(a)(3), 15073(c).) The SCAQMD has a role in all these aspects of CEQA.

Fulfilling its responsibilities to implement its air quality plan and adopt rules to attain the national ambient air quality standards, SCAQMD adopts a dozen or more rules each year to require pollution reductions from a wide variety of sources. The SCAQMD staff evaluates each rule for any adverse environmental impact and prepares the appropriate CEQA document. Although most rules reduce air emissions, they may have secondary environmental impacts such as use of water or energy or disposal of waste—e.g., spent catalyst from control equipment.[3]

---

[3] The SCAQMD's CEQA program for its rules is a "Certified Regulatory Program" under which it prepares a "functionally equivalent" document in lieu of a negative declaration or EIR. (Pub. Resources Code § 21080.5, CEQA Guidelines § 15251(l).)

The SCAQMD also approves a large number of permits every year to construct new, modified, or replacement facilities that emit regulated air pollutants. The majority of these air pollutant sources have already been included in an earlier CEQA evaluation for a larger project, are currently being evaluated by a local government as lead agency, or qualify for an exemption. However, the SCAQMD sometimes acts as lead agency for major projects where the local government does not have a discretionary approval. In such cases, SCAQMD prepares and certifies a negative declaration or environmental impact report (EIR) as appropriate.[4] SCAQMD evaluates perhaps a dozen such permit projects under CEQA each year. SCAQMD is often also a "responsible agency" for many projects since it must issue a permit for part of the projects (e.g., a boiler used to provide heat in a commercial building). For permit projects evaluated by another lead agency under CEQA, SCAQMD has the right to determine that the CEQA document is inadequate for its purposes as a responsible agency, but it may not do so because its permit program already requires all permitted sources to use the best available air pollution control technology. (SCAQMD, *Rule 1303(a)(1) – Requirements*, http://www.aqmd.gov/home/regulations/rules/scaqmd-rule-book/regulation-xiii; then follow "Rule 1303" hyperlink (last visited Apr. 1, 2015).)

Finally, SCAQMD receives as many as 60 or more CEQA documents each month (around 500 per year) in its role as commenting agency or an agency with "jurisdiction by law" over air quality—a natural resource affected by the project. (Pub. Resources Code §§ 21104(a), 21153; CEQA Guidelines § 15366(a)(3).) The SCAQMD staff provides comments on as many as 25 or 30 such documents each month.

---

[4] The SCAQMD's permit projects are not included in its Certified Regulatory Program, and are evaluated under the traditional local government CEQA analysis. (Pub. Resources Code §§ 21150-21154.)

(SCAQMD Governing Board Agenda, Apr. 3, 2015, Agenda Item 16, Attachment A, http://www.aqmd.gov/home/library/meeting-agendas-minutes/agenda?title=governing-board-meeting-agenda-april-3-2015; then follow "16. Lead Agency Projects and Environmental Documents Received by SCAQMD" hyperlink (last visited Apr. 1, 2015).) Of course, SCAQMD focuses its commenting efforts on the more significant projects.

Typically, SCAQMD comments on the adequacy of air quality analysis, appropriateness of assumptions and methodology, and completeness of the recommended air quality mitigation measures. Staff may comment on the need to prepare a health risk assessment detailing the projected cancer and noncancer risks from toxic air contaminants resulting from the project, particularly the impacts of diesel particulate matter, which CARB has identified as a toxic air contaminant based on its carcinogenic effects. (California Air Resources Board, Resolution 98-35, Aug. 27, 1998, http://www.arb.ca.gov/regact/diesltac/diesltac.htm; then follow Resolution 98-35 hyperlink (last visited Apr. 1, 2015).) Because SCAQMD already requires new or modified stationary sources of toxic air contaminants to use the best available control technology for toxics and to keep their risks below specified levels, (SCAQMD Rule 1401, supra, note 15), the greatest opportunity to further mitigate toxic impacts through the CEQA process is by reducing emissions—particularly diesel emissions—from vehicles.

II. THIS COURT SHOULD NOT SET A HARD-AND-FAST RULE CONCERNING THE EXTENT TO WHICH AN EIR MUST CORRELATE A PROJECT'S EMISSION OF POLLUTANTS WITH RESULTING HEALTH IMPACTS.

Numerous cases hold that courts do not review the correctness of an EIR's conclusions but rather its sufficiency as an informative document. (*Laurel Heights 1, supra*, 47 Cal.3d at p. 392; *Citizens of Goleta Valley v.*

Bd. of Supervisors (1990) 52 Cal.3d 553, 569; *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1197.)

As stated by the Court of Appeal in this case, where an EIR has addressed a topic, but the petitioner claims that the information provided about that topic is insufficient, courts must "draw[] a line that divides *sufficient* discussions from those that are *insufficient*." (*Sierra Club v. County of Fresno* (2014) 226 Cal.App.4th 704 (superseded by grant of review) 172 Cal.Rptr.3d 271, 290.) The Court of Appeal readily admitted that "[t]he terms themselves – sufficient and insufficient – provide little, if any, guidance as to where the line should be drawn. They are simply labels applied once the court has completed its analysis." (*Id.*)

The CEQA Guidelines, however, provide guidance regarding what constitutes a sufficient discussion of impacts. Section 15151 states that "the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible." Case law reflects this: "Analysis of environmental effects need not be exhaustive, but will be judged in light of what was reasonably feasible." (*Association of Irritated Residents v. County of Madera, supra,* 107 Cal.App.4th at p. 1390; see also CEQA Guidelines § 15204(a).)

Applying this test, this Court cannot realistically establish a hard-and-fast rule that an analysis correlating air pollution impacts of a project to quantified resulting health impacts is always required, or indeed that it is never required. Simply put, in some cases such an analysis will be "feasible"; in some cases it will not.

For example, air pollution control districts often require a proposed new source of toxic air contaminants to prepare a "health risk assessment" before issuing a permit to construct. District rules often limit the allowable cancer risk the new source may cause to the "maximally exposed individual" (worker and residence exposures). (*See, e.g.*, SCAQMD Rule 1401(c)(8); 1401(d)(1), *supra* note 15.) In order to perform this analysis, it

is necessary to have data regarding the sources and types of air toxic contaminants, location of emission points, velocity of emissions, the meteorology and topography of the area, and the location of receptors (worker and residence). (SCAQMD, *Supplemental Guidelines for Preparing Risk Assessments for the Air Toxics "Hot Spots" Information and Assessment Act (AB2588), pp. 11-16*; (last visited Apr. 1, 2015) http://www.aqmd.gov/home/library/documents-support-material; "Guidelines" hyperlink; AB2588; then follow AB2588 Risk Assessment Guidelines hyperlink.)

Thus, it is feasible to determine the health risk posed by a new gas station locating at an intersection in a mixed use area, where receptor locations are known. On the other hand, it may not be feasible to perform a health risk assessment for airborne toxics that will be emitted by a generic industrial building that was built on "speculation" (i.e., without knowing the future tenant(s)). Even where a health risk assessment can be prepared, however, the resulting maximum health risk value is only a calculation of risk—it does not necessarily mean anyone will contract cancer as a result of the project.

In order to find the "cancer burden" or expected additional cases of cancer resulting from the project, it is also necessary to know the numbers and location of individuals living within the "zone of impact" of the project: i.e., those living in areas where the projected cancer risk from the project exceeds one in a million. (SCAQMD, Health Risk Assessment Summary form, http://www.aqmd.gov/home/forms ; filter by "AB2588" category; then "Health Risk Assessment" hyperlink (last visited Apr. 1, 2015).) The affected population is divided into bands of those exposed to at least 1 in a million risk, those exposed to at least 10 in a million risk, etc. up to those exposed at the highest levels. (*Id.*) This data allows agencies to calculate an approximate number of additional cancer cases expected from

the project. However, it is not possible to predict which particular individuals will be affected.

For the so-called criteria pollutants[5], such as ozone, it may be more difficult to quantify health impacts. Ozone is formed in the atmosphere from the chemical reaction of the nitrogen oxides (NO_x) and volatile organic compounds (VOC) in the presence of sunlight. (U.S. EPA, Ground Level Ozone, http://www.epa.gov/airquality/ozonepollution/ (last updated Mar. 25, 2015).) It takes time and the influence of meteorological conditions for these reactions to occur, so ozone may be formed at a distance downwind from the sources. (U.S. EPA, *Guideline on Ozone Monitoring Site Selection* (Aug. 1998) EPA-454/R-98-002 § 5.1.2, http://www.epa.gov/ttnamti1/archive/cpreldoc.html (last visited Apr. 1, 2015).) NO_x and VOC are known as "precursors" of ozone.

Scientifically, health effects from ozone are correlated with increases in the ambient level of ozone in the air a person breathes. (U.S. EPA, *Health Effects of Ozone in the General Population,* Figure 9, http://www.epa.gov/apti/ozonehealth/population.html#levels (last visited Apr. 1, 2015).) However, it takes a large amount of additional precursor emissions to cause a modeled increase in ambient ozone levels over an entire region. For example, the SCAQMD's 2012 AQMP showed that reducing NO_x by 432 tons per day (157,680 tons/year) and reducing VOC by 187 tons per day (68,255 tons/year) would reduce ozone levels at the SCAQMD's monitor site with the highest levels by only 9 parts per billion. (South Coast Air Quality Management District, *Final 2012 AQMP (February 2013)*, http://www.aqmd.gov/home/library/clean-air-plans/air-quality-mgt-plan/final-2012-air-quality-management-plan; then follow "Appendix V: Modeling & Attainment Demonstrations" hyperlink,

[5] See discussion of types of pollutants, supra, Part I.A.

pp. v-4-2, v-7-4, v-7-24.) SCAQMD staff does not currently know of a way to accurately quantify ozone-related health impacts caused by NO_x or VOC emissions from relatively small projects.

On the other hand, this type of analysis may be feasible for projects on a regional scale with very high emissions of NO_x and VOCs, where impacts are regional. For example, in 2011 the SCAQMD performed a health impact analysis in its CEQA document for proposed Rule 1315, which authorized various newly-permitted sources to use offsets from the districts "internal bank" of emission reductions. This CEQA analysis accounted for essentially *all* the increases in emissions due to new or modified sources in the District between 2010 and 2030.[6] The SCAQMD was able to correlate this very large emissions increase (e.g., 6,620 pounds per day NO_x (1,208 tons per year), 89,180 pounds per day VOC (16,275 tons per year)) to expected health outcomes from ozone and particulate matter (e.g., 20 premature deaths per year and 89,947 school absences in the year 2030 due to ozone).[7] (SCAQMD Governing Board Agenda, February 4, 2011, Agenda Item 26, *Assessment for: Re-adoption of Proposed Rule 1315 – Federal New Source Review Tracking System* (see hyperlink in fn 6*)* at p. 4.1-35, Table 4.1-29.)

---

[6] (SCAQMD Governing Board Agenda, February 4, 2011, Agenda Item 26, Attachment G, *Assessment for: Re-adoption of Proposed Rule 1315 – Federal New Source Review Tracking System, Vol. 1, p.4.0-6,* http://www.aqmd.gov/home/library/meeting-agendas-minutes/agenda?title=governing-board-meeting-agenda-february-4-2011; the follow "26. Adopt Proposed Rule 1315 – Federal New Source Review Tracking System" (last visited April 1, 2015).)

[7] The SCAQMD was able to establish the location of future NO_x and VOC emissions by assuming that new projects would be built in the same locations and proportions as existing stationary sources. This CEQA document was upheld by the Los Angeles County Superior Court in *Natural Res. Def. Council v SCAQMD*, Los Angeles Superior Court No. BS110792).

However, a project emitting only 10 tons per year of NO_x or VOC is small enough that its regional impact on ambient ozone levels may not be detected in the regional air quality models that are currently used to determine ozone levels. Thus, in this case it would not be feasible to directly correlate project emissions of VOC or NO_x with specific health impacts from ozone. This is in part because ozone formation is not linearly related to emissions. Ozone impacts vary depending on the location of the emissions, the location of other precursor emissions, meteorology and seasonal impacts, and because ozone is formed some time later and downwind from the actual emission. (EPA Guideline on Ozone Monitoring Site Selection (Aug. 1998) EPA-454/R-98-002, § 5.1.2; https://www.epa.gov/ttnamti1/archive/cpreldoc.html; then search "Guideline on Ozone Monitoring Site Selection" click on pdf) (last viewed Apr. 1, 2015).)

SCAQMD has set its CEQA "significance" threshold for NO_x and VOC at 10 tons per year (expressed as 55 lb/day). (SCAQMD, *Air Quality Analysis Handbook*, http://www.aqmd.gov/home/regulations/ceqa/air-quality-analysis-handbook; then follow "SCAQMD Air Quality Significance Thresholds" hyperlink (last visited Apr. 1, 2015).) This is because the federal Clean Air Act defines a "major" stationary source for "extreme" ozone nonattainment areas such as SCAQMD as one emitting 10 tons/year. (42 U.S.C. §§ 7511a(e), 7511a(f); CAA §§ 182(e), 182(f).) Under the Clean Air Act, such sources are subject to enhanced control requirements (42 U.S.C. §§ 7502(c)(5), 7503; CAA §§ 172(c)(5), 173), so SCAQMD decided this was an appropriate threshold for making a CEQA "significance" finding and requiring feasible mitigation. Essentially, SCAQMD takes the position that a source that emits 10 tons/year of NO_x or VOC would contribute cumulatively to ozone formation. Therefore, lead agencies that use SCAQMD's thresholds of significance may determine

that many projects have "significant" air quality impacts and must apply all feasible mitigation measures, yet will not be able to precisely correlate the project to quantifiable health impacts, unless the emissions are sufficiently high to use a regional modeling program.

In the case of particulate matter ($PM_{2.5}$)[8], another "criteria" pollutant, SCAQMD staff is aware of two possible methods of analysis. SCAQMD used regional modeling to predict expected health impacts from its proposed Rule 1315, as mentioned above. Also, the California Air Resources Board (CARB) has developed a methodology that can predict expected mortality (premature deaths) from large amounts of $PM_{2.5}$. (California Air Resources Board, *Health Impacts Analysis: PM Premature Death Relationship*, http://www.arb.ca.gov/research/health/pm-mort/pm-mort_arch.htm (last reviewed Jan. 19, 2012).) SCAQMD used the CARB methodology to predict impacts from three very large power plants (e.g., 731-1837 lbs/day). (Final Environmental Assessment for Rule 1315, *supra*, pp 4.0-12, 4.1-13, 4.1-37 (e.g., 125 premature deaths in the entire SCAQMD in 2030), 4.1-39 (0.05 to 1.77 annual premature deaths from power plants.) Again, this project involved large amounts of additional $PM_{2.5}$ in the District, up to 2.82 tons/day (5,650 lbs/day of $PM_{2.5}$, or, or 1029 tons/year. (*Id.* at table 4.1-4, p. 4.1-10.)

However, the primary author of the CARB methodology has reported that this $PM_{2.5}$ health impact methodology is not suited for small projects and may yield unreliable results due to various uncertainties. [9] (SCAQMD, *Final Subsequent Mitigated Negative Declaration for: Warren*

---

[8] SCAQMD has not attained the latest annual or 24-hour national ambient air quality standards for "$PM_{2.5}$" or particulate matter less than 2.5 microns in diameter.

[9] Among these uncertainties are the representativeness of the population used in the methodology, and the specific source of PM and the corresponding health impacts. (*Id.* at p. 2-24.)

E&P, Inc. WTU Central Facility, New Equipment Project (certified July 19, 2011), http://www.aqmd.gov/home/library/documents-support-material/lead-agency-permit-projects/permit-project-documents---year-2011; then follow "Final Subsequent Mitigated Negative Declaration for Warren E&P Inc. WTU Central Facility, New Equipment Project" hyperlink, pp. 2-22, 2-23 (last visited Apr. 1, 2015).) Therefore, when SCAQMD prepared a CEQA document for the expansion of an existing oil production facility, with very small $PM_{2.5}$ increases (3.8 lb/day) and a very small affected population, staff elected not to use the CARB methodology for using estimated $PM_{2.5}$ emissions to derive a projected premature mortality number and explained why it would be inappropriate to do so. (*Id.* at pp 2-22 to 2-24.) SCAQMD staff concluded that use of this methodology for such a small source could result in unreliable findings and would not provide meaningful information. (*Id.* at pp. 2-23, 2-25.) This CEQA document was not challenged in court.

In the above case, while it may have been technically possible to plug the data into the methodology, the results would not have been reliable or meaningful. SCAQMD believes that an agency should not be required to perform analyses that do not produce reliable or meaningful results. This Court has already held that an agency may decline to use even the "normal" "existing conditions" CEQA baseline where to do so would be misleading or without informational value. (*Neighbors for Smart Rail v. Exposition Metro Line* (2013) 57 Cal.4th 439, 448, 457.) The same should be true for a decision that a particular study or analysis would not provide reliable or meaningful results.[10]

---

[10] Whether a particular study would result in "informational value" is a part of deciding whether it is "feasible." CEQA defines "feasible" as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and

Therefore, it is not possible to set a hard-and-fast rule on whether a correlation of air quality impacts with specific quantifiable health impacts is required in all cases. Instead, the result turns on whether such an analysis is reasonably feasible in the particular case.[11] Moreover, what is reasonably feasible may change over time as scientists and regulatory agencies continually seek to improve their ability to predict health impacts. For example, CARB staff has been directed by its Governing Board to reassess and improve the methodology for estimating premature deaths. (California Air Resources Board, *Health Impacts Analysis: PM Mortality Relationship*, http://www.arb.ca.gov/research/health/pm-mort/pm-mort.htm (last reviewed Dec. 29, 2010).) This factor also counsels against setting any hard-and-fast rule in this case.

III. THE QUESTION OF WHETHER AN EIR CONTAINS SUFFICIENT ANALYSIS TO MEET CEQA'S REQUIREMENTS IS A MIXED QUESTION OF FACT AND LAW GOVERNED BY TWO DIFFERENT STANDARDS OF REVIEW.

A. Standard of Review for Feasibility Determination and Sufficiency as an Informative Document

A second issue in this case is whether courts should review an EIR's informational sufficiency under the "substantial evidence" test as argued by Friant Ranch or the "independent judgment" test as argued by Sierra Club.

---

technological factors." (Pub. Resources Code § 21061.1.) A study cannot be "accomplished in a *successful* manner" if it produces unreliable or misleading results.

[11] In this case, the lead agency did not have an opportunity to determine whether the requested analysis was feasible because the comment was non-specific. Therefore, SCAQMD suggests that this Court, after resolving the legal issues in the case, direct the Court of Appeal to remand the case to the lead agency for a determination of whether the requested analysis is feasible. Because Fresno County, the lead agency, did not seek review in this Court, it seems likely that the County has concluded that at least some level of correlation of air pollution with health impacts is feasible.

As this Court has explained, "a reviewing court must adjust its scrutiny to the nature of the alleged defect, depending on whether the claim is predominantly one of improper procedure or a dispute over the facts." (*Vineyard Area Citizens v. City of Rancho Cordova, supra,* 40 Cal.4th at 435.) For questions regarding compliance with proper procedure or other legal questions, courts review an agency's action de novo under the "independent judgment" test. (*Id.*) On the other hand, courts review factual disputes only for substantial evidence, thereby "accord[ing] greater deference to the agency's substantive factual conclusions." (*Id.*)

Here, Friant Ranch and Sierra Club agree that the case involves the question of whether an EIR includes sufficient information regarding a project's impacts. However, they disagree on the proper standard of review for answering this question: Sierra Club contends that courts use the independent judgment standard to determine whether an EIR's analysis is sufficient to meet CEQA's informational purposes,[12] while Friant Ranch contends that the substantial evidence standard applies to this question.

///

///

///

///

///

///

///

///

///

---

[12] Sierra Club acknowledges that courts use the substantial evidence standard when reviewing predicate factual issues, but argues that courts ultimately decide as a matter of law what CEQA requires. (Answering Brief, pp. 14, 23.)

SCAQMD submits that the issue is more nuanced than either party contends. We submit that, whether a CEQA document includes sufficient analysis to satisfy CEQA's informational mandates is a mixed question of fact and law,[13] containing two levels of inquiry that should be judged by different standards.[14]

The state CEQA Guidelines set forth standards for the adequacy of environmental analysis. Guidelines Section 15151 states:

> An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection, but for adequacy, completeness, and a good-faith effort at full disclosure.

In this case, the basic question is whether the underlying analysis of air quality impacts made the EIR "sufficient" as an informative document. However, whether the EIR's analysis was sufficient is judged in light of what was reasonably feasible. This represents a mixed question of fact and law that is governed by two different standards of review.

---

[13] Friant Ranch actually states that the claim that an EIR lacks sufficient relevant information is, "most properly thought of as raising mixed questions of fact and law." (Opening Brief, p. 27.) However, the remainder of its argument claims that the court should apply the substantial evidence standard of review to all aspects of the issue.

[14] Mixed questions of fact and law issues may implicate predominantly factual subordinate questions that are reviewed under the substantial evidence test even though the ultimate question may be reviewed by the independent judgment test. *Crocker National Bank v. City and County of San Francisco* (1989) 49 Cal.3d 881, 888-889.

SCAQMD submits that an EIR's sufficiency as an informational document is ultimately a legal question that courts should determine using their independent judgment. This Court's language in *Laurel Heights I* supports this position. As this Court explained: "The court does not pass upon the correctness of the EIR's environmental conclusions, but only upon its *sufficiency as an informative document.*" (*Laurel Heights I, supra,* 47 Cal.3d at 392-393) (emphasis added.) As described above, the Court in *Vineyard Area Citizens v. City of Rancho Cordova, supra,* 40 Cal.4th at 431, also used its independent judgment to determine what level of analysis CEQA requires for water supply impacts. The Court did not defer to the lead agency's opinion regarding the law's requirements; rather, it determined for itself what level of analysis was necessary to meet "[t]he law's informational demands." (*Id.* at p. 432.) Further, existing case law also holds that where an agency fails to comply with CEQA's information disclosure requirements, the agency has "failed to proceed in the manner required by law." (*Save Our Peninsula Comm. v. Monterey County Bd. of Supervisors* (2001) 87 Cal.App.4th 99, 118.)

However, whether an EIR satisfies CEQA's requirements depends in part on whether it was reasonably feasible for an agency to conduct additional or more thorough analysis. EIRs must contain "a detailed statement" of a project's impacts (Pub. Res. Code § 21061), and an agency must "use its best efforts to find out and disclose all that it reasonably can." (CEQA Guidelines § 15144.) Nevertheless, "the sufficiency of an EIR is to be reviewed in light of what is reasonably feasible." (CEQA Guidelines § 15151.)

SCAQMD submits that the question of whether additional analysis or a particular study suggested by a commenter is "feasible" is generally a question of fact. Courts have already held that whether a particular alternative is "feasible" is reviewed by the substantial evidence test.

(*Uphold Our Heritage v. Town of Woodside* (2007) 147 Cal.App.4th 587, 598-99; *Center for Biological Diversity v. County of San Bernardino* (2010) 185 Cal.App.4th 866, 883.) Thus, if a lead agency determines that a particular study or analysis is infeasible, that decision should generally be judged by the substantial evidence standard. However, SCAQMD urges this Court to hold that lead agencies must explain the basis of any determination that a particular analysis is infeasible in the EIR itself. An EIR must discuss information, including issues related to the feasibility of particular analyses "in sufficient detail to enable meaningful participation and criticism by the public. '[W]hatever is required to be considered in an EIR must be in that formal report; what any official might have known from other writings or oral presentations cannot supply what is lacking in the report.'" (*Laurel Heights I, supra*, 47 Cal.3d at p. 405 (quoting *Santiago County Water District v. County of Orange* (1981) 118 Cal.App.3d 818, 831) (discussing analysis of alternatives).) The evidence on which the determination is based should also be summarized in the EIR itself, with appropriate citations to reference materials if necessary. Otherwise commenting agencies such as SCAQMD would be forced to guess where the lead agency's evidence might be located, thus thwarting effective public participation.

Moreover, if a lead agency determines that a particular study or analysis would not result in reliable or useful information and for that reason is not feasible, that determination should be judged by the substantial evidence test. (See *Neighbors for Smart Rail v. Exposition Metro Line Construction Authority, supra*, 57 Cal.4th 439, 448, 457:

whether "existing conditions" baseline would be misleading or uninformative judged by substantial evidence standard.[15])

If the lead agency's determination that a particular analysis or study is not feasible is supported by substantial evidence, then the agency has not violated CEQA's information disclosure provisions, since it would be infeasible to provide additional information. This Court's decisions provide precedent for such a result. For example, this Court determined that the issue of whether the EIR should have included a more detailed discussion of future herbicide use was resolved because substantial evidence supported the agency's finding that "the precise parameters of future herbicide use could not be predicted." *Ebbetts Pass Forest Watch v. California Dept. of Forestry & Fire Protection* (2008) 43 Cal.4th 936, 955.

Of course, SCAQMD expects that courts will continue to hold lead agencies to their obligations to consult with, and not to ignore or misrepresent, the views of sister agencies having special expertise in the area of air quality. (*Berkeley Keep Jets Over the Bay v. Board of Port Commissioners* (2007) 91 Cal.App.4th 1344, 1364 n.11.) In some cases, information provided by such expert agencies may establish that the purported evidence relied on by the lead agency is not in fact "substantial". (*Id.* at pp. 1369-1371.)

In sum, courts retain ultimate responsibility to determine what CEQA requires. However, the law does not require exhaustive analysis, but only what is reasonably feasible. Agencies deserve deference for their factual determinations regarding what type of analysis is reasonably feasible. On the other hand, if a commenter requests more information, and the lead agency declines to provide it but does *not* determine that the

---

[15] The substantial evidence standard recognizes that the courts "have neither the resources nor the scientific expertise" to weigh conflicting evidence on technical issues. (*Laurel Heights I, supra,* 47 Cal.3d 376, 393.)

requested study or analysis would be infeasible, misleading or uninformative, the question becomes whether the omission of that analysis renders the EIR inadequate to satisfy CEQA's informational purposes. (*Id.* at pp. 1370-71.) Again, this is predominantly a question of law and should be judged by the de novo or independent judgment standard of review. Of course, this Court has recognized that a "project opponent or reviewing court can always imagine some additional study or analysis that might provide helpful information. It is not for them to design the EIR. That further study...might be helpful does not make it necessary." (*Laurel Heights I, supra,* 47 Cal.3d 376, 415 – see also CEQA Guidelines § 15204(a) [CEQA "does not require a lead agency to conduct every test. . . recommended or demanded by commenters."].) Courts, then, must adjudicate whether an omission of particular information renders an EIR inadequate to serve CEQA's informational purposes.[16]

---

[16] We recognize that there is case law stating that the substantial evidence standard applies to "challenges to the scope of an EIR's analysis of a topic" as well as the methodology used and the accuracy of the data relied on in the document "because these types of challenges involve factual questions." (*Bakersfield Citizens for Local Control v. City of Bakersfield, supra,* 124 Cal.App.4th 1184, 1198, and cases relied on therein.) However, we interpret this language to refer to situations where the question of the scope of the analysis really is factual—that is, where it involves whether further analysis is feasible, as discussed above. This interpretation is supported by the fact that the *Bakersfield* court expressly rejected an argument that a claimed "omission of information from the EIR should be treated as inquiries whether there is substantial evidence supporting the decision approving the project. " *Bakersfield, supra,* 124 Cal.App.4th at p. 1208. And the *Bakersfield* court ultimately decided that the lead agency must analyze the connection between the identified air pollution impacts and resulting health impacts, even though the EIR already included some discussion of air-pollution-related respiratory illnesses. *Bakersfield, supra,* 124 Cal.App.4th at p. 1220. Therefore, the court must not have interpreted this question as one of the "scope of the analysis" to be judged by the substantial evidence standard.

B. Friant Ranch's Rationale for Rejecting the Independent Judgment Standard of Review is Unsupported by Case Law.

In its brief, Friant Ranch makes a distinction between cases where a required CEQA topic is not discussed at all (to be reviewed by independent judgment as a failure to proceed in the manner required by law) and cases where a topic is discussed, but the commenter claims the information provided is insufficient (to be judged by the substantial evidence test). (Opening Brief, pp. 13-17.) The Court of Appeal recognized these two types of cases, but concluded that both raised questions of law. (*Sierra Club v. County of Fresno* (2014) 226 Cal.App.4th 704 (superseded by grant of review) 172 Cal.Rptr.3d 271, 290.) We believe the distinction drawn by Friant Ranch is unduly narrow, and inconsistent with cases which have concluded that CEQA documents are insufficient. In many instances, CEQA's requirements are stated broadly, and the courts must interpret the law to determine what level of analysis satisfies CEQA's mandate for providing meaningful information, even though the EIR discusses the issue to some extent.

For example, the CEQA Guidelines require discussion of the existing environmental baseline. In *County of Amador v. El Dorado County Water Agency* (1999) 76 Cal.App.4th 931, 954-955, the lead agency had discussed the environmental baseline by describing historic month-end water levels in the affected lakes. However, the court held that this was not an adequate baseline discussion because it failed to discuss the timing and amounts of past actual water releases, to allow comparison with the proposed project. The court evidently applied the independent judgment test to its decision, even though the agency discussed the issue to some extent.

Likewise, in *Vineyard Area Citizens* (2007) 40 Cal.4th 412, this Court addressed the question of whether an EIR's analysis of water supply impacts complied with CEQA. The parties agreed that the EIR was required to analyze the effects of providing water to the development project, "and that in order to do so the EIR had, in some manner, to identify the planned sources of that water." (*Vineyard Area Citizens, supra,* at p. 428.) However, the parties disagreed as to the level of detail required for this analysis and "what level of uncertainty regarding the availability of water supplies can be tolerated in an EIR . . . ." (*Id.*) In other words, the EIR had analyzed water supply impacts for the project, but the petitioner claimed that the analysis was insufficient.

This Court noted that neither CEQA's statutory language or the CEQA Guidelines specifically addressed the question of how precisely an EIR must discuss water supply impacts. (*Id.*) However, it explained that CEQA "states that '[w]hile foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can.'" (*Id.*, [Guidelines § 15144].) The Court used this general principle, along with prior precedent, to elucidate four "principles for analytical adequacy" that are necessary in order to satisfy "CEQA's informational purposes." (*Vineyard Area Citizens, supra,* at p. 430.) The Court did not defer to the agency's determination that the EIR's analysis of water supply impacts was sufficient. Rather, this Court used its independent judgment to determine for itself the level of analysis required to satisfy CEQA's fundamental purposes. (*Vineyard Area Citizens, supra,* at p. 441: an EIR does not serve its purposes where it neglects to explain likely sources of water and "... leaves long term water supply considerations to later stages of the project.")

Similarly, the CEQA Guidelines require an analysis of noise impacts of the project. (Appendix G, "Environmental Checklist Form."[17]) In *Gray v. County of Madera* (2008) 167 Cal.App.4th 1099, 1123, the court held that the lead agency's noise impact analysis was inadequate even though it had addressed the issue and concluded that the increase would not be noticeable. If the court had been using the substantial evidence standard, it likely would have upheld this discussion.

Therefore, we do not agree that the issue can be resolved on the basis suggested by Friant Ranch, which would apply the substantial evidence standard to *every* challenge to an analysis that addresses a required CEQA topic. This interpretation would subvert the courts' proper role in interpreting CEQA and determining what the law requires.

Nor do we agree that the Court of Appeal in this case violated CEQA's prohibition on courts interpreting its provisions "in a manner which imposes procedural or substantive requirements beyond those explicitly stated in this division or in the state guidelines." (Pub. Resources Code § 21083.1.) CEQA requires an EIR to describe *all* significant impacts of the project on the environment. (Pub. Resources Code § 21100(b)(2); *Vineyard Area Citizens, supra,* at p. 428.) Human beings are part of the environment, so CEQA requires EIRs to discuss a project's significant impacts on human health. However, except in certain particular circumstances,[18] neither the CEQA statute nor Guidelines specify the precise level of analysis that agencies must undertake to satisfy the law's requirements. (see, e.g., CEQA Guidelines § 15126.2(a) [EIRs must describe "health and safety problems caused by {a project's} physical changes"].) Accordingly, courts must interpret CEQA as a whole to

[17] Association of Environmental Professionals, 2015 CEQA Statute and Guidelines (2015) p.287.

[18] E.g., Pub. Resources Code § 21151.8(C)(3)(B)(iii) (requiring specific type of health risk analysis for siting schools).

determine whether a particular EIR is sufficient as an informational document. A court determining whether an EIR's discussion of human health impacts is legally sufficient does not constitute imposing a new substantive requirement.[19] Under Friant Ranch's theory, the above-referenced cases holding a CEQA analysis inadequate would have violated the law. This is not a reasonable interpretation.

IV. COURTS MUST SCRUPULOUSLY ENFORCE THE REQUIREMENTS THAT LEAD AGENCIES CONSULT WITH AND OBTAIN COMMENTS FROM AIR DISTRICTS

Courts must "scrupulously enforce" CEQA's legislatively mandated requirements. (*Vineyard Area Citizens, supra*, 40 Cal.4th 412, 435.) Case law has firmly established that lead agencies must consult with the relevant air pollution control district before conducting an initial study, and must provide the districts with notice of the intention to adopt a negative declaration (or EIR). (*Schenck v. County of Sonoma* (2011) 198 Cal.App.4th 949, 958.) As *Schenck* held, neither publishing the notice nor providing it to the State Clearinghouse was a sufficient substitute for sending notice directly to the air district. (*Id.*) Rather, courts "must be satisfied that [administrative] agencies have fully complied with the procedural requirements of CEQA, since only in this way can the important public purposes of CEQA be protected from subversion." *Schenck,* 198 Cal.App.4th at p. 959 (citations omitted).[20]

---

[19] We submit that Public Resources Code Section 21083.1 was intended to prevent courts from, for example, holding that an agency must analyze economic impacts of a project where there are no resulting environmental impacts (see CEQA Guidelines § 15131) , or imposing new procedural requirements, such as imposing additional public notice requirements not set forth in CEQA or the Guidelines.

[20] Lead agencies must consult air districts, as public agencies with jurisdiction by law over resources affected by the project, *before* releasing an EIR. (Pub. Resources Code §§ 21104(a); 21153.) Moreover, air

Lead agencies should be aware, therefore, that failure to properly seek and consider input from the relevant air district constitutes legal error which may jeopardize their project approvals. For example, the court in *Fall River Wild Trout Foundation v. County of Shasta,* (1999) 70 Cal.App.4th 482, 492 held that the failure to give notice to a trustee agency (Department of Fish and Game) was prejudicial error requiring reversal. The court explained that the lack of notice prevented the Department from providing any response to the CEQA document. (*Id.* at p. 492.) It therefore prevented relevant information from being presented to the lead agency, which was prejudicial error because it precluded informed decision-making. (*Id.*)[21]

---

districts should be considered "state agencies" for purposes of the requirement to consult with "trustee agencies" as set forth in Public Resources Code § 20180.3(a). This Court has long ago held that the districts are not mere "local agencies" whose regulations are superseded by those of a state agency regarding matters of statewide concern, but rather have concurrent jurisdiction over such issues. (*Orange County Air Pollution Control District v. Public Util. Com.* (1971) 4 Cal.3d 945, 951, 954.) Since air pollution is a matter of statewide concern, *Id* at 952, air districts should be entitled to trustee agency status in order to ensure that this vital concern is adequately protected during the CEQA process.

[21] In *Schenck,* the court concluded that failure to give notice to the air district was not prejudicial, but this was partly because the trial court had already corrected the error before the case arrived at the Court of Appeal. The trial court issued a writ of mandate requiring the lead agency to give notice to the air district. The air district responded by concurring with the lead agency that air impacts were not significant. (*Schenck,* 198 Cal.App.4th 949, 960.) We disagree with the *Schenck* court that the failure to give notice to the air district would not have been prejudicial (even in the absence of the trial court writ) merely because the lead agency purported to follow the air district's published CEQA guidelines for significance. (*Id.*, 198 Cal.App.4th at p. 960.) In the first place, absent notice to the air district, it is uncertain whether the lead agency properly followed those guidelines. Moreover, it is not realistic to expect that an air district's published guidelines would necessarily fully address all possible air-quality related issues that can arise with a CEQA project, or that those

Similarly, lead agencies must obtain additional information requested by expert agencies, including those with jurisdiction by law, if that information is necessary to determine a project's impacts. (*Sierra Club v. State Bd. Of Forestry* (1994) 7 Cal.4th 1215, 1236-37.) Approving a project without obtaining that information constitutes a failure to proceed in the manner prescribed by CEQA. (*Id.* at p. 1236.)

Moreover, a lead agency can save significant time and money by consulting with the air district early in the process. For example, the lead agency can learn what the air district recommends as an appropriate analysis on the facts of its case, including what kinds of health impacts analysis may be available, and what models are appropriate for use. This saves the lead agency from the need to do its analysis all over again and possibly needing to recirculate the document after errors are corrected, if new significant impacts are identified. (CEQA Guidelines § 15088.5(a).) At the same time, the air district's expert input can help the lead agency properly determine whether another commenter's request for additional analysis or studies is reasonable or feasible. Finally, the air district can provide input on what mitigation measures would be feasible and effective.

Therefore, we suggest that this Court provide guidance to lead agencies reminding them of the importance of consulting with the relevant air districts regarding these issues. Otherwise, their feasibility decisions may be vulnerable to air district evidence that establishes that there is no substantial evidence to support the lead agency decision not to provide specific analysis. (*See Berkeley Keep Jets Over the Bay, supra,* 91 Cal.App.4th 1344, 1369-1371.)

---

guidelines would necessarily be continually modified to reflect new developments. Therefore we believe that, had the trial court not already ordered the lead agency to obtain the air district's views, the failure to give notice would have been prejudicial, as in *Fall River, supra,* 70 Cal.App.4th 482, 492.

CONCLUSION

The SCAQMD respectfully requests this Court *not* to establish a hard-and-fast rule concerning whether CEQA requires a lead agency to correlate identified air quality impacts of a project with resulting health outcomes. Moreover, the question of whether an EIR is "sufficient as an informational document" is a mixed question of fact and law containing two levels of inquiry. Whether a particular proposed analysis is feasible is predominantly a question of fact to be judged by the substantial evidence standard of review. Where the requested analysis is feasible, but the lead agency relies on legal or policy reasons not to provide it, the question of whether the EIR is nevertheless sufficient as an informational document is predominantly a question of law to be judged by the independent judgment standard of review.

Respectfully submitted,

DATED: April 3, 2015

SOUTH COAST AIR QUALITY
MANAGEMENT DISTRICT
KURT R. WIESE, GENERAL COUNSEL
BARBARA BAIRD, CHIEF DEPUTY COUNSEL

By: Barbara Baird
Barbara Baird
Attorneys for Amicus Curiae
SOUTH COAST AIR QUALITY MANAGEMENT DISTICT

CERTIFICATE OF WORD COUNT

Pursuant to Rule 8.520(c)(1) of the California Rules of Court, I hereby certify that this brief contains 8,476 words, including footnotes, but excluding the Application, Table of Contents, Table of Authorities, Certificate of Service, this Certificate of Word Count, and signature blocks. I have relied on the word count of the Microsoft Word Vista program used to prepare this Certificate.

DATED: April 3, 2015 Respectfully submitted,

Barbara Baird

Barbara Baird

PROOF OF SERVICE

I am employed in the County of Los Angeles, California. I am over the age of 18 years and not a party to the within action. My business address is 21865 Copley Drive, Diamond Bar, California 91765.

On April 3, 2015 I served true copies of the following document(s) described as **APPLICATION OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT FOR LEAVE TO FILE BRIEF OF *AMICUS CURIAE* IN SUPPORT OF NEITHER PARTY AND *[PROPOSED]* BRIEF OF *AMICUS CURIAE*** by placing a true copy of the foregoing document(s) in a sealed envelope addressed as set forth on the attached service list as follows:

BY MAIL: I enclosed the document(s) in a sealed envelope or package addressed to the persons at the addresses listed in the Service List and placed the envelope for collection and mailing following our ordinary business practices. I am readily familiar with this District's practice for collection and processing of correspondence for mailing. Under that practice, the correspondence would be deposited with the United States Postal Service, with postage thereon fully prepaid at Diamond Bar, California, in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on April 3, 2015 at Diamond Bar, California.

Patricia Anderson

SERVICE LIST

James G. Moose, Tiffany K. Wright, Laura M. Harris
REMY MOOSE MANLEY, LLP
555 Capitol Mall, Suite 800
Sacramento, CA 95814

Attorneys for Real Party in Interest and Respondent *Friant Ranch, L.P.*

Bryan N. Wagner
WAGNER & WAGNER
7110 N. Fresno St, Suite 340
Fresno, CA 93720

Attorney for Real Party in Interest and Respondent *Friant Ranch, L.P.*

Sara Hedgpeth-Harris
LAW OFFICE OF SARA HEDGPETH-HARRIS
5445 E. Lane Avenue
Fresno, CA 93727

Attorney for Plaintiffs and Appellants *Sierra Club, et al*

Daniel C. Cederborg
Bruce B. Johnson, Jr.
Zachary Stephen Redmond
OFFICE OF THE FRESNO COUNTY COUNSEL
2220 Tulare Street, Suite 500
Fresno, CA 93721

Attorneys for Respondents *County of Fresno*

Clerk of the Court
California Court of Appeal
Fifth Appellate District
2424 Ventura Street
Fresno, CA 93721
(via U.S. Mail & Electronic Transmission)

Clerk of the Court
Superior Court of California
County of Fresno
1130 O Street
Fresno, CA 93721

2022 SCOPING PLAN FOR ACHIEVING CARBON NEUTRALITY

NOVEMBER 16, 2022



This page intentionally left blank.

Table of Contents

Table of Contents i

List of Figures vii

List of Tables x

List of Appendices xii

Abbreviations xiii

Executive Summary 1

The Scoping Plan Process 5

Ensuring Equity and Affordability 8

Energy and Technology Transitions 9

Cost-Effective Solutions Available Today 10

Continue with a Portfolio Approach 11

Conclusion 11

Post-adoption of the Scoping Plan 12

Chapter 1: Introduction 13

Severity of Climate Change Impacts 15

Wildfires 15

Drought 17

Extreme Heat 19

Imperative To Act 21

Consequences of Further Warming 21

Scoping Plan Overview 23

Previous Scoping Plans 23

Overview of this Scoping Plan 24

Principles That Inform Our Approach to Addressing the Climate Challenge 25
Unprecedented Investments in a Sustainable Future 25
Centering Equity 27
Role of the Environmental Justice Advisory Committee 29
Maximizing Air Quality and Health Benefits 32
Economic Resilience 34
Partnering Across Government 35
Partnering with the Private Sector 35
Supporting Innovation 37
Engagement with Partners to Develop, Coordinate, and Export Policies 38
Working Toward Carbon Neutrality 41
Supporting Healthy and Resilient Lands 42
Maintaining the Focus on Methane and Short-Lived Climate Pollutants 42
Process for Developing the Scoping Plan 44
Guidance from the Administration and Legislature 44
Consideration of Relevant State Plans and Regulations 53
Input from Partners and Stakeholders 54
Emissions Data That Inform the Scoping Plan 54
Greenhouse Gas Emissions 54
Natural and Working Lands 57
Black Carbon 60
Tracking Life-Cycle and Out-of-State Emissions 60
Tracking Progress 61
Chapter 2: The Scoping Plan Scenario 63
Scenarios for the AB 32 GHG Inventory Sectors 63
Scenarios for Natural and Working Lands 65
Evaluation of Scoping Plan Alternatives 67

NWL Scoping Plan Alternatives 67
Scoping Plan Scenario 70
AB 32 GHG Inventory Sectors 70
Natural and Working Lands 79
Strategies for Carbon Removal and Sequestration 83
The Role of Carbon Capture and Sequestration 84
The Role of Natural and Working Lands Emissions and Sequestration 89
The Role for Carbon Dioxide Removal (Direct Air Capture) 91
Carbon Dioxide Removal and Capture Targets for 2030 and 2045 94
Scenario Uncertainty 97
Greenhouse Gas Emissions Modeling 97
Implementation 98
Targeted Evaluations for the Scoping Plan: Oil and Gas Extraction and Refining 100
Oil and Gas Extraction 101
Petroleum Refining 106
Progress Toward Achieving the Accelerated 2030 Target 108
Cap-and-Trade Program Update 112
Chapter 3: Economic and Health Evaluations 118
Economic Analysis 118
Estimated Direct Costs 119
AB 32 GHG Inventory Sectors 120
Natural and Working Lands 121
Economy and Employment 123
AB 32 GHG Inventory Sectors 123
Natural and Working Lands 127
Health Analysis 128
AB 32 GHG Inventory Sectors 129

Natural and Working Lands 133
AB 197 Measure Analysis 135
Estimated Emissions Reductions 136
AB 32 GHG Inventory Sectors 136
Natural and Working Lands 139
Estimated Health Endpoints 140
AB 32 GHG Inventory Sectors 140
Natural and Working Lands 146
Estimated Social Cost 148
AB 32 GHG Inventory Sectors 150
Natural and Working Lands 151
Social Costs of GHGs in Relation to Cost-Effectiveness 153
Estimated Cost per Metric Ton 153
AB 32 GHG Inventory Sectors 154
Natural and Working Lands 155
Climate Vulnerability Metric 157
Public Health 160
Health Analysis Overview 160
Health Analysis Components 162
Social and Environmental Determinants of Health Inequities 164
Environmental Determinants of Health Inequities 166
Climate Vulnerabilities 169
Summary of the Qualitative Health Analysis 171
Heat Impacts 172
Wildfires and Smoke 172
Children’s Health and Development 172
Economic Security 173

Food Security....173
Mobility and Physical Activity....173
Affordable Housing....174
Urban Greening....174
No Action Scenario (Reference)....174
Take Action Scenario....175
Summary of Health Benefits....177
Environmental Analysis....180
Chapter 4: Key Sectors....182
Transportation Sustainability....184
Sector Transition....185
Technology....185
Strategies for Achieving Success....187
Fuels....189
Strategies for Achieving Success....191
Vehicle Miles Traveled....192
Strategies for Achieving Success....194
Clean Electricity Grid....195
Sector Transition....199
Strategies for Achieving Success....205
Sustainable Manufacturing and Buildings....206
Sector Transition....207
Industry....207
Strategies for Achieving Success....210
Buildings....211
Strategies for Achieving Success....214
Carbon Dioxide Removal and Capture....216

Sector Transition 220
Strategies for Achieving Success 221
Short-Lived Climate Pollutants (Non-Combustion Gases) 222
Methane 225
Hydrofluorocarbons 227
Anthropogenic Black Carbon 229
Sector Transition 230
Methane 230
Dairy and Livestock Methane 231
Strategies for Achieving Success 232
Landfill Methane 233
Strategies for Achieving Success 234
Upstream Oil and Gas Methane Reduction 235
Strategies for Achieving Success 236
Hydrofluorocarbons 237
Strategies for Achieving Success 239
Anthropogenic Black Carbon 240
Strategies for Achieving Success 240
Natural and Working Lands 241
Landscapes 243
Trends of Carbon on Landscapes 245
Goals and Accelerating Nature-Based Solutions 246
Strategies for Achieving Success: Crosscutting Items for all NWL 249
Forests, Shrublands, and Chaparral 250
Strategies for Achieving Success 252
Grasslands 252
Strategies for Achieving Success 253

Croplands 254
Strategies for Achieving Success 255
Wetlands....257
Strategies for Achieving Success 257
Developed Lands....258
Strategies for Achieving Success 259
Sparsely Vegetated Lands....260
Strategies for Achieving Success 260
Additional Management Strategies 261
Considerations....261
Additional NWL Actions and Strategies 263
Chapter 5: Challenge Accepted....265
State-level Action 265
Regulations and Programmatic Development....266
Incentive Programs 266
Local Action....267
Local Climate Action Planning and Permitting 268
Unlocking CEQA Mitigation for Local Success....270
Communities and Environmental Justice 271
Academic Institutions and the Private Sector 277
Individuals 279

List of Figures

Figure 1-1: California total and per capita GHG emissions.... 14
Figure 1-2: The real costs of inaction.... 23
Figure 1-3: Comprehensive California climate change investments 26

Figure 1-4: California climate investments cumulative outcomes 29

Figure 1-5: Carbon neutrality: Balancing the net flux of GHG emissions from all sources and sinks 42

Figure 1-6: Short-lived climate pollutant impacts 43

Figure 1-7: 2019 State GHG emission contributions by GHG 55

Figure 1-8: 2019 State GHG emission contributions by Scoping Plan sector 56

Figure 1-9: Carbon stocks in natural and working lands (MMT carbon) 58

Figure 1-10: Changes in carbon stock by landscape type 59

Figure 2-1: Reference and Scoping Plan Scenario GHG emissions 71

Figure 2-2: Forms of carbon removal and sequestration considered in this Scoping Plan 84

Figure 2-3: Petroleum refining emissions with and without carbon capture and sequestration 88

Figure 2-4: Comparison of the Scoping Plan Scenario (NWL) with existing research 90

Figure 2-5: Residual emissions in 2022, 2030, and 2045 for the Scoping Plan Scenario 92

Figure 2-6: Oil and gas extraction sector GHG emissions in 2022 and 2045 when activity is phased down with in-state fuel demand 102

Figure 2-7: California in-state crude oil production 103

Figure 2-8: Crude oil imports by transportation type 104

Figure 2-9: Petroleum refining sector GHG emissions in 2022 and 2045 (with and without CCS) when activity is phased down with fuel demand 107

Figure 2-10: Impact of delayed implementation on 2030 GHG emissions 111

Figure 3-1: Projected California gross state product (left) and employment growth (right) from 2021 to 2035 and 2045 119

Figure 3-2: Cost and savings relative to the growing California economy for the Scoping Plan Scenario in 2035 and 2045 (AB 32 GHG Inventory sectors) 121

Figure 3-3: Gross state product (left) and employment (right) relative to a growing California economy for the Scoping Plan Scenario in 2035 and 2045 (AB 32 GHG Inventory sectors) 124

Figure 3-4: Illustration of NOx emission reductions from current levels for the Reference Scenario and the Scoping Plan Scenario (AB 32 GHG Inventory sectors) 130

Figure 3-5: Difference in annual average $PM_{2.5}$ ($\mu g/m^3$) in the Scoping Plan scenario relative to the Reference scenario in 2045 (AB 32 GHG Inventory sectors) 131

Figure 3-6: Total health benefits estimated from air quality improvements in the Scoping Plan Scenario (AB 32 GHG Inventory sectors) 132

Figure 3-7: Disadvantaged community health benefits relative to the Reference Scenario for the Scoping Plan Scenario (AB 32 GHG Inventory sectors) 133

Figure 3-8: Total average annual health benefits relative to the Reference Scenario for the Scoping Plan Scenario (NWL) 134

Figure 3-9: Categories of climate change impacts on human welfare included in the Climate Vulnerability Metric. 158

Figure 3-10: Combined impacts of climate change in 2050 under a moderate emissions scenario; damages as share of 2019 tract income (%) 159

Figure 3-11: Scoping Plan outcome and the path to health improvements.....163

Figure 3-12: Least and most impacted neighborhoods from CalEnviroScreen.....165

Figure 3-13: Top sources of $PM_{2.5}$ and their contribution to $PM_{2.5}$ exposures by race and in disadvantaged communities 168

Figure 3-14: Quantified health benefits of active transportation from increased physical activity 177

Figure 4-1: Transition of on-road vehicle sales to ZEV technology in the Scoping Plan Scenario 186

Figure 4-2: Transportation fuel mix in 2022, 2030, and 2045 in the Scoping Plan Scenario ..190

Figure 4-3: 2021 total system electric generation (based on GWh).....196

Figure 4-4: Electricity supply trend by resource for a California summer day, July 2022.....199

Figure 4-5: Projected new electricity resources needed by 2045 in the Scoping Plan Scenario 203

Figure 4-6: Electric loads in 2022, 2030 and 2045 for the Scoping Plan Scenario 204

Figure 4-7: Final energy demand in industrial manufacturing (left) and in oil and gas extraction and petroleum refining (right) in 2022, 2030, and 2045 in the Scoping Plan Scenario 208

Figure 4-8: Final energy demand in buildings in 2022, 2030, and 2045 in the Scoping Plan Scenario 213

Figure 4-9: Residential space heating appliance sales in the Scoping Plan Scenario.....214

Figure 4-10: Carbon management infrastructure 217

Figure 4-11: Expected progress toward SB 1383 targeted emissions reductions by 2030 through strategies currently in place 224

Figure 4-12: Sources of California methane emissions (2019) 226

Figure 4-13: Sources of hydrofluorocarbon (HFC) emissions (2019) 229

Figure 4-14: Sources of anthropogenic black carbon (preliminary 2017 estimates; AR5 100-yr GWP 900) 230

Figure 4-15: Methane emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario 231

Figure 4-16: Degradable carbon deposited in landfills 234

Figure 4-17: Hydrofluorocarbon emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario 237

Figure 4-18: Potential emissions from refrigerants in existing equipment 239

Figure 4-19: Remaining non-combustion emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario 241

Figure 4-20: Acreage of burned wildland vegetation area 242

Figure 4-21: Forest (left) and shrubland (right) carbon stocks by 2045 251

Figure 4-22: Grassland carbon stocks by 2045 253

Figure 4-23: Cumulative CO_2e emissions from annual croplands in 2045 255

Figure 4-24: Cumulative CO_2e emissions from Delta wetlands by 2045 257

Figure 4-25: Carbon stocks in urban forests by 2045 259

Figure 4-26: Carbon stocks in sparsely vegetated lands by 2045 260

List of Tables

Table 1-1: Major climate legislation and executive orders enacted since the 2017 Scoping Plan 45

Table 2-1: Actions for the Scoping Plan Scenario: AB 32 GHG Inventory sectors 72

Table 2-2: Actions for the Scoping Plan Scenario: NWL sectors 80

Table 2-3: GHG emissions and removals needed to achieve carbon neutrality and meet the 20 $MMTCO_2$ removal and capture target in 2030 and the 100 $MMTCO_2$ removal and capture target in 2045..... 96

Table 2-4: Estimates of 2030 GHG emissions.....109

Table 2-5: Comparison of 2017 Scoping Plan and two Reference Scenarios 116

Table 3-1: Cost and savings relative to a growing California economy for the Scoping Plan Scenario (NWL).....122

Table 3-2: Income Impacts by California household income group in 2035 and 2045 for the Scoping Plan Scenario (AB 32 GHG Inventory Sectors) 125

Table 3-3: Percentage of households in each race/ethnicity category by household income group 127

Table 3-4: Gross state product and employment relative to a growing California economy for the Scoping Plan Scenario in 2035 / 2045 (NWL) 128

Table 3-5: Estimated GHG and criteria pollutant emission reductions relative to the Reference Scenario for the Scoping Plan Scenario in 2035/2045 (AB 32 GHG Inventory sectors).....138

Table 3-6: Estimated average annual GHG and criteria pollutant emission reductions relative to the Reference Scenario for the Scoping Plan Scenario from 2025–2045 (NWL).....140

Table 3-7: Estimated avoided incidence of mortality, cardiovascular and respiratory disease onset, work loss days and hospital admissions relative to the Reference Scenario for the Scoping Plan Scenario (AB 32 GHG Inventory sectors).....143

Table 3-8: Estimated average annual avoided incidence of hospital admissions, emergency room visits, and mortality relative to the Reference Scenario for the Scoping Plan Scenario resulting from forest, shrubland, and grassland wildfire emissions (NWL).....148

Table 3-9: Estimated social cost (avoided economic damages) of measures considered in the Scoping Plan Scenario (AB 32 GHG Inventory sectors).....151

Table 3-10: Estimated social cost (avoided economic damages) of measures considered in the Scoping Plan Scenario (NWL).....152

Table 3-11: Estimated cost per metric ton of reduced CO_2e relative to the Reference Scenario for measures considered in the Scoping Plan Scenario (AB 32 GHG Inventory sectors).....155

Table 3-12: Estimated average cost per metric ton of reduced CO_2e relative to the Reference Scenario for measures considered in the Scoping Plan Scenario (NWL).....156

Table 3-13: Examples of vulnerable groups due to socioeconomic, environmental, developmental, and climate change factors.....171

Table 3-14: Scoping Plan directional benefits for health co-benefit areas (heat, affordable housing, food security, economic security, and urban greening) 178

Table 3-15: Scoping Plan directional benefits for health co-benefit areas (traffic pollution, wildfire, and active transportation) 179

Table 4-1: Scoping Plan modeled target for NWL, based on increasing action on NWL 247

List of Appendices

Appendix A. Public Process

Appendix B. Final Environmental Analysis

Appendix C. AB 197 Measure Analysis

Appendix D. Local Actions

Appendix E. Sustainable and Equitable Communities

Appendix F. Building Decarbonization

Appendix G. Public Health

Appendix H. AB 32 GHG Inventory Sector Modeling

Appendix I. Natural and Working Lands Technical Support Document

Appendix J. Uncertainty Analysis

Appendix K. Climate Vulnerability Metric

Abbreviations

°F	Fahrenheit
°C	Celsius
AB	Assembly Bill
AQMD	Air Quality Management District
AR5	IPCC Fifth Assessment Report
BECCS	bioenergy with carbon capture and storage
CAISO	California Independent System Operator
CalEPA	California Environmental Protection Agency
CalGEM	California Geologic Energy Management Division
CalSTA	California State Transportation Agency
CAP	climate action plan
CARB	California Air Resources Board
CCR	California Code of Regulations
CCS	carbon capture and sequestration
CCUS	carbon capture, utilization, and storage
CDFA	California Department of Food and Agriculture
CDPH	California Department of Public Health
CDR	carbon dioxide removal
CE	common era
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CES	CalEnviroScreen
CH_4	methane
CMAQ	Community Multiscale Air Quality
CNRA	California Natural Resources Agency
CO_2	carbon dioxide
COPD	chronic obstructive pulmonary disease

CORE	Clean Off-Road Equipment
CPUC	California Public Utilities Commission
CVM	Climate Vulnerability Metric
DAC	direct air capture
DPR	Department of Pesticide Regulation
Draft EA	Draft Environmental Analysis for this Scoping Plan
EA	Environmental Analysis
ED	emergency department
EIA	U.S. Energy Information Administration
EJ	environmental justice
EJ Advisory Committee	Environmental Justice Advisory Committee
EO	executive order
EV	electric vehicle
F-gas	fluorinated gas
FCEV	fuel cell electric vehicle
GCF	Governors' Climate and Forests Task Force
GDP	gross domestic product
GHG	greenhouse gas
GSP	gross state product
GW	gigawatt
GWh	gigawatt-hour
GWP	global warming potential
HDV	heavy-duty vehicle
HD ZEV	heavy-duty zero-emission vehicle
HFC	hydrofluorocarbon
IBank	Infrastructure and Economic Development Bank
ICE	internal combustion engine
IPCC	Intergovernmental Panel on Climate Change

IPT	incidence-per-ton
IWG	Interagency Working Group
LCFS	low-carbon fuel standard
LDV	light-duty vehicle
MDV	medium-duty vehicle
MMT	million metric tons
$MMTCO_2e$	million metric tons of carbon dioxide equivalent
MOU	memorandum of understanding
MRR	Mandatory Reporting of GHG Emissions
$MTCO_2e$	metric tons of carbon dioxide equivalent
MW	megawatt
N_2O	nitrous oxide
NEMS	National Energy Systems Model
NF_3	nitrogen trifluoride
NOAA	National Oceanic and Atmospheric Administration
NOx	nitrogen oxides
NRDC	National Resources Defense Council
NWL	Natural and Working Lands
OEHHA	Office of Environmental Health Hazard Assessment
OGV	Ocean-Going Vessel
OPR	Governor's Office of Planning and Research
OTC	once-through cooled
PFC	perfluorocarbon
PHMSA	Pipelines and Hazardous Materials Safety Administration
PM	particulate matter
$PM_{2.5}$	fine particulate matter
PPP	public-private partnership
RFS	renewable fuel standard

ROG	reactive organic gases
RPS	Renewables Portfolio Standard
SB	Senate Bill
SC-CH_4	social cost of methane
SC-CO_2	social cost of carbon
SC-GHG	social cost of greenhouse gases
SC-N_2O	social cost of nitrous oxide
SF_6	sulfur hexafluoride
SGIP	Self-Generation Incentive Program
SLCP	short-lived climate pollutant
TSD	Technical Support Document
UC	University of California
UCLA	University of California, Los Angeles
UNFCCC	United Nations Framework Convention on Climate Change
U.S. EPA	United States Environmental Protection Agency
VMT	vehicle miles traveled
WUI	wildland-urban interface
ZEV	zero-emission vehicle

Executive Summary

This Scoping Plan lays out the sector-by-sector roadmap for California, the world's fifth[1] largest economy, to achieve carbon neutrality by 2045 or earlier, outlining a technologically feasible, cost-effective, and equity-focused path to achieve the state's climate target. This is a challenging but necessary goal to minimize the impacts of climate change. There have been three previous Scoping Plans. Previous plans have focused on specific greenhouse gas (GHG) reduction targets for our industrial, energy, and transportation sectors—first to meet 1990 levels by 2020, then to meet the more aggressive target of 40 percent below 1990 levels by 2030. This plan, addressing recent legislation and direction from Governor Newsom, extends and expands upon these earlier plans with a target of reducing anthropogenic emissions to 85 percent below 1990 levels by 2045. This plan also takes the unprecedented step of adding carbon neutrality as a science-based guide and touchstone for California's climate work. The plan outlines how carbon neutrality can be achieved by taking bold steps to reduce GHGs to meet the anthropogenic emissions target and by expanding actions to capture and store carbon through the state's natural and working lands and using a variety of mechanical approaches.

What this means for California is an ambitious and aggressive approach to decarbonize every sector of the economy, setting us on course for a more equitable and sustainable future in the face of humanity's greatest existential threat, and ensuring that those who benefit from this transformation include communities hardest hit by climate impacts and the ongoing pollution from the use of fossil fuels. The combustion of fossil fuels has polluted our air—particularly in low-income communities and communities of color—for far too long and is the root cause of climate change. This Scoping Plan helps us chart the path to a future where race and class are no longer predictors of disproportionate burdens from harmful air pollution and climate impacts.

The major element of this unprecedented transformation is the aggressive reduction of fossil fuels wherever they are currently used in California, building on and accelerating carbon reduction programs that have been in place for a decade and a half. That means rapidly moving to zero-emission transportation; electrifying the cars, buses, trains, and trucks that now constitute California's single largest source of planet-warming pollution. It also means phasing out the use of fossil gas used for heating our homes and buildings. It means clamping down on chemicals and refrigerants that are thousands of times more powerful at trapping heat than carbon dioxide (CO_2). It means providing our communities

[1] In October 2022, California was poised to become the world's fourth largest economy.

with sustainable options for walking, biking, and public transit to reduce reliance on cars and their associated expenses. It means continuing to build out the solar arrays, wind turbine capacity, and other resources that provide clean, renewable energy to displace fossil-fuel fired electrical generation. It also means scaling up new options such as renewable hydrogen for hard-to-electrify end uses and biomethane where needed. Successfully achieving the outcomes called for in this Scoping Plan would reduce demand for liquid petroleum by 94 percent and total fossil fuel by 86 percent in 2045 relative to 2022.[2] Despite these world-leading efforts, some amount of residual emissions will remain from hard-to-abate industries such as cement, internal combustion vehicles still on the road, and other sources of GHGs, including high global warming chemicals used as refrigerants.

The plan addresses these remaining emissions by re-envisioning our natural and working lands—forests, shrublands/chaparral, croplands, wetlands, and other lands—to ensure they play as robust a role as possible in incorporating and storing more carbon in the trees, plants, soil, and wetlands that cover 90 percent of the state's 105 million acres while also thriving as a healthy ecosystem. Modeling indicates that natural and working lands will not, on their own, provide enough sequestration and storage to address the residual emissions. For that reason, it is necessary to research, develop, and deploy additional methods of capturing CO_2 that include pulling it from the smokestacks of facilities, or drawing it out of the atmosphere itself and then safely and permanently utilizing and storing it, as called for in recent legislation. Carbon removal also will be necessary to achieve net negative emissions to address historical GHGs already in the atmosphere.

This is a plan that aims to shatter the carbon status quo and take action to achieve a vision of California with a cleaner, more sustainable environment and thriving economy for our children. This ambitious plan will serve as a model for other partners around the world as they consider how to make their transition. As we have so often in the past, California can continue to serve as a leader in innovation that has produced not only the fifth largest economy on the planet, but ultimately one of the most energy-efficient economies, with a track record of demonstrating the ability to decouple economic growth from carbon pollution. This plan also builds upon current and previous environmental justice efforts to integrate environmental justice directly into the plan, to ensure that all communities can reap the benefits of this transformational plan. Specifically, this plan:

[2] See *https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-PATHWAYS-data-E3.xlsx* for energy demand reductions.

- Identifies a path to keep California on track to meet its SB 32 GHG reduction target of at least 40 percent below 1990 emissions by 2030.
- Identifies a technologically feasible, cost-effective path to achieve carbon neutrality by 2045 and a reduction in anthropogenic emissions by 85 percent below 1990 levels.
- Focuses on strategies for reducing California's dependency on petroleum to provide consumers with clean energy options that address climate change, improve air quality, and support economic growth and clean sector jobs.
- Integrates equity and protecting California's most impacted communities as driving principles throughout the document.
- Incorporates the contribution of natural and working lands (NWL) to the state's GHG emissions, as well as their role in achieving carbon neutrality.
- Relies on the most up-to-date science, including the need to deploy all viable tools to address the existential threat that climate change presents, including carbon capture and sequestration, as well as direct air capture.
- Evaluates the substantial health and economic benefits of taking action.
- Identifies key implementation actions to ensure success.

The path forward is informed by robust science. The recent Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) summarizes the latest scientific consensus on climate change. It finds that atmospheric concentrations of CO_2 have increased by 50 percent since the industrial revolution and continue to increase at a rate of two parts per million each year.[3] By the 2030s, and no later than 2040, the world will exceed 1.5°C warming unless there is drastic action. While every tenth of a degree matters—every incremental increase in warming brings additional negative impacts—climate-related risks to human health, livelihoods, and biodiversity are projected to increase further under 2°C warming, compared to 1.5°C.[4] For example, at 1.5°C of global warming, we would experience increasing heat waves, longer warm seasons, and shorter cold seasons, but at 2°C of global warming, heat extremes would more often reach critical tolerance thresholds for human health and agriculture.[5] We are already seeing unprecedented climate change impacts, such as continued sea level rise, that are

[3] IPCC. 2021. *Climate Change 2021: The Physical Science Basis.* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press. https://www.ipcc.ch/report/ar6/wg1/.

[4] IPCC. 2018. *Global Warming of 1.5°C.* World Meteorological Organization. Geneva, Switzerland. 32 pp. https://www.ipcc.ch/sr15/.

[5] IPCC. 2021. Climate change widespread, rapid, and intensifying – IPCC. August. *https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/.*

"irreversible" for centuries to millennia, and we are dangerously close to hitting 1.5ºC in the near term.[6] To avoid climate catastrophe and remain below 1.5°C with limited or no overshoot of that threshold, global net anthropogenic CO_2 emissions need to reach net zero by 2050.

It has been 16 years since the Global Warming Solutions Act of 2006 was passed and signed into law. In 2017, the second update to the Assembly Bill (AB) 32 Climate Change Scoping Plan[7] (2017 Scoping Plan) laid out a cost-effective and technologically feasible path to achieve the 2030 GHG reduction target. At the time, many characterized the plan and the AB 32 target as unachievable, citing that it would lead to massive business and job loss, and excessive costs. Those predictions proved to be incorrect as California achieved its AB 32 target years ahead of schedule, all the while growing our economy, with the state distinguishing itself as a hub for green technology investment. This Scoping Plan draws on a decade and a half of proven successes and additional new approaches to provide a balanced and aggressive course of effective actions to achieve carbon neutrality in 2045, if not before, in addition to the 2030 goal.

California's economy is projected to grow vigorously in the coming years and decades. In 2045, under a Reference Scenario, the gross state product would be $5.1 trillion, nearly $2 trillion more than in 2021, and allow growth that would add hundreds of thousands of jobs. Under the Scoping Plan scenario, impacts to economic and job growth would be negligible in both 2035 and 2045, while delivering $199 billion of benefits in the form of reduced hospitalizations, asthma cases, and lost work and school days due to the cleaner air supported by this plan. This should come as no surprise given the tremendous growth of California's economy since the Great Recession of 2007–2009, even as the state has taken drastic measures to lower emissions. As noted, the savings associated with ambitious climate action are extensive, both in terms of avoided climate impacts and health costs. As described in Chapter 1, the health costs of climate and air pollution in the U.S. are well over $800 billion today and will continue to grow in the coming years[8] without robust action. Similarly, the costs of delayed or insufficient climate action could cost the

[6] United Nations. 2021. IPCC report: 'Code red' for human driven global heating, warns UN chief. August 9. *https://news.un.org/en/story/2021/08/1097362*.
[7] CARB. 2017. *California's 2017 Climate Change Scoping Plan.* *https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf.*
[8] Alwis, D. D., and V. S. Limaye. No date. *The Costs of Inaction: The Economic Burden of Fossil Fuels and Climate Change on Health in the United States.* NRDC, The Medical Society Consortium on Climate and Health, and WHPCA. https://www.nrdc.org/sites/default/files/costs-inaction-burden-health-report.pdf.

U.S. upwards of $14.5 trillion over the next 50 years.[9] We can either take action now or pay the cost of inaction, both now and later.

We cannot take on this unprecedented challenge alone. Collaboration with the federal government, other U.S. states, and other jurisdictions around the world will continue to be fundamental for California to succeed in achieving its climate targets, especially as the pace of our efforts increases in the coming years. We believe this collaboration and coordination also creates a race to the top, encouraging and enabling other jurisdictions to achieve climate and air quality goals as well, and often providing lessons for national action.

One example of fruitful collaboration is California's longstanding vehicle emissions standards programs, which have repeatedly been freely adopted by other states, consistent with the federal Clean Air Act. California's programs frequently pioneer more rigorous standards or new technologies—such as the now-standard catalytic converter and the rules that led directly to the nation-leading numbers of zero-emission vehicles on our roads today. From initial standards for cars and trucks decades ago to the world-leading Advanced Clean Trucks program currently helping to electrify heavy-duty vehicles, this partnership continues to offer regulatory options and spread innovative technologies. A major example of future work is the Advanced Clean Cars II program, which lays out California's legally binding path to achieving 100 percent zero emission vehicle (ZEV) sales in 2035.[10] The California Air Resources Board (CARB) continues to work closely with many other states that also see zero-emission vehicles as critical to their climate and public health goals and expects many states to choose to adopt this regulation as well. This partnership with other states also creates market certainty for automakers, which in turn helps to ensure that California consumers have access to a variety of ZEVs at multiple price points.

The Scoping Plan Process

Four scenarios were extensively modeled to develop this Scoping Plan, with the objective of informing the most viable path to remain on track to achieve our 2030 GHG reduction target: a reduction in anthropogenic emissions by 85% below 1990 levels and carbon neutrality by 2045. All four have their merits and are informed by stakeholder input. The scenario ultimately chosen as the basis of this Scoping Plan is the alternative that most

---

[9] Deloitte. 2022. *The Turning Point: A New Economic Climate in the United States.* https://www2.deloitte.com/content/dam/Deloitte/us/Documents/about-deloitte/us-the-turning-point-a-new-economic-climate-in-the-united-states-january-2022.pdf?id=us:2el:3dp:wsjspon:awa:WSJSBJ:2021:WSJFY22.

[10] Executive Department. State of California. Executive Order N-79-20. *https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf*.

closely aligns with existing statute and Executive Orders. It was selected because it best achieves the balance of cost-effectiveness, health benefits, and technological feasibility.

For the first time, this Scoping Plan includes modeling and quantification of GHG emissions and carbon sequestration in natural and working lands (NWL). To date, the focus has been only on reducing the emissions of GHGs from our transportation, energy, and industrial sectors. The state's 2020 and 2030 GHG reductions targets only include these sources, as they are the primary drivers of climate change and disproportionate harmful air pollution in our vulnerable communities. This Scoping Plan, through the lens of carbon neutrality, expands the scope to more meaningfully consider how our NWL contribute to our long-term climate goals. For the first time, new and cutting-edge modeling tools allow us to estimate the quantitative ability of our forests and other landscapes to remove and store carbon under different scenarios. These cutting-edge tools were developed through a stakeholder process and in coordination with other agencies for the purpose of this update and will continue to be refined over time and made available to others seeking to do similar work.

As recent data and Scoping Plan modeling shows, our NWL also can act as a source of emissions, principally in the form of wildfires. California's forests are experiencing a deadly combination of drought and heat combined with a century of misguided fire suppression management. Scoping Plan modeling shows that, at this time and until our forests reach a balance through appropriate treatments, California's NWL will act as a net source of emissions, not a sink. As such, the Scoping Plan includes policy direction and actions intended to quickly move the sector toward being a net sink and a more natural state, where wildfires will continue to be an important part of the healthy forest cycle but not at the intensity and frequency observed in recent years.

Development of this Scoping Plan also includes careful consideration of, and coordination with, other state agencies, consistent with Governor Gavin Newsom's whole-of-government approach to tackling climate change. State agency plans and regulations, including the SB 100 Joint Agency Report,[11] State Implementation Plan, Climate Action Plan for Transportation Infrastructure,[12] AB 74 Studies on Vehicle Emissions and Fuel

[11] California Public Utilities Commission (CPUC), California Energy Commission (CEC), and CARB. 2021. *SB 100 Joint Agency Report.* https://www.energy.ca.gov/sb100.
[12] California State Transportation Agency (CalSTA). 2021. Climate Action Plan for Transportation Infrastructure. https://calsta.ca.gov/subject-areas/climate-action-plan.

Demand and Supply,[13,14,15] Short-Lived Climate Pollutant Strategy (SLCP Strategy),[16] CARB's Achieving Carbon Neutrality Report,[17] Climate Smart Lands Strategy,[18] Natural Working Land Implementation Plan,[19] and the California Climate Insurance Report: *Protecting Communities, Preserving Nature, and Building Resiliency,*[20] among others, provided critical inputs and data points for this plan. This Scoping Plan is the product of work by multiple agencies across the Administration, including dozens of public workshops and years of rigorous analysis and economic modeling by California's leading institutions. This cooperation on planning lays the foundation for even closer coordination among and between state agencies to put the plan into effect.

The plan is also the product of tireless efforts of, and recommendations from, the AB 32 Environmental Justice Advisory Committee (EJ Advisory Committee). The EJ Advisory Committee, created by statute, plays a critical role to inform the development of each Scoping Plan and helps to ensure environmental justice is integrated throughout the plan. CARB reconvened the EJ Advisory Committee in early 2021 to advise on the development of this Scoping Plan. In their advisory role, the EJ Advisory Committee has worked together to provide inputs to CARB to inform the development of scenarios and the associated modeling. And in April 2022, the EJ Advisory Committee provided draft preliminary recommendations in advance of the Draft 2022 Scoping Plan to help ensure the draft plan meaningfully addresses environmental justice. The CARB Board and EJ Advisory Committee held a joint board hearing on September 1, 2022, where the EJ Advisory Committee presented their final recommendations on the Scoping Plan. Over five dozen of the recommendations are reflected in the Scoping Plan. Going forward, as this plan is ultimately acted on by the Board, ongoing input from the EJ Advisory

---

[13] California Environmental Protection Agency (CalEPA). 2021. Carbon Neutrality Studies. https://calepa.ca.gov/climate/carbon-neutrality-studies/.

[14] Brown, A. L., et. al. 2021. *Driving California's Transportation Emissions to Zero.* University of California Institute of Transportation Studies. https://escholarship.org/uc/item/3np3p2t0.

[15] Deschenes, O. 2021. *Enhancing equity while eliminating emissions in California's supply of transportation fuels.* University of California Santa Barbara. https://zenodo.org/record/4707966#.YKPiaKhKi73.

[16] CARB. Short-Lived Climate Pollutants. https://ww2.arb.ca.gov/our-work/programs/slcp.

[17] Energy and Environmental Economics, Inc. 2020. *Achieving Carbon Neutrality in California: PATHWAYS Scenarios Developed for the California Air Resources Board*. October. *https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf*.

[18] California Natural Resources Agency (CNRA). 2021. Draft Climate Smart Lands Strategy. *https://resources.ca.gov/Initiatives/Expanding-Nature-Based-Solutions*.

[19] CARB. 2019. *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan. https://ww2.arb.ca.gov/resources/documents/nwl-implementation-draft*.

[20] California Department of Insurance. 2021. *Protecting Communities, Preserving Nature, and Building Resiliency. climate-insurance-report.pdf (ca.gov)*.

Committee will be essential to address environmental justice and achieve the ambitious vision outlined in the plan throughout its implementation in the coming years.

Importantly, per legislative direction, the Scoping Plan development includes modeling and analyses of emissions, economics, air quality, health, jobs, and public health. This work is important to inform the discussion around trade-offs and how to balance the various legislative direction in identifying a path to achieve the state's climate goals. The technical work serves as a backdrop to what this means to Californian's daily lives—to how they will work, play, and live as we act to eliminate fossil fuel combustion and achieve the many public health and environmental benefits that will result from that action.

Ensuring Equity and Affordability

The state has a long history of public health and environmental protection. However racist and discriminatory practices such as redlining have resulted in low-income communities and communities of color being disproportionately exposed to health hazards and pollution burdens.[21] These communities are often located adjacent to major roadways and large stationary sources that not only emit GHGs, but also harmful localized air pollution. The plan delivers on the promise to transform the way we move, live, and work by nearly eliminating our dependence on fossil fuels. It includes effective actions to move with all possible speed to clean energy, zero-emission cars and trucks, energy-efficient homes, sustainable agriculture, and resilient NWL. And it prioritizes working with the communities most impacted to ensure that these strategies address their needs.

An important part of our equity consideration is ensuring the transition to a zero-emission economy is affordable and accessible, and that it uplifts disadvantaged, low-income communities and communities of color. Some aspects of the transition will have associated costs (e.g., escalating efforts to retrofit existing homes and businesses to support electric appliances and vehicles and increased costs of insurance). The state must ensure that these costs do not disproportionately burden consumers. In addition, the state has an important role to play in providing financial incentives, especially to low-income consumers, to allow for uptake of clean technologies. The Department of Community Services and Development's Low Income Weatherization Program is a prime example of this approach, enabling low-income Californians to be part of the zero-emission transition, all while lowering energy bills. The program provides low-income households with solar photovoltaic systems and energy efficiency upgrades at no cost to residents, helping cushion the impact of climate change on vulnerable communities.

[21] CalEPA. 2021. Pollution and Prejudice: Redlining and Environmental Injustice in California. August 16. *https://storymaps.arcgis.com/stories/f167b251809c43778a2f9f040f43d2f5*.

With this Scoping Plan, the state also adds another tool to help identify and close climate change impact gaps that will emerge over time. As California invests in climate mitigation and adaptation, it is essential to understand the relative impact of climate change across the state's diverse communities. We know not all communities are equally resilient in the face of climate impacts due to persisting health and opportunity gaps. We also know that a global metric such as the Social Cost of Carbon cannot adequately capture the incremental additional impact faced by overly burdened communities. The Climate Vulnerability Metric (CVM) is specifically focused on quantifying the community-level impacts of a warming climate on human welfare.

Energy and Technology Transitions

To support the transformation needed, we must build the clean energy production and distribution infrastructure for a carbon-neutral future. The solution will have to include transitioning existing energy production and transmission infrastructure to produce zero-carbon electricity and hydrogen, and utilizing biogas resulting from wildfire management or landfill and dairy operations, among other substitutes. In almost all sectors, electrification will play an important role. That means that the grid will need to grow at unprecedented rates and ensure reliability, affordability, and resiliency through the next two decades and beyond. It also means we need to keep all options on the table, as it will take time to fully grow the electricity grid to be the backbone for a decarbonized economy. We also know that electrification is not possible in all situations. As such, this plan systematically evaluates and identifies feasible clean energy and technology options that will bring both near-term air quality benefits and deliver on longer-term climate goals.

This transition will not happen overnight. It will take time and planning to ensure a smooth transition of existing energy infrastructure and deployment of new clean technology. And while this Scoping Plan has the longest planning horizon of any Scoping Plan to date, this 25-year horizon is still relatively short in terms of transforming California's economy. We must avoid making choices that will lead to stranded assets and incorporate new technologies that emerge over time. Importantly, given the pace at which we must transition away from fossil fuels, we absolutely must identify and address market and implementation barriers to be successful. The scale of transition includes adding four times the solar and wind capacity by 2045 and about 1,700 times the amount of current hydrogen supply.

As we transition our energy systems, we must also rapidly deploy the clean technologies that rely on a decarbonized grid. As called for in Executive Order N-79-20, all new passenger vehicles sold in California will be zero-emission by 2035, and all other fleets will have transitioned to zero-emission as fully possible by 2045. This means the percentage of fossil fuel combustion vehicles will continue to rapidly decrease, becoming a fading vision of the past. Successful implementation of this Executive Order (EO) and other zero-emission priorities will have to be attractive to consumers. As an example,

electric and hydrogen transportation refueling must be readily accessible, and active transportation and clean transit options must be cheaper and more convenient than driving.

Cost-Effective Solutions Available Today

Ultimately, to achieve our climate goals, urgent efforts are needed to slash GHG emissions. Fortunately, cost-effective solutions are available to do so in many cases. In short, this plan relies on existing technologies—it does not require major technological breakthroughs that are highly uncertain.

For example, targeted action to reduce methane emissions can be achieved at low or negative cost, and with significant near-term climate and public health benefits. In many cases, renewable energy and energy storage are cheaper than polluting alternatives, and are already firmly part of our business-as-usual approach; modeling related to the most recent integrated resource planning process at the California Public Utilities Commission (CPUC) has shown that scenarios associated with the best emissions outcomes had the lowest average rates. As another example, research from Energy Innovation shows that the U.S. can achieve 100 percent zero-carbon power by 2035 without increasing customer costs.[22]

The same is either already true, or soon to be true, for zero-emission vehicles as well. Myriad studies show cost parity for light-duty and heavy-duty ZEVs being achieved by mid-decade or shortly thereafter. A carbon neutrality study conducted by the University of California (UC) Institute of Transportation Studies and funded by the California Environmental Protection Agency (CalEPA) shows that achieving carbon neutrality in the transportation sector will *save* Californians $167 billion through 2045.[23] Similar research from the Goldman School of Public Policy at UC Berkeley finds that achieving 100 percent light-duty ZEV sales nationwide would save consumers $2.7 trillion through 2050; equivalent to $1,000 per household, per year, for 30 years.[24]

Many of these outcomes are a direct result of California's vision and policy development to advance clean energy and climate solutions, including through the Renewables Portfolio Standard, Advanced Clean Cars II regulations, SLCP Reduction Strategy, and

---

[22] Phadke, A. et al. 2020. "Illustrative Pathways to 100 Percent Zero Carbon Power by 2035 Without Increasing Customer Costs, Energy Innovation." September. *https://energyinnovation.org/wp-content/uploads/2020/09/Pathways-to-100-Zero-Carbon-Power-by-2035-Without-Increasing-Customer-Costs.pdf*.

[23] Brown, A. L., et al. 2021. *Driving California's Transportation Emissions.* *http://dx.doi.org/10.7922/G2MC8X9X*. Retrieved from https://escholarship.org/uc/item/3np3p2t0.

[24] Goldman School of Public Policy. 2021. *2035: The Report: Transportation.* UC Berkeley. April. *https://www.2035report.com/transportation/*.

others. While the world collectively has not yet fully deployed clean energy and climate solutions at the scale needed to adequately address climate change, California has made tremendous progress—even since the last Scoping Plan update in 2017. Continued ambition, leadership, and climate policy development from California will help the state achieve the scale of emissions reductions needed from technologies and strategies that are already cost-effective or close to it today, and will move additional technologies and strategies to that point in the near future. Achieving those outcomes and reducing costs for the entire array of climate solutions needed to achieve carbon neutrality and then maintain net-negative emissions will prove the true measure of California's success. This will enable California to not just meet our own climate targets, but to ultimately develop the replicable solutions that can scale globally to address global warming.

Continue with a Portfolio Approach

Over the past decade and a half, the state has undertaken a successful three-pronged approach to reducing GHGs: incentives, regulations, and carbon pricing. The 2017 Scoping Plan leveraged existing programs such as the Renewables Portfolio Standard, Advanced Clean Cars, Low Carbon Fuel Standard, Short-lived Climate Pollutant Strategy, mobile source measures to achieve federal air quality targets, and a Cap-and-Trade Program, among others, to lay out a technologically feasible and cost-effective path to achieve the 2030 GHG reduction target. When looking toward the 2045 climate goals and the deeper GHG reductions needed across the AB 32 GHG Inventory sectors, all of the existing programs must be evaluated and, as necessary, strengthened to support the rapid production and deployment of clean technology and energy, as well as the increased pace and scale of actions on our natural and working lands.

The challenge before us requires us to keep all tools on the table. Given the climate mitigation co-benefits, critical actions to deliver near-term air quality benefits, such as those included in the State Implementation Plan to achieve the federal air quality standards, are incorporated into this Scoping Plan, as are new legislative mandates to decarbonize the electricity and cement sectors. And, if additional gaps are identified, new programs and policies must be developed and implemented to ensure all sectors are on track to reduce emissions. Opportunities to leverage these programs to address ongoing air quality disparities must also be considered, along with targeted environmental justice policies such as the AB 617 Community Air Protection Program and the investments made possible through the California Climate Investments Program.

Conclusion

California has never undertaken such a comprehensive, far-reaching, and transformative approach to fighting climate change as that called for in this plan. Once implemented, it will place every aspect of how we live, work, play, and travel in California on a more sustainable footing, with a focus on directly benefitting those communities already most burdened by pollution. This comprehensive approach reflects how climate change is

already changing life in California. We have all experienced the impacts of devastating wildfires, extreme heat, and drought. Despite much progress, California still has some of the worst air pollution in the nation, especially in the San Joaquin Valley and the Los Angeles Basin, which is driven by the continued use of fossil fuel-powered trucks and cars.

This Scoping Plan provides a solution; a way forward and a vision of a California where we can and will address those impacts. This plan is fundamentally based on hope. It is a hope grounded in experience and science that we can fundamentally improve the California we leave to future generations. The plan is built on the legacy of effective actions and on the conviction that we can effectively marshal the combined capabilities of California—from state, regional, tribal, and local governments to industry to our research institutions, and most importantly, to the nearly 40 million Californians who will benefit from the actions laid out in the plan. It addresses the challenge of our generation by laying out a pathway and guideposts for action across three decades. But the Scoping Plan is only that: a plan. The hard work—and hopeful work—is putting its recommendations into action. And there is no time to waste.

Post-adoption of the Scoping Plan

As with previous Scoping Plans, CARB Board approval is the beginning of the next phase of climate action. Specifically, approval of this plan catalyzes a number of efforts, including the development of new regulations as well as amendments to strengthen regulations and programs already in place, not just at CARB but across state agencies. The unprecedented rate of transition will also require the identification and removal of market and implementation barriers to the production and deployment of clean technology and energy. All of these actions and more will be needed if we are to achieve our climate goals.

Chapter 1: Introduction

"The debate is over around climate change. Just come to the state of California. Observe it with your own eyes."

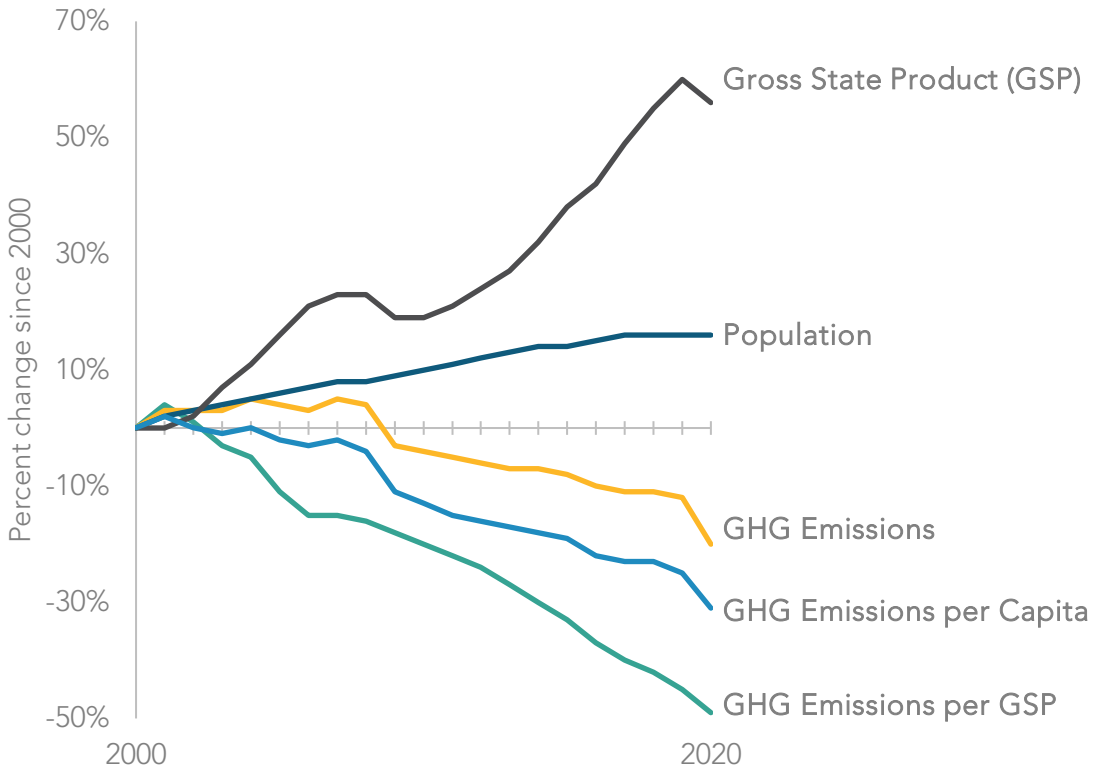
- California Governor Gavin Newsom in September 2020 after surveying the devastation caused by catastrophic wildfires

The impacts of climate change are no longer a distant threat on the horizon—they are right here, right now, with a growing intensity that is adversely affecting our communities and our environment, here in California and across the globe. The science that, decades ago, predicted the impacts we are currently experiencing is even stronger today and unambiguously tells us what we must do to limit irreversible damage: we must act with renewed commitment and focus to do more and do it sooner. That science is indisputable. Unless we increase ambition, we will be faced with more fire, more drought, more temperature extremes, and deadly, choking air pollution. The future of our state—our communities, economy, and ecosystems—is inextricably tied to the way we respond in this decade and the partnerships we forge along the way.

The impacts of climate change fall most heavily on frontline communities that bear the brunt of extreme heat, drought, wildfires, and other effects. Low-income communities and communities of color are also disproportionately impacted by fossil fuel combustion-related air pollution and related health problems. The continued phaseout of fossil fuel combustion will advance both climate and air quality goals and will deliver the greatest health benefits to the most impacted communities.

As it has responded to this climate crisis, California has established itself as a global leader in science-based, public health-focused climate change mitigation and air quality control. The California Legislature has worked with both Republican and Democratic governors to advance action on public health and environmental protections—and California has made progress on addressing climate change during periods of both Republican and Democratic federal administrations. Since the passage of Assembly Bill 32 (AB 32) (Núñez and Pavley, Chapter 488, Statutes of 2006), California has developed bold, creative, and durable policy solutions to protect our environment and public health, all while growing our economy. In fact, California met the target established in AB 32—a return of greenhouse gas (GHG) emissions to 1990 levels by 2020—years ahead of schedule, even as the state established itself as the one of the largest economies in the world. As Figure 1-1 below shows, California's emissions and economic growth have continued to decouple, and California is now the fifth largest economy in the world.

Figure 1-1: California total and per capita GHG emissions[25]



Recognizing both California's early successes in achieving GHG emissions reductions while growing the economy, as well as the worsening impacts of climate change, our governors and legislators have continued to enact ambitious goals. California's unwavering commitment to address climate change is based on indisputable science and data. This commitment is also informed by our collective efforts to address environmental justice and advance racial equity, such that race will no longer be a predictor for disproportionate environmental burdens faced by low-income communities and communities of color. As the Office of Environmental Health Hazard Assessment's

[25] Due to the global pandemic, 2020 is an outlier year and should not be considered indicative of a trend; emissions are likely to increase as economies recover from the impacts of the pandemic.

(OEHHA's) recent analysis of race/ethnicity and air pollution vulnerability and CalEnviroScreen 4.0 scores demonstrate, much work remains to be done.[26]

Many of California's environmental policies have served as models for similar policies in other U.S. states, and at national and international levels. Moving forward, California will continue its pursuit of collaborations and advocacy for action to address climate change at all levels of government. While California is responsible for just one percent of global GHG emissions, and we must do our part, we also play an important role in exporting both political will and technical solutions to address the climate crisis globally.

Today, we have a chance to re-envision California's future and set the state on a path to be carbon neutral no later than 2045 while advancing equity, addressing environmental justice, and continuing to grow our economy. This Scoping Plan provides a roadmap outlining key policies we can implement to achieve our climate goals while improving the health and welfare of Californians and addressing disparities in health outcomes to create a more equitable future. It will enable us to turn the corner in our efforts to protect and preserve our critical natural and public resources, all while providing unparalleled opportunities for clean, pollution-free economic growth.

Severity of Climate Change Impacts

With the increasing severity and frequency of drought, wildfire, extreme heat, and other impacts, Californians just have to look out their windows to know that climate change is real and rapidly getting worse. The impacts we thought we would see in the decades to come are happening now. We must act decisively to both reduce our GHG emissions and build resilience to these impacts for ourselves, future generations, and our iconic landscapes.

Wildfires

Of the twenty largest wildfires ever recorded in California, nine occurred in 2020 and 2021. The worst wildfire season in California's recorded history was in 2018, with over 24,226 structures damaged or destroyed and over 100 lives lost. The largest wildfire season ever recorded in state history was in 2020, where more than 4.3 million acres burned, albeit at different intensity and with varying ecological impacts, and over 112 million metric tons of

[26] OEHHA and CalEPA. 2021. Analysis of Race/Ethnicity and CalEnviroScreen 4.0 Scores. *https://oehha.ca.gov/media/downloads/calenviroscreen/document/calenviroscreen40raceanalysisf2021.pdf*.

carbon dioxide (CO_2) emitted into the atmosphere.[27] The economic damage of these fires was estimated to be over $10 billion in property damage and over $2 billion in fire suppression costs.[28] The Camp Fire, which destroyed much of Paradise, California, was the world's costliest natural disaster in 2018, with overall damages of $16.5 billion.[29] It was also the deadliest fire in California history, with 85 civilian fatalities. Wildfires have always been part of California's natural ecology and will continue to be. However, changes to the state's climate and precipitation expands the footprint of wildfire threat, severity, and intensity, with one quarter of California—more than 25 million acres—now classified as being under very high or extreme fire threat.[30]

The impacts of wildfire smoke have been linked to respiratory infections, cardiac arrests, low birth weight, mental health conditions, and exacerbated asthma and chronic obstructive pulmonary disease.[31] In 2020, with all of California covered by wildfire smoke for over 45 days—and 36 counties for at least 90 days—maximum fine particulate ($PM_{2.5}$) levels persisted in the "hazardous" range of the Air Quality Index for weeks in several areas of the state.[32,33]

Catastrophic wildfire damages extend beyond human health and the economy. The Castle Fire in 2020 and the KNP Complex and Windy Fires in 2021 led to the loss of an unprecedented number of giant sequoias: an estimated 13 to 19 percent of the giant

---

[27] CARB. 2020. Public Comment Draft Greenhouse Gas Emissions of Contemporary Wildfire, Prescribed Fire, and Forest Management Activities. https://ww3.arb.ca.gov/cc/inventory/pubs/ca_ghg_wildfire_forestmanagement.pdf.

[28] News18. 2021. San Francisco Bay Area Receives its First Wildfire Warning of 2021, After California Concludes its Driest Year. https://www.news18.com/news/buzz/san-francisco-bay-area-receives-its-first-wildfire-warning-of-2021-after-california-concludes-its-driest-year-3722897.html.

[29] Munich RE. 2019. Extreme Storms, Wildfires and Droughts Cause Heavy Nat Cat Losses In 2018. https://www.munichre.com/en/company/media-relations/media-information-and-corporate-news/media-information/2019/2019-01-08-extreme-storms-wildfires-and-droughts-cause-heavy-nat-cat-losses-in-2018.html#-1808457171.

[30] CARB. No date. Wildfires. https://ww2.arb.ca.gov/our-work/programs/wildfires/about.

[31] Reid, C. E., M. Brauer, F. H. Johnston, M. Jerrett, J. R. Balmes, and C. T. Elliott. 2016. "Critical Review of Health Impacts of Wildfire Smoke Exposure." *Environmental Health Perspectives* http://dx.doi.org/10.1289/ehp.1409277.

[32] Vargo J. A. 2020 (updated in 2021 using the NOAA Hazard Mapping System). "Time Series of Potential US Wildland Fire Smoke Exposures." *Frontiers in Public Health* https://doi.org/10.3389/fpubh.2020.00126.

[33] CalFire. 2020 *Fire Siege Report.* https://www.fire.ca.gov/media/hsviuuv3/cal-fire-2020-fire-siege.pdf.

sequoia population in the Sierra Nevada. An iconic species, giant sequoias are the largest trees on earth, with exceptional longevity outside of climate extremes.[34,35]

It is clear that we must take drastic measures to prepare for future wildfires, which is why California invested $2.7 billion in wildfire resilience from fiscal years 2020 to 2023. The exponential increase in funding launched more than 552 wildfire resilience projects in less than a year, and CAL FIRE met its 2025 goal of treating 100,000 acres a full three years ahead of schedule. Since Fiscal Year 2019–20, treatment work has significantly increased, and CAL FIRE has averaged 100,000 acres treated each fiscal year.

Although we are making progress, we have a lot more work to do in order to achieve our goal of treating one million acres annually by 2025. The Governor's Wildfire and Forest Resilience Strategy details 99 actions needed to address the key drivers of catastrophic wildfires, ramp up the pace and scale of forest management, and make threatened communities more resilient to catastrophic fires. It is also important to note that natural wildfire cycles are a part of a sustainable forest ecosystem and will continue to play a role in a healthy forests' future. We should not expect wildfires to cease, but we must manage our lands to address catastrophic wildfires that result from buildup of carbon stocks due to our interventions to suppress wildfires and from climate change resulting from fossil fuel combustion.

Drought

Drought is a recurring feature of the California climate that has been intensified by increasingly warmer average temperatures. Anthropogenic climate trends have exacerbated drought conditions; human-caused climate change accounts for 19 percent of drought severity and 42 percent of the soil moisture deficit in this region since 2000. The governor declared a drought state of emergency in October 2021, and as of September 2022, 94 percent of California was in severe drought, and 99.8 percent[36] of the state was in at least moderate drought. The first three months of 2022 were the driest January, February, and March on record in California.[37] The harsh drought conditions affecting California are part of a larger megadrought—a drought lasting more than two

---

[34] Shive, K., C. Brigham, T. Caprio, and P. Hardwick. 2021. 2021 Fire Season Impacts to Giant Sequoias. The Nature Conservancy and National Park Service. *https://www.nps.gov/articles/000/2021-fire-season-impacts-to-giant-sequoias.htm*.

[35] Shive, K. L., A. Wuenschel, L. J. Hardlund, S. Morris, M. D. Meyer, and S. M. Hood. 2022. "Ancient Trees and Modern Wildfires: Declining Resilience to Wildfire in the Highly Fire-adapted Giant Sequoia." *Forest Ecology and Management* 511, 120110. *https://doi.org/10.1016/j.foreco.2022.120110*.

[36] Drought.gov. California. National Oceanic and Atmospheric Administration (NOAA) and the National Integrated Drought Information System. *https://www.drought.gov/states/california*.

[37] Drought.ca.gov. September 26, 2022. California Drought Update. *https://drought.ca.gov/media/2022/09/Weekly-CA-Drought-Update-09262022-FINAL.pdf*.

decades—that has been ongoing in the Southwestern region of North America since 2000. The past 22 years have been the region's driest period since at least 800 CE.[38]

While large urban water districts with diversified sources of water supply have maintained water deliveries to customers through the drought, hundreds of individual well owners and some small water systems have suffered disruption. The state is providing funding for water system consolidation and modernization projects in small communities, emergency repairs and replacements for dry wells, and bottled and hauled water deliveries. A 2021 law requires small suppliers to create drought contingency plans. During the drought of the last three years the state has delivered emergency drinking water assistance to nearly 10,000 households and 150 water systems.

California agriculture is responsible for more than half of all U.S. domestic fruit and vegetable production, and in 2021 drought resulted in the fallowing of nearly 400,000 acres of fields.[39] Direct crop revenue losses were approximately $962 million, and total economic impacts were more than $1.7 billion, with over 14,000 full- and part-time job losses.[40] During the 2011–2017 drought, California's agricultural industry suffered at least $5 billion in losses.[41] The 2022–23 budget includes $100 million to support agricultural water conservation practices, provide on-farm technical assistance, and provide direct relief to small farm operators.

Though native California species are adapted to drought, human engineering has altered most streams and wetlands in the state, making drought increasingly stressful to fish and wildlife. The state has conducted hundreds of fish and amphibian rescues in this drought to move creatures from diminished habitat, upgraded hatcheries, and boosted hatchery production, and has hauled millions of young hatchery salmon to San Francisco Bay to avoid adverse river conditions. State biologists monitor dozens of streams statewide and have negotiated voluntary agreements with landowners and water users to improve stream flows and temperatures.

California has started to implement major policies to build resilience to combat drought—such as the Sustainable Groundwater Management Act of 2014, the governor's Water Resilience Portfolio (2020), the governor's Water and Supply Strategy (August 2022), and

---

[38] Williams, A. P., B. I. Cook, and J. E. Smerdon. 2022. "Rapid Intensification of The Emerging Southwestern North American Megadrought in 2020–2021." *Nature Climate Change* https://doi.org/10.1038/s41558-022-01290-z.

[39] Medellín-Azuara, J. 2022. *Economic Impacts of the 2021 Drought on California Agriculture.* University of California Merced. https://wsm.ucmerced.edu/wp-content/uploads/2022/02/2021-Drought-Impact-Assessment_20210224.pdf.

[40] Medellín-Azuara. *Economic Impacts of the 2021 Drought*.

[41] National Resources Defense Council (NRDC). 2019. Climate Change and Health in California. Issue Brief. https://www.nrdc.org/sites/default/files/climate-change-health-impacts-california-ib.pdf.

new standards for indoor, outdoor, and industrial water use. However, it is crucial that we take further actions to minimize the impacts of drought in the years to come.

Extreme Heat

California's hottest summer on record was 2021.[42] Death Valley recorded the world's highest reliably measured temperature (130°F) in July 2021, breaking its own record (129°F) from summer 2020.[43] Meanwhile, Fresno also broke one of its own records, with 64 days over 100°F in 2021.[44] This is part of a trend: the daily maximum average temperature, an indicator of extreme temperature shifts, is expected to rise 4.4°F–5.8°F by 2050 and 5.6°F–8.8°F by 2100.[45] Heat waves that result in public health impacts are also projected to worsen throughout the state. By 2050, these heat-related health events are projected to last two weeks longer in the Central Valley and occur four to ten times more often in the Northern Sierra region.[46]

Heat ranks among the deadliest of all climate hazards in California, and heat waves in cities are projected to cause two to three times more heat-related deaths by mid-century.[47] Climate vulnerable communities[48] will experience the worst of these effects, as heat risk is associated and correlated with physical, social, political, and economic factors. Aging populations, infants and children, pregnant people, and people with chronic illness are especially sensitive to heat exposure.[49,50] Combining these characteristics and existing health inequities with additional factors such as poverty, linguistic isolation,

---

[42] NOAA. 2022. Climate at a Glance. *https://www.ncdc.noaa.gov/cag/statewide/time-series/4/tavg/3/8/1895-2021?base_prd=true&firstbaseyear=1901&lastbaseyear=2000*.
[43] Masters, J. 2021. Death Valley, California, breaks the all-time world heat record for the second year in a row. Yale Climate Connections. *https://yaleclimateconnections.org/2021/07/death-valley-california-breaks-the-all-time-world-heat-record-for-the-second-year-in-a-row/*.
[44] NOAA. Climate Data Online Search. Accessed on 16 March 2022. *https://www.ncdc.noaa.gov/cdo-web/search*.
[45] Governor's Office of Planning and Research (OPR), CEC, and CNRA. 2018. *California's Fourth Climate Change Assessment*. Page 23. *https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf*.
[46] OPR, CEC, and CNRA. *California's Fourth Climate Change Assessment - Statewide Summary Report. https://www.energy.ca.gov/sites/default/files/2019-11/Statewide_Reports-SUM-CCCA4-2018-013_Statewide_Summary_Report_ADA.pdf*.
[47] Ostro, B., S. Rauch, and S. Green. 2011. "Quantifying the health impacts of future changes in temperature in California." National Library of Medicine. *https://pubmed.ncbi.nlm.nih.gov/21975126/*.
[48] CARB. Priority Populations. California Climate Investments. *https://www.caclimateinvestments.ca.gov/priority-populations*.
[49] Basu, R. 2009. "High Ambient Temperature and Mortality: A Review of Epidemiologic Studies from 2001 to 2008." National Library of Medicine. *https://pubmed.ncbi.nlm.nih.gov/19758453/*.
[50] Basu, R., and B. Malig. 2011. "High Ambient Temperature and Mortality in California: Exploring the Roles of Age, Disease, and Mortality Displacement." National Library of Medicine. *https://pubmed.ncbi.nlm.nih.gov/21981982/*.

housing insecurity, and the legacy of racist redlining practices, can put individuals at a disproportionately high risk of heat-related illness and death.[51,52] Rising temperatures will also speed up smog-forming chemical reactions, leading to worse asthma, reduced lung function, cardiac arrest, and cognitive decline. African American, American Indian/Alaskan Native, and Puerto Rican Californians are particularly sensitive to smog, as they are between 28.6 and 132.5 percent more likely to be diagnosed with asthma than white Californians.[53]

In addition to the dangers to public health, California's September 2022 heat wave is particularly illustrative of how more frequent extreme heat strains the state's infrastructure we depend on to adapt to a changing climate. For example, as all-time high temperature records were broken in Sacramento, San Jose, Santa Rosa and Fairfield, electricity demand for air conditioning threatened to overwhelm the state power supply.[54]

California has taken major steps to protect communities from the impacts of extreme heat. Our recent budgets invest $800 million to cool our schools and neighborhoods, including projects to reduce urban overheating. The Extreme Heat Action Plan, released in April 2022, outlines the all-of-government approach California is taking to reduce urgent risks and build long-term resilience to the impacts of extreme heat. In September 2022, Governor Newsom signed multiple bills addressing extreme heat, including AB 2238 (Rivas, Chapter 264, Statutes of 2022), which will create the nation's first extreme heat advance warning and ranking system to better prepare communities ahead of heat waves. The Administration is committed to addressing extreme heat, but we still have a lot of work to do.

Wildfires, drought, and extreme heat are some of the most pronounced climate impacts California is experiencing, but they are not the only ones. Sea level rise, rising ocean temperatures, ocean acidification, and inland flooding are also already having devastating impacts on our communities, ecosystems, and economy, and will continue to do so in the years and decades to come. The decisions and actions that we take today will determine how strongly we will feel the impacts of climate change in the future.

---

[51] Hoffman, J. S., V. Shandas, and N. Pendleton. 2020. "The Effects of Historical Housing Policies on Resident Exposure to Intra-Urban Heat: A Study of 108 US Urban Areas." MDPI. *https://www.mdpi.com/2225-1154/8/1/12/htm*.

[52] U.S. Climate Resilience Toolkit. No date. Heat and Social Inequity in the United States. *https://toolkit.climate.gov/tool/heat-and-social-inequity-united-states*.

[53] NRDC. 2019. Climate Change and Health. Issue Brief. *https://www.nrdc.org/sites/default/files/climate-change-health-impacts-california-ib.pdf*.

[54] Samenow, Jason. 2022. No September on record in the West has seen a heat wave like this. *The Washington Post.* September 9. *https://www.washingtonpost.com/climate-environment/2022/09/08/western-heatwave-records-california-climate/*.

Imperative To Act

Consequences of Further Warming

The Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) found that it will not be possible to keep global warming within the threshold of 1.5°C to avoid the most severe impacts of climate change unless we make immediate and large-scale reductions in GHG emissions. It finds that atmospheric concentrations of CO_2 have increased by 50 percent since the industrial revolution, and that they continue to increase at a rate of two parts per million each year.[55] Without immediate action, the world will exceed 1.5°C (or 2.7°F) warming by the 2030s, and no later than 2040.

While every tenth of a degree matters—every incremental increase in warming brings additional negative impacts—climate-related risks to human health, livelihoods, and biodiversity are projected to increase further under 2°C (or 3.6°F) warming, compared to 1.5°C.[56] To remain below 1.5°C with limited or no overshoot of that threshold, global net anthropogenic CO_2 emissions need to be cut by about half by 2030 and reach net-zero by 2050.

If we fail to make rapid changes, we may not be able to limit global warming to 2°C,[57] and the consequences of inaction would be catastrophic. Our planet is already 1.2°C warmer than pre-industrial times due to human-induced warming, and many impacts we are already experiencing, such as sea level rise, are "irreversible" for centuries to millennia.[58] Californians with the fewest resources, who are disproportionately low-income communities and communities of color, are the most vulnerable to the impacts of climate change. While the human costs associated with health impacts can never be fully monetized, a recent report finds that the health costs of climate and air pollution in the U.S. are well over $800 billion today and will continue to grow in the coming years.[59]

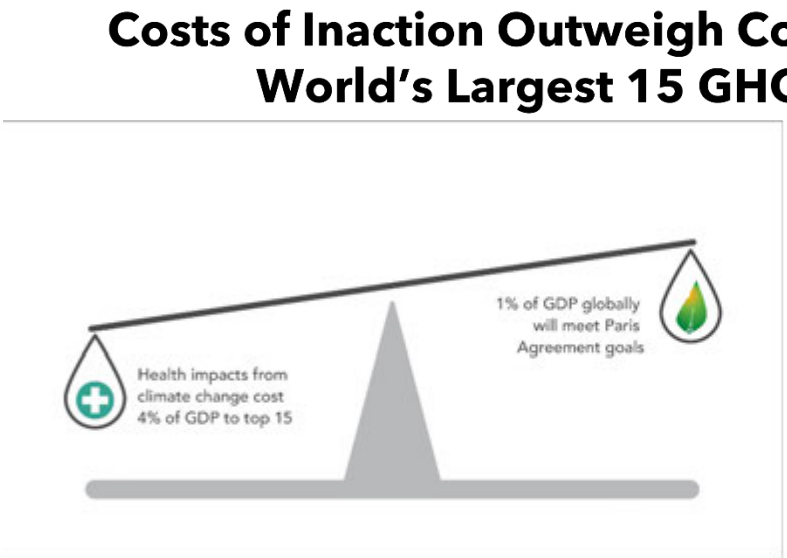
---

[55] IPCC. 2021. *Climate Change 2021: The Physical Science Basis.* https://www.ipcc.ch/report/ar6/wg1/.
[56] IPCC. 2018. *Special Report: Global Warming of 1.5°C.* World Meteorological Organization. https://www.ipcc.ch/sr15/.
[57] IPCC. 2021. Summary for Policymakers. In: *Climate Change 2021: The Physical Science Basis.* Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. In Press. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM_final.pdf.
[58] United Nations. 2021. IPCC report: 'Code red.' https://news.un.org/en/story/2021/08/1097362#:~:text=%27Code%20red%20for%20humanity%27&text=We%20are%20at%20imminent%20risk,%2C%20to%20keep%201.5%20alive.%22.
[59] Alwis, D. D., and V. S. Limaye. No date. *The Costs of Inaction*. https://www.nrdc.org/sites/default/files/costs-inaction-burden-health-report.pdf.

Any delays in action or insufficient action are a threat to public health and the environment. The impacts to our economy would be devastating as well. While not specific to California, a 2022 report from Deloitte Economics Institute finds that failing to take sufficient action to reduce emissions could result in economic losses to the U.S. of more than $14.5 trillion over the next 50 years.[60] On a hopeful note, however, the report finds that if the country invests now and in the coming years in a net-zero economy, $3 trillion could be added to the economy over the next 50 years. The U.S. annual gross domestic product (GDP) would be 2.5 percent higher in 2070 in this fast-action scenario than in the delayed action scenario. The lessons for California from these analyses are clear: invest now or pay the price later. As shown in Figure 1-2, inaction can lead to negative consequences for individuals, communities, the economy, and society as a whole. As discussed later, Governor Newsom and the Legislature have accepted this imperative and made significant investments in climate action. This Scoping Plan combined with the historic investments and policy direction from the governor and Legislature, will result in unprecedented action to address the climate crisis.

[60] Deloitte. 2022. *The Turning Point.* *https://www2.deloitte.com/content/dam/Deloitte/us/Documents/about-deloitte/us-the-turning-point-a-new-economic-climate-in-the-united-states-january-2022.pdf?id=us:2el:3dp:wsjspon:awa:WSJSBJ:2021:WSJFY22*.

Figure 1-2: The real costs of inaction[61]



Exposure to air pollution causes 7 million deaths worldwide every year and costs an estimated US$5.11 trillion in welfare losses globally. In the 15 countries that emit the most greenhouse gas emissions, the health impacts of air pollution are estimated to cost more than 4% of their GDP. Fossil fuel combustion contributes to both air pollution and climate change. Actions to meet the Paris goals would cost about 1% of global GDP.

Scoping Plan Overview

Previous Scoping Plans

The Scoping Plan is a strategy the California Air Resources Board (CARB) develops and updates at least one every five years, as required by AB 32. It lays out the transformations needed across our society and economy to reduce emissions and reach our climate targets. This Scoping Plan is the third update to the original plan that was adopted in 2008. The initial Scoping Plan laid out a path to achieve the AB 32 2020 limit of returning to 1990 levels of GHG emissions, a reduction of approximately 15 percent below business as usual.[62] The 2008 Scoping Plan included a mix of incentives, regulations, and carbon pricing, laying out the portfolio approach to addressing climate change and clearly making the case for using multiple tools to meet California's GHG targets. The 2013 Scoping Plan assessed progress toward achieving the 2020 limit and made the case for addressing

[61] Katowice, P. 2018. *Health benefits far outweigh the costs of meeting climate change goals.* WHO. https://www.who.int/news/item/05-12-2018-health-benefits-far-outweigh-the-costs-of-meeting-climate-change-goals.

[62] CARB. 2008. *Climate Change Scoping Plan.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/document/adopted_scoping_plan.pdf.

short-lived climate pollutants (SLCPs).[63] The most recent update, the 2017 Scoping Plan,[64] also assessed the progress toward achieving the 2020 limit and provided a technologically feasible and cost-effective path to achieving the Senate Bill 32 (SB 32, Pavley, Chapter 249, Statutes of 2016) target of reducing GHGs by at least 40 percent below 1990 levels by 2030.

Overview of this Scoping Plan

It is paramount that we continue to build on California's success by taking effective actions and doubling down on implementation of the strategies outlined here. As such, this Scoping Plan builds on and integrates efforts already underway to reduce the state's GHG, criteria pollutant, and toxic air contaminant emissions by identifying the clean technologies and fuels that should be phased in as the state transitions away from combustion of fossil fuels. By selecting and pursuing a sustainable and clean economic path, the state will continue to successfully execute existing programs, work to eliminate air pollution inequities, demonstrate the coupling of economic growth and environmental progress, and enhance new opportunities for engagement within the state to address and prepare for climate change.

The 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan) is the most comprehensive and far-reaching Scoping Plan developed to date. It identifies a technologically feasible and cost-effective path to achieve carbon neutrality by 2045 while also assessing the progress California is making toward reducing its GHG emissions by at least 40 percent below 1990 levels by 2030, as called for in SB 32 and laid out in the 2017 Scoping Plan.[65] The 2030 target is an interim but important stepping stone along the critical path to the broader goal of deep decarbonization by 2045. Modeling for this Scoping Plan shows that this decade must be one of transformation on a scale never seen before to set us up for success in 2045.

The relatively longer path assessed in this Scoping Plan incorporates, coordinates, and leverages many existing and ongoing efforts to reduce GHGs and air pollution, while identifying new clean technologies and energy. Given the focus on carbon neutrality, this Scoping Plan also includes discussion for the first time of the Natural and Working Lands (NWL) sectors as both sources of emissions and carbon sinks. Chapter 2 of this document

---

[63] CARB. 2014. *First Update to the Climate Change Scoping Plan.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/2013_update/first_update_climate_change_scoping_plan.pdf.
[64] CARB. 2017. *California's 2017 Climate Change Scoping Plan.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf.
[65] CARB. 2017. *California's 2017 Climate Change Scoping Plan.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf.

includes a description of a suite of specific actions to drastically reduce GHGs across all sectors. Chapter 3 provides the air quality and economic evaluations of the actions. Chapter 4 provides a broader description of the many actions needed across all sectors to achieve carbon neutrality. Chapter 5 provides an overview of the next steps and partnerships needed to implement this Scoping Plan. Guided by legislative direction, the actions identified in this Scoping Plan reduce overall GHG emissions in California and deliver policy signals that will continue to drive investment and certainty in a low carbon economy. This Scoping Plan builds upon the successful framework established by the Initial Scoping Plan and subsequent updates while identifying new, technologically feasible, and cost-effective strategies.

Principles That Inform Our Approach to Addressing the Climate Challenge

California has decades of experience addressing the climate challenge. Through this experience, and based on extensive engagement with stakeholders through our regulatory and program development processes, we have developed a set of principles to inform our approach.

Unprecedented Investments in a Sustainable Future

The scale of transformation needed over this decade to avoid the worst impacts of climate change and meet our ambitious climate goals is extraordinary. This is why Governor Newsom and the Legislature invested over $15 billion in climate action through the 2021–2022 California Comeback Plan, and why the 2022–2023 budget marks the beginning of the California Climate Commitment—the governor's multi-year plan to invest $54 billion in climate action. The enacted budgets (Figure 1-3) and the California Climate Commitment represent investments of a historic scale and will advance precisely the type of all-of-government approaches necessary to create the whole-of-society changes described in this Scoping Plan that will enable us to avert the worst impacts of climate change.

Figure 1-3: Comprehensive California climate change investments



The *California Climate Commitment* includes the following game-changing elements:

- $10 billion for zero-emission vehicles (ZEVs), including $1.5 billion for electric school buses to protect students' health and $3 billion to build an accessible charging network. ZEV investments will particularly focus on programs such as heavy-duty vehicle and port electrification that will reduce emissions and protect public health in low-income communities.
- $2.1 billion for clean energy investments, such as long duration storage, offshore wind, green hydrogen,[66] and industrial decarbonization.
- $13.8 billion for programs that reduce emissions from the transportation sector, such as improving public transportation while also funding walking, biking, and adaptation projects.
- Over $720 million for California's higher education institutions and research that will support the next generation of climate innovations.

[66] For the purposes of this Scoping Plan, "renewable hydrogen" and "green hydrogen" are interchangeable and are not limited to only electrolytic hydrogen produced from renewables.

- Nearly $1 billion to build sustainable, affordable housing and over $1 billion to help low-income Californians realize energy cost savings through building decarbonization.
- Nearly $9 billion for wildfire risk reduction, drought mitigation, extreme heat resilience, and nature-based solutions.

These investments are incredibly important in the context of this Scoping Plan in that they accompany and help support implementation of the many policies and regulations that will continue to be necessary to achieve our 2030 and carbon neutrality targets. In addition, these incentive programs jump-start emission reduction strategies for priority sectors, sources, and technologies, leveraging private-sector investment and building sustainable, growing markets for clean and efficient technologies. Many of California's incentive programs work in concert with federal and other state programs to drive emission reductions. As an example, as California pushes to move to 100% sales of new zero emission-vehicles, including plug-in hybrid vehicles, the Newsom Administration continues to invest heavily in incentive programs that allow families, communities, and businesses to choose zero-emission vehicles. This is done while simultaneously working with the federal government, other states, and jurisdictions around the world to align policies, regulations, and incentives, creating market certainty for the automakers that serve our markets.

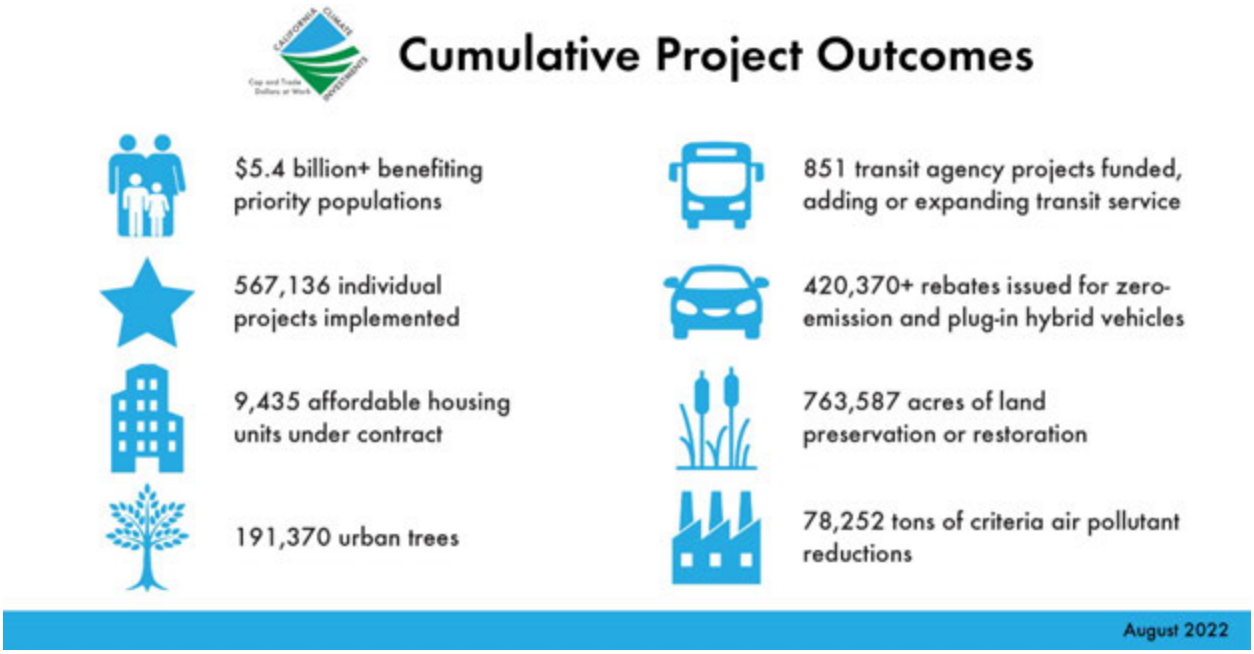
Centering Equity

Prioritizing equity is just as important as the magnitude of the climate investments California is making. Addressing climate change and advancing our equity and economic opportunity goals cannot be decoupled. In line with the governor's Executive Order[67] to take additional actions to embed equity analysis and considerations, this plan works to center equity by addressing disparities for historically underserved and marginalized communities. California strives to ensure that our climate and air research, regulations, investments, and plans include provisions that specifically address and advance equity. This includes reducing and eliminating air pollution disparities, removing barriers that can prevent frontline communities from accessing benefits, lowering costs for low-income Californians, and promoting high-quality jobs. CARB's incentive programs regularly surpass their mandated equity targets, and CARB has incorporated equity-focused provisions in our research, planning, and regulatory efforts. For instance, statute requires that a minimum of 35 percent of California Climate Investments benefit low-income households along with disadvantaged and low-income communities (referred to as *priority*

[67] Executive Department. State of California. 2022. Executive Order N-16-22. *GSS_9320_2-20220912152941 (ca.gov)*.

populations). However, 48 percent—over $5.4 billion—of implemented California Climate Investments project funding is benefiting priority populations, greatly exceeding the statutory minimums (see Figure 1-4). Senate Bill 535 (De León, Chapter 830, Statutes of 2012) and AB 1550 (Gomez, Chapter 369, Statutes of 2016) direct state and local agencies to make significant investments using auction proceeds to assist California's most vulnerable communities. Under these laws, a minimum of 25 percent of the total investments are required to be located within and provide benefits to disadvantaged communities, and at least 10 percent of the total investments must benefit low-income communities and households. Moving forward, the state will continue to devote a greater share of incentive funding to priority populations, with the light-duty vehicle incentive program as just one example. We can simultaneously confront the climate crisis and build a more resilient, just, and equitable future for all communities.

Figure 1-4: California climate investments cumulative outcomes[68,69]



Role of the Environmental Justice Advisory Committee

To inform the development of the Scoping Plan, AB 32 calls for the convening of an Environmental Justice Advisory Committee (EJ Advisory Committee) to advise CARB in developing the Scoping Plan, and any other pertinent matter in implementing AB 32. It requires that the Committee be comprised of representatives from communities with the most significant exposure to air pollution, including communities with minority populations and/or low-income populations. On January 25, 2007, CARB appointed the first

[68] CARB. 2022. California Climate Investments program implements $10.5 billion in greenhouse gas-reducing programs, expected to reduce 76 million metric tons of emissions. April 11. *https://ww2.arb.ca.gov/news/california-climate-investments-program-implements-105-billion-greenhouse-gas-reducing-projects*.

[69] SB 535 and AB 1550 require investments located in and benefiting low-income communities and households, which are termed *priority populations. Disadvantaged communities* are currently defined by CalEPA as the top 25 percent of communities experiencing disproportionate amounts of pollution, environmental degradation, and socioeconomic and public health conditions according to the Office of Environmental Health Hazard Assessment's *CalEnviroScreen tool,* plus certain additional communities including federally recognized Tribal Lands. Low-income communities and households are defined by statute as those with incomes either at or below 80 percent of the statewide median or below a threshold designated as low-income by the Department of Housing and Community Development.

Environmental Justice Advisory Committee to advise it on the Initial Scoping Plan and other climate change programs.

For this Scoping Plan, CARB reconvened the EJ Advisory Committee in May 2021. The committee is currently comprised of 14 environmental justice and disadvantaged community representatives, including the EJ Advisory Committee's first tribal representative, who was appointed in February 2022. In October 2021, the EJ Advisory Committee formally created eight workgroups. These workgroups are a space for EJ Advisory Committee members to better understand specific sectors of the Scoping Plan and to assist the EJ Advisory Committee in the development of recommendations on this Scoping Plan. In December 2021, the EJ Advisory Committee provided scenario input responses to help shape the modeling for this Scoping Plan. In February 2022, San Joaquin Valley EJ Advisory Committee members hosted their first community workshop, with over 100 attendees. In March 2022, the CARB Board held a joint public meeting with the EJ Advisory Committee to discuss their draft preliminary recommendations for this Scoping Plan. In June 2022, over 165 attendees participated in a statewide community workshop held by EJ Advisory Committee members. The full schedule of EJ Advisory Committee Meetings and meeting materials are available on CARB's website.[70] This Scoping Plan includes references where EJ Advisory Committee Final Recommendations[71] are included in the document. The final recommendations were discussed at a joint CARB and EJ Advisory Committee Hearing on September 1, 2022.

The integration of environmental justice is critical to ensure that certain communities are not left behind. The AB 32 EJ Advisory Committee provided recommendations on September 30 in advance of the final Scoping Plan. There are footnotes to indicate where there is alignment between the AB 32 EJ Advisory Committee's recommendations and this Scoping Plan. While the language in the text may not fully incorporate the specific EJ Advisory Committee's recommendation, the footnotes do acknowledge the places in the text where there is general alignment with the spirit of the EJ Advisory Committee's recommendation.

Partnering with Tribes

[70] CARB. Environmental Justice Advisory Committee Meetings and Events. *https://ww2.arb.ca.gov/environmental-justice-advisory-committee-meetings-and-events*.
[71] Environmental Justice Advisory Committee. September 30, 2022. 2022 Scoping Plan Recommendations. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/090122/finalejacrecs.pdf*.

There are 109 federally recognized tribes and over 60 non-federally recognized tribes in California.[72] In 2011, Governor Brown issued Executive Order B-10-11, recognizing and reaffirming the inherent right of tribes to exercise sovereign authority over their members and territory and directing state agencies to engage in government-to-government consultation with tribe and to work to develop partnerships and consensus.[73] In 2019, Governor Newsom issued Executive Order N-15-19, which acknowledges and apologizes on behalf of the state for the historical "violence, exploitation, dispossession and the attempted destruction of tribal communities."[74] Establishing partnerships with tribal leaders to incorporate their priorities, traditional expertise, and knowledge will be important to achieving California's climate goals. The Scoping Plan includes actions that tribal partners can voluntarily implement for sources under their jurisdiction (e.g., transitioning to zero emission fleets, installing infrastructure and control technologies, conducting climate smart land management). The Scoping Plan also uplifts the importance of having our tribal partners help guide actions that may impact tribal cultural resources and of benefitting from tribal input.

We also need alignment between state and local partners and tribes on actions related to land-use decisions. This means respecting and reinforcing tribal sovereignty and self-determination. As tribes do not always draw clear lines between the "natural" and "cultural" resources of a place, taking a holistic perspective will result in positive impacts in ability to address the complex issues of land management and regulatory undertakings.

Tribes have an intimate and historical knowledge of places and should be engaged early on to inform planning and future management related to activities that may impact tribal resources and areas including potential funding opportunities, technical assistance, and capacity building, where appropriate. Additionally, tribes should be involved in the identification of their own significant resources and areas of use. As decisions are made related to Scoping Plan undertakings, agencies should recognize and appropriately consider cultural resources and management from the beginning, not as an afterthought; and consider how the project could impact tribes.

---

[72] These numbers are subject to change depending on determinations made by the Bureau of Indian Affairs (BIA) and the Native American Heritage Commission (NAHC). Please consult the most current Federal Register for a list of federally recognized tribes and the NAHC for a list of non-federally recognized tribes in California. As of the date of the Scoping Plan, the current list for federally recognized tribes is located at 87 Fed. Reg. 4636 (Jan. 28, 2022).

[73] Executive Order B-10-11. *https://www.ca.gov/archive/gov39/2011/09/19/news17223/index.html#:~:text=EXECUTIVE%20ORDER%20B-10-11%20Published%3A%20Sep%2019%2C%202011%20WHEREAS,and%20affirmed%20in%20state%20and%20federal%20law%3B%20and*.

[74] Executive Order N-15-19. *https://tribalaffairs.ca.gov/wp-content/uploads/sites/10/2020/02/Executive-Order-N-15-19.pdf*.

Finally, to the extent allowed by law, traditional ecological knowledge and culturally sensitive information should be protected, as this is information that may not be common knowledge and may not be known outside the tribe, as each tribe is unique and influenced by its local environment and cultural practices. Protection of this information will help foster productive relationships with tribes and should be included as part of the process. CARB and other agencies should continue to foster relationships with tribal partners.

Maximizing Air Quality and Health Benefits

The state has over 50 years of experience successfully cleaning the air in California by addressing criteria pollutants and toxic air contaminants from mobile and stationary sources. CARB has been a leader in measuring, evaluating, and reducing sources of air pollution that impact public health. Its air pollution programs have been adapted for national programs and emulated in other countries. Significant progress has been made in reducing diesel particulate matter (PM), which is a designated toxic air contaminant, and many other hazardous air pollutants. CARB partners with local air districts to address stationary source emissions and adopts and implements state-level regulations to address sources of criteria and toxic air pollution, including mobile sources. CARB also collaborates with federal agencies to address air pollution from sources primarily under federal jurisdiction. In many instances, actions to reduce fossil fuel combustion and achieve federal air quality standards also help to reduce GHG emissions.

However, air pollution disparities still exist, and more must be done to ensure the most vulnerable populations have safe air to breathe. California must continue to evaluate opportunities to harmonize our climate and air quality programs through innovative policymaking and by building on existing programs like the Low Carbon Fuel Standard (LCFS) and Community Air Protection Program. The LCFS includes a provision that allows electric utilities to opt-in and generate residential electric vehicle (EV) charging credits, where some of the revenues are invested back into rebate programs that address air quality and climate pollution.[75] The Community Air Protection Program[76] is the first of its kind in the country and brings together diverse stakeholders, including CARB, local air districts, and residents of environmental justice communities to increase local air monitoring and develop community-led plans to improve air quality in the communities most impacted by air pollution.

This Scoping Plan identifies actions that will deliver near-term air quality benefits to communities with the highest exposures and provide long-term GHG benefits. Many of the actions in this Scoping Plan are key elements of the 2022 State Strategy for the State

[75] CARB. LCFS Utility Rebate Programs. *https://ww2.arb.ca.gov/resources/documents/lcfs-utility-rebate-programs*.
[76] CARB. Community Air Protection Program. *https://ww2.arb.ca.gov/capp*.

Implementation Plan to meet federal air quality standards,[77] which has a primary focus of reducing harmful air pollution and achieving federal air quality targets. California's approach of leveraging air quality and GHG policies together has yielded results. A 2022 report by the Office of Environmental Health and Hazard Assessment (OEHHA)[78] that evaluated GHG and harmful air pollution emissions from the heavy-duty vehicle (HDV) and large stationary source sectors found declines in emissions in both sectors, with the greatest declines in disadvantaged communities. Both sectors are subject to state GHG and air quality policies, in addition to federal and local rules on harmful air pollution. Because of historically racist and discriminatory practices such as redlining, both types of sources are disproportionately located adjacent to vulnerable communities, which are predominantly communities of color.[79] The key findings from the OEHHA report are as follows:

- Both HDVs and facilities subject to the Cap-and-Trade Program have reduced emissions of co-pollutants, with HDVs showing a clearer downward trend when compared to stationary sources. These emission reductions have major health benefits, including a reduction in premature pollution-related deaths.
- The greatest beneficiaries of reduced emissions from both HDVs and facilities subject to the Cap-and-Trade Program have been in communities of color and in disadvantaged communities in California, as identified by CalEnviroScreen (CES). This has reduced the emission gap between disadvantaged and non-disadvantaged communities, but a wide gap still remains.
- The transition to zero-emission HDVs will expedite further emissions reductions.
- While the progress observed is encouraging, inequities persist, and federal, state, and local climate and air quality programs must do more to reduce emissions of GHGs and co-pollutants to reduce the burden of emissions on disadvantaged communities and communities of color.

It will take all tools at all levels of government, with robust enforcement, to ensure that vulnerable communities continue to see improvements in air quality until no disparities exist in air pollution across the state.

---

[77] CARB. 2022 State Strategy for the State Implementation Plan. *https://ww2.arb.ca.gov/resources/documents/2022-state-strategy-state-implementation-plan-2022-state-sip-strategy*.
[78] OEHHA. 2022. *Impacts of Greenhouse Gas Emission Limits within Disadvantaged Communities: Progress Toward Reducing Inequities. https://oehha.ca.gov/environmental-justice/report/ab32-benefits*.
[79] CalEPA. 2021. Pollution and Prejudice. *https://storymaps.arcgis.com/stories/f167b251809c43778a2f9f040f43d2f5*.

Economic Resilience

The state's efforts to tackle the climate crisis will create economic and workforce development opportunities in the clean energy economy in communities across the state. Transitioning existing skills and expanding workforce training opportunities in climate-related fields are critical for reducing harmful emissions and supporting workers in transitioning to new, high-quality jobs. The Administration's recent budgets acknowledge the challenges facing workers in industries most affected by the state's response to climate change—especially those in the fossil fuel industry. It will invest $1 billion in regional partnerships and economic diversification to create new jobs and support a local tax base and workforce transition and development once opportunities are identified. It also will invest in safety nets to protect, and support impacted communities as part of the transition to a carbon neutral economy. Specifically, the Community Economic Resilience Fund Program[80] (CERF) supports communities and regional groups in producing regional roadmaps for economic recovery and transition that prioritize the creation of accessible, high-quality jobs in sustainable industries. The budget investments create the opportunity to future-proof and increase economic resilience in the face of more frequent climate impacts and shifting economic conditions. For these investments and implementation of the Scoping Plan to be successful in supporting the transition to a carbon neutral economy, workers and affected communities must be included in ongoing dialogue to ensure a high-road transition for regional economies.

That state also recognizes it can play a more direct role in supporting a sustainable work force through its incentive programs. In 2021, Assembly Bill 680 (AB 680) (Burke, Chapter 746, Statutes of 2021) was signed into law, requiring CARB to work with the California Labor and Workforce Development Agency to update the Funding Guidelines to include new workforce standards. CARB's Funding Guidelines currently include requirements for administering agencies to, wherever possible, foster job creation within California, provide employment opportunities or job training tied to employment, and target these opportunities to priority populations. The Funding Guidelines also recommend administering agencies prioritize investments in projects that directly support jobs or a job training and placement program, and that they report the estimated employment benefits and employment outcomes for projects that meet specified criteria. These new requirements apply to agencies administering certain California Climate Investments

[80] Office of Planning and Research. Community Economic Resilience Fund. *https://opr.ca.gov/economic-development/cerf/*.

programs that receive continuous appropriations from the Greenhouse Gas Reduction Fund and fall into the following six categories of standards:

- fair and responsible employer standards,
- inclusive procurement policies,
- prevailing wage for construction work,
- community workforce agreements for construction projects over one million dollars,
- preference for projects with educational institutions or training programs, and
- creation of high-quality jobs. CARB will be updating the Funding Guidelines through a public process over the next year to operationalize these new requirements.

Partnering Across Government

The Scoping Plan is an actionable plan to identify and align programs and policies to achieve California's climate targets. To realize the outcomes and deliver results in any Scoping Plan, action is critical. For this Scoping Plan, there are also actions that rely on our federal partners to take on sources primarily under their jurisdiction (such as aviation, and federally owned/managed lands) while they also continue to develop national programs for GHG reductions. The federal government is already taking major steps to advance these types of programs. The Inflation Reduction Act of 2022[81] includes $369 billion for domestic energy production and manufacturing and is expected to lead to U.S. GHG emission reductions of roughly 40 percent by 2030. Direct incentives will include those for clean vehicles and ENERGY STAR appliances, as well as improving transportation and clean energy in underserved communities.

We also need our local partners to align on actions related to land-use decisions that support sustainable, resilient, low-carbon communities and permitting for clean energy production facilities and infrastructure; diversion of organics from landfills; and other climate-related projects. State agencies also should use the Scoping Plan to review and update their own programs and policies to support the actions identified in this Scoping Plan. Importantly, the Scoping Plan also can serve as a resource as the Legislature considers new legislative direction and funding to support the state's path to carbon neutrality and continue action to address near-term air pollution disparities.

Partnering with the Private Sector

Government cannot achieve our climate targets alone. The scale of investment needed requires both private-sector investment and partnerships with philanthropies. Public

[81] Pub.L. No. 117-169 (August 16, 2022).

sector dollars, accompanied by strong and steady policy signals, must be a catalyst for deeper and broader investments by the private sector in both reducing emissions and building the resilience of our communities. Governor Newsom is committed to working collaboratively with businesses, including small businesses, to deploy the technologies, capital, and ingenuity that are hallmarks of the private sector.

California structures our climate policies and regulations to create market signals and certainty that spur private sector investment. For example, the Governor's Executive Order on Zero-Emission Vehicles[82] set 2035 as the target year for 100 percent zero-emission vehicle sales, creating a time horizon that allows automakers to scale up zero-emission fleets and sending a clear signal to the companies and utilities that would deploy charging infrastructure. The Executive Order has been followed by development and adoption of the Advanced Clean Cars II regulation. CARB convened auto manufacturers, environmental justice groups, labor organizations, and many other stakeholders to provide input into development of the regulation in a robust and transparent manner; again, with the aim of providing certainty for producers and consumers.

California also pursues public-private partnerships (PPP) as a mechanism to advance our collective climate goals. We know these vehicles can be effective at increasing the impact of public sector dollars and helpful in moving markets in a direction aligned with state policy. A new PPP the Administration is advancing is the Climate Catalyst Revolving Loan Fund, housed at the state's Infrastructure and Economic Development Bank (IBank). The fund offers a range of financial instruments—including flexible credit and credit support—to help bridge financing gaps currently preventing advanced climate solutions from scaling in the marketplace. The Catalyst Fund's initial areas of investment include forest biomass management and utilization (unlocking innovation to reduce wildfire threats), climate-smart agriculture, and clean energy transmission. The fund leverages public sector investments by mobilizing private finance for shovel-ready projects that are stuck in the deployment phase. As such, IBank is ideally positioned as the state's all-purpose "Green Bank," with increasing connection to federal financing programs such as US DOE's Loan Programs Office and the United States Environmental Protection Agency's (U.S. EPA) Greenhouse Gas Reduction Fund.

The Catalyst Fund builds from existing IBank financing programs that are themselves increasingly focused on the climate imperative. The IBank's Infrastructure State Revolving Fund provides supportive capital to climate-aligned projects promoted by local governments and certain nonprofit entities, and will be refining its criteria and market outreach strategies to increase its level of service. IBank's bonds program has supported

[82] Executive Department. State of California. Executive Order N-79-20. *https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf.*

multiple large environmental projects, including more than $2 billion in "green bonds," and is poised to help expand access to the state's deep and liquid bond capital market. Within IBank's Small Business Finance Center, the new Climate Tech Loan Guarantee program encourages commercial banks to back climate-focused small businesses, leveraging federal capital to insure a portion of the private bank's loan. And through IBank's Expanding Venture Capital Access Fund program, the state is promoting greater diversity in the venture capital community, including climate equity and climate justice.

All of these financing programs exist to leverage private capital in support of the state's climate goals, and to partner with state policy agencies driving the transition. IBank will also continue to collaborate closely with the State Treasurer's Office in its provision of capital support to climate solutions, ensuring that funding flows to programs best positioned to deliver success. This partnership of public and private capital, responsive to and in communication with the climate policy community, will ensure that California gets the maximum possible benefit from its allocation of scarce resources.

Supporting Innovation

Reaching our ambitious, deep decarbonization goals will require continued technological innovation. Investment in research, development, and deployment of clean technologies has never been more critical. Sending clear and sustained market and policy signals will encourage large and small companies alike to pursue innovation that can be scaled up and deployed here and beyond our borders. The full suite of AB 32 policies[83] has touched nearly every sector of California's economy and spurred technology innovation in the state, including the growth of technology developers, manufacturers, processors, and assemblers in many areas. Specifically, AB 32 policies and programs support both the supply side and the demand side to build new markets in California. On the supply side, AB 32 policies support businesses to demonstrate and refine technologies, and to help establish critical supply chains. On the demand side, AB 32 policies and programs provide outreach, education, and incentives—as well as disincentives—to motivate everyone from consumers to institutional purchasers to utility planners to adopt new, climate smart technologies. Innovations resulting directly from the state's climate policies include the following:

- In the past 10 years, a growing market for heavy-duty zero-emission vehicles (HD ZEVs) was established in California, and this market now represents the largest single share of North American supply and demand for HD ZEVs. Vehicle

[83] CARB. Climate Change Programs. *https://ww2.arb.ca.gov/our-work/topics/climate-change*.

and component manufacturers are making long-term investments to develop and produce HD ZEVs within California.

- Total consumption of renewable diesel in the California LCFS market has skyrocketed from approximately 1.8 million gallons in 2011 to nearly 589 million gallons in 2020. The LCFS is a key driver of market development for renewable diesel and its coproducts. While the federal renewable fuel standard (RFS) and blenders tax credit also benefit producers, an analysis of their respective contributions to market development, and interviews with industry representatives and independent experts, point to LCFS as a more important factor in market development, at least in recent years.
- In the past five years, a market for small-scale energy storage in California was created where none previously existed. As of 2020, 185 megawatts (MW) of small-scale energy storage projects have been interconnected to the grid. The significant increase in deployment in the last five years is a result of the Self-Generation Incentive Program (SGIP), which significantly reduces the upfront costs to purchase and install small-scale energy storage devices, and of growing customer interest in disaster resiliency in the face of increasing risk from wildfire and related utility outages. These systems have already provided disaster resiliency benefits for residential and non-residential customers.

We have seen how quickly market barriers can be overcome in response to strong policy signals, as occurred in the solar panel and electric vehicle battery space. Government-stated priorities have a significant role in guiding private and public research, development, and deployment. This Scoping Plan unequivocally puts the marker down on the need for innovation to continue in non-combustion technologies, clean energy, CO_2 removal options, and alternatives for SLCPs. The five-year update to the Scoping Plan allows for a periodic evaluation of new tools to add to the state's toolkit.

Engagement with Partners to Develop, Coordinate, and Export Policies

California works closely with other states, tribal governments, the federal government, and international jurisdictions to identify the most effective strategies and methods to reduce GHGs, manage GHG control programs, and facilitate the development of integrated and cost-effective regional, national, and international GHG reduction programs. For example, the state's Cap-and-Trade Program has been linked with Québec's since 2014, and CARB staff regularly engage with jurisdictions throughout the world on the design features of our Cap-and-Trade Program through memoranda of understanding (MOUs) and venues such as the International Climate Action

Partnership.[84] Low carbon fuel mandates similar to California's LCFS have been adopted by the U.S. EPA and by other jurisdictions, including Oregon, Washington, British Columbia, the European Union, and the United Kingdom. Many other jurisdictions from Japan to New Zealand, Australia, and the European Commission also continue to seek information and technical experience on our LCFS. California has and will continue to share information and encourage ambitious emissions reductions with interested jurisdictions, with a focus on China, India, Mexico, Canada, and the European Union. California's early action to reduce super-pollutants such as methane and other SLCPs was reaffirmed by the 2021 Global Methane Pledge signed by the U.S. and over 100 other countries at the 26th Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC).[85]

In addition, under the Clean Air Act, the federal government is authorized to allow California to set more stringent vehicle emissions regulations than federal standards. California's goals and regulations to transition to 100 percent sales of new zero-emission passenger vehicles by 2035 (including plug-in hybrid vehicles), to drayage trucks by 2035, and other trucks and buses where feasible by 2045 are being emulated by partner states across the U.S. and in jurisdictions around the world. CARB's Advanced Clean Cars II regulation, [86] which codifies these targets, was approved in August 2022, and already at least four other states have announced their plans to adopt this regulation. Earlier in June 2020 CARB adopted the Advanced Clean Truck regulation, which requires truck manufacturers to meet increasing sale targets of zero-emission trucks in California through 2035. Since adoption, at least five other states—20 percent of the U.S. truck market—have adopted this regulation. These kinds of coordinated policies help signal to vehicle manufacturers a widespread and growing demand for zero-emissions technology, which in turn helps scale production and lower costs for consumers.

With the Mexican Secretariat for Environment and Natural Resources (SEMARNAT), California has engaged in a technical exchange on clean vehicle policies and helped to establish Mexico's Emissions Trading System (being piloted in 2022). A 2019 MOU signed between California and Environment and Climate Change Canada enables in-depth collaboration on policies and programs to decarbonize vehicles, engines, and fuels. This partnership has led to tangible emissions reductions, from aligning vehicle emissions targets and policies to collaborating on emissions testing and research critical to enforcing

[84] International Carbon Action Partnership (ICAP). Homepage. *https://icapcarbonaction.com/en?msclkid=dac30cb7b4f511ec94ccd0f1ae323e98*.
[85] Global Methane Pledge. Homepage. *https://www.globalmethanepledge.org/*.
[86] Cal. Code Regs., tit. 13, §§ 1900,1961.2, 1961.3, 1962.2, 1962.3, 1962.4, 1962.5, 1962.6, 1962.7, 1962.8, 1965, 1968.2, 1969, 1976, 1978, 2037, 2038, 2112, 2139, 2140, 2147, and 2903; and Test Procedures located here: *https://ww2.arb.ca.gov/rulemaking/2022/advanced-clean-cars-ii*.

emissions limits for vehicle manufactures. At the national level, China has looked to California for cutting-edge requirements for car diagnostics and policies that promote zero-emissions vehicles. At a local level, Beijing has adopted California's vehicle emissions standards and several other progressive environmental regulations. California will continue and renew such efforts across China, including through a 2022 MOU signed with China's Ministry of Ecology and Environment.

Between 2021 and 2023, California also will serve as president of the Transport Decarbonisation Alliance, a global network of countries, regions, cities, and companies that come together to share experiences and technical expertise, and to increase the ambition and accelerate the deployment of targeted transportation decarbonization policies across freight, electric vehicle infrastructure, and active mobility. Throughout its presidency, California will focus its leadership on decarbonizing the cross-jurisdiction network of medium- and heavy-duty vehicles, both to ensure cleaner air in freight-adjacent communities and to stem the effects of climate change.

Over the years, California has also asserted the importance of and supported the ongoing efforts of state and local clean air and climate leadership. Through our participation in the Pacific Coast Collaborative alongside British Columbia, Washington, and Oregon,[87] the Under2 Coalition,[88] the U.S. Climate Alliance,[89] the International ZEV Alliance,[90] the Transportation Decarbonisation Alliance, and many more organizations, California has and will continue to build climate partnerships with state and local governments.

California also recognized the need to address the substantial emissions caused by the deforestation and degradation of tropical and other forests, and continues its work alongside other subnational governments as part of the Governors' Climate and Forests Task Force (GCF).[91] Founded in 2008, there are currently 39 GCF members, including states and provinces in Brazil, Colombia, Ecuador, Indonesia, Ivory Coast, Mexico, Nigeria, Peru, Spain, and the United States—all of whom are considering or operating programs to reduce emissions from deforestation, land-use, and rural development, and to benefit local and indigenous communities. CARB's California Tropical Forest Standard provides a rigorous methodology to assess jurisdiction-scale programs that reduce deforestation and to incentivize responsible action and investment.[92] The standard

[87] Pacific Coast Collaborative. Homepage. *https://pacificcoastcollaborative.org/*.
[88] Under2 Coalition. Homepage. *https://www.theclimategroup.org/under2-coalition*.
[89] United States Climate Alliance (USCA). Homepage. *https://www.usclimatealliance.org/*.
[90] ZEV Alliance. Homepage. Accelerating the Adoption of Zero-Emission Vehicles. *https://zevalliance.org/*.
[91] Governors' Climate and Forests Task Force. University of Colorado Boulder: Colorado Law. *https://www.gcftf.org/*.
[92] CARB. California Tropical Forest Standard. *https://ww2.arb.ca.gov/our-work/programs/california-tropical-forest-standard*.

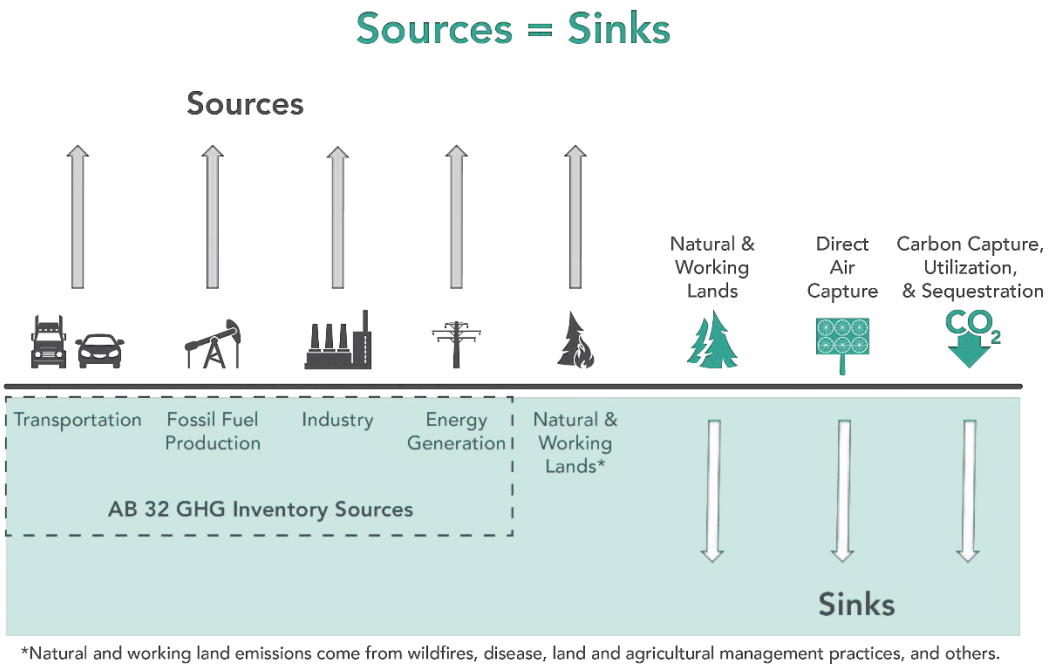
provides a strong signal to value the preservation of tropical forests over continued destructive activities such as oil exploration and extraction and ensures rigorous social and environmental safeguards for indigenous peoples and local communities.

Working Toward Carbon Neutrality

To date, California and many other regions have focused on reducing GHG emissions from the industrial, energy, and transportation sectors. As defined in statute, the state's 2020 and 2030 targets include all in-state sources of GHG emissions—and those emissions associated with imported power that is consumed in the state. By moving to a framework of carbon neutrality, the scope for accounting is expanded to include all sources and sinks. As such, carbon neutrality is achieved when the GHG fluxes are at equilibrium—when sources equal sinks. Figure 1-5 depicts the sources included in the AB 32 GHG Inventory and the new sources and sinks added in this Scoping Plan under the framework of carbon neutrality. Natural and working lands are able to sequester carbon and therefore play an increasingly important role in this framework. However, modeling for this plan shows that carbon sequestration in our natural and working lands alone will be insufficient to achieve carbon neutrality no later than 2045. Therefore, this plan also considers the role of carbon capture and sequestration, as well as biological and mechanical carbon sequestration processes that are included in the IPCC Sixth Assessment Report,[93] as necessary tools for climate change mitigation.

[93] IPCC. 2021. *Climate Change 2021: The Physical Science Basis*. https://www.ipcc.ch/report/ar6/wg1/.

Figure 1-5: Carbon neutrality: Balancing the net flux of GHG emissions from all sources and sinks



*Natural and working land emissions come from wildfires, disease, land and agricultural management practices, and others.

Supporting Healthy and Resilient Lands

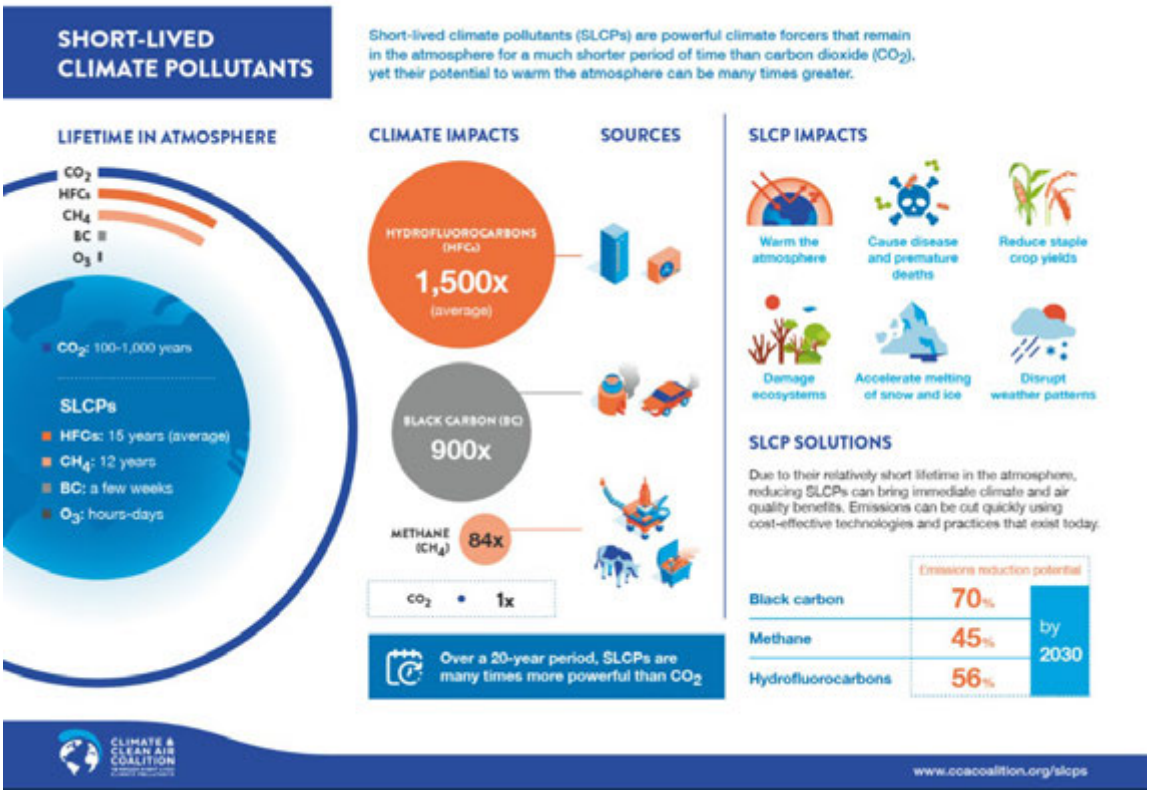
Our natural and working lands are an important piece in California's fight to achieve carbon neutrality and build resilience to the impacts of climate change. Healthy land can sequester and store atmospheric carbon dioxide in forests, grasslands, soils, and wetlands. Healthy lands can also reduce emissions of powerful short-lived climate pollutants, limit the release of future GHG emissions, protect people and nature from the impacts of climate change, and build our resilience to future climate risks. Unhealthy lands have the opposite effect—they release more GHGs than they store and are more vulnerable to future climate change impacts. Through climate smart land management that focuses on supporting healthy living systems, we can support our carbon neutrality goals, reduce emissions, advance sequestration, and support healthy and more climate-resilient lands.

Maintaining the Focus on Methane and Short-Lived Climate Pollutants

Given the urgency of climate change, the often-disproportional impacts already being felt by underserved populations across California and the world, and the need to rapidly decarbonize and avoid climate tipping points as identified in the most recent IPCC assessment, efforts to reduce short-lived climate pollutants are especially important. SLCPs include methane (CH_4), black carbon (soot), and fluorinated gases (F-gases,

including hydrofluorocarbons, or HFCs), and they are among the most harmful pollutants to both human health and the global climate. SLCPs are more potent than CO_2 in terms of their impact on climate change (and subsequently, global warming) and have a much shorter lifetime in the atmosphere than CO_2 does. That means they have an outsized impact on climate change in the near term—they are responsible for up to 45 percent of current climate forcing. It also means that targeted efforts to reduce short-lived climate pollutant emissions can provide outsized climate and health benefits, within weeks to about a decade (see Figure 1-6).

Figure 1-6: Short-lived climate pollutant impacts[94]



California has been a leader in addressing SLCP emissions. As part of the 2014 Scoping Plan,[95] CARB committed to developing a dedicated strategy to reduce SLCP emissions.

[94] Climate and Clean Air Coalition. Short-Lived Climate Pollutants (SLCPs). https://www.ccacoalition.org/en/content/short-lived-climate-pollutants-slcps.
[95] CARB. 2014. *First Update.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/2013_update/first_update_climate_change_scoping_plan.pdf.

The resulting SLCP Reduction Strategy,[96] adopted by CARB in 2017, implements targets codified in SB 1383 (Lara, Chapter 395, Statutes of 2016) to reduce methane and HFC emissions by 40 percent by 2030 and anthropogenic black carbon emissions by 50 percent. California worked with several other states through the U.S. Climate Alliance to establish a similar goal to reduce SLCP emissions in line with the requirements of the Paris Agreement,[97] identifying the potential to reduce SCLPs by 40 to 50 percent by 2030 across the U.S. Climate Alliance.[98]

Process for Developing the Scoping Plan

This Scoping Plan was developed in coordination with the Governor's Office and state agencies, in accordance with direction from the Chair and Members of CARB, through engagement with the Legislature, with advice from the EJ Advisory Committee, in consultation with tribes, and with open and transparent opportunities for stakeholders and the public to engage in workshops and other meetings. Appendix A (Public Process) includes details of the public workshops, and Chapter 5 includes details of the EJ Advisory Committee's role in the Scoping Plan update process.

Guidance from the Administration and Legislature

This Scoping Plan reflects existing and recent direction in the Governor's Executive Orders and Statutes. Table 1-1 provides a summary of major climate legislation and executive orders issued since the adoption of the 2017 Scoping Plan.

[96] CARB. 2017. *Short-Lived Climate Pollutant Reduction Strategy.* https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf.
[97] UNFCCC. 2015. Paris Agreement. https://unfccc.int/sites/default/files/english_paris_agreement.pdf.
[98] USCA. 2018. *From SLCP Challenge to Action: A Roadmap for Reducing Short-Lived Climate Pollutants to Meet the Goals of the Paris Agreement.* http://www.usclimatealliance.org/slcp-challenge-to-action.

Table 1-1: Major climate legislation and executive orders enacted since the 2017 Scoping Plan

Bill/Executive Order	Summary
Assembly Bill 1279 (AB 1279) (Muratsuchi, Chapter 337, Statutes of 2022) *The California Climate Crisis Act*	AB 1279 establishes the policy of the state to achieve carbon neutrality as soon as possible, but no later than 2045; to maintain net negative GHG emissions thereafter; and to ensure that by 2045 statewide anthropogenic GHG emissions are reduced at least 85 percent below 1990 levels. The bill requires CARB to ensure that Scoping Plan updates identify and recommend measures to achieve carbon neutrality, and to identify and implement policies and strategies that enable CO_2 removal solutions and carbon capture, utilization, and storage (CCUS) technologies. This bill is reflected directly in this Scoping Plan.
Senate Bill 905 (SB 905) (Caballero, Chapter 359, Statutes of 2022) *Carbon Capture, Removal, Utilization, and Storage Program*	SB 905 requires CARB to create the Carbon Capture, Removal, Utilization, and Storage Program to evaluate, demonstrate, and regulate CCUS and carbon dioxide removal (CDR) projects and technology. The bill requires CARB, on or before January 1, 2025, to adopt regulations creating a unified state permitting application for approval of CCUS and CDR projects. The bill also requires the Secretary of the Natural Resources Agency to publish a framework for governing agreements for two or more tracts of land overlying the same geologic storage reservoir for the purposes of a carbon sequestration project. The Scoping Plan modeling reflects both CCUS and CDR contributions to achieve carbon neutrality.
Senate Bill 846 (SB 846) (Dodd, Chapter 239, Statutes of 2022) *Diablo Canyon Powerplant: Extension of Operations*	SB 846 extends the Diablo Canyon Power Plant's sunset date by up to five additional years for each of its two units and seeks to make the nuclear power plant eligible for federal loans. The bill requires that the California Public Utilities Commission (CPUC) not include and disallow a load-serving entity from including in their adopted resource plan, the energy, capacity, or any attribute from the Diablo Canyon power plant. The Scoping Plan explains the emissions impact of this legislation.
Senate Bill 1020 (SB 1020) (Laird,	SB 1020 adds interim renewable energy and zero carbon energy retail sales of electricity targets to California end-use customers set at 90 percent in 2035 and 95 percent in 2040.

Chapter 361, Statutes of 2022) *Clean Energy, Jobs, and Affordability Act of 2022*	It accelerates the timeline required to have 100 percent renewable energy and zero carbon energy procured to serve state agencies from the original target year of 2045 to 2035. This bill requires each state agency to individually achieve the 100 percent goal by 2035 with specified requirements. This bill requires the CPUC, California Energy Commission (CEC), and CARB, on or before December 1, 2023, and annually thereafter, to issue a joint reliability progress report that reviews system and local reliability. The bill also modifies the requirement for CARB to hold a portion of its Scoping Plan workshops in regions of the state with the most significant exposure to air pollutants by further specifying that this includes communities with minority populations or low-income communities in areas designated as being in extreme federal non-attainment. The Scoping Plan describes the implications of this legislation on emissions.
Senate Bill 1137 (SB 1137) (Gonzales, Chapter 365, Statutes of 2022) *Oil & Gas Operations: Location Restrictions: Notice of Intention: Health protection zone: Sensitive receptors*	SB 1137 prohibits the development of new oil and gas wells or infrastructure in health protection zones, as defined, except for purposes of public health and safety or other limited exceptions. The bill requires operators of existing oil and gas wells or infrastructure within health protection zones to undertake specified monitoring, public notice, and nuisance requirements. The bill requires CARB to consult and concur with the California Geologic Energy Management Division (CalGEM) on leak detection and repair plans for these facilities, adopt regulations as necessary to implement emission detection system standards, and collaborate with CalGEM on public access to emissions detection data.
Senate Bill 1075 (SB 1075) (Skinner, Chapter 363, Statutes of 2022) *Hydrogen: Green Hydrogen: Emissions of Greenhouse Gases*	SB 1075 requires CARB, by June 1, 2024, to prepare an evaluation that includes: policy recommendations regarding the use of hydrogen, and specifically the use of green hydrogen, in California; a description of strategies supporting hydrogen infrastructure, including identifying policies that promote the reduction of GHGs and short-lived climate pollutants; a description of other forms of hydrogen to achieve emission reductions; an analysis of curtailed electricity; an estimate of GHG and emission reductions that could be achieved through deployment of green hydrogen through a variety of scenarios; an analysis of the potential for opportunities to integrate hydrogen production and applications with drinking water supply treatment needs; policy recommendations for regulatory and permitting processes

	associated with transmitting and distributing hydrogen from production sites to end uses; an analysis of the life-cycle GHG emissions from various forms of hydrogen production; and an analysis of air pollution and other environmental impacts from hydrogen distribution and end uses. This bill would inform the production of hydrogen at the scale called for in this Scoping Plan.
Assembly Bill 1757 (AB 1757) (Garcia, Chapter 341, Statutes of 2022) *California Global Warming Solutions Act of 2006: Climate Goal: Natural and Working Lands*	AB 1757 requires the California Natural Resources Agency (CNRA), in collaboration with CARB, other state agencies, and an expert advisory committee, to determine a range of targets for natural carbon sequestration, and for nature-based climate solutions, that reduce GHG emissions in 2030, 2038, and 2045 by January 1, 2024. These targets must support state goals to achieve carbon neutrality and foster climate adaptation and resilience. This bill also requires CARB to develop standard methods for state agencies to consistently track GHG emissions and reductions, carbon sequestration, and additional benefits from natural and working lands over time. These methods will account for GHG emissions reductions of CO_2, methane, and nitrous oxide related to natural and working lands and the potential impacts of climate change on the ability to reduce GHG emissions and sequester carbon from natural and working lands, where feasible. This Scoping Plan describes the next steps and implications of this legislation for the natural and working lands sector.
Senate Bill 1206 (SB 1206) (Skinner, Chapter 884, Statutes of 2022) *Hydrofluorocarbon gases: sale or distribution*	SB 1206 mandates a stepped sales prohibition on newly produced high- global warming potential (GWP) HFCs to transition California's economy toward recycled and reclaimed HFCs for servicing existing HFC-based equipment. Additionally, SB 1206 also requires CARB to develop regulations to increase the adoption of very low-, i.e., GWP < 10, and no-GWP technologies in sectors that currently rely on higher-GWP HFCs.
Senate Bill 27 (SB 27) (Skinner, Chapter 237, Statutes of 2021)	SB 27 requires CNRA, in coordination with other state agencies, to establish the Natural and Working Lands Climate Smart Strategy by July 1, 2023. This bill also requires CARB to establish specified CO_2 removal targets for 2030 and beyond as part of its Scoping Plan. Under SB 27, CNRA is to establish and maintain a registry to identify projects in the state

Carbon Sequestration: State Goals: Natural and Working Lands: Registry of Projects	that drive climate action on natural and working lands and are seeking funding. CNRA also must track carbon removal and GHG emission reduction benefits derived from projects funded through the registry. This bill is reflected directly in this Scoping Plan as CO_2 removal targets for 2030 and 2045 in support of carbon neutrality.
Senate Bill 596 (SB 596) (Becker, Chapter 246, Statutes of 2021) *Greenhouse Gases: Cement Sector: Net-zero Emissions Strategy*	SB 596 requires CARB, by July 1, 2023, to develop a comprehensive strategy for the state's cement sector to achieve net-zero-emissions of GHGs associated with cement used within the state as soon as possible, but no later than December 31, 2045. The bill establishes an interim target of 40 percent below the 2019 average GHG intensity of cement by December 31, 2035. Under SB 596, CARB must: • Define a metric for GHG intensity and establish a baseline from which to measure GHG intensity reductions. • Evaluate the feasibility of the 2035 interim target (40 percent reduction in GHG intensity) by July 1, 2028. • Coordinate and consult with other state agencies. • Prioritize actions that leverage state and federal incentives. • Evaluate measures to support market demand and financial incentives to encourage the production and use of cement with low GHG intensity. The Scoping Plan modeling is designed to achieve these outcomes.
Executive Order N-82-20	Governor Newsom signed Executive Order N-82-20 in October 2020 to combat the climate and biodiversity crises by setting a statewide goal to conserve at least 30 percent of California's land and coastal waters by 2030. The Executive Order also instructed the CNRA, in consultation with other state agencies, to develop a Natural and Working Lands Climate Smart Strategy that serves as a framework to advance the state's carbon neutrality goal and build climate resilience. In addition to setting a statewide conservation goal, the Executive Order directed CARB to update the target for natural and working lands in support of carbon neutrality as part of this Scoping Plan, and to take into consideration the NWL Climate Smart Strategy.

	Executive Order N-82-20 also calls on the CNRA, in consultation with other state agencies, to establish the California Biodiversity Collaborative (Collaborative). The Collaborative shall be made up of governmental partners, California Native American tribes, experts, business and community leaders, and other stakeholders from across the state. State agencies will consult the Collaborative on efforts to: • Establish a baseline assessment of California's biodiversity that builds upon existing data and can be updated over time. • Analyze and project the impact of climate change and other stressors in California's biodiversity. • Inventory current biodiversity efforts across all sectors and highlight opportunities for additional action to preserve and enhance biodiversity. CNRA also is tasked with advancing efforts to conserve biodiversity through various actions, such as streamlining the state's process to approve and facilitate projects related to environmental restoration and land management. The California Department of Food and Agriculture (CDFA) is directed to advance efforts to conserve biodiversity through measures such as reinvigorating populations of pollinator insects, which restore biodiversity and improve agricultural production. The Natural and Working Lands Climate Smart Strategy informs this Scoping Plan.
Executive Order N-79-20	Governor Newsom signed Executive Order N-79-20 in September 2020 to establish targets for the transportation sector to support the state in its goal to achieve carbon neutrality by 2045. The targets established in this Executive Order are: • 100 percent of in-state sales of new passenger cars and trucks will be zero-emission by 2035. • 100 percent of medium- and heavy-duty vehicles will be zero-emission by 2045 for all operations where feasible, and by 2035 for drayage trucks. • 100 percent of off-road vehicles and equipment will be zero-emission by 2035 where feasible. The Executive Order also tasked CARB to develop and propose regulations that require increasing volumes of zero-electric passenger vehicles, medium- and heavy-duty

	vehicles, drayage trucks, and off-road vehicles toward their corresponding targets of 100 percent zero-emission by 2035 or 2045, as listed above. The Scoping Plan modeling reflects achieving these targets.
Executive Order N-19-19	Governor Newsom signed Executive Order N-19-19 in September 2019 to direct state government to redouble its efforts to reduce GHG emissions and mitigate the impacts of climate change while building a sustainable, inclusive economy. This Executive Order instructs the Department of Finance to create a Climate Investment Framework that: • Includes a proactive strategy for the state's pension funds that reflects the increased risks to the economy and physical environment due to climate change. • Provides a timeline and criteria to shift investments to companies and industry sectors with greater growth potential based on their focus of reducing carbon emissions and adapting to the impacts of climate change. • Aligns with the fiduciary responsibilities of the California Public Employees' Retirement System, California State Teachers' Retirement System, and the University of California Retirement Program. Executive Order N-19-19 directs the State Transportation Agency to leverage more than $5 billion in annual state transportation spending to help reverse the trend of increased fuel consumption and reduce GHG emissions associated with the transportation sector. It also calls on the Department of General Services to leverage its management and ownership of the state's 19 million square feet in managed buildings, 51,000 vehicles, and other physical assets and goods to minimize state government's carbon footprint. Finally, it tasks CARB with accelerating progress toward California's goal of five million ZEV sales by 2030 by: • Developing new criteria for clean vehicle incentive programs to encourage manufacturers to produce clean, affordable cars. • Proposing new strategies to increase demand in the primary and secondary markets for ZEVs. • Considering strengthening existing regulations or adopting new ones to achieve the necessary GHG reductions from within the transportation sector.

	The Scoping Plan modeling reflects efforts to accelerate ZEV deployment.
Senate Bill 576 (SB 576) (Umberg, Chapter 374, Statutes of 2019) *Coastal Resources: Climate Ready Program and Coastal Climate Change Adaptation, Infrastructure and Readiness Program*	Sea level rise, combined with storm-driven waves, poses a direct risk to the state's coastal resources, including public and private real property and infrastructure. Rising marine waters threaten sensitive coastal areas, habitats, the survival of threatened and endangered species, beaches, other recreation areas, and urban waterfronts. SB 576 mandates that the Ocean Protection Council develop and implement a coastal climate adaptation, infrastructure, and readiness program to improve the climate change resiliency of California's coastal communities, infrastructure, and habitat. This bill also instructs the State Coastal Conservancy to administer the Climate Ready Program, which addresses the impacts and potential impacts of climate change on resources within the conservancy's jurisdiction.
Assembly Bill 65 (AB 65) (Petrie-Norris, Chapter 347, Statutes of 2019) *Coastal Protection: Climate Adaption: Project Prioritization: Natural Infrastructure: Local General Plans*	This bill requires the State Coastal Conservancy, when it allocates any funding appropriated pursuant to the California Drought, Water, Parks, Climate, Coastal Protection, and Outdoor Access For All Act of 2018, to prioritize projects that use natural infrastructure in coastal communities to help adapt to climate change. The bill requires the conservancy to provide information to the Office of Planning and Research on any projects funded pursuant to the above provision to be considered for inclusion into the clearinghouse for climate adaption information. The bill authorizes the conservancy to provide technical assistance to coastal communities to better assist them with their projects that use natural infrastructure.
Executive Order B-55-18	Governor Brown signed Executive Order B-55-18 in September 2018 to establish a statewide goal to achieve carbon neutrality as soon as possible, and no later than 2045, and to achieve and maintain net negative emissions thereafter. Policies and programs undertaken to achieve this goal shall: • Seek to improve air quality and support the health and economic resiliency of urban and rural communities, particularly low-income and disadvantaged communities. • Be implemented in a manner that supports climate adaptation and biodiversity, including protection of the state's water supply, water quality, and native plants and animals.

	This Executive Order also calls for CARB to: • Develop a framework for implementation and accounting that tracks progress toward this goal. • Ensure future Scoping Plans identify and recommend measures to achieve the carbon neutrality goal. This Scoping Plan is designed to achieve carbon neutrality no later than 2045 and the modeling includes technology and fuel transitions to achieve that outcome.
Senate Bill 100 (SB 100) (De León, Chapter 312, Statutes of 2018) *California Renewables Portfolio Standard Program: emissions of greenhouse gases*	SB 100 mandates that the CPUC, CEC, and CARB plan for 100 percent of total retail sales of electricity in California to come from eligible renewable energy resources and zero-carbon resources by December 31, 2045. This bill also updates the state's Renewables Portfolio Standard (RPS) to include the following interim targets: • 44% of retail sales procured from eligible renewable sources by December 31, 2024. • 52% of retail sales procured from eligible renewable sources by December 31, 2027. • 60% of retail sales procured from eligible renewable sources by December 31, 2030. Under SB 100, the CPUC, CEC, and CARB shall use programs under existing laws to achieve 100 percent clean electricity. The statute requires these agencies to issue a joint policy report on SB 100 every four years. The first of these reports was issued in 2021. This Scoping Plan reflects the SB 100 Core Scenario resource mix with a few minor updates.
Assembly Bill 2127 (AB 2127) (Ting, Chapter 365, Statutes of 2018) *Electric Vehicle Charging Infrastructure: Assessment*	This bill requires the CEC, working with CARB and the CPUC, to prepare and biennially update a statewide assessment of the electric vehicle charging infrastructure needed to support the levels of electric vehicle adoption required for the state to meet its goals of putting at least 5 million zero-emission vehicles on California roads by 2030 and of reducing emissions of GHGs to 40% below 1990 levels by 2030. The bill requires the CEC to regularly seek data and input from stakeholders relating to electric vehicle charging infrastructure. This bill supports the deployment of ZEVs as modeled in this Scoping Plan.

Senate Bill 30 (SB 30) (Lara, Chapter 614, Statutes of 2018) *Insurance: Climate Change*	This bill requires the Insurance Commissioner to convene a working group to identify, assess, and recommend risk transfer market mechanisms that, among other things, promote investment in natural infrastructure to reduce the risks of climate change related to catastrophic events, create incentives for investment in natural infrastructure to reduce risks to communities, and provide mitigation incentives for private investment in natural lands to lessen exposure and reduce climate risks to public safety, property, utilities, and infrastructure. The bill requires the policies recommended to address specified questions.
Assembly Bill 2061 (AB 2061) (Frazier, Chapter 580, Statutes of 2018) *Near-zero-emission and Zero-emission Vehicles*	Existing state and federal law sets specified limits on the total gross weight imposed on the highway by a vehicle with any group of two or more consecutive axles. Under existing federal law, the maximum gross vehicle weight of that vehicle may not exceed 82,000 pounds. AB 2061 authorizes a near-zero-emission vehicle or a zero-emission vehicle to exceed the weight limits on the power unit by up to 2,000 pounds. This bill supports the deployment of cleaner trucks as modeled in this Scoping Plan.

Consideration of Relevant State Plans and Regulations

Development of this Scoping Plan also included careful consideration of, and coordination with, other state agency plans and regulations, including the SB 100 Joint Agency Report,[99] the 2022 State Strategy for the State Implementation Plan,[100] Climate Action Plan for Transportation Infrastructure,[101] AB 74 Studies on Vehicle Emissions and Fuel Demand and Supply,[102,103,104] Short-Lived Climate Pollutant Strategy (SLCP Strategy),[105]

[99] CPUC, CEC, and CARB. 2021. *SB 100 Joint Agency Report.* https://www.energy.ca.gov/sb100.
[100] CARB. January 31, 2022. Draft 2022 State Strategy for the State Implementation Plan. https://ww2.arb.ca.gov/sites/default/files/2022-01/Draft_2022_State_SIP_Strategy.pdf.
[101] CalSTA. 2021. *Climate Action Plan.* https://calsta.ca.gov/subject-areas/climate-action-plan.
[102] CalEPA. 2021. Carbon Neutrality Studies. https://calepa.ca.gov/climate/carbon-neutrality-studies/.
[103] Brown, A. L., et. al. 2021. *Driving California's Transportation Emissions.* https://escholarship.org/uc/item/3np3p2t0.
[104] Deschenes, O. 2021. *Enhancing equity*. https://zenodo.org/record/4707966#.YKPiaKhKi73.
[105] CARB. Short-Lived Climate Pollutants. https://ww2.arb.ca.gov/our-work/programs/slcp.

CARB's Achieving Carbon Neutrality Report,[106] Climate Smart Strategy,[107] and draft Natural and Working Lands Implementation Plan,[108] among others.

Input from Partners and Stakeholders

CARB also collaborated with other state agencies, held consultations with tribes, and solicited comments and feedback from affected stakeholders, including labor organizations and the public. The process to update the Scoping Plan began with kickoff workshops in early June 2021,[109] followed by over a dozen public workshops, including engagement with tribes,[110] and featured a series of EJ Advisory Committee and environmental justice community meetings.[111] The June 2021 workshop and several others were a joint agency effort, as there are many agencies with direct authority or jurisdiction over different sectors of the economy. Consultation with agencies also included bi-weekly, monthly, and weekly meetings.

During the summer of 2022 CARB held three community listening sessions, hosted by the CARB Chair and Board, in communities around the state, along with one virtual community listening session and one tribal listening session specifically for tribes. Many tribes provided written feedback, which was incorporated into this Scoping Plan. In addition, CARB respects tribal sovereignty and also engaged in a consultation campaign with tribes, which resulted in government-to-government consultations, and this Scoping Plan is reflective of this process.[112]

Emissions Data That Inform the Scoping Plan

Greenhouse Gas Emissions

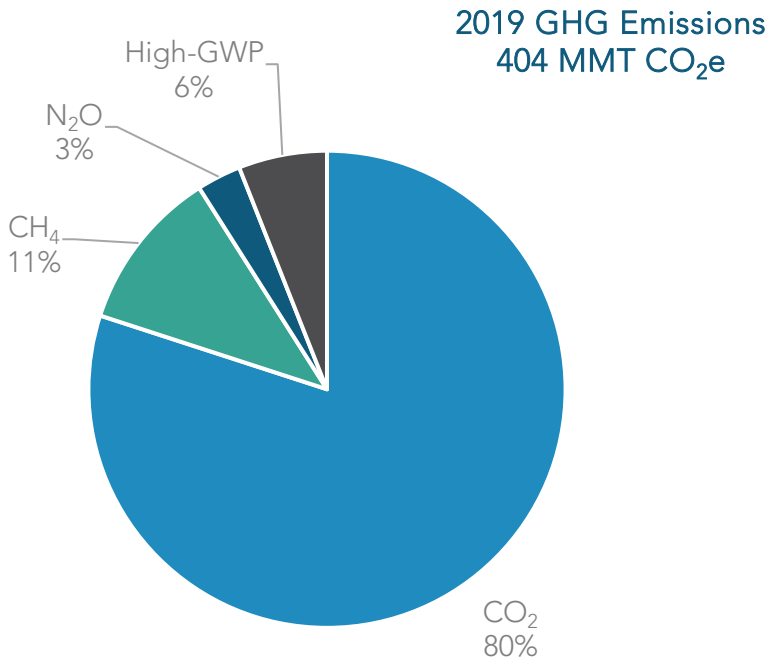
AB 32 includes which GHGs are to be regulated, reduced, and included in the state's targets and goals. That list includes seven GHGs: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), hydrofluorocarbons (HFCs),

---

[106] Energy and Environmental Economics, Inc. 2020. *Achieving Carbon Neutrality.* https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf.
[107] CNRA. 2022. Natural and Working Lands Climate Smart Strategy. https://resources.ca.gov/Initiatives/Expanding-Nature-Based-Solutions.
[108] CARB. 2019. *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan.* https://ww2.arb.ca.gov/resources/documents/nwl-implementation-draft.
[109] Appendix A (Public Process).
[110] CARB. Scoping Plan Meetings & Workshops. https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/scoping-plan-meetings-workshops.
[111] CARB. Environmental Justice Advisory Committee Meetings and Events. https://ww2.arb.ca.gov/environmental-justice-advisory-committee-meetings-and-events.
[112] CARB. 2018. Tribal Consultation Policy. October. https://www.arb.ca.gov/regact/nonreg/2018/california_air_resources_board_tribal_consultation_policy.pdf.

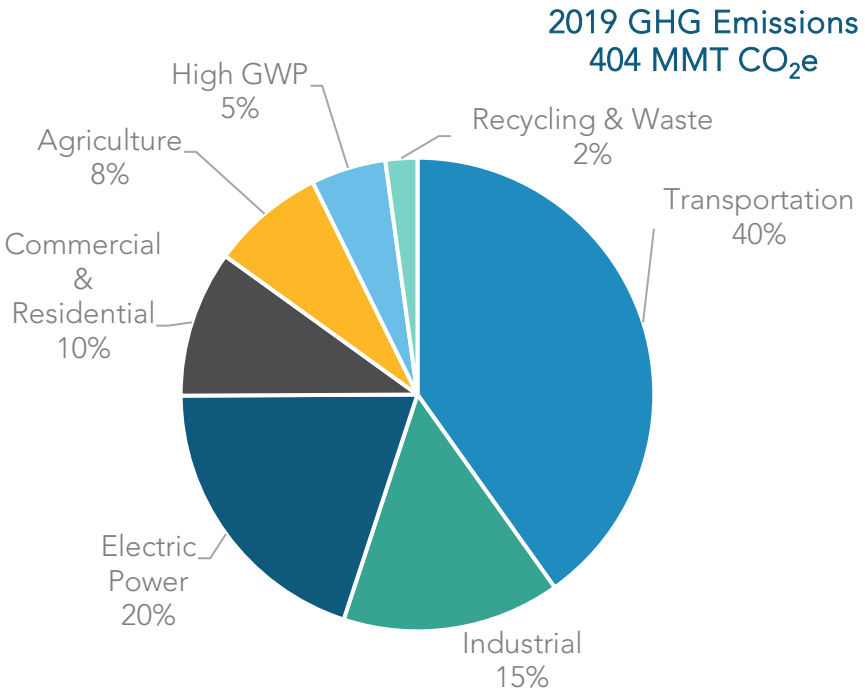
perfluorocarbons (PFCs), and nitrogen trifluoride (NF_3). Carbon dioxide is the primary GHG emitted in California, accounting for 83 percent of the total GHG emissions in 2019, as shown in Figure 1-7 below. Figure 1-8 illustrates that transportation (primarily on-road travel) is the single largest source of CO_2 emissions in the state. Upstream transportation emissions from the refinery and oil and gas sectors are categorized as CO_2 emissions from industrial sources and constitute about 50 percent of the industrial source emissions. When including these emissions, the transportation sector accounts for approximately half of statewide GHG emissions. Other significant sources of CO_2 include electricity production, industrial sources like refineries and cement plants, and residential sources like fossil gas. Figures 1-7 and 1-8 show state GHG emission contributions by GHG and sector based on the 2020 Greenhouse Gas Emission Inventory; GHG emissions for 2019 are shown because 2020 was an outlier due to the global pandemic. Emissions in Figure 1-8 are depicted by Scoping Plan sector, which includes separate categories for high-global warming potential (GWP) and recycling/waste emissions that are otherwise typically included within other economic sectors.

Figure 1-7: 2019 State GHG emission contributions by GHG[113]



[113] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020: Trends of Emissions and Other Indicators.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.

Figure 1-8: 2019 State GHG emission contributions by Scoping Plan sector[114]



The scope of the AB 32 GHG Inventory encompasses emission sources within the state's borders, as well as imported electricity consumed in the state. This construct for the inventory is consistent with IPCC practices to allow for comparison of statewide GHG emissions with those at the national level and with other international GHG inventories. Statewide GHG emissions calculations use many data sources, including data from other state and federal agencies. However, a significant source of data comes from reports submitted to CARB through the Regulation for the Mandatory Reporting of GHG Emissions (MRR). The MRR requires facilities and entities with more than 10,000 metric tons of carbon dioxide equivalent ($MTCO_2e$) of combustion and process emissions, all facilities belonging to certain industries, and all electric power entities to submit an annual GHG emissions data report directly to CARB. Furthermore, this regulation requires that reports from entities that emit more than 25,000 $MTCO_2e$ be verified by a CARB-

[114] The High GWP sector includes high global warming potential gas emissions from releases of ozone depleting substance (ODS) substitutes, SF_6 emissions from the electricity transmission and distribution system, and gases that are emitted in the semiconductor manufacturing process. ODS substitutes, which are primarily HFCs, are used in refrigeration and air conditioning equipment, solvent cleaning, foam production, fire retardants, and aerosols.

accredited third-party verification body. More information on MRR emissions reports can be found at CARB's Mandatory Greenhouse Gas Emissions Reporting website.[115]

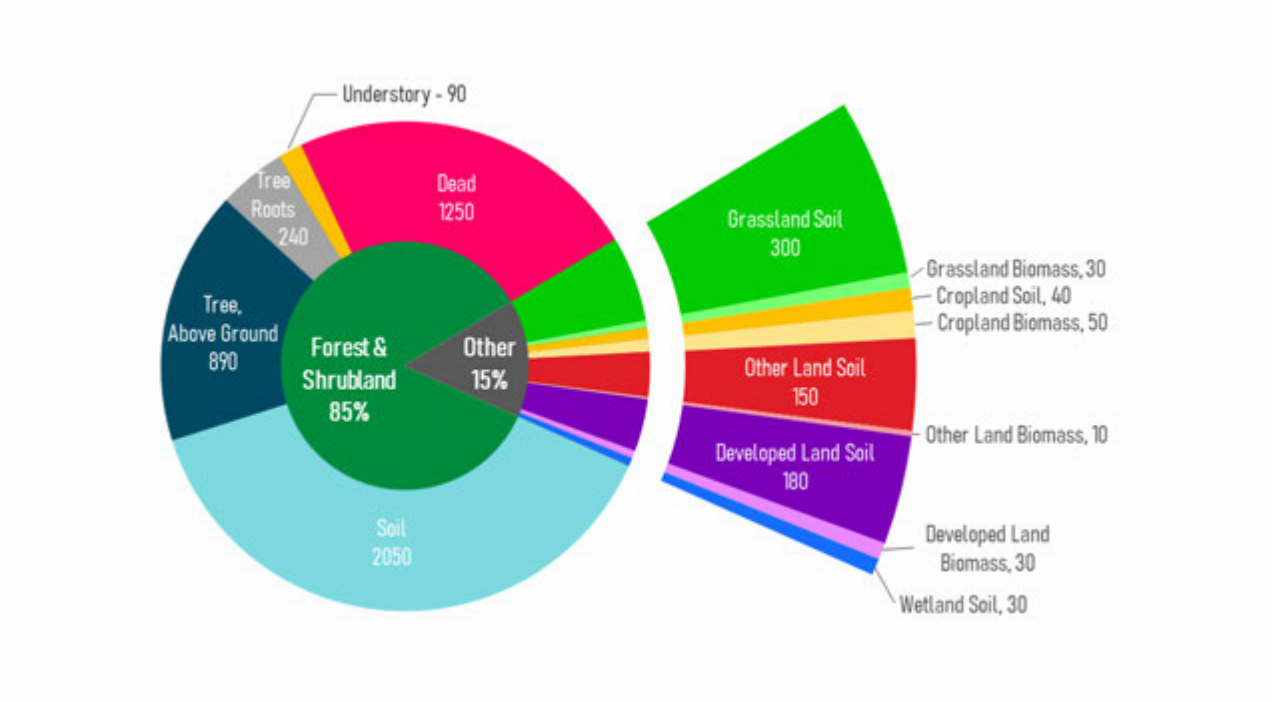
All data sources used to develop the GHG Emission Inventory are listed in CARB's inventory supporting documentation.[116]

Natural and Working Lands

For natural and working lands, the 2018 ecosystem carbon inventory (NWL Inventory)[117] shows there are approximately 5,340 million metric tons (MMT) of carbon in the carbon pools[118] (reservoirs of carbon that have the ability to both take in and release carbon) that CARB has quantified (see Figure 1-9). For purposes of comparison, 5,340 MMT of ecosystem carbon stock is equivalent to 19,600 MMT of atmospheric CO_2. Forests and shrublands contain the majority of California's carbon stock because they cover the majority of California's landscape and have the highest carbon density of any land cover type. All other land categories combined comprise over 35 percent of California's total acreage, but only 15 percent of carbon stocks. Roughly half of the 5,340 MMT of carbon resides in soils and half in plant biomass.

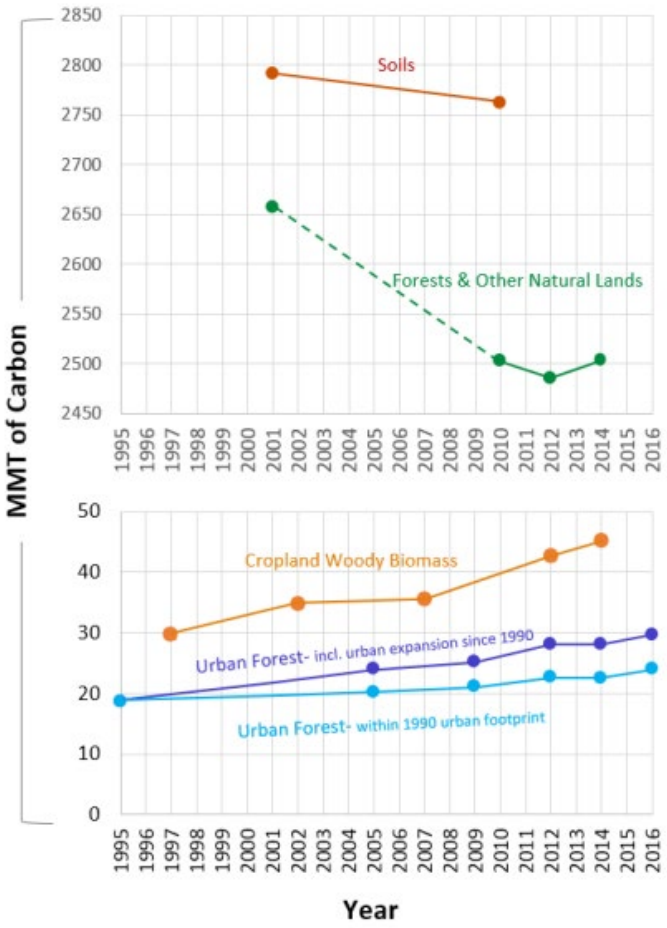
[115] CARB. Mandatory Greenhouse Gas Emissions Reporting. https://ww2.arb.ca.gov/our-work/programs/mandatory-greenhouse-gas-emissions-reporting.
[116] CARB. Current California GHG Emission Inventory Data. www.arb.ca.gov/cc/inventory/data/data.htm.
[117] CARB. 2018. *An Inventory of Ecosystem Carbon in California's Natural and Working Lands.* https://ww3.arb.ca.gov/cc/inventory/pubs/nwl_inventory.pdf.
[118] "Carbon pools" are Above-Ground Live Biomass (boles, stems, and foliage in shrubs, trees, grasses, and herbaceous vegetation), Below-Ground Live Biomass (roots in shrubs, trees, grasses, and herbaceous vegetation), Dead Organic Matter (standing or downed dead wood and litter), Harvested Wood Products (all wood and bark material that leaves harvest sites regardless of whether it is eventually incorporated into merchandisable products), and Soil Organic Matter (organic carbon in the top 30 centimeters of soil).

Figure 1-9: Carbon stocks in natural and working lands (MMT carbon)



In addition to providing an estimate of the ecosystem carbon that exists on California's landscape, the NWL Inventory also shows how those carbon stocks are changing (see Figure 1-10). The inventory attributes stock change to human activity, such as land use change, or to disturbances, such as wildfire. CARB's inventory shows these lands were a source of GHG emissions from 2001 to 2011, releasing more carbon than they stored, and then they returned to be a slight carbon sink from 2012 to 2014. These trends highlight the interannual and interdecadal variability of lands and their ability to be both a source and a sink of carbon.

Figure 1-10: Changes in carbon stock by landscape type



For natural and working lands, California's inventory is also based on IPCC methods for tracking ecosystem carbon over time, providing for comparability with other national and subnational inventories and carbon accounting. As such, the NWL Inventory is an important tool for tracking both carbon stock changes in California over time and the impacts that interventions such as those identified in this Scoping Plan, actions identified in the Climate Smart Land Strategy, and others have on NWL carbon stocks.

All data sources used to develop the NWL Inventory are listed in the technical support documentation at CARB's California Natural & Working Lands Inventory website.[119]

[119] CARB. California Natural & Working Lands Inventory. *https://ww2.arb.ca.gov/nwl-inventory*.

Black Carbon

In addition, CARB has developed a statewide emission inventory for black carbon in support of the SLCP Strategy. The inventory is reported in two categories: non-forestry (anthropogenic) sources and forestry sources.[120] The black carbon inventory is calculated using existing $PM_{2.5}$ emission inventories combined with speciation profiles that define the fraction of $PM_{2.5}$ that is black carbon. The black carbon inventory helps support implementation of the SLCP Strategy, but it is not part of California's GHG Inventory that tracks progress toward the state's climate targets under AB 32 or SB 32. The state's major anthropogenic sources of black carbon include off-road transportation, on-road transportation, residential wood burning, fuel combustion, and industrial processes. CARB estimated 2017 black carbon emissions to be approximately 8 $MTCO_2e$.[121] The majority of anthropogenic sources come from transportation—specifically, heavy-duty vehicles. The share of black carbon emissions from transportation is dropping rapidly and is expected to continue to do so between now and 2030 as a result of California's air quality programs. The remaining black carbon emissions will come largely from woodstoves/fireplaces, off-road applications, and industrial/commercial combustion. The forestry category includes non-agricultural prescribed burning and wildfire emissions.

Tracking Life-Cycle and Out-of-State Emissions

In recent years there has been increased interest in the embedded carbon in products, also known as *life-cycle emissions.* A life-cycle accounting framework refers to all of the GHG emissions generated from the sourcing, production, and transportation of products to an endpoint. In doing such assessments for a product, emissions may be associated with sourced materials and production activity outside a jurisdiction's borders. While life-cycle emissions can provide a more comprehensive picture of the emissions associated with the goods we consume and ongoing demand, life-cycle inventories are inconsistent with IPCC standards, as they would result in double counting of emissions across jurisdictions. Other countries and regions do produce their own inventory reports consistent with IPCC methods and are taking action to reduce emissions within their jurisdictions. In addition, jurisdictions often lack legal authority to regulate sources outside of their borders. Finally, it is difficult to obtain accurate data for sources and production activities outside of a region's border that would impact the accuracy of such an inventory. For these reasons, the inventory used in the Scoping Plan does not use a life-cycle

[120] SB 1383. https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201520160SB1383.
[121] This is a preliminary estimate developed for this Scoping Plan. Official Black Carbon emissions estimates are provided in the SLCP inventory here: https://ww2.arb.ca.gov/ghg-slcp-inventory.

approach and remains consistent with international accounting standards and consistent with how other countries and regions track emissions within their jurisdictions.

However, GHG mitigation action may cross geographic borders as part of subnational and international collaboration, or as a natural result of implementation of regional policies. In addition to the state's existing GHG inventory, CARB will develop an accounting framework that reflects the benefits of our policies accruing outside of the state. This accounting framework will be important to better understand the true impact of the state's policies on what is emitted into the atmosphere. For example, the LCFS incentivizes GHG reductions along the entire supply chain for the production and delivery of transportation fuel imported for use in the state. However, our inventory only captures the change in emissions from the tailpipe of when that fuel is used in California and does not capture any GHG reductions that occur in the production process if the fuel is produced out of state.

Natural and working lands forestry actions are another example, where California's policies are inspiring forest management actions in other states that result in increased permanent carbon sequestration. California's NWL inventory does not capture the increased carbon stocks resulting from forestry projects happening outside of California, and the CO_2 removals resulting from these projects are not applied in either CARB's NWL inventory or CARB's AB 32 GHG Emissions Inventory. For GHG reductions outside of the state to be attributed to our programs, those reductions must be real, quantifiable, verifiable, and permanent.

It also will be important to avoid any double counting (including claims to those reductions by other jurisdictions) and to transparently indicate whether any extra-jurisdictional emissions reductions might be included in another region's inventory. CARB is collaborating with other jurisdictions to ensure GHG accounting rules are consistent with international best practices, as robust accounting rules instill confidence in the reductions claimed and maintain support for joint action across jurisdictions. The policy goals of consistency and transparency are critical as we work together with other jurisdictions on our parallel paths to achieve our GHG targets with real benefits to the atmosphere.

Tracking Progress

Historically, the AB 32 GHG Inventory has been the primary metric to track progress toward achieving climate targets.[122] However, we must now deploy clean technology at unprecedented rates. The emissions modeling underpinning this Scoping Plan and

[122] Starting with the 2022 Edition of the AB 32 GHG inventory, the inventory development now relies more directly on the annually reported and third-party verified emissions from the Regulation for the Mandatory Reporting of Greenhouse Gas Emissions.

targets for clean technology in statute can serve as leading indicators across the economy on how our actions compare to the pace of action needed to be on track to achieve carbon neutrality. The California Climate Dashboard[123] was launched in 2022 and provides high-level metrics for clean energy production and technology deployment. Statistics such as the deployment of zero emission vehicles and clean electricity generation are just some of the examples of metrics across the economy that can be tracked, in addition to GHG emissions, to understand if the state is on track to meet its climate goals. A key indicator to track will be building of new energy infrastructure and deployment of clean technology as evaluated in the uncertainty analysis in Chapter 2. CARB will coordinate with state agencies to establish and make public similar metrics across all economic sectors to help provide transparency on the state's progress in deploying clean technology at the pace and scale needed to achieve carbon neutrality no later than 2045.

[123] CalEPA. California Climate Dashboard. *https://calepa.ca.gov/climate-dashboard/*.

Chapter 2: The Scoping Plan Scenario

This chapter describes the Scoping Plan Scenario, which for the first time includes sources in both the AB 32 GHG Inventory and Natural and Working Lands (NWL). It begins with a short description of the alternatives evaluated. Four scenarios for the AB 32 GHG Inventory and NWL were considered separately and helped to inform the Scoping Plan Scenario. Each of the alternatives were considered in terms of the important criteria and priorities that the state's comprehensive climate action must deliver, including the need for GHG reductions that are not only technologically feasible and cost-effective, but also can deliver health and economic benefits for the state. All the scenarios were set against what is called the *Reference Scenario*—that is, what the GHG emissions would look like if we did nothing at all beyond the existing policies that are required and already in place to achieve the 2030 target of at least 40 percent below 1990 levels, or those expected with no new actions in the NWL sector. For this Scoping Plan, two sets of modeling tools were used to evaluate the AB 32 GHG Inventory and NWL sectors because no single model can assess both AB 32 sectors and NWL together. As a result, two different sets of scenarios were developed for each sector type. While this chapter breaks out discussion separately for the two sector types, the Scoping Plan Scenario reflects the combined actions across both sectors by choosing an alternative from each sector type. The modeling provides point estimates; however, that does not imply precision. As discussed in the uncertainty section, several types of uncertainties are associated with any outcomes projected by the modeling results. There will be ranges of estimates associated with each point that are not shown in the graphs or results.

Scenarios for the AB 32 GHG Inventory Sectors

The Reference Scenario for the AB 32 GHG Inventory sectors shows continuing but modest GHG reductions beyond 2030 that level off toward mid-century. The comprehensive analysis of all four alternatives indicates that the Scoping Plan Scenario is the best choice to achieve California's climate and clean air goals while balancing the legislative direction on prioritizing direct emissions reductions, reducing anthropogenic emissions by at least 85 percent by 2045, being technologically feasible, and being cost-effective. It also protects public health, provides a solid foundation for continued economic growth, and drastically reduces the state's dependence on fossil fuel combustion and does not disproportionately impact disadvantaged communities. Each of the alternative scenarios was the product of a process of development informed by public input, the

governor,[124] CARB, legislative direction, and input by the EJ Advisory Committee.[125,126] Future updates to the Scoping Plan may consider new clean technologies and fuels beyond those included in this Scoping Plan.

The four scenarios evaluated shared many similarities. They each embodied the following characteristics:

- Drastic reduction in fossil fuel dependence, with some remaining in-state demand for fossil fuels for aviation, marine, and locomotion applications, and for fossil gas for buildings and industry
- Ambitious deployment of efficient non-combustion technologies such as zero emission vehicles and heat pumps
- Rapid growth in the production and distribution of clean energy such as zero carbon electricity and hydrogen
- Progressive phasedown of fossil fuel production and distribution activities as part of the transition to clean energy
- Remaining emissions of fugitive SLCPs such as refrigerants and fugitive methane
- Strong consumer adoption of clean technology and fuel options
- Removal of remaining CO_2 emissions to achieve carbon neutrality
- Some reliance on carbon capture and sequestration (CCS)

While the four scenarios had a lot in common, they also had some differences:

- Year in which carbon neutrality is achieved (2035 or 2045)
- Rate of deployment of clean technology and production and distribution of zero carbon energy
- Remaining amount of demand for fossil energy in the year carbon neutrality is achieved
- Constraints on technology and fuels deployed in certain sectors
- Consumer adoption rates of clean technologies and fuels
- Degree of reliance on CO_2 removal
- Degree of reliance on CCS

---

[124] Newsom, Gavin. July 22, 2022. Letter from Governor Newsom to CARB Chair Liane Randolph. Retrieved from *https://www.gov.ca.gov/wp-content/uploads/2022/07/07.22.2022-Governors-Letter-to-CARB.pdf*.

[125] EJ Advisory Committee. December 2, 2021. EJ Advisory Committee Responses for the CARB Scenario Inputs. *https://ww2.arb.ca.gov/sites/default/files/2021-12/EJAC%20Final%20Responses%20to%20CARB%20Scenario%20Inputs_12_2_21.pdf*.

[126] CARB. January 25, 2022. Update on PATHWAYS Scenario Modeling Assumptions. *https://ww2.arb.ca.gov/sites/default/files/2022-01/Scenario%20Slides%20for%20Jan25%20EJAC%20Mtg_01242022.pdf*.

The summary below provides an overview of the alternatives designed and considered for the energy and industrial sectors in this update. Full details of each scenario considered can be found in the *Draft 2022 Scoping Plan Update*

Scoping Plan Scenario (modeling scenario Alternative 3 from the Draft): carbon neutrality by 2045, deploy a broad portfolio of existing and emerging fossil fuel alternatives and clean technologies, and align with statutes, Executive Orders, Board direction, and direction from the governor

Alternative 1: carbon neutrality by 2035, nearly complete phaseout of all combustion, limited reliance on carbon capture and sequestration and engineered carbon removal, and restricted applications for biomass-derived fuels

Alternative 2: carbon neutrality by 2035 and aggressive deployment of a full suite of technology and energy options, including engineered carbon removal

Alternative 4: carbon neutrality by 2045, deployment of a broad portfolio of existing and emerging fossil fuel alternatives, slower deployment and adoption rates than the Scoping Plan Scenario, and a higher reliance on CO_2 removal

Other considerations for the AB 32 GHG Inventory sectors include the following:

- To what extent does an alternative meet the statewide targets and any sector targets, and also deliver clean air benefits (especially in the near term) to address ongoing healthy air disparities, prioritize reductions for mobile and large stationary sources, and emphasize continued investment in disadvantaged communities?
- Does an alternative support California in building on efforts to collaborate with other jurisdictions and include exportable policies based on robust science?
- Does an alternative provide for compliance options and a cost-effective approach to reduce GHG emissions?
- Does the alternative present a realistic and ambitious path forward consistent with statute and science, and support economic opportunities, particularly in anticipated growth sectors?

Scenarios for Natural and Working Lands

For the natural and working lands sector, the Reference Scenario shows that NWL will continue to emit GHGs and lose carbon stocks into the future as the combined effects of past unhealthy management practices and climate change impact our lands. Relative to the Reference Scenario, the four NWL scenarios represent different scales of land management on seven landscapes (forests, shrublands/chaparral, grasslands, croplands, developed lands, wetlands, and sparsely vegetated lands) to support carbon neutrality.

The analysis of the four NWL scenarios shows that the Scoping Plan Scenario is the preferred choice because it prioritizes sustainable land management to sequester carbon over the long term, GHG and air pollution reductions, ecosystem health and resilience, and implementation and technological feasibility and cost-effectiveness. The Scoping Plan Scenario reduces catastrophic wildfire risk to the state; increases the health and resilience of California's forests, shrublands, and grasslands; increases soil health; and protects, restores, and enhances California's natural and working lands for future generations. The Scoping Plan Scenario takes into consideration the priority landscapes and nature-based strategies identified in California's Climate Smart Strategy[127] and reflects the state's priorities to manage lands in ways that support the multiple benefits they provide. The Scoping Plan Scenario, as well as each of the alternative NWL scenarios, were informed by input from other agencies, the public, and the EJ Advisory Committee. Additional landscapes and land management activities will be added and evaluated in future Scoping Plan updates and in response to AB 1757.

Each of the NWL scenarios have several similarities, including the following:

- Prioritizing NWL management actions on forests, shrublands, grasslands, croplands, developed lands, wetlands, and sparsely vegetated lands. These actions can reduce GHG emissions from these lands, protect ecosystems against future climate change, protect communities, and enhance the ecosystem benefits they provide to nature and society.
- Exploring the potential impacts of different levels of NWL management actions that are designed to achieve the objective associated with each scenario.
- Analyzing the carbon impacts of land management actions, climate change, wildfire, and water use on California's diverse natural and working lands through 2045.

There are also differences across the four NWL scenarios. These include:

- The level of NWL management actions taken on each landscape, such as varying the acres of healthy soils practices for croplands.
- The types of NWL management actions taken on each landscape, such as prescribed burning or thinning for forests, grasslands, and shrublands.

[127] CNRA. 2022. Natural and Working Lands Climate Smart Strategy. *https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/CNRA-Report-2022---Final_Accessible_Compressed.pdf*.

The summary below provides an overview of the alternatives designed and considered for the NWL sectors in this Scoping Plan. Full details of each scenario considered can be found in the *Draft 2022 Scoping Plan Update*.

Scoping Plan Scenario (NWL Alternative 3 from the Draft): land management activities that prioritize restoration and enhancement of ecosystem functions to improve resilience to climate change impacts, including more stable carbon stocks

NWL Alternative 1: land management activities that prioritize short term carbon stocks in our forests and through increased climate smart agricultural practices on croplands

NWL Alternative 2: land management activities representative of California's current commitments and plans

NWL Alternative 4: land management activities that prioritize reducing catastrophic wildfires in forests, shrublands, and grasslands

Evaluation of Scoping Plan Alternatives

CARB staff solicited feedback from topical experts, affected stakeholders, and the EJ Advisory Committee, including a tribal representative, at public meetings to assemble input assumptions for four carbon neutrality scenarios to model using PATHWAYS. Revisions to the Draft Scoping Plan were informed by direction in statute, the Governor's Executive Orders, public comments, and the recommendations of the EJ Advisory Committee. The three alternative scenarios were designed to explore the potential speed, magnitude, and impacts of transitioning California's energy demand away from fossil fuels. The modeling assumptions listed below identify the primary fossil fuel alternative that is commercially available and technically feasible for widespread use by 2045 for each sector. CARB assumes that any energy demand that remains after the alternative technology or fuel is applied—such as on-road internal combustion engines, industrial processes, and gas use in existing buildings that have not yet decarbonized—will continue to be met by fossil fuels, resulting in residual GHG emissions.

NWL Scoping Plan Alternatives

For the NWL sectors, staff significantly expanded the scale of the scientific analysis for NWL from previous Scoping Plan efforts. CARB staff utilized modeling tools for this expanded analysis to assess both the carbon and other ecological, public health, and economic outcomes of management actions on forests, shrublands, grasslands, croplands, developed lands, wetlands, and sparsely vegetated lands. CARB staff aligned the scenarios with both the landscape types and actions identified in other efforts called for in Governor Newsom's Executive Order N-82-20 (e.g., California's Climate Smart Strategy and Pathways to 30x30). As part of this Scoping Plan, CARB staff modeled as many of the management actions identified in the Natural and Working Lands Climate

Smart Strategy as were feasible. The management actions that were included in the model were selected because of the State of California's previous work to quantify these actions' impacts. It was not feasible to model every land management strategy for NWL, and so it is possible that larger volumes of sequestration (e.g., in soils or in oceans) could result from additional non-modeled activities. California's Natural and Working Lands Climate Smart Strategy includes a more comprehensive listing of priority nature-based solutions and management actions. It is important to note that the absence of a particular management action or its climate benefit in the modeling is not an indication of its importance or potential contributions toward meeting the target or toward supporting the carbon neutrality target for California.

Forests: Management strategies were modeled for forests: biological/chemical/ herbaceous treatments (e.g., herbicide application), clearcut, various timber harvests (e.g., variable retention, seed tree / shelterwood, selection harvesting), mastication, other mechanical treatments (e.g., piling of dead material, understory thinning), prescribed burning, and thinning. Avoided land conversion to another land use was also included in the modeling. Wildfire was modeled and is responsive to management strategies and climate conditions.

Shrublands and chaparral: Management strategies were modeled for shrublands and chaparral: biological/chemical/herbaceous treatments, prescribed burning, mechanical treatment (e.g., mastication, crushing, mowing, piling), and avoided conversion from shrubland to another land use. Wildfire was modeled and is responsive to management strategies and climate conditions.

Grasslands: Management strategies were modeled for grasslands: biological/chemical/herbaceous treatments, prescribed burning, and avoided land conversion from grasslands to another land use. Wildfire was modeled and is responsive to management strategies and climate conditions.

Croplands: Management strategies were modeled for row crops: cover cropping, no till, reduced till, compost amendment, transition to organic[128] farming, avoided conversion of annual crop agricultural land through easements, establishing riparian forest buffers, alley cropping, establishing windbreaks/shelterbelts, establishing tree and shrubs in croplands, and establishing hedgerows. For perennial crops, windbreaks/shelterbelts, hedgerows, conversion from annual crops to perennial crops, and avoided conversion to other land uses were modeled.

[128] Note: N_2O reductions from decreases in synthetic fertilizer application in organic farming were not modeled.

Developed lands: Management strategies were modeled for developed lands: Increasing tree canopy cover through planting trees and improved management of existing trees, and removing vegetation surrounding structures in accordance with the CAL FIRE Defensible Space PRC 4291.

Wetlands: Management strategies were modeled for wetlands: Restoring wetlands through submerging cultivated land in the Sacramento-San Joaquin Delta and avoided land conversion in the Sacramento-San Joaquin Delta.

Sparsely vegetated lands: Management strategies were modeled for sparsely vegetated lands: Avoided conversion of sparsely vegetated lands to another land use.

Scoping Plan Scenario

The Scoping Plan Scenario achieves GHG emission reductions that exceed the levels expected based on existing policies represented in the Reference Scenario, keeping California on track to achieve the SB 32 GHG reduction target for 2030 and become carbon neutral no later than 2045. Actions that reduce GHG emissions and transition AB 32 GHG Inventory sources away from fossil fuel combustion affect each economic sector. Actions that lead to improved carbon stocks affect each landscape.

AB 32 GHG Inventory Sectors

The AB 32 GHG Inventory Sector Reference scenario is the forecasted statewide GHG emissions through mid-century, with existing policies and programs but without any further action to reduce GHGs beyond those needed to achieve the 2030 limit. The Reference Scenario was developed based on other projections of business-as-usual conditions. Sources of data and policies included are:

- California Energy Demand Forecast[129]
- The two transportation carbon neutrality studies required by AB 74[130]
- The Mobile Source Strategy[131]
- SB 100 60 percent Renewables Portfolio Standard
- A Low Carbon Fuel Standard carbon intensity reduction target of 20 percent

Policies that are under study or design, such the Advanced Clean Fleets regulation, are not included. The Reference Scenario reflects current trends and expected performance of policies identified in the 2017 Scoping Plan—some of which are performing better (such as the RPS and LCFS) and others that may not meet expectations (such as vehicle miles traveled [VMT] reductions and methane capture). Figure 2-1 provides the modeling results for a Reference Scenario for the AB 32 GHG Inventory sectors compared to the Scoping Plan Scenario.

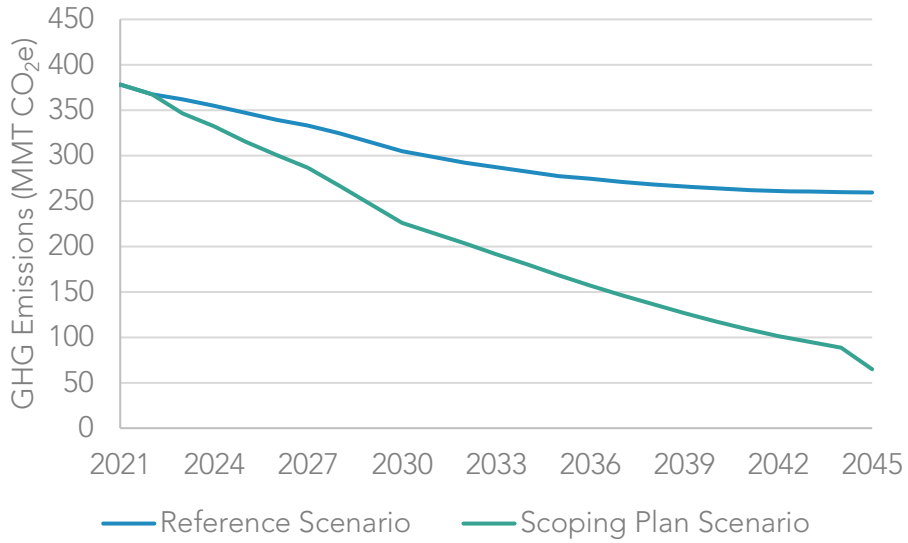
---

[129] California Energy Commission (CEC). 2020. *2019 Integrated Energy Policy Report.* https://www.energy.ca.gov/data-reports/reports/integrated-energy-policy-report/2019-integrated-energy-policy-report.

[130] Brown et al. 2021. *Driving California's Transportation Emissions.* https://escholarship.org/uc/item/3np3p2t0 and Deschenes et al. 2021. *Enhancing equity.* https://zenodo.org/record/4707966#.YI72RNrMKUn.

[131] CARB. 2021. 2020 *Mobile Source Strategy.* https://ww2.arb.ca.gov/sites/default/files/2021-12/2020_Mobile_Source_Strategy.pdf.

Figure 2-1: Reference and Scoping Plan Scenario GHG emissions[132]



The Scoping Plan Scenario is summarized in Table 2-1. The table shows the types of technologies and energy needed to drastically reduce GHG emissions from the AB 32 Inventory sectors. It also includes references to relevant statutes and Executive Orders, although it is not comprehensive of all existing new authorities for directing or supporting the actions described. Each action is expected to both reduce GHGs and help improve air quality, primarily by transitioning away from combustion of fossil fuels. The Scoping Plan Scenario achieves the AB 1279 target of 85 percent below 1990 levels by 2045 and identifies a need to accelerate the 2030 target to 48 percent below 1990 levels.

[132] The drop in emissions in 2045 reflects both the need to achieve an 85% reduction below 1990 levels in anthropogenic emissions per AB 1279 and Governor Newsom's request for a 100 MMT CO2e carbon removal and capture target in 2045. This was modeled by extending CCS to electric sector emissions.

Table 2-1: Actions for the Scoping Plan Scenario: AB 32 GHG Inventory sectors

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
GHG Emissions Reductions Relative to the SB 32 Target[133]	40% below 1990 levels by 2030	SB 32: Reduce statewide GHG emissions. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Smart Growth / Vehicle Miles Traveled (VMT)	VMT per capita reduced 25% below 2019 levels by 2030, and 30% below 2019 levels by 2045	SB 375: Reduce demand for fossil transportation fuels and GHGs, and improve air quality. In response to Board direction and EJ Advisory Committee recommendations
Light-duty Vehicle (LDV) Zero Emission Vehicles (ZEVs)	100% of LDV sales are ZEV by 2035	EO N-79-20: Reduce demand for fossil transportation fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory 2035 target aligns with the EJ Advisory Committee recommendation.

[133] While the SB 32 GHG emissions reduction target is not an Action that is analyzed independently, it is included in this table for reference.

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Truck ZEVs	100% of medium-duty (MDV)/HDV sales are ZEV by 2040 (AB 74 University of California Institute of Transportation Studies [ITS] report)	EO N-79-20: Reduce demand for fossil transportation fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Aviation	20% of aviation fuel demand is met by electricity (batteries) or hydrogen (fuel cells) in 2045. Sustainable aviation fuel meets most or the rest of the aviation fuel demand that has not already transitioned to hydrogen or batteries.	Reduce demand for petroleum aviation fuel and reduce GHGs. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter to CARB Chair Liane Randolph
Ocean-going Vessels (OGV)	2020 OGV At-Berth regulation fully implemented, with most OGVs utilizing shore power by 2027. 25% of OGVs utilize hydrogen fuel cell electric technology by 2045.	Reduce demand for petroleum fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Port Operations	100% of cargo handling equipment is zero-emission by 2037. 100% of drayage trucks are zero emission by 2035.	Executive Order N-79-20: Reduce demand for petroleum fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Freight and Passenger Rail	100% of passenger and other locomotive sales are ZEV by 2030. 100% of line haul locomotive sales are ZEV by 2035. Line haul and passenger rail rely primarily on hydrogen fuel cell technology, and others primarily utilize electricity.	Reduce demand for petroleum fuels and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Oil and Gas Extraction	Reduce oil and gas extraction operations in line with petroleum demand by 2045.	Reduce GHGs and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Petroleum Refining	CCS on majority of operations by 2030, beginning in 2028 Production reduced in line with petroleum demand.	Reduce GHGs and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Electricity Generation	Sector GHG target of 38 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) in 2030 and 30 $MMTCO_2e$ in 2035 Retail sales load coverage[134] 20 gigawatts (GW) of offshore wind by 2045 Meet increased demand for electrification without new fossil gas-fired resources.	SB 350 and SB 100: Reduce GHGs and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter, Board direction, and EJ Advisory Committee recommendation
New Residential and Commercial Buildings	All electric appliances beginning 2026 (residential) and 2029 (commercial), contributing to 6 million heat pumps installed statewide by 2030	Reduce demand for fossil gas and GHGs, and improve ambient and indoor air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter

[134] SB 100 speaks only to retail sales and state agency procurement of electricity. The *2021 SB 100 Joint Agency Report* reflects the agency authors' understanding that other loads—wholesale or non-retail sales and losses from storage and transmission and distribution lines—are not subject to the law.

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Existing Residential Buildings	80% of appliance sales are electric by 2030 and 100% of appliance sales are electric by 2035. Appliances are replaced at end of life such that by 2030 there are 3 million all-electric and electric-ready homes—and by 2035, 7 million homes—as well as contributing to 6 million heat pumps installed statewide by 2030.	Reduce demand for fossil gas and GHGs, and improve ambient and indoor air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter
Existing Commercial Buildings	80% of appliance sales are electric by 2030, and 100% of appliance sales are electric by 2045. Appliances are replaced at end of life, contributing to 6 million heat pumps installed statewide by 2030.	Reduce demand for fossil gas and GHGs, and improve ambient and indoor air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory In response to Governor Newsom's July 2022 letter
Food Products	7.5% of energy demand electrified directly and/or indirectly by 2030; 75% by 2045	Reduce demand for fossil gas and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Construction Equipment	25% of energy demand electrified by 2030 and 75% electrified by 2045	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Chemicals and Allied Products; Pulp and Paper	Electrify 0% of boilers by 2030 and 100% of boilers by 2045. Hydrogen for 25% of process heat by 2035 and 100% by 2045 Electrify 100% of other energy demand by 2045.	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Stone, Clay, Glass, and Cement	CCS on 40% of operations by 2035 and on all facilities by 2045 Process emissions reduced through alternative materials and CCS	SB 596: Reduce demand for fossil energy, process emissions, and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Other Industrial Manufacturing	0% energy demand electrified by 2030 and 50% by 2045	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Combined Heat and Power	Facilities retire by 2040.	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Agriculture Energy Use	25% energy demand electrified by 2030 and 75% by 2045	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions
Low Carbon Fuels for Transportation	Biomass supply is used to produce conventional and advanced biofuels, as well as hydrogen.	Reduce demand for petroleum fuel and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory
Low Carbon Fuels for Buildings and Industry	In 2030s biomethane[135] blended in pipeline Renewable hydrogen blended in fossil gas pipeline at 7% energy (~20% by volume), ramping up between 2030 and 2040 In 2030s, dedicated hydrogen pipelines constructed to serve certain industrial clusters	Reduce demand for fossil energy and GHGs, and improve air quality. AB 197: direct emissions reductions for sources covered by the AB 32 Inventory

[135] *Biomethane* is also known as renewable natural gas (RNG).

Sector	Action	Statutes, Executive Orders, Other Direction, Outcome
Non-combustion Methane Emissions	Increase landfill and dairy digester methane capture. Some alternative manure management deployed for smaller dairies Moderate adoption of enteric strategies by 2030 Divert 75% of organic waste from landfills by 2025. Oil and gas fugitive methane emissions reduced 50% by 2030 and further reductions as infrastructure components retire in line with reduced fossil gas demand	SB 1383: Reduce short-lived climate pollutants.
High GWP Potential Emissions	Low GWP refrigerants introduced as building electrification increases, mitigating HFC emissions	SB 1383: Reduce short-lived climate pollutants.

Natural and Working Lands

The Reference Scenario for NWL represents the amount of land management that occurred between 2001 and 2014, and projects the outcomes from maintaining the 2001–2014 levels of land management until 2045. The management and land use practices that occur within the Reference Scenario were derived from empirical data used by staff. For forests, shrublands/chaparral, and grasslands, the Reference Scenario constitutes approximately 250,000 acres of annual statewide treatments. For croplands, the Reference Scenario represents no healthy soil practices because during this period the healthy soil program did not yet exist. For land use change within all land types that consider land use change, historical rates of land conversion from 2001–2014 also were taken from empirical data and modeled into the future for the Reference Scenario.

Table 2-2 summarizes the Scoping Plan Scenario. The table also includes references to relevant statutes and Executive Orders where available.

Table 2-2: Actions for the Scoping Plan Scenario: NWL sectors

Sector	Action	Statutes, Executive Orders, Outcome
Natural and Working Lands	Conserve 30% of the state's NWL and coastal waters by 2030. Implement near- and long-term actions to accelerate natural removal of carbon and build climate resilience in our forests, wetlands, urban greenspaces, agricultural soils, and land conservation activities in ways that serve all communities—and in particular low-income, disadvantaged, and vulnerable communities.	EO N-82-20 and SB 27: CARB to include an NWL target in the Scoping Plan. AB 1757: Establish targets for carbon sequestration and nature-based climate solutions. SB 1386: NWL are an important strategy in meeting GHG reduction goals.

Sector	Action	Statutes, Executive Orders, Outcome
Forests and Shrublands	At least 2.3 million acres[136] treated statewide annually in forests, shrublands/chaparral, and grasslands, comprised of regionally specific management strategies that include prescribed fire, thinning, harvesting, and other management actions. No land conversion of forests, shrublands/chaparral, or grasslands.	Restore health and resilience to overstocked forests and prevent carbon losses from severe wildfire, disease, and pests. Improve air quality and reduce health costs related to wildfire emissions. Improve water quantity and quality and improve rural economies. Provide forest biomass for resource utilization. EO B-52-18: CARB to increase the opportunity for using prescribed fire. AB 1504 (Skinner, Chapter 534, Statutes of 2010): CARB to recognize the role forests play in carbon sequestration and climate mitigation.

[136] The 2.3 million acre target is what the Scoping Plan modeling shows would be needed to realize the carbon stock target called for in this Scoping Plan by 2045.

Sector	Action	Statutes, Executive Orders, Outcome
Grasslands	At least 2.3 million acres[137] treated includes increased management of grasslands interspersed in forests to reduce fuels surrounding communities using management strategies appropriate for grasslands. No land conversion of forests, shrublands/chaparral, or grasslands.	Help to achieve climate targets, improve air quality, and reduce health costs.
Croplands	Implement climate smart practices for annual and perennial crops on ~80,000 acres annually. Land easements/ conservation on annual crops at ~5,500 acres annually. Increase organic agriculture to 20% of all cultivated acres by 2045 (~65,000 acres annually).	Reduce short-lived climate pollutants. Increase soil water holding capacity. Increase organic farming and reduce pesticide use. SB 859: Recognizes the ability of healthy soils practices to reduce GHG emissions from agricultural lands. Target increased in response to Governor Newsom's direction to prioritize sustainable land management.

[137] The 2.3 million acre target is what the Scoping Plan modeling shows would be needed to realize the carbon stock target called for in this Scoping Plan by 2045.

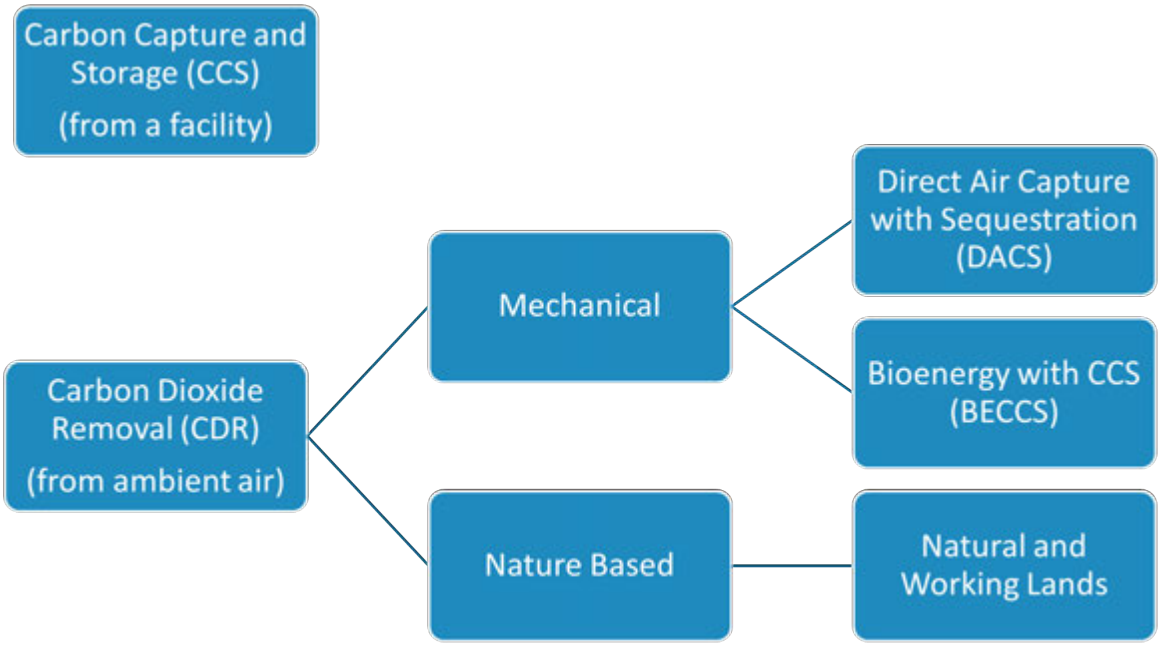
Sector	Action	Statutes, Executive Orders, Outcome
Developed Lands	Increase urban forestry investment by 200% above current levels and utilize tree watering that is 30% less sensitive to drought. Establish defensible space that accounts for property boundaries.	Increase urban tree canopy and shade cover. Reduce heat island effects and support water infrastructure. Reduce fire risk via defensible space. AB 2251 (Calderon, Chapter 186, Statutes of 2022): Increase urban tree canopy 10% by 2035. Target increased in response to AB 2251 and Governor Newsom's direction on CO_2 removal targets in his July 2022 letter.
Wetlands	Restore 60,000 acres of Delta wetlands.	Increase carbon sequestration and reduce short-lived climate pollutants. Helps to reverse land subsidence while improving flood protection and providing critical habitat.
Sparsely Vegetated Lands	Land conversion at 50% of the Reference Scenario land conversion rate.	Reduce the rate of land conversion to more GHG-intensive land uses.

Strategies for Carbon Removal and Sequestration

To achieve carbon neutrality, any remaining emissions must be compensated for using carbon removal and sequestration tools. The following discussion presents more detail

on the options available to capture and sequester carbon. Carbon removal and sequestration will be an essential tool to achieve carbon neutrality, and the modeling clearly shows there is no path to carbon neutrality without carbon removal and sequestration. Governor Newsom also recognized the importance of CO_2 removal strategies and directed CARB to establish CO_2 removal and carbon capture targets of 20 $MMTCO_2$ and 100 $MMTCO_2$ by 2030 and 2045, respectively, as well as signing 2022 legislation on carbon removal and sequestration, including: AB 1279, SB 905, SB 1137, and AB 1757. Carbon removal and sequestration can take different forms. Figure 2-2 illustrates the types of carbon removal and sequestration included in this Scoping Plan. There are numerous other carbon removal options undergoing research, development, and pilot deployment. As these options mature and new approaches emerge, they can be considered in future Scoping Plan updates.

Figure 2-2: Forms of carbon removal and sequestration considered in this Scoping Plan



The Role of Carbon Capture and Sequestration

Carbon capture and sequestration (CCS) will be a necessary tool to reduce GHG emissions and mitigate climate change while minimizing leakage and minimizing emissions where no technological alternatives may exist. CCS is a process by which large amounts of CO_2 are captured, compressed, transported, and sequestered. CCS projects are paired with a source of emissions, as the CCS project captures CO_2 as it leaves a facility's smokestack. CCS projects are often paired with large GHG-emitting facilities such as energy, manufacturing, or fuel production facilities. The sequestration component

of CCS includes CO_2 injection into geologic formations (such as depleted oil and gas reservoirs and saline formations), as well as use in industrial materials (e.g., concrete). CCS is distinct from biological sequestration, which is typically accomplished through NWL management and conservation practices that enhance the storage of carbon or reduce CO_2 emissions with nature-based approaches. CCS is also distinct from mechanical CO_2 removal technologies, where CO_2 is removed directly from the atmosphere using mechanical and/or chemical processes.

CARB adopted a CCS Protocol in 2018 as part of amendments to the Low Carbon Fuel Standard.[138] At this time, no CCS projects have been implemented or have generated any credits under that protocol. However, CCS projects have been implemented elsewhere since the 1970s, largely on coal-fired power plants, with over two dozen projects operational around the world. Over 100 are at the stages of advanced or early development and are expanding beyond coal-fired plants to fossil gas, fuel production, and electricity generation facilities.[139] CCS projects are in development for addressing emissions from fuel, gas, energy production, and chemical production. As of November 2019, more than half of global large-scale CCS facilities (representing approximately 22 $MMTCO_2$/yr in capacity[140]) were in the U.S., mostly as a result of sustained governmental support for these technologies.[141] This support includes the federal 45Q tax credit for CCS[142,143] and research and deployment grants from federal agencies.[144, 145] California's deep sedimentary rock formations in the Central Valley represent world-class

[138] CARB. 2022. Carbon Capture & Sequestration. *https://ww2.arb.ca.gov/our-work/programs/carbon-capture-sequestration*.
[139] Global CCS Institute. 2021. *Global Status of CCS 2021.* *https://www.globalccsinstitute.com/wp-content/uploads/2021/11/Global-Status-of-CCS-2021-Global-CCS-Institute-1121.pdf*.
[140] IHS Markit. August 2021. Carbon Removal Potential: An Overview. *https://ww2.arb.ca.gov/sites/default/files/2021-08/ihsmarkit_presentation_sp_engineeredcarbonremoval_august2021.pdf*.
[141] Beck, Lee. 2019. *Carbon capture and storage in the USA: The role of US innovation leadership in climate-technology commercialization.* *https://academic.oup.com/ce/article/4/1/2/5686277*.
[142] Congressional Research Service. 2021. Carbon Storage Requirements in the 45Q Tax Credit. IF11639. *https://crsreports.congress.gov/product/pdf/IF/IF11639*.
[143] The Inflation Reduction Act of August 2022 expands and enhances the 45 Q tax credit for CCS. Pub.L. No. 117-169 (August 16, 2022).
[144] U.S. Department of Energy. 2020. U.S. Department of Energy Announces $131 Million for CCUS Technologies. *https://www.energy.gov/articles/us-department-energy-announces-131-million-ccus-technologies*.
[145] U.S. Department of Energy. 2021. Funding Opportunity Announcement 2515, Carbon Capture R&D for Natural Gas and Industrial Point Sources, and Front-End Engineering Design Studies for Carbon Capture Systems at Industrial Facilities and Natural Gas Plants. *https://www.energy.gov/fecm/articles/funding-opportunity-announcement-2515-carbon-capture-rd-natural-gas-and-industrial*.

CO_2 storage sites that would meet the highest standards, with storage capacities of at least 17 billion tons of CO_2.[146,147]

In this Scoping Plan, CCS is included to address emissions from limited sectors, including electricity generation, cement production facilities, and refineries, to ensure anthropogenic emissions are reduced by at least 85 percent below 1990 levels in 2045, as directed in AB 1279. While the modeling outputs show CCS not being applied to the electricity sector until 2045, CCS could be implemented earlier on the electricity sector with a similar ramp up over time as that for refineries and cement plants. An earlier application of CCS in the electricity sector would yield additional reductions in years prior to 2045. In addition, CCS can support hydrogen production until such time as there is sufficient renewable power for electrolysis and an abundant water source.

Cement plants have emissions associated with combustion and process-related activities. Combustion emissions account for approximately 40 percent of the total emissions at cement plants. The remaining emissions are related to process-related activities. Due to the high heat content needed to produce cement, there is currently no technically feasible alternative to combustion. SB 596 calls for a 40 percent reduction in GHG intensity in cement emissions from 2019 levels by 2035, and then net zero emissions by 2045. To meet in-state demand, the state relies on cement both produced in state and imported. There are seven cement plants operating in California.[148] To minimize emissions leakage and address emissions from cement plants, the Scoping Plan Scenario includes CCS for cement plants. Additional reductions will need to be pursued and considered as part of implementation of SB 596, which calls for CARB to develop a comprehensive strategy by July 1, 2023, for the state's cement sector to achieve net-zero emissions of GHGs associated with cement used within the state as soon as possible, but no later than December 31, 2045. This effort began in the summer of 2022 and included sector specific workshops.

Even with implementation of EO N-79-20, and despite all of the ambitious efforts in the Scoping Plan Scenario, there will remain some demand for petroleum fuels for legacy vehicles on road applications, and in aviation, rail, and marine applications. Petroleum refineries will need to implement technology to decarbonize their operations and reduce their emissions. This Scoping Plan also assumes CCS at petroleum refineries as one of those potential strategies. Currently, there are seventeen petroleum refineries operating

[146] For comparison purposes, California's emitted 418.2 million metric tons of CO_2e in 2019.
[147] Lawrence Livermore National Laboratory. 2020. *Getting to Neutral: Options for Negative Carbon Emissions in California.* Revision 1. https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf.
[148] CARB. Mandatory GHG Reporting – Reported Emissions. https://ww2.arb.ca.gov/mrr-data

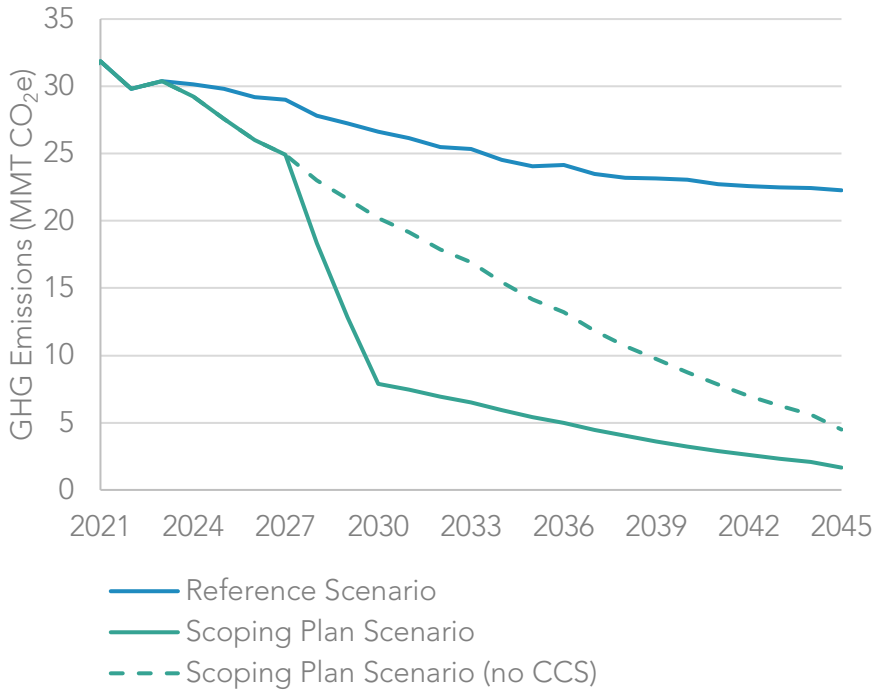
in the state.[149] On the supply side, the modeling assumes all in-state demand is met through some very limited refining activities in California. Figure 2-3 shows the emissions from the refining sector with and without CCS. If CCS is not deployed, the emissions would be directly emitted into the atmosphere, and CO_2 removal by NWL or direct air capture would need to increase to compensate for the sector's emissions.

Refineries can have a variety of point sources that emit CO_2—such as steam methane reformers for producing hydrogen, combined heat and power units, and catalytic crackers—that are best suited for CCS. Each configuration of a refinery can be unique to its footprint, onsite operations, and the types of crude oils processed. There are newer technologies with smaller footprints[150] that can be deployed in modular configurations to capture CO_2 in space-constrained and multiple-point-source facilities such as refineries. CCS can provide a path to reducing GHG emissions from these facilities to meet petroleum demand while avoiding leakage and until such time as some refineries can be transitioned to produce clean energy to support the transition away from fossil fuels.

While the Scoping Plan modeled deployment of CCS on refineries and identifies significant emissions reductions that can be achieved, the refineries in California are large and complex. The actual deployment of CCS at these facilities as modeled in the Scoping Plan is uncertain. It will be important to closely monitor the evolution of CCS deployment in the refinery sector and, in the next Scoping Plan update, to evaluate the progress toward use in this sector to determine whether the projected reductions will be achieved.

[149] CARB. Mandatory GHG Reporting. *https://ww2.arb.ca.gov/mrr-data*.
[150] Carbon Clean. Modular Carbon Capture Systems for Industry. https://www.carbonclean.com/modular-systems?hsLang=en.

Figure 2-3: Petroleum refining emissions with and without carbon capture and sequestration



This Scoping Plan also calls for accelerating the transition from combustion of fossil fuels to hydrogen. Hydrogen can be produced through electrolysis with renewable electricity or through steam methane reformation of biomethane. There is a high degree of uncertainty around the availability of solar to support both electrification of existing sectors and the production of hydrogen through electrolysis. Producing hydrogen required under the Scoping Plan Scenario with electrolysis would require about 10 gigawatts (GW)[151] of additional solar capacity. If steam methane reformation is paired with CCS, the hydrogen produced could potentially be low carbon. Additionally, the biomethane used to generate hydrogen could be sourced from gasification of forest or agricultural waste resulting from forest management and other NWL management practices, which could also lead to net negative carbon outcomes. Steam methane reformation paired with CCS can thus ensure a rapid transition to hydrogen and increase hydrogen availability until such time as

[151] The Draft Scoping Plan included an estimate for solar capacity (40 GW) to support only electrolysis to produce all hydrogen in the Proposed Scenario. The Scoping Plan now includes steam methane reformation of biomethane and biomass gasification with CCS to produce hydrogen, along with electrolysis from off-grid solar. See Appendix H (AB 32 GHG Inventory Sector Modeling) for additional details.

electrolysis with renewables can meet the ongoing need, assuming there is also sufficient water supply. Additional background and next steps for CCS can be found in Chapter 4.

The EJ Advisory Committee has raised multiple concerns related to the inclusion of CCS and mechanical CDR in the Scoping Plan. Concerns range from potential negative health and air quality impacts in communities from operation of facilities utilizing CCS that continue to emit other emissions, to safety concerns related to potential leaks, to the viability of the current technology. Additionally, the EJ Advisory Committee has policy concerns about the strategy and wants to ensure that engineered carbon removal is not used as a substitute for strategies to achieve emissions reductions onsite and that it does not result in delays in phasing out fossil fuel use. Given these and other concerns and the importance of building public awareness, CARB recognizes the need for a multi-stakeholder process including other state, federal, and local agencies; tribes; independent experts; and community residents to further understand and address community concerns related to CCS. CARB hosted a CCS Symposium with U.S. EPA Region 9 and the Stanford Doerr School of Sustainability to discuss some of these critical issues with community members and other participants. As CARB begins the process of implementing SB 905 in 2023, that will provide an opportunity for further engagement.

In the context of CCS deployment, the Council of Environmental Quality (CEQ) also highlighted the need to further assess and quantify potential impacts on local criteria air pollutants and other emissions resulting from carbon capture retrofits at industrial facilities in response to concerns regarding potential cumulative emissions from single and/or multiple sources.[152] An October 2020 Stanford report[153] discussed how the potential post-combustion capture for CO_2 could also reduce emissions of criteria air pollutant emissions from certain facilities. Exploring these potential outcomes will be important to ensure deployment of CCS does not exacerbate air pollution impacts in communities and maximizes any air pollution benefits. The need for these types of evaluations is also included in SB 905.

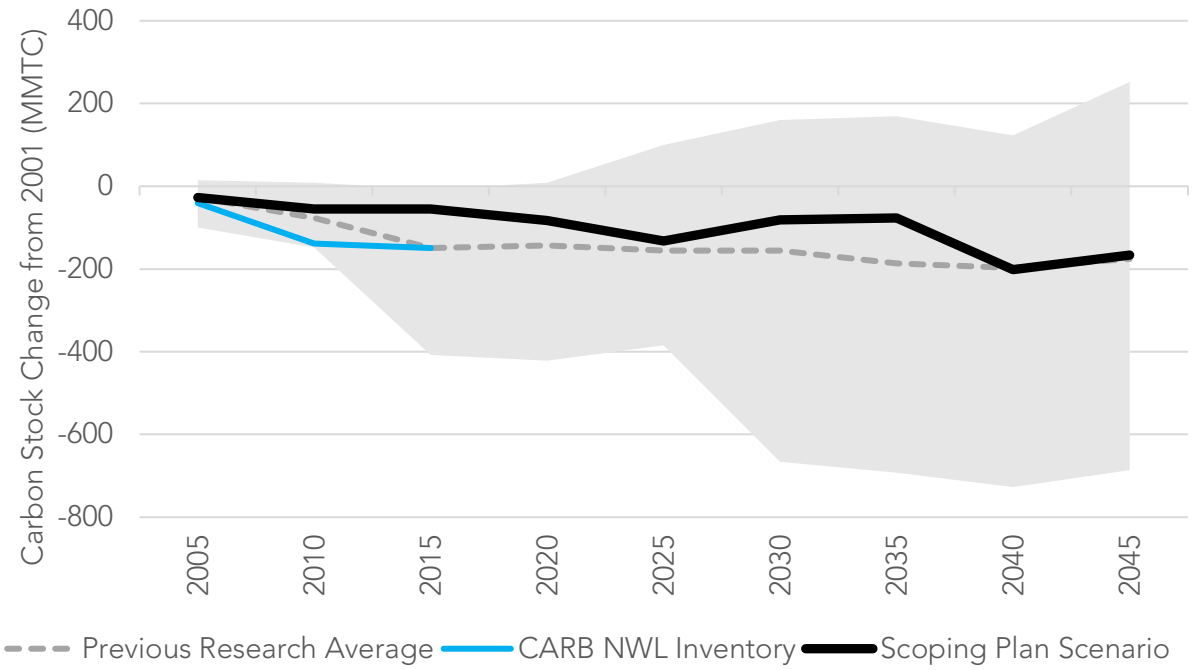
The Role of Natural and Working Lands Emissions and Sequestration

California's NWL assessments highlight the importance of increasing the pace and scale of NWL actions to ensure that our ecosystems are better equipped to withstand future climate change so they continue to provide the benefits that nature and society depend

[152] Carbon Capture, Utilization, and Sequestration Guidance. 87 Fed. Reg. 8808 (Feb. 16, 2022), *2022-03205.pdf (govinfo.gov)*.
[153] Stanford Center for Carbon Storage. 2020. *An Action Plan for Carbon Capture and Storage in California: Opportunities, Challenges, and Solutions.* October. *https://sccs.stanford.edu/ccs-in-ca/full-report-form?msclkid=6f9177f6c57811ecbebc473e75203b21*.

upon for survival. As climate change increases the likelihood of extreme wildfires, drought, heat, and other impacts, carbon stocks in California's NWL will face increased risks and impacts. We know from previous climate change and Scoping Plan work[154] that lands can be a net source of GHG emissions or a net sink, and that the magnitude of carbon stock changes and GHG emissions and sequestration from NWL are dependent on the effects of climate change and land management. The expanded modeling conducted for this Scoping Plan shows that NWL are projected to be a net source of emissions through 2045 and indicates a probable decrease of carbon stocks into the future. This projection is further corroborated by previous, independent research that has reached the same conclusion, showing a range of varying levels of carbon stock loss. Figure 2-4 shows the modeling results of the Scoping Plan Scenario overlaid with the NWL inventory and findings from independent research.

Figure 2-4: Comparison of the Scoping Plan Scenario (NWL) with existing research



The modeling indicates that immediate and aggressive climate action can reduce the environmental impacts that would occur in the absence of this action. The results of the modeling demonstrate that regular NWL management over the next two decades can

[154] CARB. 2019. January 2019. *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan*. https://ww2.arb.ca.gov/sites/default/files/2020-10/draft-nwl-ip-040419.pdf.

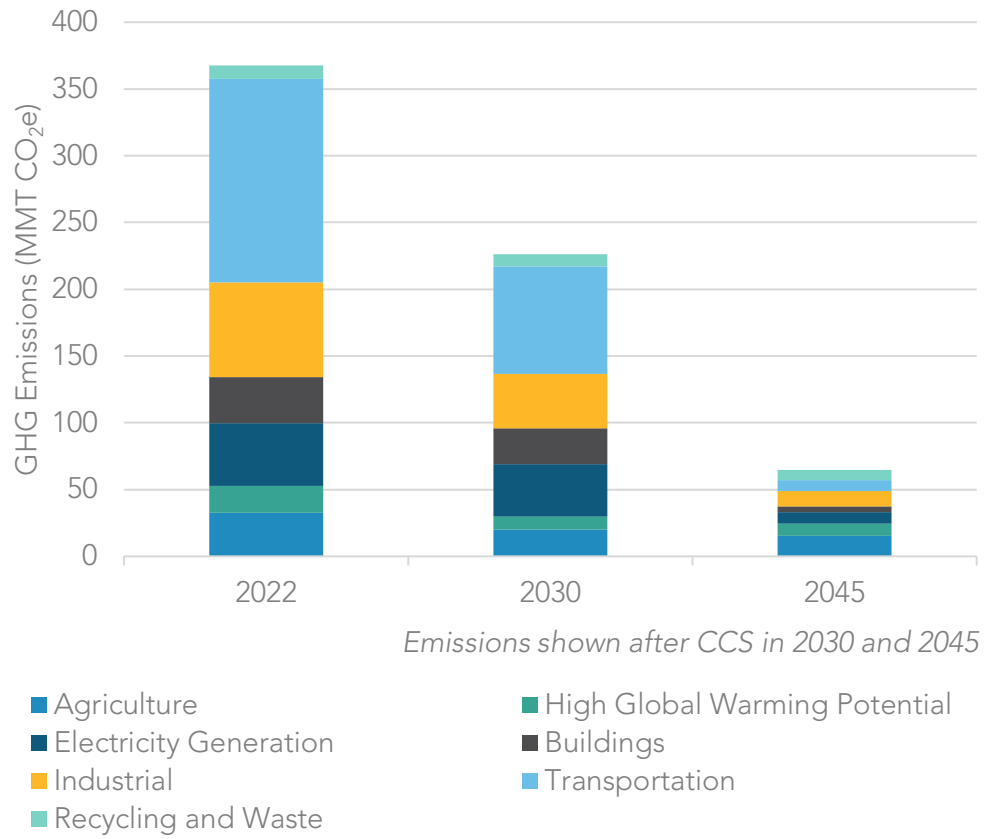
increase carbon stocks from the Reference Scenario trajectory, reduce GHG emissions from lands, and improve ecosystem and public health. This effort is the most comprehensive scientific effort taken by any government to include NWL within its overall climate strategy. Even so, we know that uncertainty exists about future climate and economic forces and the impacts they may have on our ecosystems, so it is important that the state take decisive and aggressive action to improve and diversify ecosystem structures and management.

The effects of climate change, including increased drought, wildfire, and extreme heat, play a significant role in determining the future of California's carbon stocks. And while management actions will help to reduce the impact that climate change will have on California, it is clear from the analysis that NWL sinks and sources are highly variable from year to year, and short time frames do not adequately demonstrate the impact that climate and management are having on ecosystems. For the purposes of climate planning, therefore, it is best to focus on carbon stock changes over longer periods rather than focusing on sequestration or emissions on shorter time frames. The Scoping Plan Scenario is estimated to result in additional NWL emissions of 7 million metric tons of carbon dioxide equivalent ($MMTCO_2e$) annually from 2025–2045. The Reference Scenario is estimated to result in annual emissions of 9 $MMTCO_2e$ over the same time period, and so the Scoping Plan Scenario slows the rate of emissions and provides an approximate 2 $MMTCO_2e$ in additional annual sequestration relative to the Reference Scenario. Because NWL are projected to be a net emissions source, the annual NWL emissions of approximately 7 $MMTCO_2e$ from the Scoping Plan Scenario will need to be compensated by additional CO_2 removal approaches to ensure California can achieve carbon neutrality by 2045.

The Role for Carbon Dioxide Removal (Direct Air Capture)

Even if anthropogenic emissions are reduced to at least 85 percent below 1990 levels by 2045 as called for by AB 1279, there will still be residual emissions in the AB 32 GHG Inventory sectors in 2045 that must be addressed in order to achieve the California's carbon neutrality target. Figure 2-5 includes the emissions by sector for the AB 32 GHG Inventory Sectors in 2022, 2030, and 2045 for the Scoping Plan Scenario.

Figure 2-5: Residual emissions in 2022, 2030, and 2045 for the Scoping Plan Scenario[155]



To achieve carbon neutrality, mechanical CDR will therefore need to be deployed. Because NWL management is not estimated to be a significant carbon removal path in the near term, additional CDR options will be needed. *Mechanical CDR* refers to a range of technologies that capture and concentrate ambient CO_2. Direct air capture (DAC) is one available option that is under development today and could be widely deployed. Note that, unlike CCS, DAC technologies are not designed to be attached to a specific source or smokestack. These technologies include chemical scrubbing processes that capture CO_2 through absorption or adsorption separation processes. Another carbon removal

[155] The High GWP sector includes high global warming potential gas emissions from releases of ozone depleting substance (ODS) substitutes, SF_6 emissions from the electricity transmission and distribution system, and gases that are emitted in the semiconductor manufacturing process. ODS substitutes, which are primarily hydrofluorocarbons (HFCs), are used in refrigeration and air conditioning equipment, solvent cleaning, foam production, fire retardants, and aerosols.

option that involves rapid mineralization of CO_2 at the Earth's surface is called *mineral carbonation.*[156] As is the case with CCS, mechanical CDR technologies will need governmental or other incentive support to overcome technology and market barriers. In the United States, the U.S. Department of Energy announced financing specifically for DAC in March 2020[157] and March 2021.[158] Additionally, almost $9 billion in CCS support was included in the $ 1 trillion Infrastructure Investment and Jobs Act of 2021.[159] This includes funding to establish four DAC hubs. The Inflation Reduction Act of 2022[160] increases the value of the 45Q tax credit to USD 85 per metric ton of CO_2 captured and stored in geologic formations from some industrial applications and USD 180 per metric ton for DAC with storage in geologic formations. In 2021, there were approximately 19 DAC facilities globally.[161]

Ultimately, the role for mechanical CDR will depend on the success of reducing emissions directly at the source in the AB 32 GHG Inventory sectors and the ability of the NWL to sequester carbon. However, mechanical CDR also provides an opportunity to not just achieve carbon neutrality, but also remove legacy GHG emissions from the atmosphere. As such, increased deployment of DAC can help achieve net negative emissions. This would further help avoid the most damaging impacts of climate change. While the federal incentives for DAC provide some support for this technology, the only California program that recognizes this technology is the LCFS program. Permitting must also happen across different levels of government and across multiple state agencies. Energy availability must also be addressed if DAC is to be implemented in remote areas. Additional information and next steps on DAC can be found in Chapter 4.

---

[156] The National Academies Press. 2018. Direct Air Capture and Mineral Carbonation Approaches for Carbon Dioxide Removal and Reliable Sequestration: Proceedings of a Workshop–in Brief. *https://nap.nationalacademies.org/catalog/25132/direct-air-capture-and-mineral-carbonation-approaches-for-carbon-dioxide-removal-and-reliable-sequestration#:~:text=National%20Academies%20of%20Sciences%2C%20Engineering%2C%20and%20Medicine%3B%20Division,concentrate%20carbon%20dioxide%20%28CO%202%29%20from%20ambient%20air*.

[157] U.S. Department of Energy. 2020. Department of Energy to Provide $22 Million for Research on Capturing Carbon Dioxide from Air*. https://www.energy.gov/articles/department-energy-provide-22-million-research-capturing-carbon-dioxide-air*.

[158] U.S. Department of Energy. 2021. DOE Invests $24 Million to Advance Transformational Air Pollution Capture. *https://www.energy.gov/articles/doe-invests-24-million-advance-transformational-air-pollution-capture*.

[159] Pub.L. No. 117-58 (November 15, 2021). *https://www.congress.gov/bill/117th-congress/house-bill/3684/text*.

[160] Pub.L. No. 117-169 (August 16, 2022). *https://www.congress.gov/bill/117th-congress/house-bill/5376/text*.

[161] International Energy Agency (IEA). 2022. Direct Air Capture – Analysis. *https://www.iea.org/reports/direct-air-capture*.

Carbon Dioxide Removal and Capture Targets for 2030 and 2045

Recognizing the importance of CO_2 removal, Governor Newsom and the Legislature identified the need for targets to send policy and regulatory signals to pilot, deploy, and scale action for those efforts. Governor Newsom requested that CARB set a CO_2 removal and capture target of 20 MMT for 2030 and 100 MMT for 2045, first prioritizing sequestration in NWL. And while this Scoping Plan prioritizes and recommends significant increased climate-smart action on all NWL to support carbon neutrality and healthy and resilient lands, the modeling indicates that, across all NWL, lands will be a net source of emissions when accounting for both carbon sequestration and GHG (CO_2, CH_4, and N_2O) emissions from lands.

Some landscapes, however, are projected to have a net increase in carbon stocks under the Scoping Plan Scenario between 2025 and 2045 relative to the reference case, indicating that NWL actions can help California achieve Governor Newsom's CO_2 removal targets. Carbon stocks in urban forests and grasslands are projected to increase relative to historical levels from implementation of the 2022 Scoping Plan. To support the governor's CO_2 removal targets, CARB estimates that lands would contribute an average of 1.5 MMT of CO_2 removals each year between 2025 and 2045. Any carbon sequestration contributions from lands need to reflect both long-term storage and an overall net increase in carbon stocks over time to ensure these NWL actions are contributing toward California's achievement and maintenance of carbon neutrality over time.

CARB will work to update and revise these estimates as part of implementation of AB 1757, which was signed by the governor in September 2022 and requires that CARB and the California Natural Resources Agency (CNRA) work with an expert advisory committee to determine an ambitious range of carbon sequestration targets by January 1, 2024, for the years 2030, 2038, and 2045.

For the AB 32 GHG Inventory sectors, the Scoping Plan Scenario modeling indicates that the scenario would meet or exceed the 2030 SB 32 target through GHG reduction policies without the need for CDR. CDR will, however, be necessary to increase ambition for an accelerated 2030 target and in increasing amounts over the following decades to achieve carbon neutrality by 2045.[162] Given the likelihood of NWL to be a net source of emissions, and the need for CDR to compensate for residual emissions to achieve carbon neutrality

[162] The modeled scenarios assume that residual emissions will be compensated using DAC technologies by including the direct cost in terms of dollars per ton CO_2 removed. The energy source for DAC is not modeled, but renewable electricity and/or hydrogen produced from electrolysis are zero carbon options consistent with the carbon neutrality targets in this Scoping Plan.

by 2045, California will need increasing deployment of mechanical CDR over the coming decades. In the immediate future, scaling nature-based CDR approaches also can help to provide some CO_2 removal quickly while mechanical CDR is scaled up between now and 2045. Table 2-3 provides estimates of CO_2 removal and capture needed in 2030[163] and 2045.

[163] As identified in Chapter 1, SB 27 (Skinner, Chapter 237, Statues of 2021) directed CARB to "establish carbon dioxide removal targets for 2030 and beyond" as part of this Scoping Plan. CARB is establishing these targets to satisfy both the requirements of SB 27 and the directive from Governor Newsom to establish CO_2 removal targets for 2030 and 2045.

Table 2-3: GHG emissions and removals needed to achieve carbon neutrality and meet the 20 $MMTCO_2$ removal and capture target in 2030 and the 100 $MMTCO_2$ removal and capture target in 2045.[164]

	2030 ($MMTCO_2e$)	2045 ($MMTCO_2e$)
GHG Emissions	233	72
AB 32 GHG Inventory Sector Emissions	226	65
Net NWL GHG Emissions Across All Landscapes (annual average from 2025–2045)	7	7
Carbon Capture and Sequestration (CCS): Avoided GHG Emissions from Industry and Electric Sectors	(13)	(25)
Carbon Dioxide Removal (CDR) including natural and working lands carbon sequestration,[165] Direct Air Capture, and Bioenergy with CCS (BECCS).	(7)	(75)
Net Emissions (GHG Emissions + CDR)	226	(3)

In 2030, the CO_2 removal and capture target is 20 MMT, but because the SB 32 target only encompasses the AB 32 GHG Inventory sectors, only CCS that reduces GHG emissions on AB 32 sources count toward achieving more ambitious GHG emission reductions in 2030. In 2045, the CO_2 removal and capture must compensate for any residual emissions from the AB 32 Inventory sectors and NWL emissions to support achieving carbon neutrality while also totaling at least 100 MMT. It is important to note that NWL, particularly forests, need a natural wildfire cycle to remain healthy. While the modeling projected wildfires, and implementing the Scoping Plan will result in a reduction in future wildfire emissions, getting to zero wildfires in the sector is not the goal, nor the

[164] Modeled estimates from the Scoping Plan Scenario indicate the relative quantity of emissions and removals to achieve carbon neutrality and meet carbon removal and capture targets. These estimates are not intended to imply precision, as the required policies are yet to be implemented and all models have some uncertainty in their forecasts.

[165] For the purposes of quantifying how to achieve the governor's 20 MMT and 100 MMT CO_2 removal and capture target, CARB included 1.5 $MMTCO_2e$ sequestration from NWL, which is the sequestration from urban forests. This is included as CO_2 removal because it is this sequestration that CARB can consider as having some permanence. Permanence is necessary for incorporating NWL into carbon neutrality. The net NWL emissions of 7 $MMTCO_2e$, identified in the second row of Table 2-3, includes *all* emissions and sinks from all NWL landscapes, which is inclusive of the 1.5 $MMTCO_2e$ sequestration. CARB will develop an accounting framework to accommodate NWL carbon stocks.

right approach to a sustainable forestry sector. In contrast in 2045, the reductions from programs and policies are estimated to reduce emissions by 169 $MMTCO_2e$ from business as usual.

The 2030 target for engineered CDR also provides a near term milestone for California and can serve as an important marker for progress in deploying CDR to support California's carbon neutrality goal. Preliminary estimates indicate that, globally, capacity from already announced projects will range from about 2 million metric tons per year ($MMTCO_2/y$) to 8 $MMTCO_2/y$ from bioenergy paired with CCS, and from about 2,000 metric tons per year ($MTCO_2/y$) to 1 $MMTCO_2/y$ from DACs by 2027,[166] which indicates that California's 2030 target is an ambitious, but achievable, goal.

Scenario Uncertainty

Greenhouse Gas Emissions Modeling

Several types of uncertainty are important to understand in both forecasting future emissions and estimating the benefits of emission reduction actions. In developing this Scoping Plan we forecasted a reference scenario and estimated the GHG emissions outcome of the AB 32 GHG Inventory sectors using the PATHWAYS[167] model. Inherent in the reference scenario modeling is the expectation that many of the existing programs will continue in their current form, and that the expected drivers for GHG emissions, such as energy demand, population growth, and economic growth, will match our current projections.

However, there is also the expectation that each of the policies included and implemented to achieve the 2030 target in the 2017 Scoping Plan will deliver their exact outcomes. It is unlikely the future will precisely match our projections, and this will lead to uncertainty in the forecast. For example, we never could have foreseen and forecasted economic and emissions impacts related to the extended disruptions from the COVID-19 pandemic. Thus, the single "reference" or "forecast" line should be understood to represent one possible future in a range of possible predictions. For this Scoping Plan, PATHWAYS utilized inputs that reflect technically feasible levels of deployment or adoption of low- or zero-carbon fuels and technologies. Each of the input assumptions provided to PATHWAYS has some uncertainty, which also contributes to uncertainty in the resulting reference scenario.

---

[166] IHS Markit. August 2021. Carbon Removal Potential. *https://ww2.arb.ca.gov/sites/default/files/2021-08/ihsmarkit_presentation_sp_engineeredcarbonremoval_august2021.pdf*.
[167] See Appendix H (AB 32 GHG Inventory Sector Modeling).

Similarly, for the NWL modeling, CARB used a mix of individual modeling tools[168] to estimate the carbon and other ecological, public health, and economic outcomes. The Reference scenario assumes that the level of land management actions that occurred between 2001 and 2014 for forests, shrublands, grasslands, croplands, developed lands, wetlands, and sparsely vegetated lands continues into the future. Alternative scenarios assessed the effect of increasing levels of management actions from the reference scenario beginning in 2025. There is a great deal of uncertainty about exactly how lands are currently managed, and a larger uncertainty about how they may be managed in the future. For NWL, it is unlikely that the future will precisely match the carbon stock outcomes CARB has projected, particularly given the uncertainties around current and future land management and the effects climate change will have on our lands. For any modeling exercise these uncertainties exist; however, this modeling effort brings together the best available science, data, and models to quantify the impact our actions may have on the landscape under an unknown future.

Implementation

As this Scoping Plan is designed to chart a path to achieving carbon neutrality, additional work will be required to fully design and implement any policies and actions identified in this plan. During the subsequent development of policies, the Legislature, CARB, and other state agencies will learn more about the technologies and their costs, as well as how each industry works, as a more comprehensive evaluation is conducted in coordination with stakeholders, including community engagement. Significant areas of uncertainty include permitting wait times[169] and local ordinances that might limit or slow the build-out of utility scale renewables.[170,171] In another example, times to reach commercial operations for solar projects after securing an interconnection agreement also have increased in recent years, to 3.5 to 5.5 years.[172]

The level of natural and working lands climate action identified in this Scoping Plan is ambitious. Achieving the level of action needed to result in the quantified carbon,

---

[168] See Appendix I (Natural and Working Lands Technical Support Document).
[169] CEC. 2021. *SB 100 Joint Agency Report.* https://www.energy.ca.gov/sb100#anchor_report.
[170] Roth, Sammy. 2019. "California's San Bernardino County slams the brakes on big solar projects." *Los Angeles Times.* https://www.latimes.com/business/la-fi-san-bernardino-solar-renewable-energy-20190228-story.html?fbclid=IwAR2qHGq3bahHme6SFErLsnyFi9UPIfBHIhvnOh3dU3OM7kUTMcEqYfN3pQA.
[171] Chediak, Mark. 2021. "California NIMBYs Threaten Biden's Clean Energy Goals." *BNN Bloomberg.* https://www.bnnbloomberg.ca/california-nimbys-threaten-biden-s-clean-energy-goals-1.1634351?msclkid=668c9ae9c11311ec92e34035ea157ad4.
[172] Rand, Joseph, et al. 2022. Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection as of the End of 2021. Power Point Presentation. Lawrence Berkeley National Laboratory. https://emp.lbl.gov/sites/default/files/queued_up_2021_04-13-2022.pdf.

emissions, health, and economic outcomes within this Scoping Plan requires coordination, investment, and partnerships across all levels of government and sectors of the economy. It is possible that not all of the actions at the identified level will begin in 2025. This uncertainty will result in diminished levels of beneficial outcomes quantified in the Scoping Plan Scenario. The levels of NWL action identified in this Scoping Plan represent CARB's assessment of the pace and scale of action needed to achieve the carbon stock targets and CO_2 removal targets identified in this Scoping Plan.

The Scoping Plan Scenario identifies that 2.3 million acres of forests, shrubland, and grassland management annually would achieve substantial levels of fire emissions reductions and the concomitant health and economics benefits. Currently, 1 million acres of forest treatment annually is the joint federal and state government goal (500,000 acres each). This target of one million acres annually by 2025 is for the purposes of increasing forest health and wildfire resilience in the near term, whereas the 2.3 million acre target is what the Scoping Plan modeling shows would be needed to realize the carbon stock target called for in this Scoping Plan by 2045. By identifying 2.3 million acres of climate action annually in forests, shrublands, and grasslands, this Scoping Plan emphasizes the importance of that 1 million acre annual goal as a milestone on the way to even more action and improved fire and air quality outcomes. The modeling indicates that substantial improvements to statewide fire emissions will occur at levels of action greater than 1 million acres per year. If these levels of action do not occur starting in 2025, the Scoping Plan has quantified climate benefits that will still occur, but to a lesser extent. In terms of fire emissions, compared to the Reference Scenario, 2.3 million acres of forest, shrubland and grassland management will result in a 10% reduction in wildfire emissions. At 1 million acres per year, this decreases to a 2.5% reduction. If 1 million acres per year is also not accomplished, then the emissions and health benefits are even lower.

Climate action in other NWL sectors also generates many co-benefits. Climate action identified in this Scoping Plan is aimed at not only fighting climate change but also improving air quality and public health. The climate action identified in the agricultural sector, for example, should result in decreased pesticide and synthetic fertilizer use. This decrease of synthetic chemical use in agriculture across California also should result in improved public health, especially for communities that work and live in and around agricultural lands. However, as with the forestry sector, the benefits of climate action in agricultural lands and in any other land are dependent on how much implementation takes place. Ramping up increased healthy soils practices and increasing organic agriculture in California will require continued and sustained implementation by private industry and public agencies. For example, achieving the carbon stock outcomes for the annual crops called for in this Scoping Plan would require deployment and maintenance of healthy soils practices on 80,000 additional acres of croplands in California every year between 2025 and 2045. For context, CDFA's Healthy Soils Program, which is an incentive program

supporting healthy soils practices, took almost four years of sustained funding to achieve approximately 50,000 acres total under healthy soils practices.[173]

Given the uncertainty around the modeling assumptions, and performance uncertainty as specific policies are fully designed and implemented, estimates associated with the Scoping Plan Scenario are certain to be different than what is ultimately implemented. One way to mitigate for this is to develop policies that can adapt and increase certainty in GHG emissions reductions. Periodic reviews of progress toward achieving the 2030 target and longer term deeper decarbonization, as well as performance of specific policies, also provide opportunities for the state to consider any changes to ensure we remain on course to achieve the 2030 target and carbon neutrality. The need for this periodic review process was anticipated in AB 32, as it calls for updates to the Scoping Plan at least once every five years. For this Scoping Plan, the metrics provided on the rate of deployment of clean fuels and technologies, along with the annual AB 32 GHG Inventory, provide additional information that can be used to assess progress on sectors and aggregate emissions. This is also true of CARB's NWL carbon inventory. An uncertainty analysis for achieving an accelerated 2030 target is provided toward the end of this chapter.

Targeted Evaluations for the Scoping Plan: Oil and Gas Extraction and Refining

To achieve California's air quality and climate goals, we must end our dependence on petroleum. This will not happen overnight. There are about 28 million combustion engine heavy- and light-duty trucks and passenger vehicles in California, and these are almost always replaced at their end of life. The ZEV Executive Order (EO N-79-20) calls for 100 percent new ZEV car sales beginning in 2035 and a 100 percent ZEV medium- and heavy-duty fleet sales by 2045 where feasible. The result is an ongoing, albeit shrinking, pool of vehicles that will continue to require petroleum fuels. To avoid leakage, as called for in AB 32, and to meet that remaining demand for petroleum fuel, a complete phaseout of oil and gas extraction and refining is not possible by 2045. This Scoping Plan assumes a phasedown in both oil and gas extraction as well as petroleum refining in line with the reduction in demand for in-state on-road petroleum fuel demand. Since the transportation sector is the largest source of GHG emissions and harmful local air pollution, we must continue to research and invest in efforts to deploy zero emissions technologies and clean fuels, and to reduce VMT. An assessment of ongoing progress and efforts to reduce

[173] California Department of Food and Agriculture. 2021. *Incentives Program 2017–2020 Summary by the Numbers.* https://www.cdfa.ca.gov/oefi/healthysoils/docs/HSP_Incentives_program_level_data_funded_projects.pdf.

demand for petroleum fuels and of opportunities to phase down oil and gas extraction and refining will be included in the next Scoping Plan update.

In addition to supplying in-state demand, California is a net exporter of gasoline, diesel, and jet fuel. California pipelines supply the Nevada and Arizona regions[174] with approximately 87 million barrels gasoline equivalent of refined products annually.[175] California pipelines deliver approximately 85% of Nevada's and 40% of Arizona's refined product. Most finished fuels flowing from California to Nevada and Arizona are currently produced by California refineries. To manage the phasedown of oil and gas extraction and petroleum refining in California, exports of finished fuels must be considered and factored into that process, in addition to the declining in-state demand. The authorities and considerations related to supply and demand of petroleum fuels span federal, state, and local agencies. If supply of fossil fuels is to decline along with demand, a multi-agency discussion is needed to systematically evaluate and plan for the transition to ensure that it is equitable.

This inter-agency work should also consider related topics, such as the following:

- Direct and indirect job and economic impacts
- Demand for other liquid fuel types such as renewable fuels, and expected volumes
- Legal considerations
- Public health benefits
- Demand and supply strategies for petroleum fuels, including how to avoid short term supply constraints that may impact low-income consumers

Some of these topics were also discussed as part of two studies[176] supported by the California Environmental Protection Agency, which can serve as a starting point for a working group to analyze these questions and develop policy recommendations.

Oil and Gas Extraction

On April 23, 2021,[177] Governor Newsom directed CARB to evaluate the phaseout of oil and gas extraction no later than 2045 as part of this Scoping Plan. As noted above, this Scoping Plan still has some California demand for finished fossil fuels (gasoline, diesel,

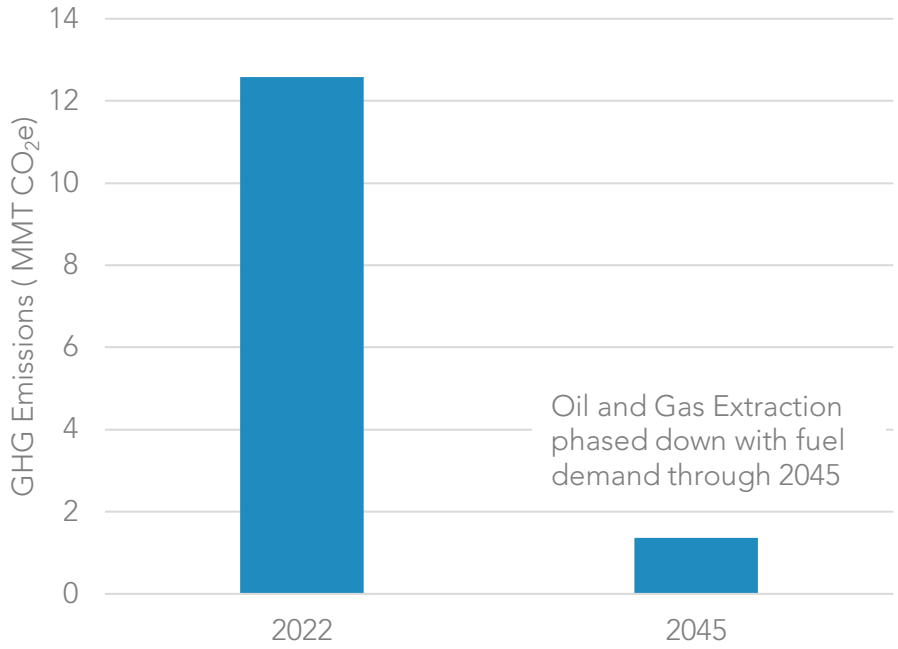
---

[174] CEC. August 2021. A Primer on California's Pipeline Infrastructure. *Petroleum Watch.* https://www.energy.ca.gov/sites/default/files/2021-08/August_Petroleum_Watch_ADA.pdf.
[175] CEC. March 2020. *Petroleum Watch.* https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf.
[176] CalEPA. 2021. Carbon Neutrality Studies: https://calepa.ca.gov/climate/carbon-neutrality-studies/.
[177] Governor Newsom. April 23, 2021. Governor Newsom Takes Action to Phase Out Oil Extraction in California. Press Release. https://www.gov.ca.gov/2021/04/23/governor-newsom-takes-action-to-phase-out-oil-extraction-in-california/.

and jet fuel) in 2045. This demand is primarily for transportation, including for sectors that are directly regulated by the state and some that are subject to federal jurisdiction, such as interstate locomotives, marine, and aviation. As discussed more fully below, while significant GHG reductions from oil and gas extraction could be achieved as demand for fossil fuels is reduced due to strategies in this Scoping Plan, it is not feasible to phase out oil and gas production fully by 2045 given this remaining demand.

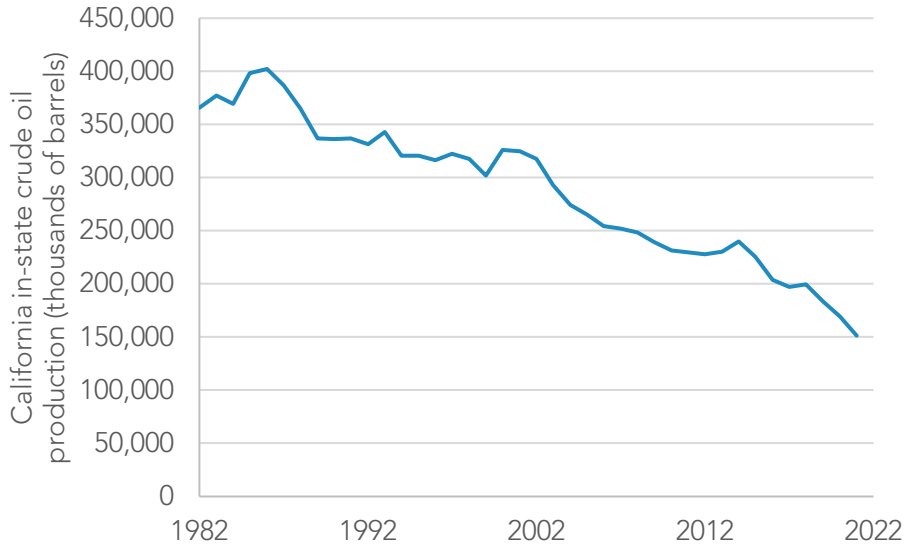
In the Scoping Plan Scenario, with successful deployment of zero carbon fuels and non-combustion technology to phase down petroleum demand, GHG emissions from oil and gas extraction could be reduced by approximately 89 percent in 2045 from 2022 levels if extraction decreases in line with in-state finished fuel demand. If in-state extraction were to be phased out fully, the future petroleum demand by in-state refineries would be met through increased crude imports to the state relative to the Scoping Plan Scenario. AB 32 defines leakage as, "a reduction in emissions in greenhouse gases within the state that is offset by an increase in emissions of greenhouse gases outside the state." AB 32 also requires any actions undertaken to reduce GHGs to "minimize leakage." Increases in imported crude could result in increased activity outside California to extract and transport crude into California. Therefore, our analysis indicates that a full phaseout of in-state extraction could result in GHG emissions leakage and in-state impacts to crude oil imported into the state. Figure 2-6 compares the 2022 emissions from this sector with the modeled results when the sector is phased down with in-state petroleum demand.

Figure 2-6: Oil and gas extraction sector GHG emissions in 2022 and 2045 when activity is phased down with in-state fuel demand



According to California Energy Commission (CEC) data used in Figure 2-7, the total oil extracted in California peaked at 402 million barrels in 1986. Since then, California crude oil production has decreased by an average of 6 million barrels per year, to about 200 million barrels in 2020. This steadily decreasing production of crude in California is expected to continue as the state's oil fields deplete.

Figure 2-7: California in-state crude oil production[178]



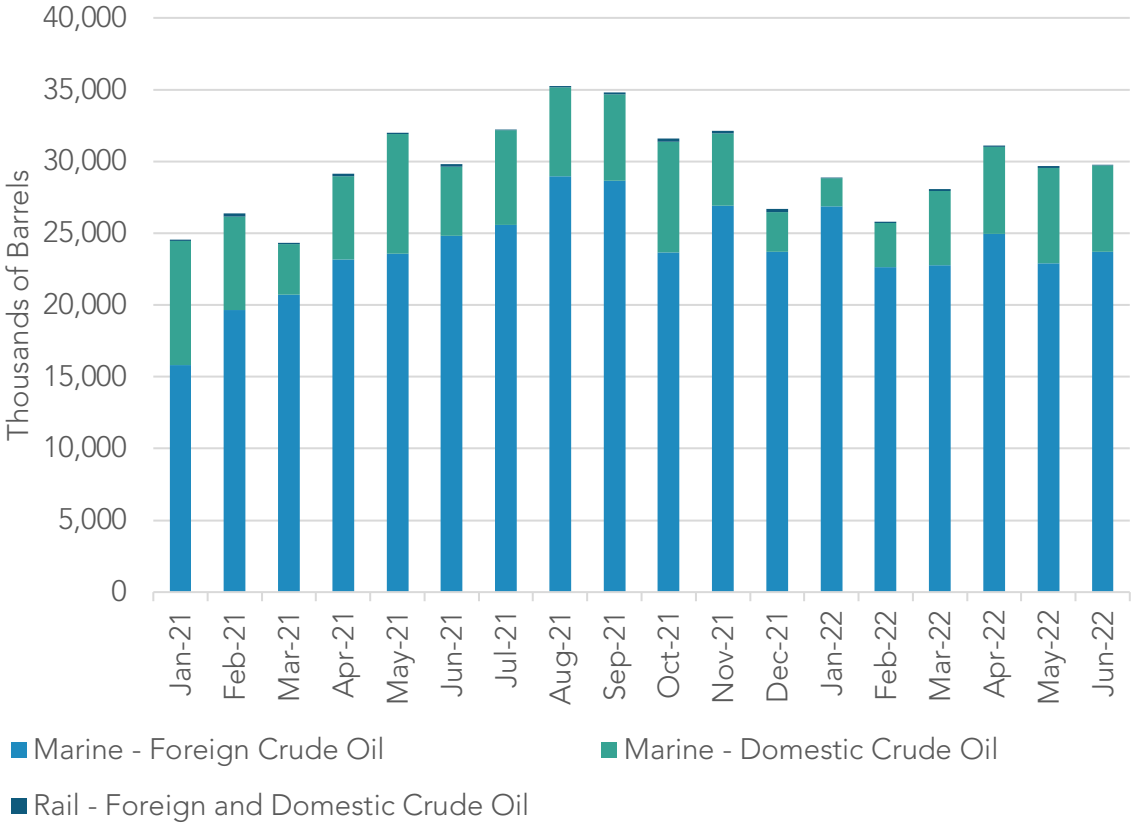
A UC Santa Barbara report estimated that, under business-as-usual conditions, California oil field production would decrease to 97 million barrels in 2045.[179] The business-as-usual model assumed no additional regulations limiting oil extraction in California.

Any crude oil demand by California refineries not met by California crude oil will be met by marine imports of Alaskan and foreign crude.[180] As shown in Figure 2-8, approximately 99 percent of crude imports into California are delivered by marine transportation. The

[178] CEC. No date. Oil Supply Sources to California Refineries. Accessed April 21, 2022. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/oil-supply-sources-california-refineries.
[179] University of California, Santa Barbara. 2021. Enhancing Equity While Eliminating Emissions in California's Supply of Transportation Fuels.
[180] CEC. 2020. *Petroleum Watch: How Petroleum Products Move.* March. https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf, and CEC. 2020. *Petroleum Watch: What Types of Crude Oil Do California Refineries Process?* February. https://www.energy.ca.gov/sites/default/files/2020-02/2020-02_Petroleum_Watch_ADA_0.pdf.

remaining imports occur by rail.[181] There are no pipelines that bring crude oil into California from out of state.[182]

Figure 2-8: Crude oil imports by transportation type[183]



Crude oil delivered by marine tankers is delivered to onshore storage tanks and subsequently to refineries via pipeline. Most crude oil produced in California is delivered to California refineries by pipeline. Using historical trends, any increases in imported crude above historic levels would result in increased deliveries through the marine ports. This increased activity could require more infrastructure to store and move larger volumes of crude to the refineries in state.

---

[181] CEC. June 2021. Crude Oil Imports by Transportation Type. Accessed March 16, 2022. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/crude-oil-imports-source.
[182] CEC. 2020. *Petroleum Watch: How Petroleum Products Move.* March. https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf.
[183] CEC. June 2021. Crude Oil Imports. https://www.energy.ca.gov/data-reports/energy-almanac/californias-petroleum-market/crude-oil-imports-source.

California refineries import a variety of crude oils to meet refinery needs. California petroleum refineries are generally designed to process relatively heavy crude relative to other U.S. refineries. In 2018, crude inputs to California refineries had an average American Petroleum Institute (API) gravity of 26.18 and an average sulfur content of 1.64 percent. Processing significantly lighter or heavier crude blends would require significant changes to a refinery.[184] Most crude imported from Alaska and the Middle East is relatively light (API gravity > 30) compared to California crude (API gravity < 20).[185] If California crude production is insufficient to meet the demand at California refineries, then California refineries will need access to a similarly heavy source of crude so that the average API gravity of crude remains within their established operating window. South American crude oil imports into California are the heaviest relative to other regions, and therefore they may be the most likely to replace decreased California crude oil supply.[186]

In summary, the modeling indicates that demand for petroleum will persist due to legacy fleets that will not be replaced until end of life. The modeling also shows what the GHG emissions reductions would be if oil and gas extraction activities were phased down in line with the reduction of in-state petroleum demand. Trend data shows that oil and gas extraction already has been on the decline and will continue to decline. It is possible to anticipate the likely regions and types of crude that would be imported to meet in-state petroleum demand if in-state extraction was fully phased out by 2045. Importantly, activity at the ports would increase, and new infrastructure would be needed to store and deliver crude to in-state refineries. And while GHG emissions from this sector would go to zero in our AB 32 GHG Inventory with a full phaseout, emissions related to the production and transport of crude to California might increase elsewhere, resulting in emissions leakage.

As the state continues to reduce demand for petroleum, efforts to protect public health for communities located near oil and gas extraction sites must also continue. In October 2021, Governor Newsom directed action to prevent new oil drilling near communities and

[184] CEC. 2020. *Petroleum Watch: What Types of Crude?* February. https://www.energy.ca.gov/sites/default/files/2020-02/2020-02_Petroleum_Watch_ADA_0.pdf.
[185] CEC. 2020. *Petroleum Watch: What Types of Crude?* February. https://www.energy.ca.gov/sites/default/files/2020-02/2020-02_Petroleum_Watch_ADA_0.pdf.
[186] CEC. 2020. *Petroleum Watch: What Types of Crude?* February. https://www.energy.ca.gov/sites/default/files/2020-02/2020-02_Petroleum_Watch_ADA_0.pdf.

expand health protections.[187,188] In 2022, the Legislature passed, and the governor signed, SB 1137 to protect communities from existing and any new oil and gas extraction activities through 3,200 foot setbacks.

Petroleum Refining

In the Scoping Plan Scenario CARB modeled a phasedown of refining activity in line with petroleum demand. Meeting petroleum demand means sufficient availability of finished fuel (gasoline, diesel, and jet fuel). Crude is processed at in-state refineries to produce finished fuel. In response to stakeholder requests,[189] this evaluation focuses on the Scoping Plan Scenario, but with an evaluation of a complete phasedown of refinery operations in state.

The Scoping Plan Scenario results in California petroleum refining emissions of 4.5 $MMTCO_2e$ in 2045; a reduction of approximately 85 percent relative to 2022 levels, which is in line with the decline in in-state finished fuel demand.[190] Emissions from refining can be reduced further through the application of CCS technology, as shown in Figure 2-9. If in-state refining is phased down to zero and the demand for the finished fuels produced by that refining persists, imported finished fuels may be needed to meet the remaining in-state demand.[191] The current data shows unmet demand for liquid petroleum transportation fuels would most likely be met by marine imports. A CEC report notes, "The only way for California to receive large amounts of crude and refined products is by marine."[192]

---

[187] Office of Governor Gavin Newsom. 2021. California Moves to Prevent New Oil Drilling Near Communities, Expand Health Protections. *https://www.gov.ca.gov/2021/10/21/california-moves-to-prevent-new-oil-drilling-near-communities-expand-health-protections-2/?msclkid=6c0da86bc58e11ecb81cf596d4d8a735*.

[188] California Department of Conservation Geologic Energy Management Division. October 2021. Draft Rule for Protection of Communities and Workers from Health and Safety Impacts from Oil and Gas Production Operations. *https://www.conservation.ca.gov/calgem/Pages/Public-Health.aspx?msclkid=45660232cf2511ecb1c56119097e3b0c*.

[189] California Environmental Justice Alliance. October 22, 2021. Comment on 2022 Scoping Plan Update - Scenario Inputs Technical Workshop. *https://www.arb.ca.gov/lists/com-attach/68-sp22-inputs-ws-WzhdPlI5AjACW1Qx.pdf*.

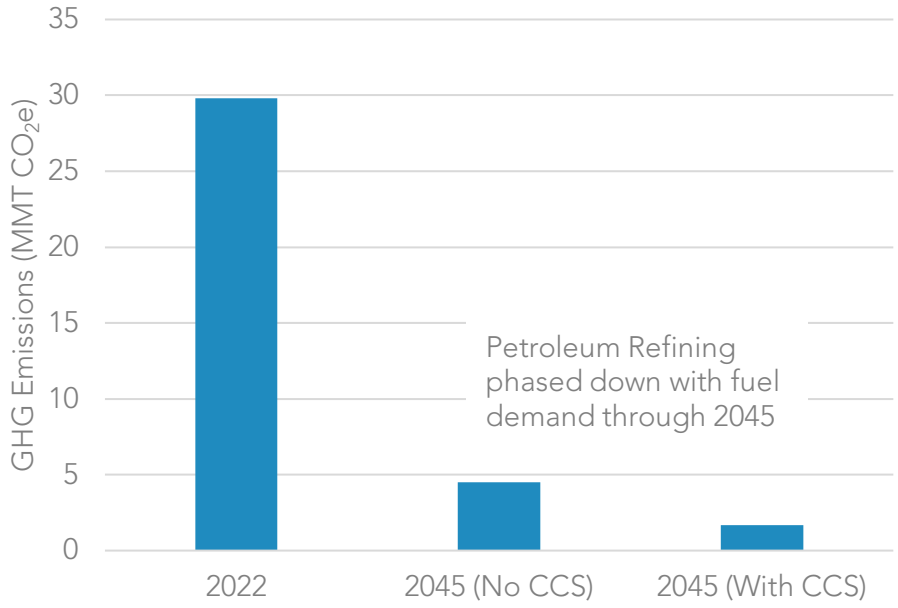
[190] This reduction in demand does not assume any need for ongoing operations to support exports to neighboring states.

[191] If demand assumes an ongoing need to support exports to neighboring states, the residual demand would require a five-fold increase in finished fuel imports.

[192] CEC. 2020. *Petroleum Watch: How Petroleum Products Move.* March. *https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf*.

There are currently no pipelines capable of bringing refined products to the state, and rail imports of refined products have historically made up less than 1 percent of all imports.[193] Significant increases in marine imports would likely require significant reconfiguring, retrofitting, or replacement of crude pipelines and storage tanks at current marine terminals, and possible reconfiguring of existing finished fuel infrastructure to account for changes in volumes and locations of supply points.

Figure 2-9: Petroleum refining sector GHG emissions in 2022 and 2045 (with and without CCS) when activity is phased down with fuel demand



If California's finished fuel demand is not met by continued refining activity in California, the state would need to import finished fuels to meet the ongoing demand. This would likely result in a two- to five-fold increase in the number of finished fuel ship deliveries to marine terminals. Marine tankers delivering refined products are often much smaller than crude oil tankers, so changes in fuel use and emissions cannot be easily estimated from the change in both the type and the number of ship deliveries.[194]

[193] CEC. 2020. *Petroleum Watch: How Petroleum Products Move.* March. https://www.energy.ca.gov/sites/default/files/2020-03/March_2020_Petroleum_Watch.pdf.
[194] Personal communication with CEC staff, March 2022; U.S EIA. 2017. *World Oil Transit Chokepoints*. 3. https://www.eia.gov/beta/international/regions-topics.php?RegionTopicID=WOTC.

If refining ceased in California, the rail and marine deliveries currently needed to support both refining processes and the export of waste products, such as petroleum coke, would cease.

In summary, the modeling indicates that demand for petroleum will persist through 2045. The modeling also shows what the GHG emissions reductions would be if refining activities were phased down in line with the reduction in in-state petroleum demand. CCS can further reduce emissions for this sector. Importantly, activity at the ports would increase, and new infrastructure would be needed to store and deliver finished fuel across the state, if in-state refining were fully phased down by 2045. And while GHG emissions from this sector would go to zero in our AB 32 GHG Inventory with a full phaseout, emissions related to the refining and transport of finished fuel to California might increase elsewhere, resulting in emissions leakage.

Progress Toward Achieving the Accelerated 2030 Target

The 2017 Scoping Plan laid out a path to achieving the SB 32 target of at least a 40 percent reduction of GHG emissions below 1990 levels by 2030 that focused on reducing emissions in the state and was technologically feasible and cost-effective, reflecting statutory direction. Many of the programs to achieve the 2030 target increased in stringency beginning January 1, 2021. However, the 2030 target must be increased to help achieve the deeper reductions needed to meet the state's statutory carbon neutrality target specified in AB 1279 and Executive Order B-55-18.

Starting in 2020 and extending into 2022, the COVID-19 pandemic impacts reverberated across the globe in a multitude of ways, including the devastating loss of millions of lives. The pandemic also had a significant impact on GHG emissions by virtue of its impact on global economies and lifestyle changes for Californians, with extended work and school disruptions. Thus, assessing our progress toward meeting our SB 32 target is confounded by the unprecedented nature of the pandemic. Nevertheless, an assessment of progress toward the 2030 target is critical, in particular the accelerated 2030 target called for in this Scoping Plan, since achieving the accelerated 2030 target would make the state well positioned to achieve its carbon neutrality goals and bring critical near-term air quality benefits to address historical and ongoing disparities in access to healthy air. Because there is only one year of data available for this decade, the analysis takes a prospective look using projected emissions over the remainder of this decade.

Estimating GHG emissions in 2030 requires projecting the effect of policies or measures that are currently deployed and undergoing implementation. Table 2-4 shows three distinct estimates of GHG emissions in 2030 that were created at different times and used different modeling approaches.

Table 2-4: Estimates of 2030 GHG emissions

Scenario Description	2030 GHG Emissions ($MMTCO_2e$)
2017 Scoping Plan: the projected outcome from implementing policies identified in the 2017 Scoping Plan that was approved by the CARB Board in December 2017.	320
Reference Scenario: the assessment of current trends and expected performance of policies identified in the 2017 Scoping Plan, as of February 2022, using the PATHWAYS model (E3).	305
Reference Scenario (Rhodium): the analysis of projected emissions from 2021 to 2030 from state and federal policies implemented as of July 2022, including the estimated impact of the Inflation Reduction Act and Advanced Clean Cars II using RHG-NEMS and other Rhodium Taking Stock 2022 methods (https://rhg.com/wp-content/uploads/2022/07/Taking-Stock-2022_US-Emissions-Outlook.pdf).	324

These three estimates of 2030 GHG emissions differ, which is expected. The estimates reflect different outcomes of the current and future impact of policies and measures. They also vary due to fundamental differences in the way these models work. For example, PATHWAYS is an economy-wide, scenario-based GHG accounting tool that tracks energy demands and supplies in line with scenario assumptions and is benchmarked to historical values. RHG-NEMS optimizes both the supply and demand sides of the energy system while factoring in consumer constraints and dynamic economic and energy systemwide feedback. Importantly, while these point estimates give the appearance of certainty and accuracy, there is significant uncertainty in future emissions projections that is documented thoroughly in each of the three emissions scenarios described above. No model can predict the future given unforeseen factors such as notable economic swings and implementation delays for programs. However, the range of emissions estimates provides a useful indication of possible outcomes from successful implementation of policies and measures.

An important source of uncertainty is the impact of delayed implementation of policy measures and market actions. The successful rate of deployment of clean technology and fuels—including consumer adoption patterns, economic recovery from the pandemic, and the permitting and build-out of necessary new assets and reuse of existing assets to produce and deliver clean energy—is essential to reach GHG emission reduction targets. Any delays will only increase GHG emissions in 2030.

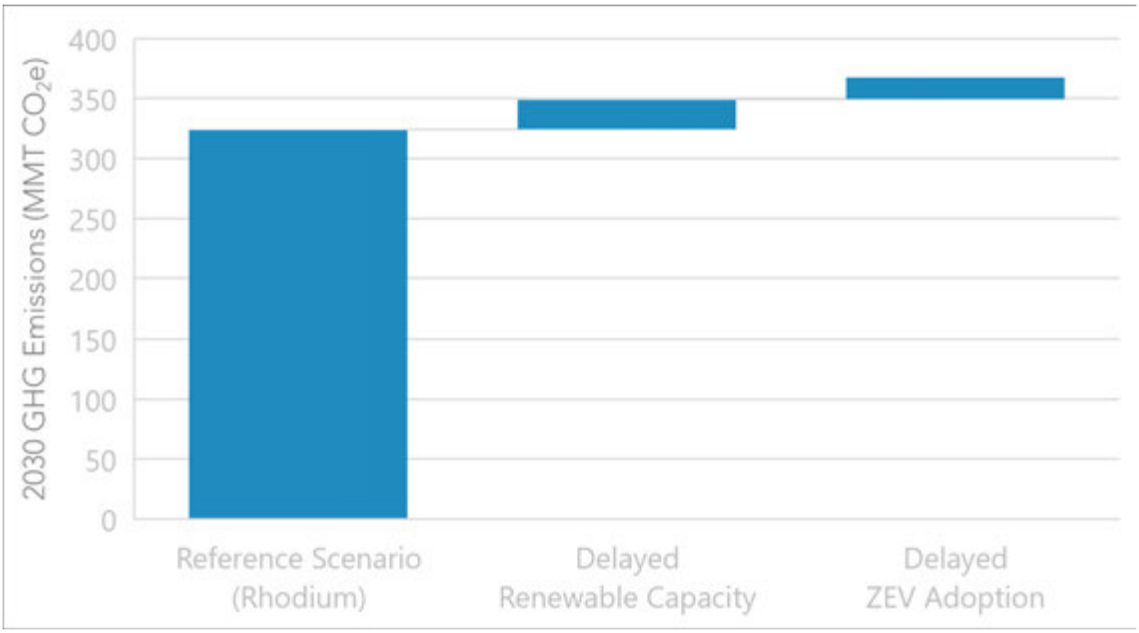
It is important to note that incentives, carbon pricing, and regulations all can result in similar types of responses including, but not limited to:

- Build-out of clean energy and infrastructure
- Deployment of clean technology
- Reduced demand for fossil energy
- Efficiency improvements

As such, the uncertainty analysis discussion focuses on implementation (technology and infrastructure deployment), and not any specific programs or policies. It is successful implementation that must ultimately happen for emissions reductions to be realized.

The uncertainty analysis described in Appendix J (Uncertainty Analysis) quantifies the impact of delayed permitting and building of renewable generation and transmission in the power sector and delayed adoption of ZEVs across all vehicle fleets in the transportation sector. The Reference Scenario (Rhodium) estimates emissions in 2030 to be 324 MMTCO2e. A five-year delay in renewable capacity would increase emissions by 8 percent in 2030 (25 MMTCO2e) relative to the Reference Scenario. If similar delays in clean energy production and deployment occur in other sectors, a larger increase in emissions relative to the reference scenario would be expected, jeopardizing the state's ability to achieve the 2030 target. Similarly, a delay in consumer adoption of zero emission vehicles (LDV, MDV, HDV) would increase emissions by 6 percent in 2030 (19 MMTCO2e) relative to the Reference Scenario. Delays in transitioning to electric equipment and appliances in homes and businesses would also lead to increased emissions in 2030. Figure 2-10 illustrates the impact on projected emissions in 2030 associated with delayed renewable capacity and delayed transportation vehicle electrification.

Figure 2-10: Impact of delayed implementation on 2030 GHG emissions[195]



Appendix J (Uncertainty Analysis) includes additional details on the assumptions and model used for the uncertainty analysis and the risks to achieve the emissions reductions from 2022 to 2030 that are anticipated in the Scoping Plan Reference Scenario. While the analysis focuses on renewable capacity and transportation, the analysis identifies a common set of themes that can impact emissions reductions across economic sectors, including permitting, technology availability, and consumer adoption. The impact of delayed emissions reductions will vary by sector and by the specific policy at risk of delay.

We give these quantitative examples of the impact implementation delays can have on GHG reductions, but almost every economic sector will have the need for permitting to enable at least a 40 percent reduction below 1990 levels. If we consider the increased ambition of the Scoping Plan Scenario, which identifies an accelerated 2030 target, the same types of uncertainty manifest themselves in successful implementation of the Scoping Plan Scenario, with the added need for CCS and CDR and a need to grow other energy sectors such as hydrogen.

[195] The implementation delay scenarios were modeled separately and do not necessarily reflect the combined impact of delayed renewable capacity and transportation vehicle electrification.

Cap-and-Trade Program Update

Since the adoption of the first Scoping Plan in 2008, carbon pricing in the form of a Cap-and-Trade Program has been part of the portfolio to achieve the state's GHG reduction targets, and it will remain critical as we work toward carbon neutrality. This section provides an update on the program and its role in achieving the 2030 target.

The Cap-and-Trade Program first came into effect in 2012, under AB 32, and included declining allowance caps through 2020. In 2017, AB 398[196] was passed by a supermajority in the Legislature and included prescriptive direction on the design of the program from 2021 through 2030. The AB 398 Cap-and-Trade Program came into effect on January 1, 2021, and it included the following changes:

- Doubling of stringency with an annual cap decline of 4 percent per year from 2021–2030
- AB 398 price ceiling
- AB 398 redesigned allowance price containment reserve with two tiers
- AB 398 100 percent leakage assistance factor for industry
- AB 398 lower offset limits: Usage limit cut from 8 percent to 4 percent, and half of offsets must provide direct benefits to California

The reduction in the role of offsets in the program was in recognition of ongoing concerns raised by environmental justice advocates regarding the ability of companies to use offsets for compliance instead of investing in actions on site to reduce GHG emissions that could also potentially reduce criteria or toxic emissions.[197,198] Note that data show the relationship between facility emissions of GHGs and co-pollutants is highly variable by sector and pollutant.[199] Changes to the allowance price containment reserve and the addition of the price ceiling were included to ensure protections against price spikes in the program, while the changes to the leakage assistance factors were to ensure the maximum protection against leakage in the program. The original design of the program included an auction floor price that increases by 5 percent plus inflation each year, and

---

[196] Assembly Bill 398 (Garcia, Chapter 135, Stats. of 2017). California Global Warming Solutions Act of 2006: market-based compliance mechanisms: fire prevention fees: sales and use tax manufacturing exemption. https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB398.

[197] OEHHA. 2022. *Impacts of Greenhouse Gas Emission Limits Within Disadvantaged Communities*. https://oehha.ca.gov/media/downloads/environmental-justice/impactsofghgpoliciesreport020322.pdf.

[198] The OEHHA report also found that companies that use the most offsets often own the facilities that contribute to local $PM_{2.5}$ exposure. However, there was no causal relationship found to indicate that implementation of the Cap-and-Trade Program was contributing to increases in local air pollution. Also see: CARB. FAQ Cap-and-Trade Program. https://ww2.arb.ca.gov/resources/documents/faq-cap-and-trade-program.

[199] OEHHA. 2022. *Impacts of Greenhouse Gas Emission Limits Within Disadvantaged Communities*. https://oehha.ca.gov/media/downloads/environmental-justice/impactsofghgpoliciesreport020322.pdf.

that escalation factor is retained in the post-2020 program and is also applied to the allowance price containment reserve and price ceiling. These features, combined with the self-ratcheting mechanism for unsold allowances at auctions,[200] help to ensure the program is able to handle periods of high and low demand for allowances while continuing to ensure a steadily increasing price signal for regulated entities to invest in GHG reduction technologies.

As a result of achieving the 2020 target several years earlier than mandated by law, there are unused allowances in circulation. CARB estimated the amount to be approximately 310 million allowances after the conclusion of the third compliance period (2018–2020).[201] AB 398 had also called for a similar analysis, which was completed in 2018.[202] This bank represents approximately 5 percent of the total number of vintage 2013–2030 allowances issued within the joint market. This bank of allowances can only remain banked if year-over-year the covered emissions are declining by 14 MMT. If the annual decline in actual emissions is less than 14 MMT, regulated entities will need to use the banked allowances to cover their compliance obligations. It is likely that the existing bank of 310 million allowances will be needed over the early part of this decade and will be exhausted by the end of the decade. During the same period, prices for allowances will continue to increase at least 5 percent plus inflation year-over-year, sending a steadily increasing price signal to spur investment in onsite reductions for covered entities.

With the passage of AB 1279, the state has a statutory target to achieve carbon neutrality no later than 2045. This Scoping Plan demonstrates that planning on a longer time frame for the new carbon neutrality target means we must accelerate our near-term ambition for 2030 in order to be on track to achieve our longer-term target. CARB will use the modeling for this Scoping Plan to assess what changes may be warranted to the Cap-and-Trade or other programs to ensure we are on track to achieve an accelerated 2030 target. Since the original adoption of the Cap-and-Trade regulation, the program has been amended eight times through a robust public process. Moreover, then-California Environmental Protection Agency Secretary Jared Blumenfeld testified at a Senate hearing in 2022 that CARB will report back to the Legislature by the end of 2023 on the status of the allowance supply with any suggestions on legislative changes to ensure the number of allowances

---

[200] The self-ratcheting mechanism temporarily removes unsold allowances from the market until either sufficient demand manifests for two consecutive auctions and they are incrementally reintroduced at future auctions, or they are permanently removed from general circulation if demand remains low.
[201] CARB. 2022. BR 18-51 Cap-and-Trade Allowance Report. Attachment A. *https://ww2.arb.ca.gov/sites/default/files/cap-and-trade/Allowance%20Report_Reso18_51.pdf*.
[202] CARB. 2018. Staff Report: Initial Statement of Reasons: Proposed Amendments to the Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation. September 4. *https://www.arb.ca.gov/regact/2018/capandtrade18/ct18398.pdf?_ga=2.134288305.1735610122.1664813952-1100516233.1657841496*.

is appropriate to help the state achieve its 2030 target of at least 40% below 1990 levels. As part of that status update, CARB will also provide information on any potential program changes that may be needed to allowance supply to help achieve an accelerated target for 2030 identified in this Scoping Plan as necessary to achieve carbon neutrality no later than 2045. Engaging in this process in 2023 will allow for the consideration of this Scoping Plan, inclusion of additional data points for the second year of operation of the AB 398-designed program (which only came into force in January 2021), and an opportunity to hold public workshops.

It is also worth noting that the COVID-19 pandemic had significant impacts on economic activity in California and elsewhere.[203] Emissions were significantly lower in 2020 due to the impacts of the global pandemic. There is an expectation that emissions will increase as the economy recovers and behaviors continue to shift from the impacts of the ongoing pandemic. As a result, 2020 should be regarded as an outlier in the emissions trends. This scenario of increasing emissions is similar to what happened in the first compliance period for Cap-and-Trade, where the state economy was recovering from the Great Recession and does not correlate to a problem with the structure of this program or other programs that cover emissions related to the manufacturing or transportation sectors. In any assessment of this and other programs, it is essential to consider external factors such as economic activity and availability of zero carbon energy such as hydropower, among others.

To better understand the role of the Cap-and-Trade Program in achieving the 2030 target, Table 2-5 compares the 2030 GHG emissions estimates from the three reference scenarios described in Table 2-4. The 2017 Scoping Plan projection is from the PATHWAYS model for the Scoping Plan Scenario approved by the Board in late 2017. It excludes the contribution of the Cap-and-Trade Program, without any consideration of uncertainty factors (i.e., a characterization of the uncertainty that a given GHG reduction measure included in the 2017 Scoping Plan will actually achieve the GHG reductions it is projected to deliver). The Reference Scenario represents what GHG emissions would look like if we did nothing beyond the existing policies that are required and already in place to achieve the 2030 target; this scenario is based on the recent PATHWAYS modeling, excluding the contribution of the Cap-and-Trade Program, and without any consideration of uncertainty factors. It indicates that GHG emissions will be lower over this decade than originally projected when the 2017 Scoping Plan was approved. The

[203] CARB. November 4, 2021. Mandatory Greenhouse Gas Reporting - 2020 Emissions Year Frequently Asked Questions. *https://www.arb.ca.gov/cc/reporting/ghg-rep/reported-data/2020mrrfaqs.pdf?_ga=2.264251343.1760432228.1650736660-1644197524.1577749754*.

Reference Scenario (Rhodium) which also does not include uncertainty bounds, is the modeling used for the uncertainty analysis above.

Importantly, PATHWAYS is not able to explicitly model a carbon pricing policy, and therefore the Cap-and-Trade Program is not represented in the 2017 Scoping Plan or the Reference Scenario. Carbon pricing is included in RHG-NEMS, which reflects state and federal policies included in the U.S. Energy Information Administration (EIA) Annual Energy Outlook 2022 and the National Energy Systems Model (NEMS), which is the basis for RHG-NEMS.[204]

As detailed in EIA's documentation, California's Cap-and-Trade Program is represented through increased energy prices, which flow across economic sectors.[205] However, many of the emissions covered by the California Cap-and-Trade Program are not energy- and fuel-related emissions. Given that, the energy systems model RHG-NEMS was used to model the impact of California Cap-and-Trade on the energy system. However, RHG-NEMS does not explicitly model the entire program, which includes non-energy related emissions from the industrial, agricultural, waste, and transportation sectors.

[204] U.S. EIA. 2022. *Summary of Legislation and Regulations Included in the Annual Energy Outlook 2022.* March. *https://www.eia.gov/outlooks/aeo/assumptions/pdf/summary.pdf*.
[205] U.S. EIA. 2022. Electricity Market Module. *https://www.eia.gov/outlooks/aeo/assumptions/pdf/electricity.pdf*.

Table 2-5: Comparison of 2017 Scoping Plan and two Reference Scenarios

	2030 GHG Emissions ($MMTCO_2e$) (2017 Scoping Plan)	2030 GHG Emissions ($MMTCO_2e$) (Reference Scenario)	2030 GHG Emissions ($MMTCO_2e$) (Reference Scenario-Rhodium)
Reference Scenarios	320	305	324
Gap to Accelerated 2030 Target under the Scoping Plan Scenario (226)[206]	94	79	98

Under the Scoping Plan Scenario, in 2030 California emissions are anticipated to be 48% below 1990 levels. This represents an acceleration of the current SB 32 target of a 40% reduction below 1990 levels. Table 2-5 includes the gap between the different reference scenarios and the accelerated 2030 target achieved under the Scoping Plan Scenario. It also shows that depending on the modeling, there are a range of potential emissions levels in 2030 prior to accounting for the full impact of the Cap-and-Trade Program on emissions. That range is from 305 to 324 $MMTCO_2e$ in 2030. That represents a 19 $MMTCO_2e$ spread, or about 8.4 percent of the accelerated 2030 target of 226 $MMTCO_2e$. Importantly, none of these scenarios includes all of the actions identified in the Scoping Plan Scenario for this Scoping Plan; many of those actions, such as SB 596, CCS, and a more stringent LCFS program, will only begin to happen in this decade, and their contributions toward meeting the accelerated 2030 target are therefore not included in the reference scenarios. The actual emissions for the remainder of this decade will therefore likely be lower than in each of the scenarios in Table 2-5 once policies and regulations are in place to support an accelerated 2030 target. However, the degree of this difference between actual and projected emissions will differ across the modeled reference scenarios.

[206] Table 3 from the 2017 Scoping Plan included a range of 34 to 79 $MMTCO_2e$ for reductions needed from the Cap-and-Trade Program to achieve a 2030 target of 40 percent below 1990 levels.

Regardless of the uncertainty and differences in the models, it is clear additional GHG reductions must happen over this decade to achieve an accelerated 2030 target. This will require an evaluation of all major programs to assess the need to increase their stringency between now and 2030. As the actual reductions from non-Cap-and-Trade Program measures increase, California will be less reliant on the Cap-and-Trade Program to "fill the gap" to meet an accelerated 2030 reduction target. For example, CARB is developing a proposal to increase the stringency of the LCFS program for 2030, the recently adopted Advanced Clean Cars II regulation is more stringent than modeled for the 2030 40 percent target in the 2017 Scoping Plan, and SB 596 requires specific reductions in the cement sector over this decade and beyond. However, we also know we are not on track to achieve the VMT reduction called for in the 2017 Scoping Plan and will need to double down to achieve the even more ambitious target called for in the Scoping Plan Scenario. Also, we will need additional actions over the coming years to reduce short-lived climate pollutants to meet the emission reductions called for in SB 1383.

Collectively, any additional legislation or prescriptive policies for sectors, delays in successful implementation of non-Cap-and-Trade programs and policies, increases in incentive program funding, and delays in economic recovery from the pandemic will continue to affect the role the Cap-and-Trade Program will need to play over this decade to meet the state's GHG reduction obligations. In summary, the Cap-and-Trade Program must continue to be able to scale across a range of possibilities. With passage of AB 1279 and the need to accelerate the 2030 target, CARB will initiate a public process to utilize the modeling results from this Scoping Plan, specifically the Scoping Plan Scenario, to evaluate and potentially propose changes to the design of the Program, including the annual caps. This process will ensure that the Program supports an increased ambition for 2030 while retaining the ability to scale as other factors, such as changing economic conditions and implementation of non Cap-and-Trade programs, impact the actual emissions at the sources covered by the Program. Any changes to the Program must continue to support a well-designed system that continues to send a steadily increasing price signal, minimizes for leakage, reduces emissions in the covered sectors toward the state's targets, is cost-effective and technologically feasible, and avoids energy rate spikes. Importantly, the Program should support air quality benefits, especially in overly burdened communities, and not exacerbate existing air quality disparities.

Chapter 3: Economic and Health Evaluations

This chapter provides two approaches for quantifying the economic and health outcomes of the Scoping Plan Scenario. One approach is to consider the combined impact of all measures[207] in a scenario. The other approach is required by AB 197, where each measure within a scenario is evaluated independently. In addition to these two evaluation approaches, this chapter also includes a discussion of the Public Health implications for the Scoping Plan Scenario, an overview of the Climate Vulnerability Metric, and the Environmental Analysis conducted in accord with the California Environmental Quality Act (CEQA).

It is important to note that all of the analyses in this chapter use a variety of data sources, but because the modeling is economy-wide at the state level, none of them produce community specific detail outputs. The AB 32 GHG Inventory Sector analysis relies on PATHWAYS data at the state level that is proportionally applied across all regions of the state to translate changes in state level fuel combustion to local level changes. The NWL analysis similarly utilizes a variety of data sources and a suite of models that produce data that are scaled up to the statewide level. All of the models, except the Wildland Urban Interface (WUI) defensible space model, which is conducted at the county level, create aspatial projections that are not applicable at the community level.

Economic Analysis

As part of the process to develop this Scoping Plan, alternative scenarios that transition energy needs away from fossil fuels and achieve carbon neutrality no later than 2045 were developed. Alternative scenarios that assess the impact of different land management strategies on carbon stocks in NWL were also developed. These alternatives are described in Appendix C (AB 197 Measure Analysis). The following sections describe the Scoping Plan Scenario in terms of direct cost, the economy, employment, and health outcomes.[208]

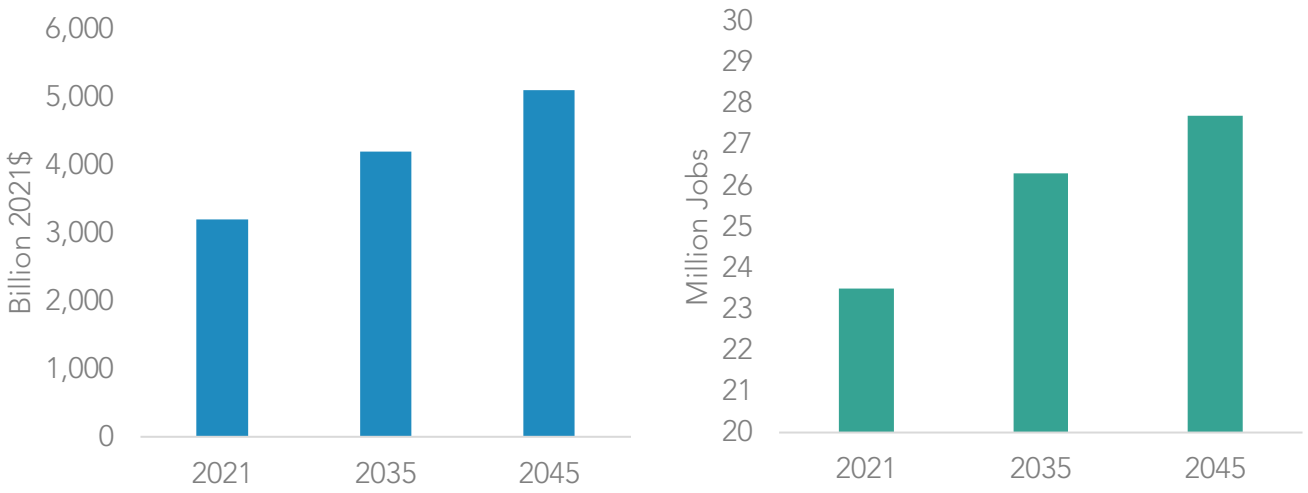
---

[207] AB 197 calls for the evaluation of "measures." This Scoping Plan treats each action and its variants on stringency as measures for the purposes of this chapter. Appendix C (AB 197 Measure Analysis) lists the measures and corresponding modeling assumptions for each alternative and the Scoping Plan Scenario. The modeling assumptions for the Scoping Plan Scenario are summarized in Table 2-1.

[208] For the Draft 2022 Scoping Plan Update, achieving carbon neutrality in 2035 and 2045 was evaluated. The AB 32 GHG Inventory sector direct cost, the economy, employment, and health outcomes were assessed in those years. Similarly, the Scoping Plan Scenario assessments that are presented in this chapter were made for years 2035 and 2045.

The California economy is growing, and it is projected to continue to grow about 2 percent each year, from $3.2 trillion in 2021 to $5.1 trillion in 2045, as shown in Figure 3-1. Similarly, employment in California is anticipated to grow 0.7 percent per year, from 23.5 million jobs in 2021 to 27.7 million jobs in 2045. It is in this context, termed the *Reference Scenario,* that CARB evaluates the Scoping Plan Scenario in terms of its impact on economic growth and employment. The projections shown in Figure 3-1 were produced by CARB to evaluate the incremental impact of regulations.

Figure 3-1: Projected California gross state product (left) and employment growth (right) from 2021 to 2035 and 2045



Source: California Air Resources Board

Transitioning away from fossil fuels to alternatives and increasing action on NWL will affect employment opportunities, household spending, businesses, and other economic aspects of our lives. Sectors expected to see growth include renewable electricity and hydrogen production, while other sectors may shrink. The deployment of clean technology may require higher upfront costs for things like heat pumps and induction stoves, but those could be offset by energy efficiency savings. Employment and economic development in NWL-related industries and sectors are expected to increase as land management actions increase, especially for the Forestry sector (in which a significant increase is called for under the Scoping Plan Scenario). The net impact of these actions on employment and jobs is presented in this chapter.

Estimated Direct Costs

One key metric is the direct cost, or net investment, reflecting any savings that result from actions. Similar approaches were used to estimate direct costs for the AB 32 GHG Inventory sectors and for the NWL, as described in this section.

AB 32 GHG Inventory Sectors

Transitioning away from fossil fuels requires investment in new equipment and infrastructure throughout the economy. It involves developing the capacity to produce fuels and electricity from renewable sources rather than producing fossil energy. This transition also takes time. One approach is to eliminate combustion of fossil fuels by replacing all equipment in a specified year. Another approach is to establish a future point at which all sales of new equipment rely on alternative energy sources and allow the transition to occur over time as equipment is replaced upon its end of life.

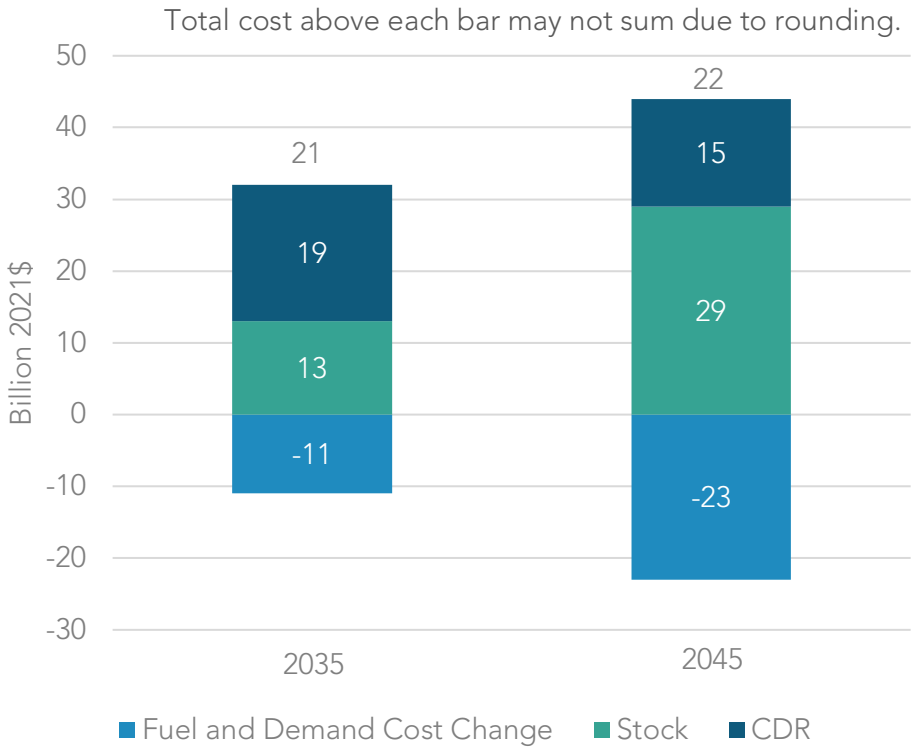
To evaluate the investment required through 2045, the PATHWAYS model was used to represent equipment stock and its turnover to non-fossil fuel alternatives over time. The annualized, incremental cost of infrastructure in excess of the annualized cost of the Reference Scenario[209] was computed for each year from 2022 through 2045. These costs were computed by first taking the absolute cost in each year—which includes both new equipment investment and also expenditures on energy, operations, and maintenance in each year—and then levelizing the costs (in the same way car or house payments are annualized or spread out over time) to arrive at an annualized cost. Fuel savings, and resulting cost savings, associated with changing energy demand—from gasoline to electricity for vehicles, for example—are included as a result of this methodology. Carbon dioxide removal includes DAC technology powered primarily by off-grid solar, BECCS to produce hydrogen or other fuels, and NWL sequestration, as discussed in Chapter 2.[210]

Figure 3-2 shows the stock investment cost, fuel/efficiency savings, and CDR cost. The Scoping Plan Scenario allows end-of-life transition of equipment. The cost of investing in new equipment is partially offset by savings associated with efficiency gains and reduced demand for fuels like gasoline. This is particularly relevant in the transportation sector, which leads to the majority of savings in 2045 in the Scoping Plan Scenario, which models near complete electrification of transport relying only on end-of-life replacement of vehicles. Appendix H (AB 32 GHG Inventory Sector Modeling) includes additional detail on direct costs in each sector and how costs change over time.

[209] The Reference Scenario described in Chapter 2 and in Appendix H (AB 32 GHG Inventory Sector Modeling) was the basis for the direct cost comparison.

[210] The energy source for DAC is not modeled, but renewable electricity and/or hydrogen produced from electrolysis are zero-carbon options consistent with the carbon neutrality targets in this Scoping Plan. The economic analysis associated the investment in DAC with the solar industry for consistency with the carbon neutrality targets.

Figure 3-2: Cost and savings relative to the growing California economy for the Scoping Plan Scenario in 2035 and 2045 (AB 32 GHG Inventory sectors)



Natural and Working Lands

For NWL, the direct costs of each management strategy were estimated using available academic literature, monitoring and reporting data, survey data, and cost data from existing subsidy programs on the per acre cost of implementing the management strategy. These cost data, in combination with the acreage of each management strategy under the scenarios, provided estimates of the overall direct cost to either the government or the private sector. The direct costs are independent of the policy lever used to implement the action and do not include many important benefits and externalities of the actions. They are assumed to be constant for each scenario and into the future. Avoided or secondary costs, such as those from reductions in wildfire suppression expenses, are not included. Appendix I (NWL Technical Support Document) includes additional direct cost details.

Table 3-1 includes the direct cost estimates for the Scoping Plan Scenario compared to the Reference Scenario.[211] Direct costs for the NWL sector are expected to be significant due to the ambitious level of action for each land type.

Table 3-1: Cost and savings relative to a growing California economy for the Scoping Plan Scenario (NWL)

Measure	Scoping Plan Scenario: Average Direct Annual Cost, 2025–2045 (millions $/year)
Forests / Shrublands / Grasslands	1,780
Annual Croplands	284
Perennial Croplands	4
Urban Forest	4,230
Wildland Urban Interface (WUI)	114
Wetlands	28
Sparsely Vegetated Lands	4
Totals	6,460
Note: Table values may not add to total due to rounding.	

CARB estimates that all jurisdictions, including private landowners, currently spend approximately $4 billion dollars annually on planting, maintenance, sidewalk repair, tree removal, and other expenses related to urban forests, and that reaching the theoretical maximum tree cover would require increasing that spending by a factor of 20. The cost of the Scoping Plan Scenario is predominantly a mix of urban forests and forests, shrubland, and grasslands spending.

[211] The Reference Scenario described in Chapter 2 and in Appendix I (NWL Technical Support Document) was the basis for the direct cost comparison.

Economy and Employment

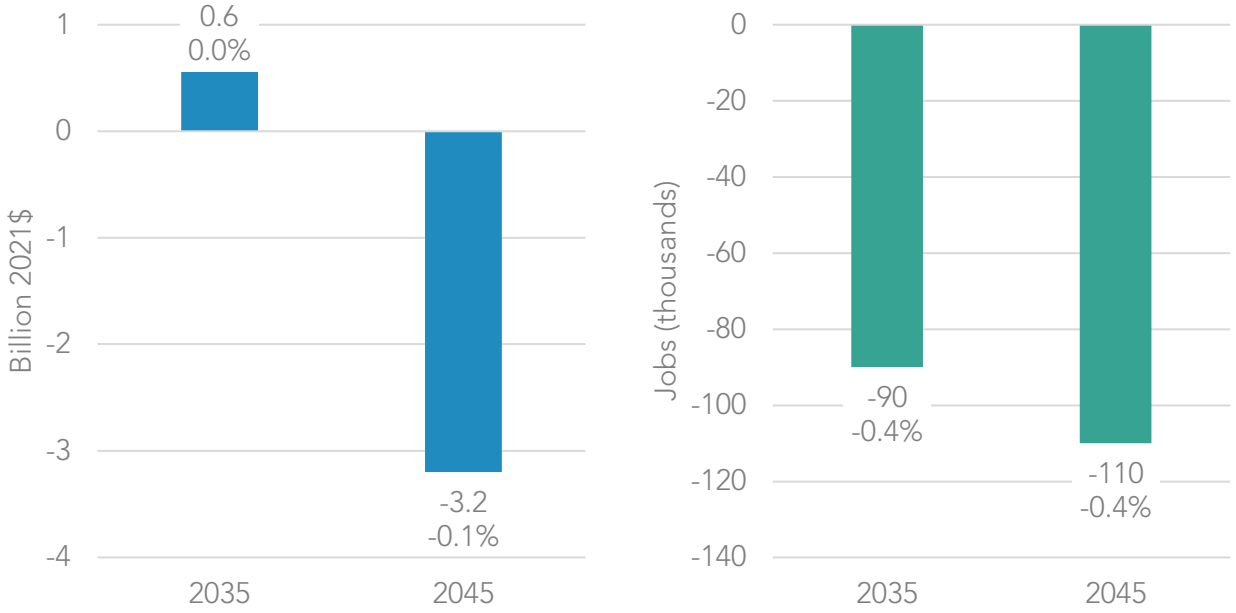
Two different models were used to estimate the overall impact that investing in a transition away from fossil fuels and in our NWL may have on the growing California economy. The transition away from fossil fuels was evaluated using the IMPLAN economic analysis model. The NWL investments were evaluated using the REMI PI+ economic model. These models provide similar outputs relative to the same economic and employment forecasts used to develop a Reference Scenario for use in each model.

AB 32 GHG Inventory Sectors

To estimate the overall impact that investing in a transition away from fossil fuels may have on the California economy, CARB used the IMPLAN model. Additional detail regarding the model, assumptions, and methodology are included in Appendix H (AB 32 GHG Inventory Sector Modeling). The IMPLAN model is a multisector representation of private industries in the U.S. economy that maps economic relationships across industries, households, and governments. This model translates direct costs and savings associated with transitioning away from fossil fuels with indirect effects such as wages, purchases of goods and services, business tax impacts, and supply chain effects. In addition, the induced effects of household purchases, local and import purchases, wages paid, and household tax impacts are estimated. This comprehensive assessment of the interactions between capital investment in fossil fuel alternatives and household purchases provides an indication of the response of the California economy to the Scoping Plan Scenario.

The Scoping Plan Scenario results in a small impact on the Gross State Product (GSP) and employment relative to the Reference Scenario, as shown in Figure 3-3. Economic growth is largely unaffected by the Scoping Plan Scenario in 2035 and slowed by 0.1 percent in 2045. Employment growth is also slowed a small amount, 0.4 percent in 2035 and in 2045, and employment still grows. Assuming annual growth rates of 0.7 percent means there would be more than 193,000 additional jobs in 2045.

Figure 3-3: Gross state product (left) and employment (right) relative to a growing California economy for the Scoping Plan Scenario in 2035 and 2045 (AB 32 GHG Inventory sectors)



California households will see increased costs from the purchase of new capital stock and savings from reduced spending on fuel, as shown in Figure 3-2. Households also will face increased costs associated with CDR, costs associated with energy efficiency measures, and commercial stock purchases—all of which are assumed to be passed directly to consumers. The impact to California households, however, is not limited to these direct costs, as changes in relative prices, employment, and wages can affect household well-being. Personal income, which captures the direct, indirect, and induced impacts, is a metric commonly used to evaluate the impact of policies on households.

Personal income in California is projected to grow from $2.7 trillion in 2021 to $3.6 trillion in 2035 and $4.4 trillion in 2045. Household projections are based on California Department of Finance population projections, which estimate the state's population to grow an average of 0.3 percent each year from 2021 to 2045.[212] California households are projected to increase from 13.3 million in 2020 to 14.6 million in 2035 and 15.0 million in 2045.

[212] California Department of Finance. Population Projections (Baseline 2019). https://dof.ca.gov/forecasting/demographics/projections/.

While the transition away from combustion of fossil fuels will improve air quality for all Californians (and even, more so in overly burdened communities), the economic impacts of the Scoping Plan Scenario are unlikely to be equal among Californians. Table 3-2 presents the change in income by household income group relative to the Reference Scenario in 2035 and 2045. While in 2035 there is a net decrease in personal income of $600 million, total income for households that make less than $100,000 per year is estimated to decline by $4.1 billion dollars, and the total income for households that make more than $100,000 per year will increase by $3.5 billion under the Scoping Plan Scenario. In 2045, although there is no net change in personal income across all California households, results vary by income level. Total income for households that make less than $100,000 per year are estimated to decline by $5.3 billion dollars, while the total income for households that make more than $100,000 per year will increase by $5.3 billion under the Scoping Plan Scenario.

Table 3-2: Income Impacts by California household income group in 2035 and 2045 for the Scoping Plan Scenario (AB 32 GHG Inventory Sectors)

Household Income Group ($2021)	Percentage of 2021 California Households[213]	Change in Income (Billion $2021)	
		2035	2045
Less than $50,000	30	-2.9	-3.9
$50,000 to $100,000	27	-1.2	-1.4
$100,000 to $200,000	28	2.5	4.0
More than $200,000	15	1.0	1.3
Total	100	-0.6	0.0

[213] U.S. Census Bureau. 2021. Household Income. California. https://data.census.gov/cedsci/table?q=california%20income.

In addition to income level, there is likely to be an impact to California personal income that varies based on race/ethnicity.[214] Table 3-3 shows the percentage of households within each income group based on eight race/ethnicity categories identified in the American Community Survey 2021. As shown in Table 3-2, households in lower income groups are anticipated to see negative impacts, while households in higher income groups are anticipated to see positive impacts from the Scoping Plan Scenario in both 2035 and 2045. Because more than 60% of households in the race/ethnicity categories of Hispanic, Black alone, Native Hawaiian (HI) or Pacific Islander, American Indian or Alaskan Native, Other, and Two or More make less than $100,000 per year, these populations generally are likely to experience reduced income. White and Asian households will generally experience both increased and decreased income because these households are distributed more evenly across all four income groups.

The state recognizes the need to ensure that accessibility to clean technology and energy do not further exacerbate health and opportunity gaps for low-income households and communities of color. The Climate Change Investments program exceeds the statutory minimums to invest in projects to benefit disadvantaged communities.[215] Utilities implement programs for reduced energy bills for qualifying low-income customers.[216] There are also resources for waste and water bills that leverage federal funds.[217] CARB also coordinated with the CPUC to ensure that the Climate Credit[218] funded from the sale of Cap-and-Trade allowances provided to utilities on behalf of ratepayers is credited equally to households and not based on how much energy is used. These are just a few examples of how the state is designing and implementing programs to avoid increasing existing disparities. The state must continue to find ways to relieve economic burdens on low-income households.

[214] The number of households in each bracket and the race/ethnicity categories are from American Community Survey 2021 results. Population changes through 2035 and 2045 are not forecast. U.S. Census Bureau. 2021. Household Income. California. *https://data.census.gov/cedsci/table?q=california%20income*.
[215] CARB. Priority Populations — California Climate Investments. *https://www.caclimateinvestments.ca.gov/priority-populations*.
[216] CPUC. CARE/FERA Program. *https://www.cpuc.ca.gov/lowincomerates/*.
[217] California Department of Community Services and Development. Low Income Household Water Assistance Program. *https:/www.csd.ca.gov/lihwap*.
[218] CPUC. California Climate Credit - FAQ. *https://www.cpuc.ca.gov/industries-and-topics/natural-gas/greenhouse-gas-cap-and-trade-program/california-climate-credit/california-climate-credit---faq*.

Table 3-3: Percentage of households in each race/ethnicity category by household income group

Household Income Group ($2021)	Households in Income Group (%)							
	White Not Hispanic	Hispanic	Black Alone	Asian Alone	Native HI or Pacific Islander	American Indian or Alaskan Native	Other	Two or More
Less than $50,000	26	35	45	25	30	35	37	32
$50,000 to $100,000	25	32	27	21	31	33	33	30
$100,000 to $200,000	29	25	21	30	30	26	24	27
More than $200,000	19	7	7	24	9	7	5	11

Natural and Working Lands

The macroeconomic impact of the NWL scenario was evaluated separately in the REMI PI+ model. For the Scoping Plan Scenario, the macroeconomic impact was modeled by assuming that economic activity in the relevant industries grows in proportion to the proposed implementation spending in that industry. All funds for implementing the actions were assumed to be sourced from within the state. For urban forests, the funds were modeled as being sourced from a combination of state government and private property owners in proportion to the current estimated private/public spending ratio. For all other actions, funds were assumed to be sourced from the state government. In each modeled scenario, government spending and income to property owners were reduced relative to the Reference Scenario in proportion to the annual costs of implementation. None of the proposed spending was modeled as being sourced from increased taxes. Additional details on the methodology for evaluating macroeconomic impacts are in Appendix I (NWL Technical Support Document).

While the macroeconomic model does count the increased economic activity in the affected industries as part of GSP, it does not quantify many of the important economic, health, and environmental benefits that would occur if these actions were implemented. While these benefits—like the reduced use of pesticides, value of urban trees, and increased recreational opportunities—would be very significant, they are outside the scope of the macroeconomic model.

The macroeconomic model also makes projections about the total level of employment in the state. The model forecasts that the Scoping Plan Scenario, which greatly increases the level of NWL management actions, channels economic activity toward related industries and would lead to a slight increase in total employment. (Table 3-4). While the model does aim to accurately represent many labor market dynamics, including adjustments of wages and migration rates, it does not account for many costs that might be associated with dramatically scaling up employment in a particular industry, such as the cost of job training.

Table 3-4: Gross state product and employment relative to a growing California economy for the Scoping Plan Scenario in 2035 / 2045 (NWL)

	Scoping Plan Scenario (%)
Gross State Product	0.00 / 0.01
Employment	0.12 / 0.10
Personal Income	-0.04 / -0.04
Personal Income per Capita	-0.04 / -0.14

Health Analysis

Air quality is affected by pollutant emissions from various processes associated with energy systems, including the combustion of fossil fuels, as well as the combustion of vegetation biomass from NWL during wildfires. Pollutants that are important contributors to degraded air quality in California include nitrogen oxides (NO_x), particulate matter (PM), reactive organic gases (ROG), and others. Further, in the atmosphere these pollutants are transported away from the locations of the emissions by wind and other phenomena, and undergo chemical reactions that result in the formation of new pollutants such as ground-level ozone and fine particulate matter ($PM_{2.5}$). Both primary (emitted) and secondary (formed) pollutants are important from a public health standpoint and contribute to the incidence of air pollution-related mortality and disease within California populations. Measures focused on GHGs do not incorporate specific targets to reduce emissions of $PM_{2.5}$ or air toxics like benzene. These co-pollutants, which are emitted from many of the same pollution sources as GHGs, affect local air quality and pose known risks to public health, such as the risk of asthma and cardiovascular disease. Generally, for stationary sources, certain harmful pollutants are regulated via local rules and regulations that are reflected in permits for stationary sources and are enforced by local air districts, with CARB also regulating air toxics contaminants from stationary sources with the air districts.

AB 32 GHG Inventory Sectors

To assess health impacts for the AB 32 GHG Inventory sectors, an integrated modeling approach was used to quantify and value the air pollution-related public health benefits of the Scoping Plan Scenario relative to the Reference Scenario. Additional details about the models, assumptions, and methodology are included in Appendix H (AB 32 GHG Inventory Sector Modeling). Using output from the PATHWAYS model, projections of pollutant emissions to 2045 were developed for stationary, area, and mobile source emissions using a detailed base year CARB pollutant emissions inventory. Further, the emissions are processed, including for where and when they occur in California, using the Sparse Matrix Operator Kernels Emissions (SMOKE) model. For example, on-road vehicle emissions were allocated along existing roadways, and refining emissions were assigned to the locations of existing refineries. It should be noted that the emissions projections represent statewide average reductions associated with high-level assumptions about alternative fuels and technologies. For example, emissions occurring from refineries to produce liquid fuels are reduced in line with petroleum demand. This reduction is applied equally to all refineries in the Scoping Plan Scenario and does not specify individual facility responses to changing demand. Similarly, the Scoping Plan Scenario does not specify which refineries transition to biofuel production or where new electricity generation facilities are built.

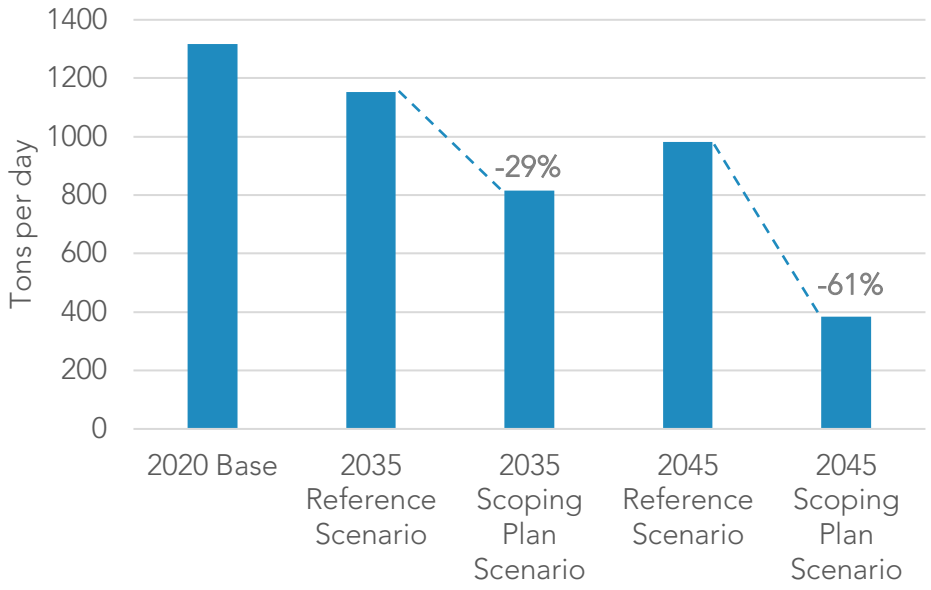
Next, emission changes were translated into impacts on atmospheric pollution levels, including ground-level ozone and $PM_{2.5}$, via an advanced photochemical air quality model called the Community Multiscale Air Quality (CMAQ) model, which accounts for atmospheric chemistry and transport. A comprehensive assessment of how pollutant concentrations are impacted throughout the year was achieved by simulating all months in 2035 and 2045 for the Scoping Plan Scenario.[219] Health benefits were estimated using the U.S. EPA's environmental Benefits Mapping and Analysis Program (BenMAP) model to translate pollutant changes into avoided incidence of mortality, hospital admissions, emergency room visits, and other outcomes as a result of reduced exposure to ozone and $PM_{2.5}$. These outcomes are associated with an economic value in order to aggregate health impacts.

The Scoping Plan Scenario shows a substantial reduction in pollutant emissions relative to the Reference Scenario, including NO_x, $PM_{2.5}$, and ROG. Reductions in NO_x are shown in Figure 3-4. Even under a business-as-usual trajectory, emissions are reduced from present levels by 26 percent in 2045 in the Reference Scenario, demonstrating the impact of current regulations and trends in energy sectors. The Scoping Plan Scenario further reduces NO_x

[219] This annual approach differs from the episodic modeling approach applied to the Proposed Scenario and Alternatives in the Draft 2022 Scoping Plan Update. Appendix H (AB 32 GHG Inventory Sector Modeling) describes both approaches.

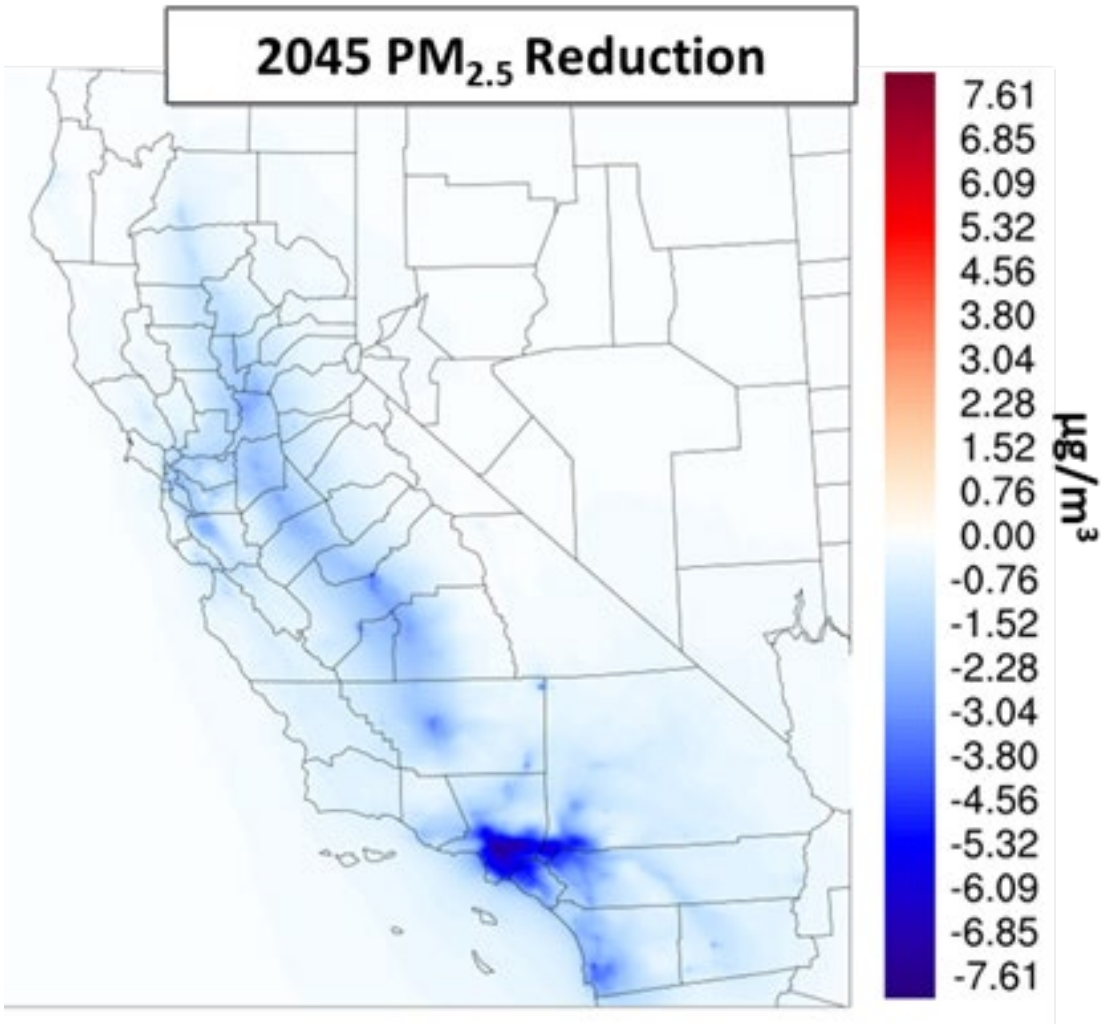
emissions from the Reference Scenario by 29% in 2035 and 61% in 2045. Emission reductions occur throughout the state with particular prominence in urban areas, including the South Coast Air Basin, due to the large presence and activity of emission sources. Appendix H (AB 32 GHG Inventory Sector Modeling) contains additional information about the pollutant emissions modeling and results.

Figure 3-4: Illustration of NOx emission reductions from current levels for the Reference Scenario and the Scoping Plan Scenario (AB 32 GHG Inventory sectors)



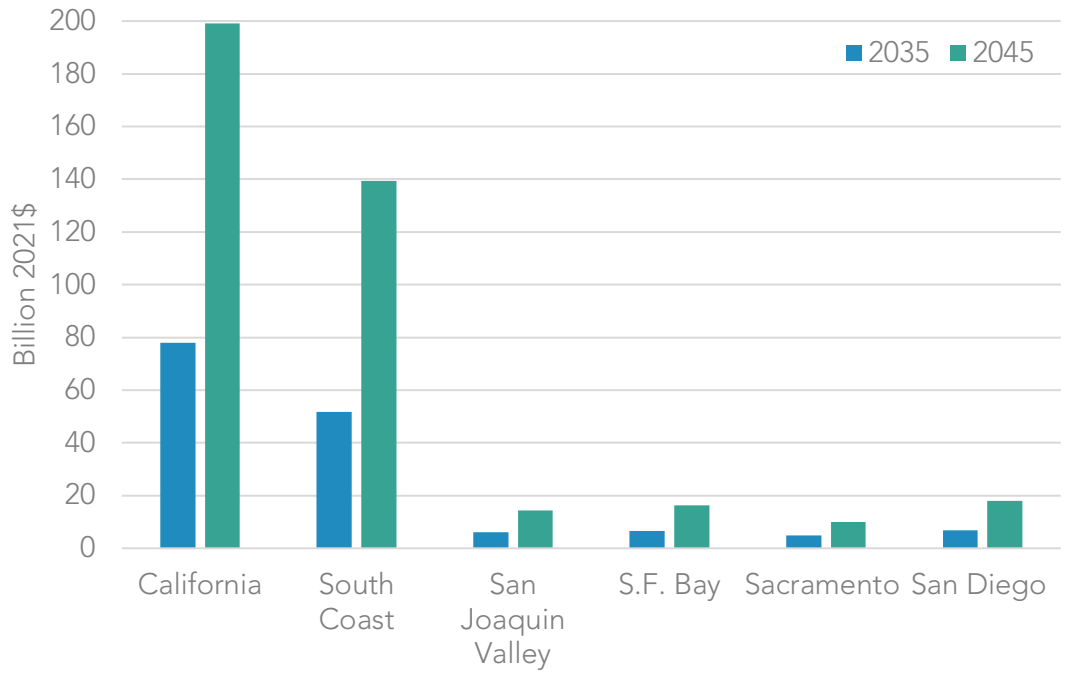
The emission reductions achieve important improvements in air quality throughout California, including reductions in the levels of ozone and $PM_{2.5}$. Reductions in annual $PM_{2.5}$ levels are shown in Figure 3-5. The greatest reductions are evident in Southern California, the San Joaquin Valley, the San Francisco Bay area, and the Greater Sacramento area due to the large presence and activity of emission sources, meteorology, topography, and others. To highlight the extent of the air quality improvements: reductions reach nearly 8 micrograms per cubic meter ($\mu g/m^3$) in 2045 and lead to 76% fewer exceedances of the health-based National Ambient Air Quality $PM_{2.5}$ standard of 12 $\mu g/m^3$. Similarly, ozone improvements reach 19 parts per billion (ppb) and yield 62% fewer exceedance events. Furthermore, the locations of improvements carry important implications for human health as these areas support large urban populations and generally experience the most degraded ozone and $PM_{2.5}$ pollution. Appendix H (AB 32 GHG Inventory Sector Modeling) provides details regarding the atmospheric modeling and results, including differences in ozone and $PM_{2.5}$.

Figure 3-5: Difference in annual average $PM_{2.5}$ (µg/m^3) in the Scoping Plan scenario relative to the Reference scenario in 2045 (AB 32 GHG Inventory sectors)



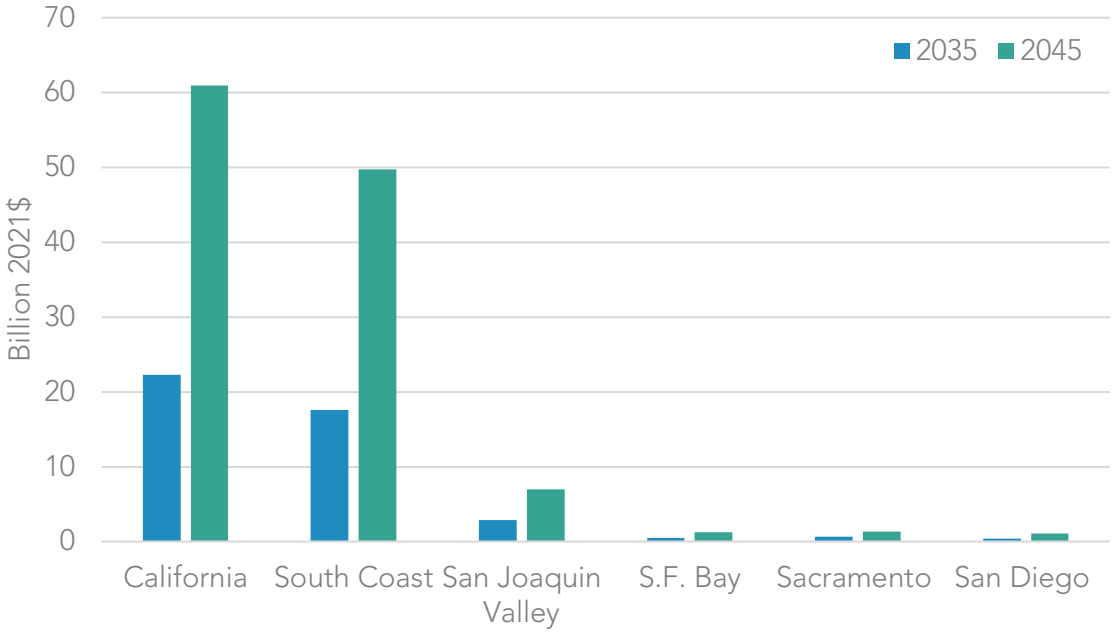
Notable health benefits representing the economic value of the avoided incidence of health effects are associated with the Scoping Plan Scenario. In total, the benefits reach $78 billion in 2035 and $199 billion in 2045, as shown in Figure 3-6. Populations in Southern California benefit the most due to preexisting air quality challenges, significant emission sources and activity, and the presence of a large, dense urban population. Additional details regarding the health impact assessment are provided in Appendix H (AB 32 GHG Inventory Sector Modeling).

Figure 3-6: Total health benefits estimated from air quality improvements in the Scoping Plan Scenario (AB 32 GHG Inventory sectors)



Furthermore, these benefits accrue within socially and economically disadvantaged communities identified by CalEnviroScreen, where they are most needed. Total health benefits within census tracts identified as disadvantaged communities using CalEnviroScreen 4.0 reach $22 billion in 2035 and $61 billion in 2045, as shown in Figure 3-7. Similarly to the statewide health benefits, the largest share of benefits occurs within disadvantaged communities in Southern California. Additional information on the health benefits within disadvantaged communities can be found in Appendix H (AB 32 GHG Inventory Sector Modeling).

Figure 3-7: Disadvantaged community health benefits relative to the Reference Scenario for the Scoping Plan Scenario (AB 32 GHG Inventory sectors)

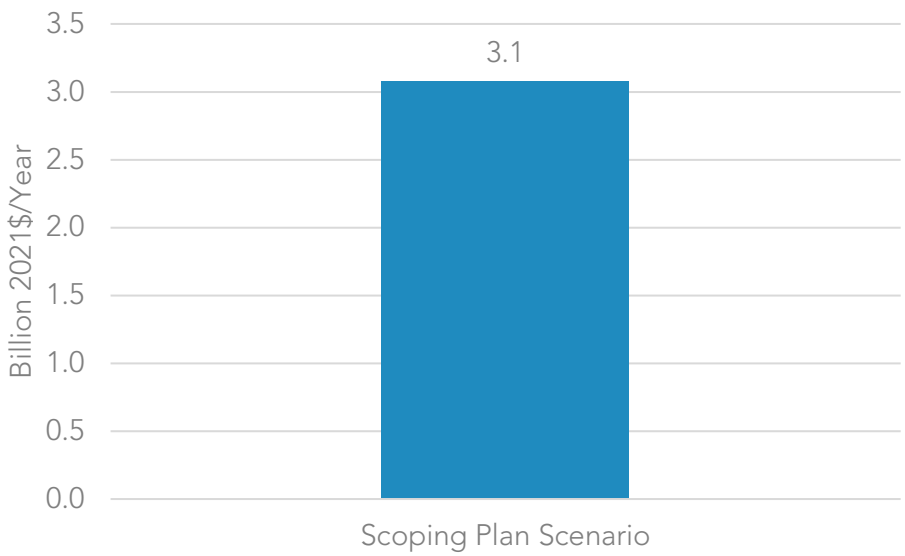


Natural and Working Lands

For NWL, health benefits were evaluated based on projected $PM_{2.5}$ wildfire emissions on forests, shrublands, and grasslands, discussed in the AB 197 Measure Analysis section of the chapter that follows.[220] The health endpoints for the Scoping Plan Scenario and in Appendix I (NWL Technical Support Document) for the alternative scenarios were the basis for the estimated health benefits shown in Figure 3-8. Health benefits were derived from the preliminary University of California, Los Angeles (UCLA) study that estimated annual health impacts and associated costs from California's wildfires from 2008–2018. Additional details are included in Appendix I (NWL Technical Support Document). These costs were applied to the health endpoints discussed in the AB 197 Measure Analysis section of the chapter.

[220] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11, N14. *finalejacrecs.pdf (arb.ca.gov)*.

Figure 3-8: Total average annual health benefits relative to the Reference Scenario for the Scoping Plan Scenario (NWL)



As health impacts analyzed here are driven by wildfire emissions, the health benefits for the Scoping Plan Scenario are directly related to the amount of forest, shrubland, and grassland management action. These management actions reduce vegetation fuels and, as a result, wildfire activity. The Scoping Plan Scenario increases the amount of these management actions, reducing wildfire emissions and avoiding incidence of emission-related health effects. The health benefits, or economic value of the avoided incidence of health effects, correspondingly increase with an increasing management implementation rate. Additional details are included in Appendix I (NWL Technical Support Document).

Estimated health benefits do not include the direct impact of wildfires on injuries, deaths, or mental health, nor the indirect costs of lost ecosystem benefits to wildfire. Additional direct health costs may result from wildfire that would likely increase the health benefits from increased forest, shrubland, and grassland management to reduce wildfire activity. Nonetheless, the conservative health benefits under the Scoping Plan Scenario are estimated to be $3.1 billion per year relative to the Reference Scenario for all NWL actions identified in the Scoping Plan Scenario.

AB 197 Measure Analysis

This section provides estimates for information associated with GHG emissions reduction measures evaluated in this Scoping Plan.[221] These estimates, which were developed as part of the process for meeting the requirements of AB 197 (E. Garcia, Chapter 250, Statutes of 2016), provide information on the relative impacts of the evaluated measures when compared to each other. To support the design of a suite of policies that result in GHG reductions, air quality co-benefits, and cost-effective measures, it is important to understand if a measure will increase or reduce criteria pollutants or toxic air contaminant emissions, or if increasing stringency at additional costs yields few additional GHG reductions. To this end, AB 197 requires the following for each potential emissions reduction measure evaluated in any Scoping Plan update:

- The range of projected GHG emissions reductions that result from the measure;
- The range of projected criteria pollutant emission reductions that result from the measure; and
- The cost-effectiveness, including avoided social costs, of the measure.

The following sections describe the evaluation of measures for the AB 32 GHG Inventory sectors and NWL. For the purposes of this Scoping Plan, the identified emissions reduction measures for the analysis required by AB 197 are actions grouped by sectors where several policies and programs are expected to overlap. This approach reflects the most granular feasible analysis given the modeling tools available,[222] the overlap and interaction effects among policies and incentive programs, the longer planning horizon used for this Scoping Plan compared to previous efforts, and the scale of transition needed to achieve carbon neutrality. To implement this Scoping Plan, dozens of individual regulations, policies, and incentive programs are anticipated that work together to drive down emissions across all economic sectors and support actions. Every specific policy or incentive program that could contribute to the deployment of clean technology and energy called for in this plan may overlap in ways that make it infeasible to tease out those policies and programs' individual effects with any reasonable degree of certainty. For example, in the transportation sector, deploying ZEVs and reducing driving demand may be achieved through a combination of the implementation of new or existing regulations, fuels programs, incentive programs, and VMT reduction initiatives that can each contribute to reductions in emissions for the sector. It is not feasible to isolate each sub action from each other at this time in terms of the share of contribution to total reductions. The estimated emission

[221] AB 197 calls for the evaluation of "emission reduction measures." This Scoping Plan treats each action and its variants on stringency as emission reduction measures for the purposes of this chapter. Appendix C (AB 197 Measure Analysis) lists the measures and corresponding modeling assumptions for each alternative.
[222] See Appendix H (AB 32 GHG Inventory Sector Modeling and Appendix I (NWL Technical Support Document).

reductions, health endpoints, and costs by measure for the Scoping Plan Scenario are presented in this chapter, and the corresponding estimates for the Proposed Scenario and Alternatives 1, 2, and 4 are included in Appendix C (AB 197 Measure Analysis).

Because many of the measures and underlying assumptions interact with each other, isolating the GHG emission reductions, corresponding changes to fuel combustion, and associated cost of an individual measure is analytically challenging. Each measure is evaluated by examining the change in fuel combustion, cost, and emissions associated with just that measure using the PATHWAYS model. The difference between the Scoping Plan Scenario and the Reference Scenario is estimated for each measure. Starting from the Scoping Plan Scenario, the modeling assumptions for an individual measure are reverted to the Reference Scenario values, resulting in GHG reductions, changes to fuel combustion, and costs (or savings). This approach does not reflect interactions between sectors in PATHWAYS that influence the results for each complete alternative, presented earlier. As such, the values associated with each measure should not be added to obtain an overall scenario estimate.

To arrive at the 2045 target for NWL, CARB modeled the ecological impact that climate smart land-based management strategies (suites of on-the-ground actions, or *treatments,* that are used across the landscape to manipulate an ecosystem) will have on ecosystem carbon; and whenever possible, additional co-benefits from those actions. The Scoping Plan Scenario incorporates a set of land management actions at varying scales of implementation for each land type to achieve the GHG emission reductions. Each land type, and its associated management actions, was considered a measure for this analysis. For modeling individual landscapes and management actions, CARB used a suite of models. The complexity of these models varies by land type, depending on the existing science, data, and availability of existing models to use. Appendix I (NWL Technical Support Document) provides detailed modeling assumptions for each NWL type. The estimated emission reductions, health endpoints, and costs by measure under the Scoping Plan Scenario for each NWL type are presented in this chapter, and the corresponding estimates for the Proposed Scenario and NWL Alternatives 1, 2, and 4 are included in Appendix C (AB 197 Measure Analysis).

Estimated Emissions Reductions

Both GHG emissions reductions and emissions of criteria air pollutants were evaluated for the AB 32 GHG Inventory sectors and for NWL. The methods and results are described in this section.

AB 32 GHG Inventory Sectors

In the absence of having direct modeling results for criteria pollutant estimates from PATHWAYS, CARB estimated criteria pollutant emissions impacts by using changes in fuel combustion in units of exajoules from PATHWAYS and emission factors in units of tons per exajoule to estimate the change in emissions in tons per year. Emission factors from a variety

of sources for each sector were utilized, including but not limited to CARB's mobile source emissions models,[223] U.S. EPA's AP 42 Emissions Factors,[224] and the South Coast Air Quality Management District's (AQMD's) District Rules.[225] These emission factors were applied to fuel burn change by fuel type, sector, equipment type, and process, where applicable. Statewide annual average emissions were estimated for three criteria pollutants: NO_x, $PM_{2.5}$, and ROG.

Table 3-5 provides the estimated GHG and criteria pollutant emission reductions for the measures in the Scoping Plan Scenario in 2035 and 2045. The other alternatives are presented in Appendix C (AB 197 Measure Analysis). Based on the estimates below, these measures are expected to provide air quality benefits. The estimates provided in this chapter and Appendix C (AB 197 Measure Analysis) are appropriate for comparing across alternatives considered for the development of this Scoping Plan, but they are not precise estimates.

[223] CARB. MSEI - Modeling Tools. *https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-modeling-tools*.
[224] U.S EPA. AP-42: Compilation of Air Emissions Factors. *https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emissions-factors*.
[225] South Coast AQMD. South Coast AQMD Rule Book. *https://www.aqmd.gov/home/rules-compliance/rules/scaqmd-rule-book*.

Table 3-5: Estimated GHG and criteria pollutant emission reductions relative to the Reference Scenario for the Scoping Plan Scenario in 2035/2045 (AB 32 GHG Inventory sectors)

Measure	GHG Reductions ($MMTCO_2$)	NOx Reductions (Short Tons/Year)	$PM_{2.5}$ Reductions (Short Tons/ Year)	ROG Reductions (Short Tons/Year)
Deploy ZEVs and reduce driving demand	-46 / -84	-51,620 / -122,806	-2,008 / -6,506	-18,967 / -30,410
Coordinate supply of liquid fossil fuels with declining California fuel demand	-25 / -30	-1,601 / -2,707	-978 / -1,705	-747 / -1,323
Generate clean electricity	-8 / -31	-92 / -1,555	-177 / -1,382	-41 / -425
Measure	**GHG Reductions ($MMTCO_2$)**	**NOx Reductions (Short Tons/Year)**	**$PM_{2.5}$ Reductions (Short Tons/ Year)**	**ROG Reductions (Short Tons/Year)**
Decarbonize industrial energy supply	-9 / -22	-21,172 / -34,876	-1,188 / -2,527	-3,710 / -6,298
Decarbonize buildings	-14 / -35	-8,105 / -94,455	-826 / -6,877	-1,093 / -8,109
Reduce non-combustion emissions[a]	-0.41 / -0.52 ($MMTCH_4$)	N/A	N/A	N/A
Compensate for remaining emissions	-25 / -64	N/A	N/A	N/A

[a] Methane emissions reductions are reported for this measure.

The measures related to reducing non-combustion emissions and compensating for the remaining emissions do not include changes to fuel combustion, and therefore are not

associated with changes to air pollutants. Biomethane combustion is captured in measures that reduce combustion of fossil gas, such as decarbonizing industrial energy supply and buildings.

Natural and Working Lands

NWL ecosystems naturally vary between being a source and a sink for carbon over time. The NWL ecosystem carbon stock changes projected through mid-century by the suite of models were used to estimate net emissions or emissions reductions relative to the Reference Scenario. These changes in carbon stocks were affected by projected climate change, the implementation of management actions under the various scenarios, land conversion, and (for forests, shrublands, grasslands) wildfire. Each NWL type was evaluated, and an overview of all NWL is presented in Table 3-6. More detailed results for each NWL type can be found in Appendix C (AB 197 Measure Analysis).

Table 3-6: Estimated average annual GHG and criteria pollutant emission reductions relative to the Reference Scenario for the Scoping Plan Scenario from 2025–2045 (NWL)

Measure	GHG Reductions ($MMTCO_2e$/year)	$PM_{2.5}$ Reductions (MT/Year)
Forests/Shrublands/Grasslands	-0.12	-17,500
Annual Croplands	-0.25	N/A
Perennial Croplands	-0.01	N/A
Urban Forest	-1.29	N/A
Wildland Urban Interface (WUI)	0.75	N/A
Wetlands	-0.43	N/A
Sparsely Vegetated Lands	<-0.01	N/A

Fine particulate wildfire emissions were evaluated for forests, shrublands, and grasslands only. Wildfire emissions decreased under the Scoping Plan Scenario compared to the Reference Scenario. The Scoping Plan Scenario's higher level of management actions that reduce tree or shrub densities, protect large trees, reintroduce fire to the landscape, and diversify species and structures result in greater reductions in wildfire emissions.

Estimated Health Endpoints

Climate change mitigation will result in both environmental and health benefits. This section provides information about the potential health benefits of the Scoping Plan Scenario. Health benefits are primarily the result of reduced $PM_{2.5}$ pollution, both from stationary and mobile sources, as well as wildfire in forests, shrublands, and chaparral.

AB 32 GHG Inventory Sectors

CARB used the criteria pollutant emissions in Table 3-5 to understand potential health impacts. Similar to the air quality estimates, this information should be used to understand the relative health benefits of the various measures and should not be taken as absolute estimates of health outcomes. CARB used the incidence-per-ton (IPT) methodology to quantify the health benefits of emission reductions. The IPT methodology is based on a methodology developed by the U.S.

EPA.[226,227,228,229] Under the IPT methodology, changes in emissions are approximately proportional to the resulting changes in health outcomes. IPT factors are derived by calculating the number of health outcomes associated with exposure to $PM_{2.5}$ for a baseline scenario using measured ambient concentrations and dividing that number by the emissions of $PM_{2.5}$ or a precursor. To estimate the reduction in health outcomes, the emission reductions are multiplied by the IPT factor. For future years, the number of outcomes is adjusted to account for population growth. IPT factors were computed for the two types of $PM_{2.5}$: primary $PM_{2.5}$ and secondary $PM_{2.5}$ of ammonium nitrate aerosol formed from precursors.

For this AB 197 analysis, CARB calculated the health benefits associated with the five key measures that are represented by changes to fuel combustion. The health benefits associated with emission reductions for the Scoping Plan Scenario were estimated for each air basin and then aggregated for the entire state of California. CARB assumed that the statewide emission reductions distribution among the air basins is proportional to the baseline emissions in that air basin.

Calculated health endpoints include premature mortality, cardiovascular emergency department (ED) visits, acute myocardial infarction, respiratory ED visits, lung cancer incidence, asthma onset, asthma symptoms, work loss days, hospitalizations due to cardiopulmonary illnesses, hospitalizations due to respiratory illnesses, hospital admissions for Alzheimer's disease, and hospital admissions for Parkinson's disease.[230,231,232] These health endpoints were calculated using the IPT method for estimated emission reductions. Table 3-7 compares the health benefits of emission reductions associated with each measure for the Scoping Plan Scenario in the year

---

[226] CARB. CARB's Methodology for Estimating the Health Effects of Air Pollution. Retrieved February 9, 2021. *https://ww2.arb.ca.gov/resources/documents/carbs-methodology-estimating-health-effects-air-pollution*.

[227] Fann, N., C. M. Fulcher, and B. J. Hubbell. 2019. "The influence of location, source, and emission type in estimates of the human health benefits of reducing a ton of air pollution." *Air Quality, Atmosphere & Health* 2:169–176. *https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2770129/*.

[228] Fann, N., K. R. Baker, and C. M. Fulcher. 2012. "Characterizing the $PM_{2.5}$-related health benefits of emission reductions for 17 industrial, area and mobile emission sectors across the U.S." *Environ Int*. 49:141–51. November 15. *https://www.sciencedirect.com/science/article/pii/S0160412012001985*.

[229] Fann, N., K. Baker, E. Chan, A. Eyth, A. Macpherson, E. Miller, and J. Snyder. 2018. "Assessing Human Health $PM_{2.5}$ and Ozone Impacts from U.S. Oil and Natural Gas Sector Emissions in 2025." *Environ. Sci. Technol.* 52 (15), 8095–8103. *https://pubs.acs.org/doi/abs/10.1021/acs.est.8b02050*.

[230] CARB. CARB's Methodology. *https://ww2.arb.ca.gov/resources/documents/carbs-methodology-estimating-health-effects-air-pollution*.

[231] CARB. 2022. Updated Health Endpoints in CARB's Health Benefits Methodology. *Evaluating New Health Endpoints for Use in CARB's Health Analyses*.

[232] Cardio-pulmonary mortality, hospitalizations due to cardiopulmonary illnesses, and hospital admissions due to respiratory illnesses endpoints utilize studies documented in CARB's methodology document. For future assessments, CARB will use more recent studies to estimate cardiovascular hospital admissions and respiratory hospital admissions, as documented in CARB's updated health endpoints memo.

specified (2035 or 2045). The other alternatives are presented in Appendix C (AB 197 Measure Analysis).

Table 3-7: Estimated avoided incidence of mortality, cardiovascular and respiratory disease onset, work loss days and hospital admissions relative to the Reference Scenario for the Scoping Plan Scenario (AB 32 GHG Inventory sectors)

Measure	Mortality	Cardiovascular ED Visits	Acute Myocardial Infarction	Respiratory ED Visits	Lung Cancer Incidence	Asthma Onset	Asthma Symptoms	Work Loss Days	Hospital Admissions, Cardiovascular	Hospital Admissions, Respiratory	Hospital Admissions, Alzheimer's Disease	Hospital Admissions, Parkinson's Disease
Deploy ZEVs and reduce driving demand in 2035	635	170	70	400	45	1,475	128,930	92,510	95	115	245	40
Deploy ZEVs and reduce driving demand in 2045	1,820	475	200	1,115	135	3,995	343,095	255,800	295	350	745	125
Coordinate supply of liquid fossil fuels with declining CA fuel demand in 2035	115	30	15	70	10	275	23,530	16,880	20	20	50	10

Measure	Mortality	Cardiovascular ED Visits	Acute Myocardial Infarction	Respiratory ED Visits	Lung Cancer Incidence	Asthma Onset	Asthma Symptoms	Work Loss Days	Hospital Admissions, Cardiovascular	Hospital Admissions, Respiratory	Hospital Admissions, Alzheimer's Disease	Hospital Admissions, Parkinson's Disease
Coordinate supply of liquid fossil fuels with declining CA fuel demand in 2045	215	55	25	130	15	490	40,860	30,445	35	40	95	15
Generate clean electricity in 2035	20	5	0	10	0	45	3,930	2,820	5	5	10	0
Generate clean electricity in 2045	170	45	20	105	15	385	32,065	23,890	25	30	75	10
Decarbonize industrial energy supply in 2035	300	80	35	190	20	695	60,660	43,520	45	55	115	20
Decarbonize industrial energy supply in 2045	595	155	65	365	45	1,310	111,925	83,435	95	115	245	40

Measure	Mortality	Cardiovascular ED Visits	Acute Myocardial Infarction	Respiratory ED Visits	Lung Cancer Incidence	Asthma Onset	Asthma Symptoms	Work Loss Days	Hospital Admissions, Cardiovascular	Hospital Admissions, Respiratory	Hospital Admissions, Alzheimer's Disease	Hospital Admissions, Parkinson's Disease
Decarbonize buildings in 2035	155	40	15	95	10	360	31,130	22,335	25	30	60	10
Decarbonize buildings in 2045	1,610	420	175	985	120	3,550	303,830	226,500	260	310	665	115
Note: All values are rounded to the nearest 0 or 5.												

The measures related to reducing non-combustion emissions and compensating for remaining emissions do not include changes to fuel combustion and therefore are not associated with changes to air pollutants or health endpoints. Biomethane combustion is captured in measures that reduce combustion of fossil gas, such as decarbonizing industrial energy supply and buildings.

Although the estimated health outcomes presented are based on a well-established methodology, they are subject to uncertainty. For instance, future population estimates are subject to increasing uncertainty as they are projected further into the future, and baseline incidence rates can experience year-to-year variation. Also, the relationship between changes in pollutant concentrations and changes in pollutant or precursor emissions is assumed to be approximately proportional.

In addition, emissions are reported at an air basin level and do not capture local variations. These estimates also do not account for impacts from global climate change, such as temperature rise, and are only based on the scenarios in this Scoping Plan.

The fuel changes for each AB 197 measure are estimated based on the impact of each measure compared to the Reference Scenario for the years 2035 and 2045. Therefore, aggregating the effect of each measure would overestimate the impacts of the Scoping Plan Scenario because the implementation of each measure would affect the level of benefits of the other measures. This measure-by-measure analysis uses a different methodology for calculating health endpoints than does the health analysis for the complete Scoping Plan Scenario provided earlier.

Natural and Working Lands

Implementation of NWL management strategies to mitigate and adapt to climate change will result in both environmental and health benefits. This section provides information about the potential health benefits of measures evaluated for the Scoping Plan Scenario. For this analysis, health benefit estimates were focused on increases or decreases to $PM_{2.5}$ resulting from wildfire emissions on forests, shrublands, and grasslands.[233] Other health benefits resulting from NWL management actions in the Scoping Plan Scenario are not quantified here but are important for all Californians. This includes, but is not limited to, reductions in exposure to synthetic pesticides when switching to organic agricultural systems, improvements in shade availability and mental health with increasing urban forest cover, improved mental health from opportunities for recreation in resilient and healthy environments, and protection from floods and rising sea levels.

[233] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11, N14. *finalejacrecs.pdf (arb.ca.gov)*.

These examples are by no means exhaustive, as our natural and working lands provide immense health benefits to everyone.

For this analysis, CARB used the $PM_{2.5}$ emissions in Table 3-6 to understand potential health impacts. This information should be used to understand the relative health endpoints of the various measures and should not be taken as absolute estimates of health outcomes of this Scoping Plan statewide or within a specific community. The IPT methodology was used to calculate health endpoints, similar to the AB 32 GHG Inventory Sector analysis. CARB calculated the annual health endpoints associated with the wildfire emissions changes resulting from the implementation of management strategies on forests, shrublands, and grasslands under each alternative. The annual health endpoints associated with emission reductions for the Scoping Plan Scenario were estimated for the entire state. Calculated health endpoints include emissions-caused mortality, hospital admittance, and emergency room visits from asthma; hospital admittance from chronic obstructive pulmonary disease; and emergency room visits from respiratory and cardiovascular outcomes. Table 3-8 compares the average annual health endpoints of wildfire emission reductions associated with the Scoping Plan Scenario over the period 2025–2045. The other alternatives are presented in Appendix C (AB 197 Measure Analysis).

Table 3-8: Estimated average annual avoided incidence of hospital admissions, emergency room visits, and mortality relative to the Reference Scenario for the Scoping Plan Scenario resulting from forest, shrubland, and grassland wildfire emissions (NWL)

Health Endpoints from Forest, Shrubland, and Grassland Wildfire Emissions	Average Annual Avoided Incidence
Hospital admissions from asthma	22
Hospital admissions from chronic obstructive pulmonary disease without asthma	19
Hospital admissions from all respiratory outcomes	63
Emergency room visits from asthma	155
Emergency room visits from all respiratory outcomes	419
Emergency room visits from all cardiovascular outcomes	156
All causes of mortality	394

Estimated Social Cost

Social costs are generally defined as the cost of an action on people, the environment, or society and are widely used to understand the impact of regulatory actions. One tool, the social cost of greenhouse gases (SC-GHG), is an estimate of the present value of the costs associated with the emission of GHGs in future years. It combines climate science and economics to help understand the benefits of reducing GHG emissions. The estimates of the social cost of carbon ($SC\text{-}CO_2$) and social cost of methane ($SC\text{-}CH_4$), two types of SC-GHGs presented here, estimate the value of the net harm to society associated with adding GHGs to the atmosphere in a given year; they do not represent the cost of actions taken to reduce GHG emissions (known as the *cost of abatement*) nor the cost of GHG emissions reductions. In principle, the SC-GHG includes the value of climate change impacts, including but not limited to, changes in net agricultural productivity, human health effects, property damage from increased flood risk and other natural disasters, disruption of energy systems, risk of conflict, environmental migration, and the value of ecosystem services. It reflects the societal value of reducing emissions

of the gas in question by one metric ton.[234] Many of these damages from GHG emissions today will affect economic outcomes throughout the next several centuries.

In 2008, federal agencies began incorporating SC-CO_2 estimates into the analysis of their regulatory actions. U.S. EPA has used various models and discount rates to determine the value of future impacts. Generally, these models begin with assumptions to predict economic activity over time, along with projected GHG emissions. The modeled emissions are input into a model of the global climate system, which then translates into estimates of surface temperature, sea level rise, and other impacts. These outputs are used to estimate economic damages per ton of GHG emitted in a given year in the future. Since the models are calculating the present value of future damages, a discount rate is applied. For example, the SC-CO_2 for the year 2045 represents the value of climate change damages from a release of CO_2 in 2045 discounted back to today. The present value is significantly affected by the discount rate used; a higher discount rate results in a lower present value. For example, in 2021 dollars the SC-CO_2 in 2045 is $31 using a 5 percent discount rate, $88 using a 3 percent discount rate, and $122 using a 2.5 percent discount rate. Additional detail is included in Appendix C (AB 197 Measure Analysis).

The 2017 Scoping Plan utilized SC-CO_2 and SC-CH_4 Obama Administration-era values developed by the Council of Economic Advisors and the Office of Management and Budget-convened Interagency Working Group on the Social Cost of Greenhouse Gases (IWG)[235] to consider the social costs of actions to reduce GHG emissions. The Biden Administration reinstated these values in February 2021,[236] after they had been rescinded and significantly revised by the Trump Administration. The reinstatement was considered an interim step, and the Biden Administration also reconvened the IWG to continue its work to evaluate and incorporate the latest climate science and economic research and

---

[234] U.S. Government. Interagency Working Group on Social Cost of Greenhouse Gases. February 2021. Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide – Interim Estimates under Executive Order 13990. *https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf*

[235] Originally titled the "Interagency Working Group on the Social Cost of Carbon," the IWG was renamed in 2016. 82 Fed. Reg. 16093, 16095-96 (Mar. 28, 2017). *https://www.govinfo.gov/content/pkg/FR-2017-03-31/pdf/2017-06576.pdf*.

[236] Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, Executive Order 13990 (Jan. 20, 2021), 86 Fed. Reg. 7037 (Jan. 25, 2021). *https://www.energy.gov/sites/default/files/2021/02/f83/eo-13990-protecting-public-health-environment-restoring.pdf*. IWG, Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates Under Executive Order 13990 (February 2021), *https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf* See also, The White House. 2021. A Return to Science: Evidence-Based Estimates of the Benefits of Reducing Climate Pollution. *https://www.whitehouse.gov/cea/written-materials/2021/02/26/a-return-to-science-evidence-based-estimates-of-the-benefits-of-reducing-climate-pollution/*.

respond to the National Academies' recommendations from 2017 as it develops a more complete revision of the estimates.

It is important to note that the models used to produce SC-GHG estimates do not include all of the important physical, ecological, and economic impacts of climate change recognized in the climate literature. There are additional costs to society, including the costs associated with changes in co-pollutants and costs that cannot be included due to modeling and data limitations. The IWG has stated that the range of the interim SC-GHG estimates likely underestimates societal damages from GHG emissions.[237] The revised estimates were originally slated to be released in early 2022 but were stalled.[238] CARB staff is applying the interim values presented in the IWG February 2021 Technical Support Document (TSD), which reflect the best available science in the estimation of the socioeconomic impacts of GHGs.[239] This Scoping Plan utilizes the TSD standardized range of discount rates, from 2.5 to 5 percent, to represent varying valuation of future damages.

AB 32 GHG Inventory Sectors

Table 3-9 presents the estimated social cost, in terms of avoided economic damages, for each measure of the Scoping Plan Scenario. For each measure, Table 3-9 includes the range of the SC-CO_2 and SC-CH_4 that results from the GHG emissions reductions in 2035 and 2045 at 2.5 and 5 percent discount rates. Additional background on the SC-GHG and methodology for calculating the SC-CO_2 and SC-CH_4 estimates in this Scoping Plan, as well as estimates for the alternatives, are provided in Appendix C (AB 197 Measure Analysis).

[237] Interagency Working Group on Social Cost of Greenhouse Gases. 2021. Technical Support Document. https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

[238] See *Louisiana v. Biden* (W.D. La. 2022) 585 F.Supp.3d 840, stayed pending review (5th Cir. Mar. 16, 2022) 2022 WL 866282. A federal district court ruling issued in early February 2022 had granted a preliminary injunction blocking the Biden Administration from using the interim IWG SC-GHG estimates. However, a federal appeals court overturned the lower court's preliminary injunction in March 2022, which allows the Biden Administration to continue using the policy as legal proceedings continue. CARB will continue to monitor the litigation. However, the federal action does not prohibit CARB from using social cost of carbon and CARB will use the best available science regardless of politics. A separate federal appeals court upheld the Biden administration's use of the IWG SC-GHG estimates in October 2022. *Missouri v. Biden* (8th Cir. 2022) ____ F.4th ____.

[239] Interagency Working Group on Social Cost of Greenhouse Gases. 2021. Technical Support Document. https://www.whitehouse.gov/wp-content/uploads/2021/02/TechnicalSupportDocument_SocialCostofCarbonMethaneNitrousOxide.pdf

Table 3-9: Estimated social cost (avoided economic damages) of measures considered in the Scoping Plan Scenario (AB 32 GHG Inventory sectors)

Measure	Social Cost of Carbon in 2035, 5%–2.5% Discount Rate Billion USD (2021 dollars)	Social Cost of Carbon in 2045, 5%–2.5% Discount Rate Billion USD (2021 dollars)
Deploy ZEVs and reduce driving demand	1.12–4.87	2.64–10.23
Coordinate supply of liquid fossil fuels with declining California fuel demand	0.61–2.63	0.95–3.67
Generate clean electricity	0.20-0.88	0.97–3.75
Decarbonize industrial energy supply	0.23–1.01	0.69–2.67
Decarbonize buildings	0.35–1.52	1.11–4.32
Reduce non-combustion emissions	0.51–1.29 (SC-CH_4)	0.86–2.01 (SC-CH_4)
Compensate for remaining emissions	0.61–2.66	2.03–7.84
Scoping Plan Scenario SC-CO_2	2.4–10.4	5.6–21.9
Scoping Plan Scenario SC-CH_4	0.51–1.3	0.86–2.0
Scoping Plan Scenario (Total)[a]	2.9–11.7	6.5–23.9

[a] CARB staff could not precisely separate some CO_2 and CH_4 from other GHGs from PATHWAYS outputs, but the contribution is believed to be small for purposes of calculating the social cost of carbon. The approach used to estimate GHG emissions reductions for individual measures in PATHWAYS does not reflect cross-sector interactions. Therefore, the GHG values for each measure do not sum to the overall scenario total. The total GHG emissions reduction used in this calculation is 97 $MMTCO_2e$ in 2035 and 180 $MMTCO_2e$ in 2045.

Natural and Working Lands

The SC-CO_2 estimates for the NWL measures shown in Table 3-10, in terms of avoided economic damages, reflect 2021 IWG interim values, updated for inflation, similar to the AB 32 GHG Inventory Sector analysis. This analysis utilizes the 2.5 percent and 5 percent

discount rate and the average annual emissions reductions from each NWL type from 2025–2045. Estimates for all alternatives are included in Appendix C (AB 197 Measure Analysis).

Table 3-10: Estimated social cost (avoided economic damages) of measures considered in the Scoping Plan Scenario (NWL)

Measure	Social Cost of Carbon in 2035, 5%–2.5% Discount Rate Billion USD (2021 dollars)	Social Cost of Carbon in 2045, 5%–2.5% Discount Rate Billion USD (2021 dollars)
Forests/Shrublands/Grasslands	0.003–0.012	0.004–0.014
Annual Croplands	0.006–0.027	0.008–0.031
Perennial Croplands	<0.001–0.001	0.000–0.001
Urban Forest	0.032–0.138	0.041–0.157
Wildland Urban Interface (WUI)	(0.018) – (0.080)[a]	(0.023) – (0.090)
Wetlands	0.011–0.046	0.014–0.053
Sparsely Vegetated Lands	<0.001	<0.001

[a] Parentheses indicate an increase in estimated social cost, i.e., an increase in economic damages. This is only the case for WUI measures where emissions are increased, shown in Table 3-6. The estimated social cost does not account for the decrease in wildfire risk or decrease in wildfire damages resulting from the WUI measures.

Social Costs of GHGs in Relation to Cost-Effectiveness

AB 32 includes a requirement that rules and regulations "achieve the maximum technologically feasible and cost-effective" greenhouse gas emissions reductions.[240] Under AB 32, *cost-effectiveness* means the relative cost per metric ton of various GHG reduction strategies,[241] which is the traditional cost metric associated with emission control. In contrast, the SC-CO_2, SC-CH_4, and social cost of nitrous oxide (SC-N_2O), because they are estimates of the cost to society of additional GHG emissions, can be used to estimate of the economic benefits of reducing emissions, but do not take into account the cost of the actions that must be taken to achieve those GHG emissions reductions.

There may be technologies or policies that do not appear to be cost-effective when compared to the SC-CO_2, SC-CH_4, and SC-N_2O associated with GHG reductions. However, these technologies or policies may result in other benefits that are not reflected in the IWG social costs. Examples include the evaluation of social diversification of the portfolio of transportation fuels (a goal outlined in the Low Carbon Fuel Standard) and reductions in criteria pollutant emissions from power plants (as in the Renewables Portfolio Standard). Additionally, costs for new technology may be higher early on in a technology's development cycle and may drop over time as use of the technology is scaled up.

Estimated Cost per Metric Ton

AB 197 requires an estimation of the cost-effectiveness of the measures evaluated for this Scoping Plan. The cost (or savings)[242] per metric ton of CO_2e reduced for each measure is one metric for comparing the performance of the measures. Additional factors beyond the cost per metric ton that could be considered include continuity with existing laws and policies, implementation feasibility, contribution to fuel diversity and technology transformation goals, and health and other benefits to California. These considerations are not reflected in the cost per metric ton estimates presented below. It is important to understand the relative cost-effectiveness of individual measures as presented in this section. However, the economic analysis presented earlier in this chapter, in Appendix H

---

[240] AB 32 Air pollution: greenhouse gases: California Global Warming Solutions Act of 2006. (AB 32, Nuñez, Chapter 488, Statutes of 2006). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060AB32.

[241] Health & Saf. Code § 38505(d).

[242] Similarly, to the direct costs reported earlier, the cost per metric ton of a measure reflects the stock costs and any fuel or efficiency savings associated with a measure divided by the GHG emission reduction achieved by the measure. Costs are reported as positive values, and savings are reported as negative values.

(AB 32 GHG Inventory Sector Modeling), and in Appendix I (NWL Technical Support Document) provides a more comprehensive analysis of how the Scoping Plan Scenario and alternative scenarios affect the state's economy and jobs.

AB 32 GHG Inventory Sectors

The cost per metric ton for the AB 32 GHG Inventory sectors was computed for each measure independently relative to the Reference Scenario using the sensitivity calculations based on PATHWAYS and RESOLVE outputs. The difference in the annualized cost between the Scoping Plan Scenario and the Reference Scenario was computed for each measure in 2035 and in 2045. The incremental cost was divided by the incremental GHG emissions impact to calculate the cost per metric ton in each year. To capture the fuel and GHG impacts of investments made from 2022 through 2035, or from 2022 through 2045, CARB computed an average annual cost per metric ton. The incremental cost in each year was averaged over the period. This value is divided by the corresponding annual, incremental GHG impact averaged over the same period.

The cost metric includes the annualized incremental cost of energy infrastructure, such as zero-emission vehicles, electric appliances, and required revenue to support all electric assets. A residual value for equipment such as vehicles or appliances that are retired early is included. The annual fuel cost or avoided fuel cost that results from efficiency improvements or changes to demand for fuels associated with transitioning to alternative fuels is included. Not included in this cost metric are costs that represent transfers within the state, such as incentive payments for early retirement of equipment.

It is important to note that this cost per metric ton does not represent an expected market price value for carbon mitigation associated with these measures. In addition, the values do not capture fuel savings or GHG reductions associated with the full economic lifetime of measures that have been implemented by the target date of 2035 or 2045 but whose impacts extend beyond the target date.

Table 3-11 includes the cost per metric ton and annual average cost per metric ton estimates for the Scoping Plan Scenario. The other alternatives are presented in Appendix C (AB 197 Measure Analysis). Measures that are relatively less costly in 2035 or 2045 are also less costly over the extended period. As noted earlier, incremental costs of new vehicles are generally offset by gains in efficiency and avoided fuel consumption resulting in negative cost per metric ton.

Table 3-11: Estimated cost per metric ton of reduced CO_2e relative to the Reference Scenario for measures considered in the Scoping Plan Scenario (AB 32 GHG Inventory sectors)

Measure	Annual Cost, 2035 ($/ton)	Average Annual Cost, 2022–2035 ($/ton)	Annual Cost, 2045 ($/ton)	Average Annual Cost, 2022–2045 ($/ton)
Deploy ZEVs and reduce driving demand	-171	-99	-103	-122
Coordinate supply of liquid fossil fuels with declining CA fuel demand	60	109	-50	39
Generate clean electricity[a]	101	156	145	161
Decarbonize industrial energy supply	290	217	257	274
Decarbonize buildings	235	230	112	213
Reduce non-combustion emissions	93	94	106	99
Compensate for remaining emissions	745	823	236	485

[a] Note: The denominator of this calculation (2045) does not include GHG reductions occurring outside of California resulting from SB 100. If these reductions were included, this number would be lower.

Natural and Working Lands

The cost per metric ton for NWL measures were computed for the Scoping Plan Scenario relative to the Reference Scenario using the projected carbon stock/sequestration data from the NWL modeling and the direct cost estimates for each management action, described earlier. Direct costs represent the cost of implementing a certain management action. The projected emissions reductions take into account the loss of carbon that results from the management action, such as fuels reduction treatments in forests, as well as climate change effects on growth. The direct cost for each NWL measure was divided by the average annual emission reductions presented in Table 3-6 to produce the cost

per metric ton. The increasing effect of climate change on diminished future growth reduces the ability of the land to sequester or store carbon, driving up the cost per ton.

It is important to note that this cost per metric ton does not represent an expected market price value for carbon mitigation associated with these measures. In addition, emissions benefits of NWL management actions often take longer time periods to accrue, and these values only capture GHG reductions up to 2045.

Table 3-12 includes the average cost per metric ton estimates for the average annual CO_2e reductions from 2025 through 2045 for the Scoping Plan Scenario. The other alternatives are presented in Appendix C (AB 197 Measure Analysis).

Table 3-12: Estimated average cost per metric ton of reduced CO_2e relative to the Reference Scenario for measures considered in the Scoping Plan Scenario (NWL)

Measure	Average Cost per Reduced Ton CO_2e ($/Ton)
Forests/Shrublands/Grasslands	15,500
Annual Croplands	1,100
Perennial Croplands	412
Urban Forest	3,270
Wildland Urban Interface (WUI)	N/A
Wetlands	64
Sparsely Vegetated Lands	451,000

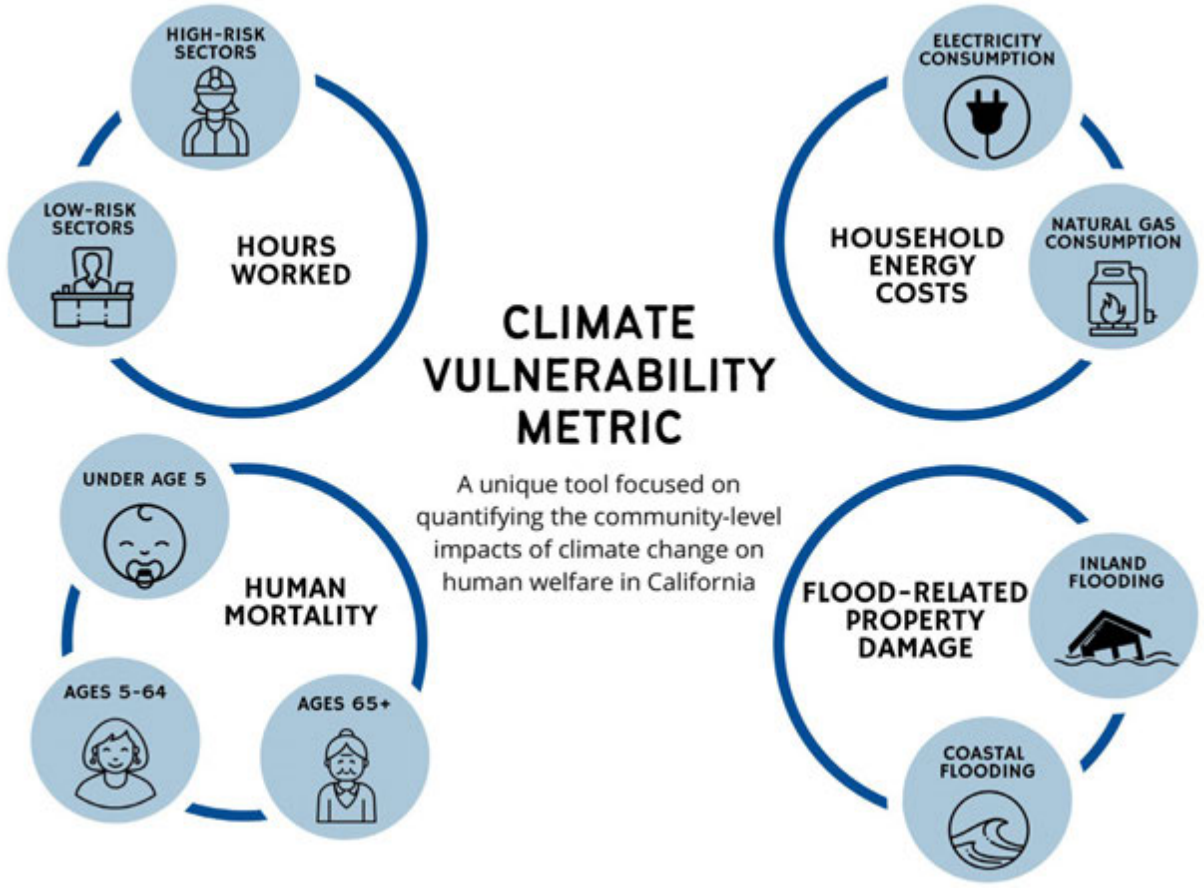
Climate Vulnerability Metric

As California invests in climate mitigation and adaptation, it is essential to understand that the relative impact of climate change will vary across the state's communities. Due to persisting health and opportunity gaps, not all communities are equally resilient in the face of climate impacts. A global metric such as the Social Cost of Carbon cannot adequately capture the incremental additional economic impact faced by overly burdened communities. The Climate Vulnerability Metric (CVM) is specifically focused on quantifying the community-level impacts of a warming climate on human welfare and the additional costs. Additional details and results are included in Appendix K (Climate Vulnerability Metric).

The CVM aggregates the impacts of climate change that can be quantified at the census tract level using robust and currently available research. The CVM includes the projected impacts of climate change on human welfare across four categories (hours worked, household energy costs, human mortality, and flood-related property damage) through midcentury. The CVM identifies nine components of the four climate impacts as shown in Figure 3-9 and aggregates the data to generate a total CVM result for each census tract. To ensure that the CVM represents the diversity of California communities, it is reported as the aggregate monetized impact of climate change as a percentage of census tract-specific incomes.[243] For example, a CVM value of 3 implies that by 2050, a census tract is projected to experience human welfare impacts of climate change that amount to 3% of annual income in that tract.

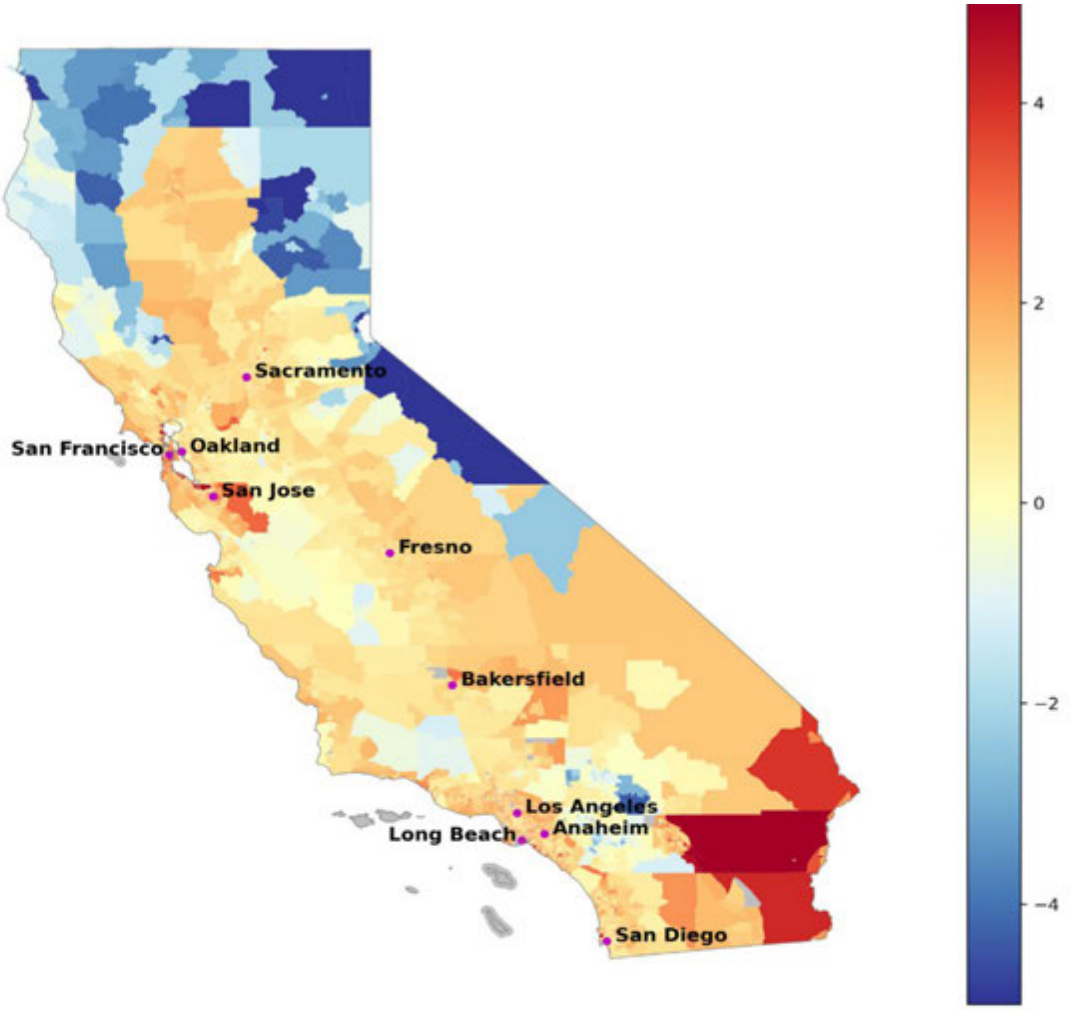
[243] Per capita income in 2019 for census tracts across California ranges from $633 to $176,388, with a median of $32,181 ($2019). Source: American Community Survey.

Figure 3-9: Categories of climate change impacts on human welfare included in the Climate Vulnerability Metric.



The CVM shows that climate change will have highly unequal impacts across California. While some southeastern regions of California are estimated to suffer damages that exceed 5% of annual income, other high-elevation northeastern regions of California are estimated to see benefits of up to 10%. Some low-lying urban areas, such as the San Francisco Bay Area, are estimated to be particularly vulnerable, while much of the Central Valley is estimated to suffer at least moderate economic damages relative to the rest of the state. It is important to note that the CVM does not set a threshold for vulnerability. Instead, it shows relative impacts across census tracts. The CVM is limited to the impacts that can currently be quantified at the census tract level.

Figure 3-10: Combined impacts of climate change in 2050 under a moderate emissions scenario; damages as share of 2019 tract income (%)



The map shows combined impacts of climate change in 2050 under a moderate emissions scenario (RCP 4.5), reported as a share of 2019 census tract income. For example, a CVM value of 3 implies that by 2050, a census tract is projected to experience human welfare impacts of climate change that amount to 3% of annual income. Impacts are combined across the categories shown in Figure 3-9. The higher the CVM for a given census tract, the more damaging the projected impacts of climate change on human welfare. Census tracts with high CVMs are represented by positive percentages in orange and red. A lower CVM is associated with lower projected impacts of climate change, shown in yellow, while a negative CVM value represents a projected beneficial impact of climate change (e.g., through reductions in deaths caused by extremely cold winter weather). Negative CVMs are represented by negative percentages in blue.

By providing information about how climate vulnerability varies across California (Figure 3-10), the CVM results can be used to direct resources to enhance resiliency in the state's

most vulnerable communities based on the specific impacts, such as heat or flooding, they are experiencing. The CVM may be used in combination with existing screening tools, such as CalEnviroScreen 4.0, to identify communities that face environmental and health hazards that contribute to disproportionate economic impacts in addition to climate vulnerability. The CVM can become an essential source of information to implement this Scoping Plan and build a more resilient, just, and equitable future for all communities.

Public Health

Health Analysis Overview

This section focuses on a broader evaluation of public health and climate change. Science demonstrates that taking action to address climate change presents one of the most significant opportunities to improve public health outcomes.[244] Transitioning to clean energy and technology and improving land and ecosystem management will lead to a much healthier future. Many actions to reduce GHG emissions also have health co-benefits that can improve the health and well-being of populations across the state, as well as address climate change. This section and the accompanying Appendix G (Public Health) provide a qualitative analysis of health benefits to accompany the quantitative health analysis included in this chapter, in Appendix C (AB 197 Measure Analysis), and in Appendix H (AB 32 GHG Inventory Sector Modeling). Together the qualitative and quantitative analyses of benefits are demonstrating the many ways that climate action and health improvements go hand in hand.

Climate change can lead to a wide range of direct health impacts such as increased heat-related illnesses (i.e., heat exhaustion and heat stroke), and injuries and deaths from extreme weather events or disasters (e.g., severe storms, flooding, wildfires). Indirect impacts include:

- more air pollution-related exacerbations of cardiovascular and respiratory diseases (e.g., due to increased smog, wildfire smoke)
- increased vector-borne and fungal diseases due to changes in the distribution and geographic range of disease-carrying species (e.g., mosquitoes, ticks, fungi in dust)
- negative nutritional consequences related to decreases in agricultural food yields
- stress and mental trauma due to extreme weather-related catastrophes
- anxiety, depression, and other mental health impacts associated with gradual changes in the climate (e.g., prolonged drought or temperature shifts affecting jobs and industries) that result in unemployment and income loss

[244] Watts, N., W. N. Adger, P. Agnolucci, et al. 2015. “Health and climate change: Policy responses to protect public health.” *Lancet* 386, 1861–1914.

- residential displacement and home loss (e.g., sea level rise impacting coastal communities)

Wildfires and wildfire smoke are one area where we have already seen and expect to see even further drastic impacts on the health of Californians. According to CalFire, since 1932 the top eight largest wildfires in California have occurred in the past five years (2017–2022), with 151 deaths due directly to fires during that period.[245] Researchers estimate that wildfire smoke during fall 2020 may have led to as many as 3,000 excess deaths, with at least 95% of Californians suffering unhealthy levels of particle pollution due to wildfires in 2020.[246] Continued climate change is projected to further increase smoke exposure from wildfires through the end of the century.[247] Wildfires also create a high-risk environment for outdoor workers, including agricultural workers. While the direct medical and physical health impacts are often most noticeable, the psychological impacts can develop and persist well after the event. Estimates indicate that 20%–65% of survivors of extreme weather events have mental health issues following the event.[248]

Extreme heat, drought, and associated worsened air quality impacts are among the most serious climate-related exposures affecting the health of Californians. Numerous studies find a wide range of adverse health effects accompanying extreme heat, including heat stroke and adverse birth outcomes, and find that extreme heat can harm most body systems. Climate change exacerbates air pollution problems that cause difficulty breathing and can lead to serious illness and death in many parts of California. Increasing temperatures cause increases in ozone and other pollution concentrations, including for California's most polluted regions, and heighten health risks for the vulnerable and marginalized populations living in these areas.[249] In 2020, there were 157 ozone polluted days across Los Angeles, Orange, Riverside, and San Bernardino Counties—the most days since 1997. In addition, particulate matter exposure is a heightened problem during

[245] California Department of Forestry and Fire Protection (CAL FIRE). "Stats and Events." *Cal Fire Department of Forestry and Fire Protection*, https://www.fire.ca.gov/stats-events/.
[246] G-FEED. 2020. Indirect mortality from recent wildfires in CA. *http://www.g-feed.com/2020/09/indirect-mortality-from-recent.html*.
[247] M. D. Hurteau, A. L. Westerling, C. Wiedinmyer, and B. P. Bryant. 2014. "Projected effects of climate and development on California wildfire emissions through 2100." *Environ. Sci. Technol.* 48, 2298–2304.
[248] American Public Health Association. 2019. Addressing the Impacts of Climate Change on Mental Health and Well-Being. Policy No: 20196. *https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2020/01/13/addressing-the-impacts-of-climate-change-on-mental-health-and-well-being*.
[249] American Lung Association. State of the Air 2021. *https://www.lung.org/research/sota*.

droughts, which are expected to increase over this century.[250,251] Worse air quality leads to illnesses, emergency room visits, and hospitalizations for chronic health conditions, including chronic obstructive pulmonary disease (COPD), asthma, chronic bronchitis, and other respiratory and cardiovascular conditions, as well as increased risk for respiratory infections, which all result in greater health costs to the state.[252,253,254] These and other climate-related health impacts are discussed in more detail in Appendix G (Public Health).

Health Analysis Components

This Scoping Plan health analysis focuses on the contrast between a California that is still dependent on a fossil fuel-based economy and a California that is transitioned to a carbon-neutral, clean energy future. This qualitative analysis evaluates and demonstrates the broad range of benefits of a dramatic reduction in fossil fuels by 2045 combined with healthier ecosystem management, comparing health outcomes for a "no-action" scenario (Reference) to a "take-action" decarbonization scenario. As this is a qualitative analysis, it looks more broadly at the public health benefits of a drastic reduction in fossil fuel combustion. While this analysis provides scientific evidence for Scoping Plan benefits based on achieving carbon neutrality by 2045, it does not analyze a specific scenario.

The key areas of focus for the analysis are: heat impacts, children's health and development, economic security, food security, mobility and physical activity, urban greening, wildfires and smoke impacts, and housing affordability. For each area of focus, the analysis covers the scientific evidence and compares expected health effects between the Reference and decarbonization scenarios. This analysis looks at the major health outcomes, provides directional effects for each health outcome, and where possible provides information on the strength and scale of health impacts. Some areas include quantitative information where tools are available to measure health outcomes. While the analysis is focused on health outcomes statewide, it also includes discussion

---

[250] Cvijanovic, I., B. D. Santer, C. Bonfils, et al. 2017. "Future Loss of Arctic Sea-ice Cover Could Drive a Substantial Decrease in California's Rainfall." 8 *Nat. Commun.* 1947. https://doi.org/10.1038/s41467-017-01907-4.

[251] Williams, A. P., R. Seager, J. T. Abatzoglou, B. I. Cook, J. E. Smerdon, and E. R. Cook. 2015. "Contribution of anthropogenic warming to California drought during 2012–2014." *Geophysical Research Letters* 42(16), 6819–6828.

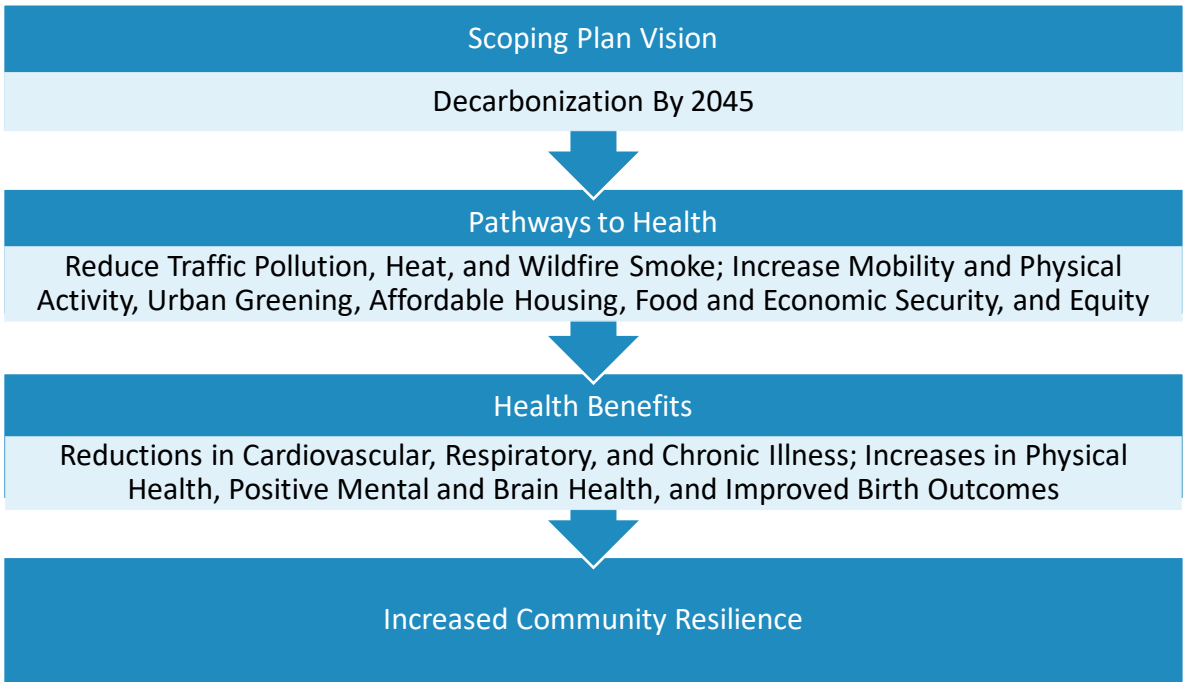
[252] Romley, J. A., A. Hackbarth, and D. P. Goldman. 2010. Cost and Health Consequences of Air Pollution in California. Santa Monica, California. RAND Corp. https://www.rand.org/pubs/research_briefs/RB9501.html.

[253] Wang, M., C. P. Aaron, J. Madrigano, E. A. Hoffman, E. Angelini, J. Yang, A. Laine, et al. 2019. "Association between long-term exposure to ambient air pollution and change in quantitatively assessed emphysema and lung function." *JAMA* 322(6), 546–556.

[254] Inserro, A. 2018. "Air Pollution Linked to Lung Infections, Especially in Young Children." *Am. J. Managed Care* (May 6). https://www.ajmc.com/view/air-pollution-linked-to-lung-infections-especially-in-young-children.

of benefits to community health and climate resilience, as well as potential inequities experienced at a community level. Figure 3-11 shows the co-benefit areas covered in this Scoping Plan and the path to health improvements and increased community resilience.

Figure 3-11: Scoping Plan outcome and the path to health improvements

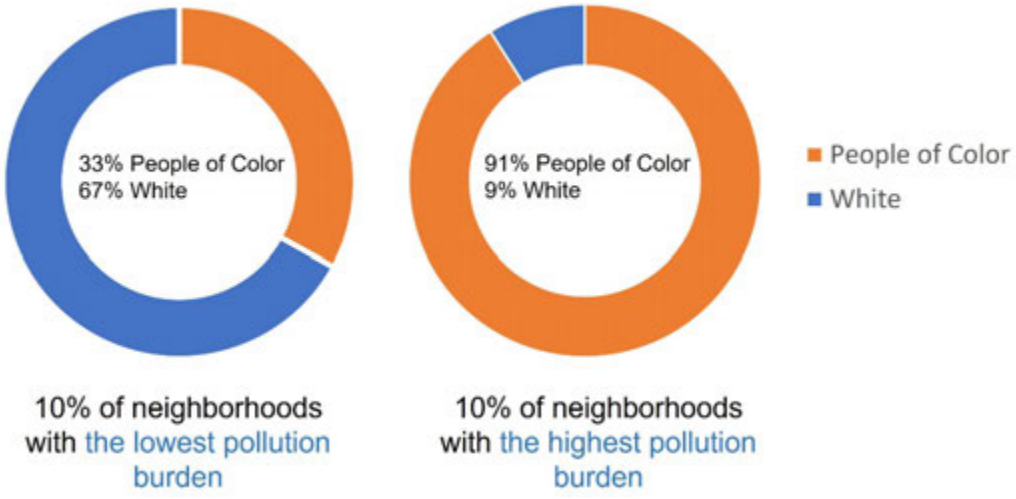


Social and Environmental Determinants of Health Inequities

Communities across the state do not experience exposure to pollution sources and the resulting effects equally. Low-income communities and communities of color (including Black, Latino and Indigenous communities) consistently experience significantly higher rates of pollution and adverse health conditions than others due to factors including historic marginalization rooted in systemic racism. As shown in Figure 3-12, the most impacted neighborhoods according to CalEnviroScreen (CES) are home to very high percentages of people of color while the least impacted neighborhoods are predominantly white. Recent findings show that Black Californians have 19% higher $PM_{2.5}$ exposure from vehicle emissions than the state average, and the census tracts with the highest $PM_{2.5}$ pollution burden from vehicle emissions have a high proportion of people of color.[255] Air pollutant emissions from mobile sources have disproportionate impacts on low-income communities and communities of color due to their proximity.[256] Diesel-fueled vehicles traveling on California's freeways and major roads expose nearby residents to pollution that is linked to lung cancer, hospitalizations and emergency department visits for chronic heart and lung disease, and premature death.[257,258] A combination of historical and social inequities are evident in communities of color disproportionately living close to freeways and other major sources of vehicle pollution. Environmental exposures and contaminants are one component of a broader set of social, economic, and environmental factors that can amplify health conditions, and the combination of all these factors can compound the health effects of individual exposures. This broader set of community factors can be referred to as "cumulative impacts." In addition, specific populations are more sensitive to pollution and face greater susceptibility. This includes young children, older adults, and individuals with existing health conditions.

[255] Reichmuth, D. 2019. *Inequitable exposure to air pollution from vehicles in California.* https://www.ucsusa.org/resources/inequitable-exposure-air-pollution-vehicles-california-2019.
[256] CARB. 2017. *California's 2017 climate change scoping plan.* https://www.arb.ca.gov/cc/scopingplan/scoping_plan_2017.pdf.
[257] CARB. 2020. Overview: Diesel exhaust & health. https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health.
[258] Kagawa, J. 2002. "Health effects of diesel exhaust emissions—a mixture of air pollutants of worldwide concern." *Toxicology* 181–182:349–353.

Figure 3-12: Least and most impacted neighborhoods from CalEnviroScreen[259]



Social Determinants of Health Inequities

The physical and mental health of individuals and communities is shaped, to a great extent, by the social, economic, and environmental circumstances in which people live, work, play, and learn. According to the World Health Organization, these same circumstances—or social determinants of health—are "mostly responsible for health inequities: the unfair and avoidable differences in health status seen within and between countries." In fact, a strong body of research demonstrates that more than 50 percent of long-term health outcomes are the result of social determinants affecting an individual.[260] Race/ethnicity and socioeconomic status, for example, have been found to amplify impacts from long- and short-term environmental exposures for several health outcomes,

[259] The figure represents the top and bottom decile scoring of CalEnviroScreen census tracts for pollution burden. This chart is modified from Figure 2. Race in the Least and Most Impacted Census Tracts of CalEnviroScreen 4.0 in the Office of Environmental Health Hazard Assessment, California Environmental Protection Agency. Analysis of Race/Ethnicity and CalEnviroScreen 4.0 Scores. 2021. *https://oehha.ca.gov/media/downloads/calenviroscreen/document/calenviroscreen40raceanalysisf2021.pdf*.

[260] California Department of Public Health (CDPH). 2015. *The Portrait of Promise: The California Statewide Plan to Promote Health and Mental Health Equity.* A Report to the Legislature and the People of California by the Office of Health Equity. Sacramento, California. California Department of Public Health, Office of Health Equity.

such as mortality and birth outcomes.[261,262,263,264] Social factors combine in low-income communities and communities of color to create levels of toxic chronic stress and limit opportunities for healthy food and healthy lifestyles. Social factors also can cause health disparities through psychosocial pathways such as discrimination and social exclusion.[265] While the importance of social determinants is well known, measuring the specific and cumulative impacts of social determinants is challenging.

There are several important tools to evaluate and map cumulative impacts and factors contributing to the results of historical practices such as redlining, and these tools have been used for air quality and climate planning, community protection, and investments. CalEnviroScreen is a tool that maps cumulative pollution burdens and vulnerabilities on a statewide basis and ranks census tracts based on environmental, exposure, population, and socioeconomic indicators. An analysis using CES shows a direct, persistent relationship between exposure to environmental burdens and socioeconomic and health vulnerabilities affecting communities of color and historical redlining practices. OEHHA has evaluated health impacts of certain climate change policies on disadvantaged communities and communities of color utilizing CES rankings.[266] The Healthy Places Index (HPI) maps indicators that affect life expectancy on a statewide basis. In the future, these and other tools can be helpful to prioritizing investments and informing implementation efforts for GHG emission reductions policies.

Environmental Determinants of Health Inequities

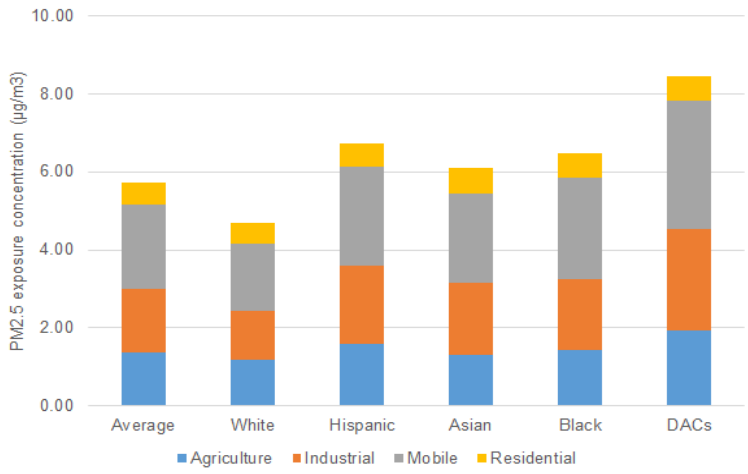
Communities with large percentages of Black and other socially vulnerable and marginalized groups are disproportionately located near pollution sources, such as traffic

[261] O'Neill, M. S., M. Jerrett, I. Kawachi, J. I. Levy, A. J. Cohen, N. Gouveia, et al. 2003. "Health, wealth, and air pollution: Advancing theory and methods." *Environ Health Perspect.* 111 (16): 1861–70.
[262] Ponce, N. A., K. J. Hoggatt, M. Wilhelm, and B. Ritz. 2005. "Preterm birth: The interaction of traffic-related air pollution with economic hardship in Los Angeles neighborhoods." *Am J Epidemiol.* 162 (2): 140–8.
[263] Morello-Frosch, R., B. Jesdale, J. Sadd, and M. Pastor. 2010. "Ambient air pollution exposure and full-term birth weight in California." *Environ Health.* 9: 44.
[264] Finkelstein, M. M., M. Jerrett, P. DeLuca, N. Finkelstein, D. K. Verma, K. Chapman, et al. 2003. "Relation between income, air pollution, and mortality: A cohort study." *CMAJ.* 169 (5): 397–402.
[265] Clougherty, J., and L. Kubzansky. 2009. "A framework for examining social stress and susceptibility in air pollution and respiratory health." *Environ Health Perspect.* 117 (9): 1351–8.
[266] OEHHA. 2022. *Impacts of Greenhouse Gas Emission Limits Within Disadvantaged Communities.* https://oehha.ca.gov/media/downloads/environmental-justice//impactsofghgpoliciesreport020322.pdf.

and freight facilities, industrial facilities, and hazardous waste sites.[267,268,269,270] Research shows large disparities in exposure to pollution between white and non-white populations in California, and between low-income and communities of color (Figure 3-13). The research also shows Black and Latino populations experience significantly greater air pollution impacts than white populations in California.[271] Additionally, Native Americans are disproportionately impacted by air pollution with high rates of exposure to industrial, diesel, and residential pollution sources and higher rates of diseases linked to air pollution.[272, 273]

[267] Mohai. P., P. M. Lanz, J. Morenoff, J. S. House, and R. P. Mero. 2009. "Racial and socioeconomic disparities in residential proximity to polluting industrial facilities: Evidence from the Americans' Changing Lives Study." *Am J Public Health.* 99 (Suppl 3): S649–56.
[268] Mohai, P., and R. Saha. 2007. "Racial inequality in the distribution of hazardous waste: A national-level reassessment." *Soc Probl.* 54 (3): 343–70.
[269] Morello-Frosch, R., M. Pastor, C. Porras, and J. Sadd. 2002. "Environmental justice and regional inequality in southern California: Implications for future research." *Environ Health Perspect.* 110 (Suppl 2): 149–54.
[270] Gunier, R. B., A. Hertz, J. von Behren, and P. Reynolds. 2003. "Traffic density in California: Socioeconomic and ethnic differences among potentially exposed children. *J Expo Anal Environ Epidemiol.* 13 (3): 240–6.
[271] Apte, J. S., S. E. Chambliss, C. W. Tessum, and J. D. Marshall. 2019. *A Method to Prioritize Sources for Reducing High $PM_{2.5}$ Exposures in Environmental Justice Communities in California.* CARB Research Contract Number 17RD006.
[272] Indigenous People and Air Pollution in the United States. A Report from the National Tribal Air Association and Moms Clean Air Force. 2021. *https://7vv611.a2cdn1.secureserver.net/wp-content/uploads/2021/04/indigenousairpollution_041421.pdf*
[273] National Tribal Air Association. 2022. Status of Tribal Air Report. Pg. 66. *https://7vv611.a2cdn1.secureserver.net/wp-content/uploads/2022/10/2022-NTAA-Status-of-Tribal-Air-Report.pdf*.

Figure 3-13: Top sources of $PM_{2.5}$ and their contribution to $PM_{2.5}$ exposures by race and in disadvantaged communities



These disparities in exposure to pollution sources generate health inequities. Communities located near major roadways are at increased risk of asthma attacks and other respiratory and cardiac effects. Studies consistently show that mobile source pollution exposure near major roadways or freight sources contributes to and exacerbates asthma, impairs lung function, and increases cardiovascular mortality.[274] The exposure to mixtures of gaseous and particulate pollutants in mobile sources (including PM, NO_x, and benzene) is associated with higher rates of heart attacks, strokes, lung cancer, autism, and dementia.[275]

Environmental hazards found in communities also can include exposures to toxic substances and emissions, as well as occupational exposures. Due to historical inequities, under-resourced communities and communities of color are often located close to sources of toxic pollution, including chrome platers; metal recycling facilities; oil and gas operations; agricultural burning; railyards; facilities transporting, managing, or disposing of hazardous waste; and areas impacted by pesticides, among others. Some populations may be at increased risk of exposure to pollutants, both at work and home.

Children are more susceptible to environmental pollutants for many reasons, including the ongoing development of their nervous, immune, digestive, and other bodily systems. Moreover, children eat more food, drink more fluids, and breathe more air relative to their

[274] U.S. Environmental Protection Agency website. How Mobile Source Pollution Effects Your Health. https://www.epa.gov/mobile-source-pollution/how-mobile-source-pollution-affects-your-health.
[275] USC Environmental Health Centers. 2018. Living Near Busy Roads or Traffic Pollution. https://envhealthcenters.usc.edu/wp-content/uploads/2016/10/living-near-bus_19696172.pdf.

body weight, as compared to adults.[276] Exposure to high levels of air pollutants, including indoor air pollutants, increases the risk of respiratory infections, heart disease, and asthma.[277] Children living in low-income communities near industrial operations, rail yards, and heavily trafficked freeways and streets in urban areas are at especially high risk of chronic respiratory conditions. Black children are four times more likely to be hospitalized for asthma compared with white children, and urban Black and Latino children are two to six times more likely to die from asthma than white children.[278] Native American children also experience more impacts from asthma and Native American children, along with Black children, have the highest prevalence of asthma.[279]

For older adults, increased vulnerability is linked to respiratory, cardiovascular, and immune systems weakened by aging.[280] Preexisting health conditions interact with environmental pollutants to enhance risks of adverse health outcomes.[281,282] The recent COVID-19 pandemic has highlighted the heightened vulnerability of older adults as well as communities of color to respiratory disease, as hospital admissions and mortality data linked to COVID-19 cases for these groups have been higher than other groups. Research has also underscored the important link between COVID-19 mortality and morbidity and air pollution, demonstrating significantly higher mortality and morbidity for COVID-19 in areas of elevated $PM_{2.5}$ pollution.

Climate Vulnerabilities

Climate change is expected to exacerbate the existing disparities of health conditions and worsen climate vulnerability, which is the degree to which natural systems and people or

---

[276] Blaisdell, R. J. Air Toxics Hot Spots Program Risk Assessment Guidelines. 2012. Technical Support Document for Exposure Assessment and Stochastic Analysis. Oakland, California: California Environmental Protection Agency, Office of Environmental Health Hazard Assessment. August.
[277] Woodruff, T. J., D. A. Axelrad, A. D. Kyle, O. Nweke, and G. G. Miller. 2003. *America's Children and the Environment: Measures of Contaminants, Body Burdens, and Illness.* 2nd ed. Washington, D.C.: United States Environmental Protection Agency. February.
[278] California Department of Public Health. Asthma Inequities in California Children. 2021. *https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHIB/CPE/CDPH%20Document%20Library/CA_Asthma_Inequities_Children_2021-Infographic.pdf*.
[279] Meng, Y., S. H. Babey, T. A. Hastert, and E. Brown. 2007. California's Racial and Ethnic Minorities More Adversely Affected by Asthma. UCLA: Center for Health Policy Research. Retrieved from *https://escholarship.org/uc/item/4k45v3xt*.
[280] Sandström, T., A. J. Frew, M. Svartengren, and G. Viegi. 2003. "The need for a focus on air pollution research in the elderly." *Eur Respir J Suppl.* 40: 92s–5s.
[281] Zanobetti, A., and J. Schwartz. 2001. "Are diabetics more susceptible to the health effects of airborne particles?" *Am J Respir Crit Care Med.* 164 (5): 831–3. *https://www.atsjournals.org/doi/pdf/10.1164/ajrccm.164.5.2012039*.
[282] Zanobetti, A., J. Schwartz, and D. Gold. 2000. "Are there sensitive subgroups for the effects of airborne particles?" *Environ Health Perspect.* 108 (9): 841–5.

communities are at risk of experiencing the negative impacts of climate change.[283] A report from the California Climate Change Center warned that the impacts of climate change will likely create especially heavy burdens on low-income and other vulnerable populations: "*Without proactive policies to address these equity concerns, climate change will likely reinforce and amplify current as well as future socioeconomic disparities, leaving low-income, minority, and politically marginalized groups with fewer economic opportunities and more environmental and health burdens*."[284]

In the U.S. Environmental Protection Agency's "Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts,"[285] investigators analyzed risks of six primary climate change impacts disproportionately affecting communities across income, educational attainment, race/ethnicity, and age groups. Four socially vulnerable populations—low income, communities of color, no high school diploma, and age 65 and older—were identified as having a higher likelihood of experiencing the greatest impacts of a changing climate (according to the projected 2°C of global warming or 50 centimeters of global sea level rise). Disproportionate impacts were projected for climate events, including air quality, extreme temperature, coastal flooding, and other impacts, leading to increased risk of health and other adverse outcomes. The study projected significant health impacts for low-income communities, certain racial and ethnic subgroups, and those with lower educational attainment.

Several climate vulnerability tools have been developed or are under development to better understand and map areas at higher risk of climate impacts. The Climate Change and Health Vulnerability Indicators (CCHVIs) for California helps state and local health officials prepare for and reduce adverse health impacts due to a changing climate.[286] For example, Los Angeles County shows higher than state average climate vulnerability overall, particularly for those who are linguistically isolated (more than twice the state average).

In summary, there are many environmental, social, individual, and economic factors affecting health and equity in California and contributing to worsening health outcomes from climate change impacts. This section and Appendix G (Public Health) reference a substantial and growing body of research documenting the different social and

---

[283] OPR. 2018. Defining Vulnerable Communities in the Context of Climate Adaptation. *https://opr.ca.gov/docs/20180723-Vulnerable_Communities.pdf*.

[284] Shonkoff, S., R. Morello-Frosch, M. Pastor, and J. Sadd. 2011. "The climate gap: environmental health and equity implications of climate change and mitigation policies in California—A review of the literature." *Climatic Change* 109 (Suppl 1): S485–S503.

[285] U.S. EPA. 2021. Climate Change and Social Vulnerability in the United States: A Focus on Six Impacts. U.S. Environmental Protection Agency. EPA 430-R-21-003.

[286] CDPH. 2022. Climate Change and Health Vulnerability Indicators for California. California Department of Public Health. *https://www.cdph.ca.gov/Programs/OHE/Pages/CC-Health-Vulnerability-Indicators.aspx*.

environmental factors affecting health outcomes and the many groups that are vulnerable to increased effects or that experience health inequities in California (see Table 3-13).

Table 3-13: Examples of vulnerable groups due to socioeconomic, environmental, developmental, and climate change factors

Examples of Vulnerable Groups Due to Socioeconomic, Environmental, Developmental, and Climate Change Factors		
Older People	People with Existing Chronic Illness	People Impacted Due to Working Conditions
Tribal Groups	Infants and Children	Low-Income People
People with Disabilities	People Experiencing Homelessness	Pregnant People
Communities of Color	Marginalized People	Immigrants/Refugees
People with Less Educational Options	Linguistically Isolated Households	People Impacted Due to Poor Housing Conditions

Summary of the Qualitative Health Analysis

CARB has developed a detailed health analysis that covers eight social and environmental co-benefit areas that impact public health (listed below). These co-benefit areas were selected due to ongoing research in these areas as well as discussion in a public workshop on climate change and health impacts held in summer 2018. For each social and environmental area, the analysis includes:

- a discussion of health impacts and disparities,
- key health metrics or epidemiological research on this topic,
- a discussion of how these areas would be affected by "no-action" (i.e., Reference) scenario compared to a "take-action" (i.e., Scoping Plan) scenario
- a discussion of where there are actions to consider for further success, and
- the types of mitigation actions that can help reduce or eliminate disparities and promote greater health equity and resilience.

All co-benefit areas are interconnected, and pursuing benefits in all areas has the potential to multiply positive results and further support building community resilience. *Community resilience* is the ability of a community to reduce harm and maintain an acceptable quality of life in the face of climate-induced stresses, which vary depending on that community's circumstances and location. Below is a brief description of the areas evaluated for public health co-benefits. The specific health outcomes impacted by each

area, as well as the directional health benefits, are included in the Summary of Health Benefits section of the chapter and covered in more detail in Appendix G (Public Health).

Heat Impacts

Globally, increased GHG concentrations in the atmosphere are causing a continuing increase of the planet's average temperature. California temperatures have risen since records began in 1895, and the rate of increase is accelerating. Recent heat waves have broken heat records and caused serious illness across the state, and these events are becoming more frequent. Heat waves have a particularly high impact in Southern California, where they have become more intense and longer lasting. In the past two years, Los Angeles recorded 121°F, and the Coachella Valley had its hottest year ever, with temperatures reaching 123°F. Heat island effects in urbanized areas can elevate heat effects and disproportionately affect low-income communities and communities of color. Heat events exacerbate respiratory and cardiac illness and cause emergency room visits to soar. Strategies that reduce the impacts of heat exposure promote improved health outcomes.

Wildfires and Smoke

California's NWL cover more than 90 percent of California and include rangeland, forests, woodlands, grasslands, and urban green space. They provide biodiversity and ecosystem benefits, including their ability to sequester carbon from the atmosphere. Protecting and managing California's forests and other natural lands and maintaining their ecosystem health are key practices for maximizing GHG benefits and minimizing negative climate change impacts. Vegetation plays an important role in storing carbon; however, it can also release CO_2 back into the atmosphere when it dies or is burned by fires. California's wildfires are getting worse with increased fire risks, higher frequency of occurrence, larger burn areas, more costly damage, and a longer fire season due to climate change. Strategies that promote healthy ecosystem management of natural and working lands and increased urban greening promote improved health outcomes. Healthy ecosystems provide many health and environmental benefits and can maximize carbon sequestration.

Children's Health and Development

There are a wide range of interconnected environmental, social, biological, and community factors associated with climate change that are adversely affecting children's health. This section focuses on air pollution and near-roadway or traffic pollution as environmental impacts that have a profound effect on children's health. Children's bodies and lungs are still developing, and they take in more air per body weight than adults do. Many low-income communities and communities of color in California experience disproportionately high levels of air pollution, as well as high levels of traffic and freight that impact children. This excess exposure harms children's development and

predisposes them to increased risk of illness throughout their lives. Strategies that reduce air pollution and traffic emissions promote improved health outcomes for children.

Economic Security

Climate change is expected to result in serious adverse socioeconomic effects across many sectors. Economic factors, such as income inequality (among geographic regions), poverty, wealth, debt, unemployment rate, and job security are among the strongest determinants of health. Along the entire income spectrum, higher income is associated with increased life expectancy and improved health outcomes in the United States. Additionally, economic insecurity and negative health impacts are more pronounced in low-income communities and communities of color. Economic strategies, such as the promotion of clean energy and other green jobs and investments in low-income communities and communities of color, and promoting a transition to high road jobs in economic sectors tied to the current fossil fuel economy, can promote improved health outcomes.[287]

Food Security

The food system is under pressure from numerous factors, and climate change is a key concern. Climate change can affect food production and agricultural yield, impact culturally significant plants and animals for Native American tribes, and exacerbate factors that limit food availability, such as supply chain disruption. Food security is defined as stable access to affordable, sufficient food for an active, healthy life. Many Californians routinely experience food insecurity, and while that impacts Californians of all races and groups, low-income communities and communities of color and children are disproportionately affected by food insecurity. Many Native Americans depend on resources from the land, such as animals and plants for consumption and cultural practices. Strategies that promote sustainable agriculture, access to healthy foods, and reduced organic food waste promote improved health outcomes.

Mobility and Physical Activity

Physical activity is one of the most important factors for a healthy lifestyle, and lack of activity increases the risk of chronic illness and premature death. Research shows that regular physical activity improves health in people of all ages by improving heart and lung

[287] According to the California Labor and Workforce Development Agency's High Road Training Partnership program, high road jobs are considered "Quality jobs [that] provide family-sustaining wages, health benefits, a pension, worker advancement opportunities, and collective worker input and are stable, predictable, safe and free of discrimination." *https://cwdb.ca.gov/wp-content/uploads/sites/43/2020/08/OneSheet_Job-Quality_ACCESSIBLE.pdf*.

function, muscle fitness, mental health and brain function, and sleep quality. A sedentary lifestyle contributes to chronic illnesses, including obesity, heart disease, and Type 2 diabetes among other chronic illnesses. Promoting community design that supports sustainable patterns of land use and transportation enables active transportation choices like walking, biking, and public transit over driving, and can significantly increase physical activity, leading to many valuable health benefits.

Affordable Housing

Housing is an important social determinant of health. The stability of housing, housing quality, conditions inside and outside the home, the cost of housing, and the environmental and social characteristics of the places people live all affect health (including energy efficiency and insulation, cooler building material, tree canopy, home size). Housing affordability is a key factor, and this section highlights how housing affordability supports not only improved health but also more sustainable land use and transportation patterns. A lack of affordable housing is increasing commute distances for low-income renters and creating health burdens. Strategies that support sustainable transportation and housing patterns, together with increased housing affordability, promote improved health outcomes.

Urban Greening

Urban Greening is well recognized as an important amenity, but the inherent health benefits are not always well understood. Under-resourced and vulnerable areas consistently show a lack of urban greening and higher percentages of concrete, asphalt, and impervious surfaces. Under-resourced communities have a greater proportion of concrete and heat-trapping surfaces and a lower amount of tree cover in the neighborhoods in which they live. Areas with reduced urban greening have the potential to create areas of higher temperatures as heat is reflected from pavements and buildings. By contrast, increasing urban greening can provide air pollution buffers and promote physical activity. Strategies that preserve and create urban parks, green space, natural infrastructure, and sustainable agricultural practices support improved physical and mental health outcomes.

No Action Scenario (Reference)

In a no-action scenario, California would remain dependent on fossil fuels and other GHG emitting technologies. Fossil-fuel powered mobile sources including cars, trucks, trains, tractors, and a myriad of other on-road and off-road vehicles and equipment are the largest source of criteria pollutants and toxic air contaminants that directly affect

community health and contribute the largest portion of GHG emissions.[288] Other key GHG emission sources include buildings, natural and working lands, and power production and industry. The no-action scenario reflects a continued reliance on fossil fuels in mobile and stationary sectors, including buildings. The continued production and use of fossil fuels; ongoing dependence on gasoline and diesel cars, trucks, buses, and equipment; continued releases of short-lived climate pollutants; and decreased emphasis on forest and ecosystem health will impact communities by reducing climate resilience and health benefits. Green space will likely remain at the same levels or degrade, and urban heat islands will likely increase. With continued growth of vehicle miles traveled, physical activity and the accompanying health benefits will not increase.

Exposure to wildfire smoke will increase, and air quality is expected to worsen as rising temperatures will increase levels of harmful air pollution. Jobs and economic security will be affected by the continuing potential for price spikes in fossil fuels, impacts to the economy from climate change, and fewer job opportunities in green technologies such as solar and electric vehicles. Food security in California will decrease due to the effects of accelerating climate impacts to agriculture; and without increased recovery of organic waste, including food products, food security will continue to decline under a no action scenario. All these impacts can be linked to worse health outcomes. Adverse health impacts are often most felt by Black, Latino, Native American, and other people of color and in low-income communities. These groups are affected more intensely by the physical stress of environmental pollution, social inequities, and the psychological stress of extreme weather events and food and economic insecurity.

Take Action Scenario

In the Take Action scenario, California will drastically reduce reliance on fossil fuels for motor vehicles, freight, buildings, electricity, or other sectors. This scenario is not a specific scenario within this Scoping Plan but examines the broad outcomes of actions to achieve carbon neutrality in 2045. Implementation of this Scoping Plan would achieve a transition to ZEVs, with 100% sales of light-duty ZEVs by 2035 and 100% sales of zero emission trucks by 2040, along with 30% VMT reductions below 2019 levels by 2045. State and local action that supports sustainable land use and transportation patterns and enables more transit and active transportation will lead to substantial health benefits from physical activity, including reduced illness and deaths.

[288] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020.* *https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf*.

The economic benefits of improved health through active transportation can be modeled using the Healthy Mobility Options Tool (HMOT).[289] In order to demonstrate the important health and economic benefits of VMT reduction, CARB and CDPH used the HMOT to analyze an illustrative trip reduction scenario for 2050 from the California Transportation Plan (CTP). The CTP has a goal of increasing active modes of travel and transit from the current level of 13 percent to a level of 23 percent of all travel trips. While the CTP goal of 23 percent for active modes of travel is not a VMT reduction target, the scenario increases active transportation through a mix of changes in land use planning for increased transportation options, including increases in biking, walking, and transit use, and it helps to show the health benefits of increased active transportation. By achieving the CTP 2050 goals, nearly 8,000 deaths would be avoided in 2050 alone (see Figure 3-14), along with significant reductions in chronic diseases. Achieving this would rank among the top public health accomplishments (see Appendix G [Public Health] for additional modeling results and detailed discussion).

The dramatic reduction in fossil fuel combustion, combined with reductions in VMT and freight and traffic emissions projected in this Scoping Plan will significantly reduce air pollution and its associated health impacts on a statewide basis and in communities near freight sources. Coordinated action strategies will emphasize natural and working lands management changes, including healthy forests, increased vegetative cover, and increased organic farming. Wildfire smoke exposure will reduce significantly with healthy ecosystem management strategies. Since many communities in California are disproportionately impacted by high levels of traffic pollution, the reduction in petroleum fueled vehicles will reduce the additional impacts of living or going to school near historically highly polluting sources. Indoor air quality is also likely to improve through a shift to non-fossil fuel appliances. Concerted state and local action to support sustainable land use and transportation patterns can enable more active transportation with health benefits from physical activity.

[289] ITHIM California. 2020. Transportation Planning for Health, Equity, and Climate Change. *https://skylab.cdph.ca.gov/HealthyMobilityOptionTool-ITHIM/*.

Figure 3-14: Quantified health benefits of active transportation from increased physical activity



*Calculated by the Healthy Mobility Options Tool, active transportation (including walking, rolling, cycling, and taking public transit) from the California Transportation Plan 2050 compared to business as usual for 2050.

Overall community resilience is expected to increase as physical activity and green space increases—potentially decreasing urban heat islands. Efforts to support VMT reduction will include coordination across state agencies on affordable housing measures. Reduced fossil fuel dependence will reduce economic pressure from wildfires, droughts, and price spikes in fossil fuels, especially as more jurisdictions implement plans with similar actions. Investment in sustainable agriculture, healthy forests, urban greening, and clean energy technologies will add sustainable jobs and further promote economic security. More sustainable agriculture and food recovery efforts will add to food security. All these impacts can be linked to wide ranging health benefits, including positive respiratory and cardiovascular effects, healthier birth and brain outcomes, improved mental health indicators, improved life expectancy, reductions in chronic illness and cancers, improved children's health and development, reduced depression, and other benefits. The magnitude of the possible co-benefits is extremely large, especially in areas that are currently the most affected.

Summary of Health Benefits

Below, Tables 3-14 and 3-15 show overall summaries of the directional benefits by co-benefit area estimated for this Scoping Plan. The supporting epidemiological studies used for qualitative or quantitative analysis of each co-benefit area are included in Appendix G (Public Health). Another section of Chapter 3, together with Appendix C (AB 197 Measure Analysis) and Appendix H (AB 32 GHG Inventory Sector Modeling), also includes the quantitative analysis of air pollution related health impacts, including recently added health endpoints for CARB's ongoing analysis.

Table 3-14: Scoping Plan directional benefits for health co-benefit areas (heat, affordable housing, food security, economic security, and urban greening)

	Health Co-benefit Areas*				
Quantitative vs. Qualitative	**Reduced Heat Impacts**	**Increased Affordable Housing**	**Increased Food Security**	**Increased Economic Security**	**Increased Urban Greening**
Research was used for Qualitative Analysis	↓ Mortality ↓ Emergency Room Visits for cardiovascular and respiratory causes and intestinal infections ↓Hospitalization for cardiovascular, respiratory causes ↓ Preterm Birth ↓ Mental Illness	↓ Infectious Disease ↓ Chronic Illness ↓ Asthma ↓ Injuries ↓ Mental Illness ↑ Children's Performance in Schools ↑ Children's Health ↓ Children's Behavioral Problems	↓ Mental Illness ↓ Iron Deficiency ↓ Chronic Diseases ↑ Life Expectancy ↓ Children's Mental Illness ↓ Children's Cognitive Problems ↓ Children's Behavioral Health Problems ↓ Children's Iron Deficiency ↓ Children's Oral Health Problems	↑ Life Expectancy ↑ Health Status ↑ Mental Health	↓ Mortality ↓ Asthma Prevalence ↓ Depression ↓ Adverse Birth Outcomes including low birth weight and small for gestational age ↑ Life Expectancy

*See Appendix G (Public Health) for a table with references to research for each health outcome listed.

Table 3-15: Scoping Plan directional benefits for health co-benefit areas (traffic pollution, wildfire, and active transportation)

	Health Co-benefit Areas*		
Quantitative vs. Qualitative	**Reduced Traffic Pollution**	**Reduced Wildfire Smoke**	**Increased Active Transportation**
Research was used for Quantitative Analysis	↓ Children's Respiratory Outcomes, Hospital Admissions ↓ Children's Respiratory Outcomes, Emergency Room Visits ↓ Children's Asthma Onset ↓ Children's Asthma Symptoms	↓ All-Cause Mortality ↓ Asthma, Hospital Admissions ↓ COPD, Hospital Admissions ↓ All Respiratory Outcomes, Hospital Admissions ↓ Asthma, Emergency Room Visits ↓ All Respiratory Outcomes, Emergency Room Visits ↓ All Cardiac Outcomes, Emergency Room Visits	↓ Cardiovascular Diseases ↓ Colon Cancer ↓ Breast Cancer ↓ Diabetes ↓ Dementia ↓ Lung Cancer ↓ Respiratory Disease ↓ Depression ↑ Traffic Accidents
Research was used for Qualitative Analysis	↑ Children's Lung Function Growth ↓ Children's Bronchitic Symptoms ↓ Children's Impaired Cognitive Development ↓ Children's Adverse Birth Outcomes, including low birth weight and preterm birth		

*See Appendix G (Public Health) for a table with references to research for each health outcome listed.

In summary, the qualitative health analysis of the No-Action versus Take-Action scenarios for this Scoping Plan shows an overwhelming benefit for the state by taking action to move forward to carbon neutrality while continuing efforts to increase health equity and resilience in individual communities. Taking action can improve physical and mental health for adults and children, reduce a range of chronic illnesses, and promote improvements in life expectancy. Development and implementation of actions to achieve the outcomes called for in this Scoping Plan should consider how to engage affected communities in implementation, address the existing health and opportunity gaps, and pursue equitable implementation statewide and locally. This Scoping Plan deployment of clean technology and fuels, together with improved land management, will reduce GHGs and air pollution and create more resilient communities that are better able to prepare for and recover from extreme climate events.

Environmental Analysis

In May 2022, CARB, as the lead agency for the Scoping Plan, released for public review the Draft Environmental Analysis (Draft EA) for this Scoping Plan; it assessed the potential environmental impacts of implementing the Scoping Plan. CARB circulated the Draft EA for public review and comment for a period of 45 days that began on May 10, 2022, and ended on June 24, 2022. CARB held a public hearing on June 23, 2022 to provide the opportunity for public comment. During the review period, written and oral comments were received on the Draft EA. CARB reviewed the comments to identify environmental topics and began preparation of responses to those comments.

After the end of the Draft EA public review period, CARB identified potential revisions to certain aspects of this Scoping Plan that merit revisions to the project description. This new information results from, among other things, revisions to the project description regarding energy sector goals (including offshore wind), revised carbon removal targets, and additional strategies for natural and working lands. CARB released a Recirculated Draft EA for a written public comment period that started September 9, 2022, and ended on October 24, 2022. See Chapter 2 of the Recirculated Draft EA[290] for further information regarding the changes. The Recirculated Draft EA assesses the potential for significant adverse and beneficial environmental impacts associated with all proposed actions in this Scoping Plan, and provides a programmatic environmental analysis of the reasonably foreseeable compliance responses that could result from implementation of the Scoping

[290] CARB. 2022. Recirculated Draft EA. *https://ww2.arb.ca.gov/sites/default/files/2022-09/2022-draft-sp-appendix-b-draft-ea-recirc.pdf*.

Plan.[291] The Recirculated Draft EA concluded implementation of this Scoping Plan could result in the following:

- Beneficial impacts to: air quality (long-term operational-related) and GHG emissions (short-term construction-related and long-term operational-related)
- Less than significant impacts to: energy demand, mineral resources, population and housing, public services, recreation (short-term construction-related), and wildfire (short-term construction-related)
- Potentially significant and unavoidable adverse impacts to: aesthetics, agriculture and forest resources, air quality (construction-related and operational odors), biological resources, cultural resources, geology and soils, hazards and hazardous materials, hydrology and water quality, land use and planning, noise, recreation (long-term operational-related), transportation and traffic, tribal cultural resources, utilities and service systems, and wildfire (long-term operational-related

Before the public meeting at which the Board will consider this Scoping Plan Update, CARB will publish the Final EA as Appendix B (Final Environmental Analysis) to this Scoping Plan, along with written responses to timely submitted comments raising significant environmental issues received on the Draft EA and the Recirculated Draft EA, which will be presented to the Board for consideration.

[291] The Recirculated Draft EA is available at *https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/2022-scoping-plan-documents*.

Chapter 4: Key Sectors

Chapter 4 provides an overview of the major energy sources and technology in use today, and of alternative clean technology and fuels to support decarbonization based on the latest information available. Every sector of the economy will need to begin to transition in this decade to meet our GHG reduction goals and achieve carbon neutrality no later than 2045. AB 32 requires climate change mitigation policies to be considered in the context of the sector's contribution to the state's total GHG emissions. The transportation, electricity (in-state and imported), and industrial sectors are the largest contributors of GHGs in the state and present the largest opportunities for GHG reductions. Actions to reduce fossil fuel combustion in these sectors also can provide critical air pollution reductions in low-income communities and communities of color, which are often located adjacent to these sources. A carbon neutrality framework also elevates the role of CO_2 removal through natural and working lands and mechanical capture and storage. Actions that support energy efficiency, reduced VMT, alternative fuels, and renewable power also can provide benefits by reducing both criteria and toxic air pollutants.

What sets this plan apart from previous Scoping Plans is the focus on the accelerated rate of deployment of clean technology and energy within every sector. As a result, specific actions, including accelerated rates of deployment of clean technology and fuels identified within this Scoping Plan, will need to be translated into both new and amended regulations, policies, and incentive programs. State agencies will need to evaluate current authority to align existing policies or develop new ones to achieve outcomes called for in this Scoping Plan. Legislative support may be needed in some cases to ensure authority and funding is sufficient to ensure this Scoping Plan is translatable to action on the ground. Most regulations, or change to existing regulations, ultimately considered by the Board or other state agencies for adoption will be subject to administrative procedure requirements. Accordingly, they must rely on specific subsequent supporting analysis and extensive public processes and consultations with interested tribes to develop and identify appropriate proposals for effective implementation. For example, any proposal to strengthen the LCFS regulations through amendments increasing the stringency of the carbon intensity (CI) targets would be considered on the basis of a public process, including workshops, and focused environmental, economic, and public health analyses.

Policies that ensure economy-wide investment or program decisions that incorporate consideration of GHG emissions are particularly important. As we pursue GHG reduction targets, we must acknowledge the manner in which built and natural environments are connected, how changes in one may impact the other, and how policy choices in one sector can and do impact other sectors. For example, fostering more compact, transportation-efficient development in infill areas and increasing transportation choices with the goal of reducing VMT not only reduces demand for transportation fuel but also requires less energy for buildings and helps to conserve natural and working lands that

sequester carbon. Therefore, the multiple and often interwoven actions that reduce VMT both reduce emissions from the transportation sector and support reductions needed in other sectors.

Legislation, such as SB 350[292] (De León and Leno, Chapter 457, Statutes of 2015), has recognized the need for CARB, the CEC, and the CPUC to work together to ensure the state's energy and climate goals are integrated in procurement decisions by load serving entities as part of Integrated Resource Plans. Moving forward, it is especially critical that similar approaches are adopted to break down silos across state agencies to ensure policies and programs are aligned with multiple state priorities outlined in this plan. Finally, supportive legislative direction, such as SB 905 that requires CARB to create the Carbon Capture, Removal, Utilization, and Storage Program, may also benefit emerging areas of policy to provide express agency authority and roles for these nascent efforts, including streamlining of permitting, while ensuring that protections for communities are in place.

Unlike previous Scoping Plans that separated out individual economic sectors, this Scoping Plan approaches decarbonization from two perspectives: (1) managing a phasedown of existing energy sources and technology and (2) ramping up, developing, and deploying alternative clean energy sources and technology over time. This approach supports a more comprehensive consideration of our energy infrastructure, the ability to repurpose existing assets, and the need to build new assets. It also provides multiple metrics beyond just the annual AB 32 GHG Inventory to better enable tracking progress. For example, it clearly demonstrates the production and distribution rates of specific types of clean energy, such as adding 4.3 GW of utility solar and 2.5 GW of storage year-over-year between now and 2035 to be on track to achieve carbon neutrality no later than 2045, and does the same for technology deployment, such as 11 million ZEVs in 2035.

The sections below include key actions to support success in the necessary transition away from fossil combustion, which is an overriding goal of this plan. The wide array of complementary and supporting actions being contemplated or to be undertaken across state government are detailed here. The broad view of actions described in this chapter thus provides context for the specific deployment of clean technology and fuels identified in the Scoping Plan Scenario described in Chapter 2. Actions identified in this Scoping Plan are based on currently known options and the latest science. As part of future Scoping Plan updates, additional clean technology and fuels may be identified and added to the mix of needed tools to continue to reduce the state's GHG emissions, support air quality co-benefits, and remove carbon from the atmosphere.

---

[292] California Air Resources Board. SB 350 Electricity Sector Greenhouse Gas Planning Targets. *https://ww2.arb.ca.gov/our-work/programs/sb350*.

Transportation Sustainability

The transportation sector has long relied on liquid petroleum fuels as the primary energy source for internal combustion engine (ICE) vehicles, including cars, trucks, locomotives, marine equipment, and aircraft. Combustion of fossil fuels in vehicles emits significant amounts of GHGs, criteria pollutants, and toxic air contaminants. In 2019,[293] the transportation sector accounted for approximately 50 percent of statewide GHG emissions[294] and thus was by far the single largest source of carbon pollution in the state. In addition, the transportation sector accounted for over 80 percent of statewide NOx emissions and 30% of fine particulate matter emissions, including toxic diesel particulate matter.[295]

Communities adjacent to congested roadways, including ports and distribution centers, are exposed to the highest concentration of toxic pollutants from vehicles and equipment consuming fossil fuels, leading to a number of demonstrated health impacts such as respiratory illnesses, higher likelihood of cancer development, and premature death. In addition, communities located near oil extraction operations or crude oil refineries often experience higher exposure to poor air quality. While CARB's programs, along with local action, have made substantial progress over the past few decades, it is clear that California must transition away from fossil fuels to zero-emission technologies with all possible speed and pursue policies that result in less driving, in order to meet our GHG and air quality targets.

The transportation sector can be divided into three general categories: Technology, Fuels, and Vehicle Miles Traveled.

- *Technology* refers to the vehicles themselves, as well as the associated refueling infrastructure for those vehicles.
- *Fuels* refers to the energy source used to power vehicles and the facilities that produce them.
- Vehicle travel is measured as *vehicle miles traveled* (VMT), and is a product of development patterns and available transportation options.

---

[293] In 2020 the state experienced shelter-in-place orders in response to the COVID-19 pandemic. The orders, and the effects of the pandemic, led to a significant year-over-year decline in transportation emissions in 2020. This means 2019 is likely a more representative year for overall transportation emissions and 2020 a likely outlier in the historical transportation emissions trend data.
[294] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020.* *https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf*. This includes upstream oil extraction and refining emissions.
[295] CARB. California Greenhouse Gas Emission Inventory Program. *https://ww2.arb.ca.gov/our-work/programs/ghg-inventory-program*.

Sector Transition

Technology

Vehicles must transition to zero emission technology to decarbonize the transportation sector. Executive Order N-79-20[296] reflects the urgency of transitioning to zero emission vehicles (ZEVs) by establishing target dates for reaching 100 percent ZEV sales or fleet transitions to ZEV technology. The primary ZEV technologies available today are battery-electric and hydrogen fuel cell electric vehicles (FCEVs), both of which emit zero tailpipe GHGs, criteria pollutants, and toxic air contaminants, as they do not burn fuel. These vehicles are rapidly growing in performance, affordability, and popularity.[297] Plug-in hybrid electric vehicles also offer a limited but increasing range of zero emission operation and will play a role in the transition to ZEVs.

Light-duty passenger vehicles consume the majority of gasoline in the state—12.9 billion gallons in 2019[298]—and are well-suited for transitioning to ZEVs. EO N-79-20 calls for 100 percent ZEV sales of new light-duty vehicles by 2035, and this target is reflected in this Scoping Plan.[299] The Advanced Clean Cars II regulation fulfills the goal in the Executive Order and serves as the primary mechanism to help deploy ZEVs. A number of existing incentive programs also support this transition, including the Clean Cars 4 All Program.[300] Heavy-duty trucks are the largest source of diesel particulate matter, a toxic air contaminant that is directly linked to a number of adverse health impacts, and EO N-79-20 also sets targets for transitioning the medium- and heavy-duty fleet to zero emissions: by 2035 for drayage trucks and by 2045 for buses and heavy-duty long-haul trucks where feasible. Replacing heavy-duty vehicles with ZEV technology will significantly reduce GHG emissions and diesel PM emissions in low-income communities and communities of color adjacent to ports, distribution centers, and highways. The existing Advanced Clean Trucks regulation, paired with the proposed Advanced Clean Fleets regulation, are designed to transition a significant amount of the

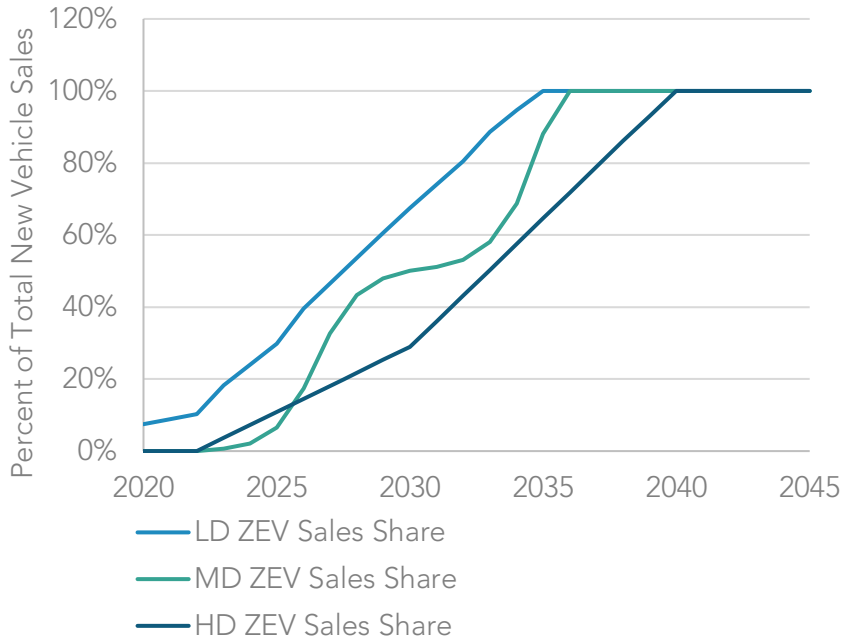
---

[296] Executive Department. State of California. Executive Order N-79-20. https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf.
[297] CARB. 2021. Public Workshop for Advanced Clean Cars II. May 6. https://ww2.arb.ca.gov/sites/default/files/2021-05/acc2_workshop_slides_may062021_ac.pdf.
[298] CARB. 2022. *Fuel Activity for California's Greenhouse Gas Inventory by Sector and Activity.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/fuel_activity_inventory_by_sector_all_00-20.xlsx.
[299] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1A, with reference to the date at which all new vehicle sales are ZEVs. finalejacrecs.pdf (arb.ca.gov).
[300] CARB. Clean Cars 4 All. https://ww2.arb.ca.gov/our-work/programs/clean-cars-4-all. The Clean Vehicle Rebate Project (CVRP) also supports the transition to ZEVs. https://cleanvehiclerebate.org/en.

California truck fleet to ZEV technology. As with the LDV sector, a number of incentive programs support this transition, such as the Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP).[301]

Figure 4-1 below illustrates the pace of transition in vehicle technology needed to drastically reduce GHG emissions from vehicles. All vehicle classes reach 100 percent ZEV sales before 2045, with some achieving this well before. The ZEV technology across the vehicle classes is assumed to be primarily battery electric and hydrogen fuel cell (reflecting the primary ZEV technologies available today).[302]

Figure 4-1: Transition of on-road vehicle sales to ZEV technology in the Scoping Plan Scenario



Today, off-road vehicles also rely heavily on ICE technology. Executive Order N-79-20 sets an off-road equipment target of transitioning the entire fleet to ZEV technology by 2035, where feasible. There is a great need for both investment and innovation in the off-road space in order to develop and commercialize zero emission equipment types that meet or exceed the performance of existing equipment. A number of funding sources currently support this transition, including programs such as FARMER, Carl Moyer, and

[301] California HVIP. Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project. https://californiahvip.org/?msclkid=efaf65f2c26f11eca6bdd08ecc323864.

[302] The light-duty fleet includes more than 11 million battery electric and hydrogen fuel cell vehicles in 2035 and over 23 million battery electric and hydrogen fuel cell vehicles in 2045.

the Community Air Protection Incentives—as well as Low Carbon Transportation Incentives, including the Clean Off-Road Equipment (CORE) program. In addition, the 2021–22 California budget provided record-high allocations for funding ZEVs, including off-road equipment, and the 2022–23 budget is similarly ambitious.[303] Several regulations focused on transitioning to zero emission off-road equipment have recently been adopted or are in the works, and apply to locomotives,[304] forklifts, ocean-going vessels at berth,[305] commercial harbor craft,[306] small off-road engines,[307] and more.

Intrastate aviation relies on ICE technology today, but battery-electric and hydrogen fuel cell aviation applications are in development, along with sustainable aviation fuel. The Scoping Plan Scenario includes a transition of 20% of aviation fuel demand to ZEV technologies by 2045 and sustainable aviation fuel for the rest.

Refueling infrastructure is a crucial component of transforming transportation technology. Electric vehicle chargers and hydrogen refueling stations must become easily accessible for all drivers to support a wholesale transition to ZEV technology. Deployment of ZEV refueling infrastructure is currently supported by a number of existing local and state public funding mechanisms, the new National Electric Vehicle Infrastructure (NEVI) federal funding mechanism, California's electric utilities, the Electrify America initiative that was established in response the Volkswagen ZEV commitment, and by numerous companies, such as EVgo, ChargePoint, Tesla, Ford, FirstElement Fuel, Chevron, Shell, and Iwatani, who are investing substantial private resources into developing these networks. Private investment in reliable, affordable and ubiquitous refueling infrastructure must drive the transition as the business case for ZEVs continues to strengthen.

Strategies for Achieving Success

- Achieve 100 percent ZEV sales of light-duty vehicles by 2035[308] and medium-heavy-duty vehicles by 2040.
- Achieve a 20% zero emission target for the aviation sector.

---

[303] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1C. CARB and the Administration are committed to increasing focus on transportation equity investment as was reflected in the governor's 2022–23 budget. *finalejacrecs.pdf (arb.ca.gov)*.
[304] CARB. Reducing Rail Emissions in California. *https://ww2.arb.ca.gov/our-work/programs/reducing-rail-emissions-california*.
[305] CARB. Ocean-Going Vessels At Berth Regulation. *https://ww2.arb.ca.gov/our-work/programs/ocean-going-vessels-berth-regulation*.
[306] CARB. CARB passes amendments to commercial harbor craft regulation. *https://ww2.arb.ca.gov/news/carb-passes-amendments-commercial-harbor-craft-regulation*.
[307] CARB. Small Off-Road Engines (SORE). *https://ww2.arb.ca.gov/our-work/programs/small-off-road-engines-sore*.
[308] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1A. *finalejacrecs.pdf (arb.ca.gov)*.

- Develop a rapid and robust network of ZEV refueling infrastructure to support the needed transition to ZEVs.
- Ensure that the transition to ZEV technology is affordable for low-income households and communities of color, and meets the needs of communities and small businesses.[309]
- Prioritize incentive funding for heavy-duty ZEV technology deployment in regions of the state with the highest concentrations of harmful criteria and toxic air contaminant emissions.[310]
- Promote private investment in the transition to ZEV technology, undergirded by regulatory certainty such as infrastructure credits in the Low Carbon Fuel Standard for hydrogen and electricity[311] and hydrogen station grants from the CEC's Clean Transportation Program[312] pursuant to Executive Order B-48-18.[313]
- Evaluate and continue to offer incentives similar to those through FARMER,[314] Carl Moyer,[315] the Clean Fuel Reward Program,[316] the Community Air Protection Program,[317] and Low Carbon Transportation,[318] including CORE.[319] Where feasible, prioritize and increase funding for clean transportation equity programs.[320]
- Continue and accelerate funding support for zero emission vehicles and refueling infrastructure through 2030 to ensure the rapid transformation of the transportation sector.

---

[309] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF6, in the context of communities. *finalejacrecs.pdf (arb.ca.gov)*.
[310] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF7. *finalejacrecs.pdf (arb.ca.gov)*.
[311] CARB. LCFS ZEV Infrastructure Crediting. *https://ww2.arb.ca.gov/resources/documents/lcfs-zev-infrastructure-crediting*.
[312] CEC. Clean Transportation Program. *https://www.energy.ca.gov/programs-and-topics/programs/clean-transportation-program*.
[313] EO B-48-18 calls for 200 hydrogen refueling stations by 2025. *https://www.library.ca.gov/wp-content/uploads/GovernmentPublications/executive-order-proclamation/39-B-48-18.pdf*.
[314] CARB. FARMER program. *https://ww2.arb.ca.gov/our-work/programs/farmer-program*.
[315] CARB. Carl Moyer program. *https://ww2.arb.ca.gov/our-work/programs/carl-moyer-memorial-air-quality-standards-attainment-program*.
[316] California Clean Fuel Reward Program. *https://cleanfuelreward.com/*.
[317] CARB. Community Air Protection Program. *https://ww2.arb.ca.gov/capp*.
[318] CARB. Low Carbon Transportation Investments and Air Quality Improvement Program. *https://ww2.arb.ca.gov/our-work/programs/low-carbon-transportation-investments-and-air-quality-improvement-program*.
[319] Clean Off-Road Equipment (CORE) Voucher Incentive Program. *https://californiacore.org/*.
[320] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1C. *finalejacrecs.pdf (arb.ca.gov)*.

- Evaluate and align with this Scoping Plan relevant CARB policies such as Advanced Clean Cars II,[321] Innovative Clean Transit,[322] Zero Emission Airport Shuttle,[323] California Phase 2 GHG Standards,[324] Advanced Clean Trucks, Advanced Clean Fleets, Zero Emission Forklifts,[325] In-use Locomotives,[326] the Off-Road Zero-Emission Targeted Manufacturer rule, Clean Off-Road Fleet Recognition Program, In-use Off-Road Diesel-Fueled Fleets Regulation,[327] Commercial Harbor Craft,[328] Off-Road Zero-Emission Targeted Manufacturer rule, Clean Off-Road Fleet Recognition Program, Amendments to the In-use Off-Road Diesel-Fueled Fleets Regulation,[329] carbon pricing through the Cap-and-Trade Program,[330] and the Low Carbon Fuel Standard.[331]
- Identify and address permitting and market barriers to successful rapid ZEV technology deployment while protecting public health and the environment.

Fuels

Transitioning away from conventional ICE vehicles is part of the solution, but we must ensure that an adequate supply of zero-carbon alternative fuel and distribution is available to power these vehicles. Electricity and hydrogen are currently the primary fuels for ZEVs,

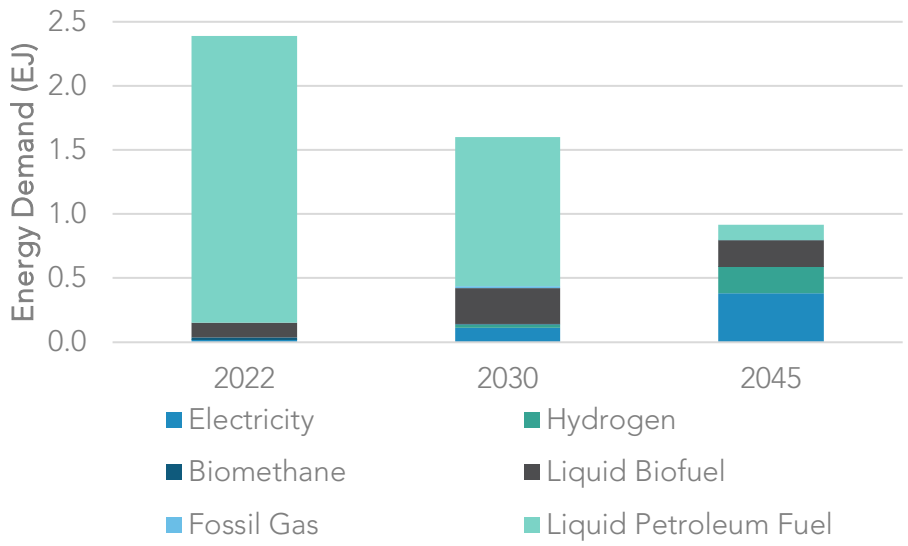
---

[321] CARB. Advanced Clean Cars Program. *https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program*. Cal. Code Regs., tit. 13, §§ 1900, 1961.2, 1961.3, 1961.4, 1962.2, 1962.3, 1962.4, 1962.5, 1962.6, 1962.7, 1962.8, 1965, 1968.2, 1969, 1976, 1978, 2037, 2038, 2112, 2139, 2140, 2147, 2317, 2903.
[322] CARB. Innovative Clean Transit. *https://ww2.arb.ca.gov/our-work/programs/innovative-clean-transit*. Cal. Code Regs., tit. 13, §§ 2023—2023.11.
[323] CARB. Zero-Emission Airport Shuttle. *https://ww2.arb.ca.gov/our-work/programs/zero-emission-airport-shuttle*. Cal. Code Regs., tit. 17, §§ 95690.1—95690.8.
[324] CARB. California Phase 2 Greenhouse Gas Standards. *https://ww2.arb.ca.gov/our-work/programs/greenhouse-gas-standards-medium-and-heavy-duty-engines-and-vehicles/phase2*. Cal. Code Regs., tit. 13, §§ 1956.8 and 2036; and Cal. Code Regs., tit. 17, §§ 95301, 95302, 95303, and 95663.
[325] CARB. Zero-Emission Forklifts. *https://ww2.arb.ca.gov/our-work/programs/zero-emission-forklifts*. Cal. Code Regs., tit. 17, §§ 95690.1—95690.8.
[326] CARB. Reducing Rail Emissions. *https://ww2.arb.ca.gov/our-work/programs/reducing-rail-emissions-california*. Proposed Cal. Code Regs., tit. 13, §§ 2478—2478.16.
[327] CARB. In-use Off-Road Diesel-Fueled Fleets Regulation. *https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation*. Cal. Code Regs., tit. 13, §§ 2449, 2449.1, 2449.2.
[328] CARB. Commercial Harbor Craft. *https://ww2.arb.ca.gov/our-work/programs/commercial-harbor-craft*. Cal. Code Regs., tit. 13, § 2299.5.
[329] CARB. In-use Off-Road Diesel-Fueled Fleets Regulation. *https://ww2.arb.ca.gov/our-work/programs/use-road-diesel-fueled-fleets-regulation*.
[330] CARB. Cap-and-Trade Program. *https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program*. Cal. Code Regs., tit. 17, §§ 95801 et seq.
[331] CARB. Low Carbon Fuel Standard. *https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard*. Cal. Code Regs., tit. 17, §§ 95480 et seq.

and both fuels must be produced using low-carbon technology and feedstocks to minimize upstream emissions.

The transition to complete ZEV technology will not happen overnight. Conventional ICE vehicles from legacy fleets will remain on the road for some time, even after all new vehicle sales have transitioned to ZEV technology. In addition, some equipment types are only now in the initial stages of development of ZEV technology for propulsion, such as commercial aircraft or ocean-going vessels. In addition to building the production and distribution infrastructure for zero-carbon fuels, the state must continue to support low-carbon liquid fuels during this period of transition and for much harder sectors for ZEV technology such as aviation, locomotives, and marine applications. Biomethane currently displaces fossil fuels in transportation and will largely be needed for hard-to-decarbonize sectors but will likely continue to play a targeted role in some fleets while the transportation sector transitions to ZEVs. Figure 4-2 provides the detail on fuels used in 2020 and the fuel mix under the Scoping Plan Scenario for 2035 and 2045.

Figure 4-2: Transportation fuel mix in 2022, 2030, and 2045 in the Scoping Plan Scenario[332]



Private investment in alternative fuels will play a key role in diversifying the transportation fuel supply away from fossil fuels. The Low Carbon Fuel Standard is the primary mechanism for transforming California's transportation fuel pool with low-carbon

[332] See https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-PATHWAYS-data-E3.xlsx for transportation fuels by year.

alternatives and has fostered a growing alternative fuel market. Partially as a result of the powerful market signals from the LCFS, fuels like renewable diesel, sustainable aviation fuel, biomethane, and electricity have all gained significant market shares and continue to displace gasoline and diesel in both on- and off-road vehicles. In addition, Executive Order N-79-20 calls on state agencies to support the transition of existing fuel production facilities away from fossil fuels and directs that this transition also protect and support workers, public health, safety, and the environment. In line with this direction, existing refineries could be repurposed to produce sustainable aviation fuel, renewable diesel, and hydrogen. This trend has already begun, and continuing to develop fuel production capacity in-state to support the energy transition while making the most efficient use of existing assets is critical to avoiding emissions leakage. If fuel demand persists after fuel production facilities have ceased operations, fuel demand will have to be met through imports.

As we transition or build new energy production facilities and infrastructure, it will be important to ensure low-income communities, tribes, and communities of color do not experience increases in existing air pollution disparities and continue to experience a reduction in the air pollution disparities that exist today. California must use the best available science to ensure that raw materials used to produce transportation fuels do not incentivize feedstocks with little to no GHG reductions from a life cycle perspective. A dramatic increase in alternative fuel production must not come at the expense of global deforestation, unsustainable land conversion, or adverse food supply impacts, to name a few examples. CARB will continue to monitor scientific findings on these topics to ensure that California policies, such as the LCFS, send the appropriate market signals and do not result in unintended consequences.[333]

Strategies for Achieving Success

- Accelerate the reduction and replacement of fossil fuel production and consumption in California.[334]
- Incentivize private investment in new zero-carbon fuel production in California.
- Incentivize the transition of existing fuel production and distribution assets to support deployment of low- and zero-carbon fuels while protecting public health and the environment.
- Invest in the infrastructure to support reliable refueling for transportation such as electricity and hydrogen refueling.

---

[333] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1E. *finalejacrecs.pdf (arb.ca.gov)*.
[334] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F3. *finalejacrecs.pdf (arb.ca.gov)*.

- Evaluate and propose, as needed, changes to strengthen the Cap-and-Trade Program.
- Initiate a public process focused on options to increase the stringency and scope of the LCFS:
    - Evaluate and propose accelerated carbon intensity targets pre-2030 for LCFS.
    - Evaluate and propose further declines in LCFS post-2030 carbon intensity targets to align with this 2022 Scoping Plan.
    - Consider integrating opt-in sectors into the program.
    - Provide capacity credits for hydrogen and electricity for heavy-duty fueling.
- Monitor for and ensure that raw materials used to produce low-carbon fuels or technologies do not result in unintended consequences.[335]

Vehicle Miles Traveled

Transforming the transportation sector goes beyond phasing out combustion technology and producing cleaner fuels. Managing total demand for transportation energy by reducing the miles people need to drive on a daily basis is also critical as the state aims for a sustainable transportation sector in a carbon neutral economy. Though GHG emissions are declining due to cleaner vehicles and fuels, rising VMT can offset the effective benefits of adopted regulations.

Even under full implementation of Executive Order N-79-20 and CARB's Advanced Clean Cars II Regulations, with 100 percent ZEV sales in the light-duty vehicle sector by 2035, a significant portion of passenger vehicles will still rely on ICE technology, as demonstrated in Figure 4-2 above. Accordingly, VMT reductions will play an indispensable role in reducing overall transportation energy demand and achieving the state's climate, air quality, and equity goals. After a significant pandemic-induced reduction in VMT during 2020, passenger VMT has steadily climbed back up and is now closing in on pre-pandemic levels.[336] Driving alone with no passengers remains the primary mode of travel in California, amounting to 75 percent of the mode share for daily commute trips. Conversely, the transit industry, which was significantly impacted during

[335] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1E. *finalejacrecs.pdf (arb.ca.gov)*.
[336] U.S. Department of Transportation. 2021. December 2021 Traffic Volume Trends. Figure 3 - Seasonally Adjusted Vehicle Miles Traveled by Month. *https://www.fhwa.dot.gov/policyinformation/travel_monitoring/21dectvt/figure3.cfm*.

the lockdown months, and has struggled to recover; ridership only averages two-thirds of pre-pandemic levels,[337] [338] and service levels also lag behind.

Sustained VMT reductions have been difficult to achieve for much of the past decade, in large part due to entrenched transportation, land use, and housing policies and practices. Specifically, historic decision-making favoring single-occupancy vehicle travel has shaped development patterns and transportation policy, generating further growth in driving (and making transit, biking and walking less viable alternatives). These policies have also reinforced long-standing racial and economic injustices that leave people with little choice but to spend significant time and money commuting long distances, placing a disproportionate burden on low-income Californians, who pay the highest proportion of their wages on housing and transportation. While CARB has included VMT reduction targets and strategies in the Scoping Plan and appendices, these targets are not regulatory requirements, but would inform future planning processes. CARB is not setting regulatory limits on VMT in the 2022 Scoping Plan; the authority to reduce VMT largely lies with state, regional, and local transportation, land use, and housing agencies, along with the Legislature and its budgeting choices.

Appendix E (Sustainable and Equitable Communities) elaborates on reasons for reducing VMT and identifies a series of policies that, if implemented by various responsible authorities, could help to achieve the recommended VMT reduction trajectory included in this Scoping Plan (and related mode share increases for transit and active transportation). These policies aim to advance four strategic objectives:

1. Align current and future funding for transportation infrastructure with the state's climate goals, preventing new state-funded projects from inducing significant VMT growth and supporting an ambitious expansion of transit service and other multimodal alternatives.
2. Move funding for transportation beyond the gasoline and diesel taxes and implement fuel-agnostic pricing strategies that accomplish more productive uses of the roadway network and generate revenues to further improve transit and other multimodal alternatives.
3. Deploy autonomous vehicles, ride-hailing services, and other new mobility options toward high passenger-occupancy and low VMT-impact service models that complement transit and ensure equitable access for priority populations.
4. Encourage future housing production and multi-use development in infill locations and other areas in ways that make future trip origins and destinations

[337] U.S. Government Accountability Office. January 25, 2022. During COVID-19, Road Fatalities Increased and Transit Ridership Dipped. *https://www.gao.gov/blog/during-covid-19-road-fatalities-increased-and-transit-ridership-dipped*.
[338] American Public Transportation Association. APTA - Ridership Trends. *https://transitapp.com/APTA*.

closer together and create more viable environments for transit, walking, and biking.

The pace of change to reduce VMT must be accelerated. Certainly, structural reform will be challenging, but California has demonstrated time and again that it possesses the collective leadership and commitment to break away from ideas that no longer represent Californians' values and their aspirations for the many generations to come.

Strategies for Achieving Success

- Achieve a per capita VMT reduction of at least 25 percent below 2019 levels by 2030 and 30 percent below 2019 levels by 2045. [339]
- Reimagine new roadway projects that decrease VMT in a way that meets community needs and reduces the need to drive.
- Invest in making public transit a viable alternative to driving by increasing affordability, reliability, coverage, service frequency, and consumer experience.[340]
- Implement equitable roadway pricing strategies based on local context and need, reallocating revenues to improve transit, bicycling, and other sustainable transportation choices.[341]
- Expand and complete planned networks of high-quality active transportation infrastructure.[342]
- Channel the deployment of autonomous vehicles, ride-hailing services, and other new mobility options toward high passenger-occupancy and low VMT-impact service models that complement transit and ensure equitable access for priority populations.
- Streamline access to public transportation through programs such as the California Integrated Travel Project.
- Ensure alignment of land use, housing, transportation, and conservation planning in adopted regional plans, such as regional transportation plans (RTP)/ sustainable communities strategies (SCS), regional housing needs assessments (RHNA), and local plans (e.g., general plans, zoning, and local transportation plans), and develop tools to support implementation of these plans.

---

[339] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1D. finalejacrecs.pdf (arb.ca.gov).
[340] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1D. finalejacrecs.pdf (arb.ca.gov).
[341] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1D. finalejacrecs.pdf (arb.ca.gov).
[342] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1F. finalejacrecs.pdf (arb.ca.gov).

- Accelerate infill development and housing production at all affordability levels in transportation-efficient places, with a focus on housing for lower-income residents.

Clean Electricity Grid

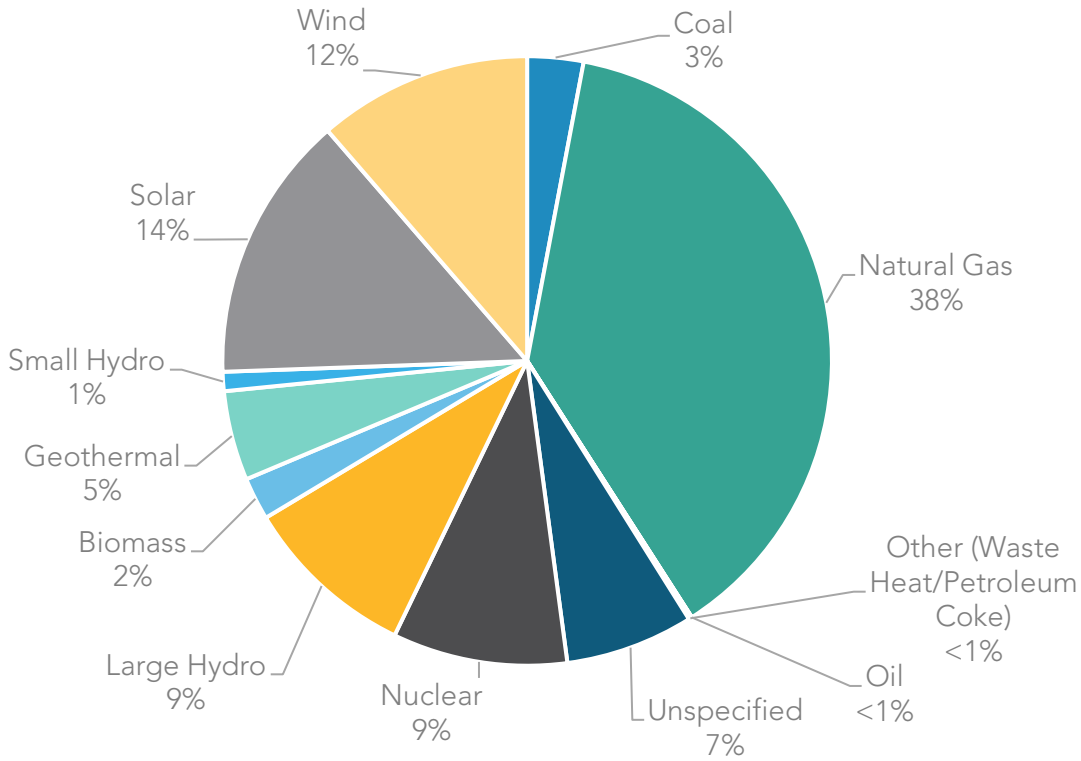
Much of the state's success to date in reducing GHGs is due to decarbonization of the electricity sector as a result of the RPS, SB 100 implementation, and the Cap-and-Trade Program. Moving forward, a clean, affordable, and reliable electricity grid will serve as a backbone to support deep decarbonization across California's economy. Under this Scoping Plan, the role of electricity in powering the economy will grow in almost every sector.

In 2021, 70 percent of California electricity demand was served by in-state power plants totaling about 82 GW, with the rest coming from out-of-state imports.[343] Additionally, approximately 8 GW of customer solar photovoltaic capacity has been installed to date to help with in-state demand.[344] Figure 4-3 shows the breakdown of in-state and imported sources of electricity.

[343] CEC. 2021. Electric Generation Capacity and Energy. Data available at: https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/electric-generation-capacity-and-energy and CEC. 2021. Total System Electric Generation. Data available at: https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2021-total-system-electric-generation. Capacity values are nameplate capacity from sources 1 MW and larger.

[344] CEC. 2021. *SB 100 Joint Agency Report Summary: Achieving 100% Clean Electricity in California, An Initial Assessment.* 10. https://www.energy.ca.gov/publications/2021/2021-sb-100-joint-agency-report-achieving-100-percent-clean-electricity.

Figure 4-3: 2021 total system electric generation (based on GWh)[345]



Note: Imports contributing to total system generation are comprised of 58% zero-carbon energy and 42% non-renewable and unspecified energy. Percentages do not add to exactly 100 due to rounding.

In 2021, about 48 percent of electricity generation serving California came from non-renewable and unspecified[346] resources, while 52 percent came from renewable and zero-carbon resources. The state's Strategic Reliability Reserve, established in AB 205 to provide additional reliability insurance during extreme events, may make three of the fossil gas-fired OTC plants planned for retirement available to support the grid on a limited basis after 2023. The state also adopted legislation to facilitate extension of the Diablo Canyon Nuclear Power Plant for five years beyond its 2025 planned closure.[347] At the

[345] *Total system generation* is the sum of all utility-scale, in-state generation, plus net electricity imports. CEC. 2021 Total System Electricity Generation. https://www.energy.ca.gov/data-reports/energy-almanac/california-electricity-data/2021-total-system-electric-generation.

[346] *Unspecified power* refers to electricity that is not traceable to a specific generating facility, such as electricity traded through open market transactions. It typically consists of a mix of resources and may include renewables.

[347] In accordance with SB 846 (Dodd, Chapter 239, Statutes of 2022).

same time, the state continues to rapidly expand deployment of clean energy generation and storage resources and plan for increased electrification.[348] This is critical to reducing GHG emissions and addressing the long-term impacts of climate change.

Climate change is causing unprecedented stress on California's energy system—driving high demand and constraining supply. Heat, drought, and wildfires can both reduce electricity supply from reductions in hydropower generation and impacts on generation and transmission performance, and increase demand, especially in the evening hours when solar generation is declining.

California has experienced three straight years of energy reliability challenges, including a multi-day extreme heat event across the western United States with temperatures up to 20 degrees above normal in California, resulting in rotating outages in August 2020. In 2021, heat waves in June prompted a Grid Warning and the onset of emergency conditions, and the Bootleg Fire caused the loss of one transmission line, reducing import capability by 3,000 megawatts into the California Independent System Operator (CAISO) balancing authority area. And from August 31–September 9, 2022, a 10-day extreme heat event resulted in an unprecedented, sustained period of high peak loads in the CAISO system, averaging 47,000 MW and maxing at an all-time record of over 52,000 MW on September 6. The Western region also hit its record peak load on September 6, at 167.5 GW.

Reliable electricity service was maintained throughout the 10-day September 2022 heat wave in spite of the record breaking load levels. Factors that contributed to this outcome include the installation of over 3,500 MW of lithium-ion battery storage since summer 2020, enhanced coordination and communication within and outside of California, engagement with customer groups and other stakeholders, state actions to reduce load during critical times, and the additional capacity provided through the Strategic Reliability Reserve and other new state programs authorized in the 2022 Budget to provide load reduction and support the grid in extreme events. CEC, CPUC, CAISO, and the California Department of Water Resources will continue to build out strategies to enhance reliability in light of the increasing and compounding impacts of climate change on the electricity system.

[348] In June 2021, the CPUC adopted D.21-06-035 directing procurement of 11,500 MW of new capacity between 2023 and 2026 to ensure systemwide electric reliability as Diablo Canyon and several OTC facilities retire. It requires that, out of the 11,500 MW, 2,500 MW must be from zero-emission resources. Additionally, 2,000 MW must be long lead-time resources, with at least 1,000 MW of long-duration storage and 1,000 MW of firm capacity with zero on-site emissions or that qualifies under the RPS eligibility requirements.

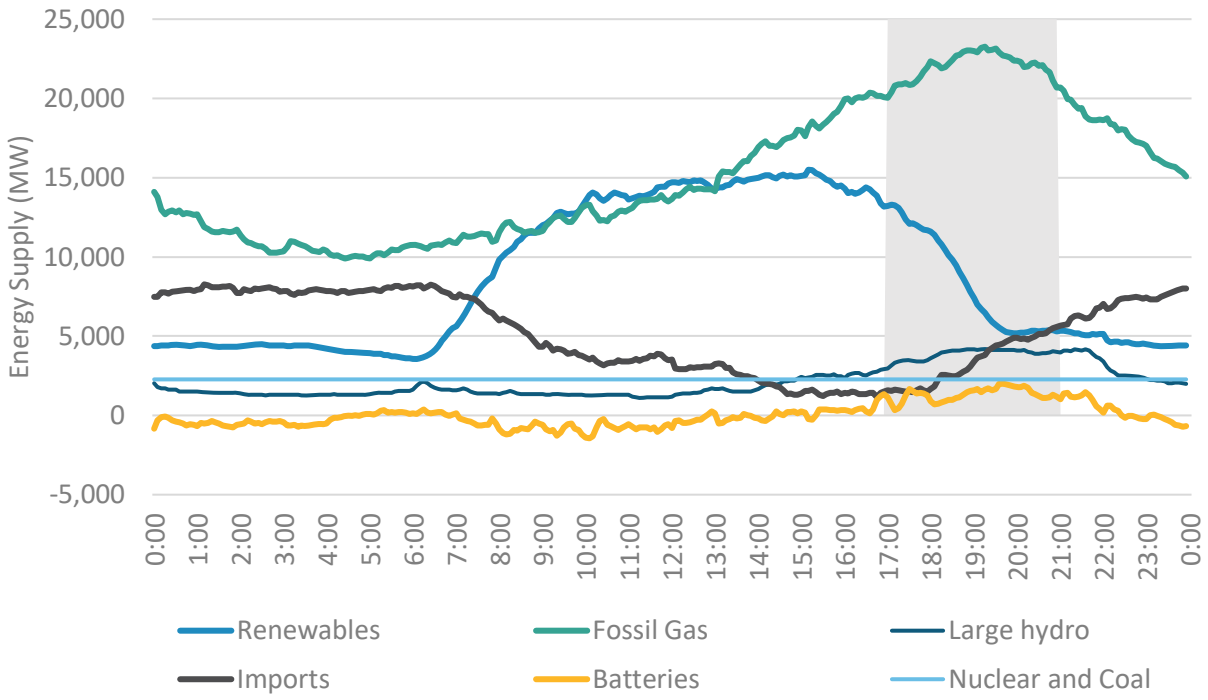
While the electricity sector is using less fossil fuel due to increasing amounts of renewables,[349] existing fossil gas generation will continue to play a critical role in grid reliability until other clean, dispatchable alternatives can be deployed at scale. The integration of greater amounts of variable renewable generation resources[350] is changing power system planning and operations, and system operators need resources with flexible attributes to balance shifting supply and demand.

High levels of solar generation can lead to instances of oversupply during the middle of the day, when the sun is brightest.[351] In the evening hours, as the sun is setting, solar generation declines to zero and customers with solar generation shift back to the electric grid. In hot weather, customer demand remains high well into the summer evening period to power air conditioning, which can lead to reliability challenges.[352]

Figure 4-4 shows the energy sources used throughout one summer day in July. Renewable energy is consistent during the middle of the day, but it cannot meet all of the evening demand in the gray area. As illustrated in the figure, fossil gas generation is currently a resource that is typically ramped up to meet this evening demand as solar production begins to drop and electrical loads increase To help address this challenge, resource installations that pair solar with batteries, as well as a greater amount of battery build-out, are coming online currently and over the next five years. Nevertheless, the state's electricity grid is expected to be stressed further in the coming years by heat waves, drought, wildfires, and the growing intermittent power supply from renewables. California must accelerate deployment of diverse clean energy resources to maintain reliability and affordability in the face of climate change.

[349] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.
[350] A *variable renewable generation resource* is a renewable source of electricity that is non-dispatchable due to its fluctuating nature and only produces electricity when weather conditions are right, such as when the sun is shining or the wind is blowing. Renewable resources that can be controlled and are dispatchable include geothermal, biomass, and dam-based hydroelectric power.
[351] *Brightness* is used colloquially here; solar energy depends on insolation (e.g., sun-hours), which is the measurement of cumulative solar energy that reaches an area over a period of time.
[352] CAISO, CPUC, and CEC. 2021. *Final Root Cause Analysis: Mid-August 2020 Extreme Heat Wave.* http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf.

Figure 4-4: Electricity supply trend by resource for a California summer day, July 2022



Sector Transition

Decarbonizing the electricity sector is a crucial pillar of this Scoping Plan. It depends on both using energy more efficiently and replacing fossil-fueled generation with renewable and zero carbon resources, including solar, wind, energy storage,[353] geothermal, biomass, and hydroelectric power. The RPS Program[354] and the Cap-and-Trade Program continue to incentivize dispatch of renewables over fossil generation to serve state demand. SB 100 increased RPS stringency to require 60 percent renewables by 2030 and for California to provide 100 percent of its retail sales[355] of electricity from renewable and zero-carbon resources by 2045. Furthermore, SB 1020 has added interim targets to

[353] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF1, NF2. *finalejacrecs.pdf (arb.ca.gov)*.

[354] The CEC estimates that 36 percent of California's 2019 retail electricity sales was served by RPS-eligible renewable resources (see CPUC. 2021. CPUC Perspectives on Electric Sector Decarbonization. *https://ww2.arb.ca.gov/sites/default/files/2021-11/CPUC-sp22-electricity-ws-11-02-21.pdf*).

[355] SB 100 speaks only to retail sales and state agency procurement of electricity. The *2021 SB 100 Joint Agency Report* interprets this to mean that other loads—wholesale or non-retail sales and losses from storage and transmission and distribution lines—are not subject to the law.

SB 100's policy framework to require renewable and zero-carbon resources to supply 90 percent of all retail electricity sales by 2035 and 95 percent of all electricity retail sales by 2040; the governor has asked the CEC to establish a planning goal of at least 20 GW of offshore wind by 2045; and the governor directed that state agencies plan for an energy transition that avoids the need for new fossil gas capacity to meet California's long-term energy goals.[356] In addition to grid-level resources, state efforts have supported rapid growth of the distributed solar industry through key actions like the California Solar Initiative (SB 1, Murray, Chapter 132, Statues of 2006).[357] Steps to commercialize microgrids powered by clean resources[358] are also being examined as part of SB 1339 (Stern, Chapter 566, Statutes of 2018).[359]

California also continues to advance its appliance and building energy efficiency standards to reduce growth in electricity consumption and meet the SB 350 goal to double statewide energy efficiency savings in electricity and fossil gas end uses[360] by 2030. In 2018, the CEC adopted a building energy efficiency code requiring most new homes to have solar photovoltaic systems[361] (or be powered by a solar array nearby) starting January 1, 2020. In 2019, California reached the milestone of 1 million solar rooftop installations.

Increased transportation and building electrification and continued policy commitment to behind-the-meter solar and storage will continue to drive growth of microgrids and other distributed energy resources (DER).[362] The CPUC's High-DER proceeding is examining how to prepare the electric grid for a high DER future by determining how to integrate

[356] Newsom, Gavin. July 22, 2022. Letter from Governor Newsom to CARB Chair Liane Randolph. *https://www.gov.ca.gov/wp-content/uploads/2022/07/07.22.2022-Governors-Letter-to-CARB.pdf*.
[357] More information on the program, which closed in 2016, can be found on the CPUC website, including annual program assessment reports, at: *https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/california-solar-initiative*.
[358] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, In part (NF2, NF13). *finalejacrecs.pdf (arb.ca.gov)*.
[359] CPUC. Resiliency and Microgrids. *https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/resiliency-and-microgrids*.
[360] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF1, ES1. *finalejacrecs.pdf (arb.ca.gov)*.
[361] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF2. *finalejacrecs.pdf (arb.ca.gov)*.
[362] Distributed energy resources include rooftop solar and other distributed renewable generation resources, energy storage, electric vehicles, time variant and dynamic electric rates, flexible load management, demand response, and energy efficiency technologies.

millions of DERs within the distribution grid to maximize societal and ratepayer benefits from DERs while ensuring grid reliability and affordable rates.[363]

SB 350 also aims to connect long-term planning for electricity needs with the state's climate targets. This is primarily accomplished through CARB's establishment of 2030 GHG emissions targets for the electricity sector in general and for each electricity provider, which inform the CPUC and publicly owned utilities' integrated resource planning. A GHG planning target range of 30 to 53 MMTCO_2e—informed by the 2017 Scoping Plan—was originally developed and adopted by CARB in 2018. In its 2021 IRP planning cycle, the CPUC adopted a 38 MMT GHG target for the electricity sector in 2030, which drops to 35 MMT in 2032.[364]

The Scoping Plan Scenario incorporates SB 350's energy efficiency doubling goal, aligns with the CPUC's IRP 2030 GHG target and latest GHG emissions benchmarks through 2035,[365] the governor's 20 GW offshore wind and no new gas generation[366] goals, and SB 100's 2030 RPS and 2045 zero-carbon retail sales targets to reduce dependence on fossil fuels in the electricity sector by transitioning substantial energy demand to renewable and zero-carbon resources.[367] As described in Chapter 2, CCS is applied in limited sectors, including on 16.7 MMT of CO_2 from existing fossil gas electricity generation in 2045, to ensure the state achieves the 85 percent reduction in anthropogenic emissions required by AB 1279. Continued transition to renewable and

---

[363] The High-DER proceeding is one of four "anchor" proceedings in the CPUC's DER Action Plan 2.0 and is within the Action Plan's infrastructure track. Information on the High-DER proceeding is available at: *https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/distribution-planning*. The Action Plan can be accessed at: *https://www.cpuc.ca.gov/about-cpuc/divisions/energy-division/der-action-plan*.

[364] The February 10, 2022, Decision 22-02-004 by the CPUC adopts the 2021 Preferred System Plan, completing the 2019–21 IRP cycle. *https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M451/K412/451412947.PDF*. The Decision requires load serving entities to submit plans in the next IRP cycle detailing how they will meet their proportionate share of a 30 MMT electric sector target, as well as a 38 MMT GHG target.

[365] June 15, 2022, Administrative Law Judge's Ruling for 2022 integrated resource plan filings specifies the need for GHG targets to plan for in 2035 to continue progress toward the 2045 goal. The ruling proposes a straight-line projection from the GHG planning target for 2030. Corresponding to the adopted Preferred System Plan in D.22-02-004, 38 MMT in 2030 leads to a target of 30 MMT in 2035. *https://docs.cpuc.ca.gov/PublishedDocs/Efile/G000/M485/K625/485625915.PDF*.

[366] The governor's July 22, 2022, letter specifies no new gas generation but does not place any constraints on existing gas resources. Therefore, for purposes of RESOLVE electricity sector modeling, existing gas capacity is an available resource that is able to be reduced over time based on announced retirements or if selected for retirement by the model.

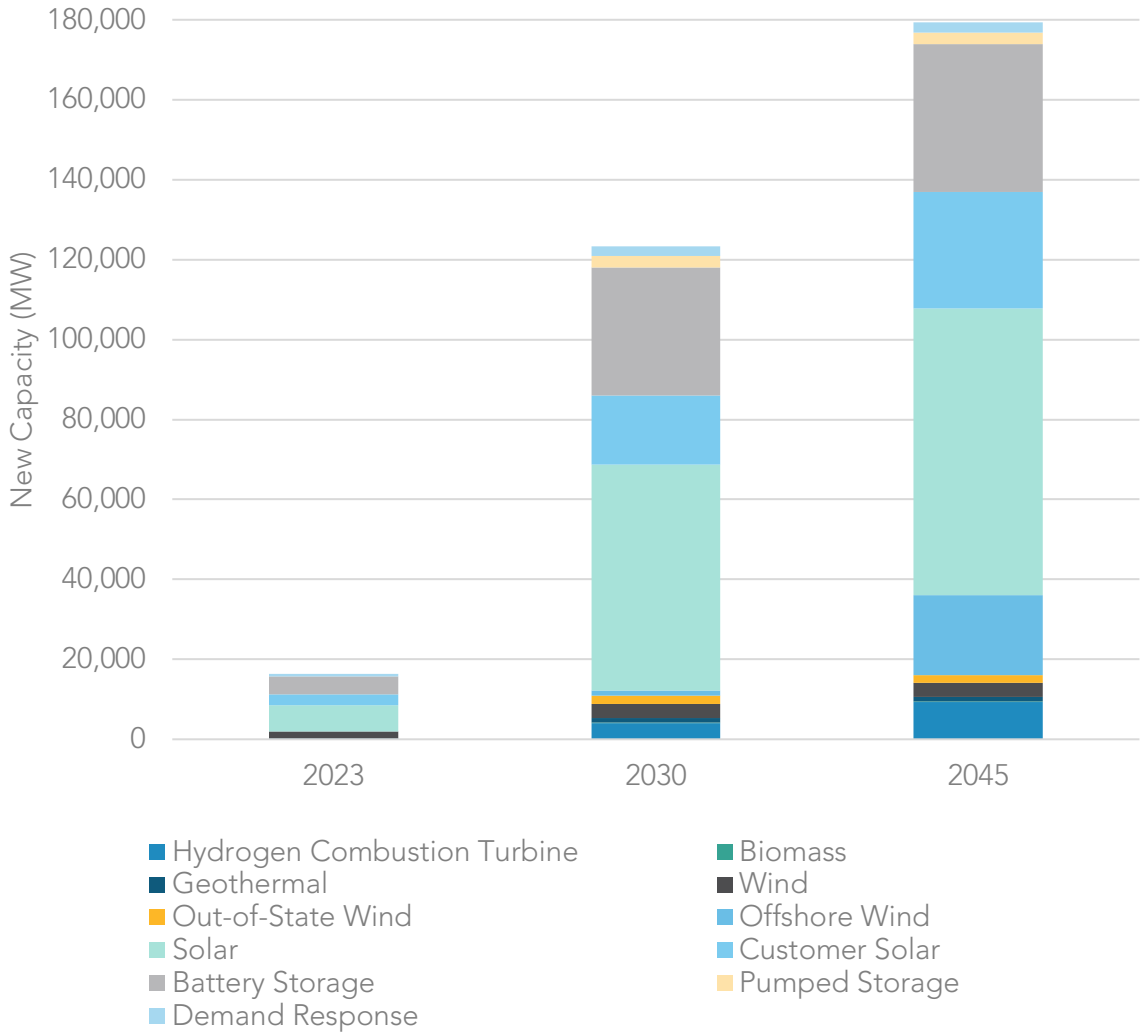
[367] CARB. 2021. PATHWAYS Scenario Modeling: 2022 Scoping Plan Update – Attachment B: Generation Technologies to be included in Modeling. *https://ww2.arb.ca.gov/sites/default/files/2021-12/Revised_2022SP_ScenarioAssumptions_15Dec.pdf*.

zero-carbon electricity resources will enable electricity to become a zero-carbon substitute for fossil fuels across the economy.

Figure 4-5 shows the modeled resource capacity to meet the SB 100 retail sales target.[368] Energy efficiency moderates some of the need for additional electricity generation. However, that is quickly surpassed by growing electricity demand of 26 percent by 2030 and 76 percent by 2045 compared to today (2022) from increased population and electrification of other sectors, as shown in Figure 4-6. The estimated resource build needed to meet this level of demand amounts to approximately 72 GW of utility solar[369] and 37 GW of battery storage by 2045. Annual build rates (over the 2022–2035 period) for the Scoping Plan Scenario will need to increase by about 60 percent and over 700 percent for utility solar and battery storage, respectively, compared to historic maximum rates.[370] To reach the 2045 target, the state will need to quadruple its current level of wind and solar capacity. This does not include capacity associated with hydrogen production nor mechanical CDR, which was modeled off-grid; assuming hydrogen production via electrolysis, this would roughly be equivalent to an additional 10 GW[371] of solar generation needed in 2045, and an additional 64 GW of solar generation for direct air capture in 2045. The scale of solar and battery build rates needed could be reduced through the commercialization of new zero-carbon technologies.

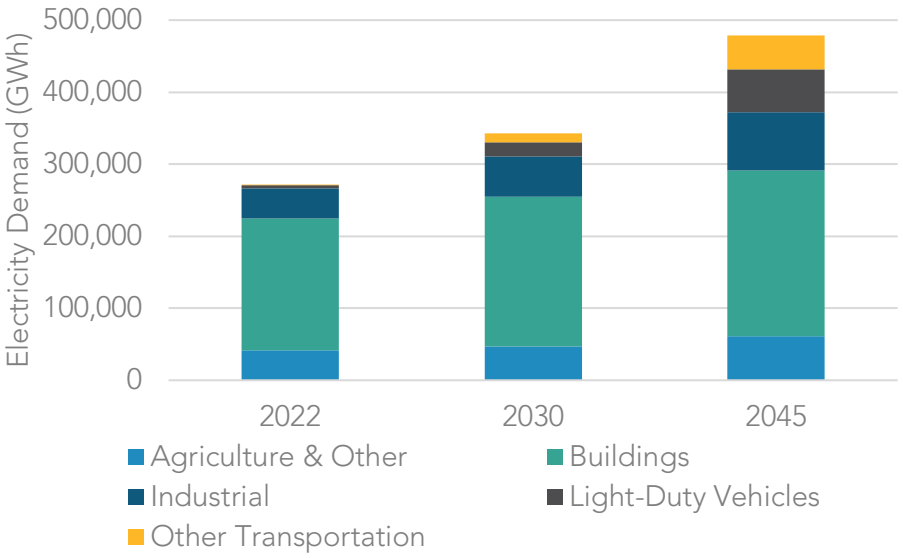
[368] SB 846 requires that load-serving entities exclude energy, capacity, or any attribute from the Diablo Canyon power plant in their resource plans. The Scoping Plan Scenario excludes energy, capacity, or any attribute from the Diablo Canyon power plant after the prior planned retirement date of 2025.
[369] The amount of additional customer solar included in the Scoping Plan Scenario is 29,208 MW by 2045.
[370] E3. 2022. CARB Scoping Plan: AB32 Source Emissions Final Modeling Results. PowerPoint. *https://ww2.arb.ca.gov/sites/default/files/2022-11/SP22-MODELING-RESULTS-E3-PPT.pdf*. Build rates are from EIA data historical builds in the 2011–2021 time frame.
[371] The estimate does not include hydrogen production assumed to be produced with bioenergy with carbon capture and storage (BECCS) and steam methane reforming (SMR).

Figure 4-5: Projected new electricity resources needed by 2045 in the Scoping Plan Scenario[372]



[372] See https://ww2.arb.ca.gov/sites/default/files/2022-11/2022-sp-PATHWAYS-data-E3.xlsx for the capacity build-out by resource type.

Figure 4-6: Electric loads in 2022, 2030 and 2045 for the Scoping Plan Scenario[373]



This transformation will drive investments in a large fleet of generation and storage resources but will also require significant transmission to accommodate these new capacity additions. Transmission needs include high-voltage lines to access out-of-state resources and major in-state generation pockets. In consideration of typical 8- to 10-year lead times for many projects, the CAISO published its first 20-Year Transmission Outlook to inform transmission planning focused on meeting the needs identified through the 2021 SB 100 Joint Agency Report process. The outlook calls for significant transmission development to access offshore wind and out-of-state wind and reinforce the existing CAISO footprint at an estimated cost of $30.5 billion.[374]

Presently, fossil gas power plants provide about 75 percent of the flexible capacity for grid reliability as more renewable power enters the system. Moving forward, other resources such as storage and demand-side management are essential to maintain reliability with high concentrations of renewables. Hydrogen produced from renewable resources and renewable feedstocks can serve a dual role as a low-carbon fuel for existing combustion turbines or fuel cells, and as energy storage for later use. Reliability

[373] *Other Transportation* includes all non-light-duty vehicles and reflects electrification of modes like passenger and freight rail, aviation, and ocean-going vessels.
[374] CAISO. 2022. *20 Year Transmission Outlook.* http://www.caiso.com/InitiativeDocuments/20-YearTransmissionOutlook-May2022.pdf.

also can be supported through increased coordination and markets in the interconnected western power grid; this is already helping to better integrate renewables.[375]

Strategies for Achieving Success

- Use long-term planning processes (Integrated Energy Policy Report, IRP, CAISO Transmission Planning Process, AB 32 Climate Change Scoping Plan) to support grid reliability and expansion of renewable and zero-carbon resource and infrastructure deployment.
- Complete systemwide and local reliability assessments across CAISO and other balancing authority areas, using realistic assumptions for land use, build rates, statewide and distribution system level constraints, and energy needs. Such assessments should be completed before state agencies update their electricity sector GHG targets.
- Prioritize actions to mitigate impacts to electricity reliability and affordability and provide sufficient flexibility in the state's decarbonization roadmap for adjustments as may be needed.
- Facilitate long lead-time resource development through the IRP and the SB 100 interagency process and through technology development and demonstration funding[376] that includes resources such as long-duration energy storage and hydrogen production.
- Continue coordination between energy agencies and energy proceedings to maximize opportunities for demand response.
- Continue to explore the benefits of regional markets to enhance decarbonization, reliability, and affordability.
- Address resource build-out challenges, including permitting, interconnection, and transmission network upgrades.
- Explore new financing mechanisms and rate designs to address affordability.[377]
- Per SB 350, double statewide energy efficiency savings in electricity and fossil gas end uses by 2030, through a combination of energy efficiency and fuel substitution actions.[378]
- Per SB 100 and SB 1020, achieve 90 percent, 95 percent, and 100 percent

[375] CEC. 2021. *2021 SB 100 Joint Agency Report – Achieving 100 Percent Clean Electricity in California: An Initial Assessment.* Publication Number: CEC-200-2021-001.
[376] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, ES2. The committee recommendation speaks specifically to offshore wind production. *finalejacrecs.pdf (arb.ca.gov)*.
[377] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF30. *finalejacrecs.pdf (arb.ca.gov)*.
[378] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF1, NF2. *finalejacrecs.pdf (arb.ca.gov)*.

renewable and zero-carbon retail sales by 2035, 2040, and 2045, respectively.

- Evaluate and propose, as needed, changes to strengthen the Cap-and-Trade Program.
- Target programs and incentives to support and improve access to renewable and zero-carbon energy projects (e.g., rooftop solar, community owned or controlled solar or wind, battery storage, and microgrids) for communities most at need, including frontline, low-income, rural, and indigenous communities.[379]
- Prioritize public investments in zero-carbon energy projects to first benefit the most overly burdened communities affected by pollution, climate impacts, and poverty.[380]

Sustainable Manufacturing and Buildings

Fossil gas is the primary gaseous fossil fuel used to produce heat at industrial facilities, as well as in residential and commercial buildings. In buildings, space and water heating, cooking, and clothes drying all rely on gaseous fuels today. Industrial processes that require heat for conventional boilers and other processes also rely on gaseous fuels. Refineries rely on fossil gas and other gaseous fossil fuels, like liquefied petroleum gas and refinery fuel gas, and fossil gas is also used to generate electricity, as discussed earlier.

Gaseous fossil fuel use can be displaced by four primary alternatives: zero-carbon electricity, solar thermal heat, hydrogen, and biogas/biomethane. Displacing gaseous fossil fuel use can yield indoor air quality benefits, protect public health and property from unexpected fossil gas leaks, and reduce short-lived climate pollutants, which are many times more potent in affecting climate change than CO_2. The Scoping Plan Scenario reduces dependence on fossil gas in the industrial and building sectors by transitioning substantial energy demand to alternative fuels. Reducing fossil gas combustion also will help toward achieving our air quality and equity goals by reducing pollution in neighboring areas and communities. In addition, reduced dependence on gasoline and diesel in the transportation sector diminishes the need for gaseous fossil fuels to support oil and gas production and petroleum refining operations as those are phased down relative to the demand.

---

[379] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF2, NF9, NF11, NF12, NF13. finalejacrecs.pdf (arb.ca.gov).

[380] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF14. finalejacrecs.pdf (arb.ca.gov).

Sector Transition

Industry

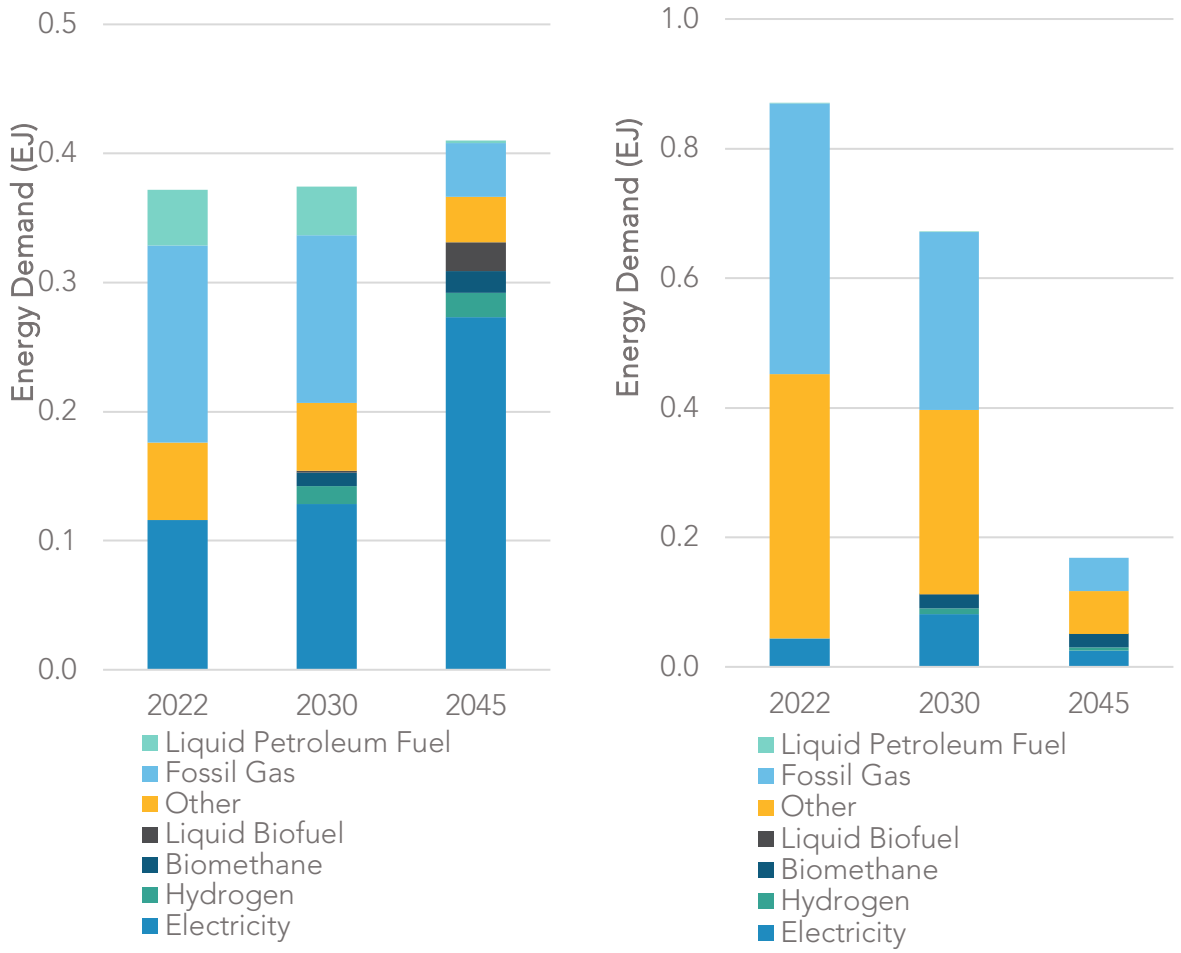
California's industrial sector contributes significantly to the state's economy, with a total output from manufacturing in 2019 of $324 billion (10.4 percent of the state total)[381] and employment of 1,222,000 manufacturing jobs (7.6 percent of the total state workforce).[382] California industry includes a diverse range of facilities, including cement plants, refineries, glass manufacturers, oil and gas producers, paper manufacturers, mining operations, metal processors, and food processors. Combustion of fossil gas, other gaseous fossil fuels, and solid fossil fuels provide energy to meet three broad industry needs: electricity, steam, and process heat. Non-combustion emissions result from fugitive emissions and from the chemical transformations inherent to some manufacturing processes. About 20 percent of the GHG emissions from the industrial sector are non-combustion emissions.

Decarbonizing industrial facilities depends upon displacing fossil fuel use with a mix of electrification, solar thermal heat, biomethane, low- or zero-carbon hydrogen, and other low-carbon fuels to provide energy for heat and reduce combustion emissions. Emissions also can be reduced by implementing energy efficiency measures and using substitute raw materials that can reduce energy demand and some process emissions. Some remaining combustion emissions and some non-combustion CO_2 emissions can be captured and sequestered. The strategy employed will depend on the industrial subsector and the specific processes utilized in production. The left side of Figure 4-7 illustrates the fuels used to meet industrial manufacturing energy demand in 2020. Industrial manufacturing energy demand needs to transition to the fuel mix shown for 2035 and 2045. The right side of Figure 4-7 illustrates the fuel mix needed to meet the energy demand of oil and gas extraction and petroleum refining operations for the same years. Energy demand in this portion of the industrial sector declines along with decreased demand for gasoline and diesel in the transportation sector. In both figures there is a continuing demand for fossil gas due to lack of non-combustion technologically feasible or cost-effective alternatives for certain industrial sectors. Policies that support decarbonization strategies like electrification, use of renewable energy, and transition to alternative fuels are needed.

---

[381] National Association of Manufacturers (NAM). 2021 California Manufacturing Facts. https://www.nam.org/state-manufacturing-data/2021-california-manufacturing-facts/.
[382] NAM. 2021 California Manufacturing Facts. https://www.nam.org/state-manufacturing-data/2021-california-manufacturing-facts/.

Figure 4-7: Final energy demand in industrial manufacturing (left) and in oil and gas extraction and petroleum refining (right) in 2022, 2030, and 2045 in the Scoping Plan Scenario[383]



Electrification and solar thermal heat are best-suited to industrial processes that have relatively low heat requirements, such as food processors, paper mills, and industries that use low-pressure steam in their processes. Approaches could include replacing fossil gas boilers with electric boilers, process heaters with industrial electric heat pumps, steel forging furnaces with induction heaters, and implementing other sector-specific process electrification. Under current rate structures for industrial electricity and fossil gas in

[383] *Other* fuel in the industrial manufacturing sector is primarily coke and coal for cement production. *Other* fuel in the petroleum refining sector is primarily fossil gas associated with refining petroleum products.

California, most projects to electrify a fossil gas-powered industrial process will face operating cost barriers and potential reliability concerns. Microgrids powered by renewable resources and with battery storage are emerging as a key enabler of electrification and decarbonization at industrial facilities.

There are fewer commercially available and economically viable electrification options to replace industrial processes that require higher-temperature heat. For these processes, onsite combustion may continue to be needed, and decarbonization will require fuel substitution to hydrogen,[384] biomethane, or other low-carbon fuels. Fuel substitution and continued combustion will require monitoring and mitigation of any potential air quality impacts, especially in low-income and communities of color which already face disproportionate air pollution burdens. Industries in California with high heat needs include steel forging, glass manufacturing, and industries with calcination processes, such as manufacturing lime and cement.

Onsite emissions from cement manufacturing derive from two main sources: (1) fuel combustion to heat the kiln to a very high temperature and (2) process CO_2 emissions from the chemical transformation of limestone. Over 60 percent of emissions from the sector are process emissions unrelated to fuel use, and most emissions related to fuel use are from coal and petroleum coke combustion. Process emissions from cement manufacturing are significant and will continue even if the sector were to operate using only zero-carbon fuels; thus carbon capture and use/sequestration will be a likely component of any strategy to fully decarbonize cement manufacturing. There are additional opportunities to reduce GHG emissions from cement manufacturing via the combination of fuel-switching to low-carbon fuels (e.g., biomethane, municipal solid waste, biochar), increased blending of non-clinker materials, and efficiency improvements. High technological and economic barriers exist to electrifying kiln process heat at cement plants, as clinker production requires temperatures in excess of 1,500°C. There are potential decarbonization opportunities throughout the value chain of cement use, including in cement manufacturing, concrete mixing, and construction practices.[385] SB 596 (Becker, Chapter 246, Statutes of 2021), which was signed by Governor Newsom in September 2021, requires CARB to develop a comprehensive strategy for cement use in California to achieve a GHG intensity 40 percent below 2019 levels by 2035, and net-zero emissions by 2045.

---

[384] Griffiths, Steve, Benjamin K. Sovacool, Jinsoo Kim, Morgan Bazilian, and Joao M. Uratani. 2021. "Industrial decarbonization via hydrogen: A critical and systematic review of developments, socio-technical systems and policy options." *Energy Research & Social Science* 80. 102208, ISSN 2214-6296. https://doi.org/10.1016/j.erss.2021.102208.

[385] California Nevada Cement Association. Achieving Carbon Neutrality in the California Cement Industry. https://cncement.org/attaining-carbon-neutrality.

Oil and gas extraction and refining make up over half of California's industrial GHG emissions. Reduced demand for transportation fossil fuels corresponds to reduced supply of fossil gas and other gaseous fossil fuels for refineries to produce these fuels. Some refining operations will continue to operate to produce fossil fuel for the remaining transportation energy demands, along with renewable diesel and sustainable aviation fuel, as discussed in the Transportation Sustainability section of this chapter.

Across industrial subsectors and processes, California facilities also could realize significant reductions in GHG emissions and energy-related costs by implementing advanced energy efficiency projects and tools.[386] While enhanced operation and maintenance practices are typical at industrial facilities, additional strategic energy management practices offer greater efficiency gains by focusing on setting goals, tracking progress, and reporting results.

Strategies for Achieving Success

- Maximize air quality benefits using the best available control technologies for stationary sources in communities most in need, including frontline, low-income, disadvantaged, rural, and tribal communities.[387]
- Prioritize alternative fuel transitions first in communities most in need, including frontline, low-income, disadvantaged, rural, and tribal communities.[388]
- Invest in research and development and pilot projects to identify options to reduce materials and process emissions along with energy emissions in California's industrial manufacturing facilities, leveraging programs like the CEC's Electric Program Investment Charge (EPIC).[389]
- Evaluate and propose, as needed, changes to strengthen the Cap-and-Trade Program.
- Support electrification with changes to industrial rate structures.
- Develop infrastructure for CCS and hydrogen production to reduce GHG emissions where cost-effective and technologically feasible non-combustion alternatives are not available.
- Implement SB 905.

---

[386] Therkelsen, Peter, Aimee McKane, Ridah Sabouini, and Tracy Evans. 2013. *Assessing the Costs and Benefits of the Superior Energy Performance Program.* U.S Department of Energy. https://www.osti.gov/servlets/purl/1165470.

[387] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, JT14. finalejacrecs.pdf (arb.ca.gov).

[388] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, JT15. finalejacrecs.pdf (arb.ca.gov).

[389] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, M20. finalejacrecs.pdf (arb.ca.gov).

- Establish markets for low-carbon products and recycled materials using Buy Clean California Act and other mechanisms relying on robust data
- Develop a net-zero cement strategy to meet SB 596 targets for the GHG intensity of cement use in California.
- Continue to leverage energy-efficiency programs, including the U.S. DOE's ENERGY STAR program,[390] U.S. DOE's Superior Energy Performance program,[391] and ISO 50001.[392]
- Evaluate and continue to offer incentives to install energy efficiency and renewable energy technologies through programs such as CPUC decisions as part of rulemaking R.19-09-009[393] and the CEC's Food Production Investment Program (FPIP) and EPIC programs.[394]
- Leverage low-carbon hydrogen programs, including the Bipartisan Infrastructure Law, for regional hydrogen hubs, hydrogen electrolysis, and hydrogen manufacturing and recycling.
- Evaluate the role of hydrogen in meeting GHG emission reductions, including policy recommendations regarding the use of hydrogen in California as required by SB 1075.
- Address cost barriers to promote low-carbon fuels for hard-to-electrify industrial applications.

Buildings

Buildings have cross-sector interactions that influence our public health and well-being and affect land use and transportation patterns, energy use, water use, and indoor and outdoor environments.[395] There are about 14 million existing homes and over 7.5 billion square feet of existing commercial buildings[396] in California. Fossil gas supplies about half of the energy consumed by end uses in these buildings. In addition to GHG emissions, fossil gas usage in buildings also produces CO_2, NOx, $PM_{2.5}$, and

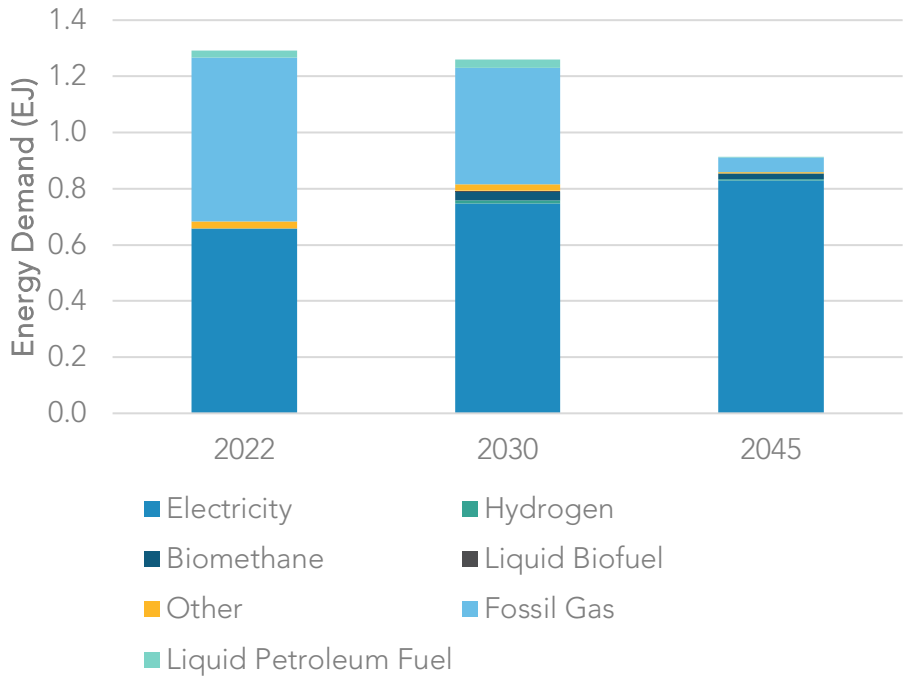
[390] ENERGY STAR. ENERGY STAR Guidelines for Energy Management. https://www.energystar.gov/buildings/tools-and-resources/energy-star-guidelines-energy-management.
[391] Energy.gov. Superior Energy Performance 50001. https://www.energy.gov/eere/amo/superior-energy-performance.
[392] ISO. ISO 50001 Energy Management. https://www.iso.org/iso-50001-energy-management.html.
[393] CPUC. January 14, 2021. CPUC Adopts Strategies to Help Facilitate Commercialization of Microgrids Statewide. https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M360/K370/360370887.PDF.
[394] Bailey, Stephanie, David Erne, and Michael Gravely. 2021. *Final 2020 Integrated Energy Policy Report Update, Volume II: The Role of Microgrids in California's Clean and Resilient Energy Future, Lessons Learned From the California Energy Commission's Research.* California Energy Commission. Publication Number: CEC-100-2020-001-V2-CMF.
[395] See Appendix F (Building Decarbonization).
[396] CEC. 2021. California Building Decarbonization Assessment. https://efiling.energy.ca.gov/GetDocument.aspx?tn=239311&DocumentContentId=72767.

formaldehyde.[397] Each year, about 120,000 new homes[398] and more than 100 million-square feet[399] of commercial buildings are newly constructed across California. These new buildings will represent between a third to half of the total building stock by mid-century.

Achieving carbon neutrality must include transitioning away from fossil gas in residential and commercial buildings, and will rely primarily on advancing energy efficiency while replacing gas appliances with non-combustion alternatives. This transition must include the goal of trimming back the existing gas infrastructure so pockets of gas-fueled residential and commercial buildings do not require ongoing maintenance of the entire limb for gas delivery. Blending low-carbon fuels such as hydrogen and biomethane into the pipeline further displaces fossil gas. Pipeline safety and reliability must be evaluated to accommodate low-carbon fuels. Figure 4-8 illustrates the energy Californians use in buildings at present compared with the Scoping Plan Scenario, which introduces alternatives to fossil gas. In that scenario almost 90 percent of energy demand is electrified by 2045, and the remaining energy demand is met with combustion of hydrogen, biomethane, and fossil gas.

[397] Zhu, Yifang, et al. 2020. *Effects of Residential Gas Appliances on Indoor and Outdoor Air Quality and Public Health in California.* UCLA Fielding School of Public Health Department of Environmental Health Sciences.
[398] Construction Industry Research Board. 2018. Annual Building Permit Summary. *http://www.cirbreport.org*.
[399] Delforge, Pierre. August 11, 2021. California Forging Ahead on Zero Emission Buildings. Blog. NRDC. *https://www.nrdc.org/experts/pierre-delforge/california-forging-ahead-zero-emission-buildings*.

Figure 4-8: Final energy demand in buildings in 2022, 2030, and 2045 in the Scoping Plan Scenario[400]

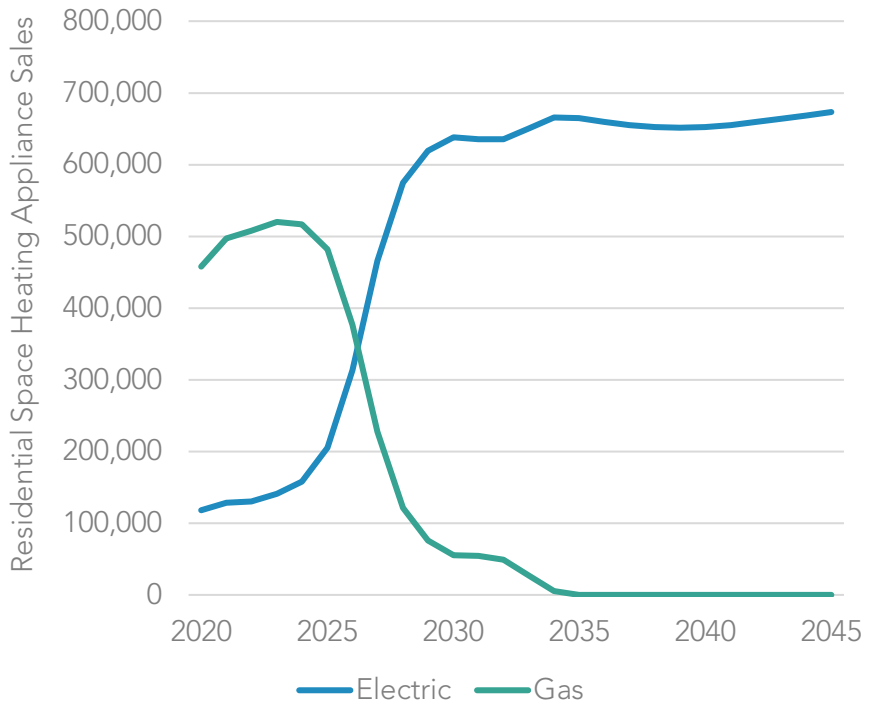


This transition is achieved when all new buildings constructed include non-combustion appliances, and appliances in existing buildings are replaced at the end of their useful life with non-combustion alternatives. Currently, electric alternatives, combined with the decarbonizing of California's grid, are the most effective alternatives, and the Scoping Plan Scenario modeled these alternatives. The Scoping Plan Scenario assumes three million all-electric and electric-ready homes by 2030 and seven million by 2035. Figure 4-9 illustrates the pace at which electric space heating appliance sales increase and gas space heating appliance sales decrease in residences in the Scoping Plan Scenario, such that by 2035 100 percent of residential home appliance sales are electric. By 2030 over six million electric heat pumps are installed statewide. The residential electric space heating appliance sales increases rapidly in the near term as new all-electric buildings are constructed and as existing buildings are renovated to utilize electric appliances. A similar transition is envisioned for other home appliances. Commercial buildings also will undergo a transition away from gas appliances to electric appliances, achieving 80 percent sales of all-electric appliances by 2035 and 100 percent by 2045. Appendix F (Building Decarbonization) describes a holistic policy approach to rapidly grow the

[400] *Other* fuel in the buildings sector is primarily liquid petroleum gas and waste heat.

number of zero emission appliances and buildings, to surmount the market barriers, and to prioritize an equitable transition for vulnerable communities.

Figure 4-9: Residential space heating appliance sales in the Scoping Plan Scenario



Strategies for Achieving Success

- Prioritize California's most vulnerable residents with the majority of funds in the new $922 million Equitable Building Decarbonization program, created through the 2022–2023 state budget. This would include residents in frontline, low-income, disadvantaged, rural, and tribal communities. This program is dedicated to a statewide direct-install building retrofit program for low-income households to replace fossil fuel appliances with electric appliances, energy-efficient lighting, and building insulation and sealing while also coordinating reductions in gas infrastructure in specific geographic areas.
- Achieve three million all-electric and electric-ready homes by 2030 and seven million by 2035 with six million heat pumps installed statewide by 2030.
- Expand incentive programs to support the holistic retrofit of existing buildings, especially for vulnerable communities.
- Ensure that incentive programs prioritize energy affordability and tenant protections, promote affordable and low-income household retrofits that improve habitability and reduce expenses, protect and empower small landlords and homeowners, address overlooked consumer groups, and pair decarbonization

with other critically needed renovation efforts to ensure that buildings support human health and are climate- and weather-resistant.[401]

- End fossil gas infrastructure expansion for newly constructed buildings.[402]
- Evaluate and propose, as needed, changes to strengthen the Cap-and-Trade Program.
- Strengthen California's building standards to support zero-emission new construction.
- Develop building performance standards for existing buildings.
- Adopt a zero-emission standard for new space and water heaters sold in California beginning in 2030, as specified in the 2022 State Strategy for the State Implementation Plan.
- Expand use of low-GWP refrigerants within buildings.
- Support electrification with changes to utility rate structures and by promoting load management programs.
- Increase funding for incentive programs and expand financing assistance programs focused on existing buildings and appliance replacements.
- Expand consumer education efforts to raise awareness and stimulate the adoption of decarbonized buildings and appliances, especially in vulnerable communities.
- Implement biomethane procurement targets for investor-owned utilities as specified in SB 1440 (Hueso, Chapter 739, Statutes of 2018) to reduce GHG emissions in remaining pipeline gas and reduce methane emissions from organic waste.

[401] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF23, NF24, NF25, NF26, NF28. *finalejacrecs.pdf (arb.ca.gov)*.
[402] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF22. *finalejacrecs.pdf (arb.ca.gov)*.

Carbon Dioxide Removal and Capture

Climate Change 2022: Mitigation of Climate Change,[403] a report by the IPCC released in early 2022, states "The deployment of CDR to counterbalance hard-to-abate residual emissions is unavoidable if net zero CO_2 or GHG emissions are to be achieved. The scale and timing of deployment will depend on the trajectories of gross emission reductions in different sectors. Upscaling the deployment of CDR depends on developing effective approaches to address feasibility and sustainability constraints especially at large scales." In line with that report, this Scoping Plan considers CDR as a complement to technologically feasible and cost-effective GHG emissions mitigation, and the size of its role will depend on the degree of success in reducing GHG emissions at the source across the economy. [404] The modeling shows that emissions from the AB 32 GHG Inventory sources will continue to persist even if all fossil related combustion emissions are phased out. These residual emissions must be compensated for to achieve carbon neutrality. Options for CDR include both sequestration in natural and working lands and mechanical approaches like direct air capture. Chapter 2 provides estimates on how much CO_2 removal is possible by our natural and working lands and how much must be removed by mechanical CDR.

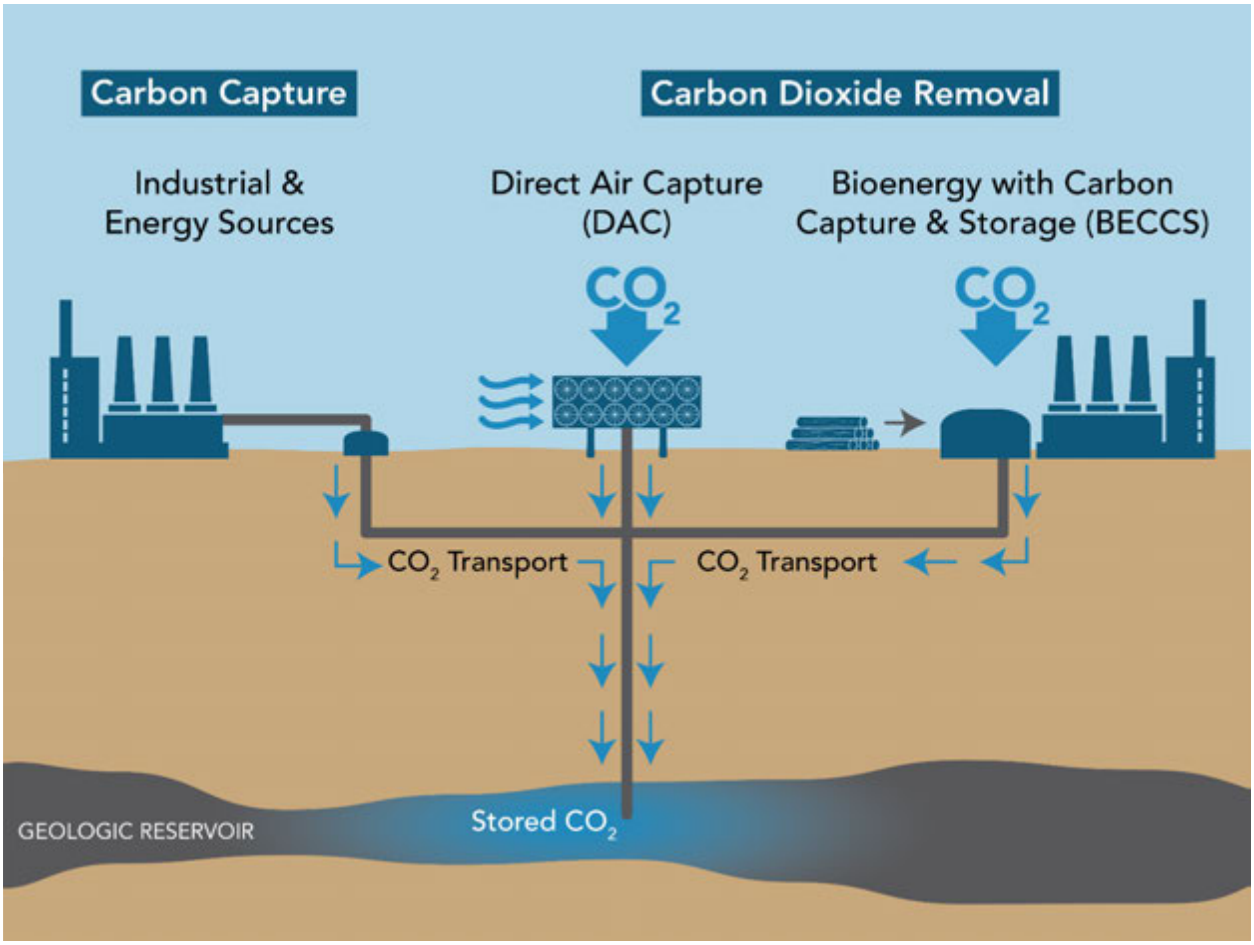
CCS, which is carbon capture from anthropogenic point sources, is described in Chapter 2 and involves capturing carbon from a smokestack of an emitting facility. Direct air capture, on the other hand, captures carbon directly from the atmosphere. Direct air capture technologies, unlike CCS, are not associated with any particular point source.

For this section, *carbon management* refers to the capture, movement, and sequestration of CO_2 through mechanical solutions for both capture at point sources and direct removal from the atmosphere through direct air capture.[405] Enabling policies and regulations across each of these steps are necessary for individual projects, and on a broader scale, for delivering reductions in support of the state's carbon neutrality and long-term carbon-negative goals. Figure 4-10 provides a graphic of the typical carbon management infrastructure.

---

[403] IPCC. 2022. *Climate Change 2022: Mitigation of Climate Change.* https://www.ipcc.ch/report/sixth-assessment-report-working-group-3/.
[404] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F4.7. finalejacrecs.pdf (arb.ca.gov).
[405] CDR through natural and working lands is discussed in Chapter 2 and later in this chapter.

Figure 4-10: Carbon management infrastructure



Carbon dioxide removal directly from the atmosphere itself refers to a suite of carbon negative technologies that can be used to draw down ongoing and historical carbon emissions already in the atmosphere. Some CO_2 removal technologies leverage the abilities of both natural photosynthesis and mechanical removal by using biomass wastes as inputs to make low- or zero-carbon energy or fuels, all while capturing and storing produced CO_2.

Captured CO_2 from point sources or from the atmosphere is permanently stored in specialized geologic formations, typically half a mile or more underground. A recent Stanford University study estimated the state's commercial storage potential is nearly 70,000 million metric tons of CO_2, even when excluding oil and gas reservoirs.[406] California is well-positioned because few other places on the West Coast are suitable for

[406] Stanford Center for Carbon Storage. Opportunities and Challenges for CCS in California. https://sccs.stanford.edu/california-projects/opportunities-and-challenges-for-CCS-in-California.

geologic storage at scale. To inform discussion around CO_2 removal, CARB held two full-day workshops exploring the types of options for carbon capture and geologic storage and utilization in products.[407,408,409]

The modeling results provided in Chapter 2 demonstrate the targeted need for CCS on large facilities such as refineries and cement. The CCS numbers do not include the potential additional applications for producing hydrogen with biomethane, other manufacturing, electricity, or other bioenergy. If CCS is not deployed, those emissions would be released directly into the atmosphere and instead need to be addressed through CDR to achieve carbon neutrality. Although a study finds California has 76 existing electricity and industrial facilities that are suitable candidates for CCS retrofit,[410] this Scoping Plan proposes a targeted role for this technology such that it would only be used to address sectors where non-combustion options are not technologically feasible or cost-effective at this time, to the extent needed to achieve the 85 percent reduction in anthropogenic emissions as called for in AB 1279. In future updates to the Scoping Plan, there may be additional options for technologically feasible or cost-effective technologies that may be deployed, which would further reduce the need for CCS and CDR except in situations to address historical GHG emissions.

Recognizing the need for carbon capture and utilization sequestration and removal, the Legislature passed, and the governor signed, SB 905. It includes several key requirements in the development of the state's Carbon Capture Removal, Utilization, and Storage Program. The following is a summary of the work to be completed to establish and administer this program. Many of these steps will address the need to evaluate the safety and efficacy of actions to support carbon removal, sequestration, and transfer via pipelines. Note that not all of these actions are under CARB's authority.

- Review technology to evaluate efficacy, safety, viability of CCUS/CDR methodologies.
- Develop monitoring and reporting requirements and schedules.
- Develop a unified permit application.
- Develop financial responsibility requirements.
- Develop a centralized public database for project status.

---

[407] CARB. December 11, 2019. Carbon Neutrality Meetings & Workshops. *https://ww2.arb.ca.gov/our-work/programs/carbon-neutrality/carbon-neutrality-meetings-workshops*.
[408] CARB. August 2, 2021 Scoping Plan Meetings & Workshops. *https://ww2.arb.ca.gov/our-work/programs/ab-32-climate-change-scoping-plan/scoping-plan-meetings-workshops*.
[409] *Carbon utilization* refers to the use of captured carbon to produce products such as plastics and concrete.
[410] Glenwright, Kara. 2020. *Roadmap for carbon capture and storage in California.* Precourt Institute for Energy. *https://earth.stanford.edu/news/roadmap-carbon-capture-and-storage-california#gs.ysj78q.*

- Consult with CNRA on pore space requirements as CNRA develops a framework for pore space governing agreements.
- Establish a Geologic Carbon Sequestration Group to identify suitable injection well locations, subsurface monitoring, and potential hazards that may require suspension of injection.

SB 905 also has requirements for project developers such as to develop monitoring plans and to avoid any adverse health and environmental impacts at the carbon capture location—or mitigation of unavoidable impacts as required under existing requirements. For the site of injection, there are requirements for site stability, monitoring, and reporting plans. SB 905 also bans CCS with enhanced oil recovery in California and prohibits the transfer of CO_2 via pipeline until the U.S. Department of Transportation's Pipelines and Hazardous Materials Safety Administration (PHMSA) completes its current rulemaking to update existing CO_2 pipeline safety requirements.

An often-cited example of pipeline concerns involves a CO_2 pipeline in Mississippi. On February 22, 2020, a CO_2 pipeline operated by Denbury Gulf Coast Pipelines LLC (Denbury) ruptured in proximity to the community of Satartia, Mississippi. The rupture followed heavy rains that resulted in a landslide, creating excessive axial strain on a pipeline weld (DOT 2022). The combination of weather and topography resulted in a slower dissipation of the gas. The pipeline was also carrying hydrogen sulfide, a flammable and toxic gas. The pipeline failed on a steep embankment, which had recently subsided. Heavy rains are believed to have led to a landslide, which created axial strain on the pipeline and resulted in a full circumferential girth weld failure. The PHMSA investigation also revealed several contributing factors to the accident, including but not limited to: Denbury not addressing the risks of geohazards in its plans and procedures, underestimating the potential affected areas that could be impacted by a release in its CO_2 dispersion model, and not notifying local responders to advise them of a potential failure.

As the Satartia example highlights, appropriate pipeline safety and environmental standards in California are critical to minimize any risks from CO_2 transport in the future. As such, SB 905 also tasks CNRA, in consultation with the Public Utilities Commission, to, no later than February 1, 2023, provide a proposal to the Legislature to establish a state framework and standards for the design, operation, siting, and maintenance of intrastate pipelines carrying CO_2 fluids of varying composition and phase to minimize the risk posed to public and environmental health and safety. The recommended framework shall be designed to minimize risk to public health and environmental health and safety, to the extent feasible. Because SB 905 prohibits the transfer of CO_2 via pipeline until the PHMSA completes its current rulemaking to update existing CO_2 pipeline safety requirements, CCS or CDR projects that would require a pipeline to transfer CO_2 are not feasible at this time within California.

Ultimately, and in accordance with SB 905, the merits of each CCS or CDR project must be evaluated on a case-by-case basis.[411] Deployment of CCS and CDR could support skilled jobs and workforces, including those in traditional fossil energy communities. Other co-benefits could include criteria air pollutant reductions and water production. It will be important to design projects that do not exacerbate community health impacts, include early and ongoing community engagement, and are in compliance with local, state, and federal public health and environmental protection laws. It also should be noted that, as these types of projects are an emerging area of governance, additional coordination and discussion will be needed among the various levels of authorities involved. SB 905 has already initiated this process by assigning specific agencies with tasks related to their expertise and authority.

Chapter 2 includes a more detailed discussion about the proposed role of CO_2 removal in this Scoping Plan.

Sector Transition

State,[412] national,[413,414] and global decarbonization analyses[415] indicate a significant role for carbon management infrastructure, yet relatively few projects are operational. Around the world, about two dozen large CCS projects are capturing tens of millions of metric tons of CO_2 each year, with about a dozen operating in the United States.[416] The vast majority of capacity is at industrial facilities, such as ethanol and fertilizer plants, that would otherwise vent nearly pure CO_2 into the atmosphere as a by-product of normal, non-combustion processes. Future research, development, and demonstration projects must refine and commercialize capture systems for more complex applications, especially

---

[411] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F4.5. *finalejacrecs.pdf (arb.ca.gov)*.
[412] E3. October 2020. Achieving Carbon Neutrality in California Report: Final Presentation. *https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_presentation_oct2020_2.pdf*.
[413] World Resources Institute. January 31, 2020. CarbonShot: Federal Policy Options for Carbon Removal in the United States. Working paper. *https://www.wri.org/research/carbonshot-federal-policy-options-carbon-removal-united-states*.
[414] C2ES. No date. Getting to Zero: A U.S. Climate Agenda — Center for Climate and Energy Solutions. *https://www.c2es.org/getting-to-zero-a-u-s-climate-agenda-report/*.
[415] IPCC. Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development. Chapter 2. *https://www.ipcc.ch/sr15/chapter/chapter-2/*. All analyzed pathways limiting warming to 1.5°C with no or limited overshoot use CDR to some extent to neutralize emissions from sources for which no mitigation measures have been identified and, in most cases, also to achieve net negative emissions to return global warming to 1.5°C following a peak (high confidence). The longer the delay in reducing CO_2 emissions toward zero, the larger the likelihood of exceeding 1.5°C, and the heavier the implied reliance on net negative emissions after mid-century to return warming to 1.5°C (high confidence).
[416] Congressional Research Service. 2021. Carbon Capture and Sequestration (CCS) in the United States. R44902. *https://crsreports.congress.gov/product/pdf/R/R44902?msclkid=e45e0012c25911ec8085ca575cb61e82*.

for those with limited decarbonization options. It has only been in the last few years that attention has seriously turned to mechanical CDR. As new information and modeling on climate change have been made available, the science has become clearer that avoiding the most catastrophic impacts of climate change requires both reducing emissions and deploying mechanical CDR.

California is paving a path forward on a science-based carbon management infrastructure policy that can serve as an example for other jurisdictions. The LCFS, which reduces the carbon intensity of transportation fuels, includes a protocol for select carbon management projects to become certified and generate LCFS credits.[417] CCS is not a new concept or technology. Twenty years of CCS testing show it is a safe and reliable tool.[418] As mentioned in Chapter 2, while no new CCS projects have been implemented or generated any credits under the CARB CCS protocol, CCS projects have been implemented elsewhere since the 1970s. Moreover, there has been a U.S. Department of Energy CCS research program underway for more than two decades. These all form a foundation of information for future efforts. Certified projects must successfully demonstrate adherence to rigorous pre-construction, operational, and site closure standards designed to strengthen environmental performance, as described in CARB's CCS Protocol. The protocol is designed to layer on top of existing federal carbon sequestration regulations designed to protect the environment. The protocol would need to be reevaluated if CCS were to be more broadly applied across sectors beyond transportation fuel production.

Direct air capture and carbon mineralization have high potential capacity for removing carbon, but direct air capture is currently limited by high cost. Carbon mineralization may also have high potential for removing carbon from the atmosphere, but understanding of the technology is still limited.[419] Direct air capture could also be deployed at higher rates to remove legacy GHG emissions from the atmosphere. Chapter 2 contains additional information on the current status of CCS and mechanical CDR projects globally, as well as federal support of such technologies.

Strategies for Achieving Success

- Implement SB 905.

---

[417] CARB. 2018. Carbon Capture and Sequestration Protocol under the Low Carbon Fuel Standard. August 13. *https://ww2.arb.ca.gov/sites/default/files/2020-03/CCS_Protocol_Under_LCFS_8-13-18_ada.pdf*.

[418] National Energy Technology Laboratory. Permanence and Safety of CCS. *https://netl.doe.gov/coal/carbon-storage/faqs/permanence-safety*.

[419] Aines, Roger. No date. Options for Removing CO_2 from California's Air. Lawrence Livermore National Laboratory. *https://ww2.arb.ca.gov/sites/default/files/2021-08/llnl_presentation_sp_engineeredcarbonremoval_august2021.pdf*.

- Convene a multi-agency Carbon Capture and Sequestration Group comprised of federal, state, and local agencies to engage with environmental justice advocates, tribes, academics, researchers, and community representatives to identify the current status, concerns, and outstanding questions concerning CCS, and develop a process to engage with communities to understand specific concerns and consider guardrails to ensure safe and effective deployment of CCS.[420]
- Iteratively update the CARB CCS Protocol with the best available science and implementation experience.
- Incorporate CCS into other sectors and programs beyond transportation where cost-effective and technologically feasible options are not currently available and to achieve the 85 percent reduction in anthropogenic sources below 1990 levels as called for in AB 1279.
- Evaluate and propose, as appropriate, financing mechanisms and incentives to address market barriers for CCS and CDR.
- Evaluate and propose, as appropriate, the role for CCS in cement decarbonization (SB 596) and as part of hydrogen production pathways (SB 1075).
- Support carbon management infrastructure projects through core CEC research, development, and demonstration (RD&D) programs.
- Continue to explore carbon capture applications for producing or leveraging zero-carbon power for reliability needs as part of SB 100.
- Consider carbon capture infrastructure when developing hydrogen roadmaps and strategy, especially for non-electrolysis hydrogen production.
- Evaluate and streamline permitting barriers to project implementation while protecting public health and the environment.
- Explore options for how local air quality benefits can be achieved when CCS is deployed.
- Explore opportunities for CCS and CDR developers to leverage existing infrastructure, including subsurface infrastructure.
- Explore permitting options to allow for scaling the number of sources at carbon sequestration hubs.

Short-Lived Climate Pollutants (Non-Combustion Gases)

Short-lived climate pollutants (SLCPs) include black carbon (soot), methane (CH_4), and fluorinated gases (F-gases, including hydrofluorocarbons [HFCs]). They are powerful climate forcers and harmful air pollutants that have an outsized impact on climate change

[420] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F4.9. finalejacrecs.pdf (arb.ca.gov).

in the near term, compared to longer-lived GHGs, such as CO_2. According to the IPCC's *Climate Change 2021: The Physical Science Basis,* in the near-term (i.e., 10- to 20-year time scale) the warming influence of all SLCPs combined will be at least as large as that of CO_2.[421] The United Nations Environment Programme's Global Methane Assessment[422] advises that achieving the least-cost pathways to limit warming to 1.5°C requires global methane emission reductions of 40–45 percent by 2030 alongside substantial simultaneous reductions of all climate forcers, including CO_2 and SLCPs. Action to reduce these powerful emissions sources today will provide immediate benefits—both to human health locally and to reduce warming globally—as the effects of our policies to transition to low carbon energy systems and achieve carbon neutrality further unfold.

In 2017, the Board approved the comprehensive Short-Lived Climate Pollutant Reduction Strategy (Strategy).[423] This strategy explained how the state would meet the following SB 1383-established targets:

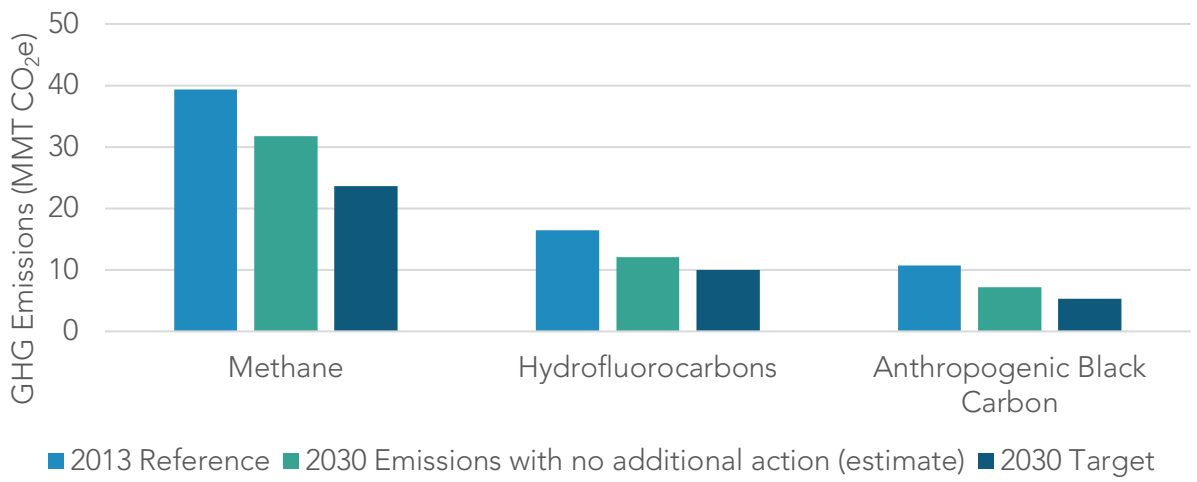
- 40 percent reduction in total methane emissions[424] (including a separate 40 percent reduction in dairy and livestock emissions)
- 40 percent reduction in hydrofluorocarbon gas emissions
- 50 percent reduction in anthropogenic black carbon emissions
- 50 percent reduction of organic waste disposal from 2014 levels by 2020, and 75 percent by 2025, including recovery of at least 20 percent of edible food for human consumption

The state is expected to achieve roughly half of the SB 1383 targeted emissions reductions by 2030 through strategies currently in place (See Figure 4-11). As directed by the Legislature under SB 1383, state agencies focused on voluntary, incentive-based mechanisms to reduce SLCP emissions in the early years of implementation to overcome technical and market barriers. Under this "carrot-then-stick" strategy, incentives are replaced with requirements as the solutions become increasingly feasible and cost-effective. To meet legislated targets, more aggressive action is needed.

---

[421] IPCC. 2021. *Climate Change 2021:The Physical Science Basis.* https://www.ipcc.ch/report/ar6/wg1/.
[422] United Nations. Global Methane Assessment. Summary for Policymakers. https://wedocs.unep.org/bitstream/handle/20.500.11822/35917/GMA_ES.pdf.
[423] CARB. 2017. Short-Lived Climate Pollution Reduction Strategy. https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf.
[424] All SB 1383 emissions reductions are mandated to be realized by 2030 and are relative to 2013 levels.

Figure 4-11: Expected progress toward SB 1383 targeted emissions reductions by 2030 through strategies currently in place



While the state's overall GHG emissions have declined by 9 percent over the past decade, SLCP emissions reductions have not kept pace with broader progress toward decarbonization. After growing steadily in the preceding decade, methane emissions have remained relatively flat since 2013.

HFCs are the fastest growing source of GHG emissions, primarily driven by their use to replace ozone-depleting substances and an increased demand for cooling and refrigeration.[425] Since 2005, statewide HFC emissions have more than doubled. While the rate of increase has slowed in recent years due to the state's measures, HFC emissions are still on the rise in California, and have grown by over 50 percent since 2010.[426] Globally, as temperatures rise, adoption of cooling technologies (and refrigerants) is increasing rapidly. If no measures are taken, it is estimated that HFCs will account for 9 to 19 percent of the total global GHG emissions by 2050.[427]

---

[425] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020: Trends of Emissions and Other Indicators.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.

[426] CARB. 2022. *California Greenhouse Gas Emissions for 2000 to 2020.* https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/2000-2020_ghg_inventory_trends.pdf.

[427] Velders, G. J., D. W. Fahey, J. S. Daniel, M. McFarland, and S. O. Andersen. 2009. "The large contribution of projected HFC emissions to future climate forcing." *Proceedings of the National Academy of Sciences* 106(27), 10949–10954.

Methane

Human sources of methane emissions are estimated to be responsible for up to 25 percent of current warming.[428] Fortunately, methane's short atmospheric lifetime of ~12 years[429] means that emissions reductions will rapidly reduce concentrations in the atmosphere, slowing the pace of temperature rise in this decade. Further, a substantial portion of the targeted reductions can be achieved at low cost and will provide significant human health benefits. For example, the UN's *Global Methane Assessment* (2021)[430] found that over half of the available targeted measures have mitigation costs below $21/MTCO$_2$e, and that each million metric tons of methane reduced would prevent 1,430 premature deaths annually due to ozone pollution caused by methane.

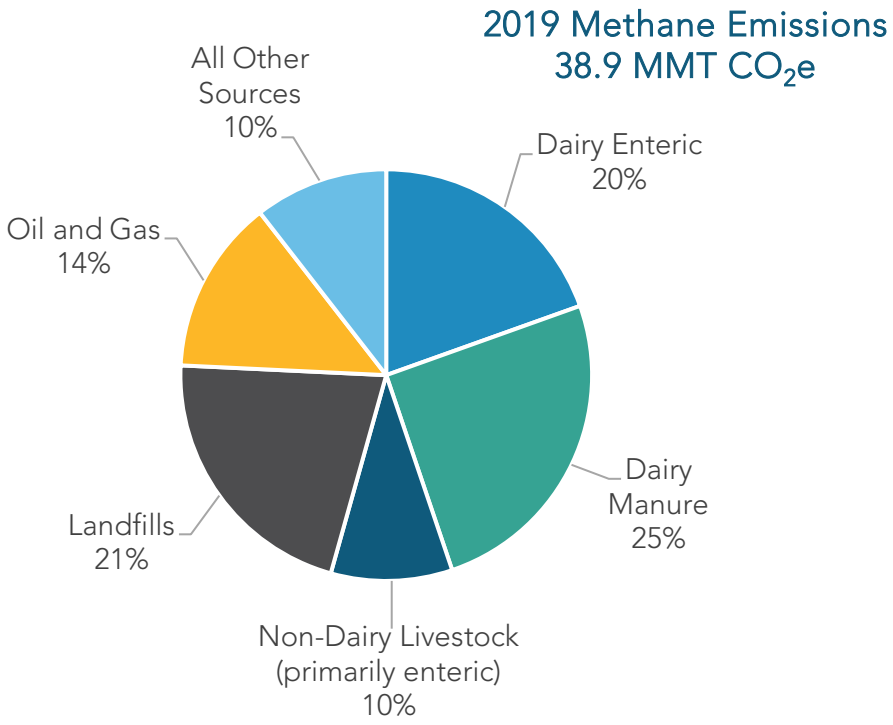
Following the Twenty Sixth Conference of Parties (COP26) (the United Nations Convention on Climate Change in 2021), over 110 nations have signed onto the Global Methane Pledge (Pledge)[431] to limit methane emissions by 30 percent relative to 2020 levels. The Pledge covers countries that emit nearly half of all methane and make up 70 percent of global GDP. The UN's Global Methane Assessment[432] shows that human-caused methane emissions can be reduced by up to 45 percent this decade, which would avoid nearly 0.3°C of global warming by 2045.

As shown in Figure 4-12, the three largest sources of California's methane emissions are the dairy and livestock industry, landfills, and oil and gas systems.

---

[428] IPCC. 2021. *Climate Change 2021:The Physical Science Basis.* https://www.ipcc.ch/report/ar6/wg1/.
[429] In contrast, the lifetime of CO_2 is hundreds of years. The IPCC Third Assessment Report concluded that no single lifetime can be defined for CO_2 because of the different rates of uptake by different removal processes. According to IPCC Fourth Assessment Report, the majority of an increase in CO_2 will be removed from the atmosphere within decades to a few centuries, while the remaining 20 percent may stay in the atmosphere for many thousands of years.
[430] United Nations. 2021. Global Methane Assessment. https://wedocs.unep.org/bitstream/handle/20.500.11822/35917/GMA_ES.pdf.
[431] Global Methane Pledge. https://www.globalmethanepledge.org/.
[432] United Nations Environment Programme. 2021. Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions. https://www.unep.org/resources/report/global-methane-assessment-benefits-and-costs-mitigating-methane-emissions?msclkid=00661370c85811eca078eb8fdbd603d1.

Figure 4-12: Sources of California methane emissions (2019)



Emissions from dairy and livestock operations come from two main sources: (1) enteric fermentation and (2) manure management operations, especially at dairies that employ open anaerobic lagoons that allow methane to escape into the atmosphere. Landfills, the second largest source of methane emissions, produce methane from the decomposition of organic waste. Although approximately 95 percent of all the waste that has been disposed of in the state has been deposited in a landfill that is equipped with a gas collection and control system, as required by California's Landfill Methane Regulation,[433] a portion of the methane still escapes into the atmosphere. Fugitive methane emissions can be intermittent and highly variable, both seasonally and spatially, particularly at landfills. Research has shown that landfills are complex systems and a wide range of conditions (e.g., atmospheric, operational, biological, chemical, and physical) may contribute to variability in rates of organic waste degradation, methane generation, and capture efficiency, so reducing the amount of organics deposited in landfills is critical to reducing overall landfill methane emissions. And despite the variability in individual landfill emissions, landfill gas collection and control systems remain the most effective strategy

[433] CARB. Landfill Methane Regulation. https://ww2.arb.ca.gov/our-work/programs/landfill-methane-regulation.

for reducing methane emissions from waste once it is placed in a landfill. Non-combustion methane emissions from the oil and gas sector are the third largest source of methane emissions in California. Almost three-quarters of the methane emissions from this sector come from leaks and venting from fossil gas transmission and distribution pipelines and equipment.

Hydrofluorocarbons

HFCs are synthetic GHGs that are powerful climate forcers. They are used mainly as refrigerants or heat transfer fluids in refrigeration, space conditioning, and heat pump equipment. Refrigerants are ubiquitous and are used everywhere from supermarkets, convenience stores, cold storage warehouses and wineries, to vending machines and residential and motor vehicle air-conditioners. Additionally, HFCs are also used as foam-blowing agents, solvents, aerosol-propellants, and fire suppressants. While HFCs remain in the atmosphere for a much shorter time than CO_2, the relative global warming potential (GWP) values of HFCs can be hundreds to thousands of times greater than CO_2. The mix of HFCs currently in use in California, weighted by usage (tonnage), have an average 100-year GWP of 1,700.[434] The average atmospheric lifetime of the mix of HFCs in use is 15 years.[435] Given the short average lifetimes, rapid reductions in HFC emissions can translate into near-term reductions in climate change effects.

As the global temperatures increase, the demand for cooling and refrigerants will continue to grow, as will the use of electric heat pumps to replace conventional fossil gas heating options. Unless addressed, continued use of high-GWP HFCs will perpetuate a feedback loop, where the cooling agents themselves cause additional warming.

In 2016, representatives from 197 nations signed the Kigali Amendment, which amended the existing Montreal Protocol (to reduce ozone-depleting substance production and consumption) to include a global phasedown in the production and consumption of HFCs beginning in 2019.[436] As of September 2022, 137 nations have either accepted, approved, or ratified the Kigali Amendment. On September 21, 2022, the U.S. Senate approved ratification of the Kigali Amendment, and it is expected that the United States

---

[434] CARB. 2020. *Initial Statement of Reasons: Public Hearing to Consider the Proposed Amendments to the Prohibitions on Use of Certain Hydrofluorocarbons in Stationary Refrigeration, Chillers, Aerosols-Propellants, and Foam End-Uses Regulation.* October 20. https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/hfc2020/isor.pdf?_ga=2.164659835.592460318.1646664679-912670513.1542398285.

[435] Zhongming, Z., et al. 2011. *HFCs: A Critical Link in Protecting Climate and the Ozone Layer: A UNEP Synthesis Report.*

[436] United Nations Treaty Collection. Chapter XXVII, Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer. https://treaties.un.org/Pages/ViewDetails.aspx?src=IND&mtdsg_no=XXVII-2-f&chapter=27&clang=_en.

will soon join the 137 nations that have already ratified.[437] In the United States, Congress enacted the federal *American Innovation and Manufacturing (AIM) Act* in December 2020.[438] The AIM Act authorizes the U.S. EPA to address HFCs in several ways, including a national HFC phasedown that nearly mirrors the schedule of the global phasedown under the Kigali amendment.[439]

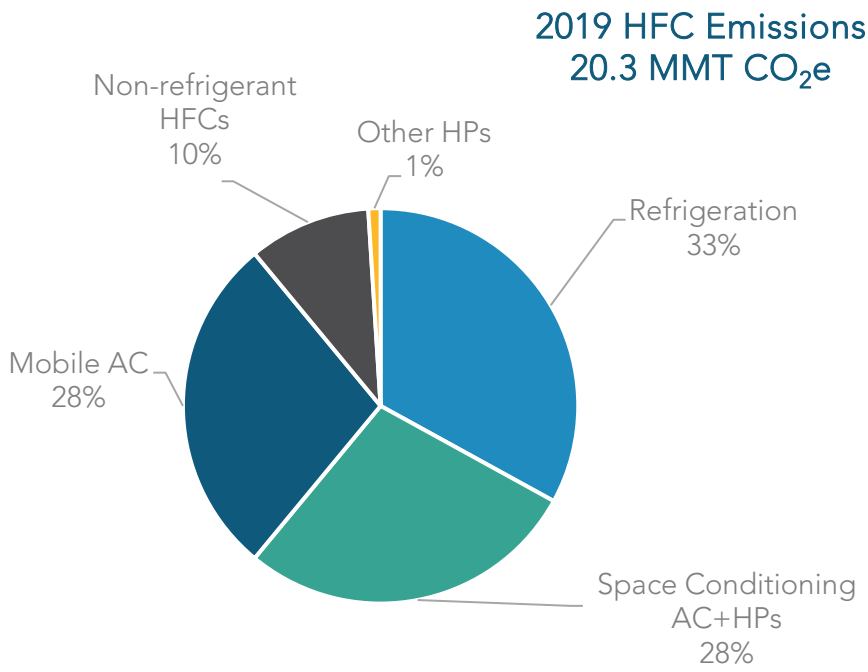
Nearly 90 percent of HFC emissions in California come from their use as refrigerants in the commercial, industrial, residential, and transportation sectors. The timescales over which the HFC emissions occur vary, depending on the type of application. Thus, strategies to reduce HFC emissions must be tailored by equipment type. CARB has several measures in place to tackle HFC emissions from the various sources shown in Figure 4-13 below. This includes the Refrigerant Management Program[440] that tracks and manages emissions from large commercial, industrial, and cold storage refrigeration facilities in the state. CARB has adopted regulations to reduce HFC emissions from consumer product aerosol propellants, semiconductor manufacturing, and small cans of automotive refrigerant.[441]

In 2018, California adopted HFC prohibitions via regulation and legislation for several sectors, including stationary refrigeration and foam end uses to backstop the partially vacated federal Significant New Alternatives Policy (SNAP) program.[442] Most recently, in 2020, CARB adopted additional measures that place GWP limits on refrigerants used in refrigeration and air conditioning equipment, which are the largest sources of HFC emissions, and are commonly used in residential, commercial, and industrial buildings. Additionally, CARB adopted a unique pilot program requiring the use of reclaimed refrigerant: the Refrigerant Recovery, Reclaim, and Reuse (R4) Program. The newly adopted HFC rules for the refrigeration and air conditioning sectors are the first of their kind in the nation.

---

[437] U.S. Ratification of the Kigali Amendment - United States Department of State. *https://www.state.gov/u-s-ratification-of-the-kigali-amendment/*.
[438] 42 U.S.C § 7675, Pub. L. 116-260, § 103. *https://www.epa.gov/sites/default/files/2021-03/documents/aim_act_section_103_of_h.r._133_consolidated_appropriations_act_2021.pdf*.
[439] 42 U.S.C § 7675, Pub. L. 116-260, § 103.
[440] Cal. Code of Regs., tit. 17, §§ 95380, et seq.
[441] Contained in various sections, commencing with Cal. Code of Regs., tit. 13, §§ 1900 et seq.
[442] Cal. Code of Regs., tit. 17, §§ 95371, et seq.; California Cooling Act, Senate Bill 1013 (Lara, Stats. of 2018, Ch. 375, Health & Saf. Code § 39764).

Figure 4-13: Sources of hydrofluorocarbon (HFC) emissions (2019)

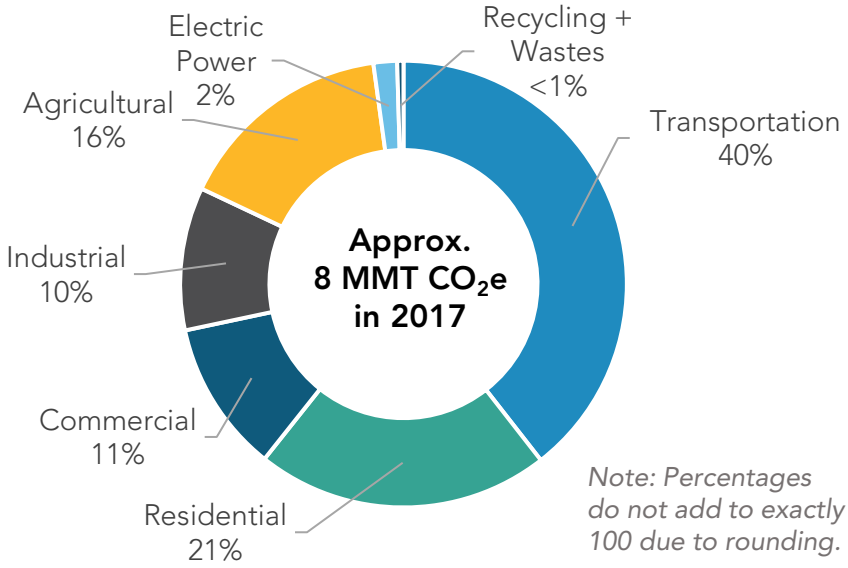


Anthropogenic Black Carbon

Black carbon is not included in AB 32 or the state's AB 32 GHG inventory that tracks progress toward the state's climate targets; however, it has been identified as a powerful climate forcer and is included California's Short-Lived Climate Pollutant Reduction Strategy. The majority of anthropogenic black carbon emissions come from transportation, specifically heavy-duty vehicles, and they have decreased since 2013 due to engine certification standards and in-use rules for on-road and off-road fleets, along with clean fuel requirements and incentives, including California Climate Investments and LCFS credits. Additionally, fuel combustion for residential, commercial, and industrial applications contribute significantly to overall black carbon emissions. Approximately 95 percent of residential black carbon emissions are due to wood combustion; these emissions are being reduced through programs like the Woodsmoke Reduction Program established by SB 563 (Lara, Chapter 671, Statutes of 2017). Alternatives to agricultural burning and policies that phase out agricultural burning will also result in agricultural black carbon emissions reductions. In 2021 CARB provided a preliminary estimate of 2017

black carbon emissions (Figure 4-14).[443] This estimate will be finalized as part of a future update to the Short-Lived Climate Pollutant Inventory.

Figure 4-14: Sources of anthropogenic black carbon (preliminary 2017 estimates; AR5 100-yr GWP 900)



Sector Transition

California has long recognized the importance of mitigating non-combustion SLCPs and took several early action measures as part of a comprehensive, ongoing program to reduce in-state GHG emissions under AB 32. The early action measures included CARB's Landfill Methane Regulation,[444] Refrigerant Management Program,[445] and Oil and Gas Methane Regulation.[446]

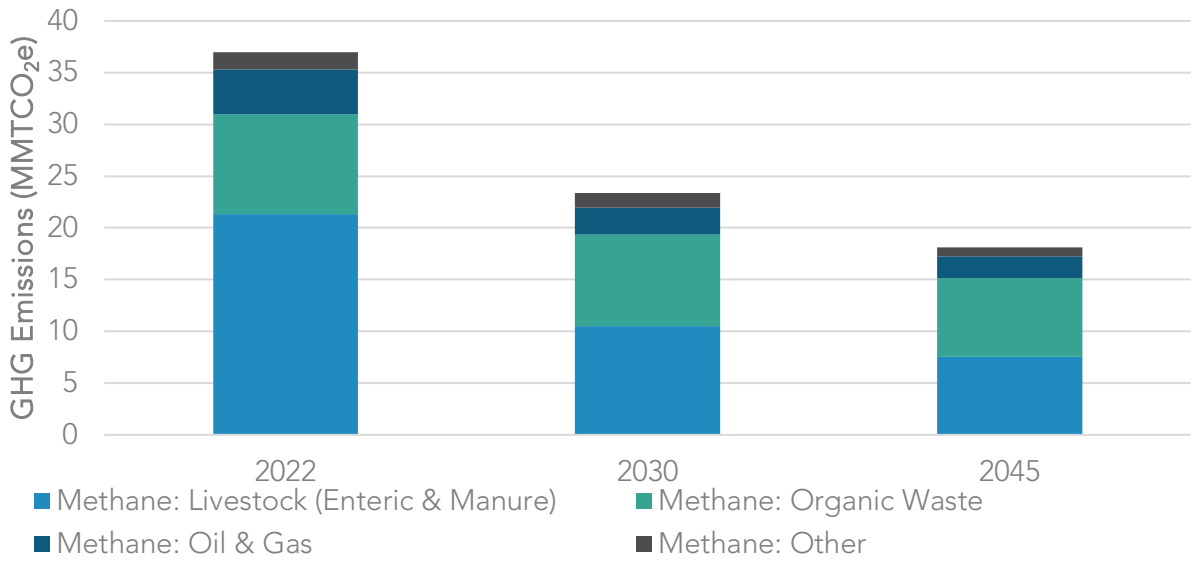
Methane

The methane abatement strategies currently in place are projected to achieve half of the methane emissions needed to meet the overall methane reduction target of SB 1383 (40 percent reduction by 2030). The reduction target translates to a limit of less than 24 MMTCO_2e in 2030 (Figure 4-15). It is anticipated that, since some sectors have fewer

[443] CARB. 2021. 2022 Scoping Plan Update – Short-Lived Climate Pollutants Workshop Presentation, September 8. https://ww2.arb.ca.gov/sites/default/files/2021-09/carb_presentation_sp_slcp_september2021_1.pdf.
[444] Cal. Code of Regs., tit. 17, §§ 95460, et seq.
[445] Cal. Code of Regs., tit. 17, §§ 95380, et seq.
[446] Cal. Code of Regs., tit. 17, §§ 95665–77.

strategies that can be implemented to reduce methane in the near-term, other sectors will need to go beyond the 40 percent reduction to meet the target.

Figure 4-15: Methane emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario[447]



Dairy and Livestock Methane

California is the largest dairy-producing state, home to one in five U.S. dairy cows. To date, methane emissions reductions from the dairy and livestock sector have mainly been driven by a decreasing animal population and the growing adoption of manure management strategies, including anaerobic digesters and conversion to dry manure systems and pasture systems. CARB recently completed a detailed analysis of the emission reductions expected by 2030 and the estimated additional investment needed to reach the dairy and livestock sector methane reduction target. [448]

Assuming no adoption of additional manure management and enteric mitigations strategies beyond the projects that have committed funding, and a continued annual animal population decrease of 0.5 percent per year through 2030, further reductions of approximately 4.4 $MMTCO_2e$ will be needed to achieve the 2030 methane emissions reduction target for the sector set by SB 1383. If the remaining reductions are met through

[447] The *Organic Waste* category includes methane from landfills, wastewater treatment, and compost facilities.
[448] CARB. 2021. Analysis of Progress toward Achieving the 2030 Dairy and Livestock Sector Methane Emissions Target. June. *https://ww2.arb.ca.gov/sites/default/files/2021-06/draft-2030-dairy-livestock-ch4-analysis.pdf*.

a mix of dairy projects in which half are dairy digesters and half are alternative manure management projects, then it is estimated that at least 420 additional projects will be necessary. Additional emissions reductions beyond this level will likely be necessary to ensure that the overall state methane emissions reduction targets are met.

Despite the considerable methane emissions mitigation potential of enteric strategies like feed additives, little progress has been made, as few products with proven mitigation potential have become commercially available, and unlike manure management strategies, there is a lack of financial incentives for their adoption.

Market conditions favoring farm consolidation and improved production efficiencies have driven reductions in the California and U.S. dairy population over the past decade. [449] These efficiency gains have allowed California to maintain production levels despite the decreasing population. If demand for dairy and beef products remains steady or increases, continued improvements in production efficiency and adoption of effective manure management and enteric mitigation strategies will be important to support dairy and livestock methane emission reductions.

Strategies for Achieving Success

- Install state of the art anaerobic digesters that maximize air and water quality protection, maximize biomethane capture, and direct biomethane to sectors that are hard to decarbonize or as a feedstock for energy.
- Increase alternative manure management projects, including but not limited to conversion to "solid," "dry," or "scrape" manure management; installation of a compost-bedded pack barn; an increase in the time animals spend on pasture; and implementation of solid-liquid separation technology into flush manure management systems.
- Implement enteric fermentation strategies that are cost-effective, scientifically proven, safe for animal and human health, and acceptable to consumers, and that do not impact animal productivity. Provide financial incentives for these strategies as needed.
- Accelerate demand for dairy and livestock product substitutes such as plant-based or cell-cultured dairy and livestock products to achieve reductions in animal populations.
- In consideration of pace of deployment of methane mitigation strategies and the scale of complimentary incentives, consider regulation development to ensure that the 2030 target is achieved, assuming the conditions outlined in SB 1383 are met.

[449] MacDonald, James M., Jonathan Law, and Roberto Mosheim. 2020. *Consolidation in U.S. Dairy Farming.* ERR-274. July. https://www.ers.usda.gov/webdocs/publications/98901/err-274.pdf.

Landfill Methane

Achieving the 75 percent organic waste disposal reduction target[450] of SB 1383, and maintaining that level of disposal in subsequent years, would bring annual landfill emissions in 2030 to just below the 2013 baseline. Annual methane emissions will be higher through 2030 than originally anticipated by the SLCP Strategy because the state did not achieve the anticipated reductions in organic waste disposal of 50 percent below 2014 levels by 2020. SB 1383 prohibited the organic disposal regulations from taking effect until 2022,[451] and, as a result, emissions have continued to increase.

Due to the multidecadal time frame required to break down landfilled organic material, the emissions reductions from diverting organic material in one year are realized over the course of several decades. For example, one year of waste diversion in 2030 is expected to avoid 8 $MMTCO_2e$ of landfill emissions, cumulatively, over the lifetime of that waste's decomposition.[452] Near-term diversion efforts are critical to avoid locking in future landfill methane emissions.

CalRecycle's 2020 report, *Analysis of the Progress Toward the SB 1383 Waste Reduction Goals,*[453] estimated that 8 million short tons of composting and anerobic digestion capacity will be needed to manage organic wastes, above the existing and new capacity expected to be available by 2025. The 2019 report, *Co-Digestion Capacity in California,*[454] from the State Water Resources Control Board estimated that at least 2.4 million tons of digester capacity is available at urban wastewater treatment plants if sufficient incentives or funding for collection, receiving, and processing operations are provided to enable utilization of this capacity. The CPUC approved a decision in February 2022 implementing the biomethane procurement program, which will require investor-owned utilities by 2025 to procure 17.6 billion cubic feet (BCF) of biomethane produced from organic wastes to support the landfill disposal reduction and SLCP target and reduce fossil gas reliance for

---

[450] The target is from 2014 levels by 2025.
Public Resources Code, § 42652.5. CalRecycle approved the SLCP: Organic Waste Reductions regulations (*https://calrecycle.ca.gov/organics/slcp/*) in 2020 and began implementing them in January 2022. These regulations are designed to achieve the 2025 disposal reduction and edible food recovery targets.

[452] The life cycle emissions reduction is based on anticipated diversion of 27 million short tons of organic waste from CalRecycle (2020) Analysis of the Progress Toward the SB 1383 Organic Waste Reduction Goals (*https://www2.calrecycle.ca.gov/Publications/Details/1693*). Under CalRecycle's SLCP regulations, an alternative to landfill disposal must achieve a life cycle GHG reduction of 0.3 $MTCO_2e$ per short ton of waste diverted.

[453] CalRecycle. 2020. *Analysis of the Progress Toward the SB 1383 Waste Reduction Goals.* *https://www2.calrecycle.ca.gov/Publications/Details/1693*.

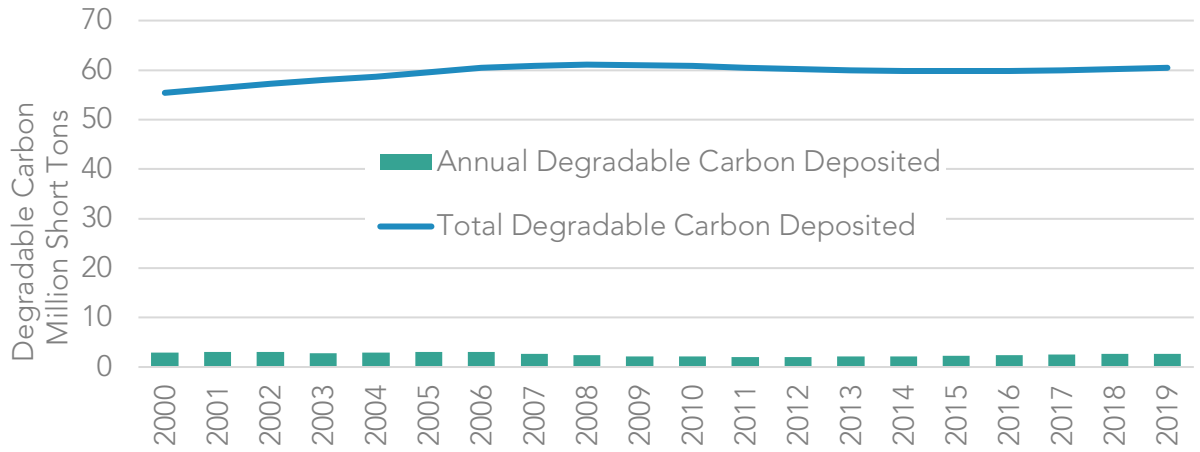
[454] State Water Resources Control Board. 2019. *Co-Digestion Capacity in California.* *https://www.waterboards.ca.gov/water_issues/programs/climate/docs/co_digestion/final_co_digestion_capacity_in_california_report_only.pdf*.

residential and commercial customers.[455] Additionally, the organic waste stream includes more than one million tons of edible food that could be recovered before it enters the waste stream through food rescue programs that combat hunger in communities throughout California.

While reducing organic waste disposal is the most effective means of achieving reductions in waste sector methane, strategies to reduce emissions from waste already in place in landfills also will play a role in achieving near-term reductions. As Figure 4-16 shows, the total degradable carbon (a measure of the amount of waste with potential to generate methane) that is accumulated from waste deposited in previous years is over 20 times greater than the amount added each year. This illustrates that even if we were able to entirely phase out landfilling of organic waste today, the existing waste in place at landfills would continue to generate methane for decades into the future.

Through a combination of improvements in operational practices, use of lower permeability covers, advanced landfill gas collection systems, and increased monitoring to detect and repair leaks, it is estimated that a direct emission reduction of 10 percent is achievable across the state's landfills by 2030. Technologies to utilize landfill gas efficiently can contribute further emission reductions in the energy sector.

Figure 4-16: Degradable carbon deposited in landfills



Strategies for Achieving Success

- Maximize existing infrastructure and expand it to reduce landfill disposal, with strategies including composting, anaerobic digestion, co-digestion at wastewater treatment plants, and other non-combustion conversion technologies.

[455] CPUC. 2022. Decision 22-02-025.

- Expand markets for products made from organic waste, including through recognition of the co-benefits of compost, biochar, and other products.[456]
- Recover edible food to combat food insecurity.
- Invest in the infrastructure needed to support growth in organic recycling capacity.
- Utilize existing digesters at wastewater treatment facilities to rapidly expand food waste digestion capacity.
- Direct biomethane captured from landfills and organic waste digesters to sectors that are hard to decarbonize.
- Implement improved technologies and best management practices at composting and digestion operations.
- Reduce emissions from landfills through improvements in operational practices, lower permeability covers, advanced collection systems, and technologies to utilize landfill gas.
- Leverage advances in remote sensing capabilities to quickly pinpoint large methane sources and mitigate leaks, improve understanding of the factors that lead to better capture efficiency, and explore new technologies and practices that can reliably improve methane control at landfills.

Upstream Oil and Gas Methane Reduction

For oil and gas production, processing, and storage, California is currently on track to achieve a 41 percent reduction in methane emissions by 2025 relative to 2013. The additional reductions needed to meet the 2030 target may be achieved by implementing additional regulatory requirements to further reduce intentional venting of fossil gas from equipment. If necessary, additional reductions from transmission and distribution facilities may be achieved by requiring the utilities to increase inspection and repair activities or further reduce emissions from pipeline blowdowns by implementing methods such as using portable compressors, using plugs to isolate sections of pipelines, flaring vented gas, routing gas to fuel gas systems, and installing static seals on compressor rods. Advances in methane detection technologies (e.g., satellites equipped to detect large methane sources) may also help to identify and mitigate methane emissions quickly across the oil and gas sector.

As California transitions away from fossil fuels, in-state oil and gas production will likely decline. This could result in an increase over time in the number of long-term idle and orphan wells (idle wells lacking a financially solvent, responsible owner) in the state. While California has regulations aimed at helping ensure operators manage their idle wells,

[456] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F4.4. finalejacrecs.pdf (arb.ca.gov).

there could likely be an increase in California's orphan well population. Plugging all orphan wells, of which there are currently over 5,000, could take decades due to the limited resources California has for orphan well plugging. The benefits from plugging wells include methane emission reductions and job creation; employment gains from well plugging and site remediation activities could help temporarily offset job losses from the oil and gas industry. The California Council on Science and Technology's 2018 report on orphan wells, *Orphan Wells in California: An Initial Assessment of the State's Potential Liabilities to Plug and Decommission Orphan Oil and Gas Wells,*[457] found that the potential cost to the state of plugging current orphan wells could be approximately $500 million, and the cost of plugging all active and idle wells could total over $9.1 billion. As oil and gas production in California declines due to reduced demand for fossil fuels, additional funding will likely be needed to cover the costs of plugging wells that have no viable operator.

Strategies for Achieving Success

- Mitigate emissions from leaks by regular leak detection and repair (LDAR) surveys at all facilities.
- Replace high emitting equipment with zero emission alternatives wherever feasible.[458]
- Have CARB and CalGEM lead a Task Force to identify and address methane leaks from oil infrastructure near communities.
- Pursuant to SB 1137, develop leak detection and repair plans for facilities in health protection zones, implement emission detection system standards, and provide public access to emissions data.
- Minimize emissions from equipment that must vent fossil gas by design (e.g., fossil gas powered compressors).
- Install vapor collection systems on high emitting equipment.
- Phase out venting and routine flaring of associated gas (gas produced as a by-product during oil production).
- Continuous ambient monitoring at fossil gas underground storage facilities to quickly detect large methane sources.
- Reduce pipeline and compressor blowdown emissions.

---

[457] The California Council on Science and Technology. 2018. *Orphan Wells in California: An Initial Assessment of the State's Potential Liabilities to Plug and Decommission Orphan Oil and Gas Wells.* *https://ccst.us/wp-content/uploads/CCST-Orphan-Wells-in-California-An-Initial-Assessment.pdf*.

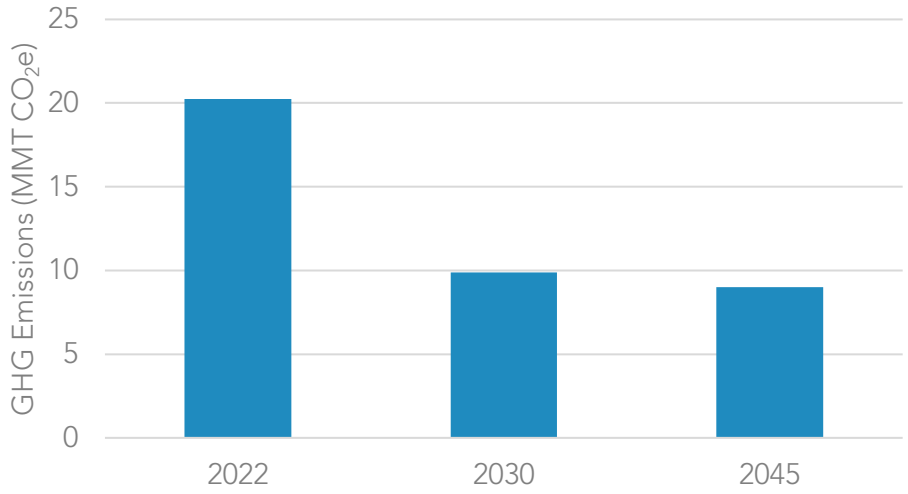
[458] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, P5. *finalejacrecs.pdf (arb.ca.gov)*.

- Leverage advances in remote sensing capabilities to quickly pinpoint large methane sources and mitigate leaks.[459]

Hydrofluorocarbons

In California, all the HFC measures currently in place will help achieve more than 70 percent of the reductions needed to achieve the 2030 HFC goal and provide very significant emissions reductions by 2045 and beyond. However, new targeted measures will be needed to maintain the pace of reductions, as demand for technologies that currently predominantly use high-GWP refrigerants is anticipated to grow. Despite decarbonization efforts, high-GWP HFCs are expected to be among the last remaining persistent GHG emission sources, as shown in Figure 4-17.[460]

Figure 4-17: Hydrofluorocarbon emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario



HFC emissions from new and existing sources should be addressed in tandem with building decarbonization efforts to maximize reductions.[461] As buildings are electrified in an effort to decarbonize them, the use of heat pumps for space conditioning, water heaters, and clothes dryers is expected to increase significantly. Heat pumps, while using

[459] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, CC17. finalejacrecs.pdf (arb.ca.gov).
[460] Energy and Environmental Economics, Inc. 2020. *Achieving Carbon Neutrality.* https://ww2.arb.ca.gov/sites/default/files/2020-10/e3_cn_final_report_oct2020_0.pdf.
[461] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF26. finalejacrecs.pdf (arb.ca.gov).

electricity, not fossil gas, currently rely predominantly on high-GWP refrigerants. Very low- or no-GWP technologies and solutions are either available or emerging for various heat pump technologies, and likely to develop further as international efforts to mitigate HFCs continue. However, most of these technologies are still nascent in the United States. In addition, some of the alternatives cannot be used until California building codes are updated, which is currently expected at the earliest in mid-2024 for some technologies based on the recently adopted provisions in AB 209[462] requiring the California Building Standards Commission to adopt the latest safety standards for refrigerant containing equipment into California's building codes. The current updates to the building codes will allow the use of many refrigerants with lower GWPs than HFCs currently in use. However, additional building code updates are needed to expand the choices of ultra-low-GWP alternatives, and that will need to happen in the next few years. The adoption of low-GWP refrigerants must occur in parallel with building decarbonization efforts; without such efforts, the vast GHG benefits of the latter will be partially offset, and the proportion of HFC emissions from buildings will continue to grow.

Leaks from existing air conditioning and refrigeration equipment are a major source of statewide and global HFC emissions. Once installed, refrigeration and air conditioning equipment can stay in place for decades, while leaking refrigerants into the atmosphere. This makes it very important that new installed equipment use refrigerants with a GWP as low as possible. The refrigerants inside existing equipment are sometimes collectively referred to as the *installed base* or *banks* of potential HFC emissions. If released spontaneously, the existing HFC banks would equal 60 percent of all annual statewide GHG emissions in California, as illustrated in Figure 4-18.[463]

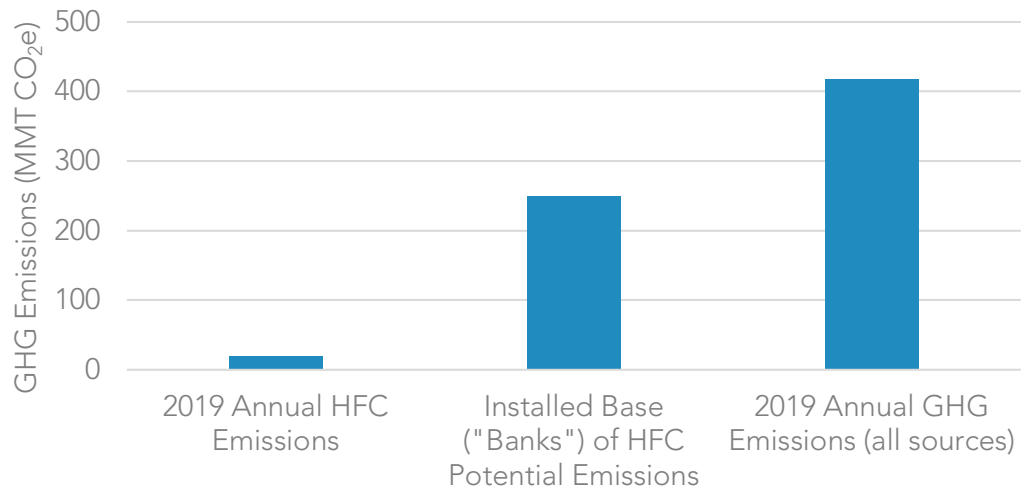
The sales prohibitions on newly produced refrigerants set forth in SB 1206 (2022) and the national/international HFC phasedown will help in reducing HFC emissions from existing equipment by restricting the supply of and increasing the value of existing high-GWP HFCs, thus enabling a circular economy. In the 2022–2023 state budget, CARB received $45 million in incentive funding for climate-friendly refrigerant technologies; this funding will be critical in shifting the market toward the best available refrigerant technologies in various sectors.

---

[462] AB 209: Energy and climate change. *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220AB209.*

[463] CARB. 2021. 2022 Scoping Plan Update – Short-Lived Climate Pollutants Workshop Presentation. September 8. *https://ww2.arb.ca.gov/sites/default/files/2021-09/carb_presentation_sp_slcp_september2021_1.pdf*.

Figure 4-18: Potential emissions from refrigerants in existing equipment



Strategies for Achieving Success

- Expand the use of very low- or no-GWP technologies in all HFC end-use sectors, including emerging sectors, like heat pumps for applications other than space conditioning, to maximize the benefits of building decarbonization.[464]
- Convert large HFC emitters such as existing refrigeration systems to the lowest practical GWP technologies.[465]
- Prioritize small-scale and independent grocers serving priority populations in addressing existing "banks" of high-GWP refrigerants.[466]
- Improve recovery, reclamation, and reuse of refrigerants by limiting sales of new or virgin high-GWP refrigerants and requiring the use of reclaimed refrigerants where appropriate.[467]
- Assist low-income and disadvantaged communities in obtaining low-GWP space conditioning units to protect vulnerable communities from heat stress and wildfire smoke.[468]

[464] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF26. finalejacrecs.pdf (arb.ca.gov).
[465] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF22. finalejacrecs.pdf (arb.ca.gov).
[466] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, JT5 and JT6. finalejacrecs.pdf (arb.ca.gov).
[467] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, JT1. finalejacrecs.pdf (arb.ca.gov).
[468] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, NF28, JT5, and JT6. finalejacrecs.pdf (arb.ca.gov).

- Accelerate technology transitions in California and the U.S. overall by collaborating with international partners committed to taking action on HFCs under the Kigali Amendment to the Montreal Protocol; this includes addressing barriers to adoption of very low- or no-GWP refrigerant technologies such as high upfront costs, shortage of trained technicians, and lag in updating safety standards and building codes.

Anthropogenic Black Carbon

Significant progress has been made since 2013 to reduce anthropogenic black carbon emissions, primarily from decreased combustion of distillate fuels in the agricultural sector, as well as improvements to provide cleaner, on-road combustion technologies. Under current strategies, anthropogenic black carbon from transportation is expected to be reduced by over 60 percent in 2030. Continued reductions in combustion emissions across all sectors from both the state's climate and air quality programs will also help reduce anthropogenic black carbon emissions going forward.

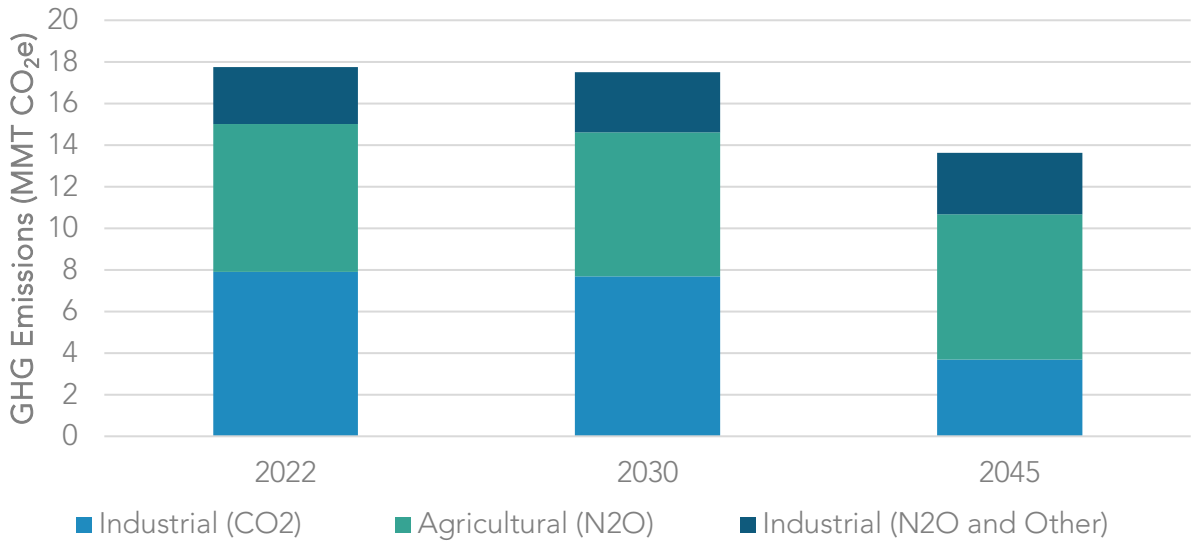
Strategies for Achieving Success

- Reduce fuel combustion commensurate with state's climate and air quality programs, particularly from reductions in transportation emissions and agricultural equipment emissions.[469]
- Invest in residential woodsmoke reduction.

In addition to SLCP emissions, some remaining non-combustion emissions are anticipated to persist in the coming decades, as shown in Figure 4-19. These include CO_2 from industrial processes such as cement manufacturing, oil and gas extraction, and geothermal electric power; N_2O from wastewater treatment, fertilizers, and livestock manure applied to agricultural soils; and other industrial, non-HFC GHG emissions.

[469] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, F1A and Appendix A (Table Summary of Direct Emission Reduction Strategies). "Emissions reductions from energy consumed by California's agricultural sector, including post-harvest processing, use of tractors and other farm equipment, and water import and irrigation." finalejacrecs.pdf (arb.ca.gov).

Figure 4-19: Remaining non-combustion emissions in 2022, 2030, and 2045 in the Scoping Plan Scenario



Natural and Working Lands

California's natural and working lands (NWL) cover approximately 90 percent of the state's 105 million acres,[470] and include forests, grasslands, shrublands and chaparral, croplands, wetlands, sparsely vegetated lands, and the green spaces in urban and built environments. These lands include California Native American tribes' ancestral and cultural lands, parks and green spaces in our cities and communities, and the waters and the iconic landscapes we know and love. The diverse landscapes and biodiversity found throughout California's NWL provide a multitude of benefits to the people of California, including clean water, clean air, biodiversity, food, economic prosperity, recreational opportunities, continuation of traditional tribal ways of life, mental health benefits, and many others.

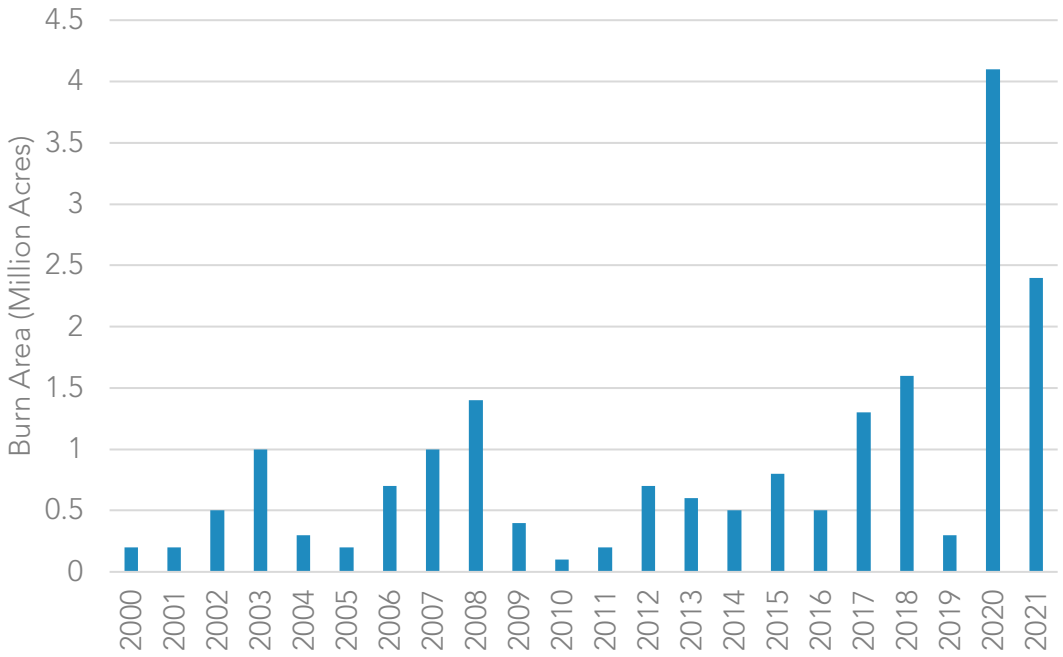
Our lands are a critical sector in California's fight to achieve carbon neutrality and build resilience to the impacts of climate change. Healthy land can sequester and store atmospheric CO_2. Healthy lands also can reduce emissions of powerful SLCPs, limit the release of future GHG emissions, protect people and nature from the impacts of climate change, and build our resilience to future climate risks. Creation of healthy lands through

[470] CNRA. 2022. Natural and Working Lands Climate Smart Strategy. *https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/CNRA-Report-2022---Final_Accessible_Compressed.pdf*.

multi-benefit and mitigation measures can also support tribal and local traditional lifeways. Unhealthy lands have the opposite effect—they release more GHGs than they store and are more vulnerable to future climate change impacts.

Climate change impacts have become more apparent in recent years and are having significant effects on communities throughout the state. One of these impacts is the much more frequent occurrence of unusually large, high-severity wildfires, which are being driven by climate change and by a recent history of fire-exclusion and land management practices that have resulted in forests with high levels of biomass. These recent large and high-severity wildfires have resulted in a significant amount of burned acreage and emissions in California (Figure 4-20).[471]

Figure 4-20: Acreage of burned wildland vegetation area



These wildfires deviate from the lower-severity fires that previously occurred at frequent intervals, around which California's forests evolved. As climate change accelerates, these large, uncharacteristic wildfires are likely to become more common and impact more of our landscapes. Climate change is also expected to have other significant effects on our lands, including more extreme droughts, floods, extreme heat, and the spread of invasive aquatic and terrestrial species, pests, diseases, and parasites. These impacts can lead

[471] CARB. 2022. Wildfire Emission Estimates for 2021. https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/Wildfire%20Emission%20Estimates%202000-2021.pdf.

to negative feedback loops on human and ecological health; for example, increasing the spread of invasive species can lead to increases in pesticide use, if not managed through regulation or mitigation, which can pose risks to human health and the environment.

California's approach to climate action in the NWL sector is not solely focused on maximizing carbon stocks but instead on supporting carbon management that holistically fosters ecosystem health, resilience, provision of overall climate function, and other co-benefits.

Natural systems operate on a longer timescale than the energy and industrial sectors, and benefits from climate action on our lands can take decades to accrue. Scaling climate smart land management in California requires taking action now and playing the "long game" by establishing and maintaining consistent, patient approaches and programs.

Landscapes

For the first time, this Scoping Plan includes modeling for the NWL sector. The focus of the initial modeling is limited to seven land types that align with the those in the NWL Climate Smart Strategy.[472] Work will continue to incorporate more landscapes and management practices into the modeling over time. The initial landscapes included in the modeling for this Scoping Plan are:

- Forests
- Shrublands and Chapparal
- Grasslands
- Croplands
- Wetlands
- Developed Lands
- Sparsely Vegetated Lands

Each of these land types are a key component to the state's approach to increasing climate action in the NWL sector, as called for in Executive Order N-82-20 and AB 1757.[473] The Executive Order directs CARB to update the target for this sector in support of carbon neutrality by 2045 as part of this Scoping Plan, and to take into consideration the NWL Climate Smart Strategy. AB 1757 calls for the development of an

[472] CNRA. 2022. *Natural and Working Lands Climate Smart Strategy. Appendix B.* *https://resources.ca.gov/-/media/CNRA-Website/Files/Initiatives/Expanding-Nature-Based-Solutions/Appendix-B_04132022_ada.pdf*.

[473] AB 1757 California Global Warming Solutions Act of 2006: Climate Goal: Natural and Working Lands. *https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB1757*.

ambitious range of targets for the NWL sector to be integrated into the Scoping Plan and other state policies. It directs CARB and CNRA to work closely together to update the NWL Climate Smart Strategy, and establish an expert advisory committee to inform and advise on NWL modeling, targets, and implementation strategies.[474] Additionally, in 2021, the governor signed SB 27[475] (Skinner, Chapter 237, Statutes of 2021) into law. It directed CARB to establish CO_2 removal targets for 2030 and beyond and take into consideration the NWL Climate Smart Strategy. The governor's Executive Order, AB 1757, and SB 27 go beyond previous direction from the Legislature and past administrations. These directives emphasize the importance of quantifying land-based carbon both statewide,[476] and in programs and policies,[477] setting targets[478] for NWL to support the state's climate objectives, and advancing land management actions[479] that support the health and resiliency of these lands.

Blue carbon (also known as carbon captured and held in coastal vegetation and soils, such as seagrasses, seaweeds, and wetlands)—is also important to consider as we look at long-term climate goals. While this landscape is not currently covered by IPCC inventory guidelines or included in California's NWL Inventory, the United States was the first nation to include blue carbon in its national GHG emissions inventory. California's Ocean Protection Council and San Francisco Estuary Institute are partnering to create a new coastal wetlands, beaches, and watersheds inventory. CARB staff will utilize information from this effort and assess other available data to evaluate how this landscape may be integrated into our efforts in the future as more data become available.[480]

---

[474] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N20. *finalejacrecs.pdf (arb.ca.gov)*.
[475] SB 27 Carbon sequestration: state goals: natural and working lands: registry of projects. *https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220SB27*.
[476] SB 859 Public resources: greenhouse gas emissions and biomass (SB 859, Committee on Budget and Fiscal Review, Chapter 368, Statutes of 2016). *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB859*.
[477] SB 1386. Resource conservation: working and natural lands. (SB 1386, Chapter 545, Statutes of 2016). *https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160SB1386*.
[478] CARB. 2017. 2017 Climate Change Scoping Plan Update. Board Resolution 17-46. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/res/2017/res17-46.pdf*.
[479] Executive Department. State of California. EO B-52-18. *https://www.ca.gov/archive/gov39/wp-content/uploads/2018/05/5.10.18-Forest-EO.pdf*.
[480] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N2. *finalejacrecs.pdf (arb.ca.gov)*.

Trends of Carbon on Landscapes

CARB currently tracks the carbon stock changes though the Inventory of Ecosystem Carbon in California's Lands[481] (NWL Inventory), which is summarized in Chapter 1. The NWL Inventory is a key tool for tracking changes in carbon stocks across the state, and it will serve as the inventory of record for this sector, tracking sector-wide progress toward the target. The NWL Inventory provides a retrospective snapshot of the status of California's lands, and captures the gains or losses of carbon stocks that occur over time. In addition to tracking carbon stock changes, the NWL Inventory is an important tool for understanding the impacts of our efforts to increase climate action in this sector (such as those identified in this Scoping Plan and the NWL Climate Smart Strategy) on NWL carbon stocks. The inventory is also used as the foundation for Scoping Plan scenario modeling and target setting.

CARB's inventory shows that carbon stocks decreased in NWL lands from 2001 to 2011, releasing more carbon than they were storing, and then increased slightly from 2012 to 2014.[482] These trends highlight the interannual and interdecadal variability of lands and their ability to be both a source and a sink of carbon, and the importance of looking at NWL data and trends over multiyear and multidecadal time periods, as opposed to looking only at annual changes. This movement is part of the Earth's carbon cycle, where carbon transfers between the land, ocean, and atmosphere. As part of the carbon cycle, over decades or centuries, fire and plant respiration and decomposition move carbon from the land to the atmosphere, while plant growth and other processes move carbon from the atmosphere to the land. Emissions from fossil-fuel combustion are contributing to putting this cycle out of balance.

Additionally, some historic land management practices that have resulted in the loss of carbon from the soil are also contributing to the atmospheric rise of CO_2 while simultaneously exacerbating the imbalance of the water cycle, which is influenced by and linked to the carbon cycle. These emissions are also contributing to a feedback loop for California's lands: as CO_2 emissions accumulate in the atmosphere—and California experiences more warming, extreme heat events, and droughts—the risk and intensity of carbon losses also increases, which in turn transfers more carbon from the land to the atmosphere. And because forests and shrublands comprise approximately 85 percent of the carbon stocks in California, management strategies and disturbances in forest and

[481] CARB. *An Inventory of Ecosystem Carbon in California's Natural & Working Lands.* 2018 Edition. nwl_inventory.pdf (ca.gov). Accessed 3/2/2022.
[482] These trends are consistent estimates in the most recent AB 1504 reporting period.

shrubland carbon play an important role in determining whether California's lands are providing either net carbon sequestration or net emissions on an annual basis.

The gains and losses of carbon on our lands will fluctuate in the future; what is important is to restore carbon in places where it has been lost and reduce large carbon losses on our NWL through active, attentive, and adaptive management. For additional details on the nexus between NWL and GHGs, see pages 5–6 of the NWL Climate Smart Strategy.

Goals and Accelerating Nature-Based Solutions

The state's climate mitigation targets are traditionally identified by individual years, (i.e., tons of GHG emissions in 2020 or 2030). However, because NWL processes fluctuate year to year and because it can sometimes take decades for climate action to fully impact carbon in NWL, it is important to consider the statewide, long-term trends of carbon stock change when identifying how this sector contributes to California's pathway to achieving carbon neutrality. Tracking carbon stock change over a multi-decadal period is the best way to assess the full direct impact climate action has on carbon storage. Such an approach filters out fluctuations from year-to-year weather variations and multi-year natural climate cycles, such as El Niño patterns.

Current data sources and methods allow us to track only certain carbon stocks that exist on NWL. For target tracking to be successful, each carbon pool must be inventoried using a methodology that can detect changes due to management and climate change. Certain carbon pools lack the scientific data and methodologies necessary for target-setting and tracking. For example, soils in forests, shrublands, and grasslands are not included in the Scoping Plan carbon stock target because, currently, there is no way to track statewide soil carbon through time in a way that would capture the effects of increased climate action and climate change.

When considering how NWL contribute to the state's goal of carbon neutrality, all lands' carbon stock gains and losses must be considered, and the Scoping Plan target is set in these terms. It is not sufficient to aggregate climate benefits only within areas where projects, management, or climate action occur. Much of the state does not receive active or quantifiable management, but these areas still contribute to the state's overall carbon stock change and GHG emissions. To incorporate the entire carbon balance toward true carbon neutrality, the Scoping Plan target is set in terms of carbon stock change across the entire state. This incorporates all lands that both receive and do not receive active management, and includes the end result of all sequestration, emissions, and other changes to carbon on the landscape.

However, carbon stock change is not equivalent to emissions. Currently, the data and emission quantification science is not sufficient to enable inventories to comprehensively track all NWL emissions in a way that would enable us to set an NWL target in terms of

statewide emissions and sequestration. There is a great need, across the entire NWL sector statewide, for more empirical data, science, and tools to track all carbon stocks across each carbon pool, and to begin to track emission and sequestration rates. As California implements AB 1757, there is an opportunity to update the data, science, and tools to enable this level of tracking and target setting in the future.

As outlined in Chapter 2, California is projected to lose carbon stocks over the coming decades, but this Scoping Plan analysis also shows that increasing the pace and scale of climate smart land management in California will reduce the carbon stock losses and GHG emissions from the NWL sector. In response to EO N-82-20 and AB 1757, the proposed target for NWL is shown in Table 4-1.

Table 4-1: Scoping Plan modeled target for NWL, based on increasing action on NWL

	Total Carbon Stock % Change from 2014
2045	-4

Achieving this target will require significant expansion of the pace and scale of climate action on California's NWL, including the following:

- Increasing climate smart forest, shrubland, and grassland management to at least 2.3 million acres a year—an approximate 10x increase in management from current levels.
- Increasing climate smart agricultural practices by at least 78,000 acres adopted a year, annually conserving at least 8,000 acres a year of croplands, and increasing organic agriculture to comprise at least 20 percent of cultivated acres in California by 2045—an approximate 7.5x increase in healthy soils practices from previous levels and a 2x increase in total acres of organic agriculture.
- Increasing annual investment in urban trees in developed lands by at least 200 percent above historic levels and establishing defensible space on all parcels by 2045.
- Restoring at least 60,000 acres, or approximately 15 percent of all Sacramento–San Joaquin River Delta (Delta) wetlands, by 2045.
- Cutting land conversion of deserts and sparsely vegetated landscapes by at least 50 percent annually from current levels, starting in 2025.

If the carbon stock target above is met, and the management actions above are implemented, the modeling for NWL indicates that California's lands will be a net source of emissions, producing approximately 7 $MMTCO_2e$ of average annual emissions.

Additional climate smart management practices and additional landscapes, such as those included in the Climate Smart Strategy and discussed below in Additional Management Strategies, have the potential to increase carbon stocks and reduce GHG emissions from NWL beyond the levels modeled for this Scoping Plan.

The purpose of the NWL target and the above estimated outcomes is to provide a numerical guide that can support the state's efforts to accelerate both near-term and long-term climate action on California's lands, prioritizing durable solutions that deliver multiple outcomes. Taking these actions over the coming decades will reduce the potential carbon losses from NWL, reduce GHG emissions from some landscape types (such as croplands and Delta wetlands), and support sequestration of GHGs from NWL between 2025 and 2045. These actions will also deliver significant benefits to Californians beyond advancing our climate goals, such as reducing wildfire emissions and their associated health impacts, increasing habitat for biodiversity, reducing urban heat island effects, reducing harmful pesticide exposure, expanding economic opportunities, and others. Additional information on several economic and health outcomes from the Scoping Plan Scenario is included in Chapters 2 and 3.

Statewide planning and target setting for the NWL sector will only create meaningful change if followed by effective on-the-ground implementation. State government cannot accomplish this implementation alone. Effective large scale climate action is dependent on partnerships among tribal, federal, state, regional, and local partners, and across governmental, private, nonprofit, and commercial sectors. The NWL sector of the Scoping Plan sets a carbon target with climate action recommendations that can be used to achieve the quantified carbon, health, and economic outcomes. Implementation of these actions must be led by local or regional partnerships that plan and execute projects appropriate to the specific conditions. The technical expertise and local knowledge of land managers and stewards in all sectors must be elevated to ensure relevant, efficient, and effective climate action.

Implementation of climate action should contribute to state targets, maximize local benefits, and alleviate environmental injustices and other social inequities. On-the-ground action is largely executed and managed by local and regional actors, but state government agencies must support communities across the state in implementing nature-based climate solutions that address statewide objectives, such as the Scoping Plan carbon target. This includes providing resources and developing frameworks, while greatly increasing capacity and technical assistance to assist and empower local partners. Examples of how this can be done are the Regional Forest and Fire Capacity Program within the forestry sector, the UC Cooperative Extension in the agricultural and forestry sectors—as well as the work of the state's 10 regional Conservancies. These programs provide strong examples to emulate as they facilitate statewide coordination, and information and resource transfer from the state to the regional and local levels. The Regional Forest and Fire Capacity Program provides funding for local and regional groups

to build their organizational capacity to plan and implement wildfire and forest management projects that are informed by their own local expertise. The UC Cooperative Extension is an example of how the state provides technical assistance to local landowners and community organizations, helping them apply the latest science-based management strategies to their lands. California's regional Conservancies play a pivotal role in implementing regional conservation, restoration, and land management efforts through activities such as grant funding, science generation, and planning assistance.

The state also has identified the need to incorporate and elevate traditional indigenous knowledge into climate action on the regional and local scales. Accomplishing this requires close partnerships with tribes for mutual knowledge and resource sharing, while protecting culturally sensitive knowledge and resources. As Tribes are sovereign nations with specialized cultural knowledge and experience in managing lands, climate action on these lands that contribute to the State of California's climate targets can only be accomplished with the full participation and under the leadership of the Tribes that govern those lands.

Strategies for Achieving Success: Crosscutting Items for all NWL

- Implement AB 1757 and SB 27.
- Implement the Climate Smart Strategy.
- Accelerate the pace and scale of climate smart action, consistent with the management levels identified above, as part of a collective effort between federal, state, private, nonprofit, and individual land managers.
- Prioritize and practice equity, including through meaningful community engagement and prioritizing implementation of nature-based solutions that benefit the communities most vulnerable to climate change.[483]
- Advance multi-benefit, collaborative, landscape-level approaches that engage communities and landowners, and incorporate adaptive managements.
- Consult and partner with California Native American tribes to increase co-management and tribal management authority; restore, protect, and enhance natural cultural resources, traditional foods, and cultural landscapes; respect tribal sovereignty; and support tribes' implementation of tribal expertise and Traditional Ecological Knowledge and cultural easements.[484]

[483] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N8. *finalejacrecs.pdf (arb.ca.gov).*
[484] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N1, N6, N16, N17, N18. *finalejacrecs.pdf (arb.ca.gov)*.

- Leverage existing innovative financial and market mechanisms, and explore new ones, between the public, private, and philanthropic sectors to secure funding of climate smart land management.
- In partnership with communities, tribes, and the private sector, expand and develop new infrastructure for manufacturing and processing of climate smart agricultural and biomass products.
- Leverage and support technical assistance providers: such as the UC Cooperative Extension and California's 98 Resource Conservation Districts, that have track records of providing technical assistance to local landowners and implementing agriculture, forestry, natural resource management, and restoration projects across the state.
- Establish and expand mechanisms that ensure NWL are protected from land conversion and parcelization (e.g., conservation easements or Williamson Act), in line with the strategies outlined in CNRA's Pathways to 30x30 California.[485,486] Pair land conservation projects with management plans that increase carbon sequestration, where feasible.
- Increase opportunities for private and philanthropic investments in nature-based climate solutions, utilizing existing voluntary and compliance carbon markets, existing state and local programs, and the California Carbon Sequestration and Climate Resiliency Project Registry established pursuant to SB 27.
- Expand monitoring and tracking of management actions and outcomes consistent with the tracking and monitoring recommendations of the Climate Smart Strategy.

Forests, Shrublands, and Chaparral

At roughly 29 million acres, forests cover 27 percent of California. Shrublands and chaparral cover 31 percent of the state; roughly 33 million acres. Both types are distinct, with their own ecological dynamics and management strategies, and are modeled within a single model that is calibrated to treat them uniquely.

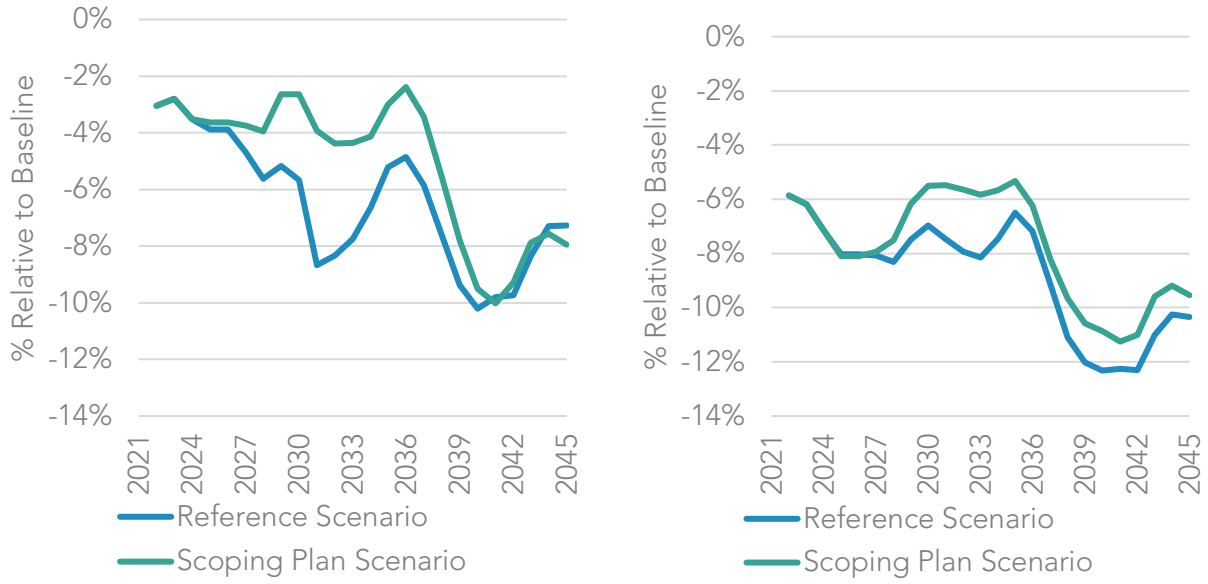
Together, forests, shrublands, and chaparral support a high biodiversity of plants and animals, in addition to high levels of carbon stocks. They provide important air and water quality benefits to all Californians, as well as recreational opportunities and, for forests, harvested wood products for the state. These landscapes are fire-adapted, and historical tribal management of these lands has fostered ecosystem health and resilience. Over the past century, these lands have been impacted severely by fire exclusion, including

[485] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N5, N26, N27. finalejacrecs.pdf (arb.ca.gov).
[486] CNRA. 2022. *Pathways to 30x30 California*. https://www.californianature.ca.gov/pages/30x30.

exclusion of indigenous people's management and past management practices, which has resulted in less resilient ecosystems and communities and more destructive wildfires today. This, along with drought induced stress and mortality, has changed these landscapes from a carbon sink to a carbon source. Climate smart management can help make forests more resilient to climate change and less prone to catastrophic wildfire. Climate-smart management in shrublands and chaparral face additional challenges and uncertainty, but can still provide protection for threatened communities and natural resources. This management, if conducted on a regular basis to maintain forest health, can help reduce emissions from forests, shrublands, and chaparral, and help strengthen and maintain the co-benefits that Californians experience from them.

Under all management levels, forests and shrublands are expected to lose carbon over the next two decades due to climate change and wildfire (Figure 4-21).

Figure 4-21: Forest (left) and shrubland (right) carbon stocks by 2045[487,488]



While this decrease in carbon stocks may be inevitable, forest management under the Scoping Plan Scenario can help direct where and how carbon loss occurs. By proactively managing forests and shrublands, the loss of carbon from wildfire can be lessened as the risk of high severity fire is decreased, with the removed biomass going toward a more

[487] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N13. *finalejacrecs.pdf (arb.ca.gov)*.

[488] This analysis is the aggregation of all forests and shrublands from all ownerships across the entire state of California.

useful purpose such as harvested wood products, bioenergy, and engineered carbon removal. Managing for a diverse and resilient forest landscape also can help forests recover more quickly so that when climate change and wildfire impacts occur, forests will be less affected and can continue to thrive and sequester carbon. Additional details on the climate benefit potential of forests and shrublands/chapparal can be found in Section 2 of the NWL Climate Smart Strategy.

Strategies for Achieving Success

- Accelerate the pace and scale of climate smart forest management to at least 2.3 million acres annually by 2025, in line with the climate smart management strategies identified in this Scoping Plan, the NWL Climate Smart Strategy, and the Wildfire and Forest Resilience Action Plan.[489]
- Establish and expand mechanisms that ensure forests, shrublands, and grasslands are protected from land conversion and that support ongoing, rather than one-time, management actions.
- In collaboration with state and local agencies, accelerate the deployment of long-term carbon storage from waste woody biomass residues resulting from climate smart management, including storage in durable wood products, underground reservoirs, soil amendments, and other mediums.
- Expand infrastructure to facilitate processing of biomass resulting from climate smart management.
- Expand permit streamlining in collaboration with state and local agencies to accelerate implementation of climate smart forest management while protecting natural resources.

Grasslands

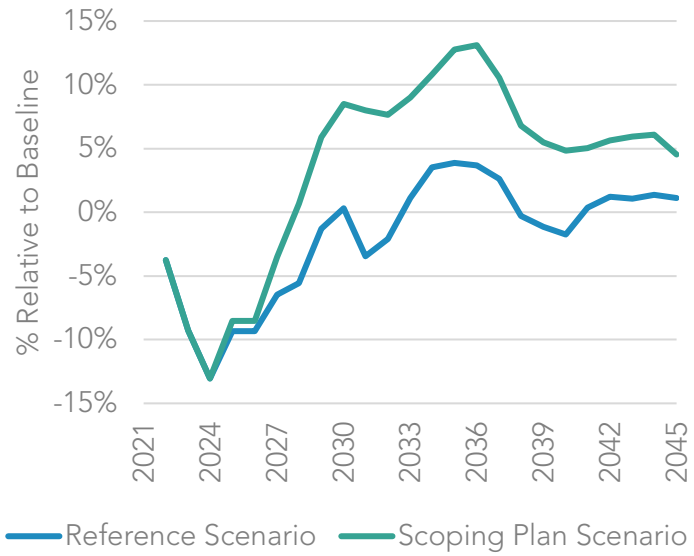
Grasslands cover 9 percent of California, roughly 10 million acres, and are found throughout the state in various landscapes, with concentrations in the foothills surrounding the Sacramento and San Joaquin Valleys. In addition to carbon storage (primarily in the soil), grasslands provide open space, wild habitat, grazing land, and important water filtration and recharge benefits. The protection of grasslands provides an opportunity to reduce sprawl and complement VMT reduction strategies. As grasslands are susceptible to invasive species, climate smart strategies can increase grassland

[489] Forest Management Task Force. 2021. *California's Wildfire and Forest Resilience Action Plan: Recommendations of the Governor's Forest Management Task Force.* https://www.fire.ca.gov/media/ps4p2vck/californiawildfireandforestresilienceactionplan.pdf.

resilience to climate change by improving species diversity and maintaining or increasing soil carbon stocks.

Modeling results show that increased fuels treatments and avoided land conversion can increase carbon stocks on grasslands by 2045, but sequestration rates fluctuate annually. Grasslands are capable of high carbon sequestration rates but are susceptible to carbon losses from wildfire and land conversion. Soil carbon is the major carbon pool on these lands, and continued future improvement of the monitoring and modeling of soil carbon is needed. Similar to forests and shrubland/chaparral, modeling alternatives that include fuels treatments resulted in greater carbon stocks compared to no management, and had lower wildfire emissions. Unlike forests and shrubland/chaparral, which have a general declining carbon stocks trend, the modeling results (Figure 4-22) show grasslands can maintain or increase carbon stocks with active management. Details on the climate benefit potential of grasslands can be found in Section 2 of the NWL Climate Smart Strategy.

Figure 4-22: Grassland carbon stocks by 2045



Strategies for Achieving Success

- Establish and expand mechanisms that ensure grasslands are protected from land conversion/parcelization and that support ongoing, rather than one-time, management actions that improve carbon sequestration.
- Deploy grassland management strategies, like prescribed grazing, compost application, and other regenerative practices, to support soil carbon sequestration, biodiversity, and other ecological improvements.

- Increase adoption of compost production on farms and application of compost in appropriate grassland settings for improved vegetation and carbon storage, and to deliver waste diversion goals through nature-based solutions.

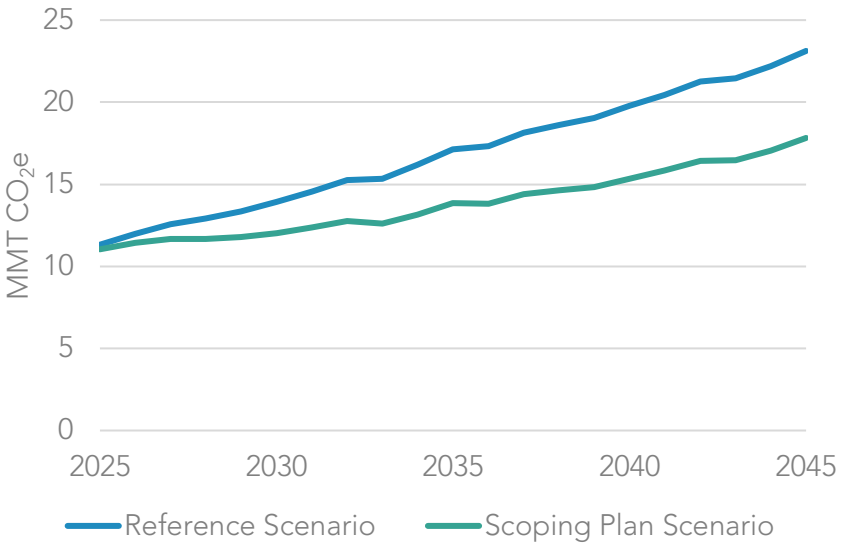
Croplands

Croplands cover 9 percent of the state, roughly 9.5 million acres. This land is some of the most productive agricultural land in the world, and enables California to be a global leader in agriculture. Aside from developed lands, croplands are the most intensively managed landscapes in the state, and are closely tied to society through the food they produce and the constant, direct contact that people have with croplands through the course of management. In addition to food security, croplands provide considerable carbon storage in the soil and, in perennial croplands, in aboveground biomass. Climate smart practices can improve public health; for example, by reducing synthetic fertilizer and pesticide use. They also help to maintain or increase the climate resilience of cropland productivity through improved soil conditions and increased pollinator habitat.

There is also significant potential to transform this sector to increase soil carbon storage, reduce GHG emissions (Figure 4-23), and reduce pesticide exposure and health impacts. Moving to an agricultural system that improves soil health and water holding capacity reduces over-application of nitrogen, reduces the use of pesticides and fumigants, and increases biodiversity and pollinator habitat, supporting California's pathway to carbon neutrality while simultaneously improving the lives of those who live and work in the agricultural community. Croplands are intricately tied to people, communities, and their health, and through climate smart practices and cropland conservation, these lands have the potential to contribute more to society than just food.[490] The implementation of climate smart agricultural practices and diversified organic agriculture can help California achieve social and environmental benefits, like improving water use efficiency, increasing pollinator habitat, and reducing synthetic fertilizer and pesticide use.[491] Additional details on the climate benefit potential of croplands can be found in Section 2 of the NWL Climate Smart Strategy.

[490] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations In-part (N3, N4, N22), N5, N21. *finalejacrecs.pdf (arb.ca.gov)*.
[491] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11. *finalejacrecs.pdf (arb.ca.gov)*.

Figure 4-23: Cumulative CO_2e emissions from annual croplands in 2045[492]



CARB recognizes the complex nature of croplands, cross-sector relationships, and the need to build on this analysis to further our understanding of cropland dynamics. Many more aspects of cropland management need to be explored for potential climate benefits, such as water and nutrient use management, pest control methods, crop rotations, and other management practices. The impacts of climate change on water availability, annual/perennial crop growth, and future carbon sequestration trends are uncertain, and recent policies such as the Sustainable Groundwater Management Act may also influence cropland management in unforeseen ways. Nonetheless, it is clear that greater climate smart practice implementation can prepare California for the future and yield tangible benefits for the state.

Strategies for Achieving Success

- Accelerate the pace and scale of healthy soils practices to 80,000 acres annually by 2025, conserve at least 8,000 acres of annual crops annually, and increase organic agriculture to 20 percent of all cultivated acres by 2045.

[492] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11. *finalejacrecs.pdf (arb.ca.gov)*.

- Utilize the recommendations included in CDFA's Farmer and Rancher-Led Climate Change Solutions[493] report to accelerate deployment of healthy soils practices, organic farming, and climate smart agriculture practices.
- Establish or expand financial mechanisms that support ongoing deployment of healthy soils practices and organic agriculture.[494]
- Support strategies that achieve co-benefits of safer, more sustainable pest management practices and the health and preservation of ecosystems, such as implementing the California Department of Pesticide Regulation's (DPR's) Sustainable Pest Management Work Group recommendations.[495]
- Conduct research on the intersection of pesticides, soil health, GHGs, and pest resiliency via a multi-agency effort with DPR, CDFA, and CARB.[496]
- Conduct outreach and education to develop and facilitate the increased adoption of safer, more sustainable pest management practices and tools; reduce the use of harmful pesticides; promote healthy soils; improve water and air quality; and reduce public health impacts.
- In collaboration with state and local agencies, accelerate the deployment of alternatives to agricultural burning that increase long-term carbon storage from waste agricultural biomass, including storage in durable wood products, underground reservoirs, soil amendments, and other mediums.
- Work across state agencies to reduce regulatory and permitting barriers around some healthy soils practices (e.g., composting), where appropriate.
- Utilize innovative agriculture energy use and carbon monitoring and planning tools to reduce on-farm GHG emissions from energy and fertilizer application or to increase carbon storage, as well as to promote on-farm energy production opportunities.

---

[493] California Department of Food and Agriculture. 2021. Farmer and Rancher Led Climate Change Solutions. *https://www.cdfa.ca.gov/oefi/climate/docs/cdfa_farmer_and_rancher-led_climate_solutions_meetings_summary.pdf*.

[494] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N5, N7. *finalejacrecs.pdf (arb.ca.gov).*

[495] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations N3, N4, N5, N7, N22. *finalejacrecs.pdf (arb.ca.gov)*.

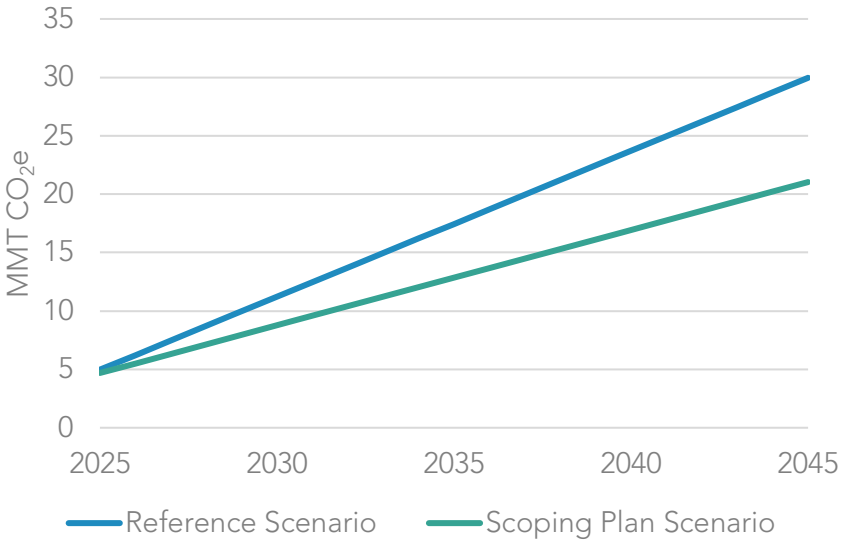
[496] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N11. *finalejacrecs.pdf (arb.ca.gov)*.

Wetlands

Wetlands cover 2 percent of the state (roughly 1.7 million acres) and include inland and coastal wetlands, such as vernal pools, peatlands, mountain meadows, salt marshes, and mudflats. These lands are essential to California's communities as they serve as hotspots for biodiversity, contain considerable carbon in the soil, are critical to the state's water supply, and protect upland areas from flooding due to sea level rise and storms. Wetlands have been severely degraded through reclamation, diking, draining, and dredging practices in the past, resulting in the emissions of the carbon stored in the soils and the loss of ecosystem benefits. Climate smart strategies to restore and protect all the types of wetlands can reduce emissions while simultaneously improving the climate resilience of surrounding areas and improving the water quality and yield for the state. Restored wetlands also can reduce pressure on California's aging water infrastructure. These benefits beyond emissions reductions will help in the future, as climate change is predicted to negatively affect water supply.

Avoided conversion and restoration of Delta wetlands reduces CO_2 and methane emissions from wetlands, with GHG reductions scaling with implementation rates (Figure 4-24). Expansion of conservation and restoration efforts will generate benefits such as the conservation of biodiversity, improved water quality and supply, and reduced flood risk. Additional details on the climate benefit potential of wetlands can be found in Section 2 of the NWL Climate Smart Strategy.

Figure 4-24: Cumulative CO_2e emissions from Delta wetlands by 2045



Strategies for Achieving Success

- Restore 60,000 acres of Delta wetlands annually by 2045 to reduce methane emissions from wetlands and reverse the resulting subsidence.

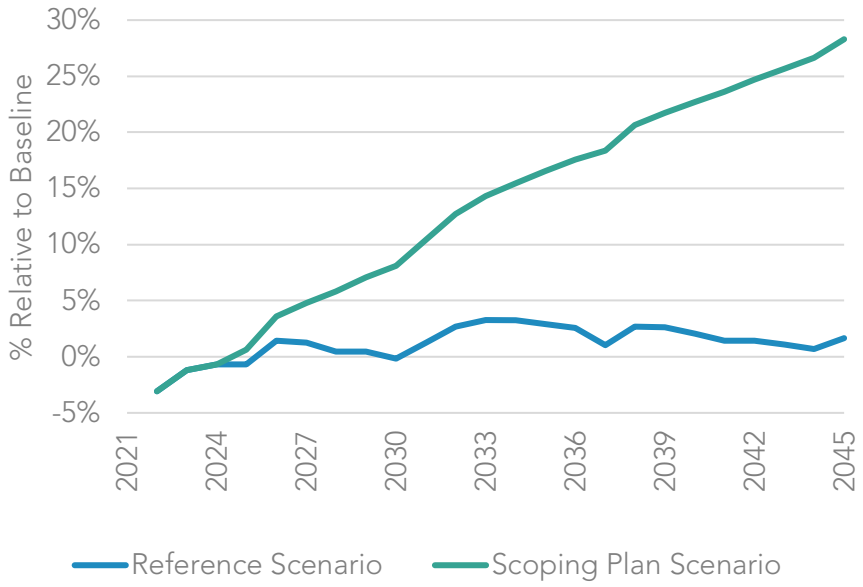
- Identify and prioritize wetland restoration efforts around climate vulnerable communities.
- Leverage other funding and institutions to support wetland restoration projects, including land trusts, local funding (e.g., San Francisco Measure AA), federal funding, and private and philanthropic funding to support wetlands restoration projects.
- Work across state agencies to reduce regulatory and permitting barriers around wetland restoration projects, where appropriate.

Developed Lands

Developed lands cover 6 percent of the state (roughly 6.8 million acres) and include urban, suburban, and rural areas, as well as transportation and supporting infrastructure throughout California. This area encapsulates the land on which the vast majority of Californians reside and call home. The vegetation within cities and communities, and along infrastructure, are all part of developed lands. This vegetation provides numerous benefits to surrounding areas, including carbon storage, air and water filtration, reduced urban heat island effect, and access to nature, aesthetics, and mental health, among others. These areas are susceptible to climate change as well, and climate smart strategies to protect and expand the urban forests, landscaping, green spaces, parks, and associated vegetation can increase their climate resilience and the benefits Californians derive from them. These strategies also have a significant opportunity to benefit disadvantaged communities, who may not have equitable access to these practices or the benefits they provide. Additional details on the climate and equity benefit potential of developed lands can be found in Section 2 and the Introduction of the NWL Climate Smart Strategy.

Urban forests have a significant potential to sequester carbon (Figure 4-25). They are vastly different from wildland forests, as they require investments to maintain and irrigate. This results in the need for a significant increase in investment to increase urban forest carbon. As urban forests become denser and management difficulty increases, the carbon stock returns on investment diminish, making it expensive to maximize carbon in urban forests. Water availability and irrigation efficiency are also an important consideration for increasing urban forest cover. As water becomes scarcer, the prioritization of irrigating trees over lawns or gardens may be required to achieve increases in urban forest carbon.

Figure 4-25: Carbon stocks in urban forests by 2045



Within wildland-urban interface (WUI) areas, defensible space can protect urban and rural communities from wildfire. Analysis results show that 48 percent of parcels are currently fully compliant with defensible space requirements. This highlights how much work needs to be done to protect communities and homes. Defensible space results in a decrease in carbon stocks, as expected when reducing fuels for wildfire.

Strategies for Achieving Success

- Increase urban forestry investment annually by 200 percent, relative to business as usual.
- Increase public awareness of urban forest benefits and, where appropriate, prioritizing irrigation of trees over lawns.
- Provide technical assistance and resources to disadvantaged communities to implement community urban greening projects to provide equitable access to the benefits of urban greening projects.[497]
- Work with state and local agencies to expand technical assistance for and enforcement of the defensible space requirements of PRC 4291 to reduce wildfire risk to homes and structures.

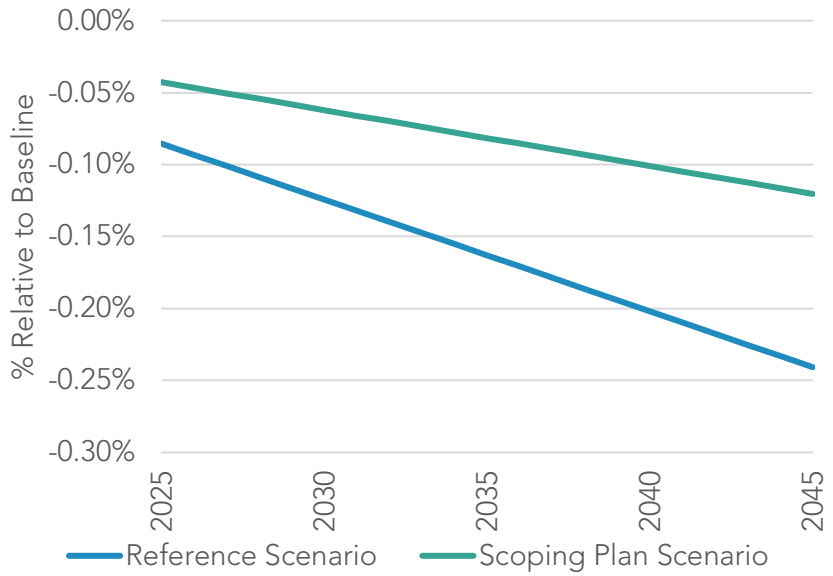
[497] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N8. finalejacrecs.pdf (arb.ca.gov).

Sparsely Vegetated Lands

Sparsely vegetated lands cover 10 percent of the state, roughly 10.2 million acres, primarily in the east and southern parts of California. These lands include deserts, beaches, dunes, bare rock, and areas covered in ice and snow (e.g., higher mountain elevations). The limited carbon storage of these lands varies from bare rock and mineral soil to more vegetated areas, though severe climate limits the amount of biomass. Nonetheless, sparsely vegetated lands are important for open space and provide rare and unique habitats for endemic species and a diversity of wildlife. These lands present important recreational opportunities for Californians and serve as important protective buffers in coastal and low-lying areas. Land use change threatens these lands, and conservation efforts are important for protecting these unique areas of California.[498]

Avoided conversion of sparsely vegetated lands reduces the organic carbon lost from the soil, which is the major carbon pool in this land type (Figure 4-26). In identifying the outcomes for sparsely vegetated lands, CARB modeled avoided land conversion to another land use.

Figure 4-26: Carbon stocks in sparsely vegetated lands by 2045



Strategies for Achieving Success

- Establish and expand mechanisms that ensure sparsely vegetated lands are

[498] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N26. finalejacrecs.pdf (arb.ca.gov).

protected from land conversion, prioritizing those areas most vulnerable to climate change and loss.

Additional Management Strategies

Additional nature-based climate solutions beyond those management strategies modeled for this Scoping Plan are available for implementation, but either cannot currently be modeled and/or affect carbon and the landscape in ways that cannot currently be tracked. Nevertheless, it is important to take action even where these technical gaps exist. Some of these actions, such as cultural burning and indigenous farming practices, have been used on large scales for decades or even centuries, while others are relatively new concepts. The state nevertheless recommends implementing the additional solutions listed here to achieve potential additional climate benefits, as well as other co-benefits. These additional solutions were drawn from the NWL Climate Smart Strategy and stakeholder, tribal government, and interagency feedback.[499]

Considerations

Although these practices are recommended, because of the lack of in-depth modeling and analysis available, several considerations must be addressed when implementing them. These considerations also apply to the management strategies included in the Scoping Plan Scenario.

- Future climate change impacts are uncertain: The negative impact that climate change can have on the ability of these practices to maintain expected climate benefits is uncertain and may significantly change in the future. Climate change is expected to further diminish the already constricting growing conditions in California, with increasing droughts, more extreme weather events, and expanding disturbances from fire, insects, and disease. It is estimated that suitable habitat for many native plant and animal species could shift, creating novel ecosystems without historical precedent. Close monitoring of all practices, including no management, across our NWL will be critical to understand if and how future climate change affects outcomes and how to adapt management to meet the needs of the system under climate change.[500]

[499] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N24. *finalejacrecs.pdf (arb.ca.gov)*.
[500] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N15. *finalejacrecs.pdf (arb.ca.gov)*.

- Local conditions: Not every practice is applicable, feasible, or even desirable in every location across California. Implementation of these practices should account for local conditions and needs that may affect the appropriateness of that practice.
- Long-term carbon storage: The ability to sequester additional carbon into NWL is only beneficial to the climate if that carbon stays out of the atmosphere. Many of the additional practices listed here may require continual incentives or interventions to ensure permanence of carbon storage in the soil and biomass. For example, in croplands, it is difficult to estimate how much of the carbon stored by no-tillage can be released by a single subsequent tillage, but a return to conventional tillage would usually be expected to erase most gains.[501,502]
- Scaling actions: There are uncertainties on how these practices may impact both the environment and communities when significantly expanded. For this reason, it is best to take a cautious and measured approach to ramping up actions to a larger scale.
- Infrastructure and operational needs: Scaling up the implementation of some of these practices demands transformational change in the supporting infrastructure and operational frameworks. For example, increasing forest management to the degree included in the Scoping Plan Scenario will require significant changes to wood-processing infrastructure, workforce capacity, permitting processes, technical assistance, and other operational constraints. The increased application of compost to croplands, and potentially to rangelands, will require a significant increase in organic waste and dairy manure collection to increase compost supply, in line with SB 1383. This will also require additional compost production facilities as well as compost/organic waste transportation and application methods.
- Co-benefits: Many co-benefits from these practices exist beyond the climate benefits. These co-benefits include improved public and worker health; improved microbial, insect, and wildlife habitat; enhanced biodiversity; greater labor demand in the nature-based economy; and improved climate resilience.
- Labor and Economics: Many of these practices require additional labor, and an evaluation of how many more jobs are needed to carry out many of these practices

[501] Muñoz-Romero, V., R. J. Lopez-Bellido, P. Fernandez-Garcia, R. Redondo, S. Murillo, and L. Lopez-Bellido. 2017. “Effects of tillage, crop rotation and N application rate on labile and recalcitrant soil carbon in a Mediterranean Vertisol.” *Soil Tillage Res.* 169, 118–123.
[502] Mitchell, J. P., A. Shrestha, W. R. Horwath, R. J. Southard, N. Madden, J. Veenstra, and D. S. Munk. 2015. “Tillage and cover cropping affect crop yields and soil carbon in the San Joaquin Valley.” *California. Agron. J.* 107, 588–596.

is currently unknown. There will also be the need to explore the costs and economic benefits of implementing these additional practices.

- Retreatments: All of these practices have limits on how long they can enhance carbon sequestration. Many of these practices need to be periodically repeated, followed by complementary practices, or maintained through time. This increases costs and requires diligence and long-term stewardship.

Additional NWL Actions and Strategies

Below is a set of additional actions that should be taken on California's natural and working lands. Again, these practices were not modeled for this Scoping Plan, and all of the considerations listed above should be taken into account before implementing the following actions.

- Conservation of all NWL types (in line with the NWL Climate Smart Strategy and CNRA's Pathways to 30x30 California) is critical to ensuring continued carbon sequestration and provision of co-benefits from these lands for all Californians.[503]
- Reforestation following disturbance, using appropriate species, is an impactful practice that can help prevent conversion away from forestland and establish new trees to sequester carbon. The number of acres that may need reforestation following high severity wildfires is estimated to continue to increase into the future.
- Restoration of shrublands, chaparral, riparian zones, and oak woodlands across California includes a variety of practices to alter their structure and return endemic species to the areas. These unique habitats provide multiple co-benefits to the state, such as clean water, reduced wildfire risk, and biodiverse habitats for flora and fauna.
- Conservation and restoration of wetlands, beyond the Delta wetlands included in the NWL modeling, can protect these unique habitats and the climate benefits they provide. These wetland types can include but are not limited to coastal wetlands, mountain meadows, vernal pool complexes, alkali sinks and meadows, and floodplains.
- Conservation and restoration of seagrasses and seaweeds provide a number of benefits, including carbon storage and sequestration, habitat provision for many culturally and commercially important species of fishes and invertebrates, shoreline protection, and tourism opportunities.[504]

---

[503] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N26, N27. finalejacrecs.pdf (arb.ca.gov).
[504] AB 32 EJ Advisory Committee. 2022 Scoping Plan Recommendations, N2. finalejacrecs.pdf (arb.ca.gov).

- Prescribed herbivory utilizes various livestock to consume vegetation to reduce fuel loads across an area. This fuel management practice can be used in forests, grasslands, and shrublands as an effective alternative to herbicide use, and should be considered wherever local conditions allow.
- Urban and community greening efforts such as green schoolyards, urban farms, rain gardens, community gardens, community composting, and many more provide numerous health benefits to communities.
- Additional Healthy Soils Program practices on annual croplands such as conservation cover and crop rotation, biomass planting for borders, wind barriers, riparian areas, and improved nutrient management can improve soil health, water retention, and increase carbon stocks.
- Healthy Soils Program practices on perennial croplands and rangelands, such as compost application and alley cropping/cover cropping to improve soil health, water retention, erosion control, and biomass growth.[505]
- Stacking of these Healthy Soils Program practices, where appropriate, in perennial and annual systems, can synergistically improve soil health and provide multiple benefits.
- Mulching adds high carbon materials to croplands or fallowed lands to reduce competing vegetation and retain moisture. This practice can support other benefits such as reduced water use and reduced synthetic pesticide and fertilizer use, as well as provide a use for suitable forest and agricultural waste biomass.
- Reductions in the use of synthetic fertilizers in cropland management, generally supported by the implementation of new management tools or technologies, can lead to reductions in GHG emissions from the production and application of fertilizers. This benefit is in addition to the co-benefits of reduced chemical runoff into waterways and reduced exposure of human populations to their harmful effects.

[505] Various types of organic amendments are being researched for application to particular landscape types. For example, compost application to rangelands is a relatively new practice that has been shown to improve soil health and increase carbon sequestration in the short term, though the science on the long-term impacts of this practice is still developing and the supply of available compost may be limiting.

Chapter 5: Challenge Accepted

This chapter provides an overview of the next steps and partnerships that will be needed to successfully implement this Scoping Plan. The path forward is not dependent on one agency, one state, or even one country. It will take action on a global level to address the threat climate change poses. But, the work begins at home.[506] The state can lead by engaging Californians and demonstrating how action at the state, regional, and local levels of government, as well as action at community and individual levels, can contribute to addressing the challenge before us. We must build partnerships with academic institutions, private industry, and others to support and accelerate the transition to carbon neutrality. Ultimately, the success of this Scoping Plan will be measured by our ability to implement the actions modeled in the Scoping Plan Scenario at all levels of government and society. This will depend on a mix of legislative action, regulatory program development, incentives, institutional support, workforce and business development, education and outreach, community engagement, and research and development and deployment. Optimizing this mix will help to ensure that clean energy and other climate mitigation strategies are clear, winning alternatives in the marketplace and in communities—to promote equity, drive innovation, and encourage consumer adoption. Bold institutional action will catalyze continued research and push private investment to create jobs and bring innovative ideas to reality.

State-level Action

Achieving the targets described in this Scoping Plan will require continued commitment to and successful implementation of existing policies and programs and identification of new policy tools and technical solutions to go further, faster. California's Legislature and state agencies will continue to collaborate to achieve the state's climate, clean air, equity, and broader economic and environmental protection goals. It will be necessary to maintain and strengthen this collaborative effort, and to draw upon the assistance of the federal government, regional and local governments, tribes, communities, academic institutions, and the private sector to achieve the state's near-term and longer-term emission reduction goals and a more equitable future for all Californians.

[506] This "polycentric" approach to climate challenges, engaging many levels of government, was articulated in leading papers by Nobel laureate Elinor Ostrom. See, for example, Ostrom, E. 2014. "A Polycentric Approach to Coping with Climate Change." *Annals of Economics and Finance* 15-1, 97–134.

Regulations and Programmatic Development

Meeting the AB 32 2020 GHG emissions reduction target several years earlier than mandated demonstrated that developing mitigation strategies through a public process, where all stakeholders have a voice, leads to effective actions that address climate change and yields a series of additional economic and environmental co-benefits to the state. Following adoption of this Scoping Plan, state agencies will continue to update and implement new and existing programs to align with the outcomes in the plan. Community, tribal, and stakeholder engagement will be a critical part of this work. Several state agencies, including CARB, the CEC, the California State Transportation Agency (CalSTA), the CPUC, and others will need to be part of various subsequent rulemaking processes. Each of these agencies' leadership and technical staff will engage with the public through public meetings, written and oral comment, and other methods of engagement. This work will be informed by evaluations of the health, air quality, environmental, equity, and economic benefits and impacts of regulations, including an assessment of the societal cost of carbon, as required under AB 197.

Incentive Programs

As described in Chapter 1, incentive programs are one of the most important tools the state has in advancing our low carbon future, especially for climate vulnerable communities. The programs ensure clean technology and energy are accessible and are critical to closing ongoing opportunity gaps. These programs also leverage private-sector investment and build sustainable, growing markets for clean and efficient technologies, and they are particularly necessary to support GHG emission reduction strategies for priority sectors, sources, and technologies. Clean technologies are often already the best and lowest cost option over their lifetimes but incentive funding is critical to ensure that they are broadly available, especially in climate vulnerable communities. Incentives also build on California's long track record of driving innovative technology developments, and creating new industries, with targeted investment. The Inflation Reduction Act also provides a new source of funding and tax incentives that must be leveraged to help achieve the state's climate goals.

Many state funding programs are designed to achieve multiple objectives simultaneously: reduce emissions from GHGs, criteria pollutants, and toxic air contaminants; manage natural and working lands for carbon sequestration; and address health and opportunity gaps in disadvantaged communities. California's incentive programs focused on jump-starting the transition to a zero emission transportation future are a good example of this "stacked" approach. The state is investing billions of dollars through programs such as the On-Road Heavy-Duty Voucher Incentive Program and Clean Cars 4 All in order to replace the light- and heavy-duty vehicles most responsible for the state's GHG emissions and poor air quality, all while bolstering the nascent ZEV market. Further strategies aid in developing new technologies, in ramping up access for all, and in shifting to cleaner

modes of transport; for instance, by supporting investments in walkable, bikeable communities and transit, as well as in vehicles. This funding strategy is, of course, paired with the regulatory approach described above.

Local Action

Local action by cities can support and amplify efforts to reduce GHGs. For example, the City of Oakland requires all new construction to be all-electric and is currently working on electrifying existing buildings.[507] In addition, starting in 2023, the City of Sacramento will require all new buildings under three stories to be all-electric, and it extends the mandate to all new construction by 2026 with some limited exemptions. The City of Sacramento also requires levels of EV charging infrastructure in new construction starting in 2023, higher than the minimum state requirements, and provides parking incentives for zero-emission carsharing and EV charging.[508] Local governments asserting this type of leadership are critical partners in supporting state-level measures to contain the growth of GHG emissions associated with the transportation system and the built environment.

California must accommodate population and economic growth in a far more sustainable and equitable manner than in the past. Good climate policy can and should create affordable and pleasant places to live, with effective transport and clean air for all—a future in which local governments and communities are central partners. Local governments have the primary authority to plan, zone, approve, and permit how and where land is developed to accommodate population growth, economic growth, and the changing needs of their jurisdictions. They also make critical decisions on how and when to deploy transportation infrastructure, and can choose to support transit, walking, bicycling, and neighborhoods that do not force people into cars. Local governments also have the option to adopt building ordinances that exceed statewide building code requirements, and play a critical role in facilitating the rollout of ZEV infrastructure. As a result, local government decisions play a critical role in supporting state-level measures to contain the growth of GHG emissions associated with the transportation system and the built environment—the two largest GHG emissions sectors over which local governments have authority.

Local governments are also frequently the source of innovative and practical climate solutions that can be replicated in other areas. Their efforts to reduce GHG emissions within their jurisdictions are vital to achieving the state's near-term air quality and long-term climate goals. Local governments must continue to take action that affirmatively

---

[507] City of Oakland. Building Electrification. *https://www.oaklandca.gov/projects/building-electrification*.

[508] City of Sacramento. Electrification of New Construction. *http://www.cityofsacramento.org/SacElectrificationOrdinance*.

builds the projects and expend the funds needed to further the state's collective path toward equitable emissions reductions. As such, aligning local jurisdiction action with state-level priorities to tackle climate change and the outcomes called for in this Scoping Plan is critical to achieving the statutory targets for 2030 and 2045. Local governments can implement climate strategies that can effectively engage residents by addressing local conditions and issues that also deliver local economic benefits.

Local Climate Action Planning and Permitting

California encourages local jurisdictions to take ambitious, coordinated climate action at the community scale; action that is consistent with and supportive of the state's climate goals.[509] As discussed in more detail in Appendix D (Local Actions), local jurisdictions can do much to enable statewide priorities, such as taking local action to help the state develop the housing, transport systems, and other tools we all need. Indeed, state tools—such as the Cap-and-Trade Program or zero-emission vehicle programs—do not substitute for these local efforts. Multiple legal tools are open to local jurisdictions to support this approach, including development of a climate action plan (CAP), sustainability plan, or inclusion of a plan for reduction of GHG emissions and climate actions within a jurisdiction's general plan. Any of these can help to align zoning, permitting, and other local tools with climate action.

Once adopted, the GHG emissions reductions plans detailed in CAPs can provide local governments with a valuable tool for coordinated climate planning in their community. When a local CAP complies with CEQA requirements, individual projects that comply with the CAP are allowed to streamline the project-specific GHG analysis.[510,511] Effectively, local governments that adopt a CEQA-compliant CAP enable project developers to use this streamlined approach. This saves time and resources and provides more consistent expectations for how GHG reduction measures are applied across projects in the jurisdiction. While the state encourages local governments to follow this approach, we acknowledge not all jurisdictions have the resources to develop a CAP that meets the CEQA requirements.

In addition to being required for a local CAP to comply with CEQA, local GHG reduction targets have long been recommended as part of the process of developing a climate

[509] This plan provides more detailed guidance and tools to local governments in Appendix D (Local Actions).
[510] Cal. Code of Regs., tit. 14, § 15183.5.
[511] California Governor's Office of Planning and Research. n.d. "General Plan Guidelines - Chapter 8 Climate Change."

action plan.[512] One challenge local jurisdictions have faced is how to evaluate and adopt quantitative, locally appropriate goals that align with statewide goals. An effective response to this challenge is to focus on goals that can help implement overall state priorities—enabling the key transformations California needs.

There are many ways that local governments can make key contributions to this transformation, depending on the characteristics of their jurisdiction and community. For example, some jurisdictions will inherently have more land capacity to remove and store carbon, whether through natural and working lands or by other means. Other jurisdictions will be host to GHG-emitting facilities that serve necessary functions and will take time to transition to clean technology (e.g., municipal wastewater treatment plants, landfills, and energy generation and transmission facilities). It is important to recognize that we will need to build new energy production and distribution infrastructure, and repurpose existing ones, for clean technology and energy before we are able to phase down existing fossil sources. There also will be a need to handle the significant amount of biomass resulting from sustainable forest management for catastrophic wildfire prevention, agricultural waste, and landfill diversion.

Regional efforts can support change too: energy and transportation systems that serve Californians do not stop at jurisdictional boundaries, and some local decisions can have ramifications for other communities. For instance, Metropolitan Planning Organizations (MPOs) can help to integrate local efforts by planning consistent with the Scoping Plan and Climate Action Plan for Transportation Infrastructure, including by removing polluting roadway capacity expansions from project pipelines and instead focusing on climate-friendly solutions. These varied capabilities and needs should be taken into account in setting targets for local climate plans. For instance, although net zero targets can often be valuable and achievable, and mitigation is important, targets should be considered in the larger context of these goals. This all means any GHG targets on a local scale should take into consideration the actions and outcomes included in this Scoping Plan. Jurisdictions considering “net zero” targets should carefully consider the implications such targets may have on emissions in neighboring communities and the ability of the state to meet our collective targets.

Jurisdictions without formal CAPs also have important opportunities within this context. These jurisdictions can still take actions that effectively translate key state plans, goals, and targets, including those articulated in this Scoping Plan for local action. For instance, state ZEV targets can advance local efforts to promote broad and equitable access to charging and fueling. Similarly, local jurisdictions can enable reduced dependence on

[512] Climate Smart Communities. 2014. Climate Action Planning Guide. https://cdrpc.org/wp-content/uploads/2015/05/CAP-Guide_MAR-2014_FINAL.pdf.

single-occupancy vehicles by supporting dense infill housing and transit, among other actions. Such actions can be reflected in particular project plans, in general plans, or through other local policies. Regional partnerships among these jurisdictions can also help tap resources and provide for more effective overall action.

Unlocking CEQA Mitigation for Local Success

The California Environmental Quality Act also provides important tools for lead agencies to support the achievement of the state's GHG and VMT reduction goals. Although many climate-friendly local government actions already fall into categories that may not require a full CEQA analysis, thanks to streamlining or other tools, and although certain product types (such as affordable infill housing) are generally clearly consistent with state climate goals, CEQA analyses may still sometimes be required. CEQA can be a powerful and useful tool to engage the public, identify additional opportunities to support climate efforts, and localize change. It is important that lead agencies look for ways to use CEQA to support these core purposes, ensuring that these processes do not become sources of delay but instead unlock more opportunities. The uncertainty analysis in Chapter 2 evaluates how project implementation delays can lead to missed state climate targets and continued dependence on fossil energy. Mitigation measures applied in the communities affected by projects subject to CEQA have the added benefit of improving health, social, and economic resiliency as climate impacts worsen.

Appendix D (Local Actions) explores the role of local government action and CEQA in detail. As discussed there, an important CEQA-related tool is mitigation—which can be used to further drive local action consistent with state climate goals. When a lead agency determines that a proposed project would result in potentially significant GHG impacts due to its GHG emissions or a conflict with state climate goals, the lead agency must impose feasible mitigation measures to minimize the impact. Appendix D (Local Actions) provides suggestions for prioritizing the various types of mitigation, starting with on-site GHG-reducing design features[513] and mitigation measures, such as methods to reduce VMT and support building decarbonization, access to shared mobility services or transit, and EV charging. After exhausting all the on-site GHG mitigation measures, CARB recommends prioritizing local, off-site GHG mitigation measures, including both direct investment and voluntary GHG reduction or sequestration projects, in the neighborhoods impacted by the project. This could include, for example, development of a neighborhood green space, investment in street trees, or expansion of transit services. Implementing GHG mitigation measures in the project's vicinity would allow the project proponent and the lead agency to work directly with the affected community to identify and prioritize the

[513] Cal. Code of Regs., tit. 14, § 15126.4(c)(2) and (3).

mitigation measures that meet their needs while minimizing multiple environmental and societal impacts.

Once all potential on-site and local off-site GHG mitigation measures have been incorporated to the extent feasible, Appendix D (Local Actions) provides further suggestions for prioritizing other mitigation types, including non-local off-site mitigation, and voluntary offsets issued by a recognized and reputable voluntary carbon registry (as listed on CARB's website[514]) may be appropriate. Additional in-state mitigation also may be available in the upcoming SB 27[515] (Skinner, Chapter 237, Statues of 2021) registry, which will serve as a database of projects in the state that drive climate action on natural and working lands. Lead agencies should use substantial evidence to demonstrate that the project proponent explored and prioritized investments in feasible, local mitigation prior to moving mitigation to a geography located farther away from the project.

Communities and Environmental Justice

As noted in Board Resolution 20-33,[516] it is incumbent on CARB to function as an agent of responsible social change, especially when it is clear that environmental injustices continue to persist for low-income communities, tribes, and communities of color.

State law defines *environmental justice* as the fair treatment of all people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies.[517] Government Alliance for Race and Equity (GARE)[518] defines *racial equity* as when race can no longer be used to predict life outcomes and outcomes for all groups are improved.

For this Scoping Plan to be successful, it must address environmental justice and advance racial equity. Implementation of the plan needs to address the needs of those communities that are disproportionately burdened by climate impacts and continue to face significant health and opportunity gaps. Now, we need to ensure our actions allow these communities to not only have a seat at the table, but also inform and shape the policies

---

[514] CARB. 2022. Offset Project Registries. https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/offset-project-registries.

[515] SB 27. Carbon sequestration: state goals: natural and working lands: registry of projects. (SB 27, Skinner, Chapter 237, Statutes of 2021). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=202120220SB27.

[516] CARB. 2020. Resolution 20-33: A Commitment to Racial Equity and Social Justice. October 22. https://ww2.arb.ca.gov/sites/default/files/barcu/board/res/2020/res20-33.pdf.

[517] Gov. Code, § 65040.12, subd. (e).

[518] Local and Regional Government Alliance on Race and Equity. 2015. *Advancing Racial Equity and Transforming Government: A Resource Guide to Put Ideas into Action.* Page 9. https://racialequityalliance.org/wp-content/uploads/2015/02/GARE-Resource_Guide.pdf.

to ensure their communities thrive. With this Scoping Plan, the state also adds a new tool to identify which communities will be the least resilient in the face of selected climate impacts and will see disproportionate economic impacts as a result. As described in Chapter 3, the CVM will enable the state to target programs and policies to build resiliency in the specific regions that will feel climate impacts more acutely due to existing health and opportunity disparities leading to disproportionate economic impacts. This tool will be critical in the state's efforts to address climate impacts while accounting for environmental injustices and racial inequities. CARB will incorporate the CVM into its work as it moves forward and will share this new tool with other agencies to align our efforts. The goal is to keep expanding the CVM to incorporate additional climate impacts to better identify disproportionate economic impacts as community level data becomes available.

AB 617 is another important tool for both Air Districts and CARB to bring resources to communities that have long been disproportionately burdened by poor air quality. While AB 617 does not require local agencies to participate in the Community Air Protection Program, several AB 617 communities are finding ways to bring local land use agencies to the table to respond to community priorities. We look forward to more opportunities to foster relationships with local authorities and continued collaboration between state and air district programs.

In alignment with AB 32, and to ensure environmental justice and racial equity were integrated into this Scoping Plan, CARB reconvened the AB 32 Environmental Justice Advisory Committee (EJ Advisory Committee) to advise CARB on the development of this Scoping Plan. Since reconvening in May 2021, the EJ Advisory Committee has engaged in the following activities:

- In October 2021, the EJ Advisory Committee sent a letter to the governor requesting a timeline extension for the Scoping Plan process. In response to the EJ Advisory Committee's letter, CARB modified this Scoping Plan process[519] and committed to an active engagement with the EJ Advisory Committee following the approval of this Scoping Plan. The EJ Advisory Committee also presented to the CARB Board[520] at its October 2021 Board meeting, reiterating its request for a timeline extension, as well as sharing additional concerns about process.

[519] Randolph, L. M. 2021. LMR October 19 response to Environmental Justice Advisory Committee Letter. *https://ww2.arb.ca.gov/sites/default/files/2021-10/LMR%20October%2019%20response%20to%20EJAC%20Letter%20Final.pdf*.

[520] Argüello, M. D., K. Hamilton, S. Taylor, and P. Torres. 2021. EJ Advisory Committee Co-Chair Informational Presentation to CARB Board. October 28. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2021/102821/21-11-4pres.pdf*.

- In December 2021, the EJ Advisory Committee shared its responses to Scenario Input Questions,[521] as well as a narrative document outlining their concerns[522] around the process, the need for evaluation, and the need for a tribal representative. In response to the EJ Advisory Committee Scenario Input Questions, CARB incorporated the EJ Advisory Committee responses into the Scenario Assumptions document,[523] and modeled results from PATHWAYS.[524] In response to the EJ Advisory Committee's concerns, CARB worked diligently to appoint a tribal representative[525] in February 2022, and to outline additional opportunities for the EJ Advisory Committee to engage in the Scoping Plan process.[526]
- In March 2022, the EJ Advisory Committee presented at the joint EJ Advisory Committee / CARB Board meeting[527] and walked through their preliminary draft recommendations to inform this Scoping Plan. In April, the EJ Advisory Committee shared its revised preliminary draft recommendations[528] to inform this Scoping Plan.
- In September 2022, the EJ Advisory Committee presented at the joint EJ Advisory Committee / CARB Board meeting[529] and engaged in discussion about priority items as they relate to incorporating environmental justice into the Scoping Plan. By the end of September, the EJ Advisory Committee shared its final

---

[521] EJ Advisory Committee. 2021. EJ Advisory Committee Final Responses to CARB Scenario Inputs. December 2. *https://ww2.arb.ca.gov/sites/default/files/2021-12/EJAC%20Final%20Responses%20to%20CARB%20Scenario%20Inputs_12_2_21.pdf*.

[522] EJ Advisory Committee. 2021. EJ Advisory Committee Responses to Scenario Input Questions. EJ Advisory Committee narrative document regarding scenario input recommendations. December 1. *https://ww2.arb.ca.gov/sites/default/files/2021-12/EJAC%20Narrative%20Document%20re%20Scenario%20Input%20Recommendations%2012_1_2021.pdf*.

[523] CARB. 2021. PATHWAYS Scenario Modeling. *https://ww2.arb.ca.gov/sites/default/files/2021-12/Revised_2022SP_ScenarioAssumptions_15Dec.pdf*.

[524] E3. 2022. CARB Draft Scoping Plan AB32 Source Emissions Initial Modeling Results. March 15. *https://ww2.arb.ca.gov/sites/default/files/2022-03/SP22-Model-Results-E3-ppt.pdf*.

[525] CARB. AB32 EJ Advisory Committee Meeting, February 28, 2022 CARB Update. *https://ww2.arb.ca.gov/sites/default/files/2022-02/CARB%20EJAC022822presentation.pdf*.

[526] Fletcher, C. 2021. CARB Response to EJ Advisory Committee Narrative. CARB. December 15. *https://ww2.arb.ca.gov/sites/default/files/2021-12/CARB%20response%20to%20EJAC%20Narrative.pdf*.

[527] EJ Advisory Committee. 2022. EJ Advisory Committee Presentation: Preliminary Draft Recommendations. March 10. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/031022/ejacpres.pdf*.

[528] AB 32 EJ Advisory Committee. Draft Recommendations. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/031022/ejacrecsrevised.pdf*.

[529] EJ Advisory Committee. 2022. EJAC Presentation. September 1. *https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/090122/ejacpres.pdf*

recommendations[530] to inform this Scoping Plan. To the extent possible, CARB has incorporated and cited these recommendations through this Scoping Plan.

In addition to the activities listed above, Central Valley EJ Advisory Committee members hosted a successful community engagement workshop[531] in San Joaquin Valley in February 2022 with over 100 attendees. Members of EJ Advisory Committee hosted a statewide community engagement workshop[532] in June 2022 with more than 165 attendees. Throughout the EJ Advisory Committee's process, members of the Committee continued to work with their communities to ground truth their recommendations to inform the development of the Scoping Plan. The EJ Advisory Committee worked hard to ensure the voices of those communities most burdened by climate impacts were reflected in the plan. The EJ Advisory Committee will continue to play an ongoing role in the implementation of this Scoping Plan to ensure environmental justice and racial equity are prioritized in our effort to address the climate challenge before us.

To the extent possible, the EJ Advisory Committee's recommendations were integrated throughout the plan. This plan directly cites instances where there is alignment between the plan and the EJ Advisory Committee recommendations. This approach seeks to ensure there is more transparency and identify consensus that exists, as well as relevant ways equity and environmental justice are addressed in this plan and in the planning for future related implementation activities. CARB is dedicated to its efforts to ensure this plan does not leave communities behind.

As this Scoping Plan moves into the implementation phase, there will be a need to better understand how to address EJ Advisory Committee recommendations on the following topics:

- Actions under the jurisdiction of other agencies: there are certain EJ Advisory Committee recommendations that are outside of CARB's jurisdiction. As the EJ Advisory Committee continues to convene, it would be helpful to understand the

---

[530] EJ Advisory Committee. 2022. EJAC 2022 Scoping Plan Recommendations. September 30. https://ww2.arb.ca.gov/sites/default/files/barcu/board/books/2022/090122/finalejacrecs.pdf

[531] San Joaquin Valley Climate Justice & the Scoping Plan. 2022. https://ww2.arb.ca.gov/sites/default/files/2022-07/SJV%20Climate%20Justice%20%26%20the%20Scoping%20Plan%20Workshop%20Report%20out%20%26%20Recommendations_5.2022.pdf

[532] EJAC. 2022. *EJAC/Community Engagement Synthesis Report '22.* https://ww2.arb.ca.gov/sites/default/files/2022-07/EJAC-CommunityEngagement-SynthesisReport-2022-English%26Spanish.pdf.

role that CARB can play as it relates to the EJ Advisory Committee's recommendations for actions outside CARB's jurisdiction and coordinates with sister agencies.

- Actions that require legislative direction: there are certain EJ Advisory Committee recommendations that would require legislative action. As the EJ Advisory Committee continues to convene, it will be helpful to understand how CARB can work with the EJ Advisory Committee to share these recommendations with the appropriate members of the Legislature.
- Actions directly tied to implementation activities: This Scoping Plan is not an implementation document; it is a plan to chart a course to continue to reduce GHG emissions and achieve carbon neutrality. Once the Scoping Plan is approved, there will be follow-up action at CARB, as well as at other agencies. In these follow-up efforts, there will be a role for ongoing EJ Advisory Committee engagement.
- Actions to implement recent legislation, such as SB 905.

CARB proposes to continue to work with the EJ Advisory Committee to better understand how to move forward on EJ Advisory Committee recommendations that fall into the topics listed above and any other recommendations that were not included in this plan. It is also important to note that there are numerous recommendations where CARB shares the goals of the EJ Advisory Committee and can assist in implementation steps. Examples include the following:

- CARB shares the goal of prioritizing non-fossil energy generation and supports non-fossil projects and opportunities to locate behind-the-meter clean resources in communities of concern in programs such as the Solar on Multifamily Affordable Housing program.
- CARB will engage with agencies and academic institutions to further workforce development.
- Many other recommendations related to financial support for various energy projects, such as microgrids, are within the purview of the CPUC or local publicly owned utilities. Similarly, utility scale projects are within the jurisdiction of other agencies. However, CARB supports strategies identified in the recommendations such as offshore wind to reduce the reliance on fossil fuel generation.
- CARB is supportive of rooftop solar, although it is not within CARB's jurisdiction to determine how incentives for those projects are structured.
- CARB is supportive of strong energy decarbonization goals, recognizing that increased reliance on electrification in transportation and other sectors will create significant demand for electricity, and therefore ensuring reliability of a decarbonized grid is a critical need for the state.
- In the transportation sector, CARB is supportive of the EJ Advisory Committee's recommendations to maintain aggressive zero emission vehicle goals consistent

with its statutory mandate to ensure regulations are technologically feasible and in alignment with Governor Newsom's ZEV Executive Order (EO N-79-20). CARB looks forward to continued engagement on rulemakings that will implement these goals.

- As noted elsewhere in this plan, CARB is supportive of the Caltrans California Transportation Plan 2050 and the California Climate Action Plan for Transportation Infrastructure.
- CARB is supportive of additional public support for transit. CARB is supportive of locating EV charging in low-income communities and communities of color.
- CARB is supportive of prioritizing funding incentives for transit and heavy- and medium-duty vehicles, although CARB does believe there is an important role for incentives that support adoption of light-duty vehicles for the time being. CARB will also be opening a rulemaking on the Low Carbon Fuel Standard to ensure it continues to support clean fuels that will displace petroleum fuels and will consider the EJ Advisory Committee recommendations on this program.
- In the industrial sector, in addition to the strategies discussed more fully in this Scoping Plan, CARB continues to work with the Legislature, local agencies, and air districts to support, implement, and enforce effective reductions in emissions of GHGs and air pollutants in stationary sources. The air districts have the authority to directly issue permits addressing a facility's criteria pollutant and toxics emissions levels. These levels are set after careful permit review, under district regulation and statute. However, AB 617 directs and authorizes CARB to take several actions to improve data reporting from facilities, air quality monitoring, and pollution reduction planning for communities affected by a high cumulative exposure burden. CARB will continue to implement AB 617 and look for ways to strengthen the Community Air Protection Program.
- Considerations around the phaseout of oil and gas extraction and refining, and the role of carbon capture are discussed more thoroughly in Chapter 2.

As CARB continues to engage with the EJ Advisory Committee—in addition to the EJ Advisory recommendations that have been integrated throughout this plan—below are the following commitments that CARB is making to ensure that environmental justice is integrated in this plan and its implementation:

- Building decarbonization is a pillar of this Scoping Plan and CARB commits to working closely with state and local agencies to implement the EJ Advisory Committee recommendations that call for prioritization for residents in low-income communities and communities of color in this transition.
- CARB commits to sharing the EJ Advisory Committee's recommendations with the CEC, CPUC, and other agencies administering funds to support building

decarbonization, and to work closely with those agencies as they engage in public processes to further building decarbonization.

- CARB has committed to review the Cap-and-Trade program and determine what potential legislative or regulatory amendments could be necessary to ensure the program continues to deliver GHG reductions needed to achieve the statutory climate goals. In that process, CARB will consider the recommendations of the EJ Advisory Committee[533] and Independent Emissions Market Advisory Committee,[534] as well as others.

Critically, the EJ Advisory Committee makes numerous recommendations centered around tracking progress of the various strategies in this Scoping Plan. Currently, progress is tracked and reported in numerous ways, including the annual GHG inventory and reports to the Legislature. Part of the ongoing work of implementation, however, will include consideration of ways to provide more data and information to the public, such as rates of deployment of clean energy and technology as described in Chapter 1. CARB will also continue to collaborate with CDPH and OEHHA on health metrics to track cumulative benefits of air pollution and climate programs, especially in low-income communities and communities of color.

As noted earlier in this document, the EJ Advisory Committee will continue to play a vital role in the Scoping Plan and its implementation to ensure environmental justice and racial equity are prioritized in our effort to address the climate challenge before us. This includes ongoing EJ Advisory Committee engagement to advise CARB on the development of the Scoping Plan and any other pertinent matters in implementing AB 32. The ongoing EJ Advisory Committee will help to ensure integration of environmental justice in implementation efforts as it relates to AB 32, and also help CARB as we work toward a future where race is no longer a predictor for life outcomes.

Academic Institutions and the Private Sector

Academic institutions produce and present the latest science on both the impacts of, and actions to reduce, climate change damages. They are also leading the way by

[533] California Legislative Information. Bill Text – AB 32. Air pollution: greenhouse gases: California Global Warming Solutions Act of 2006. (AB 32, Nuñez, Chapter 488, Statutes of 2006). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060AB32.

[534] California Legislative Information. Bill Text – AB 398. California Global Warming Solutions Act of 2006: market-based compliance mechanisms: fire prevention fees: sales and use tax manufacturing exemption. (AB 398). https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201720180AB398.

establishing their own climate goals and GHG emissions reductions targets.[535, 536, 537] They are incubators for innovation and knowledge in clean energy and technology and play an important role in adding to the wealth of robust information to inform policies and programs. Academic institutions have the ability to fill knowledge gaps and push us toward new frontiers. As we move forward, we will continue to see these institutions as partners and resources that can help CARB look for ways to accelerate and introduce actions to reduce GHG emissions and remove and store carbon.

As such, it will be important to maintain and enhance relationships with academic institutions, including community colleges. Community colleges are more likely to have a large proportion of first generation students or students that come from low-income communities or communities of color. The perspective of this diverse student body will be critical to inform discussions on climate change damages and mitigation efforts. This student body is also a future workforce, and courses to teach the skills for a sustainable economy are a chance to close historical opportunity gaps. Importantly, many of the students at community colleges are local residents and community members. This engagement provides another way to invest in communities across our state. The Foundation for California Community Colleges is already leading the way through innovate programs such as their Good Jobs Challenge - California Resilient Careers in Forestry.[538] These types of programs could be replicated across other sectors. CARB will evaluate how to leverage the requirements in AB 680 on workforce development in the California Climate Investments programs with the work at the Foundation for California Community Colleges.

As noted in Chapter 1, public and private partnerships will be important as we move forward in the great energy transition. But the private sector is also important in the context of research and development and deployment. Many of these companies have the resources and expertise to build and produce the clean technology and energy we will need. It was through the efforts of several private companies (Bell, Exxon, Telecom

---

[535] University of California. Our Commitment. *https://www.universityofcalifornia.edu/initiative/carbon-neutrality-initiative/our-commitment*.
[536] California State University. Energy, Sustainability, & Transportation. *https://www.calstate.edu/csu-system/doing-business-with-the-csu/capital-planning-design-construction/operations-center/Pages/energy-sustainability.aspx*.
[537] California Community Colleges Chancellor's Office. Climate Action and Sustainability. *https://www.cccco.edu/About-Us/Chancellors-Office/Divisions/College-Finance-and-Facilities-Planning/Facilities-Planning/Climate-Action-and-Sustainability?msclkid=4a72350ec4f511ecaf292c6b14ac9a4f*.
[538] Foundation for California Community Colleges. 2022. Good Jobs Challenge. Developing Resilient Careers in Forestry for Californians. *https://foundationccc.org/What-We-Do/Workforce-Development/Good-Jobs-Challenge*.

Australia) that the photovoltaic solar panels in use today were developed.[539] Similarly, it was companies such as General Electric and Texas Instruments that contributed to the development of hydrogen fuel cells.[540] This Scoping Plan includes the known and emerging clean technologies and fuels available today. The private sector spirit of invention, improvement, and innovation must continue to deliver new tools in the fight against climate change.

Individuals

This Scoping Plan not only projects ambitious availability of clean technology and energy, but also includes aggressive assumptions about consumer adoption of ZEVs, heat pumps, and other energy efficiency practices, among others. When it comes to climate change mitigation, the sum of the parts matters. Only when we add up the impacts of the choices we make do we understand the true impact on GHG emissions. Today, many Californians have opportunities to choose between driving a car, taking a bus, biking, or walking. Many can choose to install a heat pump or buy an electric cooktop. Together, we can increase these opportunities and pick the future we want. We can start or transform businesses that create clean jobs, innovate new technologies, or introduce new systems. We can engage with fellow workers to support durable paths for labor in a clean economy. And we can choose to engage with our community, tribes, and our governments to advocate for change, call out challenges, and propose solutions. Our choices will help determine California's climate future. Down one path is a future of climate impacts that will continue to worsen and further increase disparities across communities. Down the other is a future that avoids the worst impacts of climate change, improves air quality—especially for the most burdened communities—and fosters new economic and job opportunities to support a sustainable economy.

Importantly, we must acknowledge that historical decisions have resulted in health and opportunity gaps for residents in low-income communities and communities of color. Not everyone has the resources or access to make these choices—to buy a ZEV, install a heat pump, or use public transit to get to work. It is here that government can help. Government, at multiple levels, can fund programs and structure policies to provide consumers with more choice and to support them in adopting cleaner technology options. Whether through affordable energy rates or assistance in purchasing zero emission vehicles and appliances, we can use the transition to a carbon neutral economy as an opportunity to close some of these persisting opportunity gaps. By acting now, we can

[539] Californiasolarcenter.org. Passive Solar History. http://californiasolarcenter.org/old-pages-with-inbound-links/history-pv/.
[540] Fuel Cell Store. History of Fuel Cells. https://www.fuelcellstore.com/blog-section/history-of-fuel-cells?msclkid=04a19450c50211ec8d20f2afff4039fe.

change our planet’s fate and build a more resilient, healthier, and equitable future for all Californians.

Appendix D
Biological Resource Reports

This page intentionally left blank.

Appendix D1
Biological Resources Summary Technical Report

This page intentionally left blank.

BIOLOGICAL RESOURCES SUMMARY TECHNICAL REPORT

Discovery Solar PV and Storage Project
Kern County, California

December 2025

Prepared for

Discovery Solar PV and Storage, LLC
11455 El Camino Real # 160
San Diego, CA 92130

Prepared by

TETRA TECH

5383 Hollister Avenue, Suite 130
Santa Barbara, CA 93111

This page intentionally left blank.

EXECUTIVE SUMMARY

Biological field surveys and a desktop assessment were conducted for the proposed Discovery Solar PV and Storage Project (Project). Surveys for biological resources were conducted within the Study Area from 2022 to 2025. Although the Project site is 7,700 acres, a larger Study Area of 8,606 acres that encompasses the 7,700-acre Project site and the proposed generation tie line corridor was surveyed for vegetation communities, rare plant species and California Desert Native Plants Act species, Mojave desert tortoise (*Gopherus agassizii,* referred to herein as desert tortoise), burrowing owl (*Athene cunicularia*), and desert kit fox (*Vulpes macrotis arsipus*). Unless otherwise stated, "Study Area" refers to these 8,606 acres. Approximately 2,426 acres within the 7,700-acre Project site are designated for zone changes only and would not be disturbed. The survey area for golden eagle (*Aquila chrysaetos*) and California condor (*Gymnogyps californianus*) consisted of the Project site plus a 2-mile buffer, and the survey area for Swainson's hawk (*Buteo swainsoni*) consisted of the Project site plus a 5-mile buffer.

The following surveys were completed:

- Study Area (8,606 acres):
  - Vegetation mapping;
  - Botanical surveys;
  - Desert tortoise habitat suitability assessment and protocol-level surveys;
  - Burrowing owl burrow surveys;
  - Mohave ground squirrel (*Xerospermophilus mohavensis*) desktop assessment; and
  - Desert kit fox burrow surveys.
- Golden Eagle and California Condor survey area:
  - Protocol-level golden eagle and California condor surveys.
- Swainson's Hawk survey area:
  - Protocol-level Swainson's hawk surveys.

Results of the wetland delineation conducted for the Project are provided in a separate Aquatic Resources Delineation Report.

Three rare plant species were observed, including few-flowered woolly-star (*Eriastrum sparsiflorum*), adobe yampah (*Perideridia pringlei*), and western Joshua tree (*Yucca brevifolia*). Few-flowered woolly-star and adobe yampah are California Rare Plant Rank 4.3 species. Western Joshua tree is a candidate species under the California Endangered Species Act. Three species protected by the California Desert Native Plants Act were observed: silver cholla (*Cylindropuntia echinocarpa*), beavertail cactus (*Opuntia basilaris* var. *basilaris*), and beavertail pricklypear (*Opuntia basilaris*). In addition, two sensitive natural communities were found in the Study Area: desert needlegrass grassland and scalebroom scrub. Western Joshua trees were present in the Study Area; mapping results are provided in a separate report.

No live desert tortoise were detected in the Study Area. One adult male desert tortoise carcass with evidence of canid predation was observed. Several physical characteristics (i.e., circular hole in marginal scute, flattened and smooth abdominal and femoral scutes) were observed on the shell of the carcass that are consistent with physical characteristics observed in captive desert tortoise individuals and, therefore, likely indicates previous captivity. It is likely that this tortoise was released from captivity and died once in the wild. A Class 3 burrow (definitely tortoise, deteriorated condition; USFWS 2009) with multiple pieces of desert tortoise scat was observed within 160 feet of the carcass. It is likely that the tortoise released from captivity was using this Class 3 burrow and left the scat. Two Class 5 burrows (possibly tortoise, deteriorated condition; USFWS 2009) were found in the northern portion of the Study Area; however, no desert tortoise sign was observed at these two burrows. In addition, one Class 4 burrow (possibly tortoise, good condition; USWFS 2009) was observed near the center of the Study Area and also had no desert tortoise sign observed. All observed desert tortoise sign located within the Study Area near the Class 3 burrow was likely from the one deceased desert tortoise.

Live burrowing owl individuals, occupied known burrows, and potential burrows were observed within the Study Area. No occupied nesting burrows were detected within the Study Area.

Numerous protocol-level surveys for Mohave ground squirrel have been conducted from 2006 to present within and near the Study Area, and there have been no detections of this species. Overall, there are no records of Mohave ground squirrel occurrence closer than approximately 8 miles from the Study Area, which is outside the 5-mile dispersal range of juvenile individuals. There is no evidence of Mohave ground squirrel in or near the Project site and no reason to believe that dispersing juveniles could reach the site. In addition, much of the Project site supports vegetation communities that have little or no habitat suitability for Mohave ground squirrels. Therefore, Mohave ground squirrels are not expected to occur within the boundaries of the Project site.

Known desert kit fox dens, one natal/pupping den complex, and potential desert kit fox dens were detected throughout the Study Area. Known dens and the natal/pupping den complex had desert kit fox sign in the form of scat, tracks, and/or evidence of prey items. In addition, one desert kit fox skull was observed in the Study Area.

Active Swainson's hawk nest territories were found within the 5-mile buffer around the Project site, but not within the Project site itself. The survey area (including the Project site) provides suitable nesting and foraging habitat for this species, although no nesting territories were found within the Project site.

No golden eagles or California condors were observed during the surveys within the Project site and 2-mile buffer. In addition, no golden eagle nests were observed and no California condor nesting habitat is present within the Project site or 2-mile buffer. Minimally suitable golden eagle nesting habitat is present within the 2-mile buffer outside the Project site. Foraging habitat for both species is present within the 2-mile buffer (including the Project site).

The following special-status species or their sign were also incidentally observed during the various surveys mentioned above:

- American badger (*Taxidea taxus*) sign in the form of predatory excavations,
- Cooper's hawk (*Accipiter cooperii*),
- Bell's sparrow (*Artemisiospiza belli belli*),
- Long-eared owl (*Asio otus*),
- Prairie falcon (*Falco mexicanus*),
- Northern harrier (*Circus hudsonius*),
- Olive-sided flycatcher (*Contopus cooperi*),
- Loggerhead shrike (*Lanius ludovicianus*),
- Yellow warbler (*Setophaga petechia*), and
- Yellow-headed blackbird (*Xanthocephalus xanthocephalus*).

Nests of nine non-special-status bird species and one Bell's sparrow nest were observed within the Study Area. Nests of additional unidentified bird species were also observed within the Study Area. During the Swainson's hawk and nesting raptor survey, nests of four non-special-status bird species, long-eared owl nests, and prairie falcon nests were observed within the 5-mile buffer outside the Project site.

Table ES-1 summarizes the results of the biological resources surveys.

Table ES-1. Summary of Sensitive Biological Resources Survey Results

Survey	Status and Results
Botanical surveys	Rare and State Candidate Plant Species Observed: • Few-flowered woolly-star (*Eriastrum sparsiflorum*) – California Rare Plant Rank (CRPR) 4.3 (Plants of limited distribution [Watch List] that are not very threatened in California), • Adobe yampah (*Perideridia pringlei*) – CRPR 4.3, and • Western Joshua tree (*Yucca brevifolia*) – state candidate. California Desert Native Plants Act Species Observed: • Silver cholla (*Cylindropuntia echinocarpa*), • Beavertail cactus (*Opuntia basilaris* var. *basilaris*), and • Beavertail pricklypear (*Opuntia basilaris*). Sensitive Natural Communities Observed: • Desert needlegrass grassland – S2 (imperiled), and • Scalebroom scrub – S3 (vulnerable).
Mojave desert tortoise (*Gopherus agassizii*)	• Mojave desert tortoise is a federally listed threatened and state listed endangered species. • One tortoise carcass observed that was likely an individual previously released from captivity. • One Class 3 burrow with tortoise scat observed near the found carcass. • One Class 4 burrow and two Class 5 burrows with no tortoise sign observed.
Burrowing owl (*Athene cunicularia*)	• Burrowing owl is a California Department of Fish and Wildlife (CDFW) Species of Special Concern (SSC) and a candidate species under the California Endangered Species Act. • Live burrowing owls, occupied known burrows and potential burrows were detected throughout the Study Area.
Mohave ground squirrel (*Xerospermophilus mohavensis*)	• Mohave ground squirrel is state listed as threatened. • Surveys from 2006 to 2024 within and near the Study Area have not detected this species. • Most of the Project site supports vegetation communities that have little or no suitability for Mohave ground squirrel. • This species is not expected to occur within the Project site.

Survey	Status and Results
Desert kit fox (*Vulpes macrotis arsipus*)	• Desert kit fox is protected by California Code of Regulations Title 14, Section 460. • One natal/pupping kit fox den complex observed within the Project site. • Known dens with kit fox sign and potential dens without sign observed. • One kit fox skull observed within the Project site.
Golden eagle (*Aquila chrysaetos*) and California condor (*Gymnogyps californianus*)	• Golden eagle is a CDFW Fully Protected (FP) and Watch List (WL) species. • California condor is a federally and state listed endangered species. • No individuals observed within Project site or 2-mile buffer. • No nests observed within the Project site or 2-mile buffer. • Minimally suitable golden eagle nesting habitat is present outside the Project site within the 2-mile survey area. • Suitable foraging habitat for both species is present within the Project site and 2-mile survey area.
Swainson's hawk (*Buteo swainsoni*)	• Swainson's hawk is state listed as threatened. • Active nest territories observed within 5-mile buffer but not within the Project site. No nests were observed within the Project site. • Suitable nesting and foraging habitat is present within the Project site and 5-mile buffer.
Additional special-status species	Additional special-status species or their sign incidentally observed: • American badger (*Taxidea taxus*) sign in the form of predatory excavations – CDFW SSC, • Cooper's hawk (*Accipiter cooperii*) – CDFW WL, • Bell's sparrow (*Artemisiospiza belli belli*) – CDFW WL, • Long-eared owl (*Asio otus*) – CDFW SSC, • Prairie falcon (*Falco mexicanus*) – CDFW WL, • Northern harrier (*Circus hudsonius*) – CDFW SSC, • Olive-sided flycatcher (*Contopus cooperi*) – CDFW SSC, • Loggerhead shrike (*Lanius ludovicianus*) – CDFW SSC, • Yellow warbler (*Setophaga petechia*) – CDFW SSC, and • Yellow-headed blackbird (*Xanthocephalus xanthocephalus*) – CDFW SSC.
Nesting birds	• Nesting birds are protected by the federal Migratory Bird Treaty Act and California Fish and Game Code. • Within the Study Area, nests of nine non-special-status bird species, one Bell's sparrow nest, and additional unidentified bird species nests were observed. • Within the 5-mile Study Area buffer outside of the Project site, nests of four non-special-status bird species, prairie falcon nests, and long-eared owl nests were observed.

Potential impacts to sensitive biological resources can be reduced through implementation of recommended avoidance and minimization measures, as described below.

Biologist Requirements

- Prior to the issuance of grading or building permits, and prior to decommissioning, the Project Applicant will retain a qualified biologist(s) to oversee compliance with the protection measures. The contact information for the qualified biologist(s) will be provided in writing to the Kern County Planning and Natural Resources Department. The following measures pertain to the qualified biologist(s):

  - The qualified biologist(s), or their designee, will be on the Project site during initial grading and construction, preconstruction ground-disturbing activities, and decommissioning activities.
  - The qualified biologist(s) or their designee will have the right to halt activities that are in violation of the protection measures, as well as any regulatory permits from the USFWS and/or the CDFW, if applicable. Work will proceed only after threats are removed and the species is no longer at risk.

Worker Environmental Awareness Training Program

- Prior to the issuance of grading or building permits, or decommissioning of the site, the qualified biologist will develop a Worker Environmental Awareness Training Program containing life history and identification information of rare plants and special-status wildlife species with potential to occur onsite. The Worker Environmental Awareness Training Program will review responsibilities for all onsite personnel including trash control, checking under and around vehicles and heavy equipment before starting, scanning for wildlife resources, contacting the qualified biologist in the unanticipated instance of encountering special-status wildlife species, and prohibition of pets and firearms. All onsite personnel will be required to attend an annual worker environmental training. A sticker will be placed on hard hats, indicating that the worker has completed the Worker Environmental Awareness Training. Copies of all prepared training materials and signed acknowledgement from each worker who has attended the required training will be provided to the Kern County Planning and Natural Resources Department.

General Avoidance and Protective Measures

- During Project construction and decommissioning, the Applicant will implement the following general avoidance and protective measures:
  - Immediately prior to conducting vegetation clearing or similar activities, the qualified biologist or their designee will perform a pre-construction visual survey of the area to ensure that no special-status species are present. Daily reports of these inspections will be retained by the qualified biologist and provided to the Kern County Planning and Natural Resources Department, and as required by resource agency permits issued to the Project.
  - Within the vicinity of construction activities, sensitive biological resources (e.g., special-status species, jurisdictional drainages, nesting birds) will be delineated with stakes and/or flagging.
  - Access roads that are planned for use during construction activities will not extend beyond the planned impact area; this includes all previously disturbed lands and any location within the Project fenceline not delineated for avoidance of sensitive biological resources. Where new access routes are required, the route will be clearly marked prior to construction.
  - The Applicant will minimize the areas of disturbance. Parking areas, new roads, staging, storage, excavation, and disposal site locations will be confined to the smallest areas

possible. These areas will be demarcated and disturbance activities, vehicles, and equipment will be confined to these areas.

- Spoils will be stockpiled in disturbed areas that lack native vegetation to the maximum extent practicable. Spoils that have been stockpiled and inactive for more than 24 hours will be inspected by a qualified biologist for signs of special-status wildlife before moving or disturbing.
- To prevent inadvertent entrapment of desert kit foxes, American badgers, or other animals during construction, all excavated steep-walled holes or trenches more than 2 feet deep will be covered with plywood or similar materials at the close of each working day. If holes or trenches cannot be covered, one or more escape ramps constructed of earthen fill or wooden planks, no less than 12 inches wide and secured at the top, will be placed a minimum of every 100 feet within the open trench. Escape ramps will be 30 percent slope or less. Covered and non-covered holes or trenches will be thoroughly inspected for trapped animals by a qualified biologist at the beginning and end of each working day. Immediately before such holes or trenches are filled, they will again be thoroughly inspected by trained staff approved by the qualified biologist. If non-listed trapped animals are observed, escape ramps or structures will be installed immediately to allow for their escape. If a listed species is trapped, escape ramps or structures will be installed immediately to allow for their escape and the qualified biologist will immediately confer with the USFWS and/or CDFW.
- Construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at the site for more than 24 hours and without endcaps will be thoroughly inspected by a qualified biologist prior to being moved or capped. If a listed wildlife species is discovered inside a pipe, that section of pipe will not be moved until a qualified biologist has been consulted and the animal has either moved from the structure on its own accord or until the animal has been captured and relocated in conformance with appropriate wildlife agency guidelines.
- No vehicle or equipment parked on the Project site will be moved prior to inspecting the ground beneath the vehicle or equipment for the presence of listed wildlife species. If present, the animal will be left to move on its own.
- A speed limit of 15 miles per hour will be enforced within the limits of the Project site. If night work occurs on the Project site, the speed limit will be 10 miles per hour. This requirement will be posted with signage noted throughout the site.
- Fueling of equipment will take place within existing roads or disturbed areas. No refueling within or adjacent to any drainages (within 150 feet) will be permitted. Contractor equipment will be checked for leaks prior to operation and repaired as necessary.
- Trash and food items will be contained in closed, wildlife-proof containers to reduce the attractiveness to opportunistic predators such as common ravens, coyotes, and feral dogs.
- Workers will be prohibited from bringing pets and firearms to the Project site and from feeding wildlife.

- Unpermitted killing or collection of any listed species will be prohibited.
- Herbicides that may be used as vegetation control measures in Project areas will be restricted. All uses of such herbicidal compounds will observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and state or federal legislation as well as additional Project-related restrictions deemed necessary by the USFWS or CDFW. No rodenticides will be used on the Project site.

Best Management Practices

- During construction, operation and maintenance, and decommissioning, Project work crews will be directed to use industry accepted and standard construction best management practices (BMPs) consistent with the County zoning ordinances and with guidelines provided in the California Stormwater Quality Association's Construction Best Management Practice Handbook, where applicable, to avoid, minimize, and/or reduce potential construction-related impacts on biological resources. BMPs will be monitored and repaired throughout the life of the Project. The Applicant will implement the general measures described below:
  - BMPs will be employed to prevent erosion in accordance with the Project's approved Stormwater Pollution Prevention Plan. Detected erosion will be remedied as described in the Erosion Control Plan of the Stormwater Pollution Prevention Plan.
  - Material/spoils generated from Project activities will be located away from any jurisdictional areas and environmentally sensitive areas that are not slated for impacts.
  - Jurisdictional areas and environmentally sensitive areas will be protected from stormwater runoff using temporary perimeter sediment barriers such as berms, silt fences, fiber rolls, covers, sand/gravel bags, and straw bale barriers, as appropriate.
  - Materials will be stored on impervious surfaces or plastic ground covers to prevent any spills or leakage from contaminating the ground and generally at least 50 feet from the top of bank of any jurisdictional areas and environmentally sensitive areas.
  - Any spillage of material will be stopped if it can be done safely. The contaminated area will be cleaned, and any contaminated materials properly disposed of. For all spills, the Project foreman or designated environmental representative will be notified.

Pre-Construction Surveys

- No more than 30 days prior to the start of ground disturbance, a qualified biologist knowledgeable in the identification of all special-status wildlife species that have the potential to occur on the Project site will conduct pre-construction surveys for special-status wildlife species within the Project site, as well as within a minimum of 500 feet (where legally accessible) to determine if any special-status species are present. Surveys need not be conducted for all areas of suitable habitat at one time; they may be phased so that surveys occur no more than 30 days prior to ground disturbance in specific areas of the site. If evidence of occupation by a special-status species is observed, a suitable buffer will be established by a qualified biologist that results in sufficient avoidance.

Special-status and Nesting Birds

The following measures are recommended for special-status and nesting birds:

- If construction activities are conducted during the typical nesting bird season (February 1 to August 31), a qualified biologist(s) will conduct a pre-construction nesting survey within 30 days of ground disturbance activities to reduce potential impacts to avian species. Surveys need not be conducted for the entire Project site at one time; they may be phased so that surveys occur within 30 days prior to disturbance in specific areas of the site. The survey area will cover a 500-foot buffer (access permitting).
- If construction is scheduled to occur during the non-nesting season (September 1 to January 31), no pre-construction surveys or additional measures are required for nesting birds, including raptors.
- If nesting birds/raptors are observed, a qualified biologist will establish an appropriate buffer distance around the nest site (typically 100 feet for passerines, up to 500 feet for raptors, and 0.5 mile for Swainson's hawk). The buffer will remain in place until a qualified biologist has determined that the nest is no longer active. Encroachment into the buffer may occur at the discretion of a qualified biologist in consultation with the Kern County Planning and Natural Resources Department.
- The Applicant will install any power lines in conformance with the Avian Power Line Interaction Committee (APLIC) standards as outlined in the Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (APLIC 2006), Reducing Avian Collisions with Power Lines: The State of the Art in 2012 (APLIC 2012), or any superseding document issued by APLIC.
- During the operation and maintenance phase of the Project, an Avian Mortality Monitoring Program will be developed and implemented to systematically and periodically determine the extent of mortality occurring because of collisions with solar arrays. The measures listed below will apply to the program:
  - The program will be developed following the Mortality Monitoring Design for Utility-Scale Solar Power Facilities (USGS 2016) and include methods to estimate total mortality. Methods include using a trained and skilled team of authorized biologists to systematically sample the site by walking transects through the solar arrays scanning for deceased birds.
  - Data will be collected on any encountered deceased bird (or any other wildlife) species including species, condition of the carcass, approximate age, presence of feathers, etc.
  - Maintenance personnel working on the Project site that encounter injured or deceased birds (or any other wildlife) will be trained to collect data and photograph the encountered species.
  - Mortality monitoring will be conducted for a minimum 1-year period following the commencement of the operation and maintenance phase of the Project.

- If, after 1 year of mortality monitoring, Project impacts to any avian species caused by the Project are shown to result in a substantial, long-term reduction in the demographic viability of the population of the species in question, then adaptive management must be implemented to reduce impacts. Adaptive management measures may include but not be limited to passive avian diverter installations, the use of sound, light or other means to discourage site use consistent with legal requirements, onsite habitat management or control measures consistent with applicable legal requirements, or modification to support structures to exclude nesting birds.

American Badger and Desert Kit Fox

Evidence of American badger was found in the Study Area. Therefore, the following measures for this species are recommended:

If potential American badger or desert kit fox dens are found during pre-construction surveys, the status of the dens will be evaluated by a qualified biologist no more than 30 days prior to project ground disturbance.

- If the qualified biologist determines that the den(s) are inactive, den(s) will be collapsed by a qualified biologist to prevent occupation of the den(s) between the time of the preconstruction survey and construction activities.
- If the qualified biologist determines that the den(s) are active, construction activities will not occur within 50 feet of an active badger den or 100 feet of an active kit fox den, unless otherwise approved by the qualified biologist.
- If the qualified biologist determines that potential den(s) outside of the pupping season may be active, a passive relocation program can occur. The pupping season is defined as March 15-July 31 for American badger and February 1-August 1 for desert kit fox. The program will consist of determining status of the den(s) (confirming it is a nonmaternity den through remote camera monitoring), excluding American badger or desert kit fox from the occupied nonmaternity den(s) by installation of one-way doors at burrow entrances, monitoring of the den for a minimum of 48 hours to confirm usage has been discontinued, and excavation and collapse of the den.

Common Raven

Develop a site-specific Common Raven Management Plan in accordance with USFWS guidelines and implement management measures for ravens at the Project. These measures may include but are not limited to designing structures to eliminate perches, waste management, road kill management, management of ponded water during construction and operations, and nest removal on structures within the Project site and along the transmission line.

Botanical Resources

- Prior to conducting vegetation clearing or similar activities, a qualified biologist or their designee will perform a pre-construction visual survey of the area to determine if rare plants and/or California Desert Native Plant Act species are present. Daily reports of these inspections will be retained by the Qualified Biologist and provided to the Kern County

Planning and Natural Resources Department or the California Department of Fish and Wildlife (CDFW) upon request. If rare plant species are observed, and have not otherwise been accounted for in an approved removal action, they will be delineated with stakes and/or flagged for avoidance to the extent feasible.

- Applicant will pay the required fee to Kern County to remove silver cholla, beavertail cactus, and beavertail pricklypear in accordance with the California Desert Native Plant Act prior to construction activities.
- In September 2020, western Joshua tree was designated a candidate species under the California Endangered Species Act (CESA). If, at the commencement of Project construction, Western Joshua tree is either still a candidate species, or has been listed as threatened, or endangered under CESA, and avoidance of western Joshua tree individuals is infeasible, the Applicant will consult with CDFW regarding the take of western Joshua tree and comply with all avoidance, minimization, and compensatory mitigation measures, as set forth in any incidental take permit issued to the project by CDFW. Documentation of any such CDFW take authorization and mitigation will be provided to the Kern County Planning and Natural Resources Department.

Mojave Desert Tortoise

- No more than 30 days prior to the start of ground disturbance, a qualified biologist knowledgeable in the identification of all special-status wildlife species with potential to occur on the Project site will conduct a pre-construction survey of areas proposed for disturbance within the Project site and 500-foot buffer (where legally accessible) to determine if any special-status species are present. Surveys need not be conducted for all areas of suitable habitat at one time; they may be phased so that surveys occur no more than 30 days prior to ground disturbance in specific areas of the site. If evidence of occupation by a special-status species is observed, a suitable buffer will be established by a qualified biologist that results in sufficient avoidance.
- During construction the Project site may be fenced to keep terrestrial wildlife species from entering the site. Fencing will be maintained during all phases of construction and decommissioning. The fencing will be inspected by a qualified biologist at a regular interval and immediately after major rainfall events through the duration of construction and decommissioning activities. Any needed repairs to the fence will be performed immediately upon their discovery. Outside temporarily fenced exclusion areas, areas of disturbance will be limited to the extent feasible. Parking areas, new roads, staging, storage, excavation, and disposal site locations will be confined to the smallest areas possible. These areas will be flagged and disturbance activities, vehicles, and equipment will be confined to these flagged areas.
  - Following construction, the permanent perimeter security fence may be made permeable with a gap at the bottom of the fence to allow small and medium-sized wildlife and wildlife movement through and around the project site during facility operations. Final

perimeter fencing design would be evaluated and developed in consultation with appropriate agencies, and the best-fit scenario would be incorporated at the Project site.

- Develop a site-specific Common Raven Management Plan in accordance with USFWS guidelines and implement management measures for ravens at the Project. These measures may include but are not limited to designing structures to eliminate perches, waste management, road kill management, management of ponded water during construction and operations, and nest removal on structures within the Project site and along the transmission line

Burrowing Owl

- Potential impacts to burrowing owl can be reduced through implementation of recommended avoidance and minimization measures, as described below. No more than 30 days prior to commencement of ground-disturbing activities, a qualified biologist will conduct a pre-construction survey in areas with suitable burrowing owl habitat proposed for disturbance within the Project site and 500-foot buffer (where legally accessible) to determine if occupied known and/or occupied nesting burrowing owl burrows are present. Burrowing owl burrows will be evaluated and classified per the definitions below:
  - Potential Burrow: Any subterranean hole four inches or larger for which no current evidence is present to conclude that the burrow is being used by a burrowing owl.
  - Occupied Known Burrow: A burrow that shows sign of burrowing owl presence (whitewash, feathers, pellets, prey remains, eggshell fragments) and presence of at least one burrowing owl. If monitoring confirms that burrowing owl are no longer using a burrow, it will be redesignated as potential.
  - Occupied Nesting Burrow: A burrow where monitoring overseen by a designated biologist or designated monitor demonstrates the presence of burrowing owl eggs, chicks, dependent young, and/or brooding or egg incubation (via inter-burrow scope).
- Survey methodology will be consistent with the methods outlined in the 2012 California Department of Fish and Game *Staff Report on Burrowing Owl Mitigation* and will consist of walking parallel transects 7 to 20 meters apart, adjusting for vegetation height and density as needed, and noting burrows with fresh burrowing owl sign or presence of burrowing owl. Surveys need not be conducted for all areas of suitable habitat at one time; they may be phased so that surveys occur prior to disturbance in specific areas of the site. The burrowing owl surveys may be conducted in conjunction with other required preconstruction surveys, if timing is appropriate. Copies of the survey results will be submitted to the Kern County Planning and Natural Resources Department.
  - If potential burrowing owl burrows are detected any time of year, burrows may be excavated under the direct supervision of the qualified biologist without prior camera monitoring.
  - If occupied known and/or occupied nesting burrowing owl burrows are detected, a no-disturbance buffer will be established around the burrow and no ground-disturbing activities may occur within the buffer zone.

  - An established burrowing owl burrow no-disturbance buffer may be removed once the burrow is collapsed and the burrowing owl(s) is/are no longer using the burrow.
- The size of employed no-disturbance buffers may be up to 500 meters from an occupied known burrowing owl burrow year-round. Buffer size is dependent upon time of year and level of disturbance at the Project site. Depending on the level of disturbance, a smaller buffer may be established by a qualified biologist based on the visibility and sensitivity responses of each individual burrowing owl. Buffers will be maintained for the duration the burrowing owl burrow remains occupied as determined by a qualified biologist.
- In October 2024, burrowing owl was designated a candidate species under the California Endangered Species Act (CESA). If, at the commencement of Project construction, burrowing owl is present and is either still a candidate species, or has been listed as threatened, or endangered under CESA, and avoidance of occupied known and/or occupied nesting BUOW burrows is infeasible, the Applicant will consult with the CDFW regarding the potential for Project construction activities to result in take of burrowing owl and will comply with all avoidance, minimization, and compensatory mitigation requirements set forth in any Incidental Take Permit (ITP) issued for the project by CDFW authorizing take of the species.

Swainson's Hawk

- If construction activities are scheduled to be initiated during the Swainson's hawk nesting season (March 1 through September 15), a qualified biologist will conduct a preconstruction survey of all accessible areas within 0.5 mile of the planned disturbance area to determine the presence and activity of known or new Swainson's hawk nests. Inaccessible areas will be surveyed by binocular or spotting scope. The preconstruction survey will occur within 30 days prior to the start of construction. If construction is scheduled to commence outside of the Swainson's hawk nesting season (September 16 to February 28), no preconstruction surveys are required. The preconstruction nest survey will follow the protocols set out in the California Energy Commission (CEC) and CDFW Guidance (2010).
- If preconstruction surveys detect a nesting Swainson's hawk within 0.5 mile of the Project site, a 0.5-mile avoidance buffer will be established around the nest by a qualified biologist and no construction within the buffer will be allowed until the qualified biologist has determined the nest is no longer active. Encroachment into the buffer may occur at the discretion of a qualified biologist in consultation with CDFW. If active Swainson's hawk nests are found within a 5-mile radius of the Project site during preconstruction surveys, the Project proponent/operator will mitigate the loss of any moderate quality Swainson's hawk foraging habitat for any portion of the Project site within 5 miles of an active nest at a ratio up to 0.5:1. Mitigation lands may be nested with other compensatory lands provided it meets the necessary biological requirements. Avoided habitat would not count toward impacts in determining compensatory mitigation requirements and may be used to satisfy mitigation requirements if protected by a deed restriction or other conservation mechanism/strategy.
- If avoidance of an active nest is not feasible, the Project proponent/operator will consult with the CDFW regarding the potential for Project activities to result in take of the Swainson's hawk and will comply with all avoidance, minimization, and compensatory mitigation requirements set forth in any incidental take permit issued for the Project by CDFW authorizing take of the

species. Documentation of any such CDFW take authorization and mitigation will be provided to the Kern County Planning and Natural Resources Department.

Golden Eagle and California Condor

- Wherever possible, vegetation removal will be minimized within the Project site. Native vegetation will remain undisturbed unless removal is necessary for placement of Project components to allow for continued use by potential raptor prey species (i.e., small mammals, reptiles, and amphibians).
  - Native vegetation adjacent to the Project site will remain in place as permitted by the Kern County Fire Code.
  - In areas temporarily disturbed during construction and decommissioning (including grading or removal of root balls resulting in loose soil), the ground surface will be revegetated with a native seed mix or native plants and/or allowed to re-vegetate with the existing native seed bank in the topsoil where possible to establish revegetation.
  - Vegetation/ground cover will be continuously maintained on the site by the Project proponent/operator.
- The Project Applicant will install power lines in conformance with Avian Power Line Interaction Committee (APLIC) standards for electrocution-reducing techniques as outlined in Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (APLIC 2006), and the collision-reducing techniques outlined in Reducing Avian Collision with Power Lines: The State of the Art in 2012 (APLIC 2012), or any superseding document issued by APLIC.
- During the operation and maintenance phase of the Project, an *Avian Mortality Monitoring Program* will be developed and implemented to systematically and periodically determine the extent of mortality occurring because of collisions with solar arrays. The measures listed below would apply to the program:
  - The Avian Mortality Monitoring Program will be developed following the Mortality Monitoring Design for Utility-Scale Solar Power Facilities and include methods to achieve Objective 1 (monitoring to estimate total bird and bat mortality). Methods include using a trained and skilled team of authorized biologists to systematically sample the Project site by walking transects through the solar arrays scanning for deceased birds.
  - Data will be collected on any encountered deceased bird (or any other wildlife) species including species, condition of the carcass, approximate age, presence of feathers, and the like.
  - Additionally, maintenance personnel working on the Project site who encounter injured or deceased birds (or any other wildlife) will be trained to collect data and photograph the encountered species.
  - Mortality monitoring will be conducted for a minimum of a 1-year period following the commencement of the operation and maintenance phase of the Project.
  - If, after 1 year of mortality monitoring, Project impacts to any avian species caused by the Project are shown to result in a substantial, long-term reduction in the demographic viability of the population of the species in question, then adaptive management must be implemented to reduce impacts. Adaptive management measures may include but not be

limited to passive avian diverter installations, the use of sound, light, or other means to discourage site use consistent with legal requirements, on site habitat management or control measures consistent with applicable legal requirements, or modification to support structures to exclude nesting birds.

Mojave Ground Squirrel

There is no evidence that Mojave ground squirrel occurs on or near the Project site and no reason to believe that dispersing juveniles could reach the site. However, in the case that Mojave ground squirrel is observed during pre-construction surveys, the following measure will be triggered:

- In the event that Mojave ground squirrel is observed on or near the Project site, applicable regulatory agencies will be contacted and a small mammal avoidance and monitoring program will be prepared.

Desert Kit Fox

- A qualified biologist or their designee (that is, a biologist with the ability to identify the species and possessing previous mammal survey and avoidance and minimization protection experience) will be onsite during initial grading and construction, pre-construction ground-disturbing activities, and decommissioning activities.
- A qualified biologist or their designee will conduct pre-construction surveys of all areas that would be permanently or temporarily impacted, plus a 500-foot (152-meter) buffer to the extent property access is authorized, to locate unoccupied and occupied dens. Pre-construction surveys will be conducted within a maximum of 30 days of the start of ground-disturbing activities. Surveys need not be conducted for all areas of suitable habitat at one time; they may be phased so that surveys occur within 30 days of the portion of the Project site that would be disturbed.
- If the qualified biologist determines that the den(s) are inactive, den(s) will be collapsed by a qualified biologist to prevent occupation of the den(s) between the time of the preconstruction survey and construction activities.
- If the qualified biologist determines that the den(s) are active, construction activities will not occur within 50 feet of an active badger den or 100 feet of an active kit fox den, unless otherwise approved by the qualified biologist.
- If the qualified biologist determines that potential den(s) outside of the pupping season may be active, a passive relocation program can occur. The pupping season is defined as February 1-August 1 for desert kit fox. The program will consist of determining status of the den(s) (confirming it is a nonmaternity den through remote camera monitoring), excluding desert kit fox from the occupied nonmaternity den(s) by installation of one-way doors at burrow entrances, monitoring of the den for a minimum of 48 hours to confirm usage has been discontinued, and excavation and collapse of the den.
- To prevent inadvertent entrapment of desert kit fox, all excavated steep-walled holes or trenches more than 2 feet deep will be covered with plywood or similar materials at the close of each working day. If holes or trenches cannot be covered, one or more escape ramps constructed of earthen fill or wooden planks, no less than 12 inches wide and secured at the

top, will be placed a minimum of every 100 feet within the open trench. Covered and non-covered holes or trenches will be thoroughly inspected for trapped animals by a qualified biologist at the beginning and end of each working day. Immediately before such holes or trenches are filled, they will again be thoroughly inspected by trained Staff approved by the qualified biologist or their designee.

This page intentionally left blank.

Table of Contents

1.0 INTRODUCTION 1

2.0 PROJECT DESCRIPTION AND LOCATION 1

3.0 LITERATURE REVIEW METHODS AND RESULTS 2

3.1 Topography 3

3.1.1 Methods 3

3.1.2 Results 3

3.2 Precipitation 3

3.2.1 Methods 3

3.2.2 Results 3

3.3 Soils 3

3.3.1 Methods 3

3.3.2 Results 3

3.4 Sensitive Natural Communities 4

3.4.1 Methods 4

3.4.2 Results 4

3.5 Rare Plants and Special-status Wildlife Species 5

3.5.1 Methods 5

3.5.2 Results 5

3.6 Critical Habitat 7

3.6.1 Methods 7

3.6.2 Results 7

3.7 Wildlife Movement 7

3.7.1 Methods 7

3.7.2 Results 7

4.0 FIELD SURVEY METHODS 7

4.1 Vegetation Community Mapping 8

4.2 Botanical Surveys 9

4.3 Special-status Wildlife Surveys 9

4.3.1 Desert Tortoise Habitat Suitability Assessment 9

4.3.2 Burrowing Owl and Desert Kit Fox Habitat Assessment 10

4.3.3 Desert Tortoise Survey, Burrowing Owl and Desert Kit Fox Burrow Survey 10

4.3.4 Swainson's Hawk Survey 11

4.3.5 Golden Eagle and California Condor Survey 11

4.3.6 Mohave Ground Squirrel Occurrence Assessment 12
5.0 FIELD SURVEY RESULTS 12
5.2 Botanical Surveys 15
5.3 Special-status Wildlife Species 16
5.3.1 Desert Tortoise 16
5.3.2 Other Special-status Reptiles 17
5.3.3 Burrowing Owl 17
5.3.4 Swainson's Hawk 18
5.3.5 Golden Eagle and California Condor 18
5.3.6 Other Special-status Birds and Nests 19
5.3.7 Mohave Ground Squirrel 21
5.3.8 Desert Kit Fox 22
5.3.9 Other Special-status Mammals 22
5.3.10 Crotch's Bumble Bee 23
5.4 Summary of Rare Plants and Special-status Wildlife Species 23
6.0 DISCUSSION AND RECOMMENDATIONS 40
7.0 REFERENCES 46

Tables

Table 1. Soil Types 4
Table 2. Survey Dates 8
Table 3. Vegetation Communities 12
Table 4. Rare Plants and Special-status Wildlife Species with Potential to Occur in the Study Area 24

Figures

Figure 1. Regional Overview
Figure 2. Project Location
Figure 3. USGS Topographic Map
Figure 4a. Vegetation Communities
Figure 4b. Vegetation Communities
Figure 5a. Burrow/Den Summary
Figure 5b. Burrow/Den Summary
Figure 6. Special-status Bird Species and Active Nests
Figure 7. American Badger Sign

Appendices

Appendix A: Photographs
Appendix B: Botanical Inventory Report
Appendix C: Mojave Desert Tortoise Survey Report
Appendix D: Burrowing Owl Survey Report
Appendix E: Swainson's Hawk and Nesting Raptor Survey Report
Appendix F: Golden Eagle and California Condor Survey Report
Appendix G: Memorandum on Potential for Mohave Ground Squirrel Occurrence
Appendix H: Desert Kit Fox Survey Report
Appendix I: Desert Tortoise, Burrowing Owl, and Desert Kit Fox Survey Datasheets

Acronyms and Abbreviations

APLIC	Avian Power Line Interaction Committee
Applicant	Discovery Solar PV and Storage, LLC
BBI	Bloom Biological, Inc.
BIOS	Biogeographic and Information Observation System
BMP	best management practice
CA-KRN-Canyon	Kern County Canyon Fire
CDFW	California Department of Fish and Wildlife
CEC	California Energy Commission
CESA	California Endangered Species Act
cm	centimeter
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
EAFB	Edwards Air Force Base
ESA	U.S. Endangered Species Act
Esri	Environmental Systems Research Institute
FP	CDFW Fully Protected
GPS	Global Positioning System
gen-tie	generation tie line
IBA	Important Bird Area
IPaC	Information for Planning and Consultation
kV	kilovolt
LADWP	Los Angeles Department of Water and Power
MW	megawatts
NASA	National Aeronautics and Space Administration
NRCS	Natural Resources Conservation Service
Project	Discovery Solar PV and Storage Project
PV	photovoltaic
quad	quadrangle
SCE	Southern California Edison
SR	State Route
SSC	Species of Special Concern

UPRR	Union Pacific Railroad
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WL	Watch List

This page intentionally left blank.

1.0 INTRODUCTION

Tetra Tech was retained by Discovery Solar PV and Storage, LLC (Applicant) to conduct biological field surveys for the proposed Discovery Solar PV and Storage Project (Project). This Biological Resources Summary Technical Report has been prepared to:

- Document the methods and results of field surveys,
- Summarize existing biological resources and conditions within the Study Area and vicinity, and
- Assess potential presence of special-status wildlife and rare plants.

Separate reports have been prepared for botanical species, Mojave desert tortoise (*Gopherus agassizii)*, referred to herein as desert tortoise, burrowing owl (*Athene cunicularia*), Swainson's hawk (*Buteo swainsoni*) and nesting raptors, golden eagle (*Aquila chrysaetos*) and California condor (*Gymnogyps californianus*), Mohave ground squirrel (*Xerospermophilus mohavensis*), and desert kit fox (*Vulpes macrotis arsipus*), which are provided as appendices to this report. The results have been summarized in this report.

As shown in Figure 1:

- Although the Project site is approximately 7,700 acres, a larger Study Area of 8,606 acres that encompasses the 7,700-acre Project site and the proposed generation tie line (gen-tie) was surveyed for vegetation communities, rare plants and California Desert Native Plants Act species, desert tortoise, burrowing owl, and desert kit fox. Unless otherwise stated, "Study Area" refers to these 8,606 acres.
- Approximately 2,426 acres within the 7,700-acre Project site are designated for zone changes only and would not be disturbed.
- Surveys for golden eagle and California condor were conducted within the Project site plus a 2-mile buffer.
- Surveys for Swainson's hawk were conducted within the Project site plus a 5-mile buffer.

Results of the wetland delineation conducted for the Project are provided in a separate Aquatic Resources Delineation Report.

2.0 PROJECT DESCRIPTION AND LOCATION

The Project includes development of a photovoltaic (PV) solar facility and associated infrastructure necessary to generate up to 1,400 megawatts (MW) of renewable electrical energy with up to 8 gigawatt-hours of energy storage capacity (approximately 1,000 MW) on an approximately 7,700-acre Project site in an unincorporated area of southeastern Kern County, California. Approximately 2,426 acres within the 7,700-acre Project site are designated for zone changes only and would not be disturbed (Figure 1).

Main components of the Project consist of PV solar panels, a power collection system including medium-voltage lines that connect the solar facilities, inverters, a switchyard, foundations, and transformers that will be installed onsite. Associated Project infrastructure includes an operations and maintenance facility, telecommunication facilities, energy storage system(s), up to three onsite

collector substations, interconnection and transmission systems, and temporary laydown yards. The Project may be constructed in multiple phases.

The Project will interconnect to the existing Windhub Substation, which is owned and operated by Southern California Edison (SCE). The interconnect will be via a newly constructed 230-kilovolt (kV) gen-tie that will extend north from the Project site towards the Windhub Substation from onsite collector substations. A portion of the Project 230-kV gen-tie line would be co-located within an existing gen-tie corridor (controlled by the Applicant and/or its affiliates). A high-voltage switchyard located immediately north of the Union Pacific Railroad (UPRR) rail line will also be constructed.

The Project is generally on undeveloped and privately owned land, along the northern edge of the Antelope Valley. The Project site is located approximately 6 miles southwest of the unincorporated community of Mojave, approximately 9 miles southeast of the City of Tehachapi, and approximately 8 miles northwest of the unincorporated community of Rosamond. State Route (SR)-58 is north of the Project site, SR-14 is east of the Project site, and Tehachapi Willow-Springs Road runs between the Project site's boundaries (Figure 1). A network of existing named and unnamed dirt roads traverses the Project site. The Los Angeles Department of Water and Power (LADWP) aqueduct roughly bisects the Project site (Figures 2 and 3). On-site, adjacent, and nearby uses include renewable energy development, rural residential development, livestock grazing, heavy industrial and mining uses, and undeveloped lands. The Project site is regularly used for sheep (*Ovis aries*) grazing and sheep were observed onsite. Elevations across the Project site are relatively flat, ranging from approximately 2,970 to 3,760 feet above mean sea level. The Project site is located within the *Monolith, Willow Springs,* and *Soledad Mountain* U.S. Geological Survey (USGS) 7.5-Minute Topographic Quadrangles (quads).

3.0 LITERATURE REVIEW METHODS AND RESULTS

This section describes the literature review methods and results used to initially evaluate the biological resources within the Study Area and vicinity. The search radius utilized for each source listed below is defined in Sections 3.1 through 3.7. Species-specific literature reviews that were conducted are described in the individual reports for those species (Appendices B to H). Relevant literature, databases, geographic information system data, and aerial imagery were reviewed as follows:

- Aerial and historical imagery (Google Earth©)
- Audubon (Audubon California 2024)
- Calflora's California plants database (Calflora 2024)
- California Department of Fish and Wildlife (CDFW) Biogeographic and Information Observation System (BIOS) California Natural Diversity Database (CNDDB; CDFW 2024a)
- CDFW BIOS Habitat Connectivity Viewer (CDFW 2024b)
- CDFW California Wildlife Habitat Relationships (CDFW 2024c)
- California Native Plant Society (CNPS) Electronic Inventory of Rare and Endangered Plants (CNPS 2024)
- U.S. Fish and Wildlife Service (USFWS) Critical Habitat Portal (USFWS 2024a)

- USFWS Information for Planning and Consultation (IPaC; USFWS 2024b)
- USGS 7.5-Minute Topographic Maps

3.1 Topography

3.1.1 Methods

USGS 7.5-minute topographic maps of the *Monolith, Willow Springs,* and *Soledad Mountain* quads, as well as aerial and historical imagery, were reviewed. Topography describes the physical features of an area of land. The topographic features include natural landforms, aquatic features, developed lands, agricultural lands, undeveloped lands, and terrain. Natural landforms are natural physical features on the surface of the land, such as mountains, hills, and canyons.

3.1.2 Results

The Study Area is relatively flat and is bordered to the west by the Tehachapi Mountains. Elevations across the Study Area range from approximately 2,970 feet above mean sea level in the southeast corner to approximately 3,760 feet above mean sea level in the northwest portion. The Study Area is bisected by the LADWP Aqueduct, which runs southwest to northeast through the Study Area. Oak Creek, which was dry during all surveys, also runs through the middle of the Study Area from north to south. Surrounding land use includes energy generation from wind turbines, the Windswept Ranch property, and residential areas.

3.2 Precipitation

3.2.1 Methods

Precipitation data from the National Aeronautics and Space Administration (NASA) climatology station at Edwards Air Force Base (EAFB) were reviewed.

3.2.2 Results

At EAFB between January and December 2023, approximately 6.47 inches of precipitation were received. The annual precipitation from 2023 is higher than the average annual precipitation from 1994 to 2023 of 4.61 inches (NASA 2024). Surveys were performed during a year when rare plants and other biological resources would be expected to be found if present.

3.3 Soils

3.3.1 Methods

Soils data within the Study Area from the U.S. Department of Agriculture Natural Resources Conservation Service Web Soil Survey were reviewed (USDA NRCS 2024).

3.3.2 Results

Soils found in the Study Area primarily consisted of friable loamy sand and sandy loam soil types. The Study Area includes 13 types of soil (Table 1).

Table 1. Soil Types

Soil Type	Study Area	
	Acres	Percent
Adelanto loamy sand, 2 to 5 percent slopes	290	3
Cajon loamy sand, 2 to 9 percent slopes	1,289	15
Greenfield sandy loam, 2 to 9 percent slopes	409	5
Hanford coarse sandy loam, 2 to 9 percent slopes	300	4
Ramona coarse sandy loam, 5 to 9 percent slopes	740	9
Ramona sandy loam, 9 to 30 percent slopes, eroded	29	0
Arizo gravelly loamy sand, 2 to 9 percent slopes	18	0
Cajon loamy sand, 0 to 5 percent slopes	3,271	38
Cajon gravelly loamy sand, 0 to 9 percent slopes	1,056	12
Garlock loamy sand, 2 to 9 percent slopes	830	10
Randsburg sandy loam, 2 to 15 percent slopes	245	3
Rosamond clay loam	127	1
Torriorthents-Rock outcrop complex, very steep	2	0
Total	**8,606**	**100**

3.4 Sensitive Natural Communities

3.4.1 Methods

Natural communities considered sensitive are identified by the CDFW (CDFW 2023). Natural communities are ranked statewide (S) 1 through 5 based on NatureServe's methodology (NatureServe 2024). Sensitive natural communities are defined as vegetation alliances and associations with rarity ranking of S1, S2, or S3, with the following definitions:

- S1: Critically imperiled at very high risk of extirpation due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
- S2: Imperiled at high risk of extirpation due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
- S3: Vulnerable at moderate risk of extirpation due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

The CDFW CNDDB (CDFW 2024a) was used to identify sensitive natural communities that may exist within a USGS nine-quad search, consisting of the *Soledad Mountain, Sanborn, Rosamond Lake, Rosamond, Bissell, Mojave, Willow Springs, Monolith,* and *Little Buttes* quads.

3.4.2 Results

Three sensitive natural communities were identified within the nine-quad desktop review: Joshua tree woodland, valley needlegrass grassland, and wildflower field (CDFW 2024a). Two sensitive natural communities were found in the Study Area during the Project surveys: desert needlegrass grassland

and scalebroom scrub. Desert needlegrass grassland has a ranking of S2 (imperiled), and scalebroom scrub has a ranking of S3 (vulnerable).

3.5 Rare Plants and Special-status Wildlife Species

3.5.1 Methods

Special-status plant species include those species that are:

1. Listed as threatened or endangered under the California Endangered Species Act (CESA) or federal Endangered Species Act (ESA),
2. Proposed for federal listing as threatened or endangered,
3. State or federal candidate species,
4. Designated as rare by the CDFW, and
5. Have a California Rare Plant Rank (CRPR) of 1 through 4.

Special-status animal species include species that are:

1. Listed as threatened or endangered under the CESA or ESA,
2. Proposed for federal listing as threatened or endangered,
3. State or federal candidate species, and
4. Identified by the CDFW as species of special concern, fully protected species, or Watch List species.

These species are collectively referred to as special-status wildlife species and rare plants in this report. Searches of the CDFW CNDDB, CNPS Rare Plant Inventory, Calflora's California plants database, and USFWS IPaC were performed to identify special-status wildlife and rare plant species that have the potential to occur within the Study Area. The CDFW CNDDB and the CNPS Rare Plant Inventory were queried using a nine-quad search radius, centered on the *Soledad Mtn.* quad. Calflora was utilized as a source of information on rare plants and to investigate rare plant species from the CNPS Rare Plant Inventory search that have no documentation in the CDFW CNDDB. USFWS IPaC was searched within the Study Area. The CDFW CNDDB and California Wildlife Habitat Relationship system were used to assess species ranges (CDFW 2024b, 2024c).

3.5.2 Results

Based on the desktop review, several special-status plant species and special-status wildlife species have been historically documented in the vicinity of the Study Area, as defined in Section 3.5.1, including the following (Calflora 2024; CDFW 2024a; CNPS 2024; USFWS 2024b):

- Crotch's bumble bee (*Bombus crotchii*),
- Northern California legless lizard (*Anniella pulchra*),
- Coast horned lizard (*Phrynosoma blainvillii*),
- Desert tortoise,

- Cooper's hawk (*Accipiter cooperii*),
- Tricolored blackbird (*Agelaius tricolor*),
- Golden eagle,
- Short-eared owl (*Asio flammeus*),
- Long-eared owl (*Asio otus*),
- Burrowing owl,
- Ferruginous hawk (*Buteo regalis*),
- Swainson's hawk,
- Mountain plover (*Charadrius montanus*),
- Northern harrier (*Circus hudsonius*),
- Merlin (*Falco columbarius*),
- Prairie falcon (*Falco mexicanus*),
- Loggerhead shrike (*Lanius ludovicianus*),
- Townsend's big-eared bat (*Corynorhinus townsendii*),
- Tulare grasshopper mouse (*Onychomys torridus tularensis*),
- Tehachapi pocket mouse (*Perognathus alticola inexpectatus*),
- American badger (*Taxidea taxus*),
- Mohave ground squirrel, and
- Rare plants.

Although Le Conte's thrasher (*Toxostoma lecontei*) has been documented within the Study Area (CDFW 2024a), this species is not considered special-status in the Study Area because the CDFW Species of Special Concern (SSC) designation refers only to the San Joaquin population, which does not overlap with the Study Area (Fitton 2008). Similarly, although California horned lark (*Eremophila alpestris actia*) has been documented approximately 6 miles east of the Study Area (CDFW 2024a), the Study Area is outside the current range of this species (CDFW 2024c). The subspecies of horned lark that occurs in the Study Area is likely the Mohave horned lark (*Eremophila alpestris ammophila*).

In addition to the species listed above, the CDFW CNDDB also identified western snowy plover (*Charadrius nivosus nivosus*), white-faced ibis (*Plegadis chihi*), western pond turtle (*Actinemys marmorata*), southern rubber boa (*Charina umbratica*), and Mohave shoulderband (*Helminthoglypta greggi*) (CDFW 2024a). Since aquatic, wetland, riparian, montane forest, talus slope, and/or coastal habitats required by these species are not present in the Study Area, they are not carried forward for additional analysis.

The potential to occur for each species has been reviewed and updated based on the results of the field surveys and is provided in the summary of rare plants and special-status wildlife species results section of this report.

3.6 Critical Habitat

3.6.1 Methods

The USFWS Critical Habitat Portal was reviewed to identify designated final and proposed Critical Habitat for federally threatened and endangered species within 30 miles of the Study Area (USFWS 2024a).

3.6.2 Results

The literature review determined that there is no Critical Habitat located within 10 miles of the Study Area. The closest Critical Habitat is for California condor and is located 13 miles west of the Study Area in the Tehachapi Mountains. In addition, Critical Habitat for desert tortoise is located 26 miles southeast of the Study Area.

3.7 Wildlife Movement

3.7.1 Methods

The Essential Connectivity Map on the CDFW BIOS Habitat Connectivity Viewer was reviewed to determine whether the Study Area is located within or near a CDFW designated Natural Landscape Block or Essential Connectivity Area (CDFW 2024b). Additional resources reviewed include aerial imagery and Audubon data (Audubon California 2024).

3.7.2 Results

Per the BIOS Habitat Connectivity Viewer, the Study Area is not located within a Natural Landscape Block or Essential Connectivity Area. Natural Landscape Blocks are blocks of contiguous natural habitat connectivity in California. Essential Connectivity Areas are large areas important to maintaining ecological integrity that connect multiple Natural Landscape Blocks. The closest Essential Connectivity Area to the Study Area is located 4 miles northwest of the Study Area. One Natural Landscape Block occurs 9 miles north of the Study Area.

The Study Area is located within the Pacific Flyway, which is a significant north-south flight route that stretches 4,000 miles from the Arctic to South America. Millions of birds annually migrate along the Pacific Flyway and stop along the way at sites for nesting, wintering, resting, and foraging, which are known as Important Bird Areas (IBA). The Antelope Valley - EAFB IBA occurs within the Study Area, the Tehachapi Mountains IBA occurs approximately 10 miles west of the Study Area, and the Kelso Creek - Southern Sierra Desert Canyons IBA occurs approximately 12 miles north of the Study Area (Audubon California 2024).

4.0 FIELD SURVEY METHODS

Surveys for biological resources were conducted within the Study Area from 2022 to 2025. Although the Project site is approximately 7,700 acres, the larger 8,606-acre Study Area encompasses the 7,700-acre Project site and the proposed gen-tie corridor. Approximately 61 acres of the Project site are not included in the Study Area and were not surveyed for biological resources. These acres are included in

the 2,426 acres within the Project site that are designated for zone changes only and would not be disturbed.

As shown in Figure 1, the survey area for golden eagle and California condor consists of the Project site plus a 2-mile buffer, and the survey area for Swainson's hawk consists of the Project site plus a 5-mile buffer.

Survey methodology for the surveys conducted to date is summarized in the sections below; the species-specific reports in Appendices B to H contain additional details. Table 2 provides the dates of the surveys conducted for the Project.

Table 2. Survey Dates

Survey/Study	Dates
Vegetation Community Mapping	November 2022 July 2023 January 2024 September 2025
Botanical Surveys	April/May, and June 2023 April and June 2024 September 2025
Desert Tortoise Habitat Suitability Assessment	November 2022 November and December 2023 January and April 2024
Burrowing Owl and Desert Kit Fox Habitat Assessment	November 2022 September 2025
Desert Tortoise Protocol-Level Survey, Burrowing Owl and Desert Kit Fox Burrow Survey	April – October 2023 April 2024
Swainson's Hawk Protocol Survey	April – July 2023 April – June 2024 April – July 2025
Golden Eagle and California Condor Protocol Survey	April – May 2023
Mohave Ground Squirrel Occurrence Assessment	2024

4.1 Vegetation Community Mapping

Vegetation communities within the Study Area were documented and mapped to the alliance level in November 2022, July 2023, January 2024, and September 2025 at a minimum mapping unit of 10 acres. Biologists conducted surveys in consideration of the following protocols and guidelines:

- Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants (USFWS 2000);
- Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities (CDFW 2018); and
- CNPS Botanical Survey Guidelines (CNPS 2001).

Vegetation communities were classified to the alliance level and followed *Manual of California Vegetation, Second Edition* (CNPS 2025; Sawyer et al. 2009). Publicly available vegetation data including the CDFW Vegetation Classification and Mapping Program for the Desert Renewable Energy

Conservation Plan was reviewed and a desktop analysis of aerial imagery was performed. Following the desktop analysis, biologists conducted ground-truthing in the field using pedestrian surveys, assessments from key vantage points, and aerial imagery to characterize and map the vegetation communities. Vegetation mapping was conducted separately from the botanical surveys. Vegetation community data were collected electronically using the Environmental Systems Research Institute (Esri) Field Maps software. Representative photographs were taken during the survey to provide visual representation of select vegetation communities within the Study Area. Sensitive vegetation communities were designated based on the California Sensitive Natural Communities list provided as part of CDFW's Vegetation Classification and Mapping Program (CDFW 2023).

4.2 Botanical Surveys

The Study Area was visually surveyed for rare plants and plant species protected by the California Desert Native Plants Act in April, May, and June 2023, and April and June 2024, using transects spaced 20-meters (66 feet) apart. Biologists conducted surveys in consideration of the USFWS, CDFW, and CNPS protocols and guidelines (refer to Appendix B).

Two survey efforts were conducted in 2023 and 2024, one survey in April/May and a second survey in June, to capture the blooming periods of all potential rare plants in the Study Area. The survey was floristic in nature and all plant species observed were identified to the lowest taxonomic level necessary to determine if any were a rare plant species using a dichotomous key (The Jepson Herbarium 2024). If a rare plant species was detected, its location was recorded and a count of individuals was taken. Individual rare plants of the same species within 7 meters (23 feet) of one another were mapped as one population, and as a separate population if beyond 7 meters (23 feet). For large populations, the number of individuals was estimated based on observed density.

Rare plant species and species protected by the California Desert Native Plants Act were documented with an iPad or tablet running Esri's Field Maps software paired with an external sub-meter Global Positioning System (GPS) device.

An additional botanical survey was performed in September 2025 in areas of the Project site that were previously not surveyed. This survey focused primarily on mapping California Desert Native Plant Act species.

4.3 Special-status Wildlife Surveys

4.3.1 Desert Tortoise Habitat Suitability Assessment

The desert tortoise habitat suitability assessment was conducted in November 2022, November and December 2023, and January and April 2024. The habitat suitability assessment was performed by driving existing roads throughout the Study Area and assessing the habitat for its suitability to support desert tortoise. For inaccessible areas, aerial imagery was reviewed and evaluated in the field using binoculars.

During the habitat suitability assessment, specific features that help identify suitable desert tortoise habitat were visually evaluated, including topography, substrate texture, plant species diversity, vegetation composition and cover, presence of washes, presence of potential forage plants, and cover

sites (e.g., soil burrows, caliche caves, rock shelters, large shrubs). Additionally, evidence of disturbance was noted, such as off-highway vehicle use, fencing, roads, evidence of livestock grazing, trash dumping, existing renewable energy generating infrastructure, transmission lines, vegetation removal and ground disturbing activities (i.e., grading, grubbing), other anthropogenic features, and evidence of predators (e.g., common ravens [*Corvus corax*], canids). Habitat suitability data was collected in the field using Esri's ArcGIS Field Maps on a device connected to a GPS unit.

4.3.2 Burrowing Owl and Desert Kit Fox Habitat Assessment

A burrowing owl and desert kit fox habitat assessment was conducted in November 2022 and September 2025. Biologists ascertained existing site conditions, reviewed vegetation mapping data, and located suitable habitat.

Observed burrowing owl burrows, as well as owl sign and any live owls, were mapped. Burrowing owl burrow categories included potential burrows, occupied known burrows, and occupied nesting burrows (Appendix D). These categories are defined as the following:

- **Potential Burrow:** Any subterranean hole four inches or larger for which no current evidence is present to conclude that the burrow is being used by a burrowing owl.
- **Occupied Known Burrow:** A burrow that shows sign of burrowing owl presence (whitewash, feathers, pellets, prey remains, eggshell fragments) and presence of at least one burrowing owl.
- **Occupied Nesting Burrow:** A burrow where monitoring overseen by a designated biologist demonstrated the presence of burrowing owl eggs, chicks, dependent young, and/or brooding or egg incubation (via inter-burrow scope).

Examples of burrowing owl atypical burrows are human-made structures such as pipes, culverts, debris piles, or other various openings that meet the size criteria stated above. Any burrowing owl sign, including the presence of pellets, feathers, tracks, whitewash, burrow decoration materials, eggshell fragments, etc., were also documented.

Potential, known, and natal desert kit fox dens and any sign (e.g., tracks, scat, and prey remains) observed during the habitat assessment were also mapped. Desert kit fox dens had a diameter of approximately 13 to 20 cm (5 to 8 inches) (USFWS 2011). The *USFWS Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox Prior to or During Ground Disturbance* (USFWS 2011) was used for definitions of desert kit fox den categories since guidance specifically for the desert kit fox does not exist (Appendix H).

4.3.3 Desert Tortoise Survey, Burrowing Owl and Desert Kit Fox Burrow Survey

The desert tortoise protocol-level survey and the burrowing owl and desert kit fox burrow survey occurred concurrently in April, May, September, and October 2023, and April 2024. The survey was conducted in accordance with established burrowing owl, kit fox, and desert tortoise survey guidelines as applicable (CDFW 2012; USFWS 2011; USFWS 2019).

The desert tortoise burrow/pallet class definitions utilized are from the *Desert Tortoise Field Manual* (USFWS 2009), and carcass class definitions are from the *Field Survey Protocol for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise* (USFWS 1992; Appendix C).

Burrowing owl burrow definitions are defined above in Section 4.3.2. The *USFWS Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox Prior to or During Ground Disturbance* (USFWS 2011) was used for definitions of desert kit fox den categories.

During the survey, biologists surveyed all suitable habitat in the Study Area for burrowing owl, desert tortoise, and/or desert kit fox and their sign by walking 10-meter (33-foot) interval transects. Transects were walked during optimal weather conditions (i.e., no heavy rain or fog) to allow for the greatest visibility possible.

Individuals and sign of burrowing owl (e.g., pellets, whitewash, prey remains), desert tortoise (e.g., scat, tracks, burrows, carcasses), and desert kit fox (e.g., dens, scat, tracks) were mapped. Evidence of American badger or other incidental wildlife activity at burrows was also recorded when found. All burrows that could be used or were used by these species were mapped using Esri's ArcGIS Field Maps on a device connected to a GPS device and documented on a datasheet. Datasheets from the survey are provided in Appendix I.

4.3.4 Swainson's Hawk Survey

Bloom Biological, Inc. (BBI) conducted Swainson's hawk protocol-level surveys between April and July in 2023, between April and June in 2024, and between April and July in 2025 within accessible and suitable habitat inside the Project site and a 5-mile buffer (Appendix E). BBI conducted the Swainson's hawk protocol-level surveys in accordance with the 2010 CDFW and California Energy Commission (CEC) *Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California* (CEC and CDFW 2010). As specified by the CEC and CDFW Guidance, surveys were conducted during the minimum three survey periods between April 1 and July 15 (Survey Period II – IV), with three complete surveys per period each consisting of four person/days. Surveys were completed by driving slowly on roads through suitable habitat in the survey area while searching for Swainson's hawk and their nests and pausing frequently to observe.

Suitable nesting habitat for Swainson's hawk is defined generally as low-growing agricultural areas, fallow agricultural fields, and native and disturbed desert bordered by or containing suitable nesting trees including, but not limited to, western Joshua trees.

Surveys for other nesting raptors were conducted simultaneously with the Swainson's hawk surveys, including searches of all suitable nest trees and structures (e.g., utility poles and towers, buildings, rocks, and cliffs). All nesting raptors observed within the survey area were recorded and mapped.

4.3.5 Golden Eagle and California Condor Survey

BBI conducted protocol-level surveys between April and May 2023 for golden eagle in suitable nesting habitat within the Project site and a 2-mile radius surrounding the Project site, which followed USFWS recommendations and survey methodology (Appendix F). An initial reconnaissance-level survey was

conducted in March 2023 to identify suitable nesting habitat and position observation points from which protocol-level surveys were later conducted. Suitable nesting habitat was surveyed from the observation points for 4 hours per survey round. There is no survey protocol for California condor but the species was surveyed for simultaneously with golden eagle.

4.3.6 Mohave Ground Squirrel Occurrence Assessment

A Mohave ground squirrel desktop assessment was completed in 2024. The results of previous Mohave ground squirrel protocol-level surveys in the region surrounding the Project site were reviewed to assess the likelihood of Mohave ground squirrel occurrence within the Study Area. Habitat suitability within the Study Area was also assessed (Appendix G).

5.0 FIELD SURVEY RESULTS

Table 3 lists the vegetation communities found and their acreage within the Study Area. Results of the vegetation mapping are shown in Figures 4a and 4b. Representative photographs of the Study Area are provided in Appendix A.

Table 3. Vegetation Communities

Vegetation Communities	Acres within Study Area
Allscale scrub (*Atriplex polycarpa* Shrubland Alliance)	20
Brittle bush scrub (*Encelia farinosa* Shrubland Alliance)	206
California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii* Shrubland Alliance)	465
California juniper woodland (*Juniperus californica* Woodland Alliance)	354
Cheesebush scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance)	773
Creosote bush scrub (*Larrea tridentata* Shrubland Alliance)	5,737
Desert needlegrass grassland (*Stipa speciosa* Herbaceous Alliance)[CDFW SNC S2]	246
Developed	57
Disturbed	35
Disturbed creosote bush scrub	340
Rubber rabbitbrush scrub (*Ericameria nauseosa* Shrubland Alliance)	344
Scalebroom scrub (*Lepidospartum squamatum* Shrubland Alliance)[CDFW SNC S3]	29
Total	**8,606**

Notes:
CDFW SNC = California Department of Fish and Wildlife Sensitive Natural Community
S2 = Imperiled at high risk
S3 = Vulnerable at moderate risk

Nine natural vegetation communities were found within the Study Area: allscale scrub (*Atriplex polycarpa* Shrubland Alliance), brittle bush scrub (*Encelia farinosa* Shrubland Alliance), California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii* Shrubland Alliance), California juniper woodland (*Juniperus californica* Woodland Alliance), cheesebush scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance), creosote bush scrub *(Larrea tridentata* Shrubland Alliance), desert needlegrass grassland *(Stipa speciosa* Herbaceous Alliance*),* rubber rabbitbrush scrub (*Ericameria nauseosa* Shrubland Alliance), and scalebroom scrub (*Lepidospartum squamatum* Shrubland Alliance). Two sensitive natural communities occur in the Study Area: desert needlegrass grassland

and scalebroom scrub. The three other communities within the Study Area contained developed and disturbed areas and disturbed creosote bush scrub. In addition, the Kern County Canyon Fire (CA-KRN-Canyon) previously burned through the western portion of the Study Area in 2011 and this area is generally disturbed.

Several habitat types, including Mojavean desert scrub, chenopod scrub, grassland, and woodland, were observed within the Study Area. Mojavean desert scrub is comprised of vegetation communities that commonly occur within the Mojave Desert and are dominated by low shrubs (usually below 5 meters in height) that are adapted to low rainfall and high summer temperatures. Chenopod scrub vegetation communities are dominated by plants in the goosefoot family (*Chenopodiaceae*). Grasslands are dominated by grasses with low to no cover in the shrub and tree canopies. Woodlands are a vegetation type in which trees occur in open stands where their crowns are open and generally do not overlap (usually with 10 to 60 percent canopy cover). These habitat types are utilized by CNPS and the CNDDB to categorize habitats and are relevant for characterizing rare plant presence within the Study Area. The following habitat types were found within the Study Area:

- Mojavean desert scrub habitat – allscale scrub, brittle bush scrub, California buckwheat scrub, cheesebush scrub, creosote bush scrub, rubber rabbitbrush scrub, and scalebroom scrub;
- Chenopod scrub habitat – allscale scrub;
- Grassland habitat – desert needlegrass grassland; and
- Woodland habitat – California juniper woodland.

Vegetation communities as well as disturbed and developed areas observed within the Study Area are described below:

Allscale scrub (*Atriplex polycarpa* Shrubland Alliance): This alliance is dominated by allscale scrub, which comprises more than 2 percent absolute cover and more than 50 percent relative cover in the shrub canopy. Other plant species present in this community include creosote bush (*Larrea tridentata*) and winterfat (*Krascheninnikovia lanata*). Some scattered western Joshua trees are present. Shrubs are generally less than 3 meters in height, and canopy is open to continuous.

Brittle bush scrub (*Encelia farinosa* Shrubland Alliance): This alliance is dominated by brittle bush (*Encelia farinosa*), which comprises more than 1 percent absolute cover in the shrub canopy and more than 50 percent relative cover. Other plant species present in this community include white bursage (*Ambrosia dumosa*), creosote bush, desert needlegrass (*Stipa speciosa*), and cheesebush (*Ambrosia salsola*). Shrubs are generally less than 2 meters in height, and canopy is open to intermittent.

California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii Shrubland* Alliance): This alliance is dominated by Mojave desert California buckwheat (*Eriogonum fasciculatum* var. *polifolium*). California buckwheat is present at more than 5 percent absolute cover in the shrub canopy and Parish's goldeneye (*Viguiera parishii*) was not observed. In some areas, California buckwheat is codominant with Cooper's goldenbush (*Ericameria cooperi* var. *cooperi*). White bursage, desert needlegrass, creosote bush, cheesebush, Nevada ephedra (*Ephedra nevadensis*), desert fiddleneck (*Amsinckia tessellata* var. *tessellata*), and rayless goldenhead (*Acamptopappus sphaerocephalus)* are

also present in this community. Shrubs are generally less than 2 meters in height, and canopy is open to intermittent open.

California juniper woodland (*Juniperus californica* Woodland Alliance): This alliance is dominated by California juniper (*Juniperus californica*), which is present at more than 3 percent absolute cover over lower shrubs. No other tree species are present. Other plant species present in this community include creosote bush, Nevada ephedra, and desert needlegrass. Trees are generally less than 5 meters in height, and canopy is open to intermittent.

Cheesebush scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance): This alliance is dominated by cheesebush, which is present at more than 2 percent cover in the shrub canopy with other shrubs comprising less cover in the shrub canopy. Sweetbush (*Bebbia juncea*) is not present in this community. Other plant species observed include creosote bush, white bursage, desert needlegrass, desert fiddleneck, Nevada ephedra, Acton Encelia (*Encelia actoni*), rubber rabbitbrush (*Ericameria nauseosa*), cheatgrass (*Bromus tectorum*), and rayless goldenhead. Shrubs are less than 2 meters in height, and canopy is open to intermittent.

Creosote bush scrub (*Larrea tridentata* Shrubland Alliance): This alliance was the most encountered vegetation community in the Study Area. This alliance is dominated by creosote bush, which exceeds other shrubs in cover. In some areas, emergent western Joshua trees are present. Other small shrubs such as white bursage, winterfat, Nevada ephedra, cheesebush, rayless goldenhead, and peach thorn (*Lycium cooperi*) were observed alongside creosote in some areas, but in this alliance, their cover is less than three times the cover of creosote bush.

Desert needlegrass grassland (*Stipa speciosa* Herbaceous Alliance): Desert needlegrass grassland is a sensitive natural community with a rarity ranking in California of S2 (imperiled). This alliance is dominated by desert needlegrass, which is present at more than 50 percent relative cover in the herbaceous layer. Emergent western Joshua trees and shrubs, including cheesebush, rubber rabbitbrush, creosote bush, desert wishbone bush (*Mirabilis laevis*), and desert fiddleneck are present at low percent cover. Herbs are generally less than 1 meter in height, and canopy is open to intermittent.

Developed: Areas mapped as developed include existing wind energy generating infrastructure, existing buildings, structures, hard paved roads, and railroads. The existing Windhub substation is located off Oak Creek Road. Other areas mapped as developed include buildings on the Windswept Ranch Petting Zoo property as well as a graded gravel lot with trailers and fenced yard on Tehachapi Willow Springs Road. Multiple abandoned and/or previously occupied structures as well as associated non-occupied accessory structures within the western half of the Study Area and roads including Oak Creek Road, Santa Fe Railroad, and Tehachapi Willow Springs Road were also considered to be developed.

Disturbed: Areas described as disturbed are characterized by the presence of anthropogenic disturbances such as trash, off-road vehicle tracks, and non-native species. Areas mapped as disturbed include areas along Oak Creek Road with existing infrastructure associated with the Windhub substation, part of the southeastern section of the Study Area adjacent to the Holliday Rock Mine, an abandoned illegal grow operation in the middle of the Study Area north of the LADWP

aqueduct, and abandoned encampments with no structures in the middle of the Study Area north of the LADWP aqueduct and in the southwestern section of the Study Area south of the LADWP aqueduct.

Disturbed creosote bush scrub: This community is characterized by anthropogenic disturbances to the ground and vegetation. Disturbed creosote bush scrub in the northernmost section of the Study Area is disturbed due to historical ground and vegetation disturbance, road construction, and/or has been burned in a wildfire. The section south of the LADWP aqueduct is disturbed due to a large burn scar, because of which it exhibits characteristics different than creosote bush scrub in other areas of the Study Area. Dead creosote bush and western Joshua trees, relatively low vegetation cover, and large areas of bare soil were observed in this burned area. In the area north of the LADWP aqueduct and south of Tehachapi Willow Springs Road, anthropogenic disturbances and historical grading were observed.

Rubber rabbitbrush scrub (*Ericameria nauseosa* Shrubland Alliance): This alliance is dominated by rubber rabbitbrush, which is present at more than 50 percent relative cover in the shrub canopy. Shrubs are generally less than 3 meters in height, and canopy is open to continuous.

Scalebroom scrub (*Lepidospartum squamatum* Shrubland Alliance): Scalebroom scrub is a sensitive natural community with a rarity ranking in California of S3 (vulnerable). This alliance is dominated by scalebroom (*Lepidospartum squamatum*), which is present at more than 1 percent cover in alluvial environments. This alliance was observed along a dry streambed that runs across the Study Area. Rubber rabbitbrush and desert needlegrass were also present in this community. Shrubs are less than 2 meters in height, and canopy is open to continuous and two-tiered.

5.2 Botanical Surveys

Three rare plant species were observed in the Study Area during the botanical surveys, including few-flowered woolly-star (*Eriastrum sparsiflorum*), adobe yampah (*Perideridia pringlei*), and western Joshua tree. Few-flowered woolly-star and adobe yampah are both California Rare Plant Rank (CRPR) 4.3 species, and western Joshua tree is a candidate species under the California Endangered Species Act.

An estimated 579 few-flowered woolly-star individuals were found. Approximately 110 adobe yampah individuals were also observed in the Study Area.

Three species protected under the California Desert Native Plants Act were observed: silver cholla (*Cylindropuntia echinocarpa*), beavertail cactus (*Opuntia basilaris* var. *basilaris*), and beavertail pricklypear (*Opuntia basilaris*). Pursuant to the Western Joshua Tree Conservation Act and the California Desert Native Plants Act, the provisions of the California Desert Native Plants Act do not apply to western Joshua tree.

Details and figures for the botanical surveys are in the Botanical Inventory Report (Appendix B).

5.3 Special-status Wildlife Species

Numerous burrows and dens were mapped during the desert tortoise surveys, burrowing owl surveys, and desert kit fox surveys in 2022, 2023, 2024, and 2025. A summary of the burrows and dens mapped during the surveys is shown in Figures 5a and 5b; these figures include burrows and dens with sign as well as those without sign but that could potentially be used by the species. Burrows that are of sufficient size and correct shape can be used by burrowing owl, desert kit fox, and/or desert tortoise. At some burrows and dens, evidence of use by more than one species was observed. The following burrows and dens were mapped within the Study Area:

Burrowing Owl

- A total of 397 burrowing owl burrows were mapped within the Study Area.
  - 395 potential burrows were detected.
  - Two occupied known burrows were detected. Live burrowing owls and burrowing owl sign, including whitewash, pellets, feathers, and prey remains were observed at occupied known burrows.
  - No occupied nesting burrowing owl burrows were observed within Study Area.

Desert Kit Fox

- A total of 293 known, natal/pupping, and potential dens were mapped within the Study Area.
  - 21 known dens with sign of desert kit fox were detected.
  - One natal/pupping den was detected.
  - 271 potential dens with no sign of desert kit fox were detected.

Desert Tortoise

- Four desert tortoise burrows were mapped within the Study Area.

5.3.1 Desert Tortoise

The Study Area is within the known distributional range of the desert tortoise, which is a federally listed threatened and state listed endangered species. There is no designated desert tortoise Critical Habitat within the Study Area (USFWS 1994). According to the CNDDB, one observation of desert tortoise previously occurred within the northwestern portion of the Study Area in 2009 at a distinct location, and four more observations have been made adjacent to the Study Area in 2009 and 2013 (CDFW 2024a).

Moderate suitability, low suitability, and unsuitable desert tortoise habitats were observed within the Study Area. The majority of the Study Area consisted of moderate suitability desert tortoise habitat (78 percent) and low suitability habitat (21 percent). The Study Area consisted of less than 1 percent unsuitable desert tortoise habitat. Moderate suitability habitat was characterized by friable soils, moderate to high native vegetation cover, evidence of anthropogenic disturbance and non-native vegetation cover. Low-suitability habitat had some available cover sites, but vegetation cover was lower than in moderate suitability habitat. Disturbance was more prevalent in areas with low-suitability habitat. Unsuitable desert tortoise habitat mostly consisted of developed areas and

anthropogenically disturbed areas (i.e., abandoned and dilapidated structures, buildings, homesteads, roads, railroads).

No live desert tortoise were detected in the Study Area. One adult male desert tortoise carcass with evidence of canid predation was observed. Several physical characteristics (i.e., circular hole in marginal scute, flattened and smooth abdominal and femoral scutes) were observed on the shell of the carcass that are consistent with physical characteristics observed in captive desert tortoise individuals and, therefore, likely indicates previous captivity. It is likely that this tortoise was released from captivity and died once in the wild. A Class 3 burrow (definitely tortoise, deteriorated condition; USFWS 2009) with multiple pieces of desert tortoise scat was observed within 160 feet of the carcass. It is likely that the tortoise released from captivity was using this Class 3 burrow and left the scat. Two Class 5 burrows (possibly tortoise, deteriorated condition; USFWS 2009) were found in the northern portion of the Study Area; however, no desert tortoise sign was observed at these two burrows. In addition, one Class 4 burrow (possibly tortoise, good condition; USFWS 2009) was observed near the center of the Study Area and also had no desert tortoise sign observed. All observed desert tortoise sign was likely from the one deceased desert tortoise.

Details and figures for the habitat suitability assessment and survey for desert tortoise are in the Mojave Desert Tortoise Survey Report (Appendix C).

5.3.2 Other Special-status Reptiles

Northern California legless lizard, a CDFW SSC, was not incidentally observed during the 2023, 2024, or2025 surveys. The nearest recorded observation of northern California legless lizard in the CNDDB is approximately 3 miles north of the Study Area in 2013 (CDFW 2024a). This species is known to occur in desert scrub habitat and in sandy washes, which occur in the Study Area. Therefore, it has the potential to occur in the Study Area.

Coast horned lizard, a CDFW SSC, was not incidentally observed during the 2023, 2024, or 2025 surveys. The nearest recorded observation of coast horned lizard in the CNDDB is approximately 5 miles northwest of the Study Area in 2016 (CDFW 2024a). Coast horned lizard is known to occur in open areas with sandy soil and low vegetation. This species uses alkali desert scrub habitat, which occurs in the Study Area in all observed natural scrub habitats. Therefore, it has the potential to occur in the Study Area.

5.3.3 Burrowing Owl

The Study Area is in the known distributional range of the burrowing owl. Burrowing owl is a CDFW SSC. The Southern Desert population of burrowing owl within the Mojave Desert is also a CESA Listing Candidate, meaning that take of the species is prohibited unless authorized pursuant to an incidental take permit issued by CDFW. This species breeds and lives in burrows in valley and foothill grassland habitats, as well as agricultural areas or any open dry area with low vegetation, including deserts. According to the CNDDB, the nearest recorded observation of burrowing owl is approximately 0.6-mile south of the Study Area in 2009 (CDFW 2024a). In addition, there are 11 occurrences documented within 5 miles of the Study Area between 2005 and 2012.

A total of 397 burrows, including 395 potential burrows and 2 occupied known burrows, were mapped within the Study Area. No occupied nesting burrows were detected within the Study Area. A total of three live burrowing owls were observed within the Study Area during surveys; two were associated with occupied known burrows and one was not associated with a burrow. Based on these findings, burrowing owls are present on the Project site.

Details and figures for the burrowing owl surveys are in the Burrowing Owl Survey Report (Appendix D).

5.3.4 Swainson's Hawk

Swainson's hawk is a state listed threatened species. Swainson's hawk was observed within the Project site and outside the Project site in the 5-mile Study Area during surveys in 2025. Swainson's hawk nests were observed within the 5-mile survey area outside the Project site during the Swainson's hawk surveys and were determined to be active during the 2023, 2024, and/or 2025 breeding season. The nests are in tamarisk (*Tamarisk* sp.) tree rows and western Joshua trees approximately 3 to 4 miles from the Project site. The nearest previously recorded observation of Swainson's hawk in the CNDDB is approximately 4 miles south of the Project site in 2016 (CDFW 2024a). Suitable nesting habitat is present within the survey area (including within the Project site), particularly within stands of western Joshua trees and California juniper; however, no nesting territories were found within the Project site. With the exception of developed areas, the survey area (including the Project site) largely consists of potential Swainson's hawk foraging habitat.

Details and figures for the Swainson's hawk survey are in the Swainson's Hawk and Nesting Raptor Survey Report (Appendix E).

5.3.5 Golden Eagle and California Condor

Golden eagle, a species protected under the Bald and Golden Eagle Protection Act as well as a CDFW Fully Protected (FP) and Watch List (WL) species, was not observed during surveys in 2023. The nearest recorded observation of golden eagle in the CNDDB is approximately 6 miles east of the Project site in 1969 (CDFW 2024a). The grassland and herbaceous habitat on the site may provide nesting and foraging habitat for this species. This species forages in desert and woodland terrain and nests on cliff ledges. Minimally suitable golden eagle nesting habitat is present within the survey area (outside the Project site) in the form of rocky outcrops, but foraging habitat for this species is available within the survey area (including the Project site). The nearest extant nest is approximately 7 miles to the north of the Study Area and contained signs of nesting activity as recently as 2019 (Appendix F).

California condor, a federally and state listed endangered species, was not observed during surveys in 2023. This species has been previously documented approximately 15 to 20 miles west of the Project site in 1976 and 2013 (CDFW 2024a). California condor nests in deep canyons containing clefts in the rocky walls and forages up to 100 miles from the nest or roost. No condor nesting habitat is present within the survey area, but foraging habitat is available within the survey area (including the Project site).

Details and figures for these species are provided in the Golden Eagle and California Condor Survey Report (Appendix F).

5.3.6 Other Special-status Birds and Nests

Other special-status bird species observed within the Study Area include Cooper's hawk, northern harrier, olive-sided flycatcher (*Contopus cooperi*), loggerhead shrike, yellow warbler (*Setophaga petechia*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), and Bell's sparrow (*Artemisiospiza belli belli*). For bird species that were observed overhead during the surveys, exact locations were not mapped. Long-eared owl and prairie falcon were observed nesting within the 5-mile buffer outside the Project site (Appendix E). Cooper's hawk, prairie falcon, and Bell's sparrow are CDFW WL species, while northern harrier, olive-sided flycatcher, loggerhead shrike, yellow warbler, yellow-headed blackbird, and long-eared owl are CDFW SSC. The Study Area also provides habitat for several special-status birds that were not observed during surveys, including tricolored blackbird, ferruginous hawk, and merlin. Tricolored blackbird is a state threatened species and a CDFW SSC, while ferruginous hawk and merlin are CDFW WL species. Special-status bird species with low potential to occur are not described below but are included in Table 4, further below, including short-eared owl and mountain plover.

One Cooper's hawk was observed as a transient visitor to the Study Area on November 10, 2022, during the burrowing owl habitat assessment. Cooper's hawk will typically nest in coniferous, deciduous, and mixed woods with tall trees, which are not found in the Study Area. In the winter, they are known to forage in open areas including shrublands and grasslands. The Study Area provides foraging habitat but not nesting habitat for Cooper's hawk.

One northern harrier individual was observed on May 9, 2023, during the desert tortoise survey and burrowing owl and desert kit fox burrow survey. Northern harrier will typically nest near marshes, which are not found in the vicinity of the Study Area. This species forages in grasslands and shrublands. The Study Area provides foraging but not nesting habitat for northern harrier.

One potential olive-sided flycatcher was observed on May 9, 2023, during the desert tortoise survey and burrowing owl and desert kit fox burrow survey. Olive-sided flycatcher breeds in coniferous forests, mountains, and near the coast of California. This species mostly winters in South America and the Study Area is not within its breeding range or habitat, so it is unlikely to inhabit the Study Area. The observed individual was likely migrating north towards its breeding habitat.

Loggerhead shrike was observed and/or heard vocalizing 41 times within the Study Area during surveys conducted in 2023 and 2024. The location of each individual was recorded (Figure 6). Loggerhead shrike nest in trees and shrubs and forage in open grassland, shrubland, and desert habitats. The Study Area provides both nesting and foraging habitat for loggerhead shrike. Chicks and fledglings of this species were observed during the surveys and it likely breeds in the Study Area.

Yellow warbler was observed in the Study Area on May 3, 2023 (Figure 6). Yellow warbler breeds along streamsides and forages in shrubland and woodland habitats. The Study Area likely provides foraging habitat for yellow warbler but would not provide breeding habitat. This species was likely using the site as a stopover during migration.

Yellow-headed blackbird was observed in the Study Area on May 2, 2023. Yellow-headed blackbird breeds in freshwater sloughs, marshy lakes, and tall cattails, which are not present within the vicinity

of the Study Area. Yellow-headed blackbirds are known to inhabit desert grassland and shrubland habitat, which are available in the Study Area. The Study Area provides foraging habitat but not nesting habitat for yellow-headed blackbird.

One Bell's sparrow nest was observed in the Study Area on May 16, 2023 (Figure 6). Bell's sparrow typically nests in chaparral and coastal sage scrub and is also found in arid scrub habitat. The Study Area is within the breeding range of this species.

Long-eared owl was observed nesting in the 5-mile buffer outside the Project site during the nesting raptor survey in 2024, approximately 2 to 3 miles from the site (Appendix E). In 2025, the previously active nests from 2024 were unoccupied. The nearest previously recorded occurrence is approximately 4 miles south of the Study Area in 2011 (CDFW 2024a). Long-eared owl nests have previously been found in desert woodland habitat, which the Study Area could provide in California juniper woodland habitat or areas with western Joshua trees. This species is known to forage in desert scrub and grassland habitat. The Study Area provides both nesting and foraging habitat for long-eared owl.

Tricolored blackbird was not observed during 2023, 2024, or 2025 surveys. The nearest recorded observation of tricolored blackbird in the CNDDB is approximately 11 miles south of the Study Area in 1995 (CDFW 2024a). Tricolored blackbird breeds in large freshwater marshes in dense stands of cattail, which are not present in or near the Study Area. This species is known to occupy grasslands. The Study Area may provide foraging but not nesting habitat for tricolored blackbird.

Ferruginous hawk was not observed during the 2023, 2024, or 2025 surveys. The nearest recorded observation of ferruginous hawk in the CNDDB is approximately 4 miles south of the Study Area in 2009 (CDFW 2024a). The Study Area could provide nesting habitat for ferruginous hawks, which prefer to nest in riparian habitat and are not known to nest in the Mojave Desert. Ferruginous hawk occurs in desert saltbush habitats, which are found in the Study Area. Foraging habitat is widely available for ferruginous hawk in the Study Area.

Merlin was not observed during the 2023, 2024, or 2025 surveys. There are two occurrences of this species within the Study Area, one from 2009 in the southern portion and one from 2011 in the northern portion of the Study Area, both north of the Los Angeles Aqueduct (CDFW 2024a). Merlin do not breed in California but are known to forage in open and semi-open habitat, including grasslands, woodlands, and shrublands. Merlin may use the Study Area for foraging.

Prairie falcon was observed nesting in the 5-mile buffer outside the Project site during the nesting raptor survey in 2025, approximately 2 to 3 miles from the Project site (Appendix E). No prairie falcon nests were observed in the 5-mile buffer during surveys in 2023 or 2024. There is one occurrence of prairie falcon in the CNDDB within the nine-quad search, approximately 4 miles east of the Study Area in 1982 in the *Soledad Mountain* quad (CDFW 2024a). Prairie falcon nest in cliff habitat, which can be found near but not within the Study Area. This species is known to forage in desert grassland and shrubland habitat. The Study Area may provide foraging habitat but not nesting habitat for prairie falcon.

Active bird nests were found within the Study Area in 2023 as shown in Figure 6, including 11 common raven nests, 1 American kestrel (*Falco sparverius*) nest, 15 Brewer's sparrow (*Spizella breweri*) nests, 3 horned lark (*Eremophila alpestris*) nests, 2 Le Conte's thrasher nests, 2 lesser nighthawk (*Chordeiles acutipennis*) nests, 19 mourning dove (*Zenaida macroura*) nests, 1 western meadowlark (*Sturnella neglecta*) nest, 1 Bell's sparrow nest (as described above), and 5 unknown sparrow nests. Three nests of additional unknown bird species were also observed in the Study Area. Overall, the Study Area provides nesting habitat for ground-nesting birds, shrub-nesting birds, and for species that nest in western Joshua trees and California juniper.

During the nesting raptor survey in the 5-mile buffer outside the Project site in 2023, 2024, and 2025, active red-tailed hawk (*Buteo jamaicensis*) nests, great horned owl (*Bubo virginianus*) nests, barn owl (*Tyto alba*) nests, long-eared owl nests, and common raven nests were mapped. Additional common raven nests were also found in the Project site during the nesting raptor survey. Active red-tailed hawk nests were observed as close as 104 meters from the Project site, active great-horned owl nests were documented as close as 2.4 miles from the Project site, active barn owl nests were observed as close as 0.01 miles from the Project site, active long-eared owl nests were found as close as 2.3 miles from the Project site, and active common raven nests were found within Project site during the raptor survey in 2023, 2024, and 2025. Details and figures for these nests can be found in the Swainson's Hawk and Nesting Raptor Survey Report (Appendix E).

5.3.7 Mohave Ground Squirrel

Mohave ground squirrel is state listed as threatened. Mohave ground squirrel is often found in areas dominated by Mojave creosote bush scrub and the Study Area supports this plant community; the soils in the Study Area are also suitable for the species. West of the Los Angeles Aqueduct, a number of other shrub communities are present that are very unlikely to support Mohave ground squirrels, including allscale scrub, brittle bush scrub, California buckwheat scrub, cheesebush scrub, desert needlegrass grassland, and rubber rabbitbush scrub. California juniper woodland becomes dominant at higher elevations within the Project site and is not suitable habitat for Mohave ground squirrel. In addition, the overall habitat quality of the Project site for Mohave ground squirrel has been degraded by decades of sheep grazing and other anthropogenic disturbances. Therefore, much of the Project site supports vegetation communities that have little or no suitability for Mohave ground squirrel.

From 2006 to present, numerous protocol-level surveys for Mohave ground squirrel have been conducted in the vicinity of the Study Area, including within the Study Area, and there have been no captures or visual detections of the species. In addition, there are no records of Mohave ground squirrel occurrence closer than approximately 8 miles from the northeast corner of the Study Area, which is outside the 5-mile dispersal range of juvenile Mohave ground squirrels. The Project site is separated from any documented occurrence by a number of barriers (urban development, highways, and other existing infrastructure), which would further restrict movement of Mohave ground squirrel westward toward the Project site. There is no evidence of Mohave ground squirrel on or near the Project site and no reason to believe that dispersing juveniles could reach the site. Therefore, Mohave ground squirrel is not expected to occur within the boundaries of the Project. Additional details are provided in the Memorandum on Potential for Mohave Ground Squirrel Occurrence (Appendix G).

5.3.8 Desert Kit Fox

Desert kit fox, a species protected by the California Code of Regulations Title 14, Section 460, was found in the Study Area. During the desert kit fox surveys, numerous potential desert kit fox dens were observed, as well as some known dens which had sign in the form of scat, tracks, and/or evidence of prey items. One natal/pupping den complex was also observed within the Project site. In addition, one desert kit fox skull was observed in the Project site. Details and figures for desert kit fox within the Study Area can be found in the Desert Kit Fox Survey Report (Appendix H).

5.3.9 Other Special-status Mammals

The soils in the Study Area are suitable for other special-status mammal species, including the American badger, Tehachapi pocket mouse, and Tulare grasshopper mouse. The range of Townsend's big-eared bat also overlaps with the Study Area. American badger, Tehachapi pocket mouse, Tulare grasshopper mouse, and Townsend's big-eared bat are CDFW SSC.

Evidence of American badger was detected at 57 locations within the Study Area (Figure 7). Evidence consisted of predatory excavations of rodent burrows with claw marks. No American badger individuals were observed, which is expected because this species is generally nocturnal and surveys were conducted during the day. American badger can have expansive home ranges within foothill and grassland communities, and the Study Area provides both foraging and denning habitat for American badger.

Not much information is known regarding the Tehachapi pocket mouse and Tulare grasshopper mouse and their life histories and habitat requirements (CDFW 2024c, CSU Stanislaus undated). Sign of these species was not observed within the Study Area. Tehachapi pocket mouse mainly inhabits chaparral, sagebrush scrub, and pinyon juniper woodland habitats within and at the base of the Tehachapi Mountains, which are not found within the Study Area. Tulare grasshopper mouse inhabits shrubland habitats, which are found within the Study Area. However, Tulare grasshopper mouse has only been observed once within the Tehachapi Mountains in 1973 (CDFW 2024a). Due to a lack of habitat and potential range limitation to the Tehachapi Mountains, it is unlikely for the Tehachapi pocket mouse to inhabit the Study Area. Tulare grasshopper mouse may occur given presence of shrubland habitat in the Study Area.

Townsend's big-eared bat was not incidentally observed during surveys within the Study Area. The nearest recorded observation of Townsend's big-eared bat in the CNDDB is approximately 3.8 miles east of the Study Area in 1997 in an abandoned mine in Soledad Mountain (CDFW 2024a). This species roosts in open and cavernous spaces such as caves, mines, tunnels, bridges, abandoned buildings, and other human-made structures. In southern California, Townsend's big-eared bats are commonly found in abandoned mines. This species is not likely to roost in the Study Area because there are no caves or mines within the site. However, three abandoned mines are found on the side of Middle Butte Mountain that borders the southern boundary of the Study Area, approximately 0.1 mile from the Study Area (Hudson Institute of Mineralogy 2024). There are an additional 11 mines on the opposite end of the mountain, about 0.25 to 2 miles from the Study Area. Townsend's big-eared bat may forage up to 6.5 miles from their roost site, but the average distance traveled while foraging is 2 miles. Since the Study Area is within 6.5 miles of a known roost site, this species may roost on Middle Butte

Mountain and use the Study Area to forage. This species requires drinking water within its foraging range and would likely only have sources of drinking water on the Study Area immediately after a rain event. Sources of drinking water (i.e., crop-irrigated areas or human-made ponds) may occur offsite. Therefore, Townsend's big-eared bat is unlikely to roost but may forage in the Study Area.

5.3.10 Crotch's Bumble Bee

Crotch's bumble bee is a state candidate endangered species. This species primarily nests in late February to late October in thatched grasses, abandoned rodent burrows or bird nests, brush piles, rock piles, and fallen logs. Overwintering sites may include soft soil, leaf litter, or other debris. Crotch's bumble bee uses a variety of suitable floral resources, including but not limited to flowering plants in the *Asteraceae*, *Boraginaceae*, *Fabaceae*, and *Hydrophyllaceae* families (Xerces Society 2018). These flowering plants occur within the Study Area and the Study Area also contains small mammal burrows.

Crotch's bumble bee was documented once in the *Mojave* quad, about 7 miles northeast of the Study Area in 1936 (CDFW 2024a). During 2024 Crotch's bumble bee surveys for a separate project, one Crotch's bumble bee individual was found approximately 1.2 miles northwest of the Project site (unpublished data). No confirmed Crotch's bumble bees or Crotch's bumble bee nests were observed during surveys for the separate project and no nests have been documented within the vicinity of the Study Area.

This species may occur in the Study Area due to the presence of floral resources (potential foraging habitat), burrows and crevices (potential nesting habitat), and overwintering habitat. Routine grazing and trampling of the site by ungulates may disturb habitat for this species and reduce habitat suitability (Xerces Society 2018). No confirmed Crotch's bumble bees were observed and no Crotch's bumble bee nests were incidentally observed within the Study Area during surveys conducted for the Project.

5.4 Summary of Rare Plants and Special-status Wildlife Species

Based on the survey results, the potential to occur for each rare plant and special-status wildlife species from the nine-quad search has been reviewed and updated and is provided in Table 4. Rare plant species that were observed or were not observed during botanical surveys conducted within the appropriate blooming seasons are noted in the table. The following potential to occur categories are used in Table 4:

- Low: recent records of the species do not exist in the vicinity of the Study Area and there is limited suitable habitat.
- Moderate: recent records of the species exist in the vicinity of the Study Area or suitable habitat is present.
- High: recent records of the species exist in the vicinity of the Study Area and suitable habitat is present.
- Observed: the species or its sign was observed during Project-specific surveys.

Table 4. Rare Plants and Special-status Wildlife Species with Potential to Occur in the Study Area

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Plants					
Allium howellii var. *howellii*	Howell's onion	None	CRPR 4.3 / None	Howell's onion is present in the *Monolith* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of Howell's onion are present in the CDFW CNDDB (CDFW 2024a). Howell's onion occurs in valley and foothill grassland habitats. Preferred soil types for this species are serpentine soils on grassy slopes. This species is typically observed growing at an elevation of 165-7,220 feet. Howell's onion blooms from March to April. Due to a lack of preferred habitat on the Study Area (e.g., serpentine soils in grassland slopes), Howell's onion has a low potential to occur on the Study Area.	Low potential. Not observed during surveys.
Astragalus hornii var. *hornii*	Horn's milkvetch	None	CRPR 1B.1 / None	Horn's milkvetch is present in the *Little Buttes* and *Willow Springs* quads in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 6 miles south of the Study Area in 1931, and the closest most recent occurrence is 55 miles northwest in 2013 (CDFW 2024a). Horn's milkvetch occurs in meadow, seep, and playa habitats. This species is typically observed growing on salty flats and lake shores at an elevation of approximately 195-2,790 feet, which is lower than the Study Area elevation. Horn's milkvetch blooms from May to October. Due to a lack of preferred habitat and elevation, Horn's milkvetch has a low potential to occur on the Study Area.	Low potential. Not observed during surveys.
Calochortus striatus	Alkali mariposa-lily	None	CRPR 1B.2 / None	Alkali mariposa-lily is present in the *Little Buttes, Bissell, Rosamond, Rosamond Lake, Sanborn, Soledad Mtn.,* and *Willow Springs* quads in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of alkali mariposa-lily are present in the CDFW CNDDB (CDFW 2024a). However, alkali mariposa-lily was observed in high numbers at a location approximately 9.5 miles west of the Study Area (Tetra Tech 2025). Alkali mariposa-lily occurs in chaparral, chenopod scrub, meadow and seep, and Mojavean desert scrub habitats at an elevation of 230-5,235 feet. This species prefers alkaline meadows and moist creosote-bush scrub. Alkali mariposa-lily blooms from April to June. Alkali mariposa-lily has a moderate potential to occur in the Study Area given the presence of chenopod scrub and Mojavean desert scrub habitat.	Moderate potential. Not observed during surveys.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Camissonia kernensis ssp. *kernensis*	Kern County evening-primrose	None	CRPR 4.3 / None	Kern County evening-primrose is present in the *Mojave* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of Kern County evening-primrose are present in the CDFW CNDDB (CDFW 2024a). Kern County evening-primrose occurs in chaparral, Joshua tree woodland, and pinyon and juniper tree woodland habitats at an elevation of 2,590-6,990 feet. This species prefers sandy slopes and flats, which can be found in the Study Area in all natural vegetation communities. Kern County evening primrose blooms from March to May. Kern County evening-primrose has a moderate potential to occur in the Study Area given the presence of sandy slopes and flats.	Moderate potential. Not observed during surveys.
Canbya candida	White pygmy-poppy	None	CRPR 4.2 / None	White pygmy-poppy is present in the *Rosamond, Rosamond Lake, Bissell,* and *Mojave* quads in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 9 miles northeast of the Study Area from 1935, and the closest most recent occurrence is 38 miles north in 1995 (CDFW 2024a). White pygmy-poppy occurs in Joshua tree woodland, Mojavean desert scrub, and pinyon and juniper woodland habitats at an elevation of 1,970-4,790 feet. This species is typically observed growing in sandy places. White pygmy-poppy blooms from March to May. White pygmy-poppy has a moderate potential to occur in the Study Area given the presence of sandy soil in Mojavean desert scrub habitat.	Moderate potential. Not observed during surveys.
Castilleja plagiotoma	Mojave paintbrush	None	CRPR 4.3 / None	Mojave paintbrush is present in the *Monolith* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of Mojave paintbrush are present in the CDFW CNDDB (CDFW 2024a). Mojave paintbrush occurs in Great Basin scrub, Joshua tree woodland, lower montane coniferous forest, and pinyon and juniper woodland habitats at an elevation of 985-8,205 feet. This species prefers dry sagebrush scrub and pinyon woodland. Mojave paintbrush blooms from April to June. Mojave paintbrush has a moderate potential to occur in the Study Area the presence of juniper woodland habitat.	Moderate potential. Not observed during surveys.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Chorizanthe spinosa	Mojave spineflower	None	CRPR 4.2 / None	Mojave spineflower is present in all quads searched except for the *Monolith* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of Mojave spineflower are present in the CDFW CNDDB (CDFW 2024a). However, Mojave spineflower was observed at a location approximately 9.5 miles west of the Study Area (Tetra Tech 2025). Mojave spineflower occurs in chenopod scrub, Joshua tree woodland, playa, and Mojavean desert scrub habitats at an elevation of 20-4,265 feet. This species prefers sandy or gravelly soil types, which were found in the Study Area in all natural vegetation communities. Mojave spineflower blooms from March to July. Mojave spineflower has a moderate potential to occur in the Study Area given the presence of sandy soil in Mojavean desert scrub habitat.	Moderate potential. Not observed during surveys.
Delphinium recurvatum	Recurved larkspur	None	CRPR 1B.2 / None	Recurved larkspur is present in the *Soledad Mtn.* quad in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 8 miles southeast of the Study Area in 2011 (CDFW 2024a). Recurved larkspur occurs in chenopod scrub, cismontane woodland, and valley and foothill grassland habitats at an elevation of 10-2,590 feet. This species prefers poorly drained, fine, alkaline soils in grassland and saltbush scrub habitat. Recurved larkspur blooms from March to June. The preferred elevation of this species is lower than the elevation of the Study Area. Therefore, recurved larkspur has a low potential to occur in the Study Area.	Low potential. Not observed during surveys.
Dudleya abramsii ssp. *calcicola*	Limestone dudleya	None	CRPR 4.3 / None	Limestone dudleya is present in the *Monolith* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of limestone dudleya are present in the CDFW CNDDB (CDFW 2024a). Limestone dudleya occurs in chaparral, pinyon woodland, and juniper woodland habitats at an elevation of 1,640-8,530 feet. This species prefers open, rocky, granite or limestone outcrops. Limestone dudleya blooms from April to August. Limestone dudleya has a moderate potential to occur on the Study Area given the presence of rocky outcrops and juniper woodland habitat.	Moderate potential. Not observed during surveys.
Eriastrum rosamondense	Rosamond eriastrum	None	CRPR 1B.1 / None	Rosamond eriastrum is present in the *Rosamond* and *Rosamond Lake* quads in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 13 miles southeast of the Study Area in 2010 (CDFW 2024a). Rosamond eriastrum occurs in chenopod scrub and vernal pool habitats at an elevation of 2,295-3,855 feet. This species prefers flat alkali plains, hard-packed sandy soil among low hummocks, and alkaline scrub. Rosamond eriastrum blooms from April to May. Rosamond eriastrum has a moderate potential to occur in the Study Area given the presence of sandy soil in chenopod scrub and alkaline scrub habitats.	Moderate potential. Not observed during surveys.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Eriastrum sparsiflorum	Few-flowered woolly-star	None	CRPR 4.3 / None	Few-flowered woolly-star was observed during 2023 surveys along a wash that runs through the Study Area. It is also present in the *Monolith* and *Willow Springs* quads in the CNPS Rare Plant Inventory database (CNPS 2024). Few-flowered woolly-star occurs in chaparral, cismontane woodland, Great Basin scrub, Joshua tree woodland, Mojavean desert scrub, pinyon woodland, and juniper woodland habitats at an elevation of 3,525-5,610 feet. This species prefers open sunny areas on flats, hillsides, small washes, floodplains, and disturbed areas. Few-flowered woolly-star blooms from May to September.	Observed in the Study Area. Refer to Appendix B.
Eriastrum tracyi	Tracy's eriastrum	None	CRPR 3.2 / None	Tracy's eriastrum is present in the *Monolith* quad in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 13 miles northwest of the Study Area in 1910, and the closest most recent occurrence is 20 miles north in 2010 (CDFW 2024a). Tracy's eriastrum occurs in chaparral, cismontane woodland, and valley and foothill grassland habitats at an elevation of 1,035-5,840 feet. This species is typically observed in shale barrens, open hillsides, ridge tops, flats, floodplains, dry washes, and disturbed areas. Tracy's eriastrum blooms from May to July. Tracy's eriastrum has a moderate potential to occur in the Study Area given the presence of grassland habitat, hillsides, ridges, flats, and dry washes.	Moderate potential. Not observed during surveys.
Eriophyllum mohavense	Barstow woolly sunflower	None	CRPR 1B.2 / None	Barstow woolly sunflower is present in the *Sanborn* and *Rosamond Lake* quads in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 14 miles northwest of the Study Area in 2015 (CDFW 2024a). Barstow woolly sunflower occurs in chenopod scrub, playa, and Mojavean desert scrub habitats at an elevation of 1,640-3,150 feet. This species prefers creosote bush scrub habitat. Barstow woolly sunflower blooms from March to May. Barstow woolly sunflower has a moderate potential to occur in the Study Area given the presence of creosote bush scrub habitat.	Moderate potential. Not observed during surveys.
Gilia interior	Inland gilia	None	CRPR 4.3 / None	Inland gilia is present in the *Little Buttes* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of inland gilia are present in the CDFW CNDDB (CDFW 2024a). Inland gilia occurs in cismontane woodland, Joshua tree woodland, and lower montane coniferous forest habitats at an elevation of 2,295-5,580 feet. This species prefers rocky slopes, open woodland, and scrub habitats. Inland gilia blooms from March to May. Inland gilia has a moderate potential to occur in the Study Area given the presence of scrub habitats.	Moderate potential. Not observed during surveys.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Goodmania luteola	Golden goodmania	None	CRPR 4.2 / None	Golden goodmania is present in the *Rosamond, Rosamond Lake, and Mojave* quads in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of golden goodmania are present in the CDFW CNDDB (CDFW 2024a). Golden goodmania occurs in Mojavean desert scrub, meadow and seep, playa, and valley and foothill grassland habitats at an elevation of 65-7,220 feet. This species prefers clay soils. One small area of the Study Area may contain clay soils. Golden goodmania blooms from April to August. Golden goodmania has a moderate potential to occur in the Study Area given the presence of clay soil and Mojavean desert scrub habitat.	Moderate potential. Not observed during surveys.
Layia heterotricha	Pale-yellow layia	None	CRPR 1B.1 / None	Pale-yellow layia is present in the *Mojave* and *Monolith* quads in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 1 mile northwest of the Study Area in 2016 (CDFW 2024a). Pale-yellow layia occurs in cismontane woodland, coastal scrub, pinyon and juniper tree woodland, and valley and foothill grassland habitats at an elevation of 985-5,595 feet. Preferred soil types for this species are clay and sandy soils that may or may not be alkaline in open areas. Pale-yellow layia blooms from March to June. Pale-yellow layia has a moderate potential to occur in the Study Area given the presence of clay and sandy soils as well as juniper woodland and grassland habitats.	Moderate potential. Not observed during surveys.
Loeflingia squarrosa var. *artemisiarum*	Sagebrush loeflingia	None	CRPR 2B.2 / None	Sagebrush loeflingia is present in the *Soledad Mtn., Rosamond,* and *Rosamond Lake* quads in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 10 miles east of the Study Area in 1998, and the closest most recent occurrence is 32 miles southeast in 2003 (CDFW 2024a). Sagebrush loeflingia occurs in desert dunes, Great Basin scrub, and Sonoran desert scrub habitats at an elevation of 2,295-5,300 feet. This species is typically observed growing in sand, gravelly hills, mesas, dunes, and disturbed areas. Sagebrush loeflingia blooms from April to May. Sagebrush loeflingia has a moderate potential to occur in the Study Area given the presence of Great Basin scrub habitats.	Moderate potential. Not observed during surveys.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Monardella exilis	Mojave monardella	None	CRPR 4.2 / None	Mojave monardella is present in the *Little Buttes, Rosamond, Rosamond Lake, Soledad Mtn.,* and *Mojave* quads in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of Mojave monardella are present in the CDFW CNDDB (CDFW 2024a). Mojave monardella occurs in chenopod scrub, desert dune, Great Basin scrub, Joshua tree woodland, lower montane coniferous forest, Mojavean desert scrub, and pinyon and juniper woodland habitats at an elevation of 1,970-6,725 feet. This species prefers washes, desert scrub, and pinyon woodland habitats. Mojave monardella blooms from April to September. Mojave monardella has a moderate potential to occur in the Study Area given the presence of washes as well as Mojavean desert scrub habitat.	Moderate potential. Not observed during surveys.
Nemacladus secundiflorus var. *robbinsii*	Robbins' nemacladus	None	CRPR 1B.2 / None	Robbins' nemacladus is not present in the nine quads searched in the CNPS Rare Plant Inventory database; however, observations of Robbin's nemacladus in the CNPS Rare Plant Inventory database have occurred within the nine-quad radius (CNPS 2024). The closest occurrence is 32 miles southwest of the Study Area in 1978 (CDFW 2024a). Robbins' nemacladus occurs in chaparral, valley grassland, and foothill grassland habitats at an elevation of 1,150-5,580 feet. This species is typically observed growing on dry, gravelly slopes. Robbins' nemacladus blooms from April to June. Sagebrush loeflingia has a moderate potential to occur in the Study Area given the presence of foothill grassland habitat.	Low potential. Not observed during surveys.
Perideridia pringlei	Adobe yampah	None	CRPR 4.3 / None	Adobe yampah was observed during 2023 surveys in the western section of the Study Area. It is present in the *Monolith* and *Willow Springs* quads in the CNPS Rare Plant Inventory database (CNPS 2024). Adobe yampah occurs in chaparral, cismontane woodland, coastal scrub, and pinyon and juniper woodland habitats at an elevation of 985-5,905 feet. Adobe yampah typically grows along grassy slopes and in serpentine outcrops. Adobe yampah blooms from April to June.	Observed in the Study Area. Refer to Appendix B.
Puccinellia simplex	California alkali grass	None	CRPR 1B.2 / None	California alkali grass is present in the *Rosamond Lake* quad in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 18 miles southeast of the Study Area in 1995 (CDFW 2024a). California alkali grass occurs in chenopod scrub, meadow and seep, valley and foothill grassland, and vernal pool habitats at an elevation of 5-3,050 feet. This species prefers saline flats and mineral springs. California alkali grass blooms from March to May. California alkali grass has a moderate potential to occur in the Study Area given the presence of chenopod scrub habitat.	Low potential. Not observed during surveys.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Saltugilia latimeri	Latimer's woodland-gilia	None	CRPR 1B.2 / None	Latimer's woodland-gilia grass is present in the *Monolith* quad in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 2 miles west of the Study Area in 2014 (CDFW 2024a). Latimer's woodland-gilia occurs in chaparral, Mojavean desert scrub, and pinyon and juniper woodland habitats at an elevation of 1,310-6,235 feet. This species prefers rocky or sandy substrate in washes. Latimer's woodland-gilia blooms from March to June. Latimer's woodland gilia has a moderate potential to occur in the Study Area given the presence of sandy washes as well as Mojavean desert scrub and juniper woodland habitat.	High potential. Not observed during surveys.
Syntrichopappus lemmonii	Lemmon's syntrichopappus	None	CRPR 4.3 / None	Lemmon's syntrichopappus grass is present in the *Willow Springs* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of Lemmon's syntrichopappus are present in the CDFW CNDDB (CDFW 2024a). Lemmon's syntrichopappus occurs in chaparral, Joshua tree woodland, and pinyon and juniper woodland habitats at an elevation of 1,640-6,005 feet. This species prefers open, sandy or gravelly areas. Lemmon's syntrichopappus blooms from April to May. Lemmon's syntrichopappus has a moderate potential to occur in the Study Area given the presence of open sandy areas and juniper woodland habitat.	Moderate potential. Not observed during surveys.
Yucca brevifolia	Western Joshua tree	None	Candidate threatened, CBR / None	Western Joshua trees were observed within the Study Area during surveys. Observations of western Joshua tree in the CNPS Rare Plant Inventory database have occurred within the nine-quad search radius (CNPS 2024). Western Joshua trees occur in chaparral, Mojavean desert scrub, and Joshua tree woodland habitats at an elevation of 1,310-7,545 feet. Western Joshua trees bloom from March to June. Western Joshua trees were most prevalent within creosote bush scrub habitat, with individuals present sporadically within the Study Area.	Observed in the Study Area. Refer to Appendix B.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Invertebrates					
Bombus crotchii	Crotch's bumble bee	None	Candidate / None	Foraging and nectaring bumble bees were observed within the Study Area multiple times during surveys. Crotch's bumble bee was previously documented once in the Mojave quad in the CNDDB, about 7 miles northeast of the Study Area in 1936, and the Study Area is within its current range (CDFW 2024a). During 2024 Crotch's bumble bee surveys conducted for another project in the region (approximately 1.2 miles from the Project site), one Crotch's bumble bee individual was found approximately 1.2 miles northwest of the Project site (unpublished data). No nests were observed during surveys for other projects and no nests have been documented in or near the Study Area. This species primarily nests in late February to late October in thatched grasses, abandoned rodent burrows or bird nests, brush piles, rock piles, and fallen logs. Overwintering sites may include soft soil, leaf litter, or other debris. Crotch's bumble bee uses a variety of suitable floral resources including, but not limited to, flowering plants in the *Asteraceae, Boraginaceae, Fabaceae*, and *Hydrophyllaceae* families (Xerces Society 2018). These flowering plants occur in the Study Area. This species may occur onsite due to the presence of floral resources, burrows and crevices, and overwintering habitat.	High potential for foraging; Moderate potential for nesting.
Reptiles					
Anniella pulchra	Northern California legless lizard	None	None / SSC	Northern California legless lizard was not observed during the surveys. The nearest recorded observation of northern California legless lizard in the CNDDB is approximately 3 miles north of the Study Area in 2013 (CDFW 2024a). There are seven occurrences documented between 1952 and 2017 in the *Monolith, Little Buttes,* and *Rosamond* quads. This species is known to occur in desert scrub habitat and in sandy washes, which occur in the Study Area.	Moderate potential given presence of sandy washes and desert scrub habitat.
Phrynosoma blainvillii	Coast horned lizard	None	None / SSC	Coast horned lizard was not observed during the surveys. The nearest recorded observation of coast horned lizard in the CNDDB is approximately 5 miles northwest of the Study Area in 2016 (CDFW 2024a). There are three occurrences documented between 2013 and 2016 in the *Monolith* quad in the Tehachapi Mountains. Coast horned lizard is known to occur in open areas with sandy soil and low vegetation. This species uses alkali desert scrub habitat, which occurs in the Study Area in all observed natural scrub habitats.	Moderate potential given presence of alkali desert scrub habitat.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Gopherus agassizii	Mojave desert tortoise	Threatened	Endangered / None	No live desert tortoises were observed in the Study Area. One desert tortoise carcass was observed, which was likely a tortoise released from captivity that died once in the wild. In addition, one burrow was observed with desert tortoise scat that was likely being used by the deceased tortoise released from captivity. According to the CNDDB, one observation of desert tortoise previously occurred within the northwestern portion of the Study Area in 2009 at a distinct location, and four more observations have been made adjacent to the Study Area from 2009-2013 (CDFW 2024a). There are 16 previous occurrences documented within the nine-quad search between 2004 and 2018. Desert tortoise occurs primarily on flats and bajadas characterized by scattered shrubs and abundant inter-space for growth of herbaceous plants, with soils ranging from sand to sandy-gravel; desert tortoises are also found on rocky terrain and slopes. During inactive periods, desert tortoises hibernate, aestivate, or rest in subterranean burrows, spending approximately 98 percent of their time in these cover sites.	No live tortoises observed. Carcass observed. One burrow with desert tortoise scat observed, was likely used by the deceased tortoise. Refer to Appendix C.
Birds					
Accipiter cooperii	Cooper's hawk	None	None / WL	Cooper's hawk was observed as a transient visitor to the Study Area during 2023 surveys. There are no previous occurrences of Cooper's hawk in the CNDDB within the nine quads searched (CDFW 2024a). Cooper's hawk nest in coniferous, deciduous, and mixed woods with tall trees, which are not found in the Study Area. In the winter, they are known to forage in open areas including shrublands and grasslands. The Study Area provides foraging habitat but not nesting habitat for Cooper's hawk.	Observed (transient) in the Study Area.
Agelaius tricolor	Tricolored blackbird	None	Threatened / SSC	Tricolored blackbird was not observed during surveys. The nearest recorded observation of tricolored blackbird in the CNDDB is approximately 11 miles south of the Study Area in 1995 (CDFW 2024a). There are two occurrences documented in 1995 in the *Rosamond Lake* and *Rosamond* quads. Tricolored blackbird breeds in large freshwater marshes in dense stands of cattail, which are not present in or near the Study Area. This species is known to occupy grasslands. The Study Area may provide foraging but not nesting habitat for tricolored blackbird.	No potential for nesting; moderate potential for foraging.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Aquila chrysaetos	Golden eagle	None	None / FP, WL	Golden eagle was not observed during surveys. The nearest recorded observation of golden eagle in the CNDDB is approximately 6 miles east of the Project site in 1969 (CDFW 2024a). There are three occurrences documented between 1949 and 2010 in the *Little Buttes, Monolith,* and *Soledad Mountain* quads. The grassland and herbaceous habitat on the site may provide nesting and foraging habitat for this species. This species forages in desert and woodland terrain and nests on cliff ledges. Minimally suitable golden eagle nesting habitat is present within the 2-mile survey area outside the Project site in the form of rocky outcrops, but foraging habitat for this species is available within the survey area (including the Project site).	Minimally suitable for nesting within survey area outside Project site (7 miles north of Study Area); foraging habitat is available within survey area (including the Project site). Refer to Appendix F.
Artemisiospiza belli belli	Bell's sparrow	None	None / WL	One Bell's sparrow nest was observed during surveys in 2023. This species has not been previously documented within 10 miles of the Study Area (CDFW 2024a). Bell's sparrow typically nests in chaparral and coastal sage scrub and is also found in arid scrub habitat. The Study Area is within the breeding range of this species.	Observed in the Study Area.
Asio flammeus	Short-eared owl	None	None / SSC	Short-eared owl was not observed during surveys. There is one occurrence of this species within the nine-quad search, approximately 18 miles southeast of the Study Area in 1932 in the Rosamond Lake quad (CDFW 2024a). Short-eared owl prefers open terrain in prairie, marsh, dune, and tundra habitat and does not breed in California. The Study Area lacks preferred foraging and nesting habitat for this species.	No potential for nesting; low potential for foraging.
Asio otus	Long-eared owl	None	None / SSC	Long-eared owl was observed nesting in the 5-mile buffer outside the Project site during the nesting raptor survey in 2024, approximately 2 to 3 miles from the site. In 2025, the previously active nests from 2024 were unoccupied. The nearest previously recorded occurrence is approximately 4 miles south of the Study Area in 2011 (CDFW 2024a). There are seven documented occurrences of long-eared owl in the Willow Springs quad in 2011. Long-eared owl nests have previously been found in desert woodland habitat, which the Study Area could provide in Joshua tree woodland or California juniper woodland habitats. This species is known to forage in desert scrub and grassland habitat. The Study Area provides both nesting and foraging habitat for long-eared owl.	Active nests observed within 5-mile buffer outside Project site. Moderate potential for nesting and foraging within the Study Area. Refer to Appendix E.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Athene cunicularia	Burrowing owl	None	Candidate and SSC	Three live burrowing owl were observed during the surveys. Burrowing owl sign was also found in the Study Area. According to the CNDDB, the nearest previously recorded observation of burrowing owl is approximately 0.6 mile south of the Study Area in 2009 (CDFW 2024a). However, there are 11 occurrences documented within 5 miles of the Study Area between 2005 and 2012. This species breeds and lives in burrows in valley and foothill grassland habitats, as well as agricultural areas or any open dry area with low vegetation.	Observed in the Study Area. Refer to Appendix D.
Buteo regalis	Ferruginous hawk	None	None / WL	Ferruginous hawk was not observed during the surveys. The nearest recorded observation of ferruginous hawk in the CNDDB is approximately 4 miles south of the Study Area in 2009 (CDFW 2024a). There are five occurrences of ferruginous hawk documented from 1998 to 2011 in the *Rosamond, Willow Springs,* and *Little Buttes* quads. The Study Area could provide nesting habitat for ferruginous hawks, which prefer to nest in riparian habitat and are not known to nest in the Mojave Desert. Ferruginous hawk occurs in desert saltbush habitats, which are found in the Study Area. Foraging habitat is widely available for ferruginous hawk in the Study Area.	No potential for nesting; moderate potential for foraging.
Buteo swainsoni	Swainson's hawk	None	Threatened / None	Active Swainson's hawk nests were observed approximately 3 to 4 miles from the Project site during the Swainson's hawk surveys. Swainson's hawk was observed foraging within the Project site and 5-mile buffer during the survey in 2025. The nearest previously recorded observation of Swainson's hawk in the CNDDB is approximately 4 miles south of the Project site in 2016 (CDFW 2024a). There are 19 previous occurrences of Swainson's hawk documented from 2009-2021 in the *Rosamond, Little Buttes,* and *Willow Springs* quads. Swainson's hawks are known to nest in Joshua tree woodland habitat and forage in grasslands and native desert scrub habitats, which are found in the 5-mile survey area (including the Project site). Swainson's hawk could use the survey area (including the Project site) for nesting and foraging, although no nesting territories were found within the Project site.	Active nests observed within the survey area outside Project site. Nesting and foraging habitat is available within survey area (including the Project site). Refer to Appendix E.
Charadrius montanus	Mountain plover	None	None / SSC	Mountain plover was not observed during the surveys. The nearest recorded observation of mountain plover in the CNDDB is approximately 11 miles south of the Study Area in 2008 (CDFW 2024a). There are four occurrences of mountain plover documented from 1981-2008 in the *Rosamond, Rosamond Lake,* and *Little Buttes* quads. Mountain plover does not breed in California and is only found in California when wintering. Mountain plover occupies flat short-grass habitat and areas with bare ground, and is known to inhabit agricultural land, which does not occur in the Study Area.	No potential for nesting; low potential for foraging.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Circus hudsonius	Northern harrier	None	None / SSC	Northern harrier was observed during the 2023 surveys. There is one previous occurrence of this species within the nine-quad search, approximately 13 miles south of the Study Area in 2011 in the Rosamond quad (CDFW 2024a). Northern harrier typically nests in wetlands or along rivers and lakes but may nest in grasslands or sagebrush flats near water sources. This species forages in grasslands, desert sinks, and shrublands. Due to a lack of habitat, northern harrier is unlikely to use the Study Area for nesting, but foraging habitat is widely available.	Observed in the Study Area.
Contopus cooperi	Olive-sided flycatcher	None	None / SSC	Potential olive-sided flycatcher was observed during surveys as a transient fly over. There are no previous occurrences of olive-sided flycatcher in the CNDDB within the nine quads searched (CDFW 2024a). Olive-sided flycatcher breeds in coniferous forests, mountains, and near the coast of California. This species mostly winters in South America and the Study Area is not within its breeding range or habitat type, so it is unlikely to inhabit the Study Area. The observed individual was likely migrating north towards its breeding habitat.	Potential observation, unlikely to nest or forage.
Falco columbarius	Merlin	None	None / WL	Merlin was not observed during the surveys. There are two occurrences of this species within the Study Area, one from 2009 in the southern portion and one from 2011 in the northern portion of the Study Area, both north of the Los Angeles Aqueduct (CDFW 2024a). There are three total occurrences of merlin documented from 1998-2011 in the *Rosamond, Willow Springs,* and *Monolith* quads. Merlin do not breed in California. Merlin are known to forage in open and semi-open habitat, including grasslands, woodlands, and shrublands. Merlin may use the Study Area for foraging.	No potential for nesting; moderate potential for foraging.
Falco mexicanus	Prairie falcon	None	None / WL	Prairie falcon was observed nesting in the 5-mile buffer outside the Project site during the nesting raptor survey in 2025, approximately 2 to 3 miles from the Project site. No prairie falcon nests were observed during the survey in 2023 or 2024. There is one occurrence of prairie falcon in the CNDDB within the nine-quad search, approximately 4 miles east of the Study Area in 1982 in the *Soledad Mountain* quad (CDFW 2024a). Prairie falcon nest in cliff habitat, which can be found near but not within the Study Area. This species is known to forage in desert grassland and shrubland habitat. The Study Area may provide foraging habitat but not nesting habitat for prairie falcon.	Low potential for nesting; high potential for foraging.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Gymnogyps californianus	California condor	Endangered	Endangered / None	California condor was not observed during surveys. This species has been previously documented approximately 15-20 miles west of the Project site in 1976 and 2013 (CDFW 2024a). This species nests in deep canyons containing clefts in the rocky walls and forages up to 100 miles from the nest or roost. No condor nesting habitat is present within the 2-mile survey area, but foraging habitat is available in the survey area (including the Project site).	No nesting habitat present within survey area; foraging habitat is available within survey area (including the Project site). Refer to Appendix F.
Lanius ludovicianus	Loggerhead shrike	None	None / SSC	Loggerhead shrike was observed during 2023 and 2024 surveys. There is one previous occurrence of loggerhead shrike within the southern portion of the Study Area in 2009 (CDFW 2024a). There are seven previous occurrences of loggerhead shrike documented from 2004-2009 in the Sanborn, Willow Springs, and Little Buttes quads. Loggerhead shrike nest in trees and shrubs and forage in desert grassland and shrubland habitats, which can be found in the Study Area. Chicks and fledglings of this species were observed during the surveys and it likely breeds in the Study Area.	Observed in the Study Area.
Setophaga petechia	Yellow warbler	None	None / SSC	Yellow warbler was observed during 2023 surveys. There are no previous occurrences of yellow warbler in the CNDDB within the nine quads searched (CDFW 2024a). Yellow warbler breeds along streamsides and forages in shrubland and woodland habitats. The Study Area provides foraging habitat for yellow warbler but does not provide breeding habitat. This species was using the site as a stopover during migration.	Observed in the Study Area.
Xanthocephalus xanthocephalus	Yellow-headed blackbird	None	None / SSC	Yellow-headed blackbird was observed during 2023 surveys. There are no previous occurrences of yellow-headed blackbird in the CNDDB within the nine quads searched (CDFW 2024a). Yellow-headed blackbird breeds in freshwater sloughs, marshy lakes, and tall cattails, which are not present within the vicinity of the Study Area. Yellow-headed blackbirds are known to inhabit desert grassland and shrubland habitat, which are available in the Study Area. The Study Area provides foraging habitat but not nesting habitat for yellow-headed blackbird.	Observed in the Study Area.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Mammals					
Corynorhinus townsendii	Townsend's big-eared bat	None	None / SSC	Townsend's big-eared bat was not observed during surveys. The nearest recorded observation of Townsend's big-eared bat in the CNDDB is approximately 5 miles east of the Study Area in 1997 (CDFW 2024a). There are three occurrences documented between 1942 and 1997 in the *Rosamond* and *Soledad Mountain* quads. In southern California, Townsend's big-eared bats are commonly found in abandoned mines. This species is not likely to roost on the Study Area because there are no caves or mines within the site. However, three abandoned mines are found on the side of Middle Butte Mountain that borders the southern boundary of the Study Area, approximately 0.1 mile from the Study Area (Hudson Institute of Mineralogy 2024). There are an additional 11 mines on the opposite end of the mountain, approximately 0.25 to 2 miles from the Study Area. Townsend's big-eared bat may forage up to 6.5 miles from their roost site, but the average distance traveled while foraging is 2 miles. Since the Study Area is within 6.5 miles of a known roost site, this species may roost on Middle Butte Mountain and use the Study Area to forage. This species requires drinking water within their foraging range and would likely only have sources of drinking water on the Study Area immediately after a storm event. Therefore, Townsend's big-eared bat is unlikely to roost but may forage on the Study Area.	Low potential for roosting; Moderate potential for foraging.
Onychomys torridus tularensis	Tulare grasshopper mouse	None	None / SSC	Tulare grasshopper mouse was not observed during surveys. There is one documented occurrence of this species in the Monolith quad in 1973 in the Tehachapi Mountains (CDFW 2024a). This species is known to occur in shrubland habitats, but not much other information regarding its life history is known (CSU Stanislaus undated).	Moderate potential given shrubland habitat.
Perognathus alticola inexpectatus	Tehachapi pocket mouse	None	None / SSC	Tehachapi pocket mouse was not observed during surveys. The nearest recorded occurrence is 1 mile north of the gen-tie in 2011 at the base of the Tehachapi Mountains (CDFW 2024a). There are seven occurrences documented within the *Monolith* and *Willow Springs* quads from 1980 to 2011 within and at the base of the Tehachapi Mountains. Little is known about this species and its life history (CDFW 2024c), but they are known to mainly inhabit the Tehachapi Mountains in chaparral, sagebrush scrub, and pinyon juniper woodland habitat, which are not found in the Study Area.	Low potential given lack of habitat.

Scientific Name	Common Name	Federal Status	State Status/ Other Status	Summary	Potential to Occur
Taxidea taxus	American badger	None	None / SSC	American badger sign was observed during the surveys, which consisted of predatory excavations of rodent burrows with claw marks. This species has been previously documented twice within the nine-quad search, approximately 6 miles south of the Study Area in 1986 and 7 miles north in 1925 (CDFW 2024a). American badgers can have expansive home ranges to meet foraging and shelter requirements. Therefore, American badgers could reside or forage on the site. American badgers are known to inhabit desert scrub habitat, which occurs throughout the Study Area.	Sign observed in the Study Area (foraging). High potential for denning.
Vulpes macrotis arsipus	Desert kit fox	None	None / CA Title 14	Desert kit fox sign was observed during the surveys. The CNDDB does not contain data on the desert kit fox, however, the Study Area is within its historic and current range. Desert kit fox uses a variety of habitat types characterized by low-growing vegetation and the presence of burrows or burrow-like structures (i.e., burrow surrogates), including open desert, creosote bush scrub, and sand dune habitats. Desert kit fox digs dens, typically with several entrances, and often moves between den sites. This species may utilize a site for breeding, foraging, overwintering, or transient/migration stops. The Study Area provides both foraging and denning habitat for desert kit fox.	Sign observed in the Study Area (foraging and denning/breeding). Refer to Appendix H.
Xerospermophilus mohavensis	Mohave ground squirrel	None	Threatened / None	Mohave ground squirrel are often found in areas dominated by Mojave creosote bush scrub and the Study Area supports this plant community. Other vegetation communities found within the Study Area are unlikely to support this species and the overall habitat quality of the site is degraded from anthropogenic disturbances. In addition, numerous protocol-level surveys for Mohave ground squirrel have been previously conducted in the Study Area, and there have been no captures or visual detections of the species. There are no records of Mohave ground squirrel occurrence closer than approximately 8 miles from the northeast corner of the Study Area, which is outside the 5-mile dispersal range of juvenile Mohave ground squirrels. There is no evidence of Mohave ground squirrel on or near the Project site and no reason to believe that dispersing juveniles could reach the site. Therefore, Mohave ground squirrel are not expected to occur within the boundaries of the Project.	Low potential to occur given no evidence on or near the Study Area and all documented detections are well beyond the juvenile dispersal range. Refer to Appendix G.

Notes:

Federally listed endangered: an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.

Federally listed threatened: an animal or plant which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

State listed endangered: "endangered species" means a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease (Fish and Game Code § 2062).

State listed threatened: "threatened species" means a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of special protection and management efforts (Fish and Game Code § 2067).

State candidate: a native species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that has been formally noticed as being under review by CDFW for listing. Candidates are given full protection under the California Endangered Species Act.

FP = CDFW Fully Protected: species that may not be taken or possessed at any time and no licenses or permits may be issued for their take except for collecting these species for necessary scientific research, relocation of the bird species, or if they are a covered species in a Natural Community Conservation Plan.

SSC = CDFW Species of Special Concern: "Species of Special Concern" means a species, subspecies, or distinct population of an animal native to California that currently satisfies one or more of the following criteria:

- Is extirpated from the state or, in the case of birds, is extirpated in its primary season or breeding role;
- Is federally listed, but not state listed, as threatened or endangered; meets the state definition of threatened or endangered but has not formally been listed;
- Is experiencing, or formerly experienced, serious (noncyclical) population declines or range retractions (not reversed) that, if continued or resumed, could qualify it for state threatened or endangered status; and/or
- Has naturally small populations exhibiting high susceptibility to risk from any factor(s), that if realized, could lead to declines that would qualify it for state threatened or endangered status.

WL = CDFW Watch List: animal taxa that were previously designated as SSC but no longer merit that status, or which do not yet meet SSC criteria, but for which there is concern and a need for additional information to clarify status.

CA Title 14 = species protected by the California Code of Regulations Title 14, Section 460.

CRPR = California Rare Plant Rank:

CBR = Considered But Rejected

1B = Plants rare, threatened, or endangered in California and elsewhere.

2B = Plants rare, threatened, or endangered in California but more common elsewhere.

3 = Plants about which more information is needed (Review List).

4 = Plants of limited distribution (Watch List).

0.1 = Seriously threatened in California (over 80 percent of occurrences threatened / high degree and immediacy of threat).

0.2 = Moderately threatened in California (20-80 percent occurrences threatened / moderate degree and immediacy of threat).

6.0 DISCUSSION AND RECOMMENDATIONS

In summary, the following are the primary results of the surveys:

- Rare plants and plant species protected by the California Desert Native Plants Act were found within the Study Area. Sensitive natural communities were also found. Recommendations for these plant species and communities are provided in Appendix B.
- No live desert tortoises were observed within the Study Area. Desert tortoise sign in the form of a burrow with scat and one carcass that was likely from a previously captive, released tortoise was documented in the Study Area. Two possible tortoise burrows with no tortoise sign were also observed. All observed desert tortoise sign was likely from the one deceased tortoise. Recommendations for desert tortoise are provided in Appendix C.
- Burrowing owls and their sign were found within the Study Area. Recommendations for burrowing owl are provided in Appendix D.
- Active Swainson's hawk nests were found within the 5-mile survey area outside the Project site. No Swainson's hawk nests were found in the Project site. Suitable nesting and foraging habitat is present within the Project site. Recommendations for Swainson's hawk and other nesting raptors are provided in Appendix E.
- No golden eagle and California condor individuals or nests were found during surveys. Suitable foraging habitat for both species is present within the Project site. Recommendations for these two species are provided in Appendix F.
- There is no evidence of Mohave ground squirrel on or near the Study Area and no reason to believe that dispersing juveniles could reach the Study Area; therefore, Mohave ground squirrel is not expected to occur, as described in detail in Appendix G.
- Desert kit fox dens and sign were observed in the Study Area. One natal/pupping den complex was also observed within the Project site. Recommendations for this species are provided in Appendix H.

Results of the wetland delineation are provided in a separate Aquatic Resources Delineation Report. Western Joshua trees were present in the Study Area; mapping results are provided in a separate report.

In addition to the species-specific measures in each of the reports provided within the appendices, the following measures are recommended for rare plants and special-status wildlife species that may occur in the Study Area:

Biologist Requirements

- Prior to the issuance of grading or building permits, and prior to decommissioning, the Project Applicant will retain a qualified biologist(s) to oversee compliance with the protection measures. The contact information for the qualified biologist(s) will be provided in writing to the Kern County Planning and Natural Resources Department. The following measures pertain to the qualified biologist(s):

  - The qualified biologist(s), or their designee, will be on the Project site during initial grading and construction, preconstruction ground-disturbing activities, and decommissioning activities.
  - The qualified biologist(s) or their designee will have the right to halt activities that are in violation of the protection measures, as well as any regulatory permits from the USFWS and/or the CDFW, if applicable. Work will proceed only after threats are removed and the species is no longer at risk.

Worker Environmental Awareness Training Program

- Prior to the issuance of grading or building permits, or decommissioning of the site, the qualified biologist will develop a Worker Environmental Awareness Training Program containing life history and identification information of rare plants and special-status wildlife species with potential to occur onsite. The Worker Environmental Awareness Training Program will review responsibilities for all onsite personnel including trash control, checking under and around vehicles and heavy equipment before starting, scanning for wildlife resources, contacting the qualified biologist in the unanticipated instance of encountering special-status wildlife species, and prohibition of pets and firearms. All onsite personnel will be required to attend an annual worker environmental training. A sticker will be placed on hard hats, indicating that the worker has completed the Worker Environmental Awareness Training. Copies of all prepared training materials and signed acknowledgement from each worker who has attended the required training will be provided to the Kern County Planning and Natural Resources Department.

General Avoidance and Protective Measures

- During Project construction and decommissioning, the Applicant will implement the following general avoidance and protective measures:
  - Immediately prior to conducting vegetation clearing or similar activities, the qualified biologist or their designee will perform a pre-construction visual survey of the area to ensure that no special-status species are present. Daily reports of these inspections will be retained by the qualified biologist and provided to the Kern County Planning and Natural Resources Department, and as required by resource agency permits issued to the Project.
  - Within the vicinity of construction activities, sensitive biological resources (e.g., special-status species, jurisdictional drainages, nesting birds) will be delineated with stakes and/or flagging.
  - Access roads that are planned for use during construction activities will not extend beyond the planned impact area; this includes all previously disturbed lands and any location within the Project fenceline not delineated for avoidance of sensitive biological resources. Where new access routes are required, the route will be clearly marked prior to construction.
  - The Applicant will minimize the areas of disturbance. Parking areas, new roads, staging, storage, excavation, and disposal site locations will be confined to the smallest areas

possible. These areas will be demarcated and disturbance activities, vehicles, and equipment will be confined to these areas.

- Spoils will be stockpiled in disturbed areas that lack native vegetation to the maximum extent practicable. Spoils that have been stockpiled and inactive for more than 24 hours will be inspected by a qualified biologist for signs of special-status wildlife before moving or disturbing.
- To prevent inadvertent entrapment of desert kit foxes, American badgers, or other animals during construction, all excavated steep-walled holes or trenches more than 2 feet deep will be covered with plywood or similar materials at the close of each working day. If holes or trenches cannot be covered, one or more escape ramps constructed of earthen fill or wooden planks, no less than 12 inches wide and secured at the top, will be placed a minimum of every 100 feet within the open trench. Escape ramps will be 30 percent slope or less. Covered and non-covered holes or trenches will be thoroughly inspected for trapped animals by a qualified biologist at the beginning and end of each working day. Immediately before such holes or trenches are filled, they will again be thoroughly inspected by trained staff approved by the qualified biologist. If non-listed trapped animals are observed, escape ramps or structures will be installed immediately to allow for their escape. If a listed species is trapped, escape ramps or structures will be installed immediately to allow for their escape and the qualified biologist will immediately confer with the USFWS and/or CDFW.
- Construction pipes, culverts, or similar structures with a diameter of 4 inches or greater that are stored at the site for more than 24 hours and without endcaps will be thoroughly inspected by a qualified biologist prior to being moved or capped. If a listed wildlife species is discovered inside a pipe, that section of pipe will not be moved until a qualified biologist has been consulted and the animal has either moved from the structure on its own accord or until the animal has been captured and relocated in conformance with appropriate wildlife agency guidelines.
- No vehicle or equipment parked on the Project site will be moved prior to inspecting the ground beneath the vehicle or equipment for the presence of listed wildlife species. If present, the animal will be left to move on its own.
- A speed limit of 15 miles per hour will be enforced within the limits of the Project site. If night work occurs on the Project site, the speed limit will be 10 miles per hour. This requirement will be posted with signage noted throughout the site.
- Fueling of equipment will take place within existing roads or disturbed areas. No refueling within or adjacent to any drainages (within 150 feet) will be permitted. Contractor equipment will be checked for leaks prior to operation and repaired as necessary.
- Trash and food items will be contained in closed, wildlife-proof containers to reduce the attractiveness to opportunistic predators such as common ravens, coyotes, and feral dogs.
- Workers will be prohibited from bringing pets and firearms to the Project site and from feeding wildlife.

  - Unpermitted killing or collection of any listed species will be prohibited.
  - Herbicides that may be used as vegetation control measures in Project areas will be restricted. All uses of such herbicidal compounds will observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and state or federal legislation as well as additional Project-related restrictions deemed necessary by the USFWS or CDFW. No rodenticides will be used on the Project site.

Best Management Practices

- During construction, operation and maintenance, and decommissioning, Project work crews will be directed to use industry accepted and standard construction best management practices (BMPs) consistent with the County zoning ordinances and with guidelines provided in the California Stormwater Quality Association's Construction Best Management Practice Handbook, where applicable, to avoid, minimize, and/or reduce potential construction-related impacts on biological resources. BMPs will be monitored and repaired throughout the life of the Project. The Applicant will implement the general measures described below:
  - BMPs will be employed to prevent erosion in accordance with the Project's approved Stormwater Pollution Prevention Plan. Detected erosion will be remedied as described in the Erosion Control Plan of the Stormwater Pollution Prevention Plan.
  - Material/spoils generated from Project activities will be located away from any jurisdictional areas and environmentally sensitive areas that are not slated for impacts.
  - Jurisdictional areas and environmentally sensitive areas will be protected from stormwater runoff using temporary perimeter sediment barriers such as berms, silt fences, fiber rolls, covers, sand/gravel bags, and straw bale barriers, as appropriate.
  - Materials will be stored on impervious surfaces or plastic ground covers to prevent any spills or leakage from contaminating the ground and generally at least 50 feet from the top of bank of any jurisdictional areas and environmentally sensitive areas.
  - Any spillage of material will be stopped if it can be done safely. The contaminated area will be cleaned, and any contaminated materials properly disposed of. For all spills, the Project foreman or designated environmental representative will be notified.

Pre-Construction Surveys

- No more than 30 days prior to the start of ground disturbance, a qualified biologist knowledgeable in the identification of all special-status wildlife species that have the potential to occur on the Project site will conduct pre-construction surveys for special-status wildlife species within the Project site, as well as within a minimum of 500 feet (where legally accessible) to determine if any special-status species are present. Surveys need not be conducted for all areas of suitable habitat at one time; they may be phased so that surveys occur no more than 30 days prior to ground disturbance in specific areas of the site. If evidence of occupation by a special-status species is observed, a suitable buffer will be established by a qualified biologist that results in sufficient avoidance.

Special-status and Nesting Birds

The following measures are recommended for special-status and nesting birds:

- If construction activities are conducted during the typical nesting bird season (February 1 to August 31), a qualified biologist(s) will conduct a pre-construction nesting survey within 30 days of ground disturbance activities to reduce potential impacts to avian species. Surveys need not be conducted for the entire Project site at one time; they may be phased so that surveys occur within 30 days prior to disturbance in specific areas of the site. The survey area will cover a 500-foot buffer (access permitting).
- If construction is scheduled to occur during the non-nesting season (September 1 to January 31), no pre-construction surveys or additional measures are required for nesting birds, including raptors.
- If nesting birds/raptors are observed, a qualified biologist will establish an appropriate buffer distance around the nest site (typically 100 feet for passerines, up to 500 feet for raptors, and 0.5 mile for Swainson's hawk). The buffer will remain in place until a qualified biologist has determined that the nest is no longer active. Encroachment into the buffer may occur at the discretion of a qualified biologist in consultation with the Kern County Planning and Natural Resources Department.
- The Applicant will install any power lines in conformance with the Avian Power Line Interaction Committee (APLIC) standards as outlined in the Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006 (APLIC 2006), Reducing Avian Collisions with Power Lines: The State of the Art in 2012 (APLIC 2012), or any superseding document issued by APLIC.
- During the operation and maintenance phase of the Project, an Avian Mortality Monitoring Program will be developed and implemented to systematically and periodically determine the extent of mortality occurring because of collisions with solar arrays. The measures listed below will apply to the program:
  - The program will be developed following the Mortality Monitoring Design for Utility-Scale Solar Power Facilities (USGS 2016) and include methods to estimate total mortality. Methods include using a trained and skilled team of authorized biologists to systematically sample the site by walking transects through the solar arrays scanning for deceased birds.
  - Data will be collected on any encountered deceased bird (or any other wildlife) species including species, condition of the carcass, approximate age, presence of feathers, etc.
  - Maintenance personnel working on the Project site that encounter injured or deceased birds (or any other wildlife) will be trained to collect data and photograph the encountered species.
  - Mortality monitoring will be conducted for a minimum 1-year period following the commencement of the operation and maintenance phase of the Project.

- If, after 1 year of mortality monitoring, Project impacts to any avian species caused by the Project are shown to result in a substantial, long-term reduction in the demographic viability of the population of the species in question, then adaptive management must be implemented to reduce impacts. Adaptive management measures may include but not be limited to passive avian diverter installations, the use of sound, light or other means to discourage site use consistent with legal requirements, onsite habitat management or control measures consistent with applicable legal requirements, or modification to support structures to exclude nesting birds.

American Badger and Desert Kit Fox

Evidence of American badger and desert kit fox was found in the Study Area. Therefore, the following measures for these species are recommended:

If potential American badger or desert kit fox dens are found during pre-construction surveys, the status of the dens will be evaluated by a qualified biologist no more than 30 days prior to project ground disturbance.

- If the qualified biologist determines that the den(s) are inactive, den(s) will be collapsed by a qualified biologist to prevent occupation of the den(s) between the time of the preconstruction survey and construction activities.
- If the qualified biologist determines that the den(s) are active, construction activities will not occur within 50 feet of an active badger den or 100 feet of an active kit fox den, unless otherwise approved by the qualified biologist.
- If the qualified biologist determines that potential den(s) outside of the pupping season may be active, a passive relocation program can occur. The pupping season is defined as March 15-July 31 for American badger and February 1-August 1 for desert kit fox. The program will consist of determining status of the den(s) (confirming it is a nonmaternity den through remote camera monitoring), excluding American badger or desert kit fox from the occupied nonmaternity den(s) by installation of one-way doors at burrow entrances, monitoring of the den for a minimum of 48 hours to confirm usage has been discontinued, and excavation and collapse of the den.

Common Raven

Develop a site-specific Common Raven Management Plan in accordance with USFWS guidelines and implement management measures for ravens at the Project. These measures may include but are not limited to designing structures to eliminate perches, waste management, road kill management, management of ponded water during construction and operations, and nest removal on structures within the Project site and along the transmission line.

7.0 REFERENCES

APLIC (Avian Power Line Interaction Committee). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006.

APLIC. 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012.

Audubon California. 2024. California IBA Interactive Site Map. Available online at: https://ca.audubon.org/conservation/california-iba-interactive-site-map (accessed March 2024).

Calflora. 2024. Database of California plants. Available online at: https://www.calflora.org/search.html (accessed January 2024).

CDFW (California Department of Fish and Wildlife). 2012. Staff Report on Burrowing Owl Mitigation. March.

CDFW. 2018. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities. March.

CDFW. 2023. California Sensitive Natural Communities. June.

CDFW. 2024a. California Natural Diversity Database. Available online at: https://wildlife.ca.gov/Data/CNDDB/Maps-and-Data#43018408-cnddb-in-bios (accessed February 2024).

CDFW. 2024b. Habitat Connectivity Viewer. Available online at: https://apps.wildlife.ca.gov/bios6/?bookmark=648 (accessed March 2024).

CDFW. 2024c. California Wildlife Habitat Relationships. Available online at: https://wildlife.ca.gov/Data/CWHR (accessed February 2024).

CEC (California Energy Commission) and CDFW. 2010. *Swainson's Hawk Survey Protocols, Impact Avoidance, and Minimization Measures for Renewable Energy Projects in the Antelope Valley of Los Angeles and Kern Counties, California.*

CNPS (California Native Plant Society). 2001. CNPS Botanical Survey Guidelines. California Native Plant Society, Sacramento, CA. December 9, 1983. Revised June 2, 2001.

CNPS. 2024. Rare Plant Inventory (online edition, v9.5). Available online at: https://www.rareplants.cnps.org (accessed March 2024).

CNPS. 2025. Manual of California Vegetation Online. Available online at: https://vegetation.cnps.org/ (accessed September 2025).

CSU Stanislaus. Undated. Tulare grasshopper mouse (*Onychomys torridus tularensis*). Endangered Species Recovery Program.

Fitton, S. 2008. Le Conte's Thrasher (*Toxostoma lecontei*) (San Joaquin population). California Department of Fish and Game.

Hudson Institute of Mineralogy. 2024. *Mojave-Rosamond Mining District*. Available online at: https://www.mindat.org/loc-29088.html (accessed March 2024).

NASA (National Aeronautics and Space Administration). 2024. Edwards AFB, California Climatological Summaries. Armstrong Flight Research Center Weather. Available online at: https://weather.dfrc.nasa.gov/data/climo/rain.htm (accessed June 2024).

NatureServe. 2024. NatureServe Conservation Status Categories. Available online at: https://explorer.natureserve.org/AboutTheData/DataTypes/ConservationStatusCategories (accessed January 2024).

Sawyer, J., T. Keeler-Wolf, and J. Evens. 2009. *A Manual of California Vegetation, Second Edition*. California Native Plant Society.

The Jepson Herbarium. 2024. Jepson eFlora. University of California, Berkeley. Available online at: https://ucjeps.berkeley.edu/eflora/ (accessed January 2024).

USDA NRCS (U.S. Department of Agriculture Natural Resources Conservation Service). 2024. Web Soil Survey. Available online at: https://websoilsurvey.nrcs.usda.gov/app/ (accessed January 2024).

USGS (U.S. Geological Survey). 2016. Mortality Monitoring Design for Utility-Scale Solar Power Facilities. Prepared in cooperation with the U.S. Fish and Wildlife Service.

USFWS (U.S. Fish and Wildlife Service). 1992. Field Survey Protocol for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise. Available online at: https://www.deserttortoise.org/documents/1992surveyprotocol-nonfederal.pdf (accessed August 2024).

USFWS. 1994. Endangered and Threatened Wildlife and Plants. Determination of Critical Habitat for the Mojave Population of the Desert Tortoise. Available online at: https://www.federalregister.gov/documents/1994/02/08/94-2694/endangered-and-threatened-wildlife-and-plants-determination-of-critical-habitat-for-the-mojave (accessed November 2022).

USFWS. 2000. Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants. Sacramento, California.

USFWS. 2009. Desert Tortoise Field Manual. Available online at: https://www.fws.gov/sites/default/files/documents/Desert-Tortoise-Field-Manual.pdf (accessed November 2022).

USFWS. 2011. *Standardized Recommendations for Protection of the Endangered San Joaquin Kit Fox Prior to or During Ground Disturbance*. Prepared by the Sacramento Fish and Wildlife Office. January.

USFWS. 2019. Preparing for any Action that may Occur within the Range of the Mojave Desert Tortoise. Available online at:

https://www.fws.gov/sites/default/files/documents/Mojave%20Desert%20Tortoise%20Pre-project%20Survey%20Protocol_2019_v2.pdf (accessed November 2022).

USFWS. 2024a. Critical Habitat Portal. Available online at: https://ecos.fws.gov/ecp/report/table/critical-habitat.html (accessed March 2024).

USFWS. 2024b. Information for Planning and Consultation (IPaC). Available online at: https://ipac.ecosphere.fws.gov (accessed January 2024).

Xerces Society. 2018. A Petition to the State of California Fish and Game Commission To List the Crotch Bumble Bee, Franklin's Bumble Bee, Suckley Cuckoo Bumble Bee, and Western Bumble Bee as Endangered under the California Endangered Species Act.

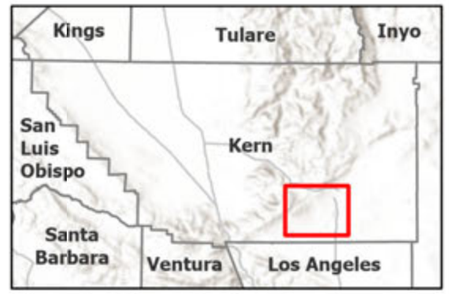
FIGURES

This page intentionally left blank.

Discovery Solar PV and Storage Project

Kern County, CA

Figure 1. Regional Overview



Windhub High-voltage Substation (Existing)

Proposed Project Features

- Project Site
- Study Area
- Study Area (2-mile buffer)
- Study Area (5-mile buffer)
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

*Already approved under separate projects.

N

0 0.75 1.5 3 Miles

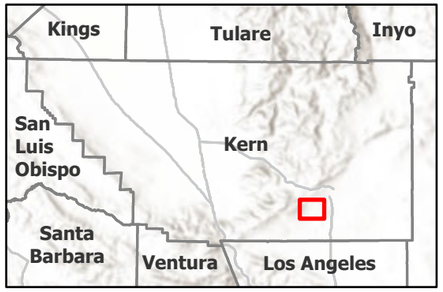
Scale is 1:3,591,900 when printed at 11"x17"

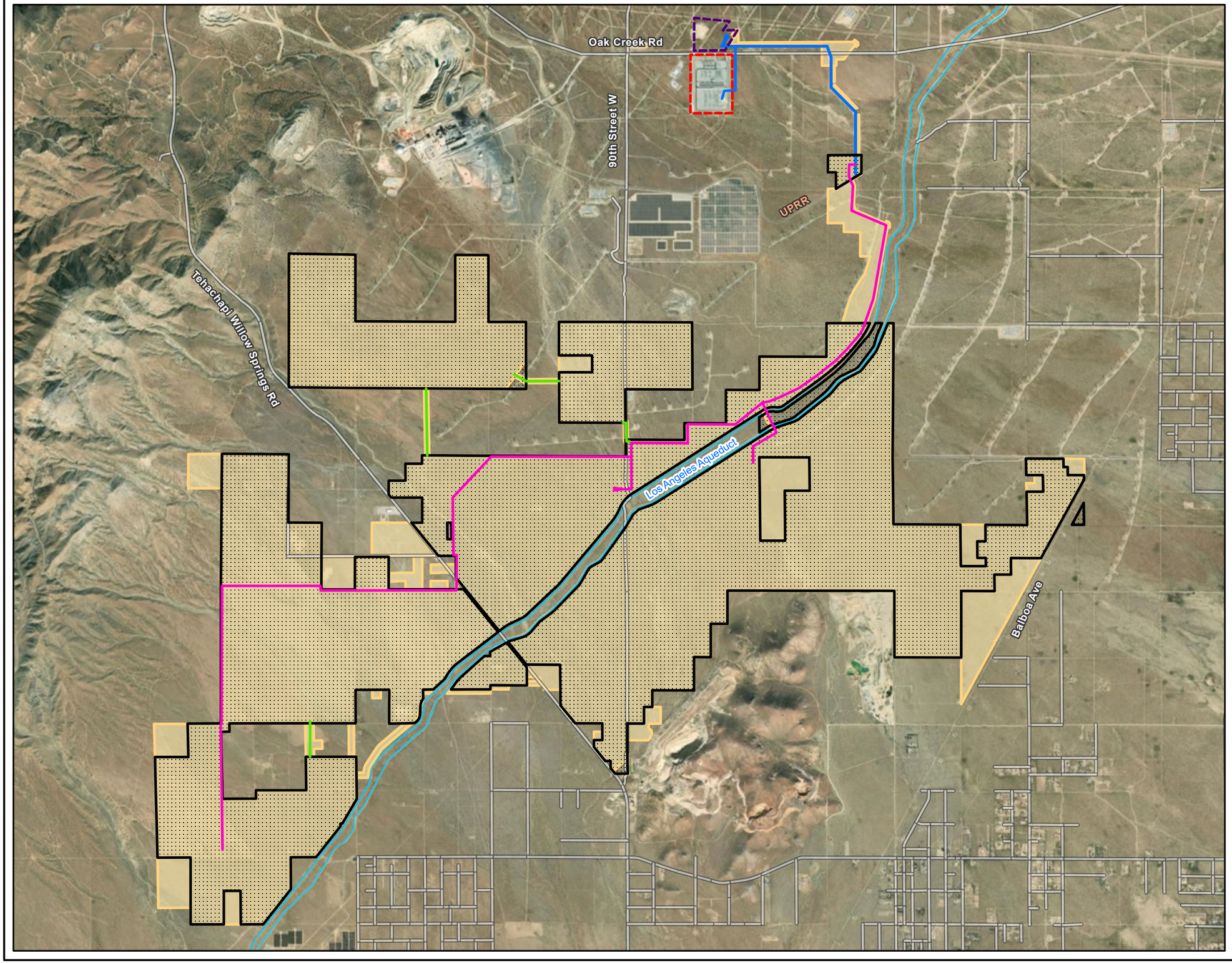
Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Figure 2. Project Location





Windhub High-voltage Substation (Existing)

Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

Scale is 1:45,000 when printed at 11"x17"

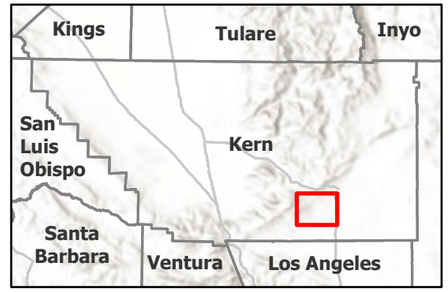
Not for Construction

Document Path: Z:\projects\194_PROJECTS\TERRA_GEN\194_1403_0001_Discovery\PRO\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 3. USGS Topographic Map



Windhub High-voltage Substation (Existing)

Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

*Already approved under separate projects.

N

Miles

0 0.5 1 2

Scale is 1:75,000 when printed at 11"x17"

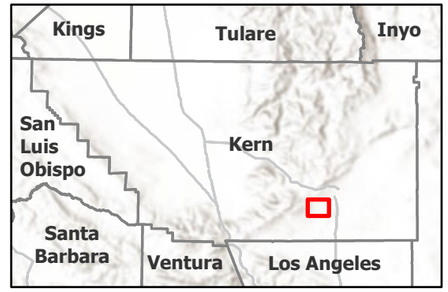
Not for Construction

Document Path: Z:\projects\94_PROJECTS\TERRA_GEN\94_1403_000_Discovery\PRO\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 4a. Vegetation Communities



Oak Creek Rd
90th Street W
UPRR
Tehachapi Willow Springs Rd
Oak Creek
Los Angeles Aqueduct
Balboa Ave
Holliday Rock Mine

Note: Additional vegetation community mapping and mapping of Joshua trees is in progress and when available, the results will be used to update this report.

- Windhub High-voltage Substation (Existing)
- Roads
- Watercourse

Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

Vegetation Communities

- Allscale Scrub
- Brittle Bush Scrub
- California buckwheat scrub
- California juniper woodland
- Cheesebush scrub
- Creosote bush scrub
- Desert needlegrass grassland
- Developed
- Disturbed
- Disturbed - Creosote bush scrub
- Rubber rabbitbrush scrub
- Scalebroom scrub

*Already approved under separate projects.

N

0 0.2 0.4 0.8 Miles

Scale is 1:39,000 when printed at 11"x17"

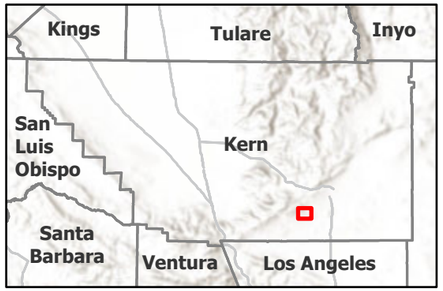
Not for Construction

Document Path: Z:\projects\194_PROJECTS\TERRA_GEN\194_1405_0001_Discovery\PROJECTS\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 4b. Vegetation Communities



Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Vegetation Communities

California buckwheat scrub

California juniper woodland

Cheesebush scrub

Creosote bush scrub

Desert needlegrass grassland

Developed

Disturbed

Disturbed - Creosote bush scrub

Rubber rabbitbrush scrub

Scalebroom scrub

Los Angeles Aqueduct

Oak Creek

Note: Additional vegetation community mapping and mapping of Joshua trees is in progress and when available, the results will be used to update this report.

N

Miles

0 0.13 0.25 0.5

Scale is 1:24,700 when printed at 11"x17"

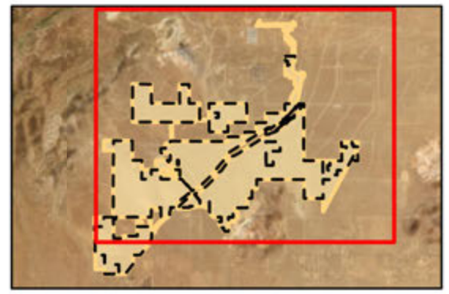
Not for Construction

Document Path: \\tes\700gis\Tes\Projects\PDR\projects\194_PROJECT\SITERRA_GEN\194_1402_0001_Discovery\PROJECT\SITERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 5a. Burrow/Den Summary



Oak Creek Rd
90th Street W
UPRR
Oak Creek
Tehachapi Willow Springs Rd
Los Angeles Aqueduct
Balboa Ave

Note: The burrows/dens shown in this figure include those with sign as well as those without sign but that could potentially be used by the species.

Species Key
- Burrowing Owl (BUOW)
- Desert Kit Fox (DKF)
- Desert Tortoise (DETO)

- Windhub High-voltage Substation (Existing)
- Roads
- Watercourse

Proposed Project Features
- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*
- Step-up HV substation
- Gen-tie Corridor

All Burrows/Dens
- BUOW
- DKF
- DETO
- BUOW/DETO
- BUOW/DKF/DETO
- BUOW/DKF

*Already approved under separate projects.

N

0 0.2 0.4 0.8 Miles

Scale is 1:39,090 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Figure 5b. Burrow/Den Summary



Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

All Burrows/Dens

BUOW

DKF

BUOW/DKF

Los Angeles Aqueduct

Oak Creek

Note: The burrows/dens shown in this figure include those with sign as well as those without sign but that could potentially be used by the species.

Species Key

Burrowing Owl (BUOW)

Desert Kit Fox (DKF)

Desert Tortoise (DETO)

*Already approved under separate projects.

N

0 0.13 0.25 0.5 Miles

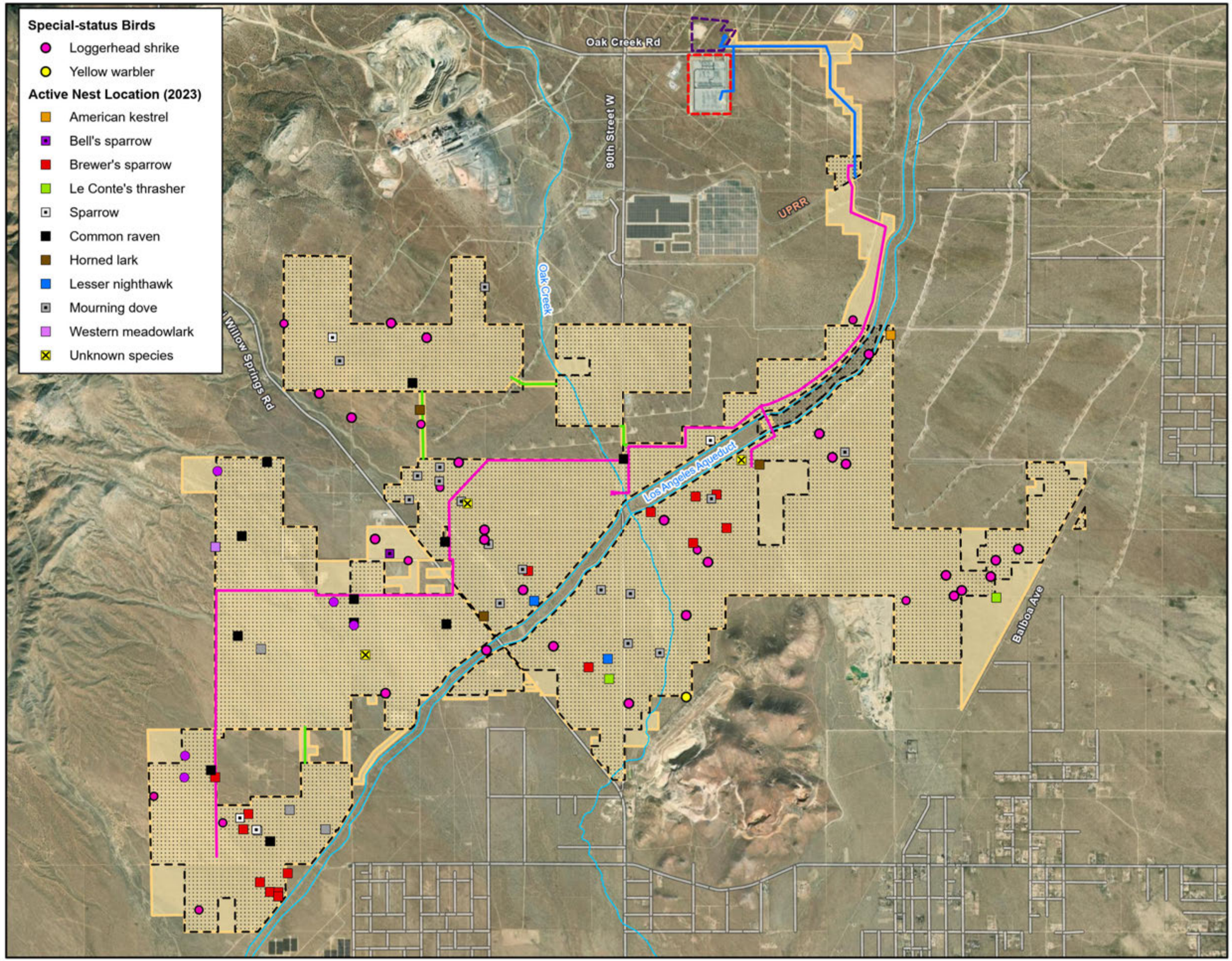
Scale is 1:24,672 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

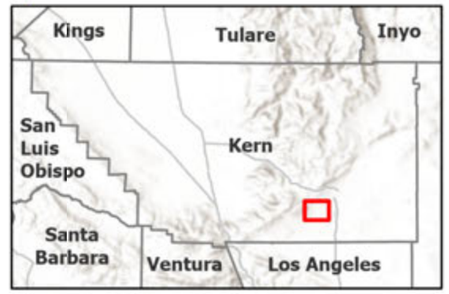
Kern County, CA

Figure 6. Special-status Bird Species and Active Nests



Special-status Birds
- Loggerhead shrike
- Yellow warbler

Active Nest Location (2023)
- American kestrel
- Bell's sparrow
- Brewer's sparrow
- Le Conte's thrasher
- Sparrow
- Common raven
- Horned lark
- Lesser nighthawk
- Mourning dove
- Western meadowlark
- Unknown species



- Windhub High-voltage Substation (Existing)
- Roads
- Watercourse

Proposed Project Features
- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/ Access Easements

Other Applicant and/or Affiliate Controlled*
- Step-up HV substation
- Gen-tie Corridor

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

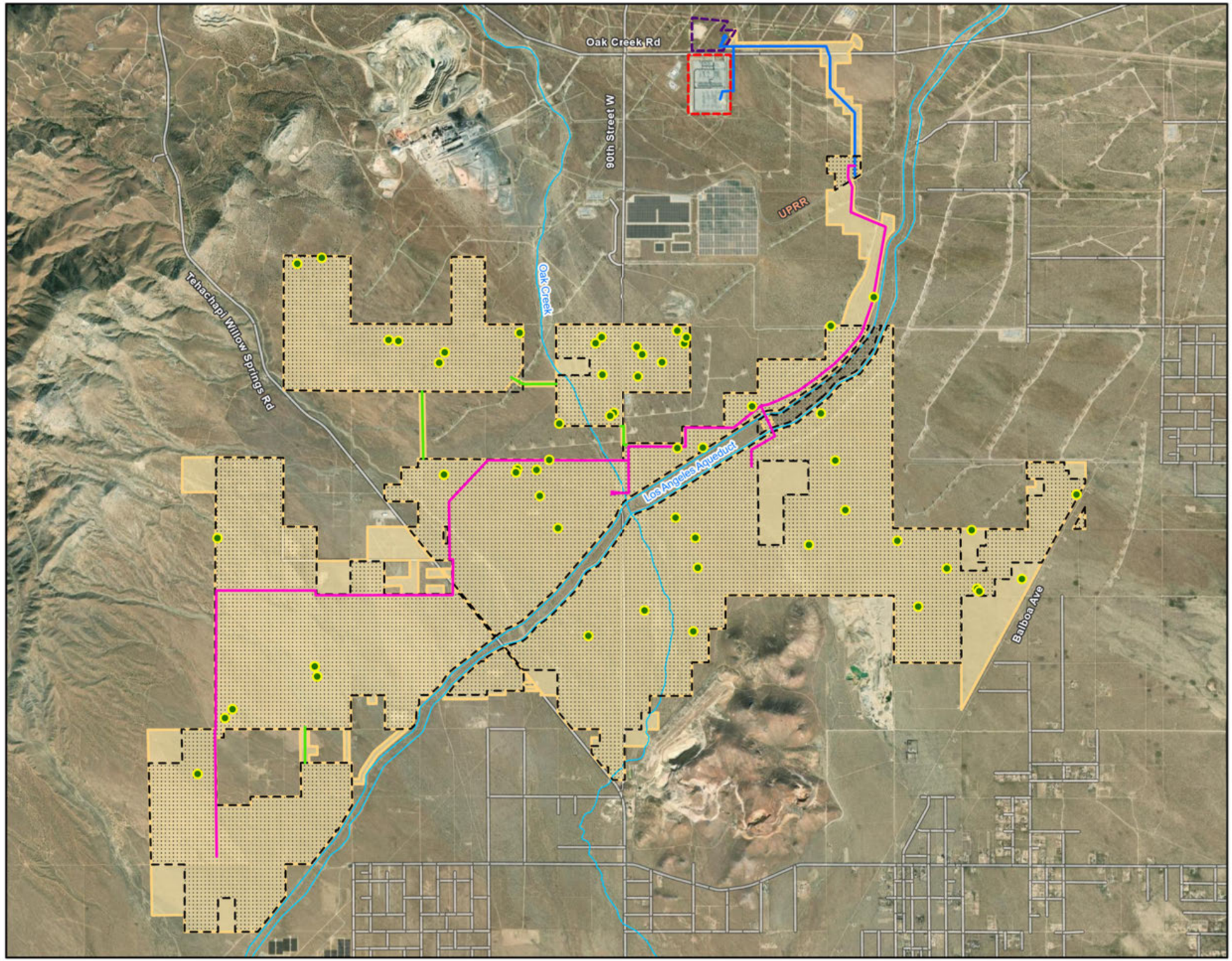
Scale is 1:45,000 when printed at 11"x17"

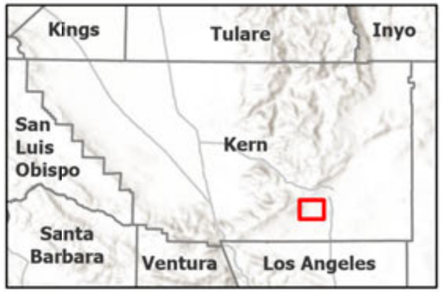
Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Figure 7. American Badger Sign





- Windhub High-voltage Substation (Existing)
- Roads
- Watercourse

Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

Burrow with American Badger Sign

- Sign Present

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

Scale is 1:45,000 when printed at 11"x17"

Not for Construction

This page intentionally left blank.

APPENDIX A: PHOTOGRAPHS

This page intentionally left blank.

Photograph 1 **Notes:** Allscale scrub (*Atriplex polycarpa*) shrubland alliance located south of the Los Angeles Department of Water and Power (LADWP) Aqueduct.	
Photograph 2 **Notes:** Brittle bush scrub (*Encelia farinosa*) shrubland alliance located in the northern portion of the Study Area.	

Photograph 3 **Notes:** California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii*) shrubland alliance located in the south portion of the Study Area.	
Photograph 4 **Notes:** California juniper (*Juniperus californica*) woodland alliance located in the northwestern portion of the Study Area.	

Photograph 5 **Notes:** Cheesebush scrub (*Ambrosia salsola – Bebbia juncea*) shrubland alliance located in the northwestern portion of the Study Area.	
Photograph 6 **Notes:** Creosote bush scrub (*Larrea tridentata*) shrubland alliance located in the western portion of the Study Area.	

Photograph 7 **Notes:** Desert needlegrass grassland (*Stipa speciosa*) herbaceous alliance located in the western portion of the Study Area.	
Photograph 8 **Notes:** Scalebroom scrub (*Lepidospartum squamatum*) shrubland alliance located along a dry streambed running through the midsection of the Study Area.	

Photograph 9 **Notes:** Trash dumping located north of the LADWP Aqueduct.	
Photograph 10 **Notes:** Disturbed area, an abandoned and burned homestead north of the LADWP Aqueduct.	

Photograph 11 **Notes:** Disturbed mining pile located in the southeastern portion of the Study Area.	
Photograph 12 **Notes:** Disturbed creosote bush scrub shrubland alliance located in the western portion of the Study Area.	

Photograph 13	
Notes: Rubber rabbitbrush scrub (*Ericameria nauseosa*) shrubland alliance located in the western section of the Study Area.	

This page intentionally left blank.

APPENDIX B: BOTANICAL INVENTORY REPORT

See Appendix D2 of the Draft EIR

This page intentionally left blank.

APPENDIX C: MOJAVE DESERT TORTOISE SURVEY REPORT

See Appendix D3 of the Draft EIR

This page intentionally left blank.

APPENDIX D: BURROWING OWL SURVEY REPORT

See Appendix D4 of the Draft EIR

This page intentionally left blank.

APPENDIX E: SWAINSON'S HAWK AND NESTING RAPTOR SURVEY REPORT

See Appendix D6 of the Draft EIR

This page intentionally left blank.

APPENDIX F: GOLDEN EAGLE AND CALIFORNIA CONDOR SURVEY REPORT

See Appendix D7 of the Draft EIR

This page intentionally left blank.

APPENDIX G: MEMORANDUM ON POTENTIAL FOR MOHAVE GROUND SQUIRREL OCCURRENCE

See Appendix D9 of the Draft EIR

This page intentionally left blank.

APPENDIX H: DESERT KIT FOX SURVEY REPORT

See Appendix D5 of the Draft EIR

This page intentionally left blank.

APPENDIX I: DESERT TORTOISE, BURROWING OWL, AND DESERT KIT FOX SURVEY DATASHEETS

This page intentionally left blank.

Date: 11/3/2022
Recorder: T. Dee

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

General Information	Weather Data		
Biologist(s): Alden Lovaas, Taylor Dee	Time (24 hr)	Start: 1000	End: 1500
	Temp° (°F)	Start: 42.4	End: 45.3
	Wind (mph)	Start: 5-12	End: 5-15
	% Cloud Cover	Start: 20	End: 20

Project/Site info	
Project Name: Enterprise/Terra Gen	Location: East of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern

Area(s) Assessed

Area B - located southwest and west of Gen-tie and south of Windhub solar project. Dirt Road named "90th St. W" runs through middle of area B.

Habitat Description
(i.e. land form, aspect, soils, disturbances, land uses, vegetation communities, plants observed)

Area B waypt ID: 7000 in field maps app.

- friable soil, sandy loam w/ gravelly substrate on surface
- good vegetation cover & diversity of shrub structure, & species diversity. mostly Creosote bushes, Joshua trees, Lycium sp., Cheesebush (AMBSAL). Shrubs ranged from 1-6 ft tall
  - Vegetation foliage looks dry/crispy/brown but some green leaves still present on shrubs.
- soil appears saturated from recent rains
- Suitable habitat for Burrowing owl, desert kit fox, desert tortoise

Plants observed:

Creosote bush, Joshua tree, Lycium sp., Cheesebush, Mentzelia sp. Krascheninnikovia lanata, Amsinkia sp., Beavertail, Cholla,

- Joshua tree (TD1) - 35.007397, -118.291867
  1 ft tall, healthy
- Joshua tree (TD2) - 35.003419, -118.284050
  3 ft tall, healthy

Date: 11/3/2022
Recorder: T. Dee

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Wildlife Observations

(species if live or raw scat, tracks, carcass, vocalization, nest, or other)

harvester ant
darkling beetle
White-crowned sparrow
rock wren
common raven

BUOW/DKF/DT Observations

Unique ID (initials/year/#)		Time (24 hr)	Species	Type*	Class*	Latitude	Longitude	Comments (i.e., burrow aspect & dimensions, nest stage, behavior, etc.)
TT001	1	1125	BUOW/DKF	B	potential	35.004910	-118.258120	soil burrow, east aspect, 9"w x 6"h x ≥3'd, no sign
TT002	2	1136	BUOW/DKF	B	potential	35.004878	-118.258449	soil burrow, S aspect, 11"w x 16"h x ≥6'd, no sign
TT003	3	1229	BUOW/DKF	B	potential	35.004691	-118.296868	soil burrow, NE aspect, 9"w x 9"h x >2'd, no sign
TT004	4	1232	BUOW/DKF	B	potential	35.004593	-118.296962	soil burrow, N aspect, 11"w x 7"h x 3'd, no sign
TT005	5	1305	BUOW/DT	B	potential Class 4	35.005130	-118.296278	soil burrow, S aspect, 10"w x 5"h x >6'd, no sign
TT006	6	1329	BUOW/DKF	B	potential	35.007165	-118.298123	soil burrow, NE aspect, 12"w x 9"h x >6'd, no sign
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, R - roost, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

*BUOW: occupied w/ owl, occupied w/ sign, potential (no sign) *ABD KF: known sign (box or sign), potential sign (no sign)

*BURROW / PALLET

1 - Currently active, evidence of recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe) definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*SCAT

1 - Wet or freshly dried, odorous odor
2 - Dry, glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached out, consisting only of plant fiber

*LIVE TORTOISE

(MCL, Max Width, Width at 7/8 Marginal Height)

1 - Healthy
2 - INJ D
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*CARCASS

1 - Fresh or putrid
2 - Normal color, sauces adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart, growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

-Tortoise scat and carcass class definitions taken from Preparing for Any Mojave Project Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

Form Updated: 11/7/2022

Date: 11/4/2022
Recorder: T. Dee

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

General Information	Weather Data		
Biologist(s): Alden Lovaas, Taylor Dee	Time (24 hr)	Start: 0820	End: 1315
	Temp° (°F)	Start: 41.2	End: 63.3
	Wind (mph)	Start: 4-10	End: 1-3
	% Cloud Cover	Start: 10	End: 25

Project/Site info

Project Name: Enterprise/Terra Gen	Location: East of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern

Area(s) Assessed

Area A - located SW & W of Gen-tie and SW of Windhub Solar project. Located south of California Portland Mojave plant, and NE of Tehachapi willow Springs Rd.

Area F - located SW of Tehachapi willow Springs Rd and SE of LA aqueduct

Habitat Description
(i.e. land form, aspect, soils, disturbances, land uses, vegetation communities, plants observed)

unique ID in field maps

7007 Area A - suitable habitat for burrowing owl, desert kit fox, and desert tortoise.
- friable sandy loam soil
- good vegetation cover but characterized by short shrubs (mostly 1-2 feet tall) w/ scattered Joshua trees. Large shrubs of creosote bush & Lycium sp. widely scattered.
- overall vegetation is diverse in species composition but mostly consists of Ericameria sp., cheesebush (AMBSAL), Ephedra sp., and indian rice grass (STIHYM).
- some patches of large (6 ft tall) creosote bush.
- NW portion has lots of cut down Joshua trees, no large Joshua trees present, only small emergent Joshua trees < 3 ft tall.

disturbance

observed evidence of grazing by a large ungulate (not cattle): lots of scat, heavily grazed Stipa grass, obvious bare patches of soil between shrubs, and shrub have sparse foliage.
disturbances from grazing most prominent in western half of Area A.

7012 Area F - suitable habitat for BUOW, DKF, and tortoise. Creosote bush scrub dominated by creosote bush - good vegetation cover w/ a variation in shrub height including small shrubs (1-3 ft tall), large creosote bush (4-6 ft tall), and widely scattered Joshua trees. Good species diversity & composition: Joshua tree, creosote bush, buckwheat sp. (shrub), golden bush (Ericameria sp.), Ephedra sp., and cheesebush (AMBSAL).

nonnative plants present include Sahara mustard and Stork's bill (EROCIC).

Joshua trees:
AL1 0.5 ft. next to golden bush. 35.005559, -118.316122
TD3 on N side of ¾ under cheesebush. 1 ft tall, healthy 35.089971, -118.308359

Date: 11/4/2022
Recorder: T. Dee

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Wildlife Observations

(specify if burrow,scat, tracks, carcass, vocalization, nest, or other)

Rock wren
White-crowned sparrow
European Starling
Comman raven
White-tailed antelope squirrel
horned lark
western meadowlark
red-tailed hawk
yellow-rumped warbler
California quail
Mountain bluebird
Le Conte's thrasher
Loggerhead Shrike
unique ID: 7011
35.002826, -118.327379
house finch
American badger (claw marks at burrow/den)
desert kit fox (scat) at den

BUOW/DKF/DT Observations

unique ID		Time (24 hr)	Species	Type*	Class*	Latitude	Longitude	Comments (i.e., burrow aspect & dimensions, nest stage, behavior, etc.)
7008	1	0840	BUOW	B	potential	35.007601	-118.307389	soil den, east aspect, 9"w x 6"h x ≥3'd. potential BUOW burrow. no sign
	2							
7009	3	0925	DKF	B	potential	35.006342	-118.310228	soil den, west aspect, 10"w x 14"h x ≥3'd Entrance under Lycium sp. shrub. other burrows present & potentially connected to den
	4							
	5							
7010	6	1010	AB/DKF/BUOW	B	pot. BUOW known den for AB & DKF	35.006105	-118.315616	soil den, south aspect, 8"w x 6"h x ≥3'd curves left. badger claw marks in & around den walls. 1 DKF scat outside den. other digs around den
	7							
	8							
	9		↑ american badger					
	10							
	11							
	12							
	13							
	14							
	15							

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, R - roost, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

*BUOW: occupied w/ owl, occupied w/ sign, potential (no sign)

*AB/DKF: known den (fox or sign), potential den (no sign)

*BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE

(MCL, Max Width, Width at 7/8 Marginal, Height)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

-Tortoise scat and carcass class definitions taken from *Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise* (USFWS 1992)

-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

Form Updated: 11/7/2022

Date: 11/7/2022
Recorder: A. Lovaas

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

General Information	Weather Data		
Biologist(s): Taylor Dee, Alden Lovaas	Time (24 hr)	Start: 0915	End: 1345
	Temp° (°F)	Start: 55.4	End: 66.8
	Wind (mph)	Start: 5-8	End: 5-16
	% Cloud Cover	Start: 95	End: 90

Project/Site info

Project Name: Enterprise/Terra Gen	Location: East of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern

Area(s) Assessed

Area G - Locakd Southwest of Tehachapi Willow Springs Road

Habitat Description
(i.e. land form, aspect, soils, disturbances, land uses, vegetation communities, plants observed)

Unique ID in field maps app for area G Habitat Suitability point is 7017

Desert Scrub with areas dominated by Creosote bush Scrub, Joshua trees, and rubber rabbit brush (Ericameria sp) Friable Sandy loam Soil. Multiple disturbances present including trash, debris piles, potential old grow operation, powerlines, dirt roads, evidence of past wildfire, livestock grazing / grubbing, and Non-Native Plants (Saharan Mustard, Erodium Circulatorium).

Northwest portion of Area G: Showed evidence of past wildfire with widely scattered large Shrubs especially Creosote bush Shrubs

Eastern portion of Area G: Contained evidence of past construction and grubbing; No large Shrubs, Creosote bushes were emergent and limited to 3' tall with a lot of Saharan mustard. Stockpiles and remnants of a chain linked fence surrounded the area that appear to have previously been grubbed

Southern Portion of Area G: Contained more Josha trees and cheese bush (AMSSAL) and Showed less disturbance; however was in proximity to more anthropogenic disturbances and rural developments including new operations, dirt roads and 2 possibly abandoned desert homesteads South of Area G.

Plants Present in Area G: Creosote bush, Joshua tree, Encelia sp. Ephedra sp., Cheesebush, Saharan Mustard, Amsinckia sp. Erodium Circulatorium, Eriogonum spp. (Shrubs and annuals), Lycium sp. rubber rabbitbrush, Stipia sp. Cholla

Date: 11/7/2022
Recorder: A. Lovaas

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Wildlife Observations

(specify if burrow,scat, tracks, carcass, vocalization, nest, or other)

White Crowned Sparrow
House Finch
Harvester ant
Common Raven
Black tailed jackrabbit
Horned lark
burrowing owl (pellets & whitewash at burrow)
desert kit fox (scat at den)
Copper's hawk

BUOW/DKF/DT Observations

Time (24 hr)	Species	Type*	Class*	Latitude	Longitude	Comments (i.e., burrow aspect & dimensions, nest stage, behavior, etc.)
1138	BUOW/DKF	B	potential	34.971389	-118.325481	Potential BUOW/DKF burrow, no sign observed East Aspect 9"w x 9"h x 5'd ID: 7013
1148	J tree			34.972896	-118.327320	1 ft tall, health Adjacent to ephedra (7014) ID
1207	BUOW/DKF	B	occupied & known	34.980295	-118.323926	Occupied BUOW burrow with pellets and white wash (no live owls observed) and known DKF den w/ scat. Two main entrances (S Aspect & SW Aspect) South Aspect: 16"w x 10"h x >6'd - Most of the sign at this entrance, pellets, white wash, and scat. Southwest Aspect: 12"w x 10"h x >2'd - pellet and white wash present, curves to left & Right. Several other digs/collapsed burrow entrances to east & Southeast. Burrow under Cycium. (7015) ID
1235	J tree			34.980008	-118.326880	0.5ft tall in Eriogonium Shrub, healthy ID 7016

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, R - roost, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

*BUOW: occupied w/ owl, occupied w/ sign, potential (no sign)

*AB/DKF: known den (fox or sign), potential den (no sign)

*BURROW / PALLET	*SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (MCL, Max Width, Width at 7/8 Marginal, Height)		*CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from *Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise* (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

Form Updated: 11/7/2022

Date: 11/8/2022
Recorder: T. Dee

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

General Information	Weather Data		
Biologist(s): Alden Lovaas, Taylor Dee	Time (24 hr)	Start: 0730	End: 1445
	Temp° (°F)	Start: 50.5	End: 44.8
	Wind (mph)	Start: 0-1	End: 1-4
	% Cloud Cover	Start: 100	End: 100

Project/Site info start: raining end: raining

Project Name: Enterprise/Terra Gen	Location: East of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern

Area(s) Assessed

Area C - northeast of Tehachapi willow springs road & northwest of LA Aqueduct

Habitat Description
(i.e. land form, aspect, soils, disturbances, land uses, vegetation communities, plants observed)

Unique ID: 7024

suitable for BUOW, DKF, and desert tortoise

Area C contains friable sandy/gravelly loam soils. Creosote bush scrub with scattered Joshua trees. Good shrub cover dominated by creosote bush shrubs (4'-7' tall) with some small shrubs (1'-3' tall) in between

West of 90th Street West: Contained most shrub and annual cover due to large shrub size, lots of foliage, and closely spaced shrubs. Most vegetation species diversity in shrub and herbaceous vegetation.

East of 90th Street West: Contained noticeable less shrub and herbaceous cover and lacked diverse species composition compared to the rest of Area C, consisted almost exclusively of widely spaced creosote bush shrubs (2'-6' tall) with bare to sparse foliage. In some sections, creosote bush shrubs were no more than 3' tall. Almost no herbaceous vegetation or other shrubs; Joshua trees were very widely scattered and far and few between.

Disturbances in Area C consisted of trash dumping, fencelines, existing and abandoned desert homesteads, livestock grazing (trampling, broken shrubs, sparse vegetation other than creosote bush, a lot of scat), non-native plants (Sahara mustard, Stork's bill [EROCIC]), and abandoned marijuana grow operation (east of 100th Street W and north of Laguna Ave.).

Date: 11/3/2022
Recorder: _____

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

General Information	Weather Data
Biologist(s): Alden Lovaas, Taylor Dee	Time (24 hr) Start: ____ End: ____ Temp° (°F) same as page 1 Start: ____ End: ____ Wind (mph) Start: ____ End: ____ % Cloud Cover Start: ____ End: ____

Project/Site info

Project Name: Enterprise/Terra Gen	Location: East of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern

Area(s) Assessed

Gen-tie - ~~located~~ northern extent begins along Oak Creek Rd. at Southern California Edison's (SCE) windhub substation Project 3 continues east 3 then extends south and southwest until Jackpine Ave. ~~near northern corners~~ 3 80th S W. intersection

Habitat Description
(i.e. land form, aspect, soils, disturbances, land uses, vegetation communities, plants observed)

unique ID point in field maps app. is 7025

Gen-tie is suitable for burrowing owl, desert kit fox, and ~~desert~~ tortoise.

Soils: friable sandy/gravelly loam

Vegetation: creosote bush scrub (especially in Southern portion) and Joshua tree woodland (especially center portion). Large creosote bush shrubs (4-6') and Joshua trees (mostly > 7' tall). Rubber rabbitbrush common along dirt access road in Southern portion.

disturbances: powerlines, Union-Pacific railroad, wind turbines

7026 — Within ≈ 1600 ft south of Oak Creek Rd. vegetation cover is very sparse due to heavy disturbance caused by livestock grazing. ~~No herbaceous vegetation or shrubs, with the exception of thistle & weedy scattered creosote bush shrubs.~~ Bunch grasses and shrubs are present but grazed to base/ground level. Also evidence of past grubbing/grading and little to no vegetation under transmission line.

* (also see datasheet for 11/1/22 for clarification) area was re-evaluated after 11/8 storm had passed.

Date: 11/8/2022
Recorder: A. Lovgas

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Wildlife Observations

(specify if burrow,scat, tracks, carcass, vocalization, nest, or other)

Common Raven
European Starling
harvester ant
White Crowned Sparrow
Black-tailed jackrabbit
yellow-rumped warbler

American Badger (Claw marks at Den) ID: 7021 & 7022

BUOW/DKF/DT Observations

Unique ID:		Time (24 hr)	Species	Type*	Class*	Latitude	Longitude	Comments (i.e., burrow aspect & dimensions, nest stage, behavior, etc.)
7018	1	0823	J-tree			34.991911	-118.299963	4 Joshua trees in this area. One tall 6ft tree w/ top cut off, two 3" tall saplings w/in 1.5' to 3', and one cut trunk.
	2							
7019	3	0841	AB/BUOW/DKF			34.992680	-118.296749	One potential AB/BUOW/DKF burrow under Lycium,
	4		Potential Den/Burrow					No sign observed. South Aspect. 4"W x 10"H x >2' D.
	5							
	6							Debris inside Mouth of burrow including Spider webs,
7020	7	0854	AB/BUOW/DKF			34.992851	-118.299088	Seeds, and leaves. Apron was not fresh
	8		Potential Den/Burrow			~~34.992951~~	~~-118.299088~~	One potential AB/BUOW/DKF burrow, No Sign observed
	9							South Aspect. 9"W x 7"H x >1'D. Open tunnel with
7021	10	0932	AB/DKF			34.992704	-118.315661	a few Spider webs present. Apron was not fresh.
	11		known AB den					One burrow with a 16" vertical drop until horizontal
	12		potential DKF den					Slope and curves to the right. 8"W x 7"H x >2' D.
	13							Northwest Aspect, Badger Claw Marks on sides of
	14							burrow tunnel. Fresh dirt on apron. Within
	15							12' of another burrow/den (ID 7022). Next to debris pile.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, R - roost, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

*BUOW: occupied w/ owl, occupied w/ sign, potential (no sign)
*AB/DKF: known den (fox or sign), potential den (no sign)

***BURROW / PALLET**

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

***SCAT**

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

***LIVE TORTOISE**
(MCL, Max Width, Width at 7/8 Marginal, Height)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

***CARCASS**

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

-Tortoise scat and carcass class definitions taken from *Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise* (USFWS 1992)

-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

Date: 11/8/2022
Recorder: A. Lovgas

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Wildlife Observations

(specify if burrow,scat, tracks, carcass, vocalization, nest, or other)

See other sheet (Page 3)

BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type*	Class*	Latitiude	Longitude	Comments (i.e., burrow aspect & dimensions, nest stage, behavior, etc.)
7022	0935	AB/Buow/DKF *Known AB ~Potential Buow/DKF			34.992879	-118.315684	One burrow with fresh Apron 8"W x 8.5"H x >5'D East Aspect. Apron contained evidence of tracks but unable to ID due to recent rain. AB claw marks present on burrow tunnel walls. no Buow/DKF sign. In close proximity to another burrow/den (ID 7021) within 12'. Burrow next to debris pile and old homestead.
7023	1141	AB/Buow/DKF ~Potential AB/Buow/DKF			34.992368	-118.288088	Two Potential AB/Buow/DKF burrows, no sign observed - Northeast Aspect Burrow: has open tunnel, no fresh Apron 10"W x 5"H x >6'D - Southwest Aspect Burrow: has signs of erosion and is slightly deteriorated. Spider webs in burrow mouth. 9"W x 5"H x >6'D. no fresh apron.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, R - roost, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

*BUOW: occupied w/ owl, occupied w/ sign, potential (no sign)

*AB/DKF: known den (fox or sign), potential den (no sign)

*BURROW / PALLET	*SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (MCL, Max Width, Width at 7/8 Marginal, Height)		*CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from *Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise* (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

Date: 11/9/22
Recorder: T. Dee

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

General Information	Weather Data		
Biologist(s): Aiden Lovaas, Taylor Dee	Time (24 hr)	Start: 0730	End: 1430
	Temp* (°F)	Start: 40.9	End: 46-3
	Wind (mph)	Start: 2-5	End: 10-25
	% Cloud Cover	Start: 10	End: 10

Project/Site info

Project Name: Enterprise/Terra Gen	Location: East of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern

Area(s) Assessed

Area D - Located southeast of LA Aqueduct, and northeast of Tehachapi willow Springs Rd, and west of "20th St. W"

Habitat Description
(i.e. land form, aspect, soils, disturbances, land uses, vegetation communities, plants observed)

Unique ID in field maps app. 7029

- Area D is suitable for BUOW, DKF, and DT.
  - soils: friable sandy/gravelly loam
  - vegetation:
    - creosote bush scrub w/ areas of Joshua tree woodland.
    - area is dominated by closely spaced creosote bushes (3-7' tall). Other shrubs are present but shorter (≤2-3' tall) and appear to be heavily grazed. Southern portion towards eastern side has patches of more shrub species diversity including lots of Lycium sp. and cheesebush (AMBSAC). multiple shrubs (creosote bush and Lycium sp.) are very large.
    - In southern half, east of Oak creek, terrain is mostly flat (no mounds) w/ a NW to SE slope and soil is very saturated from yesterday's storm and likely due to presence of alluvial fans; more herbaceous vegetation present (including Amsinkia sp.). In
    - In northern half, east of Oak Creek (like observed in area C), vegetation cover (shrub & herbaceous) is low due to very sparse shrub foliage, short shrubs (max 3' tall). Joshua trees were far & few between, and little to no herbaceous species vegetation in part due to heavy livestock grazing resulting in large patches of bare soil between shrubs
  - Disturbances:
    - grazing (tons of scat, trampled/broken shrubs, shrubs & bunchgrasses grazed to base/ground level),
    - trash dumping
    - non-native plants (minor)
      - Sahara mustard present especially w/i 1500ft of Tehachapi willow springs Rd.
      - Starks bur (ERECIC)

Date: 11/9/22
Recorder: T. Dee

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Wildlife Observations

(specify if burrow,scat, tracks, carcass, vocalization, nest, or other)

Rock wren
white-crowned sparrow
common raven
yellow-rumped warbler (Audubon's & myrtle's subsp.)
millipede sp.
white-tailed antelope squirrel
sage thrasher
burrowing owl (see details below)

BUOW/DKF/DT Observations

Unique ID in field maps		Time (24 hr)	Species	Type*	Class*	Latitude	Longitude	Comments (i.e., burrow aspect & dimensions, nest stage, behavior, etc.)
7026	1	1336	BUOW	LI/B	occupied	34.985721	-118.281937	1 owl flushed from soil burrow located at top of west bank of Oak Creek wash, ≈ 6' above wash bottom. Owl flew south along wash. Burrow has N aspect, ? is 10"w × 12"h × ≥2'd. Height shortens to ≈ 5-6" after ≈ 2'. Whitewash is present outside burrow. no pellets observed but ~~if~~ present could have been washed away by storm in wash
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
7027	14	1226	Joshua tree	—	—	34.982302	-118.281239	1 tree, ≈ 1' tall located in creosote bush shrub. Degraded condition. (few green leaves)
	15							

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, R - roost, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

*BUOW: occupied w/ owl, occupied w/ sign, potential (no sign)

*AB/DKF: known den (fox or sign), potential den (no sign)

***BURROW / PALLET**

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

***SCAT**

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

***LIVE TORTOISE**
(MCL, Max Width, Width at 7/8 Marginal, Height)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

***CARCASS**

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from *Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise* (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

Form Updated: 11/7/2022

Date: 11/10/2022
Recorder: T. Dee

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

General Information	Weather Data		
Biologist(s): Alden Lovaas, Taylor Dee	Time (24 hr)	Start: 0800	End: 1500
	Temp* (°F)	Start: 45.1	End: 52.9
	Wind (mph)	Start: 1-5	End: 1-5
	% Cloud Cover	Start: 0	End: 0

Project/Site info	
Project Name: Enterprise/Terra Gen	Location: East of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern

Area(s) Assessed

Area E - North and Northeast of Holliday Rock Mine, east of 80th Street West, and Southeast of LA aqueduct

Habitat Description
(i.e. land form, aspect, soils, disturbances, land uses, vegetation communities, plants observed)

Habitat in Area E: Friable Sandy/gravelly loam soils, especially sandy in middle corner of southern half bordered by Holliday Rock Mine. Vegetation is dominated by Creosote bush shrubs (3-5' tall) and scattered Joshua trees. Shorter shrubs (2-3' tall) are present and include Acamptopappus sp., Cheesebush (AMBSAL), and Ephedra sp. Bunch grasses also present but mostly grazed to base. Overall vegetation provides good cover for wildlife. Evidence of herbaceous vegetation throughout site but mostly present under creosote bushes. Areas are mostly flat with exception of southwest corner (west of 75th St. W) where several granite rocky outcrops and washes with steep banks are present; Rocky Mountain to the south.

Disturbances in Area E include: past wildfire in western half, between "80th Street W." and "75th Street W" (burned and dead Joshua trees and Creosote bushes. Vegetation cover low with wide areas of bare soil between remaining shrubs, most existing shrubs have sparse foliage), livestock grazing (tons of scat, trampled/broken shrubs, grazed vegetation especially bunch grasses) OHV tracks (motorcycle), trash dumping, and shot gun shells.

Area E has suitable habitat for Burrowing owl, desert Kit fox, and desert tortoise.

Unique ID: 7033

7032 Joshua tree 34.988527, -118.264608 : 6 inches tall under creosote bush on southwest side well concealed, healthy.

Date: 11/10/22
Recorder: T. Dee

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Wildlife Observations

(specify if burrow,scat, tracks, carcass, vocalization, nest, or other)

White-crowned sparrow
Horned lark
Yellow-Rumped Warbler
Common Raven
Rock Wren
Black-tailed jackrabbit
Cooper's Hawk
White-tailed antelope Squirrel
[redacted]
blue-gray gnatcatcher
Cactus Wren
Harvester ant
darkling beetle
Side blotch lizard
desert tortoise (carcass with burrow, and scat)

BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type*	Class*	Latitude	Longitude	Comments (i.e., burrow aspect & dimensions, nest stage, behavior, etc.)
7030	1196	DT	C	1	34.975210	-118.251853	adult Male (~280 mal) Carcass observed on West Side of access road. Carcass was upside down Possible predation. Gular is intact but has tooth rakes and large Canid (likely coyote) print next to Carcass. Right marginal 10 has drill hole mit Overall minimal evidence of trauma to carapace and plastron. Missing front left forelimb and back right hindlimb. Scales on right front forelimb appear to have been Chewed off.
7031	1235	DT	B	3	34.975123	-118.251614	Burrow appears to have been dug out by predator (likely associated with class 1 carcass [7030] ~70' W of burrow). At least 9 pieces of class 3 Scat around burrow apron. Burrow appears to have been dug out prior to storm event on 11/8/22. Burrow dimensions: 14"W x 7.5"H x 2'D

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, R - roost, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

*BUOW: occupied w/ owl, occupied w/ sign, potential (no sign)
*AB/DKF: known den (fox or sign), potential den (no sign)

***BURROW / PALLET**

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

***SCAT**

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

***LIVE TORTOISE** (MCL, Max Width, Width at 7/8 Marginal, Height)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

***CARCASS**

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from *Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise* (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

Form Updated: 11/4/2022

Date: 11/11/22
Recorder: T. Dee

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

General Information	Weather Data		
Biologist(s): Alden Lovaas, Taylor Dee	Time (24 hr)	Start: 0800	End: 1245
	Temp* (°F)	Start: 47-8	End: 56-4
	Wind (mph)	Start: 0-3	End: 2-5
	% Cloud Cover	Start: 30	End: 40

Project/Site info

Project Name: Enterprise/Terra Gen	Location: East of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern

Area(s) Assessed

Gen-tie

Habitat Description
(i.e. land form, aspect, soils, disturbances, land uses, vegetation communities, plants observed)

Unique ID

7036 Gen-tie w/i 1600' south of Oak Creek Rd. is disturbed cheesebush scrub. Area is suitable habitat for desert kit fox and burrowing owl but marginally suitable for desert tortoise due to lack of shrub and herbaceous cover preferred by the species, especially when considering the proximity to disturbances (ie., major transmission line and paved/busy Oak Creek Rd.)
- Vegetation cover is very sparse due to heavy disturbance (livestock grazing?). Vegetation consists of widely scattered shrubs and bunch grasses that are no more than 1-2' tall, and show signs of herbivory. Bunch grasses and shrubs present were almost all grazed to ground level. Taller vegetation included very widely scattered creosote bush shrubs and chollas. Evidence of herbaceous vegetation is present but cover is low likely due to grazing.
- friable gravelly loam soil. Small mammal & large mammal digs present.

7035 Gen-tie north of Oak Creek Rd.
- vegetation cover (shrubs & herbaceous) is good but primarily short (≤ 3' tall). Vegetation consisted of rubber rabbitbush scrub, brittlebush scrub, and Joshua tree woodland.
- soils friable but show evidence of past disturbance (ie, grading).
- Close to paved & dirt access roads, transmission lines, and wind turbines. Road shoulders had weedy vegetation including Ambrosia acanthocarpa and Sahara mustard.

Form Updated: 10/24/2022

7037 Gen-tie area south of Oak Creek Rd. by substation is suitable for BUOW, DT & DKF, consists of rubber rabbitbrush scrub & cheesebush scrub. Good veg cover & friable soil.

Date: 11/11/22
Recorder: T. Dee

BUOW/DKF/DT Habitat Assessment

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Wildlife Observations
(specify if burrow,scat, tracks, carcass, vocalization, nest, or other)

7034 ← unique ID → 7036

LOSH (35.038863, -118.283881) (35.034899, -118.265117)

yellow-rumped warbler
cactus wren
yellow rumped warbler
dark-eyed junco
red-tailed hawk
horned lark
common raven

white-tailed antelope squirrel
BUOW (live owl at burrow just north of Gen-tie)
DKF (scat at den)
house finch

BUOW/DKF/DT Observations

Unique ID		Time (24 hr)	Species	Type*	Class*	Latitude	Longitude	Comments (i.e., burrow aspect & dimensions, nest stage, behavior, etc.)
7038	1	1120	BUOW/DKF	B	potential/known	35.001791	-118.276113	Soil burrow w/ NW aspect, 6"w x 12"h x 2'd potential BUOW burrow (no sign). Known DKF den; 2 pieces of scat outside den, 1 bleached w/ small mammal remains inside, 1 dark brown (no glaze).
	2							
	3							
	4							
	5							
7039	6	1145	BUOW/DKF/DT	B	occupied/potential	35.001812	-118.272156	Soil burrow, South aspect, 8"w x 5.5"h > 2'd potential DKF den, occupied BUOW burrow - 1 owl flushed from burrow. 70' north of Gen-tie
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
7040	15	1156	Jshrub	—	—	35.000725	-118.272379	1' tall, healthy, concealed in dead ephedra

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, R - roost, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

*BUOW: occupied w/ owl, occupied w/ sign, potential (no sign)

*AB/DKF: known den (fox or sign), potential den (no sign)

*BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE
(MCL, Max Width, Width at 7/8 Marginal, Height)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

-Tortoise scat and carcass class definitions taken from *Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise* (USFWS 1992)

-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

Form Updated: 11/4/2022

Date: 4/10/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Verity Richardson Sarah Wagner Victoria Prado	Time (24 hr)	Start: 0830	End: 1515
	Temp° (°F)	Start: 75.4	End: 84.3
	Wind (mph)	Start: 0-1	End: 1-3
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Area A- western end. north of Tehachapi Willow Springs Rd. and west of 110th st. west

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

tall and dense ground cover consisting of annual vegetation, mainly Amsinkia sp.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

HOLA
WEME
CALW
WCSP
RTHA
LASP
BUOW (sign at burrows see next page for details)
Western side-blotched lizard
Bombus sp.
European honeybee
Painted lady
black widow
White-lined sphinx moth
Carpenter ant

Date: 4/10/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
CH10BA1TD	0958	B	BUOW DKF	SUI	378750	3874507	suitable burrow for DKF & BUOW, no sign observed. single entrance burrow, NE aspect, 5"w x 6"h x 1.5'd
CH10BA2TD	1007	B	BUOW DKF	SUI	378750	3874118	suitable burrow for DKF & BUOW, no sign observed. single entrance burrow, S aspect, 7"w x 8"h x ≥2'd
CH10BA3TD	1102	B	BUOW DKF	OS SUI	378712	3875197	occupied (w/ sign, no owl) BUOW burrow w/ >10 pellets (mostly bleached w/ no glaze) suitable burrow for DKF, no sign observed. single entrance burrow, W. aspect, 12"w x 7.5"h x ≥3'd very large burrow apron.
CH10BA4TD	1453	B	DKF w/ badger sign	SUI	378635	3874260	suitable burrow for DKF, no sign observed. single entrance, S aspect and fans up. drops vertically then curves to left. 11"w x 10"h x >1'd badger dug burrow (no claw marks present).

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/10/23
Recorder: A Lovaas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas Madison Panzino Jamie Perigo Derek Siver	Time (24 hr)	Start: 0840	End: 1450
	Temp° (°F)	Start: 70.1	End: 85.5
	Wind (mph)	Start: 0-2	End: 1-4
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area B - Northern portion of Area B

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Vegetation: good veg cover with diverse species and structure (Creosote bush, Joshua tree, Lycium sp. Cheesebush)

Soil: Sandy loam w/ some gravel, friable

* High and dense ground cover by annual species (Amsinkia and Erodium)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA — Western Side blotched lizard
CAGu — black-tailed jackrabbit
WCSP
CACW — AMerican Badger - Sign at burrows. See next pages for details
HOFI
LBWO
VERD
BESP
AMRO

Date: 4/10/23
Recorder: A. Lovgas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
041068AIDS	0907	B	BUOW	SUI	381893	3874810	Suitable burrow for BUOW, No sign observed. Single entrance burrow. S aspect. 9"W x 5.5"h x >2'd. Curves slightly to the right and narrows.
041068A2DS	0958	B	BUOW	SUI	381819	3874779	Suitable burrow for BUOW, No sign observed. Single entrance burrow approximately 1' North of burrow. SE aspect 8"W x 6.5"h x >2'd. Curves to the left and narrows
041068A3DS	1016	B	BUOW	SUI	382260	3874769	Suitable BUOW burrow, No Sign observed. Single entrance burrow. SE aspect 8"W x 7"h x >3'd Curves to the left.
041068A4DS	1023	B	BUOW	SUI	382299	3874764	Suitable BUOW burrow, No sign observed. Single entrance burrow. E aspect 8"W x 7"h x 2'd Curves to the right
041068A5DS	1029	B	BUOW	SUI	382441	3874774	Suitable BUOW burrow, no sign observed Single entrance burrow. S aspect 8"W x 7"h x 2'd Curves to the right
041068A6DS	1043	B	BUOW DKF W/ AB Sign	SUI SUI	382745	3874743	Suitable BUOW/DKF burrow. No sign. Single entrance badger dug den with AB Claw Marks present on side walls of burrow. 8"W x 8.5"h x >3'd Curves to the right. S aspect
041068A7DS	1225	B	BUOW	SUI	381640	3874732	Suitable BUOW burrow, No sign observed. Single entrance burrow SW aspect. 10"W x 6"h x 2'd. Burrow is too steep for tortoise.
041068A8DS	1243	B	BUOW DKF	SUI SUI	381313	3874741	Suitable BUOW and DKF burrow, No Sign observed. Single entrance burrow. SE aspect 9"W x 7.5"h x >3'd Steep Slope
041068A9DS	1300	B	BUOW	SUI	381471	3874707	Suitable BUOW burrow, No Sign observed. Single entrance burrow. SW aspect 8"W x 5.5"h x >2'd Curves to the left.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/10/23
Recorder: A. Lovoos

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
041023A10DS	1307	B	BUOW	SUI	381659	3874695	Suitable BUOW burrow, No Sign observed. Single entrance burrow. W aspect 8"W x 4"h x >3'd. burrow is too steep for tortoise. Curves to the left.
041023A11DS	1314	B	BUOW	SUI	381737	3874695	Suitable Burow and DKF burrow, no sign of target species observed. old canid scat (likely coyote) present near burrow entrance. Single entrance burrow. N aspect 8"w x 15"h x >5'd
			DKF	SUI			
041023A12DS	1353	B	BUOW	SUI	382311	3874696	Suitable BUOW and DKF burrow, No Sign observed. Single entrance burrow. E aspect 9"W x 8"h x >1.5'd Curves to the left. Dig w/ fresh apron 2.5' South of Burrow
			DKF	SUI			
041023A13DS	1413	B	BUOW	SUI	382896	3874674	Suitable Burow and DKF burrow, NO Sign observed. Single entrance burrow. N aspect. 7"W x 9"h x >2'd burrow Curves to the left
			DKF	SUI			
041023A14DS	1423	B	DKF	SUI	382766	3874736	Suitable DKF burrow, No Sign Observed. Single entrance burrow SE aspect 8"W x 7.5"h x >3'd Curves to the left and has a steep Slope.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/10/23
Recorder: A Lovaas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
CH10BA1AL	0932	B	Buow	SUI	381338	3874799	Suitable Buow burrow, No Sign observed. Single entrance burrow. E aspect 10"wx6"hx>3'd. Curves to the right
CH10BA2AL	0949	B	Buow DKF	SUI SUI	381693	3874754	Suitable Buow and DKF burrow in Lycium sp. No Sign observed. Single entrance burrow. S aspect 15"w x 17"h x >5'd. Canid digging near burrow entrance
CH10BA3AL	1038	B	Buow	SUI	382739	3874751	Suitable Buow burrow. No Sign observed. Single entrance burrow. S aspect 9"w x 7"h x >2'd. Vegetation growing in front of burrow.
CH10BA4AL	1047	B	Buow	SUI	382750	3874723	Suitable Buow burrow. No Sign observed. Single entrance in old soil pit. N aspect 14"wx 6"hx > 5'd burrow Curves to the right
CH10BA5AL	1058	B	Buow	SUI	382798	3874758	Suitable Buow burrow. No Sign observed. Single entrance burrow. E aspect 8"w x 6"h x 3'd.
CH10BA6AL	1231	B	Buow	SUI	381623	3874723	Suitable Buow burrow, no Sign observed. Single entrance burrow. S aspect 8"w x 5.5"h x 3'd. Mud inside burrow
CH10BA7AL	1319	B	Buow DKF	SUI	381734	3874694	Suitable Buow and DKF burrow, No Sign observed. Single entrance burrow in Lycium sp. S aspect 12"wx14"hx) 5'd burrow Curves to the right.
CH10BA8AL	1331	B	Buow DKF w/ AB Sign	SUI SUI	381833	3874674	Suitable Buow and DKF burrow, No Sign. Single entrance badger dug den w/ AB claw marks present on side walls Burrow has trash, apricot and sheep staple. SE aspect 8"w x 6"h x >2'd. Curves to the left
CH10BA9AL	1412	B	Buow DKF w/ AB Sign	SUI SUI	382853	3874661	Suitable Buow and DKF burrow, no Sign. Single entrance badger dug den w/ AB Claw marks on side walls W aspect 8"w x 8"h x >3'd Curves to the left

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/11/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Verity Richardson Sarah Wagner Victoria Prado	Time (24 hr)	Start: 0745	End: 1525
	Temp° (°F)	Start: 61-3	End: 76
	Wind (mph)	Start: 1-11	End: 4-10
	% Cloud Cover	Start: 0	End: 90

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Area A - west end, north of Tehachapi Willow Springs Rd and west of 110th St. west

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

tall and dense ground cover consisting of annual vegetation

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

HOLA LABU
CHSP LOSH1 (11S 378416, 3874033; 11S 378329, 3873740)
WEME western side-blotched lizard
WCSP black-tailed jackrabbit
CORA
OCWA
LEGO
SASP
BHGB
SCOR

Date: 4/11/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
041188A1TD	0946	B	BUOW DKF w/ badger sign	SUI	378192	3875659	suitable for BUOW & DKF, no sign observed. single entrance badger dug burrow. S. aspect, 8.5"w x 6"h x >7.5'd no badger chew marks observed.
041188A2TD	1011	B	DKF BUOW	SUI	378453	3874829	suitable burrow for DKF & BUOW, no sign observed. single entrance, E. aspect, 9.5"w x 8.5"h x >3'd
041188A3TD	1026	B	BUOW DKF	SUI	378429	3874292	suitable burrow for DKF & BUOW, no sign observed. single entrance, NE aspect, 8.5"w x 7"h x >2'd
041188A4TD	1054	B	BUOW DKF	SUI	378474	3874515	suitable burrow for BUOW & DKF, no sign observed. single entrance, NE aspect, 7.5"w x 6"h x >1'd under perennial bunch grass
041188A5TD	1101	B	BUOW	SUI	378486	3874699	suitable BUOW burrow, no sign observed, single entrance, N. aspect, 7.5"w x 6"h x >1'd
041188A1VR	1320	B	BUOW DKF	SUI	378427	3874331	suitable burrow for BUOW & DKF, no sign observed. single entrance, SE aspect, 10"w x 10"h x >1'd
041188A6TD	1419	B	BUOW DKF	SUI	378280	3874951	suitable burrow for BUOW & DKF, no sign observed. single entrance, E aspect, 8"w x 11"h x >1.5'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material, scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/11/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
CH11BA3VR	1420	B	BUOW DKF	SUI	378291	3874957	2 suitable burrows for BUOW & DKF located 13" apart. no sign observed, SE aspect, 7"w x 7"h x >2'd.
CH11BA7TD	1425	B	BUOW DKF	SUI	378296	3874951	suitable burrow for BUOW & DKF, no sign observed, single entrance, E aspect, curves left, 8.5"w x 6.5"h x >2'd
CH11BA3VR	1425	B	BUOW DKF	SUI	378296	3874944	suitable burrow for BUOW & DKF, no sign observed. single entrance, N aspect, 8"w x 7"h x ≥1'd
CH11BA8TD	1427	B	BUOW DKF	SUI	378297	3874948	suitable burrow for BUOW & DKF, no sign observed, single entrance, curves left, S aspect, 8"w x 5"h x >2'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/11/23
Recorder: A. Lovaas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas	Time (24 hr)	Start: 0730	End: 1500
Madison Panzino	Temp° (°F)	Start: 58.7	End: 76.1
Jamie Perigo	Wind (mph)	Start: 5-8	End: 3-6
Derek Siver	% Cloud Cover	Start: 0	End: 75

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area B - North Section of Area B

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Vegetation: good Veg Cover with diverse Species and Structure including Creosote bush, Joshua tree, Lycium sp., Cheese bush)

Soils: Sandy loam w/ some gravel, Friable

* High and dense ground cover by annual Species (Amsinkia and Eroclium)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WCSP	Western Side blotched lizard
BRSP	Black-tailed jackrabbit
ATFL	Coyote (Scat)
CORA	
CAQU	
MOCH	
MODO	
HOFI	

Date: 4/11/23
Recorder: A. Lowes

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
0411BA1AL	0805	B	BUOW	SUI	381538	3874646	Single entrance burrow, possibly tortoise. No tortoise sign observed. Suitable for Buow, no Buow sign observed. Burrow is in deteriorated condition with old vegetal debris inside and beginning to collapse. NW aspect 10"w x 4"h x 2'd.
			DETO	5			
0411BA1MP	0830	B	BUOW	SUI	381691	3874618	Suitable Buow and DKF burrow. No sign observed. Single entrance burrow. E aspect. 6"w x 7"h x 1.5'd Burrow narrows after 1.5'.
			DKF	SUI			
0411BA2AL	0834	B	BUOW	SUI	381760	3874602	Suitable Buow and DKF burrow. No sign. Single entrance badger dug den with AB claw marks on burrow side walls 9"w x 8"h x >2'd. S aspect Curves to the left
			DKF	SUI			
			W/AB Sign				
0411BA2MP	0900	B	BUOW	SUI	382508	3874611	Suitable Buow and DKF burrow. No sign observed Single entrance burrow. old/collapsed burrow nearby Canid tracks (possibly coyote) observed nearby. 8"w x 7"h x >4'd. Curves to the left. E aspect
			DKF	SUI			
0411BA3AL	0909	B	BUOW	SUI	382716	3874592	Suitable Buow burrow. No sign observed Single entrance burrow. S aspect. 10"w x 5"h x 2'd
7006	0920	B	BUOW	SUI	382828	3874591	Previously recorded burrow from habitat assessment. Still suitable for Buow and DKF. No sign observed New burrow has been dug 1.5' below previously recorded burrow. New burrow is badger dug den and has AB claw marks in side wall of burrow New burrow: 10"w x 8"h x >3'd. NE aspect
			DKF	SUI			
			W/AB Sign				
0411BA4AL	1009	B	BUOW	SUI	381674	3874560	Suitable Buow and DKF burrow. No sign observed Single entrance burrow in lycium sp shrub. E aspect 10"w x 15"h x 7'd. Burrow curves to the left.
			DKF	SUI			

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/11/23
Recorder: A. Lovaas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
041118A3MP	1024	B	BUOW	SUI	381365	3874544	Suitable BUOW burrow, No Sign observed. Single entrance burrow. SW aspect. 7.5"W x 6"H x >2'd
041118A4MP	1044	B	BUOW	SUI	381806	3874540	Suitable BUOW and DKF burrow. No Sign observed. Single entrance burrow. SW aspect 10"W x 11"H x 3'd. Curves to the right. Old canid scat (likely coyote) near burrow apron.
			DKF	SUI			
041118A5AL	1129	B	BUOW	SUI	382257	3874554	Suitable BUOW and DKF burrow, No Sign observed. Single entrance badger dug den w/ AB claw marks in burrow. 9"W x 8"H x >2'd. N aspect curves to right.
			DKF	SUI			
			W/AB Sign				
041118A6AL	1245	B	BUOW	SUI	381394	3874445	Suitable BUOW and DKF burrow, No Sign observed Single entrance burrow, curves sharply to the left. SW aspect 10"W x 9"H x >2'd.
			DKF	SUI			
041118A7AL	1254	B	BUOW	SUI	381614	3874428	Suitable BUOW and DKF burrow. No Sign observed. Single entrance burrow curves to right. S aspect 9"W x 6"H x 2'd
			DKF	SUI			
041118A8MP	1313	B	BUOW	SUI	382323	3874463	Suitable BUOW and DKF burrow, No Sign observed. Single entrance badger dug den w/ AB claw marks in burrow 10"W x 11"H x >1.5'd. W aspect. curves left. Canid Scat (likely coyote) on burrow apron.
			DKF	SUI			
			W/AB Sign				
041118A8AL	1320	B	BUOW	SUI	382391	3874489	Suitable BUOW burrow, No Sign observed. Single entrance burrow, curves to right. SE aspect. 9"W x 5"H x >3'd
041118A9AL	1334	B	BUOW	SUI	382384	3874471	Suitable BUOW burrow, No Sign observed. Single entrance burrow SE aspect 8"W x 6"H x 3'd
041118A10AL	1351	B	BUOW	SUI	382333	3874478	Suitable BUOW burrow, No Sign observed. Single entrance burrow, SE aspect 9"W x 5"H x 2'd. Tan Sheepherder bedroll
041118A6MP	1420	B	BUOW	SUI	381447	3874416	Suitable BUOW and DKF burrow, No Sign observed. Multiple (2) entrances w/in 4' of each other. E aspect 7"W x 6"H x >1.5'd
			DKF	SUI			Old tracks on burrow apron - Unable to ID species.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual. (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/11/23
Recorder: A. Lovaas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d"], behavior, etc.)*
041IBAHAL	1425	B	BUOW	SUI	381438	3874411	Suitable Burrow burrow, No Sign observed. Single entrance burrow. SE aspect 8"wx5"hx2'd
7005	1446	B	BUOW	SUI	381716	3874379	Previously recorded burrow from habitat assessment burrow is in deteriorated condition, now class 5 tortoise burrow, Still suitable for BUOW. No Sign of either species observed. S aspect
			DETO	5			

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/12/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Verity Richardson Sarah Wagner Victoria (Tori) Prado	Time (24 hr)	Start: 0745	End: 1510
	Temp* (°F)	Start: 58.6	End: 63.8
	Wind (mph)	Start: 17-25	End: 12-24
	% Cloud Cover	Start: 70	End: 80

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Area A - western end, north of Tehachapi willow Springs Rd. west and east of 110th st. west

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

tall and dense ground cover due to blooming annuals

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA
WCSP
NRWS
LASP
SPTO
WEME
MODO
CHSP
HOLA
LEGO
CAQU
DEJU
CLSW
western side-blotched lizard
Sphinx moth.
Bombus sp.
White-tailed antelope squirrel
OCWA

Date: 4/12/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
041228A1VR	0916	B	BUOW DKF w/ badger sign	SUI	378198	3826591	suitable burrow for BUOW & DKF, no sign observed. single entrance, NW aspect, 10"w x 7.5"h x >3'd, fresh apron/soft soil. badger claw marks observed on inside walls of tunnel
041228A2VR	0930	B	BUOW DKF	SUI	378144	3825461	suitable burrow for BUOW & DKF, no sign observed. single entrance and den. E aspect, 7.5"w x 6.5"h x >2'd curves left
041228A3VR	0956	B	BUOW DKF	SUI	378146	3824700	suitable burrow for BUOW & DKF, no sign observed. single entrance, NW aspect, 8"w x 8.5"h x >1'd, curves right, fresh/soft soil apron
041228A4VR	1300	B	BUOW DKF	SUI	378849	3824731	suitable burrow for BUOW & DKF, no sign observed. single entrance, E aspect, 8.5"w x 8"h x >1'd,

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
-Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
-DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/12/23
Recorder: M. Panzino

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas Madison Panzino Jamie Perigo Derek Siver	Time (24 hr)	Start: 0720	End: 1442
	Temp* (°F)	Start: 55.3	End: 66.4
	Wind (mph)	Start: 5-12	End: 4-12
	% Cloud Cover	Start: 80	End: 65

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area B- Middle Portion of Area B. Surveyed 10 Meter transects E/W

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Vegetation: Good veg cover w/ diverse species and structure including creosote bush, Joshua tree, Lycium sp., cheese bush.

Soils: Sandy loam w/ some gravel, friable and good for digging

* High and dense ground cover by annual species (Amsinkia and Erodium)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

ATFL painted lady
WCSP common side blotch lizard
CAQU desert iguana
CORA black-tailed jackrabbit
HOFI darkling beetle
WHIM
AMRO
MODO
VERD

Date: 4/12/23
Recorder: A. Lowes

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
0412BA13P	0759	B	BUOW DKF w/MB Sign	SUI SUI	382560	3874366	Suitable burrows for BUOW and DKF, NO Sign observed. Single entrance burrow, NW aspect. 7"W x 9"h x >9'd. old, degraded AB class marks present on burrow side walls.
0412BA2JP	0807	B	BUOW	SUI	382453	3874376	Suitable burrow for BUOW, NO Sign observed. Single entrance 8.5"W x 6"h x >3'd SW aspect. Fresh Sandy apron present.
7001	0808	B	BUOW DKF	* *	382455	3874352	Burrow recorded during HA in Fall 2022, was Previously Suitable for BUOW and DKF, but is Now Partially collapsed. NO Sign observed
7002	0810	B	BUOW DKF	OS SUI	382431	3874341	Burrow recorded during HA in Fall 2022, Prev Sign at burrow. Now disrupted BUOW burrow with whitewash and pellets. Also Suitable for DKF, NO DKF Sign. Single entrance Canid den (Possibly Coyote due to size). South aspect, burrow curves to the left.
7003	0834	B	BUOW DKF	SUI SUI	381661	3874320	Burrow recorded during HA in Fall 2022, burrow is in similar condition and is Still Suitable for for BUOW and DKF, NO Sign observed. NE aspect 9"W x 9"h x 7'd.
7004	0836	B	BUOW DKF	* SUI	381653	3874320	Burrow recorded during HA in Fall 2022, burrow is Slightly deteriorated but in Similar Condition, Still Suitable for DKF it dug out No longer Suitable for BUOW. NO Sign observed. N aspect 11"W x 7"h x <1'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)
* - Collapsed/deteriorated Sign in Fall 2022

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material, scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/12/23
Recorder: A. Lovgas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
041218A1AL	0848	B	BUOW	SUI	381325	3874328	Suitable burrow for BUOW and DKF, No Sign observed
			DKF	SUI			Single entrance burrow. E Aspect. 9"Wx7"hx7'd
							burrow curves to the right NO Sign.
041218A33P	0911	B	BUOW	SUI	382002	3874301	Suitable BUOW burrow, No Sign observed Single
							entrance burrow NE Aspect 8"Wx7.5"hx 2'd
							burrow near fallen dead Joshua tree.
041218A2AL	0930	B	BUOW	SUI	382442	3874272	Suitable BUOW and DKF burrow, No Sign observed.
			DKF	SUI			Single entrance burrow. W aspect. curves to the left
							7"W x6"h x 7.3'd.
041218A4JP	1043	B	BUOW	SUI	381838	3874224	Suitable BUOW and DKF burrow, No Sign observed. AB
			DKF	SUI			Claw Marks observed on burrow side walls. Single
			w/ AB Sign				entrance burrow. S aspect. 9"W x 7.5"h x 7.5'd
041218A3AL	1054	B	BUOW	SUI	382268	3874198	Suitable BUOW and DKF burrow, No Sign observed, AB Claw
			DKF	SUI			Marks observed on burrow side walls. Single entrance
			w/ AB Sign				burrow. N aspect. 9"Wx6"hx)4'd burrow curves to the left
041218A4AL	1241	B	BUOW	SUI	381819	3874118	Suitable BUOW and DKF burrow, No Sign observed.
			DKF	SUI			Single entrance burrow. E aspect. 7"Wx7"hx>2'd
							curves to the left.
041218A5JP	1318	B	BUOW	SUI	382484	3844169	Suitable BUOW burrow, No Sign observed Single entrance
							burrow, NE aspect 8"Wx 5.5"hx>2'd
041218A5AL	1424	B	BUOW	SUI	382886	3874074	Suitable BUOW and DKF burrow, no sign observed
			DKF	SUI			Single entrance burrow. SE aspect. 6"Wx5"hx>3'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material, scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/13/2023
Recorder: J. Perigo

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Madison Panzino Derek Siver Jamie Perigo	Time (24 hr)	Start: 0715	End: 1510
	Temp° (°F)	Start: 45.1	End: 60.4
	Wind (mph)	Start: 7-18	End: 10-20
	% Cloud Cover	Start: 5	End: 5

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area A - east of 110th st. west.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high and dense vegetation cover due to annual vegetation blooms.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

HOLA, WCSP, SAVS, LORA, WEME, LOSH, BRSP, painted lady, sphinx moth, side blotched lizard, tarantula hawk, Bombus sp., darkling beetle, MODO, American badger (claw marks)

(11S 379314, 3874868)

Date: 4/13/23
Recorder: J. Penigo

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type*	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
041BA1MP	0911	BUOW DKF w/ badger sign	B	SUI	379282	3874667	SE aspect, 8"W x 6.5"H x >3'D, soil burrow, curves to left, suitable for BUOW & DKF, no sign observed - Badger claw marks observed in burrow tunnel,
041BA2MP	1000	BUOW DKF w/ badger sign	B	SUI	379400	3874653	SE aspect, 10"W x 9"H x >3'D, soil burrow, curves to right, suitable (no sign) for BUOW & DKF, Badger claw marks observed
041BA3MP	1215	BUOW DKF	B	SUI	379567	3874663	S aspect, 6.5"W x 7.5"H x >2'D, soil burrow, curves to left, no sign observed, suitable for BUOW & DKF
041BA4MP	1221	BUOW DKF	B	SUI	379559	3874586	N aspect, 8"W x 7"H x >2'D, soil burrow, curves to right, no sign observed. Suitable for BUOW & DKF
041BA5MP	1238	BUOW	B	SUI	379567	3874072	S aspect, 8.5"W x 5.5"H x >2'D, soil burrow, curves to right, no sign observed, steep incline
041BA6MP	1411	BUOW & DKF	B	SUI	379719	3874203	E aspect, 8"W x 5"H x >3'D, soil burrow, no sign observed
041BA7MP	1436	BUOW DKF	B	SUI	379804	3874760	E aspect, 8" x 10.5"H x >1'D, soil burrow, steep slope, no sign observed suitable for BUOW & DKF

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/13/23
Recorder: T. Doe

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
041338A17D	0853	B	BUOW DKF	SUI	379292	3874227	Suitable for BUOW & DKF, no sign observed. single entrance N aspect, 9"w x 10"h x >2.5'd
041338A21D	1257	B	BUOW DKF	SUI	379621	3874695	Suitable for BUOW & DKF, no sign observed. single entrance W aspect, 8.5"w x 6.5"h x >2'd
041338A23D	1331	B	BUOW DKF	SUI	379700	3874776	2 burrows located w/i 3.5' of each other and way connect. Suitable for BUOW & DKF, no sign observed. N aspect, 8"w x 9.5"h x >1'd SE aspect, 7"w x 6.5"h x >1'd
041338A31D	1359	B	BUOW	SUI	379737	3874911	Suitable for BUOW, no sign observed. single entrance, NE aspect/curves left, 6.5"w x 4.5"h x >2.5'd, steep slope into burrow

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/13/23 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: V Richardson CCORE Consulting, Inc. Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden LoVaas	Time (24 hr)	Start: 0730	End: 1240
Verity Richardson	Temp° (°F)	Start: 45.5	End: 62.9
Sarah Wagner	Wind (mph)	Start: 9-15	End: 7-14
Victoria Prado	% Cloud Cover	Start: 10	End: 10

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Area B - Southern Portion - Completed Area B
Surveyed 10 Meter transects E/W

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Vegetation: Good veg cover with diverse species and structure including Creosote bush, Joshua trees, Lycium sp., Cheese bush
Soils: Sandy loam w/ some gravel, friable and good for digging
* High and dense ground cover by annual species (Amsinkia sp. and Erodium)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

AMRO
CAQU
WCSP
CORA
NEME
HOFI

Desert Kangaroo rat
Darkling beetle
Vanessa sp.
Common side-blotched lizard
Black-tailed jackrabbit
Spiny lizard
Harvester ant

Date: 4/13/23
Recorder: A. Lovaas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
041BBA1SW	0858	B	DKF	SuI	381620	3873847	Suitable DKF den, No Sign observed. Single entrance burrow. N aspect 14"w x 24"h x 74'd. burrow Curves to the left. Possibly coyote den due to size and shape.
041BBA1AL	0910	B	Buow	SuI	381289	3873849	Suitable Buow burrow, No Sign observed. Single entrance burrow. NW aspect 7"w x 55"h x 73'd. burrow curves to the light.
041BBA2SW	0943	B	Buow DKF w/AB Sign	SuI SuI	381969	3873765	Suitable Buow and DKF burrow, No Sign observed. AB claw marks on burrow side walls. Single entrance burrow. SW aspect 8"w x 9.5"h x 74'd. burrow Curves to the left.
041BBA3SW	0957	B	Buow DKF	SuI SuI	381502	3873777	Suitable Buow and DKF burrow, No Sign observed Single entrance burrow. E aspect 10"w x 6"h x 73'd burrow curves to the right.
041BBA4SW	1011	B	Buow DKF	SuI SuI	381641	3873747	Suitable Buow and DKF burrow. No Sign observed Single entrance burrow, SW aspect. Burrow goes straight back. 8"w x 6.5"h x 74'd.
041BBA5SW	1022	B	Buow DKF W/AB Sign	SuI SuI	381922	3873730	Suitable Buow and DKF burrow, No Sign observed AB claw marks observed on burrow side walls. Single entrance burrow. SE aspect, very steep slope. 9"w x 11"h x 73'd
041BBA2AL	1105	B	Buow DKF w/AB Sign	SuI SuI	381316	3873643	Suitable Buow and DKF burrow, No Sign observed. AB claw marks observed on burrow side walls Single entrance burrow. W aspect. 8"w x 9"h x 72'd burrow curves to the right and has a fresh apron.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/13/23
Recorder: VRichardson

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas Verity Richardson Sarah Wagner Victoria Prado	Time (24 hr)	Start: 1300	End: 1530
	Temp° (°F)	Start: 62.9	End: 57.2
	Wind (mph)	Start: 7-14	End: 18-27
	% Cloud Cover	Start: 10	End: 10

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

W of 100 st. W, S of homestead (abandoned) – Area F

AreaF

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

High annual cover - including Amsinkia, Erodium, Mustard, Eriogonum

Old homestead in middle of Area F - appears abandoned

Veg: good veg cover and diversity in species and shrub height,

Soils: Sandy loam soils w/ gravel, good for digging. Much flatter than other parts of the site

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA
WCSp

Pacific gopher snake
Common side-blotched lizard

Date: 4/13/23
Recorder: V. Richardson

Desert Tortoise and Burrowing Owl Survey

Project #: 2022-206
Client: Tetra Tech

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type*	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
	No sign observed						

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, R - roost, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

*BUOW: occupied w/ owl, occupied w/ sign, potential (no sign)
*AB/DKF: known den (fox or sign), potential den (no sign)

***TORTOISE BURROW / PALLET**

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

***TORTOISE SCAT**

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

***LIVE TORTOISE** (MCL, Max Width, Width at 7/8 Marginal, Height)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

***TORTOISE CARCASS**

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

Date: 4/14/23
Recorder: D. Siver

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Madison Panzino Jamie Perigo Derek Siver	Time (24 hr)	Start: 0705	End: 1432
	Temp* (°F)	Start: 49.6	End: 70.5
	Wind (mph)	Start: 9-19	End: 9-7
	% Cloud Cover	Start: 0	End: <5

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

area A - western region west of 100th st. west.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high and dense vegetation cover; especially blooming annuals.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WEME	desert woodrat (midden)
YRWA	western side-blotch lizard
WCSP	western fence lizard
LASP	white-tailed antelope squirrel
HETH	painted lady
NUMO	darkling beetle

Date: 4/14/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
CHMBAIJP	0745	B	BUOW DKF w/ badger sign	SUI	379385	3874387	suitable for BUOW & DKF, no sign observed single entrance, S. aspect, steep slope in 7.5"w x 6"h x >1.5'd. fresh & soft soil apron/mound. badger claw marks observed on interior walls.
CHMBAQJP	0750	B	BUOW	SUI	379374	3874343	suitable for BUOW, no sign observed. single entrance, SE aspect, fresh apron, 7.5"w x 4.5"h x >2'd, curves right.
7010	0813	B	BUOW DKF w/ badger sign	SUI K	379953	3874510	originally documented on 11/22/2023 as known den for DKF and suitable for BUOW. Badger claw marks were observed in and around burrow. current status: suitable for BUOW, no sign of BUOW, no new sign of DKF or badger observed and den appears to be deteriorating (burrow filling in) and in disuse. Overgrown w/ Amsinkia sp. single entrance, S aspect, 8"w x 5"h x >3'd.
CHMBA3JP	0840	B	BUOW DKF	SUI	379966	3874770	suitable for BUOW & DKF, no sign observed. single entrance, NE aspect, 8.5"w x 8"h x >2'd
CHMBAITD	0923	B	BUOW DKF	SUI	380014	3874348	suitable for BUOW & DKF, no sign observed single entrance, N aspect, 8"w x 7"h x >2'd curves right, steep slope

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart, growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/14/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
041MBA2TD	0947	B	BUOW DKF	SUI	380060	3871668	Suitable for BUOW & DKF, no sign observed. 2-entrance complex, both have steep slope into burrow & fresh soil aprons. NW aspect, 7'w x 7.5'h x >1'd SE aspect, 7'w x 7'h x >2'd
041MBA3TD	1001	B	BUOW DKF	SUI	380053	3874551	Suitable for BUOW & DKF, no sign observed. single entrance, N. aspect, 8'w x 9.5"H x >3'd, steep slope entrance
041MBA4TD	1013	B	BUOW DKF	SUI	380035	3871168	Suitable for BUOW & DKF, no sign observed. single entrance, N aspect, 7'w x 6.5"H x >3'd
041MBA5TD	1053	B	BUOW DKF	SUI	380137	3874747	Suitable for BUOW & DKF, no sign observed. 2 burrows w/i 3 feet of each other. both have fresh soil aprons, steep tunnels and curved tunnels. NE aspect, 9"w x 6"h x> 3'd SE aspect, 8"w x 6"h x> 1'd
041MBA6TD	1115	B	BUOW DKF	SUI	380130	3874169	Suitable for BUOW & DKF, no sign observed. single entrance, SW aspect, 7'w x 6"h x >3'd, steep slope into burrow

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material, scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/14/2023
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
041423AGTD	1131	B	BUOW DKF	Sui	380174	3874352	Suitable for BUOW ? DKF, no sign. single entrance, S aspect, slightly steep tunnel, 7.5"w x 8"h x >2'd, curves right
041423AGTD	1140	B	BUOW	Sui	380188	3874587	Suitable for BUOW, no sign. E aspect, 7.5"w x 4.5"h x >2'd, single entrance
041423ASJP	1146	B	BUOW	Sui	380155	3874626	Suitable for BUOW, no sign. single entrance N aspect, 7.5"w x 5.5"h x >2'd, fresh apron
041423AGJP	1327	B	BUOW DKF	Sui	380273	3874202	Suitable for BUOW ? DKF, no sign. single entrance, SE aspect, 8"w x 7"h x >2'd.
041423ASTD	1340	B	DKF	Sui	380335	3874259	Suitable for DKF, no sign observed single entrance, SE aspect, burrow has vertical drop before curving right 8"w x 8"h x >3'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/14/23
Recorder: VRichardson

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovass Verity Richardson Sarah Wagner Victoria Prado	Time (24 hr)	Start: 0785	End: 0835
	Temp* (°F)	Start: 39.5	End: 50.7
	Wind (mph)	Start: 6-2	End: 0-2
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area F-completed E Side of 100 St West, East Side of Road, North, east, and South of homestead

* Did not survey homestead due to Safety

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

High annual cover - Including Amsinkia & Erodium, Eriogonum, Mustard

Old homestead present in Middle of Area F - appears abandoned
Veg: good cover and species diversity, Variety in shrub height and composition
Soils: Sandy loam, friable, Much flatter area than other parts of the Site

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WCSP
MODO

Black-tailed jack rabbit

Date: 4/14/2023
Recorder: [illegible]

Desert Tortoise and Burrowing Owl Survey

Project #: 2022-206
Client: Tetra Tech

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type*	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
		No	Sign	observed			

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, R - roost, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

*BUOW: occupied w/ owl, occupied w/ sign, potential (no sign)
*AB/DKF: known den (fox or sign), potential den (no sign)

***TORTOISE BURROW / PALLET**

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

***TORTOISE SCAT**

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed; signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

***LIVE TORTOISE**
(MCL, Max Width, Width at 7/8 Marginal, Height)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

***TORTOISE CARCASS**

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

Date: 4/14/23 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: VRichardson ECORP Consulting, Inc. Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovass Verity Richardson Sarah Wagner Victoria Prado	Time (24 hr)	Start: 0835	End: 1430
	Temp* (°F)	Start: 50.7	End: 70.4
	Wind (mph)	Start: 0-2	End: 1-5
	% Cloud Cover	Start: 0	End: 5%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area C2 NE triagle & N portion of Southern triangle.
(E of 80th St W and NW of Aqueduct road)

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

A lot of annual species present (Amsinckia, Erodium)
Wind turbines in Northern portion of Area C2 - gates associated w/ Turbines
Veg: good Veg Cover and Species diversity (in areas outside turbines). Variation in Shrub height and composition
Soils: Sandy loam Soils good for digging/ disturbed soils and gravel inside turbine areas.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

HOFI
WCSP
GBRA
BESP

Side-blotched lizard
Painted lady butterfly.

Date: 4/14/23
Recorder: A. Lovaas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
041418AIAL	0904	B	BUOW	SUI	384584	3874452	Suitable BUOW and DKF burrow, NO Sign observed
			DKF	SUI			Single entrance burrow E aspect, curves to the right. 7"W x 7.5"h x >2'd
041418A1SW	0908	B	BUOW	SUI	384555	3874489	Suitable BUOW and DKF burrow, NO Sign observed.
			DKF	SUI			Single entrance burrow E aspect.
							8"W x 10"h x >3'd
041418A2AL	0918	B	BUOW	SUI	384584	3874784	Suitable BUOW and DKF burrow, NO Sign observed. AB
			DKF	SUI			claw marks observed on burrow side walls. SE aspect
			W/AB Sign				burrow curves to the right 8"W x 9"h x >2'd
							Single entrance burrow.
041418A3AL	1037	B	BUOW	SUI	384856	3874748	Suitable BUOW and DKF burrow, NO Sign observed
			DKF	SUI			Single entrance burrow. SW aspect 18"W x 12"h x 24'd
							burrow curves to the right
041418A4AL	1213	B	BUOW	SUI	384136	3874364	Suitable BUOW and DKF burrow, NO Sign observed
			DKF	SUI			Single entrance burrow. SW aspect 9"W x 14"h x >2'd
							burrow curves to the left
041418A5SW	1234	B	BUOW	SUI	384155	3874341	Suitable BUOW and DKF burrow, NO Sign observed.
			DKF	SUI			Single entrance burrow. E aspect. 8"W x 7"h x >3'd
							burrow curves to the right.
041418A6AL	1254	B	BUOW	SUI	383909	3874280	Suitable BUOW and DKF burrow. NO Sign observed. Single entrance burrow
			DKF	SUI			SW aspect. Curves to the right 7"W x 6.5"h x >3'd
041418A6AL	1332	B	BUOW	OS	383719	3874239	Occupied BUOW burrow w/ white wash and pellets on apron
							Single entrance burrow, curves to the left 8"W x 6"h x >5'd
							SE aspect
041418A7AL	1350	B	BUOW	SUI	384098	3874187	Suitable BUOW and DKF burrow, NO Sign observed. Single entrance burrow
			DKF	SUI			SE aspect, curves to the left 8"W x 8"h x >3'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

-Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

-DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/17/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Nikki Bottum Carter Warwick Derek Siver	Time (24 hr)	Start: 0630	End: 1520
	Temp° (°F)	Start: 58.5	End: 69.40
	Wind (mph)	Start: 9-18	End: 4-19
	% Cloud Cover	Start: 0	End: 5

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Area A - east of 100th st. west

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high ground cover due to annual vegetation

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

RTHA
WCSP
WEME
black-tailed jackrabbit
CORA
HOFI
long-nosed leopard lizard
yellow-backed spiny lizard
LASP
MODO
WEKI
gophersnake

Date: 4/17/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
041788AW	0853	B	BUOW	SUI	380072	3875289	suitable for BUOW, no sign observed, SE aspect, 9"w x 5.5"h x >2'd, single entrance soil burrow, lots of Amsinkia sp. growing on mound & at entrance.
041788AW	0901	B	BUOW DKF	SUI	380084	3875220	Suitable for BUOW & DKF, no sign, single entrance soil burrow, SE aspect, 9"w x 8.5"h x >2'd
041788AW	0912	B	BUOW DKF	SUI	380075	3875113	suitable for BUOW & DKF, no sign, single entrance soil burrow, SW aspect, steep slope into burrow, curves left 8"w x 5.5"h x 2'd
041788AW	0935	B	BUOW	SUI	380093	3875167	suitable for BUOW, no sign observed, single entrance, E aspect, 6.5"w x 8"h x >3'd, curves right, possible 2nd entrance 4' north
041788AW	0953	B	DKF	SUI	380107	3874917	suitable for DKF, no sign, single entrance, NE aspect, steep slope, 9.5"w x 7"h x >3'd
041788AW	1010	B	BUOW	SUI	380162	3875188	suitable for BUOW, no sign, single entrance, SE aspect, 9"w x 8"h x >1.5'd, width narrows to 3", steep slope w/ sharp curve

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/17/2023
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
041718A31D	1022	B	BUOW DKF	SUI	380160	3875372	Suitable for BUOW & DKF, no sign, single entrance, SE aspect, semi-steep slope w/ sharp right curve, 7'w x 7'h x >15'd
041718A5CW	1030	B	BUOW DKF	OS SUI	380129	3875579	Suitable for DKF, no sign. occupied (w/ sign 5ow) BUOW burrow. 1 old BUOW pellet observed in burrow & whitewash on mound. single entrance, S aspect, 9.5'w x 9"h x >3'd
041718A6CW	1046	B	DKF	SUI	380144	3875631	suitable for DKF, no sign. single entrance soil burrow, steep slope in, curves right, SE aspect, 9.5"w x 8.5"h x >3'd
041718A7CW	1045	B	BUOW DKF	SUI	380137	3875649	suitable for BUOW & DKF, no sign. single entrance, semi steep slope, gradual curve to right, SE aspect, 8"w x 6"h x >3'd. mammal scat on mound (dark brown, no glaze).
041718A8CW	1051	B	BUOW DKF	SUI	380194	3875595	suitable for BUOW & DKF, no sign. single entrance, E aspect, 9'w x 12"h x >4'd, annual veg growing on mound, burrow has gradual slope. Coyote scat, not fresh (dry, no glaze) on mound

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material, scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/17/2023
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
041718AHTD	1106	B	BUOW	SUI	380175	3875410	suitable for BUOW, no sign. single entrance, NE aspect, 8"w x 6.5"h x >2'd, overgrown w/ annual vegetation.
041718A9CW	1132	B	BUOW DKF	SUI	380210	3875198	suitable for BUOW & DKF. single entrance, E aspect, 9"w x 10.5"h x >2'd, curves right, steep slope
041718ASTD	1145	B	BUOW	SUI	380244	3875612	suitable for BUOW, no sign. single entrance, N aspect, 6.5"w x 8.5"h x >1.5'd
041718A10CW	1157	B	BUOW	SUI	380282	3875582	suitable for BUOW, no sign. single entrance, S aspect, 5"w x 5"h x >3'd under [illegible]
041718A6TD	1316	B	BUOW DKF	SUI	380340	3875619	suitable for BUOW & DKF, no sign. single entrance, SE aspect, steep slope, 7"w x 5"h x >3'd
041718A11CW	1322	B	BUOW DKF	SUI	380367	3875454	suitable for BUOW & DKF, no sign. single entrance, E aspect, 9.5"w x 13"h x >4'd curves right & narrows to =5"w x 5"h
041718A7TD	1359	B	BUOW DKF	SUI	380389	3875127	suitable for BUOW & DKF, no sign. single entrance, 8"w x 9"h x >3'd, E aspect, steep slope, curves left, soft apron

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/17/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0478A8TD	1402	B	BUOW	SUI	380394	3875138	suitable for BUOW, no sign observed. single entrance, NW aspect, 8"w x 6"h x > 3'd
7009	1440	B	DKF	SUI	380445	3874530	suitable for DKF, no sign observed. One entrance under Lycium sp. shrub, W aspect, 10"w x 14"h x > 3'd, other burrows observed that may connect. No changes since originally documented in Nov. 2022

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

-Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

-DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/17/23
Recorder: VRichardson
QA/QC by: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Loudon Verity Richardson Joshua Harris	Time (24 hr)	Start: 0805	End: 1115
	Temp* (°F)	Start: 54.3	End: 66.1
	Wind (mph)	Start: 10-15	End: 3-7
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Southern half of Area C2

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

NOMO
TOWA
CORA
LETA
WCSP
Desert kit fox - (scat see next page)

Common side-blotched lizard.

Date: 04/17/23
Recorder: V Richardson
edited by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d']; behavior, etc.)*
0417BA1AL	0849	B	BUOW	SUI	383875	3874090	single entrance soil burrow, no sign.
			DKF	SUI			8"w x 10"h x >2'd, N aspect
7039	0943	B	BUOW	SUI	383912	3873983	previously recorded burrow, similar
			DKF	SUI			condition to last observation.
							No BUOW or sign observed.
0417BA2AL	0952	B	BUOW	SUI	383770	3873990	single entrance soil burrow no
			DKF	SUI			sign. fresh apron. 9"w x 5.5"h x 2'd
							E aspect curves to the right
7038	1010	B	BUOW	SUI	384099	3873923	previously recorded during
			DKF	K			habitat assessment, similar
							condition. Canid scat on apron (old)
							NW aspect.
0417BA3AL	1023	B	BUOW	SUI	383748	3873935	single entrance soil burrow, no
							sign. 6"w x 4.5"h x >2'd, curves
							to left, N aspect

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/17/23
Recorder: VRichardson
QA/QC by: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovass Verity Richardson Joshua Harris	Time (24 hr)	Start: 1115	End: 1515
	Temp* (°F)	Start: 66.1	End: 64.7
	Wind (mph)	Start: 3-7	End: 11-16
	% Cloud Cover	Start: 0	End: 10

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [(N)]	Transect spacing: 10 meters

Area(s) Surveyed

Area C1 (Northern portion)

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

High annual cover

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WCSP

LOSH (380107, 3873190)
-0417WIAL

MODO

CAGA

American badger (sign - see next page)

Common side-blotched lizard

yellow-backed spiny lizard

Northern Desert iguana

Vanessa sp.

White-tailed antelope squirrel

Date: 04/17/23
Recorder: V Richardson
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0417BA4AL	1205	B	BUOW	SUI	381796	3873180	single entrance soil burrow, curves right. 8"w x 10"h x >4'd, SE aspect no sign.
			DKF	SUI			
0417BA5AL	1219	B	BUOW	SUI	381307	3873180	single entrance burrow. no sign. SE aspect 8"w x 6.5"h x >2ft d, curves left
			DKF	SUI			
0417BA6AL	1235	B	BUOW	SUI	380924	3873185	single entrance burrow, no sign. extends straight. 10"w x 16"h x >4'd E aspect, under Ipecium shrub.
			DKF	SUI			
0417BA7AL	1342	B	DKF	SUI	380695	3873216	soil burrow no sign. 7"w x 9"w x >2'd straight E aspect. Canid scat on apron, likely Coyote. 1 entry
			BUOW	SUI			
0417BA8AL	1358	B	BUOW	SUI	381191	3873212	soil burrow with claw marks on edge (badger). no other sign 10"w x 7"h x >3'd. straight E aspect
			DKF	SUI			
			w/AB sign				
0417BA9AL	1400	B	DKF	SUI	381191	3873212	burrow with no sign, n of 1 ft from 0417BA8AL. 8.5"w x 7"h x >1'd, curves right, E aspect. 1 entry
			BUOW	SUI			
0417BA10AL	1412	B	DKF	SUI	381299	3873204	soil burrow with no sign. 8.5"w x 8"h x 2' NE aspect, curves right. 1 entry
			BUOW	SUI			
0417BA11AL	1443	B	BUOW	SUI	382385	3873158	soil burrow with no sign. 9"w x 5.5"h x >2'd, straight, S aspect 1 entry
			DKF	SUI			

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/18/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Nikki Bottum Carter Warwick Alivia De Luz	Time (24 hr)	Start: 0715	End: 1230
	Temp° (°F)	Start: 49.3	End: 71.9
	Wind (mph)	Start: 0-3	End: 6-9
	% Cloud Cover	Start: <5	End: <5

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Area A - east of 100th St. West

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high annual vegetation cover

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WCSP	white-tailed antelope squirrel
NOMO	black-tailed jack rabbit
LEGO	domestic dog
COPA	American badger (claw marks at burrow see next page for details)
WEKI	
GAQU	

Date: 4/18/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
041SBA1OW	0754	B	BUOW DKF	Sui	380575	3874247	suitable burrow for BUOW & DKF. no sign observed. single entrance, W. aspect, 8"w x 9.5"h x >3'd gradual slope, curves right
041SBA1TD	0755	B	BUOW	Sui	380563	3874248	suitable burrow for BUOW. no sign observed. single entrance. E. aspect, 7.5'w x 6"h x >3'd curves right after 3'
041SBA2OW	0803	B	BUOW DKF	Sui	380583	3874259	suitable for BUOW & DKF. no sign observed. S aspect, 8.5"w x 7.5"h x >2'd slight left curve. under old creosote bush & Amsinkia sp. single entrance
041SBA2TD	0819	B	BUOW DKF	Sui	380550	3874520	suitable for BUOW & DKF. no sign observed. single entrance, SW aspect 7"w x 6"h x >3'd, curves left, fresh dirt apron
041SBA3TD	0918	B	DKF	Sui	380702	3874804	suitable for DKF. no sign observed. single entrance, S aspect. 7"w x 8"h x >1.5'd, very steep drop into burrow, curves left
7008	0926	B	BUOW	*	380710	3874666	burrow documented as suitable for BUOW in Nov. 2022 but is now deteriorated & filled in no longer suitable E aspect, under Lycium shrub

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

* class/status of burrow has been updated since the habitat assessment conducted in Nov. 2023.

Date: 4/18/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
041BEATTD	0943	B	BUOW DKF	SUI	380711	3874312	suitable for BUOW & DKF, no sign observed. single entrance, N aspect 8"w x 7.5"h x >2'd, curves left
041BEASTD	0952	B	BUOW	SUI	380714	3874458	suitable for BUOW, no sign observed. single entrance, NW aspect, curves left, 7"w x 6"h x >1.5'd, semi-steep slope
041BBA6TD	1025	B	DKF		380797	3874335	suitable for DKF, no sign observed. single entrance, W aspect, curves left, 10"w x 7"h x >2'd
041BBATTD	1046	B	DKF w/ badger sign	SUI	380862	3874734	suitable for DKF, no sign observed. single entrance, SE aspect, 7.5"w x 8.5"h > 2'd, badger claw marks observed along burrow tunnel & hair in dirt mound.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/18/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Nikki Bottum Carter Warwick Alivia De Luze	Time (24 hr)	Start: 1237	End: 1560
	Temp° (°F)	Start: 71.9	End: 60
	Wind (mph)	Start: 6-9	End: 7-15
	% Cloud Cover	Start: 0	End: <5

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area 61 - west side, along 110th St. west

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- high annual cover, tall & dense patches of Amsinkia sp. & goldfields carpeting ground.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

yellow-backed spiny lizard
western side-blotched lizard
NOMO
CORA
WESP
WEME
Gophersnake
black-tailed jackrabbit
DKF (skull) (see next page for details)

Date: 4/18/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d"], behavior, etc.)
0418BASTD	1324	C	DKF	–	378830	3876702	DKF skull (mostly bone w/ minimal tissue [nose] present) observed under transmission tower.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/18/23
Recorder: Josh H
QA/QC by: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
V. Richardson	Time (24 hr)	Start: 0710	End: 1535
A. Lovaas	Temp* (°F)	Start: 44.3	End: 54.1
J. Harris	Wind (mph)	Start: 0-1	End: 12-26
D. Siver	% Cloud Cover	Start: 0	End: 20%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Area C1 - North section

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CAQU, CORA, WCSP, . NOMO, ATFL, HOFI, MoDo,
American badger (sign - see next page)
black-tailed jack rabbit

common side-blotched lizard
Coachwhip

Date: 04/18/23
Recorder: Josh H
QA/QC by Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
041888A1AL	0758	B	BUOW	SUI	381278	3873138	burrow with no sign. fresh apron, curves right. N aspect 9"w×7"h×2'd
			DKF	SUI			
041888A2AL	0918	B	BUOW	SUI	379625	3872984	burrow with no sign. burrow curves. 1 entry right. NW aspect. 7.5"w×8"h×>2'd
			DKF	SUI			
041888A3AL	0953	B	BUOW	SUI	380810	3873105	burrow with badger claw marks on wall. NO DKF or BUOW sign. 1 entry 9"w×8.5"h×>4'd curves left, SE aspect
			DKF	SUI			
			w/AB sign				
041888A4AL	1000	B	BUOW	SUI	381035	3873102	burrow with no sign. W aspect 9"w×8"h×>3'd, curves right. 1 entry
			DKF	SUI			
041888A5AL	1012	B	BUOW	SUI	381037	3873092	burrow with badger claw marks on side walls. No BUOW or DKF sign. On NE side of lycium. 1 entry 8"w×8"h×>5'd. NE aspect, curves left
			DKF	SUI			
			w/AB sign				
041888A6AL	1213	B	DKF	SUI	380791	3873064	burrow/den with badger claw marks on side walls. no other sign. 9"w×9"h×>3'd, curves right, steep. NE aspect. 1 entry
			BUOW	SUI			
			w/AB sign				
7022	1259	B	DKF	SUI	379927	3873044	previously marked in habitat assessment similar condition, badger claw marks on side wall, no new sign. 1 entry
			BUOW	SUI			
			w/AB sign	SUI			
041888A7AL	1319	B	DKF	SUI	380668	3873025	burrow/den with no sign. steep, curves left, SE aspect. 9"w×8"h×>3'd 1 entry
			BUOW	SUI			

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 04/18/2023
Recorder: Derek Siver
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0418BA1VR	0740	B	BUOW	SUI	381510	3873142	burrow/den with no sign. SW aspect
			DKF	SUI			17" w x 14" h x >4'd. Within lycium. 1 entry
0418BA2VR	0838	B	BUOW	SUI	379836	3873165	burrow with no sign. N aspect
			DKF	SUI			8"w x 9" h x >2'd, curves right,
							gentle slope. 1 entry
0418BA3VR	0934	B	BUOW	SUI	379947	3873132	burrow with no sign. NE aspect
			DKF	SUI			under lycium. 8"w x 5" h x >5'd. 1 entry
0418BA4VR	1035	B	BUOW	SUI	381939	3873102	burrow with no sign. SW aspect
			DKF	SUI			curves right 7.5"w x 5.5" h x >2'd. 1 entry
0418BA5VR	1232	B	BUOW	SUI	380177	3873080	burrow with no sign. steep and
			DKF	SUI			curves right after entrance
							9"w x 6" h x >3'd, NE aspect. 1 entry
7022	1256		BUOW	SUI	379927	3873094	same condition as previously documented
			DKF	SUI			during habitat assessment. Steep burrow w
			w/AB sign				no sign, E aspect. 1 entry. 8"w x 8.5" h x >5'd
0418BA6VR	1306	B	BUOW	SUI	380173	3873033	burrow with no sign. NE aspect
			DKF	SUI			6" h x 5" h x >2'd. single entry
7020	1338	B	BUOW	SUI	381442	3873021	previously documented during habitat
			DKF	SUI			assessment, same condition. NS aspect
							9" w x 7" h x >1'd. vegetation
							growing at entrance.
7019	1420	B	BUOW	SUI	381655	3872999	previously documented 11/8/22 during
			DKF	SUI			habitat assessment, same conditions
							14" w x 10" h x >2'd, S aspect
0418BA7VR	1434	B	BUOW	SUI	381223	3872995	no sign, curves right, steep slope
			DKF	SUI			in burrow. W aspect 8"w x 9" h x >3'd. 1 entry

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/19/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Carter Worwick Alivia DeLuz Nikki Bothum	Time (24 hr)	Start: 0715	End: 1500
	Temp° (°F)	Start: 44.3	End: 61.3
	Wind (mph)	Start: 0-2	End: 10-23
	% Cloud Cover	Start: <5	End: <5

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Area 61 - west side & North side

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- high vegetation cover, especially annuals
- evidence of past burn, mostly in northern portion. (not recent)
- evidence of large tire tracks (similar to that of front loader or construction equipment). tracks observed over recently run over Joshua tree.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA
WEME
MGDO
CHSP
LASP
BRSP
Great Basin whiptail
western side-blotched lizard
CLSW
TRSW

Date: 4/19/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
7015	1103	B	BUOW DKF	OS K	379156	3571658	previously documented in Nov. 2022 as known DKF den ? occupied BUOW burrow (w/ sign, no live owl). - no new sign observed, still bleached DKF scat ? bleached BUOW pellets. - complex is mostly overgrown w/ Amsinkia sp. entrances still in good condition - under Lycium shrub - E aspect, 16"w x 16"h x >6'd - SW aspect, 12"w x 10"h x >2'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/19/23
Recorder: V Richardson
QA/QC by: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas Verity Richardson Joshua Hams Peter Silver	Time (24 hr)	Start: 0710	End: 1530
	Temp* (°F)	Start: 40.5	End: 67.2
	Wind (mph)	Start: 0-2	End: 11-17
	% Cloud Cover	Start: 10%	End: 15%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Area C1

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CAQU BUOW (sign - see next page)
CACW
NOMO
CORA
AMRO
WCSP
WIWA
MODO
ATFI

White-tailed antelope squirrel
Harvester ant
California ground squirrel
common side-blotched lizard.
Vanessa sp.
American badger (sign - see page 3)

Date: 04/19/23
Recorder: V Richardson
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0419BA1JH	0933	B	BUOW	OS	381557	3872921	occupied BUOW soil burrow with sign (white wash on apron - spp not determined) no owl. under Lycium shrub, N aspect, curves right. 1 entry 11"wx9"hx>6'd. No DKF sign
			DKF	SUI			
0419BA2JH	0846	B	BUOW	SUI	382008	3872911	soil burrow with no sign. SW aspect 7"wx7"h x >2'd, curves left. 1 entry
			DKF	SUI			
0419BA3JH	0901	B	BUOW	OS	382504	3873069	occupied BUOW burrow. No owl, sign- white wash on apron, 3 pellets on apron, 2 pellets 2m SE of burrow (1 with glaze), 1 pellet on top of burrow. 9.5"wx5.5"hx3'd, curves left, N aspect. soil burrow. 1 entry. NO DKF sign
			DKF	SUI			
0419BA4JH	1005	B	BUOW	SUI	382448	3872951	burrow with no sign. on same mound as 7023. SE aspect 8.5"wx9"wx>4'd., extends straight 1 entry
			DKF	SUI			

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 04/19/23
Recorder: Derek Siver
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0419BA1AL	0946	B	BUOW	SUI	382255	3872877	burrow with no sign. 5"w x 9"h x 7'd
			DKF	SUI			S aspect curves left. 1 entry
7023	1004	B	BUOW	SUI	382445	3872954	previously recorded during habitat
			DKF	SUI			assessment: one entrance (NW aspect)
							collapsed, SW aspect in similar
							condition. Amsinkia overgrown
							near burrows. No sign at either
0419BA2AL	1119	B	BUOW	SUI	380091	3872855	burrow with no sign. curves
			DKF	SUI			left and not steep, OSE aspect
							7"w x 6.5"h x 7'd, 1 entry
0419BA3AL	1141	B	BUOW	SUI	379314	3871870	burrow with no sign. curves
							left, W aspect, 8"w x 5"h x 5'd
							located on eastern wall of wash. 1 entry
0419BA4AL	1357	B	BUOW	SUI	381074	3872779	burrow with american badger
			DKF	SUI			claw marks on side. No DKF or
			w/AB sign				BUOW sign. 7"w x 6"h x 3'd,
							curves sharply left after 3ft. 1 entry

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

***TORTOISE BURROW / PALLET**	***TORTOISE SCAT**
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

***LIVE TORTOISE** (sex, estimate age/MCL)		***TORTOISE CARCASS**	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/20/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Adam Schroeder Joshua Harris Derek Siver	Time (24 hr)	Start: 0728	End: 1520
	Temp* (°F)	Start: 48.7	End: 71.1
	Wind (mph)	Start: 8-12	End: 0-1
	% Cloud Cover	Start: 0	End: 50

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Area 61

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high vegetation cover, especially annuals

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

BESP
CORA
WEKI
MODO
GREG
BRSP
WETA
HOLA
Great Basin whiptail
gophersnake
western side-blotched lizard

Date: 4/20/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
042BA1JH	0817	B	BUOW	SUI	380049	3871348	suitable for BUOW, no sign observed. S aspect, 5"w x 5"h x >3'd, curves left
042BA1TD	1125	B	BUOW DKF	SUI	380329	3871052	suitable for BUOW & DKF, no sign observed, NE aspect, 7"w x 6.5"h x >3'd, curves left, semi-steep slope
042BA2JH	1458	B	BUOW	SUI	380054	3870842	2 burrows w/i 4 ft, suitable for BUOW, no sign observed NW aspect, 5"w x 8"h x >1.5'd. under rocks N aspect, 4.5"w x 6"h x >2'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF, includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material, scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/20/23
Recorder: C. Warwick

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Loomis Carter Warwick Alivia De Luze Nikki Bottum	Time (24 hr)	Start: 0715	End: 1515
	Temp* (°F)	Start: 45.5°F	End: 70.8°F
	Wind (mph)	Start: 3-7	End: 0-3
	% Cloud Cover	Start: 0	End: 55%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WEME, WCSP, blacktailed jackrabbit, Side blotch lizard, RTHA, CORA, BUOR, WEKI, SCOR, HOFI, NOMO, CACW, Coachwhip, MODO, night lizard, long-nosed leopard lizard

Date: 04/20/23
Recorder: C. Warwick
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
042023BA1AD	1021	B	BUOW	SUI	379879	3872612	single entrance burrow with no sign. 10"w x 7"h x 3'd, SE aspect curves right
			DKF	SUI			
042023BA2AD	1259	B	DKF	SUI	381037	3872611	single entrance burrow with no sign, steep slope. 6.5"w x 7"h x ~3'd. south aspect

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

***TORTOISE BURROW / PALLET**	***TORTOISE SCAT**
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

***LIVE TORTOISE** (sex, estimate age/MCL)		***TORTOISE CARCASS**	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 04/20/23
Recorder: NB
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
042OBAIAL	1302	B	BUOW	SUI	381032	3872608	burrow located in old wood debris pile with no sign present. Canid scat (likely coyote) present around debris pile. Multiple small ground squirrel burrows present throughout debris pile
			DKF	SUI			

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/21/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Derek Siver Joshua Harris	Time (24 hr)	Start: 0700	End: 1445
	Temp* (°F)	Start: 56	End: 83
	Wind (mph)	Start: 2-4	End: 2-6
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Area 6

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high vegetation cover, especially blooming annual species

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA, WCSP, WEME, LASP, BRSP, ATFL, Mojave rattlesnake, MODO, western side-blotched lizard, night lizard, NOMO

Date: 4/21/23
Recorder: T Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
							No BUOW, DKF, or tortoise observed or detected

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 04/21/23
Recorder: C. Warwick
edited by: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovnas Carter Warwick Alivia De Luze Adam Schroeder	Time (24 hr)	Start: 0700	End: 1430
	Temp* (°F)	Start: 51.7	End: 79.2
	Wind (mph)	Start: 3-7	End: 0-3
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WCSP, (ACW, HOFI, LOSH (380407, 3872380), CAQU, coachwhip, ~~SWHA~~ LENI, ATFL, common side blotched lizard, NOMO

American badger (sign, see pg. 3)

Date: 04/21/23
Recorder: C. Warwick
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
042123AIAL	0839	B	DKF	SUI	380450	3872420	single entrance burrow with no sign and steep slope. 7"w x 9"h x >4'd; E aspect

Date: 4/21/23
Recorder: A. De Luze
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
042IBA1AS	0810	B	BUOW	SUI	380909	3872514	single entrance burrow with no sign. 8"w x 9"h x 73'd. NW aspect curves left
			DKF	SUI			
042IBA2AS	0450	B	BUOW	SUI	381287	3872391	single entrance burrow with claw marks (badger) on sides of burrow. No BUOW or DKF sign. 8"w x 8"h x 73'd. SE aspect
			DKF w/AB sign	SUI			

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/24/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Eliza McLean Julie Kaplan Derek Siver	Time (24 hr)	Start: 0800	End: 1540
	Temp* (°F)	Start: 63	End: 78.4
	Wind (mph)	Start: 9-11	End: 5-16
	% Cloud Cover	Start: 25	End: 0

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Area E - south of Jackpine between 80th St. West & 75th St. West

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- high vegetation cover, especially annuals except in areas w/ evidence of past burn/wildfire (not recent)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

BUOW (sign at burrows, see next page for details)

WCSP
CORA
WCSP
WEME
RTHA
SPTO
BRSP
SASP
BARS
MODO
HOFI

black-tailed jackrabbit
western side-blotched lizard
Great Basin whiptail

Date: 4/24/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
042424AEM	0825	B	BUOW	OS	382719	3872934	occupied BUOW burrow (w/ sign, no owl). 2 old pellets observed inside burrow. NE aspect, 8.5"w x 8"h x 2'd, burrow ends/is filled in at 2'.
042424AEM	0914	B	BUOW	Sui	383721	3871886	Suitable for BUOW, no sign observed. SE aspect, 8"w x 5"h x >4'd, single entrance, curves right after 3'
042424AEM	0958	B	BUOW DKF	OS Sui	383760	3873093	occupied BUOW burrow (w/ sign, no owl), white wash at entrance & 1 old deteriorated pellet inside burrow. Suitable for DKF, no sign observed E aspect, 8"w x 6"h x >2'd single entrance soil burrow
042424AEM	1030	B	BUOW	OS	383789	3872345	occupied BUOW burrow (w/sign, no owl) white wash & 1 old pellet on apron. single entrance, SW aspect, 8.5"w x 4.5"h x >2'd, narrows after 2'
042424AEM	1148	B	BUOW DKF	Sui	383871	3872236	suitable for BUOW & DKF, no sign observed. single entrance soil burrow E aspect, 9"w x 10"h x >4'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/24/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
D424BA1TD	1152	B	BUOW	Sui	383878	3872241	suitable for BUOW, no sign observed. single entrance sail burrow w/ soft fresh apron. E aspect, curves left, 8"w x 5"h x >2'd
D424BA2TD	1234	B	BUOW DKF	Sui	383937	3872845	2 sail burrow w/i 2' of each other suitable for BUOW & DKF, no sign observed. SE aspect 7"w x 6"h x >3'd 7.5"w x 5.5h x >2'd possible complex
D424BA3TD	1353	B	BUOW DKF	OS Sui	383945	3872675	Occupied BUOW burrow (w/ sign, no owl), white wash & 3 old pellets (bleached) or apron suitable for DKF, no sign observed. single entrance sail burrow, SE aspect, 9"w x 6"h x 3'd
D424BA4TD	1417	B	BUOW	Sui	383950	3872017	Suitable for BUOW, no sign observed. single entrance sail burrow, E aspect 9"w x 4"h x >3'd, turns sharply left
D424BA5TD	1450	B	DKF	Sui	383979	3872292	suitable for DKF, no sign observed single entrance, W aspect, nearly vertical drop, fresh apron. 8"w x 9"h x >2'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/24/23 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Maribel Lopez ECORP Consulting, Inc. Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas Rachel Woodard Maribel Lopez	Time (24 hr)	Start: 0800	End: 1540
	Temp° (°F)	Start: 60.8	End: 75.4
	Wind (mph)	Start: 5-15	End: 10-15
	% Cloud Cover	Start: 5	End: 0

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Area E, - East of Holliday Rock Mine

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Area E, directly adjacent to Holliday Rock Mine — a lot of sand has blown on to the project site on the east side of the mine.

Veg: good veg cover and composition of species, and good species diversity
*A lot of annuals, very high annual cover with Amsinckia, Erodium, Malacothrix sp., chaenactis sp.

Soils: Sandy loam and friable soils. Very sandy in portions along Mine boundary.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WHITE CROWNED SPARROW, BRSP, BTSP, HOFI, BLACK-TAILED JACKRABBIT, CORA, HOLA, COACHWHIP, SIDE BLOTCHED, WHIPTAIL, LEOPARD LIZARD, ATFL, CALW, WEKI, RWBL, LBWO, Coyote (scat).

American Badger Sign (Claw marks) - See page 2

Burrowing owl Sign (white wash & pellets) - See page 2

* Geotech crew observed crushing vegetation, including Joshua trees. Project Manager was notified.

Date: 24APR2023
Recorder: A Lovgas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
042424BA1AL	0923	B	BUOW	SUI	385356	3872199	Suitable BUOW and DKF burrow, NO sign observed. AB claw marks observed on burrow side walls. Single entrance burrow. N aspect 9"W x 12"h x >3'd
			DKF w/AB Sign	SUI			
042424BA2AL	1033	B	BUOW	OS	385411	3871181	Occupied BUOW burrow w/ old whitewash and BUOW Pellets on burrow apron. NO live owl observed. BUOW Sign is old - not from this year. Single entrance burrow W aspect 8"W x 6"h x >3'd.
042424BA3AL	1106	B	BUOW	SUI	385428	3872123	Suitable BUOW and DKF burrow, NO Sign observed. Single entrance burrow. NE aspect 10"W x 13"h x >6'd
			DKF	SUI			
042424BA4AL	1117	B	BUOW	SUI	385420	3872319	Suitable BUOW and DKF burrow, NO Sign observed. Old Canid Scat observed Nearby burrow (likely coyote based on size). Single entrance burrow. SE aspect 8"W x 14"h x >8'd.
			DKF	SUI			

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart, growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/25/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Eliza McLean Carly Mortenson Derek Siver	Time (24 hr)	Start: 0745	End: 1615
	Temp° (°F)	Start: 62.8	End: 85.6
	Wind (mph)	Start: 5-7	End: 0-1
	% Cloud Cover	Start: 5	End: <10

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area E - south of Jackpine Ave. between 80th St. west & 75th St. west

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- high vegetation cover, especially annual blooms. exception is areas w/ burn scar (not recent)
-

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CAQU
WCSP
BRSP
CORA
HOFI
ATFL
CHSP
COPO
WEME
LETH
BESP
SPTO

RCKI
MODO
ROWR
FOSP
WEKI
HOLA
AMRO
SAPH
CONI
western side-blotched lizard
Great Basin whiptail
yellow-backed spiny lizard

BUOW
American badger > (sign at burrows, see next pages)

Date: 4/25/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
042SBAITD	0809	B	BUOW	OS	384047	3872670	Occupied BUOW burrow (w/ sign, no owl), whitewash & old/deteriorated pellets on apron. single entrance. NW aspect 5"w x 7"h x >2'd. entrance is large 7"w x 8"h, but narrows.
042SBAIBM	0809	B	BUOW DKF	SUI	384050	3872669	Suitable for BUOW & DKF, no sign observed. single entrance, E aspect 8"w x 9"h x >4'd
042SBA2TD	0821	B	BUOW		384021	3872540	Suitable for BUOW, no sign observed. single entrance, E aspect, annual veg. growing on apron & in entrance 8.5"w x 5.5"h x >3'd
042SBA3BM	0832	B	BUOW DKF	SUI	384043	3872556	Suitable for BUOW & DKF, no sign observed. single entrance, E aspect, 8.5"w x 9.5"h x >2'd. sharp curve to right
042SBA3BM	0838	B	BUOW	OS	384112	3872528	Occupied BUOW burrow (w/ sign, no owl), whitewash & prey remains (small bone) on apron. single entrance. SW aspect, 7"w x 4.5"h x >2'd. curves left

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

-Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

-DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/25/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
042SBAHBM	1104	B	BUOW	OS	384217	3872575	Occupied BUOW burrow (w/ sign, no owl), lots of whitewash on apron. single entrance, SW aspect, 6"w x 5"h x >3'd steep slope w/ abrupt right curve. large opening but quickly narrows
042SBA3TD	1147	B	BUOW w/ badger sign	SUI	384296	3872160	Suitable for BUOW, no sign observed. Single entrance, E aspect, 8"w x 5"h x >3'd, badger claw marks observed on inside side walls of tunnel.
042SBA1TD	1212	B	BUOW	SUI	384286	3 872959	Suitable for BUOW, no sign observed. single entrance, SE aspect, 8"w x 5"w x >3'd, curves right, height reduced to 5" after curve
042SBA5TD	1218	B	BUOW DKF DT	SUI 4	384296	3.872906	Suitable for BUOW & DKF, no sign observed. class 4, possibly tortoise burrow in good condition (tunnel intact, w/ some deteroriation/erosion at top entrance of burrow. no tortoise sign or tortoise detected. single entrance, NE aspect, 10"w x 8"h x >3'd, gradually curves to left. annual veg on apron & in entrance. below creosote old bleached cond scat at entrance

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, lightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

-Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

-DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/25/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
DUSBAGEM	1337	B	BUOW DKF	SUI	384313	3872661	suitable for BUOW & DKF, no sign observed, single entrance, SW aspect 6"w x 8"h x >3'd. large opening but narrows, curves to left
DUSBAID	1348	B	BUOW	OS	384341	3872442	occupied BUOW burrow (w/ sign, no owl), 1 old (light brown) pellet & whitewash on apron. single entrance, narrows after entrance, filling in w/ dirt NE aspect, 6-5"w x 5"h x <2'd
DUSBAGEM	1501	B	BUOW DKF	SUI	384432	3873141	Suitable for BUOW & DKF, no sign observed. single entrance, curves right. S aspect, 7"w x 6"h x >3'd
DUSBAGEM	1515	B	BUOW DKF	SUI	384464	3871944	Suitable for BUOW & DKF, no sign observed, single entrance, N aspect, 9"w x 8"h x >4'd,

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

-Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

-DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/25/23 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: MARIBEL LOPEZ ECORP Consulting, Inc. Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas	Time (24 hr)	Start: 0800	End: 1630
Verity Richardson	Temp° (°F)	Start: 63.8	End: 82.4
Maribel Lopez	Wind (mph)	Start: 5-10	End: 0-1
Rachel Woodard	% Cloud Cover	Start: 5	End: 30

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Area E eastern portion

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

LARGE DOG TRACKS OBSERVED (4") IN CLOSE PROXIMITY TO DETO CARCASS (385709/3870962)

Veg: good veg cover and species composition. Very high annual cover (Amsinkia, Malacothrix sp., Erodium, Chaenactis sp.)
Soil: Sandy loam w/ gravel - good for digging

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

BESP, RWBL, SASP, CHSP, MODO, ATFL, BHGR, DETO (CARCASS), WESTERN MONEY BEE) LEOPARD LIZARD, SPINY LIZARD, BLACK-TAILED JACKRABBIT, SIDE BLOTCHED LIZARD, GREAT BASIN WHIPTAIL, RATTLESNAKE, BTSP, WCSP, HOFI, CORA, HOLA, WEFI

Burrowing owl Sign (white wash, Pellets, feathers) - See Page 2
American Badger Sign (Claw Marks) - See Page 2
Desert tortoise Sign (Carcass, Scat, burrow) - See Pages 2 and 3

Date: 25 APR 2023
Recorder: A. Lovaas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
042SBA1VR	0910	B	BUOW	SUI	385597	3871408	Suitable BUOW and DKF burrow, No Sign observed
			DKF	SUI			AB Claw Marks present on burrow side walls. Canid
			w/AB Sign				Scat (likely coyote based on size) present near burrow.
							Single entrance burrow. E aspect. 7"W x 14"H x >5'd
							burrow appears to have been dug by a Canid.
042SBA2VR	0943	B	BUOW	OS	385595	3872264	Occupied BUOW burrow w/ fresh pellet on apron, no
			DKF	SUI			live owl observed. Suitable DKF den. No DKF Sign
							observed. Canid Scat (likely coyote based on size)
							present near burrow entrance. Single entrance
							burrow. E aspect 13"W x 19"H x 7'4"d.
042SBA3VR	1036	B	BUOW	SUI	385648	3871168	Suitable BUOW and DKF burrow, N/O Sign Observed
			DKF	SUI			Single entrance burrow. S Aspect. 8"W x 10"H x 3'd
042SBA4VR	1120	B	BUOW	OS	385690	3871479	Occupied BUOW burrow w/ pellets, whitewash, and
							feathers. No live owls observed. Single entrance
							burrow. SE aspect. 8"W x 4.5"H x 7'4". Curves to
							the right.
042SBA5VR	1140	B	BUOW	SUI	385698	3871974	Suitable BUOW burrow, No Sign observed. Single
							entrance burrow. E aspect. 8"W x 6"H x >5'd. Curves left.
7031	1344	B, S	DETO	3 (63)	385745	3870999	DETO burrow previously recorded during the HA in Fall 2022.
							burrow is now collapsed (class 3) and covered with vegetation.
							Multiple pieces of class 2 and 3 scat present within and around burrow
7030	1353	C	DETO	3	385728	3871009	DETO Carcass previously recorded during the HA in Fall 2022 (280mm)
							Carcass is still present. Scutes detaching, new class 3 carcass.
							Radial woodland mentioned abdominal and femoral scutes
							are flattened & smooth, possibly indicating life on a man made
							hard surface. Canid latrine ~2' South Carcass.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

***TORTOISE BURROW / PALLET**

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

***TORTOISE SCAT**

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

***LIVE TORTOISE** (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

***TORTOISE CARCASS**

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 25 APR 2023
Recorder: A. Loveas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
042SBA6VR	1411	S	DETO	4	385719	3871019	1 piece, adult
042SBA7VR	1417	S	DETO	3	385728	3870987	2 pieces, adult
042SBA8VR	1426	S	DETO	3	385710	3870964	1 piece, adult
042S6A9VR	1540	B	BUOW	SUI	385761	3871987	Suitable BUOW and DKF burrow, No sign observed. Single entrance burrow. SE aspect & curves to the left 9"W x 10"h x 7'8"d
			DKF	SUI			
042S6A10VR	1613	B	BUOW	SUI	385733	3871963	Suitable BUOW and DKF burrow, No sign observed. Canid latrine (likely coyote) observed on burrow apron. Single entrance burrow. NE aspect 8"W x 7"h x >7'8"d. Burrow curves to the right.
			DKF	SUI			

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/26/2023
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee, Eliza McLean, Derek Siver, Julie Kaplan, Carly Martenson	Time (24 hr)	Start: 0730	End: 1600
	Temp* (°F)	Start: 63.7	End: 87.6
	Wind (mph)	Start: 0	End: 1-2
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Area E - east of 75th street west & south of Jackpine Ave.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- high vegetation cover including shrubs & blooming annuals

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA
CAQU
BRSP
HOLA
ATFL
WCSP
LOSH (384749 3873125; 381588, 3873206)
HOFI
BESP
LETH
black-tailed jackrabbit
western side-blotched lizard
Great Basin whiptail
yellow-backed spiny lizard
BUOW (sign at burrows, see next page)
American badger (sign at burrows, see next page)

Date: 4/26/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
042624AM1D	0831	B	DKF w/ badger	SUI	384622	3873168	suitable for DKF, no sign observed. single entrance, W aspect, 7.5"w x 6.5"h x >2'd, curves right, recent apron but not powdery, badger claw marks observed on tunnel walls
042624AM2D	0842	B	BUOW DKF	SUI	384642	3872907	suitable for BUOW & DKF, no sign observed. single entrance, annual veg. growing in entrance. S aspect, 8.5"w x 8.5"h x >3'd
042624AM3D	0937	B	BUOW	SUI	384695	3872504	suitable for BUOW, no sign observed single entrance, narrows vertically to 6" S aspect, 7"w x 6"h x >3'd curves left
042624AM4D	1006	B	BUOW DKF	SUI	384714	3873135	suitable for BUOW & DKF, no sign observed. single entrance, NW aspect, 9.5"w x 12"h x >4'd large apron
042624AM5D	1022	B	BUOW DKF w/ badger	SUI	384736	3872573	suitable for BUOW & DKF, no sign observed. single entrance, SW aspect, 11"w x 10.5"h x >3'd. badger claw marks observed in burrow

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/26/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
042668STD	1107	B	BUOW	OS	384789	3872614	occupied BUOW burrow (w/ sign, no owl), whitewash & 14 old pellets (light brown to bleached, no glaze) observed at burrow. single entrance old/deteriorated canid den that is filling in. S aspect, 5.5"w x 10"h x 2'd apron & entrance overgrown w/ Amsinkia sp.
042668STD	1123	B	BUOW DKF	SUI	384799	3872991	suitable for BUOW & DKF, no sign observed. single entrance, curves right S aspect, 9"w x 7.5"h x >3'd
042668STD	1129	B	BUOW DKF	SUI	384809	3837010	suitable for BUOW & DKF, no sign observed. single entrance, long apron, curves left, SW aspect, 9"w x 15.5"h x >3'd
042668STD	1239	B	BUOW DKF	SUI	384865	3877945	suitable for BUOW & DKF, no sign observed. single entrance, annual vegetation growing in entrance & on apron W. aspect, 8"w x 7.5"h x 3'd
042668STD	1250	B	BUOW DKF	SUI	384810	3877501	suitable for BUOW & DKF, no sign observed. single entrance, N aspect, 10"w x 14"h x >4'd, bleached mammal scat (various sizes) on apron. annual vegetation growing in apron

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/26/23
Recorder: T Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
[illegible]	1432	B	BUOW DKF	SUI	384975	3872370	suitable for BUOW & DKF, no sign observed. single entrance burrow w/ fresh apron. NE aspect, 10"w x 10"h x ≥ 2'd
[illegible]	1440	B	BUOW DKF	SUI	385019	3872617	suitable for BUOW & DKF, no sign observed. single entrance, SE aspect, 10"w x 13.5h" x > 4'd
[illegible]	1448	B	BUOW DKF	SUI	384983	3872646	suitable for BUOW & DKF, no sign observed. single entrance canid den, 10"w x 18"h x > 3'd, N aspect entrance overgrown w/ Amsinkia sp.
[illegible]	1500	B	BUOW DKF	SUI	384992	3873036	suitable for BUOW & DKF, no sign observed. single entrance canid den w/ fresh apron. N aspect, 10"w x 15"h x > 4'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

-Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

-DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/26/23 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: MARIBEL LOPEZ Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Jones	Time (24 hr)	Start: 0720	End: 1600
Verity Richardson	Temp° (°F)	Start: 58.1	End: 84.7
Maribel Lopez	Wind (mph)	Start: 0-2	End: 2-7
Rachel Woodard	% Cloud Cover	Start: 0%	End: 0%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area E - eastern portion

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Very high annual cover throughout the site
Observed evidence of geotech crew crushing vegetation, Project Management was notified
Veg: good composition and structure, a lot of annuals including Amsinkia, Malacothrix, Chenopodium
diversity in shrub sizes
Soils: Sandy loam soils, good for digging.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

ATFL, LEGO, BTSP, BESP, CHSP, RWBL, LBWO, MODO, RTHA, CORA, WCSP
BLACK-TAILED JACKRABBIT
GREAT BASIN WHIPTAIL, LEOPARD LIZARD, SIDE-BLOTCHED LIZARD, RATTLESNAKE
LOSH [x2] 385934/3871779 - 0426WIAL
LOSH [1] 386028/3871531 - 0426WIVR

Burrowing owl Sign (White wash and pellets) - See Page 2
American Badger Sign (claw Marks) - See Page 2

Date: 4/26/23
Recorder: A. Lovaas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
0426BA1AL	0943	B	BUOW	SUI	385889	3871501	Suitable BUOW and DKF burrow. No sign observed. Single entrance burrow. W Aspect. Burrow curves to the right. 8"w x 9.5"h x >4'd.
			DKF	SUI			
0426BA2AL	1045	B	BUOW	SUI	385944	3871862	Suitable BUOW and DKF burrow, No Sign observed AB claw marks observed on burrow side walls. Single entrance burrow, SW Aspect, burrow forks to the left and right. 8"W x 6"h x >2.5'd
			DKF	SUI			
			w/ AB Sign				
0426BA1VR	1147	B	BUOW	SUI	386009	3872075	Suitable BUOW burrow. No sign observed. Single entrance burrow N Aspect. Burrow curves to the left 8"w x 6"h x >3' d.
0426BA2VR	1308	B	BUOW	OS	389567	3871070	Occupied BUOW burrow with Old BUOW pellets and whitewash. Suitable DKF burrow, No DKF Sign observed. Multi-entrance burrow, two entrances w/in 6 Meters of each other SW Aspect: 18"W x 10"h x >5'd SE Aspect: 18"W x 10"h x >5'd Old canid scat (likely Coyote) observed near burrows.
			DKF	SUI			
0426BA3VR	1359	B	BUOW	SUI	386013	3871639	Suitable BUOW and DKF burrow. No Sign observed. Single entrance burrow - S Aspect Burrow Curves to the right. 8"W x 4.5"h x >4'd
			DKF	SUI			

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/27/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Derek Siver Eliza McLean Carly Mortenson Julie Kaplan	Time (24 hr)	Start: 0700	End: 1600
	Temp* (°F)	Start: 63	End: 90.1
	Wind (mph)	Start: 2-4	End: 0-1
	% Cloud Cover	Start: 25	End: 0

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Area E - north ⅓ south of Jackpine Rd. ⅓ east of 75th St.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- high vegetation cover including shrubs & blooming annual vegetation
- fresh disturbance: large vehicle/equipment tracks, crushed vegetation including shrubs & Joshua trees

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

BESP
HOLA
CORA
HOFI
WEKI
ATFL
WCSP
BRSP
MODO
CALW

BTSP
COPO
western side-blotched lizard
Great Basin whiptail
long-nosed leopard lizard
black-tailed jackrabbit
yellow-backed desert spiny

Date: 4/27/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
CMZRAHTD	0726	B	BUOW DKF	SUI	385030	3872346	suitable for BUOW & DKF, no sign. single entrance canid den w/ fresh powdery apron. curves right. E aspect, 8"w x 11.5"h x >3'd
CMZRAHTD	0807	B	BUOW DKF	SUI	385103	3872780	suitable for BUOW & DKF, no sign. single entrance canid den, S aspect, 10"w x 10"h x >4'd. fresh powdery apron.
CMZRAHTD	0814	B	BUOW DKF	SUI	385112	3872944	suitable for BUOW & DKF, no sign. single entrance, fresh powdery apron, burrow curves right S aspect, 10"w x 11"h x >3'd
CMZRAHTD	0831	B	BUOW DKF	SUI	385142	3872719	suitable for BUOW & DKF, no sign single entrance, SW aspect, 9"w x 10.5"h x >4'd. annual vegetation on apron & in entrance.
CMZRAHTD	0838	B	BUOW DKF	SUI	385131	3872634	suitable for BUOW & DKF, no sign. single entrance. large mammal, likely canid tracks on apron. N aspect, 9"w x 23"h x >6'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/27/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
042718AD6M	0848	B	BUOW DKF	SUI	385114	3872609	suitable for BUOW & DKF, no sign. NE aspect, 9"w x 8"h x > 2'd, single entrance. large canid tracks on apron
042718A3TD	0860	B	BUOW DKF	SUI	385159	3872591	suitable for BUOW & DKF, no sign. SE aspect, 10"w x 14"h x >4'd, single entrance, curves left
042718A3EM	0854	B	BUOW DKF	SUI	385136	3872576	suitable for BUOW & DKF, no sign SE aspect, 9"w x 12"h x >5'd, single entrance, annuals growing on apron
042718A6TD	0855	B	BUOW DKF	SUI	385150	3872562	suitable for BUOW & DKF, no sign. N aspect, 9.5"w x 12"h x >4'd, single entrance, annuals growing on apron
042718A7TD	0900	B	BUOW DKF	SUI	385136	3872491	suitable for BUOW & DKF, no sign. Complex w/ 2 entrances: - W aspect, 13"w x 16"h x >5'd, coyote tracks & fur observed - E aspect, 10"w x 13"h x >5'd some annual vegetation on apron

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/27/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
042718ABTD	0940	B	BUOW DKF	Sui	385196	3872388	Suitable for BUOW & DKF, no sign. SE aspect, 9"w x 14"h x >4'd, single entrance canid den, SE aspect 10"w x 13"h x >3'd, curves left
042718AYEM	1027	B	BUOW	Sui	385224	3872275	Suitable for BUOW, no sign observed. W aspect, 8"w x 10"h x >2'd, single entrance, large entrance narrows & curves left
042718AYTD	1036	B	BUOW	Sui	385231	3872251	Suitable for BUOW, no sign observed S aspect, 7.5"w x 5.5"h x >4'd. single entrance, burrow curves left after 4'. annual vegetation growing in entrance & on apron
042718AWTD	1044	B	BUOW	Sui	385234	3872355	Suitable for BUOW, no sign observed E aspect, 7"w x 7"h x >2'd, single entrance narrows to ≈5" inside burrow. apron is eroded.
042718AWTD	1124	B	BUOW DKF	Sui	385296	3872468	Suitable for BUOW & DKF, no sign. N aspect, 11"w x 15"h x >6'd single entrance

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/27/23
Recorder: T. Dec

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
UH27BA5EM	1129	B	BUOW DKF	SUI	385781	3872495	Suitable for BUOW & DKF, no sign. SE aspect, 9"w x 14"h x >4'd old single entrance coyote den
UH27BA12TD	1130	B	BUOW DKF	SUI	385364	3872505	suitable for BUOW & DKF, no sign. S aspect, 10"w x 10"h x >3'd curves left
UH27BA13TD	1135	B	BUOW DKF	SUI	385303	3872571	Suitable for BUOW & DKF, no sign. S aspect, 8"w x 13"h x >2'd. single entrance, fresh powdery apron, burrow curves left
UH27BA14TD	1431	B	BUOW	SUI	384844	3874054	Suitable for BUOW, no sign. W aspect, 7"w x 8"h x >2'd, single entrance, opening narrows to 4" high inside burrow, curves left
UH27BA15TD	1435	B	BUOW	SUI	384865	3874037	Suitable for BUOW, no sign observed E aspect, 7"w x 8"h x >3'd. single entrance, annual vegetation growing in entrance
UH27BA16TD	1451	B	BUOW	SUI	384855	3873298	Suitable for BUOW no sign observed. NW aspect, 11"w x 6.5"h x >2'd. height narrows to 5" after 1'. single entrance in old excavated stockpile

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

-Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

-DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/27/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
OUTRAGEM	1452	B	BUOW	SUI	384852	3873300	suitable for BUOW, no sign. NE aspect, 8"w x 5"h x 3'd. single entrance burrow in old stockpile from prior excavation. curves right
6427RAMD	1538	B	DKF	SUI	384753	3873239	suitable for DKF, no sign. W aspect, 7.5"w x 9"h x >3'd single entrance, fresh powdery apron, burrow curves left

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/27/23
Recorder: M. Lopez

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alder Lovass Verity Richardson Rachel Woodard Maribel Lopez	Time (24 hr)	Start: 0715	End: 1545
	Temp° (°F)	Start: 61.5	End: 89.8
	Wind (mph)	Start: 1-4	End: 0-4
	% Cloud Cover	Start: 10%	End: 10%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area E, eastern portion

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Veg: good composition and species diversity w/ variation in shrub sizes and structure. Very high annual cover (Amsinkia, Malacothrix, chaenactis, Galium, burrn grasses)

Soils: Sandy loam soils w/ gravel. Good for digging

- Evidence of geotech crew working in area. Cut back veg and piles in the ground. Project manager was notified

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

BESP, LORA, ATFL, HOFI, WCSP, COPO, CONI, MODO, RWBL, HOLA

LOSH [3+ JUVINILES, 2 ADULTS] 386128/3871616

BLACK TAILED JACKRABBIT, LONG NOSE LEOPARD LIZARD, YELLOW BACKED SPINY LIZARD, SIDE BLOTCHED LIZARD, GREAT BASIN WHIPTAIL, COACHWHIP

Date: 4/27/2023
Recorder: A. Lovaas

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
0427BAINL	0744	B	BUOW DKF	SUI SUI	386136	3870805	Suitable BUOW and DKF burrow, No Sign observed Single entrance burrow. E aspect. Burrow Curves to the right 8"W x 10"h x 74'd
0427BA1VR	1049	B	BUOW w/AB Sign	SUI	386246	3872318	Suitable BUOW burrow, No Sign observed. AB dug burrow, AB claw Marks on burrow Side walls. Single entrance burrow. SE aspect 8"W x 10"h x 73'd
0427BA2VR	1131	B	BUOW DKF	SUI SUI	386256	3870907	Suitable BUOW and DKF burrows, No Sign observed Two entrance burrow Complex E aspect: 6"W x 8"h x 73'd curves right W aspect: 6"W x 7.5"h x 73'd curves left Burrows possibly Connect in the middle.
0427BA3VR	1422	B	BUOW w/AB Sign	SUI	386305	3871616	Suitable BUOW burrow, No Sign observed. AB claw Marks observed on burrow Side walls. Single entrance burrow. S aspect, curves to the right 7"W x 5"h x 3'd
0427BA4VR	1428	B	BUOW w/AB Sign	SUI	386331	3871585	Suitable BUOW burrow, No Sign observed. AB claw Marks observed on burrow Side walls. Single entrance burrow. N Aspect. Curves to the left 8"W x 6"h x 73'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/28/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Derek Siver Julie Kaplan Eliza McLean	Time (24 hr)	Start: 0700	End: 1500
	Temp* (°F)	Start: 70	End: 91
	Wind (mph)	Start: 1-4	End: 0-2
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Area E - south of Aqueduct Rd. & north of Jackpine Ave.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high vegetation cover (shrubs & blooming annuals)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

HOFI
NOMO
CORA
AMKE
MODO
BESP
WCSP
LBWO
CAQU
ATFL

LOSH (11S 385037 3874437)
Great Basin whiptail
western side-blotched lizard
yellow-backed desert spiny
long-nosed leopard lizard
red racer

Date: 4/28/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0428BAITD	0728	B	BUOW	SUI	385299	3874635	Suitable for BUOW, no sign. SE aspect, 10"w x 7"h x >2'd narrows after 2.5'. single entrance deteroriated condition, filling in
0428BAIEM	0810	B	BUOW DKF	SUI	385271	3874157	suitable for BUOW & DKF, no sign. SE aspect, 9"w x 6.5"h x >4'd single entrance, curves left
0428BAIEM	0902	B	BUOW DKF	OS SUI	385183	3873651	Suitable for DKF, no sign observed, 3 occupied BUOW burrow w/ sign, no owl. 2 burrows, possible complex: - SE aspect, 10"w x 8"h x >3'd 1 deteroriated pellet & prey item (ie. rodent bones) observed on apron - NW aspect, 8.5"w x 7"h x >1.5'd
0428BAITD	0910	B	BUOW	SUI	385166	3873660	Suitable for BUOW, no sign. SE aspect, 7.5"w x 5"h x >2'd single entrance, w/ annual vegetation on apron & entrance, curves left. large old bleached canid scat on apron

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

***TORTOISE BURROW / PALLET**	***TORTOISE SCAT**
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

***LIVE TORTOISE** (sex, estimate age/MCL)		***TORTOISE CARCASS**	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/28/23
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
042828AGTD	0949	B	BUOW	SUI	385148	3874419	Suitable for BUOW, no sign. S aspect, 7"w x 5.5"h x >3'd. single entrance burrow w/ fresh apron. lagomorph tracks observed
042828AHTD	1215	B	BUOW	SUI	384994	3873815	Suitable for BUOW, no sign. SW aspect, 8.5"w x 4.5"h x >3'd single entrance, annual vegetation growing at entrance, curves left
042828AITD	1317	B	BUOW DKF	SUI	384644	387578	Suitable for BUOW & DKF, no sign. E aspect, 8.5"w x 8.5"h x >4'd single entrance canid den
042828AJTD	1429	B	BUOW DKF	SUI	384553	3873254	Suitable for BUOW & DKF, no sign. SE aspect, 8.5"w x 12"h x >3'd single entrance, annual vegetation growing in entrance.
042828AKTD	1435	B	BUOW	SUI	384516	3873171	Suitable for BUOW, no sign. S aspect, 7.5"w x 5.5"h x >2'd single entrance, fresh soft apron

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/28/22 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: ~~Alden Loveds~~ Rachel Woodard. ECORP Consulting, Inc. Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Loveds	Time (24 hr)	Start: 0636	End: 1525
Verity Richardson	Temp* (°F)	Start: 58.5	End: 90.4
Rachel Woodard	Wind (mph)	Start: 1-4	End: 0-2
Maribel Lopez	% Cloud Cover	Start: 0%	End: 0%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Area E - eastern portion

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Veg: Good veg composition and species diversity w/ variations in shrub sizes and structures
Very high annual cover (Amsinkia, Malacothrix, Erodium, chaenactis, bunch grasses)
Soils: Sandy loam soils w/ gravel - good for diggity

Evidence of geotech crew working in area observed crushed veg and piles in the ground
Project Manager was notified

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

MODO, ATFL, BESP, VERD, SCOR, CORA, ~~LECO~~ LCTH, HOFI, RTHA, RWBB, COPO, Black tailed Jackrabbit, Yellow backed spiny lizard, side blotch lizard, leopard lizard, whiptail lizard,
LOSH 0428W1AL 386469 3871758

Burrowing owl Sign (white wash) - See Page 2

Date: 4/28/22
Recorder: A. Lavoos

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
042GA1VR	0853	B	BUOW	SUI	386456	3872148	Suitable BUOW and DKF burrow, No Sign observed. Single entrance burrow. SW Aspect 9"wx7"hx>5'd Curves left.
			DKF	SUI			
042DA2VR	1032	B	BUOW	SUI	386524	3872186	Suitable Both burrow, No Sign observed. Single entrance burrow NW Aspect, Curves right. 5"wx7"hx>4'd
042BA3VR	1059	B	BUOW	OS	386580	3871879	Occupied BUOW burrow with white wash on burrow apron. Single entrance burrow. NW aspect Curves left 8"wx6"hx>4'd.
042GA4VR	1256	B	BUOW	SUI	386650	3872286	Suitable BUOW burrow, No Sign observed. Single entrance burrow. E Aspect Curves right 5'wx6.5'hx>7'd
042BA5VR	1357	B	BUOW	SUI	386696	3872062	Suitable BUOW and DKF burrow, No Sign observed. Two entrance burrows, Canid Scat observed near burrow entrance. E Aspect: 7"wx10"hx>3'd NE Aspect: 11"wx16"hx>4'd
			DKF	SUI			
042BA6VR	1405	B	BUOW	SUI	386699	3872081	Suitable BUOW and DKF burrow, No Sign observed. Single entrance burrow. SE aspect. 6"wx8"hx>3'd
			DKF	SUI			
042BA7VR	1439	B	BUOW	OS	386729	3871597	Occupied BUOW burrow with white wash on burrow apron. Suitable DKF den, No DKF Sign observed. Single entrance burrow, Curves left E Aspect. 12"wx11"hx>3'd
			DKF	SUI			
042BA8VR	1444	B	BUOW	SUI	386713	3871597	Suitable BUOW and DKF burrow, no Sign observed Two entrance burrow complex: Northern Most Burrow: NW Aspect 8"wx6.5"hx>4'd, Curves left Southern Most Burrow: S Aspect 8"wx7"hx>4'd, No Curves
			DKF	SUI			

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/1/2023 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Matthew Adams ECORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

Surveyor(s)	Weather Data		
Taylor Dee Josh Harris matt Adams	Time (24 hr)	Start: 0645	End: 1500
	Temp* (°F)	Start: 51	End: 72
	Wind (mph)	Start: 0-2	End: 8-12
	% Cloud Cover	Start: 20	End: 10

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

area D

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high vegetation cover, annual cover high, creosote-dominant

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

HOLA
CORA
MODO
WIWA
AFFL
BRSP
BESP
VASW
CAQU
WCSP
BTSP
SCOR
nighthawk sp.

TUVU
HETH
WETA
NOMO
WTSW
LOSH → (382565, 3872473)
LAZB
hummingbird sp.
VERD

} live

Coyote - tracks, scat
American badger - dig marks, burrows
pocket gopher - burrow
black-tailed jackrabbit - live, scat

common side-blotched lizard - live
gopher snake - live
great basin whiptail - live

master blister beetle
bomba sp.
sphynx moth
} live

Date: 5/1/2023
Recorder: Matthew Adams
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
050108AITD	1200	B	BUOW	SUI	382547	3871698	single entrance burrow with no sign. Suitable for BUOW. steep angle (non-tortoise) 7"w x 5"h x >2'd, SE aspect

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/1/23 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: L Simpson RCORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

Surveyor(s)	Weather Data		
A. Lovaas	Time (24 hr)	Start: 0645	End: 1515
G. Garcia	Temp* (°F)	Start: 49.2	End: 65.5
L. Simpson	Wind (mph)	Start: 0-3	End: 8-20
	% Cloud Cover	Start: 35	End: 15

Project/Site info:

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area D dirt lay down yard

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

Bobcat
COLA
HOLA
WTSW
Hummingbird sp.
side-blotched lizard
CAQU
BRSP
LBWO
MODO
TOWA
VENI
black-tailed jackrabbit
ATFL
HOFI
WIWA
BARS
white-tailed antelope ground squirrel
BUOW (sign - see next page)
great basin whiptail
yellow-backed spiny lizard

Date: 5/1/23
Recorder: Lauren Simpson
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0501BA1AL	0931	B	BUOW	SUI	382320	3871894	single entrance burrow with no BUOW or DKF sign. Dug by badger (claw marks present on burrow side wall). 11"w x 15"h x 4'd, SE aspect
			DKF w/AB sign	SUI			
0501BA2AL	1001	B	BUOW	SUI	382321	3870535	single entrance burrow with no sign. Canid scat present. 8"w x 8"h x 2'd, NW aspect
			DKF	SUI			
7028	1147	B	BUOW		382323	3872298	previously recorded burrow during habitat assesment - no new sign, whitewash nearby (previously recorded)
0501BA3AL	1337	B	BUOW	SUI	382200	3870458	single entry burrow with no sign 10"w x 7"h x 3'd, NE aspect
			DKF	SUI			
0501BA4AL	1403	B	BUOW	SUI	382195	3871253	single entry burrow with no sign. 7"w x 6"h x 3'd, NW aspect
			DKF	SUI			

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/1/23 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Rachel Woodard ECORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

Surveyor(s)	Weather Data		
Verity Richardson Rachel Woodard Maribel Lopez	Time (24 hr)	Start: 0700	End: 1500
	Temp* (°F)	Start: 51°	End: ~~70-75~~ 64°
	Wind (mph)	Start: 5-7	End: 10-15
	% Cloud Cover	Start: 60%	End: 15%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area E

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

BESP, CORA, WCSP, WEKI, ATFL, MODO, WAVI, SCOR, WIWA, great barn whiptail, side blotch lizard, long nose leopard lizard, Swallow sp, LOSH: 0501WIVR (2 Juvenile, 1 adult shrike) 3868037 3872084
BUOW (sign - see next page), American badger (claw marks - see next page)

Date: 5/1/23
Recorder: Rachel Woodard
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
051BA1VR	0735	B	BUOW	OS	386756	3871735	two entrances: 11"w x 12"h x 7'd BUOW sign-, pellets and white wash. S aspect present. 10"w x 6.5"h x >3'd N aspect. BUOW pellets and white wash present
			DKF	SUI			
051BA2VR	0932	B	BUOW	SUI	386043	3871726	single entrance burrow with badger claw marks, straight back. 12"w x 20"h x 4'd, S aspect. No BUOW or DKF sign.
			DKF w/AB sign	SUI			
0501BA3VR	1348	B	BUOW	OS	387103	3872572	5"w x 5"h x 3'd, South aspect, occupied BUOW-white wash and pellets on apron (BUOW sign)
0501BA4VR	1355	B	BUOW	OS	387100	3872574	two entry burrow: white wash and pellets on both aprons (BUOW) ~1m apart. under LARTRI. 8"w x 19.5"h x 3'd South aspect 10"w x 18"h x 4'd, south aspect, curves right. No DKF sign at either
			DKF	SUI			
0501BA5VR	1405	B	BUOW	OS	387113	3872601	single entry occupied BUOW burrow pellets and white wash on apron (BUOW sign) 8"w x 13"h x 7'd, curves right, NE aspect.

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/2/23 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Matthew Adams ECORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

Surveyor(s)	Weather Data		
Taylor Dee Josh Harris Matt Adams	Time (24 hr)	Start: 0615	End: 1500
	Temp* (°F)	Start: 45	End: 63.5°
	Wind (mph)	Start: 5-7	End: 11-17
	% Cloud Cover	Start: 90	End: 20

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Area D

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

creosote-dominant, high annual cover, flat-low gradient sandy soils with occasional incised washes

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

Birds

MODO HOFI
BTSP BGGN
BRSP LAZB
WCSP LASP
BESP ROPI
CORA VERD
WIWA CAQU
RTHA WEKI
BHGR LCTH
WAVI BUOW (sign-see next page)
WTSW
YHBL

live

Mammals

Desert Kangaroo Rat - dead
black tailed jackrabbit - live
White-tailed antelope squirrel - live
coyote - scat, tracks
desert kit fox - scat
american badger - sign (see pg 3)

Insects

harvester and blister beetle, horn worm, grasshopper } live

Reptiles

common side-blotched lizard, long nosed leopard lizard, great basin whiptail } live
gopher snake - live
coachwhip - live + dead
mojave rattlesnake - live

Date: 5/2/23
Recorder: Matthew Adams
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0502BA1TD	0648	B	BUOW DKF	OS SUI	382587	3871873	occupied burrowing owl burrow with sign, no owl (white wash on apron & edge of wash, three pellets on edge of wash). Suitable for DKF, not tortoise 12"w x 9.5"h x >5'd, W aspect, along bank of incised wash. 1 entry
0502BA2TD	0704	B	BUOW DKF	SUI SUI	382588	3871883	single entry burrow with no sign. suitable for BUOW & DKF. located in bank of incised wash. 10"x13"x>5'd, W aspect
0502BA3TD	0708	B	BUOW DKF	SUI SUI	382590	3871890	soil burrow with no sign. suitable for BUOW & DKF. In bank of incised wash. 9.5"x10"x>7'd, W aspect
0502BA4TD	0716	B	BUOW	OS	382583	3871936	soil burrow occupied by BUOW. sign only (1 brown pellet, white wash) no live individual. 8.5"w x 7"h x >3'd, SW aspect narrows to "3"
0502BA5TD	0734	B	BUOW	SUI	382591	3872172	soil burrow suitable for BUOW (no sign). soft apron 8.5"W x 6"h x >1'd, E aspect
0502BA6TD	1123	B	BUOW DKF	SUI SUI	382729	3871229	two entrance burrow suitable for BUOW/DKF, no sign. Steep slope into burrow (not tortoise) soft aprons E, 12"x7"x>3'd / N, 11.5"x6"x>3'd

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 05/02/2023 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Matthew Adams ECORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type°	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
0502BA-TD	1213	BUOW DKF w/AB sign	B	OS SUI	382702	3872502	NE, 17.5"x10"x>3' / known badger dig, occupied burrowing owl w/sign, no owl (whitewash). ~~two entrances~~ • N entrance old canid dig w/ coyote scat on apron, no BUOW sign, badger dig marks in burrow, curves to the right • Two additional digs w/in 7' of canid burrow with whitewash (BUOW) at entrances suitable kit fox den/burrow.
0502BA-TD	1330	BUOW DKF	B	SUI SUI	382767	3871813	S, 12.5"x14"x>2' / E 9.5"x10"x>3' potential burrow/den for BUOW, DKF, no sign. Two dens w/in 8ft of each other "latrine" of coyote scat between dens den entrances steep - not tortoise soft apron with tracks present
~~0502BA-TD~~							

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/2/23 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Lauren Simpson ECORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

Surveyor(s)	Weather Data		
Alden Loveas Lauren Simpson Annie Lightell	Time (24 hr)	Start: 0920	End: 1445
	Temp* (°F)	Start: 43.6	End: 59.6
	Wind (mph)	Start: 5-10	End: 5-15
	% Cloud Cover	Start: 75	End: 15

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area D and laydown yard

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CAGU HOFI
BRSP LETH
CORA (nest + ind.) ATFL
WISW UGTA
WIWA
Black-tailed jackrabbit
WCSP LBWD
LOSH - (382121, 3870282)
MODO (nest + indv.)
RTHA
yellow-backed spiny lizard
side-blotched lizard
long-nosed leopard lizard
coachwhip

desert kit fox (sign - see next page)

Date: 5/2/23
Recorder: Lauren Simpson
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0502BA1AL	0635	B	BUOW	SUI	382271	3871633	single entrance burrow with no
			DKF	SUI			BUOW or DKF sign. old canid
							scat. 15"W x 19"h x >4'd. SE aspect
0502BA2AL	0715	B	BUOW	SUI	382225	3871915	single entrance burrow with DKF
			DKF	K			sign. (small fresh scat, likely
							DKF) on apron). No BUOW
							sign. Old canid scat, likely coyote
							canid latrine nearby.
							14" w x 16"h x >8'd. SE aspect
0502BA3AL	0743	B	BUOW	SUI	382190	3871724	single entrance burrow with no
			DKF	SUI			DKF or BUOW sign. old canid
							scat on apron. 14"w x 17"h x 7.5'd
							N aspect

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/2/23 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Rachel Woodard ECORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

Surveyor(s)	Weather Data		
Verity Richardson Caroline Garcia Rachel Woodard Maribel Lopez	Time (24 hr)	Start: 0615	End: 0915
	Temp* (°F)	Start: 41	End: 49
	Wind (mph)	Start: 5-8	End: 5-12
	% Cloud Cover	Start: 80%	End: 80%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Section E - remainder

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA, MODO, Gull sp, WCSP, ~~scorp~~ Desert hairy scorpion
BUOW (sign - see next page),
Desert kit fox (scat - see next page)

Date: 5/2/23
Recorder: Rachel Woodard
QA/QC by: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type°	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
0502BA1VR	0639	BUOW	B	OS	387157	3872488	16"x7"x>1.5' Aspect NE curves left white wash + pellets all around (BUOW sign)
0502BA2VR	0643	BUOW	B	OS	387158	3872488	3 entries, all have white wash & pellets (BUOW) • 6"x7"x~~2.5~~>2.5' straight NW aspect • 8"x9"x >2.5'ft straight North aspect • 5"x7"x>1.5 ft straight East aspect
0502BA3VR	0652	BUOW DKF	B	OS K	387161	3872485	2 entries, DKF scat, white wash + pellets (BUOW) 8"x7"x>1ft curves to left E Aspect 9"x6"x>2ft curves left SE aspect
0502BA4VR	0721	BUOW DKF	B	SUI SUI	387210	3872440	6"x5"x>1 ft curves right NE aspect 6"x5"x>1ft curves left one main entry splits in two. No sign present.
0502BA5VR	0724	BUOW DKF	B	OS K	387214	3872434	4 entry complex. • 10"x5.5"x>2ft E aspect white wash (BUOW) • 7"x9"x>3'ft straight Aspect S • 6"x7.5"x>2ft straight SW aspect Kit fox scat, white wash present (BUOW) • 7"x10"x>3ft NW aspect, white wash - BUOW sign
0502BA6VR	0844	BUOW DKF	B	OS SUI	387502	3872734	12"x10"x>2ft curves Right SW aspect white wash on apron (BUOW sign)
0502BA7VR	0848	DKF, w/MB sign	B	SUI	387506	3872731	9"x10"x>2ft curves Left, S aspect claw marks - badger
0502BA8VR	0853	BUOW DKF	B	OS K	387510	3872729	6"x9"x>3ft curves right S. Aspect DKF scat, pellets on apron (BUOW sign)

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Form Updated: 3/29/2023

Date: 5/2/23 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Rachel Woodard ECORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

Surveyor(s)	Weather Data		
Verity Richardson Carolina Garcia Rachel Woodard Maribel Lopez	Time (24 hr)	Start: 0950	End: 1520
	Temp* (°F)	Start: 49	End: 66
	Wind (mph)	Start: 5-12	End: 10-15
	% Cloud Cover	Start: 80%	End: 40%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area C1 Norther section and middle section of 'steps' in N area.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

VGSW, WCSP, CORA, HOFI, BESP, ATFL, BRSP, HOLA, MODO
Yellow backed spiny lizard, Mojave rattlesnake, long nose leopard lizard, side blotch lizard, jackrabbit
American badger (claw marks - see next page)
Desert kit fox (scat - see next page),
BUOW (sign - see next page)

Date: 5/2/23
Recorder: Rachel Woodard
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0502BA9VR	1046	B	BUOW	SUI	383633	3873827	single entrance soil burrow, dug by badger (claw marks). No BUOW/DKF sign. 6"w x 9"h x 3'd) S aspect
			DKF	SUI			
			w/ABsign				
0502BA10VR	1059	B	BUOW	SUI	383582	3873792	single entrance burrow, curves right, no sign present. 11"w x 11"h x 3'd NE aspect
			DKF	SUI			
0502BA1CG	1111	B	DKF	SUI	383412	3873809	single entrance burrow, 8"w x 8"h x 2'd, NE aspect, curves right. NO DKF sign
0502BA11VR	1335	B	BUOW	SUI	383364	3873559	single entrance burrow, no sign. 7.5"w x 5"h x 1.5'd, straight, SE aspect
0502BA12CG	1342	B	BUOW	OS	383330	3873577	single entrance occupied BUOW burrow (white wash present) no DKF sign. 9"w x 8"h x 3'd, curves left, S aspect
			DKF	SUI			
0502BA13CG	1413	B	BUOW	OS	382958	3873529	single entrance occupied BUOW burrow (sign-pellets white wash) canid scat & tracks on mound 8.5"w x 15"h x 3'd, curves right
			DKF	SUI			
0502BA14CG	1422	B	BUOW	OS	382967	3873520	single entrance occupied BUOW burrow (white wash all over mound, pellets present) 9"w x 6.5"h x 3'd curves left, E aspect
0502BA15VR	1429	B	BUOW	OS	383005	3873523	single entrance burrow w/ DKF & BUOW sign. DKF scat, owl pellets, white wash present 6"w x 5"h x 4'd, straight, SW aspect
			DKF	K			

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/3/2023
Recorder: T. Dee
QA/QC: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Josh Harris Matt Adams	Time (24 hr)	Start: 0615	End: 1514
	Temp* (°F)	Start: 45	End: 83
	Wind (mph)	Start: 0-1	End: 9-17
	% Cloud Cover	Start: <5	End: 55

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Area D

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WETA
MODO
BESP
BRSP
NOMO
WEKI
CORA
HOLA
CAQU
BUOW (sign) (see next page)
RTHA
HOFL
BTSP
LOSH

YEWA
WIWA
TOWA
ROWR
WCSP
BHGR
WTSW

black tailed jack rabbit (382804, 3870352)
coyote (sign)
American badger (sign)
Desert kit fox (sign)
-see next page

side-blotched lizard
Great basin whiptail
Mojave rattlesnake

painted lady - butterfly
Cabbage white - butterfly

Date: 5/3/2023 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: J Harris RCORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type°	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
050308A1TD	0730	BUOW	B	OS	382789	3872131	occupied BUOW burrow w/ sign (white wash on apron and brown pellet near by), semi steep slope into burrow, burrow curves to the right, east aspect 7" w x 8.5" h >3' deep, entrance narrows after entrance
050308A2TD	0854	BUOW	B	OS	382878	3871512	occupied burrow with sign (white wash on apron and top of burrow), semi steep and straight, southwest aspect 8" w x 3.5" h >3' deep
050308A3TD	0949	BUOW	B	OS	382835	3872569	Potential burrow with sign with no sign, semi steep slope and straight, Southeast aspect, 7" w x 7" h >3' deep
050308A4TD	1116	BUOW, DKF w/AB sign	B	SUI SUI	382901	3871137	Potential den with burrow for BUOW and DKF without sign, entrance dug by AB (no claw marks observed) semi steep burrow and curves to the right, southeast aspect 9" w x 7" h >3' deep
050308A5TD	1142	BUOW, DKF	B	SUI SUI	382925	3871994	Potential den with no sign, semi steep slope, burrow curves to left, South aspect, 10" w x 15" h >3' deep, soft apron
050308A6TD	1302	BUOW	B	OS	382888	3872175	occupied burrow with sign (White wash on apron), semi steep and burrow curves to right, Southeast aspect, 8" w x 8" h >1' deep

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 05-03-2023
Recorder: J. Harris
QA/QC by: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type°	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0503BA7TD	1335	BUOW DKF w/AB sign	B	OS K	382937	3872258	Occupied BUOW burrow with sign (whitewash and brown pellet with glaze and one bleached pellet), Known DKF den, scat present AB claw marks on side wall, east aspect, 6" w x 8" > 3' deep, additional entrance to the north approx. 7' west of den, no sign, possible complex
0503BA8TD	1407	BUOW DKF w/AB sign	B	SUI K	382964	3871899	Potential den for BUOW/DKF, Known DKF den, DKF scat and (bleached) AB claw marks on side wall, suitable BUOW burrow, semi steep burrow and curved left slightly, east aspect, 7" w x 16"h > 4' deep
0503BA9TD	1417	BUOW DKF	B	SUI SUI	382960	3870958	suitable BUOW/DKF burrow/den with no sign burrow that goes straight, southeast aspects, 8" w x 9"h > 5' deep, semi steep slope into burrow

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Form Updated: 3/29/2023

Date: 5/3/23
Recorder: L. Simpson
QA/QC by: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas	Time (24 hr)	Start: 0615	End: 1505
Lauren Simpson	Temp* (°F)	Start: 26.8	End: 59.8
Annie Lightell	Wind (mph)	Start: 0-1	End: 5-12
	% Cloud Cover	Start: 1	End: 50

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area D

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WCSP BRSP MODO BUOW (sign - see next pg) Black-tailed Jackrabbit

CORA ATFL

LBWO HOFI LENI

CAQU BTSP LAZB

BESP LCTH CLSW

WTSW WEKI Heron sp.

common side-blotched lizard
great basin whiptail
coachwhip
long-nosed leopard lizard

Date: 5/3/2023 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Lauren Simpson ECORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type°	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0503BA2AL	1115	BUOW	B	OS	381886	3871655	NE aspect 9"w x 8"h x 4'd, curves to left, old whitewash
		DKF		SUI			occupied BUOW w/sign, no owl, potential DKF den single entry
0503BA2AL	1429	BUOW	B	OS	381835	3871870	old whitewash + pellet present. 8"w x 8"h x 1.5'd
							SW aspect - occupied w/sign no owl. 1 entry
0503BA3AL	1436	BUOW	B	SUI	381837	3871873	NE aspect - 18"w x 12"h x 7'd no sign
		DKF		SUI			potential BUOW + DKF possibly old pellet
							18 12 7

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/3/2023 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Rachel Woodard ECORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

Surveyor(s)	Weather Data		
Verity Richardson Rachel Woodard	Time (24 hr)	Start: 0620	End: 1500
	Temp* (°F)	Start: 37	End: 63
	Wind (mph)	Start: 0-3	End: 5-10
	% Cloud Cover	Start: 10%	End: 40%

Project/Site Info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

C1 (Northern section) most Southern 'Step'. Northern end of Southern Section (triangle)

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA, MODO, WCSP, HOLA, BESP, BRSP, ATFL, CAQU, WEME, VGSP, ~~BG~~ BHGR, HOFI, ROPI,
Black tail jackrabbit, great basin whiptail, side blotched lizard, yellow backed spiny lizard
American badger (claw marks - see next page)
BUOW (sign - see next page)

Date: May 3, 2023 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Rachel Woodard ECORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type°	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
~~0503BA1VR~~							Suitable BUOW burrow,
0503BA1VR	0735	BUOW	B	SUI	382428	3873291	No sign present, NE aspect 6x5"x7"x4' curves left. single entrance
0503BA2VR	0841	BUOW w/AB sign	B	SUI	388038	3873338	6"x11"x>4' curves left ~~Claw~~ mound (badger) S aspect. no BUOW sign. single entrance
0503BA3VR	0904	BUOW w/ AB sign	B	OS	382733	3873336	8"x8"x>3ft straight white wash on apron, claw marks, N aspect. (BUOW) 1 entry
0503BA4VR	1349	BUOW	B	OS	381520	3872172	7"x8"x>3ft SE aspect white wash on apron - BUOW sign burrow curves right

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Form Updated: 3/29/2023

Date: 5/4/2023
Recorder: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ICORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Alden Lovaas Matt Adams Shelby Dunn	Time (24 hr)	Start: 0630	End: 1500
	Temp* (°F)	Start: 39.8	End: 54.1
	Wind (mph)	Start: 1-3	End: 6-13
	% Cloud Cover	Start: 75	End: 85

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Area D

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high vegetation cover including annuals and shrubs

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

HOLA
CORA
BRSP
BESP
BTSP
CACW
CAQU
MODO
LOSH
LAZB
RO WR

ATFL
BLPH
WIWA
WISW
YRWA
TOWA
VERD
BUOW (sign - see next page)

master blister beetle

reptiles
common side blotched lizard
long nosed leopard lizard

(383085, 3871966)

mammals
black tailed jack rabbit
desert kangaroo rat
coyote (scat)
desert kit fox (scat - see next page)

Date: 05/04/23
Recorder: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type°	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
0504BA1TD	0735	BUOW DKF	B	SUI SUI	383035	3871759	suitable burrow/den, no sign. 10"w x 12"h x 4'd East aspect. Apron has a lot of annual vegetation semi-steep slope into burrow (not tortoise)
0504BA1AL	0932	DKF BUOW	B	K	383189	3871829	multiple entrances, kit fox den complex spanning across ~90ft 20 entrances, 4-5 have soft aprons, others are overgrown with ambrosia sp. recent kit fox scat (dark brown) and tracks on apron. 10"w x 8"h x 2'd No BUOW sign (potential burrow). known kit fox den
0504BA2AL	1038	BUOW	B	SUI	383277	3872176	suitable BUOW burrow, no sign. semi steep slope into burrow, straight- no curve (not tortoise). apron has annual vegetation growing over it. 7"w x 8"h x >3'd
0504BA2TD	1313	BUOW DKF	B	SUI SUI	383370	3872451	suitable BUOW/DKF den/burrow, no sign. south aspect. 9"w x 10"w x 2'd semi steep slope into burrow (not tortoise) apron has annual vegetation growth
↓		↓	↓	↓			known kit fox & BUOW burrow/den
0504BA3AL	1357	BUOW DKF	B	OS K	383406	3872290	west aspect 9"w x 6.5"h x >3'd white wash and kit fox scat on apron (old) burrow curves to the left, semi steep slope (not tortoise)

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Form Updated: 3/29/2023

Date: 5/4/2023 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Annie L. ECORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

Surveyor(s)	Weather Data		
Annie Lightell Lauren Simpson Josh Harris Derek Siver	Time (24 hr)	Start: 0630	End: 1515
	Temp* (°F)	Start: 42.5°	End: 55°
	Wind (mph)	Start: 0-1	End: 4-10
	% Cloud Cover	Start: 75	End: 70

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Area D

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high vegetation cover including annuals & shrubs

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA VERD
ATFL
CAQU
BRSP
BESP long nosed leopard lizard
NOMO common side-blotched lizard
WIWA
WETA
WAVI
WTSW
LENI
HOFI

Date: 05/04/23
Recorder: Annie L
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0504BA1JH	0900	B	BUOW	SUI	381640	3871094	single entrance burrow with badger claw marks on side wall. No BUOW or DKF sign. 7"w x 10"h x 3'd. SE aspect. Old canid scat present
			DKF w/AB sign	SUI			

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/4/2023 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: Rachel Woodard ECORP Consulting, Inc. Client: Tetra Tech
QA/QC by: Shelby Dunn

Surveyor(s)	Weather Data		
Verity Pachecdon Rachel Woodard	Time (24 hr)	Start: 0615	End: 1520
	Temp* (°F)	Start: 41°F	End: 53°F
	Wind (mph)	Start: 0-3	End: 5-10
	% Cloud Cover	Start: 100	End: 85%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area 1 Northern end of southern section, South of Laguna Avenue.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CONI, WETA, ATFL, WEME, MODO, CHSP, CORA, WIWA, WEKI, HOFI, VERD, OCWA, BESP, VGSP
Side blotched lizard, white tailed antelope ground squirrel, great basin whiptail, yellow backed spiny lizard
Domestic Dog (3), BUOW (sign - see next page)

Date: May 4, 2023
Recorder: Rachel Woodard
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0504BAIVR	0738	B	BUOW	OS	381570	3872128	occupied BUOW burrow. single entry (sign - white wash on mound) 5"w x 4"h x >3ft d. SW aspect
0504BA2VR	1248	B	BUOW	OS	380881	3871997	occupied BUOW burrow (sign - white wash on mound) (entry. 8"w x 5"h x >2ft d. SE aspect

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

***TORTOISE BURROW / PALLET**	***TORTOISE SCAT**
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

***LIVE TORTOISE** (sex, estimate age/MCL)		***TORTOISE CARCASS**	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 05/5/23
Recorder: Derek Siver
QA/QC: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Corrina Tapia Taylor Dee Annie Lightell Derek Siver	Time (24 hr)	Start: 0630	End: 1415
	Temp* (°F)	Start: 51.6	End: 60.8
	Wind (mph)	Start: 0	End: 6.5-12
	% Cloud Cover	Start: 30%	End: 45%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

area D

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high vegetation cover
dense distribution of creosote
high annual vegetation cover

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA
HOLA
CACW
CAQU
SAPH
VERD
NOMO
BESP
MODO
WEKI
BHGB

WIWA
RTHA
BRSP
WAVI
SAVS

black-tailed jack rabbit
great basin gopher snake
common side-blotched lizard
desert kit fox - sign (see next page)
BUOW - sign (see next page)

Date: 5/5/23
Recorder: Derek Siver
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0505BA1TD	0742	B	BUOW	SUI	383609	3872947	suitable burrow for BUOW & DKF, no sign. NW aspect, 7.5"w x 7"h x >2'd. semi steep slope (not tortoise)
			DKF	SUI			
0505BA2TD	0945	B	BUOW	OS	383018	3872469	occupied BUOW burrow, with sign no owl - white wash & one light brown pellet on apron. suitable for DKF, no sign. semi steep slope (not tortoise). S aspect 8"w x 7"h x >4'd
			DKF	SUI			
0505BA3TD	1037	B	BUOW	OS	383078	3872329	occupied BUOW burrow with sign (white wash on apron) and known DKF den (bleached scat on apron). semi steep slope (not tortoise). NE aspect 8"w x 8"h x >5'd
			DKF	K			
0505BA4TD	1058	B	BUOW	OS	383089	3872289	occupied BUOW burrow with sign (5 pellets on apron) and known DKF den (bleached DKF scat on apron), semi steep slope (not tortoise) long lineal apron. S aspect: 9"w x 9"h x >3'd
			DKF	K			
0505BA5TD	1130	B	BUOW	OS	383128	3872300	occupied BUOW burrow with sign, no live owl (white wash ~~on apron~~ & 5 pellets on apron, additional light brown pellets in burrow) and known DKF den (bleached scat on apron). SE aspect, 4.5"w x 6"h x >3'd, narrows
			DKF	K			

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material, scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/5/23
Recorder: Derek Siver
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0505BA6TD	1305	B	BUOW DKF	OS SUI	383243	3872712	occupied BUOW burrow with sign, no owl (white wash on apron and 3 pellets). Suitable for DKF, no sign. W aspect 7.5"w x 7"h x 3'd curves right
0505BA7TD	1318	B	BUOW	SUI	383226	3872926	soil burrow suitable for BUOW, no sign. S aspect 8"w x 5"h x 7'd semi steep slope into burrow (not tortoise)
0505BA8TD	1340	B	BUOW	OS	383258	3872574	occupied BUOW burrow with sign (white wash on apron, 1 pellet on apron, 1 pellet in burrow. Steep slope (not tortoise). W aspect 8"w x 7"h x 2'd.

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/5/23
Recorder: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas	Time (24 hr)	Start: 0630	End: 1430
Shelby Dunn	Temp* (°F)	Start: 37.5	End: 64.2
Joshua Harris	Wind (mph)	Start: 0-2	End: 2-6
Matt Adams	% Cloud Cover	Start: 40	End: 30

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area D (western side) and Area G2

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

~~white-tailed kite~~
ATFL VERD
BESP WCSP
BTSP TOWA
CORA BTYW
LENI HOLA
WIWA WEWP
WAVI HETH
MODO
WETA
HOFI
LOSH (3812M 3870976)
CATO

black tailed jackrabbit
antelope ground squirrel
coyote (scat & tracks)
california ground squirrel
american badger (digs)

night lizard
common side blotched lizard

Date: 5/5/23
Recorder: S. Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type°	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d"], behavior, etc.)*
10		Sign		Observed			

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, R - roost, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

*BUOW: occupied w/ owl, occupied w/ sign, potential (no sign)

*AB/DKF: known den (fox or sign), potential den (no sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (MCL, Max Width, Width at 7/8 Marginal, Height)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

Date: May 5, 2023
Recorder: Rachel Woodard
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Verity Richardson Rachel Woodard	Time (24 hr)	Start: 0610	End: 1430
	Temp* (°F)	Start: 44	End: 62
	Wind (mph)	Start: 0-3	End: 5-8
	% Cloud Cover	Start: 25%.	End: 35%.

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

C1

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WTSW, CORA, MODO, BESP, CHSP, BTSP, LASP, BRSP, WCSP, ATFL, WIWA, WETA, TOWA, CAQU, WEME, WAVI, LENI, side blotched lizard, gopher snake, coachwhip, yellow backed spiny lizard, black tailed jackrabbit, BUOW (sign - see next page)

Date: May 5, 2023
Recorder: Rachel Woodard
QA/QC by: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type°	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
050508A1VR	0732	B	BUOW	05	381373	3871889	single entrance BUOW burrow (sign - white wash and pellets on apron) 8"w x 4"h x 3'd, curves left, NE aspect
050508A2VR	1030	B	BUOW	05	381339	3871790	Single entrance BUOW burrow (sign - white wash, pellets, and feathers) 5m NW of burrow - multiple pellets beneath Lycium. 8.5"w x 8"h x 4'd curves left, W aspect

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material, scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/8/23
Recorder: J. Perigo
QA/QC by: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee, Jamie Perigo, Rachel, Sara, Wendy	Time (24 hr)	Start: 0760	End: 1440
	Temp* (°F)	Start: 52.2	End: 69.5
	Wind (mph)	Start: 10-12	End: 10-15
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Area E, Area D

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high ground cover consisting of annual vegetation

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

LOSH, ATPL, MODO, black tailed jackrabbit, HOPI, antelope ground squirrel, ~~whipsnake~~, ~~side blotched~~, AMRO, Mojave green rattlesnake, ~~western diamondback rattlesnake~~, WETA, VERD, WCSP, HOLA, CORA, BESP, WEME

great basin whiptail
common side blotched lizard
BUOW - sign, see next page
American badger - sign, see next page

→ pair (384434, 3873491)

Date: 05/08/23
Recorder: J. Perrigo
QA/QC by: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type°	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
050808A1TD	0715	BUOW w/AB sign	B	SUI	384455	3873734	E aspect; 9"x 5"x >2'; soil burrow; curves left; AB claw marks present; dirt clumps present; potential BUOW - no sign present; semi steep slope into burrow (not DETO)
050808A2TD	0914	BUOW	B	OS	384213	3873572	NE aspect; 6.5"x 5"x >3'; soil burrow; occupied BUOW, small amount of white wash present, fragment of bone from prey item; semi steep (not DETO)
050808A3WT	0955	BUOW	B	OS	384125	3873338	W aspect; 7.5"x 6"x 3'; soil burrow; occupied BUOW w/o owl, one pellet present; semi steep (not DETO)
050808A4WT	1252	BUOW DKF	B	SUI SUI	383421	3873088	SW aspect; 9"x 10"x >4'; soil burrow; potential BUOW + DKF, no sign present; located under downed Joshua Tree; wrong size for DETO
050808A3TD	1323	BUOW	B	OS	383410	3872854	SE aspect; 7"x 5"x >4'; soil burrow; occupied BUOW burrow w/sign, one pellet in burrow, white wash on apron; semi steep slope (not DETO)
050808A5WT	1340	BUOW DKF	B	SUI SUI	383385	3873112	N aspect; 10"x 8"x 76'; soil burrow; BUOW & DKF potential burrow; no sign present; not DETO; lots of coyote scat nearby
050808A4TD	1422	BUOW	B	OS	383314	3872681	SE aspect; 7"x 3"x 1'; soil burrow; occupied w/sign for BUOW, white wash on apron + bone fragments from prey item; deteriorated *

Area E

Area D

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 08 MAY 2023 **Desert Tortoise and Burrowing Owl Survey** Project #: 2022-206
Recorder: S. BADEN ECORP Consulting, Inc. Client: Tetra Tech
QA/QL by: Shelby Dunn

AREA E

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type*	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
05D8BA1WT	0717	DKF BUOW	B ~~B~~	SUI SUI	384430	3873722	Abandoned DKF complex - potential DKF + for BUOW - soil, NE aspect ~~8"x4"x2'~~ 8"W x 4"H x 2' D. No BUOW or DKF sign ~~multiple~~ four entrances
~~05D8BA2WT~~		~~BUOW~~					
05D8BA2WT	0823	BUOW	B	SUI	384321	3873307	Suitable BUOW burrow, no sign. soil den S aspect 8"W x 9"H x 3'D No sign present NOT DETO

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good conditlon, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is failing apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/8/23
Recorder: Derek Siver

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas Chelsie Brown Joshua Harris Derek Siver Alivia DeLuze	Time (24 hr)	Start: 0750	End: 1510
	Temp* (°F)	Start: 53.5	End: 72.2
	Wind (mph)	Start: 9-12	End: 7-11
	% Cloud Cover	Start: 0	End: 1%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Gen-tie Study Area
Gen-tie Survey area V2
Medium Volt transmission Area
between Area A and C1, Area A and B, and Area A and B

Pull Site #1a
Pull Site #1b
Pull Site #2a
Pull Site #2b

Pull Site #3
Pull Site #4
Pull Site #5
Pull Site #6

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

High Annual cover, Creosote bush scrub
- Amsinkia sp

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

coachwhip
common side-blotched lizard

antelope ground squirrel
american badger (see- next page)
black tailed jack rabbit

HOLA	WEME
SPTO	NOMO
HOFI	BRSP
ATFI	WIWA
CORA	MODO

Date: 5/8/23
Recorder: Derik Silver
QA/QC by: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc. ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type°	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
050BBA10H	0824	BUOW DKF	B	SUI SUI	383529	3878186	S Aspect 8"wX10"HX>3'D No BUOW or DKF sign Canid scat near Burrow (Coyote). single entry
050BBA2JH	1138	BUOW DKF w/ AB sign	B	SUI SUI	385104	3875120	NW. Aspect. 8"wX7"HX>3'D. Known AB Claw marks on Burrow sidewalls Potential For BUOW/DKF, no sign. single entrance

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/9/2023
Recorder: Rachel Woodard
QA/QC by: Shelby Dunn

Desert Tortoise and Burrowing Owl Survey

SCORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Rachel Jamie Sarah	Time (24 hr)	Start: 0625	End: 1530
	Temp* (°F)	Start: 51.4	End: 67.6
	Wind (mph)	Start: 0-2	End: 6-15
	% Cloud Cover	Start: 0	End: 80%

Project/Site info

Project Name: ALTA Solar	Location: West of Mojave, Southeast of Tehachapi
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Area C1, G1

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high vegetation cover (blooming annuals & shrubs)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

HOLA, ATFL, BTSP, CORA, MODO, LASP, YRWA, WIWA, OSFL, WCSP, LENI, VERD, TOWA, WEWP, CAVI, WTSW, RTHA, NOMO, NOHA, WEME, side blotched lizard, CA ground squirrel, ~~BT jackrabbit~~, gopher snake, great basin whiptail, desert cottontail, Mojave green rattlesnake, black-tailed jackrabbit

LOSH - 3808662 3871654

Date: 9MAY23
Recorder: Rachel Woodard

Desert Tortoise and Burrowing Owl Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

AB/BUOW/DKF/DT Observations

Unique ID	Time (24 hr)	Species	Type°	Class*	Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
050923AM-D	1407	BUOW	B	SUI	379412	3871776	No sign present - suitable for BUOW. NW aspect. 5"w x 4"h x >3'd
							67.6

° LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Form Updated: 3/29/2023

Date: 5/9/2023
Recorder: C. Brown

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas Chelsie Brown Alivia De Luze Jen West	Time (24 hr)	Start: 0640	End: 1510
	Temp° (°F)	Start: 45.8	End: 66.8
	Wind (mph)	Start: 0-3	End: 5-20
	% Cloud Cover	Start: 0	End: 75

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

northern Portion of Candela solar site.
west of 115th St. W.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

desert scrub w/ juniper woodland
high annual vegetation cover

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

GHOW
CORA
WEKI
CAQU
MODO
NOMO
BTSP
RTHA
WEME western side-blotched lizard
yellow backed spiny lizard

Date: 5/9/2023
Recorder: C. Brown

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0509BA1AL	0827	B	BUOW DKF	SUI	377852	3873195	suitable burrow for DKF/BUOW, no sign present. single entrance burrow, SE aspect, 8.5"w x 8.5"h x 6'd. curves right.
0509BA2AL	0906	B	BUOW DKF	SUI	377097	3873177	suitable burrow for DKF/BUOW, no sign present. single entrance burrow. 8"w x 7"h x >4'd, SW aspect. curves right
0509BA3AL	1052	B	BUOW DKF	SUI	377307	3873017	suitable burrow for DKF/BUOW, no sign present. single entrance burrow. 9"w x 8"h x >3'd, SW aspect. steep slope into tunnel

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/9/2023 **Desert Tortoise, Burrowing Owl, Kit Fox Survey** Project #: 2023-101
Recorder: J. Harris ECORP Consulting, Inc. Client: Tetra Tech

Surveyor(s)	Weather Data		
Wendy Turner Joshua Harris Derek Siver	Time (24 hr)	Start: 0615	End: 1420
	Temp° (°F)	Start: 38.8	End: 75.0
	Wind (mph)	Start: 1-4	End: 8-15
	% Cloud Cover	Start: 0	End: 40

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Southern portion
south of Backus Rd. and east of dirt road.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high annual vegetation cover

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

PASP	gopher snake
WEME	long-nosed leopard lizard
CORA	Great Basin whiptail
MODO	mojave rattlesnake
WETA	yellow-backed spiny lizard
HOLA	white-tailed antelope squirrel
CACW	black-tailed jackrabbit
BESP	

Date: 5/9/2023
Recorder: J. Harris

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d"], behavior, etc.)*
USPPAIWT	1046	B	BUOW/DKF	SUI	378228	3868811	suitable BUOW & DKF burrow, no sign, east aspect 7"w x 9"h x 3'd, coyote scat present.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

-Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

-DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/10/2023
Recorder: A. DeLuze

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas Chelsie Brown Alivia De Luze Jon West	Time (24 hr)	Start: 0630	End: 1515
	Temp° (°F)	Start: 51.4	End: 69.1
	Wind (mph)	Start: 20-25	End: 10-20
	% Cloud Cover	Start: 5	End: 1

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

northern portion of Candela
west of 115th West and windswept Ranch property

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high annual vegetation cover

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WCSP
MODO
CAQU
WEME
HOLA
CORA
WIWA
black-tailed jackrabbit
western side-blotched lizard
Great Basin whiptail
California ground squirrel
desert kangaroo rat (carcass)

Date: 5/10/2023
Recorder: A. DeLuze

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
05JUL21AL	1117	B	BUOW DKF w/ badger sign	SUI	377209	3872513	suitable BUOW & DKF burrow, no sign present. single entrance badger burrow w/ claw marks on burrow side walls. S aspect. 8" w x 9" h x > 5'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual. (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/10/23
Recorder: S. Baden

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Jamie Perigo Rachel Woodard Sarah Baden	Time (24 hr)	Start: 0630	End: 1500
	Temp° (°F)	Start: 57.2	End: 76.1
	Wind (mph)	Start: 13-24	End: 10-15
	% Cloud Cover	Start: >5%	End: <5%

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

north of w. Trotter Ave. and west of 110th St. W.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Soils: sandy loam, gravelly, friable
disturbances: past livestock grazing; likely sheep.
burn scar - evidence of old burn. stumps of burned shrubs and dead not recent Joshua trees
vegetation: desert scrub, main species were creosote bush, Joshua tree, rabbit brush (Ericameria sp.), bunch grasses (Stipa sp.)
* very high ? very dense ground cover by Amsinkia sp.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

HOLA	WIWA	domestic sheep (old scat)
LENI	RTHA	
LASP	black-tailed jackrabbit	
PUDO	gophersnake	
CORA	long-nosed leopard lizard	
WERI	Great Basin whiptail	
BRSP	coachwhip	
TOWA	western side-blotched lizard	
WTSW	BUOW	sign at burrows, see next page for details
BUOR	American badger	
SAPH		

Date: 5/10/2023
Recorder: S. Baden

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
05JUBAITD	0910	B	BUOW w/ badger sign	OS	377277	3870156	occuiped (w/ sign, no owl) BUOW burrow. white wash on apron. single-entrance badger burrow (no sign or claw marks). too steep for tortoise. 6"w x 5.5"h >4'd, northeast aspect
05JUBAIDP	1259	B	BUOW/DKF w/ badger sign	SUI	377369	3870261	suitable burrow for BUOW/DKF, no sign. single entrance badger dug den (no claw marks). recently dug. steep slope

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/10/2023 **Desert Tortoise, Burrowing Owl, Kit Fox Survey** Project #: 2023-101
Recorder: W. Turner ECORP Consulting, Inc. Client: Tetra Tech

Surveyor(s)	Weather Data		
Wendy Turner Josh Harris Derek Siver	Time (24 hr)	Start: 0615	End: 1510
	Temp* (°F)	Start: 55	End: 76
	Wind (mph)	Start: 10-25	End: 8-15
	% Cloud Cover	Start: 0	End: 10

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

north of Backus Rd. between 120th St. W. and unnamed dirt Rd. to east

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- Creosote bush scrub
- high annual vegetation cover

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA
MODO
HOLA
BESP
AMGO
WEME
BESP
black-tailed jackrabbit
Great Basin whiptail
yellow-backed spiny lizard
long-nosed leopard lizard
white-tailed antelope squirrel
gopher snake
desert kangaroo rat

Date: 5/10/2023
Recorder: W. Turner

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
			ND	tortoise, BUOW, or DKF detected			

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizi) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/11/2023
Recorder: C. Brown

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas Alivia De Luze Chelsie Brown Jen West	Time (24 hr)	Start: 0630	End: 1510
	Temp* (°F)	Start: 52.9	End: 80.2
	Wind (mph)	Start: 3-13	End: 0-3
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

south of Robert Ranch Rd and Windswept Ranch Property and west of 110th St. W.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high annual vegetation cover

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

LOSH (11S 378594 3871533)
Great Basin whiptail
yellow-backed spiny lizard
gopher snake
western side-blotched lizard
Desert cottontail
white-tailed antelope squirrel
black-tailed jackrabbit
Crotch bumble bee (11S 378071 3871385) on penstemon sp.

CORA
EUST
WEME
HOLA

Date: 5/11/2023
Recorder: C. Brown

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0511BA1AL	0714	B	BUOW DKF	SUI	377550	3871981	suitable BUOW & DKF burrow, no sign present. single entrance burrow w/ steep slope. old tracks (possibly canid) on apron but too deteroriated to determine species NE aspect, 9.5"w x 9"h x >3'd
0511BA2AL	0841	B	BUOW DKF	SUI	377235	3871880	suitable BUOW & DKF burrow, no sign present. single entrance burrow w/ steep slope. curves sharply to left. SE aspect 8"w x 8"h x >2'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex; estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/11/2023
Recorder: S Baden

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Jamie Perigo Rachel Woodard Sarah Baden	Time (24 hr)	Start: 0615	End: 1530
	Temp° (°F)	Start: 53.3	End: 85.0
	Wind (mph)	Start: 0-2	End: 0-3
	% Cloud Cover	Start: 0	End: <5%

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

North of Trotter Ave. & west of 110th St. W.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- sandy & gravelly soils, friable. some sand dunes near 110th St. W.
- tall and dense ground cover consisting of annual vegetation, mainly Amsinkia sp.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA	CAQU
NOMO	LOSH
MODO	western side-blotched lizard
WEME	long-nosed leopard lizard
HOLA	Great Basin whiptail
WERI	white-tailed antelope squirrel
BHGR	BUOW
LASP	desert kit fox } sign at burrows, see next page for details
WIWA	American badger }
CHSP	domestic sheep (old scat)
	domestic cow (skull)

Date: 5/11/2023
Recorder: S. Baden

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
051IBAUP	0744	B	BUOW-DKF	SUI K	377144	3870344	Known (sign present) DKF den & suitable for BUOW (no sign). DKF scat outside entrance, not recent & very bleached. 2 burrows that narrow at end. NE and SW aspects. 9"w x 5"h x 2.5'd, 5"w x 5"h x >2'd
051IBAUP	0923	B	BUOW-DKF	SUI K	377170	3870492	Active natal & known DKF den. Tons of DKF scat (dark & wet, very recent; also old bleached scat) and recent tracks around entrances. Evidence of prey items: feathers and rabbit fur). Vegetation around complex is highly trampled. 9-entrance canid den w/ multiple aspects. 9"w x 6"h x >6'd
051IBAUP	1104	B	BUOW DKF	OS K	378105	3870568	Known DKF den w/ old & bleached scat on apron. Occupied (w/ sign, no owl) BUOW whitewash (pile) and whitewash present; single entrance burrow. SE aspect 11"w x 6"h x >4'd
051IBAUP	1128	B	BUOW w/ badger sign	SUI	378051	3870721	Suitable for BUOW (no sign present) single entrance badger dug den w/ claw marks. NE aspect. 7.5"w x 4"h x 4'd. Fresh apron, curves left.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/11/2023
Recorder: S. Baden

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)
CEL BA2TD	1454	B	BUOW DKF	OS K	378052	3870721	known DKF den w/ old, bleached scat occupied (w/ sign, no owl) BUOW burrow w/ abundant whitewash. single entrance canid den E aspect. 11"w x 8"h x >6'd. very steep slope into burrow. bleached coyote scat near apron

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/11/2023 **Desert Tortoise, Burrowing Owl, Kit Fox Survey** Project #: 2023-101
Recorder: J. Harris ECORP Consulting, Inc. Client: Tetra Tech

Surveyor(s)	Weather Data		
Wendy Turner Josh Harris Derek Siver	Time (24 hr)	Start: 0615	End: 1510
	Temp° (°F)	Start: 48	End: 84
	Wind (mph)	Start: 1-5	End: 3-5
	% Cloud Cover	Start: 0	End: 5

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

west of 120th St. W.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

creosote bush scrub, sparse cover of Junipers in the west.
high annual vegetation cover
sparse perennial cover

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

SCOR	desert night lizard
ATFL	long-nosed leopard lizard
WEKI	black-tailed jack rabbit
WEME	Great Basin whiptail
BESP	
HOLA	
MODO	
CORA	
BRSP	
LASP	

Date: 5/11/2023
Recorder: IN · TURNER

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d"], behavior, etc.)*
							NO tortoise, BUOW, or DKF detected.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart, growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/12/2023 **Desert Tortoise, Burrowing Owl, Kit Fox Survey** Project #: 2023-101
Recorder: C. Brown ECORP Consulting, Inc. Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas Joshua Harris Chelsie Brown Derek Siver	Time (24 hr)	Start: 0615	End: 1005
	Temp° (°F)	Start: 48.3	End: 78.4
	Wind (mph)	Start: 0-3	End: 4-10
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

west of 110th st. W.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

high annual vegetation cover

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

western side-blotched lizard
Great Basin whiptail
long-nosed leopard lizard
White-tailed antelope squirrel
HOLA
CORA
MODO
BTSP
LASP
LCTH

Date: 5/12/2023
Recorder: C. Brown

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d"], behavior, etc.)*
							no live individuals or sign detected

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/12/2023
Recorder: S. Baden

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Rachel Woodard Sarah Baden	Time (24 hr)	Start: 0615	End: 1030
	Temp* (°F)	Start: 54.2	End: 81.8
	Wind (mph)	Start: 1-4	End: 0-4
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

North of W. Trotter Ave. & west of 110th St. W.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- friable sandy loam soils.
- high & dense ground cover consisting of annual vegetation mainly Amsinkia sp.
- areas w/ sand dunes along 110th St. W

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA
NOMO
HOLA
LASP
yellow-backed spiny lizard
western side-blotched lizard
long-nosed leopard lizard
Great Basin whiptail
American badger (claw marks at burrow, see next page for details)
domestic sheep (old scat)

Date: 5/12/2023
Recorder: S. Baden

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
DSERRA1TD	0902	B	BUOW w/ badger sign	SUI	378358	3870763	suitable for BUOW (no sign present) single entrance badger dug burrow w/ claw marks. E aspect. 9.5" w x 6.5" h x >5' d

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/12/2023
Recorder: J. Perigo

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Surveyor(s)	Weather Data		
Wendy Turner Alivia De Luze Jen West Jamie Perigo	Time (24 hr)	Start: 0625	End: 1035
	Temp* (°F)	Start: 56	End: 87
	Wind (mph)	Start: 1-3	End: 1-4
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

north of Backus Rd. and west of 120th St.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WEME
CAQU
MODO
HOLA
Great Basin whiptail
BRSP
western side-blotched lizard
CACW
LOSH (11s 316784 3869418)
CORA

American badger (claw marks at burrow)

Date: 5/12/2023
Recorder: J. Perigo

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
052-PAIWT	1008	B	BUOW DKF w/ badger	SUI sign	376943	3869489	suitable burrow for BUOW & DKF no sign present. single entrance badger burrow w/ claw marks present. fairly fresh apron. NE aspect, 7"w x 8"h x 3'd curves right.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/15/2023
Recorder: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Alden Lovaas Shelby Dunn	Time (24 hr)	Start: 0900	End: 1445
	Temp* (°F)	Start: 88.3	End: 88.2
	Wind (mph)	Start: 1-3	End: 5-12
	% Cloud Cover	Start: <10	End: 55

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

North of Trotter Ave. & west of 110th St. West, south of Robert Ranch Rd.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- Creosote bush scrub and Joshua tree woodland w/ short shrubs (ie., Ericameria sp., Stipa sp, LARTRI), and areas of tall and dense Amsinkia sp.
- gravelly and sandy loam soils
- evidence of burn scar - not recent. burned stumps of shrubs and dead Joshua trees

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CACW
CORA
HOLA
LASP
long-nosed leopard lizard
Great Basin whiptail
western side-blotched lizard
BUOW (pellets at burrow, see next page for details)
desert kit fox (scat at den, see next page for details)
domestic sheep (old scat)

Date: 5/15/2023
Recorder: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d"], behavior, etc.)*
1515RATD	0943	B	DKF BUOW	K SUI	378077	3870851	Known DKF den w/ sign. Suitable for BUOW, no sign present. Lots of DKF scat (bleached) & prey items (rodent skulls) on apron. single entrance canid den, east aspect. 11"w x 7"h x 1.5'd. deteriorating condition & filling in. Evidence of old entrances nearby located on hillside
1515RA2D	1002	B	BUOW DKF	OS K	377539	3870863	Occupied (w/ sign, no owl) BUOW burrow. Known (w/ sign) DKF den old and bleached BUOW pellets & DKF scat on apron. 3-entrence canid den. entrances deteriorating & filling in, overgrown w/ Amsinkia sp. NE aspect, 6"w x 5"h x 1.5'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/16/2023
Recorder: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Alden Lovaas Shelby Dunn	Time (24 hr)	Start: 0615	End: 1530
	Temp* (°F)	Start: 70.5	End: 90.9
	Wind (mph)	Start: 2-6	End: 5-15
	% Cloud Cover	Start: 40	End: 70

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

West of 110th St west, between Trotter Ave. & Robert Ranch Rd.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- creosote bush scrub & Joshua tree woodland w/ large patches of bunch grasses (Stipa sp.) and rabbitbrush (Ericamera sp.) shrubs.
- high vegetation cover including many shrubs & tall & dense annual vegetation (especially Amsinkia sp.)
- Evidence of past fire (not recent)

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

CORA	LOSH (11S 378832 3871252)
HOLA	hummingbird sp.
CACW	BUOW (pellets & whitewash at burrow, see next page for details)
HOFI	desert kit fox (scat at den, see next page for details)
WEME	gophersnake
CUTSW	Great Basin whiptail
LBWO	western side-blotched lizard
BESP	long-nosed leopard lizard
LASP	yellow-backed spiny lizard
MODO	white-tailed antelope squirrel
CAQU	black-tailed jackrabbit

domestic sheep (old scat)

Date: 5/16/2023
Recorder: S. Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
0516BAITD	0748	B	DKF BUOW	K SU1	377600	3871094	Known (w/ sign) DKF den & suitable BUOW burrow (no sign). bleached DKF scat present. 6- entrance canid den complex in deteriorated condition. most entrances overgrown w/ Amsinkia sp. multiple aspects, 7"w x 7"h >3'd
0516BA2TD	0804	B	DKF BUOW	K OS	377005	3871072	Known (w/ sign) DKF den & occupied (w/ sign, no owl) BUOW burrow. bleached & dark brown DKF scat & BUOW whitewash & pellets on/around apron & inside burrow. single entrance canid den. E aspect 9"w x 9"h x >4'd. curves right
0516BA3TD	1113	B	BUOW DKF	SU1	377371	3871166	Suitable for BUOW & DKF, no sign present. single entrance burrow in bank of wash. den filling in, N aspect. 14"w x 10"h x >2'd

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Form Updated: 3/29/2023

Date: 5/17/2023
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

2022-206
Project #: 2023-101
Client: Tetra Tech

Surveyor(s)	Weather Data			
Taylor Dee Alden Lovaas Shelby Dunn	Time (24 hr)	Start: 0615	End: 1430
	Temp° (°F)	Start: 67.3	End: 94.6
	Wind (mph)	Start: 0-2	End: 6-13
	% Cloud Cover	Start: 0	End: 15

Project/Site info

Project Name: Candela & ALTA	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101, 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Candela
- 7 acre parcel (474-072-04) SE of LA Aqueduct Rd. & west of 100th St. W
- 40.6 acre parcel (474-172-13) west of 110th St. W. and between Trotter Ave. and Backus Rd.

ALTA
- windswept Ranch property (40.6 acre) off 115th St. W and Robert Rarch Rd.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- creosote bush scrub
- annual vegetation providing lots of ground cover. Very tall and dense patches of Amsinkia sp. present especially on windswept Ranch property.
- windswept Ranch is an exotic animal farm, open to the public and has off leash dogs. Large manure piles, canid digs, and CA ground squirrel burrows present

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

HOLA	California ground squirrel
EESP	white-tailed antelope squirrel
WEME	black-tailed jackrabbit
HOFI	desert cottontail
CORA	
EUST	
MODO	
HOSP	

Great Basin whiptail
yellow-backed spiny lizard
western side-blotched lizard

Date: 5/17/2023
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
			no	live	BUOW,	DKF,	or tortoise,
			or	their	sign	was	observed

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/18/2023
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Shelby Dunn	Time (24 hr)	Start: 0630	End: 1300
	Temp* (°F)	Start: 79.1	End: 97.7
	Wind (mph)	Start: 4-8	End: 2-8
	% Cloud Cover	Start: 0	End: 10

Project/Site info

Project Name: Candela	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2023-101	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

South of W. Trotter Ave. and off 120th St. W.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- Joshua tree woodland & creosote bush scrub
- sandy loam/gravelly friable soils
- high & sometimes dense ground cover consisting of annual vegetation, especially Amsinkia sp.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

HOLA
NOMO
RTHA
LASP
WEME
ATFL
CACW
CORA
LOSH (UTS 376795 3869708)
Great Basin whiptail

western side-blotched lizard
Coachwhip
yellow-backed spiny lizard

Date: 5/18/2023
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
		No live tortoises, BUOW, or DKF or their sign was observed					

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5/23/2023
Recorder: T. Dec

Incidental Special-status Wildlife Observations

ECORP Consulting, Inc.

Project #: 2023-101
Client: Tetra Tech

Project/Site Info

Project Name: Candela	County: Kern
Project #: 2023-101	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Is site staked or marked? [Y] ([N])	

Special-status Wildlife Incidentally Observed during Non-wildlife Surveys

Observer Name	Date (MM/DD/YYYY)	Time (24 hr)	Species	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., observation type, quantity, behavior, class, etc.)*
S. Wagner	05/11/2023	1115	Crotch BB	377885	3872278	1 crotch bumble bee nectaring on Chrysactus sp. Observed during rare plant survey.
L. Simpson	5/12/2023	0932	LOSH	377218	3873115	1 loggerhead shrike flying over. Observed during rare plant survey.

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 9/25/23
Recorder: D. Jagues

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Wendy Turner Daniel Jagues	Time (24 hr)	Start: 0615	End: 1332
	Temp° (°F)	Start: 61	End: 68
	Wind (mph)	Start: 0-2	End: 1-4
	% Cloud Cover	Start: 0	End: 10

Project/Site info

Project Name: Discovery	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Large extra parcel at South end. Started on E. side, worked W.
- South of Backus Road
- 120th Stree West runs through parcel

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Creosote bush scrub, Relatively flat. Evidence of sheep/goat grazing, Offroad users observed nearby, Minor trash. Sandy Soils, Dirt Roads Cross site.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

MODO
WCSP
CORA
AMFA
AESP
LENI
Great basin whiptail

Date: 9/25/23
Recorder: D. Jaques

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
							No Data collected or Observed

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 9/26/23
Recorder: D. Jaques

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
W. Turney	Time (24 hr)	Start: 0620	End: 1340
D. Jaques	Temp° (°F)	Start: 53.2	End: 92
	Wind (mph)	Start: 0-1	End: 1-3
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: Discovery	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

Southern most parcel, middle third.
- South of Backus Road
- 120th Street West runs through parcel

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Sandy Soils, Dirt Roads ~~[illegible]~~ minor trash. Slight slope from N to S. primarily Creosote bush scrub w/ large patch in middle of parcel containing mainly buckwheat, + void of almost all creosote.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

LOSH (11S 376943/3867859) Perched on Joshua tree calling.
MoDo
Cactus wren
Common raven
Bell's sparrow
Great basin whiptail
Side blotched lizard
Leopard Tortoise (carcass) 11S 376788, 3868370, adult female, Recently died, head missing, blood fresh. Lots of flies, small maggots. Only visible injuries were the missing head.

Date: 9/26/23
Recorder: D. Jaques

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
							No target species observed or detected

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 9/27/23
Recorder: D. Jaques

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Wendy Turner Daniel Jaques	Time (24 hr)	Start: 0630	End: 1345
	Temp° (°F)	Start: 59	End: 87.5
	Wind (mph)	Start: 0-2	End: 1-3
	% Cloud Cover	Start: 10	End: 40

Project/Site info

Project Name: Discovery	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] ([N])	Transect spacing: 10 meters

Area(s) Surveyed

Finished Southern most parcel (Western third). Surveyed parcel immediately N. of Southern most Parcel, as well as the "L" shaped parcel above it. Began surveying Western most parcel, started on W. side, working east.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Parcels surveyed today (other than Southern most) contained primarily Red + white buckwheat, and Cheesebush as dominant veg cover. Scattered Creusite + Joshua tree present, but few + far between. Sandy soils with a slight slope from North to South, One area had a mini camp ground established w/ picnic table, Shade structure + bathroom. Evidence of off Roading. ~~But generally undisturbed.~~

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

Common raven
Modo
Ash-throated Flycatcher
wesme
Horned Lark
rock wren
White tailed Antelope squirrel
Great basin whiptail
Side blotch Lizard

Date: 9/27/23
Recorder: D. Jaques

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
							No target species Observed or Detected.

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/28/23
Recorder: D. Jaques

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Wendy Turner Daniel Jaques	Time (24 hr)	Start: 0635	End: 1340
	Temp* (°F)	Start: 58.6	End: 92
	Wind (mph)	Start: 1-3	End: 1-3
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: Discovery	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

Finished larger Rectangle To West, Began on yellow and Red parcels adjacent to each other.

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

primarily Disturbed Buckwheat scrub. Red-white Buckwheat is main cover with patches of cheesebush. Sandy Soils. Evidence of off Roading, Slight Slope from NW to SE and S.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

Logger Head Shrike 11S 376417 3869227 Heard calling
MODO
CORA
HOLA
WEME
WCSP
Great basin whiptail
Desert spiney lizard
Black-tailed Jack rabbit
White tailed antelope squirrel
Side-blotched lizard

Date: 9/28/23
Recorder: D. Sovos

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d"], behavior, etc.)
0928BA1W1	0957	B	BUOW	SUI	376620	3869248	Suitable burrow complex for burrowing owl and DKF. NO sign. Old complex w/3 suitable burrows and several collapsed. All burrows are overgrown w/ veg. and debris, soils are hard and compact. No sign of recent use. Representative burrow is 10" W x 12" H x 3' deep. curves to right out of site
			Desert Kit fox	SUI			

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

***TORTOISE BURROW / PALLET**

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

***TORTOISE SCAT**

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material, scaly appearance
5 - Bleached or consisting only of plant fiber

***LIVE TORTOISE** (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks
A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

***TORTOISE CARCASS**

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered
A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 28 Sept 2023
Recorder: E. McLean

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Covaas Shelby Dunn Eliza McLean	Time (24 hr)	Start: 0645	End: 1415
	Temp° (°F)	Start: 61.3	End: 85.6
	Wind (mph)	Start: 5-15	End: 3-8
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: Discovery	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]*	Transect spacing: 10 meters

Area(s) Surveyed

81 Acres added to Discovery on 9/26/23, South of oak Creek Road, Near the wind turbines

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

- Creosote bush Scrub, Joshua tree Woodland, and Cheesebush Scrub

Large and dense Creosote bush (4'-8' tall) and a lot of Joshua trees present outside the fenced wind turbine area. A lot of 2'-3' tall shrubs including cheesebush, winterfat, cholla, buckwheat, Mojave aster, white bursage. Friable soils, good for digging.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

BESP
BGGN
LOSH
CACW
HOFI
ROWR
UPTO
sideblotched lizard
coachwhip, great basin whiptail

Date: 28 Sep 2023
Recorder: E. McLean

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
092BSAIAL	0725	B	BUOW	SUI	384856	3874917	suitable burrow for DKF + BUOW, no sign obs, single entrance, NE aspect, 8" w x 7.5" h x >3ft D, very large sandy apron, burrow is under a fallen Joshua tree
		B	DKF	SUI			
092BBA2AL	0751	B	BUOW	SUI	384962	3875069	suitable burrow for DKF + BUOW, no sign obs, single entrance, curves to the right, very steep slope, SE aspect, 8.5" w x 9" h x >3' d
		B	DKF	SUI			

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 9/29/23
Recorder: A. Drough

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
A. Drough W. Turner D Jaques	Time (24 hr)	Start: 0635	End: 1135
	Temp° (°F)	Start: 59.9	End: 84
	Wind (mph)	Start: 1-3	End: 0-2
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: Discovery	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

finished area started yesterday
- South of Tatter Ave & West of 110th Street West
- Parcel added 9/26/23

large square at N end of Project site
- South of Robert Ranch road and West of 110th Street West
- Parcel added 9/26/23

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Creosote bush scrub with Joshua tree characteristically present
+
Creosote bush scrub w/ areas of disturbance + patches of Eriogonum fasciculatum scrub

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

RTHA
white-tailed antelope squirrel
side blotched lizard
MODU
CORA
ROPI
Night lizard
desert spiny lizard
whiptail
GHOW

Date: 9/29/23
Recorder: A. Drough

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d"], behavior, etc.)*
092916A1WT	0842	B	BUOW	SUI	378747	3871658	Suitable burrow for BUOW, no sign present; complex with 5 entrances with multiple aspects; representative burrow is 8" w x 8" h x 2+' deep; located under a large Lycium cooperi; fresh aprons present - most likely squirrel
092916A2WT	0903	B	BUOW	SUI	378734	3871999	suitable burrow for BUOW; no sign present; complex with 2 suitable entrances - other entrances not suitable for BUOW (too small); located under large Lycium cooperi; fresh apron present at 1 entrance, representative burrow 6" w x 6" h x 2+' deep
092916A3WT	1056	B	BUOW	SUI	378479	3871764	suitable burrow for BUOW; no sign present; single burrow, N aspect 6" w x 6" h x 3+' deep; fresh apron; located under debris in disturbed area; 3 entrances within 10m

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

*TORTOISE BURROW / PALLET	*TORTOISE SCAT
1 - Currently active, w/tortoise or recent sign	1 - Wet or freshly dried, obvious odor
2 - Good condition, definitely tortoise, no evidence of recent use	2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Deteriorated condition (describe), definitely tortoise	3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Good condition, possibly tortoise (describe)	4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Deteriorated condition, possibly tortoise (describe)	5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)		*TORTOISE CARCASS	
1 - Healthy	A - Foraging	1 - Fresh or putrid	A - signs of predation
2 - URTD	B - Basking	2 - Normal color, scutes adhered to bone	B - No signs of predation
3 - Shell Cracked	C - In burrow	3 - Scutes peeled off bone	
4 - Peeling scutes	D - Digging	4 - Shell bone is falling apart; growth rings on scutes are peeling	
5 - Ticks	E - Traveling	5 - Disarticulated and scattered	

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 29 Sep 2023
Recorder: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas	Time (24 hr)	Start: 0940	End: 1055
Shelby Dunn	Temp° (°F)	Start: 59.2	End: 77.3
Eliza McLean	Wind (mph)	Start: 7-20	End: 3-5
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: Discovery	Location: Southeast of Tehachapi, Northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

- 36 acres of the parcel added to Discovery on 9/26/23, South of Oak creek Road, North of the wind turbines
- 7.5 acres of the parcels added to Discovery on 9/26/23, South of Robert Ranch
- 5.2 acres previously part of Galaxy added on 9/5/23 - South of Oak creek road, North of the railroad tracks

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Gen-the area: Creosote bush scrub, Joshua tree woodland and cheesebush scrub. large creosotes (4'-6' tall) with other shrubs present including cheese bush, white burrsage & winterfat. Disturbed areas associated w/ Railroad tracks and wind turbine facilities. Friable soils, good for digging. large desert wash located in this area.

West of Tehachapi Willow Springs Road: Creosote bush scrub and Rubber rabbit brush scrub Creosote bushes are widely scattered w/ other low growing shrubs present including white-burrsage, Cheesebush, winterfat, and rubber rabbit brush. Past grazing on site and more nonnative vegetation including Mustard sp. and erodium.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

HOFI Western Sideblotched lizard
CACW
RAWR Great Basin whiptail
CORA
SASP
WCSP
BGGN
SPTO
LEGO

Date: 09/29/23
Recorder: Shelby Dunn

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-087
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments (i.e., burrow aspect & dimensions [w" x h" x d"], behavior, etc.)
1929BA1AL	0719	B	BUOW	SUI	384784	3876914	~~Suitable~~ Soil burrow suitable for DKF and BUOW. No sign is present for either species. Single entrance. 6"W x 5"H x >3'D E aspect
			DKF	SUI			
0929BA2AL	0846	B	BUOW	SUI	384671	3876814	Single entrance soil burrow suitable for DKF and BUOW. No sign is present. S aspect 8"W x 7"H x >4'd
			DKF	SUI			

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 5 Oct 23
Recorder: C. Warwick

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Alden Lovaas Carter Warwick	Time (24 hr)	Start: 0715	End: 0945
	Temp° (°F)	Start: 59.5	End: 75.8
	Wind (mph)	Start: 2-5	End: 2-5
	% Cloud Cover	Start: 0	End: 0

Project/Site info

Project Name: Discovery	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

20 Acres South west of Tehachapi Willow Springs Road
(layer named EKL 2023 0924)

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Crosote bush scrub (5-6 ft tall) w/ Trimble Sandy loam Soils. Areas w/ desert washes running through the site. Annual cover includes Amsinkia, erodium, dove weed, Eriogonum spp. Vinegar weed. Disturbances include trash dumping, concrete pads, old fencing and Power lines present on site

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

RoWR

CoRA

SoSp

HoFI

BESp

WCSp

White-tailed antelope squirrel

Western side blotched lizard

Date: 5 oct 23
Recorder: C. Warwick

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2022-206
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
No	Sign	observed					

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

CO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart, growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
-Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)
-DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/11/2024 **Desert Tortoise, Burrowing Owl, Kit Fox Survey** Project #: 2022-206
Recorder: Ari Naiman ECORP Consulting, Inc. Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Verity Richardson Ari Naiman	Time (24 hr)	Start: 0730	End: 1630
	Temp° (°F)	Start: 63.1	End: 89.4
	Wind (mph)	Start: 0-1	End: 3-8
	% Cloud Cover	Start: 0%	End: 0%

Project/Site info

Project Name: Discovery	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] (N)	Transect spacing: 10 meters

Area(s) Surveyed

- Gen-tie north and south of oak creek road
- parcels along Tehachapi Willow Springs road

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Disturbed due to non-native plants, adjacent development (paved road w/ high speed traffic, wind turbines, power lines, transmission lines, live stock grazing). Creosote, bush scrub, and Joshua Tree woodland with high annual and perennial tree cover.

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

Pronghorn
CORA
LOSH (34.97794758, -118.31002126)
CACW
WEME
WCSP
MODO
GRRO
CAQU

Long-nose leopard lizard
Whiptail
side-blotched lizard
desert cottontail
California ground squirrel
White tailed antelope squirrel

Date: 4/11/2024 **Desert Tortoise, Burrowing Owl, Kit Fox Survey** Project #: 2022-206
Recorder: A. Nalmark ECORP Consulting, Inc. Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d"], behavior, etc.)*
041184NR	1545	B	BUOW	SUI	378294	3871749	6"W x 5"H x 1'D, SE aspect, California ground squirrel burrow complex under Lycium sp. shrub. SE entrance, large, enough for BUOW

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

***SIGN & OBSERVATION CLASSIFICATIONS**

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate
OO - occupied (w/ live owl)
OS - occupied (w/ sign, no owl)
K - known den (w/ sign)

***TORTOISE BURROW / PALLET**

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

***TORTOISE SCAT**

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

***LIVE TORTOISE** (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

***TORTOISE CARCASS**

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:
-Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)
-Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual (Gopherus agassizii) (USFWS 2009)
-DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Date: 4/12/24
Recorder: T. Dee

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.
ENVIRONMENTAL CONSULTANTS

Project #: 2022-206
Client: Tetra Tech

Surveyor(s)	Weather Data		
Taylor Dee Joshua Harris Verity Richardson Ari Naiman	Time (24 hr)	Start: 0715	End: 1400
	Temp° (°F)	Start: 63.1	End: 79.3
	Wind (mph)	Start: 0-1	End: 10-15
	% Cloud Cover	Start: 5	End: 0

Project/Site info

Project Name: Discovery	Location: West of Mojave, Southeast of Tehachapi, northwest of Rosamond
Project #: 2022-206	County: Kern
Is site staked or marked? [Y] [N]	Transect spacing: 10 meters

Area(s) Surveyed

- Along LA Aquiduct
- Parcel South of Tehachapi Willow Springs road,

Site Characteristics (e.g., elevation, soils, land uses, land forms, disturbances, vegetation)

Creosote bush scrub and bunch grass scrub. High native shrub and annal cover. Friable sandy loam and gravely soils.
Disturbances included power lines, transmission liner, vehicle traffic

Wildlife Observations (specify if burrow, scat, tracks, carcass, vocalization, nest, or other)

WCSP	White-tailed antelope squirrel
WTSW	Western side-blotched lizard
CACW	Whiptail
WEME	Long nose leopard lizard
BRSP	Kingbird sp.
RTHA	
MODO	
LOSH (11S 379203, 3870433)	
CORA	
NOMO	

Date: 4-12-24
Recorder: J. Harris

Desert Tortoise, Burrowing Owl, Kit Fox Survey

ECORP Consulting, Inc.

Project #: 2023-087
Client: Tetra Tech

Burrowing owl (BUOW), Desert kit fox (DKF), and Desert tortoise (DT) Observations

Unique ID	Time (24 hr)	Type*	Species	Class*	11 S Easting UTM NAD83	11 S Northing UTM NAD83	Comments *(i.e., burrow aspect & dimensions [w" x h" x d'], behavior, etc.)*
041224A1VR	1206	B	BUOW	SUI	383346	3873492	8" x 7" x 24', curves to the right, no sign present, single entrance Soil burrow

* LI - live individual(s), B - burrow/den, P - Pallet, S - scat, Tr - tracks, C - carcass, N - nest, O - other (specify)

*SIGN & OBSERVATION CLASSIFICATIONS

SUI - suitable burrow/den for BUOW or DKF; includes subterranean holes, atypical dens/burrow surrogate

OO - occupied (w/ live owl)

OS - occupied (w/ sign, no owl)

K - known den (w/ sign)

*TORTOISE BURROW / PALLET

1 - Currently active, w/tortoise or recent sign
2 - Good condition, definitely tortoise, no evidence of recent use
3 - Deteriorated condition (describe), definitely tortoise
4 - Good condition, possibly tortoise (describe)
5 - Deteriorated condition, possibly tortoise (describe)

*TORTOISE SCAT

1 - Wet or freshly dried, obvious odor
2 - Dry w/glaze and some odor, no bleaching, dark brown
3 - Dry, no glaze/odor, light brown, tightly packed, signs of bleaching
4 - Dry, very light brown to yellow, loose material; scaly appearance
5 - Bleached or consisting only of plant fiber

*LIVE TORTOISE (sex, estimate age/MCL)

1 - Healthy
2 - URTD
3 - Shell Cracked
4 - Peeling scutes
5 - Ticks

A - Foraging
B - Basking
C - In burrow
D - Digging
E - Traveling

*TORTOISE CARCASS

1 - Fresh or putrid
2 - Normal color, scutes adhered to bone
3 - Scutes peeled off bone
4 - Shell bone is falling apart; growth rings on scutes are peeling
5 - Disarticulated and scattered

A - signs of predation
B - No signs of predation

SOURCES:

~Tortoise scat and carcass class definitions taken from Preparing for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise (USFWS 1992)

~Tortoise burrow class definitions taken from Desert Tortoise (Mojave Population) Field Manual: (Gopherus agassizii) (USFWS 2009)

~DKF and BUOW sign classifications taken from Staff Report on Burrowing Owl Mitigation (CDFW 2012) and San Joaquin Kit Fox Survey Protocol for the Northern Range (USFWS 1999)

Habitat Assessment			
Mapped Burrow ID (take photo)	**Species**	**Dimensions (height, width, depth)**	**Sign Observed (tracks, feathers, pellets, carcass, white wash, or other items, etc.)**
0903BA1LJ	BUOW potential burrow, DKF potential den	8"w x 8"h x >36"d	Single entrance burrow, no BUOW or DKF sign.
0904BA1LJ	BUOW potential burrow, DKF potential den	9"w x 7"h x >36"d	Single entrance burrow, no BUOW or DKF sign.
0904BA2LJ	BUOW potential burrow, DKF potential den	12"w x 7"h x >36"d	Single entrance burrow, no DKF sign. One BUOW pellet on burrow apron.
0904BA3LJ	BUOW potential burrow, DKF potential den	10"w x 6"h x >36"d	Single entrance burrow, no DKF sign. One BUOW pellet on burrow apron.
0904BA4LJ	BUOW potential burrow, DKF potential den	7"w x 12"h x >36"d	Single entrance burrow, no BUOW or DKF sign.
0904BA5LJ	BUOW potential burrow, DKF potential den	6"w x 7"h x >12"d	Single entrance burrow, no BUOW or DKF sign.
0904BA6LJ	BUOW potential burrow, DKF potential den	6"w x 7"h x >12"d	Single entrance burrow, no BUOW or DKF sign.
0904BA7LJ	BUOW potential burrow, DKF potential den	5"w x 7"h x >12"d	Single entrance burrow, no DKF sign. One BUOW pellet on burrow apron.
Comments			
Habitat assessment was conducted on September 3-4, 2025.			

This page intentionally left blank.

Appendix D2
Botanical Inventory Report

This page intentionally left blank.

BOTANICAL INVENTORY REPORT

Discovery Solar PV and Storage Project
Kern County, California

October 2025

Prepared for

Discovery Solar PV and Storage, LLC
11455 El Camino Real # 160
San Diego, CA 92130

Prepared by

TETRA TECH
5383 Hollister Avenue, Suite 130
Santa Barbara, CA 93111

This page intentionally left blank.

EXECUTIVE SUMMARY

Botanical surveys were performed for the proposed Discovery Solar PV and Storage Project (Project). Although the Project site is approximately 7,700 acres, a larger 8,606-acre Study Area was surveyed that encompasses the 7,700-acre Project site, the proposed generation tie line corridor, and temporary offsite construction laydown yard. Surveys were performed in spring and summer of 2023 and 2024 during the appropriate blooming periods to document the presence or absence of rare plant species and California Desert Native Plants Act species within the Study Area (Figure 1). An additional survey was performed in fall 2025 within acres that had previously not been surveyed, focused primarily on mapping California Desert Native Plant Act species.

Three rare plant species were observed during surveys, including few-flowered woolly-star (*Eriastrum sparsiflorum*), adobe yampah (*Perideridia pringlei*), and western Joshua tree (*Yucca brevifolia*). Few-flowered woolly-star and adobe yampah have a California Rare Plant Rank (CRPR) of 4.2 and 4.3, respectively. Western Joshua tree is a state candidate species under the California Endangered Species Act (CESA). As of the date of this report, the California Fish and Game Commission has not determined whether to list western Joshua tree under CESA. State candidate species are awarded the same protections as listed species in California. Approximately 579 few-flowered woolly-star individuals and 110 adobe yampah individuals were observed in the Study Area. Western Joshua trees were present in the Study Area; mapping results are provided in a separate report.

Three California Desert Native Plants Act species were observed: beavertail cactus (*Opuntia basilaris* var. *basilaris*), beavertail pricklypear (*Opuntia basilaris*), and silver cholla (*Cylindropuntia echinocarpa*). A total of 1,293 beavertail cactus individuals, 2 beavertail pricklypear individuals, and 4,699 silver cholla individuals were mapped.

Nine natural vegetation communities were classified and mapped in the Study Area. Of these, two are sensitive natural communities: desert needlegrass grassland and scalebroom scrub. Desert needlegrass grassland is a sensitive natural community with a rarity ranking in California of S2 (imperiled) and scalebroom scrub is a sensitive natural community with a rarity ranking in California of S3 (vulnerable).

Potential impacts to rare plants and sensitive natural communities can be reduced through the implementation of recommended avoidance and minimization measures, as described below.

- Prior to conducting vegetation clearing or similar activities, a qualified biologist or their designee will perform a pre-construction visual survey of the area to determine if rare plants and/or California Desert Native Plant Act species are present. Daily reports of these inspections shall be retained by the Qualified Biologist and provided to the Kern County Planning and Natural Resources Department or the California Department of Fish and Wildlife (CDFW) upon request. If rare plant species are observed, and have not otherwise been accounted for in an approved removal action, they shall be delineated with stakes and/or flagged for avoidance to the extent feasible.

- Applicant will pay the required fee to Kern County to remove silver cholla, beavertail cactus, and beavertail pricklypear in accordance with the California Desert Native Plant Act prior to construction activities.
- In September 2020, western Joshua tree was designated a candidate species under the CESA. If, at the commencement of Project construction, western Joshua tree is either still a candidate species, or has been listed as threatened, or endangered under CESA, and avoidance of western Joshua tree individuals is infeasible, the Applicant will consult with CDFW regarding the take of western Joshua tree and comply with all avoidance, minimization, and compensatory mitigation measures, as set forth in any incidental take permit issued to the project by CDFW. Documentation of any such CDFW take authorization and mitigation will be provided to the Kern County Planning and Natural Resources Department.

Table of Contents

1.0 INTRODUCTION 1

2.0 PROJECT DESCRIPTION AND LOCATION 1

3.0 DEFINITIONS AND REGULATORY SETTING 2

4.0 LITERATURE REVIEW 3

4.1 Methods 3

4.1.1 Precipitation 3

4.1.2 Soil Types 3

4.1.3 Rare Plant Species 3

4.2 Results 3

4.2.1 Precipitation 3

4.2.2 Soil Types 3

4.2.3 Rare Plant Species 4

5.0 BOTANICAL SURVEYS 13

5.1 Methods 13

5.1.1 Rare Plant Species 13

5.1.2 California Desert Native Plant Act Species 13

5.1.3 Vegetation Communities 14

5.2 Results 17

5.2.1 Rare Plant Species 17

5.2.2 California Desert Native Plant Act Species 18

5.2.3 Vegetation Communities 19

6.0 DISCUSSION AND SUMMARY OF RECOMMENDATIONS 22

7.0 REFERENCES 23

Tables

Table 1. Soil Types 4
Table 2. Rare Plant Species with Potential to Occur in the Study Area 5
Table 3. Vegetation Community Mapping and Botanical Surveys 15
Table 4. Rare Plant Species Observed 17
Table 5. California Desert Native Plants Observed in the Study Area 18
Table 6. Vegetation Communities 19

Figures

Figure 1. Regional Overview
Figure 2. Project Location
Figure 3. USGS Topographic Map
Figure 4. Rare Plants
Figure 5a. California Desert Native Plants – Silver Cholla
Figure 5b. California Desert Native Plants – Beavertail Cactus & Beavertail Pricklypear
Figure 6a. Vegetation Communities
Figure 6b. Vegetation Communities

Appendices

Appendix A: Photographs
Appendix B: Plants Observed in the Study Area

Acronyms/Abbreviations

Applicant	Discovery Solar PV and Storage, LLC
BIOS	Biogeographic Information and Observation System
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
EAFB	Edwards Air Force Base
Esri	Environmental Systems Research Institute
IPaC	Information for Planning and Consultation
gen-tie	generation tie line
GPS	Global Positioning System
kV	kilovolt
LADWP	Los Angeles Department of Water and Power
MW	megawatt
NASA	National Aeronautics and Space Administration
NRCS	Natural Resources Conservation Service
Project	Discovery Solar PV and Storage Project
PV	photovoltaic
quad	quadrangle
SCE	Southern California Edison
SR	State Route
UPRR	Union Pacific Railroad
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

This page intentionally left blank.

1.0 INTRODUCTION

Tetra Tech was retained by Discovery Solar PV and Storage, LLC (Applicant) to conduct botanical surveys for the proposed Discovery Solar PV and Storage Project (Project). This Botanical Inventory Report presents the methodology, results, and recommendations from surveys conducted for the Project during spring, summer, and fall from 2023 to 2025. The region in which the Study Area is located received above average precipitation in 2023 and 2024; therefore, these were suitable years to detect rare plants in the Mojave Desert.

2.0 PROJECT DESCRIPTION AND LOCATION

The Project includes development of a photovoltaic (PV) solar facility and associated infrastructure necessary to generate up to 1,400 megawatts (MW) of renewable electrical energy with up to 8 gigawatt-hours of energy storage capacity (approximately 1,000 MW) on an approximately 7,700-acre Project site in an unincorporated area of southeastern Kern County, California. Approximately 2,426 acres within the 7,700-acre Project site are designated for zone changes only and would not be disturbed (Figure 1).

Main components of the Project consist of PV solar panels, a power collection system, including medium-voltage lines that connect the solar facilities, inverters, a switchyard, foundations, and transformers that will be installed onsite. Associated Project infrastructure includes an operations and maintenance facility, telecommunication facilities, energy storage system(s), up to three onsite collector substations, interconnection and transmission systems, and temporary laydown yards. The Project may be constructed in multiple phases.

The Project will interconnect to the existing Windhub Substation, which is owned and operated by Southern California Edison (SCE). The interconnect will be via a newly constructed 230-kilovolt (kV) gen-tie line (gen-tie) that will extend north from the Project site towards the Windhub Substation from on-site collector substations. A portion of the Project 230-kV gen-tie would be co-located within an existing gen-tie corridor (controlled by the Applicant and/or its affiliates). A high-voltage switchyard located immediately north of the Union Pacific Railroad (UPRR) rail line will also be constructed.

The Project is generally on undeveloped and privately owned land, along the northern edge of the Antelope Valley. The Project site is located approximately 6 miles southwest of the unincorporated community of Mojave, approximately 9 miles southeast of the City of Tehachapi, and approximately 8 miles northwest of the unincorporated community of Rosamond. State Route (SR)-58 is north of the Project site, SR-14 is east of the Project site, and Tehachapi Willow-Springs Road runs between the Project site's boundaries (Figure 1). A network of existing named and unnamed dirt roads traverses the Project site. The Los Angeles Department of Water and Power (LADWP) aqueduct roughly bisects the Project site (Figures 2 and 3). On-site, adjacent, and nearby uses include renewable energy development, rural residential development, livestock grazing, heavy industrial and mining uses, and undeveloped lands. The Project site is regularly used for sheep (*Ovis aries*) grazing and sheep were observed onsite. Elevations across the Project site are relatively flat, ranging from approximately 2,970 to 3,760 feet above mean sea level. The Project site is located within the *Monolith, Willow*

Springs, and *Soledad Mountain* U.S. Geological Survey (USGS) 7.5-Minute Topographic Quadrangles (quads).

3.0 DEFINITIONS AND REGULATORY SETTING

Rare plants are defined as plants that are recognized and protected by federal agencies and state agencies, including:

- Species listed or proposed for listing as threatened or endangered, or are candidates for listing under the federal Endangered Species Act or California Endangered Species Act (CESA);
- Species that meet the definitions of rare or endangered under California Environmental Quality Act Section 15380;
- Plants considered rare, threatened, or endangered in California by the California Native Plant Society (CNPS) and are assigned a California Rare Plant Rank (CRPR); and
- Species designated by the California Department of Fish and Wildlife (CDFW) as state Rare Plants.

Species protected under the California Desert Native Plants Act (California Food and Agricultural Code Sections 80072 and 80073) are defined as:

- All species of Burseraceae family (elephant tree)
- *Carnegiea gigantea* (sahuaro cactus)
- *Ferocactus acanthodes* (barrel cactus)
- *Castela emoryi* (crucifixion thorn)
- *Dudleya saxosa* (panamint dudleya)
- *Pinus longaeva* (bristlecone pine)
- *Washingtonia filifera* (fan palm)
- All species of the family Agavaceae (century plants, nolinas, yuccas)
- All species of the family Cactaceae (cacti)
- All species of the family Fouquieriaceae (ocotillo, candlewood)
- All species of the genus *Prosopis* (mesquites)
- All species of the genus *Cercidium* (palos verdes)
- *Acacia greggii* (catclaw)
- *Atriplex hymenelytra* (desert-holly)
- *Dalea spinosa* (smoke tree)
- *Olneya tesota* (desert ironwood), including both dead and live desert ironwood

All plants from the cactus family that are not a rare, threatened, or endangered species are protected under the California Desert Native Plants Act and Kern County Food and Agricultural Code. A harvest permit from Kern County is required prior to harvesting or destroying any living individual, or the living or dead parts of any individual of a California Desert Native Plants Act species.

Western Joshua tree (*Yucca brevifolia*) is a state candidate species under CESA. Under the Western Joshua Tree Conservation Act, western Joshua tree is exempt from the California Desert Native Plants Act permit requirement.

Natural communities considered sensitive are identified by the CDFW (CDFW 2023). Natural communities are ranked statewide (S) 1 through 5 based on NatureServe's methodology (NatureServe

2024). Sensitive natural communities are defined as vegetation alliances and associations with rarity ranking of S1, S2, or S3, with the following definitions:

- S1: Critically imperiled at very high risk of extirpation due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.
- S2: Imperiled at high risk of extirpation due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.
- S3: Vulnerable at moderate risk of extirpation due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

4.0 LITERATURE REVIEW

This section describes the literature search used for the botanical surveys.

4.1 Methods

4.1.1 Precipitation

Precipitation data from the National Aeronautics and Space Administration (NASA) climatology station at Edwards Air Force Base (EAFB) were reviewed (NASA 2024).

4.1.2 Soil Types

Soils data from the United States Department of Agriculture Natural Resources Conservation Service Web Soil Survey were reviewed (USDA NRCS 2024).

4.1.3 Rare Plant Species

Prior to conducting botanical surveys within the Study Area, queries of the CDFW California Natural Diversity Database (CNDDB) RareFind 5 (CDFW 2024a), CDFW's Biogeographic Information and Observation System (BIOS) (CDFW 2024b), Calflora's California plants database (Calflora 2024), CNPS Electronic Inventory of Rare and Endangered Plants (CNPS 2024), and U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) (USFWS 2024) were performed. These queries were used to identify rare plants that have the potential to occur within the Study Area.

4.2 Results

4.2.1 Precipitation

At EAFB between January and December 2023, approximately 6.47 inches of precipitation were received. The annual precipitation from 2023 is higher than the average annual precipitation from 1994 to 2023 of 4.61 inches (NASA 2024). Surveys were performed during years when rare plants and other biological resources would be expected to be found if present.

4.2.2 Soil Types

Soils found in the Study Area primarily consisted of friable loamy sand and sandy loam soil types. The Study Area includes 13 types of soil (Table 1).

Table 1. Soil Types

Soil Type	Study Area	
	Acres	Percent
Adelanto loamy sand, 2 to 5 percent slopes	290	3
Cajon loamy sand, 2 to 9 percent slopes	1,289	15
Greenfield sandy loam, 2 to 9 percent slopes	409	5
Hanford coarse sandy loam, 2 to 9 percent slopes	300	4
Ramona coarse sandy loam, 5 to 9 percent slopes	740	9
Ramona sandy loam, 9 to 30 percent slopes, eroded	29	<1
Arizo gravelly loamy sand, 2 to 9 percent slopes	18	<1
Cajon loamy sand, 0 to 5 percent slopes	3,271	38
Cajon gravelly loamy sand, 0 to 9 percent slopes	1,056	12
Garlock loamy sand, 2 to 9 percent slopes	830	10
Randsburg sandy loam, 2 to 15 percent slopes	245	3
Rosamond clay loam	127	1
Torriorthents-Rock outcrop complex, very steep	2	<1
Total	**8,606**	**100**

4.2.3 Rare Plant Species

Literature review results identified the rare plant species listed in Table 2 as having potential to occur within the Study Area. This list of rare plant species was developed by querying a nine-quad search centered on the Study Area in the CNPS Rare Plant Inventory database (CNPS 2024), querying the Study Area in the Calflora database (Calflora 2024), and querying the Study Area with a 5-mile buffer in CNDDB and BIOS (CDFW 2024a, 2024b). The following USGS quads were searched in the CNPS Rare Plant Inventory database: *Soledad Mountain, Sanborn, Rosamond Lake, Rosamond, Bissell, Mojave, Willow Springs, Monolith,* and *Little Buttes*. Rare plants that only occur within habitat that is not found within the Study Area (e.g., only found in cismontane woodland) or within elevations higher or lower than the Study Area were not included in Table 2. In Table 2, the potential to occur for each species has been reviewed and updated based on the results of the field survey. Only species with a potential to occur category of "Observed" were found in the Study Area during 2023-2025 botanical surveys. Species with potential to occur categories of "Low," "Moderate," or "High" were not observed during 2023-2025 botanical surveys in the Study Area. The following potential to occur categories are used in Table 2:

- Low: recent records of the species do not exist in the vicinity of the Study Area and there is limited suitable habitat.
- Moderate: recent records of the species exist in the vicinity of the Study Area or suitable habitat is present.
- High: recent records of the species exist in the vicinity of the Study Area and suitable habitat is present.
- Observed: the species was observed during Project-specific surveys.

Table 2. Rare Plant Species with Potential to Occur in the Study Area

Scientific Name	Common Name	Federal Status	State Status	Habitat/Blooming Period	Potential to Occur	Botanical Survey Results
Plants						
Allium howellii var. *howellii*	Howell's onion	None	CRPR 4.3	Valley and foothill grassland 50-2,200 meters (165-7,220 feet) March to April	Low. Howell's onion occurs in the *Monolith* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of Howell's onion occur in the CDFW CNDDB (CDFW 2024). Preferred soil type for this species is serpentine soil on grassy slopes. Although some grasslands occur in the Study Area, the Study Area lacks the preferred habitat of this species. Due to a lack of preferred habitat within the Study Area (e.g., valley grassland), Howell's onion has a low potential to occur within the Study Area.	Absent
Astragalus hornii var. *hornii*	Horn's milkvetch	None	CRPR 1B.1	Meadows and seeps, playas 60-850 meters (195-2,790 feet) May to October	Low. Horn's milkvetch occurs in the *Little Buttes* and *Willow Springs* quads in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 6 miles south of the Study Area in 1931, and the closest most recent occurrence is 55 miles northwest in 2013 (CDFW 2024). This species is typically observed growing on salty flats and lake shores at an elevation of 60 to 850 meters (195 to 2,790 feet), which is lower than the Study Area elevation. Although some meadow habitat in the form of grasslands occurs in the Study Area, the Study Area lacks the preferred habitat of this species. Due to a lack of preferred habitat and elevation, Horn's milkvetch has a low potential to occur within the Study Area.	Absent
Calochortus striatus	Alkali mariposa lily	None	CRPR 1B.2	Chaparral, chenopod scrub, meadows and seeps, Mojavean desert scrub 70-1,595 meters (230-5,235 feet) April to June	Moderate. Alkali mariposa lily occurs in the *Little Buttes, Bissell, Rosamond, Rosamond Lake, Sanborn, Soledad Mtn.,* and *Willow Springs* quads in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of alkali mariposa lily are listed in the CDFW CNDDB (CDFW 2024). However, alkali mariposa lily was observed in high numbers at a location approximately 9.5 miles west of the Study Area (Tetra Tech 2025). This species prefers alkaline meadows and moist creosote-bush scrub. The Study Area meets the habitat and elevation requirements of this species. Therefore, alkali mariposa lily has a moderate potential to occur within the Study Area.	Absent

Scientific Name	Common Name	Federal Status	State Status	Habitat/Blooming Period	Potential to Occur	Botanical Survey Results
Camissonia kernensis ssp. kernensis	Kern County evening-primrose	None	CRPR 4.3	Chaparral, Joshua tree woodland, pinyon and juniper woodland 790-2,130 meters (2,590-6,990 feet) March to May	Moderate. Kern County evening-primrose occurs in the *Mojave* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of Kern County evening-primrose occur in the CDFW CNDDB (CDFW 2024). This species prefers sandy slopes and flats, which were found in the Study Area in Joshua tree woodland and California juniper woodland vegetation communities. The Study Area meets the habitat and elevation requirements of this species. Therefore, Kern County evening-primrose has a moderate potential to occur within the Study Area.	Absent
Canbya candida	White pygmy-poppy	None	CRPR 4.2	Joshua tree woodland, Mojavean desert scrub, pinyon and juniper woodland 600-1,460 meters (1,970-4,790 feet) March to May	Moderate. White pygmy-poppy occurs in the *Rosamond, Rosamond Lake, Bissell,* and *Mojave* quads in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 9 miles northeast of the Study Area from 1935, and the closest most recent occurrence is 38 miles north in 1995 (CDFW 2024). This species is typically observed growing in sandy places. The Study Area meets the habitat and elevation requirements of this species. Therefore, white pygmy-poppy has a moderate potential to occur within the Study Area.	Absent
Castilleja plagiotoma	Mojave paintbrush	None	CRPR 4.3	Great Basin scrub, Joshua tree woodland, lower montane coniferous forest, pinyon and juniper woodland 300-2,500 meters (985-8,205 feet) April to June	Moderate. Mojave paintbrush occurs in the *Monolith* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of Mojave paintbrush occur in the CDFW CNDDB (CDFW 2024). This species prefers dry sagebrush scrub and pinyon woodland. The Study Area meets the habitat and elevation requirements of this species. Therefore, Mojave paintbrush has a moderate potential to occur within the Study Area.	Absent

Scientific Name	Common Name	Federal Status	State Status	Habitat/Blooming Period	Potential to Occur	Botanical Survey Results
Chorizanthe spinosa	Mojave spineflower	None	CRPR 4.2	Chenopod scrub, Joshua tree woodland, Mojavean desert scrub, playas 6-1,300 meters (20-4,265 feet) March to July	Moderate. Mojave spineflower occurs in all quads searched except for the *Monolith* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of Mojave spineflower occur in the CDFW CNDDB (CDFW 2024). However, Mojave spineflower was observed at a location approximately 9.5 miles west of the Study Area (Tetra Tech 2025). This species prefers sandy or gravelly soil types, which were found on the Study Area in allscale, brittle bush, California buckwheat, cheesebush, creosote bush, rubber rabbitbrush, and scalebroom scrub, as well as Joshua tree woodland. The Study Area meets the habitat and elevation requirements of this species. Therefore, Mojave spineflower has a medium potential to occur within the Study Area.	Absent
Delphinium recurvatum	Recurved larkspur	None	CRPR 1B.2	Chenopod scrub, cismontane woodland, valley and foothill grassland 3-790 meters (10-2,590 feet) March to June	Low. Recurved larkspur occurs in the *Soledad Mtn.* quad in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 8 miles southeast of the Study Area in 2011 (CDFW 2024). This species prefers poorly drained, fine, alkaline soils in grassland and saltbush scrub habitat, which is a type of Mojavean desert scrub. The preferred elevation of this species is lower than the elevation of the Study Area. Therefore, recurved larkspur has a low potential to occur within the Study Area.	Absent
Dudleya abramsii ssp. calcicola	Limestone dudleya	None	CRPR 4.3	Chaparral, pinyon and juniper woodland 500-2,600 meters (1,640-8,530 feet) April to August	Moderate. Limestone dudleya occurs in the *Monolith* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of limestone dudleya occurs in the CDFW CNDDB (CDFW 2024). This species prefers open, rocky, granite or limestone outcrops. The Study Area meets the habitat and elevation requirements of this species. Therefore, limestone dudleya has a moderate potential to occur within the Study Area.	Absent
Eriastrum rosamondense	Rosamond eriastrum	None	CRPR 1B.1	Chenopod scrub, vernal pools 700-1,175 meters (2,295-3,855 feet) April to May	Moderate. Rosamond eriastrum occurs in the *Rosamond* and *Rosamond Lake* quads in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 13 miles southeast of the Study Area in 2010 (CDFW 2024). This species prefers flat alkali plains, hard-packed sandy soil among low hummocks, and alkaline scrub. The Study Area meets the habitat and elevation requirements of this species. Therefore, Rosamond eriastrum has a medium potential to occur within the Study Area.	Absent

Scientific Name	Common Name	Federal Status	State Status	Habitat/Blooming Period	Potential to Occur	Botanical Survey Results
Eriastrum sparsiflorum	Few-flowered woolly-star	None	CRPR 4.3	Chaparral, cismontane woodland, Great Basin scrub, Joshua tree woodland, Mojavean desert scrub, pinyon, and juniper woodland 1,075-1,710 meters (3,525-5,610 feet) May to September	Observed. Few-flowered woolly-star was observed during 2023 surveys along a wash that runs through the Study Area. It also occurs in the *Monolith* and *Willow Springs* quads in the CNPS Rare Plant Inventory database (CNPS 2024). Few-flowered woolly-star prefers open sunny areas on flats, hillsides, small washes, floodplains, and disturbed areas. An estimated 579 individuals of this species were observed within the Study Area in 2023.	Present
Eriastrum tracyi	Tracy's eriastrum	None	Rare, CRPR 3.2	Chaparral, cismontane woodland, valley, and foothill grassland 315-1,780 meters (1,035-5,840 feet) May to July	Moderate. Tracy's eriastrum occurs in the *Monolith* quad in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 13 miles northwest of the Study Area in 1910, and the closest most recent occurrence is 20 miles north in 2010 (CDFW 2024). This species is typically observed in shale barrens, open hillsides, ridge tops, flats, floodplains, dry washes, and disturbed areas. The Study Area meets the habitat and elevation requirements of this species. Therefore, Tracy's eriastrum has a moderate potential to occur within the Study Area.	Absent
Eriophyllum mohavense	Barstow woolly sunflower	None	CRPR 1B.2	Chenopod scrub, Mojavean desert scrub, playas 500-960 meters (1,640-3,150 feet) March to May	Moderate. Barstow woolly sunflower occurs in the *Sanborn* and *Rosamond Lake* quads in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 14 miles northwest of the Study Area in 2015 (CDFW 2024). This species prefers creosote bush-scrub habitat, which is a type of Mojavean desert scrub. The Study Area meets the habitat and elevation requirements of this species. Therefore, Barstow woolly sunflower has a moderate potential to occur within the Study Area.	Absent
Gilia interior	Inland gilia	None	CRPR 4.3	Cismontane woodland, Joshua tree woodland, lower montane coniferous forest 700-1,700 meters (2,295-5,580 feet) March to May	Moderate. Inland gilia occurs in the *Little Buttes* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of inland gilia occurs in the CDFW CNDDB (CDFW 2024). This species prefers rocky slopes, open woodland, and scrub habitats. The Study Area meets the habitat and elevation requirements of this species. Therefore, inland gilia has a moderate potential to occur within the Study Area.	Absent

Scientific Name	Common Name	Federal Status	State Status	Habitat/Blooming Period	Potential to Occur	Botanical Survey Results
Goodmania luteola	Golden goodmania	None	CRPR 4.2	Mojavean desert scrub, meadows and seeps, playas, valley and foothill grassland 20-2,200 meters (65-7,220 feet) April to August	Moderate. Golden goodmania occurs in the *Rosamond, Rosamond Lake,* and *Mojave* quads in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of golden goodmania occur in the CDFW CNDDB (CDFW 2024). This species prefers clay soils. One small area of the Study Area may contain clay soils. This small area within the Study Area meets the habitat and elevation requirements of this species. Therefore, golden goodmania has a moderate potential to occur within the Study Area.	Absent
Layia heterotricha	Pale-yellow layia	None	CRPR 1B.1	Cismontane woodland, coastal scrub, pinyon and juniper woodland, valley and foothill grassland 300-1,705 meters (985-5,595 feet) March to June	Moderate. Pale-yellow layia occurs in the *Mojave* and *Monolith* quads in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 1 mile northwest of the Study Area in 2016 (CDFW 2024). Preferred soil types for this species are clay and sandy soils that may or may not be alkaline in open areas. The Study Area meets the habitat and elevation requirements of this species. Therefore, pale-yellow layia has a moderate potential to occur within the Study Area.	Absent
Loeflingia squarrosa var. artemisiarum	Sagebrush loeflingia	None	CRPR 2B.2	Desert dunes, Great basin scrub, Sonoran desert scrub 700-1,615 meters (2,295-5,300 feet) April to May	Moderate. Sagebrush loeflingia occurs in the *Soledad Mtn., Rosamond,* and *Rosamond Lake* quads in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 10 miles east of the Study Area in 1998, and the closest most recent occurrence is 32 miles southeast in 2003 (CDFW 2024). This species is typically observed growing in sand, gravelly hills, mesas, dunes, and disturbed areas. The Study Area meets the habitat and elevation requirements of this species. Therefore, sagebrush loeflingia has a moderate potential to occur within the Study Area.	Absent

Scientific Name	Common Name	Federal Status	State Status	Habitat/Blooming Period	Potential to Occur	Botanical Survey Results
Monardella exilis	Mojave monardella	None	CRPR 4.2	Chenopod scrub, desert dunes, Great Basin scrub, Joshua tree woodland, lower montane coniferous forest, Mojavean desert scrub, pinyon and juniper woodland 600-2,050 meters (1,970-6,725 feet) April to September	Moderate. Mojave monardella occurs in the *Little Buttes, Rosamond, Rosamond Lake, Soledad Mtn.,* and *Mojave* quads in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of Mojave monardella occur in the CDFW CNDDB (CDFW 2024). This species prefers washes, desert scrub, and pinyon woodland habitats. The Study Area meets the habitat and elevation requirements of this species. Therefore, Mojave monardella has a moderate potential to occur within the Study Area.	Absent
Nemacladus secundiflorus var. robbinsii	Robbins' nemacladus	None	CRPR 1B.2	Chaparral, valley and foothill grassland 350-1,700 meters (1,150-5,580 feet) April to June	Low. Robbins' nemacladus does not occur in the nine quads searched in the CNPS Rare Plant Inventory database; however, observations of Robbin's nemacladus in the CNPS Rare Plant Inventory database have occurred within the nine-quad radius (CNPS 2024). The closest occurrence is 32 miles southwest of the Study Area in 1978 (CDFW 2024). This species is typically observed growing on dry, gravelly slopes. Due to a lack of preferred habitat and recent observation records, Robbins' nemacladus has a low potential to occur within the Study Area.	Absent
Perideridia pringlei	Adobe yampah	None	CRPR 4.3	Chaparral, cismontane woodland, coastal scrub, pinyon and juniper woodland 300-1,800 meters (985-5,905 feet) April to June	Observed. Adobe yampah was observed during 2023 surveys in the western section of the Study Area. It occurs in the *Monolith* and *Willow Springs* quads in the CNPS Rare Plant Inventory database and the closest record is approximately 3 to 4 miles from the Study Area (CNPS 2024). Approximately 110 adobe yampah individuals were identified growing on a slope along a dry streambed. Adobe yampah typically grows along grassy slopes and in serpentine outcrops.	Present

Scientific Name	Common Name	Federal Status	State Status	Habitat/Blooming Period	Potential to Occur	Botanical Survey Results
Puccinellia simplex	California alkali grass	None	CRPR 1B.2	Chenopod scrub, meadows and seeps, valley and foothill grassland, vernal pools 2-930 meters (5-3,050 feet) March to May	Low. California alkali grass occurs in the *Rosamond Lake* quad in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 18 miles southeast of the Study Area in 1995 (CDFW 2024). This species prefers saline flats and mineral springs. The Study Area meets the elevation requirement of this species. However, the Study Area lacks its preferred habitat. Therefore, California alkali grass has low potential to occur within the Study Area.	Absent
Saltugilia latimeri	Latimer's woodland-gilia	None	CRPR 1B.2	Chaparral, Mojavean desert scrub, pinyon and juniper woodland 400-1,900 meters (1,310-6,235 feet) March to June	High. Latimer's woodland-gilia grass occurs in the *Monolith* quad in the CNPS Rare Plant Inventory database (CNPS 2024). The closest occurrence is 2 miles west of the Study Area in 2014 (CDFW 2024). This species prefers rocky or sandy substrate in washes. The Study Area meets the habitat and elevation requirements of this species. Therefore, Latimer's woodland-gilia has high potential to occur within the Study Area.	Absent
Syntrichopappus lemmonii	Lemmon's syntrichopappus	None	CRPR 4.3	Chaparral, Joshua tree woodland, pinyon and juniper woodland 500-1,830 meters (1,640-6,005 feet) April to May	Moderate. Lemmon's syntrichopappus grass occurs in the *Willow Springs* quad in the CNPS Rare Plant Inventory database (CNPS 2024). No observations of Lemmon's syntrichopappus occurs in the CDFW CNDDB (CDFW 2024). This species prefers open, sandy or gravelly areas in chaparral, Joshua tree woodland, and pinyon/juniper woodland habitats. The Study Area meets the habitat and elevation requirements of this species. Therefore, Lemmon's syntrichopappus has a moderate potential to occur within the Study Area.	Absent
Yucca brevifolia	Western Joshua tree	None	Candidate threatened, CBR	Chaparral, Mojavean desert scrub, Joshua tree woodland 400-2,300 meters (1,310-7,545 feet) March to May	Observed. Western Joshua trees were present in the Study Area. Although observed during surveys, individual trees were not mapped. Western Joshua tree was included in the CNPS Rare Plant Inventory database nine-quad search; however, the database lacks information on western Joshua tree and the locations of its occurrences (CNPS 2024). This is because western Joshua tree was considered for a CNPS CRPR and was ultimately rejected. Western Joshua trees were most prevalent within creosote bush scrub habitat, with individuals present sporadically throughout the rest of the Study Area.	Present

Federally listed endangered: an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.
State candidate: a native species or subspecies of bird, mammal, fish, amphibian, reptile, or plant that has been formally noticed as being under review by CDFW for listing. Candidate threatened species are temporarily given the same protection as state-listed threatened species under the California Endangered Species Act.
State rare: a species, subspecies, or variety that although not presently threatened with extinction is in such small numbers throughout its range that it may become endangered if its present environment worsens.

CRPR = California Rare Plant Rank:
1B = Plants rare, threatened, or endangered in California and elsewhere.
2B = Plants rare, threatened, or endangered in California but more common elsewhere.
3 = Plants about which more information is needed (Review List).
4 = Plants of limited distribution (Watch List).
0.1 = Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat).
0.2 = Moderately threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat).
0.3 = Not very threatened in California (less than 20% of occurrences threatened / low degree and immediacy of threat or no current threats known).
CBR = Considered But Rejected

5.0 BOTANICAL SURVEYS

This section describes the field methods and results of the botanical surveys.

5.1 Methods

Although the Project site is approximately 7,700 acres, a larger 8,606-acre Study Area was surveyed that encompasses the 7,700-acre Project site, the proposed generation tie line corridor, and temporary offsite construction laydown yard. Botanical surveys were conducted between April 3 to May 16, 2023, June 6 to 21, 2023, April 8 to 12, 2024, June 3 to 5, 2024, and September 3 to 4, 2025. The Study Area was visually surveyed using transects spaced 20 meters apart. Table 3 provides vegetation community mapping and botanical surveys dates and personnel. Appendix B lists plant species observed in the Study Area during the vegetation community mapping from 2022 to 2025 and botanical surveys in 2023, 2024, and 2025.

5.1.1 Rare Plant Species

Biologists conducted surveys in consideration of the following protocols and guidelines:

- Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants (USFWS 2000);
- Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities (CDFW 2018); and
- CNPS Botanical Survey Guidelines (CNPS 2001).

Plant species observed in the Study Area were identified to the lowest taxonomic level necessary to determine if any were a rare species using a dichotomous key (The Jepson Herbarium 2024; Hickman and Jepson 1993; Baldwin et al. 2012). If a rare plant species was detected, its location or extent was recorded and a count of individuals was taken. Specifically, individual rare plants of the same species within 7 meters of one another were mapped as one polygon, or population, using an iPad or tablet running the Environmental Systems Research Institute (Esri) ArcGIS Field Maps software paired with an external sub-meter Global Positioning System (GPS) device. Rare plant individuals not within 7 meters of another individual of the same species were mapped as a separate point or polygon. For large populations, the number of individuals was estimated based on observed density. Two surveys were conducted, one survey from April to May and a second in June in both 2023 and 2024, to capture the blooming periods of the potential rare plants in the Study Area. An additional botanical survey was performed in September 2025 within areas of the Project site that were previously not surveyed. This survey was performed primarily with the purpose of mapping California desert native plant species. While western Joshua tree was present in the Study Area, individuals were not mapped as part of the botanical survey effort.

5.1.2 California Desert Native Plant Act Species

Counts of species listed in the California Desert Native Plants Act, excluding western Joshua tree, were collected during surveys to facilitate the Desert Native Harvest Permits. Species protected by the

California Desert Native Plants Act were documented with an iPad or tablet running Esri Field Maps software paired with an external sub-meter GPS device. The health status of individuals protected by the California Desert Native Plants Act was assessed and representative photos are included in Appendix A. Four health statuses were defined:

- **Healthy:** A majority of the plant has green foliage or chlorophyll. Some small signs of stress may be present but there is no indication that the specimen will perish in the imminent future.
- **Degraded:** The specimen has green foliage; however, about 50 percent or more of the plant is under stress (discolored foliage/pests/damage, etc.). In Cactaceae, specimens may have cholla wood (skeleton) or deceased/diseased pads. The imminent survival of the specimen is uncertain.
- **Appears Dead:** The specimen has no green foliage or chlorophyll. The specimen does have a discolored or yellow epidermis, and/or sections of exposed wood. It appears dead but has a small chance of resprouting if conditions change. Some specimens may have fallen or partially collapsed but have potential to vegetate from branches that are now lying on the ground.
- **Dead:** The specimen has no green or yellow foliage or chlorophyll. A majority of the plant has exposed woody tissue with remnants of the epidermis, but no signs of potential life or resprouting are present. It is not expected to resprout. Many specimens at this stage have collapsed completely or partially fallen.

5.1.3 Vegetation Communities

Vegetation communities within the Study Area were documented and mapped in November 2022, July 2023, January 2024, and September 2025 at a minimum mapping unit of 10 acres. Biologists conducted surveys in consideration of the following protocols and guidelines:

- Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants (USFWS 2000);
- Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities (CDFW 2018); and
- CNPS Botanical Survey Guidelines (CNPS 2001).

Vegetation communities were classified to the alliance level and followed the *Manual of California Vegetation Online* and the *Manual of California Vegetation, Second Edition* (CNPS 2025, Sawyer et al. 2009). The vegetation community data were collected electronically using Esri Field Maps software.

Table 3. Vegetation Community Mapping and Botanical Surveys

Survey	Date	Biologists	Notes
Vegetation Community Mapping	November 3-4, 2022 November 7-11, 2022 July 6, 2023 January 2024 September 3-4, 2025	Carley Adams Alexandra Dorough Greg Hampton Lauren Jennings Reena Lam Ari Naiman	
Botanical Survey 1	April 3-7, 2023 April 10-14, 2023 April 17-21, 2023 April 24-28, 2023 May 1-5, 2023 May 8-12, 2023 May 15-16, 2023	Carley Adams Nikki Bottum Chelsie Brown Alexandra Dorough Greg Hampton Joshua Harris Sam Harrison Daniel Jacques Lauren Jennings Julie Kaplan Reena Lam Carla Marriner Madison Panzino Jamie Perigo Victoria Prado Brant Primrose Lauren Simpson Corrina Tapia Sara Townsend Sarah Wagner Elisha Yacko	First survey effort for plant species with a bloom period from April to May 2023.

Survey	Date	Biologists	Notes
Botanical Survey 2	June 6-9, 2023 June 12-16, 2023 June 19-21, 2023	Carley Adams Richie C. Carmen David Alexandra Dorough Joshua Harris Sam Harrison Daniel Jacques Lauren Jennings Reena Lam Victoria Prado Brant Primrose Sarah Wagner	Second survey effort for plants with a June bloom period..
Botanical Survey 3	April 8-12, 2024	Carley Adams Alexandra Dorough Joshua Harris Lauren Jennings	Third survey effort for plant species with a bloom period in April for areas not surveyed in 2023.
Botanical Survey 4	June 3-5, 2024	Alexandra Dorough Joshua Harris Lauren Jennings Eliza McLean	Fourth survey effort for plants with a June bloom period for areas not surveyed in 2023.
Botanical Survey 5	September 3-4, 2025	Lauren Jennings Ari Naiman	Fifth survey effort for areas not surveyed in 2023 or 2024 focused primarily on mapping California Desert Native Plant Act species.

5.2 Results

5.2.1 Rare Plant Species

Three rare plant species were observed in the Study Area, including few-flowered woolly-star (*Eriastrum sparsiflorum*), adobe yampah (*Perideridia pringlei*), and western Joshua tree. Few-flowered woolly-star and adobe yampah are not federally listed but have a CRPR of 4.2 and 4.3, respectively. Western Joshua tree is a state candidate species under CESA.

A total of 579 few-flowered woolly-star individuals were mapped during the second survey effort in June 2023 (Figure 4). In total, 18 few-flowered woolly-star populations were mapped as points and 10 populations were mapped as polygons east of Tehachapi Willow Springs Road. Populations of few-flowered woolly-star that were mapped as points ranged from 1 to 10 individuals, while populations mapped as polygons ranged from 5 to 200 individuals. All observations of few-flowered woolly-star occurred within the Project site. Few-flowered woolly-star was observed in creosote bush scrub and disturbed creosote bush scrub vegetation communities.

One population of adobe yampah was observed along a hillside within the Study Area and outside of the Project site (Figure 4). This population was mapped as a polygon and consisted of approximately 100 adobe yampah individuals. A second small population consisting of 10 individuals was observed in the western portion of the Study Area within the Project site. These populations were observed during the first survey effort from April to May 2023. A total of 110 adobe yampah individuals were observed and mapped. The adobe yampah populations were located within the California juniper woodland and rubber rabbitbrush vegetation communities.

Western Joshua trees were present in the Study Area but were not quantified during the botanical surveys. Western Joshua trees were present in all natural vegetation communities and were most prevalent within creosote bush scrub and cheesebush scrub.

More details on the rare plant species observed in the Study Area are provided in Table 4.

Table 4. Rare Plant Species Observed

ID	Common Name	Scientific Name	Date Observed	Vegetation Community	Count
1	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 8, 2023	Creosote bush scrub	1
2	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 9, 2023	Creosote bush scrub	1
3	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 9, 2023	Creosote bush scrub	1
4	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 9, 2023	Creosote bush scrub	2
5	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 12, 2023	Creosote bush scrub	1
6	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 12, 2023	Creosote bush scrub	1
7	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 12, 2023	Creosote bush scrub	7
8	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 12, 2023	Creosote bush scrub	1
9	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 12, 2023	Creosote bush scrub	3
10	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 13, 2023	Disturbed creosote bush scrub	10
11	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 14, 2023	Disturbed creosote bush scrub	1
12	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 14, 2023	Disturbed creosote bush scrub	1
13	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 14, 2023	Creosote bush scrub	8

ID	Common Name	Scientific Name	Date Observed	Vegetation Community	Count
14	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 14, 2023	Creosote bush scrub	2
15	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 14, 2023	Creosote bush scrub	6
16	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 14, 2023	Creosote bush scrub	1
17	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 14, 2023	Disturbed creosote bush scrub	1
18	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 16, 2023	Creosote bush scrub	3
19	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 9, 2023	Creosote bush scrub	16
20	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 9, 2023	Creosote bush scrub	75
21	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 9, 2023	Creosote bush scrub	100
22	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 12, 2023	Creosote bush scrub	12
23	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 12, 2023	Creosote bush scrub	200
24	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 13, 2023	Creosote bush scrub	52
25	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 14, 2023	Disturbed creosote bush scrub	30
26	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 14, 2023	Creosote bush scrub	9
27	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 16, 2023	Creosote bush scrub	29
28	few-flowered woolly-star	*Eriastrum sparsiflorum*	June 16, 2023	Creosote bush scrub	5
29	adobe yampah	*Perideridia pringlei*	May 17, 2023	Rubber rabbitbrush scrub	10
30	adobe yampah	*Perideridia pringlei*	May 23, 2023	California juniper woodland, rubber rabbitbrush scrub	100

5.2.2 California Desert Native Plant Act Species

Three cactus species were observed in the Study Area, including silver cholla (*Cylindropuntia echinocarpa*), beavertail cactus (*Opuntia basilaris* var. *basilaris*), and beavertail pricklypear (*Opuntia basilaris*).

Within the Study Area, 4,699 silver cholla individuals were mapped, as well as 1,293 beavertail cactus individuals and 2 beavertail pricklypear individuals (Figures 5a and 5b). Silver cholla and beavertail cactus were most dense in the western and eastern portions of the Study Area. Beavertail pricklypear was only found in one small area within the western portion of the Study Area. Table 5 provides more details on the health status of cacti subject to the California Desert Native Plants Act.

Table 5. California Desert Native Plants Observed in the Study Area

Health	Silver Cholla (*Cylindropuntia echinocarpa*)	Beavertail Cactus (*Opuntia basilaris* var. *basilaris*)	Beavertail Pricklypear (*Opuntia basilaris*)	Total
Appears Dead	1,145	Not Applicable	Not Applicable	1,127
Dead	388	133	0	519
Degraded	659	186	0	797
Healthy	2,507	974	2	3,253
Total	**4,699**	**1,293**	**2**	**5,696**

The majority (approximately 53 percent of silver cholla, 75 percent of beavertail cactus, and 100 percent of beavertail pricklypear) of the cacti observed were healthy. Approximately 33 percent of the silver cholla and 10 percent of the beavertail cactus individuals observed were recorded as appears

dead or dead. The "appears dead" health category does not apply to beavertail cactus or beavertail pricklypear since these species do not resprout when they die. Therefore, if a beavertail cactus or beavertail pricklypear individual had no signs of life, it was marked as dead.

5.2.3 Vegetation Communities

Table 6 lists the vegetation communities found and their acreage within the Study Area. Results of the vegetation mapping are shown in Figures 6a and 6b. Representative photographs of the Study Area are provided in Appendix A.

Table 6. Vegetation Communities

Vegetation Communities	Acres within Study Area
Allscale scrub (*Atriplex polycarpa* Shrubland Alliance)	20
Brittle bush scrub (*Encelia farinosa* Shrubland Alliance)	206
California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii* Shrubland Alliance)	465
California juniper woodland (*Juniperus californica* Woodland Alliance)	354
Cheesebush scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance)	773
Creosote bush scrub (*Larrea tridentata* Shrubland Alliance)	5,737
Desert needlegrass grassland (*Stipa speciosa* Herbaceous Alliance)[CDFW SNC S2]	246
Developed	57
Disturbed	35
Disturbed creosote bush scrub	340
Rubber rabbitbrush scrub (*Ericameria nauseosa* Shrubland Alliance)	344
Scalebroom scrub (*Lepidospartum squamatum* Shrubland Alliance)[CDFW SNC S3]	29
Total	**8,606**

CDFW SNC = California Department of Fish and Wildlife Sensitive Natural Community
S2 = Imperiled at high risk.
S3 = Vulnerable at moderate risk.

Nine natural vegetation communities were found within the Study Area: allscale scrub (*Atriplex polycarpa* Shrubland Alliance), brittle bush scrub (*Encelia farinosa* Shrubland Alliance), California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii* Shrubland Alliance), California juniper woodland (*Juniperus californica* Woodland Alliance), cheesebush scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance), creosote bush scrub (*Larrea tridentata* Shrubland Alliance), desert needlegrass grassland (*Stipa speciosa* Herbaceous Alliance), rubber rabbitbrush scrub (*Ericameria nauseosa* Shrubland Alliance), and scalebroom scrub (*Lepidospartum squamatum* Shrubland Alliance). Two sensitive natural communities occur in the Study Area: desert needlegrass grassland and scalebroom scrub. Desert needlegrass grassland is a sensitive natural community with a rarity ranking in California of S2 (imperiled) and scalebroom scrub is a sensitive natural community with a rarity ranking in California of S3 (vulnerable). The three other communities within the Study Area contained developed and disturbed areas and disturbed creosote bush scrub.

Mojavean desert scrub habitat, including allscale scrub, brittle bush scrub, California buckwheat scrub, cheesebush scrub, creosote bush scrub, rubber rabbitbrush scrub, and scalebroom scrub, was

found in the Study Area. Chenopod scrub habitat, including allscale scrub, was also found in the Study Area.

Vegetation communities as well as disturbed and developed areas observed within the Study Area are described below:

Allscale scrub (*Atriplex polycarpa* Shrubland Alliance): This alliance is dominated by allscale, which comprises more than 2 percent absolute cover and more than 50 percent relative cover in the shrub canopy. Other plant species present in this community include creosote bush (*Larrea tridentata*) and winterfat (*Krascheninnikovia lanata*). Some scattered western Joshua trees are present. Shrubs are generally less than 3 meters in height, and the canopy is open to continuous.

Brittle bush scrub (*Encelia farinosa* Shrubland Alliance): This alliance is dominated by brittle bush (*Encelia farinosa*), which comprises more than 1 percent absolute cover in the shrub canopy and more than 50 percent relative cover. Other plant species present in this community include white bursage (*Ambrosia dumosa*), creosote bush, desert needlegrass (*Stipa speciosa*), and cheesebush (*Ambrosia salsola*). Shrubs are generally less than 2 meters in height, and the canopy is open to intermittent.

California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii* Shrubland Alliance): This alliance is dominated by Mojave desert California buckwheat (*Eriogonum fasciculatum* var. *polifolium*). California buckwheat is present at more than 5 percent absolute cover in the shrub canopy and Parish's goldeneye (*Viguiera parishii*) was not observed. In some areas, California buckwheat is codominant with Cooper's goldenbush (*Ericameria cooperi* var. *cooperi*). White bursage, desert needlegrass, creosote bush, cheesebush, Nevada ephedra (*Ephedra nevadensis*), desert fiddleneck (*Amsinckia tessellata* var. *tessellata*), and rayless goldenhead (*Acamptopappus sphaerocephalus*) are also present in this community. Shrubs are generally less than 2 meters in height, and the canopy is open to intermittent open.

California juniper woodland (*Juniperus californica* Woodland Alliance): This alliance is dominated by California juniper (*Juniperus californica*), which is present at more than 3 percent absolute cover over lower shrubs. No other tree species are present. Other plant species present in this community include creosote bush, Nevada ephedra, and desert needlegrass. Trees are generally less than 5 meters in height, and the canopy is open to intermittent.

Cheesebush scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance): This alliance is dominated by cheesebush, which is present at more than 2 percent cover in the shrub canopy with other shrubs comprising less cover in the shrub canopy. Sweetbush (*Bebbia juncea*) is not present in this community. Other plant species observed include creosote bush, white bursage, desert needlegrass, desert fiddleneck, Nevada ephedra, Acton Encelia (*Encelia actoni*), rubber rabbitbrush (*Ericameria nauseosa*), cheatgrass (*Bromus tectorum*), and rayless goldenhead. Shrubs are less than 2 meters in height, and the canopy is open to intermittent.

Creosote bush scrub (*Larrea tridentata* Shrubland Alliance): This alliance was the most encountered vegetation community in the Study Area. This alliance is dominated by creosote bush, which exceeds other shrubs in cover. In some areas, emergent western Joshua trees are present. Other small shrubs such as white bursage, winterfat, Nevada ephedra, cheesebush, rayless

goldenhead, and peach thorn (*Lycium cooperi*) were observed alongside creosote in some areas, but in this alliance, their cover is less than three times the cover of creosote bush.

Desert needlegrass grassland (*Stipa speciosa* Herbaceous Alliance): Desert needlegrass grassland is a sensitive natural community with a rarity ranking in California of S2 (imperiled). This alliance is dominated by desert needlegrass, which is present at more than 50 percent relative cover in the herbaceous layer. Emergent western Joshua trees and shrubs, including cheesebush, rubber rabbitbrush, creosote bush, desert wishbone bush (*Mirabilis laevis*), and desert fiddleneck are present at low percent cover. Herbs are generally less than 1 meter in height, and the canopy is open to intermittent.

Developed: Areas mapped as developed include existing wind energy generating infrastructure, existing buildings, structures, hard paved roads, and railroads. The existing Windhub substation is located off Oak Creek Road. Other areas mapped as developed include buildings on the Windswept Ranch Petting Zoo property as well as a graded gravel lot with trailers and fenced yard on Tehachapi Willow Springs Road. Multiple abandoned and/or previously occupied structures as well as associated non-occupied accessory structures within the western half of the Study Area and roads including Oak Creek Road, Santa Fe Railroad, and Tehachapi Willow Springs Road were also considered to be developed.

Disturbed: Areas described as disturbed are characterized by the presence of anthropogenic disturbances such as trash, off-road vehicle tracks, and non-native species. Areas mapped as disturbed include areas along Oak Creek Road with existing infrastructure associated with the Windhub Substation, part of the southeastern section of the Study Area adjacent to the Holliday Rock Mine, an abandoned illegal grow operation in the middle of the Study Area north of the LADWP aqueduct, and abandoned encampments with no structures in the middle of the Study Area north of the LADWP aqueduct and in the southwestern section of the Study Area south of the LADWP aqueduct.

Disturbed creosote bush scrub: This community is characterized by anthropogenic disturbances to the ground and vegetation. Disturbed creosote bush scrub in the northernmost section of the Study Area is disturbed due to historical ground and vegetation disturbance, road construction, and/or has been burned in a wildfire. The section south of the LADWP aqueduct is disturbed due to a large burn scar, because of which it exhibits characteristics different than creosote bush scrub in other areas of the Study Area. Dead creosote bush and western Joshua trees, relatively low vegetation cover, and large areas of bare soil were observed in this burned area. In the area north of the LADWP aqueduct and south of Tehachapi Willow Springs Road, anthropogenic disturbances and historical grading were observed.

Rubber rabbitbrush scrub (*Ericameria nauseosa* Shrubland Alliance): This alliance is dominated by rubber rabbitbrush, which is present at more than 50 percent relative cover in the shrub canopy. Shrubs are generally less than 3 meters in height, and the canopy is open to continuous.

Scalebroom scrub (*Lepidospartum squamatum* Shrubland Alliance): Scalebroom scrub is a sensitive natural community with a rarity ranking in California of S3 (vulnerable). This alliance is dominated by scalebroom (*Lepidospartum squamatum*), which is present at more than one percent cover in alluvial environments. This alliance was observed along a dry streambed that runs across the

Study Area. Rubber rabbitbrush and desert needlegrass were also present in this community. Shrubs are less than 2 meters in height, and the canopy is open to continuous and two-tiered.

6.0 DISCUSSION AND SUMMARY OF RECOMMENDATIONS

Three species of rare plants were identified in the Study Area: few-flowered woolly-star, adobe yampah, and western Joshua tree. A total of 579 few-flowered woolly-star individuals and 110 adobe yampah individuals were observed in the Study Area. Western Joshua tree was not quantified during botanical surveys; however, it was present in the Study Area. Three California Desert Native Plants Act species were identified in the Study Area: silver cholla, beavertail cactus, and beavertail pricklypear. A total of 4,699 silver cholla individuals, 1,293 beavertail cactus individuals, and 2 beavertail pricklypear individuals were recorded.

Potential impacts to rare plants and sensitive natural communities can be reduced through the implementation of avoidance and minimization measures. Impacts to western Joshua trees will require consultation with CDFW regarding the take of western Joshua trees and will require compliance with additional avoidance, minimization, and mitigation measures, as determined through consultation with CDFW.

The Applicant proposes implementation of the following measures to ensure potential impacts on rare plant species and California Desert Native Plant Act species resulting from Project construction, operations and maintenance, and decommissioning activities would be avoided and/or minimized to the extent feasible:

- Prior to conducting vegetation clearing or similar activities, a qualified biologist or their designee will perform a pre-construction visual survey of the area to determine if rare plants and/or California Desert Native Plant Act species are present. Daily reports of these inspections shall be retained by the Qualified Biologist and provided to the Kern County Planning and Natural Resources Department or CDFW upon request. If rare plant species are observed, and have not otherwise been accounted for in an approved removal action, they shall be delineated with stakes and/or flagged for avoidance to the extent feasible.
- Applicant will pay the required fee to Kern County to remove silver cholla, beavertail cactus, and beavertail pricklypear in accordance with the California Desert Native Plant Act prior to construction activities.
- In September 2020, western Joshua tree was designated a candidate species under the California Endangered Species Act (CESA). If, at the commencement of Project construction, western Joshua tree is either still a candidate species, or has been listed as threatened, or endangered under CESA, and avoidance of western Joshua tree individuals is infeasible, the Applicant will consult with CDFW regarding the take of western Joshua tree and comply with all avoidance, minimization, and compensatory mitigation measures, as set forth in any incidental take permit issued to the project by CDFW. Documentation of any such CDFW take authorization and mitigation will be provided to the Kern County Planning and Natural Resources Department.

7.0 REFERENCES

Baldwin, B., D. Goldman, D. Keil, R. Patterson, T. Rosatti, and D. Wilken. 2012. *The Jepson Manual: Vascular Plants of California*. Second Edition. University of California, Berkeley.

Calflora. 2024. Database of California plants. Available online at: https://www.calflora.org/search.html (accessed January 2024).

CDFW (California Department of Fish and Wildlife). 2018. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities. March 20, 2018.

CDFW. 2023. California Sensitive Natural Communities. June.

CDFW. 2024a. California Natural Diversity Database RareFind 5. Available online at: https://apps.wildlife.ca.gov/rarefind/view/RareFind.aspx (accessed January 2024).

CDFW. 2024b. Biogeographic Information and Observation System. Available online at: https://apps.wildlife.ca.gov/bios6/?bookmark=327 (accessed January 2024).

CNPS (California Native Plant Society). 2001. CNPS Botanical Survey Guidelines. California Native Plant Society, Sacramento, CA. December 9, 1983. Revised June 2, 2001.

CNPS. 2024. Electronic Inventory of Rare and Endangered Plants. Available online at: https://rareplants.cnps.org/ (accessed January 2024).

CNPS. 2025. Manual of California Vegetation Online. Available online at: https://vegetation.cnps.org/ (accessed September 2025).

Hickman, J. and W. Jepson. 1993. *The Jepson Manual, Higher Plants of California*. First Edition. University of California, Berkeley.

NASA (National Aeronautics and Space Administration). 2024. Edwards AFB, California Climatological Summaries. Armstrong Flight Research Center Weather. Available online at: https://weather.dfrc.nasa.gov/data/climo/rain.htm (accessed June 2024).

NatureServe. 2024. NatureServe Conservation Status Categories. Available online at: https://explorer.natureserve.org/AboutTheData/DataTypes/ConservationStatusCategories (accessed January 2024).

Sawyer, J., T. Keeler-Wolf, and J. Evens. 2009. *A Manual of California Vegetation, Second Edition*. California Native Plant Society.

Tetra Tech. 2025. Botanical Inventory Report. Prepared for Galaxy Solar PV & Solar Project, LLC. October.

The Jepson Herbarium. 2024. Jepson eFlora. University of California, Berkeley. Available online at: https://ucjeps.berkeley.edu/eflora/ (accessed January 2024).

USDA NRCS (United States Department of Agriculture National Resources Conservation Service). 2024. Web Soil Survey. Available online at: https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx (accessed January 2024).

USFWS (U.S. Fish and Wildlife Service). 2000. Guidelines for Conducting and Reporting Botanical Inventories for Federally Listed, Proposed, and Candidate Plants. Sacramento, California.

USFWS. 2024. Information for Planning and Consultation (IPaC). Available online at: https://ipac.ecosphere.fws.gov (accessed January 2024).

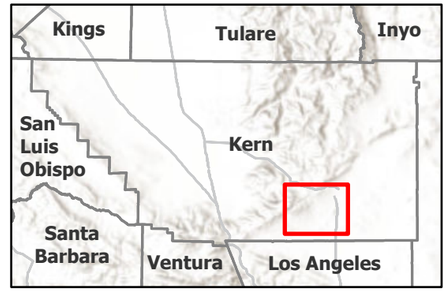
FIGURES

This page intentionally left blank.

Discovery Solar PV and Storage Project

Kern County, CA

Figure 1. Regional Overview



Windhub High-voltage Substation (Existing)

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

*Already approved under separate projects.

N

0 0.75 1.5 3 Miles

Scale is 1:116,800 when printed at 11"x17"

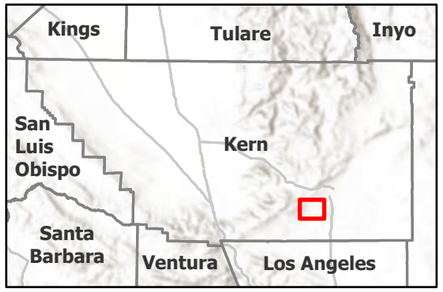
Not for Construction

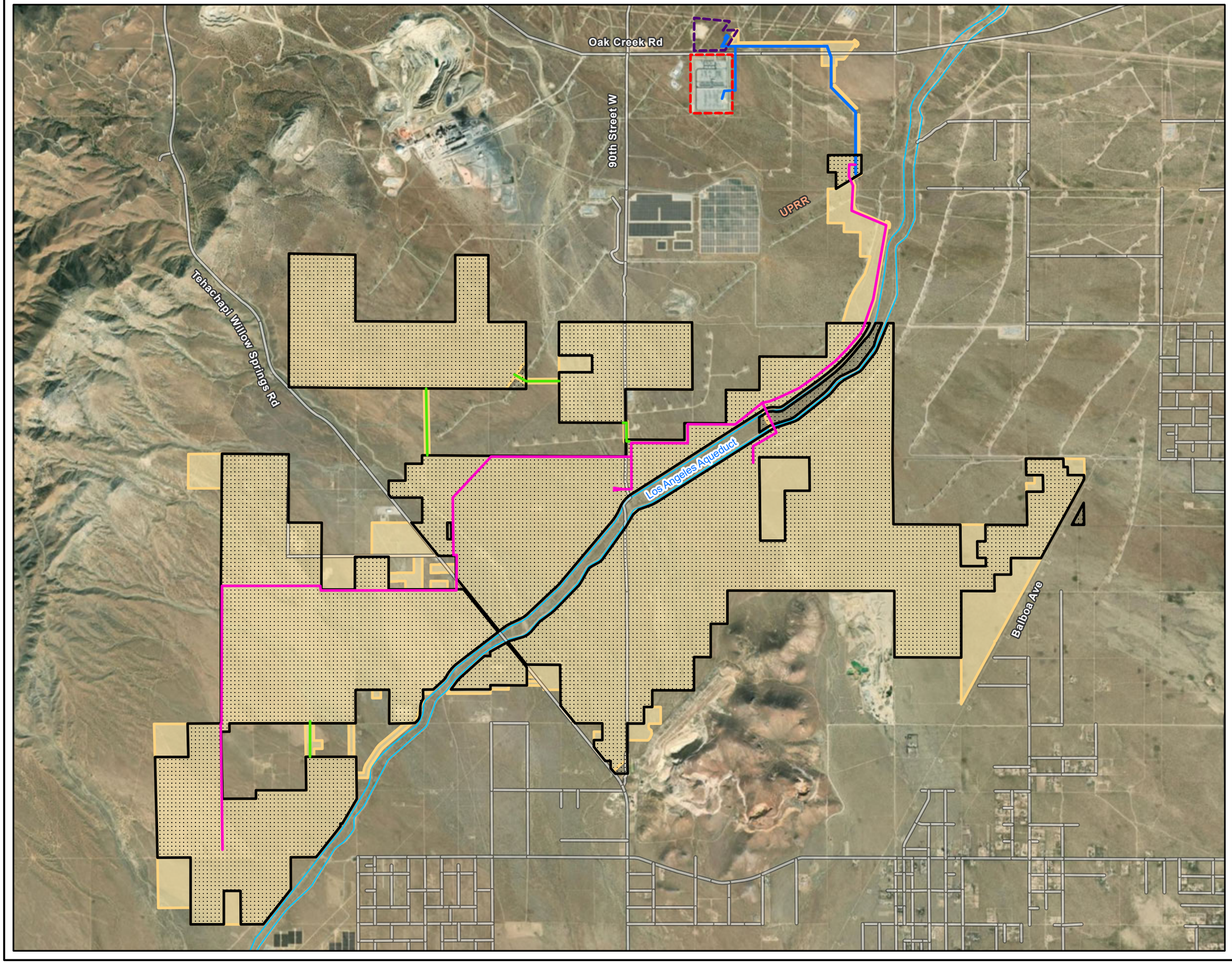
Document Path: \\cesi70\gis1\CesiProjects\POR\projects\194_PROJECT\SITERA_GEN\194_1405_0001_Discovery\PROJECT\SITERA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 2. Project Location





Windhub High-voltage Substation (Existing)

Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

Scale is 1:45,000 when printed at 11"x17"

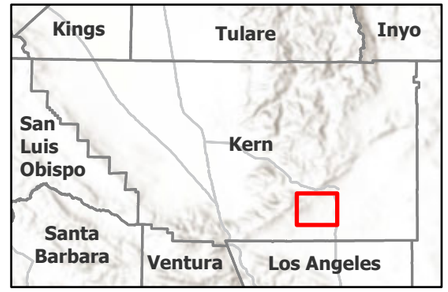
Not for Construction

Document Path: Z:\projects\194_PROJECTS\TERRA_GEN\194_1403_0001_Discovery\PRO\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 3. USGS Topographic Map



Windhub High-voltage Substation (Existing)

Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

*Already approved under separate projects.

N

Miles

0 0.5 1 2

Scale is 1:75,000 when printed at 11"x17"

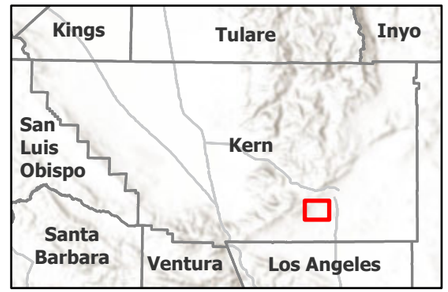
Not for Construction

Document Path: Z:\projects\94_PROJECTS\TERRA_GEN\94_1403_000_Discovery\PRO\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 4. Rare Plants



Windhub High-voltage Substation (Existing)

Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

Rare Plant Species

Few-flowered woolly-star (*Eriastrum sparsiflorum*)

Point

Polygon

Adobe yampah (*Perideridia pringlei*)

Point

Polygon

*Already approved under separate projects.

N

Miles

0 0.25 0.5 1

Scale is 1:45,000 when printed at 11"x17"

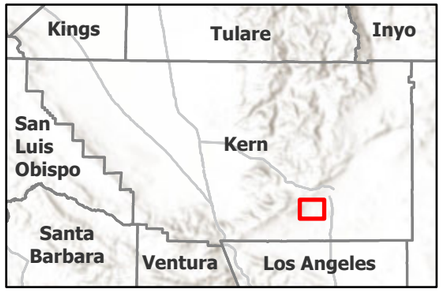
Not for Construction

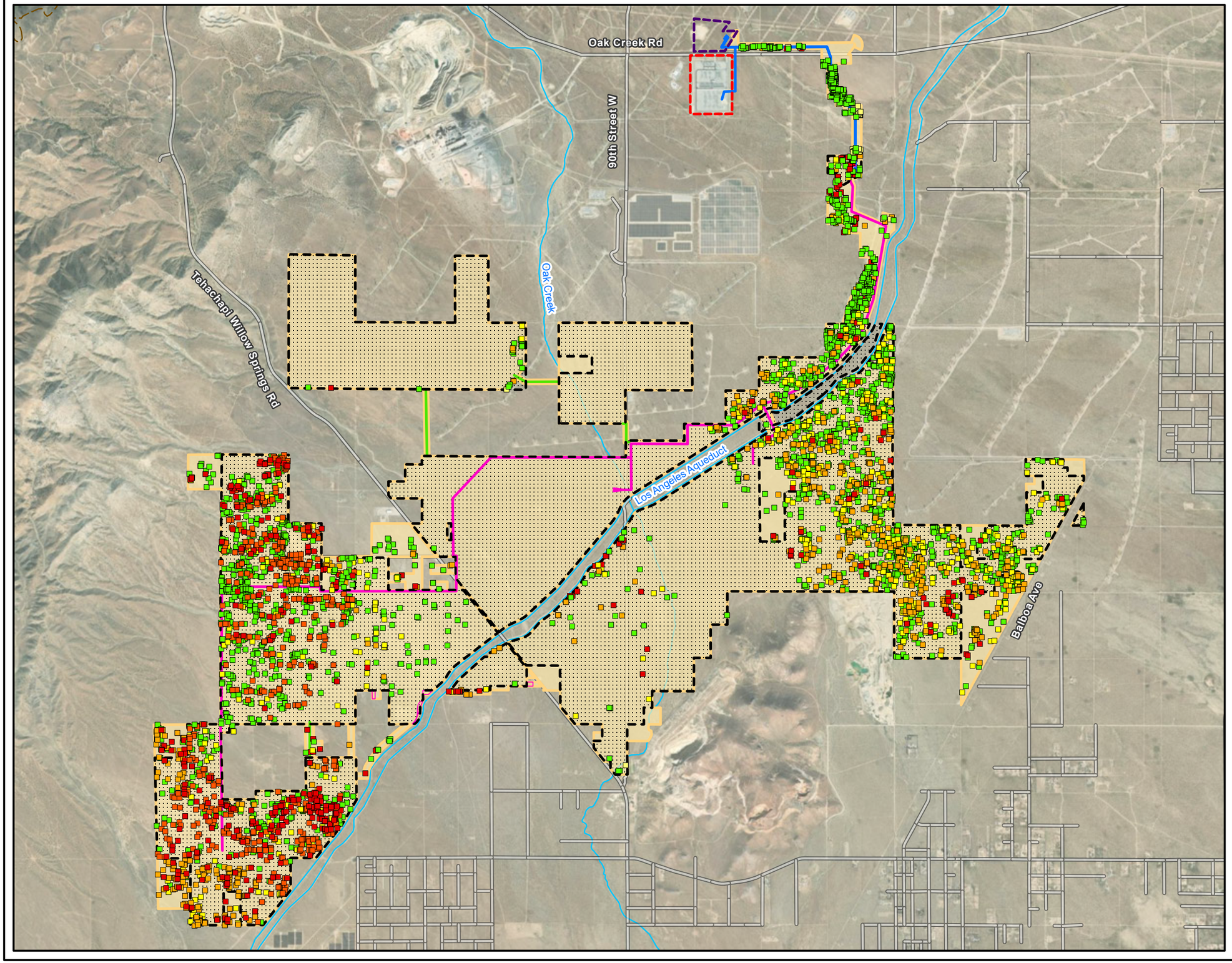
Document Path: \\tocan\GIS\CES\Projects\PDR\projects\194_PROTECTSTERRA_GEN\194_1403_0001_Discovery\PROTERRA_GEN_BIO_RGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 5a. California Desert Native Plants - Silver Cholla





Windhub High-voltage Substation (Existing)

Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

Silver cholla (*Cylindropuntia echinocarpa*) Location and Health

Healthy

Degraded

Appears Dead

Dead

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

Scale is 1:45,000 when printed at 11"x17"

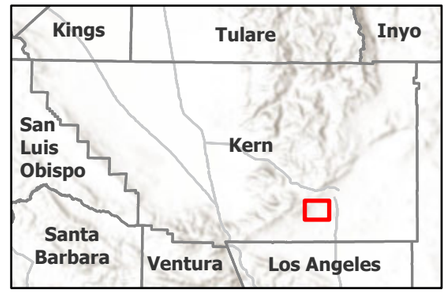
Not for Construction

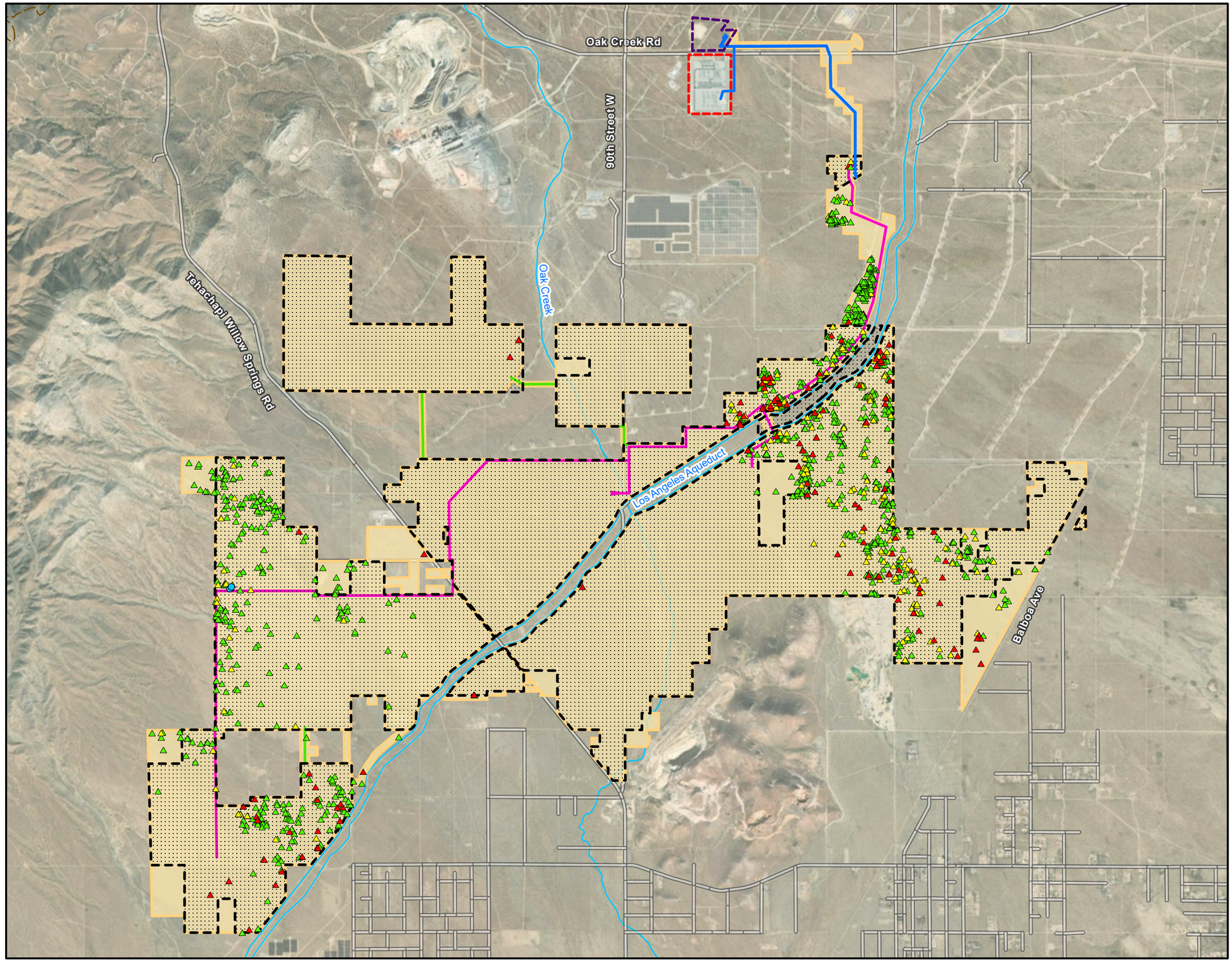
Document Path: W:\Local\GIS\CESProjects\PORProjects\194_PROJECTS\TERRA_GEN\194_1401_0001_Discovery\PROTERRA_GEN_BIO_Figs_v2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 5b. California Desert Native Plants - Beavertail Cactus & Beavertail Pricklypear





- Windhub High-voltage Substation (Existing)
- Roads
- Watercourse

Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

Beavertail cactus (*Opuntia basilaris* var. *basilaris*) Location and Health

- Healthy
- Degraded
- Dead

Beavertail pricklypear (*Opuntia basilaris*) Location and Health

- Healthy

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

Scale is 1:45,000 when printed at 11"x17"

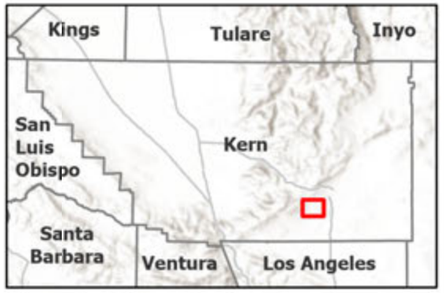
Not for Construction

Document Path: M:\acad\GIS\CES\Projects\PDR\projects\194_PROJECT\TERRA_GEN\194_1403_0001_Discovery\PROJECT\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 6a. Vegetation Communities



Windhub High-voltage Substation (Existing)

Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

Vegetation Communities

Allscale Scrub

Brittle Bush Scrub

California buckwheat scrub

California juniper woodland

Cheesebush scrub

Creosote bush scrub

Desert needlegrass grassland

Developed

Disturbed

Disturbed - Creosote bush scrub

Rubber rabbitbrush scrub

Scalebroom scrub

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

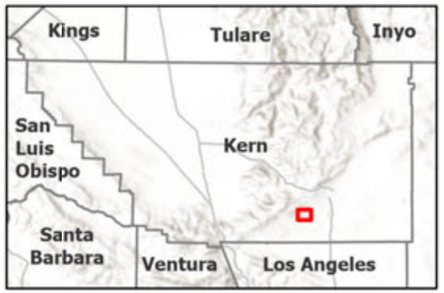
Scale is 1:39,090 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Figure 6b. Vegetation Communities



Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Vegetation Communities

California buckwheat scrub

California juniper woodland

Cheesebush scrub

Creosote bush scrub

Desert needlegrass grassland

Developed

Disturbed

Disturbed - Creosote bush scrub

Rubber rabbitbrush scrub

Scalebroom scrub

N

0 0.13 0.25 0.5 Miles

Scale is 1:24,700 when printed at 11"x17"

Not for Construction

Los Angeles Aqueduct

Oak Creek

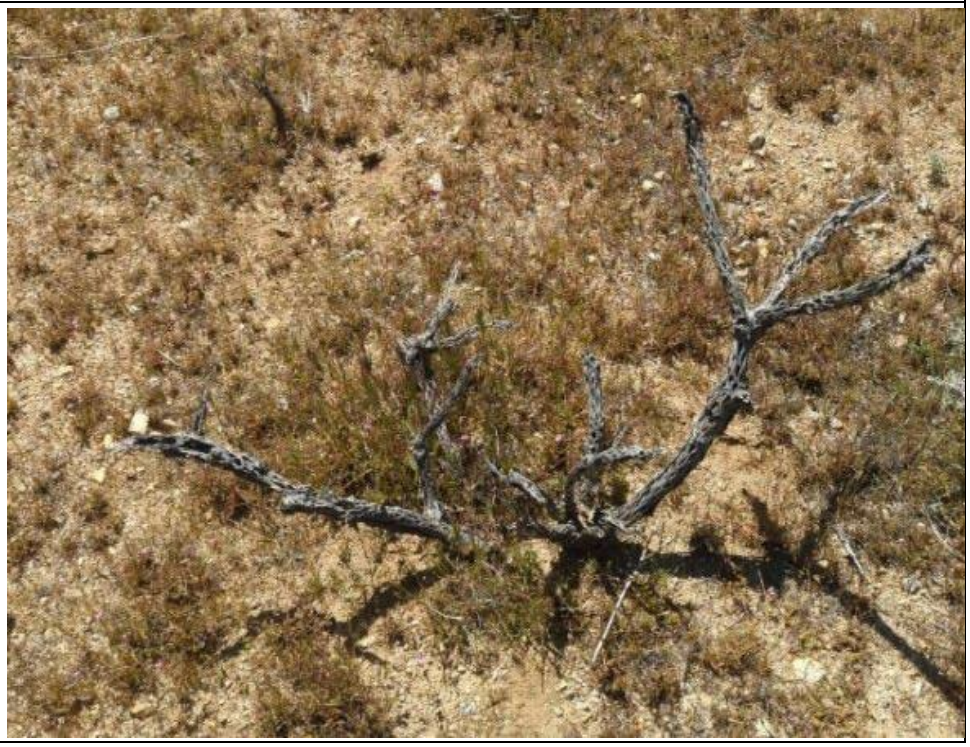
APPENDIX A: PHOTOGRAPHS

This page intentionally left blank.

Photograph 1 **Notes:** Representative photograph of Study Area showing Creosote bush scrub (*Larrea tridentata*) shrubland.	
Photograph 2 **Notes:** Western Joshua tree (*Yucca brevifolia*) is a candidate for listing under the California Endangered Species Act.	

Photograph 3 **Notes:** Few-flowered woolly-star (*Eriastrum sparsiflorum*) is a rare plant (CRPR 4.2).	
Photograph 4 **Notes:** Adobe yampah (*Perideridia pringlei*) is a rare plant (CRPR 4.3).	

Photograph 5 **Notes:** Silver cholla (*Cylindropuntia echinocarpa*) is a protected plant under the California Desert Native Plant Act. Shown is a healthy silver cholla individual. Healthy individuals are mostly comprised of green foliage.	
Photograph 6 **Notes:** A degraded silver cholla individual. Degraded individuals have green foliage; however, about 50% or more of the plant is under stress (discolored foliage/pests/damage, etc.).	

Photograph 7 **Notes:** A silver cholla individual that appears dead, meaning it has no green foliage or chlorophyll, a discolored or yellow epidermis, and/or sections of exposed wood. These individuals appear dead but have a small chance of resprouting if conditions change.	
Photograph 8 **Notes:** A dead silver cholla individual. Dead individuals have no green or yellow foliage, with the majority of the woody skeleton exposed.	

Photograph 9 **Notes:** Beavertail pricklypear (*Opuntia basilaris*) is a protected plant under the California Desert Native Plant Act. Shown is a healthy beavertail pricklypear individual. Healthy individuals are mostly comprised of green foliage.	
Photograph 10 **Notes:** Beavertail cactus (*Opuntia basilaris* var. *basilaris*) is a protected plant under the California Desert Native Plant Act. Shown is a healthy beavertail cactus individual in bloom. Healthy individuals are mostly comprised of green foliage.	

Photograph 11 **Notes:** A degraded beavertail cactus individual. Degraded individuals have green foliage; however, about 50% or more of the plant is under stress (discolored foliage/pests/damage, etc.).	
Photograph 12 **Notes:** A dead beavertail cactus individual. Dead individuals have no green or yellow foliage and are mostly collapsed and degraded.	

APPENDIX B: PLANTS OBSERVED IN THE STUDY AREA

This page intentionally left blank.

Scientific Name	Common Name
GYMNOSPERMS	
CUPRESSACEAE	**CYPRESS FAMILY**
*Cupressus sempervirens**	Italian cypress
Juniperus californica	California juniper
ANGIOSPERMS (DICOTYLEDONS)	
ALLIACEAE	**ONION FAMILY**
Allium fimbriatum var. *fimbriatum*	fringed onion
Allium lacunosum	pitted onion
APIACEAE	**CARROT FAMILY**
Lomatium mohavense	Mojave wild parsley
Perideridia pringlei CRPR 4.3	**adobe yampah**
ASTERACEAE	**SUNFLOWER FAMILY**
Acamptopappus sphaerocephalus	rayless goldenhead
Ambrosia acanthicarpa	annual bursage
Ambrosia deltoidea	triangle leaf bursage
Ambrosia dumosa	white bursage
Ambrosia salsola	cheesebush
Anisocoma acaulis	scalebud
Artemisia dracunculus	tarragon
Baileya multiradiata	desert marigold
Calycoseris parryi	yellow tack-stem
Chaenactis fremontii	Fremont pincushion
Chaenactis stevioides	desert pincushion
Encelia actoni	Acton encelia
Encelia farinosa	brittle bush
Ericameria cooperi var. *cooperi*	Cooper's goldenbush
Ericameria cuneata	wedgeleaf goldenbush
Ericameria linearifolia	interior goldenbush
Ericameria nauseosa	rubber rabbitbrush
Ericameria teretifolia	green rabbitbrush
Erigeron sp.	fleabane daisy
Eriophyllum pringlei	Pringle's woolly sunflower
Eriophyllum wallacei	Wallace's woolly daisy
Gutierrezia sp.	matchweed
*Lactuca serriola**	prickly lettuce
Lasthenia gracilis	common goldfields
Layia glandulosa	white layia
Lepidospartum squamatum	scalebroom
Leptosyne bigelovii	Bigelow coreopsis
Lessingia glandulifera	valley vinegar weed
Logfia depressa	hierba limpia
Malacothrix californica	California dandelion
Malacothrix coulteri	snakes head

Scientific Name	Common Name
Malacothrix glabrata	desert dandelion
Psilocarphus sp.	woollyheads
Stephanomeria spp.	wire-lettuce
Stephanomeria pauciflora	wire-lettuce
Syntrichopappus fremontii	Fremont's syntrichopappus
Tetradymia stenolepis	narrow scaled felt thorn
Uropappus lindleyi	silver puffs
Xylorhiza tortifolia	Mojave woodyaster
BORAGINACEAE	**BORAGE FAMILY**
Amsinckia tessellata var. *tessellata*	desert fiddleneck
Cryptantha dumetorum	scrambling cryptantha
Cryptantha pterocarya	wingnut cryptantha
Cryptantha utahensis	scented cryptantha
Eremocarya micrantha var. *micrantha*	desert red-root
Greeneocharis circumscissa var. *circumscissa*	cushion greeneocharis
Pectocarya penicillata	northern pectocarya
Pectocarya linearis	narrow-toothed pectocarya
Pectocarya setosa	round-nut pectocarya
Plagiobothrys arizonicus	Arizona popcornflower
BRASSICACEAE	**MUSTARD FAMILY**
Caulanthus coulteri	Coulter's jewel flower
Caulanthus lasiophyllus	California mustard
*Brassica nigra**	black mustard
*Brassica tournefortii**	Sahara mustard
Descurainia pinnata	yellow tansy mustard
Descurainia sp.	tansy mustard
*Hirschfeldia incana**	short podded mustard
Lepidium fremontii	desert alysum
Lepidium nitidum	shining pepperweed
*Sisymbrium altissimum**	tumble mustard
Stanleya pinnata	desert princesplume
Tropidocarpum gracile	dobie pod
CACTACEAE	**CACTUS FAMILY**
Cylindropuntia echinocarpa CDNPA	**silver cholla**
Opuntia basilaris* var. *basilaris CDNPA	**beavertail cactus**
Opuntia basilaris CDNPA	**beavertail pricklypear**
CARYOPHYLLACEAE	**CARNATION FAMILY**
Herniaria hirsuta	hairy rupturewort
CHENOPODIACEAE	**CHENOPOD FAMILY**
Atriplex canescens	four-wing saltbush
Atriplex polycarpa	allscale
Grayia spinosa	hop sage
Krascheninnikovia lanata	winterfat

Scientific Name	Common Name
*Salsola tragus**	Russian thistle
CLEOMACEAE	**SPIDERFLOWER FAMILY**
Cleomella arborea	bladderpod
CUCURBITACEAE	**GOURD FAMILY**
Cucurbita palmata	coyote melon
Cuscuta sp.	dodder
Marah fabacea	California man-root
EPHEDRACEAE	**EPHEDRA FAMILY**
Ephedra nevadensis	Nevada ephedra
EUPHORBIACEAE	**SPURGE FAMILY**
Croton setiger	turkey mullein
Euphorbia albomarginata	rattlesnake sandmat
Euphorbia micromera	Sonoran sandmat
Euphorbia sp.	spurge
FABACEAE	**LEGUME FAMILY**
Astragalus didymocarpus	two-seeded milkvetch
Astragalus lentiginosus var. *variabilis*	freckled milkvetch
Lupinus bicolor	miniature lupine
Lupinus odoratus	Mojave lupine
Trifolium gracilentum	pinpoint clover
GERANIACEAE	**GERANIUM FAMILY**
*Erodium cicutarium**	redstem filaree
HYDROPHYLLACEAE	**WATERLEAF FAMILY**
Emmenanthe penduliflora	whispering bells
Phacelia fremontii	Fremont's phacelia
Phacelia tanacetifolia	lacy phacelia
Pholistoma membranaceum	white fiesta flower
LAMIACEAE	**MINT FAMILY**
Salvia carduacea	thistle sage
Salvia columbariae	chia
Salvia dorrii	desert sage
LILIACEAE	**LILY FAMILY**
Calochortus kennedyi var. *kennedyi*	desert mariposa lily
LOASACEAE	**LOASA FAMILY**
Mentzelia albicaulis	white stemmed blazing star
MALVACEAE	**MALLOW FAMILY**
Eremalche exilis	white mallow
Malva parviflora	cheeseweed
Sphaeralcea ambigua	apricot mallow
MONTIACEAE	**MINER'S LETTUCE FAMILY**
Calandrinia menziesii	red maids
Calyptridium monandrum	pussy paws
Claytonia exigua	little spring beauty

Scientific Name	Common Name
NAMACEAE	**NAMA FAMILY**
Nama demissa	purplemat
NYCTAGINACEAE	**FOUR O'CLOCK FAMILY**
Abronia pogonantha	Mojave sand verbena
Mirabilis laevis	desert wishbone bush
ONAGRACEAE	**EVENING PRIMROSE FAMILY**
Camissonia campestris ssp. *campestris*	field sun cup
Camissoniopsis pallida ssp. *pallida*	pale sun cup
Chylismia claviformis ssp. *claviformis*	browneyes
Eremothera boothii ssp. *desertorum*	Booth's desert primrose
Oenothera avita ssp. *californica*	California evening primrose
Tetrapteron palmeri	Palmer's sun cup
OROBANCHACEAE	**BROOMRAPE FAMILY**
Castilleja chromosa	desert paintbrush
Castilleja exserta	purple owl's clover
PAPAVERACEAE	**POPPY FAMILY**
Argemone munita	chicalote
Eschscholzia minutiflora	pygmy poppy
Platystemon californicus	cream cups
PINACEAE	**PINE FAMILY**
*Pinus halepensis**	Aleppo pine
PLANTAGINACEAE	**PLAINTAIN FAMILY**
Penstemon incertus	Mojave beardtongue
POLEMONIACEAE	**PHLOX FAMILY**
Eriastrum densifolium ssp. *mohavense*	Mojave woolly-star
Eriastrum cf. eremicum	desert woolly-star
Eriastrum pluriflorum	many-flowered woolly-star
Eriastrum sapphirinum	sapphire woolly-star
Eriastrum sparsiflorum CRPR 4.2	**few-flowered woolly-star**
Gilia brecciarum ssp. *brecciarum*	Nevada gilia
Gilia brecciarum ssp. *neglecta*	Nevada gilia
Gilia capitata	bluehead gilia
Gilia jacens	Nevada gilia
Gilia latiflora ssp. *davyi*	Davy's broad-flowered gilia
Leptosiphon breviculus	Mojave linanthus
Leptosiphon chrysanthus ssp. *chrysanthus*	linanthus
Leptosiphon parviflorus	variable linanthus
Linanthus dichotomus	evening snow
Linanthus parryae	Parry's linanthus
Loeseliastrum matthewsii	desert calico
Loeseliastrum schottii	Schott's calico
POLYGONACEAE	**BUCKWHEAT FAMILY**
Centrostegia thurberi	red triangles

Scientific Name	Common Name
Chorizanthe rigida	devil's spineflower
Chorizanthe watsonii	Watson's spineflower
Eriogonum deflexum	skeleton weed
Eriogonum elongatum	longstem buckwheat
Eriogonum fasciculatum var. *polifolium*	Mojave desert California buckwheat
Eriogonum gracillimum	rose-and-white wild buckwheat
Eriogonum maculatum	spotted wild buckwheat
Eriogonum mohavense	Western Mojave wild buckwheat
Eriogonum nudum	naked buckwheat
Eriogonum plumatella	yucca wild buckwheat
Eriogonum pusillum	yellow turbans
Eriogonum reniforme	kidney-leaf wild buckwheat
Eriogonum viridescens	two-toothed wild buckwheat
Oxytheca perfoliata	round-leaf puncturebract
Rumex hymenosepalus	canaigre wild-rhubarb
RANUNCULACEAE	**BUTTERCUP FAMILY**
Delphinium parishii ssp. *parishii*	Parish's larkspur
Delphinium parryi	San Bernadino larkspur
ROSACEAE	**ROSE FAMILY**
Purshia tridentata var. *glandulosa*	antelope brush
SOLANACEAE	**NIGHTSHADE FAMILY**
Datura wrightii	jimsonweed
Lycium andersonii	Anderson thornbush
Lycium cooperi	peach thorn
THEMIDACEAE	**BRODIAEA FAMILY**
Dipterostemon capitatus	blue dicks
Muilla maritima	common muilla
ZYGOPHYLLACEAE	**CALTROP FAMILY**
Larrea tridentata	creosote bush
ANGIOSPERMS (MONOCOTYLEDONS)	
AGAVACEAE	**YUCCA FAMILY**
Yucca brevifolia [SC]	**western Joshua tree**
POACEAE	**GRASS FAMILY**
Bromus arizonicus	Arizona brome
Bromus madritensis ssp. *madritensis**	foxtail chess
*Bromus rubens**	red brome
*Bromus tectorum**	cheatgrass
Elymus elymoides	squirreltail
Festuca microstachys	small fescue
*Festuca myuros**	rattail sixweeks grass
Festuca octoflora	sixweeks grass
Hordeum murinum ssp. *glaucum**	smooth barley
Poa secunda	Nevada bluegrass

Scientific Name	Common Name
*Schismus barbatus**	common Mediterranean grass
Stipa cernua	nodding needle grass
Stipa hymenoides	sand rice grass
Stipa speciosa	desert needlegrass
*Triticum aestivum**	common wheat

*Not native to California

State Designations:

California Desert Native Plants Act (CDNPA)

California Endangered Species Act:

SC: state candidate

California Native Plant Society (CNPS), California Rare Plant Rank (CRPR):

1A: Plants presumed extirpated in California and either rare or extinct elsewhere
1B: Plants rare, threatened, or endangered in CA and elsewhere
2A: Plants presumed extirpated in California but common elsewhere
2B: Plants rare, threatened, or endangered in CA but more common elsewhere
3: Plants about which need more information; a review list
4: Plants of limited distribution; a watch list

Threat Ranks:

0.1 Seriously endangered in CA (over 80% of occurrences threatened / high degree and immediacy of threat)
0.2 Moderately threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)
0.3 Not very threatened in California (<20% of occurrences threatened/low degree and immediacy of threat or current threats known)

Appendix D3
Mojave Desert Tortoise Survey Report

This page intentionally left blank.

MOJAVE DESERT TORTOISE SURVEY REPORT

Discovery Solar PV and Storage Project
Kern County, California

October 2025

Prepared for

Discovery Solar PV and Storage, LLC
11455 El Camino Real # 160
San Diego, CA 92130

Prepared by

TETRA TECH

5383 Hollister Avenue, Suite 130
Santa Barbara, CA 93111

This page intentionally left blank.

EXECUTIVE SUMMARY

A Mojave desert tortoise (DETO, *Gopherus agassizii*) habitat suitability assessment and protocol-level presence/absence survey were performed for the proposed Discovery Solar PV and Storage Project (Project). Although the Project site is approximately 7,700 acres, a larger 8,606-acre Study Area was surveyed that encompasses the 7,700-acre Project site, the proposed gen-tie corridor, and temporary offsite construction laydown yard. The DETO habitat suitability assessment was performed in fall 2022, fall 2023, winter 2023-2024, and spring 2024, and protocol-level presence/absence survey was performed during the DETO active season in spring 2023, fall 2023, and spring 2024 to assess the potential presence of the species within the Study Area (Figure 1). Moderate suitability, low suitability, and unsuitable DETO habitat was found during the habitat suitability assessment. There is no designated critical habitat for DETO within the Study Area. No live DETO were observed during the habitat suitability assessment or protocol-level survey. The following DETO burrow class definitions are from the U.S. Fish and Wildlife Service (USFWS) *Desert Tortoise Field Manual* (USFWS 2009), and DETO scat and carcass class definitions are from the *Field Survey Protocol for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise* (USFWS 1992).

One Class 3 DETO adult male carcass was found in 2022, and again in 2023, in the eastern portion of the Study Area. Signs of predation (i.e., tooth rakes, missing scales) were observed on the carcass. Several physical characteristics (i.e., circular hole in marginal scute, flattened and smooth abdominal and femoral scutes) were observed on the shell of the carcass that are consistent with physical characteristics observed in captive DETO individuals. Therefore, it is likely that this tortoise was released from captivity and died once in the wild. All observed DETO sign in the Study Area was likely from one deceased DETO.

The following DETO burrows were detected:

- A Class 3 desert tortoise burrow with multiple pieces of Class 3 and Class 4 scat was observed within 160 feet of the Class 3 carcass. It is likely that the tortoise released from captivity was using this Class 3 burrow and left the scat.
- Two Class 5 burrows (deteriorated condition, possibly tortoise) were found in the northern portion of the Study Area; however, no DETO sign was observed at these two burrows.
- One Class 4 burrow (good condition, possibly tortoise) was observed near the center of the Study Area and also had no DETO sign observed.

Potential impacts to DETO can be reduced through implementation of recommended avoidance and minimization measures, as described below:

- No more than 30 days prior to the start of ground disturbance, a qualified biologist knowledgeable in the identification of all special-status wildlife species with potential to occur on the Project site will conduct a pre-construction survey of areas proposed for disturbance within the Project site and 500-foot buffer (where legally accessible) to determine if any special-status species are present. Surveys need not be conducted for all areas of suitable habitat at one time; they may be phased so that surveys occur no more than 30 days

prior to ground disturbance in specific areas of the site. If evidence of occupation by a special-status species is observed, a suitable buffer will be established by a qualified biologist that results in sufficient avoidance.

- During construction the Project site may be fenced to keep terrestrial wildlife species from entering the site. Fencing will be maintained during all phases of construction and decommissioning. Fencing will be inspected by a qualified biologist at a regular interval and immediately after major rainfall events through the duration of construction and decommissioning activities. Any needed repairs to the fence will be performed immediately upon their discovery. Outside temporarily fenced exclusion areas, areas of disturbance will be limited to the extent feasible. Parking areas, new roads, staging, storage, excavation, and disposal site locations will be confined to the smallest areas possible. These areas will be flagged and disturbance activities, vehicles, and equipment will be confined to these flagged areas.
  - Following construction, the permanent perimeter security fence may be made permeable with a gap at the bottom of the fence to allow small and medium-sized wildlife and wildlife movement through and around the project site during facility operations. Final perimeter fencing design would be evaluated and developed in consultation with appropriate agencies, and the best-fit scenario would be incorporated at the Project site.
- Develop a site-specific Common Raven Management Plan in accordance with USFWS guidelines and implement management measures for ravens at the Project. These measures may include but are not limited to designing structures to eliminate perches, waste management, road kill management, management of ponded water during construction and operations, and nest removal on structures within the Project site and along the transmission line.

Table of Contents

1.0 INTRODUCTION 1

2.0 PROJECT DESCRIPTION AND LOCATION 1

3.0 LITERATURE REVIEW 2

3.1 Methods 2

3.2 Results 2

3.2.1 Species Information 2

3.2.2 Soils 3

4.0 FIELD SURVEY 4

4.1 Methods 4

4.1.1 Habitat Suitability Assessment 4

4.1.2 Protocol-Level Presence/Absence Survey 6

4.2 Results 8

4.2.1 Habitat Suitability Assessment 9

4.2.2 Protocol-level Presence/Absence Survey 12

5.0 DISCUSSION AND RECOMMENDATIONS 15

6.0 REFERENCES 18

Tables

Table 1. Soil Types 3
Table 2. Summary of Habitat Suitability Categories 6
Table 3. DETO Sign Classifications 7
Table 4. DETO Habitat Suitability Assessment and Presence/Absence Survey Conducted 8
Table 5. Vegetation Communities 9
Table 6. Habitat Suitability Assessment 12
Table 7. Summary of DETO Sign Observations 13
Table 8. Details of DETO Sign Observations 14

Figures

Figure 1. Regional Overview
Figure 2. Project Location
Figure 3. USGS Topographic Map
Figure 4a. Vegetation Communities
Figure 4b. Vegetation Communities
Figure 5. Mojave Desert Tortoise Habitat Suitability
Figure 6. Mojave Desert Tortoise Sign

Appendices

Appendix A: Photographs
Appendix B: Plant Species Observed in the Study Area
Appendix C: Wildlife Species Observed in the Study Area

Acronyms/Abbreviations

Applicant	Discovery Solar PV and Storage, LLC
CDFW	California Department of Fish and Wildlife
CNDDB	California Natural Diversity Database
CWHR	California Wildlife Habitat Relationships
DETO	Mojave desert tortoise
Esri	Environmental Systems Research Institute
gen-tie	generation tie line
GPS	Global Positioning System
kV	kilovolt
LADWP	Los Angeles Department of Water and Power
MCL	midline carapace length
mm	millimeters
MW	megawatts
NRCS	Natural Resources Conservation Service
NWI	National Wetlands Inventory
Project	Discovery Solar PV and Storage Project
PV	photovoltaic
quad	quadrangle
SCE	Southern California Edison
SR	State Route
UPRR	Union Pacific Railroad
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

This page intentionally left blank.

1.0 INTRODUCTION

Tetra Tech was retained by Discovery Solar PV and Storage, LLC (Applicant) to conduct a habitat suitability assessment and protocol-level presence/absence survey for Mojave desert tortoise (DETO, *Gopherus agassizii*) for the proposed Discovery Solar PV and Storage Project (Project). This Mojave Desert Tortoise Survey Report presents the methods, results, and recommendations from the DETO habitat suitability assessment and protocol-level survey conducted for the Project during fall 2022 through spring 2024, in accordance with the guidelines outlined in the U.S. Fish and Wildlife Service (USFWS) protocol *Preparing for Any Action that May Occur within the Range of the Mojave Desert Tortoise* (USFWS 2019). For the purposes of this report, all references to DETO in this document refer to the Mojave (Agassiz's) DETO.

2.0 PROJECT DESCRIPTION AND LOCATION

The Project includes development of a photovoltaic (PV) solar facility and associated infrastructure necessary to generate up to 1,400 megawatts (MW) of renewable electrical energy with up to 8 gigawatt-hours of energy storage capacity (approximately 1,000 MW) on an approximately 7,700-acre Project site in an unincorporated area of southeastern Kern County, California. Approximately 2,426 acres within the 7,700-acre Project site are designated for zone changes only and would not be disturbed (Figure 1).

Main components of the Project consist of PV solar panels, a power collection system, including medium-voltage lines that connect the solar facilities, inverters, a switchyard, foundations, and transformers that will be installed onsite. Associated Project infrastructure includes an operations and maintenance facility, telecommunication facilities, energy storage system(s), up to three onsite collector substations, interconnection and transmission systems, and temporary laydown yards. The Project may be constructed in multiple phases.

The Project will interconnect to the existing Windhub Substation, which is owned and operated by Southern California Edison (SCE). The interconnect will be via a newly constructed 230-kilovolt (kV) generation tie line (gen-tie) that will extend north from the Project site towards the Windhub Substation from on-site collector substations. A portion of the Project 230-kV gen-tie would be co-located within an existing gen-tie corridor (controlled by the Applicant and/or its affiliates). A high-voltage switchyard located immediately north of the Union Pacific Railroad (UPRR) rail line will also be constructed.

The Project is generally on undeveloped and privately owned land, along the northern edge of the Antelope Valley. The Project site is located approximately 6 miles southwest of the unincorporated community of Mojave, approximately 9 miles southeast of the City of Tehachapi, and approximately 8 miles northwest of the unincorporated community of Rosamond. State Route (SR)-58 is north of the Project site, SR-14 is east of the Project site, and Tehachapi Willow-Springs Road runs between the Project site's boundaries (Figure 1). A network of existing named and unnamed dirt roads traverses the Project site. The Los Angeles Department of Water and Power (LADWP) aqueduct roughly bisects the Project site (Figures 2 and 3). On-site, adjacent, and nearby uses include renewable energy

development, rural residential development, livestock grazing, heavy industrial and mining uses, and undeveloped lands. The Project site is regularly used for sheep (*Ovis aries*) grazing and sheep were observed onsite. Elevations across the Project site are relatively flat, ranging from approximately 2,970 to 3,760 feet above mean sea level. The Project site is located within the *Monolith, Willow Springs,* and *Soledad Mountain* U.S. Geological Survey (USGS) 7.5-Minute Topographic Quadrangles (quads).

3.0 LITERATURE REVIEW

This section describes the methods and results of the literature review for the DETO habitat suitability assessment and protocol presence/absence survey in accordance with USFWS protocol *Preparing for Any Action that May Occur within the Range of the Mojave Desert Tortoise* (USFWS 2019).

3.1 Methods

Prior to the habitat suitability assessment and protocol-level presence/absence survey, a literature review of pertinent background information for the Study Area was completed, which included review of the following:

- California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB; CDFW 2024a);
- CDFW RareFind 5 (CDFW 2024b);
- CDFW California Wildlife Habitat Relationships (CWHR; CDFW 2023);
- USGS 7.5-Minute Topographic Maps;
- Aerial and historical imagery (Google Earth©);
- ArcGIS online data;
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA NRCS 2023);
- National Wetlands Inventory (NWI; USFWS 2023); and
- Vegetation community mapping data from 2023 and 2024 (completed in accordance with the *Manual of California Vegetation*, Second Edition [Sawyer et al. 2009]) from additional surveys performed within the Study Area.

3.2 Results

3.2.1 Species Information

DETO is listed as threatened under the federal Endangered Species Act and endangered under the California Endangered Species Act. DETO occurs primarily on flats and bajadas characterized by scattered shrubs and abundant inter-space for growth of herbaceous plants, with soils ranging from sand to sandy-gravel; DETO are also found on rocky terrain and slopes (USFWS 1994a). During inactive periods, DETO hibernate (known as brumation for ectotherms), aestivate, or rest in subterranean burrows, spending approximately 98 percent of their time in these cover sites (Boarman 2002). In

general, DETO is most active April through May and September through October when air temperatures are below 95 degrees Fahrenheit (USFWS 2019).

There is no designated critical habitat for DETO within the Study Area (USFWS 1994b). According to the CNDDB, one observation of DETO has occurred within the Study Area (Occurrence Number 1,006) and four more observations have been made adjacent to the Study Area (Occurrence Numbers 974, 975, 1,005, and 1,007) (CDFW 2024a). The observation within the Study Area occurred in 2009 and consisted of one tortoise within creosote bush scrub (CDFW 2024a, 2024b). Two more DETO occurrences, both from 2009, were located approximately 450 feet away and directly adjacent to the northern and eastern portions of the Study Area, respectively, and each consisted of one DETO in creosote bush scrub (CDFW 2024a, 2024b). The last two DETO records adjacent to the Study Area were in 2013 and located approximately 0.4-mile and 0.8-mile northeast of the proposed gen-tie (CDFW 2024a). For each of these sightings, one adult female DETO was seen foraging in creosote bush scrub (CDFW 2024b).

3.2.2 Soils

Soils found in the Study Area primarily consisted of friable loamy sand and sandy loam soil types. According to the USDA NRCS Web Soil Survey (USDA NRCS 2023), the Study Area includes 13 types of soil (Table 1).

Table 1. Soil Types

Soil Type	Study Area		Project Site[1/]	
	Acres	Percent	Acres	Percent
Adelanto loamy sand, 2 to 5 percent slopes	290	3	273	4
Cajon loamy sand, 2 to 9 percent slopes	1,289	15	1,126	15
Greenfield sandy loam, 2 to 9 percent slopes	409	5	349	5
Hanford coarse sandy loam, 2 to 9 percent slopes	300	4	267	3
Ramona coarse sandy loam, 5 to 9 percent slopes	740	9	689	9
Ramona sandy loam, 9 to 30 percent slopes, eroded	29	0	14	<1
Arizo gravelly loamy sand, 2 to 9 percent slopes	18	0	18	<1
Cajon loamy sand, 0 to 5 percent slopes	3,271	38	2,956	38
Cajon gravelly loamy sand, 0 to 9 percent slopes	1,056	12	958	12
Garlock loamy sand, 2 to 9 percent slopes	830	10	672	9
Randsburg sandy loam, 2 to 15 percent slopes	245	3	245	3
Rosamond clay loam	127	1	127	2
Torriorthents-Rock outcrop complex, very steep	2	0	2	<1
Total	**8,606**	**100**	**7,696**	**100**

1/ The new gen-tie, existing gen-tie corridor, and medium-voltage lines are not included in the Project site acres. Acres for these areas are included in the Study Area.

4.0 FIELD SURVEY

This section describes the field methods and results used for the DETO habitat suitability assessment and protocol presence/absence survey in accordance with USFWS protocol *Preparing for Any Action that May Occur within the Range of the Mojave Desert Tortoise* (USFWS 2019).

4.1 Methods

Although the Project site is approximately 7,700 acres, a larger 8,606-acre Study Area was surveyed that encompasses the 7,700-acre Project site, the proposed gen-tie corridor, and temporary offsite construction laydown yard.

The Study Area is in the known distributional range of DETO; therefore, it was determined that a DETO habitat suitability assessment and protocol-level presence/absence survey were needed. The habitat suitability assessment was conducted in fall 2022, fall 2023, winter 2023-2024, and spring 2024, and the protocol-level presence/absence survey was conducted in spring 2023, fall 2023, and spring 2024.

DETO habitat suitability assessments and protocol-level presence/absence surveys, in accordance with the *Desert Tortoise Field Manual* (USFWS 2009) and *Preparing for Any Action that may Occur within the Range of the Mojave Desert Tortoise* (USFWS 2019), are intended to determine whether DETO are present in a project area; estimate the number of DETO in a project area, when appropriate; and provide information on habitat conditions in the project area. The protocol includes walking 10-meter-wide belt transects, recording all evidence that indicates DETO may be present, and categorizing the condition of sign. Additional details are provided in the sections below.

4.1.1 Habitat Suitability Assessment

The habitat suitability assessment was performed by driving existing roads throughout the Study Area and assessing the habitat for its suitability to support DETO. Areas inaccessible on foot or by vehicle were evaluated in the field via binoculars in combination with review of multiple sources of aerial imagery (i.e., ArcGIS™, Google Earth). The survey was conducted in November 2022, November 2023, December 2023, January 2024, and April 2024.

During the habitat suitability assessment, specific features that help identify suitable DETO habitat were visually evaluated in the field, including topography, substrate texture, plant species diversity, vegetation composition and cover, presence of washes, presence of potential forage plants, and cover sites (e.g., soil burrows, caliche caves, rock shelters, large shrubs). Additionally, evidence of disturbance was noted, such as off-highway vehicle use, fencing, roads, evidence of livestock grazing, trash dumping, existing renewable energy generating infrastructure, transmission lines, vegetation removal and ground-disturbing activities (i.e., grading, grubbing), other anthropogenic features, and evidence of predators (e.g., common ravens [*Corvus corax*], canids).

Habitat suitability data was collected in the field using the Environmental Systems Research Institute (Esri) ArcGIS Field Maps software on a device connected to a Global Positioning System (GPS) unit. Areas of moderate and low suitability, and unsuitable DETO habitat were mapped based on aerial imagery, vegetation mapping data, CWHR data, and NWI data.

Habitat suitability definitions were developed based on field experience with DETO across the Mojave Desert and information provided by USFWS guidance documents (USFWS 1992, 1994a, 1994b, 2009, 2019, 2020). DETO habitat within the Study Area was categorized based on four habitat suitability categories:

- **High Suitability:** High-suitability DETO habitat is suitable for all life stages. This habitat type is characterized by an abundance of available cover sites, friable soils for digging, substantial native vegetation cover for forage, minimal anthropogenic disturbances and predation threats, and minimal to no non-native vegetation cover. High-suitability DETO habitat would support tortoises across multiple seasons due to available cover sites that provide reliable shelter from extreme weather and predation threats. Characteristics that contribute to the reliability of a cover site may include the rigidity of the structure (i.e., rock shelters, caliche caves) that could withstand potential predation attacks (i.e., digging out burrows) and extreme storm events (e.g., erosion), and potential to provide deep shade (i.e., deep burrows and caves, large and dense shrubs) during high temperatures. An abundance of recent DETO sign, evidence of occupation, and the presence of live DETO may be present in this type of habitat. High-suitability habitat would be expected to support a healthy DETO population.
- **Moderate Suitability:** Moderate-suitability DETO habitat may either contain most of the elements of high-suitability habitat, but not in abundance, or may contain all elements of high-suitability habitat but evidence of disturbance and/or predation threats is more prominent. This habitat type is characterized by the presence of available cover sites, some friable soils for digging, native vegetation cover for forage that is dispersed and/or intermixed with non-native cover, and some anthropogenic disturbances and predation threats. Available and reliable cover sites may be present but likely not in abundance. DETO sign and evidence of occupation in this habitat type may be old or degraded, and/or recent sign may be minimal and localized. Moderate-suitability habitat may support all DETO life stages but would be expected to support a small and/or fragmented DETO population.
- **Low Suitability:** Low-suitability DETO habitat may contain elements of moderate-suitability habitat but that is subjected to prominent disturbances and predation threats (such as a large raven population or evidence of feral canids), is extremely degraded due to anthropogenic disturbances, and/or lacks sufficient elements of DETO habitat (e.g., shrub cover, cover sites, available forage) to support all DETO life stages. Cover sites and friable soils for digging may or may not be present. If present, reliable cover sites (i.e., reliable across multiple seasons during storm events and/or during predation attacks) may be scarce. Vegetation cover is typically low and/or dominated by non-native species. Shrub cover is likely monotypic and/or lacks a variable shrub structure. Low-suitability habitat is usually fragmented and lacks connectivity to higher-suitability habitat areas or may be isolated from other patches of suitable or potentially suitable DETO habitat. Alternatively, low-suitability habitat may be present along the margins of higher-suitability habitat but is subjected to higher frequencies of anthropogenic disturbances, such as along well-traveled dirt roads or near development (e.g., solar fields, transmission lines). If present, DETO sign would be expected to be old, degraded, or minimal in this type of habitat. At times, low-suitability DETO habitat may be unsuitable for

disturbances. In general, low-suitability habitat may be used by DETO for forage, cover, and/or dispersal to get to higher suitability habitat, and may support individual resident tortoises, but this habitat type would not be expected to maintain a DETO population.

- **Unsuitable:** Unsuitable DETO habitat lacks cover sites and contains compacted or anthropogenically altered soils or substrates. Vegetation, if present, is dominated by or entirely composed of non-native species and disturbances are abundant. Unsuitable habitat for DETO typically includes areas such as large and well-established dirt roads, paved roads, and urban development. Unsuitable areas do not contain characteristic or physical features of suitable habitat that are necessary to support DETO at any life stage.

A summary of DETO habitat suitability categories is provided in Table 2.

Table 2. Summary of Habitat Suitability Categories

Habitat Suitability	Summary
High	• Has an abundance of cover sites, friable soils, substantial native vegetation cover, minimal disturbances and predation threats, and minimal to no non-native vegetation cover. • Provides reliable cover sites that provide shelter across multiple seasons (e.g., extreme storm events), could withstand potential predation attacks, and provide deep shade. • May have an abundance of recent DETO sign, evidence of occupation, and presence of live DETO. • Expected to support a healthy DETO population.
Moderate	• Has cover sites, some friable soils, native vegetation dispersed and/or intermixed with non-native cover, and some anthropogenic disturbances and predation threats. • May have available and reliable cover sites but likely not in abundance. • DETO sign may be old or degraded and/or recent sign may be minimal and localized. • Expected to support a small and/or fragmented DETO population.
Low	• Cover sites and friable soils may or may not be present; reliable cover sites are likely scarce, and habitat may be unsuitable for permanent DETO occupation. • Vegetation cover is likely low and/or dominated by non-native species, often with monotypic shrub cover. • Is usually fragmented, isolated, and lacks connectivity to higher suitability habitat or may be present along the margins of higher suitability habitat where anthropogenic disturbances are frequent (e.g., well-traveled roads or near development). • DETO sign is likely old, degraded, minimal, or not present. • Not expected to support all life stages of DETO due to prominent disturbance/predation threats and/or lacks sufficient elements (e.g., cover sites, forage) of DETO habitat.
Unsuitable	• Lacks cover sites. • Soils or substrates are compacted or anthropogenically altered. • Vegetation is dominated by or consists of non-native species or is absent. • Disturbances are abundant. • Lacks characteristics or physical features necessary to support DETO or any of their life stages.

4.1.2 Protocol-Level Presence/Absence Survey

The protocol-level presence/absence survey for DETO was performed during the DETO active season in April, May, September, and October 2023 and April 2024. This survey occurred concurrently with a burrowing owl (*Athene cunicularia*) and desert kit fox (*Vulpes macrotis arsipus*) burrow survey. The DETO presence/absence survey was conducted in accordance with the *Desert Tortoise Field Manual* (USFWS 2009) and *Preparing for Any Action that may Occur within the Range of the Mojave Desert Tortoise* (USFWS 2019) survey guidelines.

The survey was led by DETO biologists Taylor Dee and Alden Lovaas, who have 7 and 5 years of experience conducting surveys in California, respectively. The remaining team members consisted of qualified DETO biologists who have undergone the Desert Tortoise Council's DETO Training Workshop or have been trained by the lead DETO biologists. The survey team walked pedestrian transects spaced 10 meters (33 feet) apart.

The survey team walked approximately 3,398 linear kilometers within the Study Area. If encountered, DETO locations and their sign were recorded on paper datasheets and electronically using Esri ArcGIS Field Maps software on a device connected to a GPS unit. Burrows and vegetation were checked for tortoises and burrows were investigated using a handheld mirror or flashlight. DETO sign was classified based on the rating system from the USFWS *Desert Tortoise Field Manual* (USFWS 2009) and *Field Survey Protocol for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise* (USFWS 1992), as shown in Table 3. Any other special-status species observed or detected by the presence of sign during the survey was also recorded on datasheets and documented using a GPS unit. Details on the DETO presence/absence survey conducted are provided in Table 4.

Table 3. DETO Sign Classifications

Type	Class	Description
Burrow[1/]	1	Definitely tortoise – currently active with DETO or recent sign
	2	Definitely tortoise – good condition, no evidence of recent use
	3	Definitely tortoise – deteriorated condition
	4	Possibly tortoise – good condition
	5	Possibly tortoise – deteriorated condition
Scat[2/]	1	Wet (not from rain or dew) or freshly dried, obvious odor
	2	Dried, with glaze, some odor, dark brown
	3	Dried, no glaze or odor, signs of bleaching (light brown), tightly packed material
	4	Dried, very light brown – yellow, loose material, scaly appearance
	5	Bleached, or consisting only of plant fiber
Carcass[2/]	1	Fresh, putrid, scutes mostly adhered, sheen on exposed bone
	2	Scutes mostly adhered to bone, normal color
	3	Scutes peeled off bone
	4	Shell bone falling apart, growth rings on scutes peeling
	5	Disarticulated and scattered

Notes:
1/ DETO burrow class definitions taken from *Desert Tortoise Field Manual* (USFWS 2009).
2/ DETO scat and carcass class definitions are from *Field Survey Protocol for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise* (USFWS 1992).

Table 4. DETO Habitat Suitability Assessment and Presence/Absence Survey Conducted

Survey	Date(s)	Biologists
Habitat Suitability Assessment	November 3-4, 2022 November 7-11, 2022 November 27-29, 2023 December 11-13, 2023 January 23-26, 2024 April 11-12, 2024	Taylor Dee Alden Lovaas Verity Richardson Wendy Turner
Protocol-level Presence/Absence Survey	April 10-14, 2023 April 17-21, 2023 April 24-28, 2023 May 1-5, 2023 May 8-12, 2023 May 15-18, 2023 September 25-29, 2023 October 5, 2023 April 11-12, 2024	Taylor Dee Alden Lovaas Matt Adams Sarah Baden Nikki Bottum Chelsie Brown Alivia De Luz Alexandra Dorough Shelby Dunn Caroline Garcia Joshua Harris Daniel Jacques Julie Kaplan Annie Lightell Maribel Lopez Eliza McLean Carly Martenson Ari Naiman Madison Panzino Jamie Perigo Victoria Prado Verity Richardson Adam Schroeder Lauren Simpson Derek Siver Corrina Tapia Wendy Turner Sarah Wagner Carter Warwick Jennifer West Rachel Woodard

4.2 Results

This section describes the results of the DETO habitat suitability assessment and protocol-level presence/absence survey. The Study Area was composed of moderate-suitability habitat, low-suitability habitat, and unsuitable habitat for DETO, and no live DETO were observed during the habitat suitability assessment or protocol-level presence/absence survey.

4.2.1 Habitat Suitability Assessment

Comprehensive lists of plants and wildlife observed within the Study Area were compiled from surveys conducted within the Study Area. A list of plant species observed within the Study Area is included in Appendix B, and a list of wildlife species observed within the Study Area is included in Appendix C. Potential predators of DETO documented within the Study Area included American badger (*Taxidea taxus*), common raven, and canids. While no specific evidence was found of American badger or raven predation on DETO, possible canid predation on DETO was observed and details are provided in Section 4.2.2 of this report.

Table 5 lists the vegetation communities found and their acreage within the Study Area. Results of the vegetation mapping are shown in Figures 4a and 4b.

Table 5. Vegetation Communities

Vegetation Communities	Study Area		Project Site[1/, 2/]	
	Acres	Percent	Acres	Percent
Allscale scrub (*Atriplex polycarpa* Shrubland Alliance)	20	<1	20	<1
Brittle bush scrub (*Encelia farinosa* Shrubland Alliance)	206	2	206	3
California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii* Shrubland Alliance)	465	5	388	5
California juniper woodland (*Juniperus californica* Woodland Alliance)	354	4	312	4
Cheesebush scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance)	773	9	640	8
Creosote bush scrub (*Larrea tridentata* Shrubland Alliance)	5,737	67	5,093	66
Desert needlegrass grassland (*Stipa speciosa* Herbaceous Alliance)	246	3	227	4
Developed	57	1	52	1
Disturbed	35	<1	26	<1
Disturbed creosote bush scrub	340	4	337	4
Rubber rabbitbrush scrub (*Ericameria nauseosa* Shrubland Alliance)	344	4	303	4
Scalebroom scrub (*Lepidospartum squamatum* Shrubland Alliance)	29	<1	29	<1
Not surveyed	0	0	61	1
Total	**8,606**	**100**	**7,696**	**100**

1/ The new gen-tie, existing gen-tie corridor, and medium-voltage lines are not included in the Project site acres. Acres for these areas are included in the Study Area.

2/ Approximately 61 acres of the Project site have no vegetation mapping data. Unmapped areas are designated for zone changes only and no Project disturbance would occur in these areas.

Nine natural vegetation communities were found within the Study Area: allscale scrub (*Atriplex polycarpa* Shrubland Alliance), brittle bush scrub (*Encelia farinosa* Shrubland Alliance), California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii* Shrubland Alliance), California juniper woodland (*Juniperus californica* Woodland Alliance), cheesebush scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance), creosote bush scrub (*Larrea tridentata* Shrubland Alliance), desert needlegrass grassland (*Stipa speciosa* Herbaceous Alliance), rubber rabbitbrush scrub (*Ericameria nauseosa* Shrubland Alliance), and scalebroom scrub (*Lepidospartum squamatum* Shrubland

Alliance). These vegetation communities provide habitat suitable for DETO. The three other communities within the Study Area contained developed and disturbed areas and disturbed creosote bush scrub. Disturbed areas may provide low-suitability habitat for DETO. The Study Area is regularly used for sheep grazing and sheep were observed onsite. In addition, the Kern County Canyon Fire (CA-KRN-Canyon) previously burned through the western portion of the Study Area in 2011 and has generally resulted in lower habitat suitability for DETO in this area.

Vegetation communities as well as disturbed and developed areas observed within the Study Area are described below:

Allscale scrub (*Atriplex polycarpa* Shrubland Alliance): This alliance is dominated by allscale, which comprises more than 2 percent absolute cover and more than 50 percent relative cover in the shrub canopy. Other plant species present in this community include creosote bush (*Larrea tridentata*) and winterfat (*Krascheninnikovia lanata*). Some scattered western Joshua trees are present. Shrubs are generally less than 3 meters in height, and the canopy is open to continuous.

Brittle bush scrub (*Encelia farinosa* Shrubland Alliance): This alliance is dominated by brittle bush (*Encelia farinosa*), which comprises more than 1 percent absolute cover in the shrub canopy and more than 50 percent relative cover. Other plant species present in this community include white bursage (*Ambrosia dumosa*), creosote bush, desert needlegrass (*Stipa speciosa*), and cheesebush (*Ambrosia salsola*). Shrubs are generally less than 2 meters in height, and the canopy is open to intermittent.

California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii* Shrubland Alliance): This alliance is dominated by Mojave desert California buckwheat (*Eriogonum fasciculatum* var*. polifolium*). California buckwheat is present at more than 5 percent absolute cover in the shrub canopy and Parish's goldeneye (*Viguiera parishii*) was not observed. In some areas, California buckwheat is codominant with Cooper's goldenbush (*Ericameria cooperi* var. *cooperi*). White bursage, desert needlegrass, creosote bush, cheesebush, Nevada ephedra (*Ephedra nevadensis*), desert fiddleneck (*Amsinckia tessellata* var. *tessellata*), and rayless goldenhead (*Acamptopappus sphaerocephalus*) are also present in this community. Shrubs are generally less than 2 meters in height, and the canopy is open to intermittent open.

California juniper woodland (*Juniperus californica* Woodland Alliance): This alliance is dominated by California juniper (*Juniperus californica*), which is present at more than 3 percent absolute cover over lower shrubs. No other tree species are present. Other plant species present in this community include creosote bush, Nevada ephedra, and desert needlegrass. Trees are generally less than 5 meters in height, and canopy is open to intermittent.

Cheesebush scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance): This alliance is dominated by cheesebush, which is present at more than 2 percent cover in the shrub canopy with other shrubs comprising less cover in the shrub canopy. Sweetbush (*Bebbia juncea*) is not present in this community. Other plant species observed include creosote bush, white bursage, desert needlegrass, desert fiddleneck, Nevada ephedra, Acton Encelia (*Encelia actoni*), rubber rabbitbrush (*Ericameria nauseosa*), cheatgrass (*Bromus tectorum*), and rayless goldenhead. Shrubs are less than 2 meters in height, and canopy is open to intermittent.

Creosote bush scrub (*Larrea tridentata* Shrubland Alliance): This alliance was the most encountered vegetation community in the Study Area. This alliance is dominated by creosote bush, which exceeds other shrubs in cover. In some areas, emergent western Joshua trees are present. Other small shrubs such as white bursage, winterfat, Nevada ephedra, cheesebush, rayless goldenhead, and peach thorn (*Lycium cooperi*) were observed alongside creosote in some areas, but in this alliance, their cover is less than three times the cover of creosote bush.

Desert needlegrass grassland (*Stipa speciosa* Herbaceous Alliance): This alliance is dominated by desert needlegrass, which is present at more than 50 percent relative cover in the herbaceous layer. Emergent western Joshua trees and shrubs, including cheesebush, rubber rabbitbrush, creosote bush, desert wishbone bush (*Mirabilis laevis*), and desert fiddleneck are present at low percent cover. Herbs are generally less than 1 meter in height, and canopy is open to intermittent.

Developed: Areas mapped as developed include existing wind energy generating infrastructure, existing buildings, structures, hard paved roads, and railroads. The existing Windhub substation is located off Oak Creek Road. Other areas mapped as developed include buildings on the Windswept Ranch Petting Zoo property as well as a graded gravel lot with trailers and fenced yard on Tehachapi Willow Springs Road. Multiple abandoned and/or previously occupied structures as well as associated non-occupied accessory structures within the western half of the Study Area and roads including Oak Creek Road, Santa Fe Railroad, and Tehachapi Willow Springs Road were also considered to be developed.

Disturbed: Areas described as disturbed are characterized by the presence of anthropogenic disturbances such as trash, off-road vehicle tracks, and non-native species. Areas mapped as disturbed include areas along Oak Creek Road with existing infrastructure associated with the Windhub Substation, part of the southeastern section of the Study Area adjacent to the Holliday Rock Mine, an abandoned illegal grow operation in the middle of the Study Area north of the LADWP aqueduct, and abandoned encampments with no structures in the middle of the Study Area north of the LADWP aqueduct and in the southwestern section of the Study Area south of the LADWP aqueduct.

Disturbed creosote bush scrub: This community is characterized by anthropogenic disturbances to the ground and vegetation. Disturbed creosote bush scrub in the northernmost section of the Study Area is disturbed due to historical ground and vegetation disturbance, road construction, and/or has been burned in a wildfire. The section south of the LADWP aqueduct is disturbed due to a large burn scar, because of which it exhibits characteristics different than creosote bush scrub in other areas of the Study Area. Dead creosote bush and western Joshua trees, relatively low vegetation cover, and large areas of bare soil were observed in this burned area. In the area north of the LADWP aqueduct and south of Tehachapi Willow Springs Road, anthropogenic disturbances and historical grading were observed.

Rubber rabbitbrush scrub (*Ericameria nauseosa* Shrubland Alliance): This alliance is dominated by rubber rabbitbrush, which is present at more than 50 percent relative cover in the shrub canopy. Shrubs are generally less than 3 meters in height, and canopy is open to continuous.

Scalebroom scrub (*Lepidospartum squamatum* Shrubland Alliance): This alliance is dominated by scalebroom (*Lepidospartum squamatum*), which is present at more than 1 percent cover in alluvial

environments. This alliance was observed along a dry streambed that runs across the Study Area. Rubber rabbitbrush and desert needlegrass were also present in this community. Shrubs are less than 2 meters in height, and canopy is open to continuous and two-tiered.

Moderate-suitability, low-suitability, and unsuitable DETO habitat was observed within the Study Area (Figure 5). The majority of the Study Area consisted of moderate-suitability DETO habitat, with some low-suitability and unsuitable habitat. Low-suitability and unsuitable DETO habitat were predominantly located in the western and northwestern portions of the Study Area. High-suitability DETO habitat was not found within the Study Area due to the large amounts of anthropogenic disturbances documented throughout the Study Area and proximity of existing development (i.e., residential, transmission lines, mining, railroad). Moderate-suitability habitat was characterized by friable soils, moderate to high native vegetation cover, evidence of anthropogenic disturbance, and non-native vegetation cover. Low-suitability habitat had some available cover sites, but vegetation cover was lower than in moderate suitability habitat, and disturbance was more prevalent. Unsuitable DETO habitat mostly consisted of developed areas and anthropogenically disturbed areas (i.e., abandoned and dilapidated structures, buildings, homesteads, roads, railroads). Results from the DETO habitat suitability assessment are shown in Table 6.

Table 6. Habitat Suitability Assessment

Habitat Suitability Category	Study Area		Project Site		Vegetation Communities
	Acres	Percent	Acres[1/]	Percent	
High	0	0	0	0	None.
Moderate	6,690	78	5,852	77	• Creosote bush scrub
Low	1,879	22	1,753	23	• Cheesebush scrub • Rubber rabbitbrush scrub • Creosote bush scrub • Desert needlegrass grassland • Brittle bush scrub • California juniper woodland
Unsuitable	37	<1	29	<1	• Developed • Disturbed
Total	**8,606**	**100**	**7,634**	**100**	-

1/ Approximately 61 acres of the Project site have no vegetation or habitat suitability mapping data. Unmapped areas are designated for zone changes only and no Project disturbance would occur in these areas.

4.2.2 Protocol-level Presence/Absence Survey

Live DETO was not observed in the Study Area. Confirmed DETO sign observed in the Study Area during the survey is summarized below and overall observations are provided in Table 7. All observed DETO sign was likely from one deceased DETO.

- One Class 3 (scutes peeled off bone) adult male DETO carcass in 2023, formerly Class 1 in 2022;
- One Class 3 burrow (definitely tortoise, deteriorated condition) with Class 3 DETO scat; and
- Three pieces of Class 3 and 4 adult DETO scat, all of which were within 160 feet of the adult male DETO carcass but not associated with a burrow.

DETO burrow/pallet locations can also be used by multiple other species opportunistically, such as burrowing owl and desert kit fox (Crowe and Longshore 2013; USFWS 2009, 2022).

Table 7. Summary of DETO Sign Observations

Sign Type	Sign Class[1/, 2/]					Total[3/]
	1	2	3	4	5	
Burrow	-	-	1	1	2	**4**
Scat[4/]	-	-	2	1	-	**3**
Carcass	-	-	1	-	-	**1**

1/ DETO Sign Classification*

BURROWS
1 - Currently active, with tortoise or active sign.
2 - Good condition, definitely tortoise, no evidence of recent use.
3 - Deteriorated condition, definitely tortoise.
4 - Good condition, possibly tortoise.
5 - Deteriorated condition, possibly tortoise.

SCAT
1 - Wet or freshly dried, obvious odor.
2 - Dry with glaze and some odor, no bleaching, dark brown.
3 - Dry without glaze or odor, light brown, tightly packed, signs of bleaching.
4 - Dry, very light brown to yellow, loose material; scaly.
5 - Bleached or consisting only of plant fiber.

CARCASS
1 - Fresh or putrid.
2 - Normal color, scutes adhered to bone.
3 - Scutes peeled off bone.
4 - Shell bones falling apart; growth rings on scutes are peeling.
5 - Disarticulated and scattered.

2/ For the purposes of this table, classification provided is based on the most recent observation of the sign.

3/ Sign was quantified based on the number of locations.

4/ Scat observations are those not found on a burrow apron/mound or inside a burrow (i.e., scat found at Class 3 burrow ID 7031 is not included in this table).

* Burrow class definitions taken from USFWS (2009); scat and carcass class definitions taken from USFWS (1992).

The locations of DETO sign observed are shown in Figure 6. The DETO carcass was originally observed during the initial habitat suitability assessment in November 2022 and was documented as a Class 1 (fresh or putrid) carcass with mostly recent signs of trauma to the shell and flesh including evidence of possible canid predation; however, evidence of old trauma was observed on a marginal scute. The DETO carcass had a midline carapace length (MCL) of approximately 280 millimeters (mm). In 2022, the carcass was observed upside down with minimal trauma to the carapace and plastron (bottom shell). The gular (extension of shell under the neck) was intact; however, tooth rakes were observed on the gular. A large canid print was located next to the carcass. The front left forelimb and back right hindlimb were missing, and scales on the front right forelimb were missing and appeared to have been recently chewed off. Additionally, evidence of old trauma consisted of a circular, likely anthropogenic hole observed in the right marginal 10 scute.

In April 2023, the carcass was still present in the same location, but it had deteriorated. Its scutes had begun to detach, and therefore the classification was updated to a Class 3. A canid latrine (pile of scat) was observed within two feet of the carcass. In addition to the trauma related to the canid predation, multiple physical characteristics were documented on the carcass, which included the following: (1) a smooth and clean circular hole was observed in the right marginal scute of the carapace, similar to a drilled hole used for tethering pet tortoises; and (2) the femoral and abdominal scutes were observed to be smooth and flat, consistent with captive DETO that have lived on a hard surface (e.g., concrete). No signs of pyramiding (excessive upward growth of the scutes), paint, tags, notches filed into the

scutes, or other potential indications of captivity or involvement as a research subject were observed. Regardless, the physical characteristics observed are consistent with those observed in captive DETO individuals and, therefore, likely indicate previous captivity.

Photographs of representative DETO sign are provided in Appendix A. Datasheets from the survey are provided in the Project Biological Resources Summary Technical Report (Tetra Tech 2025). Details on the DETO sign observed within the Study Area are provided in Table 8. Table 8 reflects the most updated and accurate data, and datasheets may not reflect updates from the quality control process that were made in the table.

Table 8. Details of DETO Sign Observations

ID	DETO Sign Type	Date[1/] (2023)	Class	Quantity	Vegetation Community	Notes
7005	Burrow	April 11	5 *Possibly DETO, deteriorated condition*	1	Creosote bush scrub	Soil burrow classified as Class 4 on November 10, 2022, but reclassified to Class 5 on April 11, 2023, due to deterioration. No DETO sign observed. Burrow dimensions: 10 inch (“) width (w) x 5” height (h) x >72” deep (d)
0411BA1AL	Burrow	April 11	5 *Possibly DETO, deteriorated condition*	1	Creosote bush scrub	Soil burrow was in deteriorated condition with dead vegetation and debris in the burrow entrance. Burrow was beginning to collapse. No DETO sign observed. Burrow dimensions: 10”w x 4”h x 24”d
0425BA5TD	Burrow	April 25	4 *Possibly DETO, good condition*	1	Creosote bush scrub	Soil burrow was in good condition. .No DETO sign observed. Located under a creosote bush with vegetation growing over the apron and entrance. Old, bleached canid scat observed around the entrance. Burrow dimensions: 10”w x 8”h x 36”d
7031	Burrow	April 25	3 *Definitely DETO, deteriorated condition*	1	Creosote bush scrub	Soil burrow originally observed on November 10, 2022 near an adult DETO carcass. Burrow entrance was enlarged and surrounded by broken creosote branches. It appeared that the burrow had been recently dug out by a canid and was likely associated with the observed carcass. Nine pieces of Class 3 scat were observed immediately surrounding the burrow. The deceased DETO was likely using the burrow and left the scat in this localized portion of the Study Area. On April 25, 2023, the burrow had collapsed and the entrance was overgrown with annual vegetation. Burrow dimensions: 14”w x 7.5“h x 24”d
0425BA6VR	Scat	April 25	4 *Dried, very light brown-yellow, loose material*	1	Creosote bush scrub	One piece of adult tortoise scat.

ID	DETO Sign Type	Date[1/] (2023)	Class	Quantity	Vegetation Community	Notes
0425BA7VR	Scat	April 25	3 *Dried, no glaze or odor, light brown, tightly packed*	2	Creosote bush scrub	Two pieces of adult tortoise scat.
0425BA8VR	Scat	April 25	3 *Dried, no glaze or odor, light brown, tightly packed*	1	Creosote bush scrub	One piece of adult tortoise scat.
7030	Carcass	April 25	3 *Scutes peeled off bone*	1	Creosote bush scrub	On November 10, 2022, a Class 1 adult male DETO carcass (approximately 280 mm MCL) was observed upside down near burrow (ID 7031). Recent and old trauma observed on shell and flesh, including evidence of predation and likely anthropogenic circular hole in right marginal scute. On April 25, 2023, the carcass was reclassified to Class 3 due to deterioration, scute peeled from bone, scutes detaching from the carapace. It was observed that the abdominal and femoral scutes on the plastron were flattened and smooth, possibly indicating life on a hard manmade surface. A canid latrine was observed within 2 feet of the carcass.

1/ Date provided is the date the sign was most recently observed, if it was observed multiple times during the survey.

5.0 DISCUSSION AND RECOMMENDATIONS

The majority of the Study Area consists of moderate-suitability DETO habitat, with some low-suitability habitat and unsuitable habitat. Sign of species known to prey on DETO (i.e., desert kit fox, coyote [*Canis latrans*], American badger, and common raven) were detected throughout the Study Area, which could contribute to low tortoise density. In addition, while suitable habitat is available for DETO in the Study Area, anthropogenic disturbances such as off-road vehicle use and nearby development could also contribute to low tortoise density and tortoise mortality.

DETO sign was found within the Study Area, but no live DETO were observed during survey. All observed DETO sign was likely from one deceased DETO. The deceased DETO showed multiple signs of predation consisting of recent trauma to the shell and flesh (i.e., tooth rakes, missing limbs, and missing scales from a forelimb) and evidence of canids were observed at the carcass and nearby Class 3 (definitely tortoise) DETO burrow (i.e., latrine and tracks). The deceased DETO also showed signs of old trauma to the shell that is consistent with shell trauma observed in some captive tortoises (i.e., circular hole in the right marginal scute, and flat and smooth abdominal and femoral scutes on the plastron); however, no pyramiding was observed which is also sometimes observed in captive tortoises. The circular hole is consistent with a hole created by a drill; drilled holes have been documented in some captive tortoises and are used to tether the animal. The flat and smooth abdominal and femoral scutes on the plastron likely indicate prolonged time on a hard surface such as that observed in some captive tortoises living on concrete. The habitat where the deceased DETO

and nearby sign were observed was not rocky but consisted of friable soils; therefore, the flat and smooth scutes likely indicate captivity. In addition, the only DETO sign observed in the Study Area was localized within 160 feet of the deceased DETO; this is a relatively small home range for an adult male DETO. DETO are known to occupy a home range of approximately 0.75 square miles and can travel long distances for resource use (USFWS 1994a).

Only three additional burrows that were classified as Class 4 and 5 (possibly tortoise) were observed. No other DETO sign was observed in the Study Area.

DETO burrow/pallet locations can also be used by multiple other species opportunistically, such as burrowing owl and desert kit fox (Crowe and Longshore 2013; USFWS 2009, 2022).

The results of the DETO habitat suitability assessment and protocol presence/absence survey have been used to develop DETO-specific recommendations for pre-construction surveys and avoidance and minimization measures.

The Applicant proposes implementation of the following measures to ensure potential impacts on DETO resulting from Project construction, operations and maintenance, and decommissioning activities would be avoided and minimized:

- No more than 30 days prior to the start of ground disturbance, a qualified biologist knowledgeable in the identification of all special-status wildlife species with potential to occur on the Project site will conduct a pre-construction survey of areas proposed for disturbance within the Project site and 500-foot buffer (where legally accessible) to determine if any special-status species are present. Surveys need not be conducted for all areas of suitable habitat at one time; they may be phased so that surveys occur no more than 30 days prior to ground disturbance in specific areas of the site. If evidence of occupation by a special-status species is observed, a suitable buffer will be established by a qualified biologist that results in sufficient avoidance.
- During construction the Project site may be fenced to keep terrestrial wildlife species from entering the site. Fencing will be maintained during all phases of construction and decommissioning. The fencing will be inspected by a qualified biologist at a regular interval and immediately after major rainfall events through the duration of construction and decommissioning activities. Any needed repairs to the fence will be performed immediately upon their discovery. Outside temporarily fenced exclusion areas, areas of disturbance will be limited to the extent feasible. Parking areas, new roads, staging, storage, excavation, and disposal site locations will be confined to the smallest areas possible. These areas will be flagged and disturbance activities, vehicles, and equipment will be confined to these flagged areas.
  - Following construction, the permanent perimeter security fence may be made permeable with a gap at the bottom of the fence to allow small and medium-sized wildlife and wildlife movement through and around the project site during facility operations. Final perimeter fencing design would be evaluated and developed in consultation with appropriate agencies, and the best-fit scenario would be incorporated at the Project site.

- Develop a site-specific Common Raven Management Plan in accordance with USFWS guidelines and implement management measures for ravens at the Project. These measures may include but are not limited to designing structures to eliminate perches, waste management, road kill management, management of ponded water during construction and operations, and nest removal on structures within the Project site and along the transmission line.

6.0 REFERENCES

Boarman, W.I. 2002. Desert Tortoise (*Gopherus agassizii*). In: Boarman, W.I. and Beaman, K. The Sensitive Plant and Animal Species of the Western Mojave Desert. U. S. Geological Survey, Western Ecological Research Center, Sacramento, CA.

CDFW (California Department of Fish and Wildlife). 2023. California Wildlife Habitat Relationships. Available online at: https://wildlife.ca.gov/Data/CWHR (accessed October 2023).

CDFW. 2024a. California Natural Diversity Database. Available online at: https://wildlife.ca.gov/Data/CNDDB/Maps-and-Data#43018408-cnddb-in-bios (accessed February 2024).

CDFW 2024b. RareFind 5. Available online at: https://wildlife.ca.gov/Data/CNDDB/Maps-and-Data#43018407-rarefind-5 (accessed February 2024).

Crowe, D.E., and K.M. Longshore. 2013. Nest Site Characteristics and Nesting Success of the Western Burrowing Owl in the Eastern Mojave Desert. Abstract and Summary. Available online at: https://www.sciencedirect.com/science/article/abs/pii/S0140196313000384 (accessed July 2024).

Sawyer, J., T. Keeler-Wolf, and J. Evens. 2009. *A Manual of California Vegetation, Second Edition*. California Native Plant Society.

Tetra Tech. 2025. Biological Resources Summary Technical Report. Discovery Solar PV and Storage Project. Prepared for Discovery Solar PV and Storage, LLC. October.

USDA NRCS (U.S. Department of Agriculture Natural Resources Conservation Service). 2023. Web Soil Survey. Available online at: https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx (accessed February 2023).

USFWS (U.S. Fish and Wildlife Service). 1992. Field Survey Protocol for Any Non-Federal Action that May Occur Within the Range of the Desert Tortoise. Available online at: https://www.deserttortoise.org/documents/1992surveyprotocol-nonfederal.pdf (accessed November 2022).

USFWS. 1994a. Desert Tortoise (Mojave Population) Recovery Plan. Available online at: https://ecos.fws.gov/docs/recovery_plan/940628.pdf (accessed November 2022).

USFWS. 1994b. Endangered and Threatened Wildlife and Plants. Determination of Critical Habitat for the Mojave Population of the Desert Tortoise. Available online at: https://www.federalregister.gov/documents/1994/02/08/94-2694/endangered-and-threatened-wildlife-and-plants-determination-of-critical-habitat-for-the-mojave (accessed November 2022).

USFWS. 2009. Desert Tortoise Field Manual. Available online at: https://www.fws.gov/sites/default/files/documents/Desert-Tortoise-Field-Manual.pdf (accessed November 2022).

USFWS. 2019. Preparing for Any Action that may Occur within the Range of the Mojave Desert Tortoise. Available online at: https://www.fws.gov/sites/default/files/documents/Mojave%20Desert%20Tortoise%20Pre-project%20Survey%20Protocol_2019_v2.pdf (accessed November 2022).

USFWS. 2020. Translocation of Mojave Desert Tortoises from Project Sites: Plan Development Guidance. Available online at: https://www.fws.gov/sites/default/files/documents/Revised%20USFWS%20DT%20Translocation%20Guidance.20200603final.pdf (accessed November 2022).

USFWS. 2022. Dedicated to Recovering the Desert Tortoise, Roy Averill-Murray and Desert Tortoises. Available online at: https://www.fws.gov/story/2022-07/dedicated-recovering-desert-tortoise (accessed July 2024).

USFWS. 2023. National Wetlands Inventory. Available online at: https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper (accessed February 2023).

This page intentionally left blank.

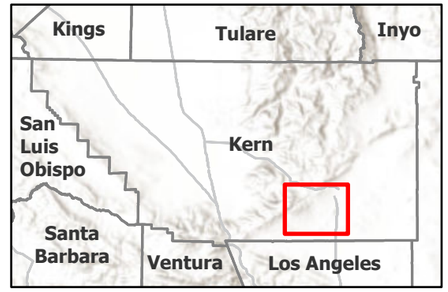
FIGURES

This page intentionally left blank.

Discovery Solar PV and Storage Project

Kern County, CA

Figure 1. Regional Overview



Windhub High-voltage Substation (Existing)

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

*Already approved under separate projects.

N

0 0.75 1.5 3 Miles

Scale is 1:116,800 when printed at 11"x17"

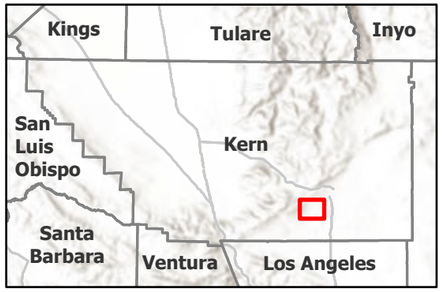
Not for Construction

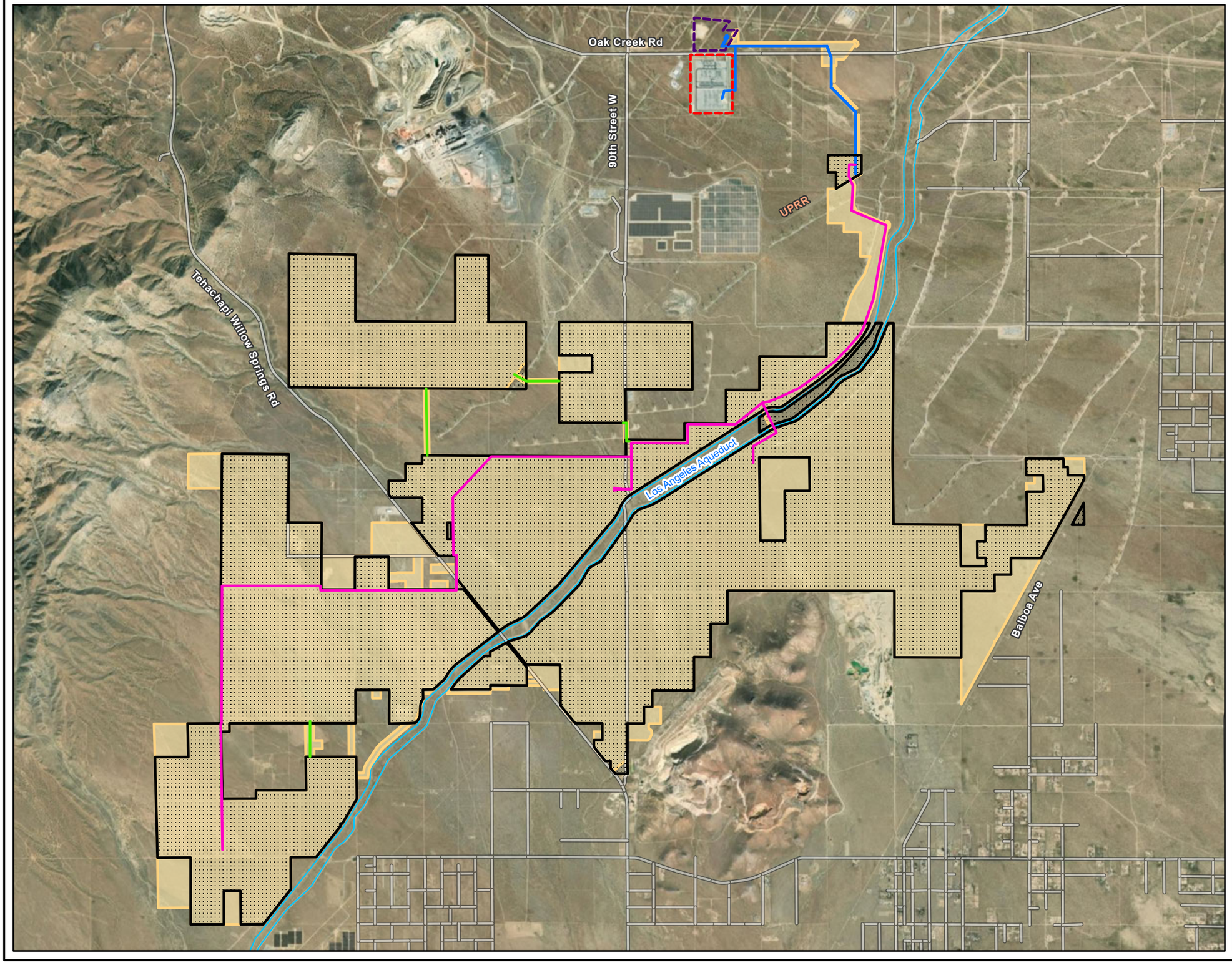
Document Path: \\cesi70\gis1\CesiProjects\POR\projects\194_PROJECT\SITERA_GEN\194_1405_0001_Discovery\PROJECT\SITERA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 2. Project Location





Windhub High-voltage Substation (Existing)

Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

Scale is 1:45,000 when printed at 11"x17"

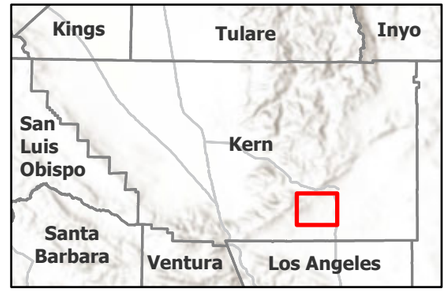
Not for Construction

Document Path: Z:\projects\194_PROJECTS\TERRA_GEN\194_1403_0001_Discovery\PRO\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 3. USGS Topographic Map



Windhub High-voltage Substation (Existing)

Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

*Already approved under separate projects.

N

Miles

0 0.5 1 2

Scale is 1:75,000 when printed at 11"x17"

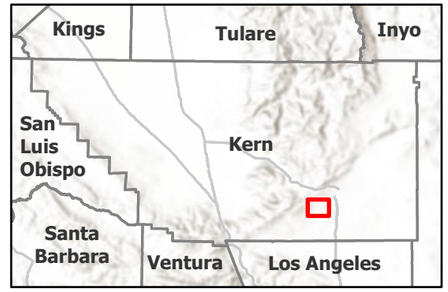
Not for Construction

Document Path: Z:\projects\94_PROJECTS\TERRA_GEN\94_1403_000_Discovery\PRO\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 4a. Vegetation Communities



Oak Creek Rd
90th Street W
UPRR
Tehachapi Willow Springs Rd
Oak Creek
Los Angeles Aqueduct
Balboa Ave
Holliday Rock Mine

Note: Additional vegetation community mapping and mapping of Joshua trees is in progress and when available, the results will be used to update this report.

- Windhub High-voltage Substation (Existing)
- Roads
- Watercourse

Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

Vegetation Communities

- Allscale Scrub
- Brittle Bush Scrub
- California buckwheat scrub
- California juniper woodland
- Cheesebush scrub
- Creosote bush scrub
- Desert needlegrass grassland
- Developed
- Disturbed
- Disturbed - Creosote bush scrub
- Rubber rabbitbrush scrub
- Scalebroom scrub

*Already approved under separate projects.

N

0 0.2 0.4 0.8 Miles

Scale is 1:39,000 when printed at 11"x17"

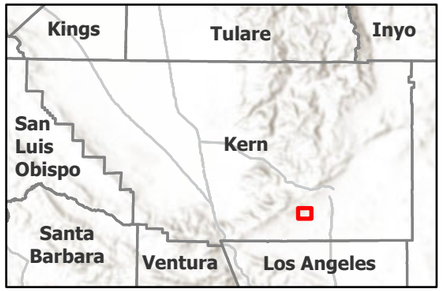
Not for Construction

Document Path: Z:\projects\194_PROJECTS\TERRA_GEN\194_1405_0001_Discovery\PROJECTS\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 4b. Vegetation Communities



Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Vegetation Communities

California buckwheat scrub

California juniper woodland

Cheesebush scrub

Creosote bush scrub

Desert needlegrass grassland

Developed

Disturbed

Disturbed - Creosote bush scrub

Rubber rabbitbrush scrub

Scalebroom scrub

Los Angeles Aqueduct

Oak Creek

Note: Additional vegetation community mapping and mapping of Joshua trees is in progress and when available, the results will be used to update this report.

N

Miles

0 0.13 0.25 0.5

Scale is 1:24,700 when printed at 11"x17"

Not for Construction

Document Path: \\tes\700gis\Tes\Projects\PDR\projects\194_PROJECT\SITERRA_GEN\194_1402_0001_Discovery\PROJECT\SITERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 5. Mojave Desert Tortoise Habitat Suitability



Windhub High-voltage Substation (Existing)

Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

Habitat Suitability

Low

Moderate

Unsuitable

High (none in Study Area)

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

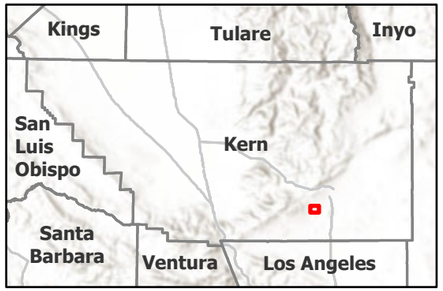
Scale is 1:45,000 when printed at 11"x17"

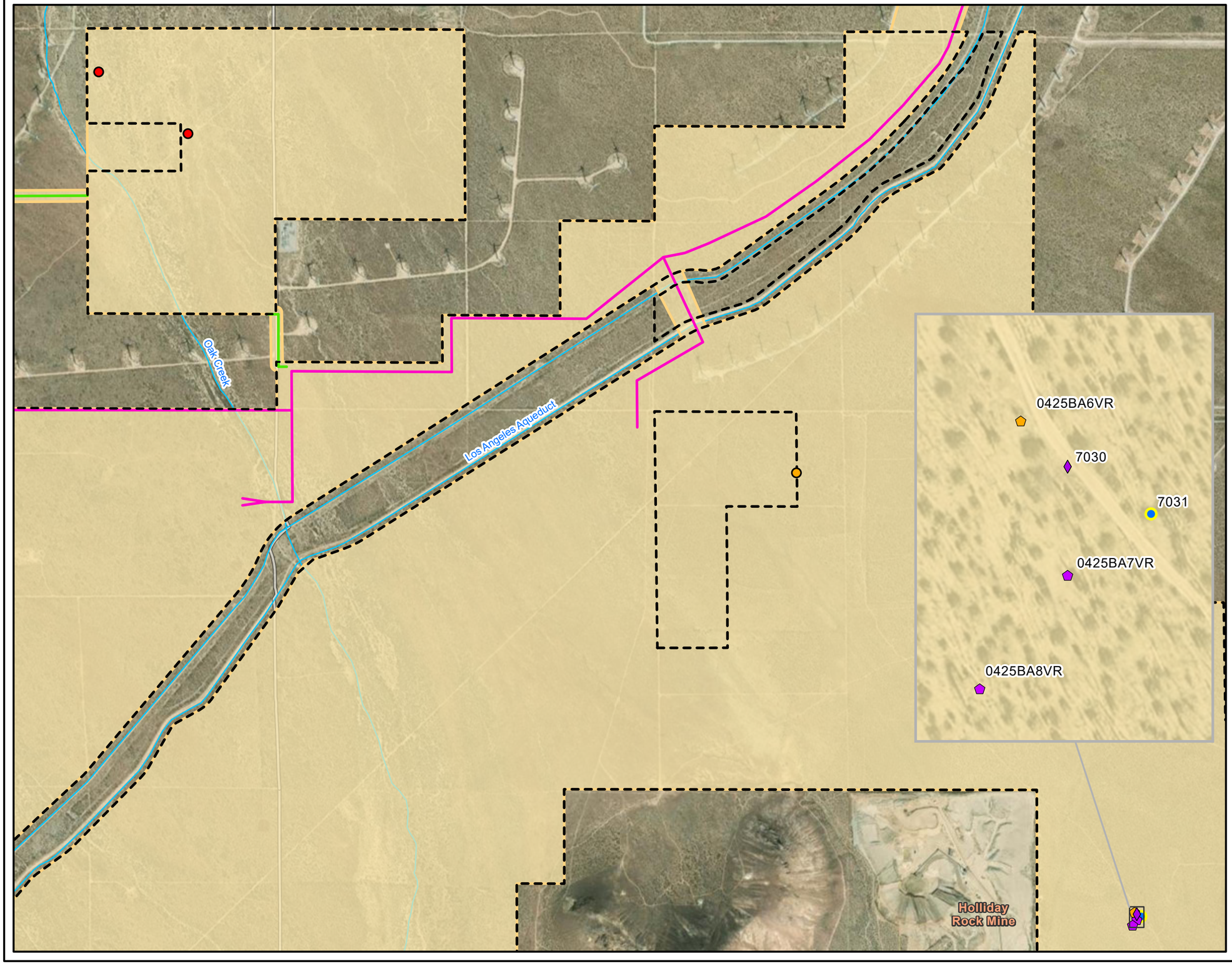
Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Figure 6. Mojave Desert Tortoise Sign





Watercourse

Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Observed Burrow

Class 3
- Sign Observed

Class 4
- No Sign Observed

Class 5
- No Sign Observed

Mojave Desert Tortoise Scat
- Class 3
- Class 4

Mojave Desert Tortoise Carcass
- Class 3

N

0 550 1,100 2,200 Feet

Scale is 1:15,903 when printed at 11"x17"

Not for Construction

Document Path: \\Local\GIS\USCES\Projects\POR\projects\194_PROJECTS\TERRA_GEN\194_1403_0001_Discovery\PROJECTS\TERRA_GEN\194_1403_0001_Discovery_V2.aprx

This page intentionally left blank.

APPENDIX A: PHOTOGRAPHS

This page intentionally left blank.

Photograph 1 **Notes:** Representative photograph of Study Area showing creosote bush scrub (*Larrea tridentata*) shrubland.	
Photograph 2 **Notes:** Class 1 adult male Mojave desert tortoise carcass (Fresh, putrid, scutes mostly adhered, sheen on exposed bone; 280-millimeter midline carapace length; ID 7030) originally observed in November 2022. Carcass showed possible signs of canid predation.	

Photograph 3 **Notes:** Canid predation sign in the form of tooth rakes on the Class 1 carcass (fresh, putrid, scutes mostly adhered, sheen on exposed bone; ID 7030) in November 2022.	
Photograph 4 **Notes:** Adult male Mojave desert tortoise carcass observed in November 2022 and again in April 2023. Carcass had degraded to Class 3 (scutes peeled off bone; ID 7030). Circular hole observed in right marginal 10 scute.	

Photograph 5 **Notes:** Class 3 DETO burrow (definitely DETO, deteriorated condition; ID 7031) located near the DETO carcass, originally observed in November 2022. DETO scat located on the apron. Broken branches around the burrow and the enlarged entrance appeared to have been recently dug out by a canid predator.	
Photograph 6 **Notes:** Class 3 burrow (definitely DETO, deteriorated condition; ID 7031) when observed again during the DETO presence/ absence survey in April 2023. Burrow had collapsed and become overgrown with vegetation.	

Photograph 7 **Notes:** Representative photo of Class 5 burrow (possibly tortoise). No DETO sign was detected at this burrow.	
Photograph 8 **Notes:** Representative Class 3 scat (dry without glaze or odor, light brown, tightly packed, signs of bleaching; ID 0425BA8VR). One piece of Class 3 scat was observed within 160 feet of the adult male DETO carcass (ID: 7030)	

Photograph 9	
Notes: Class 3 scat (dry without glaze or odor, light brown, tightly packed, signs of bleaching) was located in the vegetation near burrow 7031.	

This page intentionally left blank.

APPENDIX B: PLANT SPECIES OBSERVED IN THE STUDY AREA

This page intentionally left blank.

Scientific Name	Common Name
GYMNOSPERMS	
CUPRESSACEAE	**CYPRESS FAMILY**
*Cupressus sempervirens**	Italian cypress
Juniperus californica	California juniper
ANGIOSPERMS (DICOTYLEDONS)	
ALLIACEAE	**ONION FAMILY**
Allium fimbriatum var. *fimbriatum*	fringed onion
Allium lacunosum	pitted onion
APIACEAE	**CARROT FAMILY**
Lomatium mohavense	Mojave wild parsley
Perideridia pringlei CRPR 4.3	adobe yampah
ASTERACEAE	**SUNFLOWER FAMILY**
Acamptopappus sphaerocephalus	rayless goldenhead
Ambrosia acanthicarpa	annual bursage
Ambrosia deltoidea	triangle leaf bursage
Ambrosia dumosa	white bursage
Ambrosia salsola	cheesebush
Anisocoma acaulis	scalebud
Artemisia dracunculus	tarragon
Baileya multiradiata	desert marigold
Calycoseris parryi	yellow tack-stem
Chaenactis fremontii	Fremont pincushion
Chaenactis stevioides	desert pincushion
Encelia actoni	Acton encelia
Encelia farinosa	brittle bush
Ericameria cooperi var. *cooperi*	Cooper's goldenbush
Ericameria cuneata	wedgeleaf goldenbush
Ericameria linearifolia	interior goldenbush
Ericameria nauseosa	rubber rabbitbrush
Ericameria teretifolia	green rabbitbrush
Erigeron sp.	fleabane daisy
Eriophyllum pringlei	Pringle's woolly sunflower
Eriophyllum wallacei	Wallace's woolly daisy
Gutierrezia sp.	matchweed
*Lactuca serriola**	prickly lettuce
Lasthenia gracilis	common goldfields
Layia glandulosa	white layia
Lepidospartum squamatum	scalebroom
Leptosyne bigelovii	Bigelow coreopsis
Lessingia glandulifera	valley vinegar weed
Logfia depressa	hierba limpia
Malacothrix californica	California dandelion
Malacothrix coulteri	snakes head

Scientific Name	Common Name
Malacothrix glabrata	desert dandelion
Psilocarphus sp.	woollyheads
Stephanomeria spp.	wire-lettuce
Stephanomeria pauciflora	wire lettuce
Syntrichopappus fremontii	Fremont's syntrichopappus
Tetradymia stenolepis	narrow scaled felt thorn
Uropappus lindleyi	silver puffs
Xylorhiza tortifolia	Mojave woodyaster
BORAGINACEAE	**BORAGE FAMILY**
Amsinckia tessellata var. *tessellata*	desert fiddleneck
Cryptantha dumetorum	scrambling cryptantha
Cryptantha pterocarya	wingnut cryptantha
Cryptantha utahensis	scented cryptantha
Eremocarya micrantha var. *micrantha*	desert red-root
Greeneocharis circumscissa var. *circumscissa*	cushion greeneocharis
Pectocarya penicillata	northern pectocarya
Pectocarya linearis	narrow-toothed pectocarya
Pectocarya setosa	round-nut pectocarya
Plagiobothrys arizonicus	Arizona popcornflower
BRASSICACEAE	**MUSTARD FAMILY**
Caulanthus coulteri	Coulter's jewel flower
Caulanthus lasiophyllus	California mustard
*Brassica nigra**	black mustard
*Brassica tournefortii**	Sahara mustard
Descurainia pinnata	yellow tansy mustard
Descurainia sp.	tansy mustard
*Hirschfeldia incana**	short podded mustard
Lepidium fremontii	desert alysum
Lepidium nitidum	shining pepperweed
*Sisymbrium altissimum**	tumble mustard
Stanleya pinnata	desert princesplume
Tropidocarpum gracile	dobie pod
CACTACEAE	**CACTUS FAMILY**
Cylindropuntia echinocarpa CDNPA	**silver cholla**
Opuntia basilaris* var. *basilaris CDNPA	**beavertail cactus**
Opuntia basilaris CDNPA	**beavertail pricklypear**
CARYOPHYLLACEAE	**CARNATION FAMILY**
Herniaria hirsuta	hairy rupturewort
CHENOPODIACEAE	**CHENOPOD FAMILY**
Atriplex canescens	four-wing saltbush
Atriplex polycarpa	allscale
Grayia spinosa	hop sage
Krascheninnikovia lanata	winterfat

Scientific Name	Common Name
*Salsola tragus**	Russian thistle
CLEOMACEAE	**SPIDERFLOWER FAMILY**
Cleomella arborea	bladderpod
CUCURBITACEAE	**GOURD FAMILY**
Cucurbita palmata	coyote melon
Cuscuta sp.	dodder
Marah fabacea	California man-root
EPHEDRACEAE	**EPHEDRA FAMILY**
Ephedra nevadensis	Nevada ephedra
EUPHORBIACEAE	**SPURGE FAMILY**
Croton setiger	turkey mullein
Euphorbia albomarginata	rattlesnake sandmat
Euphorbia micromera	Sonoran sandmat
Euphorbia sp.	spurge
FABACEAE	**LEGUME FAMILY**
Astragalus didymocarpus	two-seeded milkvetch
Astragalus lentiginosus var. *variabilis*	freckled milkvetch
Lupinus bicolor	miniature lupine
Lupinus odoratus	Mojave lupine
Trifolium gracilentum	pinpoint clover
GERANIACEAE	**GERANIUM FAMILY**
*Erodium cicutarium**	redstem filaree
HYDROPHYLLACEAE	**WATERLEAF FAMILY**
Emmenanthe penduliflora	whispering bells
Phacelia fremontii	Fremont's phacelia
Phacelia tanacetifolia	lacy phacelia
Pholistoma membranaceum	white fiesta flower
LAMIACEAE	**MINT FAMILY**
Salvia carduacea	thistle sage
Salvia columbariae	chia
Salvia dorrii	desert sage
LILIACEAE	**LILY FAMILY**
Calochortus kennedyi var. *kennedyi*	desert mariposa lily
LOASACEAE	**LOASA FAMILY**
Mentzelia albicaulis	white stemmed blazing star
MALVACEAE	**MALLOW FAMILY**
Eremalche exilis	white mallow
Malva parviflora	cheeseweed
Sphaeralcea ambigua	apricot mallow
MONTIACEAE	**MINER'S LETTUCE FAMILY**
Calandrinia menziesii	red maids
Calyptridium monandrum	pussy paws
Claytonia exigua	little spring beauty

Scientific Name	Common Name
NAMACEAE	**NAMA FAMILY**
Nama demissa	purplemat
NYCTAGINACEAE	**FOUR O'CLOCK FAMILY**
Abronia pogonantha	Mojave sand verbena
Mirabilis laevis	desert wishbone bush
ONAGRACEAE	**EVENING PRIMROSE FAMILY**
Camissonia campestris ssp. *campestris*	field sun cup
Camissoniopsis pallida ssp. *pallida*	pale sun cup
Chylismia claviformis ssp. *claviformis*	browneyes
Eremothera boothii ssp. *desertorum*	Booth's desert primrose
Oenothera avita ssp. *californica*	California evening primrose
Tetrapteron palmeri	Palmer's sun cup
OROBANCHACEAE	**BROOMRAPE FAMILY**
Castilleja chromosa	desert paintbrush
Castilleja exserta	purple owl's clover
PAPAVERACEAE	**POPPY FAMILY**
Argemone munita	chicalote
Eschscholzia minutiflora	pygmy poppy
Platystemon californicus	cream cups
PINACEAE	**PINE FAMILY**
*Pinus halepensis**	Aleppo pine
PLANTAGINACEAE	**PLAINTAIN FAMILY**
Penstemon incertus	Mojave beardtongue
POLEMONIACEAE	**PHLOX FAMILY**
Eriastrum densifolium ssp. *mohavense*	Mojave woolly-star
Eriastrum cf. eremicum	desert woolly-star
Eriastrum pluriflorum	many-flowered woolly-star
Eriastrum sapphirinum	sapphire woolly-star
Eriastrum sparsiflorum **CRPR 4.2**	**few-flowered woolly-star**
Gilia brecciarum ssp. *brecciarum*	Nevada gilia
Gilia brecciarum ssp. *neglecta*	Nevada gilia
Gilia capitata	bluehead gilia
Gilia jacens	Nevada gilia
Gilia latiflora ssp.*davyi*	Davy's broad-flowered gilia
Leptosiphon breviculus	Mojave linanthus
Leptosiphon chrysanthus ssp. *chrysanthus*	linanthus
Leptosiphon parviflorus	variable linanthus
Linanthus dichotomus	evening snow
Linanthus parryae	Parry's linanthus
Loeseliastrum matthewsii	desert calico
Loeseliastrum schottii	Schott's calico
POLYGONACEAE	**BUCKWHEAT FAMILY**
Centrostegia thurberi	red triangles

Scientific Name	Common Name
Chorizanthe rigida	devil's spineflower
Chorizanthe watsonii	Watson's spineflower
Eriogonum deflexum	skeleton weed
Eriogonum elongatum	longstem buckwheat
Eriogonum fasciculatum var. *polifolium*	Mojave desert California buckwheat
Eriogonum gracillimum	rose-and-white wild buckwheat
Eriogonum maculatum	spotted wild buckwheat
Eriogonum mohavense	Western Mojave wild buckwheat
Eriogonum nudum	naked buckwheat
Eriogonum plumatella	yucca wild buckwheat
Eriogonum pusillum	yellow turbans
Eriogonum reniforme	kidney-leaf wild buckwheat
Eriogonum viridescens	two-toothed wild buckwheat
Oxytheca perfoliata	round-leaf puncturebract
Rumex hymenosepalus	canaigre wild-rhubarb
RANUNCULACEAE	**BUTTERCUP FAMILY**
Delphinium parishii ssp. *parishii*	Parish's larkspur
Delphinium parryi	San Bernadino larkspur
ROSACEAE	**ROSE FAMILY**
Purshia tridentata var. *glandulosa*	antelope brush
SOLANACEAE	**NIGHTSHADE FAMILY**
Datura wrightii	jimsonweed
Lycium andersonii	Anderson thornbush
Lycium cooperi	peach thorn
THEMIDACEAE	**BRODIAEA FAMILY**
Dipterostemon capitatus	blue dicks
Muilla maritima	common muilla
ZYGOPHYLLACEAE	**CALTROP FAMILY**
Larrea tridentata	creosote bush
ANGIOSPERMS (MONOCOTYLEDONS)	
AGAVACEAE	**YUCCA FAMILY**
Yucca brevifolia [SC]	**western Joshua tree**
POACEAE	**GRASS FAMILY**
Bromus arizonicus	Arizona brome
Bromus madritensis ssp. *madritensis**	foxtail chess
*Bromus rubens**	red brome
*Bromus tectorum**	cheatgrass
Elymus elymoides	squirreltail
Festuca microstachys	small fescue
*Festuca myuros**	rattail sixweeks grass
Festuca octoflora	sixweeks grass
Hordeum murinum ssp. *glaucum**	smooth barley
Poa secunda	Nevada bluegrass

Scientific Name	Common Name
*Schismus barbatus**	common Mediterranean grass
Stipa cernua	nodding needle grass
Stipa hymenoides	sand rice grass
Stipa speciosa	desert needlegrass
*Triticum aestivum**	common wheat

*Not native to California

State Designations:

California Desert Native Plants Act (CDNPA)

California Endangered Species Act:

SC: state candidate

California Native Plant Society (CNPS), California Rare Plant Rank (CRPR):

1A: Plants presumed extirpated in California and either rare or extinct elsewhere
1B: Plants rare, threatened, or endangered in CA and elsewhere
2A: Plants presumed extirpated in California but common elsewhere
2B: Plants rare, threatened, or endangered in CA but more common elsewhere
3: Plants about which need more information; a review list
4: Plants of limited distribution; a watch list

Threat Ranks:

0.1 Seriously endangered in CA (over 80% of occurrences threatened / high degree and immediacy of threat)
0.2 Moderately threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat)
0.3 Not very threatened in California (<20% of occurrences threatened/low degree and immediacy of threat or current threats known)

APPENDIX C: WILDLIFE SPECIES OBSERVED IN THE STUDY AREA

This page intentionally left blank.

Scientific Name	Common Name	Federal/State Status
Invertebrates		
Acrididea	Grasshopper	None
Apis mellifera	European honeybee	None
Bombus sp.	Bumblebee	None
Camponotus sp.	Carpenter ant	None
Diplopoda	Millipede	None
Hadrurus arizonensis	Desert hairy scorpion	None
Hyles lineata	White lined sphynx moth	None
Latrodectus mactans	Black widow	None
Lytta magister	Master blister beetle	None
Manduca quinquemaculata	Hornworm	None
Pogonomyrmex sp.	Harvester ant	None
Pompilidae	Tarantula hawk	None
Tenebrionidae	Darkling beetle	None
Vanessa cardui	Painted lady butterfly	None
Reptiles* [2/]		
Aspidoscelis tigris tigris	Great basin whiptail	None
Crotalus scutulatus	Mojave green rattlesnake	None
Dipsosaurus dorsalis	Desert iguana	None
Gambelia wislizenii	Long-nosed leopard lizard	None
Masticophis flagellum testaceus	Coachwhip	None
Pituophis catenifer	Gopher snake	None
Sceloporus magister	Desert spiny lizard	None
Sceloporus uniformis	Yellow backed spiny lizard	None
Uta stansburiana	Side blotch lizard	None
Xantusia vigilis	Night lizard	None
Birds		
Aegithalus flaviceps	Verdin	None
Accipiter cooperii	**Cooper's hawk**	**None/WL**
Aeronautes saxatalis	White-throated swift	None
Agelaius phoeniceus	Red-winged blackbird	None
Amphispiza bilineata	Black-throated sparrow	None
Ardea alba	Great egret	None
Ardeidae	Heron	None
Artemisiospiza belli belli	**Bell's sparrow**	**None/WL**
Athene cunicularia	**Burrowing owl**	**None/Candidate and SSC**
Bubo virginianus	Great horned owl	None
Buteo jamaicensis	Red-tailed hawk	None
Callipepla californica	California quail	None
Campylorhynchus brunneicapillus	Cactus wren	None
Cathartes aura	Turkey vulture	None
Catharus guttatus	Hermit thrush	None

Scientific Name	Common Name	Federal/State Status
Chondestes grammacus	Lark sparrow	None
Chordeiles acutipennis	Lesser nighthawk	None
Circus hudsonius	**Northern harrier**	**None/SSC**
Columba livia	Rock pigeon	None
Contopus cooperi	**Olive-sided flycatcher**	**None/SSC**
Corvus corax	Common raven	None
Dendroica townsendi	Townsend's warbler	None
Dryobates scalaris	Ladder-backed woodpecker	None
Eremophila alpestris	Horned lark	None
Falco sparverius	American kestrel	None
Geococcyx californianus	Greater roadrunner	None
Haemorhous mexicanus	House finch	None
Hirundo rustica	Barn swallow	None
Icterus bullockii	Bullock's oriole	None
Icterus parisorum	Scott's oriole	None
Junco hyemalis	Dark eyed junco	None
Lanius ludovicianus	**Loggerhead shrike**	**None/SSC**
Laridae	Gull	None
Mimus polyglottos	Northern mockingbird	None
Myiarchus cinerascens	Ash-throated fly catcher	None
Numenius phaeopus	Whimbrel	None
Oreoscoptes montanus	Sage thrasher	None
Oreothlypis celata sordida	Orange-crowned warbler	None
Passerculus sandwichensis	Savannah sparrow	None
Passerella iliaca	Fox sparrow	None
Passerina amoena	Lazuli bunting	None
Petrochelidon pyrrhonota	Cliff swallow	None
Phalaenoptilus nuttallii	Common poorwill	None
Pheucticus melanocephalus	Black-headed grosbeak	None
Pipilo maculatus	Spotted towhee	None
Piranga ludoviciana	Western tanager	None
Poecile gambeli	Mountain chickadee	None
Polioptila caerulea	Blue-gray gnatcatcher	None
Regulus calendula	Ruby-crowned kinglet	None
Salpinctes obsoletus	Rock wren	None
Sayornis saya	Say's phoebe	None
Setophaga coronata	Yellow-rumped warbler	None
Setophaga petechia	**Yellow warbler**	**None/SSC**
Sialia currucoides	Mountain bluebird	None
Spinus psaltria	Lesser goldfinch	None
Spinus tristis	American goldfinch	None
Spizella breweri	Brewer's sparrow	None

Scientific Name	Common Name	Federal/State Status
Spizella passerina	Chipping sparrow	None
Stelgidopteryx serripennis	Northern rough-winged swallow	None
Sturnella neglecta	Western meadowlark	None
Sturnus vulgaris	European starling	None
Tachycineta bicolor	Tree swallow	None
Tachycineta thalassina	Violet-green swallow	None
Toxostoma lecontei	Le Conte's thrasher	None
Trochilidae	Hummingbird	None
Turdus migratorius	American robin	None
Tyrannus verticalis	Western kingbird	None
Vireo cassinii	Cassin's vireo	None
Vireo gilvus	Warbling vireo	None
Xanthocephalus xanthocephalus	**Yellow-headed blackbird**	**None/SSC**
Zenaida macroura	Mourning dove	None
Zonotrichia leucophrys	White-crowned sparrow	None
Mammals		
Ammospermophilus leucurus	White-tailed antelope squirrel	None
Antilocapra americana	Pronghorn	None
Bos taurus 1/	Domestic cow	None
Canis latrans 1/	Coyote	None
Canis lupus familiaris	Domestic dog	None
Dipodomys deserti	Desert kangaroo rat	None
Lepus californicus	Black tailed jackrabbit	None
Lynx rufus	Bobcat	None
Neotoma lepida 1/	Desert woodrat	None
Otospermophilus beecheyi	California ground squirrel	None
Ovis aries 1/	Domestic sheep	None
Sylvilagus audubonii	Desert cottontail	None
Taxidea taxus 1/	**American badger**	**None/SSC**
Vulpes macrotis arsipus 1/	**Desert kit fox**	**None/CA Title 14**

Notes:

*Only one Mojave desert tortoise adult male carcass was found in the Study Area; this carcass had physical characteristics consistent with those observed in captive individuals, which likely indicates previous captivity.
1/ Only sign of these species observed.
2/ A fresh adult female leopard tortoise carcass was observed within the Study Area. This species is native to central and southern Africa and known in the pet trade and therefore, was likely a captive individual that was released into the wild.
Species in **bold** have a federal or State status.
FT = Federally threatened; SE = State endangered; WL = Watch list; SSC = Species of special concern; CA Title 14 = Protected under California Code of Regulations Title 14, Chapter 5, Section 460.

This page intentionally left blank.

Appendix D4
Burrowing Owl Survey Report

This page intentionally left blank.

BURROWING OWL SURVEY REPORT

Discovery Solar PV and Storage Project
Kern County, California

October 2025

Prepared for

Discovery Solar PV and Storage, LLC
11455 El Camino Real # 160
San Diego, CA 92130

Prepared by

TETRA TECH
5383 Hollister Avenue, Suite 130
Santa Barbara, CA 93111

This page intentionally left blank.

EXECUTIVE SUMMARY

A burrowing owl (BUOW, *Athene cunicularia*) habitat assessment and burrow survey, conducted in accordance with the Staff Report on Burrowing Owl Mitigation (California Department of Fish and Game 2012), were performed for the proposed Discovery Solar PV and Storage Project (Project). Although the Project site is approximately 7,700 acres, the larger 8,606-acre Study Area encompasses the 7,700-acre Project site, the proposed gen-tie corridor, and temporary offsite construction laydown yard. The BUOW habitat assessment was performed in fall 2022 and the burrow survey was performed in spring 2023, fall 2023, spring 2024, and fall 2025 to assess the potential presence of BUOW within the Study Area (Figure 1). During the initial habitat assessment in fall 2022, two live owls associated with two occupied known burrows were observed within the Project site. During a botanical inventory survey performed in April 2023 for the Project, an additional live owl that was not associated with a burrow was observed within the Project site. During surveys from 2022 to 2025, a total of 397 burrows, including 395 potential burrows and 2 occupied known burrows were mapped within the Study Area. No occupied nesting burrows were detected within the Study Area. A total of three live BUOW individuals were observed in the Study Area. Based on these findings, BUOW are present on the Project site and are using the Project site.

Potential impacts to BUOW can be reduced through implementation of recommended avoidance and minimization measures, as described below:

- No more than 30 days prior to commencement of ground-disturbing activities, a qualified biologist will conduct a pre-construction survey in areas with suitable BUOW habitat proposed for disturbance within the Project site and 500-foot buffer (where legally accessible) to determine if occupied known and/or occupied nesting BUOW burrows are present. BUOW burrows will be evaluated and classified per the definitions below:
  - Potential Burrow: Any subterranean hole four inches or larger for which no current evidence is present to conclude that the burrow is being used by a BUOW.
  - Occupied Known Burrow: A burrow that shows sign of BUOW presence (whitewash, feathers, pellets, prey remains, eggshell fragments) and presence of at least one BUOW. If monitoring confirms that BUOW are no longer using a burrow, it will be redesignated as potential.
  - Occupied Nesting Burrow: A burrow where monitoring overseen by a designated biologist or designated monitor demonstrates the presence of BUOW eggs, chicks, dependent young, and/or brooding or egg incubation (via inter-burrow scope).
- Survey methodology will be consistent with the methods outlined in the 2012 California Department of Fish and Game *Staff Report on Burrowing Owl Mitigation* and will consist of walking parallel transects 7 to 20 meters apart, adjusting for vegetation height and density as needed, and noting burrows with fresh BUOW sign or presence of BUOW. Surveys need not be conducted for all areas of suitable habitat at one time; they may be phased so that surveys occur prior to disturbance in specific areas of the site. The BUOW surveys may be conducted in conjunction with other required preconstruction surveys, if timing is appropriate. Copies of

the survey results will be submitted to the Kern County Planning and Natural Resources Department.

  - If potential BUOW burrows are detected any time of year, burrows may be excavated under the direct supervision of the qualified biologist without prior camera monitoring.
  - If occupied known and/or occupied nesting BUOW burrows are detected, a no-disturbance buffer will be established around the burrow and no ground-disturbing activities may occur within the buffer zone.
  - An established BUOW burrow no-disturbance buffer may be removed once the burrow is collapsed and the BUOW(s) is/are no longer using the burrow.

- The size of employed no-disturbance buffers may be up to 500 meters from an occupied known BUOW burrow year-round. Buffer size is dependent upon time of year and level of disturbance at the Project site. Depending on the level of disturbance, a smaller buffer may be established by a qualified biologist based on the visibility and sensitivity responses of each individual BUOW. Buffers will be maintained for the duration the BUOW burrow remains occupied as determined by a qualified biologist.
- In October 2024, BUOW was designated a candidate species under the California Endangered Species Act (CESA). If, at the commencement of Project construction, BUOW is present and is either still a candidate species, or has been listed as threatened, or endangered under CESA, and avoidance of occupied known and/or occupied nesting BUOW burrows is infeasible, the Applicant will consult with the California Department of Fish and Wildlife (CDFW) regarding the potential for Project construction activities to result in take of BUOW and will comply with all avoidance, minimization, and compensatory mitigation requirements set forth in any Incidental Take Permit (ITP) issued for the project by CDFW authorizing take of the species.

Table of Contents

1.0 INTRODUCTION 1

2.0 PROJECT DESCRIPTION AND LOCATION 1

2.1 Additional Project Details 2

3.0 LITERATURE REVIEW 2

3.1 Methods 2

3.2 Results 3

3.2.1 Species Information 3

3.2.2 Soils 3

4.0 FIELD SURVEYS 4

4.1 Methods 4

4.1.1 Habitat Assessment and Burrow Survey 4

4.2 Results 6

4.2.1 Vegetation Communities 6

4.2.2 Live Owls and Burrows 9

5.0 DISCUSSION AND RECOMMENDATIONS 13

6.0 REFERENCES 15

Tables

Table 1. Soil Types 3
Table 2. Habitat Assessment and Burrow Survey 5
Table 3. Vegetation Communities 6
Table 4. Live BUOW Observations 9
Table 5. Summary of BUOW Burrows 10
Table 6. Wildlife Species Observed Within the Study Area 10

Figures

Figure 1. Regional Overview
Figure 2. Project Location
Figure 3. USGS Topographic Map
Figure 4a. Vegetation Communities
Figure 4b. Vegetation Communities
Figure 5. Overview of BUOW Burrows and Observations

Appendices

Appendix A: Photographs
Appendix B: BUOW Burrows and Observations Table
Appendix C: BUOW Burrows and Observations Figures

Acronyms/Abbreviations

°	decimal degrees
AB	American badger
Applicant	Discovery Solar PV and Storage, LLC
BUOW	burrowing owl
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
cm	centimeters
CNDDB	California Natural Diversity Database
CWHR	California Wildlife Habitat Relationships
Esri	Environmental Systems Research Institute
gen-tie	generation tie line
ITP	Incidental Take Permit
kV	kilovolt
LADWP	Los Angeles Department of Water and Power
MW	megawatts
NRCS	National Resources Conservation Service
Project	Discovery Solar PV and Storage Project
PV	photovoltaic
quad	quadrangle
SCE	Southern California Edison
SR	State Route
SSC	Species of Special Concern
UPRR	Union Pacific Railroad
USDA	United States Department of Agriculture
USGS	U.S. Geological Survey

This page intentionally left blank.

1.0 INTRODUCTION

Tetra Tech was retained by Discovery Solar PV and Storage, LLC (Applicant) to conduct a habitat assessment and burrow survey for burrowing owl (BUOW, *Athene cunicularia*) for the proposed Discovery Solar PV and Storage Project (Project). This Burrowing Owl Survey Report presents the methodology, results, and recommendations from the BUOW habitat assessment and burrow survey conducted for the Project during the period of November 2022 through September 2025, in accordance with the guidelines in the *Burrowing Owl Survey Protocol and Mitigation Guidelines* (The California Burrowing Owl Consortium 1993) and the *Staff Report on Burrowing Owl Mitigation* (California Department of Fish and Game 2012).

2.0 PROJECT DESCRIPTION AND LOCATION

The Project includes development of a photovoltaic (PV) solar facility and associated infrastructure necessary to generate up to 1,400 megawatts (MW) of renewable electrical energy with up to 8 gigawatt-hours of energy storage capacity (approximately 1,000 MW) on an approximately 7,700-acre Project site in an unincorporated area of southeastern Kern County, California. Approximately 2,426 acres within the 7,700-acre Project site are designated for zone changes only and would not be disturbed (Figure 1).

Main components of the Project consist of PV solar panels, a power collection system, including medium-voltage lines that connect the solar facilities, inverters, a switchyard, foundations, and transformers that will be installed onsite. Associated Project infrastructure includes an operations and maintenance facility, telecommunication facilities, energy storage system(s), up to three onsite collector substations, interconnection and transmission systems, and temporary laydown yards. The Project may be constructed in multiple phases.

The Project will interconnect to the existing Windhub Substation, which is owned and operated by Southern California Edison (SCE). The interconnect will be via a newly constructed 230-kilovolt (kV) generation-tie line (gen-tie) that will extend north from the Project site towards the Windhub Substation from on-site collector substations. A portion of the Project 230-kV gen-tie would be co-located within an existing gen-tie corridor (controlled by the Applicant and/or its affiliates). A high-voltage switchyard located immediately north of the Union Pacific Railroad (UPRR) rail line will also be constructed.

The Project is generally on undeveloped and privately owned land, along the northern edge of the Antelope Valley. The Project site is located approximately 6 miles southwest of the unincorporated community of Mojave, approximately 9 miles southeast of the City of Tehachapi, and approximately 8 miles northwest of the unincorporated community of Rosamond. State Route (SR)-58 is north of the Project site, SR-14 is east of the Project site, and Tehachapi Willow-Springs Road runs between the Project site's boundaries (Figure 1). A network of existing named and unnamed dirt roads traverses the Project site. The Los Angeles Department of Water and Power (LADWP) aqueduct roughly bisects the Project site (Figures 2 and 3). On-site, adjacent, and nearby uses include renewable energy development, rural residential development, livestock grazing, heavy industrial and mining uses, and undeveloped lands. The Study Area is regularly used for sheep (*Ovis aries*) grazing and sheep were

observed onsite. Elevations across the Project site are relatively flat, ranging from approximately 2,970 feet to 3,760 feet above mean sea level. The Project site is located within the *Monolith, Willow Springs,* and *Soledad Mountain* U.S. Geological Survey (USGS) 7.5-Minute Topographic Quadrangles (quads).

2.1 Additional Project Details

Project construction is expected to last for approximately 34 months, commencing in Q4 2025.

The Project site spans multiple Township, Ranges, and Sections including the following:

- Township 10N, Range 13W, Sections 2, 3, 4, 5, 6, 7, 8, 10, 18;
- Township 10N, Range 14W, Sections 1, 2, 11, 12, 14, 15, 22, 23;
- Township 11N, Ranges 13W, Sections 21, 28, 31, 32, 33; and
- Township 11N, Ranges 14W, Sections 25, 26, 35, 36.

The Project site is centered at a latitude of 34.993136 decimal degrees (°) and longitude of -118.288684°, and it is located within the *Monolith, Willow Springs,* and *Soledad Mountain* USGS 7.5-Minute Topographic quads (Figure 3).

Representative photographs of the Project site are provided in Appendix A.

3.0 LITERATURE REVIEW

This section describes the methods and results of the literature review in accordance with the *Staff Report on Burrowing Owl Mitigation* (California Department of Fish and Game 2012).

3.1 Methods

A literature review of pertinent background information on BUOW and the Study Area was completed which included review of the following:

- California Department of Fish and Wildlife (CDFW) California Natural Diversity Database (CNDDB; CDFW 2024a);
- CDFW RareFind 5 (CDFW 2024b);
- CDFW California Wildlife Habitat Relationships (CWHR; CDFW 2023);
- USGS 7.5-Minute Topographic Maps;
- Aerial and historical imagery (Google Earth©);
- ArcGIS online data;
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey (USDA NRCS 2024); and
- Vegetation community mapping data from 2023 and 2024 (completed in accordance with the Manual of California Vegetation, Second Edition [Sawyer et al. 2009]) from additional surveys performed within the Study Area.

The topographic features reviewed include natural landforms, aquatic features, developed lands, agricultural lands, undeveloped lands, and terrain.

3.2 Results

3.2.1 Species Information

BUOW are a CDFW Species of Special Concern (SSC). The Southern Desert population of BUOW within the Mojave Desert is also a California Endangered Species Act (CESA) Listing Candidate, meaning that take of the species is prohibited unless authorized pursuant to an incidental take permit issued by the CDFW. It is possible that BUOW may be listed as threatened or endangered under CESA during the Project's lifespan.

The Study Area is in the known distributional range of BUOW and contains suitable habitat for the species (CDFW 2023). BUOW use a variety of habitat types characterized by low-growing vegetation and the presence of burrows or burrow-like structures (i.e., burrow surrogates). BUOW may utilize a site for breeding, foraging, overwintering, or transient/migration stops; therefore, a site that is utilized by BUOW may only be occupied for a short duration of a year. The BUOW nesting season is from February 1 to August 31.

According to the CNDDB, the nearest recorded observation of BUOW is approximately 0.6-mile south of the Study Area in 2009 (CDFW 2024a). There are no records of BUOW in the Study Area; however, there are 11 occurrences documented within 5 miles of the Study Area between 2005 and 2012.

3.2.2 Soils

Soils found in the Study Area primarily consisted of friable loamy sand and sandy loam soil types. Friable soils can occur in all series associated with the soil types found in the Study Area. The Study Area includes 13 types of soil (Table 1).

Table 1. Soil Types

Soil Type	Study Area	
	Acres	Percent
Adelanto loamy sand, 2 to 5 percent slopes	290	3
Cajon loamy sand, 2 to 9 percent slopes	1289	15
Greenfield sandy loam, 2 to 9 percent slopes	409	5
Hanford coarse sandy loam, 2 to 9 percent slopes	300	4
Ramona coarse sandy loam, 5 to 9 percent slopes	740	9
Ramona sandy loam, 9 to 30 percent slopes, eroded	29	<1
Arizo gravelly loamy sand, 2 to 9 percent slopes	18	<1
Cajon loamy sand, 0 to 5 percent slopes	3,271	38
Cajon gravelly loamy sand, 0 to 9 percent slopes	1,056	12
Garlock loamy sand, 2 to 9 percent slopes	830	10
Randsburg sandy loam, 2 to 15 percent slopes	245	3
Rosamond clay loam	127	1
Torriorthents-Rock outcrop complex, very steep	2	<1
Total	**8,606**	**100**

4.0 FIELD SURVEYS

This section describes the field methods and results for the BUOW habitat assessment and burrow survey in accordance with the *Staff Report on Burrowing Owl Mitigation* (California Department of Fish and Game 2012).

4.1 Methods

Although the Project site is approximately 7,700 acres, the larger 8,606-acre Study Area encompasses the 7,700-acre Project site, the proposed gen-tie corridor, and temporary offsite construction laydown yard.

The Study Area is in the known distributional range of BUOW and contains suitable habitat for the species. Therefore, it was determined that a BUOW habitat assessment and burrow survey was needed. The habitat assessment was conducted in fall 2022 and fall 2025, and the burrow survey was conducted in spring 2023, fall 2023, and spring 2024. In winter 2022, summer 2023, winter 2024, and fall 2025, separate from the burrow survey, biologists collected vegetation community mapping data in accordance with the *Manual of California Vegetation* (Sawyer et al. 2009).

BUOW habitat assessments, as outlined in the *Burrowing Owl Survey Protocol and Mitigation Guidelines*, are intended to assess the presence of BUOW habitat within a project site and 150-meter buffer (The California Burrowing Owl Consortium 1993). These guidelines define a BUOW burrow survey as a pedestrian transect survey for suitable BUOW burrows and live BUOW individuals, spaced no more than 30 meters apart, within a project site and 150-meter buffer. Due to access restrictions from safety and/or ownership issues, a 150-meter buffer around the Project site was not surveyed for the habitat assessment or burrow survey; however, as mentioned above, the 8,606-acre Study Area does cover an area that extends beyond the approximately 7,700-acre Project site and provides for a buffer around portions of the Project site.

4.1.1 Habitat Assessment and Burrow Survey

As part of the habitat assessment, biologists ascertained existing site conditions and referenced vegetation mapping data, collected in accordance with the *Manual of California Vegetation* (Sawyer et al. 2009), and located habitat in the Study Area suitable for BUOW. Habitat in the Study Area was evaluated for characteristics known to be important to BUOW (i.e., vegetation structure, density, and height; presence of burrows or burrow surrogates; and presence of prey such as small mammals).

During the habitat assessment and burrow survey, any observed BUOW or sign of BUOW presence was documented, including pellets, feathers, whitewash, burrow decoration materials, and eggshell fragments at burrows. When encountered, it was determined whether natural burrows or atypical burrows were suitable for use by BUOW and evidence of BUOW occupation was noted. BUOW burrows and BUOW observations were documented and separated into one of the following categories: potential burrow, occupied known burrow, and occupied nesting burrow. The BUOW burrow and observation categories are described below (Stantec 2025):

- **Potential Burrow:** Any subterranean hole four inches or larger for which no current evidence is present to conclude that the burrow is being used by a BUOW.

- **Occupied Known Burrow:** A burrow that shows sign of BUOW presence (whitewash, feathers, pellets, prey remains, eggshell fragments) and presence of at least one BUOW.
- **Occupied Nesting Burrow:** A burrow where monitoring overseen by a designated biologist demonstrated the presence of BUOW eggs, chicks, dependent young, and/or brooding or egg incubation (via inter-burrow scope).
- **Live owl:** Locations where a live BUOW individual was observed foraging or perched, but no burrow was located within the vicinity of the observation.

The burrow survey occurred concurrently with a Mojave desert tortoise (*Gopherus agassizii*) and desert kit fox (*Vulpes macrotis arsipus*) survey. During the burrow survey, biologists surveyed suitable habitat in the Study Area for burrows by walking 10-meter (33-foot) interval transects. Transects were walked during optimal weather conditions (i.e., no heavy rain or fog) to allow for the greatest visibility possible. Burrows and burrow surrogates observed during the habitat assessment were revisited and checked for new sign of BUOW during the burrow survey. Burrows were quantified by the number of burrow locations, rather than the number of entrances at a burrow location. Burrow monitoring was not conducted as part of this burrow survey effort.

BUOW burrows and observations observed during the habitat assessment or burrow survey were mapped using the Environmental Systems Research Institute (Esri) ArcGIS Field Maps application on a tablet paired with a sub-meter accuracy Global Positioning System device and documented on a datasheet. Datasheets from the survey are provided in the Project Biological Resources Summary Technical Report (Tetra Tech 2025a). Details on the BUOW burrows and observations mapped in the Study Area are included in Appendix B. The table in Appendix B reflects the most updated and accurate data following the habitat assessment and burrow survey.

Table 2 provides more information on the details of the habitat assessment and burrow survey completed within the Study Area. Observations of live BUOW and detections of sign recorded during the habitat assessment and burrow survey gathered sufficient data to determine BUOW presence and burrow occupancy. A comprehensive list of wildlife observed was compiled from surveys within the Study Area (Table 6). The wildlife list only includes species observed and detected within the Study Area.

Table 2. Habitat Assessment and Burrow Survey

Survey	Date	Biologists	Notes
Habitat Assessment	November 3-4, 2022 November 7-11, 2022 September 3-4, 2025	Taylor Dee Lauren Jennings Alden Lovaas Ari Naiman	In 2025, a habitat assessment was conducted in acres that had previously not been surveyed.
Burrow Survey	April 10-14, 2023 April 17-21, 2023 April 24-28, 2023 May 1-5, 2023 May 8-12, 2023 May 15-18, 2023 September 25-29, 2023	Matt Adams Sarah Baden Nikki Bottum Chelsie Brown Taylor Dee Alivia De Luz Alexandra Dorough	Surveys in 2023 were performed in the acres within the Study Area at that time. Acres added after October 2023 were surveyed in 2024. Burrows observed during the habitat assessment in 2022 were revisited in 2023. Surveys were conducted both during and outside

Survey	Date	Biologists	Notes
	October 5, 2023 April 11-12, 2024	Shelby Dunn Caroline Garcia Joshua Harris Daniel JacquesJulie Kaplan Annie Lightell Maribel Lopez Alden Lovaas Eliza McLean Carly Martenson Ari Naiman Madison Panzino Jamie Perigo Victoria Prado Verity Richardson Adam Schroeder Lauren Simpson Derek Siver Corrina Tapia Wendy Turner Sarah Wagner Carter Warwick Jennifer West Rachel Woodard	of the nesting season. Burrow monitoring to determine burrow nesting status was not conducted during nesting season surveys.

4.2 Results

This section describes the results of the BUOW habitat assessment and burrow survey.

4.2.1 Vegetation Communities

Table 3 lists the vegetation communities found and their acreage within the Study Area. Results of the vegetation mapping are shown in Figures 4a and 4b.

Table 3. Vegetation Communities

Vegetation Communities	Acres within Study Area
Allscale scrub (*Atriplex polycarpa* Shrubland Alliance)	20
Brittle bush scrub (*Encelia farinosa* Shrubland Alliance)	206
California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii* Shrubland Alliance)	465
California juniper woodland (*Juniperus californica* Woodland Alliance)	354
Cheesebush scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance)	773
Creosote bush scrub (*Larrea tridentata* Shrubland Alliance)	5,737
Desert needlegrass grassland (*Stipa speciosa* Herbaceous Alliance)	246
Developed	57
Disturbed	35
Disturbed creosote bush scrub	340
Rubber rabbitbrush scrub (*Ericameria nauseosa* Shrubland Alliance)	344

Vegetation Communities	Acres within Study Area
Scalebroom scrub (*Lepidospartum squamatum* Shrubland Alliance)	29
Total	**8,606**

Nine natural vegetation communities were found within the Study Area: allscale scrub (*Atriplex polycarpa* Shrubland Alliance), brittle bush scrub (*Encelia farinosa* Shrubland Alliance), California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii* Shrubland Alliance), California juniper woodland (*Juniperus californica* Woodland Alliance), cheesebush scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance), creosote bush scrub (*Larrea tridentata* Shrubland Alliance), desert needlegrass grassland (*Stipa speciosa* Herbaceous Alliance), rubber rabbitbrush scrub (*Ericameria nauseosa* Shrubland Alliance), and scalebroom scrub (*Lepidospartum squamatum* Shrubland Alliance). These vegetation communities provide suitable habitat for BUOW. The three other communities within the Study Area contained developed and disturbed areas and disturbed creosote bush scrub.

Vegetation communities as well as disturbed and developed areas observed within the Study Area are described below:

Allscale scrub (*Atriplex polycarpa* Shrubland Alliance): This alliance is dominated by allscale, which comprises more than 2 percent absolute cover and more than 50 percent relative cover in the shrub canopy. Other plant species present in this community include creosote bush (*Larrea tridentata*) and winterfat (*Krascheninnikovia lanata*). Some scattered western Joshua trees are present. Shrubs are generally less than 3 meters in height, and the canopy is open to continuous.

Brittle bush scrub (*Encelia farinosa* Shrubland Alliance): This alliance is dominated by brittle bush (*Encelia farinosa*), which comprises more than 1 percent absolute cover in the shrub canopy and more than 50 percent relative cover. Other plant species present in this community include white bursage (*Ambrosia dumosa*), creosote bush, desert needlegrass (*Stipa speciosa*), and cheesebush (*Ambrosia salsola*). Shrubs are generally less than 2 meters in height, and the canopy is open to intermittent.

California buckwheat scrub (*Eriogonum fasciculatum – Viguiera parishii Shrubland* Alliance): This alliance is dominated by Mojave desert California buckwheat (*Eriogonum fasciculatum* var. *polifolium*). California buckwheat is present at more than 5 percent absolute cover in the shrub canopy and Parish's goldeneye (*Viguiera parishii*) was not observed. In some areas, California buckwheat is codominant with Cooper's goldenbush (*Ericameria cooperi* var. *cooperi*). White bursage, desert needlegrass, creosote bush, cheesebush, Nevada ephedra (*Ephedra nevadensis*), desert fiddleneck (*Amsinckia tessellata* var. *tessellata*), and rayless goldenhead (*Acamptopappus sphaerocephalus)* are also present in this community. Shrubs are generally less than 2 meters in height, and the canopy is open to intermittent open.

California juniper woodland (*Juniperus californica* Woodland Alliance): This alliance is dominated by California juniper (*Juniperus californica*), which is present at more than 3 percent absolute cover over lower shrubs. No other tree species are present. Other plant species present in this community include creosote bush, Nevada ephedra, and desert needlegrass. Trees are generally less than 5 meters in height, and canopy is open to intermittent.

Cheesebush scrub (*Ambrosia salsola – Bebbia juncea* Shrubland Alliance): This alliance is dominated by cheesebush, which is present at more than 2 percent cover in the shrub canopy with other shrubs comprising less cover in the shrub canopy. Sweetbush (*Bebbia juncea*) is not present in this community. Other plant species observed include creosote bush, white bursage, desert needlegrass, desert fiddleneck, Nevada ephedra, Acton Encelia (*Encelia actoni*), rubber rabbitbrush (*Ericameria nauseosa*), cheatgrass (*Bromus tectorum*), and rayless goldenhead. Shrubs are less than 2 meters in height, and canopy is open to intermittent.

Creosote bush scrub (*Larrea tridentata* Shrubland Alliance): This alliance was the most encountered vegetation community in the Study Area. This alliance is dominated by creosote bush, which exceeds other shrubs in cover. In some areas, emergent western Joshua trees are present. Other small shrubs such as white bursage, winterfat, Nevada ephedra, cheesebush, rayless goldenhead, and peach thorn (*Lycium cooperi*) were observed alongside creosote in some areas, but in this alliance, their cover is less than three times the cover of creosote bush.

Desert needlegrass grassland (*Stipa speciosa* Herbaceous Alliance): This alliance is dominated by desert needlegrass, which is present at more than 50 percent relative cover in the herbaceous layer. Emergent western Joshua trees and shrubs, including cheesebush, rubber rabbitbrush, creosote bush, desert wishbone bush (*Mirabilis laevis*), and desert fiddleneck are present at low percent cover. Herbs are generally less than 1 meter in height, and canopy is open to intermittent.

Developed: Areas mapped as developed include existing wind energy generating infrastructure, existing buildings, structures, hard paved roads, and railroads. The existing Windhub substation is located off Oak Creek Road. Other areas mapped as developed include buildings on the Windswept Ranch Petting Zoo property as well as a graded gravel lot with trailers and fenced yard on Tehachapi Willow Springs Road. Multiple abandoned and/or previously occupied structures as well as associated non-occupied accessory structures within the western half of the Study Area and roads including Oak Creek Road, Santa Fe Railroad, and Tehachapi Willow Springs Road were also considered to be developed.

Disturbed: Areas described as disturbed are characterized by the presence of anthropogenic disturbances such as trash, off-road vehicle tracks, and non-native species. Areas mapped as disturbed include areas along Oak Creek Road with existing infrastructure associated with the Windhub Substation, part of the southeastern section of the Study Area adjacent to the Holliday Rock Mine, an abandoned illegal grow operation in the middle of the Study Area north of the LADWP aqueduct, and abandoned encampments with no structures in the middle of the Study Area north of the LADWP aqueduct and in the southwestern section of the Study Area south of the LADWP aqueduct.

Disturbed creosote bush scrub: This community is characterized by anthropogenic disturbances to the ground and vegetation. Disturbed creosote bush scrub in the northernmost section of the Study Area is disturbed due to historical ground and vegetation disturbance, road construction, and/or has been burned in a wildfire. The section south of the LADWP aqueduct is disturbed due to a large burn scar, because of which it exhibits characteristics different than creosote bush scrub in other areas of the Study Area. Dead creosote bush and western Joshua trees, relatively low vegetation cover, and large areas of bare soil were observed in this burned area. In the area north of the LADWP aqueduct

and south of Tehachapi Willow Springs Road, anthropogenic disturbances and historical grading were observed.

Rubber rabbitbrush scrub (*Ericameria nauseosa* Shrubland Alliance): This alliance is dominated by rubber rabbitbrush, which is present at more than 50 percent relative cover in the shrub canopy. Shrubs are generally less than 3 meters in height, and canopy is open to continuous.

Scalebroom scrub (*Lepidospartum squamatum* Shrubland Alliance): This alliance is dominated by scalebroom (*Lepidospartum squamatum*), which is present at more than 1 percent cover in alluvial environments. This alliance was observed along a dry streambed that runs across the Study Area. Rubber rabbitbrush and desert needlegrass were also present in this community. Shrubs are less than 2 meters in height, and canopy is open to continuous and two-tiered.

4.2.2 Live Owls and Burrows

The BUOW results from surveys performed in the Study Area from 2022 to 2025 are described below.

Live Owls

- Two live owls were flushed from two different occupied known burrows during the habitat assessment in November 2022 (ID: 12, 14). One of these sightings occurred in the northeastern corner of the Study Area north of the LADWP aqueduct, while the other was observed in the middle of the Study Area south of the LADWP aqueduct. During the burrow survey from April to May 2023, no live owls were observed at either occupied known burrow when revisited and no new sign was detected.
- One live owl observation occurred during a botanical inventory survey conducted for the Project in April 2023 in the northeastern corner of the Study Area, south of the LADWP aqueduct (ID: 15). This owl was not associated with a burrow.
- In total, three live owls were observed in the Study Area. No live owls were observed during the burrow survey from April to May 2023, September to October 2023, April 2024, or the habitat assessment in September 2025.
  - Of these, two live owl observations were located within the Project site.

Table 4 summarizes the details of the live BUOW observations.

Table 4. Live BUOW Observations

Observation ID	Survey	Date Observed	Observed at a Burrow?	BUOW Observed
12[1/]	Habitat Assessment	November 9, 2022	Yes	1
14[1/]	Habitat Assessment	November 11, 2022	Yes	1
15[2/]	Botanical Inventory Survey	April 5, 2023	No	1
			Total Number of Live Owl Observations in the Study Area	**3**

1/ Burrow/observation was mapped within the Project site boundary.
2/ Burrow/observation was mapped within the Study Area but was not located within the Project site boundary.

Burrows and Sign

- 395 potential burrows were detected (Table 5):

  - Of the 395 potential burrows, 348 were located within the Project site.
- Two occupied known burrows were detected. One live owl was observed at each burrow.
  - Of the two occupied known burrows, two were located within the Project site.
- No occupied nesting burrows were observed within Study Area.

Table 5 summarizes the BUOW burrows observed in the Study Area and Project site.

Table 5. Summary of BUOW Burrows

Burrow Status	Number Observed	
	Study Area	Project Site
Potential burrow	395	348
Occupied known burrow	2	2
Occupied nesting burrow	0	0
Total	**397**	**350**

Appendix B contains a table with more information on the burrows mapped within the Study Area and Appendix C contains figures displaying the mapped burrows.

Table 6 lists wildlife species observed and detected in the Study Area. Species observed including great horned owl (*Bubo virginianus*), red-tailed hawk (*Buteo jamaicensis*), and common raven (*Corvus corax*) could potentially predate on BUOW if present; however, no evidence of predation of BUOW was observed. Observed and detected special-status species are indicated with bold text in Table 6.

Table 6. Wildlife Species Observed Within the Study Area

Scientific Name	Common Name	Federal/State Status
Invertebrates		
Acrididea	Grasshopper	None
Apis mellifera	European honeybee	None
Bombus sp.	Bumblebee	None
Camponotus sp.	Carpenter ant	None
Diplopoda	Millipede	None
Hadrurus arizonensis	Desert hairy scorpion	None
Hyles lineata	White lined sphynx moth	None
Latrodectus mactans	Black widow	None
Lytta magister	Master blister beetle	None
Manduca quinquemaculata	Hornworm	None
Pogonomyrmex sp.	Harvester ant	None
Pompilidae	Tarantula hawk	None
Tenebrionidae	Darkling beetle	None
Vanessa cardui	Painted lady butterfly	None
Reptiles[2/, 3/]		
Aspidoscelis tigris tigris	Great basin whiptail	None
Crotalus scutulatus	Mojave green rattlesnake	None

Scientific Name	Common Name	Federal/State Status
Dipsosaurus dorsalis	Desert iguana	None
Gambelia wislizenii	Long nosed leopard lizard	None
Masticophis flagellum testaceus	Coachwhip	None
Pituophis catenifer	Gopher snake	None
Sceloporus magister	Desert spiny lizard	None
Sceloporus uniformis	Yellow backed spiny lizard	None
Uta stansburiana	Side blotch lizard	None
Xantusia vigilis	Night lizard	None
Birds		
Aegithalus flaviceps	Verdin	None
Accipiter cooperii	**Cooper's hawk**	**None/WL**
Aeronautes saxatalis	White-throated swift	None
Agelaius phoeniceus	Red-winged blackbird	None
Amphispiza bilineata	Black-throated sparrow	None
Ardea alba	Great egret	None
Ardeidae	Heron	None
Artemisiospiza belli belli	**Bell's sparrow**	**None/WL**
Athene cunicularia	**Burrowing owl**	**None/Candidate and SSC**
Bubo virginianus	Great horned owl	None
Buteo jamaicensis	Red-tailed hawk	None
Callipepla californica	California quail	None
Campylorhynchus brunneicapillus	Cactus wren	None
Cathartes aura	Turkey vulture	None
Catharus guttatus	Hermit thrush	None
Chondestes grammacus	Lark sparrow	None
Chordeiles acutipennis	Lesser nighthawk	None
Circus hudsonius	**Northern harrier**	**None/SSC**
Columba livia	Rock pigeon	None
Contopus cooperi	**Olive-sided flycatcher**	**None/SSC**
Corvus corax	Common raven	None
Dendroica townsendi	Townsend's warbler	None
Dryobates scalaris	Ladder-backed woodpecker	None
Eremophila alpestris	Horned lark	None
Falco sparverius	American kestrel	None
Geococcyx californianus	Greater roadrunner	None
Haemorhous mexicanus	House finch	None
Hirundo rustica	Barn swallow	None
Icterus bullockii	Bullock's oriole	None
Icterus parisorum	Scott's oriole	None
Junco hyemalis	Dark eyed junco	None
Lanius ludovicianus	**Loggerhead shrike**	**None/SSC**

Scientific Name	Common Name	Federal/State Status
Laridae	Gull	None
Mimus polyglottos	Northern mockingbird	None
Myiarchus cinerascens	Ash-throated fly catcher	None
Numenius phaeopus	Whimbrel	None
Oreoscoptes montanus	Sage thrasher	None
Oreothlypis celata sordida	Orange-crowned warbler	None
Passerculus sandwichensis	Savannah sparrow	None
Passerella iliaca	Fox sparrow	None
Passerina amoena	Lazuli bunting	None
Petrochelidon pyrrhonota	Cliff swallow	None
Phalaenoptilus nuttallii	Common poorwill	None
Pheucticus melanocephalus	Black-headed grosbeak	None
Pipilo maculatus	Spotted towhee	None
Piranga ludoviciana	Western tanager	None
Poecile gambeli	Mountain chickadee	None
Polioptila caerulea	Blue-gray gnatcatcher	None
Regulus calendula	Ruby-crowned kinglet	None
Salpinctes obsoletus	Rock wren	None
Sayornis saya	Say's phoebe	None
Setophaga coronata	Yellow-rumped warbler	None
Setophaga petechia	**Yellow warbler**	**None/SSC**
Sialia currucoides	Mountain bluebird	None
Spinus psaltria	Lesser goldfinch	None
Spinus tristis	American goldfinch	None
Spizella breweri	Brewer's sparrow	None
Spizella passerina	Chipping sparrow	None
Stelgidopteryx serripennis	Northern rough-winged swallow	None
Sturnella neglecta	Western meadowlark	None
Sturnus vulgaris	European starling	None
Tachycineta bicolor	Tree swallow	None
Tachycineta thalassina	Violet-green swallow	None
Toxostoma lecontei	Le Conte's thrasher	None
Trochilidae	Hummingbird	None
Turdus migratorius	American robin	None
Tyrannus verticalis	Western kingbird	None
Vireo cassinii	Cassin’s vireo	None
Vireo gilvus	Warbling vireo	None
Xanthocephalus xanthocephalus	**Yellow-headed blackbird**	**None/SSC**
Zenaida macroura	Mourning dove	None
Zonotrichia leucophrys	White-crowned sparrow	None

Scientific Name	Common Name	Federal/State Status
Mammals		
Ammospermophilus leucurus	White-tailed antelope squirrel	None
Antilocapra americana	Pronghorn	None
Bos taurus 1/	Domestic cow	None
Canis latrans 1/	Coyote	None
Canis lupus familiaris	Domestic dog	None
Dipodomys deserti	Desert kangaroo rat	None
Lepus californicus	Black tailed jackrabbit	None
Lynx rufus	Bobcat	None
*Neotoma lepida*1/	Desert woodrat	None
Otospermophilus beecheyi	California ground squirrel	None
*Ovis aries*1/	Domestic sheep	None
Sylvilagus audubonii	Desert cottontail	None
Taxidea taxus1/	**American badger**	**None/SSC**
Vulpes macrotis arsipus1/	**Desert kit fox**	**None/CA Title 14**

Notes:

1/ Sign of these species detected.

2/ One adult male Mojave desert tortoise carcass was found in the Study Area; this carcass had physical characteristics consistent with those observed in captive individuals, which likely indicates previous captivity.

3/ One adult female leopard tortoise carcass was observed within the Study Area. This species is native to central and southern Africa and known in the pet trade and therefore, was likely a captive individual that was released into the wild.

Species in **bold** have a federal or State status.

FT = Federally threatened; SE = State endangered; WL = Watch list; SSC = Species of special concern; CA Title 14 = Protected under California Code of Regulations Title 14, Chapter 5, Section 460.

5.0 DISCUSSION AND RECOMMENDATIONS

In total, two occupied known burrows were detected in the Study Area during surveys performed from 2022 to 2025. During all surveys, three live owls were observed at multiple locations in the Study Area; two of these live owls were observed within the Project site. The two occupied known burrows were located within the northeastern and central portions of the Study Area. Potential burrows were distributed throughout the Study Area, with some concentration in the northern and eastern portions.

Based on these findings, BUOW are present on the Project site and are using the Project site. No evidence of BUOW using the site for breeding was observed and no occupied nesting burrows were detected within the Study Area.

The results of the BUOW habitat assessment and burrow survey have been used to develop recommendations for pre-construction surveys and avoidance and minimization measures.

The Applicant proposes implementation of the following measures to ensure potential impacts on BUOW resulting from Project construction, operations and maintenance, and decommissioning activities would be avoided and minimized:

- No more than 30 days prior to commencement of ground-disturbing activities, a qualified biologist will conduct a pre-construction survey in areas with suitable BUOW habitat proposed

for disturbance within the Project site and 500-foot buffer (where legally accessible) to determine if occupied known and/or occupied nesting BUOW burrows are present. BUOW burrows will be evaluated and classified per the definitions below:

  - Potential Burrow: Any subterranean hole four inches or larger for which no current evidence is present to conclude that the burrow is being used by a BUOW.
  - Occupied Known Burrow: A burrow that shows sign of BUOW presence (whitewash, feathers, pellets, prey remains, eggshell fragments) and presence of at least one BUOW. If monitoring confirms that BUOW are no longer using a burrow, it will be redesignated as potential.
  - Occupied Nesting Burrow: A burrow where monitoring overseen by a designated biologist or designated monitor demonstrates the presence of BUOW eggs, chicks, dependent young, and/or brooding or egg incubation (via inter-burrow scope).

- Survey methodology will be consistent with the methods outlined in the 2012 California Department of Fish and Game *Staff Report on Burrowing Owl Mitigation* and will consist of walking parallel transects 7 to 20 meters apart, adjusting for vegetation height and density as needed, and noting burrows with fresh BUOW sign or presence of BUOW. Surveys need not be conducted for all areas of suitable habitat at one time; they may be phased so that surveys occur prior to disturbance in specific areas of the site. The BUOW surveys may be conducted in conjunction with other required preconstruction surveys, if timing is appropriate. Copies of the survey results will be submitted to the Kern County Planning and Natural Resources Department.
  - If potential BUOW burrows are detected any time of year, burrows may be excavated under the direct supervision of the qualified biologist without prior camera monitoring.
  - If occupied known and/or occupied nesting BUOW burrows are detected, a no-disturbance buffer will be established around the burrow and no ground-disturbing activities may occur within the buffer zone.
  - An established BUOW burrow no-disturbance buffer may be removed once the burrow is collapsed and the BUOW(s) is/are no longer using the burrow.
- The size of employed no-disturbance buffers may be up to 500 meters from an occupied known BUOW burrow year-round. Buffer size is dependent upon time of year and level of disturbance at the Project site. Depending on the level of disturbance, a smaller buffer may be established by a qualified biologist based on the visibility and sensitivity responses of each individual BUOW. Buffers will be maintained for the duration the BUOW burrow remains occupied as determined by a qualified biologist.
- In October 2024, BUOW was designated a candidate species under CESA. If, at the commencement of Project construction, BUOW is present and is either still a candidate species, or has been listed as threatened, or endangered under CESA, and avoidance of occupied known and/or occupied nesting BUOW burrows is infeasible, the Applicant will consult with CDFW regarding the potential for Project construction activities to result in take of BUOW and will comply with all avoidance, minimization, and compensatory mitigation

requirements set forth in any Incidental Take Permit (ITP) issued for the project by CDFW authorizing take of the species.

6.0 REFERENCES

California Department of Fish and Game. 2012. Staff Report on Burrowing Owl Mitigation. March.

CDFW (California Department of Fish and Wildlife). 2023. California Wildlife Habitat Relationships. Available online at: https://wildlife.ca.gov/Data/CWHR. (accessed April 2024).

CDFW (California Department of Fish and Wildlife). 2024a. California Natural Diversity Database. Available online at: https://wildlife.ca.gov/Data/CNDDB/Maps-and-Data#43018408-cnddb-in-bios. (accessed April 2024).

CDFW 2024b. RareFind 5. Available online at: https://wildlife.ca.gov/Data/CNDDB/Maps-and-Data#43018407-rarefind-5. (accessed August 2024).

Johnson, D., D. Gillis, M. Gregg, J. Rebholz, J. Lincer, and J. Belthoff. 2010. Users Guide to Installation of Artificial Burrows for Burrowing Owls. Unpublished report. Tree Top Inc., Selah, Washington, USA.

Sawyer, J., T. Keeler-Wolf, and J. Evens. 2009. A Manual of California Vegetation. Second Edition. California Native Plant Society.

Stantec. 2025. Enterprise Solar Storage Project and Sanborn Solar Project (90-Acre Portion), Burrowing Owl and Mohave Ground Squirrel Mortality Reduction Plan. Last amended April 1, 2025.

Tetra Tech. 2025a. Biological Resources Summary Technical Report. Discovery Solar PV and Storage Project. Prepared for Discovery Solar PV and Storage, LLC. October.

Tetra Tech. 2025b. Mojave Desert Tortoise Survey Report. Prepared for Discovery Solar PV and Storage, LLC. October.

The California Burrowing Owl Consortium. 1993. Burrowing Owl Survey Protocol and Mitigation Guidelines. April.

USDA NRCS (United States Department of Agriculture Natural Resources Conservation Service). 2024. Web Soil Survey. Available online at: https://websoilsurvey.nrcs.usda.gov/app/. (accessed January 2024).

This page intentionally left blank.

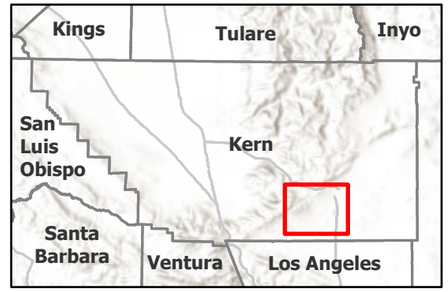
FIGURES

This page intentionally left blank.

Discovery Solar PV and Storage Project

Kern County, CA

Figure 1. Regional Overview



Windhub High-voltage Substation (Existing)

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

*Already approved under separate projects.

N

0 0.75 1.5 3 Miles

Scale is 1:116,800 when printed at 11"x17"

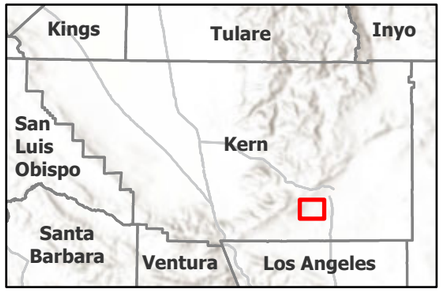
Not for Construction

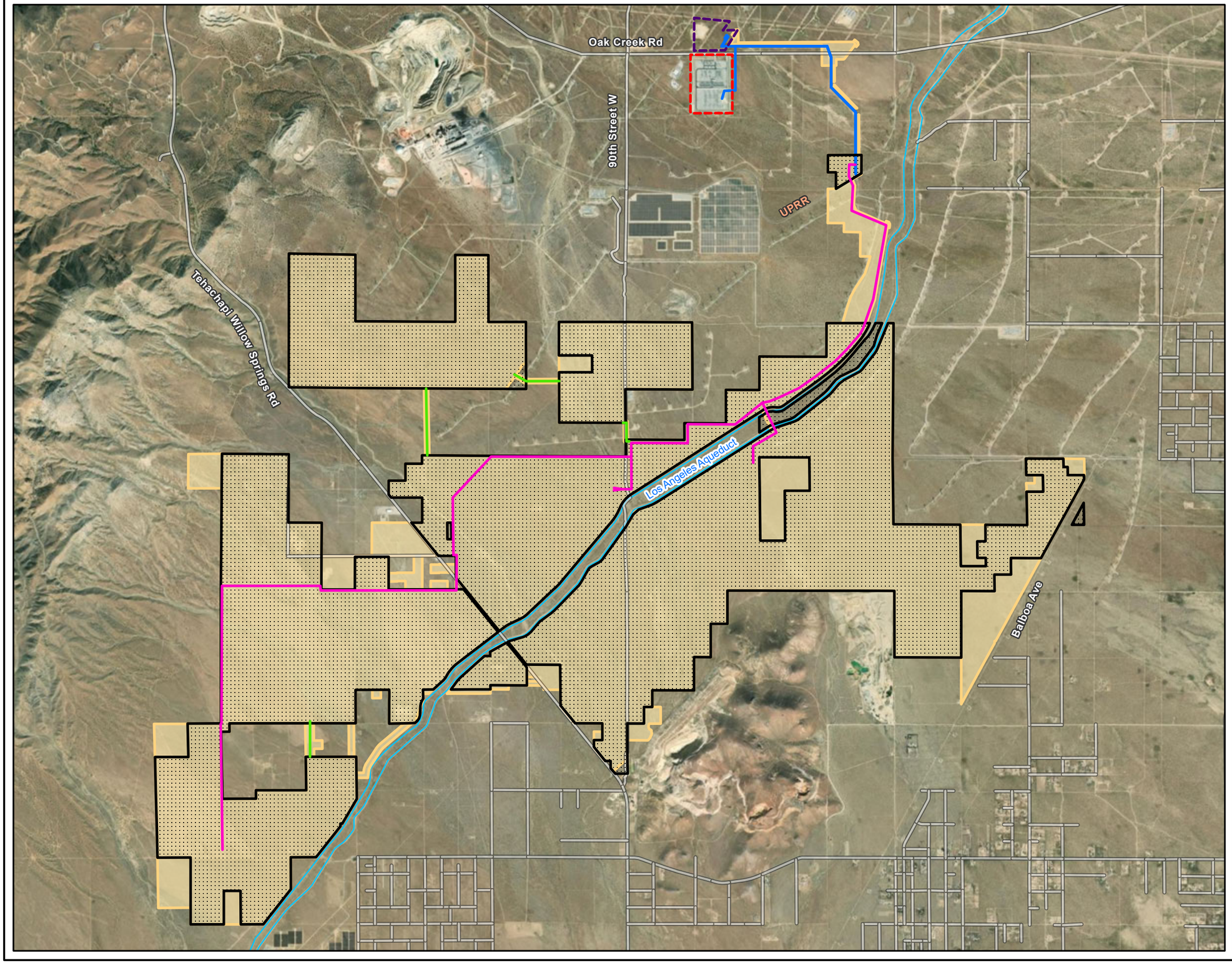
Document Path: \\cesi70\gis1\CesiProjects\POR\projects\194_PROJECT\SITERA_GEN\194_1405_0001_Discovery\PROJECT\SITERA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 2. Project Location





Windhub High-voltage Substation (Existing)

Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

Scale is 1:45,000 when printed at 11"x17"

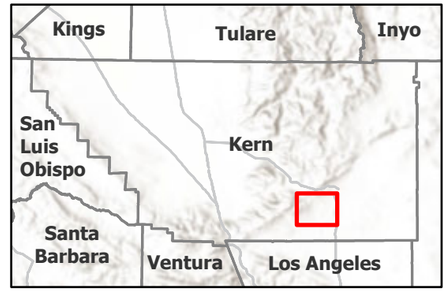
Not for Construction

Document Path: Z:\projects\194_PROJECTS\TERRA_GEN\194_1403_0001_Discovery\PRO\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 3. USGS Topographic Map



Windhub High-voltage Substation (Existing)

Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

*Already approved under separate projects.

N

Miles

0 0.5 1 2

Scale is 1:75,000 when printed at 11"x17"

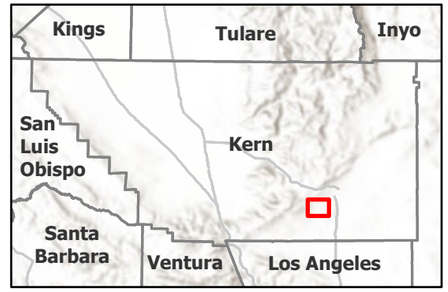
Not for Construction

Document Path: Z:\projects\94_PROJECTS\TERRA_GEN\94_1403_000_Discovery\PRO\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 4a. Vegetation Communities



Oak Creek Rd
90th Street W
UPRR
Tehachapi Willow Springs Rd
Oak Creek
Los Angeles Aqueduct
Balboa Ave
Holliday Rock Mine

Note: Additional vegetation community mapping and mapping of Joshua trees is in progress and when available, the results will be used to update this report.

- Windhub High-voltage Substation (Existing)
- Roads
- Watercourse

Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

Vegetation Communities

- Allscale Scrub
- Brittle Bush Scrub
- California buckwheat scrub
- California juniper woodland
- Cheesebush scrub
- Creosote bush scrub
- Desert needlegrass grassland
- Developed
- Disturbed
- Disturbed - Creosote bush scrub
- Rubber rabbitbrush scrub
- Scalebroom scrub

*Already approved under separate projects.

N

0 0.2 0.4 0.8 Miles

Scale is 1:39,000 when printed at 11"x17"

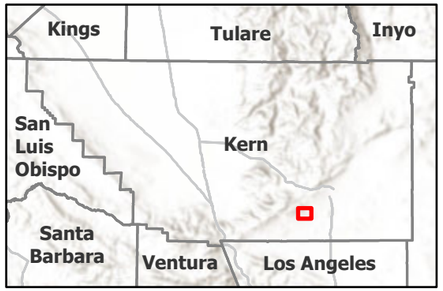
Not for Construction

Document Path: Z:\projects\194_PROJECTS\TERRA_GEN\194_1405_0001_Discovery\PROJECTS\TERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 4b. Vegetation Communities



Roads

Watercourse

Proposed Project Features

Project Site

Study Area

Gen-tie Line (New)

Medium-voltage/Transmission/Access Easements

Vegetation Communities

California buckwheat scrub

California juniper woodland

Cheesebush scrub

Creosote bush scrub

Desert needlegrass grassland

Developed

Disturbed

Disturbed - Creosote bush scrub

Rubber rabbitbrush scrub

Scalebroom scrub

Los Angeles Aqueduct

Oak Creek

Note: Additional vegetation community mapping and mapping of Joshua trees is in progress and when available, the results will be used to update this report.

N

Miles

0 0.13 0.25 0.5

Scale is 1:24,700 when printed at 11"x17"

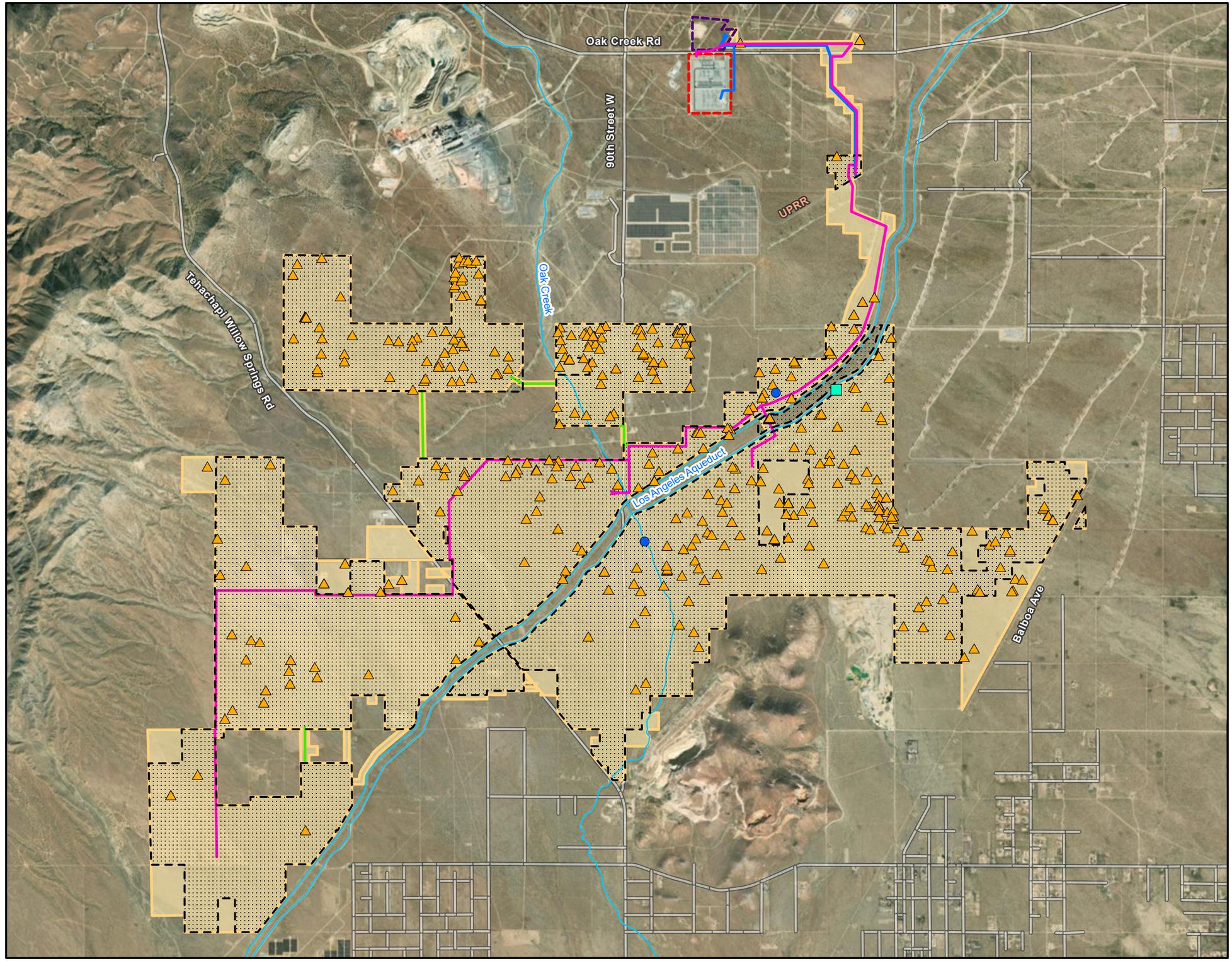
Not for Construction

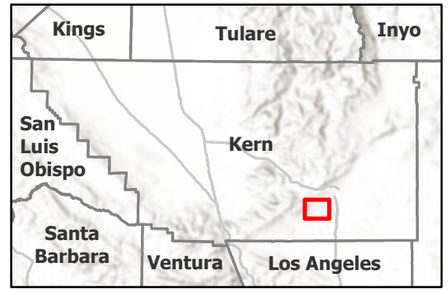
Document Path: \\tes\700gis\Tes\Projects\PDR\projects\194_PROJECT\SITERRA_GEN\194_1402_0001_Discovery\PROJECT\SITERRA_GEN_BIO_FIGS_V2.aprx

Discovery Solar PV and Storage Project

Kern County, CA

Figure 5. Overview of BUOW Burrows and Observations





- Windhub High-voltage Substation (Existing)
- Roads
- Watercourse
- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Other Applicant and/or Affiliate Controlled*

- Step-up HV substation
- Gen-tie Corridor

Burrowing Owl Observations

- Potential burrow
- Live owl
- Occupied known burrow

*Already approved under separate projects.

N

0 0.25 0.5 1 Miles

Scale is 1:45,000 when printed at 11"x17"

Not for Construction

Document Path: W:\Local\GIS\CES\Projects\POR\projects\194_PROJECTS\TERRA_GEN\194_1405_0001_Discovery\PROTERRA_GEN_BIO_FIGS_V2.aprx

APPENDIX A: PHOTOGRAPHS

This page intentionally left blank.

Photograph 1 **Notes:** Representative photograph of Study Area showing creosote bush scrub (*Larrea tridentata*) shrubland.	
Photograph 2 **Notes:** Representative potential burrow suitable for burrowing owl (BUOW, *Athene cunicularia*). No sign of BUOW was detected at this burrow.	

Photograph 3 **Notes:** Representative potential burrow suitable for BUOW, surrounded by desert fiddleneck (*Amsinkia tessellata* var. *tessellata*). No sign of BUOW was detected at this burrow.	
Photograph 4 **Notes:** Representative potential burrows suitable for BUOW consisting of a burrow complex. No sign of BUOW was detected at these burrows. This complex is also a natal/pupping den for desert kit fox.	

Photograph 5 **Notes:** Occupied known burrow, live owl observed in 2022, but not in 2023 (Burrow ID 12). Live owl flushed from the burrow as surveyors approached. No live owl or new sign was observed at the burrow in 2023. Whitewash documented in 2022 was still present at the burrow in 2023.	
Photograph 6 **Notes:** Whitewash at the entrance to a potential burrow. No live owl was observed at this burrow.	

Photograph 7 **Notes:** BUOW pellet detected at a potential burrow. No live owl was observed at this burrow.	
Photograph 8 **Notes:** BUOW pellet and prey remains detected near a potential burrow. No live owl was observed at this burrow. Desert kit fox sign in the form of prey remains (rodent skull) and desert kit fox scat were also found at this burrow and are shown in this picture.	

APPENDIX B: BUOW BURROWS AND OBSERVATIONS TABLE

This page intentionally left blank.

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
1	7002	11"width (w) x 16"height (h) x >72"diameter (d)	Potential burrow	11/3/22: Single entrance potential burrow suitable for burrowing owl (BUOW). No sign detected. Likely coyote den due to size and shape. 4/12/23: Single entrance BUOW potential burrow. BUOW sign, including whitewash and pellets, was detected.
2	7003	9"w x 9"h x >24"d	Potential burrow	11/3/22: Single entrance potential burrow suitable for BUOW. No sign detected. 4/12/23: Single entrance potential burrow suitable for BUOW. No sign detected.
3	7005	10"w x 5"h >72"d	Potential burrow	11/3/22: Single entrance potential burrow suitable for BUOW. No sign detected. Burrow is mostly straight then curves right after approximately 6 feet. Burrow is located on mound covered by *Lycium* sp. approximately 30 ft south of transmission tower. Recorded during the habitat assessment. 4/11/23: Single entrance potential burrow suitable for BUOW. No sign detected. Burrow is now in deteriorated condition.
4	7006	12"w x 9"h x >72"d; new burrow: 10"w x 8"h x >36"d	Potential burrow	11/3/22: Single entrance potential burrow suitable for BUOW. No sign detected. 4/11/23: Two-entrance potential burrow complex suitable for BUOW. No sign detected. Previously recorded burrow is slightly deteriorated but still suitable for BUOW, and a new entrance has been dug 1.5' below previously recorded burrow. New burrow has American badger (AB) claw marks on side walls.
5	7010	8"w x 5"h x >36"d, previously 6"h	Potential burrow	11/4/22: Single entrance potential burrow suitable for BUOW. No sign detected. Recorded during habitat assessment. AB claw marks also observed in and around burrow walls. Burrow curves to the left. Multiple other digs detected around burrow. 4/14/23: Single entrance potential burrow suitable for BUOW. No new sign detected. Burrow appears to be in disuse with signs of deterioration (overgrown and filling in). Burrow entrance slightly smaller.
6	7013	9"w x 9"h x 60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow is mostly straight but curves slightly to the left. Burrow apron is not fresh but burrow is in good condition (11/7/2022).
7	7015	16"w x 10"h x >72"d; 12"w x 10"h x >24"d	Potential burrow	11/7/2022: Two-entrance potential BUOW burrow complex, with pellets, whitewash, and feathers. Complex is under *Lycium* sp. shrub and has two main entrances (south and southwest aspects). Entrance with south aspect has most of the sign including whitewash, pellets, and scat. Entrance with southwest aspect had 1 fresh BUOW pellet and curved right and left. Several other potential entrances to the southeast and east. 4/19/23: Two-entrance potential BUOW burrow complex. No new BUOW sign detected, only bleached scat and pellets. Complex overgrown with *Amsinkia* sp. but entrances in good condition.

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
8	7019	14"w x 10"h x >24"d	Potential burrow	11/8/22: Single entrance potential burrow suitable for BUOW. No sign detected. Burrow is under *Lycium* sp. shrub. 04/18/23: Single entrance potential burrow suitable for BUOW. No sign detected. Burrow is in similar condition as previously described during fall 2022 habitat assessment. A lot of vegetation growing around and in front of the entrance.
9	7020	9"w x 7"h x >12"d	Potential burrow	11/8/22: Single entrance potential burrow suitable for BUOW. No sign detected. 4/18/23: Single entrance potential burrow suitable for BUOW. No sign detected. Burrow is in similar conditions as previously documented during fall 2022 habitat assessment. A lot of annual vegetation growing around and in front of the entrance.
10	7022	8"w x 8.5"h x >60"d	Potential burrow	11/8/22: Single entrance potential burrow suitable for BUOW. No sign detected. Fresh apron with evidence of tracks but unable to ID tracks due to recent rain. AB claw marks present. 4/18/23: Single entrance potential burrow suitable for BUOW. No new sign detected. Burrow is in similar condition to fall 2022 habitat assessment. Burrow is still in good condition.
11	7023	10"w x 5"h x >72"d; 9"w x 5.5"h x 24"d	Potential burrow	11/8/22: Two-entrance potential burrow complex suitable for BUOW. No sign detected. 4/19/23: Single entrance potential burrow suitable for BUOW. No sign detected. Northwest aspect entrance is now collapsed; the southwest aspect entrance is in similar condition to the condition it was in during the fall 2022 habitat assessment. Vegetation is growing around the mound the burrow is on. Located on the same mound as Observation ID #176.
12	7028	10"w x 12"h x >24"d	Occupied known burrow	11/9/22: Single entrance occupied known BUOW burrow recorded during habitat assessment; one live owl flushed south. Whitewash outside burrow but no pellets detected. On the west bank of Oak Creek wash towards the top of the bank (about 6 feet above bottom of wash). After approximately 2 feet deep, height shortens to 5-6 inches tall. 5/1/23: Single entrance potential BUOW burrow. Burrow has slightly deteriorated. Previously documented BUOW sign (whitewash) is still present nearby burrow, no new sign was detected.
13	7038	6"w x 12"h x 24"d	Potential burrow	11/11/22: Single entrance potential burrow suitable for BUOW. No sign detected. 4/17/23: Single entrance potential burrow suitable for BUOW. No sign detected. Similar conditions to fall 2022 habitat assessment.

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
14	7039	8"w x 5.5"h x >24"d	Occupied known burrow	11/11/23: Single entrance occupied known BUOW burrow, one BUOW was flushed from this location and flew north. 4/17/23: Single entrance potential burrow suitable for BUOW. No sign detected. Burrow is in similar condition to fall 2022 habitat assessment. Annual vegetation growing around entrance.
15	0405BA1SW	N/A	Live owl	Incidentally observed one BUOW fly southwest during botanical inventory survey. No burrow detected (4/5/23).
16	0410BA1DS	9"w x 5.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right slightly and narrows (4/10/23).
17	0410BA1AL	10"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right (4/10/23).
18	0410BA2AL	15"w x 17"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW, in middle of *Lycium* sp. patch. No sign detected. Canid dig next to entrance (4/10/23).
19	0410BA2DS	8"w x 6.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Deteriorated second entrance approximately 1 foot north of burrow. Curves left and narrows after 10” (4/10/23).
20	0410BA3DS	8"w x 7"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves left (4/10/23).
21	0410BA4DS	8"w x 7"h x 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right (4/10/23).
22	0410BA1TD	5"w x 6"h x >18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Annual vegetation growing in entrance (4/10/23).
23	0410BA2TD	7"w x 8"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/10/23).
24	0410BA3AL	9"w x 7"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Vegetation present in front of burrow, blocking entrance (4/10/23).
25	0410BA5DS	8"w x 7.5"h x 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right (4/10/23).
26	0410BA6DS	8"w x 8.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB dug burrow with claw marks inside of wall. Burrow curves to the left (4/10/23).
27	0410BA4AL	14"w x 6"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Located on southern wall of old soil pit. Curves right (4/10/23).
28	0410BA5AL	8"w x 6"h x 36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/10/23).
29	0410BA7DS	10"w x 6"h x 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope (4/10/23).
30	0410BA3TD	12"w x 7.5h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with over 10 BUOW pellets detected. Most pellets had no glaze or were bleached, and one light brown pellet. Large apron (4/10/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
31	0410BA6AL	8"w x 5.5"h x 36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Mud present inside burrow at time of survey (4/10/23).
32	0410BA8DS	9"w x 7.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow has a steep slope (4/10/23).
33	0410BA9DS	8"w x 5.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves left (4/10/23).
34	0410BA10DS	8"w x 4"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope, curves left (4/10/23).
35	0410BA11DS	8"w x 15"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Old canid scat present near entrance. Nearby burrow (ID 0410BA7AL) detected in middle of *Lycium* sp. shrub (4/10/23).
36	0410BA7AL	12"w x 14"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW, in *Lycium* sp. shrub. No sign detected. Nearby burrow (ID 35) detected on east side of shrub (4/10/23).
37	0410BA8AL	8"w x 6"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB dug burrow with claw marks inside. Burrow has a steep slope and appears to be recently dug, fresh soil on apron. Burrow curves to the left (4/10/23).
38	0410BA12DS	9"w x 8"h x >18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the left. Dig with a fresh apron detected approximately 2.5 feet south of burrow (4/10/23).
39	0410BA9AL	8"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB dug burrow with claw marks inside. Burrow curves to the left (4/10/23).
40	0410BA13DS	7"w x 9"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the left (4/10/23).
41	0411BA1AL	10"w x 4"h x 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow beginning to collapse (4/11/23).
42	0411BA1MP	6"w x 7"h x 18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow begins to narrow after 1.5 feet (4/11/23).
43	0411BA2AL	9"w x 8"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB dug burrow with claw marks inside. Burrow curves to the left (4/11/23).
44	0411BA2MP	8"w x 7"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Old/collapsed burrows and canid digs adjacent to this burrow. Canid tracks (possibly coyote) detected nearby, burrow curves to the left (4/11/23).
45	0411BA3AL	10"w x 5"h x 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/11/23).
46	0411BA4AL	10"w x 15"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Located on the east side of a *Lycium* sp. shrub, burrow curves to the left (4/11/23).
47	0411BA3MP	7.5"w x 6"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/11/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
48	0411BA4MP	10"w x 11"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the right. Old bleached canid scat (likely coyote) detected near burrow apron (4/11/23).
49	0411BA1TD	8.5"w x 6"h x >18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB dug burrow (4/11/23).
50	0411BA2TD	9.5"w 8.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/11/23).
51	0411BA3TD	8.5"w x 7"h x > 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/11/23).
52	0411BA4TD	7.5"w x 6"h x >12"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Under perennial bunch grass (4/11/23).
53	0411BA5TD	7.5"w x 6"h x >12"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right (4/11/23).
54	0411BA6AL	10"w x 9"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves sharply to the left (4/11/23).
55	0411BA7AL	9"w x 6"h x 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the right (4/11/23).
56	0411BA8AL	9"w x 5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right (4/11/23).
57	0411BA5MP	10"w x 11"h x >18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB dug burrow with claw marks inside. Burrow curves to the left. Canid scat (likely coyote) on burrow apron (4/11/23).
58	0411BA1VR	10"w x 10"h x >12"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/11/23).
59	0411BA9AL	8"w x 6"h x 36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/11/23).
60	0411BA10AL	9"w x 5"h x 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope (4/11/23).
61	0411BA11AL	8"w x 5"h x 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/11/23).
62	0411BA6TD	8"w x 10"h x >18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Annual vegetation growing on burrow mound/apron but not in entrance or tunnel (4/11/23).
63	0411BA7TD	8.5"w x 6.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the left (4/11/23).
64	0411BA6MP	7"w x 6"h x >18"d; 7"w x 6"h x >18"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Old tracks detected on burrow aprons but unable to ID due to age and condition of tracks (4/11/23).
65	0411BA5AL	9"w x 8"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB dug burrow with claw marks inside. Burrow curves to the right (4/11/23).
66	0411BA2VR	7"w x 7"h x >24"d; 7"w x 7"h x >24"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Burrows located 13 inches apart with the same dimensions and same aspect (4/11/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
67	0411BA3VR	8"w x 7"h x >18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Tunnel is steep and curves to the right (4/11/23).
68	0411BA8TD	8"w x 5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Tunnel is steep and curves left (4/11/23).
69	0412BA1JP	7"w x 9"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Old AB claw marks present on side walls (4/12/23).
70	0412BA2JP	8.5"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fresh, sandy apron (4/12/23).
71	0412BA1AL	9"w x 7"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the right (4/12/23).
72	0412BA3JP	8"w x 7.5"h x 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Located within an area of a fallen/dead Joshua tree (4/12/23).
73	0412BA2AL	7"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the left. Fresh sandy apron (4/12/23).
74	0412BA3AL	9"w x 6"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks present on side walls. Burrow curves to the left (4/12/23).
75	0412BA4AL	8"w x 7"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the left (4/12/23).
76	0412BA5AL	6"w x 5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/12/23).
77	0412BA4JP	9"w x 7.5"h x >18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks present on side walls (4/12/23).
78	0412BA5JP	8"w x 5.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/12/23).
79	0412BA1VR	10"w x 7.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fresh apron (soft soil). Canid scat detected on apron (not identifiable to species). AB claw marks detected on side walls inside tunnel (4/12/23).
80	0412BA2VR	7.5"w x 6.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Canid den. Curves to the left (4/12/23).
81	0412BA3VR	8"w x 8.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fresh and soft soil apron. Curves to the right (4/12/23).
82	0412BA4VR	8.5"w x 8"h x >12"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/12/23).
83	0413BA1AL	7"w x 5.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right (4/13/23).
84	0413BA2AL	8"w x 9"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks detected on side walls. Burrow curves to the right and has a fresh apron (4/13/23).
85	0413BA2SW	8"w x 9.5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks detected on side walls. Burrow curves to the left (4/13/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
86	0413BA3SW	10"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the right (4/13/23).
87	0413BA4SW	8"w x 6.5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow goes straight back (4/13/23).
88	0413BA5SW	9"w x 11"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks detected on side walls. Burrow has a very steep slope (4/13/23).
89	0413BA1TD	9"w x 10"h x >30"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right (4/13/23).
90	0413BA2TD	8.5"w x 6.5"h x > 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope into burrow (4/13/23).
91	0413BA3TD	8"w x 9.5"h x >12"d; 7"w x 6.5"h x >12"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Entrances within 3.5 feet of each other. Curves sharply left, steep slopes into burrows (4/13/23).
92	0413BA4TD	6.5"w x 4.5"h x >30"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope, curves sharply left (4/13/23).
93	0413BA1MP	8"w x 6.5"h x >30"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks detected on inside side walls. Tunnel curves left (4/13/23).
94	0413BA2MP	10"w x 9"h x >30"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks detected on inside side walls. Curves to the right (4/13/23).
95	0413BA3MP	6.5"w x 7.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves left. Two smaller mammal digs located 1-2 feet away (4/13/23).
96	0413BA4MP	8"w x 7"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right (4/13/23).
97	0413BA5MP	8.5"w x 5.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope, curves right (4/13/23).
98	0413BA6MP	8"w x 5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep incline into burrow (4/13/23).
99	0413BA7MP	8"w x 10.5"h x >12"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Circular entrance and steep incline into burrow (4/13/23).
100	0414BA1AL	7"w x 7.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the right (4/14/23).
101	0414BA2AL	8"w x 9"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUO. No sign detected. AB claw marks detected on side walls. Burrow curves to the right (4/14/23).
102	0414BA3AL	10"w x 12"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the right (4/14/23).
103	0414BA1SW	8"w x 10"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/14/23).
104	0414BA2SW	8"w x 7"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/14/23).
105	0414BA4AL	9"w x 14"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the left (4/14/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
106	0414BA5AL	9"w x 6.5"h x >42"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/14/23).
107	0414BA6AL	8"w x 6"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with three BUOW pellets and whitewash detected on apron. No live owl observed. Curves to left (4/14/23).
108	0414BA7AL	8"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the left (4/14/23).
109	0414BA1TD	8"w x 7"h >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope into burrow, curves to right (4/14/23).
110	0414BA2TD	7"w x 7"h x > 24"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Both entrances have fresh powdery apron and steep slope into burrow (4/14/23).
111	0414BA3TD	8"w x 9.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the left, steep slope into burrow (4/14/23).
112	0414BA4TD	9"w x 6"h x >36"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Entrances within 3 feet of each other, fresh dirt aprons, steep tunnels and both curve. One of the burrows has jackrabbit tracks on apron (4/14/23).
113	0414BA5TD	7"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope into tunnel (4/14/23).
114	0414BA6TD	7.5"w x 8"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Slightly steep tunnel, curves right (4/14/23).
115	0414BA7TD	7.5"w x 4.5"h x > 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/14/23).
116	0414BA1JP	7.5"w x 6"h x 18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fresh and soft soil apron. AB claw marks detected on interior. Steep slope into burrow (4/14/23).
117	0414BA2JP	7.5"w x 4.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right (4/14/23).
118	0414BA3JP	8.5"w x 8"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right (4/14/23).
119	0414BA4JP	7"w x 6.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/14/23).
120	0414BA5JP	7.5"w x 5.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fresh apron (4/14/23).
121	0414BA6JP	8"w x 7"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/14/23).
122	0417BA1AL	8"w x 10"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/17/23).
123	0417BA2AL	9"w x 5.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right and has a fresh apron (4/17/23).
124	0417BA3AL	6"w x 4.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves left (4/17/23).
125	0417BA4AL	8"w x 10"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the right (4/17/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
126	0417BA5AL	8"w x 6.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the left (4/17/23).
127	0417BA6AL	10"w x 16"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow under *Lycium* sp. shrub. Burrow goes straight back (4/17/23).
128	0417BA7AL	7"w x 9"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow under *Lycium* sp. shrub. Canid scat on burrow apron, likely coyote (4/17/23).
129	0417BA8AL	10"w x 7"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks on side walls. Burrow goes straight back. Additional burrow nearby; this burrow is located approximately 2 feet south of other burrow (ID 130) (4/17/23).
130	0417BA9AL	8.5"w x 7"h x >12"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the right. Located 2 feet north of ID 129. (4/17/23).
131	0417BA10AL	8.5"w x 8"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the right (4/17/23).
132	0417BA11AL	9"w x 5.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow extends straight back (4/17/23).
133	0417BA1CW	9"w x 5.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Annual vegetation growing at entrance and on burrow (4/17/23).
134	0417BA2CW	9"w x 8.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope into burrow (4/17/23).
135	0417BA3CW	8"w x 5.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves down left (4/17/23).
136	0417BA4CW	6.5"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Slopes down right. Possible second entrance 4 feet north (4/17/23).
137	0417BA5CW	9.5"w x 9"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash on apron and one old pellet inside burrow (4/17/23).
138	0417BA7CW	8"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Detected mammal scat (dark brown, no glaze) on mound. Burrow has semi-steep slope and curves right (4/17/23).
139	0417BA8CW	9"w x 12"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Annual vegetation growing on mound. Detected coyote scat (dry, no glaze) on mound. Burrow has gradual slope (4/17/23).
140	0417BA9CW	9"w x 10.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope, curves right (4/17/23).
141	0417BA10CW	5"w x 5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Under *Lycium* sp. shrub. Gradual slope (4/17/23).
142	0417BA11CW	9.5"w x 13"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope, turns right, narrows to 5" x 5" (4/17/23).
143	0417BA2TD	9"w x 8"h x >18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Narrows in width by 3" after entrance. Steep slope and sharp curve left (4/17/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
144	0417BA3TD	7"w x 7"h x >18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope into burrow, sharp curve to right (4/17/23).
145	0417BA4TD	8"w x 6.5"h x > 24"d	Potential burrow	Single entrance potential burrow existing suitable for BUOW. No sign detected. Annual vegetation overgrown at entrance (4/17/23).
146	0417BA5TD	6"w x 8.5"h x >18"d	Potential burrow	Single entrance potential burrow existing suitable for BUOW. No sign detected (4/17/23).
147	0417BA6TD	7"w x 5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope into burrow (4/17/23).
148	0417BA7TD	8"w x 9"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Soft dirt apron and steep slope into burrow. Tunnel curves left (4/17/23).
149	0417BA8TD	8"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope (4/17/23).
150	0418BA1AL	9"w x 7"h x <24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fresh apron present. Curves to the right (4/18/23).
151	0418BA2AL	7.5"w x 8"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/18/23).
152	0418BA3AL	9"w x 8.5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow dug by AB (claw marks present on side walls). Curves to the left (4/18/23).
153	0418BA4AL	9"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the right (4/18/23).
154	0418BA5AL	8"w x 8"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Dug by AB (claw marks detected on side walls). Burrow curves to the left and is on the northeast side of a *Lycium* sp. shrub (4/18/23).
155	0418BA6AL	9"w x 9"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Dug by AB (claw marks on side walls). Curves to the right and is steep (4/18/23).
156	0418BA1CW	8"w x 9.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Gradual slope, curves right, high apron (4/18/23).
157	0418BA2CW	8.5"w x 7.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Mammal paw print on apron, slight curve left, under old creosote bush and *Amsinkia* sp., high apron (4/18/23).
158	0418BA1VR	17"w x 14"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the left. Within *Lycium* sp. shrub (4/18/23).
159	0418BA2VR	8"w x 9"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right and has a gentle slope (4/18/23).
160	0418BA3VR	8"w x 5"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right. Under *Lycium* sp. shrub (4/18/23).
161	0418BA4VR	7.5"w x 5.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/18/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
162	0418BA5VR	9"w x 6"h x 36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep and slightly curves to the right (4/18/23).
163	0418BA6VR	6"w x 5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Extends straight back (4/18/23).
164	0418BA7VR	8"w x 9"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right, steep slope (4/18/23).
165	0418BA7AL	9"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow is steep and curves to the left (4/18/23).
166	0418BA1TD	7.5"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. After 3 feet, curves right (4/18/23).
167	0418BA2TD	7"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope into burrow, fresh dirt apron, tunnel curves to the left (4/18/23).
168	0418BA4TD	8"w x 7.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope, curves right then left (4/18/23).
169	0418BA5TD	7"w x 6"h x >18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Gradual curve to left, semi-steep slope (4/18/23).
170	0419BA1AL	5"w x 9"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the left and is steep (4/19/23).
171	0419BA2AL	7"w x7.5"h x >72"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the left (4/19/23).
172	0419BA3AL	8"w x 5"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Located on eastern side wall of wash. Curves left (4/19/23).
173	0419BA1JH	11"w x 9"h x >72"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow located under *Lycium* sp. shrub. Whitewash detected on apron, however, whitewash appears to be from songbirds sitting in shrub surrounding burrow (4/19/23).
174	0419BA2JH	7"w x 7"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to left (4/19/23).
175	0419BA3JH	9.5"w x 5.5"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with three pellets on apron, one pellet on top of burrow, two pellets 2 meters southeast of burrow (one with glaze). Curves to the left (4/19/23).
176	0419BA4JH	8.5"w x 9"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow goes straight back, on same mound as burrow detected during habitat assessment (ID 11). (4/19/23).
177	0419BA4AL	7"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow dug by AB (claw marks detected on side walls). Curves sharply to the left after 3 feet (4/19/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
178	0420BA1AL	9"w x 9"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow located in old wood debris pile, multiple small ground squirrel burrows present throughout debris pile, however, most entrances are too small for target species. Canid scat (likely coyote) present around debris pile (4/20/23).
179	0420BA1JH	5"w x 5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves left (4/20/23).
180	0420BA2JH	5"w x 8"h x >18"d; 4.5"w x 6"h x >24"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Burrows within 4 feet of each other. First burrow located in rock pile but burrowed into soil, second burrow located southeast (4/20/23).
181	0420BA1TD	7"w x 6.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Gradually curves left, semi-steep slope into burrow (4/20/23).
182	0420BA1AD	10"w x 7"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right (4/20/23).
183	0421BA1AS	8"w x 9"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to left (4/21/23).
184	0421BA2AS	8"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow dug by AB (claw marks on sides of wall). Curves to the left (4/21/23).
185	0424BA1AL	9"w x 12"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks detected on side walls. Curves to the right and has a fresh apron (4/24/23).
186	0424BA2AL	8"w x 6"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with old pellets and whitewash on burrow apron, no live owl observed. Burrow is overgrown with annual vegetation (4/24/23).
187	0424BA3AL	10"w x 13"h x >72"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/24/23).
188	0424BA4AL	8"w x 14"h x >96"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Old canid scat detected nearby, likely coyote based on size (4/24/23).
189	0424BA1EM	8.5"w x 8"h x 24"d	Potential burrow	Single entrance potential BUOW burrow. Two old BUOW pellets inside burrow, back of burrow looks filled in. Steep slope into burrow (4/24/23).
190	0424BA2EM	8"w x 5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope, goes back 2 feet then curves to right (4/24/23).
191	0424BA3EM	8"w x 6"h x >24"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash at entrance and old, deteriorated pellet inside burrow (4/24/23).
192	0424BA4EM	8.5"w x 4.5"h x >24"d	Potential burrow	Single entrance potential BUOW burrow, old whitewash and BUOW pellet detected on apron. Narrows at 2 feet (4/24/23).
193	0424BA5EM	9"w x 10"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/24/23).
194	0424BA6EM	9"w x 4"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Turns sharply to the left (4/24/23).
195	0424BA1TD	8"w x 5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fresh fluffy apron, curves left (4/24/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
196	0424BA2TD	7"w x 6"h x >36"d; 7.5"w x 5.5"h x 24"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Burrows within 2 feet of each other (4/24/23).
197	0424BA3TD	9"w x 6"h x 36"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash and three old BUOW pellets (bleached and deteriorated) on apron. Semi-steep slope into burrow (4/24/23).
198	0425BA1EM	8"w x 19"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Unidentified mammal scat deep down inside burrow (4/25/23).
199	0425BA2EM	8.5"w x 9.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope, sharply curves right (4/25/23).
200	0425BA3EM	7"w x 4.5"h x >24"d	Potential burrow	Single entrance potential BUOW burrow, whitewash and prey remains (mammal bone) on apron. Larger entrance narrows to specified dimensions, semi-steep slope into burrow (4/25/23).
201	0425BA4EM	6"w x 5"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, whitewash on apron. Curves right (4/25/23).
202	0425BA5EM	6"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope. Large entrance but narrows. Curves to left (4/25/23).
203	0425BA6EM	6"h x 7"w x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves slightly right (4/25/23).
204	0425BA7EM	9"w x 8"h x > 48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fluffy fresh apron (4/25/23).
205	0425BA1TD	5"w x 7"h x >24"d	Potential burrow	Single entrance potential BUOW burrow, whitewash and old deteriorated BUOW pellets (falling apart) on apron. Burrow entrance is 7"w x 8"h then narrows to 5"w x 7"h (4/25/23).
206	0425BA2TD	8.5"w x 5.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Annual vegetation growing over apron and in entrance. Semi-steep slope (4/25/23).
207	0425BA3TD	8"w x 5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks on side wall of burrow. Semi-steep slope, curves right (4/25/23).
208	0425BA4TD	8"w x 5"h x > 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope into burrow. Entrance height is 6", curves right after 2 feet and narrows in height to 5" (4/25/23).
209	0425BA5TD	10"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Gradual curve to the left, annual vegetation growing over apron and in entrance, old/bleached canid scat around apron (4/25/23).
210	0425BA6TD	6.5"w x 5"h x <24"d	Potential burrow	Single entrance potential BUOW burrow, whitewash on apron and one old light brown BUOW pellet deep inside burrow. Burrow narrows and is in deteriorated condition (filling in). Semi-steep slope (4/25/23).
211	0425BA1VR	7"w x 14"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. likely dug by a canid. AB claw marks detected on side walls and old canid scat detected nearby (likely coyote based on size) (4/25/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
212	0425BA2VR	13"w x 19"h x >48"d	Potential burrow	Single entrance potential BUOW burrow, with old BUOW pellet on apron, no live owl observed. Old canid scat (likely coyote based on size) detected near entrance. Burrow is overgrown with annual vegetation (4/25/23).
213	0425BA3VR	8"w x 10"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/25/23).
214	0425BA4VR	8"w x 4.5"h x >48"d	Potential burrow	Single entrance potential BUOW burrow, with BUOW pellets, whitewash, and feathers on burrow apron. Curves right (4/25/23).
215	0425BA5VR	8"w x 6"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to left (4/25/23).
216	0425BA9VR	9"w x 10"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the left (4/25/23).
217	0425BA10VR	8"w x 7"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right. Canid latrine (likely coyote) detected on apron (4/25/23).
218	0426BA1AL	8"w x 9.5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/26/23).
219	0426BA2AL	8"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks on walls. Forks to the right and left (4/26/23).
220	0426BA2TD	8.5"w x 8.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope, annual vegetation growing in entrance and on apron (4/26/23).
221	0426BA3TD	7"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to left, semi-steep slope into burrow. Narrows vertically to around 5" height inside (4/26/23).
222	0426BA4TD	11"w x 10.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope into burrow, fresh powdery dirt apron, AB claw marks on side walls (4/26/23).
223	0426BA5TD	5.5"w x 10"h x <12"d	Potential burrow	Single entrance potential BUOW burrow. Whitewash and about 14 old BUOW pellets (light brown to bleached, no glaze). Old deteriorated canid den, filling in and collapsing. Burrow entrance and apron is heavily overgrown with *Amsinkia* sp. Semi-steep slope (4/26/23).
224	0426BA6TD	9"w x 7.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope, curves to right (4/26/23).
225	0426BA7TD	9"w x 15.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope into curve, curves left, long linear apron (4/26/23).
226	0426BA8TD	8"w x 7.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Annual vegetation growing on apron and in entrance (4/26/23).
227	0426BA9TD	10"w x 13.5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope into burrow (4/26/23).
228	0426BA10TD	10"w x 18"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Canid den. Entrance and apron heavily overgrown (4/26/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
229	0426BA11TD	10"w x 15"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Canid den with fresh powdery dirt apron (4/26/23).
230	0426BA1EM	9.5"w x 12"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Large apron (4/26/23).
231	0426BA2EM	10"w x 14"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Dead snake inside burrow, bleached mammal scat of various sizes (4/26/23).
232	0426BA3EM	10"w x 10"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fresh apron (4/26/23).
233	0426BA1VR	8"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to left (4/26/23).
234	0426BA2VR	10"w x 18"h x >60"d; 10"w x 18"h x >60"d	Potential burrow	Two-entrance potential BUOW burrow complex. One of the burrows has old BUOW pellets and whitewash on the apron, no live owl observed. Canid scat (likely coyote) present on apron. Burrows are approximately 5 meters apart and both entrances are the same size (4/26/23).
235	0426BA3VR	8"w x 4.5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/26/23).
236	0427BA1VR	8"w x 10"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks detected on burrow side walls (4/27/23).
237	0427BA2VR	6"w x 7.5"h x >36"d; 6"w x 8"h x 36"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. East aspect burrow curves to the right and the west aspect burrow curves to the left, burrows possibly connect in the middle (4/27/23).
238	0427BA1AL	8"w x 10"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/27/23).
239	0427BA1TD	8"w x 11.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Canid den, fresh powdery dirt apron, curves right (4/27/23).
240	0427BA2TD	10"w x 10"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Canid den. Fresh powdery dirt apron (4/27/23).
241	0427BA3TD	10"w x 11"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fresh powdery dirt apron. Curves to right (4/27/23).
242	0427BA4TD	9"w x 10.5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves left, some annual vegetation growing on apron and in entrance (4/27/23).
243	0427BA5TD	10"w x 14"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves left, semi-steep slope (4/27/23).
244	0427BA6TD	9.5"w x 12"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Some annual vegetation growing on apron (4/27/23).
245	0427BA7TD	13"w x 16"h x >60"d; 10"w x 13"h x >60"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. West entrance had fresh dirt apron and coyote tracks and fur; east entrance had no sign and annual vegetation on apron and at entrance (4/27/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
246	0427BA8TD	10"w x 13"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to left (4/27/23).
247	0427BA9TD	7.5"w x 5.5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Some annual vegetation growing on apron and in entrance. After 4 feet, curves left (4/27/23).
248	0427BA10TD	7"w x 7"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Evidence of erosion on apron. Narrows after entrance to about 5" in diameter (4/27/23).
249	0427BA11TD	11"w x 15"h x >72"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (4/27/23).
250	0427BA12TD	10"w x 10"h >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves left (4/27/23).
251	0427BA13TD	8"w x 13"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves left. Fresh powdery dirt apron (4/27/23).
252	0427BA14TD	7"w x 8"h >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Narrows after entrance to about 4" in height. Curves left (4/27/23).
253	0427BA15TD	7"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Annual vegetation growing on apron and in entrance (4/27/23).
254	0427BA16TD	11"w x 6.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Annual vegetation growing on apron and in entrance. Curves right. After 1 foot, height narrows to 5" tall (4/27/23).
255	0427BA1EM	9"w x 23"h x >72"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Coyote den, large prints on apron, after 6 feet curves to right (4/27/23).
256	0427BA2EM	9"w x 8"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Canid tracks on apron (4/27/23).
257	0427BA3EM	9"w x 12"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Annuals growing on apron (4/27/23).
258	0427BA4EM	8"w x 10"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves left at 3 feet into the burrow and narrows (4/27/23).
259	0427BA5EM	9"w x 14"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Coyote den (4/27/23).
260	0427BA6EM	8"w x 5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Located in old stockpile from previous excavation. Curves to right, gentle slope (4/27/23).
261	0427BA3VR	7"w x 5"h x 36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks detected on burrow side walls. Curves to right (4/27/23).
262	0427BA4VR	8"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks detected on burrow side walls. Curves to left (4/27/23).
263	0428BA1VR	9"w x 7"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow curves to the left (4/28/23).
264	0428BA2VR	9"w x 7"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/28/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
265	0428BA3VR	8"w x 6"h x >48"d	Potential burrow	Single entrance potential BUOW burrow, whitewash on burrow apron. Curves left (4/28/23).
266	0428BA1EM	9"w x 6.5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the left (4/28/23).
267	0428BA2EM	10"w x 8"h x >36"d; 8.5"w x 7"h x >18"d	Potential burrow	Two-entrance potential BUOW burrow complex, with deteriorated BUOW pellet detected on apron of entrance with southeast aspect. Burrows possibly connect. Rodent bones on apron, steep slope in, second entrance curves right and has no sign (4/28/23).
268	0428BA3EM	8.5"w x 8.5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Steep slope, curves to the left (4/28/23).
269	0428BA4VR	9"w x 6.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/28/23).
270	0428BA5VR	7"w x 10"hx >36"d; 11"w x 16"h x >48"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Canid scat (likely coyote) detected on the top of the burrow (4/28/23).
271	0428BA6VR	6"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Goes straight back (4/28/23).
272	0428BA7VR	12"w x 11"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash on burrow apron. Curves to the left (4/28/23).
273	0428BA8VR	8"w x 6.5"h x >48"d; 8"w x 7"h x >48"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Northwest aspect burrow curves to the left and the south aspect burrow goes straight back. The burrows are approximately 10 meters apart (4/28/23).
274	0428BA1TD	10"w x 7"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. After 2.5 feet burrow narrows and is starting to fill in with dirt (4/28/23).
275	0428BA2TD	7.5"w x 5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Annual vegetation growing over apron and in entrance. Curves left. Large old and bleached canid scat detected near apron (4/28/23).
276	0428BA3TD	7.5"w x 5.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fresh and soft apron. Curves right (4/28/23).
277	0428BA4TD	8.5"w x 4.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Annual vegetation growing in entrance. Gradually curves left (4/28/23).
278	0428BA5TD	8.5"w x 12"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope into burrow. Annual vegetation growing in apron. Curves left (4/28/23).
279	0428BA6TD	7.5"w x 5.5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope into burrow. Curves left. Fresh and soft dirt apron (4/28/23).
280	0501BA1TD	7"w x 5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope (5/1/23).
281	0501BA1VR	11"w x 12"h x >48"d; 10"w x 6.5"h x >36"d	Potential burrow	Two-entrance potential BUOW burrow complex, both with whitewash and multiple pellets on apron (5/1/23).
282	0501BA2VR	20"w x 12"h x 48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB dug burrow with claw marks in entrance and tunnel, continues straight back (5/1/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
283	0501BA3VR	5"w x 5"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, lots of whitewash and BUOW pellets on burrow apron. Curves left (5/1/23).
284	0501BA4VR	8"w x 19.5"h x >36"d; 10"w x 18"h x >48"d	Potential burrow	Two-entrance potential BUOW burrow complex, with pellets and whitewash on both aprons. Entrance to burrows <1 meter apart. Beneath creosote bush shrubs. One entrance curves up and other curves to the right (5/1/23).
285	0501BA5VR	8"w x 13"h x >24"d	Potential burrow	Single entrance potential BUOW burrow, degraded BUOW pellets and whitewash on apron. Curves right (5/1/23).
286	0501BA1AL	11"w x 15"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Dug by AB (claw marks present on side wall) with whitewash on apron. Curves to the right (5/1/23).
287	0501BA2AL	8"w x 8"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Canid scat (likely coyote) detected nearby (5/1/23).
288	0501BA3AL	10"w x 7"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (5/1/23).
289	0501BA4AL	7"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the left (5/1/23).
290	0502BA1AL	15"w x 15"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Old canid scat (likely coyote) detected on apron (5/2/23).
291	0502BA1VR	6"w x 7"h x >18"d	Potential burrow	Single entrance potential BUOW burrow, whitewash and BUOW pellets on burrow apron. Curves left (5/2/23).
292	0502BA2VR	6"w x 7"h x >30"d; 8"w x 9"h x >30"d; 5"w x 7"h x >18"d	Potential burrow	Three-entrance potential BUOW burrow complex, lots of whitewash and BUOW pellets across the burrow aprons and on top of all burrows. All burrows extend straight back (5/2/23).
293	0502BA1TD	12"w x 9.5"h x >60"d	Potential burrow	Single entrance potential BUOW burrow, with three BUOW pellets (one bleached and two light brown, no glaze) detected next to burrow. Lots of BUOW whitewash on bank next to burrow and on apron. Along bank of incised wash. Curves left after 5 feet (5/2/23).
294	0502BA3VR	8"w x 7"h x >12"d; 9"w x 16"h x >24"d	Potential burrow	Two-entrance potential BUOW burrow complex, with whitewash and pellets on aprons. Entrances <3 feet apart (5/2/23).
295	0502BA2TD	10"w x 13"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves left after 5 feet, on bank of incised wash (5/2/23).
296	0502BA3TD	9.5"w x 10"h x 84"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. In bank of incised wash, curves right after 7 feet (5/2/23).
297	0502BA2AL	14"w x 16"h x >96"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. A canid latrine (for a large canid) was detected nearby (5/2/23).
298	0502BA4VR	6"w x 5"h x >12"d; 6"w x 5"h x >12"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Main entrance splits into two (5/2/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
299	0502BA4TD	8.5"w x 7"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, one brown BUOW pellet and whitewash detected across burrow entrance. On back of incised wash. Narrows after about 2 feet to 3" in height. Curves right (5/2/23).
300	0502BA5VR	10"w x 5.5"h x >24"d; 7"w x 9"h x >36"d; 6"w x 7.5"h x >24"d; 7"w x 10"h x >36"d	Potential burrow	Four-entrance potential BUOW burrow complex, with whitewash on aprons of all entrances (5/2/23).
301	0502BA5TD	8.5"w x 6"h x >12"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Soft apron, curves left and then right. Height narrows to 5" inside burrow (5/2/23).
302	0502BA3AL	14"w x 17"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Old canid scat (likely coyote) detected on apron (5/2/23).
303	0502BA6VR	12"w x 10"h x >24"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash on apron. Curves right (5/2/23).
304	0502BA8VR	6"w x 9"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with a BUOW pellet on apron. Curves slightly right (5/2/23).
305	0502BA9VR	6"w x 9"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Dug by AB with claw marks on edges (5/2/23).
306	0502BA10VR	11"w x 11"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves right (5/2/23).
307	0502BA6TD	12"w x 7"h x >36"d; 11.5"w x 6"h x >36"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Both have semi-steep slopes into burrow and soft aprons (5/2/23).
308	0502BA7TD	17.5"w x 10"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash. Two deteriorated mammal digs within 7 feet. Entrance is old canid den with long linear apron with coyote scat. AB claw marks on walls of burrow. Curves right. Two mammal digs with deteriorated entrances, both have whitewash at entrances (5/2/23).
309	0502BA8TD	12.5"w x 14"h x >24"d; 9.5"w x 10"h x >36"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Burrows within 7 feet of each other. Soft apron with evidence of mammal tracks. Coyote scat latrine between aprons. Semi-steep slope into burrows (5/2/23).
310	0502BA11VR	7.5"w x 5"h x >18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Extends straight (5/2/23).
311	0502BA2CG	9"w x 8"h >36"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash present. Curves left (5/2/23).
312	0502BA3CG	8.5"w x 15"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with pellets, whitewash, canid scat and tracks on mound. Curves right (5/2/23).
313	0502BA4CG	9"w x 6.5"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, whitewash all over mound, BUOW pellets present. Curves left (5/2/23).
314	0502BA12VR	6"w x 5"h x >48"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash and pellets on apron and in entrance. Extends straight (5/2/23).
315	0503BA1VR	6.5"w x 7"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the left (5/3/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
316	0503BA2VR	6"w x 11"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB-dug burrow, AB claw marks on burrow entrance and in tunnel (5/3/23).
317	0503BA3VR	8"w x 8"h x >36"d	Potential burrow	Single entrance potential BUOW burrow. AB-dug burrow, AB claw marks in burrow entrance and tunnel. Whitewash on apron (5/3/23).
318	0503BA1AL	9"w x 8"h x >48"d	Potential burrow	Single entrance potential BUOW burrow, with BUOW sign (old whitewash present on apron). Curves to the left (5/3/23).
319	0503BA2AL	8"w x 8"h x 18"d	Potential burrow	Single entrance potential BUOW burrow, old BUOW pellets and whitewash present on burrow apron. Burrow is deteriorated (5/3/23).
320	0503BA3AL	18"w x 12"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (5/3/23).
321	0503BA1TD	7"w x 5"h x >36"d	Potential burrow	Single entrance potential BUOW burrow. Whitewash on apron and one BUOW pellet nearby. Semi-steep slope into burrow. Sharply curves right. Entrance is 7" x 7" and narrows at curve about 10" into burrow (5/3/23).
322	0503BA2TD	8"w x 3.5"h x >36"d	Potential burrow	Single entrance potential BUOW burrow. Whitewash on apron and on top of burrow. Burrow is filling in with seeds and dirt. Semi-steep slope. Straight tunnel (5/3/23).
323	0503BA3TD	7"w x 7"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope, straight tunnel (5/3/23).
324	0503BA4TD	9"w x 7"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Dug by AB, no claw marks detected. Fresh apron. Semi-steep slope into burrow. Curves right (5/3/23).
325	0503BA5TD	10"w x 15"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Soft apron. Curves left. Semi-steep slope into burrow (5/3/23).
326	0503BA6TD	8"w x 8"h x >12"d	Potential burrow	Single entrance potential BUOW burrow. Whitewash on apron. Semi-steep slope, curves right (5/3/23).
327	0503BA7TD	6"w x 8"h x >36"d	Potential burrow	Two-entrance potential BUOW burrow complex, with whitewash and pellets. First entrance; semi-steep slope into burrow. Lots of BUOW whitewash and three pellets (two bleached and one brown). AB claw marks present inside wall. Second entrance; 7 feet west of burrow with west aspect and no sign (5/3/23).
328	0503BA8TD	7"w x 16"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope, curves left slightly. Soft apron, AB claw marks inside walls (5/3/23).
329	0503BA9TD	8"w x 9"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope into burrow. Straight tunnel (5/3/23).
330	0503BA4VR	7"w x 8"h x >36"d	Potential burrow	Single entrance potential BUOW burrow. Whitewash on apron. Curves right (5/3/23).
331	0504BA1VR	5"w x 4"h x >36"d	Potential burrow	Single entrance potential BUOW burrow. Whitewash on apron. Curves left (5/4/23).
332	0504BA1JH	7"w x 10"h X >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks on sidewalls (5/4/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
333	0504BA1AL	average entrance size 10"w x 8"h x >24"d	Potential burrow	20-entrance potential burrow complex suitable for BUOW. No sign detected. The remaining entrances are overgrown with vegetation (5/4/23).
334	0504BA2AL	7"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Annual vegetation growing on burrow apron. Straight tunnel (5/4/23).
335	0504BA1TD	10"w x 12"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Lots of annual vegetation growing on apron. Semi-steep slope into burrow (5/4/23).
336	0504BA2VR	8"w x 5"h x >24"d	Potential burrow	Single entrance potential BUOW burrow. Whitewash on apron. Curves left (5/4/23).
337	0504BA3AL	9"w x 6.5"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with old whitewash present on apron. Curves to the left. Semi-steep slope (5/4/23).
338	0504BA2TD	9"w x 10"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope into burrow. Annual vegetation growing in apron (5/4/23).
339	0505BA1VR	8"w x 4"h x >36"d	Potential burrow	Single entrance potential BUOW burrow. Whitewash and BUOW pellets on apron. Curves left (5/5/23).
340	0505BA1TD	7.5"w x 7"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Sharply curves right. Semi-steep slope into burrow (5/5/23).
341	0505BA2TD	8" w x 7" h >48"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash and one brown pellet on apron. Semi-steep slope into burrow. Curves right (5/5/23).
342	0505BA2VR	8.5"w x 8"h x >48"d	Potential burrow	Single entrance potential BUOW burrow. Degraded BUOW pellets and whitewash on apron, feathers in tunnel. Multiple pellets 5 meters northwest of burrow entrance beneath *Lycium* sp. shrub. Curves left (5/5/23).
343	0505BA3TD	8"w x 8"h x >60"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash on apron. Semi-steep slope into burrow (5/5/23).
344	0505BA4TD	9"w x 9"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with five BUOW pellets (two light brown) on apron. Semi-steep slope into burrow. Long linear apron (5/5/23).
345	0505BA5TD	4.5"w x 6"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash and five BUOW pellets on apron, additional pellets inside. Pellets range from light brown to bleached. Semi-steep slope into burrow (5/5/23).
346	0505BA6TD	7.5"w x 7"h x >36"d	Potential burrow	Single entrance potential BUOW burrow, with lots of BUOW whitewash and three BUOW pellets on apron. Curves right (5/5/23).
347	0505BA7TD	8"w x 5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope (5/5/23).
348	0505BA8TD	8"w x 7"h x 24"d	Potential burrow	Single entrance potential BUOW burrow. Small amount of whitewash on apron and two BUOW pellets. One pellet inside burrow and one on apron. Steep slope (5/5/23).
349	0508BA1WT	8w" x 4"h x 24"d	Potential burrow	Four-entrance potential burrow complex suitable for BUOW. No sign detected (5/8/23).
350	0508BA2WT	8"w x 9"h x 36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope (5/8/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
351	0508BA3WT	7.5"w x 6"h x 36"d	Potential burrow	Single entrance potential BUOW burrow. Single BUOW pellet present. Steep slope (5/8/23).
352	0508BA4WT	9"w x 10"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Located under downed western Joshua tree. Burrow in good condition (5/8/23).
353	0508BA5WT	10"w x 8"h x > 72"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Lots of coyote scat nearby (5/8/23).
354	0508BA1TD	9"w x 5"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB-dug burrow, AB claw marks on inside walls of burrow. Curves left, semi-steep slope (5/8/23).
355	0508BA2TD	6.5"w x 5"h x >36"d	Potential burrow	Single entrance potential BUOW burrow. Small amount of whitewash and bone fragment from prey item on apron. Semi-steep slope (5/8/23).
356	0508BA3TD	7"w x 5"h x >48"d	Potential burrow	Single entrance potential BUOW burrow. One BUOW pellet in burrow and whitewash on apron. Semi-steep slope (5/8/23).
357	0508BA4TD	7"w x 3"h x >24"d	Potential burrow	Single entrance potential BUOW burrow. Whitewash and bone fragment of prey item on apron. Semi-steep slope, burrow in deteriorated condition (5/8/23).
358	0508BA1JH	8"w x 10"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Canid scat present around burrow (likely coyote) (5/8/23).
359	0508BA2JH	8"w x 7 h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB sign (claw marks present on side wall) (5/8/23).
360	0509BA1TD	5"w x 4"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fresh apron with mammal tracks. Semi-steep slope (5/9/23).
361	0509BA1AL	8.5"w x 8.5"h x >72"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (5/9/23).
362	0509BA2AL	8"w x 7"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (5/9/23).
363	0509BA3AL	9"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow has steep slope and goes straight back (5/9/23).
364	0509BA1WT	7"w x 9"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Fresh dig. Coyote scat present (5/9/23).
365	0510BA1AL	8"w x 9"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB burrow with claw marks present on side walls. Large dirt apron (5/10/23).
366	0510BA1JP	7.5"w x 5.5"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB dug burrow, no claw marks present. Recently dug. Steep slope (5/10/23).
367	0510BA1TD	6” w x 5.5"h x >48"d	Potential burrow	Single entrance potential BUOW burrow. Burrow dug by AB. Whitewash present on apron. Steep slope into burrow (5/10/23).
368	0511BA1AL	9.5"w x 9"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Slightly steep slope. Old tracks (possibly canid) on apron but too deteriorated to determine species (5/11/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
369	0511BA2AL	8"w x 8"h x >24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Burrow has a steep slope and curves very sharply to the left (5/11/23).
370	0511BA1JP	9"w x 5"h x 30"d; 5"w x 5"h x >24"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Burrows narrow at ends, not recent and very bleached (5/11/23).
371	0511BA2JP	9"w x 6"h x >72"d	Potential burrow	Nine-entrance potential burrow complex suitable for BUOW. No sign detected. Vegetation around complex is highly trampled (5/11/23).
372	0511BA3JP	11"w x 6"h x >48"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash and pellet present (5/11/23).
373	0511BA1TD	7.5"w x 4"h x 48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks on side walls of burrow. Fresh apron. Burrow curves left (5/11/23).
374	0511BA2TD	11"w x 8"h > 72"d	Potential burrow	Single entrance potential BUOW burrow, with whitewash on apron and around burrow. Very steep slope into burrow. Bleached coyote scat around apron (5/11/23).
375	0512BA1TD	9.5"w x 6.5"h x >60"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. AB claw marks on side walls of burrow (5/12/23).
376	0512BA1WT	7"w x 8"h x 36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign present. AB dug burrow with claw marks present on sides of tunnel. Fairly fresh dirt apron, curves slightly to right (5/12/23).
377	0515BA1TD	11"w x 7"h x 18"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Evidence of old collapsed entrances nearby. Canid den in deteriorated condition, filling in (5/15/23).
378	0515BA2TD	6"w x 5"h x 18"d	Potential burrow	Three-entrance potential BUOW burrow complex with multiple old BUOW pellets falling apart on apron. Burrow is old and deteriorated (filling in and overgrown) (5/15/23).
379	0516BA1TD	7"w x 7"h x >36"d	Potential burrow	Six-entrance potential burrow complex suitable for BUOW. No sign detected. Deteriorated burrow complex with at least six entrances, most overgrown (5/16/23).
380	0516BA2TD	9"w x 9"h x >48"d	Potential burrow	Single entrance potential BUOW burrow, with lots of BUOW whitewash and multiple pellets on apron and inside. Curves right (5/16/23).
381	0516BA3TD	14"w x 10"h x > 24"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Semi-steep slope into burrow. Burrow is filling in (becoming shallower) (5/16/23).
382	0928BA1AL	8"w x 7.5"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Large sandy apron under a fallen western Joshua tree. Curves to the right (9/28/23).
383	0928BA2AL	8.5"w x 9"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right and has a very steep slope (9/28/23).

Observation ID	Datasheet Identification (ID)	Dimensions (inches ["])	Burrow Status	Notes (Date)
384	0928BA1WT	10"w x 12"h x >36"d	Potential burrow	Three-entrance potential burrow complex suitable for BUOW. No sign detected. Old complex with three suitable entrances and several collapsed entrances. All suitable entrances are overgrown with vegetation and filled with debris. Soils are hard and compact, no sign of recent use (9/28/23).
385	0929BA2AL	8"w x 7"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Vegetation present in entrance (9/29/23).
386	0929BA1WT	8"w x 8"h x >24"d	Potential burrow	Five-entrance potential burrow complex suitable for BUOW. No sign detected. Located under a large shrub. Burrows have fresh aprons and are likely squirrel burrows based on their size and shape (9/29/23).
387	0929BA2WT	6"w x 6"h x >24"d	Potential burrow	Two-entrance potential burrow complex suitable for BUOW. No sign detected. Other entrances are not suitable for BUOW due to their size. Burrows are located under large shrub. Burrows have fresh aprons (9/29/23).
388	0929BA3WT	6"w x 6"h x >36"d	Potential burrow	Three-entrance potential burrow complex suitable for BUOW. No sign detected. Located in a debris pile within 10 meters of each other. Burrows have fresh aprons (9/29/23).
389	041124BA1VR	6"w x 5"h x >12"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Part of a California ground squirrel complex under *Lycium* sp. shrub. Burrow appears to have been dug out by canid. One deceased young California ground squirrel observed on burrow apron. Multiple other entrances in complex that are not suitable for BUOW. (4/11/2024).
390	041224BA1VR	8"w x 7"h x >48"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected. Curves to the right (4/12/2024).
391	0903BA1LJ	8"w x 8"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (9/3/2025).
392	0904BA1LJ	9"w x 7"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (9/4/2025).
393	0904BA2LJ	12"w x 7"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. One old BUOW pellet on burrow apron (9/4/2025).
394	0904BA3LJ	10"w x 6"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. One old BUOW pellet on burrow apron (9/4/2025).
395	0904BA4LJ	7"w x 12"h x >36"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (9/4/2025).
396	0904BA5LJ	6"w x 7"h x >12"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (9/4/2025).
397	0904BA6LJ	6"w x 7"h x >12"d	Potential burrow	Single entrance potential burrow suitable for BUOW. No sign detected (9/4/2025).
398	0904BA7LJ	5"w x 7"h x >12"d	Potential burrow	Single entrance potential burrow suitable for BUOW. One old BUOW pellet on burrow apron (9/4/2025).

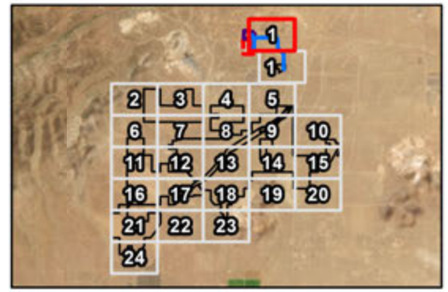
APPENDIX C: BUOW BURROWS AND OBSERVATIONS FIGURES

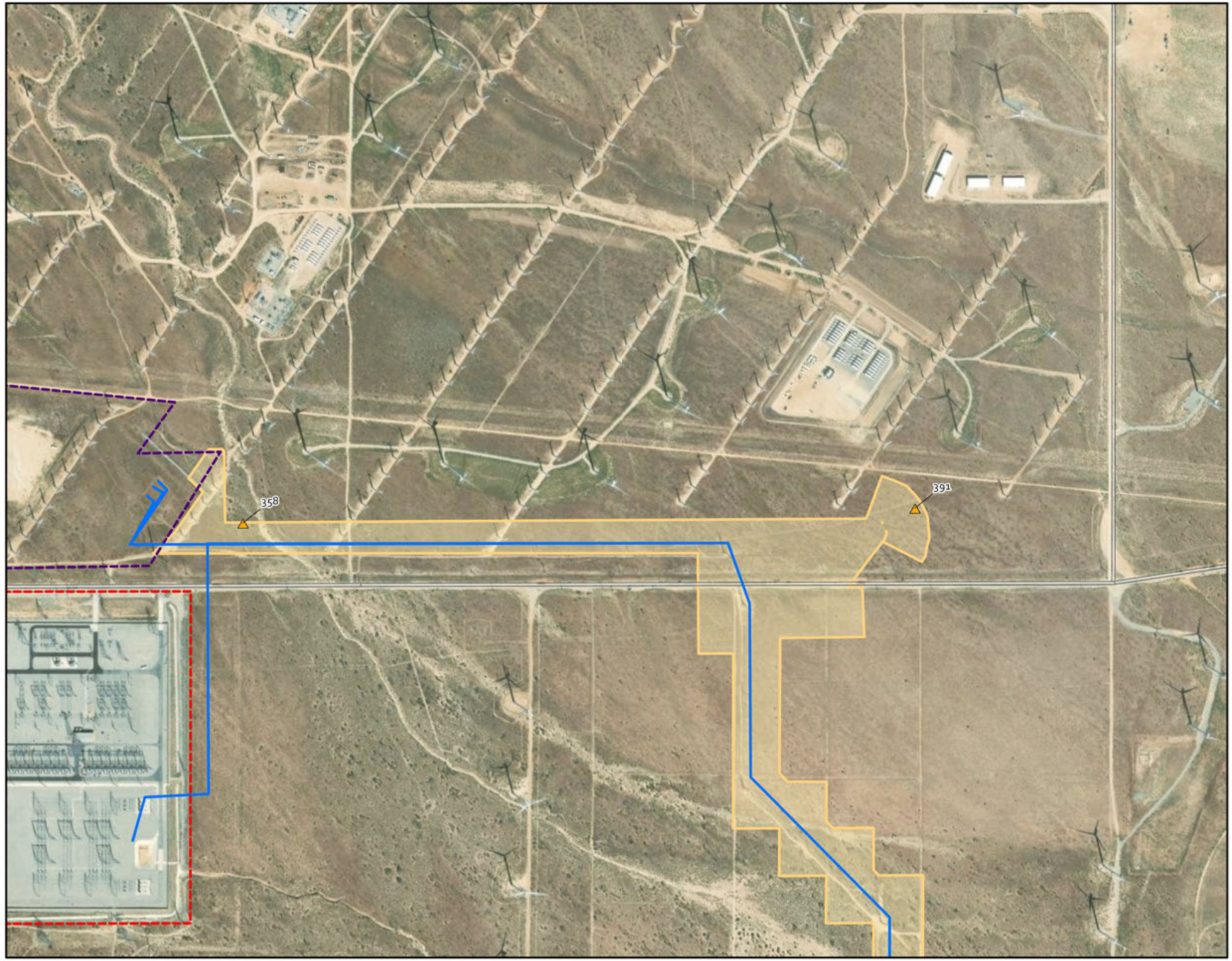
This page intentionally left blank.

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 01 of 24
BUOW Burrows and Observations





Windhub High-voltage Substation (Existing)

Study Area

Other Applicant and/or Affiliate Controlled*

Step-up HV substation

Gen-tie Corridor

Burrowing Owl Observations

Potential Burrow

N

US Feet

0 250 500 1,000

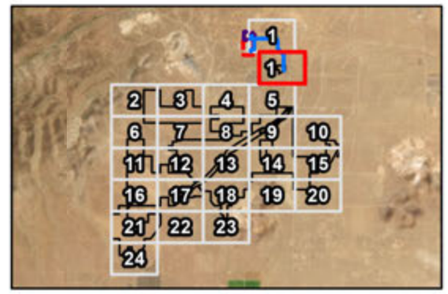
Scale is 1:8,000 when printed at 11"x17"

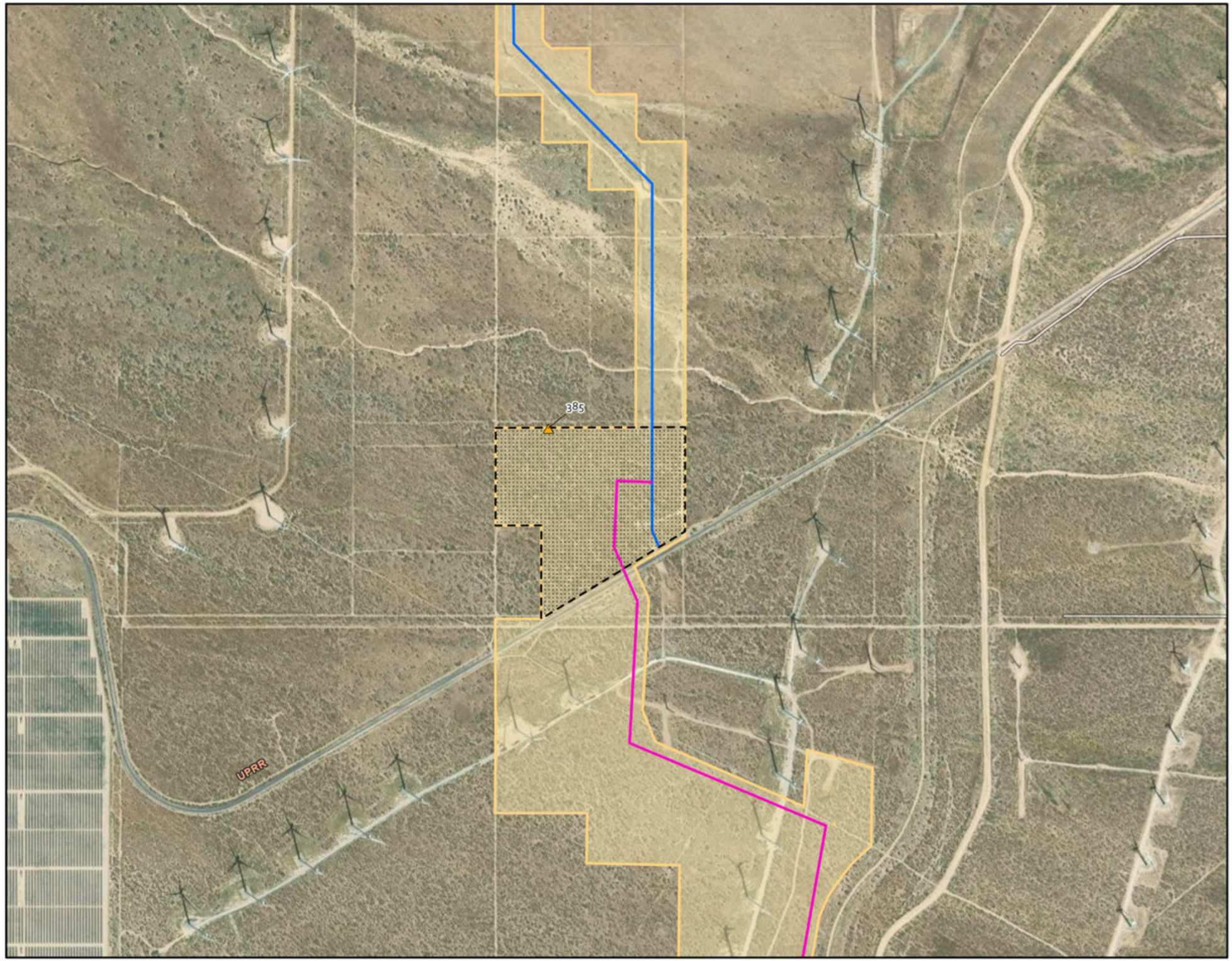
Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 02 of 24
BUOW Burrows and Observations





Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)

Other Applicant and/or Affiliate Controlled*

- Gen-tie Corridor

Burrowing Owl Observations

- Potential Burrow

N

US Feet

0 250 500 1,000

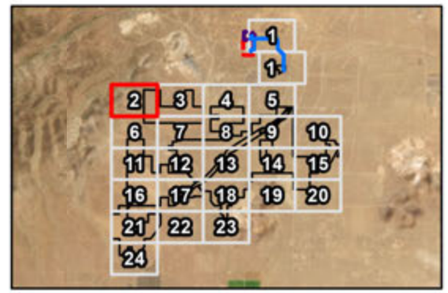
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 03 of 24
BUOW Burrows and Observations



Proposed Project Features

Project Site

Study Area

Burrowing Owl Observations

Potential Burrow

Tehachapi Willow Springs Rd

79
49
80
30
66
62
63
68
67
50
82
81
53
52
22
23
58
51

N

US Feet

0 250 500 1,000

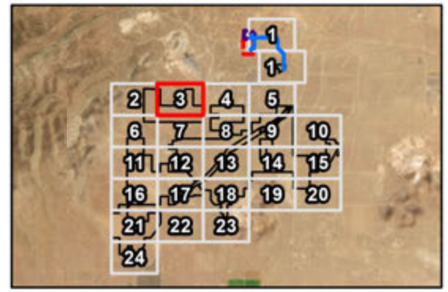
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 04 of 24
BUOW Burrows and Observations



Proposed Project Features

- Project Site
- Study Area
- Medium-voltage/Transmission/Access Easements

Burrowing Owl Observations

- Potential Burrow

N

US Feet
0 250 500 1,000

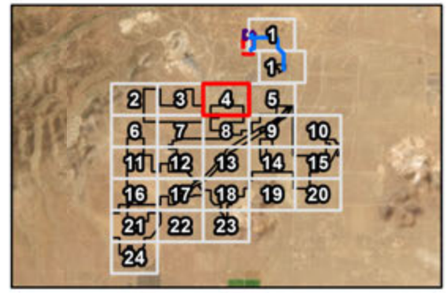
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 05 of 24
BUOW Burrows and Observations



Proposed Project Features

- Project Site
- Study Area
- Medium-voltage/Transmission/Access Easements

Burrowing Owl Observations

- Potential Burrow

N

US Feet
0 250 500 1,000

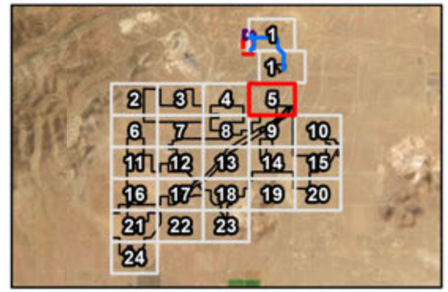
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 06 of 24
BUOW Burrows and Observations

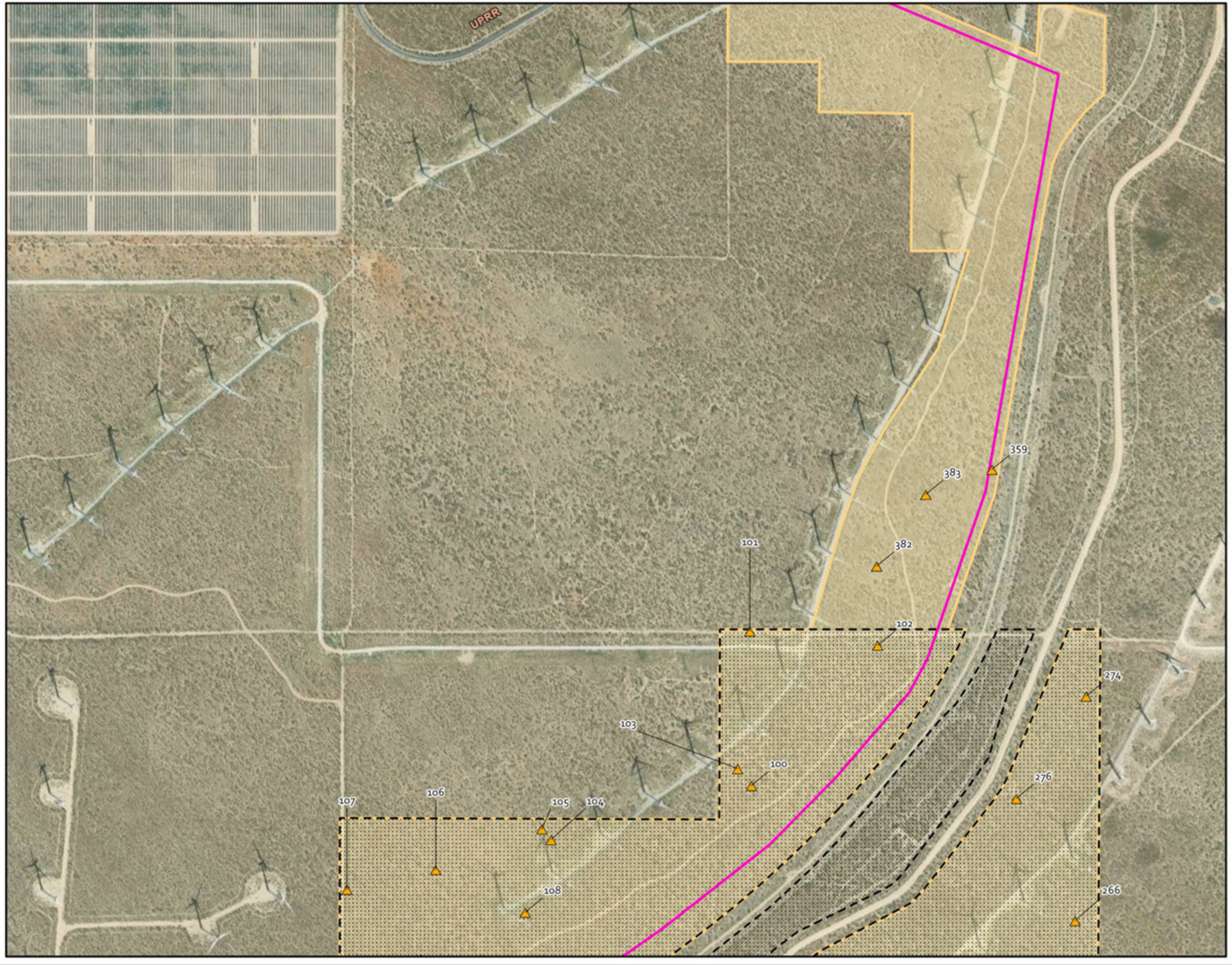


Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)

Burrowing Owl Observations

- Potential Burrow



N

US Feet
0 250 500 1,000

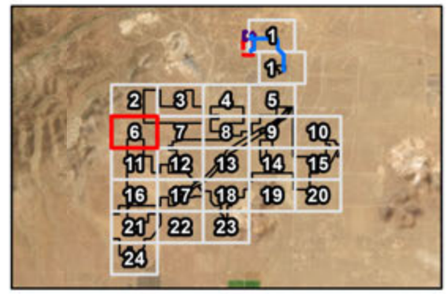
Scale is 1:8,000 when printed at 11"x17"

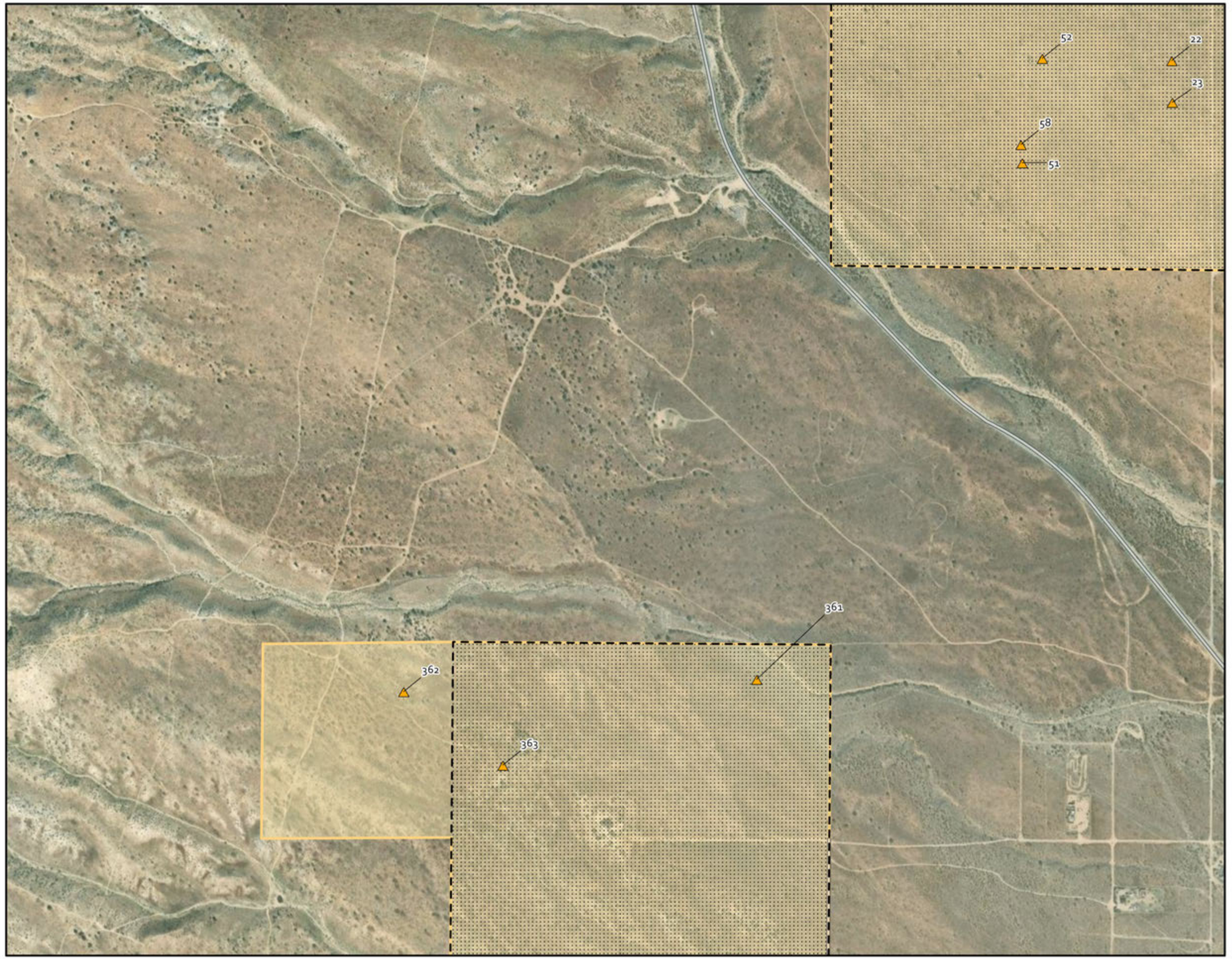
Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 07 of 24
BUOW Burrows and Observations





Proposed Project Features

- Project Site
- Study Area

Burrowing Owl Observations

- Potential Burrow

N

US Feet
0 250 500 1,000

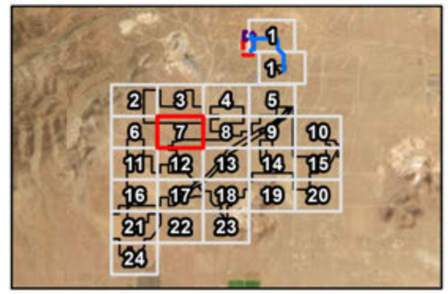
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 08 of 24
BUOW Burrows and Observations



Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Burrowing Owl Observations

- Potential Burrow

N

0 250 500 1,000 US Feet

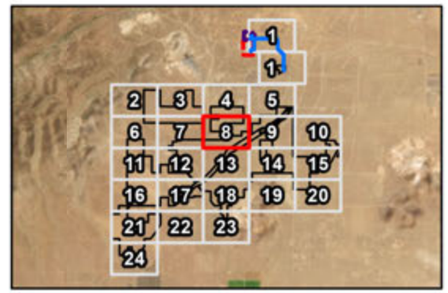
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 09 of 24
BUOW Burrows and Observations



Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Burrowing Owl Observations

- Potential Burrow

N

0 250 500 1,000 US Feet

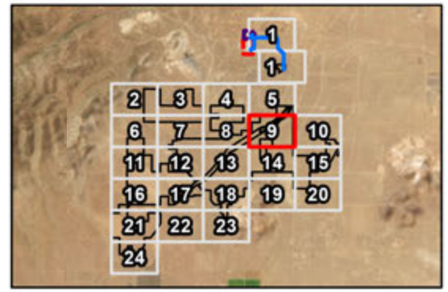
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 10 of 24
BUOW Burrows and Observations



Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)

Burrowing Owl Observations

- Potential Burrow
- Live owl
- Occupied known burrow

N

0 250 500 1,000 US Feet

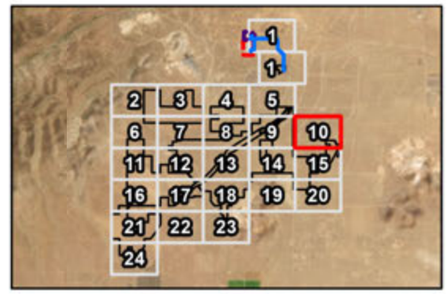
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 11 of 24
BUOW Burrows and Observations



Proposed Project Features

- Project Site
- Study Area

Burrowing Owl Observations

- Potential Burrow

N

US Feet
0 250 500 1,000

Scale is 1:8,000 when printed at 11"x17"

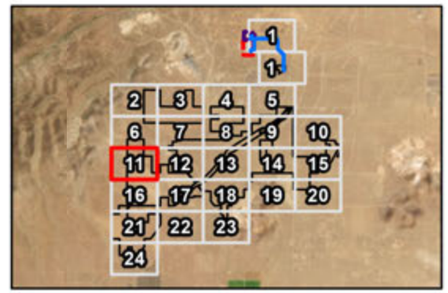
Not for Construction

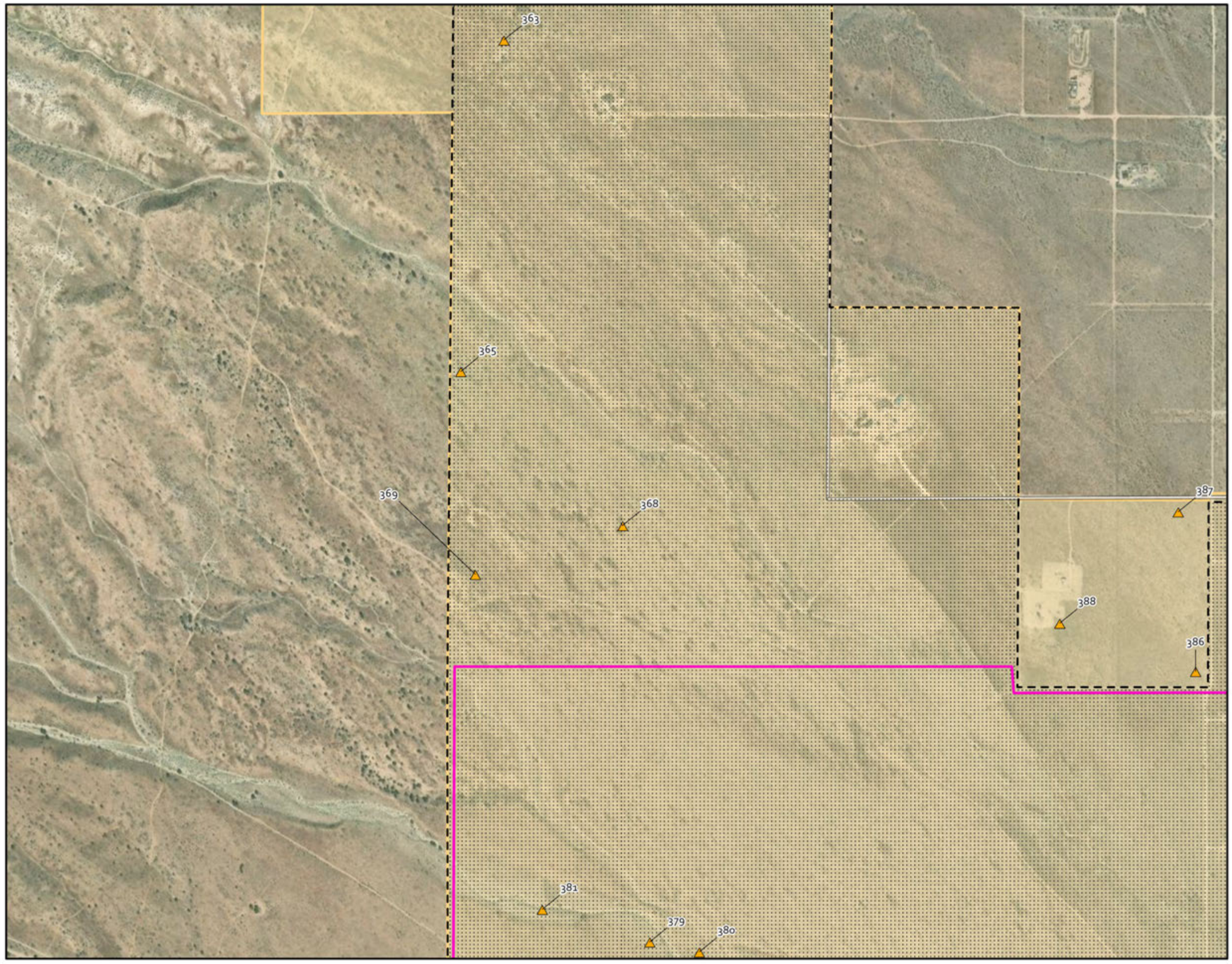
266
258
247
251
304
303
285
284
283

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 12 of 24
BUOW Burrows and Observations





Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)

Burrowing Owl Observations

- Potential Burrow

N

US Feet

0 250 500 1,000

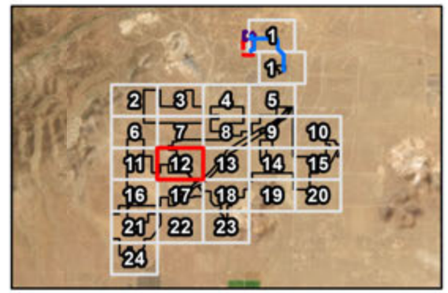
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 13 of 24
BUOW Burrows and Observations

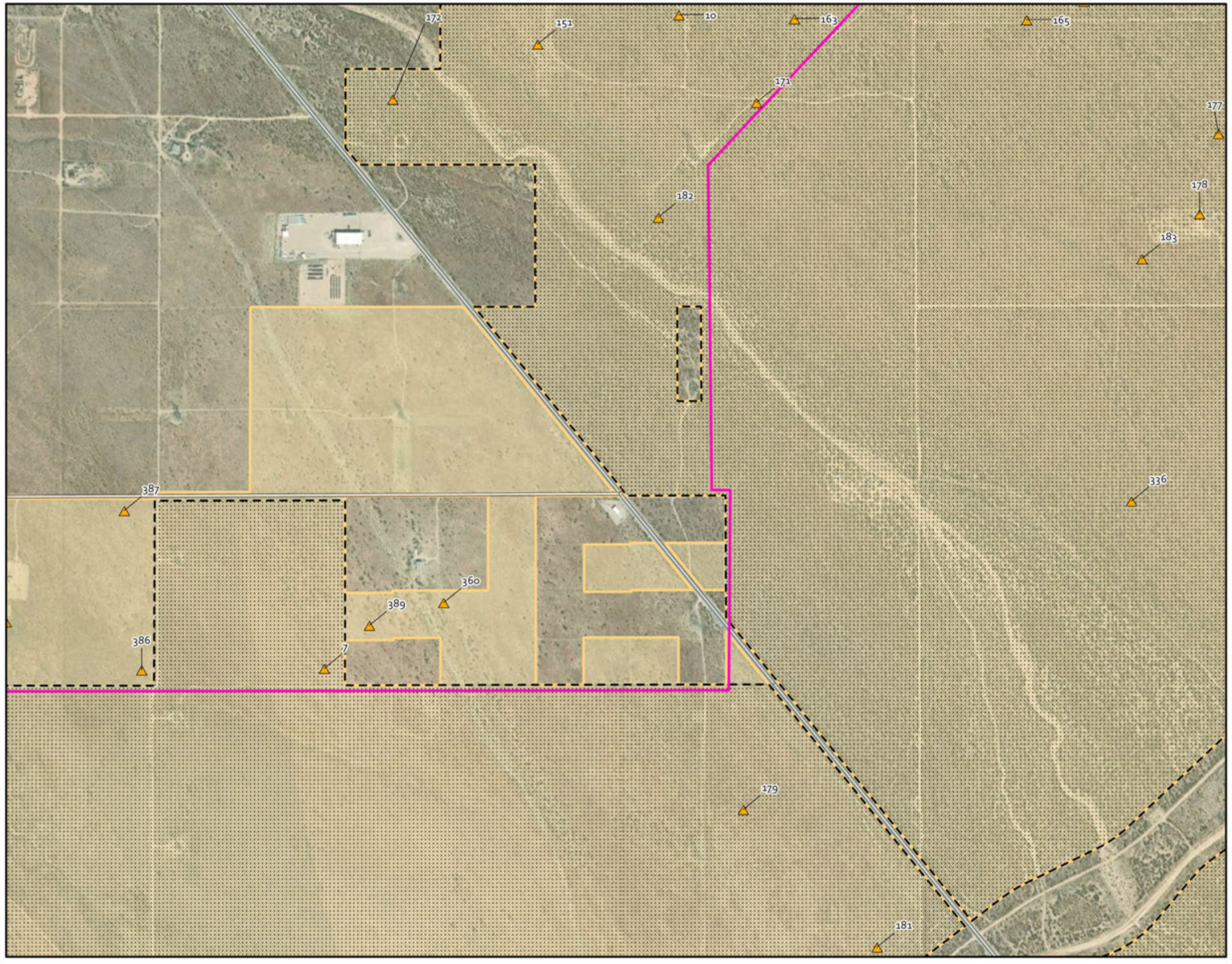


Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)

Burrowing Owl Observations

- Potential Burrow



N

0 250 500 1,000 US Feet

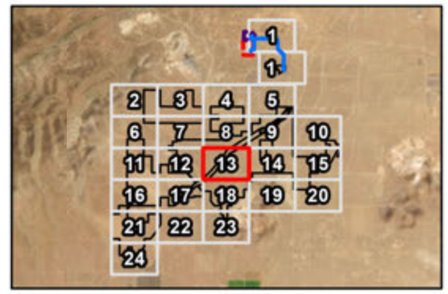
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 14 of 24
BUOW Burrows and Observations



Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)

Burrowing Owl Observations

- Potential Burrow
- Occupied known burrow

N

0 250 500 1,000 US Feet

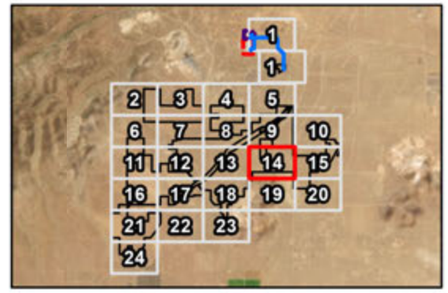
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 15 of 24
BUOW Burrows and Observations



Proposed Project Features

- Project Site
- Study Area

Burrowing Owl Observations

- Potential Burrow

N

0 250 500 1,000 US Feet

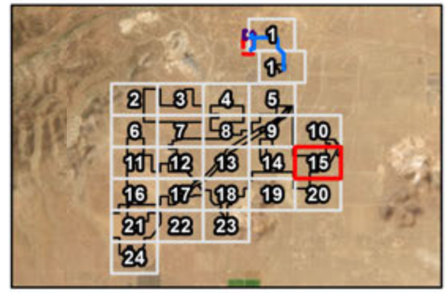
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 16 of 24
BUOW Burrows and Observations



Proposed Project Features

- Project Site
- Study Area

Burrowing Owl Observations

- Potential Burrow

N

0 250 500 1,000 US Feet

Scale is 1:8,000 when printed at 11"x17"

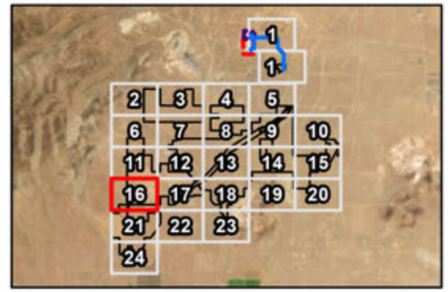
Not for Construction

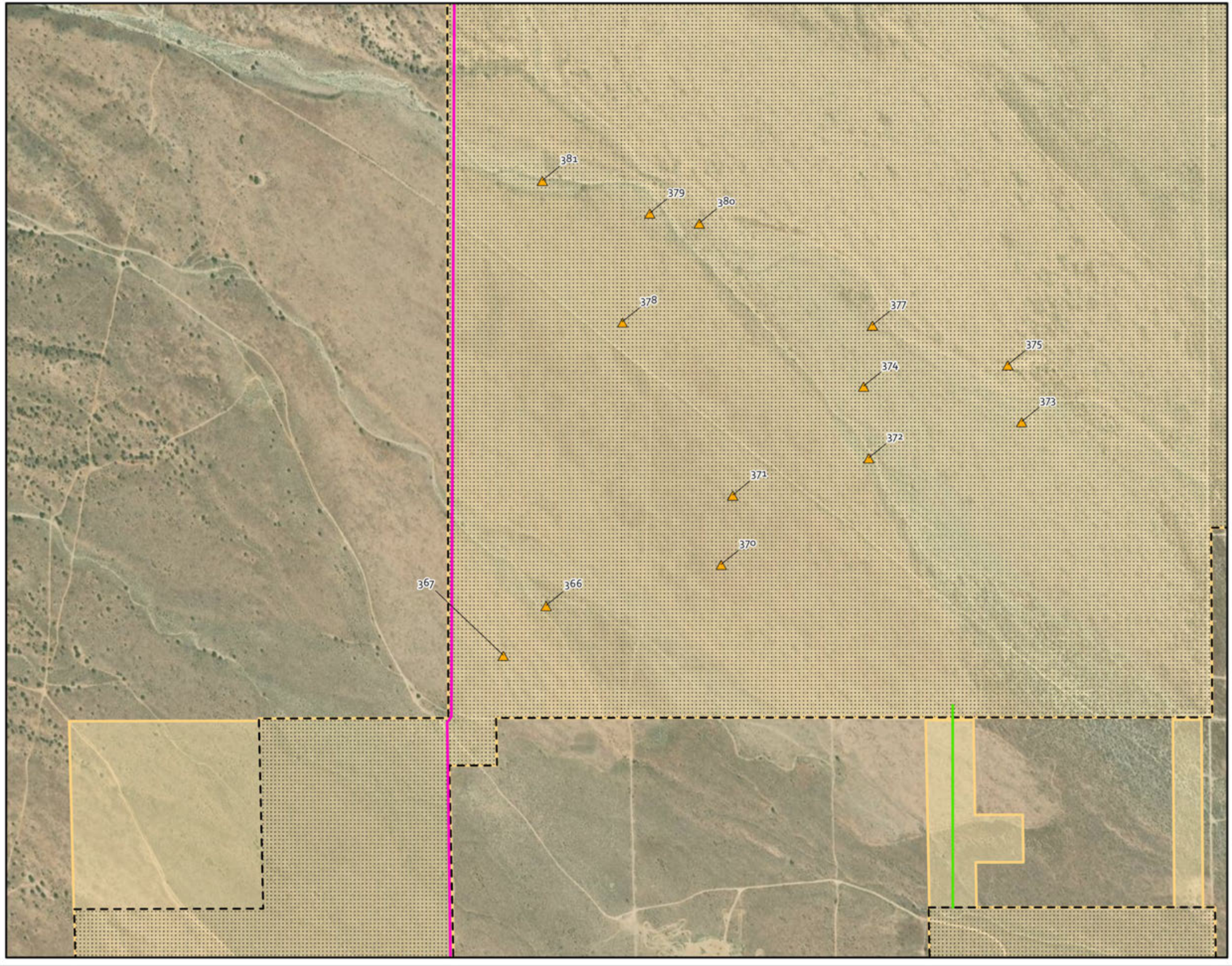
Balboa Ave

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 17 of 24
BUOW Burrows and Observations





Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Burrowing Owl Observations

- Potential Burrow

N

US Feet

0 250 500 1,000

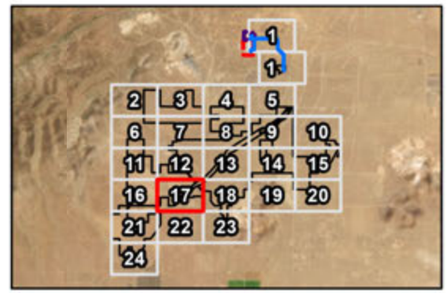
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 18 of 24
BUOW Burrows and Observations





Proposed Project Features

- Project Site
- Study Area

Burrowing Owl Observations

- Potential Burrow

N

US Feet

0 250 500 1,000

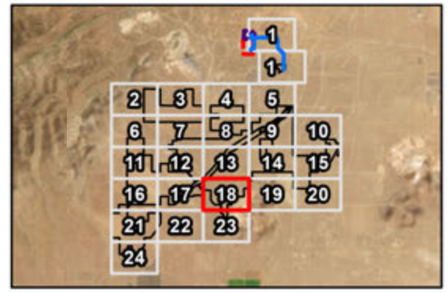
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 19 of 24
BUOW Burrows and Observations



Proposed Project Features

Project Site

Study Area

Burrowing Owl Observations

Potential Burrow

N

US Feet

0 250 500 1,000

Scale is 1:8,000 when printed at 11"x17"

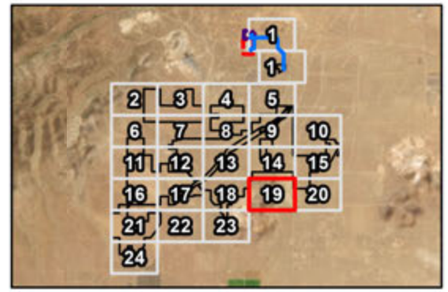
Not for Construction



Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 20 of 24
BUOW Burrows and Observations



Proposed Project Features

Project Site

Study Area

Burrowing Owl Observations

Potential Burrow

N

US Feet

0 250 500 1,000

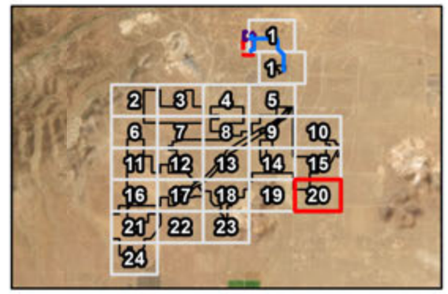
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 21 of 24
BUOW Burrows and Observations





Proposed Project Features

- Project Site
- Study Area

Burrowing Owl Observations

- Potential Burrow

N

0 250 500 1,000 US Feet

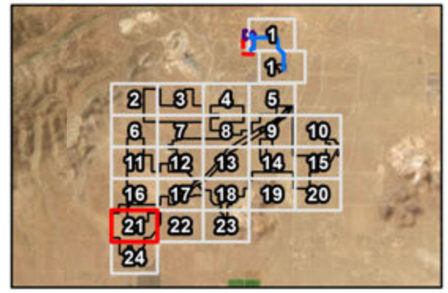
Scale is 1:8,000 when printed at 11"x17"

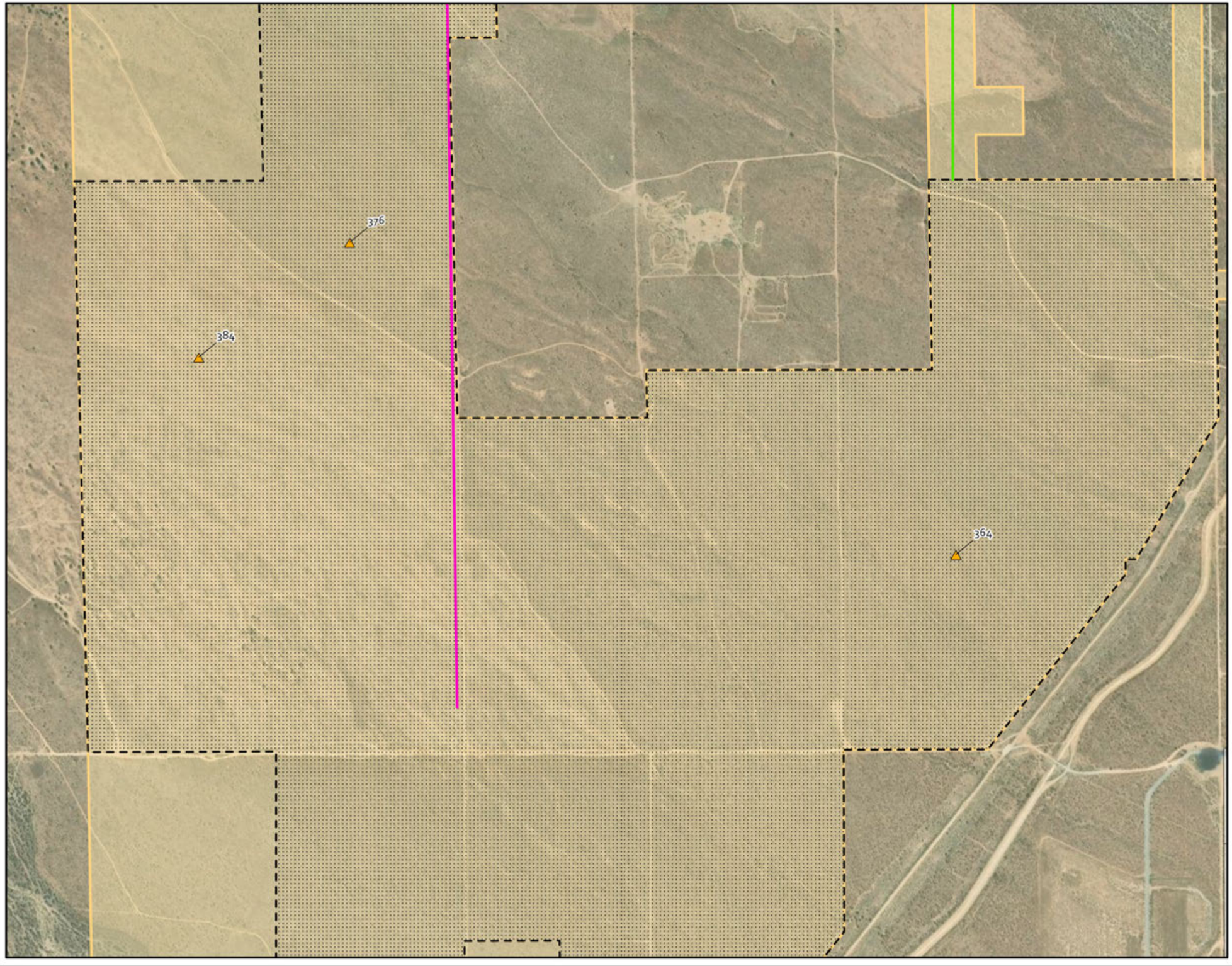
Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 22 of 24
BUOW Burrows and Observations





Proposed Project Features

- Project Site
- Study Area
- Gen-tie Line (New)
- Medium-voltage/Transmission/Access Easements

Burrowing Owl Observations

- Potential Burrow

N

US Feet

0 250 500 1,000

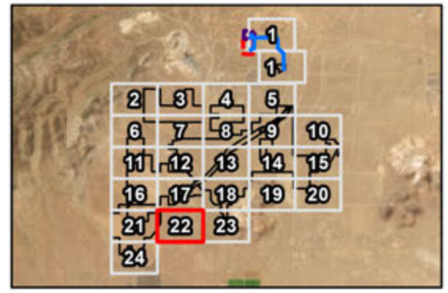
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 23 of 24
BUOW Burrows and Observations



Proposed Project Features

Project Site

Study Area

N

US Feet

0 250 500 1,000

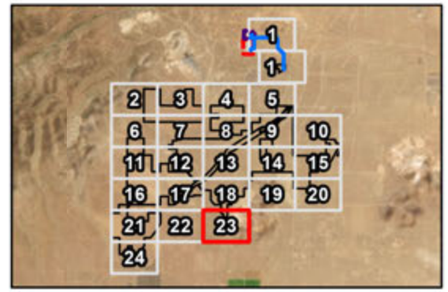
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 24 of 24
BUOW Burrows and Observations



Proposed Project Features

Project Site

Study Area

N

US Feet

0 250 500 1,000

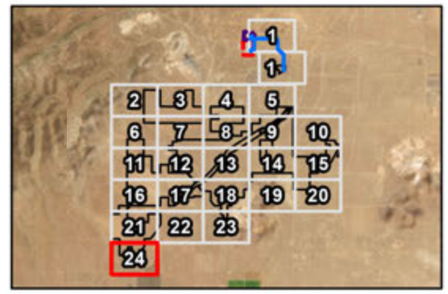
Scale is 1:8,000 when printed at 11"x17"

Not for Construction

Discovery Solar PV and Storage Project

Kern County, CA

Appendix C. Sheet 25 of 24
BUOW Burrows and Observations



Proposed Project Features

Project Site

Study Area

N

US Feet

0 250 500 1,000

Scale is 1:8,000 when printed at 11"x17"

Not for Construction

This page intentionally left blank.