PRELIMINARY DRAINAGE REPORT

TERRIBLE HERBST TRAVEL CENTER

SAN BERNARDINO COUNTY, CA

Prepared By:

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Date: January 19, 2024

This document was prepared under the supervision and direction of the undersigned whose seal as a Professional Engineer, licensed to practice as such in the State of California, is affixed below.

Eric Villalobos

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1/19/2024
Date

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Appendices

I. Purpose, General Location & Description

The purpose of this report is to document the stormwater improvements proposed for the Terrible Herbst Travel Center in San Bernardino County, California. This report summarizes the hydrologic and hydraulic analyses performed to date and provides the existing and proposed drainage patterns for the site. A final drainage report will be submitted with the construction plans.

A. LOCATION

The site is 8.2 acres in area and located on Halloran Summit Road, south and adjacent to Interstate 15. It is located in Section 10 of Township 15 and Range 11 East in San Bernardino County. There are no existing regional or local drainage facilities in, or adjacent to, the site. Figure 1 below provides the parcel map of the site and surrounding area.

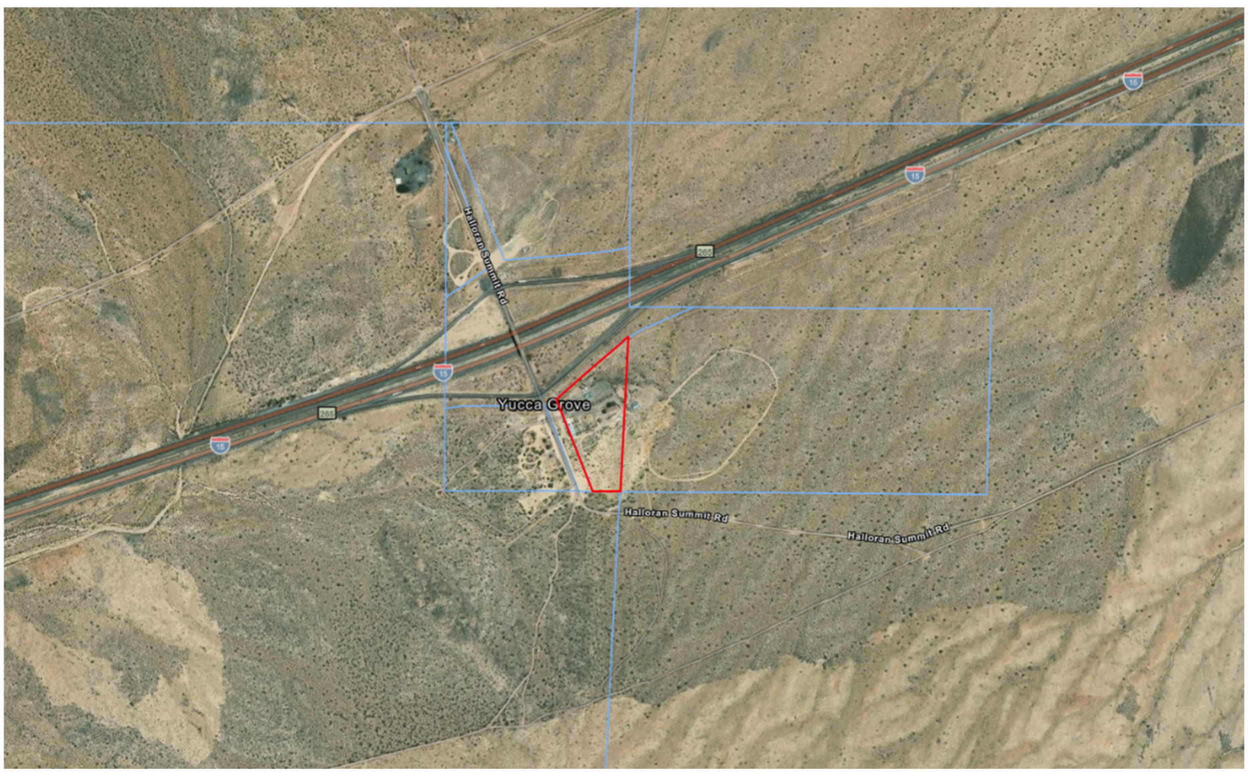


Figure 1. Parcel Map

B. DESCRIPTION OF SITE

The Terrible Herbst Travel Center is comprised of a convenience store, passenger vehicle and truck fueling stations and parking stalls. The site is partially undeveloped with sparse vegetation, consisting mostly of weeds and brush. The developed portion of the site consists of dirt roads, underground gas tanks, fencing, abandoned buildings, and overhead electrical lines. A 20-foot utility access easement is located within the site and contains an existing cell tower. The site is zoned as CH, Commercial – Highway.

II. Drainage Basins

A. MAJOR BASINS DESCRIPTIONS

The major basin can be characterized by undeveloped hillslopes, with the ultimate outfall to the Kingston Wash to the northeast. No major drainageway planning reports, studies, or irrigation facilities are located within the site.

The site lies within San Bernardino County Unincorporated Areas FEMA FIRM Panel Number 06071C1825H (not printed) effective August 28, 2008, in Zone D. Zone D is described as “Area with Flood Risk due to Levee.” Discussions with San Bernardino County concluded that the site is not at risk of flood inundation, and no levee was found within the greater area. Additionally, the off-site drainage impacts were evaluated for the site and findings are discussed in a later section of this report. The FIRMette is provided in Appendix A.

Surveyed 1-foot contours were utilized within the site and available USGS contour data were supplemented for off-site areas where there was no surveyed data. In general, the site drains northeast with slopes ranging from less than 1% to approximately 12%. Halloran Summit Road is a highpoint along Interstate 15, and therefore the site receives minimal off-site drainage due to surrounding topography.

B. SUBBASIN DESCRIPTIONS

The existing conditions subbasins are delineated and shown on the Existing Basin Map in Appendix D. Subbasins with prefixes “OFF” represent the offsite areas that impact and terminate at the site boundaries. Subbasins with prefixes “EX” represent the existing onsite subbasins that generate flow within the site and terminate at the site boundaries. Flow paths on the Existing Basin Map show the offsite and onsite drainage patterns.

The proposed conditions subbasins are delineated and shown on the Proposed Basin Map in Appendix D. Offsite subbasins are maintained generally from the existing conditions except for Subbasin OFF-4, where the proposed improvements on Halloran Summit Road have altered the basin delineation. Subbasins with prefixes “PR” represent the proposed onsite subbasins that generate flow within the site and terminate at the project boundary. Flow paths on the Proposed Basin Map show the offsite and onsite drainage patterns.

C. OFF-SITE DRAINAGE

As mentioned above, Halloran Summit Road is a highpoint along Interstate 15, and therefore the offsite drainage impacts to the site are minimal. The offsite subbasins OFF-1 through OFF-3 enter the site in the existing conditions. In the proposed conditions, these basins will be routed around the site by way of drainage swale. The drainage swales will maintain historic flow patterns of these offsite basins, and ultimately all drainage from the offsite basins will terminate in the existing swale along Interstate 15. In the existing conditions, subbasins OFF-4 and EX-6 terminate at a low point on Halloran Summit Road and eventually drain west. In the proposed conditions a portion of the site is included with subbasin OFF-4 and will be captured by way of curb inlet and routed west across Halloran Summit Road to maintain historic flow patterns. Historic peak flows for the 100-year event are maintained at this location.

III. Preliminary Drainage Plan

A. DEVELOPMENT CRITERIA & CONSTRAINTS

This report has been prepared in accordance with the San Bernardino County Hydrology Manual. The hydrology, the stormwater conveyance systems, and the stormwater discharge controls were followed as outlined within the San Bernardino County Hydrology Manual, and methods have been supplemented with the California Department of Transportation Highway Design Manual, and the Urban Hydrology for Small Watersheds Technical Release 55 (TR-55).

The San Bernardino County Hydrology Manual specifies the Rational Method to estimate the peak runoff rates for basin sizes in this analysis. The Caltrans Highway Desing Manual was used to estimate runoff coefficients and time of concentration for each subbasin flow path. TR-55 has been used to size the detention pond and the first flush volume has been calculated per the San Bernardino County Hydrology Manual.

The storm drain on the site has been sized for the 100-year storm event to remain within the gutter line. A minimum pipe size of 24 inches has been proposed in accordance with San Bernardino County requirements. Inlets have been proposed to contain the 100-year event within the curb and gutter.

B. RAINFALL

Precipitation data for the site was obtained from the National Oceanic and Atmospheric Administration (NOAA) 14 website. Table 1 below shows the rainfall intensity in inches per hour for the duration and rainfall events shown. The NOAA Atlas 14 point precipitation data is included with Appendix C.

Table 1: NOAA 14 Point Precipitation Frequency Estimates

Storm Event	Duration (minutes)			
	5-min	10-min	15-min	30-min
2-yr Rainfall Depth (in/hr)	2.51	1.80	1.45	1.07
5-yr Rainfall Depth (in/hr)	3.70	2.65	2.14	1.57
10-yr Rainfall Depth (in/hr)	4.69	3.36	2.71	1.99
100-yr Rainfall Depth (in/hr)	8.23	5.9	4.76	3.5

C. TIME PARAMETERS

The time of concentration is the sum of the travel times associated with two phases of runoff within each subbasin. These phases are sheet flow and shallow concentrated flow. Flow path geometries and surface roughness account for the travel time for each of these phases of flow. The minimum time of concentration allowed is 5 minutes for the developed subbasins and 10 minutes for the undeveloped subbasins.

Sheet Flow

Sheet flow occurs within all sub-basins, and the equation follows the Manning's kinematic solution. See section 810-16 the *Caltrans Highway Design Manual*. The sheet flow parameters are length; slope; effective Manning's *n*-value; and 2-yr, 24-hour rainfall depth:

$$Tt = \frac{0.42(nL)^{0.8}}{(\mathrm{P})^{0.5}S^{0.4}}$$

Tt (hours): Sheet Flow Travel time.

L (feet): Length of flow path (maximum 300 feet) measured from the sub-basin boundary to the shallow concentrated flow estimated location.

S (ft/ft): Land slope, measured as the difference between the highest and the lowest elevations divided by the flow path length.

n: Effective Manning's *n*-value, 0.13 for all reaches. This value is equivalent to the type for "Range (natural)" from Table 3-1 of the *TR-55* manual.

P (inches): 2-year, 24-hour precipitation depth, 1.54.

Shallow Concentrated Flow

Visual inspection of topography and aerial imagery determines the limits of shallow concentrated flow. The shallow concentrated flow is identified by an intercept coefficient, *k,* from Table 816.6B in the *Caltrans Highway Design Manual.* For the existing conditions a coefficient of 0.305, nearly bare, was used. For the proposed conditions a coefficient of 0.620, pavement, was used for improved areas and 0.305 was used for areas that remained nearly bare. The shallow concentrated flow parameters are length; slope; intercept coefficient; and average velocity:

$$V = 3.28kS^{0.5}$$

V (ft/s): Average velocity.

S (ft/ft): Land slope, measured as the difference between the highest and the lowest elevations divided by the length of the flow path.

k: Intercept coefficient depending on land cover.

For the shallow concentrated flow and the channel flow computations, the travel time is a function of flow length and average velocity, see section 810-17 of the *Caltrans Highway Design Manual*.

$$Tt = L/60V$$

Tt (min): Shallow Concentrated Travel time.

L (ft): Length of the flow path.

Tables 2 and 3 below provide the existing and proposed conditions travel time analysis summary.

Table 2: Existing Conditions Travel Time Summary

Subbasin ID	Sheet Flow Travel Time (min)	Shallow Concentrated Travel Time (min)	Total Travel Time (min)	Travel Time Used (min)
OFF-1	6.20	3.42	9.63	10.00
OFF-2	0.00	1.97	1.97	10.00
OFF-3	2.25	0.27	2.52	10.00

Table 2: Existing Conditions Travel Time Summary Cont.

Subbasin ID	Sheet Flow Travel Time (min)	Shallow Concentrated Travel Time (min)	Total Travel Time (min)	Travel Time Used (min)
OFF-4	5.20	4.69	9.89	9.89
EX-1	3.49	0.26	3.75	10.00
EX-2	0.00	4.63	4.63	10.00
EX-3	2.15	6.09	8.24	10.00
EX-4	8.27	3.45	11.72	11.72
EX-5	2.58	3.95	6.52	10.00
EX-6	3.40	0.32	3.71	10.00

Table 3: Proposed Conditions Travel Time Summary

Subbasin ID	Sheet Flow Travel Time (min)	Shallow Concentrated Travel Time (min)	Total Travel Time (min)	Minimum Travel Time Used (min)
OFF-1	6.20	3.43	9.63	10.00
OFF-2	0.00	1.97	1.97	10.00
OFF-3	2.25	0.27	2.52	10.00
OFF-4	6.11	3.00	9.11	9.11
PR-1	9.20	0.17	9.38	9.38
PR-2	8.73	1.01	9.73	9.73
PR-3	8.58	0.81	9.40	9.40
PR-4	8.20	1.36	9.56	9.56
PR-5	8.20	0.02	8.22	8.22
PR-6	4.05	0.00	4.05	5.00
PR-7	2.32	0.00	2.32	5.00
PR-8	3.83	0.00	3.83	5.00
PR-9	3.67	0.00	3.67	5.00

D. RUNOFF COEFFICIENTS

The rational runoff coefficients have been estimated using Table 819.2B from the Caltrans Highway Desing Manual. Table 4 below shows the values used fore each land use type.

Table 4: Rational Runoff Coefficients

Land Use Type	Runoff Coefficient
Natural	0.40
Gravel	0.60
Pavement	0.95
Roofs	0.95
Landscape	0.30

E. HYDROLOGIC RESULTS

Tables 5 and 6 below summarize the existing and proposed conditions rational calculation.

Table 5: Existing Conditions Rational Summary

Subbasin ID	Runoff Coefficient	Area (acre)	2-yr Peak Flow (cfs)	5-yr Peak Flow (cfs)	10-yr Peak Flow (cfs)	100-yr Peak Flow (cfs)
OFF-1	0.40	0.82	0.59	0.87	1.11	1.94
OFF-2	0.40	0.17	0.12	0.18	0.23	0.40
OFF-3	0.30	0.14	0.08	0.11	0.14	0.25
OFF-4	0.76	0.79	1.09	1.61	2.04	3.58
EX-1	0.40	0.20	0.15	0.22	0.27	0.48
EX-2	0.40	1.30	0.93	1.38	1.74	3.06
EX-3	0.60	1.55	1.67	2.46	3.12	5.47
EX-4	0.60	2.63	2.65	3.90	4.94	8.68
EX-5	0.30	2.27	1.22	1.80	2.28	4.01
EX-6	0.50	0.29	0.26	0.38	0.48	0.85

Table 6: Proposed Conditions Rational Summary

Subbasin ID	Runoff Coefficient	Area (acre)	2-yr Peak Flow (cfs)	5-yr Peak Flow (cfs)	10-yr Peak Flow (cfs)	100-yr Peak Flow (cfs)
OFF-1	0.40	0.85	0.61	0.90	1.14	2.01
OFF-2	0.40	0.17	0.12	0.18	0.23	0.40
OFF-3	0.30	0.14	0.08	0.11	0.14	0.25
OFF-4	0.82	0.83	1.31	1.93	2.44	4.29
PR-1	0.89	1.45	2.43	3.58	4.54	7.98
PR-2	0.95	0.49	0.85	1.25	1.59	2.79
PR-3	0.95	1.67	2.99	4.41	5.59	9.82
PR-4	0.90	2.36	3.95	5.82	7.38	12.96
PR-5	0.45	1.68	1.55	2.29	2.90	5.09
PR-6	0.40	0.26	0.26	0.39	0.49	0.86
PR-7	0.30	0.16	0.12	0.17	0.22	0.38
PR-8	0.30	0.06	0.05	0.07	0.09	0.16
PR-9	0.30	0.05	0.04	0.06	0.07	0.12

F. HYDRAULIC ANALYSIS

The proposed storm drain is shown on the Proposed Basin Map in Appendix D. The storm drains and inlets have been sized for the 100-year storm event to remain in the gutter line.

Curb and Gutter

Street capacity for curb and gutter was checked using the Mile High Flood District Inlet software to ensure that runoff would be contained within the curb and gutter. The 10-year was the design storm and the 100-year as the check storm. The street capacity calculations are included in Appendix F.

Inlets

Four inlet locations are proposed on the site to contain the 100-year storm event within the curb and route flow to the proposed detention pond. One inlet is proposed on Halloran Summit Road to route drainage at the sump across the road and to the west. Inlets were sized using the Mile High Flood District Inlet software, and outputs are included with Appendix F.

Storm Drain

Bently's StormCAD hydraulic modeling software was used to design the storm drain systems. The storm drains used for this project are proposed as RCP with a minimum diameter of 24-inches. For the 10-year event, the hydraulic grade line is contained within the pipe. The hydraulic grade line for the 100-year event is at or below the gutter flow line in the street. Tailwater conditions for the outfalls have been set to a free outfall. The StormCAD results for the 10- and 100-year events are included in Appendix E.

G. ON-SITE DETENTION & FIRST FLUSH

Onsite detention will be provided in the northeast corner of the site. The detention pond will provide water quality of the first flush volume, which will drain from the pond by way of infiltration. The detention pond has been sized to detain the proposed peak 100-year flow and reduce the release rate to match existing conditions. The 100-year event will drain from the pond by way of a 24" RCP. The pond outlet structure will be designed and provided as part of the final drainage report.

The detention pond has been graded using 3:1 side slopes on all embankments. Additionally, 1 foot of freeboard is provided above the 100-year water surface elevation. An emergency spillway on the north side of the pond will convey the full unattenuated proposed 100-year peak flow in the event the outlet structure fails. The spillway will drain to the right of way.

Table 7 below provides the stage-storage curve for the proposed detention pond. A stage-storage-discharge curve will be provided with the final drainage report.

Table 7: Stage-Storage-Discharge Curve

	Elevation (ft)	Stage (ft)	Storage (ac-ft)
Bottom of Pond	4112	0	0.00
First Flush Vol.	4113	1	0.35
	4114	2	0.74
	4115	3	1.18
	4116	4	1.67
100-year WSE	4117	5	2.21
Emergency Spillway	4118	6	2.79

IV. Maintenance

Ongoing maintenance of the storm drain system is required to preserve the design integrity and function, and to mitigate drainage hazards downstream. Failure to provide adequate maintenance can prevent the drainage system from performing in accordance with its intent.

Maintenance will include the removal of debris, weeds, and sediment following storms, inlet and outlet repairs to the pipes to halt erosion, and removal of sediment from storm drain structures to maintain hydraulic capacity and function.

V. Final Drainage Plan

A final drainage report will be prepared and submitted with the construction plan set. Any adjustments to the final grading will be reflected in the hydrologic analysis and storm drain design. Additionally, the outlet structure for the detention pond will be designed and included with the final drainage report.

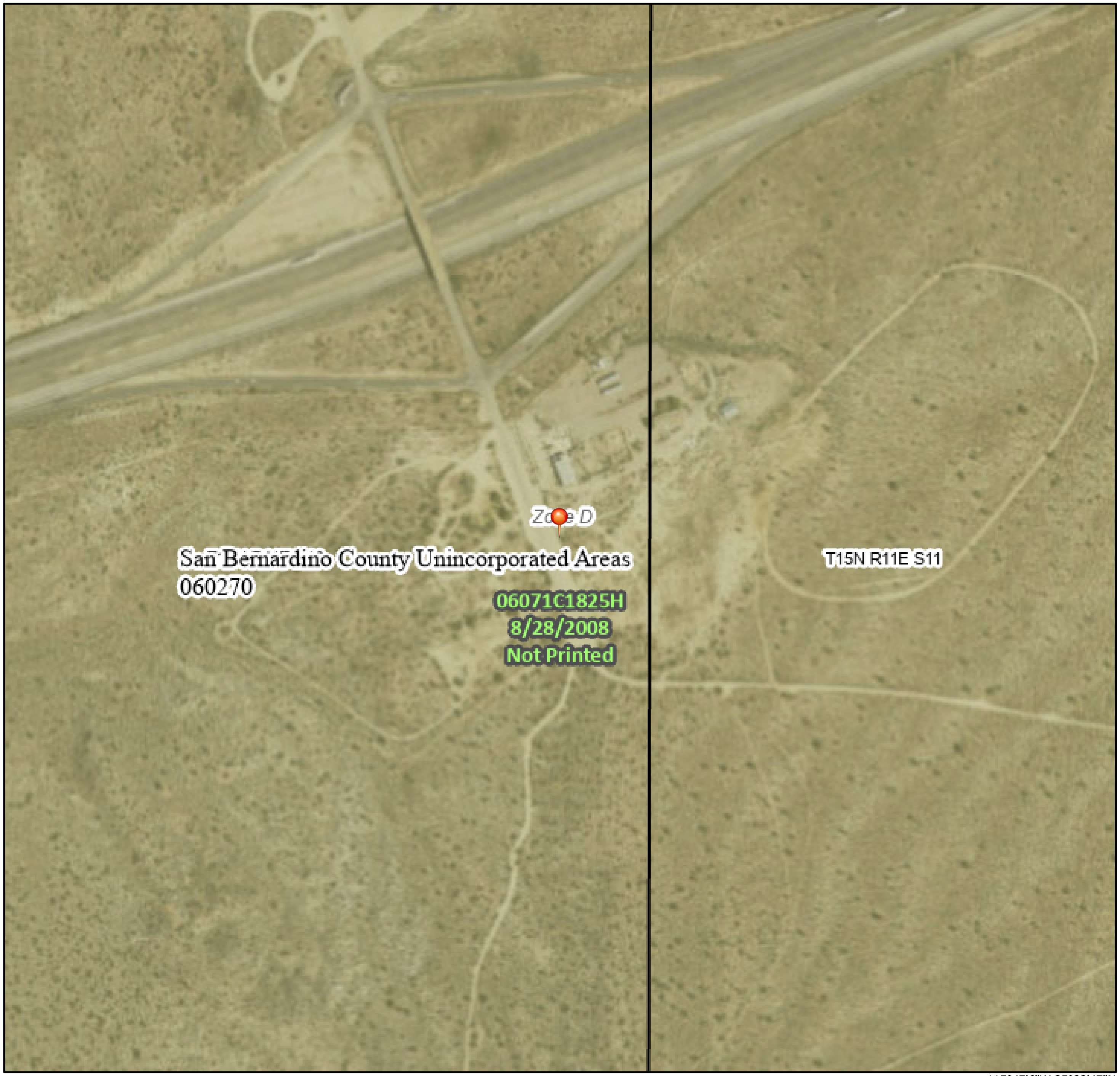
VI. References

1. *Urban Hydrology for Small Watersheds TR-55,* United States Department of Agriculture, National Resources Conservation Service, June 1986.
2. *Highway Design Manual*, Seventh Edition, California Department of Transportation, Sacramento, California, 2019.
3. *San Bernardino County Hydrology Manual.* August 1986.
4. NOAA (National Oceanic and Atmospheric Administration), National Weather Service. Accessed 2022.03.22. NOAA 14, Point Precipitation Frequency Estimates from NOAA ALTAS 14, Heber City, Utah, Volume 1 (Version 5). Silver Spring, MD.
5. USDA (U.S. Department of Agriculture), Natural Resources Conservation Service. 2008. “Web Soil Survey.” Accessed 2022.03.25. https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm.
6. Bentley FlowMaster Connect Edition Update 3, Bentley Systems, Inc. Haestad Methods Solution Center, Watertown CT.
7. Bentley OpenFlows StormCAD CONNECT Edition, Bentley systems, Inc., 2020.

National Flood Hazard Layer FIRMette

FEMA

115°47'43"W 35°24'16"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

115°47'6"W 35°23'47"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) *Zone A, V, A99*
		With BFE or Depth *Zone AE, AO, AH, VE, AR*
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
		Future Conditions 1% Annual Chance Flood Hazard *Zone X*
		Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
		Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
		Effective LOMRs
		Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8	Coastal Transect
	513	Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

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Natural
Resources
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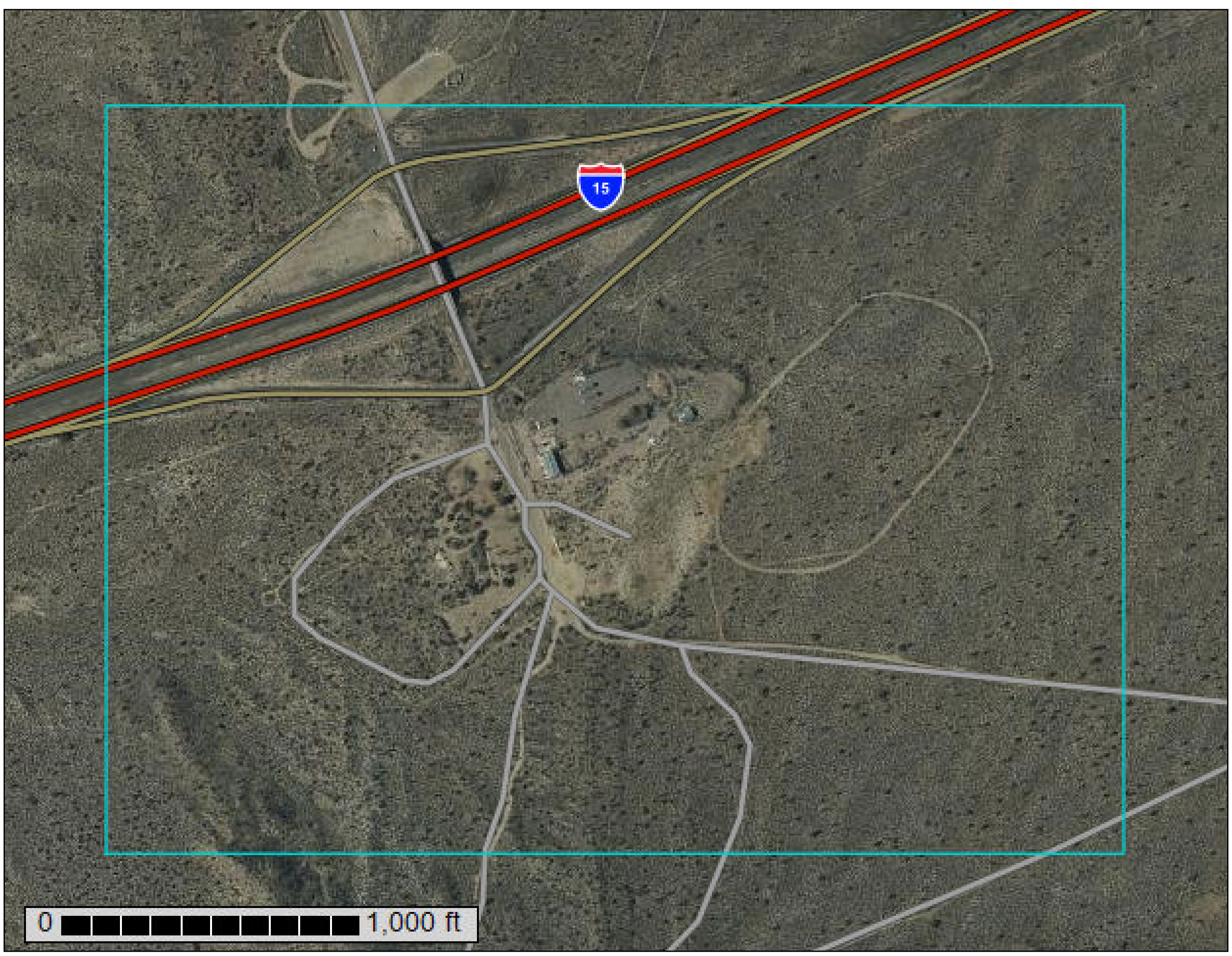
A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Mojave Desert Area, Northeast Part, California; and Mojave National Preserve Area, California



January 18, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

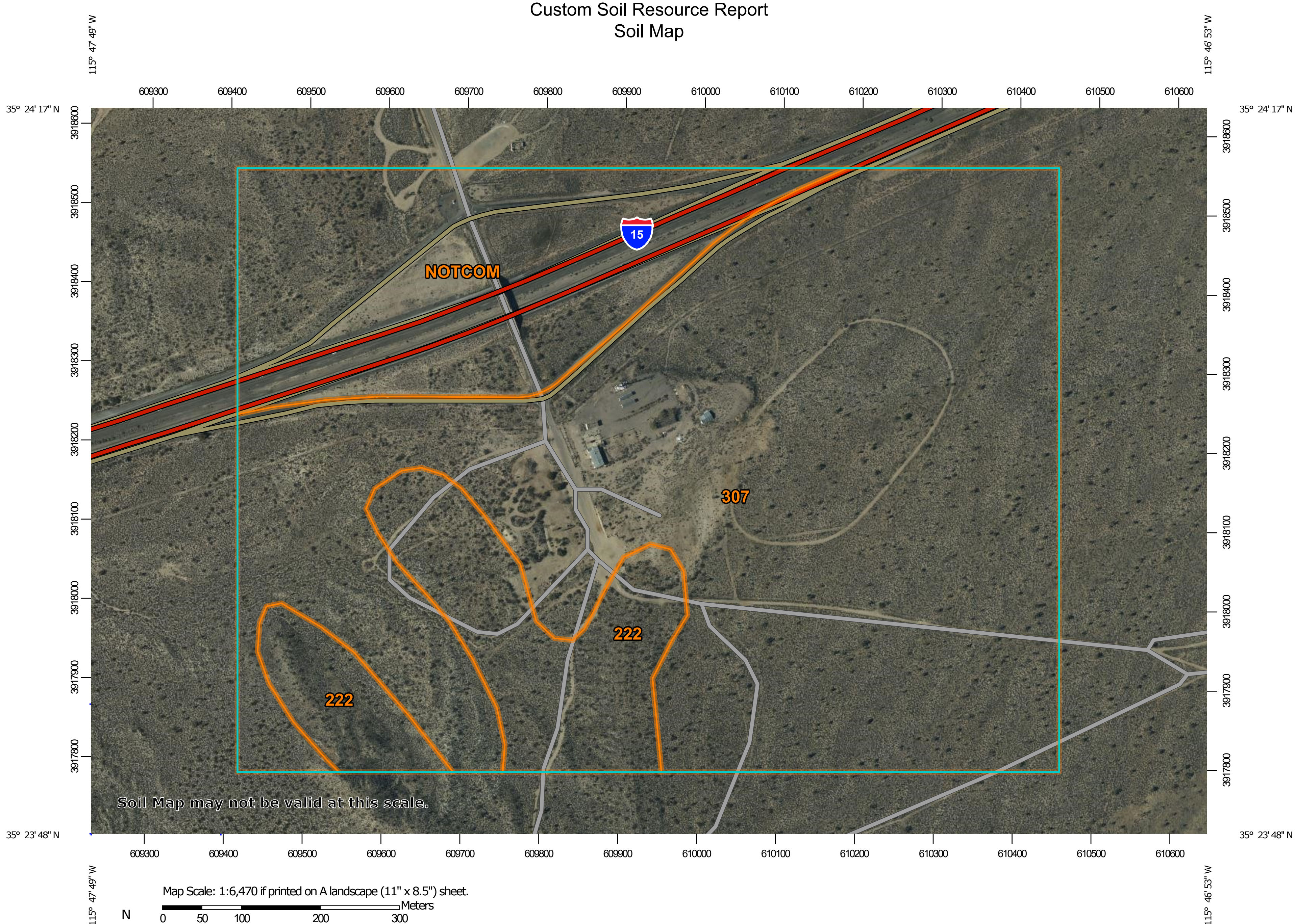
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

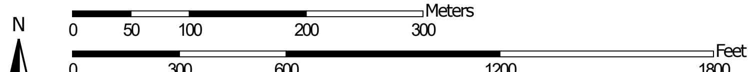
Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:6,470 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mojave Desert Area, Northeast Part, California
Survey Area Data: Version 13, Sep 5, 2023

Soil Survey Area: Mojave National Preserve Area, California
Survey Area Data: Version 12, Sep 20, 2023

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

MAP LEGEND

MAP INFORMATION

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 3, 2019—May 14, 2019

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
NOTCOM	No Digital Data Available	40.2	20.4%
Subtotals for Soil Survey Area		**40.2**	**20.4%**
Totals for Area of Interest		**197.1**	**100.0%**

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
222	Randsburg family-Gravesumit family complex, 15 to 50 percent slopes	25.2	12.8%
307	Randsburg-Gravesumit association, 2 to 15 percent slopes	131.8	66.9%
Subtotals for Soil Survey Area		**156.9**	**79.6%**
Totals for Area of Interest		**197.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Mojave Desert Area, Northeast Part, California

NOTCOM—No Digital Data Available

Map Unit Composition

Notcom: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Notcom

Properties and qualities

Mojave National Preserve Area, California

222—Randsburg family-Gravesumit family complex, 15 to 50 percent slopes

Map Unit Setting

National map unit symbol: 2ww48
Elevation: 3,210 to 4,590 feet
Mean annual precipitation: 5 to 7 inches
Mean annual air temperature: 57 to 63 degrees F
Frost-free period: 210 to 270 days
Farmland classification: Not prime farmland

Map Unit Composition

Randsburg and similar soils: 50 percent
Gravesumit and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Randsburg

Setting

Landform: Rock pediments
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Colluvium derived from granitoid and/or residuum weathered from granitoid

Typical profile

A - 0 to 3 inches: sandy loam
Bw - 3 to 6 inches: sandy loam
CB - 6 to 11 inches: very paragravelly loamy sand
Cr - 11 to 21 inches: bedrock

Properties and qualities

Slope: 15 to 50 percent
Surface area covered with cobbles, stones or boulders: 7.0 percent
Depth to restrictive feature: 10 to 14 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: Very low (about 1.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Ecological site: R030XB056NV - SHALLOW GRANITIC SLOPE 5-7 P.Z.

Hydric soil rating: No

Description of Gravesumit

Setting

Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium and/or colluvium derived from granitoid

Typical profile

A - 0 to 4 inches: sandy loam
Bt - 4 to 11 inches: gravelly coarse sandy loam
Btk1 - 11 to 20 inches: gravelly coarse sand
Btk2 - 20 to 39 inches: gravelly coarse sand

Properties and qualities

Slope: 15 to 50 percent
Surface area covered with cobbles, stones or boulders: 2.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 2.83 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: R030XB001NV - LIMY HILL 5-7 P.Z.
Hydric soil rating: No

Minor Components

Dime

Percent of map unit: 7 percent
Landform: Fan remnants
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R030XB085NV - BASALTIC NORTH SLOPE 7-9 P.Z.
Hydric soil rating: No

Kidwell, mod steep

Percent of map unit: 5 percent
Landform: Fan remnants
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R030XB005NV - Arid Active Alluvial Fans
Hydric soil rating: No

Dragonwash, fr-fl

Percent of map unit: 3 percent
Landform: Drainageways
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: R030XB186CA - Mid Size Thermic To Hyperthermic Ephemeral Stream
Hydric soil rating: No

307—Randsburg-Gravesumit association, 2 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2zlpn
Elevation: 3,770 to 4,200 feet
Mean annual precipitation: 6 to 8 inches
Mean annual air temperature: 55 to 66 degrees F
Frost-free period: 230 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Randsburg and similar soils: 50 percent
Gravesumit and similar soils: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Randsburg

Setting

Landform: Fan remnants on rock pediments
Landform position (two-dimensional): Summit
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Tertiary gravel deposits of colluvium and/or residuum weathered from conglomerate

Typical profile

A - 0 to 3 inches: gravelly sandy loam
Bk - 3 to 14 inches: gravelly loam
Crk - 14 to 41 inches: bedrock

Properties and qualities

Slope: 4 to 15 percent
Surface area covered with cobbles, stones or boulders: 3.0 percent
Depth to restrictive feature: 10 to 20 inches to paralithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.14 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Very low (about 1.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Ecological site: R030XB057NV - SHALLOW GRANITIC LOAM 5-7 P.Z.
Hydric soil rating: No

Description of Gravesumit

Setting

Landform: Fan remnants
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granitoid

Typical profile

A - 0 to 2 inches: sandy loam
C - 2 to 7 inches: sandy loam
Btk - 7 to 19 inches: sandy loam
Bk - 19 to 43 inches: coarse sandy loam
Bkq - 43 to 59 inches: very gravelly coarse sand

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 2.13 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: B
Ecological site: R030XB057NV - SHALLOW GRANITIC LOAM 5-7 P.Z.
Hydric soil rating: No

Minor Components

Gocougs

Percent of map unit: 5 percent
Landform: Fan remnants

Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R030XB107NV - COARSE GRAVELLY LOAM 5-7 P.Z.
Hydric soil rating: No

Granitepass

Percent of map unit: 4 percent
Landform: Fan aprons
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R030XB057NV - SHALLOW GRANITIC LOAM 5-7 P.Z.
Hydric soil rating: No

Dalvord

Percent of map unit: 4 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Down-slope shape: Linear
Across-slope shape: Concave
Ecological site: R030XB056NV - SHALLOW GRANITIC SLOPE 5-7 P.Z.
Hydric soil rating: No

Arizo

Percent of map unit: 2 percent
Landform: Inset fans
Landform position (two-dimensional): Summit
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: R030XB028NV - VALLEY WASH
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

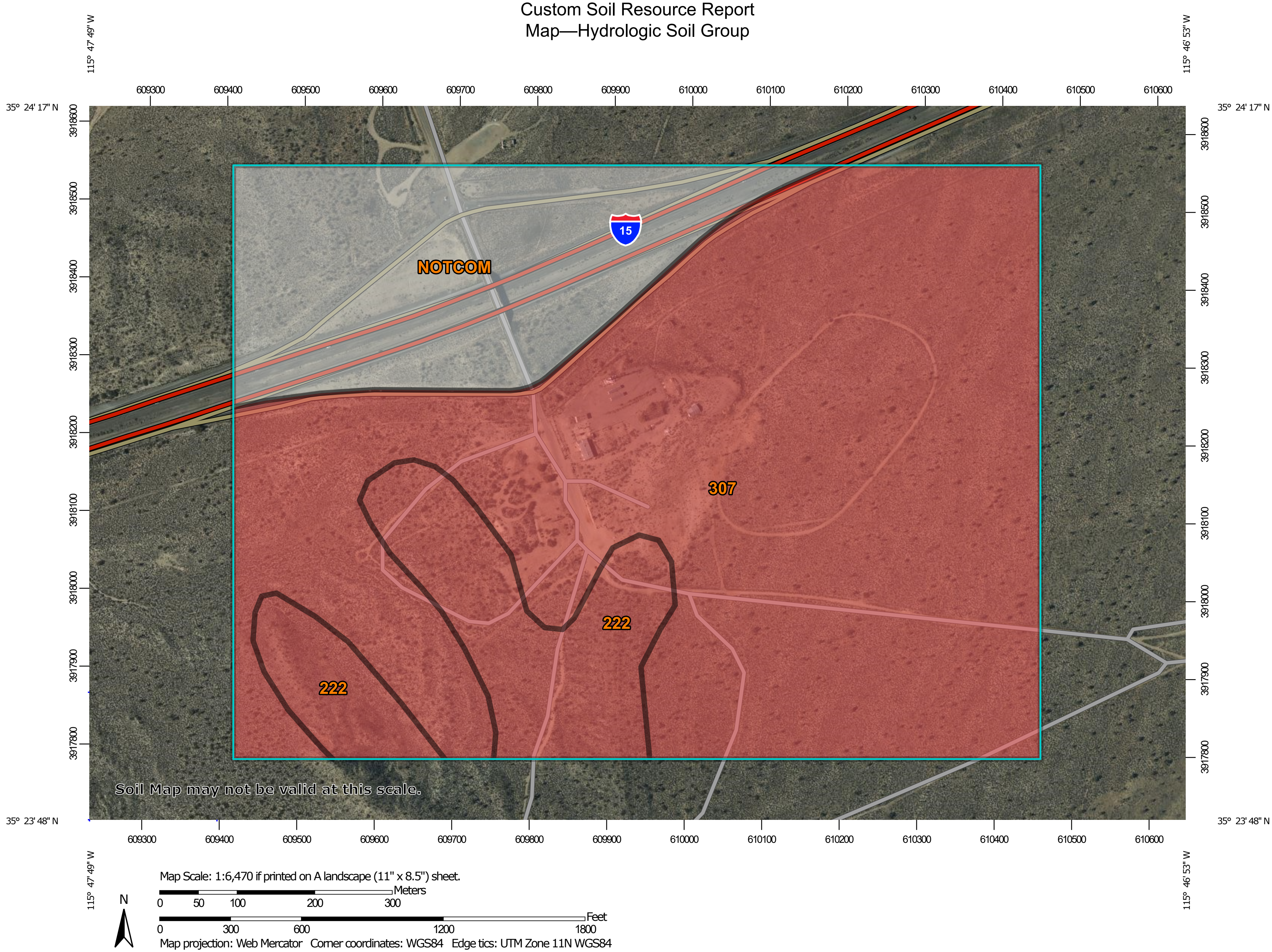
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Custom Soil Resource Report
Map—Hydrologic Soil Group



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Mojave Desert Area, Northeast Part, California
Survey Area Data: Version 13, Sep 5, 2023

Soil Survey Area: Mojave National Preserve Area, California
Survey Area Data: Version 12, Sep 20, 2023

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

MAP LEGEND	MAP INFORMATION
	Soil map units are labeled (as space allows) for map scales 1:50,000 or larger. Date(s) aerial images were photographed: Apr 3, 2019—May 14, 2019 The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
NOTCOM	No Digital Data Available		40.2	20.4%
Subtotals for Soil Survey Area			**40.2**	**20.4%**
Totals for Area of Interest			**197.1**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
222	Randsburg family-Gravesumit family complex, 15 to 50 percent slopes	D	25.2	12.8%
307	Randsburg-Gravesumit association, 2 to 15 percent slopes	D	131.8	66.9%
Subtotals for Soil Survey Area			**156.9**	**79.6%**
Totals for Area of Interest			**197.1**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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NOAA Atlas 14, Volume 6, Version 2
Location name: Nipton, California, USA*
Latitude: 35.4057°, Longitude: -115.7928°
Elevation: 4115 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.134 (0.110-0.165)	0.209 (0.172-0.257)	0.308 (0.253-0.380)	0.391 (0.318-0.485)	0.504 (0.397-0.647)	0.593 (0.457-0.777)	0.686 (0.516-0.920)	0.784 (0.574-1.08)	0.922 (0.648-1.32)	1.04 (0.703-1.54)
10-min	0.192 (0.158-0.236)	0.300 (0.246-0.369)	0.442 (0.362-0.544)	0.560 (0.455-0.696)	0.723 (0.569-0.927)	0.851 (0.656-1.11)	0.983 (0.740-1.32)	1.12 (0.823-1.55)	1.32 (0.929-1.90)	1.48 (1.01-2.21)
15-min	0.233 (0.191-0.286)	0.363 (0.298-0.446)	0.534 (0.438-0.658)	0.677 (0.551-0.841)	0.874 (0.688-1.12)	1.03 (0.793-1.35)	1.19 (0.895-1.60)	1.36 (0.995-1.88)	1.60 (1.12-2.30)	1.79 (1.22-2.67)
30-min	0.343 (0.282-0.421)	0.534 (0.439-0.656)	0.787 (0.645-0.970)	0.997 (0.811-1.24)	1.29 (1.01-1.65)	1.52 (1.17-1.98)	1.75 (1.32-2.35)	2.00 (1.47-2.76)	2.36 (1.66-3.38)	2.64 (1.80-3.93)
60-min	0.474 (0.390-0.581)	0.738 (0.607-0.907)	1.09 (0.891-1.34)	1.38 (1.12-1.71)	1.78 (1.40-2.28)	2.09 (1.61-2.74)	2.42 (1.82-3.25)	2.77 (2.03-3.82)	3.25 (2.29-4.68)	3.65 (2.48-5.43)
2-hr	0.609 (0.501-0.748)	0.897 (0.737-1.10)	1.29 (1.05-1.58)	1.62 (1.31-2.01)	2.08 (1.64-2.67)	2.45 (1.89-3.21)	2.84 (2.14-3.81)	3.26 (2.39-4.50)	3.87 (2.72-5.56)	4.37 (2.97-6.50)
3-hr	0.681 (0.560-0.836)	0.980 (0.806-1.20)	1.39 (1.14-1.71)	1.74 (1.41-2.16)	2.23 (1.76-2.86)	2.63 (2.03-3.44)	3.05 (2.30-4.10)	3.51 (2.57-4.85)	4.18 (2.94-6.01)	4.74 (3.22-7.05)
6-hr	0.795 (0.654-0.975)	1.11 (0.914-1.37)	1.55 (1.27-1.91)	1.92 (1.56-2.39)	2.46 (1.94-3.16)	2.91 (2.24-3.81)	3.38 (2.54-4.54)	3.90 (2.86-5.38)	4.66 (3.27-6.69)	5.30 (3.60-7.87)
12-hr	0.908 (0.747-1.11)	1.24 (1.02-1.53)	1.70 (1.40-2.10)	2.10 (1.71-2.61)	2.68 (2.11-3.44)	3.15 (2.43-4.13)	3.66 (2.76-4.91)	4.22 (3.09-5.82)	5.05 (3.55-7.25)	5.74 (3.90-8.53)
24-hr	1.14 (1.00-1.32)	1.54 (1.35-1.78)	2.09 (1.83-2.43)	2.56 (2.24-3.00)	3.25 (2.75-3.92)	3.81 (3.17-4.68)	4.41 (3.59-5.53)	5.07 (4.02-6.51)	6.01 (4.60-8.02)	6.81 (5.05-9.36)
2-day	1.35 (1.19-1.56)	1.82 (1.60-2.11)	2.45 (2.15-2.85)	3.00 (2.61-3.51)	3.78 (3.20-4.56)	4.41 (3.67-5.42)	5.09 (4.14-6.38)	5.82 (4.62-7.48)	6.87 (5.26-9.16)	7.74 (5.75-10.7)
3-day	1.47 (1.29-1.70)	1.97 (1.74-2.29)	2.65 (2.33-3.08)	3.23 (2.82-3.78)	4.06 (3.44-4.89)	4.73 (3.93-5.81)	5.44 (4.43-6.82)	6.21 (4.93-7.98)	7.30 (5.59-9.74)	8.20 (6.09-11.3)
4-day	1.56 (1.37-1.80)	2.08 (1.84-2.42)	2.79 (2.45-3.24)	3.38 (2.95-3.96)	4.24 (3.59-5.10)	4.93 (4.09-6.05)	5.65 (4.60-7.09)	6.43 (5.11-8.27)	7.54 (5.77-10.1)	8.46 (6.28-11.6)
7-day	1.71 (1.50-1.98)	2.24 (1.98-2.60)	2.94 (2.58-3.42)	3.54 (3.08-4.14)	4.37 (3.70-5.26)	5.04 (4.19-6.19)	5.76 (4.69-7.23)	6.54 (5.19-8.41)	7.66 (5.86-10.2)	8.59 (6.37-11.8)
10-day	1.84 (1.62-2.14)	2.40 (2.11-2.78)	3.11 (2.73-3.61)	3.70 (3.23-4.34)	4.53 (3.84-5.46)	5.20 (4.32-6.38)	5.91 (4.81-7.41)	6.68 (5.30-8.59)	7.77 (5.95-10.4)	8.70 (6.46-12.0)
20-day	2.19 (1.93-2.53)	2.80 (2.46-3.24)	3.55 (3.12-4.12)	4.15 (3.62-4.86)	4.95 (4.19-5.97)	5.58 (4.64-6.85)	6.23 (5.07-7.82)	6.94 (5.51-8.92)	7.98 (6.10-10.6)	8.86 (6.57-12.2)
30-day	2.53 (2.23-2.93)	3.24 (2.85-3.76)	4.07 (3.57-4.73)	4.71 (4.10-5.51)	5.51 (4.67-6.64)	6.13 (5.10-7.52)	6.78 (5.51-8.50)	7.47 (5.93-9.60)	8.49 (6.50-11.3)	9.38 (6.96-12.9)
45-day	2.96 (2.61-3.43)	3.79 (3.33-4.39)	4.72 (4.14-5.49)	5.40 (4.71-6.32)	6.20 (5.25-7.48)	6.76 (5.62-8.30)	7.35 (5.98-9.22)	8.00 (6.35-10.3)	8.94 (6.84-11.9)	9.79 (7.26-13.5)
60-day	3.39 (2.99-3.93)	4.32 (3.80-5.01)	5.32 (4.67-6.18)	6.01 (5.24-7.04)	6.80 (5.76-8.19)	7.30 (6.07-8.96)	7.79 (6.34-9.77)	8.38 (6.65-10.8)	9.22 (7.05-12.3)	10.0 (7.44-13.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.
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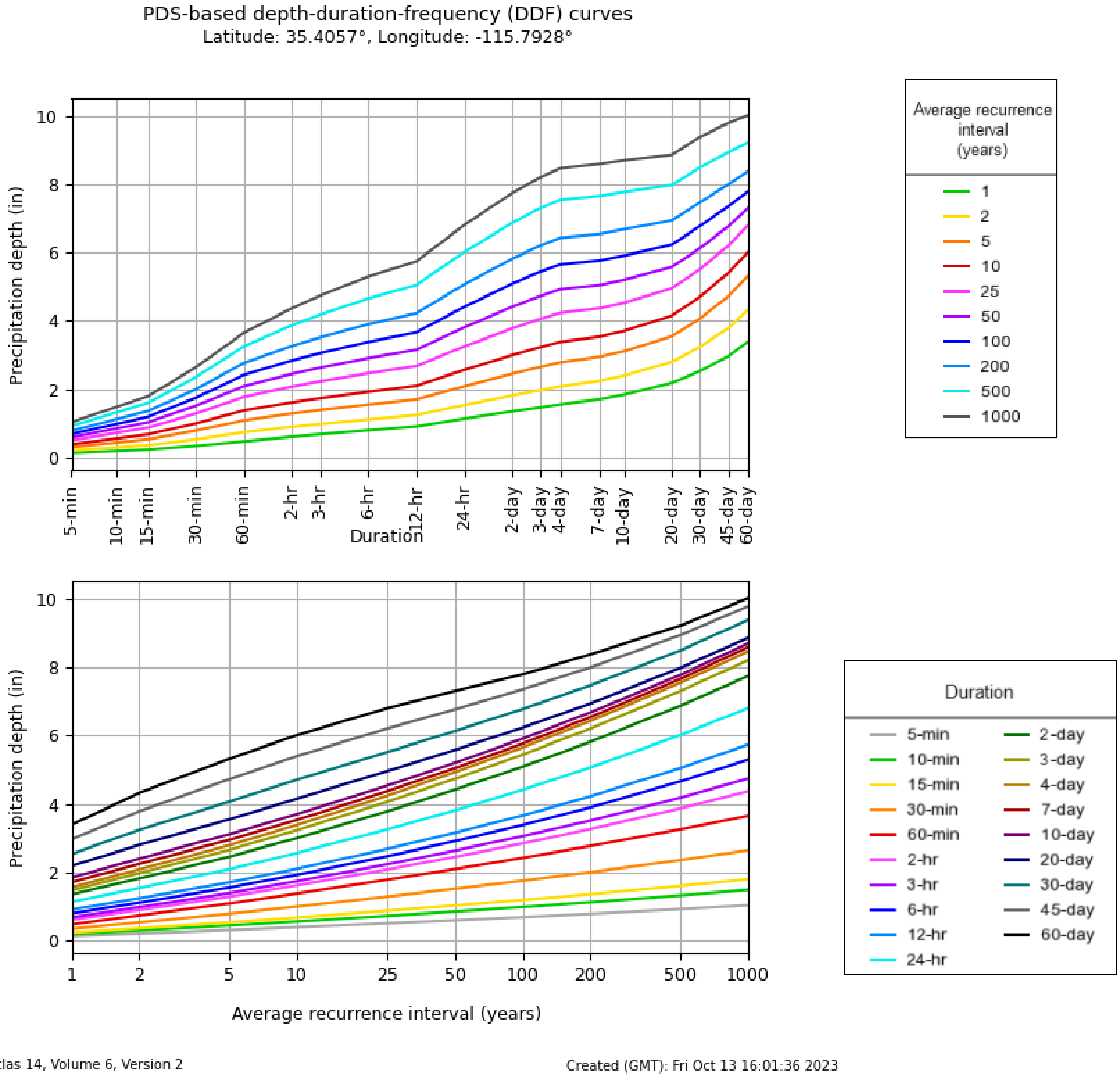
PF graphical



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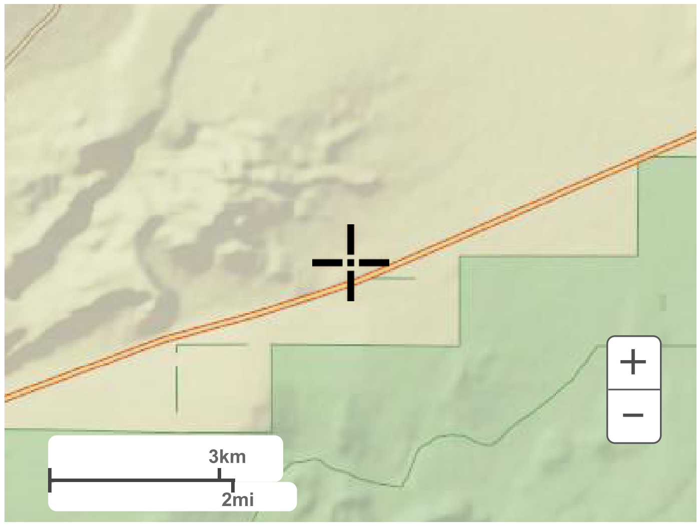
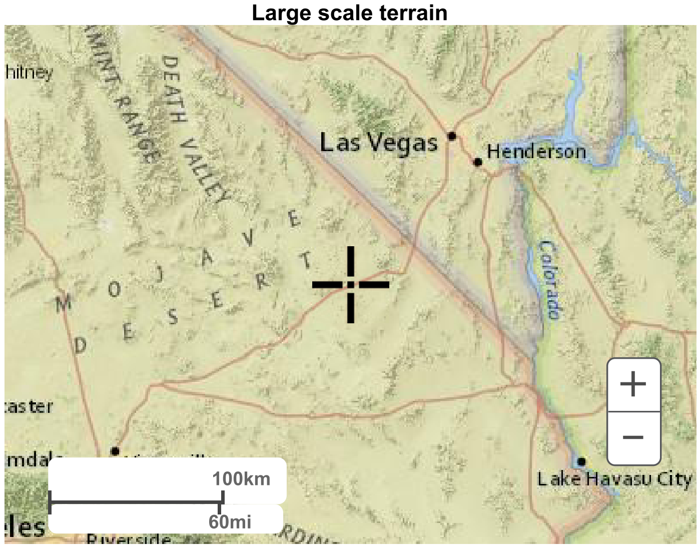
Maps & aerials

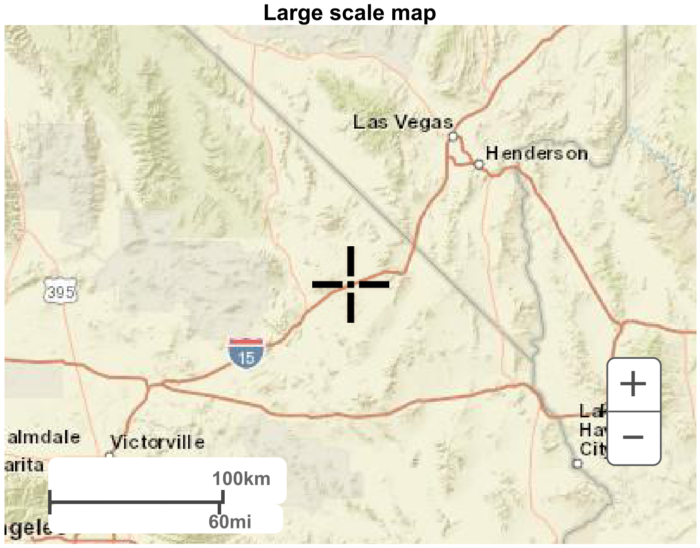
Small scale terrain



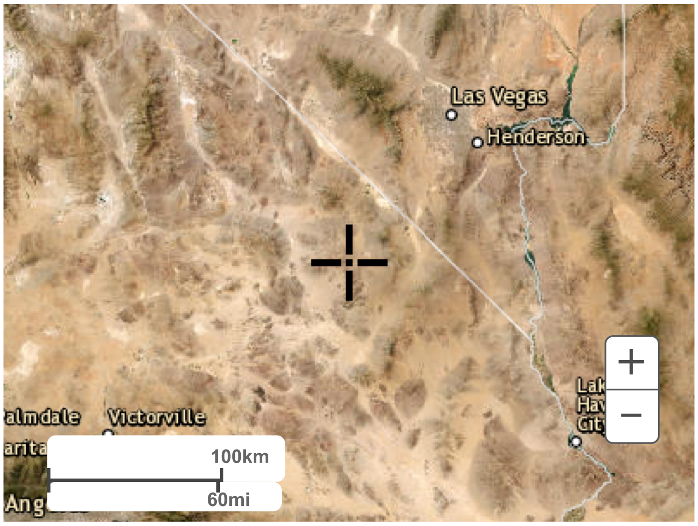
Large scale terrain



Large scale map



Large scale aerial



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National Weather Service
National Water Center
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Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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NOAA Atlas 14, Volume 6, Version 2
Location name: Nipton, California, USA*
Latitude: 35.4057°, Longitude: -115.7928°
Elevation: 4115 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**1.61** (1.32-1.98)	**2.51** (2.06-3.08)	**3.70** (3.04-4.56)	**4.69** (3.82-5.82)	**6.05** (4.76-7.76)	**7.12** (5.48-9.32)	**8.23** (6.19-11.0)	**9.41** (6.89-13.0)	**11.1** (7.78-15.9)	**12.4** (8.44-18.5)
10-min	**1.15** (0.948-1.42)	**1.80** (1.48-2.21)	**2.65** (2.17-3.26)	**3.36** (2.73-4.18)	**4.34** (3.41-5.56)	**5.11** (3.94-6.68)	**5.90** (4.44-7.91)	**6.74** (4.94-9.31)	**7.93** (5.57-11.4)	**8.90** (6.05-13.2)
15-min	**0.932** (0.764-1.14)	**1.45** (1.19-1.78)	**2.14** (1.75-2.63)	**2.71** (2.20-3.36)	**3.50** (2.75-4.49)	**4.12** (3.17-5.39)	**4.76** (3.58-6.38)	**5.44** (3.98-7.50)	**6.40** (4.50-9.19)	**7.18** (4.88-10.7)
30-min	**0.686** (0.564-0.842)	**1.07** (0.878-1.31)	**1.57** (1.29-1.94)	**1.99** (1.62-2.48)	**2.57** (2.03-3.30)	**3.03** (2.34-3.97)	**3.50** (2.64-4.70)	**4.00** (2.93-5.52)	**4.71** (3.31-6.77)	**5.29** (3.59-7.86)
60-min	**0.474** (0.390-0.581)	**0.738** (0.607-0.907)	**1.09** (0.891-1.34)	**1.38** (1.12-1.71)	**1.78** (1.40-2.28)	**2.09** (1.61-2.74)	**2.42** (1.82-3.25)	**2.77** (2.03-3.82)	**3.25** (2.29-4.68)	**3.65** (2.48-5.43)
2-hr	**0.304** (0.250-0.374)	**0.448** (0.368-0.551)	**0.643** (0.527-0.792)	**0.807** (0.656-1.00)	**1.04** (0.817-1.33)	**1.22** (0.943-1.60)	**1.42** (1.07-1.91)	**1.63** (1.20-2.25)	**1.94** (1.36-2.78)	**2.18** (1.48-3.25)
3-hr	**0.226** (0.186-0.278)	**0.326** (0.268-0.401)	**0.462** (0.379-0.570)	**0.578** (0.470-0.718)	**0.742** (0.584-0.953)	**0.875** (0.674-1.15)	**1.02** (0.765-1.36)	**1.17** (0.856-1.61)	**1.39** (0.978-2.00)	**1.58** (1.07-2.35)
6-hr	**0.132** (0.109-0.162)	**0.185** (0.152-0.228)	**0.258** (0.212-0.318)	**0.321** (0.261-0.399)	**0.411** (0.323-0.528)	**0.485** (0.374-0.635)	**0.564** (0.425-0.757)	**0.651** (0.477-0.898)	**0.777** (0.546-1.12)	**0.884** (0.600-1.31)
12-hr	**0.075** (0.062-0.092)	**0.103** (0.084-0.126)	**0.141** (0.115-0.174)	**0.174** (0.141-0.216)	**0.222** (0.174-0.285)	**0.261** (0.201-0.342)	**0.303** (0.228-0.407)	**0.350** (0.256-0.483)	**0.418** (0.294-0.601)	**0.476** (0.323-0.708)
24-hr	**0.047** (0.041-0.054)	**0.064** (0.056-0.074)	**0.087** (0.076-0.101)	**0.106** (0.093-0.125)	**0.135** (0.114-0.163)	**0.158** (0.131-0.194)	**0.183** (0.149-0.230)	**0.211** (0.167-0.271)	**0.250** (0.191-0.334)	**0.283** (0.210-0.389)
2-day	**0.028** (0.024-0.032)	**0.037** (0.033-0.043)	**0.051** (0.044-0.059)	**0.062** (0.054-0.073)	**0.078** (0.066-0.094)	**0.091** (0.076-0.112)	**0.105** (0.086-0.132)	**0.121** (0.096-0.155)	**0.143** (0.109-0.190)	**0.161** (0.119-0.221)
3-day	**0.020** (0.017-0.023)	**0.027** (0.024-0.031)	**0.036** (0.032-0.042)	**0.044** (0.039-0.052)	**0.056** (0.047-0.067)	**0.065** (0.054-0.080)	**0.075** (0.061-0.094)	**0.086** (0.068-0.110)	**0.101** (0.077-0.135)	**0.113** (0.084-0.156)
4-day	**0.016** (0.014-0.018)	**0.021** (0.019-0.025)	**0.029** (0.025-0.033)	**0.035** (0.030-0.041)	**0.044** (0.037-0.053)	**0.051** (0.042-0.062)	**0.058** (0.047-0.073)	**0.067** (0.053-0.086)	**0.078** (0.060-0.104)	**0.088** (0.065-0.121)
7-day	**0.010** (0.008-0.011)	**0.013** (0.011-0.015)	**0.017** (0.015-0.020)	**0.021** (0.018-0.024)	**0.025** (0.022-0.031)	**0.030** (0.024-0.036)	**0.034** (0.027-0.043)	**0.038** (0.030-0.050)	**0.045** (0.034-0.060)	**0.051** (0.037-0.070)
10-day	**0.007** (0.006-0.008)	**0.009** (0.008-0.011)	**0.012** (0.011-0.015)	**0.015** (0.013-0.018)	**0.018** (0.015-0.022)	**0.021** (0.018-0.026)	**0.024** (0.020-0.030)	**0.027** (0.022-0.035)	**0.032** (0.024-0.043)	**0.036** (0.026-0.049)
20-day	**0.004** (0.004-0.005)	**0.005** (0.005-0.006)	**0.007** (0.006-0.008)	**0.008** (0.007-0.010)	**0.010** (0.008-0.012)	**0.011** (0.009-0.014)	**0.012** (0.010-0.016)	**0.014** (0.011-0.018)	**0.016** (0.012-0.022)	**0.018** (0.013-0.025)
30-day	**0.003** (0.003-0.004)	**0.004** (0.003-0.005)	**0.005** (0.004-0.006)	**0.006** (0.005-0.007)	**0.007** (0.006-0.009)	**0.008** (0.007-0.010)	**0.009** (0.007-0.011)	**0.010** (0.008-0.013)	**0.011** (0.009-0.015)	**0.013** (0.009-0.017)
45-day	**0.002** (0.002-0.003)	**0.003** (0.003-0.004)	**0.004** (0.003-0.005)	**0.005** (0.004-0.005)	**0.005** (0.004-0.006)	**0.006** (0.005-0.007)	**0.006** (0.005-0.008)	**0.007** (0.005-0.009)	**0.008** (0.006-0.011)	**0.009** (0.006-0.012)
60-day	**0.002** (0.002-0.002)	**0.003** (0.002-0.003)	**0.003** (0.003-0.004)	**0.004** (0.003-0.004)	**0.004** (0.003-0.005)	**0.005** (0.004-0.006)	**0.005** (0.004-0.006)	**0.005** (0.004-0.007)	**0.006** (0.004-0.008)	**0.006** (0.005-0.009)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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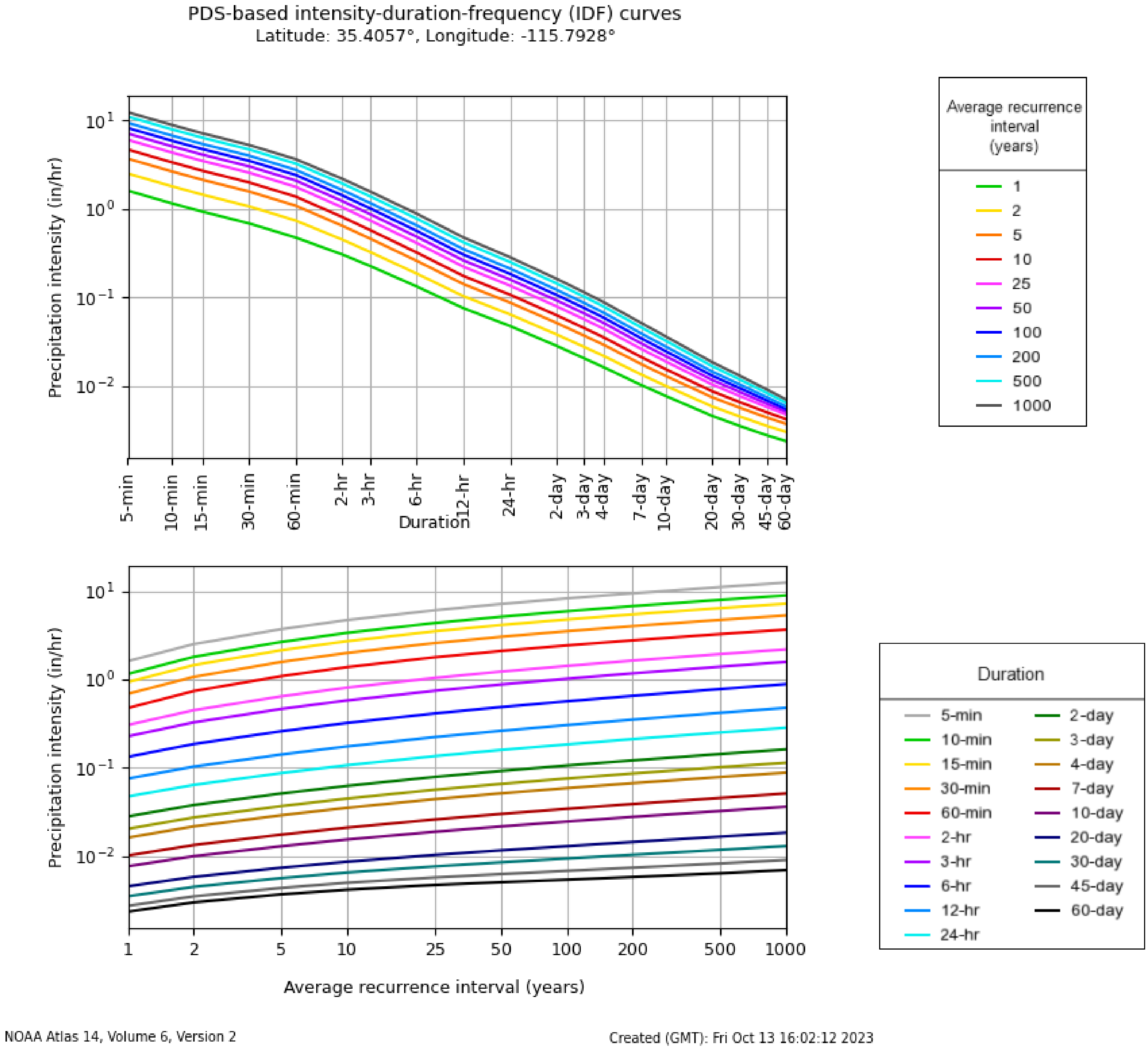
PF graphical



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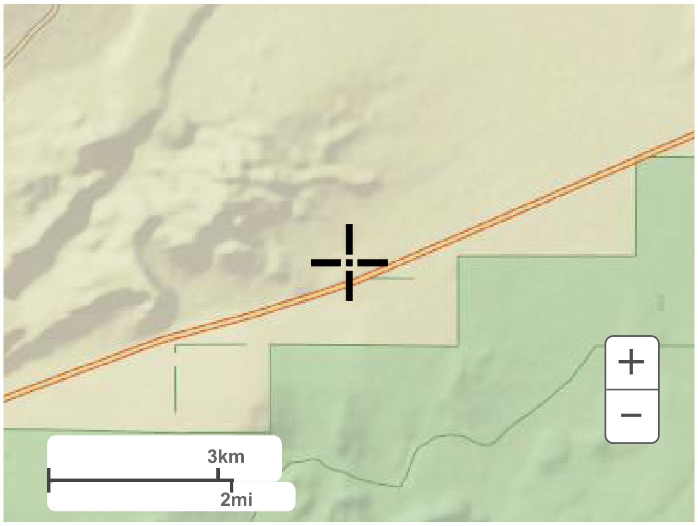
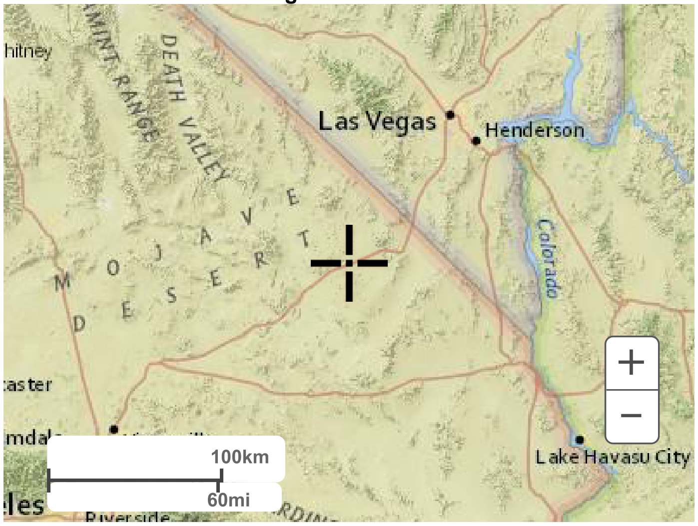
Maps & aerials

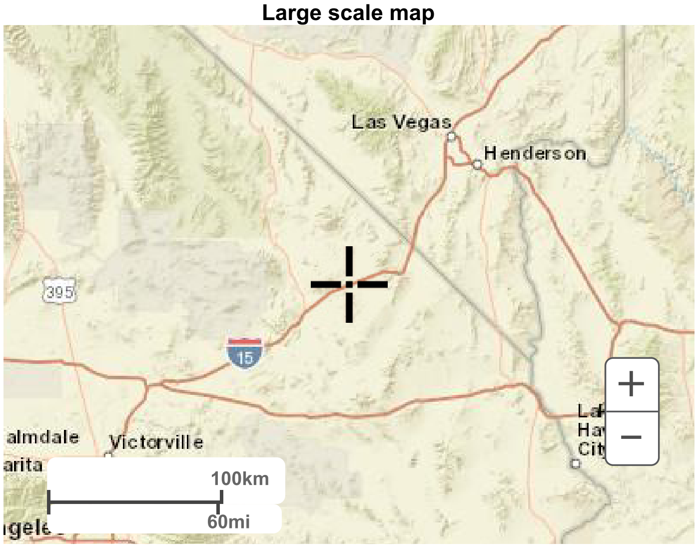
Small scale terrain



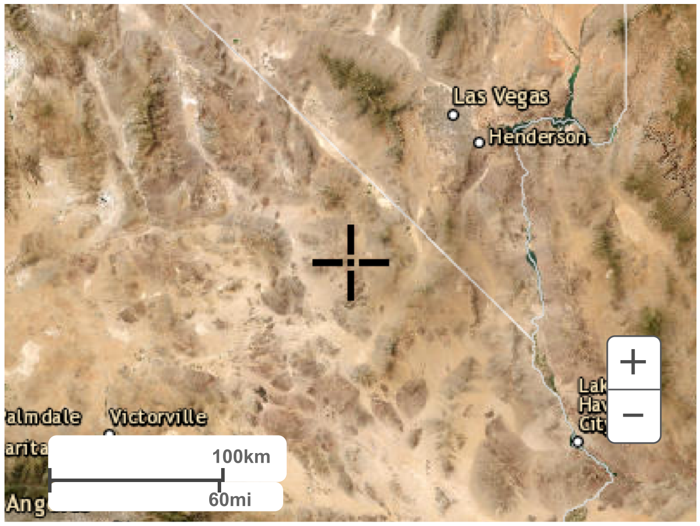
Large scale terrain



Large scale map



Large scale aerial



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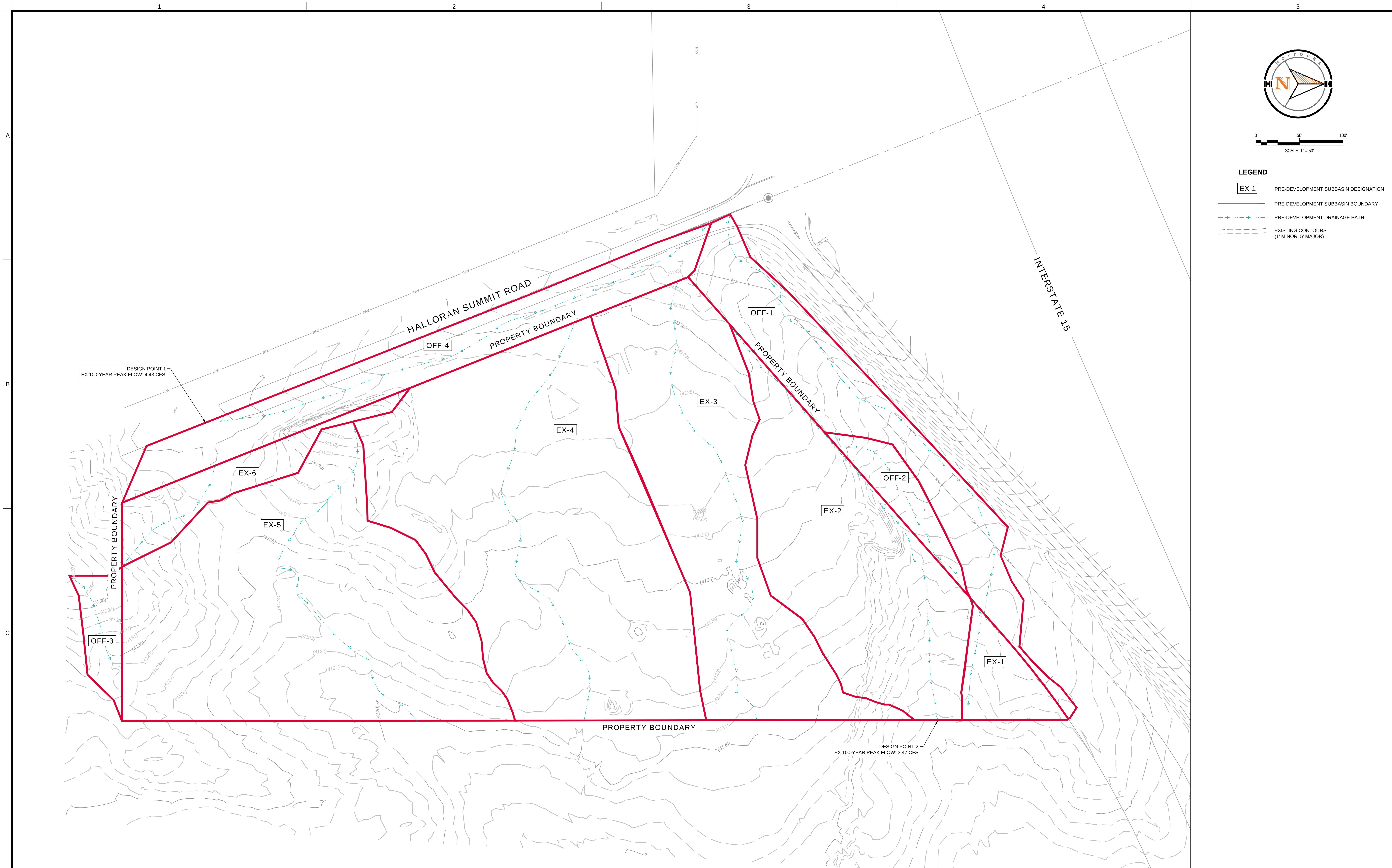

LEGEND

EX-1	PRE-DEVELOPMENT SUBBASIN DESIGNATION
	PRE-DEVELOPMENT SUBBASIN BOUNDARY
	PRE-DEVELOPMENT DRAINAGE PATH
	EXISTING CONTOURS (1' MINOR, 5' MAJOR)

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Pleasant Grove, UT 84062
(801) 763-5100
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WARNING

IF THIS BAR DOES NOT MEASURE 2" THEN DRAWING IS NOT TO SCALE

REVISIONS

REV #	DATE

*SEE GENERAL NOTES SHEET

DRAWING INFO

DATE	01/19/2024
DESIGNED	HB
DRAWN	HB
CHECKED	JG
PROJECT	UT-8052-23

PRELIMINARY
NOT FOR CONSTRUCTION

TERRIBLE HERBST TRAVEL CENTER

HALLORAN SUMMIT, CA

EXISTING DRAINAGE BASINS

DR-EX

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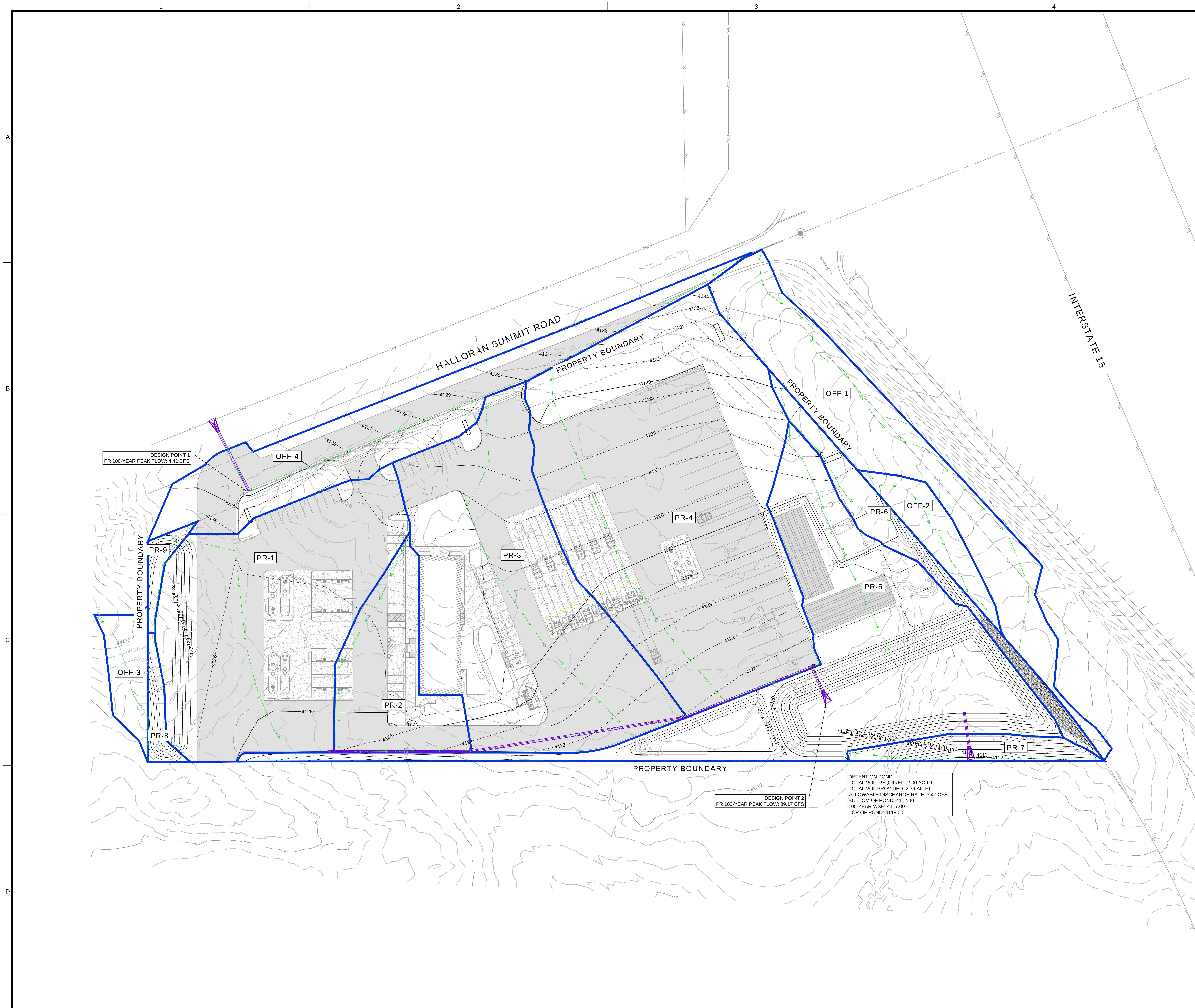

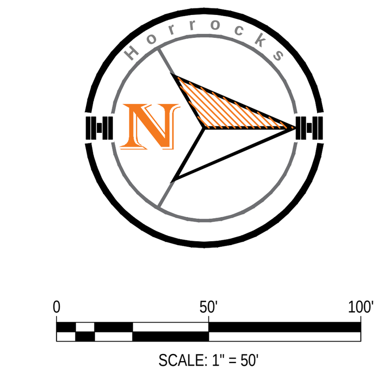

LEGEND

PR-1	POST-DEVELOPMENT SUBBASIN DESIGNATION
	POST-DEVELOPMENT SUBBASIN BOUNDARY
	POST-DEVELOPMENT DRAINAGE PATH
	EXISTING CONTOURS (1' MINOR, 5' MAJOR)
	PROPOSED CONTOURS (1' MINOR, 5' MAJOR)

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WARNING
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REVISIONS

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PRELIMINARY
NOT FOR CONSTRUCTION

TERRIBLE HERBST TRAVEL CENTER

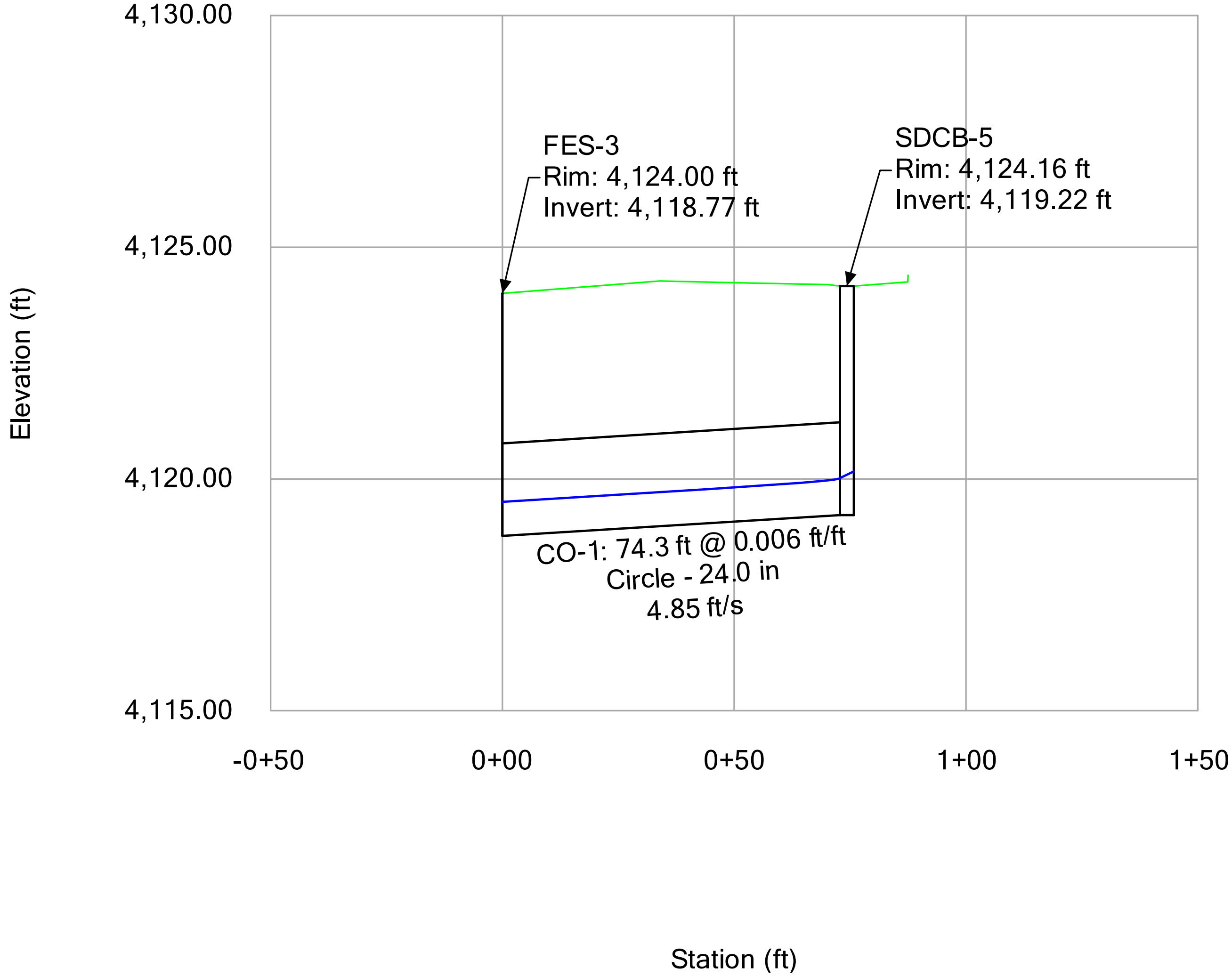
HALLORAN SUMMIT, CA

PROPOSED DRAINAGE BASINS

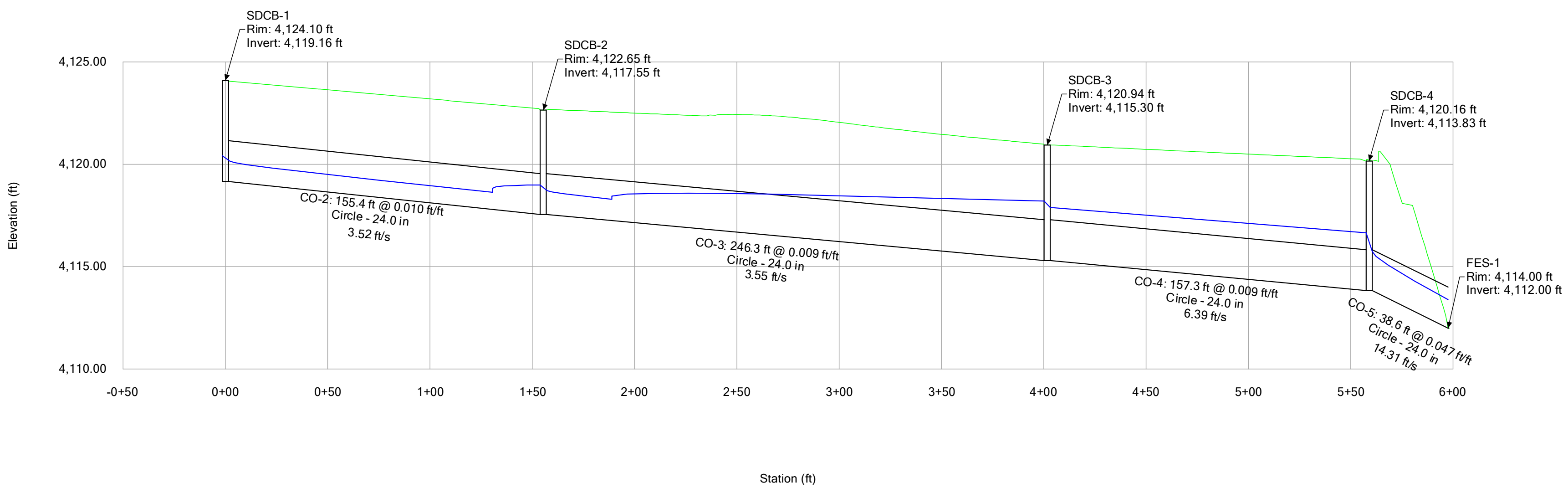
DR-PR

Q:\2023\UT-8052-23 Terrible Herbst - Halloran Summit\Project Data\02 CAD\2.01 Base Files\Working\UT-8052-23_Drainage Analysis.dwg - Proposed - 1/25/2024 11:27am, hannah.baxter

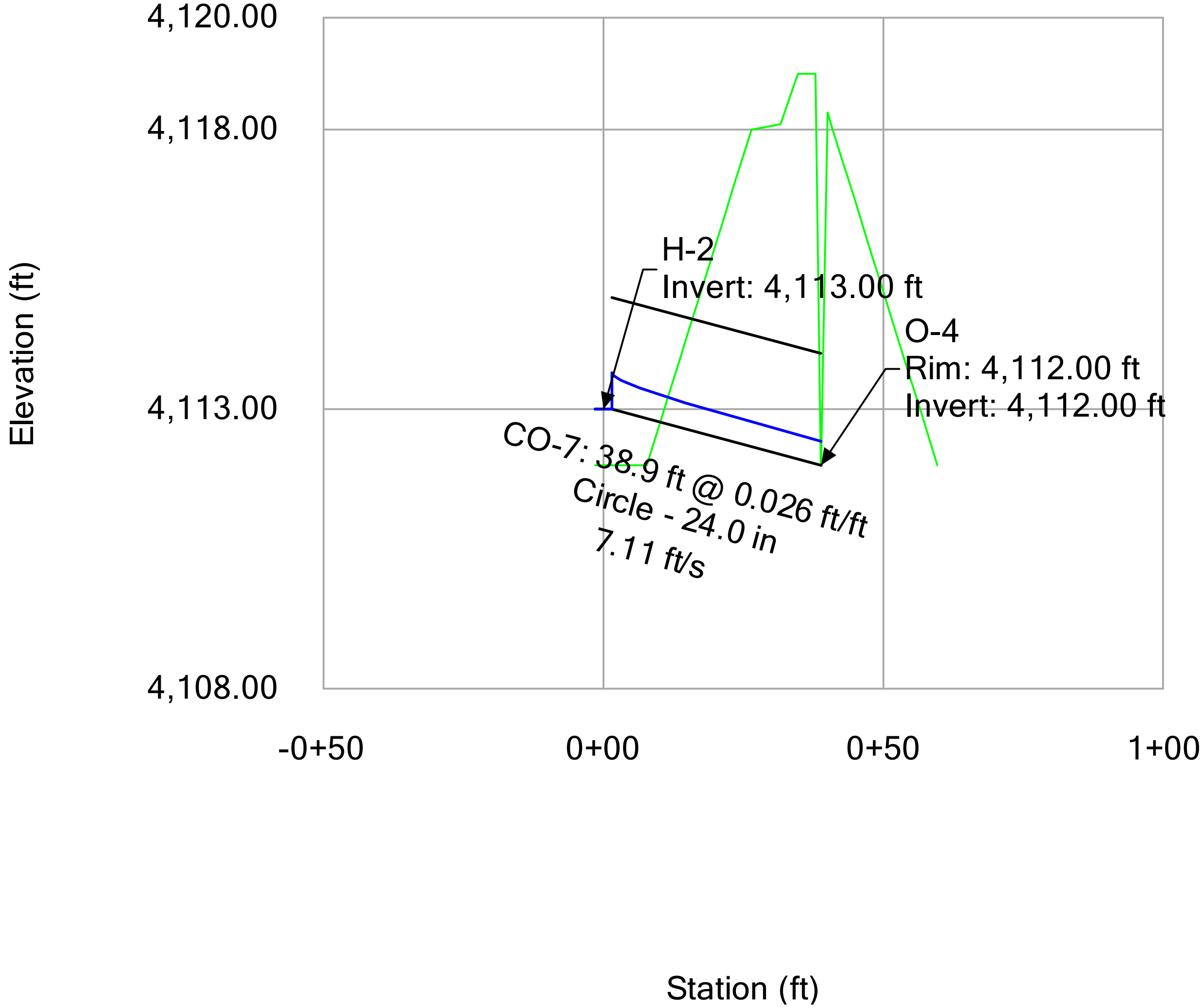
Profile Report
Engineering Profile - Profile - 1 (01.16_StormCAD.stsw)



Profile Report
Engineering Profile - Profile - 2 (01.16_StormCAD.stsw)



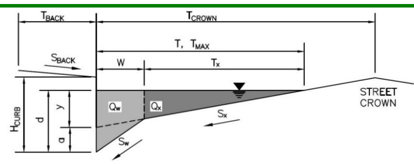
Profile Report
Engineering Profile - Pond Outlet (01.16_StormCAD.stsw)



ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:
Inlet ID: SDCB-1



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.330	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.030	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.009	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

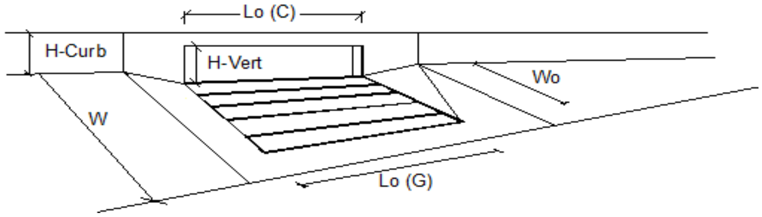
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**8.0**	**8.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 4.53 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 7.96 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



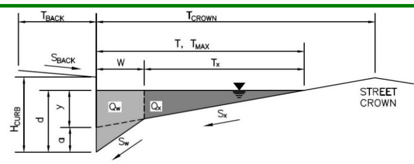
Design Information (Input)	CDOT/Denver 13 Combination		MINOR	MAJOR	
Type of Inlet		Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.3**	**3.2**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**2.2**	**4.7**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**51**	**41**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:
Inlet ID: SDCB-2



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.330	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.030	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.009	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

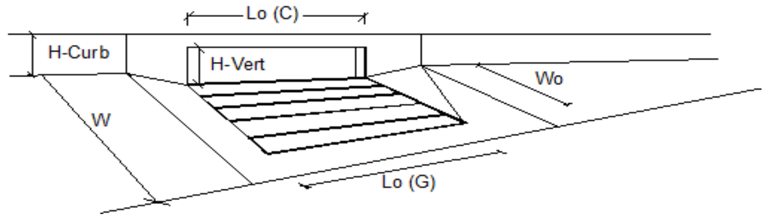
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**8.0**	**8.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 3.79 cfs on sheet 'Inlet Management'
Major storm max. allowable capacity GOOD - greater than the design peak flow of 7.49 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)



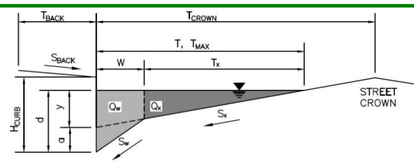
Design Information (Input)	CDOT/Denver 13 Combination		MINOR	MAJOR	
Type of Inlet		Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.1**	**3.1**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**1.7**	**4.4**	**cfs**
Capture Percentage = Q_a/Q_o	**C% =**	**55**	**42**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:
Inlet ID: SDCB-3



Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	0.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.330	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.030	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.009	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

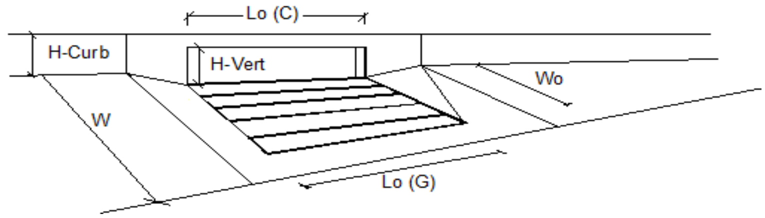
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Allow Flow Depth at Street Crown (check box for yes, leave blank for no)		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**8.0**	**8.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design peak flow of 7.28 cfs on sheet 'Inlet Management'
WARNING: MAJOR STORM max. allowable capacity is less than the design peak flow of 14.20 cfs on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

MHFD-Inlet, Version 5.03 (August 2023)

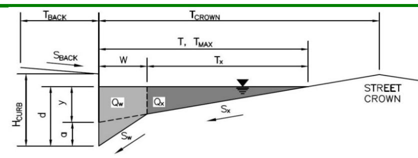


Design Information (Input)	CDOT/Denver 13 Combination		MINOR	MAJOR	
Type of Inlet		Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	2.0	2.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	3.00	3.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	1.73	1.73	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f (G) =	0.50	0.50	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f (C) =	0.10	0.10	
Street Hydraulics: WARNING: Q > ALLOWABLE Q FOR MAJOR STORM			MINOR	MAJOR	
Total Inlet Interception Capacity		**Q =**	**5.0**	**8.0**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)		**Q_b =**	**2.3**	**6.2**	**cfs**
Capture Percentage = Q_a/Q_o		**C% =**	**69**	**56**	**%**

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:
Inlet ID: **SDCB-4**



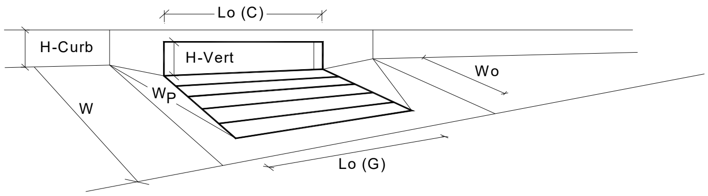
Gutter Geometry:

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0		ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.068		ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.012		
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00		inches
Distance from Curb Face to Street Crown	T_{CROWN} =	30.0		ft
Gutter Width	W =	2.00		ft
Street Transverse Slope	S_X =	0.026		ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083		ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000		ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020		
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	30.0	30.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition				
MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)

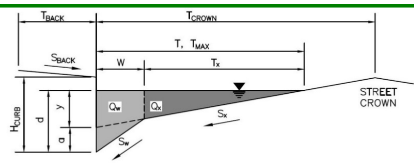


Design Information (Input)		MINOR	MAJOR	
Type of Inlet (CDOT/Denver 13 Combination)	Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	10.6	10.6	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.91	0.91	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.72	0.72	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	1.00	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	1.00	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**20.0**	**20.0**	**cfs**
WARNING: Inlet Capacity < Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	10.2	20.0	cfs

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project:
Inlet ID: SDCB-5



Gutter Geometry:

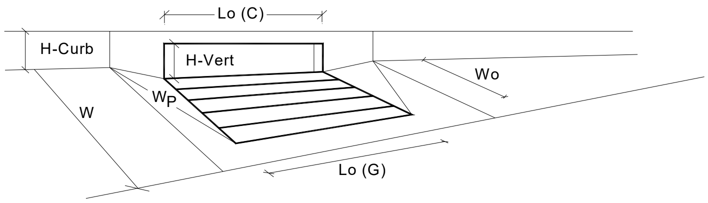
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.075	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	27.5	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.002	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.020	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	27.5	27.5	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is not applicable to Sump Condition MAJOR STORM Allowable Capacity is not applicable to Sump Condition	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

MHFD-Inlet, Version 5.03 (August 2023)



		MINOR	MAJOR	
Design Information (Input) — CDOT/Denver 13 Combination				
Type of Inlet	Type =	CDOT/Denver 13 Combination		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	2.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	☑ Override Depths
Length of a Unit Grate	L_o (G) =	3.00	3.00	feet
Width of a Unit Grate	W_o =	1.73	1.73	feet
Open Area Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.43	0.43	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	3.30	3.30	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.60	0.60	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	3.00	3.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	6.50	6.50	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	5.25	5.25	inches
Angle of Throat	Theta =	0.00	0.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.70	3.70	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.66	0.66	

Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.52	0.52	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.33	0.33	ft
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.94	0.94	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.94	0.94	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	$\mathbf{Q_a}$ **=**	**5.1**	**5.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q Peak)	$Q_{PEAK\ REQUIRED}$ =	2.9	5.0	cfs