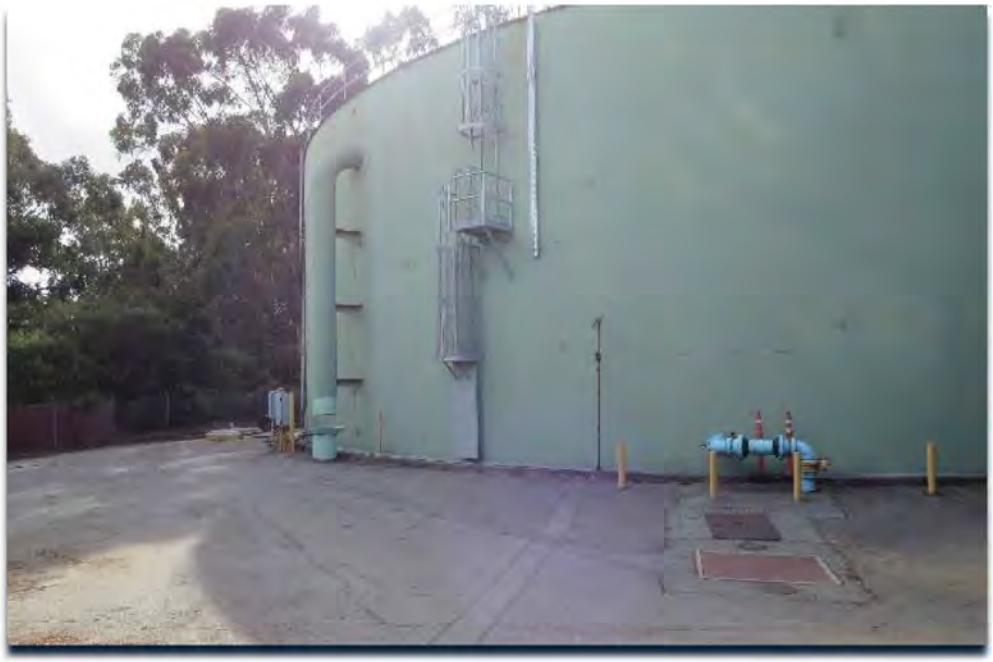
Water Tank 1 (Cunningham Tank) Replacement Project

IS/MND Appendices



February 2025

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Appendix A: Cunningham Way Tank 1 Replacement Project Air Quality Analysis Emissions Calculations

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Cunningham Way Tank 1 Replacement - Air Quality Emissions Calculations

Table of Contents

1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Cunningham Way Tank 1 Replacement, San Bruno
Construction Start Date	1/1/2024
Lead Agency	—
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	4.60
Precipitation (days)	44.8
Location	37.615822526667, -122.42308424042943
County	San Mateo
City	San Bruno
Air District	Bay Area AQMD
Air Basin	San Francisco Bay Area
TAZ	1228
EDFZ	1
Electric Utility	Pacific Gas & Electric Company
Gas Utility	Pacific Gas & Electric
App Version	2022.1.1.21

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
General Light Industry	20.0	1000sqft	0.46	20,000	0.00	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.	4.69	3.86	38.8	32.6	0.07	1.57	0.71	2.28	1.45	0.17	1.62	—	7,833	7,833	0.37	0.21	4.13	7,909
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	4.68	3.86	39.0	32.4	0.07	1.57	1.15	2.28	1.45	0.22	1.62	—	7,806	7,806	0.37	0.21	0.11	7,879
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	2.15	1.75	17.7	14.8	0.03	0.72	0.42	1.14	0.67	0.10	0.76	—	3,295	3,295	0.18	0.11	0.92	3,335
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.39	0.32	3.24	2.71	0.01	0.13	0.08	0.21	0.12	0.02	0.14	—	546	546	0.03	0.02	0.15	552

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)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

2024	4.69	3.86	38.8	32.6	0.07	1.57	0.71	2.28	1.45	0.17	1.62	—	7,833	7,833	0.37	0.21	4.13	7,909
2025	0.18	0.13	1.22	1.88	< 0.005	0.04	0.23	0.27	0.04	0.06	0.10	—	606	606	0.04	0.05	1.25	621
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2024	4.68	3.86	39.0	32.4	0.07	1.57	1.15	2.28	1.45	0.22	1.62	—	7,806	7,806	0.37	0.21	0.11	7,879
2025	2.92	2.38	23.8	20.2	0.04	0.94	0.61	1.55	0.86	0.15	1.01	—	4,928	4,928	0.25	0.17	0.09	4,986
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2024	2.15	1.75	17.7	14.8	0.03	0.72	0.42	1.14	0.67	0.10	0.76	—	3,295	3,295	0.18	0.11	0.92	3,335
2025	0.33	0.27	2.61	2.58	< 0.005	0.11	0.11	0.22	0.10	0.03	0.13	—	613	613	0.03	0.02	0.25	621
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2024	0.39	0.32	3.24	2.71	0.01	0.13	0.08	0.21	0.12	0.02	0.14	—	546	546	0.03	0.02	0.15	552
2025	0.06	0.05	0.48	0.47	< 0.005	0.02	0.02	0.04	0.02	< 0.005	0.02	—	101	101	< 0.005	< 0.005	0.04	103

3. Construction Emissions Details

3.1. 30 Workday Equipment (2024) - 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 Equipmen	0.24	0.20	1.38	1.66	< 0.005	0.05	—	0.05	0.04	—	0.04	—	207	207	0.01	< 0.005	—	208

Demolition	—	—	—	—	—	—	0.75	0.75	—	0.11	0.11	—	—	—	—	—	—	—
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 Equipmen	0.02	0.02	0.11	0.14	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	17.1	17.1	< 0.005	< 0.005	—	17.1
Demolition	—	—	—	—	—	—	0.06	0.06	—	0.01	0.01	—	—	—	—	—	—	—
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 Equipmen	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	2.82	2.82	< 0.005	< 0.005	—	2.83
Demolition	—	—	—	—	—	—	0.01	0.01	—	< 0.005	< 0.005	—	—	—	—	—	—	—
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	0.01	0.01	0.01	0.08	0.00	0.00	0.02	0.02	0.00	0.01	0.01	—	21.8	21.8	< 0.005	< 0.005	< 0.005	22.0
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	0.18	0.02	1.69	1.05	0.01	0.01	0.23	0.24	0.01	0.06	0.08	—	1,013	1,013	0.16	0.16	0.05	1,066
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.79	1.79	< 0.005	< 0.005	< 0.005	1.82
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	0.02	< 0.005	0.14	0.09	< 0.005	< 0.005	0.02	0.02	< 0.005	0.01	0.01	—	83.3	83.3	0.01	0.01	0.07	87.7
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	< 0.005	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	0.30	0.30	< 0.005	< 0.005	< 0.005	0.30
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	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	13.8	13.8	< 0.005	< 0.005	0.01	14.5

3.3. 90 Workday Equipment (2024) - 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 Equipmen	0.25	0.21	2.10	3.35	< 0.005	0.09	—	0.09	0.09	—	0.09	—	508	508	0.02	< 0.005	—	510
Dust From Material Movemen	—	—	—	—	—	—	< 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	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipmen	0.06	0.05	0.52	0.83	< 0.005	0.02	—	0.02	0.02	—	0.02	—	125	125	0.01	< 0.005	—	126
Dust From Material Movemen	—	—	—	—	—	—	< 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	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipmen	0.01	0.01	0.09	0.15	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	20.8	20.8	< 0.005	< 0.005	—	20.8
Dust From Material Movemen	—	—	—	—	—	—	< 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	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Offsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.18	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	46.1	46.1	< 0.005	< 0.005	0.17	46.8
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	0.08	0.01	0.66	0.44	< 0.005	< 0.005	0.10	0.10	< 0.005	0.03	0.03	—	420	420	0.06	0.07	0.82	443
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.04	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	10.8	10.8	< 0.005	< 0.005	0.02	10.9
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	0.02	< 0.005	0.17	0.11	< 0.005	< 0.005	0.02	0.02	< 0.005	0.01	0.01	—	104	104	0.02	0.02	0.09	109
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.78	1.78	< 0.005	< 0.005	< 0.005	1.81
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	< 0.005	< 0.005	0.03	0.02	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	17.1	17.1	< 0.005	< 0.005	0.01	18.1

3.5. 60 Workday Equipment (2024) - 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 Equipmen	0.30	0.25	1.87	1.01	< 0.005	0.07	—	0.07	0.06	—	0.06	—	246	246	0.01	< 0.005	—	247
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 Equipmen	0.30	0.25	1.87	1.01	< 0.005	0.07	—	0.07	0.06	—	0.06	—	246	246	0.01	< 0.005	—	247
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 Equipmen	0.05	0.04	0.31	0.17	< 0.005	0.01	—	0.01	0.01	—	0.01	—	40.4	40.4	< 0.005	< 0.005	—	40.5
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 Equipmen	0.01	0.01	0.06	0.03	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	6.69	6.69	< 0.005	< 0.005	—	6.71
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	0.03	0.02	0.02	0.31	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	77.4	77.4	< 0.005	< 0.005	0.28	78.6
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	0.02	0.02	0.02	0.28	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	73.1	73.1	< 0.005	< 0.005	0.01	74.0
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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.04	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	12.1	12.1	< 0.005	< 0.005	0.02	12.2
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	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	2.00	2.00	< 0.005	< 0.005	< 0.005	2.02
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. 150 Workday Equipment (2024) - 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	0.03	0.02	0.02	0.31	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	77.4	77.4	< 0.005	< 0.005	0.28	78.6
Vendor	0.05	0.01	0.47	0.28	< 0.005	< 0.005	0.08	0.08	< 0.005	0.02	0.02	—	307	307	0.03	0.04	0.75	322
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	0.02	0.02	0.02	0.28	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	73.1	73.1	< 0.005	< 0.005	0.01	74.0
Vendor	0.05	0.01	0.49	0.29	< 0.005	< 0.005	0.08	0.08	< 0.005	0.02	0.02	—	307	307	0.03	0.04	0.02	321
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	< 0.005	< 0.005	< 0.005	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	14.6	14.6	< 0.005	< 0.005	0.02	14.8
Vendor	0.01	< 0.005	0.10	0.06	< 0.005	< 0.005	0.01	0.02	< 0.005	< 0.005	< 0.005	—	61.4	61.4	0.01	0.01	0.06	64.2
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	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	2.42	2.42	< 0.005	< 0.005	< 0.005	2.46
Vendor	< 0.005	< 0.005	0.02	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	10.2	10.2	< 0.005	< 0.005	0.01	10.6
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

3.9. 150 Workday Equipment (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)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
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	0.02	0.02	0.02	0.28	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	75.7	75.7	< 0.005	< 0.005	0.25	76.1

Vendor	0.04	0.01	0.44	0.27	< 0.005	< 0.005	0.08	0.08	< 0.005	0.02	0.02	—	302	302	0.03	0.04	0.75	316
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	0.02	0.02	0.02	0.26	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	71.5	71.5	< 0.005	< 0.005	0.01	72.4
Vendor	0.04	0.01	0.46	0.28	< 0.005	< 0.005	0.08	0.08	< 0.005	0.02	0.02	—	302	302	0.03	0.04	0.02	315
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	< 0.005	< 0.005	< 0.005	0.05	0.00	0.00	0.02	0.02	0.00	< 0.005	< 0.005	—	15.2	15.2	< 0.005	< 0.005	0.02	15.4
Vendor	0.01	< 0.005	0.10	0.06	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	0.01	—	63.8	63.8	0.01	0.01	0.07	66.7
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	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	2.51	2.51	< 0.005	< 0.005	< 0.005	2.54
Vendor	< 0.005	< 0.005	0.02	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	10.6	10.6	< 0.005	< 0.005	0.01	11.0
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

3.11. 185 Workday Equipment (2024) - 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 Equipmen	0.09	0.08	1.45	1.56	< 0.005	0.01	—	0.01	0.01	—	0.01	—	295	295	0.01	< 0.005	—	296
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 Equipmen	0.09	0.08	1.45	1.56	< 0.005	0.01	—	0.01	0.01	—	0.01	—	295	295	0.01	< 0.005	—	296
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 Equipmen	0.04	0.03	0.61	0.66	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	124	124	0.01	< 0.005	—	124
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 Equipmen	0.01	0.01	0.11	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	20.5	20.5	< 0.005	< 0.005	—	20.5
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	0.03	0.02	0.02	0.31	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	77.4	77.4	< 0.005	< 0.005	0.28	78.6
Vendor	0.05	0.01	0.47	0.28	< 0.005	< 0.005	0.08	0.08	< 0.005	0.02	0.02	—	307	307	0.03	0.04	0.75	322
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	0.02	0.02	0.02	0.28	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	73.1	73.1	< 0.005	< 0.005	0.01	74.0
Vendor	0.05	0.01	0.49	0.29	< 0.005	< 0.005	0.08	0.08	< 0.005	0.02	0.02	—	307	307	0.03	0.04	0.02	321
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	0.01	0.01	0.01	0.11	0.00	0.00	0.03	0.03	0.00	0.01	0.01	—	30.7	30.7	< 0.005	< 0.005	0.05	31.1
Vendor	0.02	0.01	0.20	0.12	< 0.005	< 0.005	0.03	0.03	< 0.005	0.01	0.01	—	129	129	0.01	0.02	0.14	135
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	< 0.005	< 0.005	< 0.005	0.02	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	5.08	5.08	< 0.005	< 0.005	0.01	5.15
Vendor	< 0.005	< 0.005	0.04	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	21.3	21.3	< 0.005	< 0.005	0.02	22.3
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

3.13. 185 Workday Equipment (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 Equipmen	0.09	0.08	1.45	1.55	< 0.005	0.01	—	0.01	0.01	—	0.01	—	295	295	0.01	< 0.005	—	296
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 Equipmen	0.01	0.01	0.13	0.14	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	26.0	26.0	< 0.005	< 0.005	—	26.1
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 Equipmen	< 0.005	< 0.005	0.02	0.02	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	4.30	4.30	< 0.005	< 0.005	—	4.32

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	0.02	0.02	0.02	0.26	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	71.5	71.5	< 0.005	< 0.005	0.01	72.4
Vendor	0.04	0.01	0.46	0.28	< 0.005	< 0.005	0.08	0.08	< 0.005	0.02	0.02	—	302	302	0.03	0.04	0.02	315
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	< 0.005	< 0.005	< 0.005	0.02	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	6.32	6.32	< 0.005	< 0.005	0.01	6.40
Vendor	< 0.005	< 0.005	0.04	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	26.6	26.6	< 0.005	< 0.005	0.03	27.8
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	< 0.005	< 0.005	< 0.005	< 0.005	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.05	1.05	< 0.005	< 0.005	< 0.005	1.06
Vendor	< 0.005	< 0.005	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	4.40	4.40	< 0.005	< 0.005	< 0.005	4.60
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

3.15. 250 Workday Equipment (2024) - 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 Equipmen	2.20	1.85	18.2	14.7	0.02	0.81	—	0.81	0.74	—	0.74	—	2,411	2,411	0.10	0.02	—	2,420
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 Equipmen	2.20	1.85	18.2	14.7	0.02	0.81	—	0.81	0.74	—	0.74	—	2,411	2,411	0.10	0.02	—	2,420
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 Equipmen	1.32	1.11	10.9	8.82	0.01	0.48	—	0.48	0.45	—	0.45	—	1,444	1,444	0.06	0.01	—	1,449
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 Equipmen	0.24	0.20	1.99	1.61	< 0.005	0.09	—	0.09	0.08	—	0.08	—	239	239	0.01	< 0.005	—	240
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	0.03	0.02	0.02	0.31	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	77.4	77.4	< 0.005	< 0.005	0.28	78.6
Vendor	0.05	0.01	0.47	0.28	< 0.005	< 0.005	0.08	0.08	< 0.005	0.02	0.02	—	307	307	0.03	0.04	0.75	322
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	0.02	0.02	0.02	0.28	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	73.1	73.1	< 0.005	< 0.005	0.01	74.0

Vendor	0.05	0.01	0.49	0.29	< 0.005	< 0.005	0.08	0.08	< 0.005	0.02	0.02	—	307	307	0.03	0.04	0.02	321
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	0.01	0.01	0.01	0.16	0.00	0.00	0.04	0.04	0.00	0.01	0.01	—	43.9	43.9	< 0.005	< 0.005	0.07	44.5
Vendor	0.03	0.01	0.29	0.17	< 0.005	< 0.005	0.04	0.05	< 0.005	0.01	0.01	—	184	184	0.02	0.03	0.19	193
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	< 0.005	< 0.005	< 0.005	0.03	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	7.27	7.27	< 0.005	< 0.005	0.01	7.37
Vendor	< 0.005	< 0.005	0.05	0.03	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	30.5	30.5	< 0.005	< 0.005	0.03	31.9
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

3.17. 250 Workday Equipment (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 Equipmen	2.00	1.68	15.9	13.1	0.02	0.70	—	0.70	0.64	—	0.64	—	2,411	2,411	0.10	0.02	—	2,420
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 Equipmen	0.17	0.14	1.37	1.13	< 0.005	0.06	—	0.06	0.06	—	0.06	—	208	208	0.01	< 0.005	—	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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipmen	0.03	0.03	0.25	0.21	< 0.005	0.01	—	0.01	0.01	—	0.01	—	34.4	34.4	< 0.005	< 0.005	—	34.5
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	0.02	0.02	0.02	0.26	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	71.5	71.5	< 0.005	< 0.005	0.01	72.4
Vendor	0.04	0.01	0.46	0.28	< 0.005	< 0.005	0.08	0.08	< 0.005	0.02	0.02	—	302	302	0.03	0.04	0.02	315
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	< 0.005	< 0.005	< 0.005	0.02	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	6.17	6.17	< 0.005	< 0.005	0.01	6.26
Vendor	< 0.005	< 0.005	0.04	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	26.0	26.0	< 0.005	< 0.005	0.03	27.2
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	< 0.005	< 0.005	< 0.005	< 0.005	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.02	1.02	< 0.005	< 0.005	< 0.005	1.04
Vendor	< 0.005	< 0.005	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	4.30	4.30	< 0.005	< 0.005	< 0.005	4.50
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

3.19. 300 Workday Equipment (2024) - 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 Equipmen	0.53	0.45	4.82	2.58	0.01	0.20	—	0.20	0.18	—	0.18	—	807	807	0.03	0.01	—	810
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 Equipmen	0.53	0.45	4.82	2.58	0.01	0.20	—	0.20	0.18	—	0.18	—	807	807	0.03	0.01	—	810
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 Equipmen	0.38	0.32	3.45	1.85	0.01	0.14	—	0.14	0.13	—	0.13	—	578	578	0.02	< 0.005	—	580
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 Equipmen	0.07	0.06	0.63	0.34	< 0.005	0.03	—	0.03	0.02	—	0.02	—	95.7	95.7	< 0.005	< 0.005	—	96.0
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	0.03	0.02	0.02	0.31	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	77.4	77.4	< 0.005	< 0.005	0.28	78.6
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	0.02	0.02	0.02	0.28	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	73.1	73.1	< 0.005	< 0.005	0.01	74.0
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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.02	0.20	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	52.5	52.5	< 0.005	< 0.005	0.09	53.3
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	< 0.005	< 0.005	< 0.005	0.04	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	8.69	8.69	< 0.005	< 0.005	0.01	8.82
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

3.21. 300 Workday Equipment (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 Equipmen	0.49	0.41	4.24	2.35	0.01	0.18	—	0.18	0.17	—	0.17	—	807	807	0.03	0.01	—	810
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 Equipmen	0.05	0.04	0.43	0.24	< 0.005	0.02	—	0.02	0.02	—	0.02	—	82.1	82.1	< 0.005	< 0.005	—	82.4
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 Equipmen	0.01	0.01	0.08	0.04	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	13.6	13.6	< 0.005	< 0.005	—	13.6
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	0.02	0.02	0.02	0.26	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	71.5	71.5	< 0.005	< 0.005	0.01	72.4
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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.03	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	7.30	7.30	< 0.005	< 0.005	0.01	7.40
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	< 0.005	< 0.005	< 0.005	< 0.005	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	1.21	1.21	< 0.005	< 0.005	< 0.005	1.23
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

3.23. 500 Workday Equipment (2024) - 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 Equipmen	0.10	0.08	0.80	1.05	< 0.005	0.05	—	0.05	0.04	—	0.04	—	152	152	0.01	< 0.005	—	153
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 Equipmen	0.10	0.08	0.80	1.05	< 0.005	0.05	—	0.05	0.04	—	0.04	—	152	152	0.01	< 0.005	—	153
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 Equipmen	0.07	0.06	0.57	0.75	< 0.005	0.03	—	0.03	0.03	—	0.03	—	109	109	< 0.005	< 0.005	—	110
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 Equipmen	0.01	0.01	0.10	0.14	< 0.005	0.01	—	0.01	0.01	—	0.01	—	18.1	18.1	< 0.005	< 0.005	—	18.1
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	0.03	0.02	0.02	0.31	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	77.4	77.4	< 0.005	< 0.005	0.28	78.6
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	0.02	0.02	0.02	0.28	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	73.1	73.1	< 0.005	< 0.005	0.01	74.0
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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.02	0.20	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	52.5	52.5	< 0.005	< 0.005	0.09	53.3
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	< 0.005	< 0.005	< 0.005	0.04	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	8.69	8.69	< 0.005	< 0.005	0.01	8.82
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

3.25. 500 Workday Equipment (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)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipmen	0.09	0.08	0.74	1.04	< 0.005	0.04	—	0.04	0.04	—	0.04	—	152	152	0.01	< 0.005	—	153
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 Equipmen	0.09	0.08	0.74	1.04	< 0.005	0.04	—	0.04	0.04	—	0.04	—	152	152	0.01	< 0.005	—	153
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 Equipmen	0.06	0.05	0.48	0.68	< 0.005	0.03	—	0.03	0.02	—	0.02	—	99.1	99.1	< 0.005	< 0.005	—	99.4
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 Equipmen	0.01	0.01	0.09	0.12	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	16.4	16.4	< 0.005	< 0.005	—	16.5
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	0.02	0.02	0.02	0.28	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	75.7	75.7	< 0.005	< 0.005	0.25	76.1
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	0.02	0.02	0.02	0.26	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	71.5	71.5	< 0.005	< 0.005	0.01	72.4

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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.16	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	46.6	46.6	< 0.005	< 0.005	0.07	47.3
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	< 0.005	< 0.005	< 0.005	0.03	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	7.71	7.71	< 0.005	< 0.005	0.01	7.82
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

3.27. 10 Workday Equipment (2024) - 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 Equipmen	1.45	1.22	12.0	9.88	0.03	0.49	—	0.49	0.45	—	0.45	—	2,715	2,715	0.11	0.02	—	2,724
Paving	—	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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipmen	1.45	1.22	12.0	9.88	0.03	0.49	—	0.49	0.45	—	0.45	—	2,715	2,715	0.11	0.02	—	2,724
Paving	—	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	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipmen	0.04	0.03	0.33	0.27	< 0.005	0.01	—	0.01	0.01	—	0.01	—	74.4	74.4	< 0.005	< 0.005	—	74.6
Paving	—	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	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipmen	0.01	0.01	0.06	0.05	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	12.3	12.3	< 0.005	< 0.005	—	12.4
Paving	—	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)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.03	0.02	0.37	0.00	0.00	0.09	0.09	0.00	0.02	0.02	—	92.1	92.1	< 0.005	< 0.005	0.34	93.5
Vendor	0.01	< 0.005	0.08	0.05	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	51.2	51.2	0.01	0.01	0.13	53.7
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	0.03	0.03	0.03	0.33	0.00	0.00	0.09	0.09	0.00	0.02	0.02	—	87.0	87.0	< 0.005	< 0.005	0.01	88.1
Vendor	0.01	< 0.005	0.08	0.05	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	51.2	51.2	0.01	0.01	< 0.005	53.6
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	< 0.005	< 0.005	< 0.005	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	2.39	2.39	< 0.005	< 0.005	< 0.005	2.42
Vendor	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	1.40	1.40	< 0.005	< 0.005	< 0.005	1.47

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	< 0.005	< 0.005	< 0.005	< 0.005	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	0.40	0.40	< 0.005	< 0.005	< 0.005	0.40
Vendor	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	0.23	0.23	< 0.005	< 0.005	< 0.005	0.24
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

4.10. 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	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Sequest	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
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
30 Workday Equipment	Demolition	1/13/2024	2/23/2024	5.00	30.0	—
90 Workday Equipment	Site Preparation	5/18/2024	9/20/2024	5.00	90.0	—
60 Workday Equipment	Building Construction	2/24/2024	5/17/2024	5.00	60.0	—
150 Workday Equipment	Building Construction	9/21/2024	4/18/2025	5.00	150	—
185 Workday Equipment	Building Construction	6/1/2024	2/14/2025	5.00	185	—
250 Workday Equipment	Building Construction	3/1/2024	2/13/2025	5.00	250	—
300 Workday Equipment	Building Construction	1/1/2024	2/21/2025	5.00	300	—

500 Workday Equipment	Building Construction	1/1/2024	11/28/2025	5.00	500	—
10 Workday Equipment	Paving	9/21/2024	10/4/2024	5.00	10.0	—

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
30 Workday Equipment	Welders	Diesel	Average	1.00	8.00	46.0	0.45
90 Workday Equipment	Tractors/Loaders/Backhoes	Diesel	Average	2.00	7.00	84.0	0.37
60 Workday Equipment	Dumpers/Tenders	Diesel	Average	4.00	8.00	16.0	0.38
185 Workday Equipment	Aerial Lifts	Diesel	Average	2.00	8.00	46.0	0.31
250 Workday Equipment	Rubber Tired Dozers	Diesel	Average	2.00	7.00	367	0.40
300 Workday Equipment	Cranes	Diesel	Average	1.00	8.00	299	0.29
500 Workday Equipment	Forklifts	Diesel	Average	1.00	8.00	82.0	0.20
10 Workday Equipment	Pavers	Diesel	Average	1.00	6.00	81.0	0.42
10 Workday Equipment	Rollers	Diesel	Average	1.00	5.00	36.0	0.38
10 Workday Equipment	Scrapers	Diesel	Average	1.00	8.00	423	0.48
10 Workday Equipment	Cranes	Diesel	Average	1.00	4.00	367	0.29

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
30 Workday Equipment	—	—	—	—

30 Workday Equipment	Worker	2.50	12.8	LDA,LDT1,LDT2
30 Workday Equipment	Vendor	—	7.30	HHDT,MHDT
30 Workday Equipment	Hauling	12.6	20.0	HHDT
30 Workday Equipment	Onsite truck	—	—	HHDT
90 Workday Equipment	—	—	—	—
90 Workday Equipment	Worker	5.00	12.8	LDA,LDT1,LDT2
90 Workday Equipment	Vendor	—	7.30	HHDT,MHDT
90 Workday Equipment	Hauling	5.22	20.0	HHDT
90 Workday Equipment	Onsite truck	—	—	HHDT
60 Workday Equipment	—	—	—	—
60 Workday Equipment	Worker	8.40	12.8	LDA,LDT1,LDT2
60 Workday Equipment	Vendor	0.00	7.30	HHDT,MHDT
60 Workday Equipment	Hauling	0.00	20.0	HHDT
60 Workday Equipment	Onsite truck	—	—	HHDT
150 Workday Equipment	—	—	—	—
150 Workday Equipment	Worker	8.40	12.8	LDA,LDT1,LDT2
150 Workday Equipment	Vendor	12.0	7.30	HHDT,MHDT
150 Workday Equipment	Hauling	0.00	20.0	HHDT
150 Workday Equipment	Onsite truck	—	—	HHDT
185 Workday Equipment	—	—	—	—
185 Workday Equipment	Worker	8.40	12.8	LDA,LDT1,LDT2
185 Workday Equipment	Vendor	12.0	7.30	HHDT,MHDT
185 Workday Equipment	Hauling	0.00	20.0	HHDT
185 Workday Equipment	Onsite truck	—	—	HHDT
250 Workday Equipment	—	—	—	—
250 Workday Equipment	Worker	8.40	12.8	LDA,LDT1,LDT2
250 Workday Equipment	Vendor	12.0	7.30	HHDT,MHDT

250 Workday Equipment	Hauling	0.00	20.0	HHDT
250 Workday Equipment	Onsite truck	—	—	HHDT
300 Workday Equipment	—	—	—	—
300 Workday Equipment	Worker	8.40	12.8	LDA,LDT1,LDT2
300 Workday Equipment	Vendor	0.00	7.30	HHDT,MHDT
300 Workday Equipment	Hauling	0.00	20.0	HHDT
300 Workday Equipment	Onsite truck	—	—	HHDT
500 Workday Equipment	—	—	—	—
500 Workday Equipment	Worker	8.40	12.8	LDA,LDT1,LDT2
500 Workday Equipment	Vendor	0.00	7.30	HHDT,MHDT
500 Workday Equipment	Hauling	0.00	20.0	HHDT
500 Workday Equipment	Onsite truck	—	—	HHDT
10 Workday Equipment	—	—	—	—
10 Workday Equipment	Worker	10.0	12.8	LDA,LDT1,LDT2
10 Workday Equipment	Vendor	2.00	7.30	HHDT,MHDT
10 Workday Equipment	Hauling	0.00	20.0	HHDT
10 Workday Equipment	Onsite truck	—	—	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 (Cubic Yards)	Material Exported (Cubic Yards)	Acres Graded (acres)	Material Demolished (Building Square Footage)	Acres Paved (acres)
30 Workday Equipment	0.00	0.00	0.00	32,798	—
90 Workday Equipment	3,760	—	0.00	0.00	—
10 Workday Equipment	0.00	0.00	0.00	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	2	61%	61%
Water Demolished Area	2	36%	36%

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
General Light Industry	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
2024	0.00	204	0.03	< 0.005
2025	0.00	204	0.03	< 0.005

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	7.10	annual days of extreme heat
Extreme Precipitation	8.60	annual days with precipitation above 20 mm
Sea Level Rise	—	meters of inundation depth
Wildfire	24.0	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	3	0	0	N/A
Sea Level Rise	1	0	0	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	N/A	N/A	N/A	N/A
Air Quality Degradation	0	0	0	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	3	1	1	3
Sea Level Rise	1	1	1	2
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	N/A	N/A	N/A	N/A
Air Quality Degradation	1	1	1	2

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	10.6
AQ-PM	22.8
AQ-DPM	45.8
Drinking Water	17.8
Lead Risk Housing	67.0
Pesticides	0.00
Toxic Releases	32.6
Traffic	77.0
Effect Indicators	—
CleanUp Sites	33.9
Groundwater	71.8
Haz Waste Facilities/Generators	47.6
Impaired Water Bodies	0.00

Solid Waste	22.1
Sensitive Population	—
Asthma	53.0
Cardio-vascular	31.0
Low Birth Weights	37.6
Socioeconomic Factor Indicators	—
Education	28.8
Housing	9.53
Linguistic	39.8
Poverty	13.5
Unemployment	2.73

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	87.47593995
Employed	99.0632619
Median HI	83.65199538
Education	—
Bachelor's or higher	65.64865905
High school enrollment	100
Preschool enrollment	21.01886308
Transportation	—
Auto Access	84.51174131
Active commuting	79.03246503
Social	—

2-parent households	93.9304504
Voting	80.85461311
Neighborhood	—
Alcohol availability	44.88643655
Park access	81.35506224
Retail density	60.64416784
Supermarket access	42.44835108
Tree canopy	91.09457205
Housing	—
Homeownership	40.39522649
Housing habitability	78.03156679
Low-inc homeowner severe housing cost burden	70.96111895
Low-inc renter severe housing cost burden	89.18259977
Uncrowded housing	49.60862312
Health Outcomes	—
Insured adults	84.53740536
Arthritis	0.0
Asthma ER Admissions	46.9
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	63.6
Cognitively Disabled	66.4
Physically Disabled	52.4

Heart Attack ER Admissions	76.6
Mental Health Not Good	0.0
Chronic Kidney Disease	0.0
Obesity	0.0
Pedestrian Injuries	84.0
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	0.0
SLR Inundation Area	0.0
Children	67.0
Elderly	29.3
English Speaking	43.3
Foreign-born	52.2
Outdoor Workers	39.7
Climate Change Adaptive Capacity	—
Impervious Surface Cover	51.2
Traffic Density	62.5
Traffic Access	61.6
Other Indices	—
Hardship	18.3
Other Decision Support	—
2016 Voting	74.7

7.3. Overall Health & Equity Scores

Metric	Result for Project Census Tract
CalEnviroScreen 4.0 Score for Project Location (a)	20.0
Healthy Places Index Score for Project Location (b)	90.0
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	—
Construction: Construction Phases	Updated construction phasing based on data request response received 1/2/2024.
Construction: Off-Road Equipment	Updated construction equipment based on data request response received 1/2/24.
Construction: Trips and VMT	Updated daily trips based on data request response received 1/2/24.

Appendix B: Health Risk Assessment Memo

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2055 JUNCTION AVENUE, STE. 205
SAN JOSE, CA 95131
650.327.0429
WWW.MIGCOM.COM

Memo

To: Dalia Manaois, City of San Bruno, 567 El Camino Real, San Bruno, CA 94066

CC: --

From: Chris Dugan and William Deeman

Date: January 25, 2024

SUBJECT: Cunningham Water Tank Replacement Project Construction Health Risk Assessment

This memorandum describes the methodology and results of the construction health risk assessment (HRA) prepared for the proposed Cunningham Way Water Tank Project (proposed project) in the City of San Bruno, California. As explained in this memorandum, the proposed project would not result in risks that exceed the Bay Area Air Quality District's (BAAQMD) recommended significance threshold of 10 excess cancers per million population with the incorporation of mitigation that requires mobile construction equipment over 50 horsepower to meet Tier IV final exhaust emissions standards established by the United States Environmental Protection Agency (U.S. EPA) and California Air Resources Board (CARB).

Construction Exhaust $PM_{2.5}$ Modeling Methodology

Construction activities associated with the proposed project would generate on- and off-site exhaust emissions, including diesel particulate matter (DPM), in the form of $PM_{2.5}$. The specific quantity of emissions emitted at any given time would be dependent on the type and number of pieces of equipment operating, the equipment's engine classification, the equipment's horsepower, and the load the engine is under. Off-site emissions would be generated from haul trucks used to transport soil and construction debris to and from the site.

The U.S. EPA's AERMOD dispersion model (version 21112) was used to predict pollutant concentrations at existing sensitive receptors near the project site. The AERMOD dispersion model is an EPA-approved and BAAQMD-recommended model for simulating the dispersion of pollutant emissions and estimating ground level concentrations of pollutants at specified receptor locations. AERMOD requires the user to input information on the source(s) of pollutants being modeled, the receptors where pollutant concentrations are modeled, and the meteorology, terrain, and other factors that affect the potential dispersion of pollutants. These variables are described below.

Modeled Construction Sources / Emission Rates

On- and off-site construction emissions were modeled as a series of area and line area sources, as shown in Table 1 and Figure 1.

Table 1: AERMOD Source Parameters				
Source ID	**Source Description**	**UTM Coordinates(A)**		**Size (m^2)**
		X	**Y**	
PAREA01	Construction Equipment on the Project Site During Year 1	550922.44	4163365.70	1,718.7
PAREA02	Construction Equipment on the Project Site During Year 2	550922.44	4163365.70	1,718.7
ARLN01	Hauling Truck Trips Along Access Road During Year 1	550919.22	4163367.57	127.3(B)
ARLN02	Hauling Truck Trips Along Cunningham Way During Year 1	550862.72	4163578.38	360.5(B)
ARLN03	Hauling Truck Trips Along Access Road During Year 2	550919.22	4163367.57	127.3(B)
ARLN04	Hauling Truck Trips Along Cunningham Way During Year 2	550862.72	4163578.38	360.5(B)

(A) UTM coordinates represent the southwest corner of the source.
(B) Reflects length of line area source in meters.

Consistent with BAAQMD-recommendations, $PM_{2.5}$ construction exhaust emissions were presumed to be 100 percent DPM; $PM_{2.5}$ fugitive dust emissions were not modeled to determine total combined $PM_{2.5}$ exposure pursuant to BAAQMD CEQA Guidelines and guidance provided by staff of the BAAQMD's Planning and Climate Protection Division (BAAQMD 2017 and 2018). An emissions rate for each source listed in Table 1 was derived from the CalEEMod emissions estimates shown in Appendix A. The annual emissions generated during construction of the proposed project were converted to an average emission rate in terms of grams / second averaged annually over the duration of construction activity.[1]

On-site DPM emissions were modeled as a series of polygon area sources. Two area sources were modeled for the construction activity area, which reflect construction activities occurring at the project site during Year 1 and Year 2, respectively. The Sacramento Metro Air Quality Management District (SMAQMD) recommends a release height of 5 meters for construction equipment. Since the BAAQMD does not have a recommended release height for $PM_{2.5}$ exhaust emissions generated by construction equipment, the SMAQMD's release heights have been used instead (SMAQMD 2013). Two percent of the CalEEMod estimated off-site emissions were added to each polygon area source in order to account for any on-site truck idling during construction activity.

Off-site DPM emissions from vehicles were modeled as a line area source. All haul trips entering and exiting the project area were assumed to travel on Cunningham Way via the access road. Hauling and vendor trips were modeled as area line sources, with a release height of 4.15 meters, the approximate height of a truck exhaust.

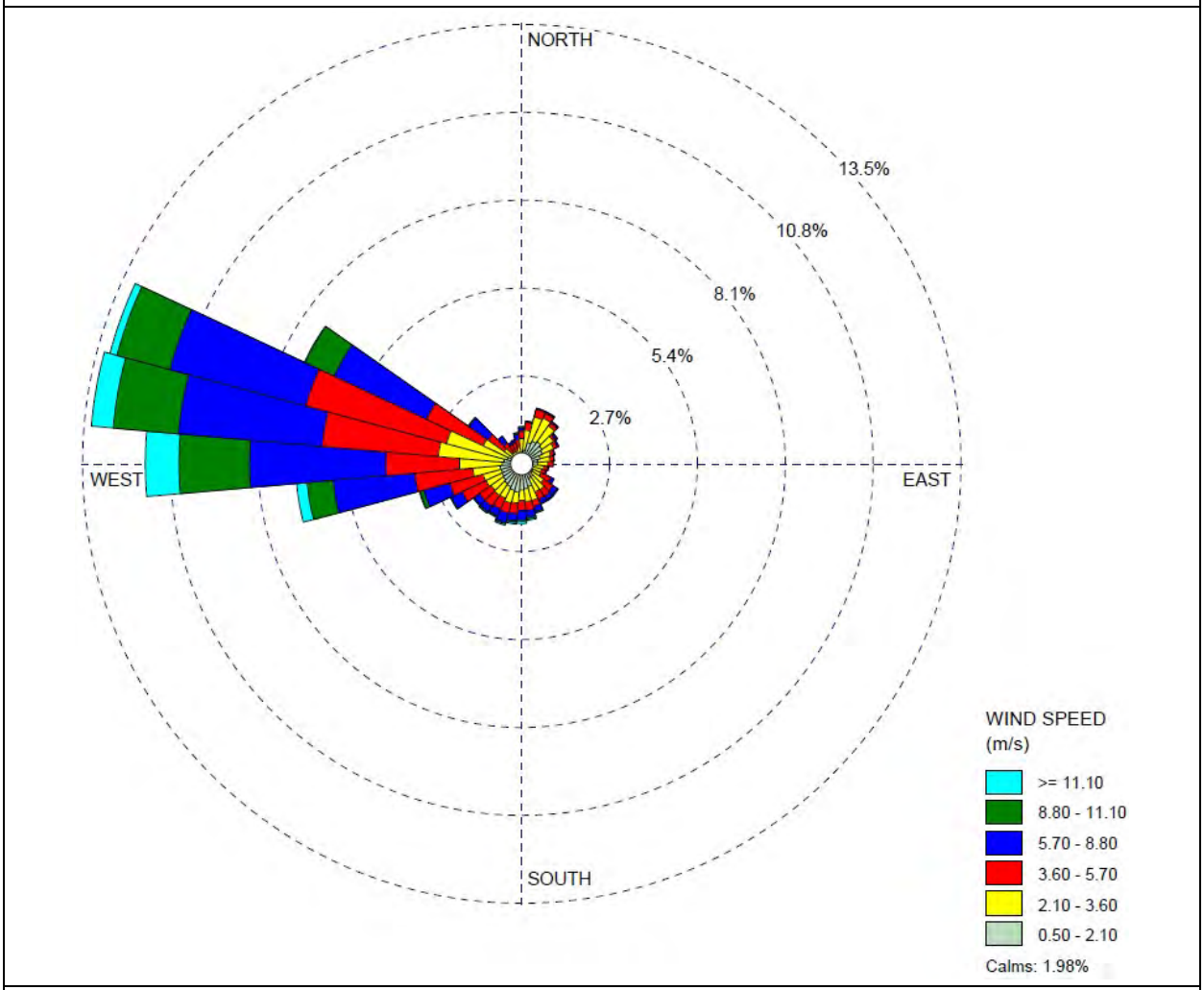
[1]The average emissions rate is based on 500 active construction days, with construction emissions occurring 7:00 AM to 10:00 PM, seven days a week.

Figure 1: Modeled Construction Emissions Sources

Meteorological Data Inputs

AERMOD requires meteorological data as an input into the model. The meteorological data is processed using AERMET, a pre-processor to AERMOD. AERMET requires surface meteorological data, upper air meteorological data, and surface parameter data such as albedo (reflectivity) and surface roughness. For the proposed project, pre-processed surface data was obtained from BAAQMD for San Francisco International Airport, the closest meteorological station to the project site (see Figure 2). Five complete years of meteorological data from January 2013 to December 2017 were utilized. The meteorological data was processed using AERMET version 18081.

Figure 2: Wind Rose for San Francisco International Airport



Source: BAAQMD 2022

Modeled Receptors

A 50 by 50-meter coarse receptor grid, totaling 1,000 meters by 1,000 meters, was centered on 550919.77 meters east and 4163417.00 meters north. A 25 by 25-meter fine receptor grid, 250 meters by 250 meters, was centered on 551082.91 meters east and 4163344.30 meters north. The coarse and fine grids were converted to 441 and 121 discrete Cartesian receptors, respectively, totaling 562 receptors. An additional 15 discrete receptors were added along the plant boundary area. The converted grid receptors and plant boundary receptors yielded a total

of 577 discrete modeled receptors. All modeled receptors were assigned a flagpole breathing height of 1.5 meters above ground surface, consistent with BAAQMD guidance.

Terrain Inputs

Terrain was incorporated by using AERMAP (an AERMOD pre-processor) to import the elevation of the project site, sources, and receptors using data from the National Elevation Dataset (NED) with a resolution of 1/3 arcsecond.

Health Risk Analysis Methodology

Cancer risk and non-cancer health risks to sensitive receptors within one-half mile of on-site sources were estimated using the U.S. EPA's AERMOD dispersion model and recommendations contained in the BAAQMD's *Health Risks Assessment Modeling Protocol,* as well as the OEHHA *Air Toxics Hot Spots Program Guidance Manual*.

Cancer Risk

Cancer risk is the calculated, pollutant-specific estimated probability of developing cancer based upon the dose and exposure to the toxic air contaminants (TAC). Cancer risk is determined by calculating the combinatory effects of the cancer potency factor (CPF) when inhaling the toxic, the daily inhalation dose, the age group the receptor is cohort to, the duration of exposure over a lifetime (70 years), and other factors such as age sensitivity and the amount of time spent at the location of exposure. Risks were assessed for the inhalation pathway (i.e., breathing) for residential receptors. Cancer risk equations for residential receptors are summarized in Tables 2 and 3.

Receptor exposure to potential construction emissions was assessed for the one year in which construction activities would take place and the receptors would be exposed to construction $PM_{2.5}$ emissions. The exposure time is consistent with the construction schedule described in the Air Quality Chapter (4.2) of the Administrative Draft Environmental Impact Report (ADEIR) prepared for the project (MIG 2023).

Table 2: Cancer Risk Equations	
Residential/Student Risk:	$RISK_{INH.RES} = DOSE_{AIR.RES} \times CPF \times ASF \times \frac{ED}{AT} \times FAH$
Where:	
$DOSE_{AIR}$ =	Daily Inhalation Dose (mg/kg-day). See Table A2-3.
CPF =	Cancer Potency Factor for Inhalants (mg/kg-day). CPF is expressed as the 95th percent upper confidence limit of the slope of the dose response curve under continuous lifetime exposure conditions. The CPF for diesel exhaust is 1.1 mg/kg-day.
ASF =	Age Sensitivity Factor. ASF is a protective coefficient intended to take into account increased susceptibility to long-term health effects from early-life exposure to TACs. The recommended ASFs are 10 for the third-trimester to birth and two-year age bins, three for the two-year to nine-year and 16-year age bins, and one for receptors over 16 years of age.
ED =	Exposure Duration (years). Exposure duration characterizes the length of residency (30 Years) or employment (25 Years) of the receptor.
AT =	Averaging Time (years). A 70-year (lifetime) averaging time is used to characterize to total risk as a factor of average risk over a typical lifespan.
FAH =	Fraction at Home. FAH is the percentage of time the receptor is physically at the receptor location. *Residential Receptors* Consistent with BAAQMD and OEHHA recommendations, the FAH was set to 100% for each receptor age bin due to the fact that the Parkside Middle School is located within the one in a million cancer risk isopleth. *Student Receptors* The FAH for school receptors was set to 42 percent. This reflects receptors being present at the site for 10 hours per day.

Table 3: Inhalation Dose Equations	
Residential Dose	$DOSE_{AIR.RES} = C_{AIr} \times \frac{BR}{BW} \times A \times EF \times 10^{-6}$
Where:	
C_{AIR} =	Concentration of TAC in air (µg/m^3). Concentration of toxic in micrograms per one cubic meter of air. The AERMOD program is used in the study to determine concentrations of diesel particulate matter at surrounding discrete and grid receptor points.
BR/BW =	Breathing Rate ÷ Body Weight (L/kg/day). Daily breathing rate normalized to body weight. *Residential Receptors* The 95th percentile breathing rate to body weight ratios are used in this study with a recommended 361 L/kg/day for the third-trimester to birth age bin and 1,090 L/kg/day for the birth to two-years age bin. The 80th percentile breathing rate to body weight ratios are used in this study with a recommended 572 for the two-years to 16-years age bin, 261 L/kg/day for the 16-years to 30-years age bin, and 233 L/kg/day for the 16-years to 70-years age bin. *Student Receptors* Consistent with OEHHA guidance, the daily breathing rate to body weight ratios were set to 361 for the third-trimester to birth age bin, 1090 for the birth to two-years age bin, and 640 for the two-years to nine-years age bin.
A =	Inhalation Absorption Factor. Is a coefficient that reflects the fraction of chemical absorbed in studies used in the development of CPF and Reference Exposure Levels (RELs). An absorption factor of one is recommended for all chemicals.
EF =	Exposure Frequency. EF is the ratio of days in a year that a receptor is receiving the dose. *Residential Receptor* The recommended EF is 0.96 characterizing an assumed 350 days a year that a residential receptor is home for some portion of the day. *Student Receptor* The EF for student receptors was set to 0.71. This reflects student receptors would be at the site 260 days per year.

Non-Cancer Risk

The chronic non-cancer hazard quotient is the calculated pollutant-specific indicator for risk of developing an adverse health effect on specific organ system(s) targeted by the identified TAC, in this case DPM. The potential for exposure to result in chronic non-cancer effects is evaluated by comparing the estimated annual average air concentration to the chemical-specific, non-cancer chronic reference exposure levels (RELs). The REL is a concentration below which there is assumed to be no observable adverse health impact to a target organ system. When calculated for a single chemical, the comparison yields a ratio termed a hazard quotient. To evaluate the potential for adverse chronic non-cancer health effects from simultaneous exposure to multiple chemicals, the hazard quotients for all chemicals are summed, yielding a hazard index. The chronic REL for DPM was established by OEHHA as 5 µg/m^3. For an acute hazard quotient, the one-hour maximum concentration is divided by the acute REL for the substance; however, there is no acute REL for DPM.

Chronic non-cancer risks are considered significant if a project's TAC emissions result in a hazard index greater than or equal to one. Non-cancer risk equations are summarized in Table 4.

Table 4: Non-Cancer Risk Equation	
Chronic Hazard Quotient:	$HI_{DPM} = \frac{C_{DPM}}{REL_{AAC}}$
Where:	
HI_{DPM} =	Hazard Index; an expression of the potential for non-cancer health effects.
C_{DPM} =	Annual average DPM concentration (µg/m^3).
REL_{DPM} =	Reference exposure level (REL) for DPM; the DPM concentration at which no adverse health effects are anticipated.

Health Risk Assessment Results

The results of the construction HRA are presented below.

Individual Cancer Risk from Exposure to DPM

The predicted locations of the annual point of maximum impact (PMI) and the maximally exposed individual resident (MEIR) for DPM exposure during construction, along with contours of pollutant concentrations in proximity of the project site, are shown in Figure 3 for unmitigated construction emissions. The predicted unmitigated PMI is located immediately west of the project site. Since the PMI for DPM exposure is located on land that is not occupied by a receptor on a permanent basis, lifetime excess cancer risks and chronic non-cancer health hazards, which are based on exposure to annual average pollutant concentrations, were not estimated for the modeled PMI. Accordingly, health risks were assessed at the modeled MEIR location. For both years, the MEIR for DPM exposure is located at a single-family residential building at 415 Cunningham Way. The predicted unmitigated, annual average $PM_{2.5}$ concentration at the unmitigated MEIR is 0.41765 µg/m^3. The HRA for residential receptors evaluated worst-case carcinogenic and non-carcinogenic risks to child (3rd trimester, 0-2 years, and 2-16 years) and adult (16-30 years and 30-70 years) receptors.

As shown in Table 5, unmitigated construction exhaust emissions would have the potential to result in incremental cancerogenic health risk increases that are in excess of the BAAQMD's threshold of 10 excess cancers per million population. To reduce potential $PM_{2.5}$ (and DPM) emissions generated by project construction activities, the following mitigation would be incorporated into the project:

> **Mitigation Measure:** To reduce potential, short-term adverse health risks associated with $PM_{2.5}$ exhaust emissions, including emissions of DPM generated during project construction activities, the City shall require its designated contractors, contractor's representatives, and/or other appropriate personnel to comply with the following construction equipment restrictions:
>
> - All mobile construction equipment greater than 50 horsepower in size shall meet with U.S. EPA and CARB Tier IV final exhaust emission standards. This may be achieved via the use of equipment with engines that have been certified to meet U.S. EPA and CARB Tier IV final emissions standards, or through the use of equipment that has been retrofitted with a CARB-verified diesel emission control strategy (e.g., particulate filter) capable of reducing exhaust $PM_{2.5}$ emissions to levels that meet U.S. EPA and CARB Tier IV final emissions standards.
>
> As an alternative to having all mobile construction equipment greater than 50 horsepower meet U.S. EPA and CARB Tier IV final exhaust emission standards, the Applicant may prepare and submit a refined construction health risk assessment to the City once additional project-specific construction information is known (e.g., specific construction equipment type, quantity, engine tier, and runtime by phase). The refined

health risk assessment shall demonstrate and identify any measures necessary such that the proposed project's incremental carcinogenic health risk at nearby sensitive receptor locations is below the applicable BAAQMD threshold of 10 cancers in a million.

The above mitigation measure requires all mobile diesel construction equipment greater than 50 horsepower meet U.S. EPA and CARB Tier IV final emission standards. This measure is estimated to reduce construction related $PM_{2.5}$ emissions by approximately 90%, thus rendering the Project's potential adverse health risks from construction activities a less than significant impact. Table 5 summarizes the project's mitigated construction health risk estimates. The predicted locations of the PMI and the MEIR for total DPM exposure during construction, along with contours of pollutant concentrations in proximity of the project site, are shown in Figure 4 for mitigated construction emissions.

Table 5: Maximum Increased Cancer Risk from Project Construction DPM Emissions

Receptor Age Range(A)	**Health Risk Increase at MEIR (Excess Cancer Risk per Million Population)**	
	415 Cunningham Way	
	Unmitigated	**Mitigated**
Child Receptor (3rd Trimester)	67.1	6.3
Child Receptor (0-2 Years of Age)	78.6	7.4
Child Receptor (2 -16 Years of Age)	12.4	1.2
Adult Receptor (16 to 30 Years of Age)	1.9	0.2
Adult Receptor (30 to 70 Years of Age)	1.7	0.2
BAAQMD Significance Threshold	10	10
Threshold Exceeded?	**Yes**	**No**

Source: MIG, 2024

(A) Excess cancer risk estimate assumes the receptor is in the infant stage at the beginning of exposure and proceeds to child and adult stages over time.

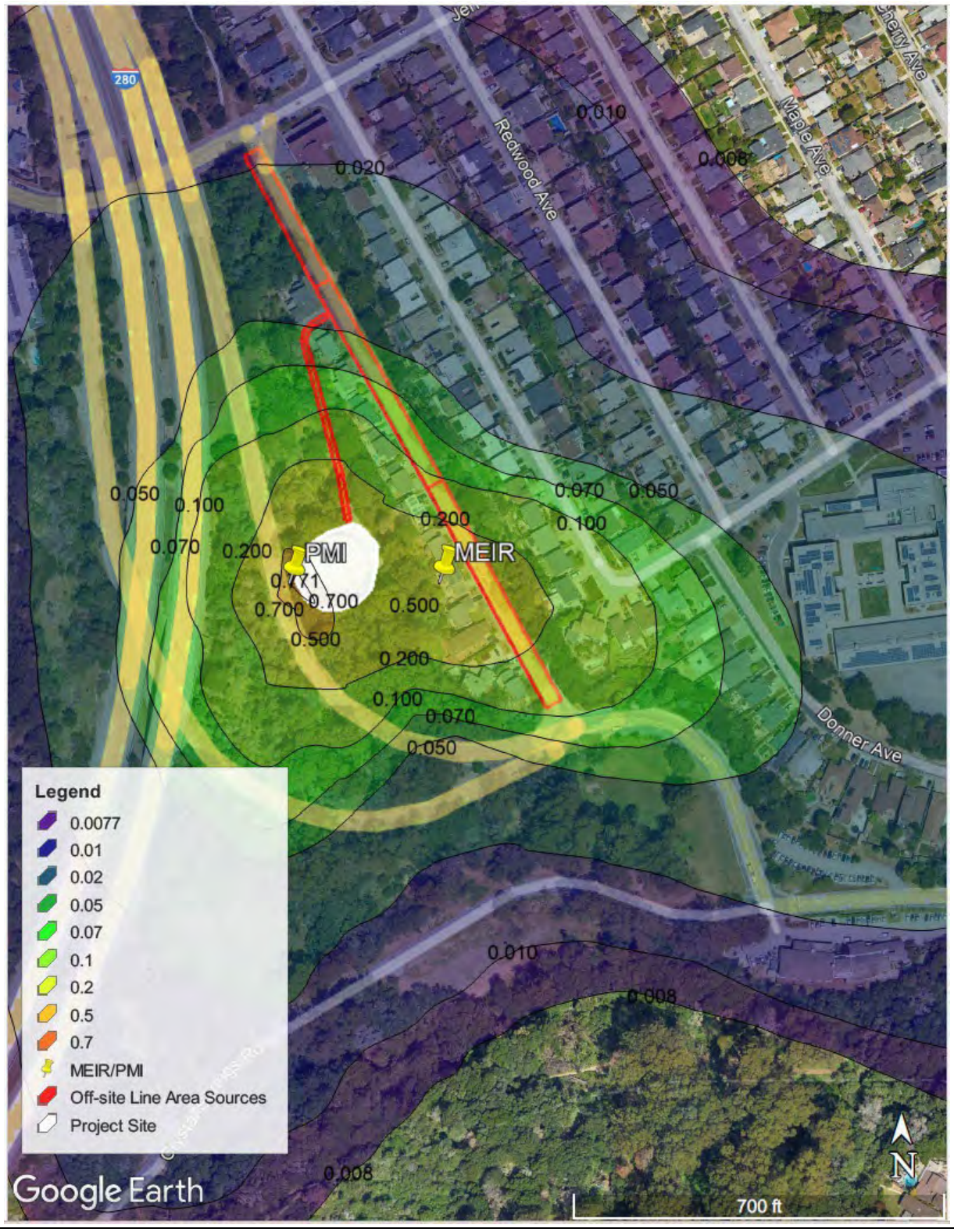
As shown in Table 5, the maximum mitigated health risk for the mitigated MEIR location would be approximately 7.4 excess cancers in a million, which does not exceed the BAAQMD cancer risk threshold of 10 in a million.

Maximum unmitigated health risks for student receptors would be approximately 3.1 excess cancers in a million, which does not exceed the BAAQMD cancer risk threshold of 10 in a million.

Non-Cancer Risk

The maximum annual average DPM concentration at the MEIR location under unmitigated and mitigated conditions would be approximately 0.41765 µg/m^3 and 0.04001 µg/m^3, respectively. All other receptors would be exposed to annual average concentrations below these values. Based on the chronic inhalation REL for DPM (5 µg/m^3), the calculated chronic hazard quotient during the maximum exposure to DPM concentration would be 0.084 (unmitigated) and 0.008 (mitigated), which is below the BAAQMD's non-cancer hazard index threshold value of 1.0. This impact would be less than significant.

Figure 3: Construction Health Risk Assessment – Year 1 Unmitigated DPM Concentrations (µg/m^3)



Note: Concentrations for Year 1 of construction are presented as Year 1 has the highest emissions during the construction period.

Figure 4: Construction Health Risk Assessment – Year 1 Mitigated DPM Concentrations (µg/m³)

Note: Concentrations for Year 1 of construction are presented as Year 1 has the highest emissions during the construction period.

Conclusion

As described in this memo, the proposed project would not exceed the applicable BAAQMD-recommended CEQA thresholds of significance for cancer risk or non-cancer risk with the incorporation of mitigation that requires mobile construction equipment over 50 hp to meet U.S. EPA and CARB Tier IV interim exhaust emissions standards.

References

The following references were used to prepare this memorandum:

Bay Area Air Quality Management District (BAAQMD) 2017. California Environmental Quality Air Quality Guidelines. 2017. https://www.baaqmd.gov/~/media/files/planning-and-research/ceqa/ceqa_guidelines_may2017-pdf.pdf?la=en

_____2022. AEMOD-Ready Meteorological Data. Last updated November 15, 2022. Available online at: https://www.baaqmd.gov/plans-and-climate/california-environmental-quality-act-ceqa/ceqa-tools/ceqa-modeling-data

Office of Environmental Health Hazard Assessment (OEHHA) 2015. *Air Toxics Hot Spots Program Guidance Manual*. Sacramento, CA. February 2015.

Sacramento Metro Air Quality Management District (SMAQMD) 2013. "CEQA Guide". Chapter 3. Dispersion Modeling of Construction-Generated PM_{10} Emissions. Revised July 2013. Web. http://www.airquality.org/LandUseTransportation/Documents/Ch3PMDispersionModelingGuidanceFINAL7-2013.pdf

Attachment 1: AERMOD Unmitigated Output Summary

```
 *** AERMOD - VERSION 23132  ***   *** C:\Lakes
\Cunningham_Way_Water_Tank_San_Bruno\Cunningham_Way_Water_Ta ***
01/22/24
 *** AERMET - VERSION  18081 ***   ***
***        13:51:08

PAGE   1
 *** MODELOPTs:    RegDFAULT  CONC  ELEV  FLGPOL  URBAN  ADJ_U*

                                              ***     MODEL SETUP
OPTIONS SUMMARY       ***
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 ** Model Options Selected:
      * Model Uses Regulatory DEFAULT Options
      * Model Is Setup For Calculation of Average CONCentration
Values.
      * NO GAS DEPOSITION Data Provided.
      * NO PARTICLE DEPOSITION Data Provided.
      * Model Uses NO DRY DEPLETION. DDPLETE  =  F
      * Model Uses NO WET DEPLETION. WETDPLT  =  F
      * Stack-tip Downwash.
      * Model Accounts for ELEVated Terrain Effects.
      * Use Calms Processing Routine.
      * Use Missing Data Processing Routine.
      * No Exponential Decay.
      * Model Uses URBAN Dispersion Algorithm for the SBL for
26 Source(s),
        for Total of    1 Urban Area(s):
   Urban Population =     43893.0 ;  Urban Roughness Length =
1.000 m
      * Urban Roughness Length of 1.0 Meter Used.
      * ADJ_U*   - Use ADJ_U* option for SBL in AERMET
      * CCVR_Sub - Meteorological data includes CCVR
substitutions
      * TEMP_Sub - Meteorological data includes TEMP
substitutions
      * Model Accepts FLAGPOLE Receptor . Heights.
      * The User Specified a Pollutant Type of: PM_2.5

 **Model Calculates PERIOD Averages Only

 **This Run Includes:     26 Source(s);       6 Source Group(s);
and     577 Receptor(s)

                with:      0 POINT(s), including
                           0 POINTCAP(s) and      0 POINTHOR(s)
                 and:      0 VOLUME source(s)
                 and:     26 AREA type source(s)
                 and:      0 LINE source(s)
                 and:      0 RLINE/RLINEXT source(s)
```

```
                 and:      0 OPENPIT source(s)
                 and:      0 BUOYANT LINE source(s) with a total
of     0 line(s)
                 and:      0 SWPOINT source(s)


 **Model Set To Continue RUNning After the Setup Testing.

 **The AERMET Input Meteorological Data Version Date:  18081

 **Output Options Selected:
          Model Outputs Tables of PERIOD Averages by Receptor
          Model Outputs External File(s) of High Values for
Plotting (PLOTFILE Keyword)
          Model Outputs Separate Summary File of High Ranked
Values (SUMMFILE Keyword)

 **NOTE:  The Following Flags May Appear Following CONC Values:
c for Calm Hours

m for Missing Hours

b for Both Calm and Missing Hours

 **Misc. Inputs:  Base Elev. for Pot. Temp. Profile (m MSL) =
2.40 ;  Decay Coef. =    0.000     ;  Rot. Angle =     0.0
                 Emission Units =
GRAMS/SEC                                ;  Emission Rate Unit
Factor =   0.10000E+07
                 Output Units   = MICROGRAMS/M**3

 **Approximate Storage Requirements of Model =      3.7 MB of
RAM.

 **Input Runstream File:          aermod.inp
 **Output Print File:             aermod.out

 **Detailed Error/Message File:
Cunningham_Way_Water_Tank_San_Bruno.err
 **File for Summary of Results:
Cunningham_Way_Water_Tank_San_Bruno.sum
```

```
 *** AERMOD - VERSION 23132  ***   *** C:\Lakes
\Cunningham_Way_Water_Tank_San_Bruno\Cunningham_Way_Water_Ta ***
01/22/24
 *** AERMET - VERSION  18081 ***   ***
***       13:51:08

PAGE   2
 *** MODELOPTs:    RegDFAULT  CONC  ELEV  FLGPOL  URBAN  ADJ_U*

                                            *** METEOROLOGICAL
DAYS SELECTED FOR PROCESSING ***
                                                                 (1
=YES; 0=NO)

            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1  1 1 1 1 1

                NOTE:  METEOROLOGICAL DATA ACTUALLY PROCESSED
WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.



                                  *** UPPER BOUND OF FIRST
THROUGH FIFTH WIND SPEED CATEGORIES ***

(METERS/SEC)

                                                 1.54,   3.09,
5.14,   8.23,  10.80,
```

*** MODELOPTs: RegDFAULT CONC ELEV FLGPOL URBAN ADJ_U*

*** UP TO THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

Surface file: datC690.tmp
Met Version: 18081
Profile file: datC6A0.tmp
Surface format: FREE
Profile format: FREE
Surface station no.: 23234 Upper air station no.: 23230
Name: SAN_FRANCISCO/INT'L_ARPT Name: OAKLAND/WSO_AP
Year: 2013 Year: 2013

First 24 hours of scalar data

YR	MO	DY	JDY	HR	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	WD	HT	REF TA	HT
13	01	01	1	01	-2.1	0.066	-9.000	-9.000	-999.	41.	12.3	0.04	0.49	1.00	0.83	164.	10.0	279.9	2.0
13	01	01	1	02	-10.6	0.137	-9.000	-9.000	-999.	121.	22.0	0.06	0.49	1.00	1.94	280.	10.0	280.4	2.0
13	01	01	1	03	-20.6	0.202	-9.000	-9.000	-999.	217.	44.7	0.04	0.49	1.00	2.93	142.	10.0	280.4	2.0
13	01	01	1	04	-9.7	0.129	-9.000	-9.000	-999.	113.	20.4	0.04	0.49	1.00	1.94	153.	10.0	280.4	2.0
13	01	01	1	05	-6.8	0.096	-9.000	-9.000	-999.	71.	11.7	0.00	0.49	1.00	2.44	50.	10.0	280.9	2.0
13	01	01	1	06	-15.5	0.152	-9.000	-9.000	-999.	143.	25.5	0.00	0.49	1.00	3.76	69.	10.0	280.9	2.0
13	01	01	1	07	-17.4	0.171	-9.000	-9.000	-999.	169.	32.0	0.00	0.49	1.00	4.19	47.	10.0	280.9	2.0
13	01	01	1	08	-17.0	0.166	-9.000	-9.000	-999.	163.	30.5	0.00	0.49	1.00	4.09	56.	10.0	280.9	2.0
13	01	01	1	09	2.9	0.227	0.145	0.005	38.	259.	-363.0	0.00	0.49	0.37	5.17	57.	10.0	280.4	2.0
13	01	01	1	10	35.3	0.193	0.464	0.005	103.	204.	-18.6	0.00	0.49	0.24	4.05	62.	10.0	281.4	2.0
13	01	01	1	11	60.1	0.191	0.715	0.005	222.	200.	-10.6	0.00	0.49	0.19	3.88	95.	10.0	280.9	2.0
13	01	01	1	12	74.4	0.135	1.009	0.005	504.	120.	-3.0								

```
0.00   0.49   0.18    2.50   79.   10.0  282.5    2.0
 13 01 01   1 13   77.1  0.258  1.185  0.008  788.  315.    -20.4
0.00   0.49   0.17    5.44   36.   10.0  283.8    2.0
 13 01 01   1 14   68.1  0.339  1.184  0.008  890.  474.    -52.3
0.00   0.49   0.18    7.43   31.   10.0  284.2    2.0
 13 01 01   1 15   43.7  0.334  1.027  0.008  904.  463.    -77.5
0.00   0.49   0.21    7.40   43.   10.0  284.2    2.0
 13 01 01   1 16   17.9  0.267  0.765  0.007  910.  333.    -96.3
0.00   0.49   0.29    5.95   40.   10.0  284.9    2.0
 13 01 01   1 17  -21.8  0.285 -9.000 -9.000 -999.  366.     97.2
0.00   0.49   0.53    6.82   38.   10.0  284.2    2.0
 13 01 01   1 18  -22.4  0.222 -9.000 -9.000 -999.  253.     54.2
0.00   0.49   1.00    5.39   70.   10.0  283.8    2.0
 13 01 01   1 19  -22.0  0.217 -9.000 -9.000 -999.  243.     51.9
0.00   0.49   1.00    5.28  110.   10.0  282.5    2.0
 13 01 01   1 20  -11.6  0.142 -9.000 -9.000 -999.  130.     22.5
0.04   0.49   1.00    2.11  146.   10.0  281.4    2.0
 13 01 01   1 21   -7.9  0.116 -9.000 -9.000 -999.   95.     18.2
0.04   0.49   1.00    1.76  130.   10.0  280.9    2.0
 13 01 01   1 22  -11.2  0.140 -9.000 -9.000 -999.  125.     22.2
0.04   0.49   1.00    2.08  137.   10.0  281.4    2.0
 13 01 01   1 23   -6.3  0.103 -9.000 -9.000 -999.   80.     16.0
0.04   0.49   1.00    1.57  143.   10.0  280.4    2.0
 13 01 01   1 24  -10.2  0.132 -9.000 -9.000 -999.  115.     20.8
0.04   0.49   1.00    1.98  126.   10.0  278.8    2.0


 First hour of profile data
 YR MO DY HR HEIGHT F  WDIR    WSPD AMB_TMP sigmaA  sigmaW
sigmaV
 13 01 01 01   10.0 1  164.    0.83   279.9
99.0  -99.00  -99.00

 F indicates top of profile (=1) or below (=0)
```

*** THE SUMMARY OF MAXIMUM PERIOD (43848 HRS) RESULTS ***

** CONC OF PM_2.5 IN MICROGRAMS/M**3 **

NETWORK GROUP ID	AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG)	OF TYPE	GRID-ID
Y1_ALL	1ST HIGHEST VALUE IS	0.77064 AT (550889.51, 4163332.87, 72.38, 387.67, 1.50)	DC	
	2ND HIGHEST VALUE IS	0.69334 AT (550895.81, 4163321.59, 71.84, 387.67, 1.50)	DC	
	3RD HIGHEST VALUE IS	0.69220 AT (550904.63, 4163317.05, 72.00, 387.67, 1.50)	DC	
	4TH HIGHEST VALUE IS	0.67950 AT (550889.66, 4163342.37, 72.36, 387.67, 1.50)	DC	
	5TH HIGHEST VALUE IS	0.50000 AT (550957.91, 4163319.30, 64.43, 387.67, 1.50)	DC	
	6TH HIGHEST VALUE IS	0.49685 AT (550957.91, 4163344.30, 64.41, 387.67, 1.50)	DC	
	7TH HIGHEST VALUE IS	0.48611 AT (550894.90, 4163351.46, 71.63, 387.67, 1.50)	DC	
	8TH HIGHEST VALUE IS	0.48547 AT (550932.78, 4163327.60, 70.08, 386.41, 1.50)	DC	
	9TH HIGHEST VALUE IS	0.48264 AT (550902.05, 4163357.67, 71.78, 387.67, 1.50)	DC	
	10TH HIGHEST VALUE IS	0.46309 AT (550969.77, 4163317.00, 61.45, 387.67, 1.50)	DC	
Y2_ALL	1ST HIGHEST VALUE IS	0.11241 AT (550889.51, 4163332.87, 72.38, 387.67, 1.50)	DC	
	2ND HIGHEST VALUE IS	0.10114 AT (550895.81, 4163321.59, 71.84, 387.67, 1.50)	DC	
	3RD HIGHEST VALUE IS	0.10097 AT (550904.63, 4163317.05, 72.00, 387.67, 1.50)	DC	
	4TH HIGHEST VALUE IS	0.09912 AT (550889.66, 4163342.37, 72.36, 387.67, 1.50)	DC	

```
          5TH HIGHEST VALUE IS      0.07293 AT (  550957.91,
4163319.30,    64.43,   387.67,    1.50)  DC
          6TH HIGHEST VALUE IS      0.07248 AT (  550957.91,
4163344.30,    64.41,   387.67,    1.50)  DC
          7TH HIGHEST VALUE IS      0.07091 AT (  550894.90,
4163351.46,    71.63,   387.67,    1.50)  DC
          8TH HIGHEST VALUE IS      0.07081 AT (  550932.78,
4163327.60,    70.08,   386.41,    1.50)  DC
          9TH HIGHEST VALUE IS      0.07041 AT (  550902.05,
4163357.67,    71.78,   387.67,    1.50)  DC
         10TH HIGHEST VALUE IS      0.06755 AT (  550969.77,
4163317.00,    61.45,   387.67,    1.50)  DC

Y1_OFF    1ST HIGHEST VALUE IS      0.00011 AT (  550969.77,
4163417.00,    60.05,   387.67,    1.50)  DC
          2ND HIGHEST VALUE IS      0.00010 AT (  550982.91,
4163394.30,    60.04,   387.67,    1.50)  DC
          3RD HIGHEST VALUE IS      0.00009 AT (  550957.91,
4163444.30,    59.12,   387.67,    1.50)  DC
          4TH HIGHEST VALUE IS      0.00008 AT (  550982.91,
4163419.30,    60.31,   387.67,    1.50)  DC
          5TH HIGHEST VALUE IS      0.00008 AT (  550957.91,
4163469.30,    58.10,   387.67,    1.50)  DC
          6TH HIGHEST VALUE IS      0.00008 AT (  550919.77,
4163517.00,    58.97,   387.67,    1.50)  DC
          7TH HIGHEST VALUE IS      0.00007 AT (  550957.91,
4163369.30,    58.95,   387.67,    1.50)  DC
          8TH HIGHEST VALUE IS      0.00007 AT (  550982.91,
4163444.30,    58.66,   387.67,    1.50)  DC
          9TH HIGHEST VALUE IS      0.00007 AT (  550969.77,
4163467.00,    58.19,   387.67,    1.50)  DC
         10TH HIGHEST VALUE IS      0.00007 AT (  551007.91,
4163369.30,    61.66,   386.41,    1.50)  DC

Y2_OFF    1ST HIGHEST VALUE IS      0.00002 AT (  550969.77,
4163417.00,    60.05,   387.67,    1.50)  DC
          2ND HIGHEST VALUE IS      0.00002 AT (  550982.91,
4163394.30,    60.04,   387.67,    1.50)  DC
          3RD HIGHEST VALUE IS      0.00002 AT (  550957.91,
4163444.30,    59.12,   387.67,    1.50)  DC
          4TH HIGHEST VALUE IS      0.00002 AT (  550982.91,
4163419.30,    60.31,   387.67,    1.50)  DC
          5TH HIGHEST VALUE IS      0.00002 AT (  550957.91,
4163469.30,    58.10,   387.67,    1.50)  DC
          6TH HIGHEST VALUE IS      0.00002 AT (  550919.77,
4163517.00,    58.97,   387.67,    1.50)  DC
          7TH HIGHEST VALUE IS      0.00002 AT (  550957.91,
4163369.30,    58.95,   387.67,    1.50)  DC
          8TH HIGHEST VALUE IS      0.00002 AT (  550982.91,
4163444.30,    58.66,   387.67,    1.50)  DC
          9TH HIGHEST VALUE IS      0.00002 AT (  550969.77,
4163467.00,    58.19,   387.67,    1.50)  DC
```

```
         10TH HIGHEST VALUE IS       0.00002 AT (  551007.91,
4163369.30,    61.66,   386.41,    1.50)  DC
```

*** THE SUMMARY OF MAXIMUM PERIOD (43848 HRS) RESULTS ***

** CONC OF PM_2.5 IN MICROGRAMS/M**3 **

NETWORK GROUP ID	AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG)	OF TYPE	GRID-ID
Y1_ON	1ST HIGHEST VALUE IS	0.77061 AT (550889.51, 4163332.87, 72.38, 387.67, 1.50)	DC	
	2ND HIGHEST VALUE IS	0.69332 AT (550895.81, 4163321.59, 71.84, 387.67, 1.50)	DC	
	3RD HIGHEST VALUE IS	0.69218 AT (550904.63, 4163317.05, 72.00, 387.67, 1.50)	DC	
	4TH HIGHEST VALUE IS	0.67947 AT (550889.66, 4163342.37, 72.36, 387.67, 1.50)	DC	
	5TH HIGHEST VALUE IS	0.49997 AT (550957.91, 4163319.30, 64.43, 387.67, 1.50)	DC	
	6TH HIGHEST VALUE IS	0.49682 AT (550957.91, 4163344.30, 64.41, 387.67, 1.50)	DC	
	7TH HIGHEST VALUE IS	0.48608 AT (550894.90, 4163351.46, 71.63, 387.67, 1.50)	DC	
	8TH HIGHEST VALUE IS	0.48545 AT (550932.78, 4163327.60, 70.08, 386.41, 1.50)	DC	
	9TH HIGHEST VALUE IS	0.48260 AT (550902.05, 4163357.67, 71.78, 387.67, 1.50)	DC	
	10TH HIGHEST VALUE IS	0.46305 AT (550969.77, 4163317.00, 61.45, 387.67, 1.50)	DC	
Y2_ON	1ST HIGHEST VALUE IS	0.11241 AT (550889.51, 4163332.87, 72.38, 387.67, 1.50)	DC	
	2ND HIGHEST VALUE IS	0.10113 AT (550895.81, 4163321.59, 71.84, 387.67, 1.50)	DC	
	3RD HIGHEST VALUE IS	0.10096 AT (550904.63, 4163317.05, 72.00, 387.67, 1.50)	DC	
	4TH HIGHEST VALUE IS	0.09912 AT (550889.66, 4163342.37, 72.36, 387.67, 1.50)	DC	

```
          5TH HIGHEST VALUE IS       0.07292 AT (  550957.91,
4163319.30,    64.43,   387.67,    1.50)  DC
          6TH HIGHEST VALUE IS       0.07247 AT (  550957.91,
4163344.30,    64.41,   387.67,    1.50)  DC
          7TH HIGHEST VALUE IS       0.07090 AT (  550894.90,
4163351.46,    71.63,   387.67,    1.50)  DC
          8TH HIGHEST VALUE IS       0.07081 AT (  550932.78,
4163327.60,    70.08,   386.41,    1.50)  DC
          9TH HIGHEST VALUE IS       0.07040 AT (  550902.05,
4163357.67,    71.78,   387.67,    1.50)  DC
         10TH HIGHEST VALUE IS       0.06754 AT (  550969.77,
4163317.00,    61.45,   387.67,    1.50)  DC


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
```

```
 *** AERMOD - VERSION 23132  ***   *** C:\Lakes
\Cunningham_Way_Water_Tank_San_Bruno\Cunningham_Way_Water_Ta ***
01/22/24
 *** AERMET - VERSION  18081 ***   ***
***        13:51:08

PAGE   6
 *** MODELOPTs:    RegDFAULT  CONC  ELEV  FLGPOL  URBAN  ADJ_U*

 *** Message Summary : AERMOD Model Execution ***

  --------- Summary of Total Messages --------

 A Total of            0 Fatal Error Message(s)
 A Total of            2 Warning Message(s)
 A Total of         1267 Informational Message(s)

 A Total of        43848 Hours Were Processed

 A Total of          867 Calm Hours Identified

 A Total of          400 Missing Hours Identified (  0.91
Percent)


    ******** FATAL ERROR MESSAGES ********
               ***  NONE  ***


    ********   WARNING MESSAGES   ********
 ME W186     557       MEOPEN: THRESH_1MIN 1-min ASOS wind speed
threshold used           0.50
 ME W187     557       MEOPEN: ADJ_U* Option for Stable Low Winds
used in AERMET
```

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Attachment 2: AERMOD Mitigated Output Summary

```
 *** AERMOD - VERSION 23132  ***   *** C:\Lakes
\Cunningham_Way_Water_Tank_San_Bruno\Cunningham_Way_Water_Ta ***
01/23/24
 *** AERMET - VERSION  18081 ***   ***
***        11:35:18

PAGE   1
 *** MODELOPTs:    RegDFAULT  CONC  ELEV  FLGPOL  URBAN  ADJ_U*

                                              ***     MODEL SETUP
OPTIONS SUMMARY       ***
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

 ** Model Options Selected:
      * Model Uses Regulatory DEFAULT Options
      * Model Is Setup For Calculation of Average CONCentration
Values.
      * NO GAS DEPOSITION Data Provided.
      * NO PARTICLE DEPOSITION Data Provided.
      * Model Uses NO DRY DEPLETION. DDPLETE  =  F
      * Model Uses NO WET DEPLETION. WETDPLT  =  F
      * Stack-tip Downwash.
      * Model Accounts for ELEVated Terrain Effects.
      * Use Calms Processing Routine.
      * Use Missing Data Processing Routine.
      * No Exponential Decay.
      * Model Uses URBAN Dispersion Algorithm for the SBL for
26 Source(s),
        for Total of    1 Urban Area(s):
   Urban Population =     43893.0 ;  Urban Roughness Length =
1.000 m
      * Urban Roughness Length of 1.0 Meter Used.
      * ADJ_U*   - Use ADJ_U* option for SBL in AERMET
      * CCVR_Sub - Meteorological data includes CCVR
substitutions
      * TEMP_Sub - Meteorological data includes TEMP
substitutions
      * Model Accepts FLAGPOLE Receptor . Heights.
      * The User Specified a Pollutant Type of: PM_2.5

 **Model Calculates PERIOD Averages Only

 **This Run Includes:     26 Source(s);       6 Source Group(s);
and     577 Receptor(s)

                with:      0 POINT(s), including
                           0 POINTCAP(s) and      0 POINTHOR(s)
                 and:      0 VOLUME source(s)
                 and:     26 AREA type source(s)
                 and:      0 LINE source(s)
                 and:      0 RLINE/RLINEXT source(s)
```

```
                 and:      0 OPENPIT source(s)
                 and:      0 BUOYANT LINE source(s) with a total
of     0 line(s)
                 and:      0 SWPOINT source(s)


 **Model Set To Continue RUNning After the Setup Testing.

 **The AERMET Input Meteorological Data Version Date:  18081

 **Output Options Selected:
          Model Outputs Tables of PERIOD Averages by Receptor
          Model Outputs External File(s) of High Values for
Plotting (PLOTFILE Keyword)
          Model Outputs Separate Summary File of High Ranked
Values (SUMMFILE Keyword)

 **NOTE:  The Following Flags May Appear Following CONC Values:
c for Calm Hours

m for Missing Hours

b for Both Calm and Missing Hours

 **Misc. Inputs:  Base Elev. for Pot. Temp. Profile (m MSL) =
2.40 ;  Decay Coef. =    0.000     ;  Rot. Angle =     0.0
                 Emission Units =
GRAMS/SEC                                ;  Emission Rate Unit
Factor =   0.10000E+07
                 Output Units   = MICROGRAMS/M**3

 **Approximate Storage Requirements of Model =      3.7 MB of
RAM.

 **Input Runstream File:          aermod.inp
 **Output Print File:             aermod.out

 **Detailed Error/Message File:
Cunningham_Way_Water_Tank_San_Bruno_mitigated.err
 **File for Summary of Results:
Cunningham_Way_Water_Tank_San_Bruno_mitigated.sum
```

```
 *** AERMOD - VERSION 23132  ***   *** C:\Lakes
\Cunningham_Way_Water_Tank_San_Bruno\Cunningham_Way_Water_Ta ***
01/23/24
 *** AERMET - VERSION  18081 ***   ***
***        11:35:18

PAGE   2
 *** MODELOPTs:    RegDFAULT  CONC  ELEV  FLGPOL  URBAN  ADJ_U*

                                            *** METEOROLOGICAL
DAYS SELECTED FOR PROCESSING ***
                                                              (1
=YES; 0=NO)

            1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1
1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1
            1 1 1 1 1 1 1 1 1 1   1 1 1 1 1

                NOTE:  METEOROLOGICAL DATA ACTUALLY PROCESSED
WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.



                                  *** UPPER BOUND OF FIRST
THROUGH FIFTH WIND SPEED CATEGORIES ***

(METERS/SEC)

                                                 1.54,   3.09,
5.14,   8.23,  10.80,
```

*** MODELOPTs: RegDFAULT CONC ELEV FLGPOL URBAN ADJ_U*

*** UP TO THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

Surface file: datC1D1.tmp
Met Version: 18081
Profile file: datC1E2.tmp
Surface format: FREE
Profile format: FREE
Surface station no.: 23234 Upper air station no.: 23230
Name: SAN_FRANCISCO/INT'L_ARPT Name: OAKLAND/WSO_AP
Year: 2013 Year: 2013

First 24 hours of scalar data

YR	MO	DY	JDY	HR	H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS	WD	HT	REF TA	HT
13	01	01	1	01	-2.1	0.066	-9.000	-9.000	-999.	41.	12.3	0.04	0.49	1.00	0.83	164.	10.0	279.9	2.0
13	01	01	1	02	-10.6	0.137	-9.000	-9.000	-999.	121.	22.0	0.06	0.49	1.00	1.94	280.	10.0	280.4	2.0
13	01	01	1	03	-20.6	0.202	-9.000	-9.000	-999.	217.	44.7	0.04	0.49	1.00	2.93	142.	10.0	280.4	2.0
13	01	01	1	04	-9.7	0.129	-9.000	-9.000	-999.	113.	20.4	0.04	0.49	1.00	1.94	153.	10.0	280.4	2.0
13	01	01	1	05	-6.8	0.096	-9.000	-9.000	-999.	71.	11.7	0.00	0.49	1.00	2.44	50.	10.0	280.9	2.0
13	01	01	1	06	-15.5	0.152	-9.000	-9.000	-999.	143.	25.5	0.00	0.49	1.00	3.76	69.	10.0	280.9	2.0
13	01	01	1	07	-17.4	0.171	-9.000	-9.000	-999.	169.	32.0	0.00	0.49	1.00	4.19	47.	10.0	280.9	2.0
13	01	01	1	08	-17.0	0.166	-9.000	-9.000	-999.	163.	30.5	0.00	0.49	1.00	4.09	56.	10.0	280.9	2.0
13	01	01	1	09	2.9	0.227	0.145	0.005	38.	259.	-363.0	0.00	0.49	0.37	5.17	57.	10.0	280.4	2.0
13	01	01	1	10	35.3	0.193	0.464	0.005	103.	204.	-18.6	0.00	0.49	0.24	4.05	62.	10.0	281.4	2.0
13	01	01	1	11	60.1	0.191	0.715	0.005	222.	200.	-10.6	0.00	0.49	0.19	3.88	95.	10.0	280.9	2.0
13	01	01	1	12	74.4	0.135	1.009	0.005	504.	120.	-3.0								

```
0.00   0.49   0.18    2.50   79.   10.0  282.5    2.0
 13 01 01   1 13   77.1  0.258  1.185  0.008  788.  315.    -20.4
0.00   0.49   0.17    5.44   36.   10.0  283.8    2.0
 13 01 01   1 14   68.1  0.339  1.184  0.008  890.  474.    -52.3
0.00   0.49   0.18    7.43   31.   10.0  284.2    2.0
 13 01 01   1 15   43.7  0.334  1.027  0.008  904.  463.    -77.5
0.00   0.49   0.21    7.40   43.   10.0  284.2    2.0
 13 01 01   1 16   17.9  0.267  0.765  0.007  910.  333.    -96.3
0.00   0.49   0.29    5.95   40.   10.0  284.9    2.0
 13 01 01   1 17  -21.8  0.285 -9.000 -9.000 -999.  366.     97.2
0.00   0.49   0.53    6.82   38.   10.0  284.2    2.0
 13 01 01   1 18  -22.4  0.222 -9.000 -9.000 -999.  253.     54.2
0.00   0.49   1.00    5.39   70.   10.0  283.8    2.0
 13 01 01   1 19  -22.0  0.217 -9.000 -9.000 -999.  243.     51.9
0.00   0.49   1.00    5.28  110.   10.0  282.5    2.0
 13 01 01   1 20  -11.6  0.142 -9.000 -9.000 -999.  130.     22.5
0.04   0.49   1.00    2.11  146.   10.0  281.4    2.0
 13 01 01   1 21   -7.9  0.116 -9.000 -9.000 -999.   95.     18.2
0.04   0.49   1.00    1.76  130.   10.0  280.9    2.0
 13 01 01   1 22  -11.2  0.140 -9.000 -9.000 -999.  125.     22.2
0.04   0.49   1.00    2.08  137.   10.0  281.4    2.0
 13 01 01   1 23   -6.3  0.103 -9.000 -9.000 -999.   80.     16.0
0.04   0.49   1.00    1.57  143.   10.0  280.4    2.0
 13 01 01   1 24  -10.2  0.132 -9.000 -9.000 -999.  115.     20.8
0.04   0.49   1.00    1.98  126.   10.0  278.8    2.0


 First hour of profile data
 YR MO DY HR HEIGHT F  WDIR    WSPD AMB_TMP sigmaA  sigmaW
sigmaV
 13 01 01 01   10.0 1  164.    0.83   279.9
99.0  -99.00  -99.00

 F indicates top of profile (=1) or below (=0)
```

*** MODELOPTs: RegDFAULT CONC ELEV FLGPOL URBAN ADJ_U*

*** THE SUMMARY OF MAXIMUM PERIOD (43848 HRS) RESULTS ***

** CONC OF PM_2.5 IN MICROGRAMS/M**3 **

NETWORK GROUP ID	AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG)	OF TYPE	GRID-ID
Y1_ALL	1ST HIGHEST VALUE IS	0.07376 AT (550889.51, 4163332.87, 72.38, 387.67, 1.50)	DC	
	2ND HIGHEST VALUE IS	0.06636 AT (550895.81, 4163321.59, 71.84, 387.67, 1.50)	DC	
	3RD HIGHEST VALUE IS	0.06625 AT (550904.63, 4163317.05, 72.00, 387.67, 1.50)	DC	
	4TH HIGHEST VALUE IS	0.06504 AT (550889.66, 4163342.37, 72.36, 387.67, 1.50)	DC	
	5TH HIGHEST VALUE IS	0.04786 AT (550957.91, 4163319.30, 64.43, 387.67, 1.50)	DC	
	6TH HIGHEST VALUE IS	0.04757 AT (550957.91, 4163344.30, 64.41, 387.67, 1.50)	DC	
	7TH HIGHEST VALUE IS	0.04654 AT (550894.90, 4163351.46, 71.63, 387.67, 1.50)	DC	
	8TH HIGHEST VALUE IS	0.04647 AT (550932.78, 4163327.60, 70.08, 386.41, 1.50)	DC	
	9TH HIGHEST VALUE IS	0.04622 AT (550902.05, 4163357.67, 71.78, 387.67, 1.50)	DC	
	10TH HIGHEST VALUE IS	0.04434 AT (550969.77, 4163317.00, 61.45, 387.67, 1.50)	DC	
Y2_ALL	1ST HIGHEST VALUE IS	0.00958 AT (550889.51, 4163332.87, 72.38, 387.67, 1.50)	DC	
	2ND HIGHEST VALUE IS	0.00862 AT (550895.81, 4163321.59, 71.84, 387.67, 1.50)	DC	
	3RD HIGHEST VALUE IS	0.00861 AT (550904.63, 4163317.05, 72.00, 387.67, 1.50)	DC	
	4TH HIGHEST VALUE IS	0.00845 AT (550889.66, 4163342.37, 72.36, 387.67, 1.50)	DC	

```
          5TH HIGHEST VALUE IS      0.00622 AT (  550957.91,
4163319.30,    64.43,   387.67,    1.50)  DC
          6TH HIGHEST VALUE IS      0.00618 AT (  550957.91,
4163344.30,    64.41,   387.67,    1.50)  DC
          7TH HIGHEST VALUE IS      0.00605 AT (  550894.90,
4163351.46,    71.63,   387.67,    1.50)  DC
          8TH HIGHEST VALUE IS      0.00604 AT (  550932.78,
4163327.60,    70.08,   386.41,    1.50)  DC
          9TH HIGHEST VALUE IS      0.00601 AT (  550902.05,
4163357.67,    71.78,   387.67,    1.50)  DC
         10TH HIGHEST VALUE IS      0.00576 AT (  550969.77,
4163317.00,    61.45,   387.67,    1.50)  DC

Y1_OFF    1ST HIGHEST VALUE IS      0.00011 AT (  550969.77,
4163417.00,    60.05,   387.67,    1.50)  DC
          2ND HIGHEST VALUE IS      0.00010 AT (  550982.91,
4163394.30,    60.04,   387.67,    1.50)  DC
          3RD HIGHEST VALUE IS      0.00009 AT (  550957.91,
4163444.30,    59.12,   387.67,    1.50)  DC
          4TH HIGHEST VALUE IS      0.00008 AT (  550982.91,
4163419.30,    60.31,   387.67,    1.50)  DC
          5TH HIGHEST VALUE IS      0.00008 AT (  550957.91,
4163469.30,    58.10,   387.67,    1.50)  DC
          6TH HIGHEST VALUE IS      0.00008 AT (  550919.77,
4163517.00,    58.97,   387.67,    1.50)  DC
          7TH HIGHEST VALUE IS      0.00007 AT (  550957.91,
4163369.30,    58.95,   387.67,    1.50)  DC
          8TH HIGHEST VALUE IS      0.00007 AT (  550982.91,
4163444.30,    58.66,   387.67,    1.50)  DC
          9TH HIGHEST VALUE IS      0.00007 AT (  550969.77,
4163467.00,    58.19,   387.67,    1.50)  DC
         10TH HIGHEST VALUE IS      0.00007 AT (  551007.91,
4163369.30,    61.66,   386.41,    1.50)  DC

Y2_OFF    1ST HIGHEST VALUE IS      0.00002 AT (  550969.77,
4163417.00,    60.05,   387.67,    1.50)  DC
          2ND HIGHEST VALUE IS      0.00002 AT (  550982.91,
4163394.30,    60.04,   387.67,    1.50)  DC
          3RD HIGHEST VALUE IS      0.00002 AT (  550957.91,
4163444.30,    59.12,   387.67,    1.50)  DC
          4TH HIGHEST VALUE IS      0.00002 AT (  550982.91,
4163419.30,    60.31,   387.67,    1.50)  DC
          5TH HIGHEST VALUE IS      0.00002 AT (  550957.91,
4163469.30,    58.10,   387.67,    1.50)  DC
          6TH HIGHEST VALUE IS      0.00002 AT (  550919.77,
4163517.00,    58.97,   387.67,    1.50)  DC
          7TH HIGHEST VALUE IS      0.00002 AT (  550957.91,
4163369.30,    58.95,   387.67,    1.50)  DC
          8TH HIGHEST VALUE IS      0.00002 AT (  550982.91,
4163444.30,    58.66,   387.67,    1.50)  DC
          9TH HIGHEST VALUE IS      0.00002 AT (  550969.77,
4163467.00,    58.19,   387.67,    1.50)  DC
```

```
         10TH HIGHEST VALUE IS       0.00002 AT (  551007.91,
4163369.30,    61.66,   386.41,    1.50)  DC
```

*** THE SUMMARY OF MAXIMUM PERIOD (43848 HRS) RESULTS ***

** CONC OF PM_2.5 IN MICROGRAMS/M**3 **

NETWORK GROUP ID	AVERAGE CONC	RECEPTOR (XR, YR, ZELEV, ZHILL, ZFLAG)	OF TYPE	GRID-ID
Y1_ON	1ST HIGHEST VALUE IS	0.07373 AT (550889.51, 4163332.87, 72.38, 387.67, 1.50)	DC	
	2ND HIGHEST VALUE IS	0.06634 AT (550895.81, 4163321.59, 71.84, 387.67, 1.50)	DC	
	3RD HIGHEST VALUE IS	0.06623 AT (550904.63, 4163317.05, 72.00, 387.67, 1.50)	DC	
	4TH HIGHEST VALUE IS	0.06501 AT (550889.66, 4163342.37, 72.36, 387.67, 1.50)	DC	
	5TH HIGHEST VALUE IS	0.04784 AT (550957.91, 4163319.30, 64.43, 387.67, 1.50)	DC	
	6TH HIGHEST VALUE IS	0.04754 AT (550957.91, 4163344.30, 64.41, 387.67, 1.50)	DC	
	7TH HIGHEST VALUE IS	0.04651 AT (550894.90, 4163351.46, 71.63, 387.67, 1.50)	DC	
	8TH HIGHEST VALUE IS	0.04645 AT (550932.78, 4163327.60, 70.08, 386.41, 1.50)	DC	
	9TH HIGHEST VALUE IS	0.04618 AT (550902.05, 4163357.67, 71.78, 387.67, 1.50)	DC	
	10TH HIGHEST VALUE IS	0.04431 AT (550969.77, 4163317.00, 61.45, 387.67, 1.50)	DC	
Y2_ON	1ST HIGHEST VALUE IS	0.00958 AT (550889.51, 4163332.87, 72.38, 387.67, 1.50)	DC	
	2ND HIGHEST VALUE IS	0.00862 AT (550895.81, 4163321.59, 71.84, 387.67, 1.50)	DC	
	3RD HIGHEST VALUE IS	0.00860 AT (550904.63, 4163317.05, 72.00, 387.67, 1.50)	DC	
	4TH HIGHEST VALUE IS	0.00845 AT (550889.66, 4163342.37, 72.36, 387.67, 1.50)	DC	

```
          5TH HIGHEST VALUE IS       0.00621 AT (  550957.91,
4163319.30,    64.43,   387.67,    1.50)  DC
          6TH HIGHEST VALUE IS       0.00617 AT (  550957.91,
4163344.30,    64.41,   387.67,    1.50)  DC
          7TH HIGHEST VALUE IS       0.00604 AT (  550894.90,
4163351.46,    71.63,   387.67,    1.50)  DC
          8TH HIGHEST VALUE IS       0.00603 AT (  550932.78,
4163327.60,    70.08,   386.41,    1.50)  DC
          9TH HIGHEST VALUE IS       0.00600 AT (  550902.05,
4163357.67,    71.78,   387.67,    1.50)  DC
         10TH HIGHEST VALUE IS       0.00575 AT (  550969.77,
4163317.00,    61.45,   387.67,    1.50)  DC


 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
```

```
 *** AERMOD - VERSION 23132  ***   *** C:\Lakes
\Cunningham_Way_Water_Tank_San_Bruno\Cunningham_Way_Water_Ta ***
01/23/24
 *** AERMET - VERSION  18081 ***   ***
***        11:35:18

PAGE   6
 *** MODELOPTs:    RegDFAULT  CONC  ELEV  FLGPOL  URBAN  ADJ_U*

 *** Message Summary : AERMOD Model Execution ***

  --------- Summary of Total Messages --------

 A Total of            0 Fatal Error Message(s)
 A Total of            2 Warning Message(s)
 A Total of         1267 Informational Message(s)

 A Total of        43848 Hours Were Processed

 A Total of          867 Calm Hours Identified

 A Total of          400 Missing Hours Identified (  0.91
Percent)


    ******** FATAL ERROR MESSAGES ********
               ***  NONE  ***


    ********   WARNING MESSAGES   ********
 ME W186     557       MEOPEN: THRESH_1MIN 1-min ASOS wind speed
threshold used           0.50
 ME W187     557       MEOPEN: ADJ_U* Option for Stable Low Winds
used in AERMET
```

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Appendix C: Special-Status Animal and Plant Species Evaluated for Potential to Occur on the Project Site.

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Appendix C: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Potential for Occurrence[3]
INVERTEBRATES				
Western bumblebee *Bombus occidentalis*	SCE	Once common and widespread, this species has declined precipitously from central California to southern British Columbia. They are now largely confined to high-elevation sites and areas east of the Cascade Crest**.**	Western bumble bees use a wide variety of natural, agricultural, urban, and rural habitat types. Require suitable nesting sites, overwintering sites for the queens, and nectar and pollen resources throughout the spring, summer, and fall.	**Low.** There are four CNDDB records of western bumblebee within 5 miles of the project site. Nectar and pollen sources are limited on the project site since vegetation is eucalyptus and oak woodland with not much of an understory.
San Bruno elfin butterfly *Callophrys mossii bayensis*	FE	Coastal, mountainous areas with grassy ground cover, mainly in the vicinity of San Bruno Mountain, San Mateo County.	Colonies are located on steep, north-facing slopes within the fog belt. Larval host plant is *Sedum spathulifolium*.	**Not Expected.** There are six CNDDB records of San Bruno elfin butterfly within 5 miles of the project site. However, the project site is outside of the known range of this species and the larval host plant is not present at the site.
Monarch- California overwintering population *Danaus plexippus plexippus* pop. 1	FC	Winter roost sites extend along the coast from northern Mendocino to Baja California, Mexico.	Roosts located in wind-protected tree groves (eucalyptus, Monterey pine, cypress), with nectar and water sources nearby.	**Low.** Eucalyptus and Monterey pine are present on the site, but it is four miles from the coast and the nearest water source is about 0.1 mile south. Nectar sources are limited on the project site since vegetation is eucalyptus and oak woodland with not much of an understory.
Bay checkerspot butterfly *Euphydryas editha bayensis*	FT	Restricted to native grasslands on outcrops of serpentine soil in the vicinity of San Francisco Bay.	*Plantago erecta* is the primary host plant, *Castilleja densiflorus* and *C. purpurscens* are secondary host plants.	**Not Expected.** There are two CNDDB records of Bay checkerspot butterfly within 5 miles of the project site but they have been extirpated. There are no serpentine outcrops or host plants at or near the site.
Mission blue butterfly *Icaricia icarioides missionensis*	FE	Inhabits grasslands of the San Francisco peninsula.	Three larval host plants: *Lupinus albifrons, L. variicolor,* and *L. formosus*, of which *L. albifrons* is favored.	**Not Expected.** There are nine CNDDB records of Mission blue butterfly within 5 miles of the project site. However, the project site is outside of the known range of this species and the larval host plants are not present at the site.

Appendix C: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Potential for Occurrence[3]
callipe silverspot butterfly *Speyeria callippe callippe*	FE	Restricted to the northern coastal scrub of the San Francisco peninsula.	Hostplant is *Viola pedunculata*. Most adults found on E-facing slopes; males congregate on hilltops in search of females.	**Not Expected.** There are three CNDDB records of calllipe silverspot butterfly within 5 miles of the project site. However, the project site is outside of the known range of this species and the larval host plant is not present at the site.
Myrtle's silverspot butterfly *Speyeria zerene myrtleae*	FE	Restricted to the foggy, coastal dunes/hills of the Point Reyes peninsula; extirpated from coastal San Mateo County.	Larval foodplant thought to be *Viola adunca*.	**Not Expected.** There is one CNDDB record of Myrtle's silverspot butterfly within 5 miles of the project site, but it has been extirpated. However, the project site is outside of the known range of this species and the larval host plant is not present at the site.
FISH				
green sturgeon Southern DPS *Acipenser medirostris*	FT	Green sturgeon range from the Bering Sea, Alaska, to Ensenada, Mexico. The Southern DPS inhabits coastal watersheds south of the Eel River. The only known spawning population for the Southern DPS is in the Sacramento River.	Green sturgeon spend a large portion of their lives in coastal marine waters as adults and subadults. Spawning most likely occurs in fast, deep water (> 10 feet or 3 meters deep) over substrates ranging from clean sand to bedrock, with preferences for cobble.	**Not Expected.** There is one CNDDB record of green sturgeon Southern DPS within 5 miles of the project site. However, there is no suitable habitat for this species on or near the project site.
tidewater goby *Pomatiopsis californica*	FE	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River.	Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	**Not Expected.** There are no CNDDB records of tidewater goby within 5 miles of the project site. There is no suitable habitat for this species on or near the project site.
hardhead *Mylopharodon conocephalus*	CSSC	Low to mid-elevation streams in the Sacramento-San Joaquin drainage. Also present in the Russian River.	Clear, deep pools with sand-gravel-boulder bottoms and slow water velocity. Not found where exotic centrarchids predominate.	**Not Expected.** There are no CNDDB records of tidewater goby within 5 miles of the project site. There is no suitable habitat for this species on or near the project site.

Appendix C: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Potential for Occurrence[3]
steelhead - central California coast DPS *Oncorhynchus mykiss irideus*	FT	This DPS includes all populations of steelhead from the Russian River south to Aptos Creek. Steelhead in drainages of San Francisco, San Pablo, and Suisun Bays are also part of this DPS.	Steelhead are the anadromous form of rainbow trout. Adult steelhead migrate from the ocean into streams in the late fall, winter, or early spring seeking out deep pools within fast moving water to rest prior to spawning. Steelhead spawn in shallow-water gravel beds.	**Not Expected.** There is one CNDDB record of steelhead-central California coast DPS within 5 miles of the project site. However, there is no suitable habitat for this species on or near the project site.
longfin smelt *Spirinchus thaleichthys*	FC, ST, CSSC	Found in California's bays, estuaries, and nearshore coastal environments from the San Francisco Bay north to Lake Earl near the Oregon border. The San Francisco Bay estuary and the Sacramento-San Joaquin Delta support the largest longfin smelt population in California.	Found in aquatic and estuary habitats. This species is euryhaline, nektonic and anadromous. Found in open waters of estuaries, mostly in middle or bottom of water column. Prefer salinities of 15-30 parts per thousand but can be found in completely freshwater to almost pure seawater.	**Not Expected.** There is one CNDDB record of longfin smelt within 5 miles of the project site. However, there is no suitable habitat for this species on or near the project site.
AMPHIBIANS				
California tiger salamander *Ambystoma californiense*	FT, ST	Found in the Coast Range and Sierra Nevada foothills of California. In the Coast Range, it occurs from southern San Mateo County south to central San Luis Obispo County, and also in the vicinity of northwestern Santa Barbara County. In the Sierra Nevada foothills, it occurs from northern Yolo County to northwestern Kern County and northern Tulare County.	Found in cismontane woodland, meadows and seeps, riparian woodland, valley and foothill grassland, vernal pools, and wetland habitats. Need California ground squirrel or gopher burrows for underground refuges, and vernal pools or other seasonal water sources that do not support predatory fish or frog populations for breeding.	**Not Expected.** There are no CNDDB records of California tiger salamander within 5 miles of the project site. There is no suitable habitat for this species on or near the project site.
Santa Cruz black salamander *Aneides niger*	CSSC	Found in mixed deciduous and coniferous woodlands and coastal grasslands in San Mateo, Santa Cruz, and Santa Clara counties.	Adults found under rocks, talus, and damp woody debris.	**Not Expected.** There are no CNDDB records of Santa Cruz black salamander within 5 miles of the project site. There is no suitable habitat for this species on or near the project site.
California giant salamander *Dicamptodon ensatus*	CSSC	Known from wet coastal forests near streams and seeps from Mendocino County south to Monterey County, and east to Napa County.	Aquatic larvae found in cold, clear streams, occasionally in lakes and ponds. Adults known from wet forests under rocks and logs near streams and lakes.	**Not Expected.** There is one CNDDB record of California giant salamander within 5 miles of the project site. However, there is no suitable habitat for this species on or near the project site.

Appendix C: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Potential for Occurrence[3]
foothill yellow-legged frog-Central Coast DPS *Rana boylii* pop. 4	FPT, SE	San Francisco Peninsula and Diablo Range south of San Francisco Bay Estuary, and south through the Santa Cruz and Gabilan Mountains east of the Salinas River in the southern inner Coast Ranges.	Partly shaded shallow streams and riffles with a rocky substrate in a variety of habitats. Needs at least some cobble-sized substrate for egg-laying and at least 15 weeks to attain metamorphosis.	**Not Expected.** There is one CNDDB record of foothill yellow-legged frog within 5 miles of the project site, but it has been extirpated. There is no suitable habitat for this species on or near the project site.
California red-legged frog *Rana draytonii*	FT, CSSC	Found from Riverside County to Mendocino County along the Coast Range, from Calaveras County to Butte County in the Sierra Nevada, and in Baja California.	Found in aquatic, artificial flowing waters, artificial standing waters, freshwater marsh, marsh and swamp, riparian forest, riparian scrub, riparian woodland, Sacramento/San Joaquin flowing waters, Sacramento/San Joaquin standing waters, south coast flowing waters, south coast standing waters, and wetland habitats. Likely within lowlands and foothills in or near permanent sources of deep water with dense, shrubby or emergent riparian vegetation. Requires 11-20 weeks of permanent water for larval development. Must have access to estivation habitat.	**Not Expected.** There are twenty-seven CNDDB records of California red-legged frogs within 5 miles of the project site. The closest to the project site about 0.8 mile to the southeast near the San Andreas Lake. However, there is no suitable habitat for this species on or near the project site.
REPTILES				
Western pond turtle *Actinemys marmorata*	CSSC	Found from Baja California, Mexico north through Klickitat County, Washington. In California, found west of the Sierra-Cascade crest. Absent from desert regions, except the Mojave Desert along the Mojave River and its tributaries.	Requires permanent or nearly permanent bodies of water including ponds, marshes, rivers, streams, and irrigation ditches below 6,000 feet in elevation. Requires basking sites, such as submerged rocks, logs, open mud banks, or floating vegetation mats. Needs basking sites and suitable (sandy banks or grassy open fields) upland habitat up to 0.5 kilometers from water for egg-laying.	**Not Expected.** There are no CNDDB records of western pond turtle within 5 miles of the project site. There is no suitable habitat for this species on or near the project site.

Appendix C: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Potential for Occurrence[3]
San Francisco garter snake *Thamnophis sirtalis tetralaenia*	FE, SE, CFP	Found primarily within San Francisco county and San Mateo county, with a small portion of the range extending into northern Santa Cruz county (Big Basin Redwoods State Park).	Found in artificial standing waters, marsh and swamp, Sacramento/San Joaquin standing waters, and wetland habitats. Likely found in the vicinity of freshwater marshes, ponds and slow-moving streams in San Mateo County and extreme northern Santa Cruz County. Avoids brackish marsh areas because their preferred prey (CRLF) cannot survive in saline water. Prefers dense cover and water depths of at least one foot. Upland areas near water are also very important.	**Not Expected.** There are twenty-two CNDDB records of San Francisco garter snake within 5 miles of the project site. However, there is no suitable habitat for this species on or near the project site.
BIRDS				
burrowing owl *Athene cunicularia*	CSSC	Found year-round throughout much of California, except the coastal counties north of Marin and mountainous areas. Breeding has not been observed in Sonoma County since 1987 and breeding colonies are considered extirpated from this county.	Found in coastal prairie, coastal scrub, Great Basin grassland, Great Basin scrub, Mojavean desert scrub, Sonoran Desert scrub, and valley and foothill grassland habitats. Likely in open, dry annual or perennial grasslands, deserts, and scrublands characterized by low-growing vegetation. Subterranean nester, dependent upon burrowing mammals, most notably, the California ground squirrel.	**Not Expected.** There are no CNDDB records of burrowing owl within 5 miles of the project site. There is no suitable habitat for this species on or near the project site.
marbled murrelet *Brachyramphus marmoratus*	FT, SE	Feeds near-shore; nests inland along coast from Eureka to Oregon border and from Half Moon Bay to Santa Cruz.	Nests in old-growth redwood-dominated forests, up to six miles inland, often in Douglas-fir.	**Not Expected.** There are no CNDDB records of marbled murrelet within 5 miles of the project site. There is no suitable habitat for this species on or near the project site.
western snowy plover *Charadrius nivosus nivosus*	FT	Pacific population of western snowy plover occurs along the entire coastline.	Found in standing waters, sand shore, and wetland habitats. Likely within open sandy beaches, salt pond levees and shores of large alkali lakes. Needs sandy, gravelly or friable soils for nesting.	**Not Expected.** There are no CNDDB records of western snowy plover within 5 miles of the project site. There is no suitable habitat for this species on or near the project site.
merlin *Falco columbarius*	WL	Within California, winter resident in suitable habitats.	Seacoast, tidal estuaries, open woodlands, savannahs, edges of grasslands and deserts, farms and ranches. Clumps of trees or windbreaks are required for roosting in open country.	**Low.** There is one CNDDB record of merlin within 5 miles of the project site. This species may occasionally pass through the project area, but its preferred habitats are not present on or near the project site.

Appendix C: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Potential for Occurrence[3]
American peregrine falcon *Falco peregrinus anatum*	FD, SD	Within California, year round resident along the coast and east of the Sierras, winter resident in the Central Valley, migrant in the southeast corner of the state.	Near wetlands, lakes, rivers, or other water; on cliffs, banks, dunes, mounds; also, human-made structures. Nest consists of a scrape or a depression or ledge in an open site.	**Low.** There are two CNDDB records of American peregrine falcon within 5 miles of the project site. This species may occasionally pass through the project area, but its preferred habitats are not present on or near the project site. There is no nesting habitat in or near the site.
saltmarsh common yellowthroat *Geothlypis trichas sinuosa*	CSSC	Found year-round in the vicinity of San Francisco Bay, from Tomales Bay in Marin County and Napa Sloughs in southern Sonoma County on the north, east to Carquinez Straight, and south to vicinity of San Jose in Santa Clara County. Historic locations of confirmed breeding include Lake Merced in San Francisco County, and Coyote Creek, Alviso, and Milpitas in Santa Clara County	Found in fresh and salt water marshes. Requires thick, continuous cover down to water surface for foraging; tall grasses, tule patches, willows for nesting.	**Not Expected.** There are two CNDDB records of saltmarsh common yellowthroat within 5 miles of the project site. However, there is no suitable marsh habitat for this species on or near the project site.
California black rail *Laterallus jamaicensis coturniculus*	ST, CFP	The majority found in the tidal salt marshes of the northern San Francisco Bay region, primarily in San Pablo and Suisun Bays. Smaller populations occur in San Francisco Bay, the Outer Coast of Marin County, freshwater marshes in the foothills of the Sierra Nevada, and in the Colorado River Area.	Found in brackish marsh, freshwater marsh, marsh and swamp, salt marsh, and wetland habitats. Inhabits freshwater marshes, wet meadows and shallow margins of saltwater marshes bordering larger bays. Needs water depths of about 1 inch that do not fluctuate during the year and dense vegetation for nesting habitat.	**Not Expected.** There are no CNDDB records of California black rail within 5 miles of the project site. There is no suitable marsh habitat for this species on or near the project site.
Alameda song sparrow *Melospiza melodia pusillula*	CSSC	Resident of salt marshes bordering south arm of San Francisco Bay.	Found in salt marsh habitats. Inhabits pickleweed (*Salicornia* sp.) marshes; nests low in gumplant (*Grindelia* sp.) bushes (high enough to escape high tides) and in pickleweed.	**Not Expected.** There are two CNDDB records of Alameda song sparrow within 5 miles of the project site. However, there is no suitable marsh habitat for this species on or near the project site.
double-crested cormorant *Nannopterum auritum*	WL (nesting)	Within California, colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state.	Nests along coast on sequestered islets, usually on ground with sloping surface, or in tall trees along lake margins.	**Not Expected.** There are no CNDDB records of double-crested cormorant within 5 miles of the project site. There is no suitable nesting habitat for this species on or near the project site.

Appendix C: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Potential for Occurrence[3]
California ridgway's rail *Rallus obsoletus obsoletus*	FE, SE, CFP	Found almost exclusively in the marshes of the San Francisco estuary in San Mateo, Santa Clara, Alameda, Contra Costa, Solano, Napa, Sonoma, and Marin counties.	Found in brackish marsh, marsh and swamp, salt marsh, and wetland habitats. Likely in salt water and brackish marshes traversed by tidal sloughs in the vicinity of San Francisco Bay. Associated with abundant growths of pickleweed but feeds away from cover on invertebrates from mud-bottomed sloughs.	**Not Expected.** There are three CNDDB records of California ridgeway's rail within 5 miles of the project site. However, there is no suitable marsh habitat for this species on or near the project site.
bank swallow *Riparia riparia*	ST	Colonial nester; nests primarily in riparian and other lowland habitats west of the desert.	Requires vertical banks/cliffs with fine-textured/sandy soils near streams, rivers, lakes, ocean to dig nesting hole.	**Not Expected.** There are no CNDDB records of bank swallow within 5 miles of the project site. There is no suitable habitat for this species on or near the project site.
California least tern *Sternula antillarum browni*	FE, SE, CFP	Nests along the coast from San Francisco Bay south to Northern Baja California.	Found foraging in alkali playa, coastal, lake, and wetland habitats. Colonial breeder on bare or sparsely vegetated, flat substrates: sand beaches, alkali flats, landfills, or paved areas.	**Not Expected.** There are no CNDDB records of California least tern within 5 miles of the project site. There is no suitable habitat for this species on or near the project site.
MAMMALS				
pallid bat *Antrozous pallidus*	CSSC	Common throughout low elevations of California. No found in the high Sierra from Shasta to Kern counties and the northwestern corner of the State from Del Norte and western Siskiyou counties to northern Mendocino County.	Found in chaparral, coastal scrub, desert wash, Great Basin grassland, Great Basin scrub, Mojavean Desert scrub, riparian woodland, Sonoran Desert scrub, upper montane coniferous forest, and valley and foothill grassland habitats. Prefers deserts, grasslands, shrublands, woodlands and forests. Most common in open, dry habitats with rocky areas for roosting. Roosts must protect bats from high temperatures. Very sensitive to disturbance of roosting sites.	**Low.** There is one CNDDB record of pallid bat within 5 miles of the project site. There is limited suitable habitat for this species at the project site, and a high degree of human disturbance in the project area.

Appendix C: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Potential for Occurrence[3]
Townsend's big-eared bat *Corynorhinus townsendii*	CSSC	Found throughout California, but details of its distribution are not well known. Found in all but subalpine and alpine habitats.	Found in broadleaved upland forest, chaparral, chenopod scrub, Great Basin grassland, Great Basin scrub, Joshua tree woodland, lower montane coniferous forest, meadow and seep, Mojavean Desert scrub, riparian forest, riparian woodland, Sonoran Desert scrub, Sonoran thorn woodland, upper montane coniferous forest, and valley and foothill grassland habitats. Most common in mesic sites. Roosts in the open, hanging from walls and ceilings. Roosting sites limiting. Extremely sensitive to human disturbance.	**Low.** There are no CNDDB records of Townsend's big-eared bat within 5 miles of the project site. There is limited suitable habitat for this species at the project site, and a high degree of human disturbance in the project area.
Steller sea lion *Eumetopias jubatus*	FD, CSSC	Breeds on Ano Nuevo, San Miguel and Farallon islands, Point St. George, and Sugarloaf. Hauls-out on islands and rocks.	Needs haul-out and breeding sites with unrestricted access to water, near aquatic food supply and with no human disturbance.	**Not Expected.** There are no CNDDB records of Steller sea lion within 5 miles of the project site. There is no suitable habitat for this species on or near the project site.
San Francisco dusky-footed woodrat *Neotoma fuscipes annectens*	CSSC	This California endemic is found throughout the San Francisco Bay area in grasslands, scrub and wooded areas.	Forest habitats of moderate canopy and moderate to dense understory. May prefer chaparral and redwood habitats. Constructs nests of shredded leaves, grass and other material. May be limited by availability of nest-building materials.	**Low.** There are three CNDDB records of San Francisco dusky-footed woodrat within 5 miles of the project site. However, nest building materials are limited on the project site since vegetation is eucalyptus and oak woodland with not much of an understory.
big free-tailed bat *Nyctinomops macrotis*	CSSC	Low-lying arid areas in Southern California.	Need high cliffs or rocky outcrops for roosting sites. Feeds principally on large moths.	**Not Expected.** There is one CNDDB record of big free-tailed bat within 5 miles of the project site. There is no suitable roosting habitat for this species on or near the project site.
salt-marsh harvest mouse *Reithrodontomys raviventris*	FE, SE, CFP	Occurs only in the saline emergent wetlands of the San Francisco Bay and its tributaries.	Found in marsh and swamp and wetland habitats. Pickleweed is primary habitat but may occur in other marsh vegetation types and in adjacent upland areas. Does not burrow; builds loosely organized nests. Requires higher areas for flood escape.	**Not Expected.** There are no CNDDB records of salt-marsh harvest mouse within 5 miles of the project site. There is no suitable habitat for this species on or near the project site.

Appendix C: Special-Status Animal Species with Potential to Occur on the Project Site**.**

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Potential for Occurrence[3]
American badger *Taxidea taxus*	CSSC	Occurs throughout California, the western United States, and Canada.	American badger is rare in western San Francisco Bay area. It occurs in grasslands and open stages of forest and scrub habitats with friable soils and good prey base of burrowing rodents. Most abundant in drier open stages of most shrub, forest, and herbaceous habitats, with friable soils. Needs sufficient food, friable soils and open, uncultivated ground. Preys on burrowing rodents. Digs burrows.	**Not Expected.** There is one CNDDB record of American badger within 5 miles of the project site. However, here is no suitable open habitat for this species on or near the project site.

STATUS KEY:
Federal
FE: listed as Endangered under the Federal Endangered Species Act (FESA)
FT: Threatened under FESA
FD: Delisted from FESA

State
SE: Listed as Endangered under the California Endangered Species Act (CESA)
ST: Threatened under CESA
SCE: Candidate Endangered under CESA
SD: Delisted under CESA
CSSC: California Species of Special Concern
CFP: California Fully Protected
WL: California Department of Fish and Wildlife (CDFW) Watchlist

SOURCES:
1. United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPAC) Species List (November 28, 2023).
2. California Natural Diversity Database (CNDDB) Rarefind 5 search of Montara Mountain USGS Quad and five surrounding quads; BIOS five mile radius search (December 5, 2023).

CNDDB SPECIES WITHIN 9 QUAD SEARCH THAT DON'T MEET THE DEFINITION OF SPECIAL-STATUS SPECIES:

- incredible harvestman, *Banksula incredula*
- Edgewood blind harvestman, *Calicina minor*
- Edgewood Park micro-blind harvestman, *Microcina edgewoodensis*
- Opler's longhorn moth, *Adela oplerella*
- obscure bumblebee, *Bombus caliginosus*
- sandy beach tiger beetle, *Cicindela hirticollis gravida*
- Stage's dufourine bee, *Dufourea stagei*
- Ricksecker's water scavenger beetle, *Hydrochara rickseckeri*
- Leech's skyline diving beetle, *Hydroporus leechi*
- Pheres blue butterfly, *Icaricia icarioides pheres*
- San Francisco forktail damselfly, *Ischnura gemina*

Appendix C: Special-Status Animal Species with Potential to Occur on the Project Site**.**

- bumblebee scarab beetle, *Lichnanthe ursina*
- Tomales isopod, *Caecidotea tomalensis*
- San Francisco Bay leaf-cutter bee, *Trachusa gummifera*
- Pacific walker, *Pomatiopsis californica*
- mimic tryonia, *Tryonia imitator*
- Santa Cruz kangaroo rat, *Dipodomys venustus venustus*
- North American porcupine, *Erethizon dorsatum*
- hoary bat, *Lasiurus cinereus*
- fringed myotis, *Myotis thysanodes*

Appendix C: Special Status Plant Species Evaluated for Potential to Occur on the Project Site

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Life Form; Blooming Period[2]	Potential Occurrence in the Project Area[3]
Franciscan onion *Allium peninsulare-var. franciscanum*	CRPR 1B.2	Coastal mid California, from Monterey to Mendocino Counties.	Cismontane woodland, valley and foothill grasslands. Often on dry hillsides and in serpentine bunchgrass grasslands; 52-300 m.	Perennial bulbiferous herb; Blooms May to June	**Low.** There are five CNDDB records of Franciscan onion within 5 miles of the project site. However, there is limited suitable habitat for this species at or near the site.
bent-flowered fiddleneck *Amsinckia lunaris*	CRPR 1B.2	Mid California, including Monterey, Santa Cruz, San Mateo, Marin, Alameda, Contra Costa, Napa, Lake and Colusa counties.	Coastal bluff scrub, cismontane woodland, or valley and foothill grassland; 3-500 m.	Annual herb; Blooms March to June	**Low.** There is one CNDDB record of bent-flowered fiddleneck within 5 miles of the project site. However, there is limited suitable habitat for this species at or near the site.
San Bruno Mountain manzanita *Arctostaphylos imbricata*	SE, CRPR 1B.1	San Mateo County.	Chaparral and coastal scrub in rocky soils; 275-370 m.	Perennial evergreen shrub; Blooms February to May	**Not Expected.** There are two CNDDB records of San Bruno Mountain manzanita within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
Montara manzanita *Arctostaphylos montaraensis*	CRPR 1B.2	San Mateo County.	Chaparral (maritime), coastal scrub; 80-500m.	Perennial evergreen shrub; Blooms January to March	**Not Expected.** There are four CNDDB records of Montara manzanita within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
Pacific manzanita *Arctostaphylos pacifica*	SE, CRPR 1B.1	San Mateo County.	Chaparral and coastal scrub; 330-330m.	Perennial evergreen shrub; Blooms February to April	**Not Expected.** There is one CNDDB record of Pacific manzanita within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
Kings Mountain manzanita *Arctostaphylos regismontana*	CRPR 1B.2	San Mateo, Santa Clara, and Santa Cruz counties.	Boardleafed upland forest, chaparral, North Coast coniferous forest; 305-730 m.	Perennial evergreen shrub; Blooms December to April.	**Not Expected.** There is one CNDDB record of Kings Mountain manzanita within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
pappose tarplant *Centromadia parryi* ssp. *parryi*	CRPR 1B.2	Butte, Colusa, Glenn, Lake, Napa, San Mateo, Solano, Sonoma, and Yolo counties.	Chaparral, coastal prairie, meadows and seeps, marshes and swamps (coastal salt), valley and foothill grassland (vernally mesic); 0-420 m.	Annual herb; Blooms May to November	**Not Expected.** There are two CNDDB records of pappose tarplant within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.

Appendix C: Special Status Plant Species Evaluated for Potential to Occur on the Project Site

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Life Form; Blooming Period[2]	Potential Occurrence in the Project Area[3]
San Francisco Bay spineflower *Chorizanthe cuspidata* var. *cuspidata*	CRPR 1B.2	Marin, San Francisco, and San Mateo counties, possibly Sonoma County.	Coastal bluff scrub, coastal dunes, coastal prairie, coastal scrub in sandy soils; 3-215 m.	Annual herb; Blooms April to July (August)	**Not Expected.** There is one CNDDB record of San Francisco Bay spineflower within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
robust spineflower *Chorizanthe robusta* var. *robusta*	FE, CRPR 1B.1	Endemic to the San Francisco Bay Area and Monterey Coast.	Chaparral (maritime), cismontane woodland (openings), coastal dunes or coastal scrub in sandy or gravelly soils; 3-300 m.	Annual herb; Blooms April to September	**Not Expected.** There is one CNDDB record of San Francisco Bay spineflower within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
Franciscan thistle *Cirsium andrewsii*	CRPR 1B.2	Contra Costa, Marin, San Francisco, San Mateo, and Sonoma counties.	Boardleafed upland forest, coastal bluff scrub, coastal prairie, coastal scrub on mesic, sometimes serpentinite soils; 0-150 m.	Perennial herb; Blooms March to July.	**Not Expected.** There is one CNDDB record of Franciscan thistle within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
San Francisco collinsia *Collinsia multicolor*	1B.2	Mid-coastal California from Monterey to Marin county including Santa Clara county.	Moist shady woodland, closed-cone coniferous forests and coastal scrub. Occasionally found in serpentine; 30-250 m.	Annual herb; Blooms March to May	**Not Expected.** There are five CNDDB records of San Francisco collinsia within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
Western leatherwood *Dirca occidentalis*	CRPR 1B.2	San Francisco Bay area including Santa Clara to Marin county and east to Alameda county.	Cool, moist slopes in foothill woodland and riparian forests. Mesic environments in broadleaved upland forests, chaparral and coniferous woodlands and mixed evergreen and oak woodlands; 25-425 m.	Perennial deciduous shrub; Blooms January to April.	**Low.** There are eleven CNDDB records of western leatherwood within 5 miles of the project site. However, there is limited suitable habitat for this species at or near the site.
San Mateo woolly sunflower *Eriophyllum latilobum*	FE, SE, CRPR 1B.1	San Mateo and Napa counties.	Cismontane and oak woodland, often on roadcuts; found on and off of serpentine and on grassy hillsides; 45-150m.	Perennial herb; Blooms April to June	**Not Expected** There are three CNDDB records of San Mateo woolly sunflower within 5 miles of the project site and only three known extant occurrences in total. There is no serpentine or high quality habitat at or near the project site and this species is extremely rare.

Appendix C: Special Status Plant Species Evaluated for Potential to Occur on the Project Site

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Life Form; Blooming Period[2]	Potential Occurrence in the Project Area[3]
Hillsborough chocolate lily *Fritillaria biflora* var. *ineziana*	CRPR 1B.1	San Mateo County.	Cismontane woodland, valley and foothill grasslands on serpentinite soils; 150-150 m.	Perennial bulbiferous herb; Blooms March to April.	**Not Expected.** There are two CNDDB records of Hillsborough chocolate lily within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
fragrant fritillary *Fritillaria liliacea*	CRPR 1B.2	Found throughout northern and central California wherever there is suitable habitat.	Cismontane woodland and coastal scrub and prairie, in valley and foothill grasslands (often serpentine bunchgrass grassland); 3-410 m.	Perennial bulbiferous herb; Blooms February to April	**Not Expected.** There is one CNDDB record of fragrant fritillary within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
dark-eyed gilia *Gilia millefoliata*	CRPR 1B.2	Coastal California from the Bay Area to the Oregon border.	Coastal dunes; 2-30 m.	Annual herb; Blooms April to July	**Not Expected.** There is one CNDDB record of dark-eyed gilia within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
San Francisco gumplant *Grindelia hirsutula* var. *maritima*	CRPR 3.2	Bay Area and San Luis Obispo County.	Coastal bluff scrub, coastal scrub, valley and foothill grasslands sometimes on sandy or serpentinite soils; 15-400 m.	Perennial herb; Blooms June to September	**Not Expected.** There is one CNDDB record of San Francisco gumplant within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
Diablo helianthella *Helianthella castanea*	CRPR 1B.2	Alameda, Contra Costa, and San Mateo counties.	Boardleafed upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley and foothill grassland in rocky soils; 60-1,300 m.	Perennial herb; Blooms March to June	**Not Expected.** There is one CNDDB record of Diablo helianthella within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
congested-headed hayfield tarplant *Hemizonia congesta* ssp. *congesta*	CRPR 1B.2	Lake, Marin, Mendocino, San Francisco, San Mateo, and Sonoma counties.	Valley and foothill grassland sometimes on roadsides; 20-560 m.	Annual herb; Blooms April to November	**Not Expected.** There are two CNDDB records of congested-headed hayfield tarplant within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
water star-grass *Heteranthera dubia*	CRPR 2B.2	Butte, Colusa, Marin, Modoc, San Francisco, San Mateo, Shasta, and Sutter counties.	Marshes and swamps (alkaline, still, slow-moving water); 30-1,495 m.	Perennial herb (aquatic); Blooms July to October	**Not Expected.** There is one CNDDB record of water star-grass within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.

Appendix C: Special Status Plant Species Evaluated for Potential to Occur on the Project Site

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Life Form; Blooming Period[2]	Potential Occurrence in the Project Area[3]
Kellogg's horkelia *Horkelia cuneata* var. *sericea*	CRPR 1B.1	Monterey, San Luis Obispo, San Mateo, Santa Barbara, and Santa Cruz counties.	Closed-cone coniferous forest, chaparral (maritime), coastal dunes, coastal scrub in openings, sometimes on gravelly or sandy soils; 10-200 m.	Perennial herb; Blooms April to September	**Not Expected.** There are two CNDDB records of Kellogg's horkelia within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
Point Reyes horkelia *Horkelia marinensis*	CRPR 1B.2	Marin, Mendocino, Monterey, San Mateo, Santa Cruz, and Sonoma counties.	Coastal dunes, coastal prairie, coastal scrub on sandy soils; 5-755 m.	Perennial herb; Blooms May to September	**Not Expected.** There are two CNDDB records of Point Reyes horkelia within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
island tube lichen *Hypogymnia schizidiata*	CRPR 1B.3	Marin, Mendocino, San Mateo, and Santa Barbara counties.	Closed-cone coniferous forest, chaparral on bark and wood of hardwoods and conifers; 360-405 m.	Lichen	**Not Expected.** There are two CNDDB records of island tube lichen within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
rose leptosiphon *Leptosiphon rosaceus*	CRPR 1B.2	Marin and San Mateo counties.	Coastal bluff scrub; 0-100 m.	Annual herb, Blooms April to July	**Not Expected.** There are two CNDDB records of rose leptosiphon within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
Crystal Springs lessingia	CRPR 1B.2	San Mateo and Sonoma counties.	Cismontane woodland, coastal scrub, valley and foothill grasslands in serpentinite soils, often on roadsides; 60-200 m.	Annual herb, Blooms July to October	**Not Expected.** There is one CNDDB record of Crystal Springs lessingia within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
Arcuate bush mallow *Malacothamnus arcuatus*	CRPR 1B.2	Found throughout the San Francisco peninsula and the south bay area throughout San Mateo and Santa Clara counties and Merced county.	Ultramafic chaparral, gravelly alluvium. Locally, in openings in mixed evergreen forests; 15-355 m.	Perennial evergreen shrub; Blooms April to September	**Not Expected.** There are three CNDDB records of arcuate bush mallow within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
woodland woollythreads *Monolopia gracilens*	CRPR 1B.2	Through central California from San Mateo and Contra Costa counties south to San Luis Obispo county.	Grassy openings in chaparral, valley and foothill grasslands (serpentine), cismontane woodland, broadleafed upland forests, North coast coniferous forest. Sandy to rocky soils; 100-1,200 m.	Annual herb; Blooms February to July	**Not Expected.** There is one CNDDB record of woodland woollythreads within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.

Appendix C: Special Status Plant Species Evaluated for Potential to Occur on the Project Site

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Life Form; Blooming Period[2]	Potential Occurrence in the Project Area[3]
white-rayed pentachaeta *Pentachaeta bellidiflora*	FE, SE, CRPR 1B.1	San Mateo County.	Cismontane woodland, valley and foothill grasslands (often serpentinite); 35 to 620 m.	Annual herb; Blooms March to May	**Not Expected.** There are three CNDDB records of white-rayed pentachaeta within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
Choris' popcornflower *Plagiobothrys chorisianus* var. *chorisianus*	CRPR 1B.2	Monterey, San Francisco, San Mateo, Santa Clara, and Santa Cruz counties.	Chaparral, coastal prairie, coastal scrub in mesic soils; 3-160 m.	Annual herb; Blooms March to June	**Not Expected.** There are three CNDDB records of Choris' popcornflower within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
Oregon polemonium *Polemonium carneum*	CRPR 2B.2	Alameda, Del Norte, Humboldt, Marin, San Francisco, San Mateo, Siskiyou, and Sonoma counties.	Coastal prairie, coastal scrub, lower montane coniferous forest; 0-1,830 m.	Perennial herb; Blooms April to September	**Not Expected.** There is one CNDDB record of Oregon polemonium within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
Scouler's catchfly *Silene scouleri* ssp. *scouleri*	CRPR 2B.2	Del Norte, Humboldt, Marin, San Francisco, San Mateo, and Sonoma counties.	Coastal bluff scrub, coastal prairie, valley and foothill grasslands; 0-600 m.	Perennial herb; Blooms June to August (September)	**Not Expected.** There are six CNDDB records of Scouler's catchfly within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
San Francisco campion *Silene verecunda* ssp. *verecunda*	CRPR 1B.2	San Francisco, San Mateo, and Santa Cruz counties.	Coastal bluff scrub, chaparral, coastal prairie, coastal scrub, valley and foothill grasslands in sandy soils; 30-645 m.	Perennial herb; Blooms (February) March to July (August)	**Not Expected.** There are three CNDDB records of San Francisco campion within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.
two-fork clover *Trifolium amoenum*	FE, CRPR 1B.1	Marin, San Mateo, and possibly Sonoma counties.	Coastal bluff scrub, valley and foothill grassland (sometimes serpentinite); 5-415 m.	Annual herb, Blooms April to June	**Not Expected.** There is one CNDDB record of two-fork clover within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.

Appendix C: Special Status Plant Species Evaluated for Potential to Occur on the Project Site

Species	Status	Geographic Distribution[1]	Habitat Requirements[2]	Life Form; Blooming Period[2]	Potential Occurrence in the Project Area[3]
San Francisco owl's clover *Triphysaria floribunda*	CRPR 1B.2	Marin, San Francisco, and San Mateo counties.	Coastal prairie, coastal scrub, valley and foothill grasslands usually in serpentinite soils; 10-160 m.	Annual herb, Blooms April to June	**Not Expected.** There are six CNDDB records of San Francisco owl's clover within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site
coastal triquetella *Triquetrella californica*	CRPR 1B.2	Contra Costa, Del Norte, Marin, Mendocino, San Diego, San Francisco, San Mateo, and Sonoma counties.	Coastal bluff scrub, coastal scrub on soil; 10-100 m.	Moss	**Not Expected.** There are two CNDDB records of coastal triquetella within 5 miles of the project site. However, there is no suitable habitat for this species at or near the site.

STATUS KEY:
Federal
FE: Federally-listed Endangered
FT: Federally-listed Threatened

State
SE: State-listed Endangered
ST: State-listed Threatened

California Native Plant Society (CNPS) California Rare Plant Rank (CRPR):
1B: Plants listed as rare, threatened, or endangered in California and elsewhere
2B: Plants listed as rare, threatened, or endangered in California but more common elsewhere
3: Plants about which more information is needed.
4: Plants of limited distribution, a watchlist.

CNPS CRPR added a decimal threat rank to the List rank to parallel that used by the CNDDB. This extension replaces the E (Endangerment) value from the R-E-D Code. CRPR ranks therefore read like this: 1B.1, 1B.2, etc. Threat code extensions and their meanings are as follows:
.1 – Seriously endangered in California (over 80% of occurrences threatened / high degree of immediacy of threat)
.2 – Fairly endangered in California (20-80% occurrences threatened)
.3 – Not very endangered in California (<20% of occurrences threatened or no current threats known)

SOURCES:
1. United States Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPAC) Species List (November 28, 2023).
2. California Natural Diversity Database (CNDDB) Rarefind 5 search of Montara Mountain USGS Quad and five surrounding quads; BIOS five mile radius search (November 28, 2023).
3. California Native Plant Society (CNPS) Rare and Endangered Plant Inventory Montara Mountain USGS Quad and five surrounding quads (December 4, 2023).

Appendix C: Special Status Plant Species Evaluated for Potential to Occur on the Project Site

OTHER CNDDB AND/OR CNPS SPECIAL-STATUS PLANT SPECIES IN 6 QUAD SEARCH AREA (NOT WITHIN 5 MILES OF THE PROJECT SITE)

- San Mateo thorn-mint (*Acanthomintha duttonii*), FE, SE, CRPR 1B.1
- Blasdale's bentgrass (*Agrostis blasdelei*), CRPR 1B.1
- Robbins' broomrape (*Aphyllon robbinsii*), CRPR 1B.1
- coast rockcress (*Arabis belpharophylla*), CRPR 4.3
- Anderson's manzanita (*Arctostaphylos andersonii*), CRPR 1B.2
- Franciscan manzanita (*Arctostaphylos franciscana*), FE, CRPR 1B.1
- Presidio manzanita (*Arctostaphylos montana* ssp. *ravenii*), FE, SE, CRPR 1B.1
- ocean bluff milk-vetch (*Astragalus nuttallii* var. *nuttallii*), CRPR 4.2
- coastal marsh milk-vetch (*Astragalus pycnostachyus* var. *pycnostachyus*), CRPR 1B.2
- Johnny-nip (*Castilleja ambigua* var. *ambigua*), CRPR 4.2
- Point Reye's salty bird's beak (*Chloropyron maritimum* ssp. *palustre*), CRPR 1B.2
- fountain thistle (*Cirsium fontinale* var. *fontinale*), FE, SE, CRPR 1B.1
- compact cobwebby thistle (*Cirsium occidentale* var. *compactum*), CRPR 1B.2
- round-headed collinsia (*Collinsia corymbosa*), CRPR 1B.2
- clustered lady's slipper (*Cypripedium fasciculatum*), CRPR 4.2
- California bottle-brush grass (*Elymus californicus*), CRPR 4.3
- San Francisco wallflower (*Erysimum franciscanum*), CRPR 4.2
- Marin checkered lily (*Fritillaria lanceolata* var. *tristulis*), CRPR 1B.1
- blue coast gilia (*Gilia capitata* ssp. *chamissonis*), CRPR 1B.1
- short-leaved evax (*Hesperevax sparsiflora var. brevifolia*), CRPR 1B.2
- Marin western flax (*Hesperolinon congestum*), FT, ST, CRPR 1B.1
- Harlequin lotus (*Hosackia gracilis*), CRPR 4.2
- coast iris (*Iris longipetala*), CRPR 4.2
- perennial goldfields (*Lasthenia californica* ssp. *macrantha*), CRPR 1B.2
- coast yellow leptosiphon (*Leptosiphon croceus*), SE, CRPR 1B.1
- Woolly-headed lessingia (*Lessingia hololeuca*), CRPR 3
- Ornduff's meadowfoam (*Limnanthes douglasii* ssp. *ornduffii*), CRPR 1B.1
- San Mateo tree lupine (*Lupinus arboreus* var. *eximius*), CRPR 3.2
- Northern curly-leaved monardella (*Monardella sinuata* ssp. *nigrescens*), CRPR 1B.2
- Marin knotweed (*Polygonum marinense*), CRPR 3.1
- Hickman's cinquefoil (*Potentilla hickmanii*), FE, SE, CRPR 1B.1
- Adobe sanicle (*Sanicula maritima*), CRPR 1B.1
- chaparral ragwort (*Senecio aphanactis*), CRPR 2B.2
- California seablite (*Suaeda californica*), FE, CRPR 1B.1
- Saline clover (*Trifolium hydrophilum*), CRPR 1B.2

Appendix D: Arborist Report

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ARBORIST REPORT

January 18, 2024
6762.00

PROJECT
Cunningham Water Tank 1
San Bruno, CA

PREPARED FOR
Lee + Ro

PREPARED BY
HMH
1570 Oakland Road
San Jose, CA 95131
William Sowa
ISA Certified Arborist #WE-12270A

TABLE OF CONTENTS

INTRODUCTION AND OVERVIEW

HMH was contracted to complete a survey, assessment and arborist report for trees located within the limit of work illustrated on Exhibit A. The project site encompasses a parcel with the City of San Bruno's Water Tank 1 and the access road. The scope includes the west side of the access road, the north side of the tank and the east side of the tank. There is a northbound onramp to the 280 to the west of the site and residential parcels to the east. Our scope of services includes locating, measuring DBH, assessing, and photographing the condition of all trees within the limit of work. Disposition and health recommendations are based on current site conditions. Site development/design may affect the preservation suitability. In addition, trees located outside the limit of work may be included if they may potentially be impacted by development of the site. These trees will not be measured, nor health assessed due to limited access. Tree locations are approximate, and their exact location should be determined by a licensed land surveyor. It should not be assumed that all trees inventoried are owned by the property owner. Check city and/or county codes for regulations regarding trees in the public right of way, setbacks, and/or easements.

METHODOLOGY

Our tree survey work is a deliberate and systematic methodology for cataloging trees on site:

1. Identify each tree species.
2. Note each tree's location on a site map.
3. Measure each trunk circumference at 4.5' above grade per ISA standards.
4. Evaluate the health and structure of each tree using the following numerical standard:

   5 *- A healthy, vigorous tree, reasonably free of disease, with good structure and form typical of the species.*

   4 *- A tree with slight decline in vigor, small amount of twig dieback, minor structural defects that could be corrected.*

   3 *- A tree with moderate vigor, moderate twig and small branch dieback, thinning of crown, poor leaf color, moderate structural defects that may be mitigated with care.*

   2 *- A tree in decline, epicormic growth, extensive dieback of medium to large branches, significant structural defects that cannot be abated.*

   1 *- A tree in severe decline, dieback of scaffold branches and or trunk, mostly epicormic growth; extensive structural defects that cannot be abated.*

   0 - Tree is dead.

SUMMARY OF FINDINGS

HMH conducted a tree inventory of 44 trees located within the limit of work outlined in Exhibit A. Thirty nine (39) of the trees inventoried are classified as heritage trees under the City of San Bruno Municipal Code.

A heritage tree is:
1. Any native bay (Umbellularia californica), buckeye (Aesculus species), oak (Quercus species), redwood (Sequoia sempervirens), or pine (Pinus radiata) tree that has a diameter of six inches or more measured at fifty-four inches above natural grade;
2. Any tree or stand of trees designated by resolution of the city council to be of special historical value or of significant community benefit;
3. A stand of trees, the nature of which makes each dependent on the others for survival; or
4. Any other tree with a trunk diameter of ten inches or more, measured at fifty-four inches above natural grade.

There are many native trees on the site. But there are also several invasive species as well.

Table 1 - Tree Quantity Summary summarizes tree quantities by both species and size. Each species that was inventoried as part of this scope is included. This is a useful tool for analyzing the mixture of trees as part of the project. The size table is useful when calculating mitigation requirements in the case of tree removal as well as aiding in determining tree maturity.

Table 2 - Tree Evaluation Summary lists each tree number, botanical name, common name, DBH, circumference, ordinance trees, health rating, preservation suitability, general notes and observations and recommendations.

See Exhibit A & B for Existing Tree Locations
See Table 1 for Tree Quantity Summary by species and size.
See Table 2 for Tree Evaluation Summary for sizes, notes and recommendations regarding each tree.

GENERAL OBSERVATIONS AND RECOMMENDATIONS

Species: *Acacia dealbata* (Silver Wattle)
Quantity: 4
Tree Numbers: 40 – 41, 43 – 44
Observations / Recommendations:
There are 4 silver wattles that were inventoried. Silver wattles are considered moderately invasive by the California Invasive Plants Council (Cal IPC). They spread underground as well as by seed and resprout easily after being cut. They can also have allelopathic effects which prevent other plants such as native plants from growing beneath them. Tree 40 is a spreading meandering tree that emerges from the ground and has many trunks spreading from it. There is an active beehive in the base of the trunk. Tree 41 is a multi trunk tree where it is clear there was a central trunk that is now gone. Tree 43 and 44 both have a severe lean. It is generally recommended to remove invasive species. The bees should be relocated prior to removal.

Species: *Acacia melanoxylon* (Blackwood Acacia)
Quantity: 3
Tree Numbers: 26 – 27, 36
Observations / Recommendations:
Blackwood acacia is another species that is considered invasive by Cal IPC. They spread via root suckers and seeds. These trees will probably require removal due to development, but it is recommended to remove invasive species regardless.

Species: *Eucalyptus globulus* (Blue Gum)
Quantity: 7
Tree Numbers: 28 – 31, 34, 39, 42
Observations / Recommendations:
There are 7 blue gum trees that were inventoried. They are all in moderate shape and health and several of them are very large specimens. They are another species that is considered invasive by Cal IPC. They are also considered to raise the risk of fire danger. These trees will probably require removal due to development, but it is recommended to remove invasive species regardless.

Species: *Heteromeles arbutifolia* (Toyon)
Quantity: 1
Tree Numbers: 24
Observations / Recommendations:
Toyon is mostly considered a shrub but there was one toyon inventoried that was large enough to be considered a tree. It is in moderate shape and health. It is being crowded by the nearby trees and shrubs, has cracks in the bark and some of the leaves are curling, which is probably the result of a pest.

Species: *Pinus radiata* (Monterey Pine)
Quantity: 12
Tree Numbers: 2 – 5, 10 – 13, 15, 23, 32 – 33
Observations / Recommendations:
There are eleven Monterey pine trees in various conditions. Two are very large multi trunk specimens. Tree 2 is in moderate health and shape, but it is on a steep slope above a residential property. If there is any grading beneath the canopy, it is recommended to remove the tree due to risk of failure. Trees 3 – 5 were further away from the scope of work but all three trees are dead and on a steep slope and should be removed due to the potential risk of falling. Trees 10 and 12 are in moderate condition. Tree 10 has crown die back and 12 is leaning. Tree 11 is another tree that was further away from the scope of work, but because it is dead and poses a risk of falling, it is recommended for removal. Tree 13 is dead and recommended for removal. Tree 15 is a large specimen but appears to be in decline. There are several dead branches and sap leak. The tree may require removal due to development, but if it is retained, it should be pruned and monitored. Tree 32 is in moderate shape and condition. Tree 33 is dead and should be removed.

Species: *Quercus agrifolia* (Coast Live Oak)
Quantity: 16
Tree Numbers: 1, 6 – 9, 14, 16 – 22, 25, 35, 38
Observations / Recommendations:
There are 16 coast live oaks that were inventoried. Most of the trees are in moderate shape and health. Almost all of them are infested by what appears to be leaf galls and have dead spots on the foliage. Generally all the trees would benefit from structural pruning and removal of dead material. Tree 1 has the most severe leaf gall issues with much of the foliage appearing brown. The tree is leaning and could pose a risk for falling. Due to this risk, this tree should be removed. Trees 6 – 8 are in moderate shape in condition, but may need to be removed due to development. They are crowded by each other, have cracks in the bark and dead branches. Tree 8 has fungus growing beneath it which is a sign of potential root problems. Tree 9 has a dead tree leaning on it which has caused structural problems. This tree should be removed. Tree 14 is in moderate condition but also has fungus at the base. Tree 16 is growing beneath tree 15 and has not developed a proper canopy. Trees 17 & 18 are crowded next to each other and have cracks in the bark. Trees 19 – 22, 25 and 35 are all in moderate shape and health. Tree 38 is on the edge of a steep slope over a residential property. It was too hazardous to get close to the tree to tag or measure it, so the size was estimated. Due to the hazardous location and potential for falling, this tree is recommended for removal.

Species: *unknown* (unknown)
Quantity: 1
Tree Numbers: 37
Observations / Recommendations:
Because of the thick brush and steep slope, it was impossible to get close to this tree to identify it, tag it, or measure it. It is dead and is hazardous and should be removed.

RECOMMENDATIONS FOR TREE PROTECTION DURING CONSTRUCTION

Site preparation: All existing trees shall be fenced within or at the drip line (foliar spread) of the tree. Depending on the location of the tree the fencing may not be able to be at the dripline. Examples of this would be public right of way, near property lines or around existing structures to remain. Where complete drip line fencing is not possible, the addition of straw waddles and orange snow fencing wrapping the trunk shall be installed per the tree protection detail. The fence should be a minimum of six feet high, made of galvanized 11-gauge wire mesh with galvanized posts or any material superior in quality. A tree protection zone (TPZ) sign shall be affixed to fencing at appropriate intervals as determined by the arborist on site. See tree protection detail for additional information, including tree protection zone sign. If the fence is within the drip line of the trees, the foliar fringe shall be raised to offset the chance of limb damage from active construction.

Active Construction: All contractors, subcontractors and other personnel shall be warned that encroachment within the fenced area and dripline is prohibited without the consent of the certified arborist on the job. This includes, but is not limited to, storage of lumber and other materials, disposal of paints, solvents or other noxious materials, parked cars, grading equipment or other heavy equipment. If construction activity needs to happen in the TPZ the fence can be moved temporarily for delivery of construction materials. The contractor should make accommodations to off load items such as trusses, timber, plasterboard, wallboard, concrete, gypsum board, flooring, roofing or any other heavy construction material outside the foliar spread of the tree so there is no heavy equipment needed that could cause damage to the canopy of the tree or compact the root zone. The tree protection fencing should be reestablished per the plans and details immediately after any activity through the TPZ. Penalties, based on the cost of remedial repairs and the evaluation guide published by the International Society of Arboriculture, shall be assessed for damages to the trees.

Grading/excavating: All grading plans that specify grading within the drip line of any tree, or within the distance from the trunk as outlined in the site preparation section above when said distance is outside the drip line, shall first be reviewed by a certified arborist. Provisions for aeration, drainage, pruning, tunneling beneath roots, root pruning or other necessary actions to protect the trees shall be outlined by an arborist. If trenching is necessary within the area as described above, said trenching shall be undertaken by hand labor and dug directly beneath the trunk of the tree. All roots 2 inches or larger shall be tunneled under and other roots shall be cut smoothly to the trunk side of the trench. The trunk side should be draped immediately with two layers of untreated burlap to a depth of 3 feet from the surface. The burlap shall be soaked nightly and left in place until the trench is back filled to the original level. An arborist shall examine the trench prior to back filling to ascertain the number and size of roots cut, so as to suggest the necessary remedial repairs.

Remedial repairs: An arborist shall have the responsibility of observing all ongoing activities that may affect the trees and prescribing necessary remedial work to ensure the health and stability of the trees. This includes, but is not limited to, all arborist activities brought out in the previous sections. In addition, pruning, as outlined in International Society of Arboriculture Best Management Practices: Pruning and ANSI A300 Part 1 Standard Practices: Pruning, shall be prescribed as necessary. Fertilizing, aeration, irrigation, pest control and other activities shall be prescribed according to the tree needs, local site requirements, and state agricultural pest control laws. All specifications shall be in writing. For pest control operations, consult the local county agricultural commissioner's office for individuals licensed as pest control advisors or pest control operators.

Final inspection: Upon completion of the project, the arborist shall review all work undertaken that may impact the existing trees. Special attention shall be given to cuts and fills, compacting, drainage, pruning and future remedial work. An arborist should submit a final report in writing outlining the ongoing remedial care following the final inspection.

MAINTENANCE RECOMMENDATIONS FOR TREES TO REMAIN

Regular maintenance, designed to promote plant health and vigor, ensures longevity of existing trees. Regular inspections and the necessary follow-up care of mulching, fertilizing, and pruning, can detect problems and correct them before they become damaging or fatal.

Tree Inspection: Regular inspections of mature trees at least once a year can prevent or reduce the severity of future disease, insect, and environmental problems. During tree inspection, four characteristics of tree vigor should be examined: new leaves or buds, leaf size, twig growth, and absence of crown dieback (gradual death of the upper part of the tree). A reduction in the extension of shoots (new growing parts), such as buds or new leaves, is a fairly reliable cue that the tree's health has recently changed. Growth of the shoots over the past three years may be compared to determine whether there is a reduction in the tree's typical growth pattern. Further signs of poor tree health are trunk decay, crown dieback, or both. These symptoms often indicate problems that began several years before. Loose bark or deformed growths, such as trunk conks (mushrooms), are common signs of stem decay. Any abnormalities found during these inspections, including insect activity and spotted, deformed, discolored, or dead leaves and twigs, should be noted and observed closely.

Mulching: Mulch, or decomposed organic material, placed over the root zone of a tree reduces environmental stress by providing a root environment that is cooler and contains more moisture than the surrounding soil. Mulch can also prevent mechanical damage by keeping machines such as lawn mowers and string trimmers away from the tree's base. Furthermore, mulch reduces competition from surrounding weeds and turf. To be most effective, mulch should be placed 2 to 4 inches deep and cover the entire root system, which may be as far as 2 or 3 times the diameter of the branch spread of the tree. If the area and activities happening around the tree do not permit the entire area to be mulched, it is recommended that as much of the area under the drip line of the tree is mulched as possible. When placing mulch, care should be taken not to cover the actual trunk of the tree. This mulch-free area, 1 to 2 inches wide at the base, is sufficient to avoid moist bark conditions and prevent trunk decay. An organic mulch layer 2 to 4 inches deep of loosely packed shredded leaves, pine straw, peat moss, or composted wood chips is adequate. Plastic should not be used as it interferes with the exchange of gases between soil and air, which inhibits root growth. Thicker mulch layers, 5 to 6 inches deep or greater, may also inhibit gas exchange.

Fertilization: Trees require certain nutrients (essential elements) to function and grow. Urban landscape trees may be growing in soils that do not contain sufficient available nutrients for satisfactory growth and development. In certain situations, it may be necessary to fertilize to improve plant vigor. Fertilizing a tree can improve growth; however, if fertilizer is not applied wisely, it may not benefit the tree at all and may even adversely affect the tree. Mature trees making satisfactory growth may not require fertilization. When considering supplemental fertilizer, it is important to consider nutrients deficiencies and how and when to amend the deficiencies. Soil conditions, especially pH and organic matter content, vary greatly, making the proper selection and use of fertilizer a somewhat complex process. To that end, it is recommended that the soil be tested for nutrient content. A soil testing laboratory and can give advice on application rates, timing, and the best blend of fertilizer for each tree and other landscape plants on site. Mature trees have expansive root systems that extend from 2 to 3 times the size of the leaf

canopy. A major portion of actively growing roots is located outside the tree's drip line. Understanding the actual size and extent of a tree's root system before applying fertilizer is paramount to determine quantity, type and rate at which to best apply fertilizer. Always follow manufacturer recommendations for use and application.

Pruning: Pruning is often desirable or necessary to remove dead, diseased, or insect-infested branches and to improve tree structure, enhance vigor, or maintain safety. Because each cut has the potential to change the growth of (or cause damage to) a tree, no branch should be removed without reason. Removing foliage from a tree has two distinct effects on growth: (1) it reduces photosynthesis and, (2) it may reduce overall growth. Pruning should always be performed sparingly. Caution must be taken not to over-prune as a tree may not be able to gather and process enough sunlight to survive. Pruning mature trees may require special equipment, training, and experience. Licensed and insured tree maintenance companies are equipped to provide a variety of services to assist in performing the job safely and reducing risk of personal injury and property damage and should be consulted for this type of work. *(See also ANSI A300 Part 1 Pruning Standards- https://www.tcia.org).*

Planting and Irrigation: Any new planting and irrigation that is to occur under the drip line of an existing tree should be conducted with care to avoid the root system. Generally installation of an irrigation mainline should be avoided under the dripline of the existing tree. Refer to the Grading/Excavating section for installation of any irrigation lines to be installed under the drip line of an existing tree. Any new planting should match the water use of the existing tree (as defined by WUCOLS). The irrigation hydro zone for the new planting should also match the requirements of the existing tree.

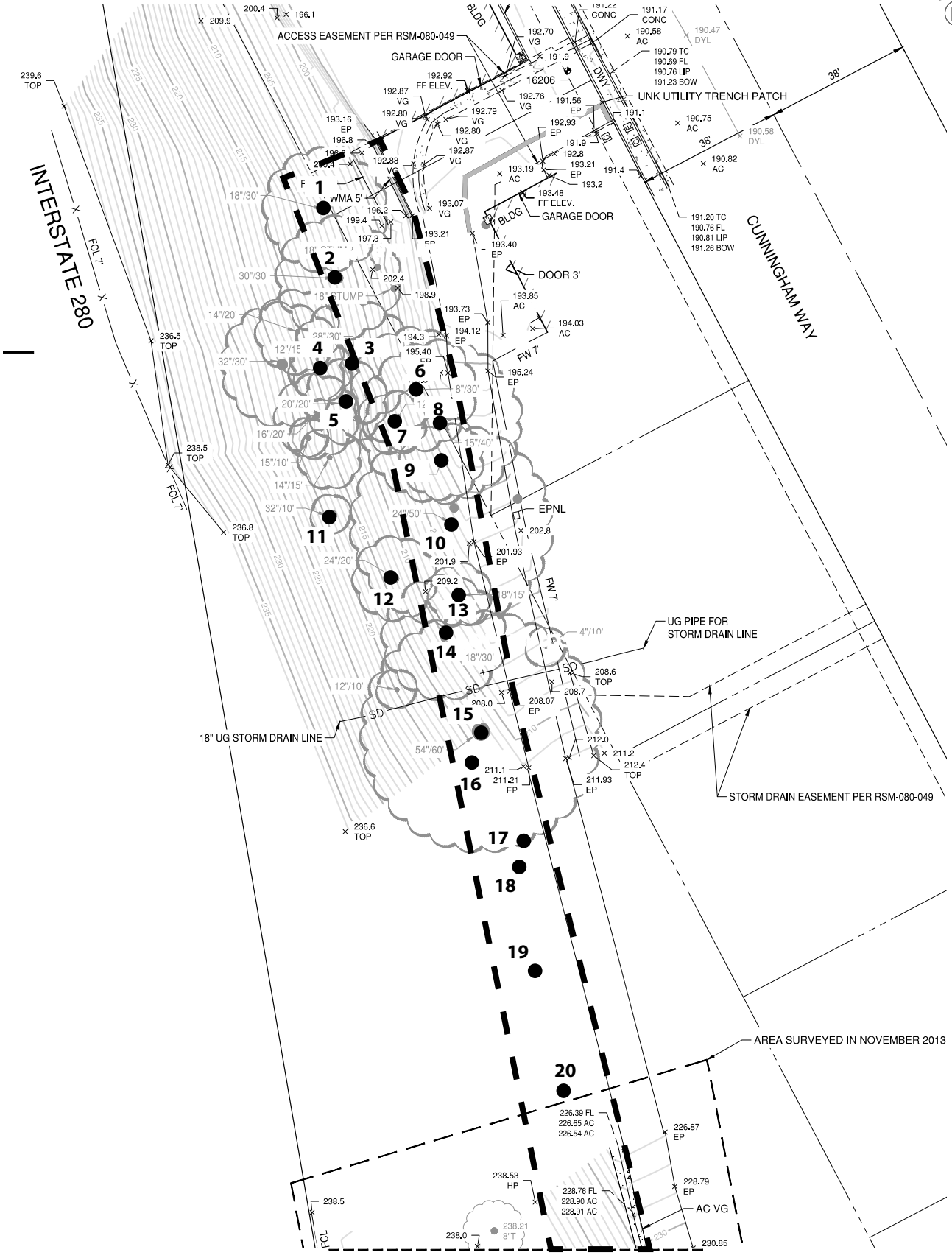
Removal: There are circumstances when removal is necessary. An arborist can help decide whether or not a tree should be removed. Professionally trained arborists have the skills and equipment to safely and efficiently remove trees. Removal is recommended when a tree: (1) is dead, dying, or considered irreparably hazardous; (2) is causing an obstruction or is crowding and causing harm to other trees and the situation is impossible to correct through pruning; (3) is to be replaced by a more suitable specimen, and; (4) should be removed to allow for construction. Pruning or removing trees, especially large trees, can be dangerous work. It should be performed only by those trained and equipped to work safely in trees.

TERMS AND CONDITIONS

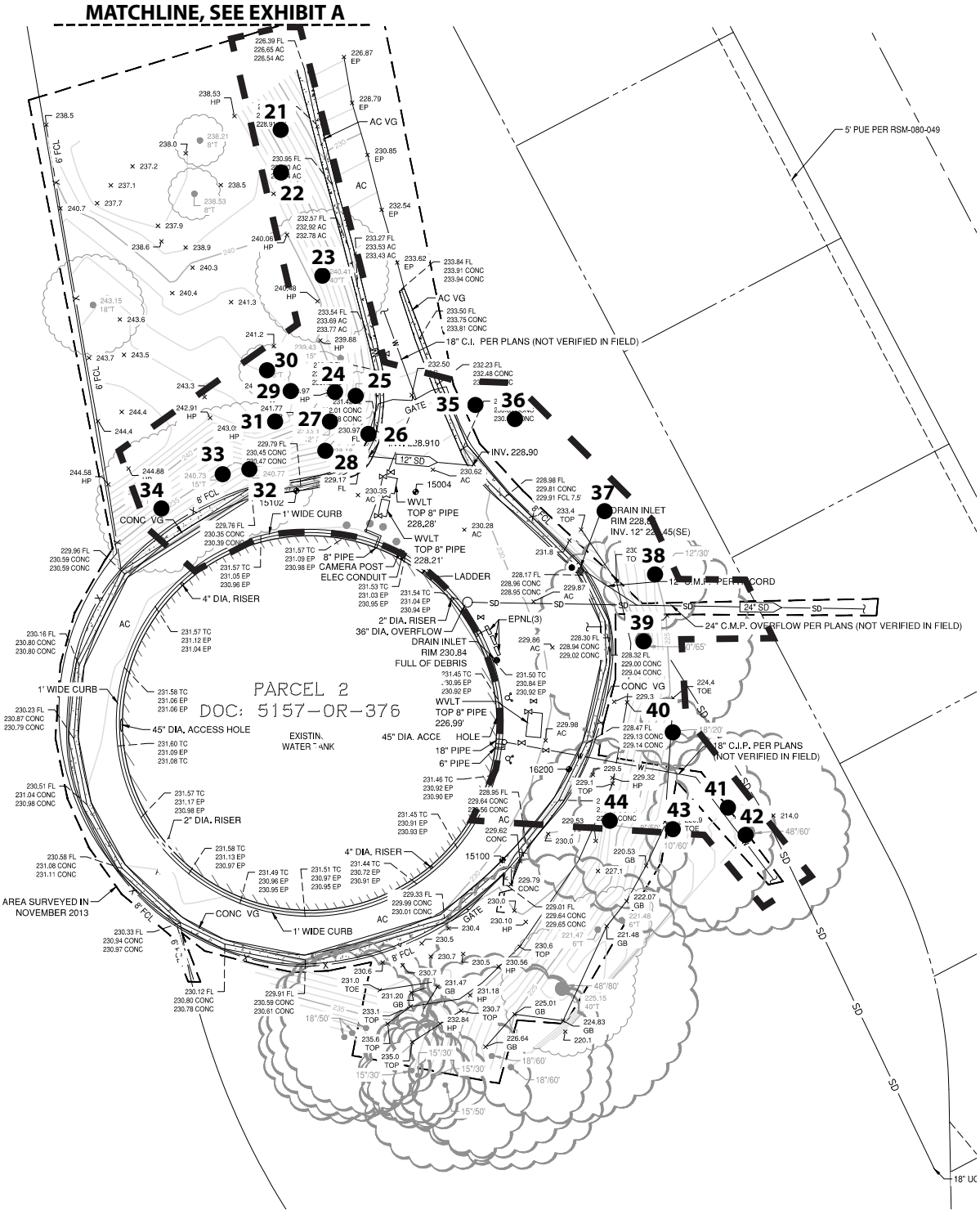
The following terms and conditions apply to all oral and written reports and correspondence pertaining to consultations, inspections and activities of HMH.

1. The scope of any report or other correspondence is limited to the trees and conditions specifically mentioned in those reports and correspondence. HMH assumes no liability for the failure of trees or parts of trees, either inspected or otherwise. HMH assumes no responsibility to report on the condition of any tree or landscape feature not specifically requested by the named client.
2. No tree described in this report was climbed, unless otherwise stated. HMH does not take responsibility for any defects, which could have only been discovered by climbing. A full root collar inspection, consisting of excavating the soil around the tree to uncover the root collar and major buttress roots was not performed unless otherwise stated. HMH does not take responsibility for any root defects, which could only have been discovered by such an inspection.
3. HMH shall not be required to provide further documentation, give testimony, be deposed, or attend court by reason of this appraisal or report unless subsequent contractual arrangements are made, including payment of additional fees for such services as described by HMH or in the schedule of fees or contract.
4. HMH guarantees no warrantee, either expressed or implied, as to the suitability of the information contained in the reports for any reason. It is the responsibility of the client to determine applicability to his/her case.
5. Any report and the values, observations and recommendations expressed therein represent the professional opinion of HMH, and the fee for services is in no manner contingent upon the reporting of a specified value nor upon any particular finding to be reported.
6. Any photographs, diagrams, graphs, sketches or other graphic material included in any report, being intended solely as visual aids, are not necessarily to scale and should not be construed as engineering reports or surveys, unless otherwise noted in the report. Any reproductions of graphic material or the work produced by other persons, is intended solely for clarification and ease of reference. Inclusion of said information does not constitute a representation by HMH as to the sufficiency or accuracy of that information.
7. Trees can be managed, but they cannot be controlled. To live near trees is to accept some degree of risk. The only way to eliminate all risk associated with trees is to eliminate all trees.

Existing Tree Map
Exhibit A



Existing Tree Map
Exhibit B



APPROXIMATE LIMIT OF WORK

TABLE 1 - TREE QUANTITY SUMMARY

Tree Quantity by Species		
Species	**Quantity**	**% of Site**
Acacia dealbata	4	9%
Acacia melanoxylon	3	7%
Eucalyptus globulus	7	16%
Heteromeles arbutifolia	1	2%
Pinus radiata	12	27%
Quercus agrifolia	16	36%
unknown	1	2%
Total Trees	**44**	**100%**

TABLE 2 - TREE EVALUATION SUMMARY

Prepared By: William Sowa ISA Certified Arborist WE-12270A

DBH MEASUREMENT HEIGHT: 54"

Date of Evaluation: 12/21/2023

Suitability for Preservation is based on the following	
Good - Trees with good health and structural stability that have the potential for longevity at the site.	
Moderate - Trees in somewhat declining health and/or exhibits structural defects that cannot be abated with treatment. Trees will require more intense management and will have a shorter lifespan than those in the 'Good' category.	
Poor - Trees in poor health or with significant structural defects that cannot be mitigated. Tree is expected to decline, regardless of treatment.	

Health Rating	
5	A healthy, vigorous tree, reasonably free of disease, with good structure and form typical of the species.
4	A tree with slight decline in vigor, small amount of twig dieback, minor structural defects that could be corrected.
3	A tree with moderate vigor, moderate twig and small branch dieback, thinning of crown, poor leaf color, moderate structural defects that may that might be mitigated with care.
2	A tree in decline, epicormic growth, extensive dieback of medium to large branches, significant structural defects that cannot be abated.
1	A tree in severe decline, dieback of scaffold branches and or trunk, mostly epicormic growth; extensive structural defects that cannot be abated.
0	Tree is dead.

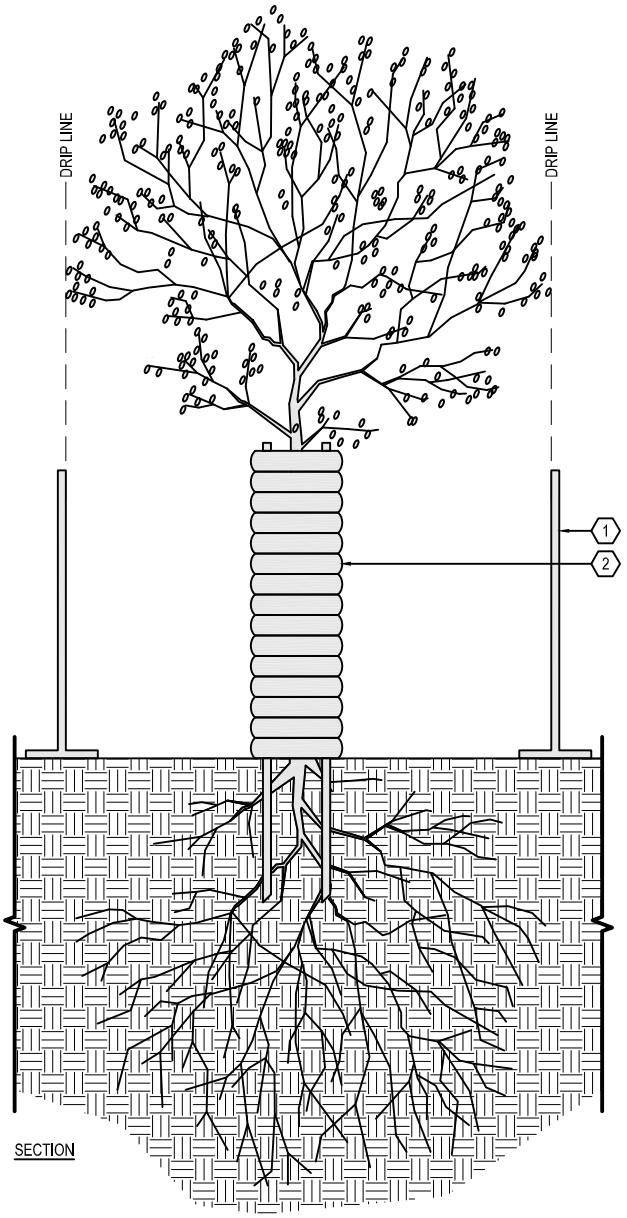
Abbreviations and Definitions		
BDB	Branch dieback	Condition where branch tips or entire sections of branches die off. Typically indicative of tree stress.
CD	Codominant branches	Forked branches nearly the same size in diameter, arising from a common junction an lacking a normal branch union.
CDB	Dieback in Crown	Condition where branches in the tree crown die from the tips toward the center.
CR	Crowded	Tree is bounded closely by one or more of the following: structure, tree, Etc.
D	Decline	Tree shows obvious signs of decline, which may be indicative of the presence of multiple biotic and abiotic disorders.
DBH	Diameter at Breast Height	Measurement of tree diameter in inches. Measurement height varies by City and is noted above.
EG	Epicormic Growth	Watersprouting on trunk and main leaders or suckers, sprouts arising out of roots.Typically indicative of tree stress.
EH	Exposed Heartwood	Exposure of the tree's heartwood is typically seen as an open wound that leaves a tree more susceptible to pathogens, disease or infection.
GR	Girdling Roots	Roots that grow around or across other roots. Can cause restriction of nutrient and water uptake, swelling, dieback or structural instability.
H	Hazardous	A tree that in it's current condition, presents a hazard.
HD	Headed	Poor pruning practice of cutting back branches. Often practiced under utility lines to limit tree height.
IB	Included Bark	Structural defect where bark is included between the branch attachment so the wood can't join. Such defect can have a higher probability of failure.
LN	Leaning Tree	Tree leaning, see notes for severity.
MT	Multi Trunk	Multiple central leaders originating below the DBH measurement.
PT	Phototropism	Tree exhibits phototropic growth habits. Reduced trunk taper, misshapen trunk and canopy growth are examples of this growth habit.
SD	Structural Defects	Naturally or secondary conditions including cavities, poor branch attachments, cracks, or decayed wood in any part of the tree that may contribute to structural failure.
SE	Severe	Indicates the severity of the following term.
SL	Slight	Indicates the mildness of the following term.
SR	Surface Roots	Roots visible at finished grade.
ST	Stress	Environmental factor inhibiting regular tree growth. Includes drought, salty soils, nitrogen and other nutrient deficiencies in the soil.
WU	Weak Union	Weak union or fork in tree branching structure.
	Heritage Tree	1. Any native bay (Umbellularia californica), buckeye (Aesculus species), oak (Quercus species), redwood (Sequoia sempervirens), or pine (Pinus radiata) tree that has a diameter of six inches or more measured at fifty-four inches above natural grade; 2. Any tree or stand of trees designated by resolution of the city council to be of special historical value or of significant community benefit; 3. A stand of trees, the nature of which makes each dependent on the others for survival; or 4. Any other tree with a trunk diameter of ten inches or more, measured at fifty-four inches above natural grade.

* REMOVAL RECOMMENDED: 1 - Removal recommended due to poor health or invasiveness. 2 - Removal recommended due to construction.
Lee + Ro 60% submittal plans dated 12/1/23 were reviewed to determine construction removals.

TREE #	BOTANICAL NAME	COMMON NAME	DBH (INCHES)	CIRCUMFERENCE (INCHES)	HERITAGE TREE	HEALTH	PRESERVATION SUITABILITY	REMOVAL RECOMMENDED*	NOTES
1	*Quercus agrifolia*	Coast Live Oak	4, 8, 14.3	26	YES	2	Poor	1, 2	Infestation, dead foliage, IB, LN
2	*Pinus radiata*	Monterey Pine	23.9	75	YES	3	Moderate	2	Sap Leak, SL LN
3	*Pinus radiata*	Monterey Pine	27.5	86	YES	0	Poor	1, 2	Dead, H
4	*Pinus radiata*	Monterey Pine	13.3, 10.5	24	YES	0	Poor	1	Dead, H
5	*Pinus radiata*	Monterey Pine	17.5	55	YES	0	Poor	1	Dead, H
6	*Quercus agrifolia*	Coast Live Oak	9.3	29	YES	3	Moderate	2	Uneven canopy, CR other trees, infestation, SD
7	*Quercus agrifolia*	Coast Live Oak	10.3, 5	15	YES	3	Moderate	2	Dead branches, CR, bark cracks, infestation
8	*Quercus agrifolia*	Coast Live Oak	13.3	42	YES	3	Moderate	2	IB, fungus, uneven canopy, CR, bark cracks, infestation
9	*Quercus agrifolia*	Coast Live Oak	5.5	17	NO	2	Poor	1,2	Dead tree leaning on , LN, Infestation
10	*Pinus radiata*	Monterey Pine	21.3	67	YES	3	Moderate	2	CDB
11	*Pinus radiata*	Monterey Pine	28.0	88	YES	0	Poor	1	Dead
12	*Pinus radiata*	Monterey Pine	18.5	58	YES	3	Moderate	Retain	LN
13	*Pinus radiata*	Monterey Pine	8.3	26	YES	0	Poor	1,2	Dead
14	*Quercus agrifolia*	Coast Live Oak	12.3	39	YES	3	Moderate	2	LN, fungus at base
15	*Pinus radiata*	Monterey Pine	13.7, 13.6, 37.2, 16.5, 10.6, 15.2	107	YES	1	Poor	1,2	D, Dead branches, sap leak
16	*Quercus agrifolia*	Coast Live Oak	4, 7.1	11	YES	3	Moderate	2	SE CR #15, cracks in bark, infestation
17	*Quercus agrifolia*	Coast Live Oak	8.5	27	YES	3	Moderate	Retain	CR #15 & 18, cracks in bark, infestation
18	*Quercus agrifolia*	Coast Live Oak	7.0	22	YES	3	Moderate	Retain	CR #15 & 17, cracks in bark, infestation
19	*Quercus agrifolia*	Coast Live Oak	7.6, 8.3	16	YES	3	Moderate	Retain	Lower branches dead, infestation
20	*Quercus agrifolia*	Coast Live Oak	4.5, 5, 2.5	12	YES	3	Moderate	Retain	
21	*Quercus agrifolia*	Coast Live Oak	8.4	26	YES	3	Moderate	Retain	IB
22	*Quercus agrifolia*	Coast Live Oak	5.3	17	NO	3	Moderate	Retain	CR #21

TREE #	BOTANICAL NAME	COMMON NAME	DBH (INCHES)	CIRCUMFERENCE (INCHES)	HERITAGE TREE	HEALTH	PRESERVATION SUITABILITY	REMOVAL RECOMMENDED*	NOTES
23	*Pinus radiata*	Monterey Pine	22.2, 19.5, 12.4, 16, 17.1	87	YES	3	Moderate	Retain	sap leak
24	*Heteromeles arbutifolia*	Toyon	5.2, 4.5	10	YES	3	Moderate	2	cracks in bark, crowded by surrounding plants, leaf curl
25	*Quercus agrifolia*	Coast Live Oak	2.2, 3.6	6	YES	3	Moderate	2	CR by surrounding plants, MT, IB, infestation
26	*Acacia melanoxylon*	Blackwood Acacia	4.7, 3.3, 4.5, 3.5	16	YES	3	Moderate	1,2	MT, invasive
27	*Acacia melanoxylon*	Blackwood Acacia	6.8, 5.2	12	YES	3	Moderate	1,2	MT, invasive
28	*Eucalyptus globulus*	Blue Gum	9.6, 10.9, 3.2, 8, 6.2, 9, 12.5, 4.7	64	YES	3	Moderate	1,2	MT, center tree gone, invasive
29	*Eucalyptus globulus*	Blue Gum	8.2	26	NO	3	Moderate	1,2	invasive
30	*Eucalyptus globulus*	Blue Gum	14.6	46	YES	3	Moderate	1,2	invasive
31	*Eucalyptus globulus*	Blue Gum	7.5	24	NO	3	Moderate	1,2	invasive
32	*Pinus radiata*	Monterey Pine	18.4	58	YES	3	Moderate	2	
33	*Pinus radiata*	Monterey Pine	18.3	57	YES	0	Poor	1,2	Dead
34	*Eucalyptus globulus*	Blue Gum	30.0	94	YES	3	Moderate	1,2	not tagged, DBH estimated, invasive
35	*Quercus agrifolia*	Coast Live Oak	3.5, 5, 6.2	15	YES	3	Moderate	2	MT, IB, Infestation
36	*Acacia melanoxylon*	Blackwood Acacia	13.0	41	YES	1	Poor	1,2	Mostly dead on one side, ivy infestation, SD, invasive
37	*unknown*	unknown	18.0	57	YES	0	Poor	1,2	not tagged, DBH estimated, H
38	*Quercus agrifolia*	Coast Live Oak	14.0	44	YES	3	Moderate	1,2	not tagged, DBH estimated, H
39	*Eucalyptus globulus*	Blue Gum	7, 18.2, 32, 14, 16	87	YES	3	Moderate	1,2	invasive
40	*Acacia dealbata*	Silver Wattle	24.0	75	YES	2	Poor	1,2	active bee habitat, trunk goes underground & meanders, SD, invasive
41	*Acacia dealbata*	Silver Wattle	5.5, 4.3, 5, 4.8, 2.5, 4.2, 3, 2, 2, 3, 2.5	39	YES	2	Poor	1,2	MT, center tree gone, invasive
42	*Eucalyptus globulus*	Blue Gum	43.9	138	YES	3	Moderate	1,2	invasive
43	*Acacia dealbata*	Silver Wattle	11.4	36	YES	2	Poor	1,2	SE LN, invasive

TREE #	BOTANICAL NAME	COMMON NAME	DBH (INCHES)	CIRCUMFERENCE (INCHES)	HERITAGE TREE	HEALTH	PRESERVATION SUITABILITY	REMOVAL RECOMMENDED*	NOTES
44	*Acacia dealbata*	Silver Wattle	8.0	25	NO	2	Poor	1,2	SE LN, under dead tree, invasive



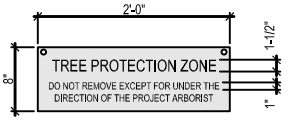
SECTION

NOTES:

1. REFER TO THE TREE PROTECTION NOTES.
2. TREE PROTECTION MEASURES SHALL BE INSTALLED BEFORE GRADING OR EQUIPMENT IS ALLOWED ON SITE.
3. PRIOR TO CONSTRUCTION, SEE THE REMEDIAL REPAIRS SECTION TO DETERMINE FERTILIZING AND WATERING SCHEDULES FOR EXISTING TREES.
4. WHEN CONSTRUCTION IS TO TAKE PLACE WITHIN A TREE'S DRIP LINE, SEE SITE PREPARATION SECTION.
5. NO CONSTRUCTION WASTE, EITHER LIQUID, SOLID, OR ANY OTHER SUBSTANCE WHICH COULD ENTER INTO THE ROOT SYSTEM (OIL, GASOLINE, CHEMICALS, OR OTHER HARMFUL MATERIALS) SHALL BE DEPOSITED, DISPOSED OF, OR STORED WITHIN OR NEAR A TREE'S DRIP LINE.
6. WIRE, SIGNS, ROPES, PULLEYS, ETC., SHALL NOT BE ATTACHED TO ANY TREE.
7. IF TRENCHING WITHIN A TREE'S DRIP LINE IS NECESSARY, SEE GRADING/EXCAVATION SECTION.
8. IF TREE PRUNING IS NECESSARY, SEE REMEDIAL REPAIRS SECTION.
9. INSTALL ONE SIGN TO DRIP LINE FENCING PER AREA.
10. SEE TREE PROTECTION ZONE (TPZ) INSTRUCTIONS UNDER SITE PREPARATION SECTION.

(1) 6'-0" HIGH TEMPORARY CHAIN LINK FENCE, INSTALLED AT DRIP LINE. SEE TREE PROTECTION PLAN FOR LOCATIONS. PREFERENCE WOULD BE AT DRIP LINE OR FOLLOW LOCAL CODES.

(2) INSTALL TRUNK WRAP IF DRIP LINE FENCE IS NOT PRACTICAL, INSTALL FOUR (4) LODGE POLES AROUND EACH TREE, WRAP TRUNK IN STRAW WADDLE, THEN WRAP IN ORANGE SNOW FENCING UP TO BRANCHING STRUCTURE



SIGN
SCALE: 1" = 1'-0"

TREE PROTECTION

SCALE: 1/2" = 1'-0"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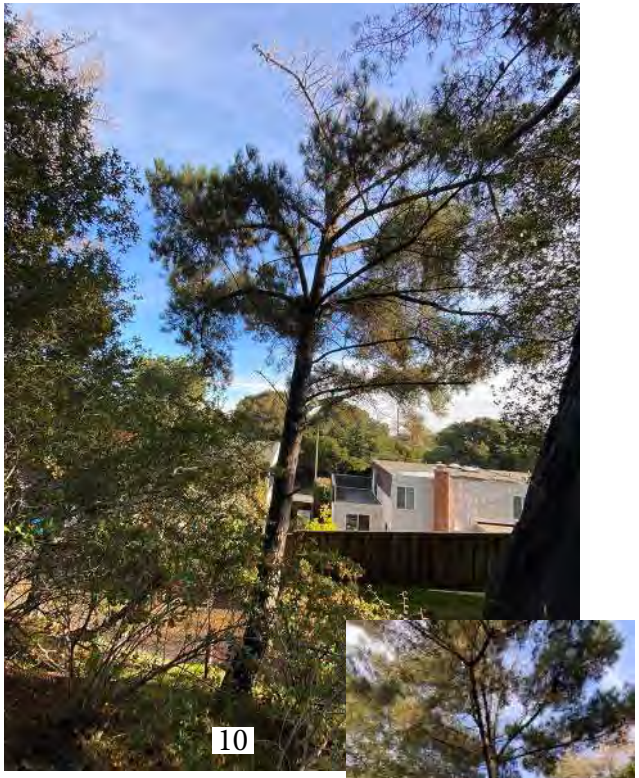
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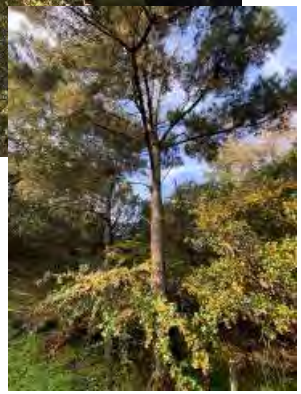


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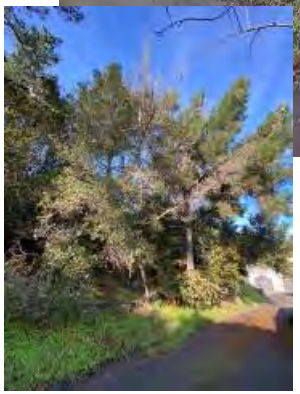


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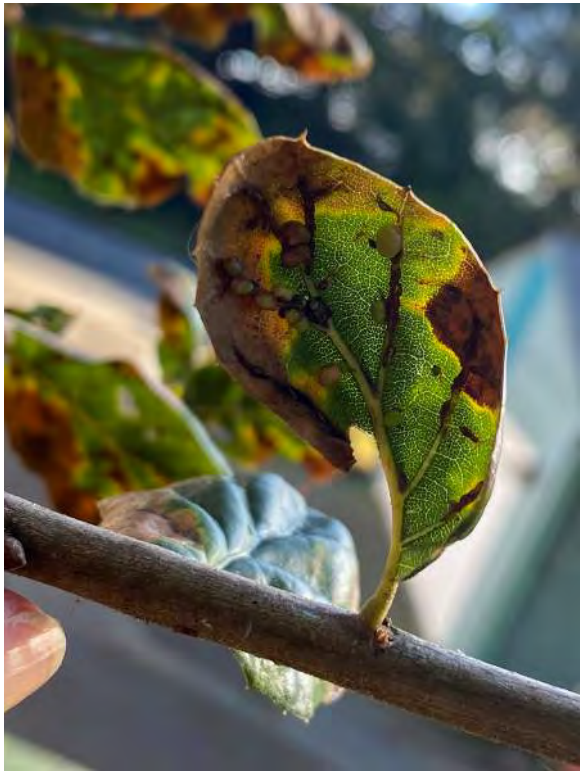

INFESTATION AND DIEBACK MOST OAKS EXHIBITED

Appendix E: Archaeological Resources Assessment Report

CONFIDENTIAL HELD ON FILE AT THE CITY

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Appendix F: Geotechnical Report

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BRIERLEY ASSOCIATES

Creating Space Underground

Geotechnical Report
Cunningham Water Storage Tank Project
San Bruno, California

February 9, 2024

BRIERLEY ASSOCIATES
Creating Space Underground

February 9, 2024
File Number: 120098-000

Lee & Ro
10640 Scripps Ranch Blvd., Suite 150
San Diego, CA 921310

Attention: Mr. Eric McGee, P.E., Project Manager

Subject: Geotechnical Report
Cunningham Water Storage Tank Project
San Bruno, California

Mr. Lukiewski:

Brierley Associates Corporation (Brierley) is providing this Geotechnical Report to Lee & Ro for planned improvements at the Cunningham Water Storage Tank (Water Tank No. 1) site located off of Cunningham Way in San Bruno, California. The purpose of this report is to provide geotechnical engineering recommendations for the design and construction of a new 3.5 MG prestressed concrete tank that will replace the existing 2.5 MG steel water storage tank, and a soil nail wall along a portion of the existing tank access road as depicted on design drawings by Lee & Ro (2023). Recommendations for general site grading, pavements, utilities, and drainage are to be provided by others.

This report is prepared in accordance with the proposal included in our contract dated July 31, 2023, and provides geotechnical engineering recommendations limited to design of the replacement water storage tank and soil nail wall.

If you have any questions about the report, please do not hesitate to contact us.

Sincerely,

BRIERLEY ASSOCIATES

Bridgette Hassett, P.E.
Project Engineer

Patrick Smith, PhD, P.E., G.E.
Senior Associate

TABLE OF CONTENTS

Tables

Figures

Appendices

1 SITE AND PROJECT DESCRIPTION

1.1 Existing Site Conditions

The project site is located along an access road near Cunningham Way in San Bruno, California (Figure 1). The site is bounded to the north, south and west by California Department of Transportation (Caltrans) right-of-way property associated with the Interstate 280 (I-280) freeway and on-ramp, and to the east by residential properties. The site generally slopes upwards to the south and southwest, with elevations varying from approximately 191 feet on the north side of the site up to 245 feet on the southwest side of the site (per City of San Bruno Datum).

The access road to the existing storage tank consists of a narrow driveway that begins on the southwest side of Cunningham Way and runs roughly 450 feet to the south. The road slopes gradually upwards to the south and leads to the existing water storage tank located on the south side of the site. To the west of the access road, the site slopes upwards at 1.75H:1V (horizontal: vertical), extending to Caltrans right-of-way.

1.2 Project Understanding

A new partially buried reinforced concrete water storage tank (tank) is to be constructed on the south side of the site in the same footprint as the existing steel tank (Figure 2B). Based on review of design drawings provided by Lee & Ro (2023), the tank is to have a diameter of 112 feet and a height of 60.5 feet. The planned finished grade around the tank varies from El. 229.5 to 232.5 feet, and the tank floor will be located at El. 213.5 feet (16 to 19 feet below finished grade). The replacement tank will be supported on a reinforced concrete ring wall foundation that is connected to the reinforced concrete tank floor. The tank foundation will sit atop the compacted aggregate base, and ring drain will be placed around the foundation to drain water from adjacent and beneath the tank.

The approximately 12 feet wide by 450 feet long access road will be widened near a turn near the entrance for approximately 180 to 200 feet. A soil nail wall will be constructed in order to support this permanent cut slope to the west (Figure 2A). The final configuration of the widened access road and wall has yet to be finalized, but it will vary in height from a few to approximately 10 feet in height. The wall is to be finished with shotcrete and v-ditch will be located at the top of the wall to intercept and drain surface water from the above slope.

2 WORK PERFORMED

The purpose of this report is to provide geotechnical opinions and recommendations for the design and construction of the proposed tank and soil nail wall. The main geologic and geotechnical considerations that we evaluated to provide recommendation for design and construction of proposed improvements are characterization of subsurface conditions, area seismicity, geologic and seismic hazard assessment, tank and soil nail wall requirements, and associated construction considerations.

2.1 Scope of Work

Our scope of work included the following:

- Review of pertinent information for the site, including previous geotechnical and geologic reports available for the site, existing topographic and geologic maps, aerial photographs, construction documentation, and other publicly available information.
- Performing a one (1) day site reconnaissance visit by a Certified Engineering Geologist to verify site geologic conditions and make observations of the road cut near the proposed soil nail wall.
- Summarize project geology and characterize subsurface conditions.
- Preparation of geologic maps including profiles.
- Provide seismic design parameters needed for design of the new tank and soil nail wall.
- Geohazard assessment relative to proposed improvements.
- Provide recommended geotechnical design parameters for subsurface materials.
- Provide geotechnical engineering design recommendations for the tank and soil nail wall including allowable bearing capacity, settlement, and lateral earth pressure recommendations.
- Discussion of construction considerations for temporary excavations and construction of the soil nail wall.
- Preparation of this final report outlining our findings and recommendations.

2.2 Fieldwork

Fieldwork was limited to a site reconnaissance by William Godwin, PG, CEG and Brierley representative on September 1, 2023. The site reconnaissance included observing existing topographic and geologic conditions at the site as well as excavation of several shallow potholes to observe near-surface materials. Findings from the site reconnaissance are included in Godwin's geologic assessment report provided in Appendix A.

A subsurface exploration and laboratory testing program was not performed by Brierley. However, ENGEO (2023) performed a limited program consisting of one (1) borehole located on the slope above the proposed soil nail wall that extended to 27.5 feet

below ground surface (bgs) and laboratory testing of select samples. A copy of ENGEO's (2023) report is provided in Appendix .

2.3 Previous Studies

To assist in preparing this report, we reviewed previous geotechnical and geologic reports for the project site that were provided by Lee & Ro in addition to the report prepared by ENGEO (2023). Subsurface data from boreholes, trenching, and laboratory testing included in these reports were used in developing geotechnical engineering recommendations included in this report. These reports are summarized below:

- **Cornerstone Earth Fault Study (2014a).** In January of 2014, Cornerstone Earth Group (CEG) provided a fault study report for the site in order to assess whether active traces of the Serra Fault cross below the existing water tank (CEG, 2014a). As part of their study, CEG performed three fault trenches adjacent to the tank. Based on the observation of hairline fault traces in the trenches, CEG concluded that potentially active faults underlie the site. Accordingly, they provided recommendations to mitigate damage to the tank resulting from surface fault rupture.
- **Cornerstone Geotechnical Investigation (2014b).** In April of 2014, CEG performed a geotechnical investigation for the proposed tank replacement at the site (CEG, 2014b). Their field exploration included one (1) boring, EB-1, which was performed on the east side of the existing tank to a depth of 30 feet with some laboratory testing on select samples. They provided geotechnical recommendations for design and construction of the proposed replacement tank.
- **ENGEO Fault Trench Exploration (2014).** In October of 2014, ENGEO performed a fault trench exploration (ENGEO, 2014) to further assess the likelihood of faulting at the site. They performed one additional fault trench to the south of the tank. ENGEO did not find evidence of surface fault rupture during the Holocene period in their trench and fractures observed in nearby CEG (2014a) trenches are unlikely to be laterally continuous faults capable of producing significant ground displacement. However, ENGEO concluded ground deformation resulting from an earthquake on a nearby fault could not be entirely ruled out and provided tank design recommendations to mitigate these associated effects.

3 SURFACE AND SUBSURFACE CONDITIONS

3.1 Surface Conditions

Site topography slopes downward from Interstate Highway 280 towards the access road along Cunningham Way to the east at an approximate 0.5H:1V slope. Low lying vegetation covers the site except in paved areas and the existing tank, and trees and dry brush are present throughout the project site. Existing structures or utilities were not observed up slope of the access road or adjacent to the tank, but there are some existing utilities present around the tank and crossing the access road based on review of as-built drawings.

Based on information included with a report by ENGEO (2014), it appears that site was originally graded to create the tank pad and access road that likely to mostly reside in cut (excavated) areas. Fill areas are mostly located to the east of the tank pad and access road as inferred by Cornerstone (2014a and 2014b).

3.2 Subsurface Conditions

We concur with description and interpretations of geology as interpreted by Godwin (2023). In general, Godwin (2023) indicates the project site is underlain at shallow depths by sandstone and siltstone bedrock of the Colma Formation. A thin layer of undocumented fill or colluvium up to a couple feet overlies the Colma Formation.

Regional geologic maps and site-specific trench exposures indicate generally favorable bedding with a strike mostly along the trend of the access road slope and shallow to moderate dips ranging from 5 to 20 degrees to the south or west. Geologic profiles that depict interpretive subsurface conditions adjacent to the access road where a soil nail will be constructed are provided in Godwin's report (2023).

3.3 Groundwater

Groundwater was not encountered in either boring 1-B1 (ENGEO, 2023) which extended to a depth of approximately 27.5 feet, or in boring EB-1 (CEG, 2014) which extended to a depth of 30 feet. We expect that groundwater will be deeper than the depth of the proposed improvements at the site. Groundwater levels may vary seasonally, and perched groundwater may be present following heavy rains.

3.4 Expansive Soils

Based upon review of geotechnical laboratory data from this study and provided in reports by Cornerstone (2014b) and ENGEO (2023), onsite soils and bedrock have a Low Expansion Potential per Section 1803.5.3 of the 2022 California Building Code.

3.5 Geohazards

Geologic hazards (Geohazards) are geologic conditions capable of causing significant damage or loss should they occur. Geohazards that represent a significant risk to the project site are associated with the occurrence of a major earthquake and include strong shaking, fault surface rupture, ground lurching, and seismic slope instability. The risk of other geohazards including regional subsidence or uplift, soil liquefaction, lateral spreading,

landslides, tsunamis, flooding, or seiches is considered very low to negligible for the project site based on review of topographic data and interpreted subsurface conditions.

3.5.1 Strong Shaking

The project site is in a seismically active area and could experience strong shaking during a significant earthquake. Nearby active faults capable of generating strong seismic ground shaking at the site include the San Andreas, San Gregorio, and Pilarcitos faults; but strong shaking will be considerable with rupture on the San Adreas fault due to its size and proximity to the project site.

3.5.2 Fault Surface Rupture

The project site is not located within an Earthquake Fault Zone as defined by the Alquist-Priolo Special Studies Act of 1972 (CGS, 2023). Additionally, Godwin (2023) indicates the project site is not crossed by the Serra Fault and does not expect surface fault rupture hazard to be a concern for the project.

3.5.3 Ground Lurching

Ground lurching is the permanent horizontal movement of soils, sediment, or fill located on relatively steep slopes, embankments, or scarps due to earthquake induced strong shaking. Ground lurching is often characterized by downslope movement of slopes, ground cracking, and slope bulging. Although it is possible ground lurching could occur at the site, the risk to proposed improvements is low given the minor amounts and composition of materials prone to ground lurching (fill and colluvium) that are present.

3.5.4 Seismic Slope Instability

The project site is located within an earthquake-induced landslide zone as mapped by California Geological Survey (CGS) (CGS, 2023). However, the risk of seismic slope instability at the project site is considered to be low based on our review surface and subsurface data. Godwin (2023) and ENGEO (2023) reached similar conclusions.

3.6 Seismic Design Parameters

Based on review of subsurface information and interpretive geology, the project is classified as Site Class C per Chapter 20 of ASCE 7-16. California Building Code (CBC) seismic design parameters using Risk Category III are provided in Table 1.

Table 1. Seismic Design Parameters

Parameter	Value
Latitude (degrees)	37.616935
Longitude (degrees)	-122.423507
Site Class	C
Risk Category	III
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	2.39
Mapped MCE_R Spectral Response Acceleration at 1-second Periods, S_1 (g)	1.001
Site Coefficient, F_a	1.2
Site Coefficient, F_v	1.4
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	2.868
MCE_R Spectral Response Acceleration at 1-second Periods, S_{M1} (g)	1.401
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	1.912
Design Spectral Response Acceleration at 1-second Periods, S_{D1} (g)	0.934
Importance Factor, Ie	1.25
Mapped MCE Geometric Mean (MCE_G) Peak Ground Acceleration, PGA (g)	1.022
Site Coefficient, F_{PGA}	1.2
MCE_G Peak Ground Acceleration adjusted for Site Class effects, PGA_M (g)	1.226
Long period transition-period, T_L (sec)	12

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Geotechnical Units and Properties

Undisturbed materials below and adjacent to the planned tank and slope above the access road consists of friable siltstone, sandstone, and claystone of the Colma Formation. Review of borehole logs included with reports by CEG (2014b) and ENGEO (2023) show Standard Penetration Tests (SPTs) within Colman Formation materials exceeding 50 bpf through various material types. The onsite undisturbed soils are anticipated to be mostly composed of lightly cemented, dense to very dense, coarse grained soils, but the upper few feet of these materials are anticipated to be weaker due to weathering. Additionally, the planned tank will be located on stiff to very stiff, lean, fine grained materials beginning about El. 218 ft. Figures 3A and 3B depict interpreted conditions for the soil nail wall and planned tank, respectively.

Excavated Colma Formation sandy materials are expected to be mostly suitable for use as fill where needed (e.g. backfill around the tank). These materials are anticipated to have geotechnical engineering properties similar to test results on remolded bedrock samples performed by CEG (2014b). Fill and colluvium are anticipated to have similar properties to the weathered Colma Formation materials.

Table 2 summarizes interpreted units and adopted geotechnical properties.

Table 2. Interpreted Units and Adopted Geotechnical Properties

Unit	Depth Range (ft)	Total Unit Weight (pcf)	Friction Angle (deg)	Cohesion (psf)
Fill and Colluvium	N/A	110	30	300
Weathered Colma Formation (SM-SC)	0 to 4	120	30	300
Colma Formation (SM-SC)	4 >	125	30	700
Colma Formation (ML/CL)	4 >	125	0	3000

ENGEO (2023) performed corrosivity testing on a single sample recovered during it field exploration. The measured pH was 6.6, resistivity was 3,500 ohms-cm, sulfate was non-detectable, and chloride was non-detectable. The resistivity test result indicates the onsite materials are corrosive to buried metal piping. Also, concretes would not be considered susceptible to sulfate attack when in contact with surrounding materials. A corrosion expert should be consulted to evaluate and provide specific corrosion requirements for planned improvements in contact with onsite earthen materials.

4.2 Water Storage Tank

Review of documents provided indicates that the tank is currently planned to be founded on a shallow reinforced concrete foundation system at depth of at least 18.5 feet below grade that overlies a 6 inch thick drainage system (Figure 2B). It is anticipated the concrete foundation will be designed by the tank manufacturer and is likely to consist of a ring wall around the tank perimeter that is connected to a 6 inch thick reinforce slab at the tank interior. The drainage system will be installed atop native compacted soils and consists of a 6 inch thick gravel layer overlying a 30 mil PVC liner.

This is a suitable foundation system provided the applied loads are less than the allowable bearing capacity and some level of permanent ground deformation can be tolerated (e.g., settlement of underlying soils and ground lurching resulting from a large earthquake). Alternatively, a mat slab may be utilized to further mitigate risks of permanent ground displacements damaging the tank.

4.2.1 Foundation

Foundation elements supporting the tank should bear on a 6 inch layer of compacted gravel overlying Colma Formation fine grained materials. Overlying foundations may be designed using an allowable bearing capacity of 4,000 psf. This assumes a factor of safety of 3 and bearing capacity for short-term loading such as wind or seismic loads can be increased by 50 percent. Any contribution from adjacent soils resisting downward loads should be neglected in design.

Estimated total settlement for the tank foundation is on the order of ½ inch for a load equivalent to the allowable bearing capacity. Corresponding differential settlements of up to ½ inch over a horizontal distance of 20 feet are estimated. A modulus of subgrade reaction of 150 pci may be used in design of the tank foundation with a maximum resistance equivalent to allowable bearing capacity.

To resist lateral loads, a coefficient of friction of 0.25 may be assumed between the tank with the PVC liner. If the PVC liner is not present, a coefficient of friction of 0.35 may be used to resist lateral loads. Additionally, passive resistance from adjacent compacted fill may be relied onto to resist lateral loads, but a corresponding lateral load from active pressure should be applied when assessing the overall lateral resistance of the tank.

4.2.2 Lateral Earth Pressures

Tank walls with fill can be designed using lateral earth pressures in terms of equivalent fluid pressures are provided in Table 3.

Table 3. Horizontal Lateral Earth Pressures for Tank Wall Design

Unit	At-Rest, p_o (psf)	Static Active, p_a (psf)	Static Passive, p_p (psf)	Seismic Active Increment, p_{ae} (psf)
Fill	45*D	25*D	1000+300*D	80*H-80*D

Notes:
1. Calculations of earth pressures should be made relative to finished grade.
2. D is depth below grade.
3. H is distance (height) between bottom of foundation and grade.
4. The seismic active increment is for a restrained wall.

Long-term design should use a triangular distribution of at-rest earth pressure (p_o) that increases with depth (D). The resulting earth pressure distribution should be applied around the perimeter of the tank.

Short-term static analysis should use triangular and trapezoidal distributions for the static active pressure (p_a) and static passive pressure (p_p), respectively that increase with depth (D). Short-term loading would include cases during placement of fill around the tank. A uniform horizontal surcharge of 100 psf should be applied to the active pressure to account for live loads.

For seismic design, the following active and passive earth pressure distributions can be used for seismic design:

- Total active seismic pressure should be equal to the static active pressure (pa) plus the seismic active increment (p_{ae}). A triangular distribution that increases with depth is used for static active pressure (p_a), and an inverted triangular distribution that decreases with depth is used for the seismic active increment (p_{ae}).
- The static passive pressure (p_p) multiplied by a reduction factor of 0.60 can be used to calculate the total seismic passive pressure, which is a trapezoidal distribution that increases with depth.
- The total seismic active and passive pressures assume the tank walls are non-yielding for a ground motion return period of 1,000 years. If the walls can yield and accommodate some level damage, lower total seismic active pressures can be used in design.

4.2.3 Earthwork

Fill placement and grading operations should be performed according to the grading recommendations of this report. Unless otherwise noted, fill and backfill materials be compacted to at least 90 percent relative compaction at least 2 percent over optimum moisture, as determined by the latest approved edition of ASTM Test Method D1557, unless a higher degree of compaction is otherwise recommended. Fill and backfill materials placed in foundation and pavement areas should be compacted to at least 95 percent relative compaction. Cut and fill slopes, if needed, should be designed to inclinations of 1H:1V or flatter.

4.2.3.1 Suggested Materials Specifications

The following materials are referenced in various sections of this report. Additional recommendations for placement of trench backfill materials, and other components of the project, are presented in the sections that follow.

- **Aggregate base** shall consist of imported material conforming to Caltrans Standard Specifications for Class 2 aggregate base, Section 26-1.02.
- **Compacted fill material** shall consist of imported or on-site material free of organics, oversize rock (greater than 3 inches), trash, debris, corrosive, and other deleterious materials. Fill materials shall comply with all specified material requirements for the area where the material is being placed. Fill materials used in tank areas shall have an Expansion Index of less than 20. Imported fill shall be reviewed by the geotechnical engineer prior to being brought to the site; however, imported fill materials shall comply with all specifications for material placed at the site.
- **Drainage material** shall conform to Caltrans Standard Specifications for Class 2 permeable material, Section 68-2.02F. ASTM C-33 No. 8 coarse aggregate (pea gravel) can be used in lieu of Class 2 permeable material provided the materials are enclosed in a filter fabric. As an alternative, prefabricated geocomposite drainage panels can be placed behind retaining walls as recommended in this report.

- **Geotextile for separation (filter fabric)** shall consist of geotextile that conforms to the requirements outlined in the Caltrans Standard Specifications for Filter Fabric-underdrains, Section 88-1.03.
- **Geotextile for subgrade stabilization shall** conform to the requirements outlined in Caltrans Standard Specifications for Rock Slope Protection Fabric, Section 88-1.04.
- **Geocomposite drain** shall consist of a manufactured plastic core not less than 8 millimeters thick with both sides covered with a layer of filter fabric that will provide a continuous drainage void in the horizontal and vertical directions. Geocomposite drain placed between tank walls and fill, and shall have an impermeable backing. Geocomposite drain to be embedded in the ground shall be double-sided with filter fabric covering both sides of the drainage void.

  The drain shall produce a flow rate through the drainage void of at least 10 gallons per minute per foot of width at a hydraulic gradient of 1.0 under a maximum externally applied pressure of 2,000 psf. The core materials and filter fabric shall be capable of maintaining the drainage void for the entire height of the geocomposite drain. Filter fabric shall be integrally bonded to the core materials with the drainage void. Core material manufactured from impermeable plastic sheets having non-connecting corrugations shall not be permitted.

  The fabric shall overlap a minimum of 6 inches at all joints and wrap around the exterior edges of the drain a minimum of 6 inches beyond the edge. If additional fabric is needed to provide overlaps at joints and to wrap around the edges of core material, the added fabric shall overlap the fabric on the geocomposite drain at least 6 inches and be attached thereto.

  Should the fabric on the geocomposite drain be torn or punctured: 1) the damaged section shall be replaced completely if damage is done to the core material, or 2) if the core material is not damaged than the repair can be performed by placing a piece of fabric that is large enough to cover the damaged area and provide a 1-foot overlap.
- **Subgrade stabilization** material shall consist of gravel material conforming to Caltrans Section 90-3.02, Coarse Aggregate Grading.

4.2.3.2 Use of Onsite Soils

Based on interpreted subsurface conditions within the tank area, clayey materials below El. 217 feet may not be suitable for use as backfill around the tank perimeter or as select fill materials (structural backfill, pipe bedding or pipe zone material). The overlying sandy materials may be used backfill around the tank assuming they meet compacted fill material requirements. During construction, segregation of suitable sandy materials from the unsuitable clayey materials will need to be performed if the sandy materials are to be used as compacted fill around the tank.

4.2.3.3 Clearing and Grubbing

After demolition of the existing tank and prior to commencing grading operations in the tank area, soil containing debris, organics, pavement, old foundations, slabs, abandoned utilities, uncompacted fill, or other unsuitable materials, should be removed.

4.2.3.4 Fill Placement

Fill should be placed and compacted to at least the minimum relative compaction recommended in this report. The moisture content of the fill should be 2 percent above the optimum. Each layer should be spread evenly and should be thoroughly blade-mixed during the spreading to provide relative uniformity of material within each layer. Soft or yielding materials should be removed and be replaced with properly compacted fill material, prior to placing the next layer.

Rock, gravel and other oversized material, greater than 3 inches in diameter, should be removed from the fill material being placed. Rocks should not be nested, and voids should be filled with compacted material.

When the moisture content of the fill material is below that sufficient to achieve the recommended compaction, water should be added to the fill. While water is being added, the fill should be bladed and mixed to provide relatively uniform moisture content throughout the material. When the moisture content of the fill material is excessive, the fill material should be aerated by blading or other methods. Fill should be spread in thin lifts, typically no thicker than approximately 8 inches prior to being compacted. Fill and backfill materials may need to be placed in thinner lifts to achieve the recommended compaction with the equipment and type of soil being used. Compaction using jetting or ponding should not be permitted.

4.2.3.5 Compaction

Fill placement and grading operations should be performed according to the grading recommendations of this report. Relative compaction should be assessed based on the latest approved edition of ASTM D1557. We recommend the minimum relative compaction for the locations indicated in Table 4.

Table 4. Compaction Recommendations

Location	Recommended Minimum Relative Compaction per ASTM D1557
General	90% UON
Backfill in Non-Paved Areas	90% UON
Fill or backfill placed within 3 feet of finished grade in pavement areas	95% UON
Aggregate Base or Subbase	95% UON
Tank and foundation areas and areas within 5 feet horizontally of the structure footprint including subgrade	95% UON
Retaining wall, buried tank or basin, or basement backfill	90% UON
Notes: 1. UNO = unless otherwise noted	

4.2.3.6 Site Preparation, Excavation and Grading

The tank location is interpreted to be underlain by the Colma Formation and will be founded on stiff to very stiff fine grained materials. The excavations should remove materials and extend to at least 5 feet beyond the tank foundation footprint. During the excavation, the sandy material should be segregated from clayey soils since the sandy materials will likely be used as backfill.

The onsite Colma Formation materials can be excavated with typical construction equipment in good working order. These excavated materials could be difficult to work with when wet, especially at the bottom of the excavation where materials are anticipated to be clayey.

The subgrade below the tank foundation should be scarified to a depth of 9 inches, moisture condition to 2 percent above optimum and recompacted to at least 95 percent relative to ASTM D1557.

The excavation should be performed using backhoe/excavator type equipment that will not operate on or disturb the base of the excavation. Gravel for subgrade stabilization, if required, should consist of open-graded material conforming to the recommendations of this report.

Surface water should not be allowed to collect adjacent to the excavation and drain into the excavation. Any free water within the excavation should be collected and disposed of in accordance with local regulations.

The geotechnical engineer should review the bottom of excavation to evaluate if unsuitable materials exist, need to be removed, and the base of the excavation is suitable for construction of the tank foundation and placement of fill. Project specifications should provide for review of the excavation by the geotechnical engineer and for increasing the depth of the excavation to remove additional unsuitable materials if needed.

Following subgrade preparation, PVC liner and aggregate base, and drainage materials can be placed. Aggregate base and drainage materials should be compacted to at least 95 percent relative compaction per ASTM D1557.

The geocomposite drain adjacent to the tank can be placed during backfill of the excavation. After completion of the fill, drainage should be provided such that surface water does not pond adjacent to the tank.

4.2.3.7 Temporary Slopes and Shoring

Within the anticipated depths of excavation, the soil is anticipated to consist of dense to very dense coarse grained materials and stiff to very stiff fine grained materials. Temporary slopes should be braced or sloped according to the requirements of OSHA assuming Soil Type B. Slopes for Soil Type B are 1H:1V or shallower. If shoring is used, it can be designed assuming an active pressure of 25 psf, a 100 psf uniform load on the active side to account for temporary surcharges, and passive equivalent pressure of 550 psf.

Excavated material should generally be stockpiled away from excavations, or the shoring systems should be designed for the additional surcharge from the stockpiled material. The stockpiled materials, or other surcharges, can be assumed to not influence the design of the shoring systems where the materials are located beyond a 1: 1 line projected upward from the bottom edge of the trench.

4.3 Soil Nail Wall

A permanent soil nail wall is to be used to support a portion of the slope above the access road (Figure 2A). The height of the wall is anticipated to vary from 4 to 12 feet and is anticipated to be finished with shotcrete.

Thel wall shall be designed in accordance FHWA Geotechnical Engineering Circular No. 7 - Soil-Nail Walls, FHWA 0-IF-03-017 (2003), and recommendations from the Caltrans Geotechnical Manual. The wall should be designed assuming the following:

- Colma Formation (SM-SC) material properties as presented in Table 2.
- A slope stability seismic coefficient of Kh=0.43g for internal stability and Kh = 0.29g for global stability.
- Soil to Grout Bond Capacity of 5.65 ksf.

The wall should be designed with internal drainage, and swale placed atop the wall to collect and convey water away from the wall. The area in front of the wall should be graded so that water is diverted away from the wall.

Appropriate corrosion protective measures should be used in the design of soil nail anchors and connections.

5 REMARKS AND LIMITATIONS

This report has been made and issued for the sole use of Lee and Ro and its client for this project. The intent of this report is to advise Lee and Ro on the geologic and geotechnical matters for the proposed project and provide information and recommendations that should be considered in design and construction of the project improvements.

Recommendations contained in this report are for the project as described and rely mostly on data collected by others for this project. Any changes to the project could nullify and invalidate our recommendations and conclusions unless approved by Brierley.

The interpretation between earthen material units shown on field logs are approximate and transition between these units may be different than described and shown. We have based our recommendations on the available borehole logs, in-situ testing, and laboratory tests; which represents an interpretation of available data and general knowledge of geologic and geotechnical conditions within the project site.

Brierley has performed its services in accordance with the generally accepted geologic and geotechnical engineering standards currently used in this area. All referenced standards and codes (e.g. ASTM, FHWA, etc.) were only used as guidelines for purposes of this report. No other warranties are either expressed or implied.

Brierley should be retained to review final plans, specifications, and any related contractual documents; provide responses to inquiries; and observe and document all earthwork, excavations, and foundation installation.

6 REFERENCES

American Society of Civil Engineers (ASCE). 2017. Minimum Design Loads for Buildings and Other Structures, ASCE Standard, ASCE/SEI 7-16.

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Cornerstone Earth Group, 2014b, Geotechnical Investigation, City of San Bruno Water Tank No. 1 Replacement, Cunningham Way, San Bruno, California: dated April 9.

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O'Dell Engineering, 2023, Cunningham Tank Topographic Survey, San Bruno, California, Sheets 1-2: dated June 14.

FIGURES

BRIERLEY ASSOCIATES
Creating Space Underground

N

SCALE: 1/16" = 1'

Site Location Plan

NO.	DATE	REVISIONS	BY	CK

OWNER/GC: City of San Bruno, San Bruno, Calironia

GRAPHIC SCALE: 0 1/2" 1"

FILE NAME: - | PLOT DATE: 9/22/23

CLIENT: Lee & Ro, 10640 Scripps Ranch Blvd., San Diego, CA

APPROVED: ---- | DATE: ----

BRIERLEY ASSOCIATES
Creating Space Underground
6355 Topanga Canyon Blvd, St 309, Woodland Hills CA 91367
PHONE: 818-835-9554

DESIGNED: BRH | CHECKED: PMS | DRAWN: BRH

Cunningham Water Storage Tank

SITE LOCATION PLAN

CONTRACT: ---- | DATE: ---- | PROJECT: 120098-000

SHEET: 1 OF ----

DRAWING NO.

REVISION: ----

SCALE: 1"=20'

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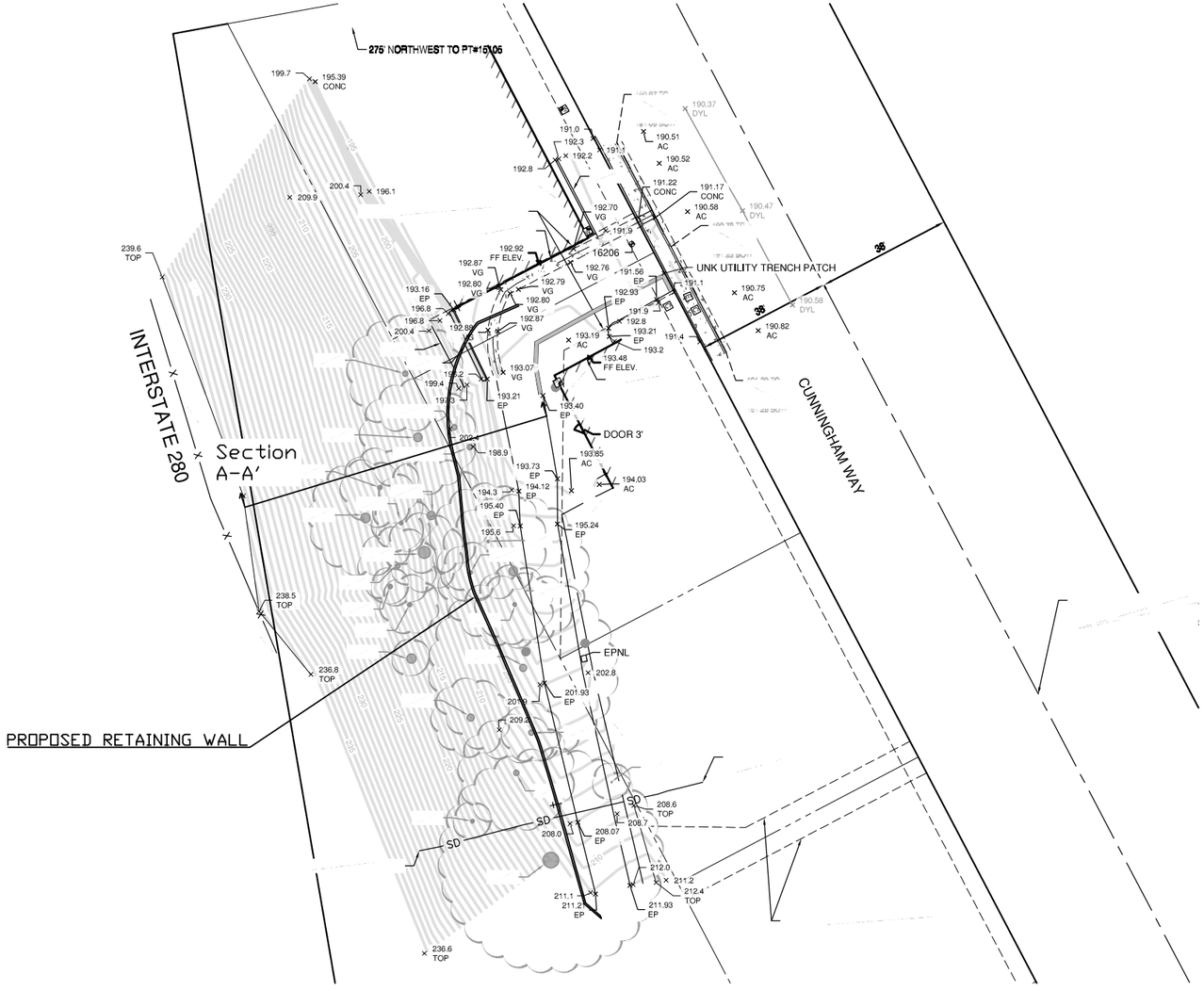
SURVEY ABBREVIATIONS

AC	ASPHALT CONCRETE
BD	BRASS DISK (MONUMENT)
BLDG	BUILDING
C	COMMUNICATIONS (UTILITY)
CG	CONCRETE SPOT ELEVATION
CMP	CMP
CMP	CORRUGATED METAL PIPE
CO-C	CONCRETE
DWY	DRIVEWAY
DYL	DOUBLE YELLOW LINE (STRIPING)
E	ELECTRIC (UTILITY)
EP	EDGE OF PAVEMENT
EPNL	ELECTRIC PANEL (UTILITY)
ETW	EDGE OF TRAVELED WAY
FCL	FENCE, CHAIN LINK
FD	FOUND
FF	FINISHED FLOOR
FL	FLOWLINE
FW	FENCE, WOOD
GB	GRADEBREAK
GS	GROUND SPOT (SPOT ELEVATION)
HP	HINGE POINT
INV	INVERT ELEVATION (UTILITY)
LIP	LIP OF GUTTER
SD	STORM DRAIN
T	TREE TRUNK



Site Plan - Proposed Retaining Wall Area

NO.	DATE	REVISIONS	BY	CK

OWNER/GC: City of San Bruno, San Bruno, Calironia

GRAPHIC SCALE: 0 1/2" 1"

FILE NAME: -

PLOT DATE: 9/22/23

CLIENT: Lee & Ro, 10640 Scripps Ranch Blvd., San Diego, CA

APPROVED: ----

DATE: ----

BRIERLEY ASSOCIATES
Creating Space Underground
6355 Topanga Canyon Blvd, St 309, Woodland Hills CA 91367
PHONE: 818-835-9554

DESIGNED: BRH | CHECKED: PMS | DRAWN: BRH

Cunningham Water Storage Tank

WALL PLAN

CONTRACT: ---- | DATE: ---- | PROJECT: 120098-000

SHEET: 2A

DRAWING NO.: OF ----

REVISION: ----

SCALE: 1"=20'

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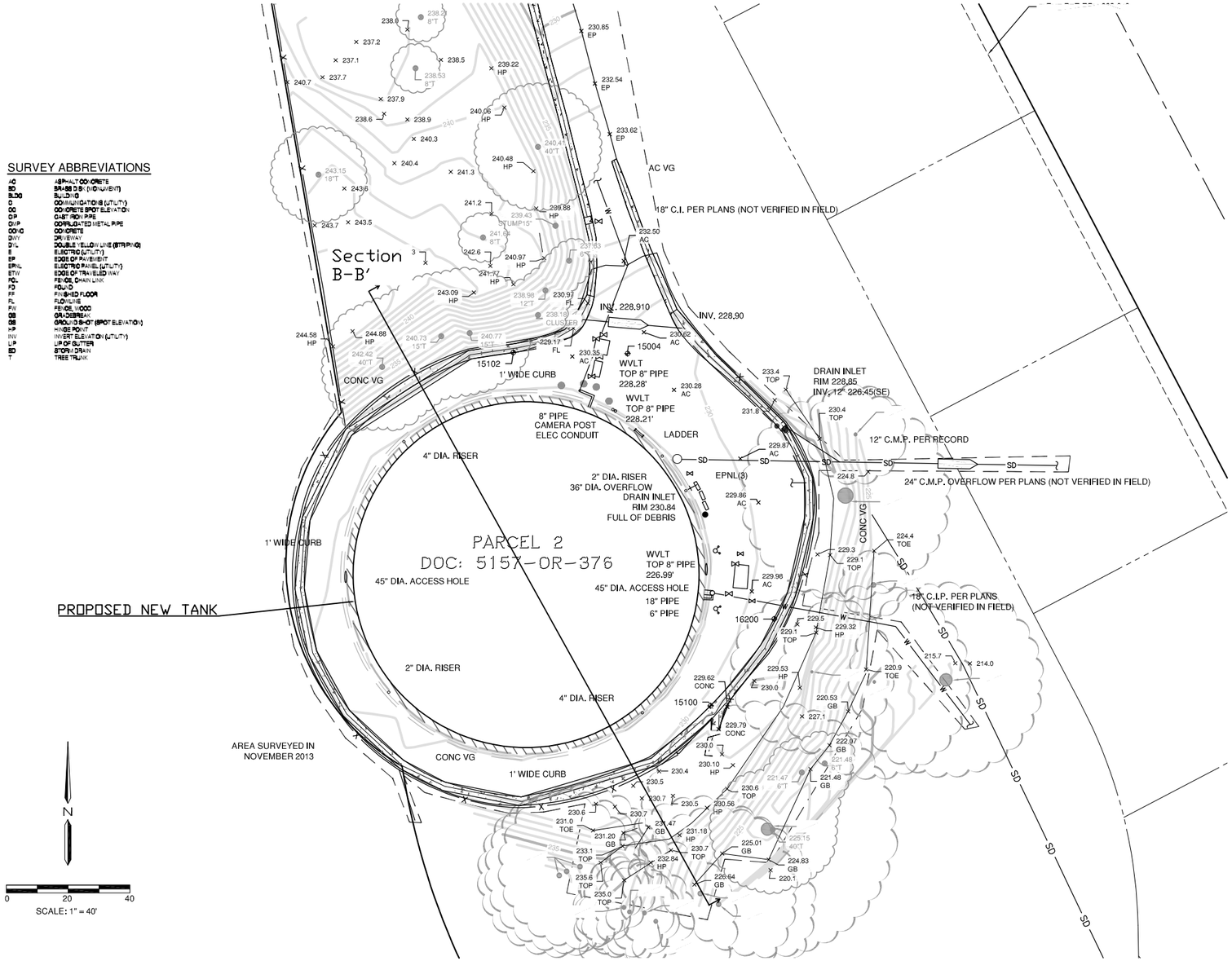
SURVEY ABBREVIATIONS

AC	ASPHALT CONCRETE
BM	BRASS DISK (MONUMENT)
BLDG	BUILDING
C	COMMUNICATIONS (UTILITY)
CO	CONCRETE SPOT ELEVATION
CIP	CAST IRON PIPE
CMP	CORRUGATED METAL PIPE
CONC	CONCRETE
DWY	DRIVEWAY
DYL	DOUBLE YELLOW LINE (STRIPING)
E	ELECTRIC (UTILITY)
EP	EDGE OF PAVEMENT
EPNL	ELECTRIC PANEL (UTILITY)
ETW	EDGE OF TRAVELED WAY
FCL	FENCE, CHAIN LINK
FO	FENCE, WOOD
FF	FINISHED FLOOR
FL	FLOWLINE
FW	FENCE, WOOD
GB	GRADE BREAK
GS	GROUND SHOT (SPOT ELEVATION)
HP	HINGE POINT
INV	INVERT ELEVATION (UTILITY)
L/P	LIP OF GUTTER
SD	STORM DRAIN
T	TREE TRUNK



Site Plan - Tank Area

BA SECTIONS_10-2-23.DWG

2/18/2016 9:23:47 AM

NO.	DATE	REVISIONS	BY	CK

OWNER/GC: City of San Bruno, San Bruno, Calironia

GRAPHIC SCALE 0 1/2" 1"

FILE NAME: - | PLOT DATE: 9/22/23

CLIENT: Lee & Ro, 10640 Scripps Ranch Blvd., San Diego, CA

APPROVED: ---- | DATE: ----

BRIERLEY ASSOCIATES
Creating Space Underground
6355 Topanga Canyon Blvd, St 309, Woodland Hills CA 91367
PHONE: 818-835-9554

DESIGNED: BRH | CHECKED: PMS | DRAWN: BRH

Cunningham Water Storage Tank

TANK PLAN

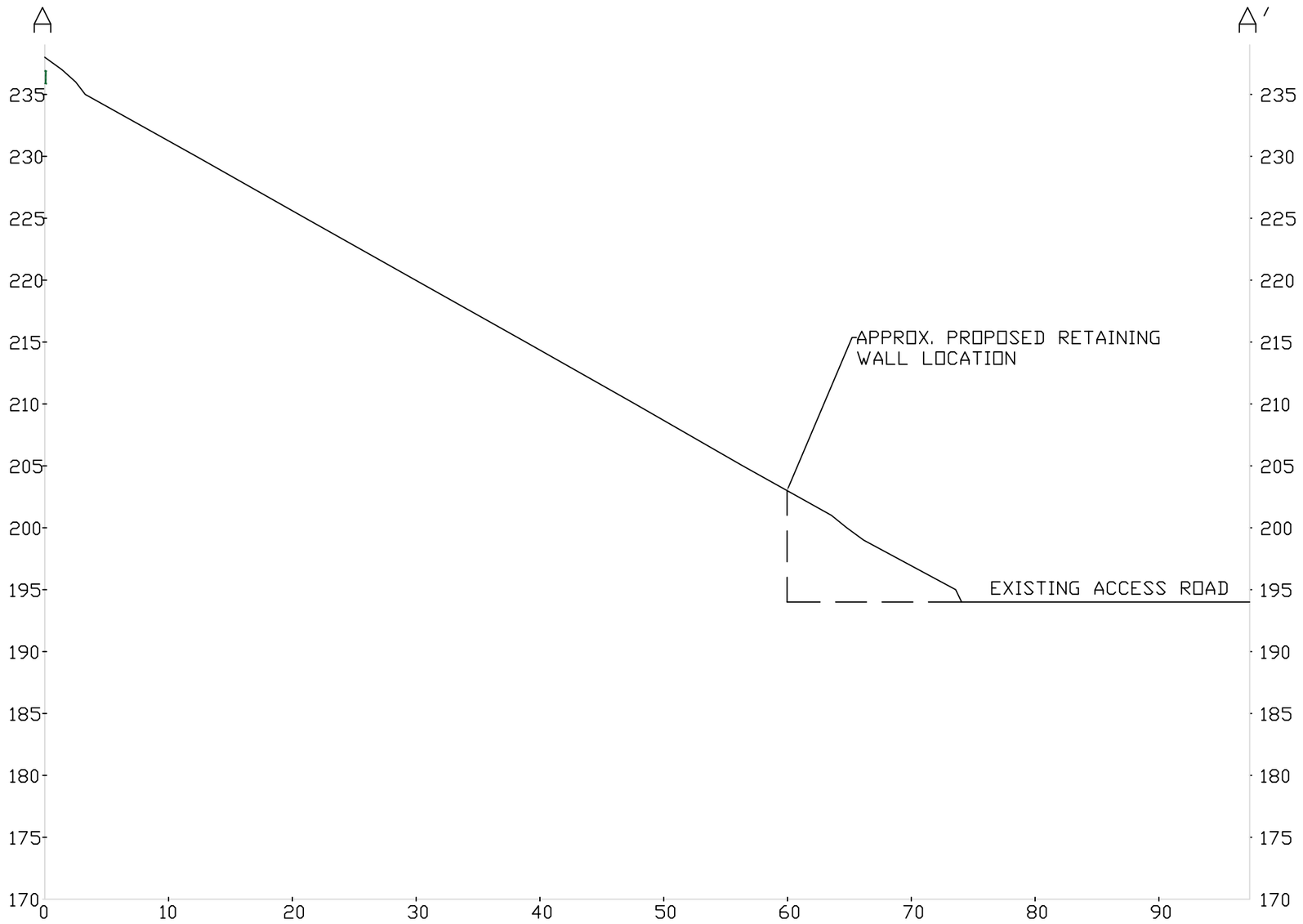
CONTRACT: ---- | DATE: ---- | PROJECT: 120098-000

SHEET: 2B

DRAWING NO.: DF ----

REVISION: ----

SCALE: 1"=20'



0 5 10

SCALE: 1" = 10'

Section A-A'

BA SECTIONS_10-2-23.DWG

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NO.	DATE	REVISIONS	BY	CK

OWNER/GC: City of San Bruno, San Bruno, Calironia

GRAPHIC SCALE: 0 1/2" 1"

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PHONE: 818-835-9554

DESIGNED: BRH | CHECKED: PMS | DRAWN: BRH

Cunningham Water Storage Tank

SECTION A-A'

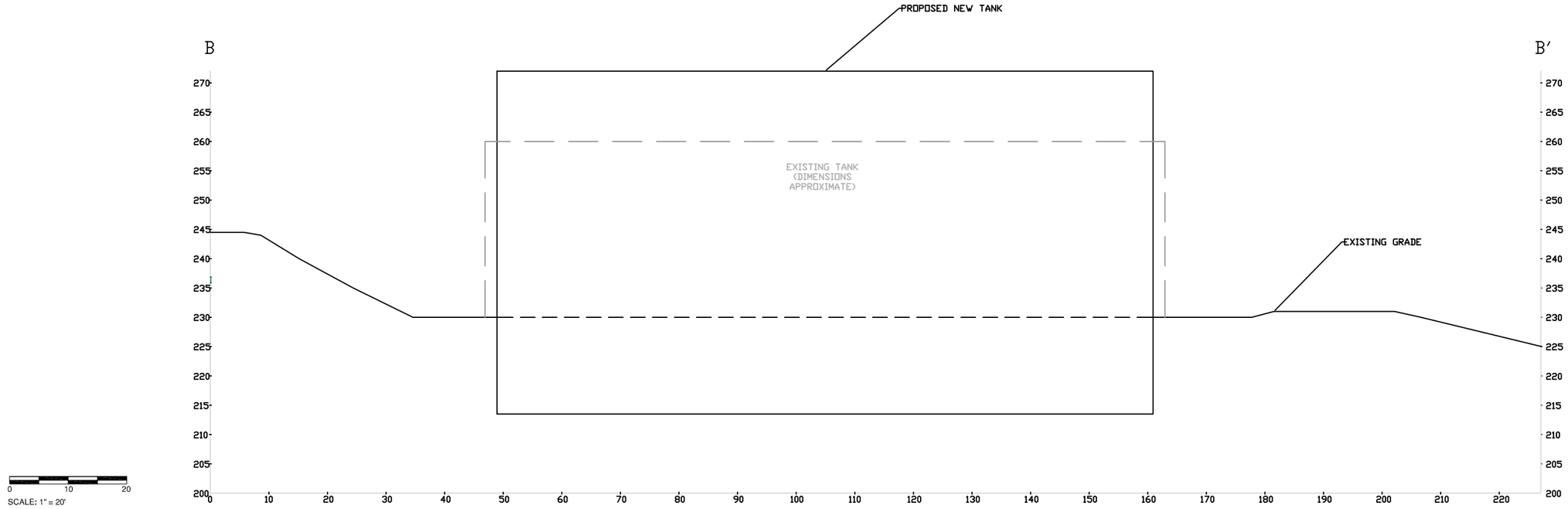
CONTRACT: ---- | DATE: ---- | PROJECT: 120098-000

SHEET: 3A

DRAWING NO.: DF ----

REVISION: ----

SCALE: 1"=10'



Section B-B′

BA SECTIONS_10-2-23.DWG

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NO.	DATE	REVISIONS	BY	CK

OWNER/GC: City of San Bruno, San Bruno, Calironia

GRAPHIC SCALE: 0 1/2" 1"

FILE NAME: - | PLOT DATE: 9/22/23

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PHONE: 818-835-9554

DESIGNED: BRH | CHECKED: PMS | DRAWN: BRH

Cunningham Water Storage Tank
SECTION B-B′

CONTRACT: ---- | DATE: ---- | PROJECT: 120098-000

SHEET: 3B
DRAWING NO.: OF ----
REVISION: ----
SCALE: 1"=10'

APPENDIX A

September 12, 2023

Patrick Smith, PE, GE, PhD
Brierley Associates
6355 Topanga Canyon Blvd, Suite 502
Woodland Hills, CA 91367

Subject: Memorandum - Geologic Assessment of Geologic Conditions, Cunningham Way Tank Site, San Bruno, California

Dear Dr. Smith:

This memorandum provides my geologic assessment of the subject tank pad property (Site) located near Cunningham Way, in San Bruno, California. The site is currently occupied by a large steel water tank, underground utilities and is reached by a paved driveway off Cunningham Way. My understanding is that the tank will be replaced by a new, partially embedded steel tank of roughly the same footprint. Access improvements to the new tank will include a wider access road that will require a soil nail wall structure near the bottom of the driveway to allow for a larger turning radius to accommodate large trucks.

The purpose of my work was to provide a geologic assessment of the site to support a Brierley Associates geotechnical design level report for the tank foundation, soil nail wall and other improvements. My scope included a review of previous site geotechnical investigations by Cornerstone Earth Group [Cornerstone] (2014a, 2014b) and ENGEO (2014, 2023), a review of published and unpublished geologic maps and reports, a review of historic aerial photographs listed in the below table a site geologic reconnaissance and preparation of this memorandum.

Flight	Frame(s)	Date	Scale	Composition
Google Earth	N/A	7/16/2023	Variable	Color
Google Earth	N/A	2/23/2014	Variable	Color
Google Earth	N/A	4/25/2005	Variable	Color
Google Earth	N/A	7/9/1993	Variable	B/W
HM USA	3042-28	1/1/2001	1:10,800	Color
USCG-JSS	3-25	1/8/1982	1:20,000	B/W
CAS-65-130	1-49, 1-48	5/11/1965	1:12,000	B/W
GS-VLX	1-96	9/8/1956	1:23,600	B/W
DDB-1943	2B-181	10/11/1943	1:20,000	B/W

GEOLOGIC SETTING AND HAZARDS

The project site occupies a high ridgeline along the San Francisco Peninsula with San Bruno to the east and Crystal Springs Reservoir, which occupies the San Andreas Rift Zone to the west. The Interstate I-280 freeway takes a winding route along the ridgeline, and abuts the Site on the west. Regional mapping by the USGS (Brabb and Pampeyan, 1983, Pampeyan, 1994 and Brabb, Graymer and Jones, 1998) shows older Jurassic-Cretaceous rocks of the Franciscan Complex to the west of the San Andreas Fault and younger Tertiary rocks of the Merced formation and Colma Formation to the east. I have adopted Pampeyan (1994) as Figure 1, Regional Geologic Map. Besides the active San Andreas fault, 0.3 miles to the west), the other fault structure in the vicinity is the Serra Fault, which is mapped as a reverse fault and in places constitutes a fault contact between the Plio-Pleistocene Merced and younger Colma Formations.

The Pleistocene Colma Formation is generally described as a friable, well sorted fine to medium sand containing a few beds of sandy silt, clay, and gravel. This description is similar to that identified by

ENGEO (2023) in their drilled boring EB-1 as shown on Figure 2A. They describe it as a soil to the full depth penetrated. Cornerstone (2014b) also encountered silty sand in the upper portion of their boring EB-1 next to the existing tank before advancing into an underlying lean clay in the lower portion of the boring. They describe it using rock nomenclature, inferring a claystone. Pampeyan (1994) shows the Colma Formation as having variable dipping beds in the vicinity of the site of between 5° and 20° to both the east and west. Site specific, fresh exposures in trenches by Cornerstone indicate bedding ranging from N28°W, dipping 5° N to N56°W and dipping 18° SW. ENGEO did not note bedding in their trenches, instead they as well as Cornerstone noted laminations striking to the NW and NW and dipping variably between 4 and 12°.

Geologic hazard zones have been identified by the California Geological Survey (CGS) in the area (CGS, 2019a) for earthquake induced landslides primarily along slopes, (including the project slope) and, liquefaction alluvial filled channels and gullies (outside of the project site). Only a small portion f the area upslope of the driveway leading to the tank site is in the landslide hazard zone. No other landslides exist on or near the project site according to CGS (2019b). The site is not located in an Earthquake Fault Zone (CDMG, 1982) however the Serra Fault had previously been zoned but was removed in 1982. According to Jennings and Bryant (2010), it has had activity in the Latest Quaternary. The Serra Fault does not appear to cross the site, but instead is likely located to the west as shown on regional map, and was encountered to the south (Hengesh et al, 1996 and Berlogar, 1978).

SITE OBSERVATIONS

During my visit on September 1, I was accompanied by Bridgette Hassett, PE, soils engineer with Brierley Associates. The purpose of the site reconnaissance was to confirm the geologic conditions and findings of Cornerstone and ENGEO, observe any recent changes to the site, and geologically map the slope that will have a soil nail wall. I used a site topographic base map provide by O'Dell Engineering (2023).

Based on some shallow, hand dug pot holes, siltstones and sandstones of the Colma Formation are at shallow depths on the portion of the 2:1 slope that will require a cut and soil nail wall, as shown on Figures 3A (cross-section A-A'), 3B (B-B') and 3C (C-C'). Logs and photos of these pot holes are provided in Appendix 1. The Colma has limited outcrops on these slopes but is exposed on 3:1 the I-280 onramp to the west and the 2:1 Cunningham Way slope to the east. In none of these locations was there discernable bedding and jointing on the surface, due to weathering and surface erosion or vegetative disturbance. As I had mentioned, laminations, shears and bedding noted by Cornerstone (CEG) and ENGEO (laminae only) were observed in trenches where fresh exposures were observable. Seepage was not observed or expected during the late Summer reconnaissance. Maps prepared by CGS (2019) indicate groundwater contours of between 10 and 20ft below the ground surface in the area.

We did not see any exposures or expression of faulting crossing the site. Traces of the Serra Fault lie some distance to the west crossing I-280, and are coincident with the contact between the Merced Formation and Colma Formation. It is not inconceivable that en echelon shears or fractures could exist near the tank, however these features are probably isolated and not connected to the main traces of the fault. They did not connect between the CEG trenches or into the ENGEO trenches.

We observed fill near the top of the 2:1 slope and to a lesser extent on the eastern flank, as shown on Figure 2A and 2B. I believe this fill is associated with the stripping of the Right-of-Way (ROW) of I-280. Elongate strips (berms) of fill are present and situated parallel to the top of slope and are contained within the ROW (on either side of the fence line). There also a thin veneer of colluvium on

the slope, as shown on the attached geologic map. Other surface mapping by Cornerstone and ENGEO in the vicinity was confirmed during our reconnaissance, and adopted.

CONCLUSIONS AND RECOMMENDATIONS

From a geological standpoint, both the tank site and access road slope appear stable and underlain at shallow depths by sandstone and siltstone bedrock of the Colma Formation. Regional and site-specific trench exposures indicate generally favorable bedding and laminae attitudes with a strike mostly along the trend of the access road slope and shallow to moderate dips to the south or into the slope.

In general, the Colma Formation bedrock will be easily excavated, should stand in vertical long enough for each lift of nails to be installed and shotcrete applied, if rain or runoff is diverted from the easily eroded face.

The site is not crossed by the Serra Fault, is no longer in an Earthquake Fault Hazard Zone and shears observed in the Cornerstone trenches appear to be isolated instances and do not extend to the ENGEO trench. Therefore, I do not think that surface fault rupture is a concern for the tank and/or site in general.

Fill, although observed and undocumented, does not constitute a risk to the project and should not be susceptible to movement or disturbance from site grading. Shallow groundwater is not expected to impact grading or require dewatering.

Seismic ground shaking will be considerable during a potential M8.0 event on the San Andreas. The ground shaking will affect the performance of the tank (sloshing, elephant-foot deformation) and the shotcrete slope (cracking). Adequate structural reinforcement and embedment will be needed.

Please let me know if you have any questions.

Sincerely,

William H. Godwin, CEG 2199

Cc: Bridgette Hassett, Brierley Associates

ATTACHMENTS:

Figure 1 – Regional Geologic Map
Figure 2A – Geologic Map Access Road
Figure 2B – Geologic Map Tank Site
Figure 3A, 3B, 3C – Geologic Cross-sections A-A’, B-B’, C-C’
APPENDIX 1 – Pothole logs and photos

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Brabb, E.E., and Pampeyan, D.L., 1983, Geologic Map of San Mateo County, California, U.S. Geological Survey, Miscellaneous Investigations Series Map I-1257-A, scale 1:62,500.

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Cornerstone Earth Group, 2014b, Geotechnical Investigation, City of San Bruno Water Tank No. 1 Replacement, Cunninghan Way, San Bruno, California: Consultants report to Lee & Ro, Inc. dated April 9, Project no. 695-1-1.

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O'Dell Engineering, 2023, Topographic Survey, Cunningham Tank, 2 sheets, scale 1"=20', signed by Scott Roberts PLS #9235, dated June 14.

Pampeyan, E. H., 1994, Geologic Map of the Montara Mountain and San Mateo 7½' Quadrangles, San Mateo County, California, U.S. Geological Survey Miscellaneous Investigations Series, Map I-2390, scale 1:24,000.

LEGEND

- SOIL BORING
- POTHOLE
- —— Geologic contact, dashed where approximate, queried where uncertain

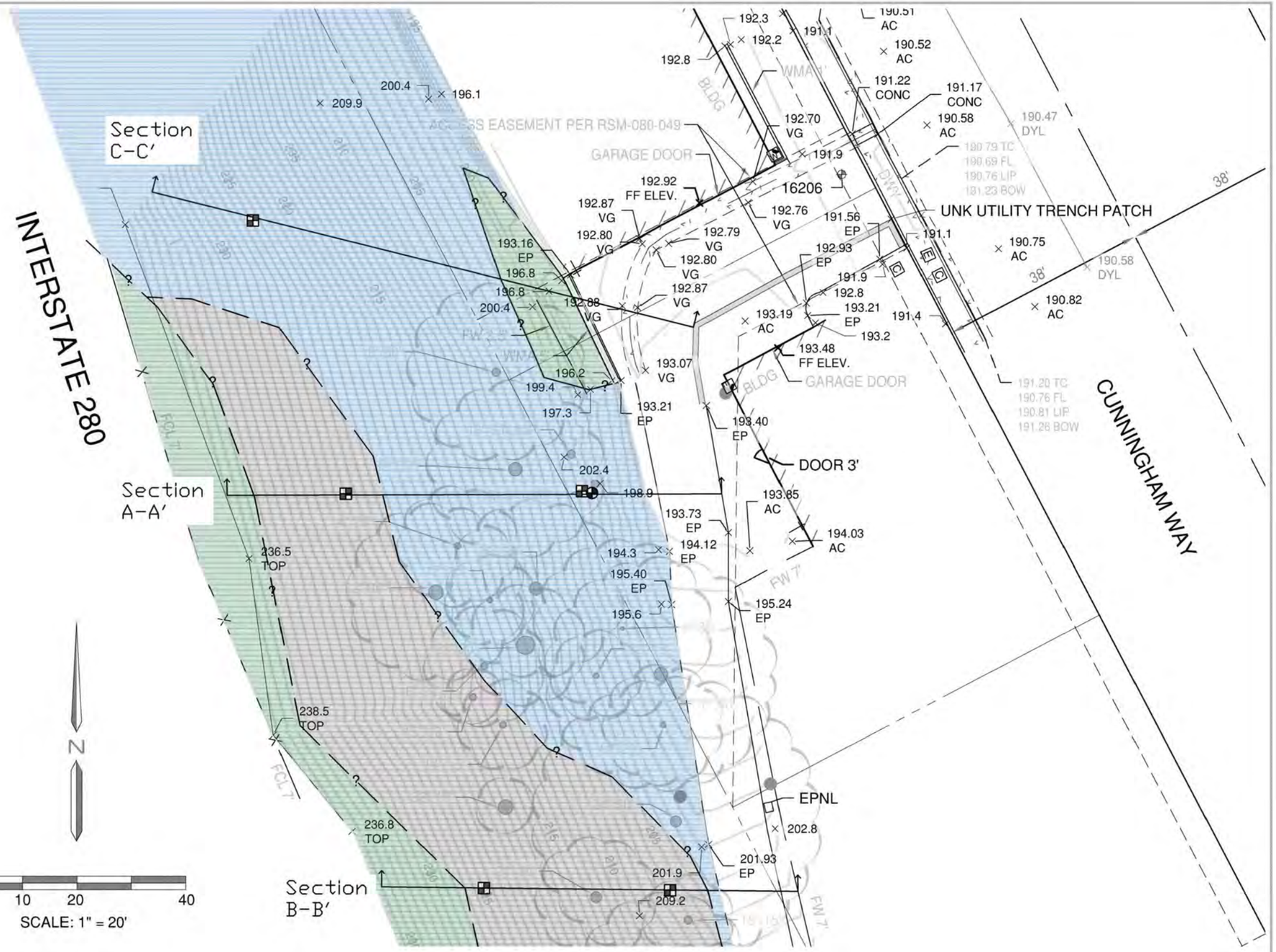
GEOLOGIC UNITS

- af - artificial fill (ridgetop and retaining wall backfill)
- col - colluvium (generally <0.5 ft thick)
- Qc - Colma Formation

(See cross-sections for geologic symbols and exploration numbering labels)

SURVEY ABBREVIATIONS

AC	ASPHALT CONCRETE
BD	BRASS DISK (MONUMENT)
BLDG	BUILDING
C	COMMUNICATIONS (UTILITY)
CC	CONCRETE SPOT ELEVATION
CIP	CAST IRON PIPE
CMP	CORRUGATED METAL PIPE
CONC	CONCRETE
DWY	DRIVEWAY
DYL	DOUBLE YELLOW LINE (STRIPING)
E	ELECTRIC (UTILITY)
EP	EDGE OF PAVEMENT
EPNL	ELECTRIC PANEL (UTILITY)
ETW	EDGE OF TRAVELED WAY
FCL	FENCE, CHAIN LINK
FD	FOUND
FF	FINISHED FLOOR
FL	FLOWLINE
FW	FENCE, WOOD
GB	GRADEBREAK
GS	GROUND SHOT (SPOT ELEVATION)
HP	HINGE POINT
INV	INVERT ELEVATION (UTILITY)
LIP	LIP OF GUTTER
SD	STORM DRAIN
T	TREE TRUNK



NO.	DATE	REVISIONS	BY	CK

OWNER/GC: City of San Bruno, San Bruno, Calironia

GRAPHIC SCALE: 0 1/2" 1"

FILE NAME: - | PLOT DATE: 9/22/23

CLIENT: Lee & Ro, 10640 Scripps Ranch Blvd, San Diego, CA

APPROVED: ---- | DATE: ----

BRIERLEY ASSOCIATES
Creating Space Underground
6355 Topanga Canyon Blvd, St 309, Woodland Hills CA 91367
PHONE: 818-835-9554

DESIGNED: WG | CHECKED: PMS | DRAWN: BRH

Cunningham Water Storage Tank
GEOLOGIC MAP

CONTRACT: ---- | DATE: ---- | PROJECT: 120098-000

SHEET: 2A
DRAWING NO.: DF ----
REVISION: ----
SCALE: 1"=20'

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LEGEND

- SOIL BORING
- TRENCH
- Geologic contact, dashed where approximate, queried where uncertain

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EPNL	ELECTRIC PANEL (UTILITY)
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FCL	FENCE, CHAIN LINK
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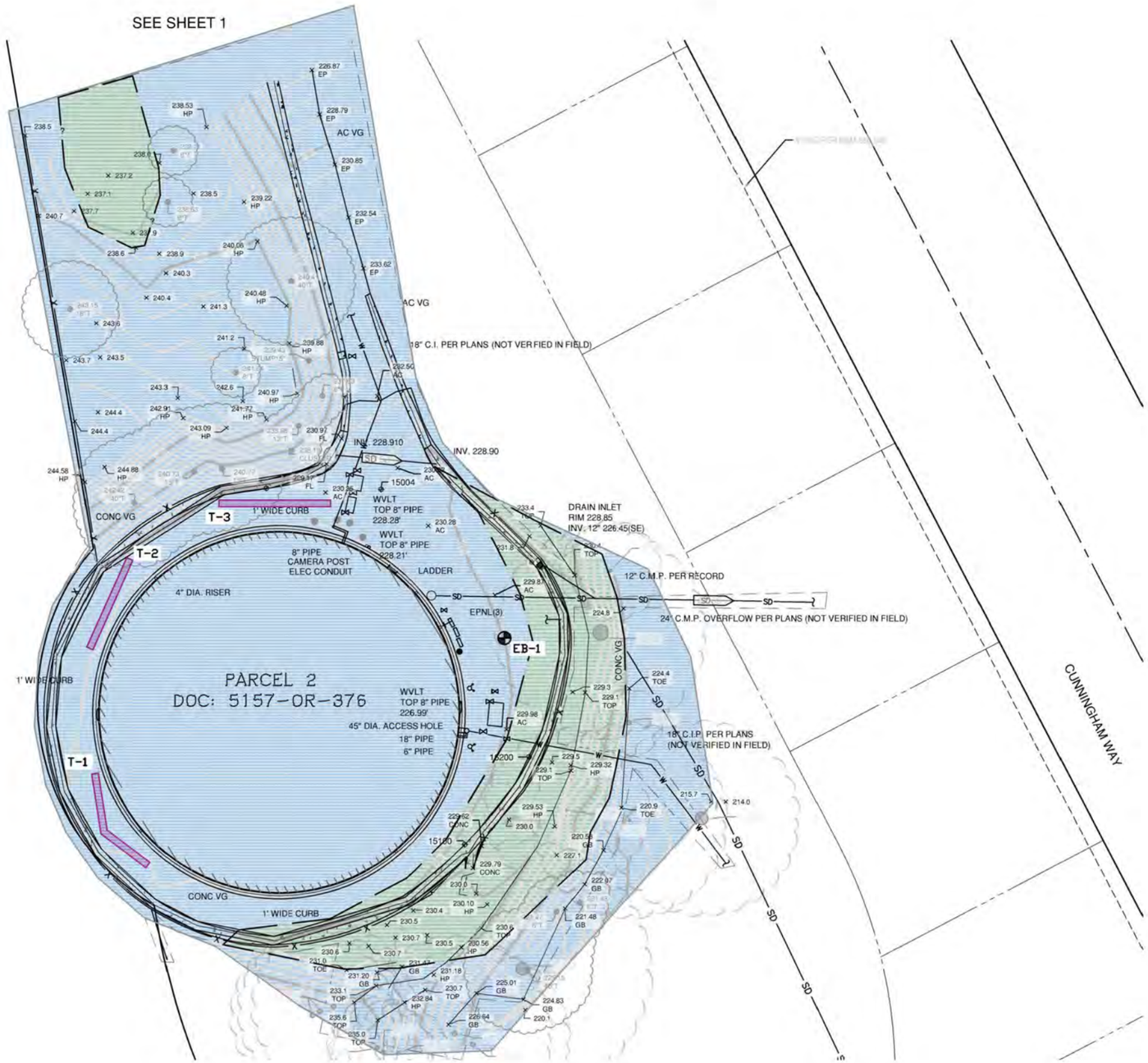
FF	FINISHED FLOOR
FL	FLOWLINE
FW	FENCE, WOOD
GB	GRADEBREAK
GS	GROUND SHOT (SPOT ELEVATION)
HP	HINGE POINT
INV	INVERT ELEVATION (UTILITY)
LIP	LIP OF GUTTER
SD	STORM DRAIN
T	TREE TRUNK

N

0 20 40

SCALE: 1" = 40'



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Creating Space Underground
6355 Topanga Canyon Blvd, St 309, Woodland Hills CA 91367
PHONE: 818-835-9554

DESIGNED: WG CHECKED: PMS DRAWN: BRH

Cunningham Water Storage Tank

GEOLOGIC MAP

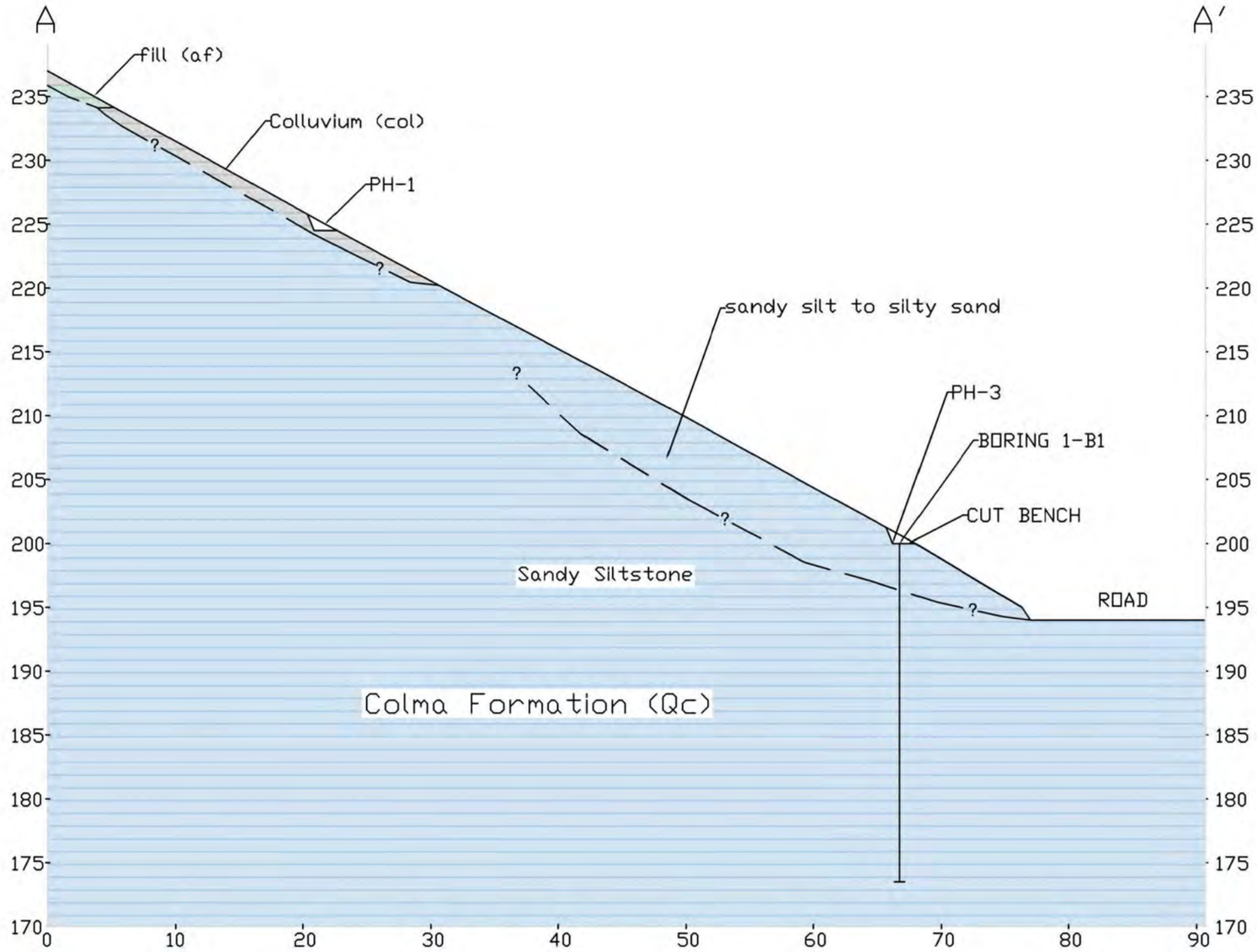
CONTRACT: ---- DATE: ---- PROJECT: 120098-000

SHEET: 2B

DRAWING NO.: OF ----

REVISION: ----

SCALE: 1"=20'



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SCALE: 1" = 10'

Section A-A'

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PHONE: 818-835-9554

DESIGNED: WG | CHECKED: PMS | DRAWN: BRH

Cunningham Water Storage Tank

SECTION A-A'

CONTRACT: ---- | DATE: ---- | PROJECT: 120098-000

SHEET: 3A

DRAWING NO.: DF ----

REVISION: ----

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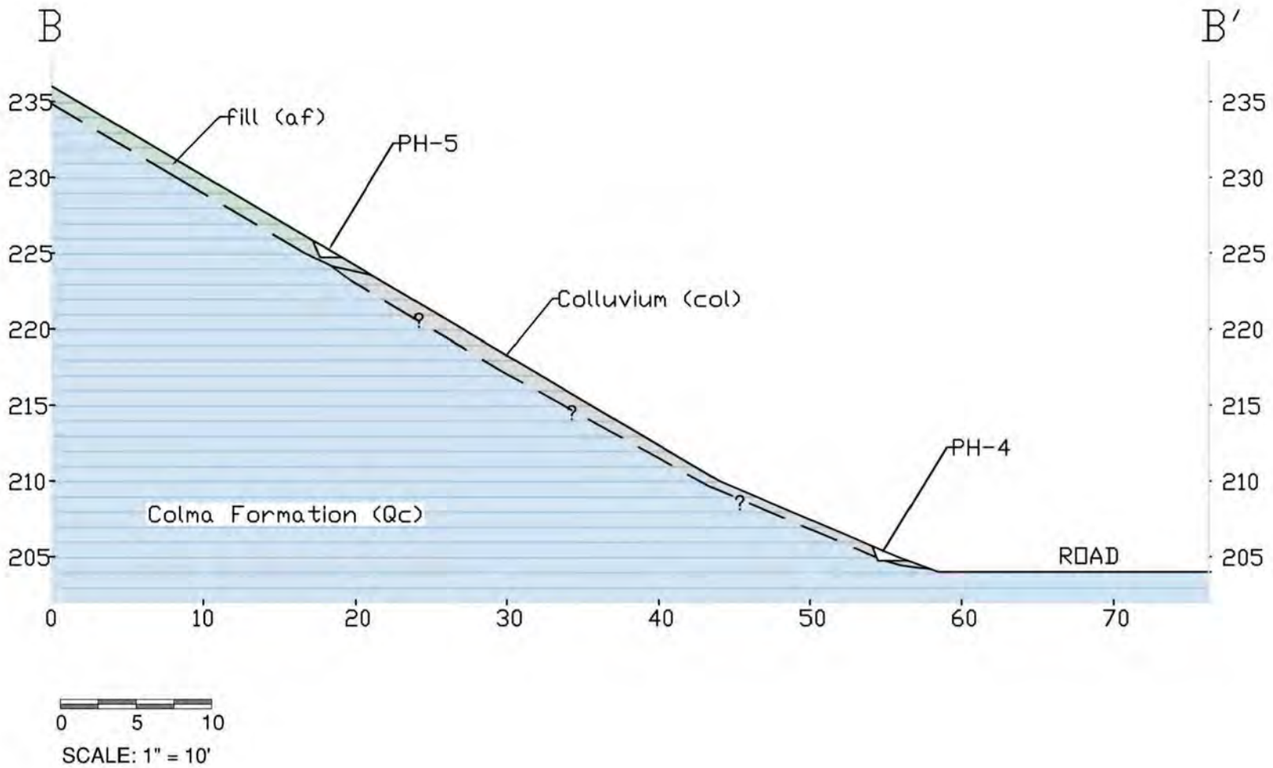

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OWNER/GC: City of San Bruno, San Bruno, Calironia

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Creating Space Underground
6355 Topanga Canyon Blvd, St 309, Woodland Hills CA 91367
PHONE: 818-835-9554

DESIGNED: WG CHECKED: PMS DRAWN: BRH

Cunningham Water Storage Tank

SECTION B-B′

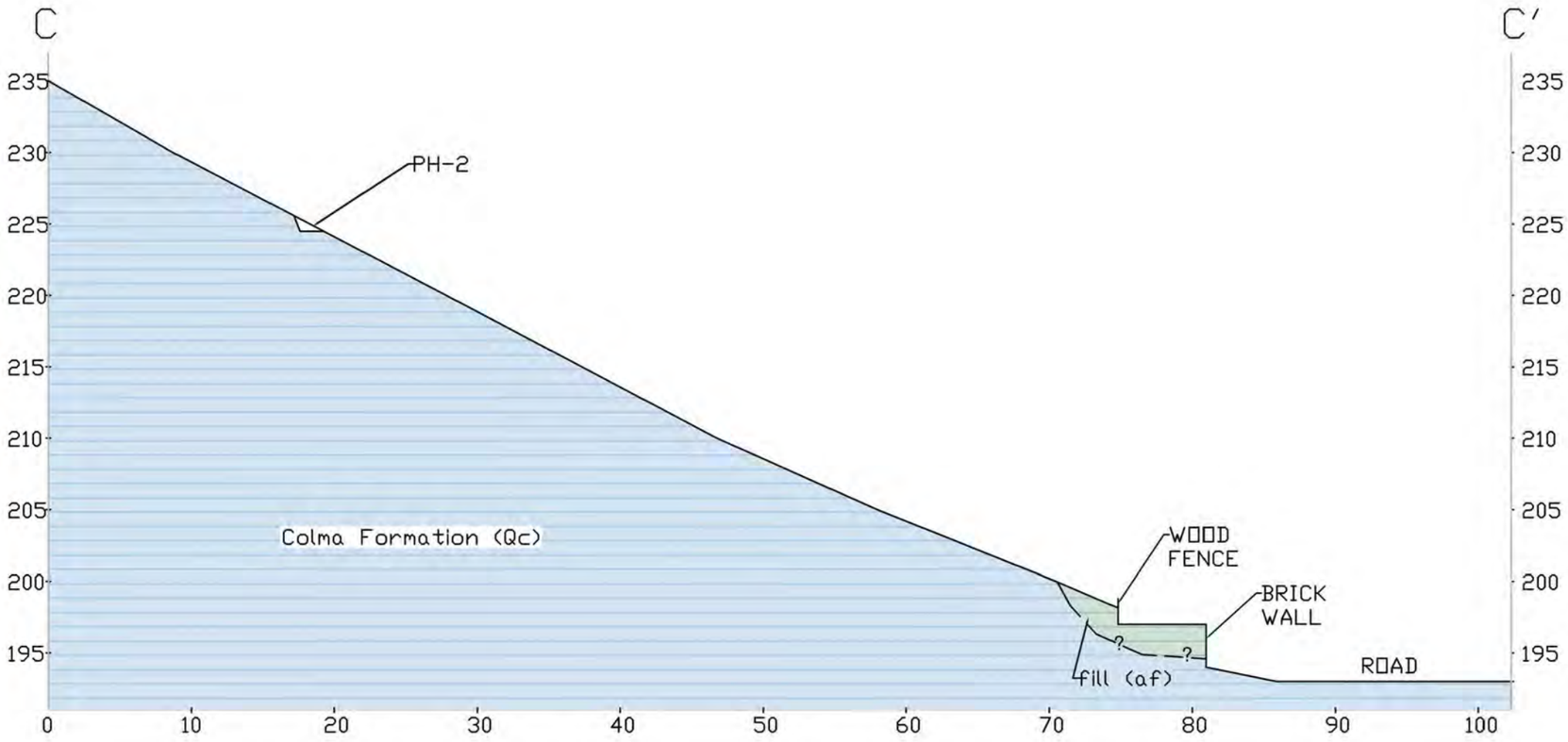
CONTRACT: ---- DATE: ---- PROJECT: 120098-000

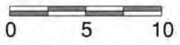
SHEET: 3B

DRAWING NO.: DF ----

REVISION: ----

SCALE: 1"=10'





SCALE: 1" = 10'

Section C-C′

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NO.	DATE	REVISIONS	BY	CK

OWNER/GC: City of San Bruno, San Bruno, Calironia

GRAPHIC SCALE: 0 1/2" 1"

FILE NAME: - | PLOT DATE: 9/22/23

CLIENT: Lee & Ro, 10640 Scripps Ranch Blvd., San Diego, CA

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Creating Space Underground
6355 Topanga Canyon Blvd, St 309, Woodland Hills CA 91367
PHONE: 818-835-9554

DESIGNED: WG | CHECKED: PMS | DRAWN: BRH

Cunningham Water Storage Tank

SECTION C-C′

CONTRACT: ---- | DATE: ---- | PROJECT: 120098-000

SHEET: 3C

DRAWING NO.: OF ----

REVISION: ----

SCALE: 1"=10'

Test Pit Logs
Cunninghan Tank Replacement Project

Test Pit TP1

Elevation 223 ft

0-1.5 ft Grey to mottled yellow-brown SILTY CLAY with sand (CL-SM), very stiff to stiff, dry, occasional hard greenstone gravels, porous, rootlets. (Colluvium).

Test Pit TP2

Elevation 220 ft

0-1.0 ft Light brown to tan silty SANDSTONE, friable, moderately weathered, dry, fine grained, massive with no relic bedding, minor rootlets (Colma Formation), [consistency of silty sand]

Test Pit TP3 (coincident with ENGEO boring 1-B1)

Elevation 198 ft

0-1.5 ft Light grey to brown sandy SILTY CLAY (CL), stiff to very stiff, dry, fine grained sand with minor rootlets

1.5-2.0 ft Yellow brown SILTSTONE , weak to friable, low hardness, moderately weathered, abundant iron oxide coatings. (Colma Formation)

Test Pit TP4

Elevation 206 ft

0-0.5 ft Light grey SILTY CLAY (CL), very stiff, dry (colluvium?)

0.5 to 1.5 ft Orange to red brown SANDSTONE , weak to moderately hard, moderately weathered, fine to medium grained, rootlets (Colma Formation, Qc)

Test Pit TP5

Elevation 225 ft

0-0.5 ft Medium Grey SILTY CLAY WITH GRAVEL (GC), medium stiff, concrete chunks to 6" (fill)

0.5 -1.3 ft Light grey to tan SILTSTONE, friable, soft, roots (Colma Formation, Qc)

APPENDIX B

BRIERLEY ASSOCIATES
Creating Space Underground

CUNNINGHAM WATER TANK ACCESS ROAD
SAN BRUNO, CALIFORNIA

GEOTECHNICAL DATA REPORT

SUBMITTED TO
Mr. Eric Magee
Lee & Ro, Inc.
10640 Scripps Ranch Boulevard, Suite 150
San Diego, CA 92131

PREPARED BY
ENGEO Incorporated

July 13, 2023

PROJECT NO.
11218.001.000

ENGEO
Expect Excellence

Project No.
11218.001.000

July 13, 2023

Mr. Eric Magee
Lee & Ro, Inc.
10640 Scripps Ranch Boulevard, Suite 150
San Diego, CA 92131

Subject: Earth Retaining Structure, Cunningham Water Tank Access Road
455 Cunningham Way
San Bruno, California

GEOTECHNICAL DATA REPORT

Dear Mr. Magee:

ENGEO prepared this geotechnical report for Lee & Ro, Inc. as outlined in our agreement dated May 19, 2023. We characterized the subsurface conditions at the site to provide the enclosed geotechnical information and recommendations.

Our experience and that of our profession clearly indicate that the risk of costly design, construction, and maintenance problems can be significantly lowered by retaining the design geotechnical engineering firm to review the project plans and specifications and provide geotechnical observation and testing services during construction. Please let us know when working drawings are nearing completion, and we will be glad to discuss these additional services with you.

If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

Kurt Katzenberger

Joey Tognolini, PE

REGISTERED PROFESSIONAL ENGINEER
JOSEPH TOGNOLINI
No. 91803
CIVIL
STATE OF CALIFORNIA

Robert H. Boeche, CEG

CERTIFIED ENGINEERING GEOLOGIST
ROBERT BOECHE
No. 2318
STATE OF CALIFORNIA

kdk/jht/rhb/ca

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

ENGEO prepared this geotechnical data report for design of an earth retaining structure in San Bruno, California. As outlined in our agreement dated May 19, 2023, you authorized ENGEO to conduct the following scope of services.

- Subsurface field exploration
- Soil laboratory testing
- Data analysis and conclusions
- Data report preparation

For our use, we received a conceptual exhibit titled “Exhibit-Truck Turn WB-40 Intermediate Semi Trailer” prepared by Lee & Ro, Inc., undated.

This report was prepared for the exclusive use of our client and their consultants for design of this project. In the event that any changes are made in the character, design, or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to evaluate whether modifications are recommended. This document may not be reproduced in whole or in part by any means whatsoever, nor may it be quoted or excerpted without our express written consent.

1.2 PROJECT LOCATION

Figure 1 displays a Site Vicinity Map. The site is located between Cunningham Way and Interstate Highway 280 in San Bruno, California, and is directly accessible from Cunningham Way.

Figure 2 shows site boundaries and the location of the single boring. The site is bordered by an approximately 1.5:1 (horizontal:vertical) slope leading up to Interstate Highway 280 to the west, residential homes along Cunningham Way to the north and east, and an access road leading to a 2.5-million-gallon water tank to the south.

1.3 PROJECT DESCRIPTION

Based on our discussion with you and review of the provided plans, we understand that the following site improvements are proposed.

1. Retrofitting the existing 2.5-million-gallon water tank.
2. Construction of a 15-foot-wide access road leading to the water tank with fill placement.
3. Earthwork cut of the existing slope.
4. Construction of a soil nail retaining wall along the proposed access road realignment.

Our report includes geotechnical data and conclusions related to the proposed retaining wall along the access road. We understand the retaining wall will be designed by others.

PHOTO 1.3-1: Soil sampling at Boring 1-B1.

2.0 FINDINGS

2.1 FIELD EXPLORATION

Our field exploration was performed on June 15, 2023, and included drilling one boring on the site to a depth of 27½ feet below ground surface. The boring was located at the approximate center of the proposed retaining structure at the most accessible area along the sloped hillside.

The location and elevations of our explorations are approximate and were estimated using Google Earth; they should be considered accurate only to the degree implied by the method used.

2.1.1 Boring

We observed drilling of one boring at the location shown in the Site Plan, Figure 2. An ENGEO representative observed the drilling and logged the subsurface conditions for the boring. We retained a limited-access Minute Man drill rig and crew to advance the boring using a 3-inch-diameter solid-flight auger. The boring was advanced until auger refusal, which was encountered at a depth of 27.5 feet below ground surface. We permitted and backfilled the borings with a clean grout mix in accordance with the requirements of San Mateo County Environmental Health Services Division.

We obtained bulk soil samples from exposed surficial soil and retrieved disturbed soil samples at various intervals in the borings using standard penetration tests and a 2.5-inch inside diameter (I.D.) Modified California sampler and a 2-inch outside diameter (O.D) split-spoon sampler.

The standard penetration resistance blow counts were obtained by dropping a 70-pound donut hammer through an approximate 30-inch free fall. The 2-inch O.D. split-spoon sampler was driven 18 inches and the number of blows was recorded for each 6 inches of penetration. In addition, 2.5-inch I.D. samples were obtained using a Modified California sampler driven into the soil with the 70-pound donut hammer previously described. Unless otherwise indicated, the blows per foot recorded on the boring log represent the accumulated number of blows to drive the last 1 foot of penetration; the blow counts have not been converted using any correction factors. When sampler driving was difficult, penetration was recorded only as inches penetrated for total hammer blows.

The logs depict subsurface conditions at the exploration locations during the exploration; however, subsurface conditions may vary with time. The exploration logs are included in Appendix A.

2.2 SITE BACKGROUND

The proposed earth retaining structure is located along an undeveloped parcel adjacent to Interstate Highway 280. Residential homes are located east of both the existing access road and slope.

2.3 GEOLOGY AND SEISMICITY

2.3.1 Geology

According to maps prepared by Pampeyan (1994), the site is underlain by the Colma Formation which primarily consists of weakly consolidated yellowish gray to tan sandy clay and silty sand, and light- to reddish-brown poorly- to well-sorted sand and gravel. According to the California Geological Survey Seismic Hazard Maps application, the site is located within an identified earthquake induced landslide zone, but not within an earthquake fault zone or liquefaction zone, as shown in Figure 5.

2.3.2 Faulting

Cornerstone Earth Group (CEG) completed a geotechnical exploration dated April 9, 2014, and a fault study dated January 29, 2014. The fault study included excavation of three trenches around the existing water tank perimeter. Two of the trenches encountered several clay-coated fractures that CEG interpreted as faults. These features were observed to offset clay layers within the Colma Formation bedrock between 0.5 inch and 7 inches. Because the previous site grading removed any dateable surface soil profile, CEG was not able to assess the relative age of the observed fracture offsets.

We also performed a fault study dated October 9, 2014, and concluded that based on the results of our research and subsurface exploration, there is no evidence that Holocene surface fault rupture has occurred at the ENGEO trench location. The fractures observed by CEG were apparently not continuous between their trenches and fractures that would project from CEG trenches into the ENGEO trench location were not observed in our trench.

The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone and no known surface expression of active faults is believed to exist within the site. Fault rupture through the site, therefore, is not anticipated.

2.3.3 Seismicity

Numerous small earthquakes occur every year in the San Francisco Bay Region, and larger earthquakes have been recorded and can be expected to occur in the future. Figure 4 shows the approximate locations of these faults and significant historic earthquakes recorded within the San Francisco Bay Region. The Uniform California Earthquake Rupture Forecast (UCERF3) (Field et al, 2015) estimates the 30-year probability for a magnitude 6.7 or greater earthquake in the San Francisco region at approximately 72 percent, considering the known active seismic sources in the region.

To determine nearby active faults that are capable of generating strong seismic ground shaking at the site, we utilized the USGS Unified Hazard Tool* and deaggregated the hazard at the peak ground acceleration (PGA) for 2475-year return period, with the resulting faults listed below in Table 2.3.3-1.

TABLE 2.3.3-1: Active Faults Capable of Producing Significant Ground Shaking at the Site (Latitude: 37.616935, Longitude: -122.423507)

SOURCE	R_{RUP}		MOMENT MAGNITUDE M_W
	(KM)	(MILES)	
San Andreas (Peninsula) [10]	1.27	0.79	7.80
San Gregorio (North) [7]	10.79	6.70	7.68
Pilarcitos [8]	6.42	3.99	7.26

*USGS Unified Hazard Tool - Edition: Dynamic Conterminous U.S. 2014 (update) (v4.2.0)

2.4 SURFACE CONDITIONS

Site topography slopes downward from Interstate Highway 280 towards the access road along Cunningham Way to the east at an approximate 0.5:1 slope. The boring location is at approximately Elevation 204 feet (Datum: Google Earth). We observed that the site featured vegetation including trees and dry brush along the face of the slope down to the paved access road. No existing structures or utilities were observed along the slope.

Please refer to the Site Plan, Figure 2, for more information on-site features.

2.5 SUBSURFACE CONDITIONS

In our exploration, we encountered yellowish brown to dark yellowish brown, sandy silt and silty sand to a depth of 27.5 feet below ground surface. Groundwater was not encountered during drilling.

Please refer to the Site Plan and exploration logs for specific subsurface conditions at our boring location. We include our exploration logs in Appendix A. The logs contain the soil type, color, consistency, and visual classification in general accordance with the Unified Soil Classification System. The logs graphically depict the subsurface conditions encountered at the time of the exploration.

2.6 GROUNDWATER CONDITIONS

We did not observe static or perched groundwater in our subsurface exploration.

Fluctuations in the level of groundwater may occur due to variations in seasonal rainfall, irrigation practice, and other factors not evident at the time measurements were made.

2.7 LABORATORY TESTING

We performed laboratory tests on selected soil samples to evaluate their engineering properties. For this project, we performed moisture content and unit weight, unconfined compression, triaxial compression, plasticity index, and corrosion testing. Moisture contents and dry densities are recorded on the boring logs in Appendix A; other laboratory data are included in Appendix B.

3.0 CONCLUSIONS

From a geotechnical engineering viewpoint, in our opinion, the site is suitable for the proposed development, provided the geotechnical recommendations in this report are properly incorporated into the design plans and specifications.

The primary geotechnical concerns that could affect development on the site are seismicity, locally-mapped landslides, and soil corrosivity. We summarize our conclusions below.

3.1 EXPANSIVE SOIL

We observed potentially expansive sandy silt near the surface of the site in Boring 1-B1. However, based on laboratory testing results and the proposed development, we opine that expansive soil should not affect the proposed development.

3.2 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking and ground lurching. The following sections present a discussion of these hazards as they apply to the site. Based on topographic and lithologic data, the risk of regional subsidence or uplift, soil liquefaction, lateral spreading, landslides, tsunamis, flooding, or seiches is considered low to negligible at the site.

3.2.1 Ground Rupture

Since there are no known active faults crossing the property and the site is not located within an Earthquake Fault Special Study Zone, it is our opinion that ground rupture is unlikely at the subject property.

3.2.2 Ground Shaking

An earthquake of moderate to high magnitude generated within the San Francisco Bay region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, structures should be designed using sound engineering judgment and the 2022 California Building Code (CBC) requirements, as a minimum. Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead and live loads. The see belowcode-prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some non-structural damage, and (3) resist major earthquakes without collapse but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

3.2.3 Liquefaction

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soil most susceptible to liquefaction is clean, loose, saturated, uniformly graded, fine-grained sand. The sand encountered in our borings was generally medium-dense to dense and contained a significant amount of fine-grained material. In addition, groundwater was not encountered to the terminal depth of our boring. For these reasons and based upon engineering judgment, it is our opinion that the potential for liquefaction at the site is low during seismic shaking.

3.2.4 Ground Lurching

Ground lurching is a result of the rolling motion imparted to the ground surface during energy released by an earthquake. Such rolling motion can cause ground cracks to form in weaker soil. The potential for the formation of these cracks is considered greater at contacts between deep alluvium and bedrock. Such an occurrence is possible at the site as in other locations in the Bay Area region, but based on the site location, it is our opinion that the offset is expected to be minor.

3.2.5 Flooding

Based on site elevation and distance from water sources, flooding is not expected at the subject site; however, the civil engineer should review pertinent information relating to possible flood levels for the subject site based on elevations and provide appropriate design measures for development of the project, if recommended.

3.2.6 Landslides

Based on the California Geologic Survey Seismic Hazard Maps, the site is located within an earthquake-induced landslide zone. However, we did not observe evidence of landslides in our 2014 fault study or our recent geotechnical exploration. Therefore, we opine that the risk of landslides is low at the site.

3.3 SOIL CORROSION POTENTIAL

As part of this study, we obtained a representative soil sample and submitted it to a qualified analytical lab for determination of pH, resistivity, sulfate, and chloride. The results are included in Appendix B and summarized in the table below.

TABLE 3.3-1: Corrosivity Test Results

SAMPLE LOCATION	DEPTH	PH	RESISTIVITY (OHMS-CM)	CHLORIDE (MG/KG)	SULFATE (MG/KG)
1-B1	3.5 feet	6.6	3,500	N.D.	N.D.

* ASTM D4327

The 2022 CBC references the 2019 American Concrete Institute Manual, ACI 318-19, Section 19.3.1 for concrete durability requirements. ACI Table 19.3.1.1 provides the following exposure categories and classes, and Table 19.3.2.1 provides requirements for concrete in contact with soil based on the exposure class.

TABLE 3.3-2: ACI Table 19.3.1.1: Exposure Categories and Classes

CATEGORY	CLASS	CONDITION	
Freezing and thawing (F)	F0	Concrete not exposed to freezing-and-thawing cycles	
	F1	Concrete exposed to freezing-and-thawing cycles with limited exposure to water	
	F2	Concrete exposed to freezing-and-thawing cycles with frequent exposure to water	
	F3	Concrete exposed to freezing-and-thawing cycles with frequent exposure to water and exposure to deicing chemicals	
		WATER-SOLUBLE SULFATE (SO_4^{2-}) IN SOIL, % BY MASS[1]	**DISSOLVED SULFATE (SO_4^{2-}) IN WATER MG/KG (PPM)[2]**
Sulfate (S)	S0	$SO_4^{2-} < 0.10$	$SO_4^{2-} < 150$
	S1	$0.10 \leq SO_4^{2-} < 0.20$	$150 \leq SO_4^{2-} \leq 1{,}500$ or seawater
	S2	$0.20 \leq SO_4^{2-} \leq 2.00$	$1{,}500 \leq SO_4^{2-} \leq 10{,}000$
	S3	$SO_4^{2-} > 2.00$	$SO_4^{2-} > 10{,}000$
		CONDITION	
In contact with water (W)	W0	Concrete dry in service	
	W1	Concrete in contact with water where low permeability is not required	
	W2	Concrete in contact with water where low permeability is required	
Corrosion protection of reinforcement (C)	C0	Concrete dry or protected from moisture	
	C1	Concrete exposed to moisture but not to an external source of chlorides	
	C2	Concrete exposed to moisture and an external source of chlorides from deicing chemicals, salt, brackish water, seawater, or spray from these sources	

[1] Percent sulfate by mass in soil determined by ASTM C1580
[2] Concentration of dissolved sulfates in water in ppm determined by ASTM D516 or ASTM D4130

In accordance with the criteria presented in the above table, this soil is categorized as within the S0 sulfate exposure class.

Considering the S0 'Not Applicable' sulfate exposure, there is no requirement for cement type or water-cement ratio; however, a minimum concrete compressive strength of 2,500 psi is specified by the building code. For this sulfate range, we recommend Type II cement and a concrete mix design for foundations that incorporates a maximum water-cement ratio of 0.50. However, it should be noted that the structural engineering design requirements for concrete may result in more stringent concrete specifications.

Based on the resistivity measurements, the soil is considered corrosive to buried metal piping. Values tested for chloride do not pose a significant impact on metals or concrete.

If desired to investigate this further, we recommend a corrosion consultant be retained to evaluate if specific corrosion recommendations are advised for the project. Note that ASTM Test Method D4327 was used in lieu of the ACI designated sulfate test methods as it provides more repeatable test results.

3.4 STATIC AND PERCHED GROUNDWATER

It does not appear that the static groundwater level beneath the site is likely to affect the proposed development. However, perched water can:

1. Impede grading and other construction activities.
2. Cause premature pavement failure if hydrostatic pressures build up beneath the section.

We provide recommendations to reduce the effects of perched water in Sections 5.2 and 5.6 addressing Over Optimum Soil Conditions and Site Drainage, respectively.

3.5 2022 CBC SEISMIC DESIGN PARAMETERS

The 2022 CBC utilizes seismic design criteria established in the ASCE/SEI Standard "Minimum Design Loads and Associated Criteria for Buildings and Other Structures," (ASCE 7-16). Based on the subsurface conditions encountered, we characterized the site as Site Class D in accordance with Chapter 20 of ASCE 7-16 .

ASCE 7-16 requires a site-specific ground-motion hazard analysis for Site Class D sites with a mapped S_1 value greater than or equal to 0.2. However, Section 11.4.8 of ASCE 7-16 and Supplement No. 3 provide an exception to this requirement. A site-specific ground-motion hazard analysis is not required where the value of the parameter S_{M1} determined by Equation 11.4-2 and shown in Table 1 is increased by 50 percent for developing the mapped Risk-Targeted Maximum Considered Earthquake (MCE_R) spectral response, calculating S_{D1}, and evaluating C_s in accordance with Chapter 12 of ASCE 7-16.

In Table 3.5-1 below, we provide the CBC seismic parameters based on the United States Geological Survey's (USGS') Seismic Design Maps for your use, assuming a Risk Category III. When using this table, considerations should be given to exceptions in Section 11.4.8 of ASCE 7-16, as described in this letter.

TABLE 3.5-1: 2022 CBC Seismic Design Parameters Latitude: 37.616935 Longitude: -122.423507

PARAMETER	VALUE
Site Class	D
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	2.39
Mapped MCE_R Spectral Response Acceleration at 1-second Period, S_1 (g)	1.001
Site Coefficient, F_a	1.2
Site Coefficient, F_v	1.7
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	2.868
MCE_R Spectral Response Acceleration at 1-second Period, S_{M1} (g)	1.702
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	0.431
Design Spectral Response Acceleration at 1-second Period, S_{D1} (g)	1.135
Mapped MCE Geometric Mean (MCE_G) Peak Ground Acceleration, PGA (g)	1.022
Site Coefficient, F_{PGA}	1.200
MCE_G Peak Ground Acceleration adjusted for Site Class effects, PGA_M (g)	1.226
Long period transition-period, T_L (sec)	12

*The parameters above should only be used for calculation of T_s, determination of Seismic Design Category, and, when taking the exceptions under Items 1 and 2 of ASCE 7-16 Section 11.4.8. (Supplement Number 3 https://ascelibrary.org/doi/epdf/10.1061/9780784414248.sup3).

We recommend that we collaborate with the structural engineer of record to further evaluate the effects of taking the exception on the structural design and identify the need for performing a site-specific ground-motion hazard analysis. We can prepare a proposal for a site-specific ground-motion hazard analysis, if requested.

4.0 CONSTRUCTION MONITORING

Our experience and that of our profession clearly indicate that the risk of costly design, construction, and maintenance problems can be significantly lowered by retaining the design geotechnical engineering firm to:

1. Review the final grading and foundation plans and specifications prior to construction to evaluate whether our recommendations have been implemented, and to provide additional or modified recommendations, as needed. This also allows us to check if any changes have occurred in the nature, design, or location of the proposed improvements and provides the opportunity to prepare a written response with updated recommendations.
2. Perform construction monitoring to check the validity of the assumptions we made to prepare this report. Earthwork operations should be performed under the observation of our representative to check that the site is properly prepared, the selected fill materials are satisfactory, and that placement and compaction of the fill has been performed in accordance with our recommendations and the project specifications. Sufficient notification to us prior to earthwork is important.

If we are not retained to perform the services described above, then we are not responsible for any party's interpretation of our report (and subsequent addenda, letters, and verbal discussions).

5.0 EARTHWORK RECOMMENDATIONS

As used in this report, relative compaction refers to the in-place dry unit weight of soil expressed as a percentage of the maximum dry unit weight of the same soil, as determined by the ASTM D1557 laboratory compaction test procedure, latest edition. Compacted soil is not acceptable if it is unstable; it should exhibit only minimal flexing or pumping, as observed by an ENGEO representative. The term "moisture condition" refers to adjusting the moisture content of the soil by either drying if too wet or adding water if too dry.

We define "structural areas" as any area sensitive to settlement of compacted soil for the grading associated with soil nail wall improvements. These areas are limited to the retaining wall and adjacent grading associated with the wall grading.

5.1 GENERAL SITE CLEARING

Areas to be developed should be cleared of surface and subsurface deleterious materials, including existing building foundations, slabs, buried utility and irrigation lines, pavements, debris, designated trees, shrubs, and associated roots. Backfill excavations extending below the planned finished site grades should be clean with suitable material compacted to the recommendations presented in Section 5.4. We should be retained to observe and test backfilling.

Following clearing, the site should be stripped to remove surface organic materials. Strip organics from the ground surface to a depth of at least 2 to 3 inches below the surface. We recommend remove strippings from the site.

5.2 OVER-OPTIMUM SOIL MOISTURE CONDITIONS

The contractor should anticipate encountering excessively over-optimum (wet) soil moisture conditions during winter or spring grading, or during or following periods of rain. Wet soil can make proper compaction difficult or impossible. Wet soil conditions can be mitigated by:

1. Frequent spreading and mixing during warm dry weather;
2. Mixing with drier materials;
3. Mixing with a lime, lime-flyash, or cement product; or
4. Stabilizing with aggregate or geotextile stabilization fabric, or both.

Options 3 and 4 should be evaluated by us prior to implementation.

5.3 ACCEPTABLE FILL

On-site soil material is suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 8 inches in maximum dimension.

Imported fill materials should meet the above requirements and have a plasticity index less than 12. We should be notified to sample and test proposed imported fill materials at least 5 days prior to delivery to the site.

5.4 FILL COMPACTION

5.4.1 Grading in Structural Areas

Perform subgrade compaction prior to fill placement, following cutting operations, and in areas left at grade as follows.

1. Scarify to a depth of at least 8 inches.
2. Moisture condition soil to at least 1 percentage point above the optimum moisture content.
3. Compact the subgrade to at least 90 percent relative compaction. Compact the upper 6 inches of finish pavement subgrade to at least 95 percent relative compaction prior to aggregate base placement.

After the subgrade soil has been compacted, place and compact acceptable fill as follows.

1. Spread fill in loose lifts that do not exceed 8 inches.
2. Moisture condition lifts to at least 1 percentage point above the optimum moisture content.
3. Compact fill to a minimum of 90 percent relative compaction; Compact the upper 6 inches of fill in pavement areas to 95 percent relative compaction prior to aggregate base placement.

Caltrans Class 2 Aggregate Base section to at least 95 percent relative compaction (ASTM D1557). Moisture condition aggregate base to or slightly above the optimum moisture content prior to compaction.

5.5 SLOPES

5.5.1 Gradients

Final slope gradients should be no steeper than 2:1 (horizontal:vertical). The contractor is responsible to construct temporary construction slopes in accordance with Cal/OSHA requirements.

5.6 SITE DRAINAGE

5.6.1 Surface Drainage

The project civil engineer is responsible for designing surface drainage improvements. With regard to geotechnical engineering issues, we recommend that finish grades be sloped away from wall foundations and pavements to the maximum extent practical. We recommend that specific drainage requirements be developed.

6.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents geotechnical information and recommendations for design of the improvements discussed in Section 1.3 (excluding the soil nail wall) for the Cunningham Water Tank Access Road project. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strived to perform our professional services in accordance with generally accepted principles and practices currently employed in the area; there is no warranty, express or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data are representative of the actual subsurface conditions across the site. Considering possible underground variability of soil and groundwater, additional costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, ENGEO must be notified immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, flood potential, or a geohazard exploration. In addition, our geotechnical exploration did not include work to determine the existence of possible hazardous materials. If any hazardous materials are encountered during construction, the proper regulatory officials must be notified immediately.

This document must not be subject to unauthorized reuse, that is, reusing without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications or other changes to ENGEO's documents. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies or other changes necessary to reflect changed field or other conditions.

We determined the lines designating the interface between layers on the exploration logs using visual observations. The transition between the materials may be abrupt or gradual. The exploration logs contain information concerning samples recovered, indications of the presence of various materials such as clay, sand, silt, rock, existing fill, etc., and observations of groundwater encountered. The field logs also contain our interpretation of the subsurface conditions between sample locations. Therefore, the logs contain both factual and interpretative information. Our recommendations are based on the contents of the final logs, which represent our interpretation of the field logs.

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FIGURES

BASEMAP SOURCE: GOOGLE EARTH MAPPING SERVICE 2022

ENGEO Expect Excellence

VICINITY MAP

CUNNINGHAM WATER TANK REPLACEMENT

SAN BRUNO, CALIFORNIA

PROJECT NO. :	11218.001.000
SCALE:	AS SHOWN
DRAWN BY: QRL	CHECKED BY: JT

FIGURE NO. 1

PATH: G:\DRAFTING\PROJECTS_10000 TO 12999\11218\11218001000\GEOTECH\GEX\CUNNINGHAM WATER TANK REPLACEMENT.APRX
LAYOUT: VICINITY USER: QLIANG

ORIGINAL FIGURE PRINTED IN COLOR

EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

- PROJECT SITE
- BORING (ENGEO, 2023)

N

0 56 111

FEET

BASEMAP SOURCE: GOOGLE EARTH MAPPING SERVICE 2022, LEE & RO INC 2020

ENGEO Expect Excellence

SITE PLAN

CUNNINGHAM WATER TANK REPLACEMENT

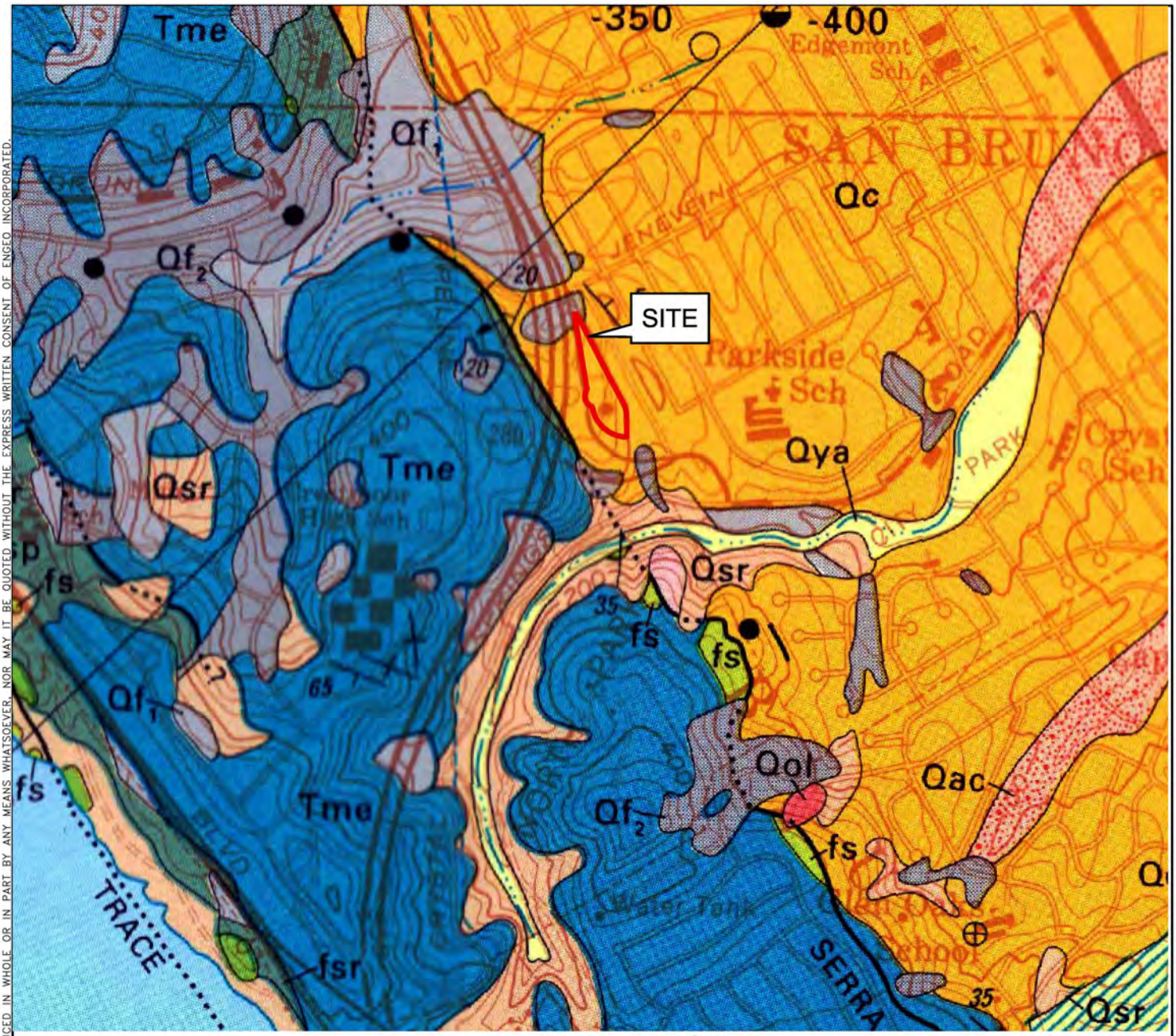
SAN BRUNO, CALIFORNIA

PROJECT NO. :	11218.001.000
SCALE:	AS SHOWN
DRAWN BY: QRL	CHECKED BY: JT

FIGURE NO. 2

PATH: G:\DRAFTING\PROJECTS_10000 TO 12999\11218\11218001000\GEOTECH\GEX\CUNNINGHAM WATER TANK REPLACEMENT.APRX
LAYOUT: SITE PLAN USER: QLIANG

ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

Qya	YOUNGER ALLUVIUM (HOLOCENE)
QTs	SEDIMENTARY DEPOSITS, UNDIVIDED (HOLOCENE TO PLIOCENE)
Qac	COARSE-GRAINED ALLUVIUM (HOLOCENE)
Qsr	SLOPE WASH, RAVINE FILL AND COLLUVIUM (HOLOCENE)
Qf	ARTIFICIAL FILL (HOLOCENE)
Qol	OLDER LANDSLIDE DEPOSITS (HOLOCENE AND PLEISTOCENE)
Qc	COLMA FORMATION (PLEISTOCENE)
Tme	MERCED FORMATION (UPPER PLIOCENE)
fs	SANDSTONE
fg	GREENSTONE
fsr	SHEARED ROCK

N

0 500 1,000

FEET

BASEMAP SOURCE: PAMPEYAN, 1994

ENGEO Expect Excellence

REGIONAL GEOLOGIC MAP

CUNNINGHAM WATER TANK REPLACEMENT

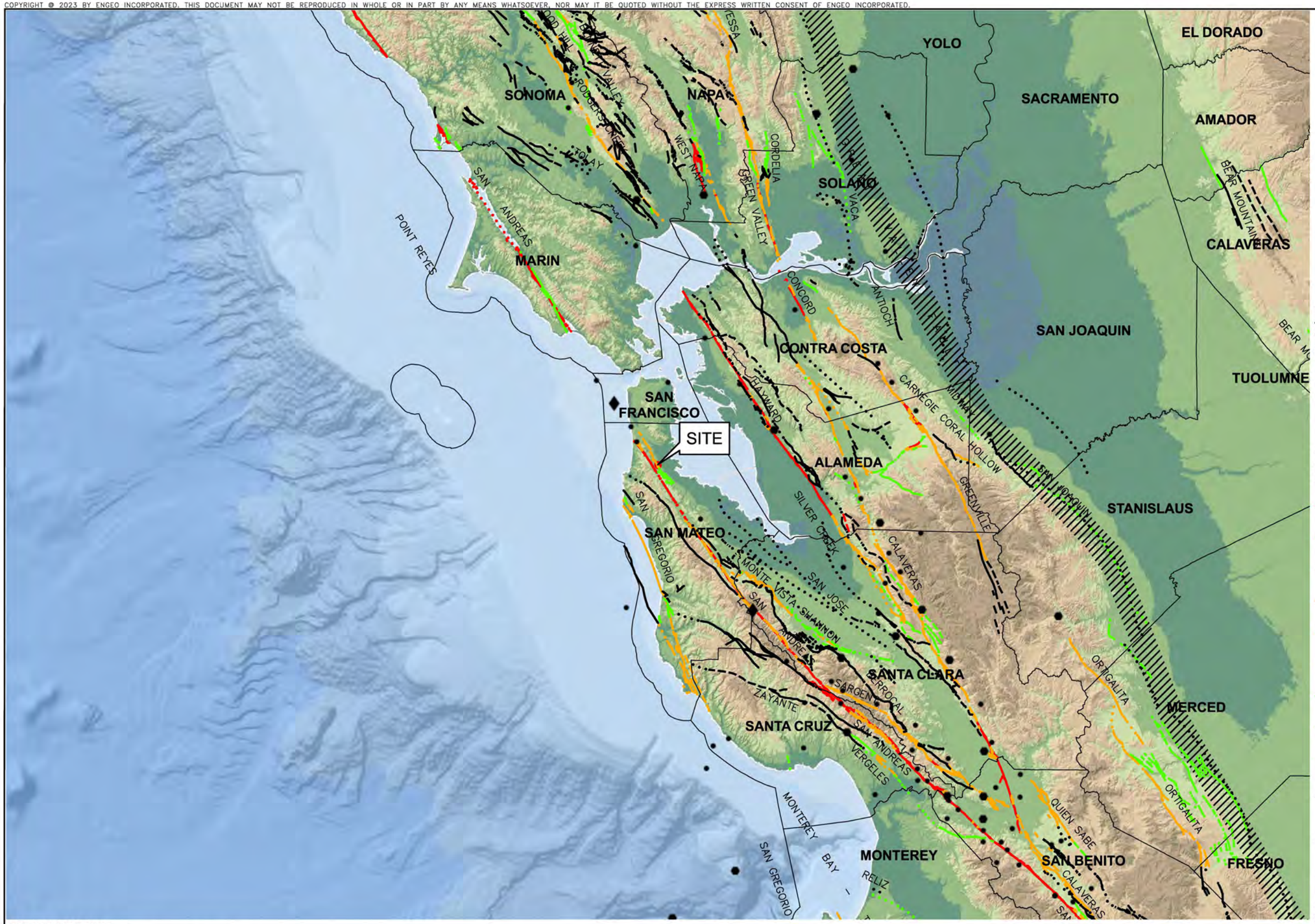
SAN BRUNO, CALIFORNIA

PROJECT NO. :	11218.001.000
SCALE:	AS SHOWN
DRAWN BY: QRL	CHECKED BY: JT

FIGURE NO. 3

PATH: G:\DRAFTING\PROJECTS_10000 TO 12999\11218\11218001000\GEOTECH\GEX\CUNNINGHAM WATER TANK REPLACEMENT.APRX
LAYOUT: GEOLOGIC USER: QLIANG

ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

EARTHQUAKE

- MAGNITUDE 7+
- MAGNITUDE 6-7
- MAGNITUDE 5-6

QUATERNARY FAULTS 2020

BASED ON TIME OF MOST RECENT SURFACE DEFORMATION

- HISTORICAL (<150 YEARS), WELL CONSTRAINED LOCATION
- HISTORICAL (<150 YEARS), MODERATELY CONSTRAINED LOCATION
- HISTORICAL (<150 YEARS), INFERRED LOCATION
- LATEST QUATERNARY (<15,000 YEARS), WELL CONSTRAINED LOCATION
- LATEST QUATERNARY (<15,000 YEARS), MODERATELY CONSTRAINED LOCATION
- LATEST QUATERNARY (<15,000 YEARS), INFERRED LOCATION
- LATE QUATERNARY (<130,000 YEARS), WELL CONSTRAINED LOCATION
- LATE QUATERNARY (<130,000 YEARS), MODERATELY CONSTRAINED LOCATION
- LATE QUATERNARY (<130,000 YEARS), INFERRED LOCATION
- UNDIFFERENTIATED QUATERNARY(<1.6 MILLION YEARS), WELL CONSTRAINED LOCATION
- UNDIFFERENTIATED QUATERNARY(<1.6 MILLION YEARS), MODERATELY CONSTRAINED LOCATION
- UNDIFFERENTIATED QUATERNARY(<1.6 MILLION YEARS), INFERRED LOCATION
- GREAT VALLEY FAULT ZONE

BASE MAP SOURCE
ESRI, GEBCO, DELORME, NATURALVUE
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATA SET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, 2020
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800-PRESENT)
U.S.G.S OPEN-FILE REPORT 96-705

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REGIONAL FAULTING AND SEISMICITY MAP

CUNNINGHAM WATER TANK REPLACEMENT

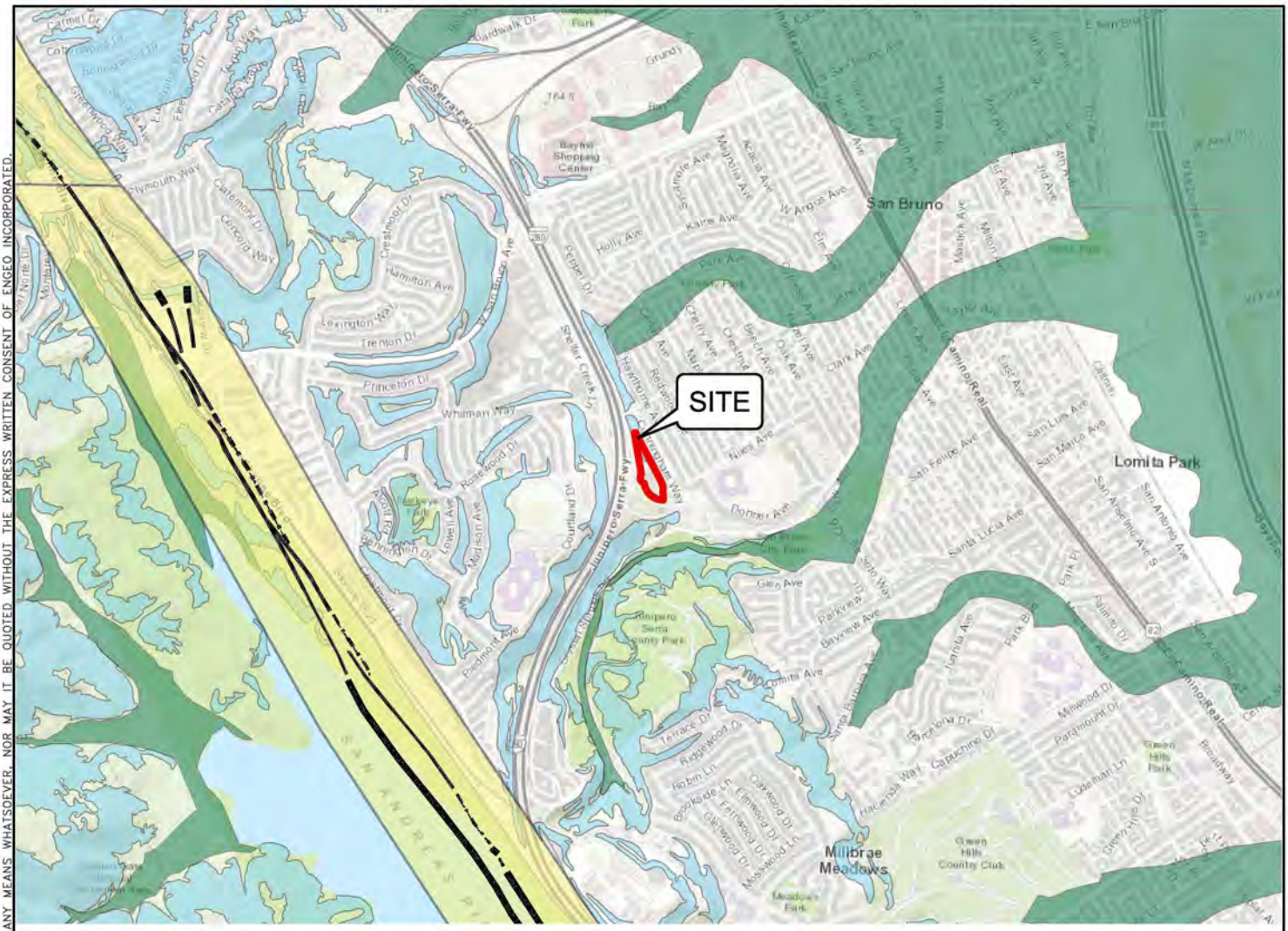
SAN BRUNO, CALIFORNIA

PROJECT NO. :	11218.001.000
SCALE:	AS SHOWN
DRAWN BY: QRL	CHECKED BY: JT

FIGURE NO. 4

PATH: G:\DRAFTING\PROJECTS_10000 TO 12999\11218\11218001000\GEOTECH\GEX\CUNNINGHAM WATER TANK REPLACEMENT.APRX
LAYOUT: FAULT&SEISMICITY – 2020 USER: QLIANG

ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

FAULT TRACES

- ACCURATELY LOCATED
- APPROXIMATELY LOCATED
- CONCEALED

EARTHQUAKE FAULT ZONE
ZONE BOUNDARIES ARE DELINEATED BY STRAIGHT-LINE SEGMENTS; THE BOUNDARIES DEFINE THE ZONE ENCOMPASSING ACTIVE FAULTS THAT CONSTITUTE A POTENTIAL HAZARD TO STRUCTURES FROM SURFACE FAULTING OR CREEP SUCH THAT AVOIDANCE AS DESCRIBED IN PUBLIC RESOURCES CODE SECTION 2621.5(A) WOULD BE REQUIRED

EARTHQUAKE-INDUCED LANDSLIDE ZONES
AREAS WHERE THE PREVIOUS OCCURRENCE OF LANDSLIDE MOVEMENT, OR LOCAL TOPOGRAPHIC, GEOLOGICAL, GEOTECHNICAL AND SUBSURFACE WATER CONDITIONS INDICATE A POTENTIAL FOR PERMANENT GROUND DISPLACEMENTS SUCH THAT MITIGATION AS DEFINED IN PUBLIC RESOURCES CODE SECTION 2693(C) WOULD BE REQUIRED.

LIQUEFACTION ZONE
AREAS WHERE THE HISTORICAL OCCURRENCE OF LIQUEFACTION, OR LOCAL GEOLOGICAL, GEOTECHNICAL AND GROUND WATER CONDITIONS INDICATE A POTENTIAL L FOR PERMANENT GROUND DISPLACEMENTS SUCH THAT MITIGATION AS DEFINED IN PUBLIC RESOURCES CODE SECTION 2693(C) WOULD BE REQUIRED

N

0 1,000 2,000

FEET

BASEMAP SOURCE: ESRI MAPPING SERVICE
CALIFORNIA DEPARTMENT OF CONSERVATION, CALIFORNIA GEOLOGICAL SURVEY

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SEISMIC HAZARDS ZONE MAP

CUNNINGHAM WATER TANK REPLACEMENT

SAN BRUNO, CALIFORNIA

PROJECT NO. :	11218.001.000
SCALE:	AS SHOWN
DRAWN BY: QRL	CHECKED BY: JT

FIGURE NO. 5

PATH: G:\DRAFTING\PROJECTS_10000 TO 12999\11218\11218001000\GEOTECH\GEX\CUNNINGHAM WATER TANK REPLACEMENT.APRX
LAYOUT: SEISMIC HAZARD USER: QLIANG

ORIGINAL FIGURE PRINTED IN COLOR

APPENDIX A

BORING LOG KEY
EXPLORATION LOGS

KEY TO BORING LOGS

MAJOR TYPES			DESCRIPTION
COARSE-GRAINED SOILS MORE THAN HALF OF MAT'L LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW - Well graded gravels or gravel-sand mixtures GP - Poorly graded gravels or gravel-sand mixtures
		GRAVELS WITH OVER 12 % FINES	GM - Silty gravels, gravel-sand and silt mixtures GC - Clayey gravels, gravel-sand and clay mixtures
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW - Well graded sands, or gravelly sand mixtures SP - Poorly graded sands or gravelly sand mixtures
		SANDS WITH OVER 12 % FINES	SM - Silty sand, sand-silt mixtures SC - Clayey sand, sand-clay mixtures
FINE-GRAINED SOILS MORE THAN HALF OF MAT'L SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50 % OR LESS		ML - Inorganic silt with low to medium plasticity CL - Inorganic clay with low to medium plasticity OL - Low plasticity organic silts and clays
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 %		MH - Elastic silt with high plasticity CH - Fat clay with high plasticity OH - Highly plastic organic silts and clays
	HIGHLY ORGANIC SOILS		PT - Peat and other highly organic soils

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words "with sand" or "with gravel" (whichever is predominant) are added to the group name.

For fine-grained soil with >30% retained on the #200 sieve, the words "sandy" or "gravelly" (whichever is predominant) are added to the group name.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE SIZE					CLEAR SQUARE SIEVE OPENINGS			
200	40	10	4	3/4 "	3"	12"		
SILTS AND CLAYS	SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE			

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FOOT (S.P.T.)
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH*
VERY SOFT	0-1/4
SOFT	1/4-1/2
MEDIUM STIFF	1/2-1
STIFF	1-2
VERY STIFF	2-4
HARD	OVER 4

SAMPLER SYMBOLS

- Modified California (3" O.D.) sampler
- California (2.5" O.D.) sampler
- S.P.T. - Split spoon sampler
- Shelby Tube
- Dames and Moore Piston
- Continuous Core
- Bag Samples
- Grab Samples
- NR No Recovery

MOISTURE CONDITION

DRY	Dusty, dry to touch
MOIST	Damp but no visible water
WET	Visible freewater

LINE TYPES

- ———— Solid - Layer Break
- – – – – – Dashed - Gradational or approximate layer break

GROUNDWATER SYMBOLS

- Groundwater level during drilling
- Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer

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LOG OF BORING 1-B1

ENGEO Expect Excellence

LATITUDE: 37.616962 LONGITUDE: -122.423348

Geotechnical Exploration
Cunningham Water Tanks
San Bruno, CA
11218.001.000

DATE DRILLED: 6/15/2023
HOLE DEPTH: 27.5 ft.
HOLE DIAMETER: 8.0 in.
SURF ELEV (Google Earth): Approx. 201 ft.

LOGGED / REVIEWED BY: J. Hoeflich / J.Tognolini
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Minute Man
HAMMER TYPE: 70 lb. Donut Hammer

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
0	200		SANDY SILT (ML), yellowish brown, medium stiff, moist, low plasticity, rootlets, fine- to medium-grained sand												
			SILTY SAND (SM), yellowish brown, dense, moist, rootlets, iron oxide staining			50/5"					23.9	95.8	979		UC
5	195		SANDY SILT (ML), dark yellowish brown, stiff, moist, low plasticity, iron oxide staining, fine- to coarse-grained sand			29	34	25	9	63					
10	190					52/4"					26.4	99	3299		UU
15	185		becomes greenish grey, increasing coarse-grained sand			65/4"					22.8	83.1			
20						60/6"									

LOG - GEOTECHNICAL_SU+QU W/ ELEV 11218001000_1-B1.GPJ ENGEO INC.GDT 7/10/23

LOG OF BORING 1-B1

LATITUDE: 37.616962 LONGITUDE: -122.423348

Geotechnical Exploration
Cunningham Water Tanks
San Bruno, CA
11218.001.000

DATE DRILLED: 6/15/2023
HOLE DEPTH: 27.5 ft.
HOLE DIAMETER: 8.0 in.
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DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Minute Man
HAMMER TYPE: 70 lb. Donut Hammer

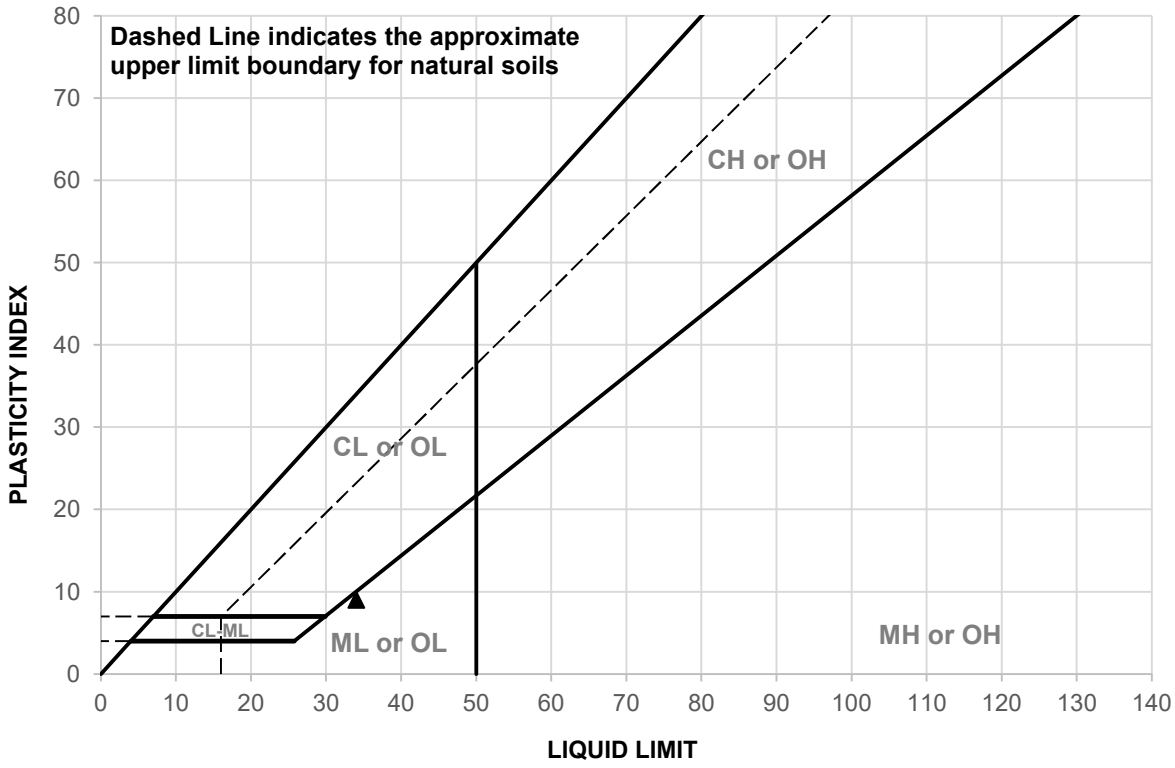
Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	180		SANDY SILT (ML), dark yellowish brown, stiff, moist, low plasticity, iron oxide staining, fine- to coarse-grained sand												
			Residual soil, includes highly weathered rock fragments			55/4"				56					
25			SILTY SAND (SM), yellowish red to reddish brown, dense, moist, increasing coarse-grained sand, trace fine rounded gravel												
	175					61/2"									
			Boring terminated at 27½ feet below the ground surface. Groundwater not encountered during drilling.												

APPENDIX B

LABORATORY TEST DATA

Liquid and Plastic Limits Test Report
Unconfined Compression Test
Triaxial Compression Test
Particle Size Distribution Report
Analytical Results of Soil Corrosion (2 pages)

LIQUID AND PLASTIC LIMITS TEST REPORT
ASTM D4318



	SAMPLE ID	DEPTH (ft)	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B1@5-6.5	5-6.5	See exploration logs	34	25	9

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B1@5-6.5	PI: ASTM D4318, Wet Method	

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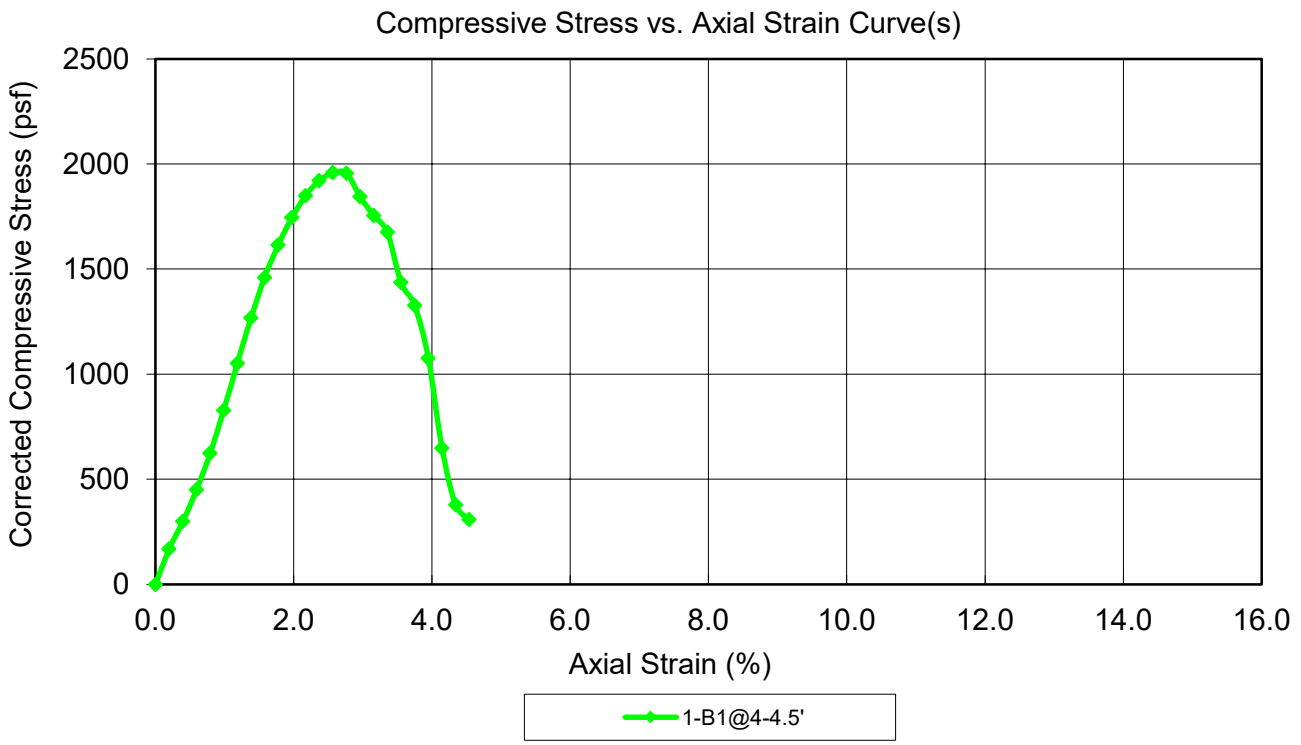
CLIENT: Lee & Ro, Inc.
PROJECT NAME: Earth Retaining Structure, Cunningham Water Tank Access Road
PROJECT NO: 11218.001.000 PH001
PROJECT LOCATION: San Bruno, CA
REPORT DATE: 6/29/2023
TESTED BY: K. Nguyen
REVIEWED BY: W. Miller

UNCONFINED COMPRESSION TEST REPORT
(ASTM D2166)



BEFORE TEST	SPECIMEN 1-B1@4-4.5'
Test Moisture Content (%)	23.87
Dry Density (pcf)	95.8
Saturation (%)	84.0
Void Ratio	0.77
Diameter (in)	2.361
Height (in)	5.068
Height-To-Diameter Ratio	2.15
TEST DATA	
Unconfined Compressive Strength (psf)	1958
Undrained Shear Strength (psf)	979.2
Strain Rate (in/min)	0.051
Specific Gravity (ASSUMED)	2.720
Strain at Failure(%)	2.57
Test Remarks	

SPECIMEN	DESCRIPTION
1-B1@4-4.5'	See exploration logs

PROJECT NAME: Cunningham Tank No. 1 Truck Turn
PROJECT NO: 11218.001.000 PH001
CLIENT: Lee & Ro, Inc.
LOCATION: San Bruno, CA

Test Date: 6/27/23
Tested By: O. Espinoza
Reviewed By: W. Miller

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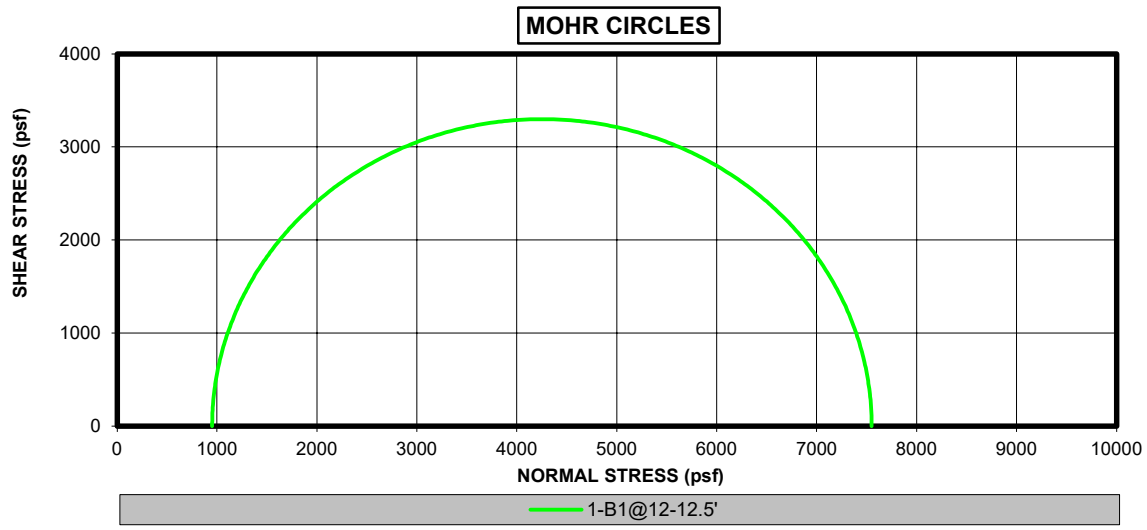
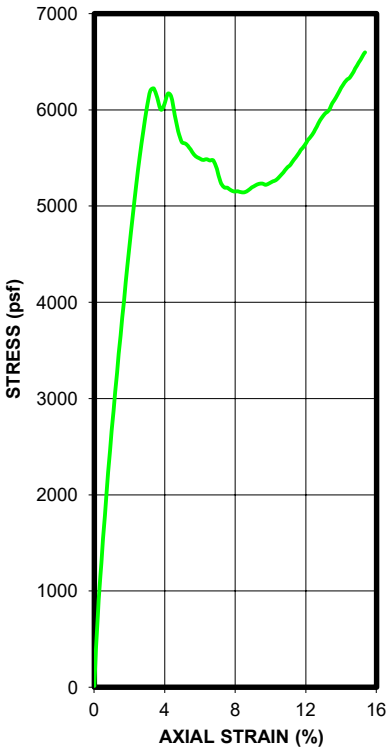
ISOTROPIC UNCONSOLIDATED UNDRAINED TRIAXIAL REPORT
ASTM D2850





	SPECIMEN			
INITIAL PARAMETERS	**1-B1@12-12.5'**			
MOISTURE (%)	26.39			
DRY DENSITY (PCF)	99.00			
SATURATION (%)	99.84			
VOID RATIO	0.722			
DIAMETER (IN.)	2.412			
HEIGHT (IN.)	5.037			
DIAMETER-TO-HEIGHT RATIO	2.088			
LIQUID LIMIT (ASTM D4318)				
PLASTIC LIMIT (ASTM D4318)				
SPECIFIC GRAVITY (ASTM D854)	2.730			
FINAL PARAMETERS	**1-B1@12-12.5'**			
MOISTURE (%)	26.39			
SATURATION (%)	99.84			
STRAIN RATE (%/MIN.)	1.000			
PEAK DEVIATOR STRESS (PSF)	6598.8			
AXIAL STRAIN AT FAILURE (%)	15.359			
CELL PRESSURE				
CELL PRESSURE (PSF)	950.4			
BACK PRESSURE (PSF)	n/a			
PRINCIPLE STRESSES AT FAILURE				
σ1 (PSF)	7549.2			
σ3 (PSF)	950.4			
COHESION AT FAILURE WITH A ZERO FRICTION ANGLE (Ø=0)				
COHESION, C (PSF)	3299.4			
REMARKS				

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CLIENT: Lee & Ro, Inc.
PROJECT NAME: Cunningham Tank No. 1 Truck Turn
PROJECT NO: 11218.001.000 PH001
PROJECT LOCATION: San Bruno, CA
REPORT DATE: 6/27/2023
TESTED BY: O. Espinoza
REVIEWED BY: W. Miller

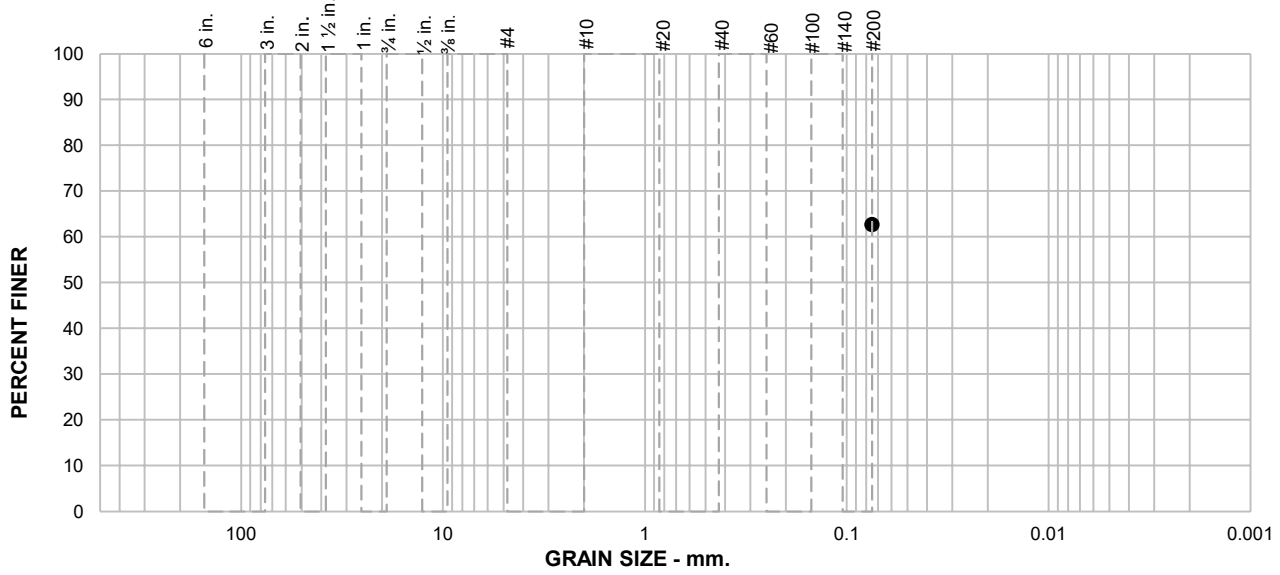
ISOTROPIC UNCONSOLIDATED UNDRAINED TRIAXIAL REPORT
ASTM D2850

ENGEO
Expect Excellence

CLIENT: Lee & Ro, Inc.
PROJECT NAME: Cunningham Tank No. 1 Truck Turn
PROJECT NO: 11218.001.000 PH001
PROJECT LOCATION: San Bruno, CA
REPORT DATE: 6/27/2023
TESTED BY: O. Espinoza
REVIEWED BY: W. Miller

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B1@5-6.5'

DEPTH (ft): 5-6.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						62.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	62.7		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

Soak time = 180 min
Dry sample weight = 190.33 g
Largest particle size < No. 4 Sieve

* (no specification provided)

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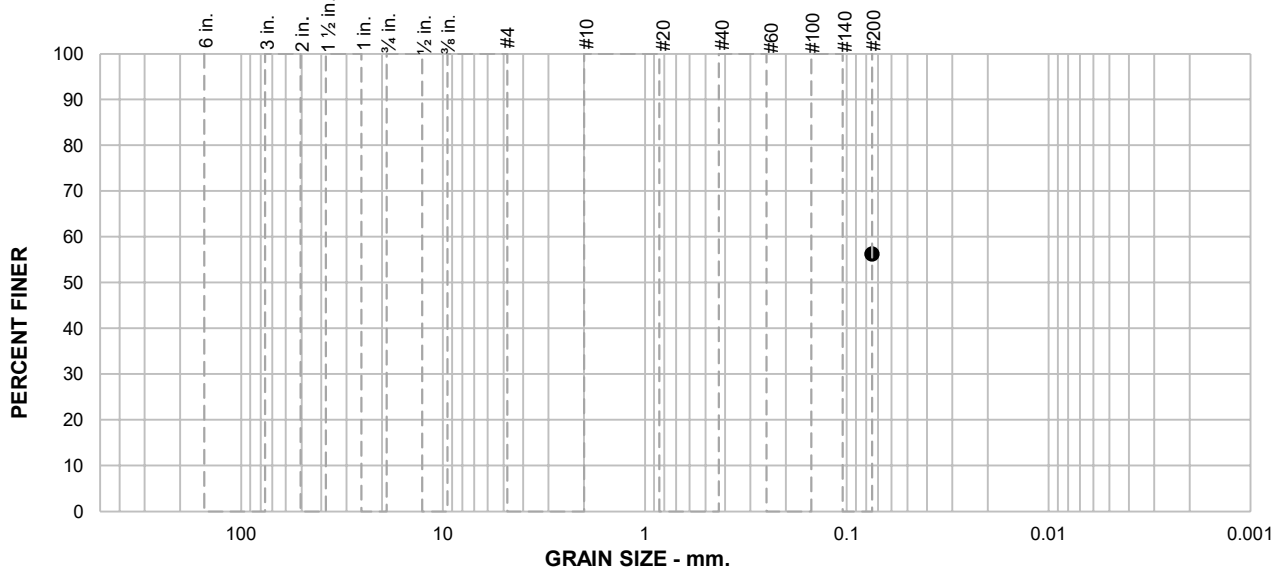
CLIENT: Lee & Ro, Inc.
PROJECT NAME: Cunningham Tank No. 1 Truck Turn
PROJECT NO: 11218.001.000 PH001
PROJECT LOCATION: San Bruno, CA
REPORT DATE: 6/27/2023
TESTED BY: O. Espinoza
REVIEWED BY: W. Miller

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B1@21-22.5

DEPTH (ft): 21-22.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						56.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	56.3		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =
D_{50} = D_{30} = D_{15} =
D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

Soak time = 180 min
Dry sample weight = 344.33 g
Largest particle size < No. 4 Sieve

* (no specification provided)

ENGEO
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CLIENT: Lee & Ro, Inc.
PROJECT NAME: Cunningham Tank No. 1 Truck Turn
PROJECT NO: 11218.001.000 PH001
PROJECT LOCATION: San Bruno, CA
REPORT DATE: 6/27/2023
TESTED BY: O. Espinoza
REVIEWED BY: W. Miller

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

26 June, 2023

Job No. 2306040
Cust. No. 10169

Mr. Joey Tognolini
ENGEO Inc.
2010 Crow Canyon Place, Suite 250
San Ramon, CA 94583

Subject: Project No.: 11218.001.000
Project Name: Cunningam Tank
Corrosivity Analysis – ASTM Test Methods

Dear Mr. Tognolini:

Pursuant to your request, CERCO Analytical has analyzed the soil sample submitted on June 20, 2023. Based on the analytical results, this brief corrosivity evaluation is enclosed for your consideration.

Based upon the resistivity measurement, this sample is classified as "moderately corrosive". All buried iron, steel, cast iron, ductile iron, galvanized steel and dielectric coated steel or iron should be properly protected against corrosion depending upon the critical nature of the structure. All buried metallic pressure piping such as ductile iron firewater pipelines should be protected against corrosion.

The chloride ion concentration reflects none detected with a reporting limit of 15 mg/kg.

The sulfate ion concentration reflects none detected with a reporting limit of 15 mg/kg.

The pH of the soil is 6.60, which does not present corrosion problems for buried iron, steel, mortar-coated steel and reinforced concrete structures.

The redox potential is 300-mV and is indicative of potentially "slightly corrosive" soils resulting from anaerobic soil conditions.

This corrosivity evaluation is based on general corrosion engineering standards and is non-specific in nature. For specific long-term corrosion control design recommendations or consultation, please call *JDH Corrosion Consultants, Inc. at (925) 927-6630.*

We appreciate the opportunity of working with you on this project. If you have any questions, or if you require further information, please do not hesitate to contact us.

Very truly yours,
CERCO ANALYTICAL, INC.

J. Darby Howard, Jr., P.E.
President

JDH/jdl
Enclosure

CERCO analytical
1100 Willow Pass Court, Suite A
Concord, CA 94520-1006
925 462 2771 Fax. 925 462 2775
www.cercoanalytical.com

Client: ENGEO, Incorporated
Client's Project No.: 11218.001.000
Client's Project Name: Cunningam Tank
Date Sampled: 19-Jun-23
Date Received: 20-Jun-23
Matrix: Soil
Authorization: Signed Chain of Custody

Date of Report: 26-Jun-2023

Job/Sample No.	Sample I.D.	Redox (mV)	pH	Conductivity (umhos/cm)*	Resistivity (100% Saturation) (ohms-cm)	Sulfide (mg/kg)*	Chloride (mg/kg)*	Sulfate (mg/kg)*
2306040-001	1-B1	300	6.60	-	3,500	-	N D	N D

Method:	ASTM D1498	ASTM D4972	ASTM D1125M	ASTM G57	ASTM D4658M	ASTM D4327	ASTM D4327
Reporting Limit:	-	-	10	-	50	15	15
Date Analyzed:	20-Jun-2023	21-Jun-2023	-	21-Jun-2023	-	21-Jun-2023	21-Jun-2023

Cheri McMillen
Chemist

* Results Reported on "As Received" Basis
N.D. - None Detected

Quality Control Summary - All laboratory quality control parameters were found to be within established limits

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REPORT END

BRIERLEY ASSOCIATES
Creating Space Underground

Appendix G: Ambient Noise Monitoring Summary

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Summary

File Name on Mete	CWLT1.001.s
File Name on PC	LxT_0005064-20240111 100000-CWLT1.001.ldbin
Serial Number	0005064
Model	SoundTrack LxT®
Firmware Version	2.404
User	
Location	
Job Description	
Note	

Measurement

Description	Cunningham Way LT 1/11/24
Start	2024-01-11 10:00:00
Stop	2024-01-12 10:00:00
Duration	24:00:00.0
Run Time	24:00:00.0
Pause	00:00:00.0
Pre-Calibration	2024-01-11 09:54:37
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamplifier	PRMLxT1L
Microphone Correction	Off
Integration Methoc	Linear
OBA Range	Normal
OBA Bandwidth	1/1 and 1/3
OBA Frequency Weighting	A Weighting
OBA Max Spectrum	Bin Max
Overload	122.9 dB

	A	C	Z	
Under Range Peak	**79.5**	76.5	81.5	dB
Under Range Limit	**24.4**	25.5	31.7	dB
Noise Floor	15.2	16.4	22.6	dB

	First	Second	Third
Instrument Identification	L01	MIG INC	916-956-3802

Results

LA_{eq}	58.5 dB

LAE		107.9	dB
EA		6.796	mPa²h
EA8		2.265	mPa²h
EA40		11.327	mPa²h
LApeak (max)	2024-01-11 10:02:08	110.8	dB
LASmax	2024-01-11 20:14:01	88.8	dB
LASmin	2024-01-12 02:53:54	31.8	dB
SEA		-99.9	dB

	Exceedance Counts	**Duration**	
LAS > 85.0 dB	2	4.8	s
LAS > 115.0 dB	0	0.0	s
LApeak > 135.0 dB	0	0.0	s
LApeak > 137.0 dB	0	0.0	s
LApeak > 140.0 dB	0	0.0	s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**	**LNight 22:00-07:00**	
	61.8	59.9	53.9	62.5	60.0	59.4	53.9	dB

LCeq	67.1	dB
LAeq	58.5	dB
LCeq - LAeq	8.6	dB
LAIeq	59.5	dB
LAeq	58.5	dB
LAIeq - LAeq	1.0	dB

	A		**C**		**Z**	
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**	**Time Stamp**
Leq	58.5		67.1			
LS(max)	88.8	2024/01				
LS(min)	31.8	2024/01				
LPeak(max)	110.8	2024/01				

Overload Count	0	
Overload Duration	0.0	s
OBA Overload Count	0	
OBA Overload Duration	0.0	s

Dose Settings

Dose Name	OSHA-1	OSHA-2	
Exchange Rate	5	5	dB
Threshold	90	80	dB
Criterion Level	90	90	dB
Criterion Duration	8	8	h

Results		
Dose	-99.94	0.02 %
Projected Dose	-99.94	0.01 %
TWA (Projected)	-99.9	19.3 dB
TWA (t)	-99.9	27.2 dB
Lep (t)	63.3	63.3 dB

Statistics	
LA 1.70	62.6 dB
LA 8.30	61.2 dB
LA 16.70	60.4 dB
LA 25.00	59.8 dB
LA 50.00	57.8 dB
LA 90.00	46.7 dB

Summary

File Name on Mete	CW_ST.001.s
File Name on PC	LxTse_0003790-20240111 102500-CW_ST.001.ldbin
Serial Number	0003790
Model	SoundExpert® LxT
Firmware Version	2.404
User	
Location	
Job Description	
Note	

Measurement

Description	Cunningham Way ST 1/11/24
Start	2024-01-11 10:25:00
Stop	2024-01-11 12:00:44
Duration	01:35:44.4
Run Time	01:35:44.4
Pause	00:00:00.0
Pre-Calibration	2024-01-11 10:14:29
Post-Calibration	None
Calibration Deviation	---

Overall Settings

RMS Weight	A Weighting
Peak Weight	A Weighting
Detector	Slow
Preamplifier	PRMLxT1L
Microphone Correction	Off
Integration Method	Exponential
OBA Range	Normal
OBA Bandwidth	1/1 and 1/3
OBA Frequency Weighting	A Weighting
OBA Max Spectrum	Bin Max
Overload	122.9 dB

	A	**C**	**Z**	
Under Range Peak	**79.5**	76.5	81.5	dB
Under Range Limit	**24.4**	25.5	31.8	dB
Noise Floor	15.2	16.4	22.6	dB

	First	**Second**	**Third**
Instrument Identification	MIG		

Results

LASeq			67.2	dB
LASE			104.8	dB
EAS			3.350	mPa²h
LApeak (max)	2024-01-11	11:40:05	118.0	dB
LASmax	2024-01-11	11:40:06	98.9	dB
LASmin	2024-01-11	11:58:40	33.5	dB
SEA			-99.9	dB

	Exceedance Counts	Duration	
LAS > 90.0 dB	1	4.8	s
LAS > 80.0 dB	5	19.5	s
LApeak > 115.0 dB	1	1.5	s
LApeak > 135.0 dB	0	0.0	s
LApeak > 140.0 dB	0	0.0	s

Community Noise	**Ldn**	**LDay 07:00-22:00**	**LNight 22:00-07:00**	**Lden**	**LDay 07:00-19:00**	**LEvening 19:00-22:00**	**LNight 22:00-07:00**	
	67.2	67.2	-99.9	67.2	67.2	-99.9	-99.9	dB

LCSeq	80.3	dB
LASeq	67.2	dB
LCSeq - LASeq	13.1	dB
LAIeq	72.2	dB
LAeq	67.2	dB
LAIeq - LAeq	5.0	dB

	A		**C**		**Z**	
	dB	**Time Stamp**	**dB**	**Time Stamp**	**dB**	**Time Stamp**
Leq	67.2					
LS(max)	98.9	2024/01/11 11:40:06				
LS(min)	33.5	2024/01/11 11:58:40				
LPeak(max)	118.0	2024/01/11 11:40:05				

Overload Count	12	
Overload Duration	24.4	s
OBA Overload Cour	12	
OBA Overload Dura	24.4	s

Statistics

LAS 1.67	72.4	dB
LAS 8.34	67.0	dB
LAS 16.70	64.3	dB
LAS 25.00	62.1	dB
LAS 50.00	57.4	dB
LAS 90.00	50.9	dB