APPENDIX A

AIR QUALITY AND GHG MODELING RESULTS

Dunisch Property Custom Report

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1. Basic Project Information

1.1. Basic Project Information

Data Field	Value
Project Name	Dunisch Property
Construction Start Date	5/1/2025
Operational Year	2029
Lead Agency	City of Elk Grove
Land Use Scale	Project/site
Analysis Level for Defaults	County
Windspeed (m/s)	3.00
Precipitation (days)	36.6
Location	38.426882460648905, -121.40114896672738
County	Sacramento
City	Elk Grove
Air District	Sacramento Metropolitan AQMD
Air Basin	Sacramento Valley
TAZ	719
EDFZ	13
Electric Utility	Sacramento Municipal Utility District
Gas Utility	Pacific Gas & Electric
App Version	2022.1.1.23

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

Single Family Housing	111	Dwelling Unit	14.4	216,450	30,492	—	311	—
Other Asphalt Surfaces	1.93	1000sqft	0.04	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.	4.02	4.22	31.7	31.2	0.06	1.37	19.8	21.2	1.26	10.1	11.4	—	6,821	6,821	0.27	0.09	2.72	6,847
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	4.01	4.20	31.7	31.0	0.06	1.37	19.8	21.2	1.26	10.1	11.4	—	6,796	6,796	0.27	0.09	0.07	6,821
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	1.92	2.95	15.2	14.8	0.02	0.65	9.51	10.2	0.60	4.86	5.47	—	2,866	2,866	0.11	0.06	0.76	2,887
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.35	0.54	2.77	2.71	< 0.005	0.12	1.74	1.85	0.11	0.89	1.00	—	475	475	0.02	0.01	0.13	478

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)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	4.02	3.38	31.7	31.2	0.05	1.37	19.8	21.2	1.26	10.1	11.4	—	5,494	5,494	0.22	0.05	0.76	5,515
2026	3.71	4.22	27.3	28.7	0.06	1.12	9.41	10.5	1.03	3.70	4.73	—	6,821	6,821	0.27	0.09	2.72	6,847
2027	1.59	4.16	10.9	16.8	0.03	0.36	0.57	0.93	0.33	0.14	0.47	—	3,383	3,383	0.13	0.09	2.46	3,415
2028	1.53	4.10	10.3	16.6	0.03	0.32	0.57	0.89	0.29	0.14	0.43	—	3,364	3,364	0.13	0.07	2.21	3,391
Daily - Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	4.01	3.38	31.7	31.0	0.05	1.37	19.8	21.2	1.26	10.1	11.4	—	5,472	5,472	0.22	0.05	0.02	5,492
2026	3.81	4.20	29.2	29.5	0.06	1.24	19.8	21.1	1.14	10.1	11.3	—	6,796	6,796	0.27	0.09	0.07	6,821
2027	1.57	4.13	11.0	16.1	0.03	0.36	0.57	0.93	0.33	0.14	0.47	—	3,325	3,325	0.13	0.09	0.06	3,354
2028	1.51	4.08	10.4	16.0	0.03	0.32	0.57	0.89	0.29	0.14	0.43	—	3,307	3,307	0.13	0.09	0.06	3,336
2029	1.47	4.04	10.0	15.9	0.03	0.29	0.57	0.87	0.27	0.14	0.41	—	3,289	3,289	0.13	0.09	0.05	3,318
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	1.92	1.62	15.2	14.8	0.02	0.65	9.51	10.2	0.60	4.86	5.47	—	2,626	2,626	0.10	0.02	0.16	2,636
2026	1.52	2.64	11.0	13.7	0.02	0.42	2.68	3.10	0.39	1.17	1.56	—	2,866	2,866	0.11	0.06	0.66	2,887
2027	1.12	2.95	7.81	11.6	0.02	0.26	0.40	0.66	0.24	0.10	0.33	—	2,384	2,384	0.09	0.06	0.76	2,405
2028	1.08	2.92	7.44	11.5	0.02	0.23	0.40	0.63	0.21	0.10	0.31	—	2,377	2,377	0.09	0.06	0.68	2,399
2029	0.05	0.22	0.35	0.57	< 0.005	0.01	0.02	0.03	0.01	< 0.005	0.01	—	116	116	< 0.005	< 0.005	0.03	117
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2025	0.35	0.30	2.77	2.71	< 0.005	0.12	1.74	1.85	0.11	0.89	1.00	—	435	435	0.02	< 0.005	0.03	436
2026	0.28	0.48	2.01	2.50	< 0.005	0.08	0.49	0.57	0.07	0.21	0.28	—	475	475	0.02	0.01	0.11	478
2027	0.21	0.54	1.43	2.11	< 0.005	0.05	0.07	0.12	0.04	0.02	0.06	—	395	395	0.02	0.01	0.13	398
2028	0.20	0.53	1.36	2.10	< 0.005	0.04	0.07	0.12	0.04	0.02	0.06	—	394	394	0.02	0.01	0.11	397
2029	0.01	0.04	0.06	0.10	< 0.005	< 0.005	< 0.005	0.01	< 0.005	< 0.005	< 0.005	—	19.1	19.1	< 0.005	< 0.005	0.01	19.3

2.4. Operations Emissions Compared Against Thresholds

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

Un/Mit.	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	5.47	10.1	6.67	47.7	0.11	0.30	8.55	8.85	0.30	2.17	2.47	47.8	14,129	14,177	4.54	0.41	26.8	14,439
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	4.51	9.12	7.26	34.6	0.11	0.30	8.55	8.85	0.30	2.17	2.47	47.8	13,269	13,316	4.58	0.44	2.21	13,565
Average Daily (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	4.73	9.42	5.59	38.2	0.10	0.19	8.35	8.53	0.18	2.12	2.30	47.8	11,640	11,688	4.53	0.42	12.5	11,939
Annual (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Unmit.	0.86	1.72	1.02	6.96	0.02	0.03	1.52	1.56	0.03	0.39	0.42	7.91	1,927	1,935	0.75	0.07	2.06	1,977

2.5. Operations Emissions by Sector, Unmitigated

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

Sector	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	4.55	4.16	3.67	40.2	0.10	0.06	8.55	8.61	0.06	2.17	2.23	—	9,724	9,724	0.37	0.38	25.3	9,871
Area	0.79	5.84	1.90	7.10	0.01	0.15	—	0.15	0.15	—	0.15	0.00	2,354	2,354	0.04	< 0.005	—	2,357
Energy	0.13	0.06	1.10	0.47	0.01	0.09	—	0.09	0.09	—	0.09	—	2,044	2,044	0.16	0.01	—	2,050
Water	—	—	—	—	—	—	—	—	—	—	—	8.36	7.45	15.8	0.03	0.02	—	22.0
Waste	—	—	—	—	—	—	—	—	—	—	—	39.4	0.00	39.4	3.94	0.00	—	138

Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.55	1.55
Total	5.47	10.1	6.67	47.7	0.11	0.30	8.55	8.85	0.30	2.17	2.47	47.8	14,129	14,177	4.54	0.41	26.8	14,439
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	4.16	3.76	4.32	33.4	0.09	0.06	8.55	8.61	0.06	2.17	2.23	—	8,880	8,880	0.41	0.41	0.66	9,014
Area	0.22	5.30	1.84	0.78	0.01	0.15	—	0.15	0.15	—	0.15	0.00	2,337	2,337	0.04	< 0.005	—	2,340
Energy	0.13	0.06	1.10	0.47	0.01	0.09	—	0.09	0.09	—	0.09	—	2,044	2,044	0.16	0.01	—	2,050
Water	—	—	—	—	—	—	—	—	—	—	—	8.36	7.45	15.8	0.03	0.02	—	22.0
Waste	—	—	—	—	—	—	—	—	—	—	—	39.4	0.00	39.4	3.94	0.00	—	138
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.55	1.55
Total	4.51	9.12	7.26	34.6	0.11	0.30	8.55	8.85	0.30	2.17	2.47	47.8	13,269	13,316	4.58	0.44	2.21	13,565
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	4.16	3.76	4.04	33.2	0.09	0.06	8.35	8.41	0.06	2.12	2.18	—	9,052	9,052	0.39	0.39	10.9	9,190
Area	0.44	5.59	0.45	4.50	< 0.005	0.04	—	0.04	0.03	—	0.03	0.00	537	537	0.01	< 0.005	—	537
Energy	0.13	0.06	1.10	0.47	0.01	0.09	—	0.09	0.09	—	0.09	—	2,044	2,044	0.16	0.01	—	2,050
Water	—	—	—	—	—	—	—	—	—	—	—	8.36	7.45	15.8	0.03	0.02	—	22.0
Waste	—	—	—	—	—	—	—	—	—	—	—	39.4	0.00	39.4	3.94	0.00	—	138
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.55	1.55
Total	4.73	9.42	5.59	38.2	0.10	0.19	8.35	8.53	0.18	2.12	2.30	47.8	11,640	11,688	4.53	0.42	12.5	11,939
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mobile	0.76	0.69	0.74	6.06	0.02	0.01	1.52	1.53	0.01	0.39	0.40	—	1,499	1,499	0.06	0.07	1.81	1,522
Area	0.08	1.02	0.08	0.82	< 0.005	0.01	—	0.01	0.01	—	0.01	0.00	88.8	88.8	< 0.005	< 0.005	—	88.9
Energy	0.02	0.01	0.20	0.09	< 0.005	0.02	—	0.02	0.02	—	0.02	—	338	338	0.03	< 0.005	—	339
Water	—	—	—	—	—	—	—	—	—	—	—	1.38	1.23	2.62	< 0.005	< 0.005	—	3.64
Waste	—	—	—	—	—	—	—	—	—	—	—	6.53	0.00	6.53	0.65	0.00	—	22.8
Refrig.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.26	0.26
Total	0.86	1.72	1.02	6.96	0.02	0.03	1.52	1.56	0.03	0.39	0.42	7.91	1,927	1,935	0.75	0.07	2.06	1,977

3. Construction Emissions Details

3.1. Site Preparation (2025) - Unmitigated

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

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	3.94	3.31	31.6	30.2	0.05	1.37	—	1.37	1.26	—	1.26	—	5,295	5,295	0.21	0.04	—	5,314
Dust From Material Movement	—	—	—	—	—	—	19.7	19.7	—	10.1	10.1	—	—	—	—	—	—	—
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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	3.94	3.31	31.6	30.2	0.05	1.37	—	1.37	1.26	—	1.26	—	5,295	5,295	0.21	0.04	—	5,314
Dust From Material Movement	—	—	—	—	—	—	19.7	19.7	—	10.1	10.1	—	—	—	—	—	—	—
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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.89	1.59	15.2	14.5	0.02	0.65	—	0.65	0.60	—	0.60	—	2,539	2,539	0.10	0.02	—	2,548

Dust From Material Movement	—	—	—	—	—	—	9.42	9.42	—	4.84	4.84	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.34	0.29	2.77	2.64	< 0.005	0.12	—	0.12	0.11	—	0.11	—	420	420	0.02	< 0.005	—	422
Dust From Material Movement	—	—	—	—	—	—	1.72	1.72	—	0.88	0.88	—	—	—	—	—	—	—
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	0.08	0.07	0.05	1.05	0.00	0.00	0.18	0.18	0.00	0.04	0.04	—	199	199	< 0.005	0.01	0.76	202
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.07	0.07	0.06	0.78	0.00	0.00	0.18	0.18	0.00	0.04	0.04	—	176	176	< 0.005	0.01	0.02	179
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	0.04	0.03	0.03	0.38	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	86.8	86.8	< 0.005	< 0.005	0.16	88.0
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

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.07	0.00	0.00	0.02	0.02	0.00	< 0.005	< 0.005	—	14.4	14.4	< 0.005	< 0.005	0.03	14.6
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

3.3. Site Preparation (2026) - Unmitigated

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

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	3.74	3.14	29.2	28.8	0.05	1.24	—	1.24	1.14	—	1.14	—	5,298	5,298	0.21	0.04	—	5,316
Dust From Material Movement	—	—	—	—	—	—	19.7	19.7	—	10.1	10.1	—	—	—	—	—	—	—
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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.26	0.22	2.00	1.97	< 0.005	0.09	—	0.09	0.08	—	0.08	—	363	363	0.01	< 0.005	—	364
Dust From Material Movement	—	—	—	—	—	—	1.35	1.35	—	0.69	0.69	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.05	0.04	0.36	0.36	< 0.005	0.02	—	0.02	0.01	—	0.01	—	60.1	60.1	< 0.005	< 0.005	—	60.3
Dust From Material Movement	—	—	—	—	—	—	0.25	0.25	—	0.13	0.13	—	—	—	—	—	—	—
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	0.07	0.06	0.06	0.73	0.00	0.00	0.18	0.18	0.00	0.04	0.04	—	173	173	< 0.005	0.01	0.02	175
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	0.05	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	12.2	12.2	< 0.005	< 0.005	0.02	12.3
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	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	2.01	2.01	< 0.005	< 0.005	< 0.005	2.04
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

3.5. Grading (2026) - Unmitigated

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

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	3.62	3.04	27.2	27.6	0.06	1.12	—	1.12	1.03	—	1.03	—	6,599	6,599	0.27	0.05	—	6,621
Dust From Material Movement	—	—	—	—	—	—	9.20	9.20	—	3.65	3.65	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	3.62	3.04	27.2	27.6	0.06	1.12	—	1.12	1.03	—	1.03	—	6,599	6,599	0.27	0.05	—	6,621
Dust From Material Movement	—	—	—	—	—	—	9.20	9.20	—	3.65	3.65	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.40	0.33	2.98	3.02	0.01	0.12	—	0.12	0.11	—	0.11	—	723	723	0.03	0.01	—	726
Dust From Material Movement	—	—	—	—	—	—	1.01	1.01	—	0.40	0.40	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Off-Road Equipment	0.07	0.06	0.54	0.55	< 0.005	0.02	—	0.02	0.02	—	0.02	—	120	120	< 0.005	< 0.005	—	120
Dust From Material Movement	—	—	—	—	—	—	0.18	0.18	—	0.07	0.07	—	—	—	—	—	—	—
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	0.09	0.08	0.05	1.13	0.00	0.00	0.20	0.20	0.00	0.05	0.05	—	223	223	< 0.005	0.01	0.80	226
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	0.07	0.07	0.07	0.83	0.00	0.00	0.20	0.20	0.00	0.05	0.05	—	198	198	< 0.005	0.01	0.02	200
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	0.09	0.00	0.00	0.02	0.02	0.00	0.01	0.01	—	22.2	22.2	< 0.005	< 0.005	0.04	22.5
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	0.02	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	3.68	3.68	< 0.005	< 0.005	0.01	3.73
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. Building Construction (2026) - Unmitigated

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

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.28	1.07	9.85	13.0	0.02	0.38	—	0.38	0.35	—	0.35	—	2,397	2,397	0.10	0.02	—	2,405
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.28	1.07	9.85	13.0	0.02	0.38	—	0.38	0.35	—	0.35	—	2,397	2,397	0.10	0.02	—	2,405
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.65	0.54	5.01	6.60	0.01	0.19	—	0.19	0.18	—	0.18	—	1,220	1,220	0.05	0.01	—	1,224
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.12	0.10	0.92	1.20	< 0.005	0.04	—	0.04	0.03	—	0.03	—	202	202	0.01	< 0.005	—	203
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	0.18	0.16	0.10	2.25	0.00	0.00	0.40	0.40	0.00	0.09	0.09	—	445	445	0.01	0.02	1.59	451
Vendor	0.04	0.01	0.58	0.22	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.03	—	336	336	0.02	0.05	0.81	353
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	0.15	0.15	0.13	1.66	0.00	0.00	0.40	0.40	0.00	0.09	0.09	—	395	395	0.01	0.02	0.04	400
Vendor	0.03	0.01	0.62	0.23	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.03	—	336	336	0.02	0.05	0.02	352
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	0.08	0.07	0.06	0.86	0.00	0.00	0.20	0.20	0.00	0.05	0.05	—	206	206	< 0.005	0.01	0.35	209
Vendor	0.02	0.01	0.31	0.11	< 0.005	< 0.005	0.04	0.05	< 0.005	0.01	0.01	—	171	171	0.01	0.03	0.18	179
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.01	0.01	0.01	0.16	0.00	0.00	0.04	0.04	0.00	0.01	0.01	—	34.1	34.1	< 0.005	< 0.005	0.06	34.6
Vendor	< 0.005	< 0.005	0.06	0.02	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	28.3	28.3	< 0.005	< 0.005	0.03	29.7
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

3.9. Building Construction (2027) - Unmitigated

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

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

Off-Road Equipment	1.23	1.03	9.39	12.9	0.02	0.34	—	0.34	0.31	—	0.31	—	2,397	2,397	0.10	0.02	—	2,405
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.23	1.03	9.39	12.9	0.02	0.34	—	0.34	0.31	—	0.31	—	2,397	2,397	0.10	0.02	—	2,405
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.88	0.74	6.71	9.24	0.02	0.24	—	0.24	0.22	—	0.22	—	1,712	1,712	0.07	0.01	—	1,718
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.16	0.13	1.22	1.69	< 0.005	0.04	—	0.04	0.04	—	0.04	—	283	283	0.01	< 0.005	—	284
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	0.16	0.15	0.10	2.12	0.00	0.00	0.40	0.40	0.00	0.09	0.09	—	437	437	0.01	0.02	1.44	443
Vendor	0.04	0.01	0.55	0.21	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.03	—	329	329	0.02	0.05	0.73	344
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	0.14	0.13	0.13	1.55	0.00	0.00	0.40	0.40	0.00	0.09	0.09	—	388	388	0.01	0.02	0.04	393

Vendor	0.03	0.01	0.58	0.22	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.03	—	329	329	0.02	0.05	0.02	343
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	0.10	0.09	0.08	1.14	0.00	0.00	0.28	0.28	0.00	0.07	0.07	—	284	284	0.01	0.01	0.45	288
Vendor	0.02	0.01	0.41	0.15	< 0.005	< 0.005	0.06	0.07	< 0.005	0.02	0.02	—	235	235	0.01	0.03	0.22	246
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.02	0.21	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	47.1	47.1	< 0.005	< 0.005	0.07	47.7
Vendor	< 0.005	< 0.005	0.07	0.03	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	38.9	38.9	< 0.005	0.01	0.04	40.7
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

3.11. Building Construction (2028) - Unmitigated

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

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.18	0.99	8.92	12.9	0.02	0.30	—	0.30	0.28	—	0.28	—	2,397	2,397	0.10	0.02	—	2,406
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.18	0.99	8.92	12.9	0.02	0.30	—	0.30	0.28	—	0.28	—	2,397	2,397	0.10	0.02	—	2,406
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.85	0.71	6.39	9.26	0.02	0.22	—	0.22	0.20	—	0.20	—	1,717	1,717	0.07	0.01	—	1,723
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.15	0.13	1.17	1.69	< 0.005	0.04	—	0.04	0.04	—	0.04	—	284	284	0.01	< 0.005	—	285
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	0.15	0.14	0.09	1.99	0.00	0.00	0.40	0.40	0.00	0.09	0.09	—	428	428	0.01	< 0.005	1.30	430
Vendor	0.03	0.01	0.51	0.21	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.03	—	320	320	0.02	0.05	0.65	335
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	0.14	0.12	0.12	1.47	0.00	0.00	0.40	0.40	0.00	0.09	0.09	—	380	380	0.01	0.02	0.03	385
Vendor	0.03	0.01	0.55	0.21	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.03	—	320	320	0.02	0.05	0.02	335
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	0.10	0.09	0.07	1.07	0.00	0.00	0.28	0.28	0.00	0.07	0.07	—	279	279	0.01	0.01	0.40	283
Vendor	0.02	0.01	0.38	0.15	< 0.005	< 0.005	0.06	0.07	< 0.005	0.02	0.02	—	229	229	0.01	0.03	0.20	240
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.01	0.20	0.00	0.00	0.05	0.05	0.00	0.01	0.01	—	46.2	46.2	< 0.005	< 0.005	0.07	46.9

Vendor	< 0.005	< 0.005	0.07	0.03	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	< 0.005	—	37.9	37.9	< 0.005	0.01	0.03	39.7
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

3.13. Building Construction (2029) - Unmitigated

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

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	1.15	0.97	8.58	12.9	0.02	0.28	—	0.28	0.25	—	0.25	—	2,397	2,397	0.10	0.02	—	2,405
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.04	0.03	0.29	0.43	< 0.005	0.01	—	0.01	0.01	—	0.01	—	79.7	79.7	< 0.005	< 0.005	—	80.0
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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.05	0.08	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	13.2	13.2	< 0.005	< 0.005	—	13.2
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	0.13	0.12	0.10	1.38	0.00	0.00	0.40	0.40	0.00	0.09	0.09	—	373	373	0.01	0.02	0.03	378
Vendor	0.03	0.01	0.51	0.20	< 0.005	< 0.005	0.09	0.09	< 0.005	0.02	0.03	—	310	310	0.02	0.05	0.01	325
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	—	12.7	12.7	< 0.005	< 0.005	0.02	12.9
Vendor	< 0.005	< 0.005	0.02	0.01	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	10.3	10.3	< 0.005	< 0.005	0.01	10.8
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	0.01	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	2.11	2.11	< 0.005	< 0.005	< 0.005	2.14
Vendor	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	—	1.71	1.71	< 0.005	< 0.005	< 0.005	1.79
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. Paving (2026) - Unmitigated

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

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.91	0.76	7.12	9.94	0.01	0.32	—	0.32	0.29	—	0.29	—	1,511	1,511	0.06	0.01	—	1,516
Paving	—	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

Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.02	0.20	0.27	< 0.005	0.01	—	0.01	0.01	—	0.01	—	41.4	41.4	< 0.005	< 0.005	—	41.5
Paving	—	< 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 Equipment	< 0.005	< 0.005	0.04	0.05	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	6.85	6.85	< 0.005	< 0.005	—	6.88
Paving	—	< 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	0.07	0.06	0.04	0.85	0.00	0.00	0.15	0.15	0.00	0.04	0.04	—	167	167	< 0.005	0.01	0.60	169
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)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.02	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	4.17	4.17	< 0.005	< 0.005	0.01	4.23
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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	< 0.005	< 0.005	< 0.005	< 0.005	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	0.69	0.69	< 0.005	< 0.005	< 0.005	0.70
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

3.17. Architectural Coating (2026) - Unmitigated

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

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.15	0.12	0.86	1.13	< 0.005	0.02	—	0.02	0.02	—	0.02	—	134	134	0.01	< 0.005	—	134
Architectural Coatings	—	2.82	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.15	0.12	0.86	1.13	< 0.005	0.02	—	0.02	0.02	—	0.02	—	134	134	0.01	< 0.005	—	134
Architectural Coatings	—	2.82	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.07	0.06	0.41	0.55	< 0.005	0.01	—	0.01	0.01	—	0.01	—	64.3	64.3	< 0.005	< 0.005	—	64.5

Architect Coatings	—	1.36	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.08	0.10	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	10.6	10.6	< 0.005	< 0.005	—	10.7
Architectural Coatings	—	0.25	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
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	0.04	0.03	0.02	0.45	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	88.9	88.9	< 0.005	< 0.005	0.32	90.2
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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.03	0.03	0.33	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	79.0	79.0	< 0.005	< 0.005	0.01	80.0
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	0.01	0.01	0.01	0.16	0.00	0.00	0.04	0.04	0.00	0.01	0.01	—	39.0	39.0	< 0.005	< 0.005	0.07	39.6
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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.03	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	6.46	6.46	< 0.005	< 0.005	0.01	6.55

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

3.19. Architectural Coating (2027) - Unmitigated

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

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.14	0.11	0.83	1.13	< 0.005	0.02	—	0.02	0.02	—	0.02	—	134	134	0.01	< 0.005	—	134
Architectural Coatings	—	2.82	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.14	0.11	0.83	1.13	< 0.005	0.02	—	0.02	0.02	—	0.02	—	134	134	0.01	< 0.005	—	134
Architectural Coatings	—	2.82	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.10	0.08	0.59	0.80	< 0.005	0.01	—	0.01	0.01	—	0.01	—	95.4	95.4	< 0.005	< 0.005	—	95.7

Architectural Coatings	—	2.02	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.01	0.11	0.15	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	15.8	15.8	< 0.005	< 0.005	—	15.8
Architectural Coatings	—	0.37	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
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	0.42	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	87.4	87.4	< 0.005	< 0.005	0.29	88.6
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	0.03	0.03	0.03	0.31	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	77.6	77.6	< 0.005	< 0.005	0.01	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
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.02	0.02	0.02	0.23	0.00	0.00	0.06	0.06	0.00	0.01	0.01	—	56.9	56.9	< 0.005	< 0.005	0.09	57.6
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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Worker	< 0.005	< 0.005	< 0.005	0.04	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	9.42	9.42	< 0.005	< 0.005	0.01	9.54
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. Architectural Coating (2028) - Unmitigated

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

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.13	0.11	0.81	1.12	< 0.005	0.02	—	0.02	0.01	—	0.01	—	134	134	0.01	< 0.005	—	134
Architectural Coatings	—	2.82	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.13	0.11	0.81	1.12	< 0.005	0.02	—	0.02	0.01	—	0.01	—	134	134	0.01	< 0.005	—	134
Architectural Coatings	—	2.82	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.09	0.08	0.58	0.80	< 0.005	0.01	—	0.01	0.01	—	0.01	—	95.6	95.6	< 0.005	< 0.005	—	96.0

Architect Coatings	—	2.02	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.02	0.01	0.11	0.15	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	15.8	15.8	< 0.005	< 0.005	—	15.9
Architect ural Coatings	—	0.37	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
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	0.40	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	85.6	85.6	< 0.005	< 0.005	0.26	86.0
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
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	0.03	0.02	0.02	0.29	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	76.0	76.0	< 0.005	< 0.005	0.01	77.0
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	0.01	0.21	0.00	0.00	0.06	0.06	0.00	0.01	0.01	—	55.9	55.9	< 0.005	< 0.005	0.08	56.6
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
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Worker	< 0.005	< 0.005	< 0.005	0.04	0.00	0.00	0.01	0.01	0.00	< 0.005	< 0.005	—	9.25	9.25	< 0.005	< 0.005	0.01	9.37

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. Architectural Coating (2029) - Unmitigated

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

Location	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Onsite	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.12	0.10	0.79	1.11	< 0.005	0.01	—	0.01	0.01	—	0.01	—	134	134	0.01	< 0.005	—	134
Architectural Coatings	—	2.82	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Average Daily	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	0.01	0.01	0.05	0.07	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	8.10	8.10	< 0.005	< 0.005	—	8.13
Architectural Coatings	—	0.17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Onsite truck	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Off-Road Equipment	< 0.005	< 0.005	0.01	0.01	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.34	1.34	< 0.005	< 0.005	—	1.35

Architect Coatings	—	0.03	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
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	0.03	0.02	0.02	0.28	0.00	0.00	0.08	0.08	0.00	0.02	0.02	—	74.7	74.7	< 0.005	< 0.005	0.01	75.7
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	0.02	0.00	0.00	< 0.005	< 0.005	0.00	< 0.005	< 0.005	—	4.65	4.65	< 0.005	< 0.005	0.01	4.71
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	—	0.77	0.77	< 0.005	< 0.005	< 0.005	0.78
Vendor	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Hauling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00

4. Operations Emissions Details

4.1. Mobile Emissions by Land Use

4.1.1. Unmitigated

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)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	4.55	4.16	3.67	40.2	0.10	0.06	8.55	8.61	0.06	2.17	2.23	—	9,724	9,724	0.37	0.38	25.3	9,871
Other Asphalt Surfaces	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	4.55	4.16	3.67	40.2	0.10	0.06	8.55	8.61	0.06	2.17	2.23	—	9,724	9,724	0.37	0.38	25.3	9,871
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	4.16	3.76	4.32	33.4	0.09	0.06	8.55	8.61	0.06	2.17	2.23	—	8,880	8,880	0.41	0.41	0.66	9,014
Other Asphalt Surfaces	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	4.16	3.76	4.32	33.4	0.09	0.06	8.55	8.61	0.06	2.17	2.23	—	8,880	8,880	0.41	0.41	0.66	9,014
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	0.76	0.69	0.74	6.06	0.02	0.01	1.52	1.53	0.01	0.39	0.40	—	1,499	1,499	0.06	0.07	1.81	1,522
Other Asphalt Surfaces	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.76	0.69	0.74	6.06	0.02	0.01	1.52	1.53	0.01	0.39	0.40	—	1,499	1,499	0.06	0.07	1.81	1,522

4.2. Energy

4.2.1. Electricity Emissions By Land Use - Unmitigated

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

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	—	—	—	—	—	—	—	—	—	—	—	—	645	645	0.03	< 0.005	—	647
Other Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	645	645	0.03	< 0.005	—	647
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	—	—	—	—	—	—	—	—	—	—	—	—	645	645	0.03	< 0.005	—	647
Other Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	645	645	0.03	< 0.005	—	647
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	—	—	—	—	—	—	—	—	—	—	—	—	107	107	0.01	< 0.005	—	107
Other Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	—	107	107	0.01	< 0.005	—	107

4.2.3. Natural Gas Emissions By Land Use - Unmitigated

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

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	0.13	0.06	1.10	0.47	0.01	0.09	—	0.09	0.09	—	0.09	—	1,399	1,399	0.12	< 0.005	—	1,403
Other Asphalt Surfaces	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.13	0.06	1.10	0.47	0.01	0.09	—	0.09	0.09	—	0.09	—	1,399	1,399	0.12	< 0.005	—	1,403
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	0.13	0.06	1.10	0.47	0.01	0.09	—	0.09	0.09	—	0.09	—	1,399	1,399	0.12	< 0.005	—	1,403
Other Asphalt Surfaces	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.13	0.06	1.10	0.47	0.01	0.09	—	0.09	0.09	—	0.09	—	1,399	1,399	0.12	< 0.005	—	1,403
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	0.02	0.01	0.20	0.09	< 0.005	0.02	—	0.02	0.02	—	0.02	—	232	232	0.02	< 0.005	—	232
Other Asphalt Surfaces	0.00	0.00	0.00	0.00	0.00	0.00	—	0.00	0.00	—	0.00	—	0.00	0.00	0.00	0.00	—	0.00
Total	0.02	0.01	0.20	0.09	< 0.005	0.02	—	0.02	0.02	—	0.02	—	232	232	0.02	< 0.005	—	232

4.3. Area Emissions by Source

4.3.1. Unmitigated

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

Source	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Hearths	0.22	0.11	1.84	0.78	0.01	0.15	—	0.15	0.15	—	0.15	0.00	2,337	2,337	0.04	< 0.005	—	2,340
Consumer Products	—	4.63	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	—	0.56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.58	0.55	0.06	6.31	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	16.8	16.8	< 0.005	< 0.005	—	16.9
Total	0.79	5.84	1.90	7.10	0.01	0.15	—	0.15	0.15	—	0.15	0.00	2,354	2,354	0.04	< 0.005	—	2,357
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Hearths	0.22	0.11	1.84	0.78	0.01	0.15	—	0.15	0.15	—	0.15	0.00	2,337	2,337	0.04	< 0.005	—	2,340
Consumer Products	—	4.63	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Architectural Coatings	—	0.56	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	0.22	5.30	1.84	0.78	0.01	0.15	—	0.15	0.15	—	0.15	0.00	2,337	2,337	0.04	< 0.005	—	2,340
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Hearths	0.01	< 0.005	0.08	0.03	< 0.005	0.01	—	0.01	0.01	—	0.01	0.00	86.9	86.9	< 0.005	< 0.005	—	87.0
Consumer Products	—	0.85	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Architectural	—	0.10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Landscape Equipment	0.07	0.07	0.01	0.79	< 0.005	< 0.005	—	< 0.005	< 0.005	—	< 0.005	—	1.91	1.91	< 0.005	< 0.005	—	1.92
Total	0.08	1.02	0.08	0.82	< 0.005	0.01	—	0.01	0.01	—	0.01	0.00	88.8	88.8	< 0.005	< 0.005	—	88.9

4.4. Water Emissions by Land Use

4.4.1. Unmitigated

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

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	—	—	—	—	—	—	—	—	—	—	—	8.36	7.45	15.8	0.03	0.02	—	22.0
Other Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	8.36	7.45	15.8	0.03	0.02	—	22.0
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	—	—	—	—	—	—	—	—	—	—	—	8.36	7.45	15.8	0.03	0.02	—	22.0
Other Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	8.36	7.45	15.8	0.03	0.02	—	22.0

Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	—	—	—	—	—	—	—	—	—	—	—	1.38	1.23	2.62	< 0.005	< 0.005	—	3.64
Other Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	1.38	1.23	2.62	< 0.005	< 0.005	—	3.64

4.5. Waste Emissions by Land Use

4.5.1. Unmitigated

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

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	—	—	—	—	—	—	—	—	—	—	—	39.4	0.00	39.4	3.94	0.00	—	138
Other Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	39.4	0.00	39.4	3.94	0.00	—	138
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	—	—	—	—	—	—	—	—	—	—	—	39.4	0.00	39.4	3.94	0.00	—	138
Other Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00

Total	—	—	—	—	—	—	—	—	—	—	—	39.4	0.00	39.4	3.94	0.00	—	138
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	—	—	—	—	—	—	—	—	—	—	—	6.53	0.00	6.53	0.65	0.00	—	22.8
Other Asphalt Surfaces	—	—	—	—	—	—	—	—	—	—	—	0.00	0.00	0.00	0.00	0.00	—	0.00
Total	—	—	—	—	—	—	—	—	—	—	—	6.53	0.00	6.53	0.65	0.00	—	22.8

4.6. Refrigerant Emissions by Land Use

4.6.1. Unmitigated

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

Land Use	TOG	ROG	NOx	CO	SO2	PM10E	PM10D	PM10T	PM2.5E	PM2.5D	PM2.5T	BCO2	NBCO2	CO2T	CH4	N2O	R	CO2e
Daily, Summer (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.55	1.55
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.55	1.55
Daily, Winter (Max)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Single Family Housing	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.55	1.55
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.55	1.55
Annual	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

Single Family Housing	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.26	0.26
Total	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.26	0.26

4.7. Offroad Emissions By Equipment Type

4.7.1. Unmitigated

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

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

4.8. Stationary Emissions By Equipment Type

4.8.1. Unmitigated

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

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

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

4.9. User Defined Emissions By Equipment Type

4.9.1. Unmitigated

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

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

4.10. Soil Carbon Accumulation By Vegetation Type

4.10.1. Soil Carbon Accumulation By Vegetation Type - Unmitigated

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

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

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

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

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

4.10.3. Avoided and Sequestered Emissions by Species - Unmitigated

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

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

Sequest	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Removed	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Subtotal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

5. Activity Data

5.1. Construction Schedule

Phase Name	Phase Type	Start Date	End Date	Days Per Week	Work Days per Phase	Phase Description
Site Preparation	Site Preparation	5/1/2025	2/4/2026	5.00	200	—
Grading	Grading	2/5/2026	4/1/2026	5.00	40.0	—
Building Construction	Building Construction	4/16/2026	1/17/2029	5.00	720	—
Paving	Paving	4/2/2026	4/15/2026	5.00	10.0	—
Architectural Coating	Architectural Coating	4/30/2026	1/31/2029	5.00	720	—

5.2. Off-Road Equipment

5.2.1. Unmitigated

Phase Name	Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor
Site Preparation	Rubber Tired Dozers	Diesel	Average	3.00	8.00	367	0.40
Site Preparation	Tractors/Loaders/Backhoes	Diesel	Average	4.00	8.00	84.0	0.37
Grading	Excavators	Diesel	Average	2.00	8.00	36.0	0.38
Grading	Graders	Diesel	Average	1.00	8.00	148	0.41
Grading	Rubber Tired Dozers	Diesel	Average	1.00	8.00	367	0.40

Grading	Scrapers	Diesel	Average	2.00	8.00	423	0.48
Grading	Tractors/Loaders/Backhoes	Diesel	Average	2.00	8.00	84.0	0.37
Building Construction	Cranes	Diesel	Average	1.00	7.00	367	0.29
Building Construction	Forklifts	Diesel	Average	3.00	8.00	82.0	0.20
Building Construction	Generator Sets	Diesel	Average	1.00	8.00	14.0	0.74
Building Construction	Tractors/Loaders/Backhoes	Diesel	Average	3.00	7.00	84.0	0.37
Building Construction	Welders	Diesel	Average	1.00	8.00	46.0	0.45
Paving	Pavers	Diesel	Average	2.00	8.00	81.0	0.42
Paving	Paving Equipment	Diesel	Average	2.00	8.00	89.0	0.36
Paving	Rollers	Diesel	Average	2.00	8.00	36.0	0.38
Architectural Coating	Air Compressors	Diesel	Average	1.00	6.00	37.0	0.48

5.3. Construction Vehicles

5.3.1. Unmitigated

Phase Name	Trip Type	One-Way Trips per Day	Miles per Trip	Vehicle Mix
Site Preparation	—	—	—	—
Site Preparation	Worker	17.5	14.3	LDA,LDT1,LDT2
Site Preparation	Vendor	—	8.80	HHDT,MHDT
Site Preparation	Hauling	0.00	20.0	HHDT
Site Preparation	Onsite truck	—	—	HHDT
Grading	—	—	—	—
Grading	Worker	20.0	14.3	LDA,LDT1,LDT2
Grading	Vendor	—	8.80	HHDT,MHDT
Grading	Hauling	0.00	20.0	HHDT
Grading	Onsite truck	—	—	HHDT

Building Construction	—	—	—	—
Building Construction	Worker	40.0	14.3	LDA,LDT1,LDT2
Building Construction	Vendor	11.9	8.80	HHDT,MHDT
Building Construction	Hauling	0.00	20.0	HHDT
Building Construction	Onsite truck	—	—	HHDT
Paving	—	—	—	—
Paving	Worker	15.0	14.3	LDA,LDT1,LDT2
Paving	Vendor	—	8.80	HHDT,MHDT
Paving	Hauling	0.00	20.0	HHDT
Paving	Onsite truck	—	—	HHDT
Architectural Coating	—	—	—	—
Architectural Coating	Worker	7.99	14.3	LDA,LDT1,LDT2
Architectural Coating	Vendor	—	8.80	HHDT,MHDT
Architectural Coating	Hauling	0.00	20.0	HHDT
Architectural Coating	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)
Architectural Coating	438,311	146,104	0.00	0.00	116

5.6. Dust Mitigation

5.6.1. Construction Earthmoving Activities

Phase Name	Material Imported (cy)	Material Exported (cy)	Acres Graded (acres)	Material Demolished (sq. ft.)	Acres Paved (acres)
Site Preparation	—	—	300	0.00	—
Grading	—	—	120	0.00	—
Paving	0.00	0.00	0.00	0.00	1.27

5.6.2. Construction Earthmoving Control Strategies

Non-applicable. No control strategies activated by user.

5.7. Construction Paving

Land Use	Area Paved (acres)	% Asphalt
Single Family Housing	1.22	0%
Other Asphalt Surfaces	0.04	100%

5.8. Construction Electricity Consumption and Emissions Factors

kWh per Year and Emission Factor (lb/MWh)

Year	kWh per Year	CO2	CH4	N2O
2025	0.00	375	0.01	< 0.005
2026	0.00	375	0.01	< 0.005
2027	0.00	375	0.01	< 0.005
2028	0.00	375	0.01	< 0.005
2029	0.00	375	0.01	< 0.005

5.9. Operational Mobile Sources

5.9.1. Unmitigated

Land Use Type	Trips/Weekday	Trips/Saturday	Trips/Sunday	Trips/Year	VMT/Weekday	VMT/Saturday	VMT/Sunday	VMT/Year

Single Family Housing	1,048	1,047	1,047	382,346	12,057	12,044	12,044	4,399,382
Other Asphalt Surfaces	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

5.10. Operational Area Sources

5.10.1. Hearths

5.10.1.1. Unmitigated

Hearth Type	Unmitigated (number)
Single Family Housing	—
Wood Fireplaces	0
Gas Fireplaces	111
Propane Fireplaces	0
Electric Fireplaces	0
No Fireplaces	0
Conventional Wood Stoves	0
Catalytic Wood Stoves	0
Non-Catalytic Wood Stoves	0
Pellet Wood Stoves	0

5.10.2. Architectural Coatings

Residential Interior Area Coated (sq ft)	Residential Exterior Area Coated (sq ft)	Non-Residential Interior Area Coated (sq ft)	Non-Residential Exterior Area Coated (sq ft)	Parking Area Coated (sq ft)
438311.25	146,104	0.00	0.00	116

5.10.3. Landscape Equipment

Season	Unit	Value
Snow Days	day/yr	0.00
Summer Days	day/yr	250

5.11. Operational Energy Consumption

5.11.1. Unmitigated

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

Land Use	Electricity (kWh/yr)	CO2	CH4	N2O	Natural Gas (kBTU/yr)
Single Family Housing	988,813	238	0.0129	0.0017	4,365,756
Other Asphalt Surfaces	0.00	238	0.0129	0.0017	0.00

5.12. Operational Water and Wastewater Consumption

5.12.1. Unmitigated

Land Use	Indoor Water (gal/year)	Outdoor Water (gal/year)
Single Family Housing	3,913,749	520,498
Other Asphalt Surfaces	0.00	0.00

5.13. Operational Waste Generation

5.13.1. Unmitigated

Land Use	Waste (ton/year)	Cogeneration (kWh/year)
Single Family Housing	73.1	—
Other Asphalt Surfaces	0.00	—

5.14. Operational Refrigeration and Air Conditioning Equipment

5.14.1. Unmitigated

Land Use Type	Equipment Type	Refrigerant	GWP	Quantity (kg)	Operations Leak Rate	Service Leak Rate	Times Serviced
Single Family Housing	Average room A/C & Other residential A/C and heat pumps	R-410A	2,088	< 0.005	2.50	2.50	10.0
Single Family Housing	Household refrigerators and/or freezers	R-134a	1,430	0.12	0.60	0.00	1.00

5.15. Operational Off-Road Equipment

5.15.1. Unmitigated

Equipment Type	Fuel Type	Engine Tier	Number per Day	Hours Per Day	Horsepower	Load Factor

5.16. Stationary Sources

5.16.1. Emergency Generators and Fire Pumps

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

5.16.2. Process Boilers

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

5.17. User Defined

Equipment Type	Fuel Type

5.18. Vegetation

5.18.1. Land Use Change

5.18.1.1. Unmitigated

Vegetation Land Use Type	Vegetation Soil Type	Initial Acres	Final Acres

5.18.1. Biomass Cover Type

5.18.1.1. Unmitigated

Biomass Cover Type	Initial Acres	Final Acres

5.18.2. Sequestration

5.18.2.1. Unmitigated

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

8. User Changes to Default Data

Screen	Justification
Land Use	Inputs updated to be consistent with the applicant information.
Construction: Construction Phases	Demolition is not required. Based on typical construction practices, architectural coating is assumed to start two weeks after the start of building construction and last for the same number of days.
Operations: Vehicle Data	Trip rates have been updated based on a project-specific Transportation Analysis.
Operations: Hearths	Fireplace information based on applicant-provided information.

APPENDIX B

SMAQMD MINOR PROJECT HEALTH EFFECTS TOOL

Minor Project Health Effects Tool

Latitude	38.42672259	**<-- Step 1: Input latitude (Please chose a value between 38.0 and 39.7)**
Longitude	-121.401155	**<-- Step 2: Input longitude (Please chose a value between -122.5 and -120.0)**

PM2.5 Health Endpoint	Age Range[1]	Incidences Across the Reduced Sacramento 4-km Modeling Domain Resulting from Project Emissions (per year)[2,5] (Mean)	Incidences Across the 5-Air-District Region Resulting from Project Emissions (per year)[2] (Mean)	Percent of Background Health Incidences Across the 5-Air-District Region[3]	Total Number of Health Incidences Across the 5-Air-District Region (per year)[4]
Respiratory					
Emergency Room Visits, Asthma	0 - 99	0.95	0.86	0.0047%	18419
Hospital Admissions, Asthma	0 - 64	0.062	0.057	0.0031%	1846
Hospital Admissions, All Respiratory	65 - 99	0.31	0.27	0.0014%	19644
Cardiovascular					
Hospital Admissions, All Cardiovascular (less Myocardial Infarctions)	65 - 99	0.17	0.15	0.00063%	24037
Acute Myocardial Infarction, Nonfatal	18 - 24	0.000079	0.000072	0.0019%	4
Acute Myocardial Infarction, Nonfatal	25 - 44	0.0070	0.0065	0.0021%	308
Acute Myocardial Infarction, Nonfatal	45 - 54	0.018	0.017	0.0022%	741
Acute Myocardial Infarction, Nonfatal	55 - 64	0.029	0.027	0.0022%	1239
Acute Myocardial Infarction, Nonfatal	65 - 99	0.11	0.097	0.0019%	5052
Mortality					
Mortality, All Cause	30 - 99	2.0	1.8	0.0040%	44766

Ozone Health Endpoint	Age Range[1]	Incidences Across the Reduced Sacramento 4-km Modeling Domain Resulting from Project Emissions (per year)[2,5] (Mean)	Incidences Across the 5-Air-District Region Resulting from Project Emissions (per year)[2] (Mean)	Percent of Background Health Incidences Across the 5-Air-District Region[3]	Total Number of Health Incidences Across the 5-Air-District Region (per year)[4]
Respiratory					
Hospital Admissions, All Respiratory	65 - 99	0.074	0.060	0.00030%	19644
Emergency Room Visits, Asthma	0 - 17	0.40	0.34	0.0058%	5859
Emergency Room Visits, Asthma	18 - 99	0.61	0.53	0.0042%	12560
Mortality					
Mortality, Non-Accidental	0 - 99	0.046	0.039	0.00013%	30386

1. Affected age ranges are shown. Other age ranges are available, but the endpoints and age ranges shown here are the ones used by the USEPA in their health assessments. The age ranges are consistent with the epidemiological study that is the basis of the health function.

2. Health effects are shown in terms of incidences of each health endpoint and how it compares to the base (2035 base year health effect incidences, or "background health incidence") values. Health effects are shown for the Reduced Sacramento 4-km Modeling Domain and the 5-Air-District Region.

3. The percent of background health incidence uses the mean incidence. The background health incidence is an estimate of the average number of people that are affected by the health endpoint in a given population over a given period of time. In this case, the background incidence rates cover the 5-Air-District Region (estimated 2035 population of 3,271,451 persons). Health incidence rates and other health data are typically collected by the government as well as the World Health Organization. The background incidence rates used here are obtained from BenMAP.

4. The total number of health incidences across the 5-Air-District Region is calculated based on the modeling data. The information is presented to assist in providing overall health context.

5. The technical specifications and map for the Reduced Sacramento 4-km Modeling Domain are included in Appendix A, Table A-1 and Appendix B, Figure B-2 of the *Guidance to Address the Friant Ranch Ruling for CEQA Projects in the Sac Metro Air District.*

Sac Metro Air District Minor Project Health Effects Tool, version 2, published June 2020

APPENDIX C

BIOLOGICAL RESOURCES ASSESSMENT

Dunisch Residential Project

Biological Resources Assessment

Prepared for:

Pappas Investments
Thad Johnson
2020 L Street, 5th Floor
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Prepared by:

HELIX Environmental Planning, Inc.
1677 Eureka Road, Suite 100
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October 2023 | 00949.00010.001

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LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

BRA	Biological Resources Assessment
CalTLC	California Tree and Landscape Consulting, Inc
CDFW	California Department of Fish and Wildlife
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CRPR	California Rare Plant Rank
CRZ	Critical Root Zone
CSA	California Special Animals
CWA	Clean Water Act
DBH	diameter at breast height
EIR	Environmental Impact Report
FESA	Federal Endangered Species Act
HCP	Habitat Conservation Plan
HELIX	HELIX Environmental Planning, Inc.
IPaC	Information for Planning and Consultation
MBTA	Migratory Bird Treaty Act
MSL	mean sea level
NAD	North American Datum
NCCP	Natural Community Conservation Plan
NEPA	National Environmental Policy Act
NPPA	Native Plant Protection Act
NRCS	Natural Resource Conservation Service
OHWM	ordinary high water mark
RWQCB	Regional Water Quality Control Board
SAA	Streambed Alteration Agreement
SEPA	Southeast Policy Area
SSC	Species of Special Concern
SWRCB	State Water Resources Control Board

ACRONYMS AND ABBREVIATIONS (cont.)

USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VPTS	Vernal Pool Tadpole Shrimp
WQC	Water Quality Certification

EXECUTIVE SUMMARY

HELIX Environmental Planning, Inc. (HELIX) prepared a Biological Resources Assessment (BRA) for the Dunisch Residential Project (Project), located immediately south of Dunisch Road and west of West Stockton Boulevard, in the City of Elk Grove, Sacramento County, California. The site is situated in Section 26 of Township 7 North and Range 5 East, Mount Diablo Meridian, and is depicted on the U.S. Geological Survey (USGS) *Florin, CA* 7.5-minute topographic quadrangle map. The approximate center of the Project is at latitude 38.4266680° and longitude -121.4016115°, North American Datum (NAD) 83.

The purpose of this BRA is to assess the general biological resources on the site, to assess the suitability of the site to support special-status species and sensitive vegetation communities or habitats (including wetlands or other aquatic resources), and to provide recommendations for any regulatory permitting or further analysis that may be required prior to development activities occurring on the site.

The 14.34-acre Study Area is mostly undeveloped and appears to be regularly disturbed from mowing; it seems to have been previously leveled/graded for the demolition of pre-existing structures. Land uses surrounding the Study Area include retail and residential development.

Known or potential biological constraints in the Study Area include:

- Potential habitat for special-status invertebrates, including vernal pool fairy shrimp;
- Potential summer breeding habitat for monarch butterfly;
- Potential nesting and foraging habitat for nesting migratory birds and raptors, including Swainson’s hawk, white-tailed kite, and Cooper’s hawk;
- Potential habitat for burrowing owl;
- Trees protected by the City of Elk Grove’s Tree Preservation and Protection Code; and
- Sensitive aquatic resources, including seasonal wetlands and a wetland ditch.

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1.0 INTRODUCTION

This report summarizes the findings of a Biological Resources Assessment (BRA) completed by HELIX Environmental Planning, Inc. (HELIX) for an approximately 14.34-acre property (Dunisch Residential Project [Project]), located immediately south of Dunisch Road and west of West Stockton Boulevard in the City of Elk Grove, Sacramento County, California (Study Area). This document addresses the on-site physical features, plant communities present, and the common plant and wildlife species occurring or potentially occurring in the Study Area. In addition, the suitability of habitats to support special-status species and sensitive habitats (including wetlands or other aquatic resources) are analyzed, and recommendations are provided for any regulatory permitting or further analysis required prior to development activities occurring on the site.

1.1 PROJECT LOCATION

The 14.34-acre Study Area is located immediately south of Dunisch Road and west of West Stockton Boulevard and Highway 99, in the City of Elk Grove, Sacramento County, California (Appendix A, Figures 1 and 2). The site is situated in Section 26 of Township 7 North and Range 5 East, Mount Diablo Meridian, and is depicted on the U.S. Geological Survey (USGS) *Florin, CA* 7.5-minute topographic quadrangle map. The approximate center of the Project is at latitude 38.4266680° and longitude -121.4016115°, NAD 83. An aerial image of the Study Area is included in Figure 3.

1.2 EXISTING CONDITIONS

The 14.34-acre Study Area is mostly undeveloped. The Study Area contains non-native annual grassland, seasonal wetlands, ruderal/disturbed areas, and developed land associated with paved roadways and sidewalks. Land uses surrounding the Study Area include retail and residential development.

1.3 PROJECT DESCRIPTION

The proposed Project includes the development of a single-family residential subdivision, drainage improvements, and associated infrastructure within the City of Elk Grove, Sacramento County, California. As currently proposed, the construction of the internal roads will include two access points to the residential subdivision via Dunisch Road.

2.0 REGULATORY FRAMEWORK

Federal, State, and local environmental laws, regulations, and policies relevant to the California Environmental Quality Act (CEQA) review process are summarized below. Applicable CEQA significance criteria are also addressed in this section.

2.1 FEDERAL REGULATIONS

2.1.1 Federal Endangered Species Act

The U.S. Fish and Wildlife Service (USFWS) enforces the provisions stipulated within the Federal Endangered Species Act of 1973 (FESA; 16 USC 1531 et seq.). Species identified as federally threatened or endangered (50 CFR 17.11, and 17.12) are protected from take, defined as direct or indirect harm, unless a Section 10 permit is granted to an entity other than a federal agency or a Biological Opinion with incidental take provisions is rendered to a federal lead agency via a Section 7 consultation. Pursuant to the requirements of FESA, an agency reviewing a proposed project within its jurisdiction must determine whether any federally-listed species may be present in the study area and determine whether the proposed project will jeopardize the continued existence of or result in the destruction or adverse modification of critical habitat of such species (16 USC 1536 (a)[3], [4]). Other federal agencies designate species of concern (species that have the potential to become listed), which are evaluated during an environmental review under the National Environmental Protection Act (NEPA) or CEQA, although they are not otherwise protected under FESA.

2.1.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) of 1918 established federal responsibilities for the protection of nearly all species of birds, their eggs, and nests. The Migratory Bird Treaty Reform Act of 2004 further defined species protected under the act and excluded all non-native species. Section 16 U.S.C. 703–712 of the Act states "unless and except as permitted by regulations, it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill" a migratory bird. A migratory bird is any species or family of birds that live, reproduce, or migrate within or across international borders at some point during their annual life cycle. Currently, there are 836 migratory birds protected nationwide by the Migratory Bird Treaty Act, of which 58 are legal to hunt. The U.S. Court of Appeals for the 9th Circuit (with jurisdiction over California) has ruled that the MBTA does not prohibit incidental take (952 F 2d 297 – Court of Appeals, 9th Circuit 1991).

2.2 STATE JURISDICTION

2.2.1 California Endangered Species Act

The California Endangered Species Act (CESA) (California Fish and Game Code Sections 2050 to 2097) is similar to the FESA. The California Fish and Wildlife Commission is responsible for maintaining lists of threatened and endangered species under CESA. CESA prohibits the take of listed and candidate (petitioned to be listed) species. "Take" under California law means to hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill (California Fish and Game Code, Section 86). The California Department of Fish and Wildlife (CDFW) can authorize take of a state-listed species under Section 2081 of the California Fish and Game Code if the take is incidental to an otherwise lawful activity, the impacts are minimized and fully mitigated, funding is ensured to implement and monitor mitigation measures, and CDFW determines that issuance would not jeopardize the continued existence of the species. A CESA permit must be obtained if a project will result in the "take" of listed species, either during construction or over the life of the project. For species listed under both FESA and CESA requiring a Biological Opinion under Section 7 of the FESA, CDFW may also authorize impacts to CESA species by issuing a Consistency Determination under Section 2080.1 of the Fish and Game Code.

2.2.2 California Code of Regulations Title 14 and California Fish and Game Code

The official listing of endangered and threatened animals and plants is contained in the California Code of Regulations Title 14 §670.5. A state candidate species is one that the California Fish and Game Code has formally noticed as being under review by CDFW to include in the state list pursuant to Sections 2074.2 and 2075.5 of the California Fish and Game Code.

Legal protection is also provided for wildlife species in California that are identified as “fully protected animals.” These species are protected under Sections 3511 (birds), 4700 (mammals), 5050 (reptiles and amphibians), and 5515 (fish) of the California Fish and Game Code. These statutes prohibit take or possession of fully protected species at any time. CDFW is unable to authorize incidental take of fully protected species unless any such take authorization is issued in conjunction with the approval of a Natural Community Conservation Plan that covers the fully protected species (California Fish and Game Code Section 2835).

2.2.3 California Environmental Quality Act

Under the California Environmental Quality Act of 1970 (Public Resources Code Section 21000 et seq.), lead agencies analyze whether projects would have a substantial adverse effect on a candidate, sensitive, or special-status species (Public Resources Code Section 21001(c)). These “special-status” species generally include those listed under FESA and CESA, and species that are not currently protected by statute or regulation, but would be considered rare, threatened, or endangered under the criteria included in CEQA Guidelines Section 15380. Therefore, species that are considered rare are addressed under CEQA regardless of whether they are afforded protection through any other statute or regulation. The California Native Plant Society (CNPS) inventories the native flora of California and ranks species according to rarity; plants ranked as 1A, 1B, 2A, 2B, and 3 are generally considered special-status species under CEQA.[1]

Although threatened and endangered species are protected by specific federal and state statutes, CEQA Guidelines Section 15380(d) provides that a species not listed on the federal or state list of protected species may be considered rare if it can be shown to meet certain specified criteria. These criteria have been modeled after the definition in FESA and the section of the California Fish and Game Code dealing with rare or endangered plants and animals. Section 15380(d) allows a public agency to undertake a review to determine if a significant effect on species that have not yet been listed by either the USFWS or CDFW (i.e., candidate species) would occur.

2.2.4 Native Plant Protection Act

The California Native Plant Protection Act of 1977 (California Fish and Game Code Sections 1900-1913) empowers the Fish and Game Commission to list native plant species, subspecies, or varieties as endangered or rare following a public hearing. To the extent that the location of such plants is known, CDFW must notify property owners that a listed plant is known to occur on their property. Where a property owner has been so notified by CDFW, the owner must notify CDFW at least 10 days in advance of any change in land use (other than changing from one agricultural use to another), in order that CDFW may salvage listed plants that would otherwise be destroyed. Currently, 64 taxa of native plants have been listed as rare under the act.

2.2.5 Nesting Birds

California Fish and Game Code Subsections 3503 and 3800 prohibit the possession, take, or needless destruction of birds, their nests, and eggs, and the salvage of dead nongame birds. California Fish and

[1] The California Rare Plant Rank system can be found at < http://www.cnps.org/cnps/rareplants/ranking.php>

Game Code Subsection 3503.5 protects all birds in the orders of Falconiformes and Strigiformes (birds of prey). Fish and Game Code Subsection 3513 states that it is unlawful to take or possess any migratory nongame bird as designated in the Migratory Bird Treaty Act or any part of such migratory nongame bird except as provided by rules and regulations adopted by the Secretary of the Interior under provisions of the Migratory Bird Treaty Act. The Attorney General of California has released an opinion that the Fish and Game Code prohibits incidental take.

2.3 JURISDICTIONAL WATERS

2.3.1 Federal Jurisdiction

On May 25, 2023, the United States Supreme Court issued a decision in the case of *Sackett v. Environmental Protection Agency* (Supreme Court of the United States, 2023) which will ultimately influence how federal waters are defined. The May 25, 2023, Supreme Court decision in *Sackett v. Environmental Protection Agency* determined that “the CWA extends to only those ‘wetlands with a continuous surface connection to bodies that are “waters of the United States” in their own right,’ so that they are ‘indistinguishable’ from those waters.*”* The United States Environmental Protection Agency and the United States Army Corps of Engineers after review issued a final rule to replace the 2023 rule that amends the "Revised Definition of “Waters of the United States” to conform key aspects of the regulatory text to the U.S. Supreme Court's May 25, 2023 decision in the case of *Sackett v. Environmental Protection Agency*.

Unless considered an exempt activity under Section 404(f) of the Federal Clean Water Act, any person, firm, or agency planning to alter or work in “waters of the U.S.,” including the discharge of dredged or fill material, must first obtain authorization from the USACE under Section 404 of the Clean Water Act (CWA; 33 USC 1344). Permits, licenses, variances, or similar authorization may also be required by other federal, state, and local statutes. Section 10 of the Rivers and Harbors Act prohibits the obstruction or alteration of navigable waters of the U.S. without a permit from USACE (33 USC 403). Activities exempted under Section 404(f) are not exempted within navigable waters under Section 10.

The Clean Water Act (33 United States Code (USC) 1251-1376) provides guidance for the restoration and maintenance of the chemical, physical, and biological integrity of the nation’s waters.

Section 401 requires that an applicant for a federal license or permit that allows activities resulting in a discharge to waters of the U.S. obtain a state certification that the discharge complies with other provisions of CWA. The Regional Water Quality Control Board (RWQCB) administers the certification program in California and may require State Water Quality Certification before other permits are issued.

Section 402 establishes a permitting system for the discharge of any pollutant (except dredged or fill material) into waters of the U.S.

Section 404 establishes a permit program administered by USACE that regulates the discharge of dredged or fill material into waters of the U.S. (including wetlands). Implementing regulations by USACE are found at 33 CFR Parts 320-332. The Section 404 (b)(1) Guidelines were developed by the USEPA in conjunction with USACE (40 CFR Part 230), allowing the discharge of dredged or fill material for non-water dependent uses into special aquatic sites only if there were no practicable alternative that would have less adverse impacts.

2.3.2 State Jurisdiction

Regional Water Quality Control Board

Any action requiring a CWA Section 404 permit, or a Rivers and Harbors Act Section 10 permit, must also obtain a CWA Section 401 Water Quality Certification. The State of California Water Quality Certification (WQC) Program was formally initiated by the State Water Resources Control Board (SWRCB) in 1990 under the requirements stipulated by Section 401 of the Federal Clean Water Act. Although the Clean Water Act is a Federal law, Section 401 of the CWA recognizes that states have the primary authority and responsibility for setting water quality standards. In California, under Section 401, the State and Regional Water Boards are the authorities that certify that issuance of a federal license or permit does not violate California's water quality standards (i.e., that they do not violate Porter-Cologne and the Water Code). The WQC Program currently issues the WQC for discharges requiring USACE permits for fill and dredge discharges within Waters of the United States, and now also implements the State's wetland protection and hydromodification regulation program under the Porter-Cologne Water Quality Control Act.

On May 28, 2020, the SWRCB implemented the State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State (Procedures) for inclusion in the forthcoming Water Quality Control Plan for Inland Surface Waters and Enclosed Bays and Estuaries and Ocean Waters of California (SWRCB 2019). The Procedures consist of four major elements:

I. A wetland definition;

II. A framework for determining if a feature that meets the wetland definition is a water of the state;

III. Wetland delineation procedures; and

IV. Procedures for the submittal, review, and approval of applications for Water Quality Certifications and Waste Discharge Requirements for dredge or fill activities.

Under the Procedures and the State Water Code (Water Code §13050(e)), "Waters of the State" are defined as "any surface water or groundwater, including saline waters, within the boundaries of the state." "Waters of the State" includes all "Waters of the U.S."

More specifically, a wetland is defined as: "*An area is wetland if, under normal circumstances, (1) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both; (2) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and (3) the area's vegetation is dominated by hydrophytes or the area lacks vegetation*." The wetland definition encompasses the full range of wetland types commonly recognized in California, including some features not protected under federal law, and reflects the current scientific understanding of the formation and functioning of wetlands (SWRCB 2019).

Unless excluded by the Procedures, any activity that could result in the discharge of dredged or fill material to Waters of the State, which includes Waters of the U.S. and non-federal Waters of the State, requires the filing of an application under the Procedures.

2.3.3 California Department of Fish and Wildlife

The CDFW is a trustee agency that has jurisdiction under Section 1600 et seq. of the California Fish and Game Code. Under Sections 1602 and 1603, a private party must notify CDFW if a proposed project will "substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank of streambeds…except when the department has been notified pursuant to Section 1601." Additionally, CDFW asserts jurisdiction over native riparian habitat adjacent to aquatic features, including native trees over four inches in diameter at breast height (DBH). If an existing fish or wildlife resource may be substantially adversely affected by the activity, CDFW may propose reasonable measures that will allow the protection of those resources. If these measures are agreeable to the parties involved, they may enter into an agreement with CDFW identifying the approved activities and associated mitigation measures. Generally, CDFW recommends submitting an application for a Streambed Alteration Agreement (SAA) for any work done within the lateral limit of water flow or the edge of riparian vegetation, whichever is greater.

2.4 CEQA SIGNIFICANCE

Section 15064.7 of the State CEQA Guidelines encourages local agencies to develop and publish the thresholds that the agency uses in determining the significance of environmental effects caused by projects under its review. However, agencies may also rely upon the guidance provided by the expanded Initial Study Checklist included in Appendix G of the State CEQA Guidelines. Appendix G provides examples of impacts that would normally be considered significant. Based on these examples, impacts to biological resources would normally be considered significant if the project would:

- Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS;

- Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the CDFW or USFWS;

- Have a substantial adverse effect on State or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;

- Interfere substantially with the movement of any native resident or migratory fish or wildlife species, or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;

- Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; and

- Conflict with the provisions of an adopted Habitat Conservation Plan (HCP), Natural Community Conservation Plan (NCCP), or other approved local, regional, or state habitat conservation plan.

An evaluation of whether or not an impact on biological resources would be substantial must consider both the resource itself and how that resource fits into a regional or local context. Substantial impacts would be those that would diminish or result in the loss of an important biological resource, or those that would obviously conflict with local, State, or federal resource conservation plans, goals, or regulations. Impacts are sometimes locally important but not significant according to CEQA. The reason for this is that although the impacts would result in an adverse alteration of existing conditions, they would not substantially diminish, or result in the permanent loss of, an important resource on a population-wide or region-wide basis.

2.4.1 California Native Plant Society

The CNPS maintains a rank of plant species native to California that have low population numbers, limited distribution, or are otherwise threatened with extinction. This information is published in the *Inventory of Rare and Endangered Vascular Plants of California*. Potential impacts to populations of CNPS-ranked plants receive consideration under CEQA review. The following identifies the definitions of the CNPS Rare Plant Ranking System:

Rank 1A: Plants presumed Extinct in California and either rare or extinct elsewhere

Rank 1B: Plants Rare, Threatened, or Endangered in California and elsewhere

Rank 2A: Plants presumed extirpated in California but common elsewhere

Rank 2B: Plants Rare, Threatened, or Endangered in California, but more common elsewhere

Rank 3: Plants about which we need more information – A Review List

Rank 4: Plants of limited distribution – A Watch List

All plants appearing on CNPS Rank 1 or 2 are considered to meet CEQA Guidelines Section 15380 criteria. While only some of the plants ranked 3 and 4 meet the definitions of threatened or endangered species, the CNPS recommends that all Rank 3 and Rank 4 plants be evaluated for consideration under CEQA. Furthermore, the CNPS Rare Plant Rankings include levels of threat for each species. These threat ranks include the following:

0.1 - Seriously threatened in California (over 80% of occurrences threatened/high degree and immediacy of threat);

0.2 - Moderately threatened in California (20-80% occurrences threatened/moderate degree and immediacy of threat); and

0.3 - Not very threatened in California (less than 20% of occurrences threatened/low degree and immediacy of threat or no current threats known).

Threat ranks do not designate a change of environmental protections, so that each species (i.e., CRPR 1B.1, CRPR 1B.2, CRPR 1B.3, etc.) be fully considered during the preparation of environmental documents under CEQA.

2.4.2 California Department of Fish and Wildlife Species of Concern

Additional fish, amphibian, reptile, bird, and mammal species may receive consideration by CDFW and lead agencies during the CEQA process, in addition to species that are formally listed under FESA and CESA or listed as fully protected. These species are included on the *Special Animals List*, which is maintained by CDFW. This list tracks species in California whose numbers, reproductive success, or habitat may be in decline. In addition to "Species of Special Concern" (SSC), the *Special Animals List* includes species that are tracked in the California Natural Diversity Database (CNDDB) but warrant no legal protection. These species are identified as “California Special Animals” (CSA).

2.5 LOCAL POLICIES AND REGULATIONS

2.5.1 City of Elk Grove Tree Preservation and Protection Code

Chapter 19.12 of the City Municipal Code, Tree Preservation and Protection, strives to protect and preserve trees of local importance, including coast live oak, valley oak, blue oak, interior live oak, oracle oak, California sycamore, and California black walnut with a single trunk 6 inches DBH or greater or multiple trunks with a combined DBH of 6 inches or greater. Chapter 19.12 requires mitigation for the removal of trees of local importance with the dimensions described above, trees that have been selected for preservation, all portions of adjacent off-site native trees that have driplines that extend onto a project site, and all off-site native trees that may be impacted by utility installation and/or improvements associated with a project. Current policies require that every inch lost will be mitigated by an inch planted or equivalent credit obtained from a tree mitigation bank (City of Elk Grove 2019).

2.5.2 City of Elk Grove Swainson’s Hawk Impact Mitigation Fees

Chapter 16.130 of the City Municipal Code, Swainson’s Hawk Impact Mitigation Fees, requires mitigation for the loss of Swainson’s hawk habitat at a 1:1 ratio. Mitigation can be achieved through the payment of a fee, which is used to fund the City’s Swainson’s hawk habitat restoration program. Other options for achieving mitigation through the code include the direct transfer to the City of a Swainson’s hawk habitat conservation easement along with an easement monitoring endowment or the purchase of credits at a CDFW-approved conservation bank. The site must be surveyed to determine whether it is suitable Swainson’s hawk foraging habitat. This chapter of the City’s Municipal Code is aimed at mitigating impacts from typical urban development projects (City of Elk Grove 2019).

2.5.3 City of Elk Grove General Plan

The *City of Elk Grove General Plan* (General Plan) includes goals, objectives, policies, and measures regarding biological resources within the City limits (City of Elk Grove 2019). Applicable sections of the General Plan for this BRA are summarized below.

Natural Resources

- GOAL NR-1: Protected natural open space lands that provide recreation and habitat for native species.
    - Policy NR-1-1: Facilitate access to and the use of open space areas located in and near Elk Grove.
    - Policy NR-1-2: Preserve and enhance natural areas that serve, or may potentially serve, as habitat for special-status species. Where preservation is not possible, require that appropriate mitigation be included in the project.

        - Standard NR-1.2a: Require a biological resources evaluation for private and public development projects in areas identified to contain or possibly contain special-status plant and animal species.

        - Standard NR-1.2b: Require development projects to retain movement corridor(s) adequate (both in size and in habitat quality) to allow for the continued wildlife use based on the species anticipated in the corridor.

    - Policy NR-1-3: Support the establishment of multipurpose open space areas to address a variety of needs, including but not limited to maintenance of agricultural uses, wildlife habitat, recreational open space, aesthetic benefits, and flood control. To the extent possible, lands protected in accordance with this policy should be in proximity to Elk Grove to facilitate the use of these areas by Elk Grove residents, assist in the mitigation of habitat loss within the City, and provide an open space resource close to the urbanized areas of Elk Grove.

    - Policy NR-1-4: Avoid impacts to wetlands, vernal pools, marshland, and riparian (streamside) areas unless shown to be technically infeasible. Ensure that no net loss of wetland areas occurs, which may be accomplished by avoidance, revegetation, restoration on-site or through the creation of riparian habitat corridors, or purchase of credits from a qualified mitigation bank.

3.0 METHODOLOGY

Biological studies conducted for the Study Area consisted of a special-status species evaluation that included a desktop review and database searches to identify known biological resources in the Study Area and vicinity, as well as a biological reconnaissance field survey, aquatic resources delineation, and special-status plant survey.

3.1 SPECIAL-STATUS SPECIES EVALUATION

For the purposes of this report, special-status species are those that fall into one or more of the following categories, including those:

- Listed as endangered or threatened under the FESA (including candidates and species proposed for listing);
- Listed as endangered or threatened under the CESA (including candidates and species proposed for listing);
- Designated as rare, protected, or fully protected pursuant to California Fish and Game Code;
- Designated as an SSC by the CDFW;
- Considered by CDFW to be a Watch List species with the potential to become an SSC;
- Defined as rare or endangered under Section 15380 of the CEQA; or

- Having a California Rare Plant Rank (CRPR) of 1A, 1B, 2A, 2B, or 3.

In order to evaluate special-status species and/or their habitats with the potential to occur in the Study Area and/or be impacted by the proposed Project, HELIX obtained lists of regionally occurring special-status species from the following information sources:

- California Department of Fish and Wildlife (CDFW). 2023. *California Natural Diversity Database* (CNDDB); For: *Florin, Courtland, Bruceville, Galt, Elk Grove, Clarksburg, Sacramento W, Sacramento E,* and *Carmichael* USGS 7.5-minute series quadrangles, Sacramento, CA. Accessed January 6, 2023;

- California Native Plant Society (CNPS). 2023. *Inventory of Rare and Endangered Plants* (online edition, v8-03 0.39) For: *Florin, Courtland, Bruceville, Galt, Elk Grove, Clarksburg, Sacramento W, Sacramento E,* and *Carmichael* USGS 7.5-minute series quadrangles, Sacramento, CA. Accessed January 6, 2023; and

- U.S. Fish and Wildlife Service (USFWS). 2022. *Information for Planning and Consultation* (IPaC) *Dunisch Residential Project.* Accessed September 27, 2022.

Appendix B includes an evaluation of the potential for special-status species to occur in the Study Area.

HELIX also reviewed the following sources for published information on the on-site conditions pertinent to biological resources:

- USGS. 2021. *Florin, California*. 7.5-minute series topographic quadrangle. United States Department of Interior; and

- USDA, NRCS. 2023a. *Web Soil Survey*. Available at: http://websoilsurvey.sc.egov.usda.gov. Accessed [January 6, 2023].

3.2 BIOLOGICAL SURVEY

HELIX biologist Greg Davis conducted the biological reconnaissance survey on September 28, 2022. The weather during the field survey was clear and warm, with an average temperature of 70 degrees Fahrenheit. The Study Area was systematically surveyed on foot in meandering transects to ensure total search coverage. Binoculars were used to further extend site coverage and identify species observed. All plant and animal species observed on-site during the surveys were recorded (Appendix D), and all biological communities occurring on-site were characterized. All resources of interest were mapped and recorded into the Project map file within the Fieldmaps Application. Data was exported into ArcMap 10.7.1® and used to produce the map of the Study Area and calculate the acreages of features. Following the field survey, the potential for each species identified in the database query to occur within the Study Area was determined based on the site survey, soils, habitats present within the Study Area, and species-specific information, as shown in Appendix B.

3.3 AQUATIC RESOURCES DELINEATION

An aquatic resources delineation was conducted on April 24, 2023, by HELIX biologist Greg Davis. The delineation was conducted in accordance with the Corps of Engineers Wetlands Delineation Manual

(USACE 1987), the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West (Version 2.0; USACE 2008), and the National Ordinary High Water Mark Field Delineation Manual for Rivers and Streams (Interim Version; USACE 2022). Vegetation, soils, and hydrologic characteristics were visually assessed by conducting meandering transects through the entire Study Area to obtain 100 percent visual coverage.

3.4 SPECIAL-STATUS PLANT SURVEY

A special-status plant survey was conducted on April 24 and May 16, 2023, by HELIX biologist Greg Davis. The survey was conducted according to CDFW *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Sensitive Natural Communities* (CDFW 2018). The entire site was surveyed and all plant species were identified to the taxonomic level necessary to determine whether they were special-status species.

3.5 ARBORIST SURVEY

California Tree and Landscape Consulting, Inc. (CalTLC) prepared an Arborist Report and Tree Inventory Summary for the Study Area (2022). Ed Stirtz, ISA Certified Arborist #WE-0510A, conducted an arborist survey of the Study Area on August 9, 2022, to identify and inventory trees within and/or overhanging the Study Area. Data collected for each tree included species identification, diameter at breast height (DBH), number of trunks, dripline radius, estimated height, and overall condition. Comments such as irregularities or other growth characteristics were recorded for each tree. The Arborist Report and Tree Inventory is included in Appendix E of this report.

4.0 RESULTS

4.1 PHYSICAL FEATURES

4.1.1 Topography and Drainage

The Study Area is relatively flat and appears to have been leveled for historic agricultural uses. The elevation within the Study Area is approximately 25 to 40 feet above mean sea level (MSL). The Study Area is located in the Lower Sacramento watershed (USGS Hydrologic Unit Code [HUC8] 18020109). The Study Area is comprised of mostly upland areas with shallow seasonal wetlands and roadside ditches. There was no observed direct surface connection from any of the features on the site to any off-site aquatic resources.

4.1.2 Soils

The Natural Resources Conservation Service has mapped two soil units within the Study Area: Galt clay, leveled, 0 to 1 percent slopes and San Joaquin silt loam, leveled, 0 to 1 percent slopes (USDA, NRCS 2023a; [Appendix A, Figure 4]). The characteristics associated with these soil types are described below.

Galt clay, leveled, 0 to 1 percent slopes: This soil unit occurs on terraces between 10 to 140 feet above MSL and consists of alluvium derived from granite. A typical soil profile is clay 0 to 32 inches and cemented 32 to 60 inches. The Galt Series consists of fine, smectitic, thermic Aquic Durixererts, which are moderately deep, moderately well drained soils that formed in fine textured alluvium from mixed but dominantly granitic rock sources. Galt soils are found on low terraces, basins, and basin rims and have slopes of 0 to 5 percent. This soil unit is rated as hydric by the NRCS (NRCS 2023b).

San Joaquin silt loam, leveled, 0 to 1 percent slopes: This soil unit occurs on terraces between 20 to 500 feet above MSL and consists of alluvium derived from granite. A typical soil profile is silt clay 0 to 23 inches; clay loam 23 to 28 inches; indurated 28 to 54 inches and stratified sandy loam 54 to 60 inches. The San Joaquin series consist of fine, mixed, active, thermic Abruptic Durixeralfs, which are moderately deep to a duripan, well and moderately well drained soils that formed in alluvium derived from mixed but predominantly granitic rock sources. They are found on undulating low terraces with slopes of 0 to 9 percent. This soil unit is not considered hydric (NRCS 2023b).

4.2 VEGETATION COMMUNITIES

The Study Area is largely comprised of approximately 10.48 acres of annual grassland, with small areas of ruderal/disturbed habitat (0.98 acre) and developed lands (0.84 acre) (Appendix A, Figure 5). These communities are described in detail below. A comprehensive list of all plant and wildlife species observed within the Study Area is provided in Appendix C. Representative photographs are included in Appendix D.

4.2.1 Annual Grassland

Non-native annual grassland is an herbaceous habitat dominated by non-native grasses and forbs. Grasses germinate in the winter following the onset of rains and grow rapidly in the spring as temperatures rise. By summer, the vegetation is predominantly dry thatch. The species assemblage depends on local colonization potential. The non-native annual grassland in the Study Area exists in a vacant lot that is subject to frequent mowing. Historic aerial imagery indicates the Study Area previously supported multiple structures, which have since been demolished. Approximately 10.48 acres of non-native annual grassland occurs within the Study Area.

Dominant species observed in this community include barley (*Hordeum murinum*), slim oats (*Avena barbata*), cheeseweed (*Malva parviflora*), wild radish (*Raphanus sativus*), and Harding grass (*Phalaris aquatica*). In addition to the dominant grasses and forbs, there are scattered valley oaks (*Quercus lobata*) present.

4.2.2 Ruderal/Disturbed

Ruderal/disturbed areas primarily occur in the western portion of the Study Area and are associated with unpaved access roads/parking areas. Vegetation within this community is composed of non-native invasive grasses and weeds. Approximately 0.98 acre of ruderal/disturbed habitat occurs within the Study Area and is comprised of previously graded areas and a graveled access road.

4.2.3 Developed

Developed habitat is often comprised of little to no vegetation and typically contains built structures and/or maintained surfaces such as roads or parking lots. Vegetation that does occur within this community type is often ornamental, rather than invasive or noxious weeds, such as in ruderal habitat types. Approximately 0.84 acre of developed habitat occurs within the Study Area and is made up of the existing paved road (Dunisch Road).

4.3 AQUATIC RESOURCES

HELIX biologist Greg Davis conducted an aquatic resources delineation within the Study Area on April 24, 2023. A total of 2.047 acres of aquatic resources were delineated within the Study Area, consisting of four seasonal wetlands (2.034 acres) and one wetland ditch (0.013 acre), hereafter referred to as ditch. Aquatic resources observed in the Study Area are described in detail below and are depicted on Figure 5. Further analysis of aquatic resources is provided under a separate aquatic resources delineation report for this project (HELIX 2023a).

4.3.1 Seasonal Wetland

A total of 2.034 acres of seasonal wetland were mapped within the Study Area, consisting of four seasonal wetlands. Seasonal wetlands collect surface runoff from surrounding terrain and are shallow depressions that stay inundated for a long enough duration to form hydric soil and support a dominance of hydrophytic vegetation. Hydrophytic vegetation observed in the seasonal wetlands within the Study Area includes Italian ryegrass (*Festuca perennis*) (FAC), Mediterranean barley (*Hordeum marinum*) (FAC), toad rush (*Juncus bufonius*) (FACW), and curly dock (*Rumex crispus*) (FAC). Multiple hydric soil indicators were observed in the seasonal wetlands within the Study Area, including depleted below dark surface, depleted matrix, and redox dark surface indicators. Wetland hydrology indicators varied between the four seasonal wetlands, but included saturation, water-stained leaves, sediment deposits, biotic crust, oxidized rhizospheres along living roots, and several secondary wetland hydrology indicators. Seasonal wetlands (SW)-1, SW-2, and SW-3 within the southwestern portion of the Study Area are isolated, shallow features that are not hydrologically connected to other aquatic resources. SW-4 makes up most of the acreage of seasonal wetland within the central portion of the Study Area, is deeper than the other features, and is drained via ditch into a stormwater drainage system that conveys excess water from the Study Area towards Laguna Creek.

4.3.2 Ditch

A total of 0.013 acre of ditch was mapped within the Study Area, consisting of one ditch that drains the large seasonal wetland in the central portion of the site into a drop inlet culvert associated with an underground stormwater drainage system. The ditch that drains the seasonal wetland was classified as an aquatic resource due to it diverting excess water from a seasonal wetland and because it contains hydrophytic vegetation, hydric soils, and wetland hydrology. Dominant vegetation within this ditch includes Italian ryegrass and toad rush, however most of the feature was barren due to prolonged inundation during the wet season. Hydric soil indicators within D-1 include the depleted below dark surface and depleted matrix indicators. Wetland hydrology within the ditch included saturation and water-stained leaves. Three other ditches within the Study Area were identified during the delineation, however these features drain uplands and lack a well-defined OHWM and/or all three parameters that would qualify these ditches as wetland.

4.4 SPECIAL-STATUS SPECIES

A total of 56 special-status species were identified during the database queries and desktop review to occur in the region surrounding the Study Area and are evaluated in Appendix B. Species that were determined to have no potential to occur or are not expected to occur in the Study Area or that were determined to be unimpacted by the proposed Project are included in Appendix B but are not discussed in this report.

4.4.1 Listed and Special-Status Plants

Based on field observations, literature review, and published information, three special-status plants have the potential to occur in the Study Area, which includes dwarf downingia (*Downingia pusila*), Boggs Lake hedge-hyssop (*Gratiola heterosepala*), and Ahart's dwarf rush (*Juncus leiospermus* var. *ahartii*). These species with potential to occur within the Study Area are presumed to be absent as a result of the special-status plant surveys that were conducted on April 24 and May 16, 2023. Further details regarding the special-status plant survey are provided under a separate letter report for this project (HELIX 2023b).

4.4.2 Listed and Special-Status Wildlife

Based on field observations, literature review, and published information, six listed and/or special-status wildlife species have the potential to occur in the Study Area. These include monarch butterfly (*Danaus plexippus*), vernal pool fairy shrimp (*Branchinecta lynchi*), white-tailed kite (*Elanus leucurus*), Swainson's hawk (*Buteo swainsoni*), burrowing owl (*Athene cunicularia*), and Cooper's hawk (*Accipiter cooperii*). In addition, other migratory birds and raptors protected under federal, State, and local laws/policies also have the potential to occur within the Study Area.

4.4.2.1 Monarch Butterfly

The federal determination December 17, 2020, determined that the Monarch butterfly warranted listing as an endangered or threatened species under the Federal Endangered Species Act of 1973, but the listing was precluded by higher priority listing actions (USFWS 2022b). Monarch butterflies roost in wind protected tree groves, especially with *Eucalyptus* sp., and species of pine or cypress with nectar and water sources nearby. Winter roost sites extend along the coast from Mendocino County to Baja California. As caterpillars, monarchs feed exclusively on the leaves of milkweed (*Asclepias* sp.) (Nial et al. 2019; USFWS 2020). Monarch butterfly migration routes pass east over the Sierra Nevada in the fall and back to the California coast in the spring (USFWS 2020). The overwintering population is located along the Coast while summer breeding areas occur in interior California and North America with spring breeding areas located further east (USFWS 2020).

Overwintering habitat is not present in the Study Area. Narrowleaf milkweed (*Asclepias fascicularis*), a larval host plant, is scattered throughout the annual grassland within the Study Area and could provide habitat for the monarch butterfly. The Study Area is in the summer breeding range of the Monarch butterfly and not in the coastal overwintering range (USFWS 2020). There are no CNNDB records for this species within a 5-mile radius of the Study Area and most records are located along the coast (CDFW 2023). Monarch butterfly could fly through the Study Area during the migration season and larval host plants are present in the Study Area. There is potential for direct and indirect effects to monarch butterfly if this species were to lay eggs on larval host plant milkweed within or adjacent to Study Area.

4.4.2.2 Vernal Pool Fairy Shrimp

The vernal pool fairy shrimp is listed as a federally threatened species and is endemic to California and the Agate Desert of southern Oregon. In California, populations are known from Stillwater Plain in Shasta County through most of the length of the Central Valley to Pixley in Tulare County (additional, disjunct populations exist at various locations throughout the state). This species generally occurs in vernal pools but may also be found in seasonal wetlands, swales, and alkali pools (Helm and Vollmar

2002). It is typically found in turbid water but can also occur in clear water with abundant aquatic vegetation. This species is most commonly found in grassy or mud bottomed pools or basalt flow depression pools in unplowed grasslands. The pools can vary in size from over 10 hectares to only 20 square meters. Occupied wetlands are typically small (ranging from 0.1 to 0.05 acre in size), and pond for a relatively short duration (3 to 4 weeks). While vernal pool fairy shrimp may reach maturity in as little as 18 days, the typical maturation time is 41 days. They are relatively short-lived, generally only surviving for 10 weeks (Eriksen and Belk 1999).

Vernal pool fairy shrimp may occur in the seasonal wetlands within the Study Area. However, this species is typically found in vernal pools rather than seasonal wetlands. In addition, the wetlands within the Study Area are very shallow and have been subject to regular disturbance through mowing along the perimeter of the site. Although the Study Area does not contain prime habitat, vernal pool fairy shrimp are documented in the vicinity of the Study Area and have been recorded in shallow wetlands (Helm and Vollmar 2002). The historic and ongoing mowing/tilling of the Study Area may limit the potential this species can occur in the Study Area, but marginally suitable habitat is present in the seasonal wetlands. The closest documented occurrence of this species is approximately 2.4 miles from the Study Area (CDFW 2023).

4.4.2.3 White-Tailed Kite

The white-tailed kite is listed as a CDFW Fully Protected species. This species occurs in a variety of open habitats, typically grassland, agricultural, oak woodland, riparian woodland, and open suburban areas. Nesting generally occurs within riparian or edge habitats or in lone trees that are adjacent to foraging habitat. Foraging habitat consists of a variety of open habitats that contain a high rodent population; especially grasslands, pastures, alfalfa fields, and other agricultural crops/fields.

The Study Area contains suitable foraging habitat for this species. The trees within the Study Area, as well as ornamental trees just outside the southern boundary of the Study Area, are not of sufficient size to provide ideal conditions for nesting. However, there are many tall trees located at nearby residential and commercial areas that could provide suitable nesting sites. Because nesting habitat occurs near the Study Area, and the Study Area contains suitable foraging habitat, white-tailed kite has a high potential to occur. The closest documented occurrence of this species is approximately 3.75 miles from the Study Area (CDFW 2023).

4.4.2.4 Swainson's Hawk

The Swainson's hawk is listed as a State threatened species. This species is a long-distance migrant with nesting grounds in western North America, and wintering grounds in Mexico and South America. Swainson's hawks typically arrive in the California Central Valley between March and early April to establish breeding territories. Breeding occurs from late March to August, peaking in late May through July (Zeiner et al. 1988-1990). In the Central Valley, Swainson's hawks generally nest in isolated trees, small groves of trees in agricultural land, or in large woodlands next to open grasslands or agricultural fields. This species typically nests near riparian areas; however, it has been known to nest in urban areas as well. In the Central Valley, the most commonly used trees include Fremont cottonwood (*Populus fremontii*), sycamores (*Platanus* spp.), valley oaks, walnut (*Juglans* spp.), and occasionally gum trees (*Eucalyptus* spp.) (Woodbridge 1998). Nest locations are usually in close proximity to suitable foraging habitats, which include fallow fields, all types of grasslands, irrigated pastures, alfalfa, and other hay crops, and low-growing row crops, especially post-harvest when the height of the vegetation is short and easy to observe prey (Bechard et al. 2010; SAIC 2012). Swainson's hawks leave their breeding grounds to return to their wintering grounds in late August or early September (Bloom and Van De Water 1994).

The Study Area contains suitable foraging habitat for this species. Several trees surrounding the Study Area provide suitable nesting habitat. Because suitable foraging occurs within the Study Area and nesting habitat occurs near the Study Area, Swainson's hawk has a high potential to occur. The closest documented occurrence of this species is approximately 0.24 mile from the Study Area (CDFW 2023).

4.4.2.5 Cooper's Hawk

Cooper's hawk is on a watch list by CDFW. This species nests in woodlands and urban trees. This species preys on medium-sized birds and small mammals and forages in open woodland and habitat edges (Zeiner et al. 1990).

There is suitable nesting habitat for this species within and adjacent to the Study Area. The annual grassland within the Study Area provides potential foraging habitat for this species. Therefore, this species may occur within the Study Area. The closest documented occurrence of this species is approximately 2.48 miles from the Study Area (CDFW 2023).

4.4.2.6 Burrowing Owl

Burrowing owl is a State Species of Special Concern as designated by the CDFW. This species occurs in a variety of open, arid habitats; typically grasslands, desert scrub, agricultural fields, washes, and disturbed areas such as golf courses or vacant lots. Burrows, perch sites, and friable soil are vital habitat components for this species, and habitats with low-lying, sparse vegetation are preferred. Ground squirrel burrows and other fossorial mammal burrows are typically used for nesting and as year-round refuge sites. This species may also utilize culverts, abandoned pipes, rubble piles, and other manmade structures if burrows are absent (Poulin et al. 2011).

Burrowing owls may occur in the Study Area. The Study Area contains suitable grassland habitat; however, suitable burrows and other structures suitable for nesting were not observed during the field survey. The soil within the Study Area is also mostly clay-like and does not appear very friable. In addition, the Study Area appears to be regularly mowed, further decreasing the likelihood this species may occur. Although not prime habitat, burrowing owl may utilize the site for foraging or nesting if suitable burrows can be formed. There are 10 CNDDB records of this species within five miles of the Study Area, and the closest CNDDB record is approximately 0.24 mile to the east (CDFW 2023).

4.4.2.7 Nesting Migratory Birds and Raptors

The Study Area provides nesting and foraging habitat for a variety of nesting migratory birds and raptors. Several birds were observed within the Study Area during the field survey, including red-shouldered hawk (*Buteo lineatus*), western scrub jay (*Aphelocoma californica*), and mourning dove (*Zenaida macroura*). No active nests were observed during the field survey; however, birds have the potential to nest in trees and on the ground within the Study Area.

Project activities such as clearing, grading, and other ground-disturbing activities during the avian nesting season (February 1 through August 31) could result in injury or mortality of eggs and chicks directly through destruction or indirectly through forced nest abandonment due to noise and other disturbance. Needless destruction of nests, eggs, and chicks would be a violation of Fish and Game Codes and have a significant impact.

4.5 SENSITIVE HABITATS

Sensitive habitats include those that are of special concern to resource agencies or those that are protected under CEQA, Section 1600 of the California Fish and Game Code (i.e., riparian areas), the Porter-Cologne Act, and/or Sections 401 and 404 of the Clean Water Act, which includes wetlands and other waters of the U.S. and State.

4.5.1 Aquatic Resources

A total of 2.047 acres of aquatic resources have been delineated in the Study Area, which consists completely of wetlands, as no other waters were observed within the Study Area. Wetlands in the Study Area consist of four seasonal wetlands (2.034 acres) and one ditch (0.013 acre), all of which would not be considered waters of the U.S. due to a lack of a continuous surface connection to Traditional Navigable Waters (TNWs), tributaries to TNWs, or wetlands adjacent to TNWs. However, all the aquatic resources within the Study Area would be considered waters of the State. The results of the aquatic resources delineation are preliminary and subject to verification by the resource agencies.

4.5.2 Wildlife Migration Corridors

Wildlife corridors link areas of suitable wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or human disturbance. This fragmentation of habitat can also occur when a portion of one or more habitats is converted into another habitat; for instance, when woodland or scrub habitat is altered or converted into grasslands after a disturbance such as fire, mudslide, or construction activities. Wildlife corridors mitigate the effects of this fragmentation by: (1) allowing animals to move between remaining habitats thereby permitting depleted populations to be replenished and promoting genetic exchange; (2) providing escape routes from fire, predators, and human disturbances, thus reducing the risk of catastrophic events (such as fire or disease) on population or local species extinction; and (3) serving as travel routes for individual animals as they move within their home ranges in search of food, water, mates, and other needs.

No apparent wildlife migration corridors occur within the Study Area. The Study Area is surrounded by urban developments. Development within the Study Area should not interfere with any potential wildlife migration corridors.

4.6 PROTECTED TREES

The Arborist Report and Tree Inventory conducted by CalTLC (Appendix E) identified a total of six trees comprised of three valley oaks, one cottonwood (*Populus* sp.), one mulberry (*Morus alba*), and one juniper shrub (*Juniperus communis*). The three valley oaks and one cottonwood are located within the Study Area. The mulberry and juniper shrub are located off-site, but were included in the arborist survey because they overhang the Study Area. Per the Arborist Report and Tree Inventory, the three valley oaks within the Study Area are protected under the City of Elk Grove tree ordinance (CalTLC 2022). A map of tree locations is included in Appendix E.

5.0 CONCLUSIONS AND RECOMMENDATIONS

The Study Area is comprised of annual grassland (10.48 acres), ruderal/disturbed areas (0.98 acre), developed land (0.84 acre), seasonal wetland (2.034 acres), and ditch (0.013 acre). No special-status plants or special-status wildlife species were observed within the Study Area during the biological field reconnaissance survey on September 28, 2022 or during surveys conducted on April 24 and May 16, 2023. However, suitable habitat is present for several special-status wildlife species, and there is potential that these species may occur within the Study Area and be affected by development activities.

Based on the current site plan, the entirety of the site is proposed to be developed. Definitive site plans for the Study Area have not been provided as of the date of preparation of this document.

Known or potential biological constraints in the Study Area include:

- Potential habitat for monarch butterfly;
- Potential habitat for vernal pool fairy shrimp;
- Nesting and foraging habitat within the site and surrounding areas for nesting migratory birds and raptors, including Swainson's hawk, white-tailed kite, and Cooper's hawk;
- Potential habitat for burrowing owl;
- Trees protected by the City of Elk Grove's Tree Preservation and Protection Code; and
- Sensitive aquatic resources, including seasonal wetlands and a ditch.

Recommendations, including avoidance and minimization measures to limit or avoid impacts to special-status species that may occur, are included below.

5.1 MONARCH BUTTERFLY

Project design should incorporate a 25-foot setback around milkweed habitat adjacent to and within the Study Area as these perennial herbs could provide larval habitat for Monarch butterfly during the summer breeding season (March 16 through October 31 [USFWS 2021]). As feasible, any construction activities associated with or within 25 feet of milkweed should occur outside of the summer breeding season (from approximately November 1 through March 15 [USFWS 2021]). This would reduce impacts to all larval butterflies. If construction activities will occur and directly or indirectly impact milkweed during the summer breeding for Monarch butterflies (approximately March 16 through October 31), pre-construction surveys should be conducted by a qualified biologist within one week prior to the onset of construction. If no Monarch butterfly life stage is identified in or immediately adjacent to the Study Area (within 25 feet), no further surveys or actions would be required. If a Monarch butterfly eggs, larvae, or chrysalis are identified in the Study Area or within 25 feet, then then a 25-foot setback should be implemented and consultation with USFWS may be necessary if the project activities will impact occupied Monarch larval host plant habitat.

5.2 VERNAL POOL FAIRY SHRIMP

Vernal pool fairy shrimp, a federally threatened species, may occur in seasonal wetlands within the Study Area. Listed invertebrate species are assumed to be present in suitable habitat within their range unless a complete protocol-level survey, consisting of one wet-season survey and one dry-season survey, results in no evidence of the listed species. The assumed presence may also be decided by the Project proponent prior to construction and mitigation for the assumed presence or positive results from focused surveys would be determined by the USFWS and the City of Elk Grove. Mitigation for occupied habitat would typically include the purchase of mitigation bank credits for vernal pool fairy shrimp at a location and amount approved by the City and the USFWS.

5.3 SWAINSON'S HAWK

The site provides suitable nesting and foraging habitat for Swainson's hawks, and development of the site could potentially impact this species through loss of nesting and foraging habitat and disturbance to nesting pairs, including potential nest abandonment if active nests are located within or nearby the Project site during construction.

The following measures are recommended to reduce potential nesting and foraging habitat impacts to Swainson's hawk from the Project:

Conduct focused Swainson's hawk nesting surveys in accordance with the Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley (Swainson's Hawk Technical Advisory Committee 2000). The nest surveys would be conducted within 0.25 mile of the Study Area, where legally permitted. If no active Swainson's hawk nests are identified on or within 0.25 mile of the Study Area, a letter report summarizing the survey results shall be submitted to the City of Elk Grove within 30 days following the final survey, and no further avoidance and minimization measures for nesting habitat are required.

If active Swainson's hawk nests are found within 0.25 mile of the Study Area, the City of Elk Grove shall be consulted to establish appropriate avoidance and minimization measures to avoid take of an active Swainson's hawk nest. The City may coordinate with CDFW to determine appropriate avoidance and minimization measures depending on various factors, including the location of the nest relative to construction activities, existing land uses in the vicinity of the nest, and existing visual barriers between the nest and construction activities. Such a plan could include measures such as the establishment of a construction setback during the nesting season, placement of high-visibility construction fencing along the setback boundaries, and biological monitoring of the nest during construction activities to confirm no nest disturbance is occurring from Project construction.

Prior to the initiation of construction activities, the Project applicant would be required to mitigate for the loss of suitable Swainson's hawk foraging habitat at a ratio determined by the City of Elk Grove, which would include impacts to the annual grassland and seasonal wetland communities. Mitigation can be accomplished through payment of an in-lieu fee to the City or acquisition of a conservation easement(s) or other means suitable to preserve foraging habitat for the Swainson's hawk in accordance with either Section 16.130.040 or 16.130.110 of the Elk Grove Municipal Code.

5.4 BURROWING OWL

Burrowing owl may occur within the annual grassland within the Study Area. The following measures are recommended to reduce potential impacts to burrowing owl:

Given that no suitable burrows, refugia, or owls were observed during the site visit, it is recommended that a take avoidance survey consistent with CDFW guidelines (CDFW 2012) be conducted prior to the start of construction. The construction footprint and a 500-foot buffer, where accessible, should be surveyed. If no burrowing owls are detected, the results of the survey should be summarized in a letter report and submitted to the City, and no further mitigation is expected. If burrowing owls are found during the take avoidance survey, the City and CDFW should be consulted regarding appropriate avoidance and minimization measures to implement during Project construction. Typical avoidance and minimization measures may include but are not limited to establishing avoidance buffers around active burrows, biological monitoring during construction, and placement of visual or sound barriers between active burrows and construction activity.

5.5 PROTECTED TREES

Protected trees occur within the Study Area, which include three valley oaks. The Project proposes the removal of all onsite trees, including the three valley oaks. Recommendations regarding tree protection measures are included in the Arborist Report and Tree Inventory prepared by CalTLC (Appendix E).

5.6 OTHER NESTING MIGRATORY BIRDS AND RAPTORS

Migratory birds and raptors, including Cooper's hawk and white-tailed kite, have the potential to nest and forage within the Study Area. No active nests were observed at the time of the field survey, but the Study Area has the potential to support nesting birds within various trees and shrubs, bare ground, and herbaceous vegetation.

The following measures are recommended to reduce potential impacts to nesting migratory birds and raptors:

If vegetation clearing, grading, and/or construction activities are planned to occur during the migratory bird nesting season (February 15 to August 30), a pre-construction survey to identify active migratory bird nests shall be conducted by a qualified biologist within three days prior to construction initiation. The survey shall be performed by a qualified biologist for the purposes of determining the presence/absence of active nest sites within a 500-foot radius of proposed construction areas, where access is available. If a break in construction activity of more than two weeks occurs, then subsequent surveys shall be conducted.

A no-disturbance buffer should be established around active nests. Buffer distances would be based on avian species and their degree of acclimation to disturbance. The no-disturbance buffers may be reduced if a smaller buffer is proposed by the qualified biologist and approved by the City after taking into consideration the natural history of the species of bird nesting, the proposed activity level adjacent to the nest, habituation to existing or ongoing activity, and nest concealment (are there visual or acoustic barriers between the proposed activity and the nest). The qualified biologist shall visit the nest as needed to determine when the young have fledged the nest and are independent of the site, or until the nest is determined to no longer be active.

5.7 AQUATIC RESOURCES

Four seasonal wetlands and one ditch were mapped within the Study Area. Based on the results of the aquatic resources delineation conducted by HELIX, the aquatic resources within the Study Area would not be considered waters of the U.S. and would not be subject to regulation under Section 404 and/or 401 of the CWA, however the results of the delineation are preliminary and subject to verification by the resource agencies. Prior to the initiation of any construction activities that could result in impacts to these features, the USACE and CVRWQCB should be consulted to determine if the features are subject to regulation under Section 404 and/or 401 of the CWA and/or the Porter-Cologne Act. It is recommended that the project proponent submit a request for an Approved Jurisdictional Determination (AJD) to the USACE to determine the jurisdictional status of the aquatic resources delineated within the Study Area, which will help guide the permitting strategy for the project. If the features are determined to be jurisdictional, appropriate agency permits should be acquired, and the features will require mitigation prior to impact according to the terms and conditions contained in the permits.

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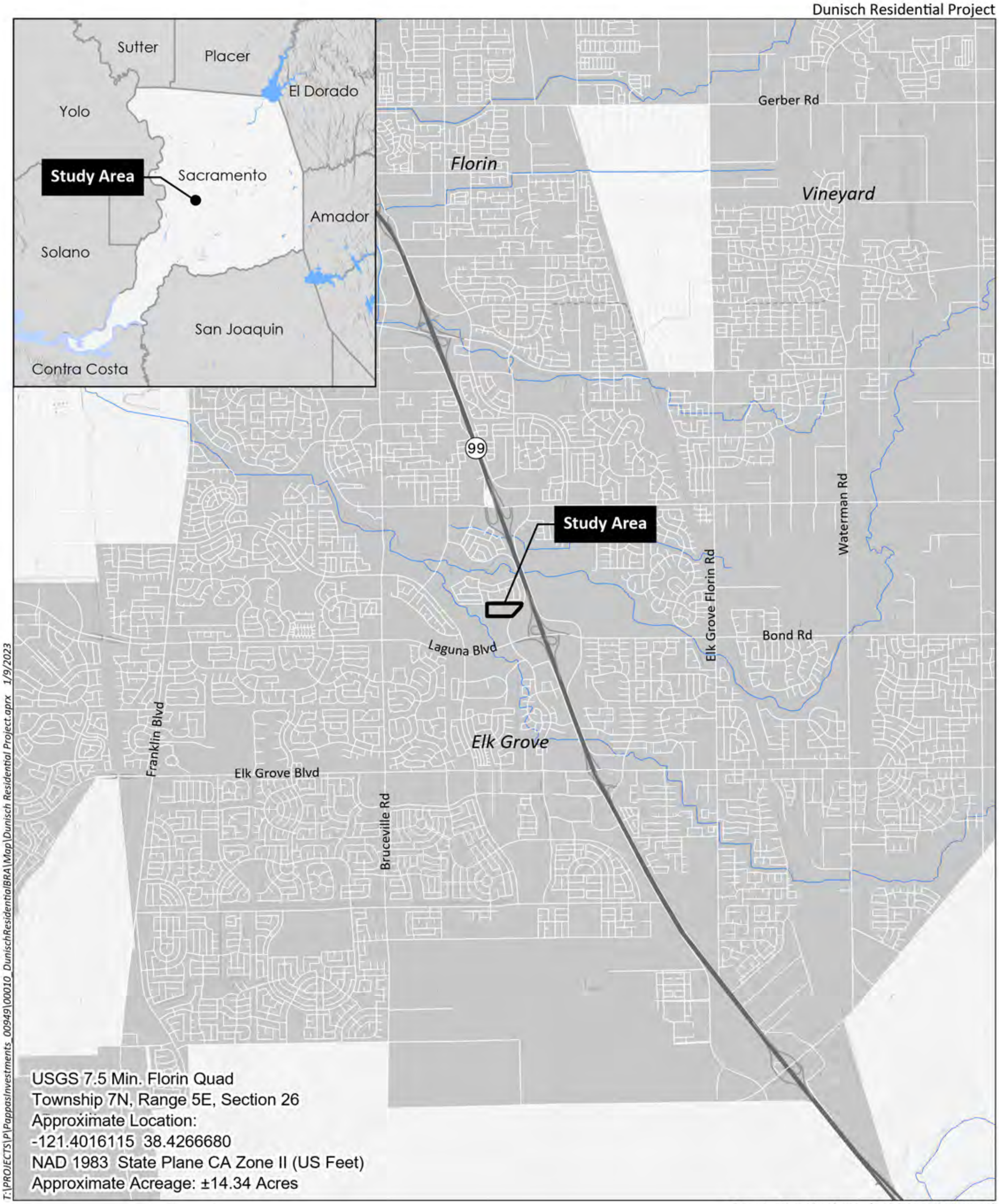
Appendix A

Figures



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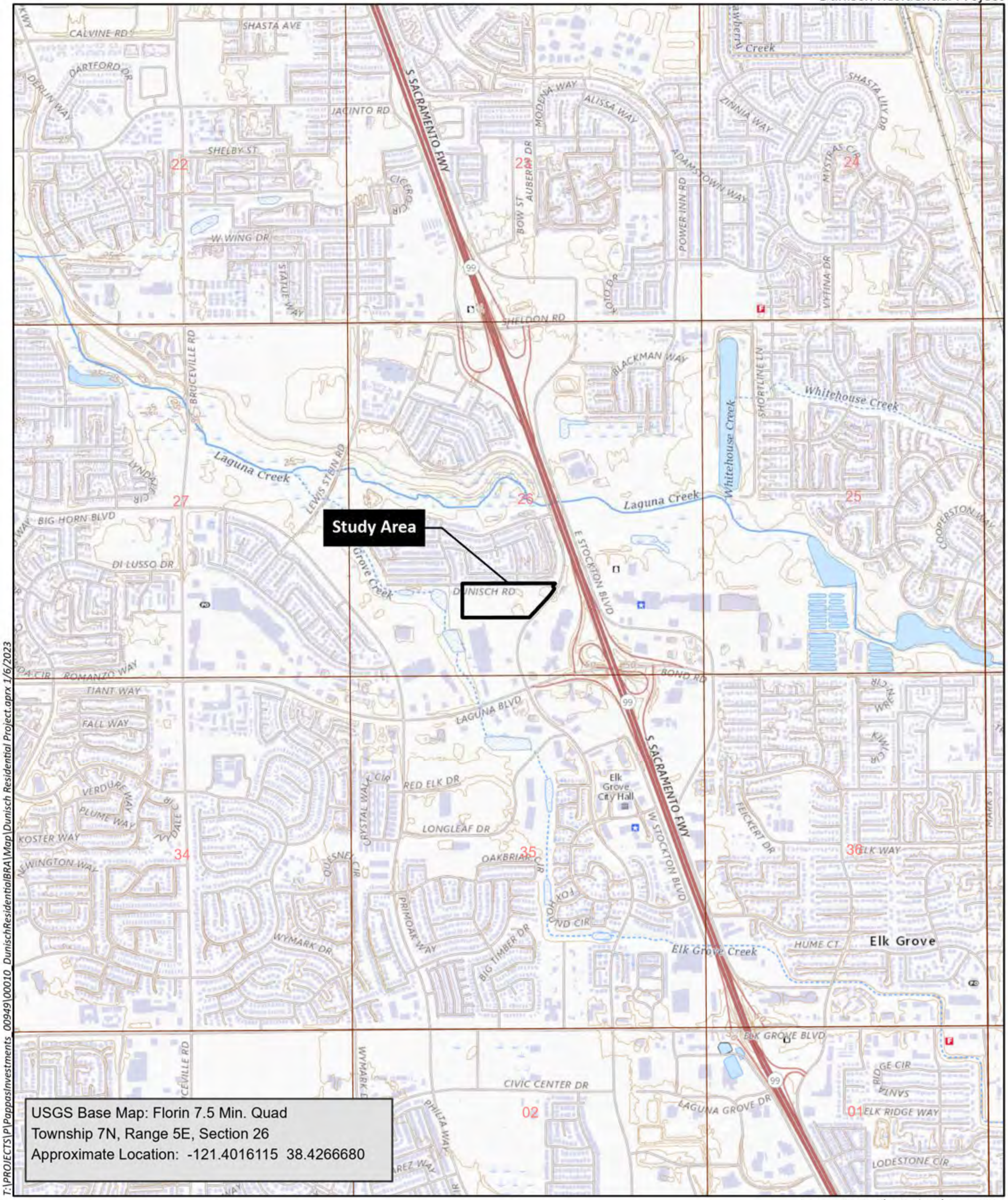
Source: Base Map Layers (Esri, USGS, NGA, NASA)

HELIX Environmental Planning

Site and Vicinity Map

Figure 1

Dunisch Residential Project



Source: USGS, The National Map, 2021

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HELIX Environmental Planning

USGS Topographic Map

Figure 2

Source: Aerial Imagery (Maxar, 4/26/2022)

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HELIX
Environmental Planning

Aerial Map

Figure 3

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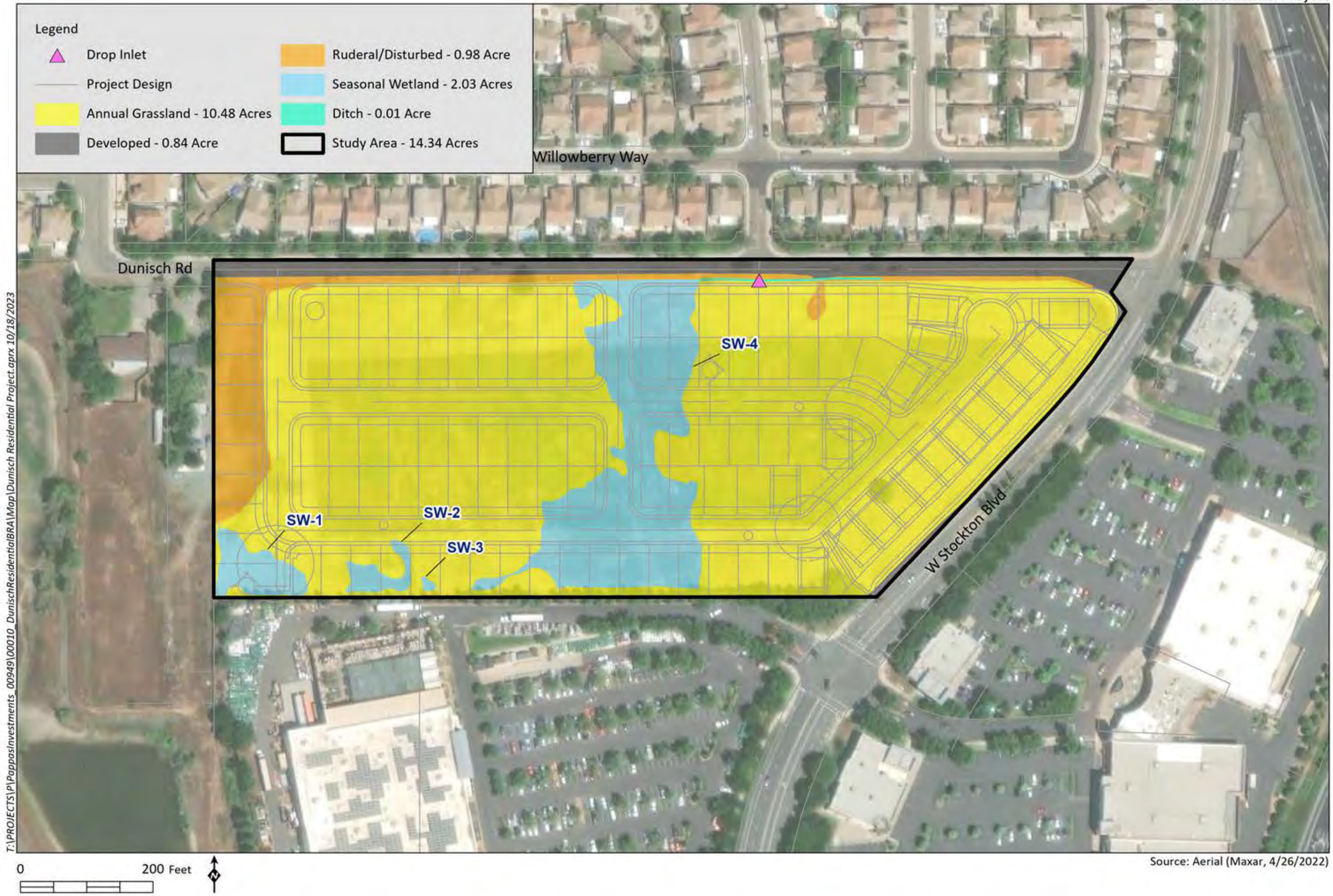
Source: NRCS, 2022; Aerial (Maxar, 4/26/2022)

HELIX Environmental Planning

Soil Map

Figure 4



Source: Aerial (Maxar, 4/26/2022)

HELIX
Environmental Planning

Habitat Map

Figure 5

Appendix B

Potential for Special-Status Species to Occur in the Study Area

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
Plants			
Astragalus tener var. *ferrisiae* Ferris' milk-vetch	--/--1B.1	Annual herb that occurs in meadows and seeps (vernally mesic) within valley and foothill grassland habitats. This species typically occurs within subalkaline flats on overflow land in the Central Valley, usually in dry, adobe soil. Blooms from April to May and is found at elevations ranging from 4 to 80 meters.	**Will not occur.** Suitable alkaline meadow and seep habitat does not occur in the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.
Brasenia schreberi watershield	--/--/2B.3	Perennial rhizomatous herb that occurs in freshwater marshes and swamps. Blooms from June to September and is found at elevations ranging from 0 to 2,220 meters.	**Will not occur.** Suitable marsh or swamp habitat does not occur in the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.
Carex comosa bristly sedge	--/--/2B.1	Perennial rhizomatous herb that occurs in marsh, swamp, coastal prairie, and sometimes wet areas of grasslands. Species is typically associated with lake margins or similarly wet places. Blooms from May to September and is found at elevations ranging from 0 to 1,010 meters.	**Presumed absent.** Although there are seasonal wetlands within the Study Area, this species is not expected to occur because marsh and swamp habitat are absent. The site appears to be routinely mowed and tilled further decreasing the possibility this species may occur. Additionally, this species was not observed during the special-status plant surveys that were conducted on April 24 and May 16, 2023. There are no documented occurrences of this species within 5 miles of the Study Area.
Centromadia parryi ssp. *parryi* pappose tarplant	--/--/1B.2	Annual herb that occurs in chaparral, coastal prairie, meadows, seeps, and vernally mesic grasslands. Blooms from May to November and is found at elevations ranging from 0 to 420 meters.	**Will not occur.** Suitable chaparral, meadow, seep, and other habitat types do not occur in the Study Area.

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
			There are no documented occurrences of this species within 5 miles of the Study Area.
Cicuta maculata var. *bolanderi* Bolander's water-hemlock	--/--/2B.1	Perennial herb that occurs in marshes and swamps. Can be in freshwater, brackish, or saltwater. Blooms from July to September and is found at elevations ranging from 0 to 200 meters.	**Will not occur.** Suitable marsh or swamp habitat do not occur in the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.
Cuscuta obtusiflora var. glandulosa Peruvian dodder	--/--/2B.2	Parasitic annual herb that occurs in freshwater marshes and swamps. Blooms from July to October and is found at elevations ranging from 15 to 280 meters.	**Will not occur.** Suitable marsh and swamp habitat do not occur in the Study Area. There is one documented occurrence within 5 miles of the Study Area (CDFW 2023).
Downingia pusilla dwarf downingia	--/--/2B.2	Annual herb that occurs in vernal pools within valley and foothill grassland habitats. Blooms from March to May and is found at elevations ranging from 1 to 455 meters.	**Presumed absent.** Suitable vernal pool habitat does not occur in the Study Area; however, the seasonal wetlands provide marginal habitat for this species. This species was not observed during the special-status plant surveys that were conducted on April 24 and May 16, 2023. There are three documented occurrences within 5 miles of the Study Area (CDFW 2023).
Gratiola heterosepala Boggs Lake hedge-hyssop	--/SE/1B.2	Annual herb found on clay soils in vernal pools, marshes, swamps, and occasionally along lake margins. Blooms from April to August and is found at elevations ranging from 9 to 2,300 meters.	**Presumed absent.** Suitable vernal pool habitat does not occur in the Study Area; however, the seasonal wetlands provide marginal habitat for this species. This species was not observed during the special-status

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
			plant surveys that were conducted on April 24 and May 16, 2023. There are three documented occurrences within 5 miles of the Study Area (CDFW 2023).
Hibiscus lasiocarpos var. occidentalis wooly rose-mallow	--/--/1B.2	Perennial rhizomatous herb that occurs in marshes and swamps and is sometimes found on riprap along levees. Blooms from June to September and is found at elevations ranging from 0 to 120 meters.	**Will not occur.** Suitable marsh or swamp habitat do not occur in the Study Area. There is one documented occurrence within one mile of the Study Area (CDFW 2023).
Juncus leiospermus var. *ahartii* Ahart's dwarf rush	--/--/1B.2	Annual herb found on mesic soils in valley and foothill grassland habitats, particularly along vernal pool margins. Blooms from March to May and is found at elevations ranging from 30 to 100 meters.	**Presumed absent.** The seasonal wetlands within the Study Area provide suitable habitat for this species; however, this species was not observed during the special-status plant surveys that were conducted on April 24 and May 16, 2023. There are no documented occurrences of this species within 5 miles of the Study Area.
Lasthenia chrysantha alkali-sink goldfields	--/--/1B.1	Annual herb that occurs in vernal pools, generally in alkaline habitats. Blooms from February to April and is found at elevations ranging from 0 to 200 meters.	**Will not occur.** Suitable vernal pool habitat does not occur in the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.
Lathyrus jepsonii var. jepsonii Delta tule pea	--/--/1B.2	Perennial herb that occurs marsh and swamp habitats (freshwater or brackish). Blooms from	**Will not occur.** Suitable marsh or swamp habitat does not occur in the Study Area.

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
		May to July and is found at elevations ranging from 0 to 5 meters.	There are no documented occurrences of this species within 5 miles of the Study Area.
Legenere limosa legenere	--/--/1B.1	Annual herb found in vernal pools. Blooms from April to June and is found at elevations ranging from 1 – 880 meters.	**Presumed absent.** Suitable vernal pool habitat does not occur in the Study Area, and it is unlikely that the seasonal wetlands provide suitable habitat for this species. Additionally, this species was not observed during the special-status plant surveys that were conducted on April 24 and May 16, 2023. There are eight documented occurrences within 5 miles of the Study Area (CDFW 2023).
Lepidium latipes var. heckardii Heckard's pepper-grass	--/--/1B.2	Annual herb that occurs on alkaline soil in grassland and may also occur in alkaline vernal pools. Blooms from March to May and is found at elevations ranging from 2 to 200 meters.	**Will not occur**. Suitable alkaline soil does not occur in the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.
Lilaeopsis masonii Mason's lilaeopsis	--/SR/1B.1	Perennial rhizomatous herb that occurs in marshes and swamps (freshwater or brackish). Blooms from April to November and is found at elevations ranging from 0 to 10 meters.	**Will not occur.** Suitable marsh or swamp habitat does not occur in the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.
Limosella australis Delta mudwort	--/--/2B.1	Perennial stoloniferous herb that occurs in marshes, swamps, and riparian scrub. Blooms from May to August and is found at elevations ranging from 0 to 3 meters.	**Will not occur.** Suitable marsh, swamp, or riparian scrub habitat does not occur in the Study Area.

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
			There are no documented occurrences of this species within 5 miles of the Study Area.
Orcuttia tenuis slender Orcutt grass	FT/SE/1B.1	Annual herb that occurs in vernal pools (often with gravelly substrate) within valley grassland and foothill woodland habitats. Blooms from May to October and is found at elevations ranging from 25 to 1755 meters.	**Will not occur.** Vernal pools with gravelly substrates do not occur in the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.
Orcuttia viscida Sacramento Orcutt grass	FE/SE/1B.1	Annual herb that occurs in vernal pools. Blooms from April to July and is found at elevations ranging from 30 to 100 meters.	**Presumed absent.** Suitable vernal pool habitat does not occur in the Study Area, and it is unlikely that the seasonal wetlands provide suitable habitat for this species. Additionally, this species was not observed during the special-status plant surveys that were conducted on April 24 and May 16, 2023. There are no documented occurrences of this species within 5 miles of the Study Area.
Sagittaria sanfordii Sanford's arrowhead	--/--/1B.2	An emergent perennial rhizomatous herb that occurs in marshes and swamps. Blooms from May to October and is found at elevations ranging from 0 to 650 meters.	**Will not occur**. Suitable marsh or swamp habitat does not occur in the Study Area. There are 15 documented occurrences within 5 miles of the Study Area (CDFW 2023).
Scutellaria galericulata marsh skullcap	--/--/2B.2	Perennial rhizomatous herb that occurs in lower montane coniferous forest, meadows, seeps, marshes, and swamps. Blooms from June to September and is found at elevations ranging from 0 to 2,100 meters.	**Will not occur.** Suitable habitat types do not occur in the Study Area.

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
			There are no documented occurrences of this species within 5 miles of the Study Area.
Scutellaria lateriflora side-flowering skullcap	--/--/2B.2	Perennial rhizomatous herb that occurs in marshes, swamps, seeps, and meadows. Blooms from July to September and is found at elevations ranging from 0 to 500 meters.	**Will not occur.** Suitable marsh, swamp, or other habitat types do not occur in the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.
Symphyotrichum lentum Suisun Marsh aster	--/--/1B.2	Perennial rhizomatous herb that occurs in marshes and swamps (freshwater or brackish). Blooms from May to November and is found at elevations ranging from 0 to 3 meters.	**Will not occur**. Suitable marsh or swamp habitat does not occur in the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.
Trifolium hydrophilum saline clover	FT/SE/1B.1	Annual herb that occurs in vernal pools, marshes, swamps, and alkaline grasslands. Blooms from April to June and is found at elevations ranging from 0 to 300 meters.	**Will not occur.** Suitable vernal pool, marsh, swamp, or alkaline habitats do not occur in the Study Area. There are three documented occurrences of this species within 5 miles of the Study Area (CDFW 2023)
Animals			
Crustaceans			
Branchinecta lynchi vernal pool fairy shrimp	FT/--/--	The range of the vernal pool fairy shrimp (VPFS) within California includes the Central Valley and southern California (USFWS 2005). Populations are known from Stillwater Plain in Shasta County through most of the length of the Central Valley to Pixley in Tulare County (additional disjunct populations exist at various locations throughout state). VPFS occurs	**May occur**. This species may occur in the seasonal wetlands within the Study Area. There are 17 documented occurrences within 5 miles of the Study Area (CDFW 2023).

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
		mostly in vernal pools, however it is also found in a variety of both natural and artificial wetland habitats, such as alkali pools, ephemeral drainages, stock ponds, roadside ditches, vernal swales, and rock outcrop pools (Helm 1997). Occupied wetlands are typically small (ranging from 0.1 to 0.05 acres in size), and pond for a relatively short duration (3-4 weeks) (Eriksen and Belk 1999).	
Lepidurus packardi vernal pool tadpole shrimp	FE/--/--	The vernal pool tadpole shrimp (VPTS) occurs within the Central Valley of California and in the San Francisco Bay area, with the majority of the populations occurring in the Sacramento Valley. This species has also been reported from the Sacramento River Delta to the east side of San Francisco Bay, and from a few scattered localities in the San Joaquin Valley. Suitable habitats include vernal pools, clay flats, alkaline pools, ephemeral stock tanks, roadside ditches, and road ruts. Vernal pools may range in size from small, clear, and well-vegetated to highly turbid, alkali scald pools to large winter lakes. They may be seasonal or ephemeral and may exhibit a wide range of salinity levels. VPTS survival requires that water bodies be deeper than 5 inches, pond for 40 days or more, and not experience wide daily temperature fluctuations (Rogers 2001).	**Not expected**. This species may occur in the seasonal wetlands within the Study Area; however, these features appear very shallow and likely do not remain inundated for a long enough duration to support this species. There are 18 documented occurrences within 5 miles of the Study Area (CDFW 2023).
Insects			
Danaus plexippus Monarch butterfly	FCE/--/--	The federal listing on December 17, 2020 was for overwintering populations of Monarch butterflies that roost in wind protected tree groves, especially with Eucalyptus sp., and species of pine or cypress with nectar and water sources nearby. Winter roost sites extend along the coast from Mendocino	**May occur.** There is no suitable overwintering habitat in the Study Area, however narrow leaf milkweed (*Asclepias fascicularis*), a larval food plant, is present in the annual grassland community within the Study Area.

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
		County to Baja California. As caterpillars, monarchs feed exclusively on the leaves of milkweed (Asclepias sp.) (Nial et al. 2019 and USFWS 2020). Monarch butterfly migration routes pass east over the Sierra Nevada in the fall and back to the California coast in the spring (USFWS 2020). The overwintering population is located along the Coast while summer breeding areas occur in interior California and North America with spring breeding areas located further east (USFWS 2020).	There are no documented CNDDB occurrences of this species within a 5-mile radius of the Study Area (CDFW 2023).
Desmocerus californicus californicus valley elderberry longhorn beetle	FT/--/--	Endemic to elderberry shrubs (Sambucus spp.) occurring in riparian habitat in the Sacramento and San Joaquin Valleys, and less common throughout riparian forests of the Central Valley from Redding to Fresno County. Elderberry stems at least 1-inch diameter or greater are necessary for larvae and pupae development.	**Will not occur.** Elderberry shrubs that provide habitat for this species are not present in the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.
Fishes			
Archoplites interruptus Sacramento perch	--/--/SSC	Found in the Sacramento and San Joaquin rivers and tributaries, as well as lakes in the Central Valley. Prefers warm water and aquatic vegetation is required for young.	**Will not occur.** There is no suitable aquatic habitat in the Study Area.
Acipenser medirostris pop. 1 green sturgeon – southern DPS	FT/--/--	Spawn in freshwater streams, in fast, deep water, over gravel, cobble, or boulders. Juveniles inhabit estuarine waters for 1-4 years until dispersing into coastal marine waters as adults. Adults return to spawn in fresh water every 6-10 years. Sacramento River watershed, including the Feather River, is the only known historical and present spawning areas for green sturgeon (NMFS 2018).	**Will not occur.** There is no suitable aquatic habitat in the Study Area.
Hypomesus transpacificus Delta smelt	FT/--/--	Occurs in estuarine waters. Majority of life span is spent within the freshwater outskirts of	**Will not occur.** There is no suitable aquatic habitat in the Study Area.

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
		the mixing zone (saltwater-freshwater interface) within the Delta.	
Oncorhynchus mykiss irideus pop. 11 Central Valley Steelhead DPS	FT/--/--	This distinct population segment includes all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers in the Sacramento and San Joaquin Rivers and their tributaries, excluding steelhead from San Francisco and San Pablo Bays and their tributaries, as well as two artificial propagation programs: the Coleman NFH, and Feather River Hatchery steelhead hatchery programs (NMFS 2016). Steelhead spawn in rivers and streams with cool, clear, water and suitable silt free substrate (NMFS 2016).	**Will not occur.** There is no suitable aquatic habitat in the Study Area.
Oncorhynchus tshawytscha pop. 11 chinook salmon - Central Valley spring-run ESU	FT/ST/--	Occurs in the Sacramento and San Joaquin rivers and their tributaries. Adults enter the river from late March through September and hold in cool water habitats through the summer, then spawn in the fall from mid-August through early October.	**Will not occur.** There is no suitable aquatic habitat in the Study Area.
Oncorhynchus tshawytscha pop. 7 chinook salmon - Sacramento River winter-run ESU	FE/SE/--	Occurs in the Sacramento and San Joaquin rivers and their tributaries. Adults pass under the Golden Gate Bridge from November through May and pass into the Sacramento River from December through early August. Adults then spawn in the upper mainstem Sacramento River from mid-April through August.	**Will not occur.** There is no suitable aquatic habitat in the Study Area.
Pogonichthys macrolepidotus Sacramento splittail	--/--SSC	Believed to be confined to the Delta, Suisun Bay and associated marshes. Requires slow moving river sections, dead end sloughs, and flooded vegetation for spawning and foraging for young.	**Will not occur.** There is no suitable aquatic habitat in the Study Area.
Spirinchus thaleichthys longfin smelt	FC/ST/--	Inhabits estuaries and bays in the Delta and Sacramento-San Joaquin Rivers. Migrate to	**Will not occur.** There is no suitable aquatic habitat in the Study Area.

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
		freshwater to spawn. Prefer salinities of 15-30 ppt, but can be found in completely freshwater to almost pure seawater.	
Amphibians			
Ambystoma californiense pop. 1 California tiger salamander – central California DPS	FT/ST/--	Requires both aquatic breeding habitat such as vernal pools, temporary ponds, stock ponds, or wetlands, and adjacent upland habitat with small mammal burrows present for refuge. Adults aestivate throughout summer and emerge after heavy rainfall to breed. This species is known to occur within the Central Valley, and Santa Barbara and Sonoma counties.	**Not expected.** The seasonal wetlands within the Study Area appear too shallow and are likely not inundated for a long enough duration to support breeding and larval development of this species. Additionally, no suitable small mammal burrows or other refugia habitat was observed in the Study Area. Given that aquatic breeding habitat within the Study Area appears to be of low quality and no upland refugia habitat was observed, California tiger salamander is not expected to occur. There are no documented occurrences of this species within 5 miles of the Study Area.
Spea hammondii western spadefoot toad	--/--/SSC	Breeds in vernal pools and seasonal ponds or slow portions of streams in grasslands and woodlands. Sandy or gravelly soils are required for this species. Adults spend most of their time in underground burrows in grasslands surrounding breeding pools (Jennings and Hayes 1994). Breeding is typically finished by the end of March and tadpoles mature through late-spring and disperse as pools dry.	**Not expected.** Although there are seasonal wetlands within the Study Area, this species is not expected to occur given that these features appear shallow and likely do not remain inundated for long enough periods to support breeding and larval development. Additionally, the Study Area does not contain sandy or gravelly soils and no burrows were observed. The Study Area also appears to be routinely mowed and tilled, further reducing

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
			the possibility this species may occur. There are no documented occurrences of this species within 5 miles of the Study Area.
Reptiles			
Emys marmorata western pond turtle	--/--/SSC	Occurs in a variety of aquatic habitats; typically permanent ponds, lakes, streams, irrigation ditches, canals, marshes, or pools in intermittent drainages. Prefers areas lined with abundant vegetation and either rocky or muddy substrates. Requires basking sites such as logs, rocks, cattail mats or exposed banks. Active from February to November, and breeding occurs from April to May. Overwintering occurs in upland terrestrial habitats close to water sources (approximately 300 feet), in which they will bury themselves under loose soil.	**Will not occur.** Suitable aquatic habitat for this species does not occur in the Study Area. There are four documented occurrences within 5 miles of the Study Area (CDFW 2023).
Thamnophis gigas giant garter snake	FT/ST/--	Occurs in aquatic habitats with open, sunny areas for basking, vegetation cover along banks, and abundant prey. Typically occurs in agricultural wetlands, canals, and sloughs, especially near rice fields. Adjacent upland habitat with small mammal burrows or other refugia sites present above flood level are also required for this species.	**Will not occur.** Suitable aquatic habitat does not occur in the Study Area. There are eight documented occurrences within 5 miles of the Study Area (CDFW 2023).
Birds			
Accipiter cooperii Cooper's hawk	--/--/WL	Occurs in open woodlands, riparian forests, montane coniferous forests, and other open woodland habitats. May also occur in wooded suburban habitats. Nests high within a large tree.	**May occur.** This species may pass through the Study Area and could potentially utilize the landscape trees along the southern boundary of the Study Area for nesting. There are two documented

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
			occurrences within 5 miles of the Study Area (CDFW 2023).
Agelaius tricolor tricolored blackbird	--/ST/--	Nests and seeks cover in emergent wetland vegetation and thorny vegetation such as Himalayan blackberry (*Rubus armeniacus*). Nesting area must be large enough to support a minimum colony of 50 pairs as they are a highly colonial species. Forages on ground in croplands, grasslands, flooded land, and edges of ponds for insects (Shuford and Gardali 2008).	**Not expected.** Emergent wetland cover and other substrates suitable for nesting do not occur in the Study Area. However, this species may forage within the Study Area. There are thirteen documented occurrences within 5 miles of the Study Area (CDFW 2023).
Aquila chrysaetos golden eagle	--/FP/--	Occurs in a variety of open habitats, typically in rolling hills, mountains, sage-juniper flats, and deserts. Typically avoids areas with human activity. Constructs nest on a platform of a cliff, or less commonly in a large tree or on isolated structures such as transmission towers. Often nests near open foraging habitat, preferably hilly grasslands.	**Not expected.** This species may pass through the Study Area but because the Study Area is located in a somewhat developed area and is not near cliffs, rolling hills, or other preferred habitat types, golden eagle is not expected to occur. There are no documented occurrences of this species within 5 miles of the Study Area.
Athene cunicularia burrowing owl	--/--/SSC	Occurs in a variety of open habitats; typically grasslands, desert scrub, agricultural fields, washes, and disturbed areas such as golf courses or vacant lots. Burrows, perch sites, and friable soil are necessary for this species, and areas with low-lying, sparse vegetation are preferred. May utilize culverts, abandoned pipes, rubble piles, and other manmade structures for nesting if burrows are absent.	**May occur.** The Study Area contains suitable grassland habitat; however, suitable burrows and other structures suitable for burrowing were not observed and the soil within the Study Area is mostly clay-like and does not appear very friable. Additionally, the Study Area appears to be regularly tilled and mowed further decreasing the likelihood this species may occur. There are ten documented occurrences within 5 miles of the

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
			Study Area (CDFW 2023).
Buteo regalis ferruginous hawk	--/--/WL	A winter resident in California that occurs in open habitats such as grasslands, shrub-steppes, sagebrush, deserts, and outer edges of pinyon-pine and other coniferous forest habitats. Not known to breed in California.	**Not expected.** This species may pass through the Study Area as a winter migrant, but breeding will not occur. There is one documented occurrence of this species within 5 miles of the Study Area (CDFW 2023).
Buteo swainsoni Swainson's hawk	--/ST/--	Swainson's hawks usually arrive in the Central Valley between March 1 and April 1 and migrate south between September and October. Found in a variety of habitats including grasslands, agricultural areas, and open woodlands. Often nests peripherally to riparian systems or other aquatic habitats. Nests in mature lone trees or groves of mature trees in agricultural fields, residential trees, or roadside trees when aquatic habitat is absent. Prefers nest sites adjacent to open areas suitable for foraging. Fremont cottonwood, walnut, and willow, at least 30 feet in height, are the most commonly used nest trees in the Central Valley.	**High.** Suitable foraging habitat is present within the Study Area and this species may nest in trees within or adjacent to the Study Area. There are dozens of documented occurrences within 5 miles of the Study Area (CDFW 2023).
Coccyzus americanus occidentalis western yellow-billed cuckoo	FT/SE/--	Occurs in large, dense riparian habitats, particularly cottonwood-willow riparian complexes. Studies in Sacramento have found nesting yellow-billed cuckoos occupied habitats of 25 acres or more of riparian habitat, with 99 acres being the average habitat size (USFWS 2017b).	**Will not occur.** Suitable riparian habitat does not occur in or near the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
Elanus leucurus white-tailed kite	--/FP/--	Occurs in a variety of habitats including grassland, agricultural, oak woodland, riparian woodland, and open suburban areas. Nests in trees often near aquatic habitats. Foraging occurs within un-grazed or lightly-grazed fields, agricultural areas, and open grasslands.	**High.** Suitable foraging habitat is present within the Study Area and this species may nest in trees within or adjacent to the Study Area. Two documented occurrence within 5 miles of the Study Area (CDFW 2023).
Falco columbarius merlin	--/--/WL	An uncommon winter resident of California that occurs in open and semi-open habitats including estuaries, Great Basin grassland, and valley and foothill grasslands. This species does not breed within California.	**Not expected.** This species could occur in the Study Area during winter, but nesting will not occur. Because merlin is an uncommon winter resident, it is not expected to occur. Five documented occurrences within 5 miles of the Study Area (CDFW 2023).
Laterallus jamaicensis coturniculus California black rail	--/ST/--	Occurs in marsh habitats, typically saltwater or brackish marshes that border bays. However, small, isolated populations are known from the Sierra Nevada foothills. Requires shallow permanent water within the marsh and dense vegetation.	**Will not occur.** Suitable marsh habitat does not occur in the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.
Melospiza melodia song sparrow (Modesto population)	--/--/SSC	Occurs marsh habitats of the Central Valley with emergent vegetation, riparian forests, and open oak woodlands near water. Most often found in habitats with dense vegetation cover for nesting, semi-open canopies, exposed ground or leaf litter, and a water source.	**Not expected.** This species may pass through the Study Area but because suitable marsh habitat is absent from the Study Area, it is not expected to occur. There are two documented occurrences of this species within 5 miles of the Study Area (CDFW 2023).

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
Nannopterum auritum double-crested cormorant	--/--/WL	Occurs near water in riparian habitats. Colonial nester on coastal cliffs, offshore islands, and along lake margins in the interior of the state.	**Will not occur.** Suitable riparian habitat and suitable nesting habitat do not occur in the Study Area. There are two documented occurrences of this species within 5 miles of the Study Area (CDFW 2023).
Progne subis purple martin	--/--/SSC	Uncommon California migrant that breeds in low to mid-elevation wooded habitats. Common habitat types include oak woodland, coniferous forest, riparian woodland, and suburban areas. Typically nests within an abandon woodpecker cavity in a tall, isolated tree.	**Not expected.** This species may pass through the Study area but because it is an uncommon winter migrant, it is not expected to occur. There are no documented occurrences of this species within 5 miles of the Study Area.
Riparia riparia bank swallow	--/ST/--	Locally common California breeding resident that occurs in open areas near water. This species nests along cliff edges, banks, bluffs, and similar features. Friable soil and tall, vertical edges are necessary for nesting. Often nests in large colonies along rivers.	**Not expected.** This species may pass through the Study Area but because suitable breeding habitat does not occur in or near the Study Area it is not expected to occur. There are no documented occurrences of this species within 5 miles of the Study Area.
Vireo bellii pusillus least Bell's vireo	FE/SE/--	Typically found in structurally diverse riparian habitats such as cottonwood-willow forests, oak woodlands, and mule fat scrub in southern California. Nests in dense riparian vegetation close to the ground. This species winters in arroyos that contain mesquite scrub habitat and are not limited to willow dominated habitats.	**Will not occur.** Suitable riparian habitat and other suitable habitat types do not occur in the Study Area. There are no documented occurrences of this species within 5 miles of the Study Area.

Scientific Name/ Common Name[1]	Status[2]	Habitat, Ecology and Life History	Potential to Occur[3]
Xanthocephalus xanthocephalus yellow-headed blackbird	--/--/SSC	Occurs in wetlands, prairies, mountain meadows, and other habitats near water. Nesting occurs over water in habitats with abundant cattails, bulrushes, or reeds. Foraging habitat consists of grassland, cropland or savanna habitat adjacent to nesting sites.	**Not expected.** This species may pass though the Study Area but because suitable wet habitats do not occur in or adjacent to the Study Area, it is not expected to occur. There are no documented occurrences of this species within 5 miles of the Study Area.
Mammals			
Taxidea taxus American badger	--/--/SSC	Occurs in a variety of dry, open habitats including grasslands, open woodlands, shrublands, and open chaparral. Large open spaces with habitat connectivity are required. Loose, friable soil is also required for this species to dig den sites.	**Not expected.** This species may pass through the Study Area, but suitable burrows were not observed and the Study Area is located in a fairly developed area. There are no documented occurrences of this species within 5 miles of the Study Area.

[1] Sensitive species reported in CNDDB or CNPS on the "*Sacramento West, Sacramento East, Carmichael, Clarksburg, Elk Grove, Courtland, Bruceville, Galt*, and *Florin*" USGS quads, or in USFWS lists for the project site.

[2] Status is as follows: Federal (ESA) listing/State (CESA) listing/other CDFW status or CRPR. F = Federal; S = State of California; E = Endangered; T = Threatened; C = Candidate; R = Rare; FP=Fully Protected; SSC=Species of Special Concern; WL=Watch List.

[3] Status in the Project site is assessed as follows. **Will Not Occur**: Species is either sessile (i.e., plants) or so limited to a particular habitat that it cannot disperse on its own and/or habitat suitable for its establishment and survival does not occur on the project site; **Not Expected**: Species moves freely and might disperse through or across the project site, but suitable habitat for residence or breeding does not occur on the project site, potential for an individual of the species to disperse through or forage in the site cannot be excluded with 100% certainty; **Presumed Absent:** Habitat suitable for residence and breeding occurs on the project site; however, focused surveys conducted for the current project were negative; **May Occur**: Species was not observed on the site and breeding habitat is not present but the species has the potential to utilize the site for dispersal, **High**: Habitat suitable for residence and breeding occurs on the project site and the species has been recorded recently on or near the project site, but was not observed during surveys for the current project; **Present**: The species was observed during biological surveys for the current project and is assumed to occupy the project site or utilize the project site during some portion of its life cycle.

CRPR = California Rare Plant Rank: 1B – rare, threatened, or endangered in California and elsewhere; 2B – rare, threatened, or endangered in California but more common elsewhere. Extension codes: .1 – seriously endangered; .2 – moderately endangered.

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Appendix C

Plant and Wildlife Species Observed in the Study Area

Table C-1. Plant Species

Family	Species Name	Common Name	Status[1]
Native			
Apiaceae	*Eryngium aristulatum* var. *aristulatum*	coyote thistle	-
Apocynaceae	*Asclepias fascicularis*	narrowleaf milkweed	-
Asteraceae	*Achyrachaena mollis*	blow wives	-
	Centromadia fitchii	spikeweed	-
	Erigeron canadensis	Canada horseweed	-
	Hemizonia congesta subsp. *luzulifolia*	woodrush tarweed	-
	Holocarpha virgata	narrow tarplant	-
	Lasthenia glaberrima	smooth goldfields	-
	Matricaria discoidea	pineapple weed	-
	Psilocarphus brevissimus var. brevissimus	dwarf woollyheads	-
	Xanthium strumarium	cocklebur	-
Boraginaceae	*Plagiobothrys stipitatus* var. *micranthus*	stalked popcornflower	-
Campanulaceae	*Downingia bicornuta* var. *picta*	doublehorn calicoflower	-
Cyperaceae	*Eleocharis macrostachya*	common spikerush	-
Euphorbiaceae	*Croton setiger*	turkey-mullein	-
Fagaceae	*Quercus agrifolia*	coast live oak	-
	Quercus lobata	valley oak	-
Juncaceae	*Juncus bufonius*	toad rush	-
Juncaginaceae	*Triglochin scilloides*	flowering-quillwort	-
Marsileaceae	*Pilularia americana*	pillwort	-
Montiaceae	*Montia fontana*	water chickweed	-
Onagraceae	*Epilobium ciliatum*	fringed willowherb	-
	Epilobium densiflorum	denseflower willowherb	-
Plantaginaceae	*Gratiola ebracteata*	bractless hedge-hyssop	
	Veronica peregrina ssp. *xalapensis*	purslane speedwell	-
Poaceae	*Alopecurus saccatus*	pacific foxtail	-
	Deschampsia danthonioides	annual hair grass	-
Ranunculaceae	*Ranunculus bonariensis* var. *trisepalus*	Carter's buttercup	-
	Ranunculus californicus	California buttercup	-
Salicaceae	*Populus fremontii*	Fremont's cottonwood	-
Themidaceae	*Brodiaea elegans* ssp. *elegans*	harvest brodiaea	-
Verbenaceae	*Phyla nodiflora*	turkey tangle frogfruit	-
Non-native			
Asteraceae	*Anthemis cotula*	mayweed	-
	Carduus pycnocephalus	Italian thistle	Moderate
	Centaurea solstitialis	yellow starthistle	High
	Cichorium intybus	chicory	-
	Dittrichia graveolens	stinkwort	Moderate
	Hypochaeris radicata	rough cat's-ear	Moderate
	Lactuca serriola	prickly lettuce	-
	Leontodon saxatilis	hawkbit	-
	Pseudognaphalium luteoalbum	Jersey cudweed	-
	Senecio vulgaris	common groundsel	-
	Silybum marianum	milk thistle	Limited
	Sonchus asper ssp. *asper*	prickly sow thistle	-
	Tragopogon porrifolius	salsify	-

Family	Species Name	Common Name	Status[1]
Brassicaceae	*Brassica nigra*	black mustard	Moderate
	Lepidium latifolium	perennial pepperweed	High
	Raphanus sativus	wild radish	Limited
Caryophyllaceae	*Spergularia rubra*	red sandspurry	-
Chenopodiaceae	*Salsola tragus*	opposite leaf Russian thistle	High
Convolvulaceae	*Convolvulus arvensis*	field bindweed	-
Crassulaceae	*Crassula tillaea*	Mediterranean pygmy weed	-
Euphorbiaceae	*Triadica sebifera*	Chinese tallowtree	Moderate
Fabaceae	*Medicago polymorpha*	California burclover	Limited
	Trifolium dubium	shamrock	-
	Trifolium hirtum	rose clover	Limited
	Vicia sativa	spring vetch	-
Geraniaceae	*Erodium cicutarium*	red stemmed filaree	Limited
	Geranium dissectum	wild geranium	Limited
Hypericaceae	*Hypericum perforatum*	common St. Johnswort	Moderate
Lythraceae	*Lythrum hyssopifolia*	hyssop loosestrife	Limited
Malvaceae	*Malva parviflora*	cheeseweed	-
Myrsinaceae	*Lysimachia arvensis*	scarlet pimpernel	-
Pinaceae	*Pinus canariensis*	Canary Island pine	-
Plantaginaceae	*Plantago lanceolata*	English plantain	Limited
Poaceae	*Avena barbata*	slim oats	Moderate
	Avena fatua	wild oat	Moderate
	Briza minor	little rattlesnake grass	-
	Bromus diandrus	ripgut brome	Moderate
	Bromus hordeaceus	soft chess	Limited
	Cynodon dactylon	Bermudagrass	Moderate
	Festuca myorus	rattail sixweeks grass	Moderate
	Festuca perennis	Italian ryegrass	Moderate
	Hordeum marinum	Mediterranean barley	Moderate
	Hordeum murinum	foxtail barley	Moderate
	Phalaris aquatica	Harding grass	Moderate
	Sorghum halepense	Johnsongrass	-
Polygonaceae	*Rumex crispus*	curly dock	Moderate
	Rumex pulcher	fiddle dock	-
Ranunculaceae	*Ranunculus arvensis*	Field buttercup	-
Rosaceae	*Pyrus calleryana*	callery pear	-
	Rubus armeniacus	Himalayan blackberry	High
Tamaricaceae	*Tamarix parviflora*	smallflower tamarisk	-

[1] Status of native species is federal listing/state listing/California Rare Plant Rank; Status for non-native species is California Invasive Species Council invasiveness rating.

Table C-2. Wildlife Species

Order/Family	Species Name	Common Name	Status[1]
Birds			
Accipitriformes			
Accipitridae	*Buteo lineatus*	Red-shouldered hawk	--
Cathartidae	*Carthartes aura*	Turkey vulture	--
Columbiformes			
Columbidae	*Zenaida macroura*	Mourning dove	--
Passeriformes			
Corvidae	*Aphelocoma californica*	Western scrub jay	--
	Corvus brachyrhynchus	American crow	--
Mammals			
Lagomorpha			
Leporidae	*Lepus californicus*	Black-tailed jackrabbit	--
Reptiles			
Squamata			
Iguanidae	*Sceloporus occidentalis*	Western fence lizard	--

[1] Status for animal species is ESA/CESA listing or other sensitivity.

Appendix D

Representative Photographs

Photo 1. Representative view of the non-native annual grassland looking south. Photo taken on 9/28/2022.

Photo 2. Representative view of the non-native annual grassland and seasonal wetland looking southwest. Note that the seasonal wetland is located at the base of the slope. Photo taken on 9/28/2022.

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HELIX Environmental Planning

Representative Photographs

Photo 3. Representative view of the roadside ditch that parallels Dunisch Road looking east. Photo taken on 9/28/2022.

Photo 4. Representative view of the non-native annual grassland looking west. Photo taken on 9/28/2022.

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Photo 5. Representative view of the windrow of landscape trees that follow the southern boundary of the Study Area. Photo taken on 9/28/2022.

Photo 6. Representative view of the seasonal wetland in the southern portion of the Study Area (darker-colored vegetation). Photo taken on 9/28/2022.

Photo 7. Representative view of the typical hydric soils found in the seasonal wetlands within the Study Area. Photo taken on 9/28/2022.

Photo 8. Representative view of the ruderal/disturbed community in the western portion of the Study Area. Photo taken on 9/28/2022.

Appendix E

CalTLC Arborist Report & Tree Inventory

September 12, 2022

Pappas Investments
Attn: Thad Johnson
555 University Ave, Suite 200
Sacramento, CA 95825
Email: thad@pappasinvestments.com

ARBORIST REPORT & TREE INVENTORY

RE: Dunisch Road Project Site, APN#'s 116-0050-027, -030, -031, -013, -011 & -034, City of Elk Grove Jurisdiction

Summary
Thad Johnson contacted California Tree and Landscape Consulting, Inc. and retained our services to inventory, evaluate, and prepare an arborist report for the purpose of providing tree locations, sizes and conditions for development planning. The project site is located at Dunisch Road and is subject to the jurisdiction of the City of Elk Grove (see Appendix 1 – Tree Location Map).

Ed Stirtz, ISA Certified Arborist #WE-0510A, was on site August 9, 2022 to provide species identification, measurements of diameter and canopy, field condition notes, and arborist ratings. A total of 6 trees were included in the survey. Two (2) off-site were included because they overhang the subject parcel. Three (3) trees are protected under City of Elk Grove tree ordinance.

Table 1 - Tree Inventory Summary

Tree Species	All Trees Surveyed	Landmark Trees	Trees of Local Importance	Secured Trees	Right-of-Way/ City Trees	Trees Offsite[1]
Valley Oak, *Quercus lobata*	3	–	3	-	2	0
Mulberry, Cottonwood, Juniper shrub	3	–		-	0	2
Totals:	**6**	–	**3**	**0**	**2**	**2**

See Appendices for specific information on each tree

[1] CalTLC is not a licensed land surveyor. Tree locations are approximate, and we do not determine tree ownership. Trees which appear to be on another parcel are listed as off-site and treated as the property of that parcel. No evaluation of easement locations, such as required for street tree status, was conducted.

Observations

No improvement or grading plans have been provided to date for this project. This report is an initial report/ tree inventory for development of plans to improve the property.

There are a number of landscape trees planted along the south property boundary which are partially protected by a masonry wall that runs approximately ⅔ of the property line. The remaining, west end of the south property line is fenced with chain link fence fabric. The trees are predominantly Canary Island pine trees ranging in diameter from 8" to 17" and some flowering pear trees, mostly found at the east end of the property line.

Care should be taken when designing the project to avoid root damage to these off-site trees. No trenching or significant (>1') shall occur at the west or south property lines.

Methods

<u>Appendix 2</u> in this report is the detailed inventory of the trees. The following terms will further explain our methods and findings.

A Level 2 – Basic Visual Assessment was performed in accordance with the International Society of Arboriculture's best management practices. This assessment level is limited to the observation of conditions and defects which are readily visible. Additional limiting factors, such as blackberries, poison oak, and/or debris piled at the base of a tree can inhibit the visual assessment.

<u>Tree Location</u>: The GPS location of each tree was collected using the ESRI's ArcGIS collector application on an Apple iPhone or Samsung. The data was then processed in ESRI's ArcMap by Julie McNamara, M.S. GISci, to produce the tree location map.

<u>Tree Measurements</u>: DBH (diameter breast high) is normally measured at 4'6" (above the average ground height for "Urban Forestry"), but if that varies then the location where it is measured is noted. A steel diameter tape was used to measure the DBH for all trees. A Stanley laser distance meter was used to measure distances and/or pacing was used to estimate canopy measurements. Canopy radius measurements may also have been estimated due to obstructions, such as steep slopes or other trees.

Terms

Field Tag #	The pre-stamped tree number on the tag which is installed at approximately 6 feet above ground level on the north side of the tree.
Old Tag #	If additional field tags are found on the trees and are legible, they are listed here.
Species	The species of a tree is listed by our local and correct common name and botanical name by genus (capitalized) and species (lower case). Oaks frequently cross-pollinate and hybridize, but the identification is towards the strongest characteristics.
DBH	Diameter breast high' is normally measured at 4'6" (above the average ground height for "Urban Forestry"), but if that varies then the location where it is measured is noted in the next column "measured at"
Measured at	Height above average ground level where the measurement of DBH was taken
Canopy radius	The farthest extent of the crown composed of leaves and small twigs. Most trees are not evenly balanced. This measurement represents the longest extension from the trunk to the outer canopy. The dripline measurement is from the center point of the tree and is shown on the Tree Location Map as a circle. This measurement can further define a protection zone if specified in the local ordinance as such or can indicate if pruning may be required for development.

Protected Root Zone	The radius of the protected root zone is a circle equal to the trunk diameter inches converted to feet and factored by tree age, condition and health pursuant to the industry standard. Best Management Practices: Managing Trees During Construction, the companion publication to the Approved American National Standard, provides guidance regarding minimum tree root protection zones for long term survival. In instances where a tree is multi-stemmed the protected root zone is equal to the extrapolated diameter (sum of the area of each stem converted to a single stem) factored by tree age, condition and health.
Arborist Rating	Subjective to condition and is based on both the health and structure of the tree. All of the trees were rated for condition, per the recognized national standard as set up by the Council of Tree and Landscape Appraisers and the International Society of Arboriculture (ISA) on a numeric scale of 5 (being the highest) to 0 (the worst condition, dead) as in Chart A. The rating was done in the field at the time of the measuring and inspection.

No problem(s)	Excellent	**5**	No problems found from a visual ground inspection. Structurally, these trees have properly spaced branches and near perfect
No apparent problem(s)	Good or Fair to Good	**4**	The tree is in good condition and there are no apparent problems that a Certified Arborist can see from a visual ground inspection. If potential structural or health problems are tended to at this stage future hazard can be reduced and more serious health problems can be averted.
Minor problem(s)	Fair	**3**	The tree is in fair condition. There are some minor structural or health problems that pose no immediate danger. When the recommended actions in an arborist report are completed correctly the defect(s) can be minimized or eliminated and/or health can be improved.
Major or uncorrectable problems (2)	Fair to Poor	**2**	The tree has major problems. If the option is taken to preserve the tree, additional evaluation to identify if health or structure can be improved with correct arboricultural work including, but not limited to: pruning, cabling, bracing, bolting, guying, spraying, mistletoe removal, vertical mulching, fertilization, etc. Additionally, risk should be evaluated as a tree rated 2 may have structural conditions which indicate there is a high likelihood of some type of failure. Tree rated 2 should be removed if these additional evaluations will not be performed.
Extreme problem(s)	Poor	**1**	The problems are extreme. This rating is assigned to a tree that has structural and/or health problems that no amount of work or effort can change. The issues may or may not be considered a dangerous situation.
Dead	Dead	**0**	This indicates the tree has no significant sign of life.

Notes	Provide notable details about each tree which are factors considered in the determination of the tree rating including: (a) condition of root crown and/or roots; (b) condition of trunk; (c) condition of limbs and structure; (d) growth history and twig condition; (e) leaf appearance; and (f) dripline environment. Notes also indicate if the standard tree evaluation procedure was not followed (for example - why dbh may have been measured at a location other than the standard 54"). Additionally, notes will list any evaluation limiting factors such as debris at the base of a tree.
Actions	Recommended actions to increase health and longevity.

Impact Term:	Long Term Result of Impact:
Negligible	Tree is unlikely to show any symptoms. Chance of survival post development is excellent. Impacts to the Protected Root Zone are less than 5%.
Minor	Tree is likely to show minor symptoms. Chance of survival post development is good. Impacts to the Protected Root Zone are less than 15% and species tolerance is good.
Moderate	Tree is likely to show moderate symptoms. Chance of survival post development is fair. Impacts to the Protected Root Zone are less than 35% and species tolerance is good or moderate.
Severe	Tree is likely to show moderate symptoms annually and a pattern of decline. Chance of long-term survival post development is low. Impacts to the Protected Root Zone are up to 50% and species tolerance is moderate to poor.
Critical	Tree is likely to show moderate to severe symptoms annually and a pattern of decline. Chance of long-term survival post development is negligible. Impacts to the Protected Root Zone are up to 80%.

Limitations

All of the conclusions in this report are based solely on the observation of conditions on the site which were readily visible from the ground. Trees may appear to be healthy and structurally sound but can contain hidden faults which could result in failure. Any tree could have had previous failures in the upper canopy which could not be seen adequately from the ground. This tree was evaluated during the dormant season.

RECOMMENDATIONS

The project proposes to remove all onsite trees (3 Valley oaks and 1 Cottonwood). The following recommendations apply to off-site trees to the west and south of the property.

Hire a Project Arborist to help ensure protection measures are incorporated into the site plans and followed. The Project Arborist should, in cooperation with the Engineers and/or Architects:

- The project arborist for this project is California Tree & Landscape Consulting. The primary contact information is Cory Kinley (916) 955-6162. Monitoring and construction oversight by the project arborist is recommended.
- The project arborist should inspect the exclusionary root protection fencing installed by the contractors prior to any construction, grading and/or grubbing for compliance with the recommended protection zones. Additionally, the project arborist shall inspect the fencing at the onset of each phase of construction.
- Clearly show trees for removal on the plans and mark them clearly on site.
- Prior to any grading, or other work on the site that will come within 50’ of any tree to be preserved:

    1. Irrigate (if needed) and place ¼” plywood on top of a 3” layer of chip mulch over the protected root zones.
    2. Erect Tree Protection Fences. Place boards against trees located within 3’ of construction zones, even if fenced off.
    3. Remove lower foliage that may interfere with equipment PRIOR to having grading or other equipment on site. The Project Arborist should approve the extent of foliage elevation, and oversee the pruning, performed by a contractor who is an ISA Certified Arborist.

- Clearly designate an area on the site outside the drip line of all trees where construction materials may be stored, and parking can take place. No materials or parking shall take place within the root zones of protected trees.
- Include on the plans an Arborist inspection schedule to monitor the site during (and after) construction to ensure protection measures are followed and make recommendations for care of the trees on site, as needed.

General Tree protection measures are included as Appendix 3. These measures need to be included on the Site, Grading, Utility and Landscape Plans. A final report of recommendations specific to the plan can be completed as part of, and in conjunction with, the actual plans. This will require the arborist working directly with the engineer and architect for the project. If the above recommendations are followed, the amount of time required by the arborist for the final report should be minimal.

Report Prepared by:

Edwin E. Stirtz, Consulting Arborist
International Society of Arboriculture
Certified Arborist WE-0510A
ISA Tree Risk Assessment Qualified
Member, American Society of Consulting Arborists

Enc: Appendix 1 – Map of the Properties Showing Tree Locations
Appendix 2 – Tree Data
Appendix 3 – General Development Guidelines for All Trees to Remain
Appendix 4 – Site Photographs

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APPENDIX 1 – MAP OF THE PROPERTIES SHOWING TREE LOCATIONS

APPENDIX 2 – TREE DATA

Tag #	Old Tag #	Protected By Code	Offsite	Species Common Name	Species Botanical Name	DBH (in.)	Multi Stem	Measured At (in.)	Measured Canopy Radius (ft.)	Arborist Rating	Dvlpmt Status	Notes
1		No	Yes	Juniper shrub	*Juniperus communis*	0		54	9	3 Fair - Minor Problems		Offsite tree to the property on the westside; trunk not visible. overhangs by 8 feet.
2		No	Yes	Mulberry	*Morus alba 'Fruitless'*	28		54	15	2 Major Structure or Health Problems		Offsite to the west a root collar is 3 feet from the fence line tree has been crown reduced or pollarded so there is only 10 feet of overhang.
2484	8	Yes	No	Valley Oak	*Quercus lobata*	33	8,9,10,13,13	54	20	2 Major Structure or Health Problems		The tree situated at the northwest property corner straddling the property earth straddling the fence line. Forks 2 feet above grade into five stems with inclusions in the attachments treatment top for utility line clearance.

2485		Yes	No	Valley Oak	*Quercus lobata*	19		54	17	2 Major Structure or Health Problems		Trees located on the property fence along Dunisch Drive forks 5 feet above grade with severe inclusion. Topped for utility line clearance.
2486		Yes	No	Valley Oak	*Quercus lobata*	17		36	18	2 Major Structure or Health Problems		Three forks 4 feet above grade with moderate to significant inclusion the smaller dominant stem bends east and south.
2487		No	No	Cottonwood	*Populus sp.*	38	11,13,14,19	54	30	2 Major Structure or Health Problems		Tree is located at the southeast property corner adjacent to W. Stockton Blvd. forks 1 to 2 feet above grade with weak attachments heavily weighted to the east towards the street. The masonry wall is 3 feet from the base of the tree.

APPENDIX 3 – GENERAL DEVELOPMENT GUIDELINES FOR ALL TREES TO REMAIN

Definitions

Root zone: The roots of trees grow fairly close to the surface of the soil, and spread out in a radial direction from the trunk of tree. A general rule of thumb is that they spread 2 to 3 times the radius of the canopy, or 1 to 1 ½ times the height of the tree. It is generally accepted that disturbance to root zones should be kept as far as possible from the trunk of a tree.

Inner Bark: The bark on large valley oaks and coast live oaks is quite thick, usually 1" to 2". If the bark is knocked off a tree, the inner bark, or cambial region, is exposed or removed. The cambial zone is the area of tissue responsible for adding new layers to the tree each year, so by removing it, the tree can only grow new tissue from the edges of the wound. In addition, the wood of the tree is exposed to decay fungi, so the trunk present at the time of the injury becomes susceptible to decay. Tree protection measures require that no activities occur which can knock the bark off the trees.

Methods Used in Tree Protection:

No matter how detailed Tree Protection Measures are in the initial Arborist Report, they will not accomplish their stated purpose unless they are applied to individual trees and a Project Arborist is hired to oversee the construction. The Project Arborist should have the ability to enforce the Protection Measures. The Project Arborist should be hired as soon as possible to assist in design and to become familiar with the project. He must be able to read and understand the project drawings and interpret the specifications. He should also have the ability to cooperate with the contractor, incorporating the contractor's ideas on how to accomplish the protection measures, wherever possible. It is advisable for the Project Arborist to be present at the Pre-Bid tour of the site, to answer questions the contractors may have about Tree Protection Measures. This also lets the contractors know how important tree preservation is to the developer.

Root Protection Zone (RPZ): Since in most construction projects it is not possible to protect the entire root zone of a tree, a Root Protection Zone is established for each tree to be preserved. The minimum Root Protection Zone is the area underneath the tree's canopy (out to the dripline, or edge of the canopy), plus 10'. The Project Arborist must approve work within the RPZ.

Irrigate, Fertilize, Mulch: Prior to grading on the site near any tree, the area within the Tree Protection fence should be fertilized with 4 pounds of nitrogen per 1000 square feet, and the fertilizer irrigated in. The irrigation should percolate at least 24 inches into the soil. This should be done no less than 2 weeks prior to grading or other root disturbing activities. After irrigating, cover the RPZ with at least 12" of leaf and twig mulch. Such mulch can be obtained from chipping or grinding the limbs of any trees removed on the site. Acceptable mulches can be obtained from nurseries or other commercial sources. Fibrous or shredded redwood or cedar bark mulch shall not be used anywhere on site.

Fence: Fence around the Root Protection Zone and restrict activity therein to prevent soil compaction by vehicles, foot traffic or material storage. The fenced area shall be off limits to all construction equipment, unless there is express written notification provided by the Project Arborist, and impacts are discussed and mitigated prior to work commencing.

> No storage or cleaning of equipment or materials, or parking of any equipment can take place within the fenced off area, known as the RPZ.
>
> The fence should be highly visible, and stout enough to keep vehicles and other equipment out. I recommend the fence be made of orange plastic protective fencing, kept in place by t-posts set no farther apart than 6'.
>
> In areas of intense impact, a 6' chain link fence is preferred.
>
> In areas with many trees, the RPZ can be fenced as one unit, rather than separately for each tree.

Where tree trunks are within 3’ of the construction area, place 2” by 4” boards vertically against the tree trunks, even if fenced off. Hold the boards in place with wire. Do not nail them directly to the tree. The purpose of the boards is to protect the trunk, should any equipment stray into the RPZ.

Elevate Foliage: Where indicated, remove lower foliage from a tree to prevent limb breakage by equipment. Low foliage can usually be removed without harming the tree, unless more than 25% of the foliage is removed. Branches need to be removed at the anatomically correct location in order to prevent decay organisms from entering the trunk. For this reason, a contractor who is an ISA Certified Arborist should perform all pruning on protected trees.[2]

Expose and Cut Roots: Breaking roots with a backhoe, or crushing them with a grader, causes significant injury, which may subject the roots to decay. Ripping roots may cause them to splinter toward the base of the tree, creating much more injury than a clean cut would make. At any location where the root zone of a tree will be impacted by a trench or a cut (including a cut required for a fill and compaction), the roots shall be exposed with either a backhoe digging radially to the trunk, by hand digging, or by a hydraulic air spade, and then cut cleanly with a sharp instrument, such as chainsaw with a carbide chain. Once the roots are severed, the area behind the cut should be moistened and mulched. A root protection fence should also be erected to protect the remaining roots, if it is not already in place. Further grading or backhoe work required outside the established RPZ can then continue without further protection measures.

Protect Roots in Deeper Trenches: The location of utilities on the site can be very detrimental to trees. Design the project to use as few trenches as possible, and to keep them away from the major trees to be protected. Wherever possible, in areas where trenches will be very deep, consider boring under the roots of the trees, rather than digging the trench through the roots. This technique can be quite useful for utility trenches and pipelines.

Protect Roots in Small Trenches: After all construction is complete on a site, it is not unusual for the landscape contractor to come in and sever a large number of “preserved” roots during the installation of irrigation systems. The Project Arborist must therefore approve the landscape and irrigation plans. The irrigation system needs to be designed so the main lines are located outside the root zone of major trees, and the secondary lines are either laid on the surface (drip systems), or carefully dug with a hydraulic or air spade, and the flexible pipe fed underneath the major roots.

Design the irrigation system so it can slowly apply water (no more than ¼” to ½” of water per hour) over a longer period of time. This allows deep soaking of root zones. The system also needs to accommodate infrequent irrigation settings of once or twice a month, rather than several times a week.

Monitoring Tree Health During and After Construction: The Project Arborist should visit the site at least twice a month during construction to be certain the tree protection measures are being followed, to monitor the health of impacted trees, and make recommendations as to irrigation or other needs. After construction is complete, the arborist should monitor the site monthly for one year and make recommendations for care where needed. If longer term monitoring is required, the arborist should report this to the developer and the planning agency overseeing the project.

[2] International Society of Arboriculture (ISA), maintains a program of Certifying individuals. Each Certified Arborist has a number and must maintain continuing education credits to remain Certified.

APPENDIX 4 – SITE PHOTOGRAPHS

Tree 2486 - Close

Tree 2486 - Distance

South Property Line

Tree 2485

North Property Line Looking East

Northwest Corner Looking South

Northwest Corner Looking South & West

Tree 2484

Tree 2487 – Masonry

South Property Line - Wall

APPENDIX D

RECOMMENDATIONS FOR THE BIOLOGICAL RESOURCES DISCUSSION

Memo

To: Thad Johnson, Pappas Investments

From: Dustin Brown, Sr. Biologist
Sue Lee, Sr. Regulatory Specialist

Date: 8 November 2024

Subject: Recommendations for California Environmental Quality Act Initial Study Biological Resources Discussion and Mitigation Measure Updates

Per agreement among the City of Elk Grove (City), Raney Planning and Management (Raney), and Pappas Investments (Pappas), Madrone has reviewed the draft mitigation measures provided by Raney Planning and Management, Inc. for the Dunisch Residential project (Project) in Elk Grove, California. The draft mitigation measures were based on a Biological Resources Assessment (BRA) prepared by Helix Environmental Planning, Inc. However, Helix is no longer under contract to assist with the Project and since the time Helix prepared the report, Pappas Investments (Applicant) and its consultants have completed additional studies and analysis and recommend some changes to the draft mitigation measures. Note that the analyses utilized to prepare the BRA are accurate and appropriate. However, this memo identifies mitigation measures and associated discussions in the Initial Study (IS) that we believe should be updated to reflect current environmental and/or regulatory conditions. Madrone's recommendations are based on our familiarity with the site and the professional opinion of Dustin Brown, a senior biologist with Madrone.

Item 1: Vernal Pool Fairy Shrimp Discussion and Mitigation Measure

Subsequent to completion of the BRA, the Applicant contracted with Brent Helm to complete wet-season branchiopod surveys of the Project area. Mr. Helm completed these surveys in 2023-24, with negative results. Additionally, dry-season surveys were conducted in June 2023, also with negative results for vernal pool fairy shrimp or other listed vernal pool branchiopods (see Attachment A to this memo for copies of the survey reports). As such, we recommend updating the text in the IS and removing any mitigation measures that address vernal pool fairy shrimp since we know that the site is not occupied by the species or any other special-status vernal pool branchiopod species. We recommend updating the Vernal Pool Fairy Shrimp discussion as follows:

> Because documented occurrences for the species exist within the vicinity of the Project site, protocol level wet-season surveys for vernal pool branchiopods, which include vernal pool fairy shrimp, were conducted by Helm Biological Consulting from December 2023 through April 2024 (Appendix ***[Helm's report]*). No special-status branchiopods were observed during any of the wet-

> season sampling visits. As such, the Project would not affect vernal pool fairy shrimp , and no mitigation is necessary.

We also recommend removing (deleting) the reference to vernal pool fairy shrimp in the conclusion for special-status wildlife and deleting the vernal pool fairy shrimp mitigation measure IV-2.

Item 3: Swainson's Hawk Discussion and Mitigation Measure

The BRA references a Swainson's hawk nesting site record from 1989 that was last updated in 2013, at which time it was unknown whether the nest tree was present any longer. The California Department of Fish and Game (now California Department of Fish and Wildlife [CDFW]) *Staff Report Regarding Mitigation for Impacts to Swainson's Hawks (*Buteo swainsoni*) in the Central Valley of California* (1994 Staff Report) (CDFG 1994) notes that an "active nest" is one used one or more of the last five years. The CDFW California Natural Diversity Database (CNDDB) shows a 2024 record of a nest site approximate 4.2 miles to the northwest (CNDDB Occurrence 2866; CDFW 2024). As such, we recommend updating the Swainson's hawk discussion as follows:

> *The Project site contains suitable foraging habitat for Swainson's hawk, and several trees surrounding the site provide suitable nesting habitat. The closest documented nesting occurrence of the species is approximately 0.24-mile east of the Project site. This nest was documented in 1989, and as of 2013, which is the last time the record was updated, it was unknown whether the nest tree was still present (CDFW 2024). The nearest active nest site (used in one or more of the last five years, per CDFW's definition of an "active" nest) is located approximately 4.2 miles to the northwest, recorded in 2024 (CNDDB Occurrence 2866; CDFW 2024). This nest site is in isolated trees adjacent to agricultural land near the edge of the Sacramento Regional Wastewater Treatment Plan bufferlands. The record indicated nest building only.*

The discussion addresses the loss of foraging habitat for Swainson's hawk, focusing on the City's Swainson's Hawk Impact Mitigation Fee ordinance. While this Project does not meet the criteria for being covered by the ordinance, the City has indicated that the ordinance can be applied via the CEQA process. Because the text currently does not state that the ordinance can be applied to the Project, we recommend a slight modification to the IS text recognizing that utilization of the ordinance is appropriate, as follows:

> *Because the Project site could provide foraging habitat for Swainson's hawk, implementation of the Project could have an adverse effect to Swainson's hawk foraging habitat. In 2003, the City established and adopted Elk Grove Municipal Code Chapter 16.130, Swainson's Hawk Impact Mitigation Fees, which establishes mitigation policies tailored for projects in Elk Grove that have been determined through the CEQA process to result in a "potential significant impact" on Swainson's hawk foraging habitat and are zoned for agricultural use. Chapter 16.130 of the Municipal Code serves as a conservation strategy that is achieved through the selection of appropriate replacement lands and through management of suitable habitat value on those lands in perpetuity. The Project site is not currently zoned for agricultural use and, thus, development of the Project would not trigger a requirement for compliance with the City's Swainson's hawk mitigation ordinance, mentioned above.*

However, the City routinely applies the ordinance to projects that occur on land that is not zoned for agricultural use through the CEQA process.

Additionally, the proposed mitigation measure for Swainson's hawk lacks specificity consistent with the *Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley* (Swainson's Hawk Technical Advisory Committee 2000), which is cited in the mitigation measure. We recommend updating the mitigation measure to reflect the Technical Advisory Committee's timing guidelines and prior mitigation assigned by the City, as follows:

IV-2(a) Prior to the commencement of construction activities during the nesting season for Swanson's hawk (approximately March 1 to September 15), a qualified biologist shall conduct at least two preconstruction surveys for active nests within 0.25-mile of the Project area. If feasible, one survey should occur in period II (March 20 – April 5) and one survey should occur in period III (April 5 – April 20) as indicated in the Recommended Timing and Methodology for Swainson's Hawk Nesting Surveys in California's Central Valley *(Swainson's Hawk Technical Advisory Committee 2000). If the final survey is completed more than 14 days prior to initiation of construction, an additional survey shall be conducted no more than 14 days prior to the start of construction to ensure that nesting has not been initiated within the intervening time. If construction begins prior to or after the period II or III dates, two surveys shall be completed no more than 14 days prior to the start of construction, with the second survey being at least 48 hours following the first survey. If portions of the survey area outside of the Project site are inaccessible for any reason, the qualified biologist shall use binoculars to visually determine whether Swainson's hawk nests occur within the 0.25-mile survey area. A letter report with the pre-construction survey results shall be provided to the City of Elk Grove within 30 days of the final survey. The survey results shall only be valid for the year in which they are conducted.*

If no active Swainson's hawk nests are identified on or within 0.25 mile of the Project site, no further avoidance and minimization measures for Swainson's hawk nesting habitat are required.

If active Swainson's hawk nests are found within 0.25-mile of the area where construction activities will occur, the qualified biologist shall contact the City of Elk Grove within one business day following the pre-construction survey to report the findings and no construction shall commence within 0.25-mile until the qualified biologist prepares a take avoidance plan. For the purposes of this mitigation measure, construction activities are defined to include heavy equipment operation associated with vegetation clearing, grading, construction (use of cranes or draglines, new rock crushing) or other Project-related activities that could cause nest abandonment or forced fledging within 0.25-mile of a nest site between. The take avoidance plan shall be submitted to the City of Elk Grove and CDFW for review, and shall be approved by the City of Elk Grove. Such a plan shall address appropriate construction setbacks (no-disturbance buffers), placement of high-visibility construction fencing along the setback boundaries, and monitoring of the nest during construction activities. The qualified biologist shall have the authority to stop construction activities if nesting hawks or young in the nest show signs of distress; if this occurs, construction may not resume until the City of Elk Grove is consulted and the construction setback is increased, the young have fledged or the nest is no longer *active, or other take-avoidance measures are modified to the satisfaction of the qualified biologist. If implementation of take avoidance measures are required, a letter report describing implementation of the take avoidance measures will be submitted to the City of Elk Grove within 30 days of the final monitoring event. No further avoidance and minimization measures for nesting habitat would be required once the qualified biologist determines that the nest is no longer active.*

Item 3: Monarch Mitigation Measure

Monarch butterfly is a candidate for federal listing. As written, the mitigation measure for assumes that the species will be present (utilizing milkweed on-site) and that pre-emptive measures would be required at the improvement plan approval stage. However, we recommend that the mitigation measure be revised to allow for a pre-construction survey for monarch life cycle stages that rely on milkweed (adults laying eggs, eggs, larvae, and sometimes chrysalis) and then application of protection measures should any of the life cycle stages be present.

IV-1 *If construction activities would directly or indirectly impact milkweed plants, the host plant for monarch butterfly, during the summer breeding season (approximately March 15 through October 31), pre-construction surveys for monarch eggs, larvae, and/or chrysalis shall be required. The surveys shall include the project impact area and any areas of milkweed habitat within 25 feet and shall be conducted by a qualified biologist no more than seven days prior to the onset of construction activity. If no monarch eggs, larvae, and/or chrysalis are identified utilizing milkweed within the survey area, no further mitigation is required. If monarch eggs, larvae, and/or chrysalis are identified utilizing milkweed in the survey area, then a 25-foot no-disturbance buffer from the occupied plant(s) shall be implemented. Occupied milkweed plants shall be checked at least once per week until it is confirmed that the plants are no longer being utilized by eggs, larvae, and/or chrysalis. The no-disturbance buffer may be removed once a qualified biologist confirms that the plant(s) are no longer being utilized. If an occupied plant must be removed, consultation with U.S. Fish and Wildlife Service may be necessary if the Project activities will impact occupied monarch larval host plant habitat.*

The results of the pre-construction survey and weekly monitoring (if required) shall be submitted to the City's Development Services Department for review.

Note that natural predation and failure at any of the pre-adult stages is common (typically less than 10% of eggs make it to the adult stage), and the best way to prevent potential take related to a project is to provide protection of occupied plants, as outlined in the above recommended update to the mitigation measure. Because the Project will require issuance of a Clean Water Act Section 404 permit, we anticipate that the U.S. Army Corps of Engineers (USACE) will determine whether it needs to consult with the U.S. Fish and Wildlife Service (USFWS) regarding the potential for adverse effects to this other federally-listed species.

Item 3: Burrowing Owl

Since the time the BRA was prepared, the California Fish and Game Commission named the burrowing owl as a candidate for potential listing under the California Endangered Species Act (CESA). We have had informal discussions with CDFW regarding how this change in status affects mitigation approaches that have historically been used. In the past, exclusion/passive relocation during the non-breeding season (September through January) was conditionally allowed as long as such activity followed CDFW's mitigation guidelines for the species. However, CDFW has indicated that with the change in status, exclusion/passive relocation of an active burrow during the non-breeding season would require an incidental take permit under CESA. As such, the description of burrowing owl and the burrowing owl mitigation measure need to be updated to reflect the change.

We recommend the following modification to the IS text description of burrowing owl:

> *Burrowing owl is a candidate for listing under the California Endangered Species Act and a State Species of Special Concern as designated by the CDFW. Burrowing owl generally occurs in a variety of open, arid habitats; typically grasslands, desert scrub, agricultural fields, washes, and disturbed areas such as golf courses or vacant lots. Burrows, perch sites, and friable soil are vital habitat components for the species, and habitats with low-lying, sparse vegetation are preferred. Ground squirrel burrows and other fossorial mammal burrows are typically used for nesting and as year-round refuge sites. The species may also utilize culverts, abandoned pipes, rubble piles, and other manmade structures if burrows are absent. The breeding season for burrowing owls is from February to August.*

In addition to updating the mitigation measure to reflect the species' status change, it also needs to be updated to include detail about what to do in the event an active burrow is located. In this regard, we recommend updating the measure to reflect the current approach taken by recent CDFW streambed alteration agreements in the valley, by the South Sacramento Habitat Conservation Plan, and as consistent with mitigation assigned for other projects in the City of Elk Grove, as follows:

IV-3 (a) If construction is scheduled begin during the non-breeding season (late September through the end of January) for burrowing owl, a qualified biologist shall conduct a survey for burrowing owls and burrows or debris that represent suitable nesting or refugia habitat for burrowing owls within areas of proposed ground disturbance. Should owls be present, construction activities shall avoid the refugia by 250 feet until the burrowing owl vacates the site. If burrow exclusion/passive relocation is required during the non-breeding season, the Project applicant shall consult with the California Department of Fish and Wildlife pursuant to Fish and Game Code 2081. Avoidance and minimization measures prescribed as part of the consultation process would include recommendations provided in the California Department of Fish and Wildlife's Staff Report on Burrowing Owl Mitigation *(2012). Survey results shall only be valid for the year in which they are conducted.*

If clearing and construction activities are planned to occur during the nesting period for burrowing owls (February 1–August 31), a qualified biologist shall conduct a targeted burrowing owl nest survey of all accessible areas within 500 feet of the proposed construction area no more than 14 days prior to construction initiation, as described in the California Department of Fish and Wildlife's Staff Report on Burrowing Owl Mitigation *(2012). Surveys shall be repeated if Project activities are suspended or delayed for more than 14 days during nesting season. The results of the surveys shall be submitted to* *the Development Services Department. If burrowing owls are not detected, further mitigation is not required. Survey results shall only be valid for the year in which they are conducted.*

If an active burrowing owl nest burrow (i.e., occupied by more than one adult owl, and/or juvenile owls are observed) is found within 250 feet of a construction area, construction shall cease within 250 feet of the active burrow until a qualified biologist determines that the young have fledged and adult has vacated, or it is determined that the nesting attempt has failed. If the applicant desires to work within 250 feet of the nest burrow, a qualified biologist shall make recommendations on an appropriate buffer and consult with the City and CDFW to determine whether and/or how the nest buffer can be reduced.

A letter report with the pre-construction survey results shall be provided to the City of Elk Grove within 30 days.

IV-3(b) If nesting burrowing owls are found during the pre-construction survey, mitigation for the permanent loss of burrowing owl foraging habitat (defined as all areas of suitable habitat within 250 feet of the active burrow) shall be accomplished at a 1:1 ratio or at a ratio acceptable to the City. The mitigation provided shall be consistent with recommendations in the CDFW Staff Report on Burrowing Owl Mitigation *and may be accomplished within the Swainson's hawk foraging habitat mitigation area for the Project if burrowing owls have been documented utilizing that area, or if the qualified biologist, the City, and CDFW collectively determine that the mitigation strategy is suitable for both species.*

Item 4: Nesting Migratory Birds and Raptors

As written, the mitigation measure for nesting migratory birds and raptors presents inconsistent dates for the nesting season and does not provide detailed guidance on exclusionary buffers. Based on comments received from City representatives, we recommend updating the mitigation measure as follows:

IV-4(a). If vegetation clearing, grading and/or construction activities are planned to occur during the migratory bird nesting season (February 1 to August 31), a preconstruction survey to identify active migratory bird nests shall be conducted by a qualified biologist within three days prior to construction initiation. The survey shall be performed by a qualified biologist for the purposes of determining presence/absence of active nest sites within a 500-foot radius of proposed construction areas. If portions of the survey area outside of the Project site are inaccessible for any reason, the qualified biologist shall use binoculars to scan visible potential habitat within the survey area. If a break in construction activity of more than two weeks occurs within the breeding season, then another survey shall be conducted prior to the resumption of work.

IV-4(b) No-disturbance buffers shall be established around active nests. Buffer distances shall be based site conditions, each avian species, and the species' degree of acclimation to disturbance, as determined by a qualified biologist. The no-disturbance buffers may be reduced if a smaller buffer is proposed by the qualified biologist and approved by the City after taking into consideration the natural history of the species of bird nesting, the proposed activity level adjacent to the nest, habituation to existing or *ongoing activity, and nest concealment (are there visual or acoustic barriers between the proposed activity and the nest). The qualified biologist shall visit the nest as needed to determine when the young have fledged the nest and are independent of the site, or until the qualified biologist determines that the nest is no longer active.*

Should construction activities cause a nesting bird to vocalize, make defensive flights at intruders, get up from a brooding position, or fly off the nest in a way that would be considered a result of construction activities, then the exclusionary buffer shall be increased such that activities are far enough from the nest to stop the agitated behavior, or as otherwise required through consultation with CDFW and the City. The exclusionary buffer shall remain in place until the chicks have fledged or as otherwise determined by a qualified biologist. Construction activities may only resume within the buffer zone after a follow-up survey by the qualified biologist has been conducted and a report indicating that the nest(s) are no longer active, and that new nests have not been identified has been submitted to the City.

Item 5: Aquatic Resources

At the time the BRA was written, the aquatic resources delineation prepared for the site had not been verified, so the current discussion and mitigation measure do not reflect the USACE jurisdictional determination that was issued on 12 September 2024 (**Attachment B** to this memo). As such we recommend updating the discussion to reflect the verification, as follows:

b,c. *HELIX conducted an aquatic resources delineation within the Project site on April 24, 2023 in accordance with the* Corps of Engineers Wetlands Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region (Version 2.0). *A total of 2.047 acres of aquatic resources were delineated within the Project site, consisting of four seasonal wetlands (2.034 acres) and one wetland ditch (0.013-acre), hereafter referred to as ditch (see Figure 8).*

Seasonal wetlands collect surface runoff from surrounding terrain and are shallow depressions that stay inundated for a long enough duration to form hydric soil and support a dominance of hydrophytic vegetation. As shown in Figure 8, the 2.034 acres of seasonal wetland mapped within the project site consist of four seasonal wetlands. Seasonal Wetland 1 (SW-1), SW-2, and SW-3, located within the southwestern portion of the Project site, are isolated, shallow features that are not hydrologically connected to other aquatic resources. SW-4 consists of the majority of the acreage of seasonal wetland within the central portion of the Project site, is deeper than the other features, and is drained via ditch into a stormwater drainage system that conveys excess water from the site towards Laguna Creek. All of these wetlands would be filled as a result of the Project.

The 0.013-acre ditch mapped within the Project site drains SW-4 into a drop inlet culvert associated with an underground stormwater drainage system. The ditch was classified as an aquatic resource due to it diverting excess water from a seasonal wetland and because it contains hydrophytic vegetation, hydric soils, and wetland hydrology. The ditch would be filled as a result of the Project.

According to the BRA, all of the on-site aquatic resources would be considered waters of the State and, thus, are subject to regulation under the Porter-Cologne Act. Because all of the aforementioned aquatic resources delineated within the Project site lack a continuous surface connection to Traditional Navigable Waters (TNW), tributaries to TNWs, or wetlands adjacent to TNWs, HELIX determined that none of the on-site aquatic resources would be considered waters of the U.S. However, the U.S. Army Corps of Engineers (USACE) issued an approved jurisdictional determination (AJD) for the Project on September 12, 2024. The AJD indicates that the ditch and one seasonal wetland (SW-4 on Figure 8, totaling 1.732 acres) are jurisdictional under the federal Clean Water Act, and that the remaining three seasonal wetlands (SW-1, SW-2, and SW-3 on Figure 8, totaling 0.315 acre) are not federally jurisdictional (they are waters of the State only). As such, the Project would require a Clean Water Act Section 404 authorization from the USACE and Clean Water Act Section 401 water quality certification from the Central Valley Regional Water Quality Control Board (CVRWQCB) for impacts to the ditch and SW-4. Filling the non-federal seasonal wetlands would require a Report of Waste Discharge/Waste Discharge Requirements under Porter-Cologne, issued by the CVRWQCB. Both processes require compensatory mitigation for the fill of aquatic resources. Without the implementation of mitigation, a potentially significant impact related to protected wetlands could occur because the Project would directly involve development within (fill of) the 2.047 acres of on-site aquatic resources.

Based on the above, implementation of the Project could result in impacts related to having a substantial adverse effect on a riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the CDFW or USFWS or related to having a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means. Thus, a potentially significant impact could occur.

We also recommend updating the mitigation to reflect the jurisdictional status of the aquatic resources, as follows (note that with deletion of the vernal pool fairy shrimp mitigation measure, this mitigation measure would require renumbering):

IV-5 Prior to initiation of grading activities, the Applicant shall complete the following to compensate for the loss of 0.013-acre of ditch and 1.719 acres of seasonal wetland, and for the loss of 0.315-acre of seasonal wetland, respectively:

(a) The Applicant shall receive authorization to discharge fill 0.013-acre of ditch and 1.719 acres of seasonal wetland from the U.S. Army Corps of Engineers (USACE)and shall request a Clean Water Act Section 401 water quality certification from the Central Valley Regional Water Quality Control Board (CVRWQCB). The application for Section 401 Water Quality Certification can be a joint application that also requests Waste Discharge Requirements required under item (b). The applicant shall provide mitigation for impacts described in the authorization requests at a ratio of at least 1:1 or as negotiated with the USACE and CVRWQCB. The Applicant shall also comply

with all other provisions of the Section 404 fill authorization and Section 401 Water Quality Certification (e.g., reporting and monitoring requirements, implementation of storm water best management practices).

(b) The Applicant shall submit a Report of Waste Discharge to the CVRWQCB with a request for Waste Discharge Requirements to receive authorization under Porter-Cologne for the fill of the 0.315-acre waters of the state. The application for Section 401 Water Quality Certification described under item (a) can be a joint application that also requests Waste Discharge Requirements. The applicant shall provide mitigation for impacts described in the Report of Waste Discharge/Waste Discharge Requirements at a ratio of at least 1:1 or as negotiated with the CVRWQCB. The Applicant shall also comply with all other provisions of the Waste Discharge Requirements (e.g., reporting and monitoring requirements, implementation of storm water best management practices).

Proof of compensatory mitigation shall be provided to the City of Elk Grove prior to the start of grading activities.

Please contact Sue Lee at slee@madroneeco.com or 916-822-6809 if you have any questions about the information presented in this memo.

Attachment A

Vernal Pool Branchiopod Sampling Reports

PROTOCOL-LEVEL WET-SEASON SAMPLING FOR FEDERALLY-LISTED LARGE BRANCHIOPOD AT THE DUNISCH PROPERTY, ELK GROVE, SACRAMENTO COUNTY, CALIFORNIA

***Prepared for*:**

PAPPAS INVESTMENTS
2020 L Street, 5th Floor235
Sacramento, CA 95811
***Contact*: Thad Johnson**
(916) 447-7112

***Prepared by*:**

HELM BIOLOGICAL CONSULTING
4600 Karchner Road
Sheridan, CA 95681
***Contact*: Dr. Brent Helm**
(916) 952-0308

June 2024

HELM
BIOLOGICAL CONSULTING
A Tansley Team Division
4600 Karchner Rd, Sheridan, CA 95681

PROTOCOL-LEVEL WET-SEASON SAMPLING FOR FEDERALLY-LISTED LARGE BRANCHIOPOD AT THE DUNISCH PROPERTY, ELK GROVE, SACRAMENTO COUNTY, CALIFORNIA

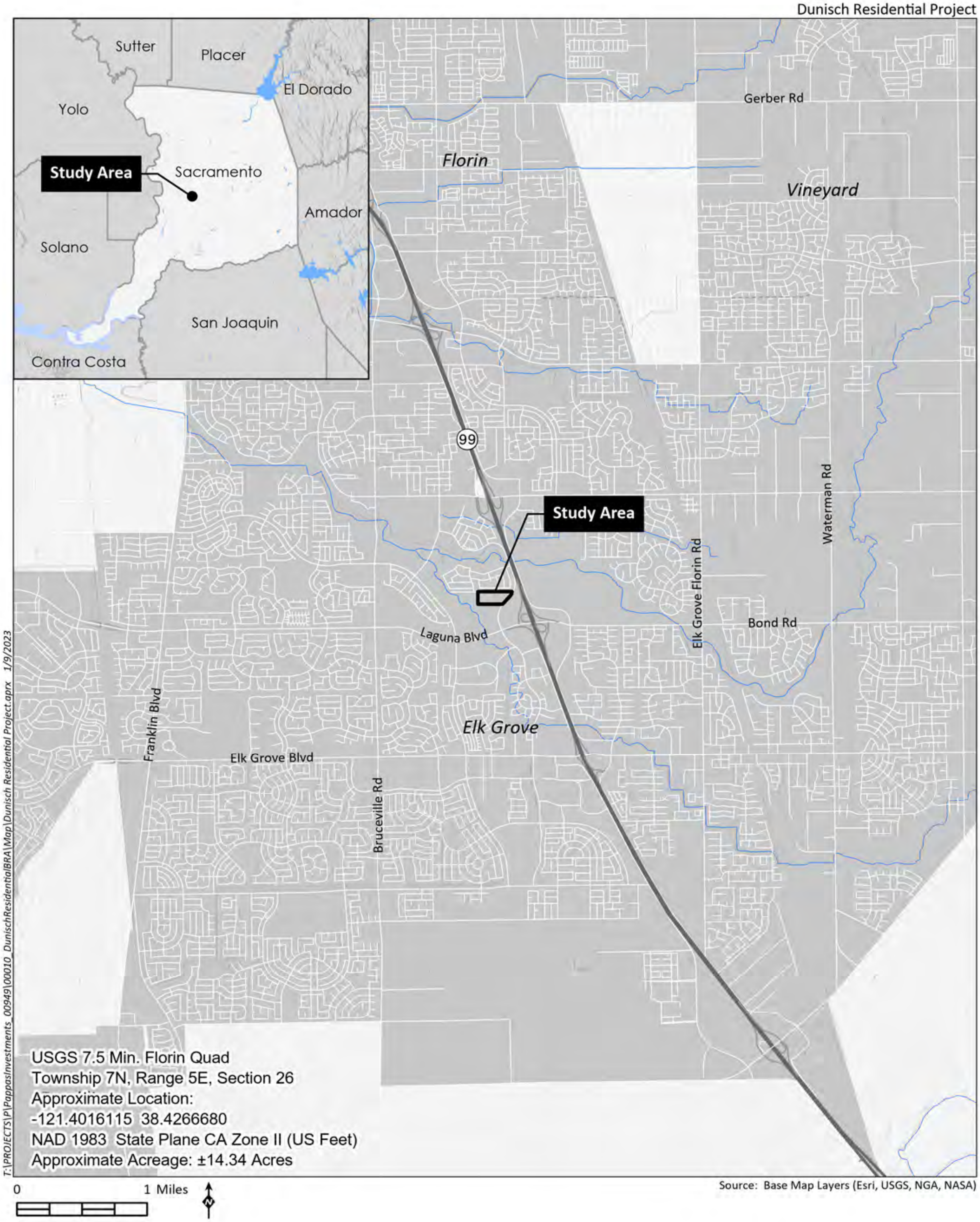
INTRODUCTION

Helm Biological Consulting (HBC), a division of Tansley Team, Inc., was contracted by Pappas Investments to conduct protocol-level wet-season sampling for large branchiopods (fairy shrimp, tadpole shrimp) that are listed as threatened or endangered under the federal Endangered Species Act (e.g., vernal pool fairy shrimp [*Branchinecta lynchi*] and vernal pool tadpole shrimp [*Lepidurus packardi*]) at the Dunisch Property (hereafter "Project").

The Project includes the development of a single-family residential subdivision, drainage improvements, and associated infrastructure located west of Highway 99, north of Laguna Boulevard, southwest of the intersection of West Stockton Boulevard and Dunisch Road, in the City of Elk Grove, Sacramento County, California (Figure 1). As currently proposed, the Project construction of the internal roads will include two access points to the residential subdivision via Dunisch Road. Additionally, the Project is located in the southeast ¼ of the southwest ¼ of Section 26, Township 7 North, Range 5 East, and Mount Diablo Base & Meridian (MDB&M) of the Florin U.S. Geological Survey (USGS) 7.5-minute topographical quadrangle map (approximate center coordinates: World Geodetic System [WGS84] Latitude: 38.426673°, Longitude: -121.401159°) (Figure 2).

"I certify that the information in this survey report and attached exhibits fully and accurately represents my work."

Brent P. Helm Signature________________________ Date 06-14-2023
(TE-795930-12)



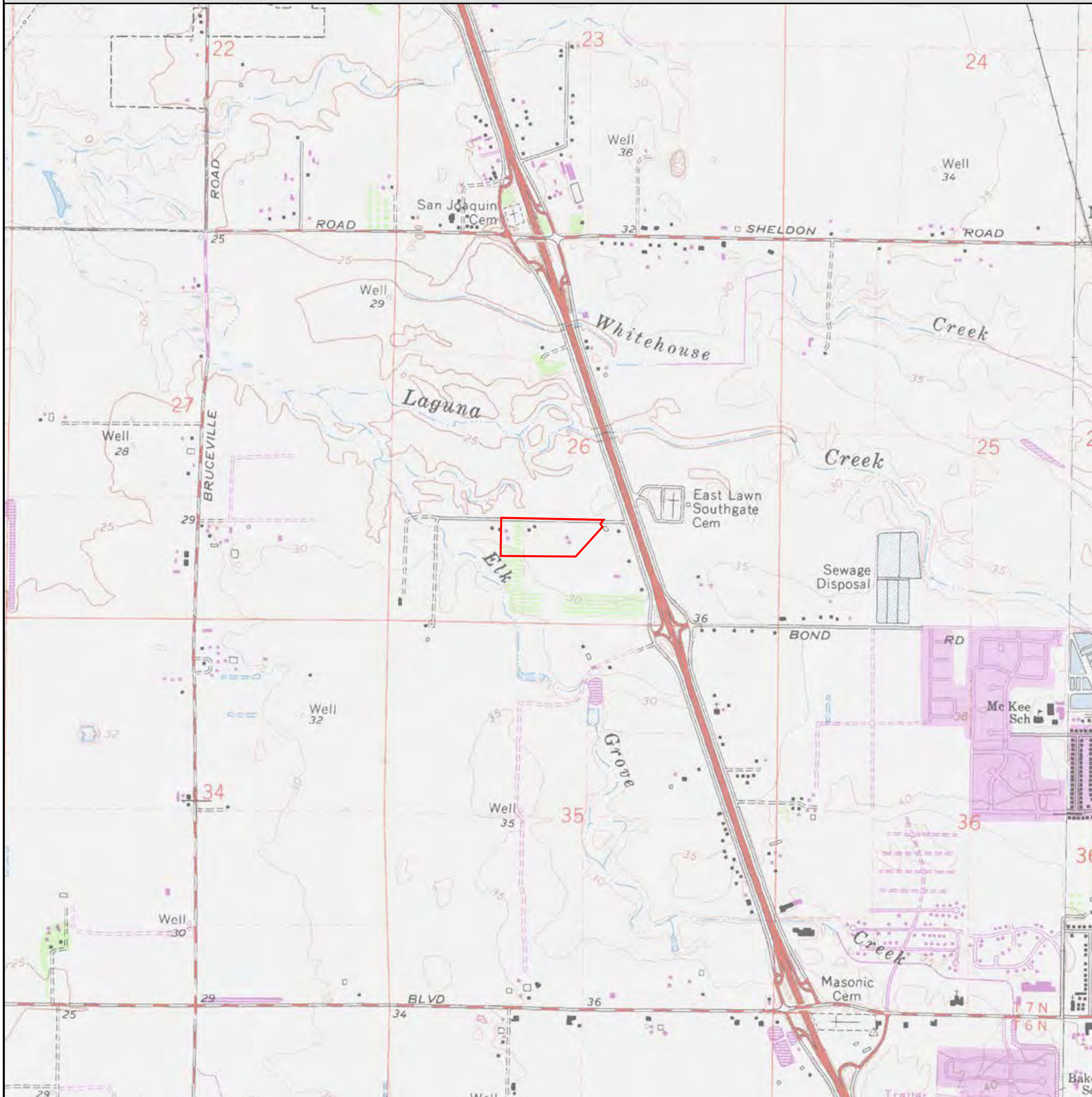
Source: Base Map Layers (Esri, USGS, NGA, NASA)

HELIX Environmental Planning

Site and Vicinity Map

Figure 1

DUNISCH PROPERTY, ELK GROVE, SACRAMENTO COUNTY, CALIFORNIA



Project Area (14.70 acres)

The Project is located within the Florin, CA USGS 7.5-minute quadrangle map.

The Project occurs within the southeast 1/4 of the southwest 1/4 of Section 26 of Township 7 North and Range 5 East, Mt. Diablo Base & Meridian.

Center Coordinates (WGS84) for Project:
Latitude 38.426673, Longitude -121.401159

0 1,000 2,000 Feet

N

Data Source:
USGS The National Map 2021;
ESRI USA Boundaries;
Public Land Survey System

Prepared by:

HELM BIOLOGICAL CONSULTING

Date: 1/31/2023

Figure 2. Project Location on USGS Topographic Quadrangle

METHODS

Dr. Brent Helm and Mr. Zachary Einweck of HBC conducted nine rounds of protocol-level wet-season sampling during the 2023/2024 wet-season as follows:

- 1st round: December 15
- 2nd round: December 29
- 3rd round: January 12
- 4th round: January 26
- 5th round: February 9
- 6th round: February 23
- 7th round: March 8
- 8th round: March 22
- 9th round: April 5

The wet-season sampling was conducted under permit TE-795930-12 of Section 10(a)(1)(A) of the federal Endangered Species Act, 16 U.S.C. 1531 et seq., and its implementing regulations as authorized by the U.S. Fish and Wildlife Service (USFWS) (Appendix A). Methods generally followed USFWS's (2017) *Survey Guidelines for Listed Large Branchiopods* (hereafter "Survey Guidelines") for wet-season sampling.

Wet sampling was conducted in all basins (habitats) at the Project that had potential to support federally-listed large branchiopods. An aquatic resources map (provided by Pappas Investments, Exhibit A), and aerial imagery of the Project obtained from Google Earth©, and other documents provided by the Client were utilized to target appropriate habitats for sampling.

Potential habitat for federally-listed large branchiopods is defined as any seasonal inundated depression that on average ponds water at a sufficient depth and duration for a listed large branchiopod to complete its lifecycle (generally 2.0 inches or greater in depth for 14 or more consecutive days for fairy shrimp and 30 or more consecutive days for tadpole shrimp) (USFWS 2017). Generally, these habitats occur within the California Floristic Province at elevations below 1,707 meters in the Coast Ranges (CNDDB #178) and below 914 meters for the rest of California and Oregon (CNDDB #244) and Oregon (USFWS 2017). Habitats that swiftly flow water (e.g., creeks, streams, and ephemeral drainages), semi-to-permanently inundated areas that support perennial population of predators (e.g., bullfrogs, fish, and crayfish), and habitats that receive water during the dry season (i.e., artificial water sources) were not generally considered suitable habitat for federally-listed large branchiopods (USFWS 2017).

According to USFWS (2017), the Project is within Survey Zone A (Southern Oregon, Sacramento Valley, San Francisco Bay Area, North Coast Ranges, Northern Sierra Valley Foothills, Cascade Range foothills, and South Coast Ranges). Therefore wet-season sampling was initiated 14 days after any of the habitats on site (determined to potential large branchiopod habitat) ponded a minimum of 3 centimeters (cm) of standing water. Specific sampling methods are described below.

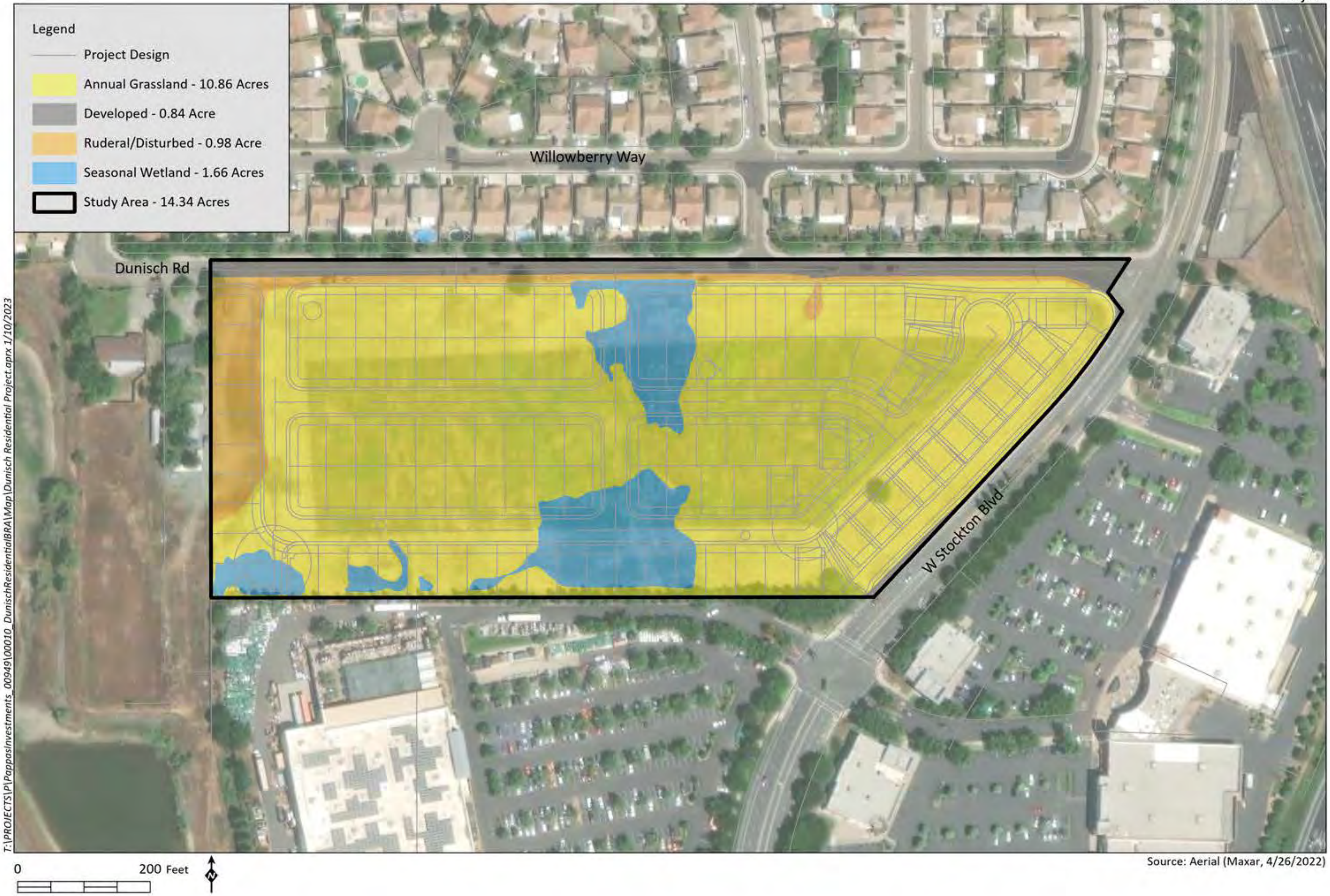
Each habitat was viewed for active large branchiopods prior to entering the water. Any large branchiopods observed were quickly netted, viewed with the aid of a 30x hand lens to determine species, and released unharmed back into the environment from which they were obtained. If no large branchiopods were observed, then a semi-quantitative sample was taken to determine the relative abundance of large branchiopods as follows.

A dip net was lowered vertically into the deepest portion of the inundated habitat (usually the center) and rested on the bottom. The 80-µm mesh size dip net was then moved in the direction of the longest axis of the habitat for approximately one-meter. In instances where half of the habitat length is less than one meter in length, the dip net was repositioned in the deepest portion of the habitat and moved in the opposite direction for the remainder of the one-meter sample. Given the aperture of the dip net of 0.025 m^2 and distance the dip net was moved, roughly 0.025 m^3 or 25 liters of the water column was sampled horizontally each time. In those cases when the water column was shallower than the dip net aperture height, the volume of water per sweep was calculated by the horizontal distance the net is moved multiplied by the width of the dip net (25-cm) multiplied by the depth of water. After the completion of each sample sweep, the contents of the net were examined for large branchiopods. All large branchiopods captured in the dip net were identified to the lowest justifiable taxon in the field, and recorded on standardized data sheets. The relative numbers of individuals observed within each taxonomic group was recorded in one of five categories: rare (≤2 individuals), not common (3-10 individuals), common (11-50 individual), very common (51 -100 individuals), and abundant (>100 individuals). This method allows for the relative abundances and richness of large branchiopods to be compared between and among wetlands through time. Additionally, this method allows for concentration estimates of large branchiopods to be calculated as number of individuals per liter of water (= number of individuals/net aperture area x length of sweep).

If federally-listed large branchiopods were not detected during the semi-quantified sampling method, then the entire habitat was sampled as follows. Starting at one end of the habitat, the net was moved from one side of the habitat to the other in a zigzag fashion, until the opposite end of the habitat was reached. During this procedure, the net was often bounced along the habitat bottom (to encourage large branchiopods to move up into the water column from hiding places for easier capture) and viewed often for evidence of large branchiopods. If still no federally listed large branchiopods were captured, then additional netting took place in specific locations within the habitat that may have not been sampled during prior efforts. Additional taxonomic groups of large branchiopods detected using this alternative method is noted as present by an “X” on the standardized field data sheet. After the taxonomic identification and enumeration were completed, the contents of the net were placed back into the habitat from which they were collected.

Data concerning air and water temperatures, present depths (maximum and average [ft]), present ponding surface area (percent inundation), and habitat conditions were collected during each field visit. The potential depths (maximum and average [ft]) and potential ponding surface area percentage were visually estimated. Additionally, presence and abundance data were recorded for all other aquatic species using the same methods as described above for large branchiopod sampling. Representative photographs were taken of the habitats sampled and species observed.

EXHIBIT A
(HABITAT MAP)



T:\PROJECTS\P\PappasInvestments_00949\00010_DunischResidentialBRA\Map\Dunisch Residential Project.aprx 1/10/2023

Source: Aerial (Maxar, 4/26/2022)

HELIX
Environmental Planning

Habitat Map

Figure 5

RESULTS

A total of five habitats were sampled using wet-season techniques (Exhibit A). Prior to the first site visit (Decenber 15, 2023) three storm events totaling 0.72 inches of rainfall occurred (University of California, Davis Integrated Pest Management daily weather Station at Lodi [UCDIPM.edu] 2024). While steady rainfall occurred through December and January (Table 1) the first inundated pool was not seen until the 5th round of sampling (February 9, 2024) after a nine-day storm resulting in 1.31 inches of rainfall. No large branchiopods were observed onsite during any of the wet-season sampling visits.

Representative photographs of the habitats sampled are provided in Appendix B. Field data forms from each wet-season sampling date are provided in Appendix C.

Table 1. Precipitation (Inches) for the 2023/2024 wet-season near the Dunisch Property*

Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
0.23	0.16	3.24	3.26	1.55	1.41	0.46	0.47	0.00	**10.78**

*Data retreived from University of California, Davis Integrated Pest Management daily weather Station at Lodi

LITERATURE CITED

University of California, Davis Integrated Pest Management. 2024. California Weather Data for Lodi, CA. LODI_WEST.A station. Available online:

U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS). 2017. Survey guidelines for the listed large branchiopods. 24 pp. Dated: 31 May 2015 (Revised November 13, 2017).

APPENDIX A.
USFWS AUTHORIZATION

Gmail

Brent Helm <bhelm@tansleyteam.com>

Survey Authorization #RP-Dunisch Property-2023-0629, Dry VPB

1 message

SFWO Permits, FW8 <FW8_SFWO_Permits@fws.gov> Thu, Jun 29, 2023 at 4:00 PM
To: Brent Helm <bhelm@tansleyteam.com>
Cc: "Cook, Megan T" <megan_cook@fws.gov>

Brent Helm,

By this email message, you are authorized to conduct dry season vernal pool branchiopod surveys, as specified in your June 21, 2023 email request, per the conditions of your recovery permit (795930). Surveys will be conducted in Elk Grove in Sacramento County, CA. Please remember to carry a copy of your permit while doing the work and to follow the terms and conditions therein. This authorization does not include access to the property which must be arranged with the landowner or manager. Please let us know if the activities are not performed as authorized, or if they are done by a different permittee under a separate authorization.

Please send survey reports with the reference #RP-Dunisch Property-2023-0629 to FW8_SFWO_Permits@fws.gov and Sacramento Valley Division Supervisor, Megan Cook (megan_cook@fws.gov). Reports for vernal pool branchiopod surveys are due in 90 days. Reports for all other species are due in 45 days, unless otherwise specified in your permit. Reports should include, at minimum:

1. The reference number to help ensure that we correctly record the fulfillment of the reporting requirement under this authorization,
2. A copy of this authorization email,
3. The names of all persons involved in each activity and their recovery permit numbers, if applicable,
4. A U.S. Geological Survey topographic map (1:24,000 scale or larger scale) depicting the location of the project site, survey area, and location(s) of species in as precise a manner as possible.
5. All other information required in the 45/90 Day Survey Report section of your permit.

Thank you,
Summer

--
10(a)(1)(A) Recovery Permitting
Sacramento Fish and Wildlife Office | USFWS
Pacific Southwest Recovery Permitting
Survey Protocols | Minimum Qualifications

The SFWO is using this consolidated mailbox for all communications regarding 10(a)(1)(A) recovery permits in our jurisdiction. Please send survey notifications, reports, and permit inquiries to this email address: FW8_SFWO_Permits@fws.gov.

APPENDIX B.
REPRESENTATIVE PHOTOGRAPHS

Photograph of Pool 1 facing east taken by Zachary Einweck on December 15, 2023

Photograph of Pool 2 facing south taken by Zachary Einweck on December 15, 2023

Photograph of Pool 3 facing south taken by Zachary Einweck on December 15, 2023

Photograph of Pool 4 facing south taken by Zachary Einweck on December 15, 2023

Photograph of Pool 5 facing southwest taken by Zachary Einweck on December 15, 2023


Photograph of Pool 1 facing north taken by Zachary Einweck on February 23, 2024


Photograph of Pool 2 facing south taken by Zachary Einweck on February 9, 2024


Photograph of Pool 3 facing south taken by Zachary Einweck on February 9, 2024


Photograph of Pool 4 facing south taken by Zachary Einweck on February 9, 2024


Photograph of Pool 5 facing south taken by Zachary Einweck on February 9, 2024

Photograph of Pseudacris found in Pool 1 and Pool 2 taken by Zachary Einweck on February 23, 2024

APPENDIX C.
WET-SEASON FIELD DATA FORMS

Project: Dunisch **Surveyor(s): Brent Helm, Zachary Einweck** **Weather Condition: 80% Cloud Cover, <10mph wind speed**

Date: 1/12/2024 **Time: 10:30 am** **Temperature: 50˚F**

<u>Abundance:</u> **R = Rare (≤2 individuals), NC = Not Common (3-10 individuals), C = Common (11-50 individuals), VC = Very Common (51-100 individuals), A = Abundant (>100 individuals)**

<u>Hydrology:</u> **D = dry, N/P = not ponding, M=moist, S = saturated to surface, I/P = intermittent ponding, X = Present but not observed in 1 meter sample**

<u>LB Redroductive Status:</u> **i = immature, m = mature, g = gravid (with eggs)**

<u>Habitat Condition:</u>

UD = undisturbed, D = disturbed - tt = tire tracks, t = trash, p =plowing

UG = ungrazed, G = grazed - C = cattle, H = horse, S = sheep, l = light grazing, m = moderate grazing, h = heavy grazing

		Present Depth (inches)		Potential Depth (Inches)		Surface Area (ft^2)		Crustacea										Insecta											Mollusca			Turbellaria	Acari	Collembola	Other	Herps			
									Copepods			Large Branchiopods (LB)						Coleoptera			Hemiptera			Odanota		Diptera													
Pool No.	Water Temp (°F)	Max	Ave.	Max	Ave.	Present	Pot. Max	Ostracods	Calanoida	Cyclopoda	Cladocera	*LIOC*	*BRLY*	*BRLI*	*LEPA*	*LYBR*	*CYCA*	Dytiscidae	Hydrophilidae	Haliplidae	Notonectidae	Corixidae	Ephemeroptera	Zygoptera	Anisoptera	Culicidae	Chironomidae	Trichoptera	Lymnaeidae	Physidae	Planorbidae	Micro-turbularian	Hydracarini		Other Invertebrate	Pseudacris	Other	Habitat Condition	Comments
1	S																																						Barely Saturated
2	S																																						Barely Saturated
3	S																																						Barely Saturated
4	S																																						Barely Saturated
5	S																																						Barely Saturated

Project: Dunisch

Surveyor(s): Brent Helm, Zachary Einweck

Weather Condition: 90% Cloud Cover, <10mph wind speed

Date: 1/26/2024

Time: 12:00 pm

Temperature: 60˚F

Abundance: R = Rare (≤2 individuals), NC = Not Common (3-10 individuals), C = Common (11-50 individuals), VC = Very Common (51-100 individuals), A = Abundant (>100 individuals)

Hydrology: D = dry, N/P = not ponding, M=moist, S = saturated to surface, I/P = intermittent ponding, X = Present but not observed in 1 meter sample

LB Redroductive Status: i = immature, m = mature, g = gravid (with eggs)

Habitat Condition:
UD = undisturbed, D = disturbed - tt = tire tracks, t = trash, p =plowing
UG = ungrazed, G = grazed - C = cattle, H = horse, S = sheep, l = light grazing, m = moderate grazing, h = heavy grazing

Pool No.	Water Temp (°F)	Present Depth (inches)		Potential Depth (Inches)		Surface Area (ft^2)		Crustacea										Insecta											Mollusca			Turbellaria	Acari	Collembola	Other	Herps		Habitat Condition	Comments
									Copepods			Large Branchiopods (LB)						Coleoptera			Hemiptera			Odanota		Diptera													
		Max	Ave.	Max	Ave.	Present	Pot. Max	Ostracods	Calanoida	Cyclopoda	Cladocera	*LIOC*	*BRLY*	*BRLI*	*LEPA*	*LYBR*	*CYCA*	Dytiscidae	Hydrophilidae	Haliplidae	Notonectidae	Corixidae	Ephemeroptera	Zygoptera	Anisoptera	Culicidae	Chironomidae	Trichoptera	Lymnaeidae	Physidae	Planorbidae	Micro-turbularian	Hydracarini		Other Invertebrate	Pseudacris	Other		
1	S																																						Barely Saturated
2	S																																						Barely Saturated
3	S																																						Barely Saturated
4	S																																						Barely Saturated
5	S																																						Barely Saturated

Project: Dunisch | **Surveyor(s):** Brent Helm, Zachary Einweck | **Weather Condition:** 90% Cloud Cover, <5mph wind speed

Date: 2/9/2024 | **Time:** 9:15 am | **Temperature:** 41˚F

Abundance: R = Rare (≤2 individuals), NC = Not Common (3-10 individuals), C = Common (11-50 individuals), VC = Very Common (51-100 individuals), A = Abundant (>100 individuals)

Hydrology: D = dry, N/P = not ponding, M=moist, S = saturated to surface, I/P = intermittent ponding, X = Present but not observed in 1 meter sample

LB Redroductive Status: i = immature, m = mature, g = gravid (with eggs)

Habitat Condition:
UD = undisturbed, D = disturbed - tt = tire tracks, t = trash, p =plowing
UG = ungrazed, G = grazed - C = cattle, H = horse, S = sheep, l = light grazing, m = moderate grazing, h = heavy grazing

		Present Depth (inches)		Potential Depth (Inches)		Surface Area (ft^2)		Crustacea										Insecta											Mollusca			Turbellaria	Acari	Collembola	Other	Herps			
									Copepods			Large Branchiopods (LB)						Coleoptera			Hemiptera			Odanota		Diptera													
Pool No.	Water Temp (°F)	Max	Ave.	Max	Ave.	Present	Pot. Max	Ostracods	Calanoida	Cyclopoda	Cladocera	*LIOC*	*BRLY*	*BRLI*	*LEPA*	*LYBR*	*CYCA*	Dytiscidae	Hydrophilidae	Haliplidae	Notonectidae	Corixidae	Ephemeroptera	Zygoptera	Anisoptera	Culicidae	Chironomidae	Trichoptera	Lymnaeidae	Physidae	Planorbidae	Micro-turbularian	Hydracarini		Other Invertebrate	Pseudacris	Other	Habitat Condition	Comments
1	45	9	3					X	X		X																					X							
2	47	6	1.5					X											X								X					X							
3	47	2	0.5					X																															Water mites
4	47	5	1					X																								X							
5	46	3	1					X																															

Project: Dunisch | **Surveyor(s): Brent Helm, Zachary Einweck** | **Weather Condition: 100% Cloud Cover**

Date: 2/23/2024 | **Time: 9:15 am** | **Temperature: 50˚F**

Abundance: R = Rare (≤2 individuals), NC = Not Common (3-10 individuals), C = Common (11-50 individuals), VC = Very Common (51-100 individuals), A = Abundant (>100 individuals)

Hydrology: D = dry, N/P = not ponding, M=moist, S = saturated to surface, I/P = intermittent ponding, X = Present but not observed in 1 meter sample

LB Redroductive Status: i = immature, m = mature, g = gravid (with eggs)

Habitat Condition:

UD = undisturbed, D = disturbed - tt = tire tracks, t = trash, p =plowing

UG = ungrazed, G = grazed - C = cattle, H = horse, S = sheep, l = light grazing, m = moderate grazing, h = heavy grazing

Pool No.	Water Temp (^oF)	Present Depth (inches) Max	Present Depth (inches) Ave.	Potential Depth (Inches) Max	Potential Depth (Inches) Ave.	Surface Area (ft^2) Present	Surface Area (ft^2) Pot. Max	Crustacea: Ostracods	Crustacea: Copepods Calanoida	Crustacea: Copepods Cyclopoda	Crustacea: Cladocera	Crustacea: Large Branchiopods (LB) *LIOC*	*BRLY*	*BRLI*	*LEPA*	*LYBR*	*CYCA*
1	51	10	4					VC			C						
2	53	6	2					C			NC						
3	50	1	0.5														

Pool No.	Insecta: Coleoptera Dytiscidae	Coleoptera Hydrophilidae	Coleoptera Haliplidae	Hemiptera Notonectidae	Hemiptera Corixidae	Ephemeroptera	Odanota Zygoptera	Odanota Anisoptera	Diptera Culicidae	Diptera Chironomidae	Trichoptera	Mollusca: Lymnaeidae	Mollusca: Physidae	Mollusca: Planorbidae	Turbellaria: Micro-turbularian	Acari: Hydracarini	Collembola	Other: Other Invertebrate	Herps: Pseudacris	Herps: Other	Habitat Condition	Comments
1																			NC		TT	Between 2/9 and 2/23 someone drove an off road vehicle through the pools
2																			C		TT	-
3																						araneae

Project: Dunisch **Surveyor(s): Brent Helm, Zachary Einweck** **Weather Condition: No Cloud Cover**

Date: 3/8/2024 **Time: 9:35 am** **Temperature: 51˚F**

Abundance: R = Rare (≤2 individuals), NC = Not Common (3-10 individuals), C = Common (11-50 individuals), VC = Very Common (51-100 individuals), A = Abundant (>100 individuals)

Hydrology: D = dry, N/P = not ponding, M=moist, S = saturated to surface, I/P = intermittent ponding, X = Present but not observed in 1 meter sample

LB Redroductive Status: i = immature, m = mature, g = gravid (with eggs)

Habitat Condition:

UD = undisturbed, D = disturbed - tt = tire tracks, t = trash, p =plowing

UG = ungrazed, G = grazed - C = cattle, H = horse, S = sheep, l = light grazing, m = moderate grazing, h = heavy grazing

		Present Depth (inches)		Potential Depth (Inches)		Surface Area (ft^2)		Crustacea										Insecta											Mollusca			Turbellaria	Acari	Collembola	Other	Herps			
									Copepods			Large Branchiopods (LB)						Coleoptera			Hemiptera			Odanota		Diptera													
Pool No.	Water Temp (°F)	Max	Ave.	Max	Ave.	Present	Pot. Max	Ostracods	Calanoida	Cyclopoda	Cladocera	*LIOC*	*BRLY*	*BRLI*	*LEPA*	*LYBR*	*CYCA*	Dytiscidae	Hydrophilidae	Haliplidae	Notonectidae	Corixidae	Ephemeroptera	Zygoptera	Anisoptera	Culicidae	Chironomidae	Trichoptera	Lymnaeidae	Physidae	Planorbidae	Micro-turbularian	Hydracarini		Other Invertebrate	Pseudacris	Other	Habitat Condition	Comments
1	52	8	2					NC	C		C												C													C		TT	Between 2/9 and 2/23 someone drove an off road vehicle through the pools
2	58	4	1					C			NC																									C		TT	-
3	S																																						araneae
4	S																																						araneae
5	S																																						araneae

Project: Dunisch **Surveyor(s): Brent Helm, Zachary Einweck** **Weather Condition: 70% Cloud Cover**

Date: 3/22/2024 **Time: 8:30 am** **Temperature: 53˚F**

Abundance: R = Rare (≤2 individuals), NC = Not Common (3-10 individuals), C = Common (11-50 individuals), VC = Very Common (51-100 individuals), A = Abundant (>100 individuals)

Hydrology: D = dry, N/P = not ponding, M=moist, S = saturated to surface, I/P = intermittent ponding, X = Present but not observed in 1 meter sample

LB Redroductive Status: i = immature, m = mature, g = gravid (with eggs)

Habitat Condition:

UD = undisturbed, D = disturbed - tt = tire tracks, t = trash, p =plowing

UG = ungrazed, G = grazed - C = cattle, H = horse, S = sheep, l = light grazing, m = moderate grazing, h = heavy grazing

		Present Depth (inches)		Potential Depth (Inches)		Surface Area (ft^2)		Crustacea										Insecta											Mollusca			Turbellaria	Acari	Collembola	Other	Herps			
									Copepods			Large Branchiopods (LB)						Coleoptera			Hemiptera			Odanota		Diptera													
Pool No.	Water Temp (°F)	Max	Ave.	Max	Ave.	Present	Pot. Max	Ostracods	Calanoida	Cyclopoda	Cladocera	*LIOC*	*BRLY*	*BRLI*	*LEPA*	*LYBR*	*CYCA*	Dytiscidae	Hydrophilidae	Haliplidae	Notonectidae	Corixidae	Ephemeroptera	Zygoptera	Anisoptera	Culicidae	Chironomidae	Trichoptera	Lymnaeidae	Physidae	Planorbidae	Micro-turbularian	Hydracarini		Other Invertebrate	Pseudacris	Other	Habitat Condition	Comments
1	S																																						
2	S																																						
3	S																																						
4	S																																						
5	S																																						

Project: Dunisch **Surveyor(s): Brent Helm, Zachary Einweck** **Weather Condition: 100% Cloud Cover**

Date: 4/5/2024 **Time: 9:20 am** **Temperature: 43˚F**

Abundance: R = Rare (≤2 individuals), NC = Not Common (3-10 individuals), C = Common (11-50 individuals), VC = Very Common (51-100 individuals), A = Abundant (>100 individuals)

Hydrology: D = dry, N/P = not ponding, M=moist, S = saturated to surface, I/P = intermittent ponding, X = Present but not observed in 1 meter sample

LB Redroductive Status: i = immature, m = mature, g = gravid (with eggs)

Habitat Condition:

UD = undisturbed, D = disturbed - tt = tire tracks, t = trash, p =plowing

UG = ungrazed, G = grazed - C = cattle, H = horse, S = sheep, l = light grazing, m = moderate grazing, h = heavy grazing

Pool No.	Water Temp (^{o}F)	Present Depth (inches)		Potential Depth (Inches)		Surface Area (ft^2)		Crustacea										Insecta											Mollusca			Turbellaria	Acari	Collembola	Other	Herps		Habitat Condition	Comments
									Copepods			Large Branchiopods (LB)						Coleoptera			Hemiptera			Odanota		Diptera													
		Max	Ave.	Max	Ave.	Present	Pot. Max	Ostracods	Calanoida	Cyclopoda	Cladocera	*LIOC*	*BRLY*	*BRLI*	*LEPA*	*LYBR*	*CYCA*	Dytiscidae	Hydrophilidae	Haliplidae	Notonectidae	Corixidae	Ephemeroptera	Zygoptera	Anisoptera	Culicidae	Chironomidae	Trichoptera	Lymnaeidae	Physidae	Planorbidae	Micro-turbularian	Hydracarini		Other Invertebrate	Pseudacris	Other		
1	49	4	1					X			X																											TT	
2	51	0.5	0																																			TT	
3	S																																						araneae
4	S																																						araneae
5	S																																						araneae

Project: Dunisch **Surveyor(s): Brent Helm, Zachary Einweck** **Weather Condition: 0% Cloud Cover, <10mph wind speed**

Date: 12/15/2023 **Time: 11:00 am** **Temperature: 56˚F**

Abundance: R = Rare (≤2 individuals), NC = Not Common (3-10 individuals), C = Common (11-50 individuals), VC = Very Common (51-100 individuals), A = Abundant (>100 individuals)

Hydrology: D = dry, N/P = not ponding, M=moist, S = saturated to surface, I/P = intermittent ponding, X = Present but not observed in 1 meter sample

LB Redroductive Status: i = immature, m = mature, g = gravid (with eggs)

Habitat Condition:

UD = undisturbed, D = disturbed - tt = tire tracks, t = trash, p =plowing

UG = ungrazed, G = grazed - C = cattle, H = horse, S = sheep, l = light grazing, m = moderate grazing, h = heavy grazing

Pool No.	Water Temp (°F)	Present Depth (inches) Max	Present Depth (inches) Ave.	Potential Depth (Inches) Max	Potential Depth (Inches) Ave.	Surface Area (ft^2) Present	Surface Area (ft^2) Pot. Max	Crustacea: Ostracods	Copepods: Calanoida	Copepods: Cyclopoda	Cladocera	Large Branchiopods (LB): *LIOC*	*BRLY*	*BRLI*	*LEPA*	*LYBR*	*CYCA*	Insecta: Coleoptera: Dytiscidae	Hydrophilidae	Haliplidae	Hemiptera: Notonectidae	Corixidae	Ephemeroptera	Odanota: Zygoptera	Anisoptera	Diptera: Culicidae	Chironomidae	Trichoptera	Mollusca: Lymnaeidae	Physidae	Planorbidae	Turbellaria: Micro-turbularian	Acari: Hydracarini	Collembola	Other: Other Invertebrate	Herps: Pseudacris	Other	Habitat Condition	Comments
1																																							Dry
2	S																																						
3	S																																						Barely Saturated
4	S																																						Barely Saturated
5	S																																						

Project: Dunisch **Surveyor(s): Brent Helm, Zachary Einweck** **Weather Condition: 80% Cloud Cover, <10mph wind speed**

Date: 12/29/2023 **Time: 9:45 am** **Temperature: 58˚F**

Abundance: **R = Rare (≤2 individuals), NC = Not Common (3-10 individuals), C = Common (11-50 individuals), VC = Very Common (51-100 individuals), A = Abundant (>100 individuals)**

Hydrology: **D = dry, N/P = not ponding, M=moist, S = saturated to surface, I/P = intermittent ponding, X = Present but not observed in 1 meter sample**

LB Redroductive Status: **i = immature, m = mature, g = gravid (with eggs)**

Habitat Condition:

UD = undisturbed, D = disturbed - tt = tire tracks, t = trash, p =plowing

UG = ungrazed, G = grazed - C = cattle, H = horse, S = sheep, l = light grazing, m = moderate grazing, h = heavy grazing

Pool No.	Water Temp (°F)	Present Depth (inches)		Potential Depth (Inches)		Surface Area (ft^2)		Crustacea										Insecta											Mollusca			Turbellaria	Acari	Collembola	Other	Herps		Habitat Condition	Comments
									Copepods			Large Branchiopods (LB)						Coleoptera			Hemiptera			Odanota		Diptera													
		Max	Ave.	Max	Ave.	Present	Pot. Max	Ostracods	Calanoida	Cyclopoda	Cladocera	*LIOC*	*BRLY*	*BRLI*	*LEPA*	*LYBR*	*CYCA*	Dytiscidae	Hydrophilidae	Haliplidae	Notonectidae	Corixidae	Ephemeroptera	Zygoptera	Anisoptera	Culicidae	Chironomidae	Trichoptera	Lymnaeidae	Physidae	Planorbidae	Micro-turbularian	Hydracarini		Other Invertebrate	Pseudacris	Other		
1	S																																						Barely Saturated
2	S																																						Barely Saturated
3	S																																						Barely Saturated
4	S																																						Barely Saturated
5	S																																						Barely Saturated

FEDERALLY -LISTED LARGE BRANCHIOPOD SAMPLING AT THE DUNISCH PROPERTY, ELK GROVE, SACRAMENTO COUNTY, CALIFORNIA (USFWS# RP-DUNISCH PROPERTY - 2023-0206)

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June 2023

FEDERALLY-LISTED LARGE BRANCHIOPOD SAMPLING AT THE DUNISCH PROPERTY, ELK GROVE, SACRAMENTO COUNTY, CALIFORNIA (USFWS# RP-DUNISCH PROPERTY – 2023-0206)

INTRODUCTION

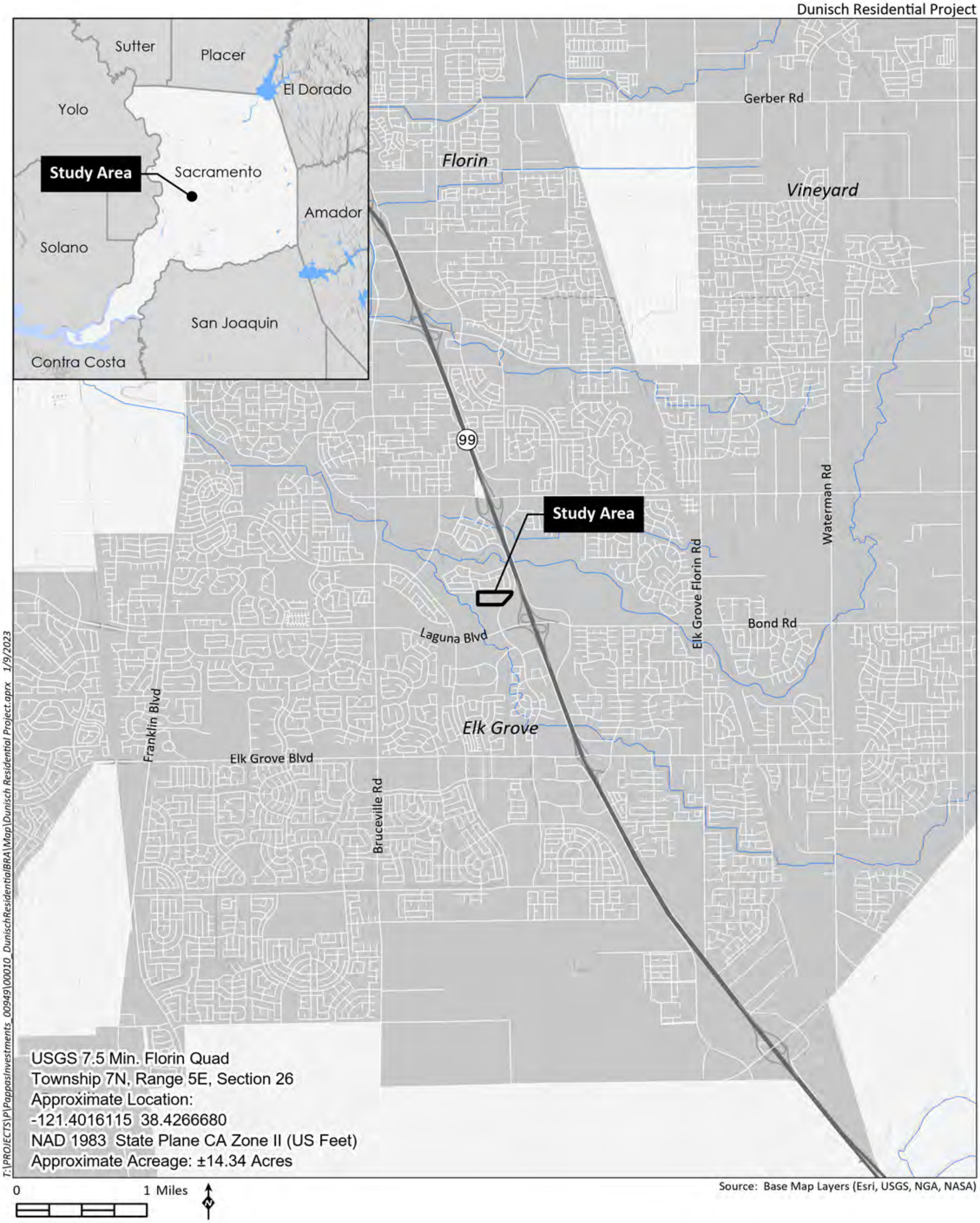
Helm Biological Consulting (HBC), a division of Tansley Team, Inc., was contracted by Pappas Investments to conduct reconnaissance-level wet-season and protocol level dry-season sampling for large branchiopods (fairy shrimp, tadpole shrimp) that are listed as threatened or endangered under the federal Endangered Species Act (e.g., vernal pool fairy shrimp [*Branchinecta lynchi*] and vernal pool tadpole shrimp [*Lepidurus packardi*]) at the Dunisch Property (hereafter "Project").

The Project includes the development of a single-family residential subdivision, drainage improvements, and associated infrastructure located west of Highway 99, north of Laguna Boulevard, southwest of the intersection of West Stockton Boulevard and Dunisch Road, in the City of Elk Grove, Sacramento County, California (Figure 1). As currently proposed, the Project construction of the internal roads will include two access points to the residential subdivision via Dunisch Road. Additionally, the Project is located in the southeast ¼ of the southwest ¼ of Section 26, Township 7 North, Range 5 East, and Mount Diablo Base & Meridian (MDB&M) of the Florin U.S. Geological Survey (USGS) 7.5-minute topographical quadrangle map (approximate center coordinates: World Geodetic System [WGS84] Latitude: 38.426673°, Longitude: -121.401159°) (Figure 2).

The remainder of this document describes the method and results of the federally-listed large branchiopod surveys conducted at the Project.

"I certify that the information in this survey report and attached exhibits fully and accurately represents my work."

Brent P. Helm (TE-795930-12) Signature ______________ Date 06-30-2023



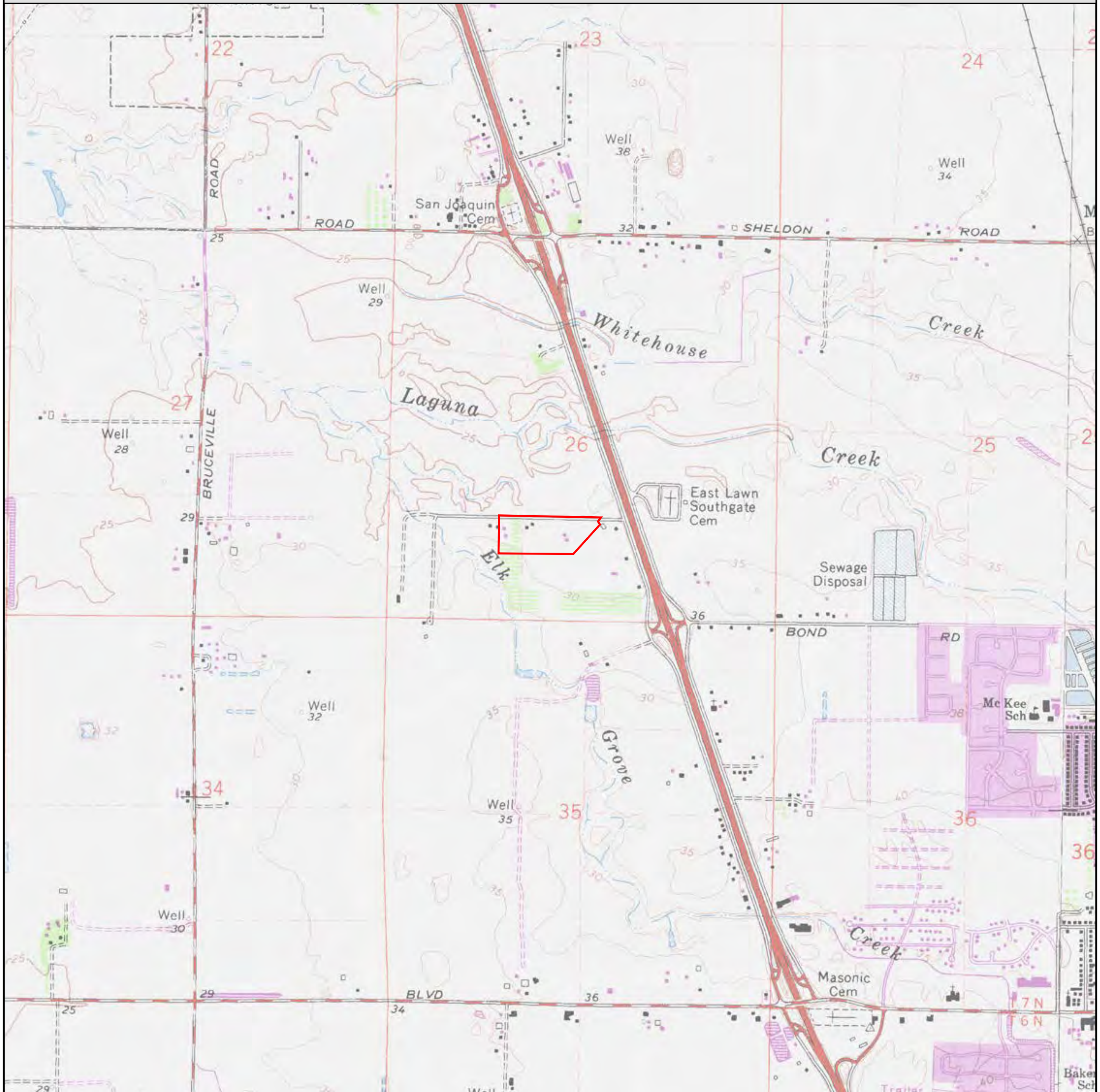
Source: Base Map Layers (Esri, USGS, NGA, NASA)

HELIX Environmental Planning

Site and Vicinity Map

Figure 1

DUNISCH PROPERTY, ELK GROVE, SACRAMENTO COUNTY, CALIFORNIA



Project Area (14.70 acres)

The Project is located within the Florin, CA USGS 7.5-minute quadrangle map.

The Project occurs within the southeast 1/4 of the southwest 1/4 of Section 26 of Township 7 North and Range 5 East, Mt. Diablo Base & Meridian.

Center Coordinates (WGS84) for Project:
Latitude 38.426673, Longitude -121.401159

0 1,000 2,000 Feet

N

Data Source:
USGS The National Map 2021;
ESRI USA Boundaries;
Public Land Survey System

Prepared by:

HELM BIOLOGICAL CONSULTING

Date: 1/31/2023

Figure 2. Project Location on USGS Topographic Quadrangle

METHODS

Methods followed U.S. Fish and Wildlife Service's (USFWS 2017) *Survey Guidelines for Listed Large Branchiopods* (hereafter "Survey Guidelines") for federally-listed large branchiopod sampling and consisted of wet-season sampling followed by dry-season sampling as described below.

WET-SEASON SAMPLING

Dr. Brent Helm and Mr. Zachary Einweck of HBC conducted two rounds of reconnaissance-level wet-season sampling during the 2023 wet-season as follows: 1st round (February 7); and 2nd round (March 22).

The wet-season sampling was conducted under permit TE-795930-12 of Section 10(a)(1)(A) of the federal Endangered Species Act, 16 U.S.C. 1531 *et seq*., and its implementing regulations as authorized by the USFWS (Appendix A). Methods generally followed USFWS's (2017) *Survey Guidelines for Listed Large Branchiopods* (hereafter "*Survey Guidelines*") for wet-season sampling as described below.

Wet sampling was conducted in all basins (habitats) on site that had potential to support federally-listed large branchiopods. Aerial imagery of the Project (Google Earth© 2023) was utilized to target appropriate habitats for sampling.

Potential habitat for federally-listed large branchiopods is defined as any seasonal inundated depression that on average ponds water at a sufficient depth and duration for a listed-large branchiopod to complete its lifecycle (generally 2.0 inches or greater in depth for 14 or more consecutive days for fairy shrimp and 30 or more consecutive days for tadpole shrimp) (USFWS 2017). Generally, these habitats occur within the California Floristic Province at elevations below 1,707 meters in the Coast Ranges (CNDDB #178) and below 914 meters for the rest of California and Oregon (CNDDB #244) and Oregon (USFWS 2017). Habitats that swiftly flow water (e.g., creeks, streams, and ephemeral drainages), semi-to-permanently inundated areas that support perennial population of predators (e.g., bullfrogs, fish, and crayfish), and habitats that receive water during the dry season (i.e., artificial water sources) were not generally considered suitable habitat for federally-listed large branchiopods (USFWS 2017).

Each habitat was viewed for active large branchiopods prior to entering the water. Any large branchiopods observed were quickly netted, viewed with the aid of a 30x hand lens to determine species, and released unharmed back into the environment from which they were obtained. If no large branchiopods were observed, then a semi-quantitative sample was taken to determine the relative abundance of large branchiopods as follows.

A dip net was lowered vertically into the deepest portion of the inundated habitat (usually the center) and rested on the bottom. The 80-µm mesh size dip net was then moved in the direction of the longest axis of the habitat for approximately one-meter. In instances where half of the habitat length is less than one meter in length, the dip net was repositioned in the deepest portion of the habitat and moved in the opposite direction for the remainder of the one-meter sample. Given the aperture of the dip net of 0.025 m^2 and distance the dip net was moved, roughly 0.025 m^3 or 25 liters of the water column was sampled horizontally each time. In those cases when the water column was shallower than the dip net aperture height, the volume of water per sweep was calculated by the horizontal distance the net is moved multiplied by the width of the dip net (25-cm) multiplied by the depth of water. After the completion of each sample sweep, the contents of the net were examined for large branchiopods. All large branchiopods captured in the dip net were identified to the lowest justifiable taxon in the field and recorded on standardized data sheets. The relative numbers of individuals observed within each taxonomic group was recorded in one of five categories: rare (≤2 individuals), not common (3-10 individuals), common (11-50 individual), very common (51 -100 individuals), and abundant (>100 individuals). This method allows for the relative abundances and richness of large branchiopods to be compared between and among wetlands through time. Additionally, this method allows for concentration estimates of large branchiopods to be calculated as number of individuals per liter of water (= number of individuals/net aperture area x length of sweep).

If federally-listed large branchiopods were not detected during the semi-quantified sampling method, then the entire habitat was sampled as follows. Starting at one end of the habitat, the net was moved from one side of the habitat to the other in a zigzag fashion, until the opposite end of the habitat was reached. During this procedure, the net was often bounced along the habitat bottom (to encourage large branchiopods to move up into the water column from hiding places for easier capture) and viewed often for evidence of large branchiopods. If still no federally-listed large branchiopods were captured, then additional netting took place in specific locations within the habitat that may have not been sampled during prior efforts. Additional taxonomic groups of large branchiopods detected using this alternative method are noted as present by an "X" on the standardized field data sheet. After the taxonomic identification and enumeration were completed, the contents of the net were placed back into the habitat from which they were collected.

Data concerning air and water temperatures, present depths (maximum and average [ft]), present ponding surface area (ft^2), and habitat conditions were collected during each field visit. The potential depths (maximum and average [ft]) and potential ponding surface area (ft^2) were estimated. Additionally, presence and abundance data were recorded for all other aquatic species using the same methods as described above for large branchiopod sampling. Representative photographs were taken of the habitats sampled and species observed (Appendix B).

DRY-SEASON SAMPLING

Dr. Brent Helm of HBC, assisted by Mr. Zachary Einweck of HBC, conducted protocol dry-season sampling on June 30, 2023 as authorized by the USFWS (Appendix A) under recovery permit TE-795930-12 of Section 10(a)(1)(A) of the federal Endangered Species Act, 16 U.S.C. 1531 *et seq.*, and its implementing regulations.

Dry-season sampling was conducted in all basins (habitats) within the Project with the potential to support federally-listed large branchiopods. Aerial imagery of the Project (Google Earth© 2023) was utilized to target appropriate habitats for sampling.

Habitat characteristics of large branchiopods are based on the life history of Central Valley endemics (Eriksen and Belk 1999; Helm 1998, 1999; Helm and Vollmar 2002, Helm and Noyes 2016). The presence of water marks, algae mats, driftlines, hydrophytic vegetation ("water-loving plants"), slope, contributing watershed, maximum potential ponding depth, and aquatic arthropods (i.e., crustaceans and insects) exoskeletons were helpful indicators for evidence of ponding depth and duration. Habitats that swiftly flow water (e.g., creeks, streams, and ephemeral drainages), semi-to-permanently inundated areas that support a population of predators (e.g., bullfrogs, fish, and crayfish), and habitats that receive water during the dry season (i.e., artificial water sources) were not generally considered suitable habitat for federally-listed large branchiopods.

Soil samples were collected mainly from the lowest topographic areas within each sampled habitat. All soil collected was dry (i.e., dry to the touch and too dry to make a ped). Soil samples were placed in liter-size plastic sealable bags and marked with the project name, habitat, and date. Representative photographs were taken of the habitats sampled (Appendix B). The soil was then transported to HBC for processing and analysis as described below.

In HBC's laboratory, a brine solution was prepared by mixing table salt (NaCl) with lukewarm tap water in a large container. The collected soil material was placed in the brine solution. The soil material was then gently worked by hand to breakdown any persistent soil structure. The organic material rising to the top of the brine solution was skimmed off and placed in a 600-micron diameter pore-size sieve stacked atop a 75-micron diameter pore-size sieve. The soil material was processed through the top sieve by flushing it with lukewarm tap water while gently rubbing it with a soft-bristle brush. The soil retained from the 75-micron diameter pore size sieve was then removed and thinly (≈1.0 mm) spread into plastic petri dishes.

The contents of each petri dish were examined under a 10 to 252-power zoom binocular microscope. A minimum of 0.5-hour was spent searching the contents of each petri dish for large branchiopod cysts (embryonic eggs). Dr. Helm's large branchiopod cyst reference collection and scanning electron micrographs of cysts (Belk 1989, Brendock *et al*. 2008, Gilchrist 1978, Hill and Shepard 1998, Mura 1991, and Rabet 2010) were used to identify and compare any cysts observed within the soil samples. This processing method (described above) favors the detection of cysts belonging to the genera *Branchinecta*, *Lepidurus*, and *Streptocephalus* since these three genera have species that are federally listed. Evidence of other macroscopic aquatic invertebrates encountered was also noted on the laboratory data sheet.

RESULTS

WET-SEASON SAMPLING

Wet-season sampling was initiated several weeks after initial inundation of the habitats (seasonal wetlands) onsite. During the first round of sampling only the two largest seasonal wetlands were inundated (Exhibit A). The non-federally listed California fairy shrimp (*Linderiella occidentalis*) was identified from these two seasonal wetlands (1 and 2). During the second round of wet-season sampling, the three smaller seasonal wetlands were inundated as well as the two larger ones (Appendix C). However, no large branchiopods were present during the second round of sampling.

Besides, the California fairy shrimp, no other large branchiopods were detected onsite. Representative photographs of the habitats sampled are provided in Appendix B. Field data forms from each wet-season sampling date are provided in Appendix C.

DRY-SEASON SAMPLING

Soils were collected from all five habitats onsite that could potentially support federally-listed large branchiopods (Exhibit A). Cysts belonging to the California fairy shrimp (*Lindeirella occidentalis*) were detected in the analyzed soils collected from the two largest seasonal wetlands (1 and 2, Table 1). No other evidence of federally-listed large branchiopods was detected (*Branchinecta* sp. or *Lepidurus* sp. cysts or carapaces of *Lepidurus*) from the analyzed soils. Representative photographs of the habitats sampled are provided in Appendix B.

Table 1. Results of Soil Examinations

Habitat No.	Insect Exo-Skeletons	Micro-Turbellaria Cysts	Cladocera Ephippia	Ostracods Live/Cysts/Carapaces	Large Branchiopod Cysts* *Linderiella occidentalis*	Hydracarina Live	Nematoda	Collembola
1	X	X	X	X	Medium	X	X	X
2	X	X	X	X	Medium	X		X
3	X				None	X	X	X
4	X			X	None	X	X	X
5	X				None	X	X	X

X = Present

*Abundance categories are derived from USFWS's Survey Guidelines for the Listed Large Branchiopods - Section VI(d) (none = no cysts found in sample; low abundance = estimate of 1-10 cysts/100 ml soil; medium abundance = estimate of 11-50 cysts/100 ml soil; high abundance = estimate of more than 50 cysts/100 ml soil)

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Helm, B., and M. Noyes. 2016. California large branchiopod occurrences: A comparison of method detection rates. Pages 31-56. In: Robert Schlising (ed.). *Vernal Pools in changing landscapes: from Shasta to Baja* –proceeding from a 2014 conference. AquaAlliance, Chico, California. 291 pp.

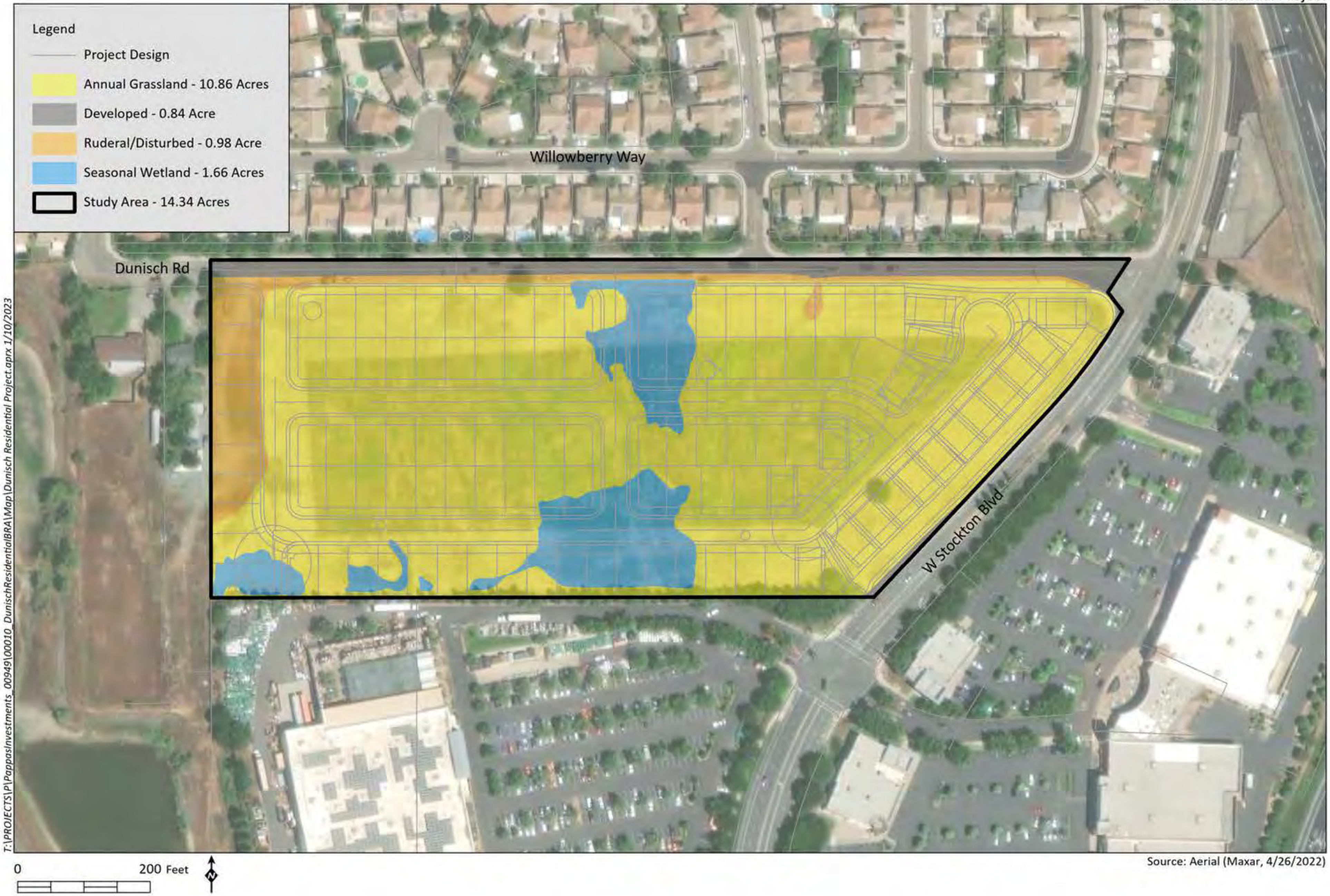
Hill, R. E., and W. D. Shepard. 1998. Observation on the identification of California anostracan cysts. *Hydrobiologia*, 359: 113-123.

Mura, G. 1991. SEM morphology of resting eggs in the species of the genus Branchinecta from North America. J. Crust. Biol., 11: 432-436.

Rabet, N. 2010. Revision of the egg morphology of *Eulimnadia* (Crustacea, Branchiopoda, Spinicaudata). *Zoosystema*, 32 (3): 373-391.

U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS). 2017. Survey guidelines for the listed large branchiopods. 24 pp. Dated: 31 May 2015 (Revised November 13, 2017).

EXHIBIT A.
HABITAT MAP
(HELIX ENVIRONMENTAL PLANNING, 2022)



Source: Aerial (Maxar, 4/26/2022)

HELIX Environmental Planning

Habitat Map

Figure 5

APPENDIX A.
USFWS AUTHORIZATION

Gmail

Brent Helm <bhelm@tansleyteam.com>

Survey Notification Approval, RP-Dunisch Property-2023-0206, Wet VpB

1 message

SFWO Permits, FW8 <FW8_SFWO_Permits@fws.gov> Mon, Feb 6, 2023 at 4:32 PM
To: Brent Helm <bhelm@tansleyteam.com>, Rachel Powell <rpowell@tansleyteam.com>
Cc: "Cook, Megan T" <megan_cook@fws.gov>, "Kong, Lauren M" <lauren_kong@fws.gov>

Brent Helm,

By this email message, you are authorized to conduct non-protocol level wet season surveys for vernal pool branchiopods, as specified in your January 31, 2023 email request, per the conditions of your recovery permit (TE-795930-12). Surveys will be conducted at the Dunisch Property in Sacramento County, CA. Please remember to carry a copy of your permit while doing the work and to follow the terms and conditions therein. This authorization does not include access to the property which must be arranged with the landowner or manager. Please let us know if the activities are not performed as authorized, or if they are done by a different permittee under a separate authorization.

Please send survey reports with the reference # RP-Dunisch Property-2023-0206 to FW8_SFWO_Permits@fws.gov and Sacramento Valley Division Supervisor, Megan Cook (megan_cook@fws.gov). Reports for vernal pool branchiopod surveys are due in 90 days. Reports for all other species are due in 45 days. Reports should include, at minimum:

1. The reference number to help ensure that we correctly record the fulfillment of the reporting requirement under this authorization,
2. A copy of this authorization letter,
3. The names of all persons involved in each activity and their recovery permit numbers, if applicable,
4. A U.S. Geological Survey topographic map (1:24,000 scale) depicting the location of the project site, survey area, and location(s) of species in as precise a manner as possible.
5. All other information required in the 45/90 Day Survey Report section of your permit.

Thank you,

Lauren

--
10(a)(1)(A) Recovery Permitting
Sacramento Fish and Wildlife Office | USFWS
Pacific Southwest Recovery Permitting
Survey Protocols | Minimum Qualifications

The SFWO is using this consolidated mailbox for all communications regarding 10(a)(1)(A) recovery permits in our jurisdiction. Please send survey notifications, reports, and permit inquiries to this email address: FW8_SFWO_Permits@fws.gov.

Gmail

Brent Helm <bhelm@tansleyteam.com>

Survey Authorization #RP-Dunisch Property-2023-0629, Dry VPB

1 message

SFWO Permits, FW8 <FW8_SFWO_Permits@fws.gov> Thu, Jun 29, 2023 at 4:00 PM
To: Brent Helm <bhelm@tansleyteam.com>
Cc: "Cook, Megan T" <megan_cook@fws.gov>

Brent Helm,

By this email message, you are authorized to conduct dry season vernal pool branchiopod surveys, as specified in your June 21, 2023 email request, per the conditions of your recovery permit (795930). Surveys will be conducted in Elk Grove in Sacramento County, CA. Please remember to carry a copy of your permit while doing the work and to follow the terms and conditions therein. This authorization does not include access to the property which must be arranged with the landowner or manager. Please let us know if the activities are not performed as authorized, or if they are done by a different permittee under a separate authorization.

Please send survey reports with the reference #RP-Dunisch Property-2023-0629 to FW8_SFWO_Permits@fws.gov and Sacramento Valley Division Supervisor, Megan Cook (megan_cook@fws.gov). Reports for vernal pool branchiopod surveys are due in 90 days. Reports for all other species are due in 45 days, unless otherwise specified in your permit. Reports should include, at minimum:

1. The reference number to help ensure that we correctly record the fulfillment of the reporting requirement under this authorization,
2. A copy of this authorization email,
3. The names of all persons involved in each activity and their recovery permit numbers, if applicable,
4. A U.S. Geological Survey topographic map (1:24,000 scale or larger scale) depicting the location of the project site, survey area, and location(s) of species in as precise a manner as possible.
5. All other information required in the 45/90 Day Survey Report section of your permit.

Thank you,
Summer

--
10(a)(1)(A) Recovery Permitting
Sacramento Fish and Wildlife Office | USFWS
Pacific Southwest Recovery Permitting
Survey Protocols | Minimum Qualifications

The SFWO is using this consolidated mailbox for all communications regarding 10(a)(1)(A) recovery permits in our jurisdiction. Please send survey notifications, reports, and permit inquiries to this email address: FW8_SFWO_Permits@fws.gov.

APPENDIX B.
REPRESENTATIVE PHOTOGRAPHS

Photo of pool 2 facing North taken on 5/30/2023.

Photo of pool 5 facing South taken on 5/30/2023.

Photo of pool 1 taken on 4/7/2023.

Photo of pool 2 taken on 4/7/2023.

Photo of pool 3 taken on 4/7/2023.

Photo of pool 4 taken on 4/7/2023.

Photo of pool 5 taken on
4/7/2023.

APPENDIX C.
WET-SEASON
FIELD DATA FORMS

Project: Dunisch Property

Surveyor(s): Brent Helm

Weather Condition: Partly Sunny, 80% Cloud Cover, No Wind

Date: 2/7/2023

Time: 10:39 am

Temperature: 49°F

Abundance: R = Rare (≤2 individuals), NC = Not Common (3-10 individuals), C = Common (11-50 individuals), VC = Very Common (51-100 individuals), A = Abundant (>100 individuals)

Hydrology: D = dry, N/P = not ponding, M=moist, S = saturated to surface, I/P = intermittent ponding, X = Present but not observed in 1 meter sample

LB Redroductive Status: i = immature, m = mature, g = gravid (with eggs)

Habitat Condition:

UD = undisturbed, D = disturbed - tt = tire tracks, t = trash, p =plowing

UG = ungrazed, G = grazed - C = cattle, H = horse, S = sheep, l = light grazing, m = moderate grazing, h = heavy grazing

Pool No.	Water Temp (°F)	Present Depth (inches)		Potential Depth (Inches)		Surface Area (ft^2)		Crustacea										Insecta											Mollusca			Turbellaria	Acari	Collembola	Other	Herps		Habitat Condition	Comments
									Copepods			Large Branchiopods (LB)						Coleoptera			Hemiptera			Odanota		Diptera													
		Max	Ave.	Max	Ave.	Present	Pot. Max	Ostracods	Calanoida	Cyclopoda	Cladocera	*LIOC*	*BRLY*	*BRLI*	*LEPA*	*LYBR*	*CYCA*	Dytiscidae	Hydrophilidae	Haliplidae	Notonectidae	Corixidae	Ephemeroptera	Zygoptera	Anisoptera	Culicidae	Chironomidae	Trichoptera	Lymnaeidae	Physidae	Planorbidae	Micro-turbularian	Hydracarini		Other Invertebrate	Pseudacris	Other		
1	50	8	2	10	5	65		NC		VC		NC										X										X							
2	51	7	5	12	8	85		NC		VC		C																				X							
3	S																																						
4	S																																						
5	S																																						

Project: Dunisch Property | **Surveyor(s):** Brent Helm, Zachary Einweck | **Weather Condition:** Just rained, 80% cloud cover

Date: 03/22/2023 | **Time:** 4:17pm | **Temperature:** 55˚F

Abundance: R = Rare (≤2 individuals), NC = Not Common (3-10 individuals), C = Common (11-50 individuals), VC = Very Common (51-100 individuals), A = Abundant (>100 individuals)

Hydrology: D = dry, N/P = not ponding, M=moist, S = saturated to surface, I/P = intermittent ponding, X = Present but not observed in 1 meter sample

LB Redroductive Status: i = immature, m = mature, g = gravid (with eggs)

Habitat Condition:
UD = undisturbed, D = disturbed - tt = tire tracks, t = trash, p =plowing
UG = ungrazed, G = grazed - C = cattle, H = horse, S = sheep, l = light grazing, m = moderate grazing, h = heavy grazing

Pool No.	Water Temp (°F)	Present Depth (inches)		Potential Depth (Inches)		Surface Area (ft^2)		Crustacea										Insecta											Mollusca			Turbellaria	Acari	Collembola	Other	Herps		Habitat Condition	Comments
									Copepods			Large Branchiopods (LB)						Coleoptera			Hemiptera			Odanota		Diptera													
		Max	Ave.	Max	Ave.	Present	Pot. Max	Ostracods	Calanoida	Cyclopoda	Cladocera	*LIOC*	*BRLY*	*BRLI*	*LEPA*	*LYBR*	*CYCA*	Dytiscidae	Hydrophilidae	Haliplidae	Notonectidae	Corixidae	Ephemeroptera	Zygoptera	Anisoptera	Culicidae	Chironomidae	Trichoptera	Lymnaeidae	Physidae	Planorbidae	Micro-turbularian	Hydracarini		Other Invertebrate	Pseudacris	Other		
1		10	5	10	5	90		R		R												X										X							
2		12	8	12	8	90		R		R																						X							
3		3	1.5	5	3	80		R		R																													
4		2.5	1	4	2	80		R																															
5		3	1	5	2.5	80																																	

Attachment B

Approved Jurisdictional Determination, Dunisch Residential

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

September 12, 2024

Regulatory Division (SPK-2024-00316)

Pappas Investments
Attn: Mr. Thad Johnson
2020 L Street
Sacramento, California 95811-4259
thad@pappasinvestments.com

Dear Mr. Johnson:

We are responding to your April 16, 2024, request for an approved jurisdictional determination for the Dunisch Residential Project site. The approximately 14-acre project site is located immediately south of Dunisch Road and west of West Stockton Boulevard, Latitude 38.4266477313025°, Longitude -121.401202001193°, within the City of Elk Grove, Sacramento County, California.

Based on available information, we concur with your aquatic resources delineation for the site, as depicted on the enclosed October 11, 2023, *Aquatic Resource Delineation Map* prepared by Helix Environmental Planning (HELIX) (Enclosure 1). Approximately 2.047 acres of aquatic resources, consisting of 2.034 acres of seasonal wetlands, 0.013 acre of ditch are present within the survey area. This letter verifies that the location and boundaries of wetlands were delineated consistent with the wetland definition at 33 CFR §328.3(c)(16), the 1987 *Corps of Engineers Wetlands Delineation Manual* (Wetlands Research Program Technical Report Y-87-1) and the applicable regional supplements and the location and boundaries of non-tidal waters conform with the ordinary high water mark definition at 33 CFR §328.3(c)(7), Regulatory Guidance Letter 05-05, and any applicable regional guide.

Of these aquatic resources, we have determined that those features identified as D-1, and SW-4 totaling 1.732 acres are waters of the United States pursuant to 33 CFR Part 328 and are regulated under Section 404 of the Clean Water, and features SW-1, SW-2 and SW-3 acre totaling 0.315 acre are not waters of the U.S. regulated under Section 404 of the Clean Water Act or under Section 10 of the Rivers and Harbors Act. We are enclosing a copy of the Memorandum for Record prepared to support this Approved Jurisdictional for your site (Enclosure 2). This approved jurisdictional determination is valid for five years from the date of this letter unless new information warrants revision of the determination before the expiration date.

If you object to this determination, you may request an administrative appeal under Corps regulations at 33 Code of Federal Regulations (CFR) Part 331. A *Notification of Appeal Process (NAP) and Request for Appeal (RFA) Form* is enclosed (enclosure 3). If you request to appeal this determination, you must submit a completed RFA form to the South Pacific Division Office at the following address: Administrative Appeal Review Officer, Army Corps of Engineers, South Pacific Division, CESPD-PDO, 1455 Market Street, 2052B, San Francisco, California 94103-1399, Telephone: 415-503-6574, FAX: 415-503-6646.

In order for an RFA to be accepted by the Corps, we must determine that the form is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that the form was received by the Division Office within 60 days of the date of the NAP. It is not necessary to submit an RFA form to the Division Office unless you object to the determination in this letter.

The delineation included herein has been conducted to identify the location and extent of the aquatic resource boundaries and/or the jurisdictional status of aquatic resources for purposes of the Clean Water Act for the particular site identified in this request. This delineation and/or jurisdictional determination may not be valid for the Wetland Conservation Provisions of the Food Security Act of 1985, as amended. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should discuss the applicability of a certified wetland determination with the local USDA service center, prior to starting work. We recommend that you provide a copy of this letter and notice to all other affected parties, including any individual who has an identifiable and substantial legal interest in the property.

Please refer to identification number SPK-2024-00316 in any correspondence concerning this project. If you have any questions, please contact Kelley Herbel by email at Kelley.C.Herbel@usace.army.mil, or telephone at (916) 557-7808. For program information or to complete our Customer Survey, visit our website at www.spk.usace.army.mil/Missions/Regulatory.aspx.

Sincerely,

Mary R. Pakenham-Walsh

Mary Pakenham Walsh
Chief
CA Delta Section

Enclosures

cc (w/ encls):
Mr. Joseph Morgan, U.S. Environmental Protection Agency, Region 9, morgan.joseph@epa.gov
Central Valley Regional Water Quality Control Board, centralvalleysacramento@waterboards.ca.gov
Ms. Ginger Fodge, Madrone Ecological Consulting, gfodge@madroneeco.com

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Pappas Investments, Attn: Mr. Thad Johnson	File No.: SPK-2024-00316	Date: September 12, 2024
Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
→	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at *http://www.usace.army.mil/cecw/pages/reg_materials.aspx* or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.

- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer (address on reverse). This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer (address on reverse). This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.

- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer (address on reverse). This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also, you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:

Mary Pakenham Walsh
Chief
CA Delta Section
U.S. Army Corps of Engineers
1325 J Street, Room 560
Sacramento, CA 95814-2922
Phone: (916) 557-7808, FAX 916-557-7803
Email: Kelley.C.Herbel@usace.army.mil

If you only have questions regarding the appeal process you may also contact:

Travis Morse
Administrative Appeal Review Officer
U.S. Army Corps of Engineers
South Pacific Division
Phillip Burton Federal Building, Post Office Box 36023
450 Golden Gate Avenue
San Francisco, California 94102
Phone: 970-243-1199x1014, FAX: 971-241-2358
Email: W.Travis.Morse@usace.army.mil

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15-day notice of any site investigation and will have the opportunity to participate in all site investigations.

Signature of appellant or agent.	Date:	Telephone number:

Other Features

- Upland Data Point
- Wetland Data Point
- Culvert
- Drop Inlet
- Study Area - 14.34 Acres

NOTES

- Aquatic resources are subject to U.S. Army Corps of Engineers verification.
- Aquatic resources were mapped by HELIX Environmental using a Juniper Geode Submeter GPS on 4/24/2023
- Delineated By: G. Davis
- This delineation utilizes the Corps' 1987 three-parameter methodology and Arid West Supplement to delineate jurisdictional waters of the U.S.
- The boundaries and jurisdictional status of all waters shown on this map are preliminary and subject to verification by the U.S. Army Corps of Engineers.
- Coordinate System: California State Plane Zone II.
- Projection: Lambert Conformal Conic.
- Datum: North American Datum 1983.

AQUATIC RESOURCES INDIVIDUAL FEATURE

Seasonal Wetland

Label	Acres	Latitude	Longitude
SW-1	0.211	38.426057	-121.403104
SW-2	0.095	38.426038	-121.402443
SW-3	0.009	38.425991	-121.402193
SW-4	1.719	38.426535	-121.401120
Subtotal	**2.034**		

Ditch

Label	Acres	Length (LF)	Avg Width (FT)	Latitude	Longitude
D-1	0.013	272	2	38.427247	-121.400272
Subtotal	**0.013**				

HELIX
Environmental Planning

USACE REGULATORY FILE #:
VERIFIED BY: TBD
DATE OF VERIFICATION: TBD

REVISIONS

DATE	DESCRIPTION	BY

0 100 200
Feet
1 inch = 100 feet

N

AQUATIC RESOURCES DELINEATION MAP

Dunisch Residential Project

City of Elk Grove, Sacramento County, California

October 11, 2023

APPENDIX B

Enclosure 1

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, SACRAMENTO DISTRICT
1325 J STREET
SACRAMENTO CA 95814-2922

CESPK-RDC-D 12 September 2024

MEMORANDUM FOR RECORD

SUBJECT: US Army Corps of Engineers (Corps) Approved Jurisdictional Determination in accordance with the "Revised Definition of 'Waters of the United States'"; (88 FR 3004 (January 18, 2023) as amended by the "Revised Definition of 'Waters of the United States'; Conforming" (8 September 2023) ,[1] [SPK-2024-00316]

BACKGROUND. An Approved Jurisdictional Determination (AJD) is a Corps document stating the presence or absence of waters of the United States on a parcel or a written statement and map identifying the limits of waters of the United States on a parcel. AJDs are clearly designated appealable actions and will include a basis of JD with the document.[2] AJDs are case-specific and are typically made in response to a request. AJDs are valid for a period of five years unless new information warrants revision of the determination before the expiration date or a District Engineer has identified, after public notice and comment, that specific geographic areas with rapidly changing environmental conditions merit re-verification on a more frequent basis.[3]

On January 18, 2023, the Environmental Protection Agency (EPA) and the Department of the Army ("the agencies") published the "Revised Definition of 'Waters of the United States,'" 88 FR 3004 (January 18, 2023) ("2023 Rule"). On September 8, 2023, the agencies published the "Revised Definition of 'Waters of the United States'; Conforming", which amended the 2023 Rule to conform to the 2023 Supreme Court decision in *Sackett v. EPA*, 598 U.S., 143 S. Ct. 1322 (2023) ("*Sackett*").

This Memorandum for Record (MFR) constitutes the basis of jurisdiction for a Corps AJD as defined in 33 CFR §331.2. For the purposes of this AJD, we have relied on Section 10 of the Rivers and Harbors Act of 1899 (RHA),[4] the 2023 Rule as amended, as well as other applicable guidance, relevant case law, and longstanding practice in evaluating jurisdiction.

1. SUMMARY OF CONCLUSIONS.

[1] While the Revised Definition of "Waters of the United States"; Conforming had no effect on some categories of waters covered under the CWA, and no effect on any waters covered under RHA, all categories are included in this Memorandum for Record for efficiency.
[2] 33 CFR 331.2.
[3] Regulatory Guidance Letter 05-02.
[4] USACE has authority under both Section 9 and Section 10 of the Rivers and Harbors Act of 1899 but for convenience, in this MFR, jurisdiction under RHA will be referred to as Section 10.

a. Provide a list of each individual feature within the review area and the jurisdictional status of each one (i.e., identify whether each feature is/is not a water of the United States and/or a navigable water of the United States).

Name of Aquatic Resource	Cowardin	Description	Waters of the U.S.	Navigable Waters of the U.S.
D-1	R4	Ditch	Yes	No
SW-1	PEM	Seasonal Wetland	No	No
SW-2	PEM	Seasonal Wetland	No	No
SW-3	PEM	Seasonal Wetland	No	No
SW-4	PEM	Seasonal Wetland	Yes	No

2. REFERENCES.

a. "Revised Definition of 'Waters of the United States,'" 88 FR 3004 (January 18, 2023) ("2023 Rule")

b. "Revised Definition of 'Waters of the United States'; Conforming" 88 FR No. 173 (September 8, 2023))

c. *Sackett v. EPA*, 598 U.S., 143 S. Ct. 1322 (2023)

3. REVIEW AREA. The approximately 14.5-acre review area is located immediately south of Dunisch Road and west of West Stockton Boulevard, Latitude: 38.4266680°, Longitude -121.4016115°, in the City of Elk Grove, Sacramento County, California.

4. NEAREST TRADITIONAL NAVIGABLE WATER (TNW), THE TERRITORIAL SEAS, OR INTERSTATE WATER TO WHICH THE AQUATIC RESOURCE IS CONNECTED. The nearest TNW is the Sacramento River, which is approximately 6 miles west of the review area.[5]

5. FLOWPATH FROM THE SUBJECT AQUATIC RESOURCES TO A TNW, THE TERRITORIAL SEAS, OR INTERSTATE WATER: SW-4, a paragraph (a)(4) water, has a continuous surface connection (csc) to a paragraph (a)(3) ditch (D-1), which flows into

[5] This MFR should not be used to complete a new stand-alone TNW determination. A stand-alone TNW determination for a water that is not subject to Section 9 or 10 of the Rivers and Harbors Act of 1899 (RHA) is completed independently of a request for an AJD. A stand-alone TNW determination is conducted for a specific segment of river or stream or other type of waterbody, such as a lake, where upstream or downstream limits or lake borders are established.

a stormwater system confluence, and detention basin, before discharging into Laguna Creek, an (a)(3) relatively permanent tributary to the Sacramento River.

6. SECTION 10 JURISDICTIONAL WATERS[6]: There are no Section 10 waters within the review area

7. SECTION 404 JURISDICTIONAL WATERS: The following aquatic resources within the review area were found to meet the definition of waters of the United States in accordance with the 2023 Rule as amended, consistent with the Supreme Court's decision in Sackett: D-1, and SW-4.

The geographical extent of aquatic resources was initially delineated by HELIX Environmental Planning (HELIX). According to HELIX, their aquatic resources delineation was performed in accordance with the Corps' 1987 Wetlands Delineation Manual, the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region, A Field Guide to the Identification of the Ordinary High-Water Mark (OHWM) in the Arid West Region of the Western United States, and the Sacramento District's Minimum Standards for Acceptance of Preliminary Wetlands Delineations. U.S. Army Corps of Engineer regulations (33 CFR 328) were used to determine the presence of Waters of the United States other than wetlands. The most recent National Wetland Plant List was used to determine the wetland indicator status of plants observed in the study area. The Corps concurs with the extent of wetlands and other waters as mapped by HELIX and portrayed on their October 2023 Aquatic Resource Delineation (ARD) map (Enclosure 1).

a. Traditional Navigable Waters (TNWs) (a)(1)(i): N/A.

b. The Territorial Seas (a)(1)(ii): N/A.

c. Interstate Waters (a)(1)(iii): N/A.

d. Impoundments (a)(2): N/A.

e. Tributaries (a)(3): **(D-1)**, this roadside ditch is approximately 270 linear feet (LF) and located along the northern boundary of the review area abutting a paved road, a residential development, SW-4, and uplands which can been seen in the enclosed map of the review area (Enclosure 1). This ditch exhibits an Ordinary High-Water Mark

[6] 33 CFR 329.9(a) A waterbody which was navigable in its natural or improved state, or which was susceptible of reasonable improvement (as discussed in § 329.8(b) of this part) retains its character as "navigable in law" even though it is not presently used for commerce or is presently incapable of such use because of changed conditions or the presence of obstructions.

(OHWM) and meets the definition of a paragraph (a)(3) tributary under the Waters Rule, as amended. Site photos taken during the wet season show wetland matting, and vegetative communities within the ditch that provides evidence of the relative permanence of the ditch (Enclosure 2, Photo 6). A drop-inlet culvert associated with an underground stormwater drainage system function as the low point within the ditch where water drains towards (Enclosure 3, Photo 7). Madrone Consulting, Inc., (Madrone) traced the drainage path of water once it leaves the site to confirm where and how storm water is discharged (Enclosure 4). Once water from the site enters the storm water system via the drop inlet located within the roadside ditch, it is comingled with storm water from the approximately 56.4-acre residential development area. Storm water from the site travels for about 3,000 feet in the storm water system (which also intercepts storm water via multiple drop inlets in the residential area) before discharging to a storm water detention basin adjacent to Guttridge Park (Enclosure 5). This basin is just east of the confluence of Laguna Creek and Elk Grove Creek and was constructed to manage municipal storm water. A review of aerial photography indicates that water from the basin is discharged to the northeast into an engineered wetland channel or bioswale to the north of Laguna Creek and eventually flows west and into Laguna Creek.

f. Adjacent Wetlands (a)(4): **SW-4**, this 1.7-acre wetland feature exhibits a csc with a paragraph (a)(3) tributary that meets the relatively permanent standard. SW-4 drains east towards D-1, a paragraph (a)(3) water, via an approximately 25-foot culvert located at the northeastern edge of the wetland feature (Enclosure 6). Based on the conclusion from the Corps' July 2024, implementation memorandum with the EPA, Memorandum on NAP-2023-01223, which describes how a 70-foot pipe under a roadway may serve as a continuous surface connection between a wetland and a relatively permanent tributary this wetland feature meets the definition of a paragraph (a)(4) water under the Waters Rule, as amended.

g. Additional Waters (a)(5): N/A.

8. NON-JURISDICTIONAL AQUATIC RESOURCES AND FEATURES

a. Describe aquatic resources and other features within the review area identified in the 2023 Rule as amended as not "waters of the United States" even where they otherwise meet the terms of paragraphs (a)(2) through (5). Include the type of excluded aquatic resource or feature, the size of the aquatic resource or feature within the review area and describe how it was determined to meet one of the exclusions listed in 33 CFR 328.3(b).[7]

[7] 88 FR 3004 (January 18, 2023)

b. Describe aquatic resources and features within the review area that were determined to be non-jurisdictional because they do not meet one or more categories of waters of the United States under the 2023 Rule as amended (e.g., tributaries that are non-relatively permanent waters; non-tidal wetlands that do not have a continuous surface connection to a jurisdictional water). **SW-1, SW-2, and SW-3** do not meet the definition of Waters of the U.S. Although the wetlands meet the Corps definition of a wetland as defined in 33 CFR §328.3(c)(16), these wetlands do not exhibit a continuous surface connection with a paragraph (a)(1) water, relatively permanent (a)(2) impoundment, or (a)(3) tributary that meets the relatively permanent standard. As shown in the enclosed LiDAR map, the southwest portion of the review area is lower in elevation than adjacent areas to the west between the review area and Elk Grove Creek (Enclosure 7). During the consultants site visit, the landowner of the residential parcel west of the review area confirmed that overall drainage is north, toward Dunisch Road. Site photos provided by the consultant depicted vegetative transitions between the wetland feature and the uplands (Enclosure 8, Photo 3 and 4). Imagery analysis using Digital Globe imagery, LiDAR, and site photos provide evidence that these features do not have a continuous surface connection to a relatively permanent water. Therefore, SW-1, SW-2, and SW-3 are not jurisdictional as they do not meet the definition of an (a)(4) wetland under the 2023 rule due to the lack of a continuous surface connection with a jurisdictional resource.

9. DATA SOURCES.

a. Helix Environmental Planning (Helix). 2023. *Dunisch Residential Project Aquatic Resources Delineation Report*. Dated October 2023.

b. Google Earth Pro 7.3.3.7786 (July 21, 2020). Taken January 26, 2024. Sacramento, California. Latitude 38.426604°, Longitude -121.401143°. Accessed June 6, 2024.

c. USGS National Map 3D Digital Elevation Program (3DEP). ArcGIS Pro. Latitude 38.426604°, Longitude -121.401143°. Accessed June 7, 2024.

d. Digital Globe. Taken February 08, 2022. G-EGD. Latitude 38.426604°, Longitude -121.401143°. Accessed May 06, 2024.

e. Digital Globe. Taken January 13, 2022. G-EGD. Latitude 38.426604°, Longitude -121.401143°. Accessed May 06, 2024.

f. Digital Globe. Taken March 04, 2021. G-EGD. Latitude 38.426604°, Longitude -121.401143°. Accessed May 06, 2024.

g. Digital Globe. Taken January February 14, 2017. G-EGD. Latitude 38.426604°, Longitude -121.401143°. Accessed May 06, 2024.

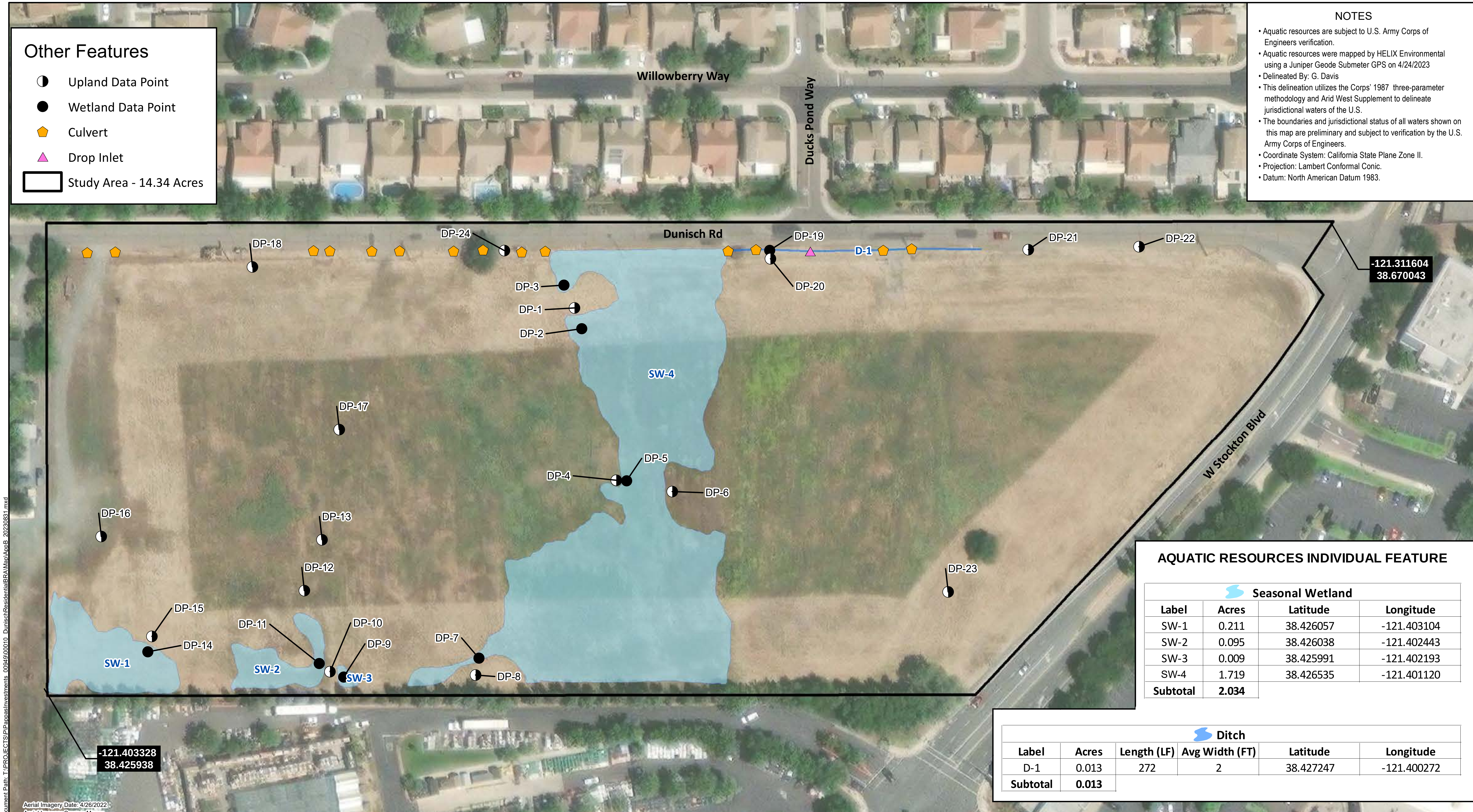
10. OTHER SUPPORTING INFORMATION. N/A.

11. NOTE: The structure and format of this MFR were developed in coordination with the EPA and Department of the Army. The MFR's structure and format may be subject to future modification or may be rescinded as needed to implement additional guidance from the agencies; however, the approved jurisdictional determination described herein is a final agency action.

Kelley Herel

KELLEY C. HEREL
REGULATORY PROJECT MANAGER
CA DELTA SECTION

8 Encls
1 – Delineation Map
2 – D-1 Site Photos
3 – D-1 Drop Inlet Photo
4 – Project Vicinity Stormwater System
5 – Flow into Laguna Creek
6 – CSC of SW4
7 – LiDAR Map of site
8 – Site Photos of SW-1-3



Other Features

- Upland Data Point
- Wetland Data Point
- Culvert
- Drop Inlet
- Study Area - 14.34 Acres

NOTES

- Aquatic resources are subject to U.S. Army Corps of Engineers verification.
- Aquatic resources were mapped by HELIX Environmental using a Juniper Geode Submeter GPS on 4/24/2023
- Delineated By: G. Davis
- This delineation utilizes the Corps' 1987 three-parameter methodology and Arid West Supplement to delineate jurisdictional waters of the U.S.
- The boundaries and jurisdictional status of all waters shown on this map are preliminary and subject to verification by the U.S. Army Corps of Engineers.
- Coordinate System: California State Plane Zone II.
- Projection: Lambert Conformal Conic.
- Datum: North American Datum 1983.

AQUATIC RESOURCES INDIVIDUAL FEATURE

Seasonal Wetland

Label	Acres	Latitude	Longitude
SW-1	0.211	38.426057	-121.403104
SW-2	0.095	38.426038	-121.402443
SW-3	0.009	38.425991	-121.402193
SW-4	1.719	38.426535	-121.401120
Subtotal	**2.034**		

Ditch

Label	Acres	Length (LF)	Avg Width (FT)	Latitude	Longitude
D-1	0.013	272	2	38.427247	-121.400272
Subtotal	**0.013**				

Document Path: T:\PROJECTS\P\PappasInvestments_00949\00010_DunischResidential\BRA\Map\AppB_20230831.mxd

HELIX Environmental Planning

USACE REGULATORY FILE #:
VERIFIED BY: TBD
DATE OF VERIFICATION: TBD

REVISIONS

DATE	DESCRIPTION	BY

0 100 200
Feet
1 inch = 100 feet

N

AQUATIC RESOURCES DELINEATION MAP

Dunisch Residential Project

City of Elk Grove, Sacramento County, California

October 11, 2023

APPENDIX B

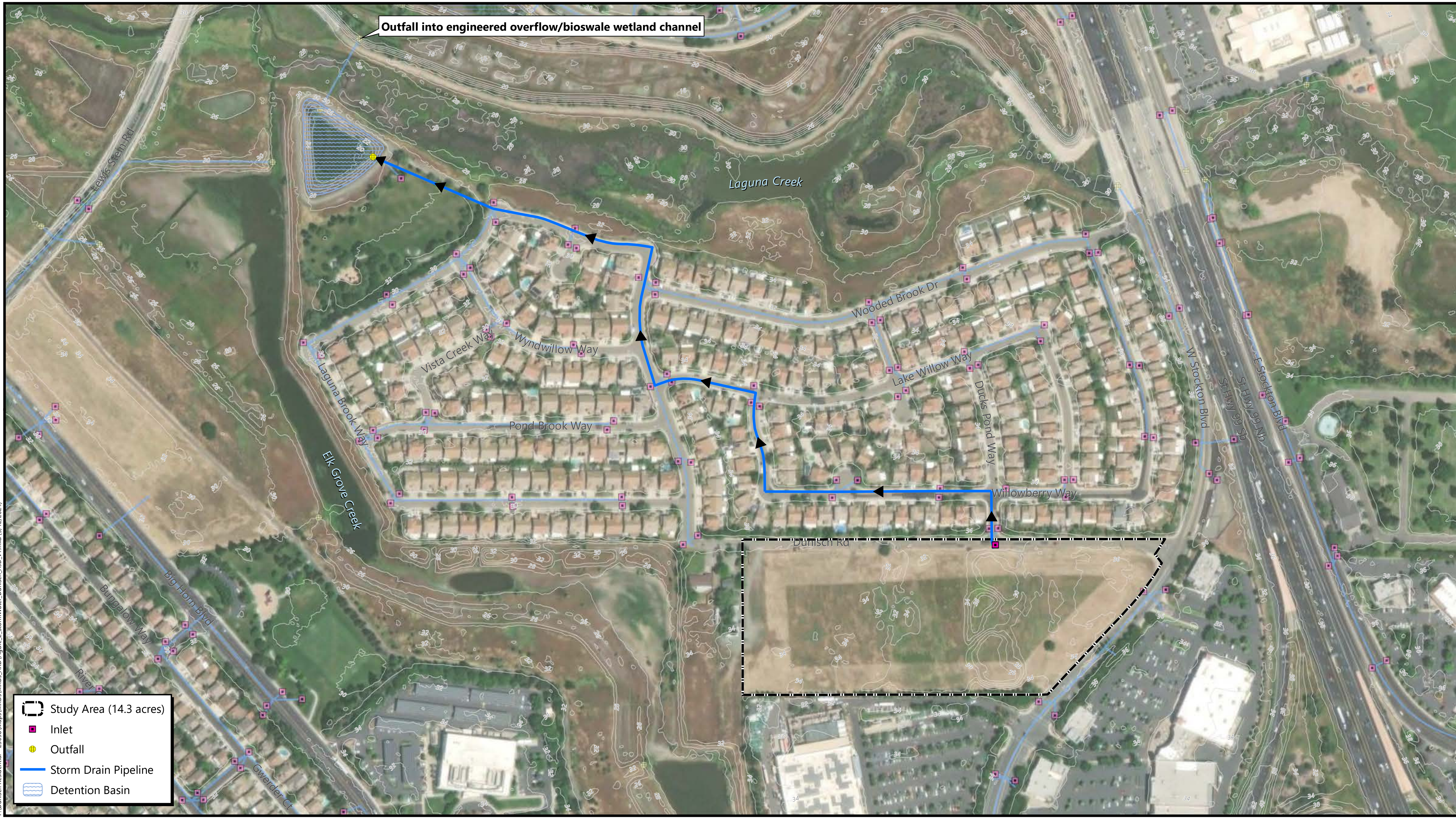
Photo 5. Representative view of the southern portion of SW-4 looking southwest towards Home Depot. Photo taken 4/24/2023.

Photo 6. Representative view of the roadside ditch (D-1) looking west along Dunisch Road. Note that D-1 drains SW-4 within the Study Area. Photo taken 4/24/2023.

Photo 7. Representative view of the drop inlet culvert that conveys water from D-1 into the stormwater drainage system under Dunisch Road. Photo taken 5/16/2023.

M:\PROJECTS\P\PappasInvestments_00949\00010_DunischResidentialBRA_Reports\ARD\AppE_Photos G\PROJECTS\Biology\H\HDL-05\Reports\Year 5 (2010)\Yr5 Appx E site photos

P:\Dunisch Residential - 23098\Maps\MXDs\MXDs_ARD\Figure_2_StormWater_Dunisch_AJD_v1.mxd (3/12/2024)



N

Feet
0 300

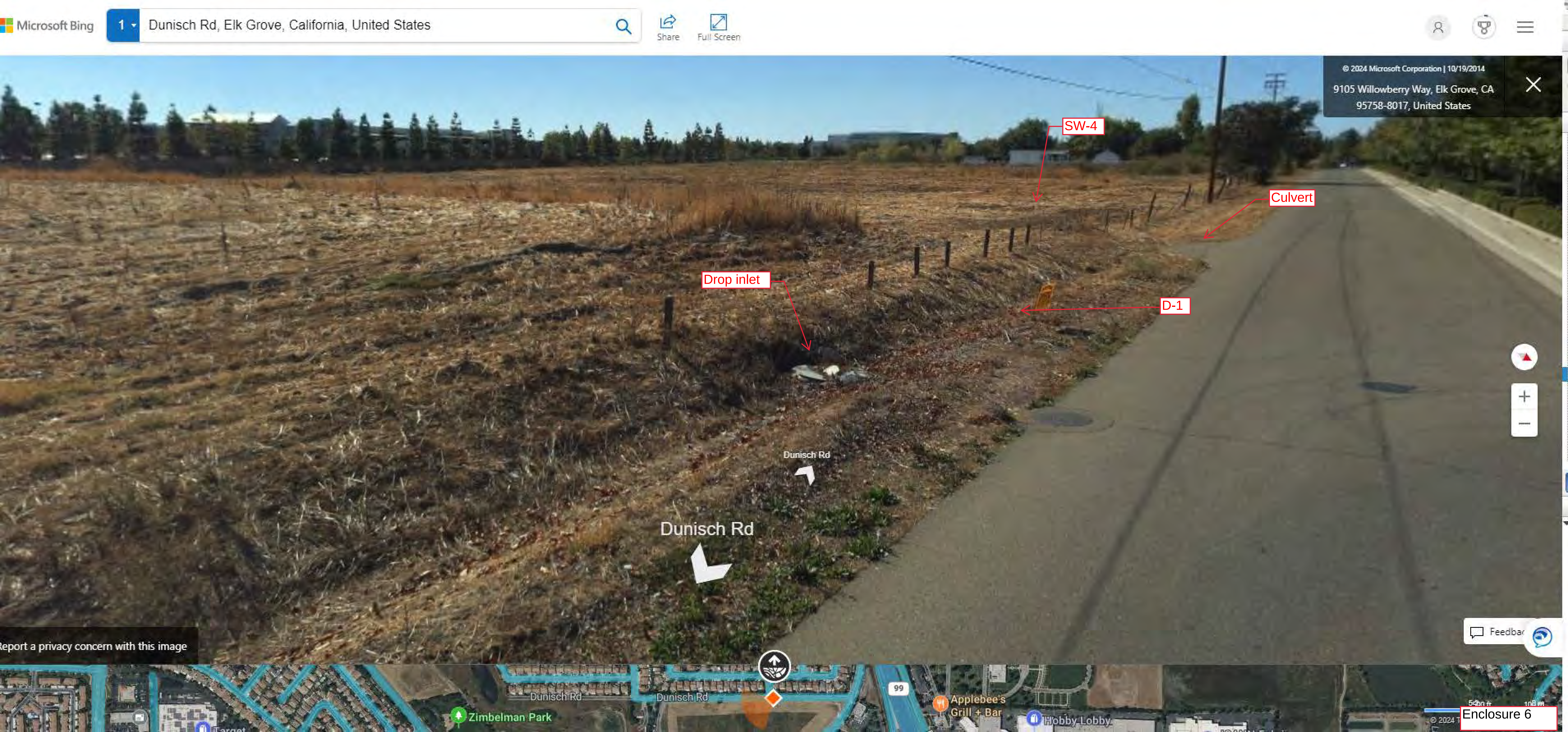
Boundary Source: Helix Environmental Planning
Storm Water Source: City of Elk Grove
Contour Source: Sacramento County 2' Contours
Aerial Source: Maxar, 26 April 2022

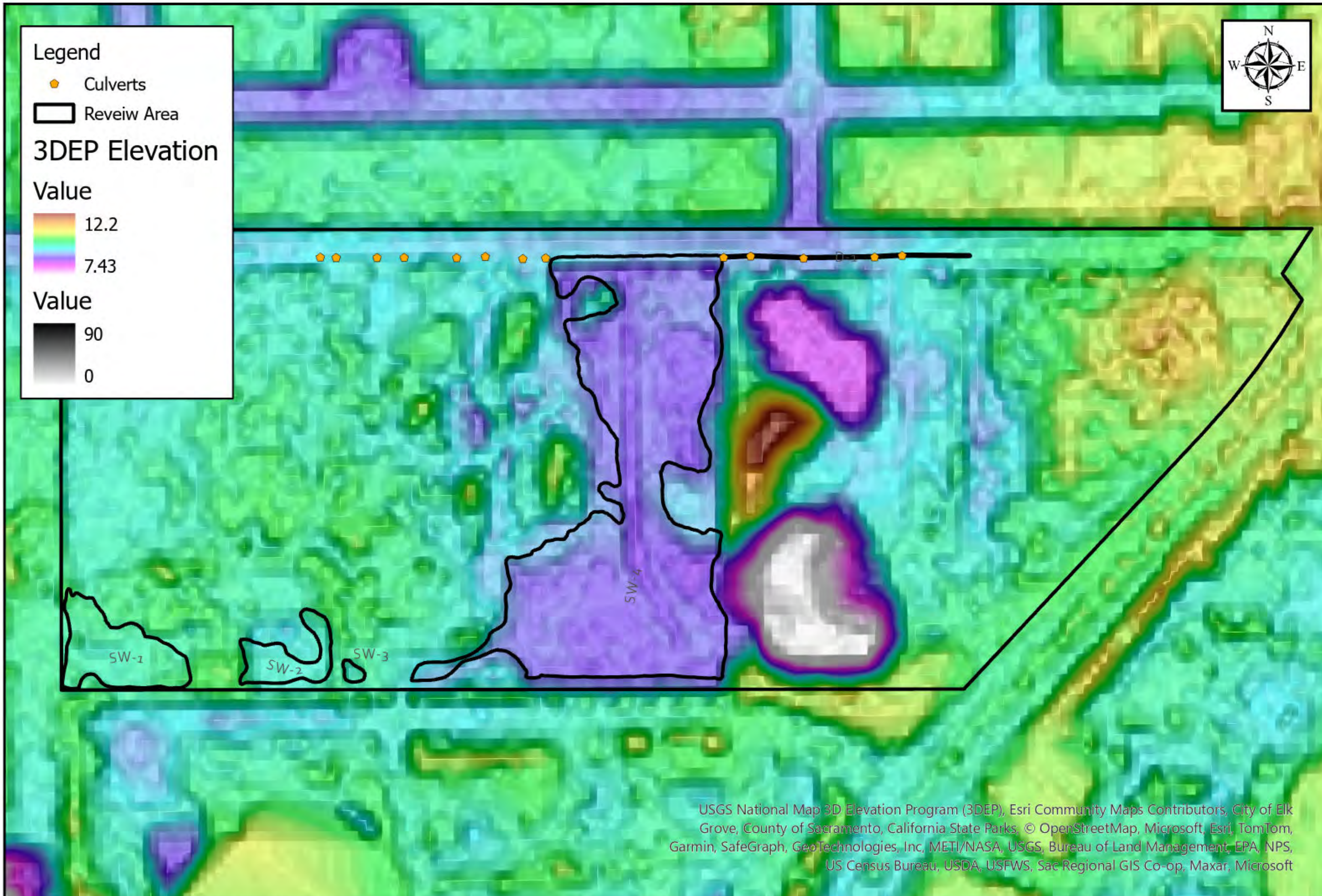
Figure 2
Project Vicinity Storm Water System

Dunisch Residential
Elk Grove, Sacramento County, California

MADRONE ECOLOGICAL CONSULTING


Flowpath from Detention Basin to Laguna Creek
Legend
Flowpath
Stormwater drainage system discharges into detention basin
LAGUNA CREEK
Google Earth
Enclosure 5
N
200 ft


Microsoft Bing
Dunisch Rd, Elk Grove, California, United States
Share
Full Screen
© 2024 Microsoft Corporation | 10/19/2014
9105 Willowberry Way, Elk Grove, CA 95758-8017, United States
SW-4
Culvert
Drop inlet
D-1
Dunisch Rd
Dunisch Rd
Report a privacy concern with this image
Feedback
Dunisch Rd
Dunisch Rd
Zimbelman Park
99
Applebee's Grill + Bar
Hobby Lobby
Enclosure 6



Elevation Map of the Dunisch Residential Review Area
SPK-2024-00318

0 70 140 280
Feet

Map Center: 121.400968°W 38.426652°N

Author Name Kelley Herbel

Map Prepared on: 6/7/2024

Coordinate System: NAD 1983 StatePlane California II FIPS 0402 Feet

Photo 3. Representative view of the SW-2 looking north. Note that the shovel is in the central portion of the wetland. Photo taken 4/24/2023.

Photo 4. Representative view of the SW-3 looking northwest. Note that the shovel is near the edge of the wetland and SW-2 is visible slightly above the shovel handle. Photo taken 4/24/2023.

APPENDIX E

GEOTECHNICAL ENGINEERING STUDY

GEOTECHNICAL ENGINEERING STUDY
FOR
DUNISCH PROPERTY SUBDIVISION
Dunisch Road and W Stockton Blvd
Elk Grove, California

Project No. E24033.001
April 2024

YOUNGDAHL
ESTABLISHED 1984

YOUNGDAHL CONSULTING GROUP, INC.

Woodside Homes
1130 Iron Point Road, Suite 200
Folsom, California 95630

Project No. E24033.001
30 April 2024

Attention: Michael LaFortune

Subject: **DUNISCH PROPERTY SUBDIVISION**
Dunisch Road and W Stockton Blvd, Elk Grove, California
GEOTECHNICAL ENGINEERING STUDY

References: See Page ii

Dear Mr. LaFortune:

In accordance with your authorization, Youngdahl Consulting Group, Inc. has prepared this geotechnical engineering study update for the project site located at Dunisch Road and W Stockton Blvd in Elk Grove, California. The purpose of this study was to prepare a site-specific geotechnical report based on existing and new information that can be incorporated into design of the proposed site. To complete this task, our firm completed a subsurface exploration, reviewed the referenced documents, and prepared this report in accordance with the Reference 5 contract.

Based upon our observations, the geotechnical aspects of the site appear to be suitable for support of the proposed structure provided the recommendations presented in this report are incorporated into the design and construction. Geotechnical conditions associated with site development are anticipated to include processing existing grades for preparation to receive engineered fills, the placement of engineered fills, mitigation of expansive soils, improvement for drainage controls, and the construction of foundations.

Due to the non-uniform nature of soils, other geotechnical issues may become more apparent during grading operations which are not listed above. The descriptions, findings, conclusions, and recommendations provided in this report are formulated as a whole; specific conclusions or recommendations should not be derived or used out of context. Please review the limitations and uniformity of conditions section of this report.

This report has been prepared for the exclusive use of the addressee of this report and their consultants, for specific application to this project, in accordance with generally accepted geotechnical engineering practice. Should you have any questions or require additional information, please contact our office at your convenience.

Very truly yours,
Youngdahl Consulting Group, Inc.

REGISTERED PROFESSIONAL ENGINEER
CORINNE GOODWIN
C 90559
CIVIL
STATE OF CALIFORNIA
4/30/2024

Corinne Goodwin, P.E.
Project Engineer

Reviewed by:

REGISTERED PROFESSIONAL ENGINEER
MATTHEW J. GROSS
GE 3088
GEOTECHNICAL
STATE OF CALIFORNIA
4/30/2024

Matthew J. Gross, P.E., G.E.
Senior Engineer

Distribution: PDF to Client

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P: 916.933.0633
F: 916.933.6482
youngdahl.net

References:

1. Laguna Gateway Geotechnical Engineering Report, prepared by Wallace Kuhl & Associates, dated 2015 August 13 (WKA No. 10665.01).
2. Laguna Gateway Phase 3 Supplemental Soil Borings, prepared by Wallace Kuhl & Associates, dated 20157 April 11 (WKA No. 10665.01).
3. Tentative Subdivision Map for Dunisch Property, prepared by Wood Rodgers, dated 18 February 2022.
4. Draft Phase 1 Environmental Site Assessment, prepared by Youngdahl Consulting Group, Inc., dated 15 February 2024 (No. E24033.000).
5. Fully Executed Service Agreement, prepared by Woodside Homes of Northern California, dated 20 February 2024.

TABLE OF CONTENTS

GEOTECHNICAL ENGINEERING STUDY
FOR
DUNISCH PROPERTY SUBDIVISION

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering study performed for the proposed improvements planned to be constructed at Dunisch Road and W Stockton Blvd in Elk Grove, California. The vicinity map provided on Figure A-1, Appendix A shows the approximate project location.

Project Understanding

We understand that the proposed development will consist of the construction of a new subdivision. We anticipate that the new buildings will be up to two stories, of wood frame construction and supported on shallow post-tensioned concrete foundations or conventional shallow foundations with concrete slab on grade floors. Based on the provided grading plan, the site appears to be relatively flat with a stockpile on the eastern half of the site. The lot is anticipated to be developed by removing or reworking the existing stockpile which is approximately 6 to 8 feet in height and overexcavation and recompaction of existing undocumented fills throughout the site. Appurtenant construction is anticipated to include new roadways, underground utilities, concrete hardscaping, and landscaping. At this time, we understand that the import location for the proposed fill is not known.

Background

Geotechnical reports were previously prepared by another firm, References 1 and 2, and contained other pertinent geotechnical information. The previous reports are for reference only in preparation of this report and the recommendations are not incorporated into this report. The Phase 1 ESA report (Reference 4) details the history of the site with historical aerial photography, USGS topographic maps, city directory abstracts, previous Phase 1 ESA reports, regulatory records, and interviews. The site was undeveloped until 1947 when it began being used for agricultural land then in 1957 residential structures began appearing until a time between 1993 and 1998 where the structures on the west were removed and by 2016, no more residential structures were present on site. Stockpiles began appearing by 2012.

If studies or plans pertaining to the site exist and are not cited as a reference in this report, we should be afforded the opportunity to review and modify our conclusions and recommendations as necessary.

Purpose and Scope

Youngdahl Consulting Group, Inc. has prepared this report to provide geotechnical engineering recommendations and considerations for incorporation into the design and development of the site. The recommendations provided in this update supersede those provided in the previous geotechnical reports. The following scope of services were developed and performed for preparation of this report:

- A review of geotechnical and geologic data available to us at the time of our study;
- Performance of a field study consisting of a site reconnaissance and subsurface explorations to observe and characterize the subsurface conditions;
- Laboratory testing on representative samples collected during our field study;
- Evaluation of the data and information obtained from our field study, laboratory testing, and literature review for geotechnical conditions;

- Development of the following geotechnical recommendations and considerations regarding earthwork construction including, site preparation and grading, engineered fill criteria, seasonal moisture conditions, compaction equipment, excavation characteristics, slope configuration and grading, and drainage;
- Development of geotechnical design criteria for code-based seismicity, foundations, slabs on grade, and retaining walls;
- Preparation of this report summarizing our findings, conclusions, and recommendations regarding the above-described information.

2.0 SITE CONDITIONS

The following section describes our findings regarding the site conditions that we observed during our site reconnaissance and subsequent subsurface explorations.

Surface Observations

The project site is located at the southwest corner of Dunisch Road and West Stockton Boulevard in Elk Grove, California and is bounded by Dunisch Road to the north, West Stockton Boulevard to the southeast, commercial development to the south, and rural residential structures and undeveloped land to the west. Topography at the site is relatively flat with the exception of a stockpile on the west side that has been built up since the removal of the residential structures around 2006. At the time of our visit on 15 and 20 February 2024, the vegetation at the site consisted of seasonal grasses with few trees.

Subsurface Conditions

Our field study included a site reconnaissance by a representative of our firm and a subsurface exploration program. The exploration program included the advancement of five test borings, excavation of four test pits, and drilling of two hand auger borings to evaluate the near surface soils conditions. The approximate locations of the borings and test pits are presented on Figure A-2, Appendix A. The logs from our boring and test pit exploration program are provided in Appendix B and the logs from the previous field studies are provided in Appendix B.

The subsurface soils at the project site were observed to consist clays and of sandy clays in a stiff to very stiff condition and clayey sands in a loose to medium dense condition underlain by poorly graded, clayey, and silty sands in medium dense to very dense conditions. While our subsurface exploration revealed a similar soil profile as described in the Reference 1 and 2 reports, we did identify more expansive soils and found the blow counts were lower than previously reported.

As noted in the Reference 1 report, stockpiled soils are present in the western portion of the site. The subsurface conditions based on the boring and test pit data we obtained in this stockpile area include fills of approximately up to 8 feet above the prevailing site elevation. The fill material generally consisted of sandy clays and clayey sands in a stiff to very stiff condition (test pits TP-2 and TP-4, and boring B-5).

Groundwater Conditions

A permanent groundwater table was not encountered at the project site and is expected to be no impact to the development of the site for shallow facilities. According to California Department of Water Resources Water Data Library Station Map, a groundwater well located approximately on the north side of the site was measured to have groundwater at a depth of 32 feet below the ground surface (bgs) in April 2023 which could impact deeper facilities (i.e., pipelines, manholes, that encroach this depth or wet wells).

Perched water conditions have been encountered on neighboring developments; typically, during the winter and spring seasons. The presence of perched water can vary because of many factors such as, the proximity to the cemented soil horizon, topographic elevations, and the presence of utility trenches. Based on our experience in the area, water may be perched on the shallow cemented soil horizon found beneath the site during or following precipitation events and likely occurring during the winter and spring season.

3.0 GEOTECHNICAL SOIL CHARACTERISTICS

The geotechnical soil characteristics presented in this section of the report are based on laboratory testing from recent and previous studies and observation of samples collected from subsurface soils.

Laboratory Testing

Laboratory testing of the collected samples was directed towards evaluating the physical and engineering properties of the soil underlying the site. A description of the tests performed for this project and the associated test results are presented in Appendix B. In summary, the following tests were performed for the preparation of this report:

Table 1: Laboratory Tests (YCG 2024)

Laboratory Test	Test Standard	Summary of Results	
Direct Shear	ASTM D3080	B-4 @ 6’	Φ = 30.8°, c = 830 psf
Expansion Index	ASTM D4829	B-2 @ 2.5-4’ TP-1 @ 0-2’	EI = 109 (High) EI = 100 (High)
Atterberg Limits	ASTM D4318	B-2 @ 2.5-4’	LL = 56; PL = 16; PI = 40 (CH)
Sieve Analysis	ASTM D6913	B-2 @ 2.5-4’	0 > #4; 75.8% < #200 52.1% < 2 μm
Maximum Dry Density	ASTM D1557	TP-1 @ 0-2’	DD = 118.9 pcf, MC = 11.5 %
R-Value	CTM 301	TP-3 @ 1-4’ HA-1 & HA-2 @ 0-3’	R < 5 R = 35
Corrosivity Suite	CA DOT Tests 417, 422 and 643	See Soil Corrosivity Section	

The previous laboratory testing evaluated physical and engineering properties of the soil underlying the site. A description of the tests performed for this project and the associated test results are presented in Appendix C. In summary, the following tests were performed for the preparation of this report:

Table 2: Laboratory Tests (WKA 2015)

Laboratory Test	Test Standard	Summary of Results	
Expansion Index	ASTM D4829	S1 @ 1-4’	EI = 40 (Low)
Sieve Analysis	ASTM D6913	D4-4i	66% < #200
Unconfined Compression	ASTM D2166	D4-4i	UCS = 2.4 tsf
R-Value	CTM 301	S1 @ 1-4’ S2 @ 1-4’	R < 5 R = 15
Corrosivity Suite	CA DOT Tests 417, 422 and 643	See Soil Corrosivity Section	

Soil Expansion Potential
We observed expansive soils in the upper 5 feet in most of our recent borings and test pits. The clay samples were tested to have high (EI = 100 and 109) expansion potential. Due to the presence of plastic materials observed, special design considerations for expansive soils should be planned.

Soil Corrosivity
A corrosivity testing suite consisting of soil pH, resistivity, sulfate, and chloride content tests were performed on selected soil samples collected during our recent site exploration and the 2015 exploration. We are not corrosion specialists and recommend that the results be evaluated by a qualified corrosion expert. The laboratory test results (provided by Sunland Analytical, Inc.) are provided in Appendices C and D.

Table 3: Corrosivity Summary (YCG 2024)

Location	Depth (in)	Soil pH	Minimum Resistivity ohm-cm (x1000)	Chloride (ppm)	Sulfate (ppm)	Caltrans Environment	ACI Environment
TP-1	0-4	7.57	1.15	14.7	46.0	Non-Corrosive	S0 (Not a Concern)
TP-4	1-4	7.63	1.07	4.8	21.1	Non-Corrosive	S0 (Not a Concern)

A corrosivity testing suite consisting of soil pH, resistivity, sulfate, and chloride content tests were performed on selected soil samples collected during our previous site exploration. We are not corrosion specialists and recommend that the results be evaluated by a qualified corrosion expert. The laboratory test results (provided by Sunland Analytical, Inc.) are provided in Appendix D.

Table 4: Previous Corrosivity Summary (WKA 2015)

Location	Depth (in)	Soil pH	Minimum Resistivity ohm-cm (x1000)	Chloride (ppm)	Sulfate (ppm)	Caltrans Environment	ACI Environment
D1-1ii	n/a	7.35	1.51	11.0	28.5	Non-Corrosive	S0 (Not a Concern)
D4-1ii	n/a	7.29	1.10	16.7	18.0	Non-Corrosive	S0 (Not a Concern)

According to Caltrans Corrosion Guidelines Version 3.2, May 2021, the test results appear to indicate a non-corrosive environment. According to the 2022 California Building Code Section 1904.1 and ACI 318-19 Table 19.3.1.1, the test results indicate the onsite soils have a negligible potential for sulfide attack of concrete. Accordingly, Type I/II Portland cement is appropriate for use in concrete construction. A certified corrosion engineer should be consulted to review the tests and site conditions in order to develop specific mitigation recommendations if metallic pipes or structural elements are designed to be in contact with or buried in soil.

4.0 GEOLOGY AND SEISMICITY
The geologic portion of this report includes a review of geologic data pertinent to the site based on an interpretation of our observations of the surface exposures and our observations in our exploratory test pits.

Geologic Conditions
The site is located within the Great Valley geomorphic province of California. This province is underlain by Cretaceous, Tertiary and Quaternary age sediments which may exceed 6,500 feet in thickness in the south Sacramento County area (Harwood & Helley, 1987). The basement Cretaceous age rocks consist of indurated marine sandstones and shales. The overlying semi-consolidated Tertiary and late Quaternary sediments consist of interbedded stream and lake deposits. Based upon a review of published geologic data for the Sacramento Regional Quadrangle (Wagner and others, 1981), the vicinity is mapped as the alluvium Riverbank formation of late Quaternary age.

Seismicity
Our evaluation of seismicity for the project site included reviewing existing fault maps and obtaining seismic design parameters from the USGS online calculators and databases. For the purpose of this study, we used a latitude and longitude of 38.426619, 121.401164 to identify the project site.

<u>Alquist-Priolo Regulatory Faults</u>
Based upon the records currently available from the California Department of Conservation, the project site is not located within an Alquist-Priolo Regulatory Review Zone and there are no known faults located at the subject site. We do not anticipate special design or construction requirements for faulting at this project site.

<u>Code Based Seismic Criteria</u>
Based upon the subsurface conditions encountered during our study and our experience in the area, the site should be classified as Site Class D. The structural engineer should review the conditions of the exception and the final choice of design parameters remains the purview of the project structural engineer.

Table 5: Seismic Design Parameters*

Reference		Seismic Parameter	Recommended Value
ASCE 7-16	Table 20.3-1	Site Class	D
	Figure 22-7	Maximum Considered Earthquake Geometric Mean (MCEC) PGA	0.233g
	Table 11.8-1	Site Coefficient F_{PGA}	1.367
	Equation 11.8-1	$PGA_M = F_{PGA}$ PGA	0.318g
2022 CBC	Figure 1613.2.1(1)	Short-Period MCE at 0.2s, S_S	0.556g
	Figure 1613.2.1(2)	1.0s Period MCE, S_1	0.247g
	Table 1613.2.3(1)	Site Coefficient, F_a	1.356
	Table 1613.2.3(2)	Site Coefficient, F_v	2.106
	Equation 16-36	Adjusted MCE Spectral Response Parameters, $S_{MS} = F_a S_s$	0.753g
	Equation 16-37	Adjusted MCE Spectral Response Parameters, $S_{M1} = F_v S_1$	0.520g
	Equation 16-38	Design Spectral Acceleration Parameters, $S_{DS} = \frac{2}{3} S_{MS}$	0.502g
	Equation 16-39	Design Spectral Acceleration Parameters, $S_{D1} = \frac{2}{3} S_{M1}$	0.347g
	Table 1613.2.5(1)	Seismic Design Category (Short Period), Occupancy I to III	D
	Table 1613.2.5(1)	Seismic Design Category (Short Period), Occupancy IV	D
	Table 1613.2.5(2)	Seismic Design Category (1-Sec Period), Occupancy I to IV	D

*Based on the online calculator available at https://earthquake.usgs.gov/ws/designmaps/

Earthquake Induced Liquefaction, Settlement, and Surface Rupture Potential
Liquefaction is the sudden loss of soil shear strength and sudden increase in porewater pressure caused by shear strains, as could result from an earthquake. Research has shown that saturated,

loose to medium-dense sands with a silt content less than about 25 percent and located within the top 40 feet are most susceptible to liquefaction and surface rupture/lateral spreading.

The permanently elevated groundwater table is recorded with a historical high at approximately 32 feet. Due to the relatively low seismicity of the area and the high blow counts our borings, the potential for seismically induced damage due to liquefaction, surface ruptures, and settlement is considered low. For the above-mentioned reasons mitigation for these potential hazards is not considered necessary for the development of this project.

Static and Seismically Induced Slope Instability
The existing slopes on the project site were observed to have adequate vegetation on the slope face, appropriate drainage away from the slope face, and no apparent tension cracks or slump blocks in the slope face or at the head of the slope. No other indications of slope instability such as seeps or springs were observed. Additionally, due to the absence of a permanently elevated groundwater table, the relatively low seismicity of the area, and the relatively shallow depth to cemented soils, the potential for seismically induced slope instability for the existing slopes is considered low.

5.0 DISCUSSION AND CONCLUSIONS

Based upon the results of our field explorations, findings, and analysis described above, it is our opinion that construction of the proposed improvements is feasible from a geotechnical standpoint, provided the recommendations contained in this report are incorporated into the design plans, specifications, and implemented during construction. The native soils, once processed and compacted as recommended below, may be considered “engineered” and suitable for support of the planned improvements.

Geotechnical Considerations for Development
The project site is generally comprised of alluvial soils, stockpiles of undocumented fill, and low-lying areas. Generally, issues associated with development on the site include the presence of expansive soils and implementation of drainage features. The soils are considered suitable for support of the proposed improvements provided the recommendations presented in this report are incorporated into design and construction operations.

Highly expansive clay soils were found at the project site. It appears that these clays may be encountered within the upper 5 feet of soil and throughout the project site, including the stockpile of undocumented fill. We provided two options for support of the planned structures 1) post-tensioned concrete slabs-on-grade and 2) concrete slabs on-grade over conventional shallow foundations. The selection to design for replacement pavements may be driven by economic factors and acceptable risk.

The project site has wetland areas which are considered to be indicators of potential drainage issues. To reduce the potential impacts associated with this condition, we have included recommendations for plug and drain systems in the utility trenches and pre-saturating the soils following grading operations for foundations, slabs, and flatwork on expansive soils.

The stockpile of soil on the east side of the site covers a large portion of the project area and should be removed or reworked and used as engineered fill material if it meets the criteria presented in Table 15 of this report.

6.0 SITE GRADING AND EARTHWORK IMPROVEMENTS

Excavation Characteristics

The uppermost site soils are anticipated to be excavatable with conventional earthwork equipment. Sites with similar subsurface conditions generally resort to using backhoes for shallow work and mid-size excavators for deeper excavations. Mass grading operations have been successfully completed on adjacent sites using scrapers and motor graders equipped with ripper shanks in combination with CAT 815 compactors.

Based on our understanding of the project, we anticipate that the majority or all of the project could be completed using open excavations. Open excavation is the typical excavation approach performed on utility installations. This approach utilizes excavation equipment such as excavators or backhoes to remove soils to a specified depth. Based on the test pits performed as part of our report and local experience, we expect that the site soils can be excavated using conventional excavating equipment, such as a medium sized excavator (i.e., CAT 320) for trench excavations. It is the responsibility of the contractor to appropriately apply construction methods to execute the proposed task

Soil Moisture Considerations

The compaction of soil to a desired relative compaction is dependent on conditioning the soil to a target range of moisture content. Moisture contents that are excessively dry or wet could limit the ability of the contractor to compact soils to the requirements for engineered fill. When dry, moisture should be added to the soil and the soils blended to improve consistency. Wet soil will need to be dried to become compactable. Generally, this includes blending and working the soil to avoid trapping moisture below a dryer surficial crust. Other options are available to reduce the time involved but typically have higher costs and require more evaluation prior to implementation.

The largest contributor to excessive soil moisture is generally precipitation and seepage during the rainy season. In recognition of this, we suggest that consideration be given to the seasonal limitations and costs of winter grading operations on the site. Special attention should be given regarding the drainage of the project site. If the project is expected to work through the wet season, the contractor should install appropriate temporary drainage systems at the construction site and should minimize traffic over exposed subgrades due to the moisture-sensitive nature of the on-site soils. During wet weather operations, the soil should be graded to drain and should be sealed by rubber tire rolling to minimize water infiltration.

Site Preparation

Preparation of the project site should involve site drainage controls, dust control, clearing and stripping, overexcavation and recompaction of loose native soils, and exposed grade compaction considerations. The following paragraphs state our geotechnical comments and recommendations concerning site preparation.

<u>Demolition</u>

As part of the demolition operation, any unwanted foundation, structural improvement, or site improvement elements (including underground utilities) should be exhumed and removed from the site. In addition, any underground storage tanks, abandoned wells or other utilities not intended for reuse should be removed or backfilled in accordance with the appropriate regulations.

Concrete and asphalt separated from the other debris, and adequately broken down in particle size, may be mixed thoroughly with soil and placed as engineered fill as described below. If this option is exercised, a representative from our firm should be contacted to observe the adequacy of grading operations associated with the breaking and mixing of these elements.

Site Drainage Controls

We recommend that initial site preparation involve intercepting and diverting any potential sources of surface or near-surface water within the construction zones. Because the selection of an appropriate drainage system will depend on the water quantity, season, weather conditions, construction sequence, and methods used by the contractor, final decisions regarding drainage systems are best made in the field at the time of construction. All drainage and/or water diversion performed for the site should be in accordance with the Clean Water Act and applicable Storm Water Pollution Prevention Plan.

Dust Control

Dust control provisions should be provided for as required by the local jurisdiction's grading ordinance (i.e. water truck or other adequate water supply during grading). Dust control is the purview of the grading contractor.

Clearing and Stripping of Organic Materials

Clearing and stripping operations should include the removal of all organic laden materials including trees, bushes, root balls, root systems, and any soft or loose soil generated by the removal operations. Short or mowed dry grasses may be pulverized and lost within fill materials provided no concentrated pockets of organics result. It is the responsibility of the grading contractor to remove excess organics from the fill materials. **No more than 2 percent of organic material, by weight, should be allowed within the fill materials at any given location.** Preserved trees may require tree root protection which should be addressed on an individual basis by a qualified arborist.

Our recommendations are based on limited windows into the surface and interpretations thereof; therefore, a representative of our firm should be present during site clearing operations to identify the location and depth of potential fills or loose soils, some of which may not have been found during our evaluation. We should also be present to observe removal of deleterious materials, and to identify any existing site conditions which may require mitigation or further recommendations prior to site development.

Expansive Soil Mitigation

Expansive soils were encountered during the WKA exploration programs and our recent field exploration for this study. The expansive soils appeared in within the upper 5 feet of test pits across the site. Mitigation measures or special design is anticipated for this project.

Overexcavation and Recompaction of Loose Native Soils

Following general site clearing, all existing loose or saturated native soils within the development footprint should be overexcavated down to firm native materials and backfilled with engineered fill as detailed in the engineered fill section below. Any depressions extending below final grade resulting from the removal of fill materials or other deleterious materials should be properly prepared as discussed below and backfilled with engineered fill.

Addressing Existing Fills Soils

The site has a current use for stockpiles from off-site grading and historic use for housing and grading/demolition. Therefore, existing fills are expected to be present on the site. Following general site clearing, all existing fills within the development should be overexcavated down to firm native materials and recompacted as engineered fill as detailed in the engineered fill section below. Any depressions extending below final grade resulting from the removal of fill materials or other deleterious materials should be properly prepared as discussed below and backfilled with engineered fill.

A representative of our firm should be present during site clearing operations to identify the location and depth of potential fills, some of which may not have been found during our evaluation. We should also be present to observe removal of deleterious materials, and to identify any existing site conditions which may require mitigation or further recommendations prior to site development.

Exposed Grade Compaction
Exposed soil grades following initial site preparation activities and overexcavation operations should be scarified to a minimum depth of 8 inches and compacted to the requirements for engineered fill. Grades developed by cutting into native soils should also be scarified and recompacted in the same manner.

Prior to placing fill, the exposed grades should be in a firm and unyielding state. Any localized zones of soft or pumping soils observed within the exposed grade should either be scarified and recompacted or be overexcavated and replaced with engineered fill as detailed in the engineered fill section below.

Engineered Fill Criteria
All materials placed as fills on the site should be placed as “Engineered Fill" which is observed, tested, and compacted as described in the following paragraphs.

Suitability of Onsite Materials
We expect that soil generated from excavations on the site, excluding deleterious material, may be used as engineered fill. Any expansive soils should be thoroughly blended with non-expansive material prior to use as engineered fill. Asphalt concrete and concrete materials may also be mixed into the engineered fills provided they are reduced to not greater than 8 inches in maximum dimension and placed in low concentration to prevent nesting and allow for conventional testing of relative compaction.

Fill Placement and Compaction
Engineered fills should be placed in thin horizontal lifts not to exceed 12 inches in uncompacted thickness. If the contractor can achieve the recommended relative compaction using thicker lifts, the method may be judged acceptable based on field verification by a representative of our firm using standard density testing procedures. Lightweight compaction equipment may require thinner lifts to achieve the recommended relative compaction. Fills should have a maximum particle size of 8 inches unless approved by our firm.

Table 6: Recommended Relative Compaction

Fill Materials	Relative Compaction	Method
Engineered Fill, General	90 percent	ASTM D1557
Engineered Fill, Clay	88 to 95 percent +4% optimum moisture	ASTM D1557
Utility Trench Backfill*	90 percent	ASTM D1557
Subgrade	95 percent 0 to +3% optimum moisture	ASTM D1557
Aggregate Baserock Grade	95 percent	ASTM D1557
Asphalt Concrete Pavement	92 to 96 percent	ASTM D2041 or CTM 309

*Unless otherwise noted by the governing agency.

Fill soil compaction should be evaluated by means of in-place density tests performed during fill placement so that the adequacy of soil compaction efforts may be determined as earthwork progresses.

Import Materials
The recommendations presented in this report are based on the assumption that the import materials will be similar to the materials present at the project site. High quality materials are preferred for import; however, these materials can be more dependent on source availability. Import material should be approved by our firm prior to transporting it to the project site.

Material for this project should consist of a material with the geotechnical characteristics presented below. If these requirements are not met, additional testing and evaluation may be necessary to determine the appropriate design parameters for foundations, pavement, and other improvements.

Table 7: Select Import Criteria

Behavior Property	Reference Document	Recommendation
Direct Shear Strength	ASTM D3080	≥ 30° when compacted
Plasticity Index	ASTM D4318	≤ 12
Expansion Index	ASTM D4829	≤ 20
Sieve Analysis	ASTM D1140	Not more than 30% Passing the No. 200 sieve
Maximum Aggregate Size	ASTM D1140	≤ 3 inches
R-Value	CTM 301	> 20

Underground Improvements

Trench Excavation
Trenches or excavations in soil should be shored or sloped back in accordance with current Cal/OSHA regulations prior to persons entering them. The potential use of a shield to protect workers cannot be precluded. Refer to the Excavation Characteristics section of Site Grading and Improvements of this report for anticipated excavation conditions.

Backfill Materials
Backfill materials for utilities should conform to the requirements of the local jurisdiction. It should be realized that permeable backfill materials will likely carry water at some time in the future.

When backfilling within structural footprints, compacted low permeability materials are recommended to be used a minimum of 5 feet beyond the structural footprint to minimize moisture intrusion.

Backfill Compaction

Backfill compaction should conform to the requirements of the local jurisdiction or to the recommendations of this report, whichever is greater. Where backfill compaction is not specified by the local jurisdiction, the backfill should be compacted to achieve the minimum relative compactions specified in Table 6 of this report.

Drainage Considerations

On projects with the potential for a perched groundwater condition (i.e., shallow cemented soils), underground utilities can become collection points for subsurface water. This is particularly true within the utility penetrations of infiltration areas such as basins. As a result, we recommend that slurry plug be installed where storm drain utilities enter and exit these areas (if present). The plugs should consist of a sand/cement slurry mixture, containing a minimum of 2 sacks of cement per cubic yard. The plugs should extend a minimum of 2 feet below bottom of the trenches and should be cut a minimum of 2 feet into the sides of the trenches. The top of the plug should extend upward to finish grade elevation. Additionally, exposed trenches or un-improved areas should be capped with low permeability native soils to reduce surface water intrusion into the utility system.

7.0 DESIGN RECOMMENDATIONS

The contents of this section include recommendations for foundations, slabs-on-grade, retaining walls, pavements, and drainage.

Post Tension Slab-on-Grade (Option 1)

It is our opinion that soil-supported post tension slab-on-grade floors could be used for the main floor of the proposed structures and will be constructed on the existing native soils or recompacted soils consisting of expansive materials as described in the Engineered Fills, Section 6.0 of this report. We offer the following comments and recommendations concerning support of slab-on-grade floors. The slab design (concrete mix, reinforcement, moisture protection, and underlayment materials) is the purview of the project Structural Engineer.

The post-tensioned slab design parameters below are considered applicable to the project site soils. Post-tensioned slabs will be subject to a higher degree of movement related to expansive soil shrinkage and swelling due to their lighter soil contact pressures as compared to deepened conventional foundations. The slab design (concrete mix, reinforcement, moisture protection, and underlayment materials) is the purview of the project Structural Engineer.

Post Tension Slab-on-Grade Bearing Capacities

A localized allowable dead plus live load bearing pressure of 1,500 psf may be used for design of a post-tension slab-on-grade based on firm native soils or engineered fills. The ratio of total load to soil contact area in the horizontal plane should not exceed 750 psf for the entire slab. The allowable pressures are for support of dead plus live loads and may be increased by 1/3 for short-term wind and seismic loads.

Post Tension Slab-on-Grade Lateral Capacities

The allowable lateral soil capacities are presented in the table below. The bearing capacity is for support of dead plus live loads based on the foundation configuration presented in this report. The allowable capacity may be increased by 1/3 for short-term wind and seismic loads. Lateral forces on structures may be resisted by passive pressure acting against the sides of shallow footings and/or friction between the foundation bearing material and the bottom of the footing. Section 1806.3 of the 2022 CBC allows for the combination of the friction factor and passive resistance value to lateral resistance. Consideration should be given to ignoring passive resistance where soils could be disturbed later or within 6 feet horizontally of the slope face.

Table 8: Foundation Lateral Soil Capacities

Soil Type	Design Condition	Design Value	Minimum Applied Factor of Safety
Engineered Fill or Firm Native Soil	Allowable Friction Factor*	0.35	1.5
	Allowable Passive Resistance	230 psf/ft	1.5

* Friction Factor is calculated as tan(ϕ)

<u>Post-Tensioned Slab Section</u>

Based on our experience with post tensioned slabs in the area, we anticipate that the slab may be on the order of 8 to 10 inches thick with reinforcing cables spaced at about 30 inches. Our firm does not perform calculations for structural design of this type of slab/foundation and these values should not be misconstrued as design minimums or requirements. *<u>Design for thickness and reinforcement is the purview of the structural engineer.</u>*

<u>Geotechnical Design Parameters</u>

A post-tension slab-on-grade foundation for expansive soil conditions may be used for support of the proposed structures. Based on the results of our laboratory testing and the methodology described in the Standard Requirements for Design and Analysis of Shallow Post-Tensioned Concrete Foundations on Expansive and Stable Soils, PTI DC10.5-19, prepared by the Post-Tensioning Institute, we anticipate the following design parameters are suitable for use in designing the post-tension slab.

Table 9: Expansive Soil Parameters for Post Tension Slabs

Parameter	Design Value	
Thornthwaite Index	-20	
Wettest Suction	3.0 pF	
Driest Suction	4.5 pF	
Equilibrium Suction	3.91 pF	
Lift Criteria	**Edge Lift**	**Edge Drop (Center Lift)**
e_m	4.0 feet	7.9 feet
y_m	1.35 inches	0.51 inches

<u>Edge Moisture Protection</u>

The local practice generally uses a uniform slab thickness as opposed to the conventional ribbed foundation. While this method is intended to maintain the stiffness of the conventional system, it is more susceptible to edge moisture fluctuations which result in foundation tilt (localized expansion of the soil) or gaps between the soils and the edge of the slab foundation (localized contraction of the soil). It has been our experience that this risk increases for soils with moderate-high to high expansion potential. To reduce the risks associated with this condition, we recommend a moisture barrier around the perimeter of the foundation. The moisture barrier should extend to a minimum of 18 inches below the lowest adjacent soil grade and be under or at the perimeter edge. This edge protection should consist of concrete materials used for this purpose and should be a minimum of 8 inches wide.

Pre-Saturation and Desiccation Cracks
We recommend the slab-on-grade surface be pre-saturated to a moisture condition that is above optimum to a depth of about 12 inches from the exposed soil surface and exhibits no desiccation cracks. These conditions should be observed by our representative prior to the placement of the vapor retarder materials. The time between inspection and the placement of concrete should be limited to avoid excessive drying.

Post-Tensioned Slab Underlayment and Vertical Moisture Protection
Due to the potential for landscape to be present directly adjacent to the slab edge/foundation or for drainage to be altered following our involvement with the project, varying levels of moisture below, at, or above the pad subgrade level should be anticipated. The slab designer should consider the potential for moisture vapor transmission when designing the slab. Our experience has shown that vapor transmission through concrete is controlled through slab thickness as well as proper concrete mix design. It should be noted that placement of the recommended plastic membrane, proper mix design, and proper slab underlayment and detailing per ASTM E1643 and E1745 will not provide a waterproof condition. If a waterproof condition is desired, we recommend that a waterproofing expert be consulted for slab design.

The 2022 California Green Building Standards Code addresses the use of capillary breaks in Section 4.505.2.1 and allows for the installation of a conventional aggregate capillary break, other methods approved by the enforcing agency, or when the slab is designed by a licensed design professional and refers to ACI PRC 302.2-22 for additional information.

Based on our experience with post-tensioned slabs on grade, it is conventional practice to construct post-tensioned slabs without a conventional capillary break. When the conventional capillary break has been eliminated, a vapor retarder with a significantly reduced permeance has been incorporated into the design to reduce the potential for vapor transmission through the slab (i.e. a permeance of 0.01 perms or lower). The current minimum standard for vapor retarders is presented in ASTM E1745 and indicates that the maximum requirement for a vapor retarder is 0.1 perms. The structural designer of the slab should consider the impacts of the permeance in the proposed design.

Moisture Maintenance
Maintaining uniformity in moisture content for the life of the structure is considered paramount to minimizing the potential of for shrinkage and swell of the near-surface soil and for optimum foundation and slab performance. In landscaping areas adjacent to the foundation and other improvements, it is suggested that the homeowner establish landscaping with an automated watering system around the foundation in order to reduce the fluctuation in moisture content of the foundation soils caused by wet and dry weather cycles. Some features that could be incorporated to promote a constant moisture condition included the use of 4 to 6 inches of bark with planter areas and the avoidance of rock-lined swales and groundcover which tend to bake out moisture in high temperature seasons. Overwatering of landscape must be avoided. Additionally, planters should be constructed to slope to abundant area drainage inlets which should be installed flush to the adjacent grade.

It has been our experience that trees planted near foundation and flatwork elements contribute to moisture-related issues, especially during periods of drought. The trees tend to require significant amounts of water which are drawn from the local soils. The Post-Tension Institute recognized the effects of tree drying in the 3rd Edition of the PTI Design Manual and has provided limited recommendations for counteracting the effects. We recommend working with the landscape contractor to avoid the condition.

Shallow Conventional Foundations (Option 2)
Shallow conventional foundation systems are considered suitable for construction of the planned improvements, provided that the site is prepared in accordance with the recommendations discussed in Section 6.0 of this report.

The provided values do not constitute a structural design of foundations which should be performed by the structural engineer. In addition to the provided recommendations, foundation design and construction should conform to applicable sections of the 2022 California Building Code.

Foundation Capacities
The foundation bearing and lateral capacities are presented in the table below. The allowable bearing capacity is for support of dead plus live loads based on the foundation configuration presented in this report. The allowable capacity may be increased by 1/3 for short-term wind and seismic loads. Lateral forces on structures may be resisted by passive pressure acting against the sides of shallow footings and/or friction between the foundation bearing material and the bottom of the footing. Section 1806.3 of the 2022 CBC allows for the combination of the friction factor and passive resistance value to lateral resistance. Consideration should be given to ignoring passive resistance where soils could be disturbed later or within 6 feet horizontally of the slope face.

Table 10: Foundation Capacities

Soil Type	Design Condition	Design Value	Minimum Applied Factor of Safety
Engineered Fill or Firm Native Soil	Allowable Bearing Capacity	2,500 psf	3.0
	Allowable Friction Factor*	0.35	1.5
	Allowable Passive Resistance	230 psf/ft	1.5
* Friction Factor is calculated as tan(ϕ)			

Foundation Settlement
A total settlement of less than 1 inch is anticipated; a differential settlement of 0.5 inches in 25 feet is anticipated where foundations are bearing on like materials. The settlement criteria are based upon the assumption that foundations will be sized and loaded in accordance with the recommendations in this report.

Foundation Configuration for Residential Structures
Conventional shallow foundations for residential structures should be a minimum of 12 inches wide and founded a minimum of 24 inches below the lowest adjacent soil grade for one- and two-story slab-on-grade residences. Foundations should be connected in two directions.

Foundation reinforcement should be provided by the structural engineer. The reinforcement schedule should account for typical construction issues such as load consideration, concrete cracking, and the presence of isolated irregularities. At a minimum, we recommend that continuous footing foundations be reinforced four No. 4 reinforcing bars, two located near the bottom of the footing and two near the top of the stem wall.

Foundation Influence Line and Slope Setback
All footings should be founded below an imaginary 2H:1V plane projected up from the bottoms of adjacent footings and/or parallel utility trenches, or to a depth that achieves a minimum horizontal

clearance of 6 feet from the outside toe of the footings to the slope face, whichever requires a deeper excavation.

Subgrade Conditions
Footings should never be cast atop soft, loose, organic, slough, debris, nor atop subgrades covered by ice or standing water. A representative of our firm should be retained to observe all subgrades during footing excavations and prior to concrete placement so that a determination as to the adequacy of subgrade preparation can be made.

Shallow Footing / Stemwall Backfill
All footing/stemwall backfill soil should be compacted to the criteria for engineered fill as recommended in Section 6.0 of this report.

Pre-Saturation
We recommend pre-saturating the foundation soils to a minimum of 4 percent over the optimum moisture content for 12 inches within 48 hours of the placement of concrete. Supplemental recommendations could be made based on further evaluation.

Slab-on-Grade Construction for Conventional Foundations
It is our opinion that soil-supported slab-on-grade floors could be used for the main floor of the structure over conventional foundations, contingent on proper subgrade preparation. Often the geotechnical issues regarding the use of slab-on-grade floors include proper soil support and subgrade preparation, proper transfer of loads through the slab underlayment materials to the subgrade soils, and the anticipated presence or absence of moisture at or above the subgrade level. We offer the following comments and recommendations concerning support of slab-on-grade floors. The slab design (concrete mix design, curing procedures, reinforcement, joint spacing, moisture protection, and underlayment materials) is the purview of the project Structural Engineer.

Slab Subgrade Preparation
All subgrades proposed to support slab-on-grade floors should be prepared and compacted to the requirements of engineered fill as discussed in Section 6.0 of this report.

Slab Underlayment
As a minimum for slab support conditions, the slab should be underlain by a minimum 4-inch-thick crushed rock layer that is covered by a minimum 10-mil thick moisture retarding plastic membrane. The membrane may only be functional when it is above the vapor sources. The bottom of the crushed rock layer should be above the exterior grade to act as a capillary break and not a reservoir, unless it is provided with an underdrain system. The slab design and underlayment should be in accordance with ASTM E1643 and E1745.

An optional 1-inch blotter sand layer placed above the plastic membrane, is sometimes used to aid in curing of the concrete. Although historically common, this blotter layer is not currently included in slabs designed according to the 2022 Green Building Code. When omitted, special wet curing procedures will be necessary. If installed, the blotter layer can become a reservoir for excessive moisture if inclement weather occurs prior to pouring the slab, excessive water collects in it from the concrete pour, or an external source of water enters above or bypasses the membrane.

Our experience has shown that vapor transmission through concrete is controlled through proper concrete mix design. As such, proper control of moisture vapor transmission should be considered in the design of the slab as provided by the project architect, structural or civil engineer. It should be noted that placement of the recommended plastic membrane, proper mix design, and proper slab underlayment and detailing per ASTM E1643 and E1745 will not provide a waterproof condition. If a waterproof condition is desired, we recommend that a waterproofing expert be consulted for slab design.

Slab Thickness and Reinforcement

Geotechnical reports have historically provided minimums for slab thickness and reinforcement for general crack control. The concrete mix design and construction practices can additionally have a large impact on concrete crack control. All concrete should be anticipated to crack. As such, these minimums should not be considered to be standalone items to address crack control, but are suggested to be considered in the slab design methodology.

In order to help control the growth of cracks in interior concrete from becoming significant, we suggest the following minimums. Interior concrete slabs-on-grade not subject to heavy loads, should be a minimum of 5-inches thick and reinforced. A minimum of No. 4 deformed reinforcing bars placed at 18 inches on center both ways, at the center of the structural section is suggested. Joint spacing should be provided by the structural engineer. Troweled joints recovered with paste during finishing or “wet sawn” joints should be considered every 10 feet on center. Expansion joint felt should be provided to separate floating slabs from foundations and at least at every third joint. Cracks will tend to occur at recurrent corners, curved or triangular areas and at points of fixity. Trim bars can be utilized at right angle to the predicted crack extending 40 bar diameters past the predicted crack on each side.

Pre-Saturation

We recommend that the slab be constructed by pre-saturating the soils to at least 4 percent over optimum moisture content or 12 inches of penetration with a ½-inch diameter probe.

Non-Expansive Soil Surface

A non-expansive soil surface could be provided below the slab in lieu of special design measures. For this condition, the slab should be underlain by a minimum of 12 inches of non-expansive material. Open graded gravels should not be utilized for this purpose due to their ability to capture or store water. Where this 12-inch layer is provided, the slab thickness may be reduced to not less than 4 inches, reinforcement spacing increased to 24 inches on-center, and pre-saturation not performed.

Vertical Deflections

Soil-supported slab-on-grade floors can deflect downward when vertical loads are applied, due to elastic compression of the subgrade. For preliminary design of concrete floors, a modulus of subgrade reaction of k = 100 psi per inch would be applicable for engineered fills.

Exterior Flatwork

Exterior concrete flatwork is recommended to have a 4-inch-thick rock cushion. This could consist of vibroplate compacted crushed rock or compacted ¾-inch aggregate baserock. If exterior flatwork concrete is against the floor slab edge without a moisture separator it may transfer moisture to the floor slab. Expansion joint felt should be provided to separate exterior flatwork from foundations and at least at every third joint. Contraction / groove joints should be provided to a depth of at least 1/4 of the slab thickness and at a spacing of less than 30 times the slab thickness for unreinforced flatwork, dividing the slab into nearly square sections. Cracks will tend to occur at recurrent corners, curved or triangular areas and at points of fixity. Trim bars can be utilized at right angle to the predicted crack extending 40 bar diameters past the predicted crack on each side.

Due to the presence of expansive soils, consideration should be given to; 1) moisture conditioning the subgrade soils to above optimum moisture content, 2) underlaying the flatwork with 12 inches of non-expansive material, and/or 3) providing thickened slab edges and installing reinforcing bars at a spacing not greater than 18 inches on-center both ways. The methods described above are intended to reduce the potential for expansive soil damage, and the decision to utilize any or all of the methods described above is ultimately left to others.

Retaining Walls

Our design recommendations and comments regarding retaining walls for the project site are discussed below. *Retaining wall foundations should be designed in accordance with the Shallow Conventional Foundations section above.*

Retaining Wall Lateral Pressures

Based on our observations and testing, the retaining wall should be designed to resist lateral pressure exerted from a soil media having an equivalent fluid weight provided in the table below. The values presented below are not factored and are for conditions when firm native soil or engineered fill is used within the zone behind the wall defined as twice the height of the retaining wall. Additionally, the values do not account for the friction of the backfill on the retaining wall which may or may not be present depending on the wall materials and construction.

The lateral pressures presented in the table below include recommendations for earthquake loading which is required for structures to be designed in Seismic Design Categories D, E, or F per Section 1803.5.12.1 of the 2022 California Building Code. The lateral pressures presented have been calculated using the Mononobe-Okabe Method derived from Wood (1973) and modified by Whitman et al. (1991). The values are intended to be used as the multiplier for uniformly distributed loads and the parameter “H” is the total height of the wall including the footing but excluding any key, if used.

Table 11: Retaining Wall Pressures

Wall Type	Wall Slope Configuration	Equivalent Fluid Weight (pcf)	Lateral Pressure Coefficient	Earthquake Loading (plf)	
Free Cantilever	Flat	42	0.33	$4H^2$	Applied 0.6H above the base of the wall
	2H:1V	67	0.54	$15H^2$	
Restrained*	Flat	63	0.50		

* Restrained conditions shall be defined as walls which are structurally connected to prevent flexible yielding, or rigid wall configurations (i.e., walls with numerous turning points) which prevent the yielding necessary to reduce the driving pressures from an at-rest state to an active state.

Design Values for Dry Stacked Walls

Dry stacked walls do not generally use the equivalent fluid weight method presented above; instead, they use design soil properties for a given soil condition such as the internal friction angle, cohesion, and bulk unit weight. Where walls are constructed, expansive soils should not be used within the total height of the wall including the footing, “H”, of the wall.

The walls could include keyed or interlocking non-mortared walls such as segmental block (Basalite, Keystone, Allan Block, etc.), rockery walls, or specialty designs for proprietary systems. When this occurs, the following soil parameters would be applicable for design with the onsite native materials in a firm condition or for engineered fills. The seismic coefficient is considered to be ½ of the adjusted peak ground acceleration for the site conditions is given in Section 4.0 of this report. Some software allows for the extension of the Mononobe-Okabe Method beyond the conventional limitations and, if the method is applied, could calculate seismic values significantly higher than those provided by the multiplier method provided above.

Table 12: Generalized Design Parameters

Internal Angle of Friction	Cohesion	Bulk Unit Weight	Seismic Coefficient, Kh
30°	0 psf	130 pcf	0.117g

Wall Drainage

The criteria presented above is based on fully drained conditions as detailed in the attached Figure C-2, Appendix C. For these conditions, we recommend that a blanket of filter material be placed behind all proposed walls. Permeable materials are specified in Section 68 of the California Department of Transportation Standard Specifications, current edition. The filter material should conform to Class 1, Type B permeable material in combination with a filter fabric to separate the open graded gravel/rock from the surrounding soils. Generally, a clean ¾ inch crushed rock should be acceptable. Consistent with Caltrans Standards, when Class 2 permeable materials are used, the filter fabric may be omitted unless otherwise designed.

The blanket of filter material should be a minimum of 12-inches thick and should extend from the bottom of the wall to within 12 inches of the ground surface. The top 12 inches of wall backfill should consist of a compacted soil cap. A filter fabric having specifications equal to or greater than those for Mirafi 140N should be placed between the gravel filter material and the surrounding soils to reduce the potential for infiltration of soil into the gravel. A 4-inch diameter drain pipe should be installed near the bottom of the filter blanket with perforations facing down. The drainpipe should be underlain by at least 4 inches of filter-type material. An adequate gradient should be provided along the top of the foundation to discharge water that collects behind the retaining wall to a controlled discharge system.

The configuration of a long retaining wall generally does not allow for a positive drainage gradient within the perforated drain pipe behind the wall since the wall footing is generally flat with no gradient for drainage. Where this condition is present, to maintain a positive drainage behind the walls, we recommend that the wall drains be provided with a discharge to an appropriate non-erosive outlet a maximum of 50 feet on center. **In addition, if the wall drain outlets are temporarily stubbed out in front of the walls for future connection during building construction, it is imperative that the outlets be routed into the tight pipe area drainage system and not buried and rendered ineffective.**

Asphalt Concrete Pavement Design

We understand that asphalt pavements will be used for the associated roadways. The following comments and recommendations are given for pavement design and construction purposes. All pavement construction and materials used should conform to applicable sections of the latest edition of the California Department of Transportation Standard Specifications.

Relative Compaction

The asphalt concrete pavement section should be constructed to achieve the minimum relative compactions specified in Section 6.0 of this report. Deviation from the following values should be reviewed by the governing agency when the pavements are to be constructed within their right-of-way.

Subgrade Stability

All subgrades and aggregate base should be proof-rolled with a full water truck or equivalent immediately before paving, in order to evaluate their condition. If unstable subgrade conditions are observed, these areas should be overexcavated down to firm materials and the resulting excavation backfilled with suitable materials for compaction (i.e., drier native soils or aggregate base). Areas displaying significant instability may require geotextile stabilization fabric within the overexcavated area, followed by placement of aggregate base. Final determination of any required overexcavation depth and stabilization fabric should be based on the conditions observed during subgrade preparation.

Subgrade Resistance Value

Critical features that govern the durability of a pavement section include the stability of the subgrade; the presence or absence of moisture, free water, and organics; the fines content of the subgrade soils; the traffic volume; and the frequency of use by heavy vehicles. Soil conditions can be defined by a soil resistance value, or “R-Value,” and traffic conditions can be defined by a Traffic Index (TI).

Laboratory testing was performed as part of the Reference 1 and 2 reports and our recent exploration, on bulk samples considered to be representative of the materials expected to be exposed at subgrade, which resulted in R-Values ranging from 5 to 45. Considering the low values and expansive clays, an R-Value of 5 has been used for the pavement sections this report. Following the rough grading operations, the subgrade conditions should be evaluated to determine whether adjustments to the design R-value are warranted.

Design values provided are based upon properly drained subgrade conditions. Although the R-Value design to some degree accounts for wet soil conditions, proper surface and landscape drainage design is integral in performance of adjacent street sections with respect to stability and degradation of the asphalt. If clay soils are encountered and cannot be sufficiently blended with non-expansive soils, we should review pavement subgrades to determine the appropriateness of the provided sections, and provide additional pavement design recommendations as field conditions dictate. Even minor clay constituents will greatly reduce the design R-Value.

Section Thickness

The recommended design thicknesses presented in the following table were calculated in accordance with the methods presented in the Sixth Edition of the California Department of Transportation Highway Design Manual. A varying range of traffic indices are provided for use by the project Civil Engineer for roadway design.

Table 13: Asphalt Pavement Section Recommendations (R-Value = 5)

Design Traffic Indices	Alternative Pavement Sections (Inches)	
	Asphalt Concrete *	Aggregate Base **
5.0	2.5 3.0	11.0 10.0
5.5	3.0 3.5	12.0 11.0
6.0	3.0 3.5	14.0 13.0
7.0	4.0 4.5	15.5 14.5
8.0	4.5 5.0	18.5 17.5
9.0	5.5 6.0	20.5 20.0
10.0	5.0 6.0 7.0	25.5 23.5 21.5

* Asphalt Concrete: must meet specifications for Caltrans Hot Mix Asphalt Concrete
** Aggregate Base: must meet specifications for Caltrans Class II Aggregate Base (R-Value = minimum 78)

Portland Cement Concrete Pavement Design
We understand that Portland cement concrete pavements may be considered for various aspects of the project. The American Concrete Institute (ACI) Concrete Pavement Design method (ACI 330R-08) was used for design of the exterior concrete (rigid) pavements at the site.

Relative Compaction
The asphalt concrete pavement section should be constructed to achieve the minimum relative compactions specified in Section 6.0 of this report. Deviation from the following table should be reviewed by the governing agency when the pavements are to be constructed within their right-of-way. Final acceptance of the constructed pavement section is the purview of the governing agency.

Subgrade Stability
All subgrades and aggregate base should be proof-rolled with a full water truck or equivalent immediately before paving, in order to evaluate their condition.

Soil Design Parameters
The pavement thicknesses were evaluated based on the soil design parameters provided in the following table.

Table 14: Soil Parameters

Subgrade Soil Description	k, Modulus of Subgrade Reaction*	Base Course
Sandy CLAY	75 pci*	6 inches

* Based on an R-Value of 5 as recommended above and correlated to a k-Value recommended by ACI 330R.

Section Thickness
Based on the subgrade soil parameters shown in the above table, the recommended concrete thicknesses for various traffic descriptions are presented in the table below. The recommended thicknesses provided below assume the use of plain (non-reinforced) concrete pavements.

Table 15: Concrete Pavement Section Recommendations (R-Value = 5)

Category	ADTT*	Pavement Traffic Description	Thickness (inches)	
			3000 psi**	4000 psi**
A	1	Car parking areas and access lanes Autos, pickups, and panel trucks only	5.0	4.5
A	10		5.5	5.0
B	25	Shopping center entrance and service lanes Bus parking areas and interior lanes Single-unit truck parking areas and interior lanes	6.0	5.5
B	300		7.0	6.0
C	100	Roadway Entrances and Exterior Lanes	7.0	6.5
C	300		7.5	6.5
C	700		7.5	7.0

* Average Daily Truck Traffic
** 28-day concrete compressive strength

<u>Jointing and Reinforcement</u>
From a geotechnical perspective, contraction joints should be placed in accordance with the American Concrete Institute (ACI) recommendations which include providing a joint spacing about 30 times the slab thickness up to a maximum of 10 feet. The joint patterns should also divide the slab into nearly square panels. If increased joint spacing is desired, reinforcing steel should be installed within the pavement in accordance with ACI recommendations. Final determination of steel reinforcement configurations (if used within the pavements) remains the purview of the Project Structural Engineer.

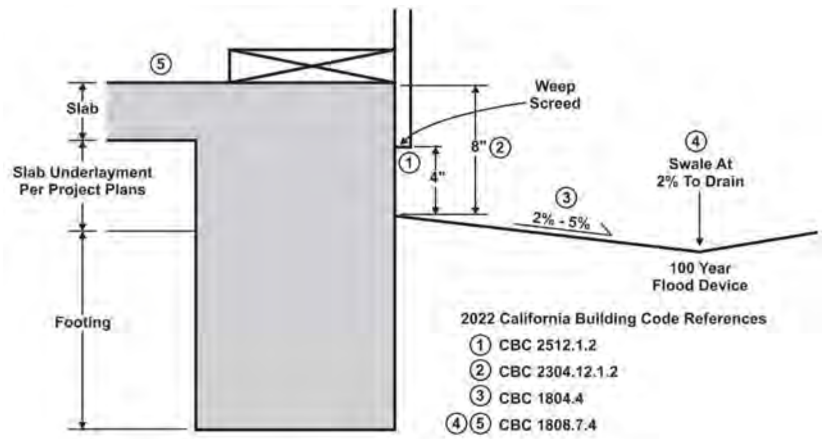
Drainage
In order to maintain the engineering strength characteristics of the soil presented for use in this report, maintenance of the site will need to be performed. This maintenance generally includes, but is not limited to, proper drainage and control of surface and subsurface water which could affect structural support and fill integrity. A difficulty exists in determining which areas are prone to the negative impacts resulting from high moisture conditions due to the diverse nature of potential sources of water; some of which are outlined in the paragraph below. We suggest that measures be installed to minimize exposure to the adverse effects of moisture, but this will not guarantee that excessive moisture conditions will not affect the structure.

Some of the diverse sources of moisture could include water from landscape irrigation, annual rainfall, offsite construction activities, runoff from impermeable surfaces, collected and channeled water, and water perched in the subsurface soils. Some of these sources can be controlled through drainage features installed either by the owner or contractor. Others may not become evident until they, or the effects of the presence of excessive moisture, are visually observed on the property.

Some measures that can be employed to minimize the buildup of moisture include, but are not limited to proper backfill materials and compaction of utility trenches within the footprint of the proposed structures; grout plugs at foundation penetrations; collection and channeling of drained water from impermeable surfaces (i.e. roofs, concrete or asphalt paved areas); installation of subdrain/cut-off drain provisions; utilization of low flow irrigation systems; education to the proposed owners of proper design and maintenance of landscaping and drainage facilities that they or their landscaper installs.

Drainage Adjacent to Buildings

All grades should provide rapid removal of surface water runoff; ponding water should not be allowed on building pads or adjacent to foundations or other structural improvements (during and following construction). All soils placed against foundations during finish grading should be compacted to minimize water infiltration. Finish and landscape grading should include positive drainage away from all foundations. Section 1808.7.4 of the 2022 California Building Code (CBC) states that for graded soil sites, the top of any exterior foundation shall extend above the elevation of the street gutter at the point of discharge or the inlet of an approved drainage device a minimum of 12 inches plus 2 percent. If overland flow is not achieved adjacent to buildings, the drainage device should be designed to accept flows from a 100-year event. Grades directly adjacent to foundations should be no closer than 8 inches from the top of the slab (CBC 2304.12.1.2), and weep screeds are to be placed a minimum of 4 inches clear of soil grades and 2 inches clear of concrete or other hard surfacing (CBC 2512.1.2). From this point, surface grades should slope a minimum of 2 percent away from all foundations for at least 5 feet but preferably 10 feet, and then 2 percent along a drainage swale to the outlet (CBC 1804.4). Downspouts should be tight piped via an area drain network and discharged to an appropriate non-erosive outlet away from all foundations.



Typical 2022 California Building Code Drainage Requirements

The above referenced elements pertaining to drainage of the proposed structures is provided as general acknowledgement of the California Building Code requirements, restated and graphically illustrated for ease of understanding. Surface drainage design is the purview of the Project Architect/Civil Engineer. Review of drainage design and implementation adjacent to the building envelopes is recommended as performance of these improvements is crucial to the performance of the foundation and construction of rigid improvements.

Subdrainage

Reduction of potential moisture related issues could be addressed by the construction of subdrains in addition to the drainage provisions provided in the 2022 CBC. Considering that this site is down sloping from the road, a subdrain should be considered along the front of the residence to collect and redirect unwanted water from the structure.

Typical subdrain construction would include a 3 feet deep trench (or depth required to intercept the bottom of utility trenches) constructed as detailed on Figure C-3, Appendix C. The water collected in the subdrain pipe would be directed to an appropriate non-erosive outlet. We recommend that a representative from our firm be present during the subdrain installation procedures to document that the drain is installed in accordance with the observed field conditions, as well as to provide additional consultation as the conditions dictate.

As noted in the previous discussions, the moisture conditions may not manifest until after the site is developed. As such, any recommendations for the subdrain orientation and location to mitigate the moisture conditions can be provided on an as requested basis as the conditions arise.

ADA Compliance and Drainage

It should be noted that due to the Americans with Disabilities Act (ADA) requirements, design and construction of alternative site drainage configurations may be necessary, particularly for multi-family and commercial developments. In this case, design and construction of adequate drainage adjacent to foundations and slabs are essential to preserving foundation support and reducing the potential for wet slab related issues. A typical example of this condition occurs in commercial developments where the landscape grades are situated at the same elevation as the parking areas so as to not create a drop off between the grades. This condition subsequently results in flat grades between the building, landscape area, and parking lot which do not meet building code requirements and may require more substantial drain inlets.

Subsurface Water within Utilities

In addition, water can become perched on the relatively impermeable soil horizons and eventually inundate utility trench backfill. The variable support condition between native soils and compacted trench-backfill materials, coupled with prolonged water exposure can lead to subsidence of trench backfill materials if bridging of trench backfill occurs during placement or natural jetting of soils into voids around pipes occurs. Joint utility trenches are generally more susceptible to the jetting issues due to the quantity of pipe placed in the trench. Recommendations to reduce the risk associated with this condition may be provided based on observed field conditions.

Following site development, additional water sources (i.e. landscape watering, downspouts) are generally present. The presence of low permeability materials can prohibit rapid dispersion of surface and subsurface water drainage. Utility trenches typically provide a conduit for water distribution. Provisions may be necessary to mitigate adverse effects of perched water conditions. Mitigation measures may include the construction of cut-off systems and/or plug and drain systems. Close coordination between the design professionals regarding drainage and subdrainage conditions may be warranted.

Roadway or Parking Area Landscaping Drainage

Prolonged water seepage into pavement sections can result in softening of subgrade soils and subsequent pavement distress. It is anticipated that heavy landscape watering could enter and pond within the street aggregate base section as it permeates through the aggregate base under the sidewalks and/or curbs. Prolonged seepage within the pavement section could cause distress to pavements in heavy traffic areas. Some measures that can be employed to minimize the saturation of the subgrade and aggregate base materials include, but are not limited to, construction of cut-off drains or moisture barriers alongside the roadway adjacent to the roadway interface, construction of subdrains within landscape medians and installation of plug and drain systems within utility trenches. Due to the elusive and discontinuous nature of drainage related issues, a risk-based approach should be determined by the developer based on consultation and discussions with the design professionals and the amount of protection of facilities that the developer may want to provide against potential moisture related issues.

Post Construction
All drainage related issues may not become known until after construction and landscaping are complete. Therefore, some mitigation measures may be necessary following site development. Landscape watering is typically the largest source of water infiltration into the subgrade. Given the soil conditions on site, excessive or even normal landscape watering could contribute to moisture related problems and/or cause distress to foundations and slabs, pavements, and underground utilities, as well as creating a nuisance where seepage occurs.

Low Impact Development Standards
Low Impact Development or LID standards have become a consideration for many projects in the region. LID standards are intended to address and mitigate urban storm water quality concerns. These methods include the use of Source Controls, Run-off Reduction and Treatment Controls. For the purpose of this report use of Run-off Reduction measures and some Treatment Controls may impact geotechnical recommendations for the project.

Youngdahl Consulting Group, Inc. did not perform any percolation or infiltration testing for the site as part of the Geotechnical Investigation. A review of soil survey and the data collected from test pits indicate that soils within the project are Hydrologic Soil Group D (low permeability). Based on this condition, use of infiltration type LID methods (infiltration trenches, dry wells, infiltration basins, permeable pavements, etc.) should not be considered without addressing applicable geotechnical considerations/implications. As such, use of any LID measure that would require infiltration of discharge water to surfaces adjacent to structures/pavement or include infiltration type measures should be reviewed by Youngdahl Consulting Group, Inc. during the design process.

8.0 DESIGN REVIEW AND CONSTRUCTION MONITORING
Geotechnical engineering can be affected by natural variability of soils and, as with many projects, the contents of this report could be used and interpreted by many design professionals for the application and development of their plans. For these reasons, we recommend that our firm provide support through plan reviews and construction monitoring to aid in the production of a successful project.

Plan Review
The design plans and specifications should be reviewed and accepted by Youngdahl Consulting Group, Inc. prior to contract bidding. A review should be performed to determine whether the recommendations contained within this report are still applicable and/or are properly interpreted and incorporated into the project plans and specifications. Modifications to the recommendations provided in this report or to the design may be necessary at the time of our review based on the proposed plans.

Construction Monitoring
Construction monitoring is a continuation of geotechnical engineering to confirm or enhance the findings and recommendations provided in this report. It is essential that our representative be involved with all grading activities in order for us to provide supplemental recommendations as field conditions dictate. Youngdahl Consulting Group, Inc. should be notified at least two working days before site clearing or grading operations commence, and should observe the stripping of deleterious material, overexcavation of soft soils and existing fills (if present), and provide consultation, observation, and testing services to the grading contractor in the field. At a minimum, Youngdahl Consulting Group, Inc. should be retained to provide services listed in Table 16 below.

The recommendations included in this report have been based in part on assumptions about strata variations that may be tested only during earthwork. Accordingly, these recommendations should not be applied in the field unless Youngdahl Consulting Group, Inc. is retained to perform construction observation and thereby provide a complete professional geotechnical engineering service through the observational method. Youngdahl Consulting Group, Inc. cannot assume responsibility or liability for the adequacy of its recommendations when they are used in the field without Youngdahl Consulting Group, Inc. being retained to observe construction.

Post Construction Drainage Monitoring

Due to the elusive nature of subsurface water, the alteration of water features for development, and the introduction of new water sources, all drainage related issues may not become known until after construction and landscaping are complete. Youngdahl Consulting Group, Inc. can provide consultation services upon request that relate to proper design and installation of drainage features during and following site development.

9.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. This report has been prepared for the exclusive use of the addressee of this report for specific application to this project. The addressee may provide their consultants authorized use of this report. Youngdahl Consulting Group, Inc. has endeavored to comply with generally accepted geotechnical engineering practice common to the local area. Youngdahl Consulting Group, Inc. makes no other warranty, expressed or implied.

2. As of the present date, the findings of this report are valid for the property studied. With the passage of time, changes in the conditions of a property can occur whether they be due to natural processes or to the works of man on this or adjacent properties. Legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may cause this report to be invalid, wholly or partially. Therefore, this report should not be relied upon after a period of three years without our review nor should it be used or is it applicable for any properties other than those studied.

3. Section [A] 107.3.4 of the 2022 California Building Code states that, in regard to the design professional in responsible charge, the building official shall be notified in writing by the owner if the registered design professional in responsible charge is changed or is unable to continue to perform the duties.

   WARNING: Do not apply any of this report's conclusions or recommendations if the nature, design, or location of the facilities is changed. If changes are contemplated, Youngdahl Consulting Group, Inc. must review them to assess their impact on this report's applicability. Also note that Youngdahl Consulting Group, Inc. is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of this report's subsurface data or engineering analyses without the express written authorization of Youngdahl Consulting Group, Inc.

4. The analyses and recommendations contained in this report are based on limited windows into the subsurface conditions and data obtained from subsurface exploration. The methods used indicate subsurface conditions only at the specific locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Samples cannot be relied on to accurately reflect the strata variations that usually exist between sampling locations. Should any variations or undesirable conditions be encountered during the development of the site, Youngdahl Consulting Group, Inc. will provide supplemental recommendations as dictated by the field conditions.

Table 16: Checklist of Recommended Services

Item Description		Recommended	Not Anticipated
1	Provide foundation design parameters	Included	
2	Review grading plans and specifications	✓	
3	Review foundation plans and specifications	✓	
4	Observe and provide recommendations regarding demolition	✓	
5	Observe and provide recommendations regarding site stripping	✓	
6	Observe and provide recommendations on moisture conditioning removal, and/or recompaction of unsuitable existing soils	✓	
7	Observe and provide recommendations on the installation of subdrain facilities	✓	
8	Observe and provide testing services on fill areas and/or imported fill materials	✓	
9	Review as-graded plans and provide additional foundation recommendations, if necessary	✓	
10	Observe and provide compaction tests on storm drains, water lines and utility trenches	✓	
11	Observe foundation excavations and provide supplemental recommendations, if necessary, prior to placing concrete	✓	
12	Observe and provide moisture conditioning recommendations for foundation areas and slab-on-grade areas prior to placing concrete	✓	
13	Provide design parameters for retaining walls	Included	
14	Provide finish grading and drainage recommendations	Included	
15	Provide geologic observations and recommendations for keyway excavations and cut slopes during grading		✓
16	Excavate and recompact all test pits within structural areas	✓	

APPENDIX A

Field Study (YCG 2024)

Vicinity Map
Site Plan
Logs of Exploratory Borings and Test Pits
Soil Classification Chart and Log Explanation

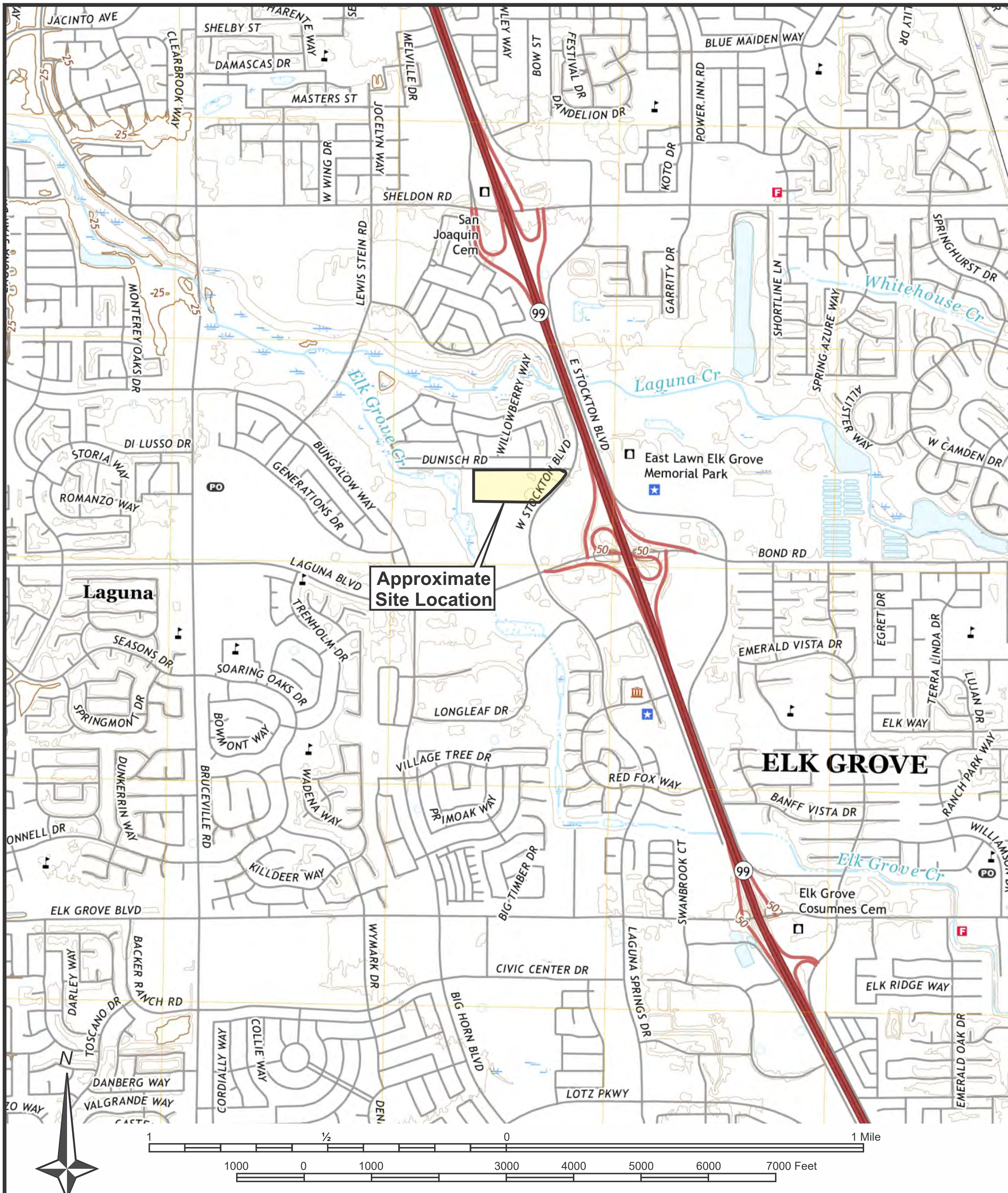
Introduction
The contents of this appendix shall be integrated with the Geotechnical Engineering Study of which it is a part. They shall not be used in whole or in part as a sole source for information or recommendations regarding the subject site.

Our field study included a site reconnaissance by a Youngdahl Consulting Group, Inc. representative followed by a subsurface exploration program including borings and test pits. The first exploration was conducted on 15 February 2024, which included the advancement of 5 borings under our direction and the second exploration was conducted on 20 February 2024, which included the excavation of 4 exploratory test pits under our direction, and the third exploration was conducted on 25 March 2024, which included the drilling of 2 hand auger borings under our direction at the approximate locations shown on Figure A-2, this Appendix. Drilling of the exploratory borings was accomplished with a CME 55 track mounted drill rig or hand auger equipment. Excavation of the test pits was accomplished with a CAT 303.5 E2 track-mounted excavator equipped with an 18-inch-wide bucket. The bulk and bag samples collected from the test pits were returned to our laboratory for further examination and testing.

Throughout the drilling operation, soil samples were obtained at 5-foot depth intervals by means of a Modified California Sampler. This testing and sampling procedure consists of driving the steel sampler 18 inches into the soil with a 140-pound hammer free-falling 30 inches. The number of blows required to drive the sampler through each 6-inch interval is counted, and the total number of blows struck during the final 12 inches is recorded. If a total of 50 blows are struck within any 6-inch interval, the driving is stopped and the blow count is recorded as 50 blows for the actual penetration distance.

The Exploratory Test Pit Logs describe the vertical sequence of soils and materials encountered in each test pit, based primarily on our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradual, our logs indicate the average contact depth. Our logs also graphically indicate the sample type, sample number, and approximate depth of each soil sample obtained from the test pits.

The soils encountered were logged during excavation and provide the basis for the "Logs of Exploratory Borings and Test Pits", Figures A-3 through A-12, this Appendix. The boring logs describe the vertical sequence of soils and materials encountered in each boring, based primarily on our field classifications and supported by our subsequent laboratory examination and testing. Where a soil contact was observed to be gradational, our logs indicate the average contact depth. Where a soil type changed between sample intervals, we inferred the contact depth. Our logs also graphically indicate the blow count, sample type, sample number, and approximate depth of each soil sample obtained from the borings, as well as any laboratory tests performed on these soil samples. If any groundwater was encountered in a borehole, the approximate groundwater depth is depicted on the boring log. Groundwater depth estimates are typically based on the moisture content of soil samples, the wetted height on the drilling rods, and the water level measured in the borehole after the auger has been extracted. The test pit logs show a graphic representation of the soil profile, the location, and depths at which samples were collected.



Scale: 1:24,000

BASE MAP REFERENCE: *U.S.G.S. 7.5 Minute Topographic Series, Florin Quadrangle, Dated 2021*

YOUNGDAHL CONSULTING GROUP, INC. *Celebrating 40 Years of Service*	Project No.: E24033.001	**VICINITY MAP**	**FIGURE**
	March 2024	**Dunisch Property** Elk Grove, California	**A-1**

= Approximate Former Structure Locations

= Approximate Stockpile Extent

= Approximate Location of Seasonal Wetland

= Approximate Location of Former Ponds

TP-1 = Approximate Test Pit Locations (YCG 2024)

B-1 = Approximate Boring Locations (YCG 2024)

HA-2 = Approximate Hand Auger Locations (YCG 2024)

NB-1 = Approximate Boring Locations (WKA 2017)

D-1 = Approximate Boring Locations (WKA 2015)

S-2 = Approximate Bulk Sample Locations (WKA 2015)

D-1 = Approximate Boring Locations (WKA 2005)

REFERENCE: *Grading & Drainage Exhibit, Dunisch Property, Wood Rodgers, Sheet 3 of 3, Dated 2/22/2022; Google Earth, Aerial Data Dated 2/15/2022*

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March 2024

SITE PLAN

Dunisch Property
Elk Grove, California

FIGURE **A-2**

Logged By: **ARD**	Date: **15 February 2024**	Lat / Lon: **~N° / ~W°**	Boring No. **B-1**
Equipment: **CME 55 Drill Rig - 4" Solid Stem Auger**		Elevation: **~**	

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Blow Counts	Pocket Pen (tsf)	Dry Density (pcf)	Moisture Content (%)	Tests & Comments
0	Brown sandy **CLAY (CH)**, stiff, slightly moist						
3.5	Brown clayey **SAND (SC)**, dense, slightly moist	2.5–4	53		106.1	20.4	
6	*Grades very dense*	5–6.5	50/5"		114.8	16.0	
10.5	Red yellow fine to medium **SAND (SP)** with silt, medium dense, slightly moist *Grades light brown, fine to coarse grained*	10–11.5	16				
14.5	Brown silty **SAND (SM)** with clay, dense, slightly moist						Rig Chatter
16	*Grades without clay*	15–16.5	39				
21	*Grades light brown, fine grained*	20–21.5	48				
21.5	Boring terminated at 21.5' No groundwater encountered						

Note: The boring log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations. Note, too, that the passage of time may affect conditions at the sampling locations.

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March 2024

EXPLORATORY BORING LOG

Dunisch Property
Elk Grove, California

FIGURE **A-3**

Logged By: **ARD**	Date: **15 February 2024**	Lat / Lon: **~N° / ~W°**	Boring No. **B-2**
Equipment: **CME 55 Drill Rig - 4" Solid Stem Auger**		Elevation: **~**	

Depth (Feet)	Graphic Log	Ground Water	Geotechnical Description & Unified Soil Classification	Sample	Blow Counts	Pocket Pen (tsf)	Dry Density (pcf)	Moisture Content (%)	Tests & Comments
0			Brown sandy **CLAY (CH)**, stiff, slightly moist						
4					17		102.6	19.8	*EI = 109 (High)*
6			Brown clayey **SAND (SC)**, medium dense, slightly moist		22		96.2	25.2	
10.5			Light brown silty fine to coarse **SAND (SM)** with clay, medium dense, slightly moist *Grades fine grained*		16				
15			*Grades fine to medium grained, dense*		32				
19			Light brown to light grey clayey **SAND (SC)**, dense, slightly moist		46				
21.5			Boring terminated at 21.5' No groundwater encountered						

Note: The boring log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations. Note, too, that the passage of time may affect conditions at the sampling locations.

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March 2024

EXPLORATORY BORING LOG

Dunisch Property
Elk Grove, California

FIGURE A-4

Logged By: **ARD**	Date: **15 February 2024**	Lat / Lon: **~N° / ~W°**	Boring No. **B-3**
Equipment: **CME 55 Drill Rig - 4" Solid Stem Auger**		Elevation: **~**	

Depth (Feet)	Graphic Log	Ground Water	Geotechnical Description & Unified Soil Classification	Sample	Blow Counts	Pocket Pen (tsf)	Dry Density (pcf)	Moisture Content (%)	Tests & Comments
0			Brown clayey **SAND (SC)**, medium dense, moist						
3.5			*Grades loose, slightly moist*		11		108.1	16.9	
6.5			*Grades dark brown, very dense*		50/5"		105.3	22.0	
9.5			Blue grey fine to coarse **SAND (SP)** with silt, medium dense to dense, moist						
11			Light brown clayey fine **SAND (SC)**, very dense, slightly moist		50/3"				
15.5			Light brown silty fine **SAND (SM)**, dense, slightly moist		35				
21			*Grades very dense*		55				
21.5			Boring terminated at 21.5' No groundwater encountered						

Note: The boring log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations. Note, too, that the passage of time may affect conditions at the sampling locations.

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March 2024

EXPLORATORY BORING LOG

Dunisch Property
Elk Grove, California

FIGURE **A-5**

Logged By: **ARD**	Date: **15 February 2024**	Lat / Lon: **~N° / ~W°**	Boring No.
Equipment: **CME 55 Drill Rig - 4" Solid Stem Auger**		Elevation: **~**	**B-4**

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Blow Counts	Pocket Pen (tsf)	Dry Density (pcf)	Moisture Content (%)	Tests & Comments
0	Brown sandy **CLAY (CH)**, very stiff, slightly moist						
3–4.5			17		109.0	19.4	
4.5	Light brown clayey **SAND (SC)**, very dense, slightly moist						
5–6.5			71		113.5	17.2	$\phi = 30.8^{o}$ c = 830 psf
10	*Grades brown*						
10.5	Brown **SAND (SP)** with silt, dense, slightly moist		31				
15	Brown silty fine **SAND (SM)**, medium dense, slightly moist						
16	Brown fine to coarse **SAND (SP)** with silt, medium dense, slightly moist		17				
19	Brown silty fine **SAND (SM)** with clay, medium dense, slightly moist						
21	Red brown **SAND (SP)** with silt, dense, slightly moist		31				
21.5	Boring terminated at 21.5' No groundwater encountered						

Note: The boring log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations. Note, too, that the passage of time may affect conditions at the sampling locations.

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Project No.: E24033.001

March 2024

EXPLORATORY BORING LOG

Dunisch Property
Elk Grove, California

FIGURE A-6

Logged By: **ARD**	Date: **15 February 2024**	Lat / Lon: **~N° / ~W°**	Boring No. **B-5**
Equipment: **CME 55 Drill Rig - 4" Solid Stem Auger**		Elevation: **~**	

Depth (Feet)	Graphic Log	Ground Water	Geotechnical Description & Unified Soil Classification	Sample	Blow Counts	Pocket Pen (tsf)	Dry Density (pcf)	Moisture Content (%)	Tests & Comments
0			Brown clayey **SAND (SC)**, loose, slightly moist						
4					10		104.2	20.7	
5			Brown sandy **CLAY (CL)**, medium stiff to stiff, slightly moist						
6					10		103.2	21.4	
10.5			Light brown clayey **SAND (SC)**, very dense, slightly moist						
11					50/4"				
16					56				
19.5			Light grey silty **SAND (SM)** with clay, very dense, slightly moist						
21.5					50/5"				
			Boring terminated at 21.5' No groundwater encountered						

Note: The boring log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations. Note, too, that the passage of time may affect conditions at the sampling locations.

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March 2024

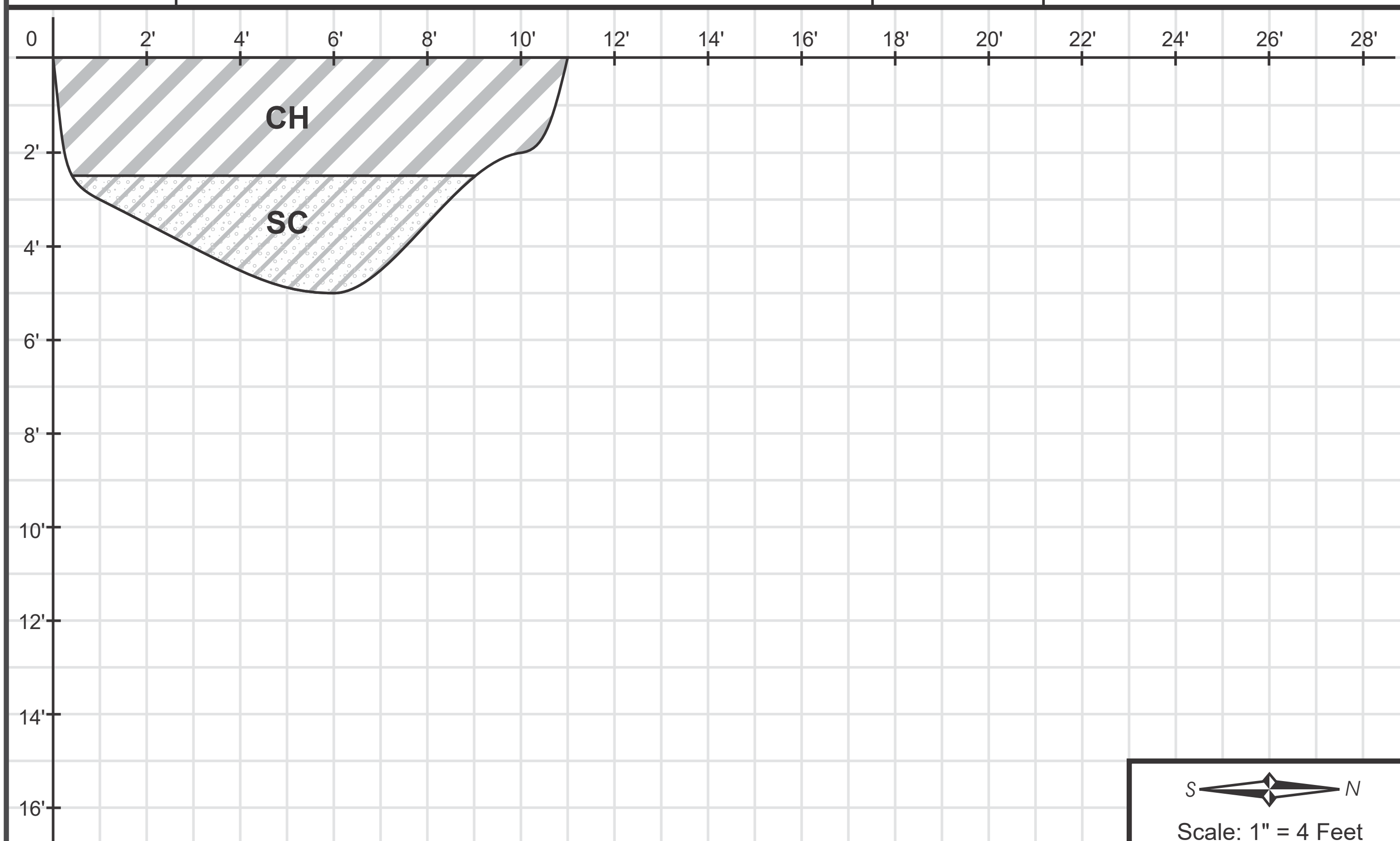
EXPLORATORY BORING LOG

Dunisch Property
Elk Grove, California

FIGURE A-7

Logged By: **CAG**	Date: **20 February 2024**	Lat / Lon: **N 38.426805° / W 121.403090°**	Pit No. **TP-1**
Equipment: **CAT 303.5 E2 with 18" Bucket**		Pit Orientation: **0°**	Elevation: **~**

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Tests & Comments
@ 0' - 2.5'	Dark brown fine to coarse sandy **CLAY (CH)**, medium plasticity, stiff to very stiff, moist	**TP-1** @ 0-2'	EI = 100 (high)
@ 2.5' - 4'	Yellow brown clayey fine to coarse **SAND (SC)**, dense to very dense, slightly moist	**TP-1** @ 0-4'	Max DD = 118.9 pcf Opt MC = 11.5%
@ 4' - 5'	*Grades strongly cemented, very dense*	**TP-1** @ 4-5'	
	Test pit terminated at 5' (practical refusal) No free groundwater encountered No caving noted		



Scale: 1" = 4 Feet

Note: The test pit log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations, Note, too, that the passage of time may affect conditions at the sampling locations.

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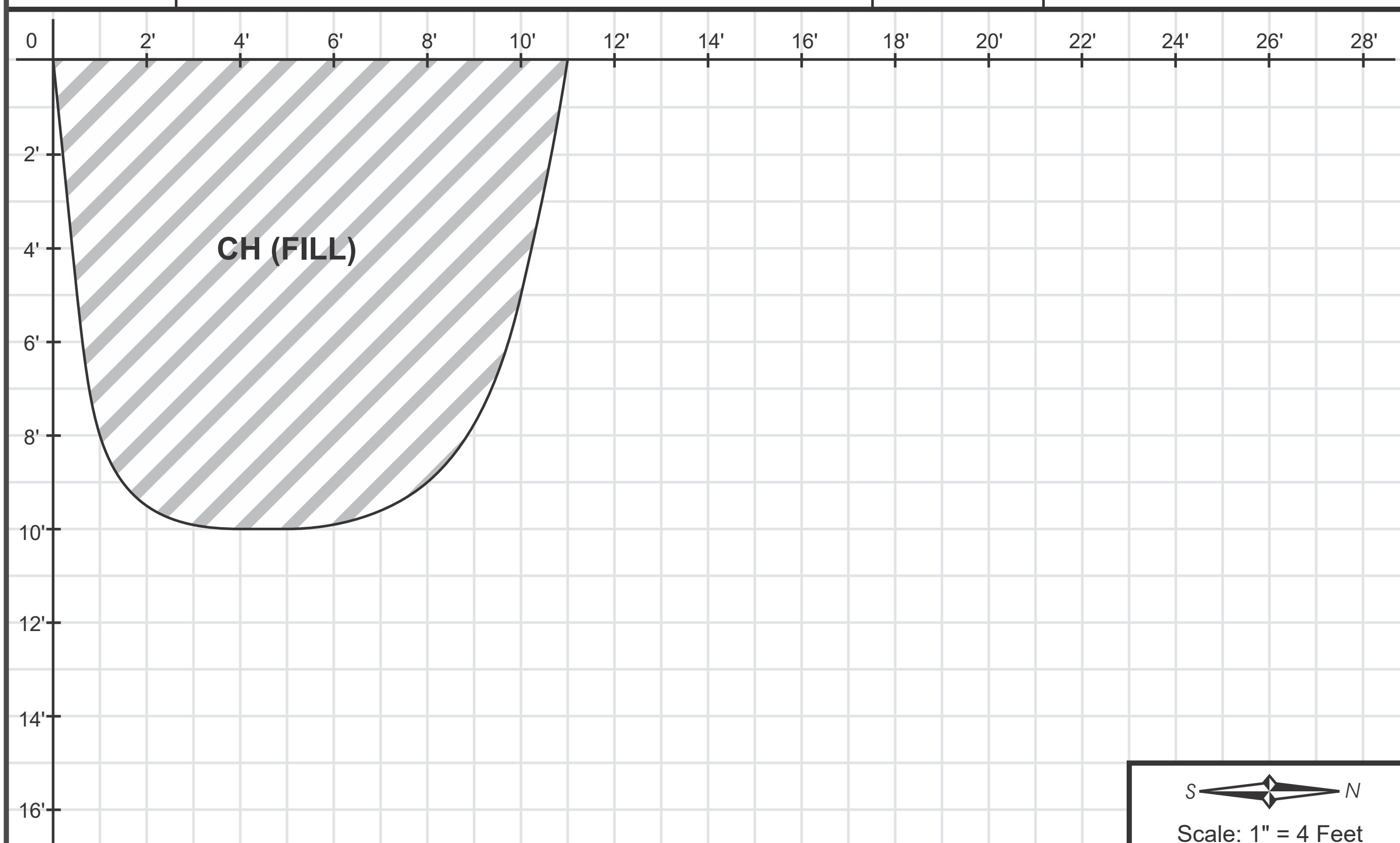
YOUNGDAHL CONSULTING GROUP, INC.	Project No.: E24033.001 **March 2024**	**EXPLORATORY BORING LOG** **Dunisch Property** Elk Grove, California	FIGURE **A-8**

Logged By: **CAG**	Date: **20 February 2024**	Lat / Lon: **N 38.426910° / W 121.400230°**		Pit No. **TP-2**
Equipment: **CAT 303.5 E2 with 18" Bucket**		Pit Orientation: **0°**	Elevation: **~**	

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Tests & Comments
@ 0' - 0.5'	Dark brown sandy **CLAY (CH)**, medium to high plasticity, medium stiff, moist, with organics (FILL)		
@ 0.5' - 2'	*Grades brown and grey brown, stiff to very stiff*		
@ 2' - 7'	*Grades grey brown*	**TP-2** @ 2'	
@ 7' - 7.5'	*Grades with debris*	**TP-2** @ 7'	
@ 7.5' - 10'	*Grades dark grey*	**TP-2** @ 8-10'	
	Test pit terminated at 10' (max reach) No free groundwater encountered No caving noted		

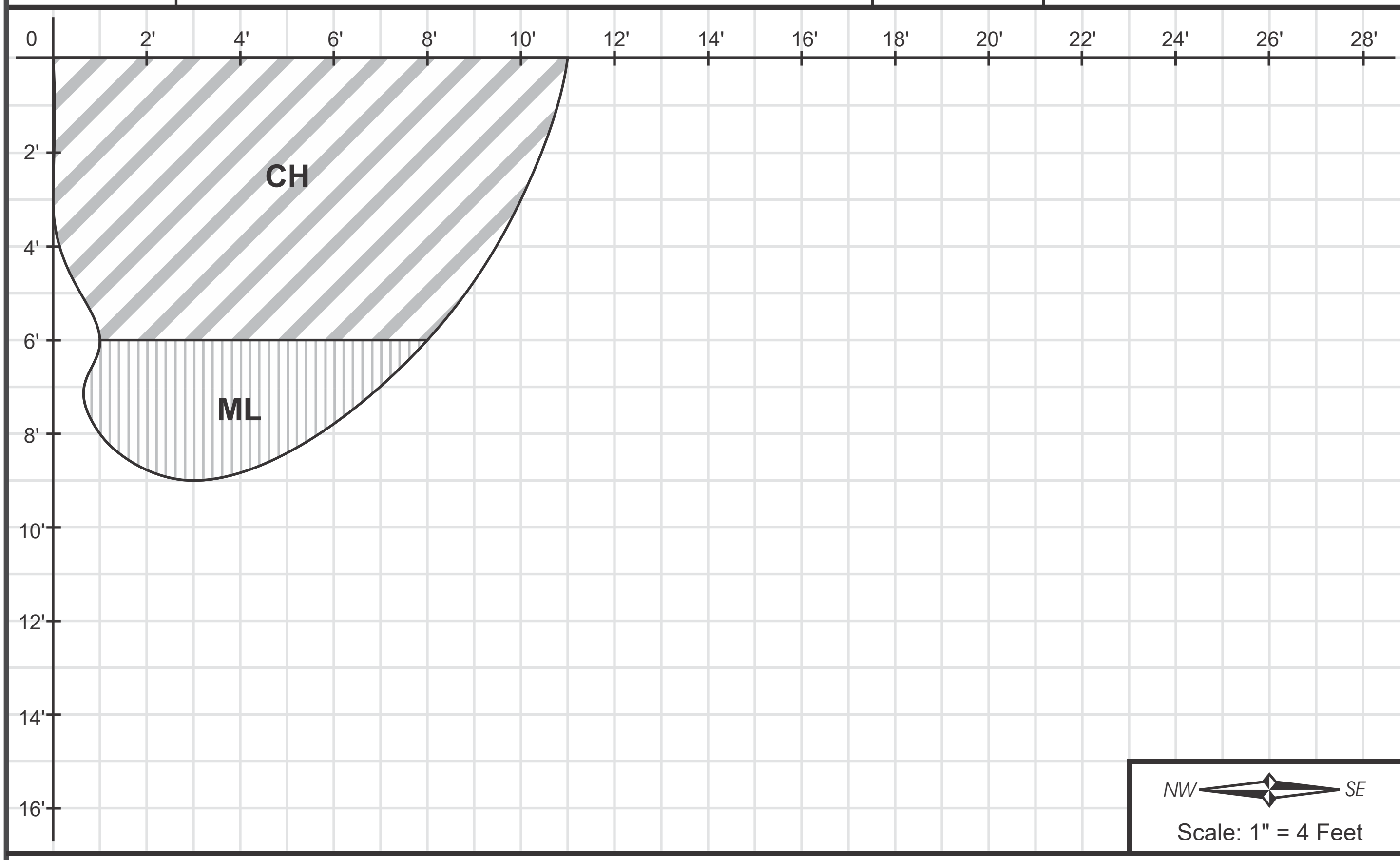


Note: The test pit log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations, Note, too, that the passage of time may affect conditions at the sampling locations.

YOUNGDAHL CONSULTING GROUP, INC. *Celebrating 40 Years of Service*	Project No.: E24033.001	**EXPLORATORY BORING LOG**	FIGURE
	March 2024	**Dunisch Property** Elk Grove, California	**A-9**

Logged By: **CAG**	Date: **20 February 2024**	Lat / Lon: **N 38.426561° / W 121.399317°**	Pit No. **TP-3**
Equipment: **CAT 303.5 E2 with 18" Bucket**		Pit Orientation: **135°** / Elevation: **~**	

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Tests & Comments
@ 0' - 5'	Brown fine to coarse sandy **CLAY (CH)** with trace gravel, low to medium plasticity, medium stiff, moist, with trace organics		
@ 5' - 6'	*Grades moderately cemented, low plasticity, stiff*		
@ 6' - 8.5'	Dark brown sandy **SILT (ML)** with trace clay and gravel, very stiff, moist	**TP-3** @ 6-7.5'	
@ 8.5' - 9'	*Grades very stiff to hard*		
	Test pit terminated at 9' (max reach) No free groundwater encountered No caving noted		

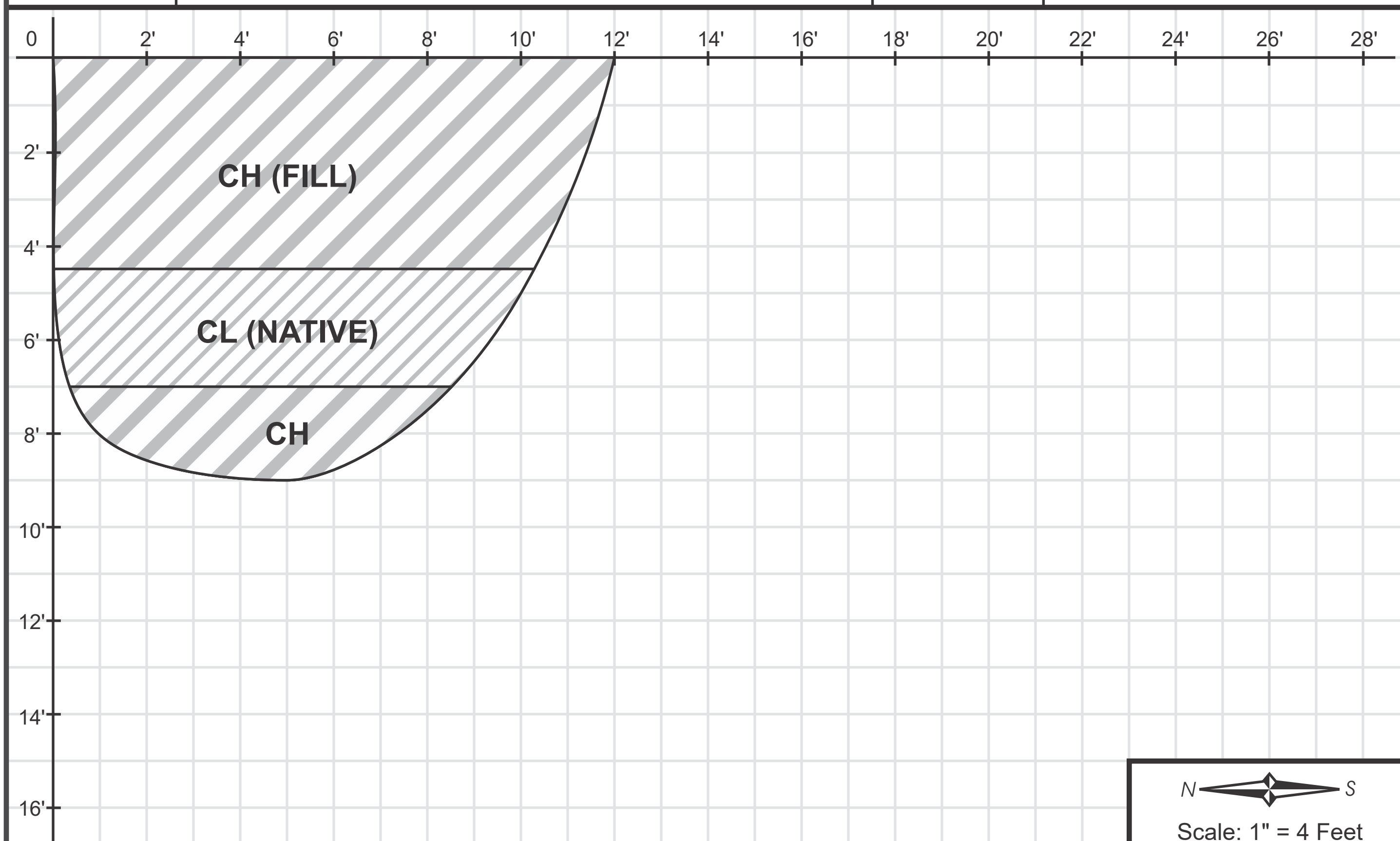


Note: The test pit log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations, Note, too, that the passage of time may affect conditions at the sampling locations.

YOUNGDAHL CONSULTING GROUP, INC. *Celebrating 40 Years of Service*	Project No.: E24033.001 **March 2024**	**EXPLORATORY BORING LOG** **Dunisch Property** Elk Grove, California	**FIGURE** **A-10**

Logged By: **CAG**	Date: **20 February 2024**	Lat / Lon: **N 38.426132° / W 121.400314°**		Pit No. **TP-4**
Equipment: **CAT 303.5 E2 with 18" Bucket**		Pit Orientation: **170°**	Elevation: **~**	

Depth (Feet)	Geotechnical Description & Unified Soil Classification	Sample	Tests & Comments
@ 0' - 0.5'	Dark brown sandy **CLAY (CH)**, medium to high plasticity, medium stiff, moist, with organics (FILL)		
@ 0.5' - 4'	*Grades brown and grey brown, stiff to very stiff*	**TP-4** @ 1-4'	R = <5
@ 4' - 4.5'	*Grades with debris*	**TP-4** @ 4-4.5'	
@ 4.5' - 7'	Yellow brown sandy **CLAY (CL)**, stiff, moist (NATIVE)		
@ 7' - 9'	Dark grey sandy **CLAY (CH)**, medium to highly plastic, stiff to very stiff, moist		
	Test pit terminated at 9' (max reach) No free groundwater encountered No caving noted		



Scale: 1" = 4 Feet

Note: The test pit log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations, Note, too, that the passage of time may affect conditions at the sampling locations.

YOUNGDAHL CONSULTING GROUP, INC. *Celebrating 40 Years of Service*	Project No.: E24033.001 **March 2024**	**EXPLORATORY BORING LOG** **Dunisch Property** Elk Grove, California	**FIGURE A-11**

Logged By: **CG**	Date: **25 March 2024**	Elevation: **~**	Boring No. **HA-1**
Equipment: **Hand Auger**			

Depth (Feet)	Graphic Log	Ground Water	Geotechnical Description & Unified Soil Classification	Sample	Dry Density (pcf)	Moisture Content (%)	Tests & Comments
0–3			Brown sandy **CLAY (CH)** with clay, stiff, slightly moist to moist	**HA-1&HA-2** @ 0-3'			R = 35
3			Boring terminated at 3' No free groundwater encountered				
4							
5							
6							

Logged By: **CG**	Date: **25 March 2024**	Elevation: **~**	Boring No. **HA-2**
Equipment: **Hand Auger**			

Depth (Feet)	Graphic Log	Ground Water	Geotechnical Description & Unified Soil Classification	Sample	Dry Density (pcf)	Moisture Content (%)	Tests & Comments
0–3			Brown sandy **CLAY (CH)** with clay, stiff, slightly moist to moist	**HA-1&HA-2** @ 0-3'			R = 35
3			Boring terminated at 3' No free groundwater encountered				
4							
5							
6							

Note: The boring log indicates subsurface conditions only at the specific location and time noted. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ significantly from conditions which, in the opinion of Youngdahl Consulting Group, Inc., exist at the sampling locations. Note, too, that the passage of time may affect conditions at the sampling locations.

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Project No.: E24033.001

March 2024

HAND AUGER LOG

Dunisch Property
Elk Grove, California

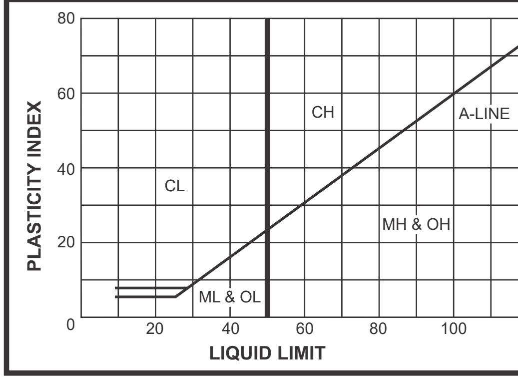
FIGURE A-12

UNIFIED SOIL CLASSIFICATION SYSTEMS

MAJOR DIVISION			SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS Over 50% > #200 sieve	GRAVELS Over 50% > #4 sieve	Clean **GRAVELS** With Little Or No Fines	GW	Well graded **GRAVELS**, **GRAVEL-SAND** mixtures
			GP	Poorly graded **GRAVELS**, **GRAVEL-SAND** mixtures
		GRAVELS With Over 12% Fines	GM	Silty **GRAVELS**, poorly graded **GRAVEL-SAND-SILT** mixtures
			GC	Clayey **GRAVELS**, poorly graded **GRAVEL-SAND-CLAY** mixtures
	SANDS Over 50% < #4 sieve	Clean **SANDS** With Little Or No Fines	SW	Well graded **SANDS**, gravelly **SANDS**
			SP	Poorly graded **SANDS**, gravelly **SANDS**
		SANDS With Over 12% Fines	SM	Silty **SANDS**, poorly graded **SAND-SILT** mixtures
			SC	Clayey **SANDS**, poorly graded **SAND-CLAY** mixtures
FINE GRAINED SOILS Over 50% < #200 sieve	**SILTS & CLAYS** Liquid Limit < 50		ML	Inorganic **SILTS**, silty or clayey fine **SANDS**, or clayey **SILTS** with plasticity
			CL	Inorganic **CLAYS** of low to medium plasticity, gravelly, sandy, or silty **CLAYS**, lean **CLAYS**
			OL	Organic **CLAYS** and organic silty **CLAYS** of low plasticity
	SILTS & CLAYS Liquid Limit > 50		MH	Inorganic **SILTS**, micaceous or diamacious fine sandy or silty soils, elastic **SILTS**
			CH	Inorganic **CLAYS** of high plasticity, fat **CLAYS**
			OH	Organic **CLAYS** of medium to high plasticity, organic **SILTS**
HIGHLY ORGANIC CLAYS			PT	PEAT & other highly organic soils

PLASTICITY CHART

USED FOR CLASSIFICATION OF FINE GRAINED SOILS



SAMPLE DRIVING RECORD

BLOWS PER FOOT	DESCRIPTION
25	25 Blows drove sampler 12 inches, after initial 6 inches of seating
50/7"	50 Blows drove sampler 7 inches, after initial 6 inches of seating
50/3"	50 Blows drove sampler 3 inches during or after initial 6 inches of seating

Note: To avoid damage to sampling tools, driving is limited to 50 blows per 6 inches during or after seating interval.

SOIL GRAIN SIZE

U.S. STANDARD SIEVE	6"		3"	¾"	4	10	40	200		
	BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY	
			COARSE	FINE	COARSE	MEDIUM	FINE			
SOIL GRAIN SIZE IN MILLIMETERS	150		75	19	4.75	2.0	.425	0.075	0.002	

KEY TO PIT & BORING SYMBOLS

Standard Penetration test

2.5" O.D. Modified California Sampler

3" O.D. Modified California Sampler

Shelby Tube Sampler

2.5" Hand Driven Liner

Bulk Sample

Water Level At Time Of Drilling

Water Level After Time Of Drilling

P Perched Water

KEY TO PIT & BORING SYMBOLS

	Joint
	Foliation
	Water Seepage
NFWE	No Free Water Encountered
FWE	Free Water Encountered
REF	Sampling Refusal
DD	Dry Density (pcf)
MC	Moisture Content (%)
LL	Liquid Limit
PI	Plasticity Index
PP	Pocket Penetrometer
UCC	Unconfined Compression (ASTM D2166)
TVS	Pocket Torvane Shear
EI	Expansion Index (ASTM D4829)
Su	Undrained Shear Strength

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Project No.: E24033.001

March 2024

SOIL CLASSIFICATION CHART AND LOG EXPLANATION
Dunisch Property
Elk Grove, California

FIGURE A-13

APPENDIX B
Field Study (WKA 2015 and 2017)

Project: Laguna Gateway	**LOG OF SOIL BORING D1**
Project Location: Elk Grove, California	Sheet 1 of 1
WKA Number: 10665.01	

Date(s) Drilled	**7/28/15**	Logged By	**DCD**	Checked By	**MMW**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**21.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Modified California Sampler**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, dry, very stiff, fine sandy CLAY (FILL)						
					D1-1I	21	12.7	103	
			Grey-brown, moist, stiff, fine to medium sandy CLAY (CL)						
	5				D1-2I	13	16.3	100	
			Grey-brown with white, moist, dense to very dense, clayey fine to medium SAND (SC)						
	10				D1-3I	50+	17.0	89	
	15		weakly cemented		D1-4I	50/5"	19.0	97	
			Grey-brown, moist, very dense, silty fine to medium SAND (SM)						
	20				D1-5I	50+	19.7	87	
			Boring terminated at 21.5 feet below existing site grade. Groundwater was not encountered.						

BORING LOG 10665.01 - LAGUNA GATEWAY.GPJ WKA.GDT 8/12/15 9:18 AM

Wallace Kuhl & ASSOCIATES

FIGURE 3

Project: Laguna Gateway **Project Location: Elk Grove, California** **WKA Number: 10665.01**	**LOG OF SOIL BORING D2** Sheet 1 of 1

Date(s) Drilled	**7/28/15**	Logged By	**DCD**	Checked By	**MMW**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**16.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Modified California Sampler**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, stiff, fine sandy CLAY (FILL)						
					D2-1I	13			
	5								
			Brown, dry, very stiff, fine to medium sandy CLAY (CL)						
			Grey-brown, moist, very dense, weakly cemented, silty fine to medium SAND (SM)		D2-2I	50/5"			
	10		Reddish grey-brown, moist, medium dense, silty fine to medium SAND (SM)						
					D2-3I	38			
			Light grey-brown, moist, medium dense, clayey fine to medium SAND (SC)						
	15				D2-4I	43			

Boring terminated at 16.5 feet below existing site grade. Groundwater was not encountered.

WallaceKuhl & ASSOCIATES

FIGURE 4

Project: Laguna Gateway **Project Location:** Elk Grove, California **WKA Number:** 10665.01		**LOG OF SOIL BORING D3** Sheet 1 of 1

Date(s) Drilled	**7/28/15**	Logged By	**DCD**	Checked By	**MMW**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**31.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Modified California Sampler**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
				SAMPLE DATA			TEST DATA		
			Brown, dry, very stiff, fine sandy CLAY (CL)						
					D3-1I	26	12.5	100	
			Reddish grey-brown, moist, very dense, silty fine to medium SAND (SM)						
	5				D3-2I	50/6"	8.5	101	
			Light grey-brown, moist, very dense, weakly cemented, clayey fine to medium SAND (SC)						
	10		Grey-brown		D3-3I	50/4"	16.0	100	
	15				D3-4I	50/2"	23.3	84	
			Reddish grey-brown, moist, dense to very dense, silty fine to medium SAND (SM)						
	20				D3-5I	50+	10.2	89	
			Grey, less silt						
	25				D3-6I	50/6"	7.8	99	
	30				D3-7I	50+	6.3	101	
			Boring terminated at 31.5 feet below existing site grade. Groundwater was not encountered.						

BORING LOG 10665.01 - LAGUNA GATEWAY.GPJ WKA.GDT 8/12/15 9:18 AM

Project: Laguna Gateway
Project Location: Elk Grove, California
WKA Number: 10665.01

LOG OF SOIL BORING D4

Date(s) Drilled	**7/28/15**	Logged By	**DCD**	Checked By	**MMW**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**16.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Modified California Sampler**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
				SAMPLE DATA			**TEST DATA**		
	0		Brown, dry, very stiff, fine sandy CLAY (CL)						
					D4-1I	30			
			Grey-brown with white, moist, very dense, weakly cemented, fine to medium sandy CLAY (CL)						
	5				D4-2I	50/6"			
	10				D4-3I	50/5"			
									UCC = 2.4 tsf
	15		Light grey-brown		D4-4I	50/4"	16.3	83	66% < No. 200
			Boring terminated at 16.5 feet below existing site grade. Groundwater was not encountered.						

BORING LOG 10665.01 - LAGUNA GATEWAY.GPJ WKA.GDT 8/12/15 9:18 AM

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FIGURE 6

Project: Laguna Gateway **Project Location: Elk Grove, California** **WKA Number: 10665.01**	# LOG OF SOIL BORING D5 Sheet 1 of 1

Date(s) Drilled	**7/28/15**	Logged By	**DCD**	Checked By	**MMW**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**15.0 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Modified California Sampler**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, dry, stiff, fine sandy CLAY (CL)						
			Reddish grey-brown with white, moist, dense to very dense, weakly cemented, clayey fine to medium SAND (SC)		D5-1I	50+			
	5								
			Grey-brown		D5-2I	50+			
	10		Light grey-brown		D5-3I	50/4"			
			Reddish grey-brown						
	15				D5-4I	50/3"			
			Boring terminated at 15 feet below existing site grade. Groundwater was not encountered.						

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FIGURE 7

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		SYMBOL	CODE	TYPICAL NAMES
COARSE GRAINED SOILS (More than 50% of soil > no. 200 sieve size)	GRAVELS (More than 50% of coarse fraction > no. 4 sieve size)	GW		Well graded gravels or gravel - sand mixtures, little or no fines
		GP		Poorly graded gravels or gravel - sand mixtures, little or no fines
		GM		Silty gravels, gravel - sand - silt mixtures
		GC		Clayey gravels, gravel - sand - clay mixtures
	SANDS (50% or more of coarse fraction < no. 4 sieve size)	SW		Well graded sands or gravelly sands, little or no fines
		SP		Poorly graded sands or gravelly sands, little or no fines
		SM		Silty sands, sand - silt mixtures
		SC		Clayey sands, sand - clay mixtures
FINE GRAINED SOILS (50% or more of soil < no. 200 sieve size)	SILTS & CLAYS LL < 50	ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL		Organic silts and organic silty clays of low plasticity
	SILTS & CLAYS LL ≥ 50	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH		Inorganic clays of high plasticity, fat clays
		OH		Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOILS		Pt		Peat and other highly organic soils
ROCK		RX		Rocks, weathered to fresh
FILL		FILL		Artificially placed fill material

OTHER SYMBOLS

= Drive Sample: 2-1/2" O.D. Modified California sampler

= Drive Sampler: no recovery

= SPT Sampler

= Initial Water Level

= Final Water Level

= Estimated or gradational material change line

= Observed material change line

Laboratory Tests

PI = Plasticity Index

EI = Expansion Index

UCC = Unconfined Compression Test

TR = Triaxial Compression Test

GR = Gradational Analysis (Sieve)

K = Permeability Test

PP = Pocket Penetrometer

GRAIN SIZE CLASSIFICATION

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size in Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVEL coarse (c) fine (f)	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND coarse (c) medium (m) fine (f)	No. 4 to No. 200 No. 4 to No. 10 No. 10 to No. 40 No. 40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT & CLAY	Below No. 200	Below 0.074

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UNIFIED SOIL CLASSIFICATION SYSTEM

LAGUNA GATEWAY

Elk Grove, California

FIGURE	8
DRAWN BY	RWO
CHECKED BY	DCD
PROJECT MGR	MMW
DATE	08/15
WKA NO.	10665.01

Project: Laguna Gateway Phase 3
Project Location: Elk Grove, California
WKA Number: 10665.02

LOG OF SOIL BORING NB1

Date(s) Drilled	**3/31/17**	Logged By	**ADW**	Checked By	**MSM**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**16.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Bulk, California (1.94 ID)**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
	0		Brown, moist, silty CLAY with sand (CL)		D1-Bulk				
			Light brown, moist, very dense, moderately to strongly cemented, silty clayey SAND (SC)		D1-1	46			
	5				D1-2	50/6"			
			Light grayish brown, moist, very dense, strongly cemented, silty SAND (SM)						
	10				D1-3	50+			
	15				D1-4	50+			
			Boring terminated at 16.5 feet below existing ground surface. Groundwater was not encountered.						

BORING LOG 10665.02 - LAGUNA GATEWAY PHASE 3.GPJ WKA.GDT 4/11/17 11:24 AM

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FIGURE 2

Project: Laguna Gateway Phase 3
Project Location: Elk Grove, California
WKA Number: 10665.02

LOG OF SOIL BORING NB2

Sheet 1 of 1

Date(s) Drilled	**3/31/17**	Logged By	**ADW**	Checked By	**MSM**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**11.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Bulk, California (1.94 ID)**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, silty CLAY with sand (CL)		D2-Bulk				
			Brown, moist, medium dense, silty clayey SAND (SC)		D2-1	19			
	5								
			Light brown to brown, moist, medium dense, moderately to strongly cemented, silty SAND with gravel (SM)		D2-2	18			
	10								
			Light brown, moist, very stiff, sandy silty CLAY (CL)		D2-3	37			PP=4.5+
			Boring terminated at 11.5 feet below existing ground surface. Groundwater was not encountered.						

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FIGURE 3

Project: Laguna Gateway Phase 3 **Project Location:** Elk Grove, California **WKA Number:** 10665.02	**LOG OF SOIL BORING NB3** Sheet 1 of 1

Date(s) Drilled	**3/31/17**	Logged By	**ADW**	Checked By	**MSM**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**21.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Bulk, California (1.94 ID)**	Drill Hole Backfill	**Soil Cuttings**
Remarks			Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**	

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, sandy CLAY (CL)		D3-Bulk				
			Light brown, moist, very dense, strongly cemented, silty SAND (SM)		D3-1	50+			
	5				D3-2	50/6"			
			Lighty grayish brown, moist, very dense, strongly cemented, silty clayey SAND (SC)						
	10				D3-3	50+			
			Brown, moist, very dense, strongly cemented, silty sand (SM)						
	15				D3-4	50/5"			
			Brown, moist, variably cemented, dense, silty SAND (SM)						
	20				D3-5	32			
			Boring terminated at 21.5 feet below existing ground surface. Groundwater was not encountered.						

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FIGURE 4

Project: Laguna Gateway Phase 3	**LOG OF SOIL BORING NB4**
Project Location: Elk Grove, California	Sheet 1 of 1
WKA Number: 10665.02	

Date(s) Drilled	**3/31/17**	Logged By	**ADW**	Checked By	**MSM**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**11.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Bulk, California (1.94 ID)**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, sandy silty CLAY (CL)		D4-Bulk				
			Light brown, moist, very dense, moderately to strongly cemented, silty SAND (SM) - trace fine gravel		D4-1	50+			
	5				D4-2	43			
			Light brown, moist, medium dense, poorly graded SAND (SP)						
	10				D4-3	29			
			Boring terminated at 11.5 feet below existing ground surface. Groundwater was not encountered.						

Project: Laguna Gateway Phase 3
Project Location: Elk Grove, California
WKA Number: 10665.02

LOG OF SOIL BORING NB5

Date(s) Drilled	**3/31/17**	Logged By	**ADW**	Checked By	**MSM**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**16.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Bulk, California (1.94 ID)**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Brown, moist, silty clayey SAND (SC)		D5-Bulk				
			Light brown, moist, very dense, strongly cemented, silty SAND (SM)		D5-1	50/6"			
	5				D5-2	45			
	10		Light grayish brown with white veins		D5-3	37			
	15		Brown with orange mottling		D5-4	50/6"			
			Boring terminated at 16.5 feet below existing ground surface. Groundwater was not encountered.						

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FIGURE 6

Project: Laguna Gateway Phase 3
Project Location: Elk Grove, California
WKA Number: 10665.02

LOG OF SOIL BORING NB6

Date(s) Drilled	**3/31/17**	Logged By	**ADW**	Checked By	**MSM**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**11.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Bulk, California (1.94 ID)**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Brown, moist, loose, silty clayey SAND (SC)		D6-Bulk				
			Brown, moist, loose, moderately to strongly cemented, poorly graded SAND with silt (SP)		D6-1	10			
	5		Light grayish brown with orange mottling, moist, dense to very dense, moderately to strongly cemented, silty SAND (SM)		D6-2	33			
	10				D6-3	50+			
			Boring terminated at 11.5 feet below existing ground surface. Groundwater was not encountered.						

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FIGURE 7

Project: Laguna Gateway Phase 3
Project Location: Elk Grove, California
WKA Number: 10665.02

LOG OF SOIL BORING NB7

Date(s) Drilled	**3/31/17**	Logged By	**ADW**	Checked By	**MSM**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**21.5 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Bulk, California (1.94 ID)**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, sandy CLAY (CL)	Bulk	D7-Bulk				
			Brown, moist, medium dense, moderately cemented, silty clayey SAND (SC)	California	D7-1	22			
	5		grades to silty SAND (SM)	California	D7-2	25			
			Brown, moist, medium dense, variably cemented, poorly graded SAND with silt (SP)						
	10			California	D7-3	23			
			Light grayish brown with orange mottling, moist, very dense, variably cemented, silty SAND (SM)						
	15			California	D7-4	46			
	20			California	D7-5	49			
			Boring terminated at 21.5 feet below existing ground surface. Groundwater was not encountered.						

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FIGURE 8

Project: Laguna Gateway Phase 3
Project Location: Elk Grove, California
WKA Number: 10665.02

LOG OF SOIL BORING NB8

Date(s) Drilled	3/31/17	Logged By	ADW	Checked By	MSM
Drilling Method	Solid Flight Augers	Drilling Contractor	V&W Drilling	Total Depth of Drill Hole	21.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	6"	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	Groundwater was not encountered	Sampling Method(s)	Bulk, California (1.94 ID)	Drill Hole Backfill	Soil Cuttings
Remarks		Driving Method and Drop	140 lb. automatic hammer, 30 inch drop		

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
	0	SC	Brown, moist, clayey SAND (SC)	Bulk	D8-Bulk				
	1.5	SM	Brown, moist, loose to medium dense, variably cemented, silty SAND (SM)						
				California	D8-1	7			
	5		grades to dark grayish brown with orange mottling	California	D8-2	15			
	8.5	SC	Grayish brown, moist, dense, moderately cemented, clayey SAND (SC)						
	10			California	D8-3	34			
	13.5	SM	Light grayish brown with orange mottling, moist, very dense, silty SAND (SM)						
	15			California	D8-4	50+			
	20			California	D8-5	50+			
	21.5		Boring terminated at 21.5 feet below existing ground surface. Groundwater was not encountered.						

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FIGURE 9

Project: Laguna Gateway Phase 3 **Project Location:** Elk Grove, California **WKA Number:** 10665.02	**LOG OF SOIL BORING NB9** Sheet 1 of 1

Date(s) Drilled	**3/31/17**	Logged By	**ADW**	Checked By	**MSM**
Drilling Method	**Solid Flight Augers**	Drilling Contractor	**V&W Drilling**	Total Depth of Drill Hole	**5.0 feet**
Drill Rig Type	**CME 75**	Diameter(s) of Hole, inches	**6"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Bulk, California (1.94 ID)**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**140 lb. automatic hammer, 30 inch drop**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown, moist, CLAY with sand (CL)		D9-Bulk				
	5		Brown, moist, medium dense, strongly cemented, sitly SAND (SM)		D9-1	28			
			Boring terminated at 5 feet below existing ground surface. Groundwater was not encountered.						

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FIGURE 10

Project: Laguna Gateway Phase 3 **Project Location:** Elk Grove, California **WKA Number:** 10665.02	**LOG OF SOIL BORING NB10** Sheet 1 of 1

Date(s) Drilled	**3/31/17**	Logged By	**ADW**	Checked By	**MSM**
Drilling Method	**Hand Auger**	Drilling Contractor	**-**	Total Depth of Drill Hole	**3.0 feet**
Drill Rig Type	**-**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Bulk**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**-**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Brown, moist, sandy SILT (ML)		D10-Bulk				
			Light brown, moist, strongly cemented, silty SAND (SM)						
			Practical refusal to hand augering at 3 feet below existing ground surface and boring terminated. Groundwater was not encountered.						

FIGURE 11

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Project: Laguna Gateway Phase 3
Project Location: Elk Grove, California
WKA Number: 10665.02

LOG OF SOIL BORING NB11

Date(s) Drilled	3/31/17	Logged By	ADW	Checked By	MSM
Drilling Method	Hand Auger	Drilling Contractor	-	Total Depth of Drill Hole	5.0 feet
Drill Rig Type	-	Diameter(s) of Hole, inches	4"	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	Groundwater was not encountered	Sampling Method(s)	Bulk	Drill Hole Backfill	Soil Cuttings
Remarks				Driving Method and Drop	-

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Brown to dark brown, moist, silty CLAY with sand (CL)		D11-Bulk				
	5		Light brown, moist, weakly cemented, silty SAND (SM)						
			Boring terminated at 5 feet below existing ground surface. Groundwater was not encountered.						

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FIGURE 12

Project: Laguna Gateway Phase 3 **Project Location: Elk Grove, California** **WKA Number: 10665.02**	**LOG OF SOIL BORING NB12** Sheet 1 of 1

Date(s) Drilled	**3/31/17**	Logged By	**ADW**	Checked By	**MSM**
Drilling Method	**Hand Auger**	Drilling Contractor	**-**	Total Depth of Drill Hole	**3.5 feet**
Drill Rig Type	**-**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Bulk**	Drill Hole Backfill	**Soil Cuttings**
Remarks				Driving Method and Drop	**-**

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: SAMPLE NUMBER	SAMPLE DATA: NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			Brown, moist, sandy CLAY (CL)		D12-Bulk				
			Brown, moist, strongly cemented, silty SAND (SM)						
			Practical refusal to hand augering at 3.5 feet below existing ground surface and boring terminated. Groundwater was not encountered.						

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FIGURE 13

Project: Laguna Gateway Phase 3 **Project Location: Elk Grove, California** **WKA Number: 10665.02**	**LOG OF SOIL BORING NB13** Sheet 1 of 1

Date(s) Drilled	**3/31/17**	Logged By	**ADW**	Checked By	**MSM**
Drilling Method	**Hand Auger**	Drilling Contractor	**-**	Total Depth of Drill Hole	**5.0 feet**
Drill Rig Type	**-**	Diameter(s) of Hole, inches	**4"**	Approx. Surface Elevation, ft MSL	
Groundwater Depth [Elevation], feet	**Groundwater was not encountered**	Sampling Method(s)	**Bulk**	Drill Hole Backfill	**Soil Cuttings**
Remarks			Driving Method and Drop	**-**	

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE NUMBER	NUMBER OF BLOWS	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			Brown to dark brown, moist sandy CLAY (CL)		D13-Bulk				
	5		Brown, moist, moderately cemented, silty SAND (SM)						
			Boring terminated at 5 feet below existing ground surface. Groundwater was not encountered.						

FIGURE 14

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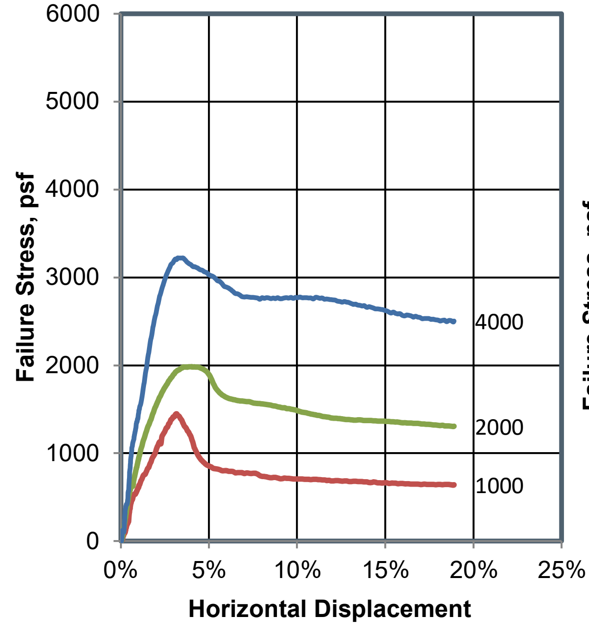
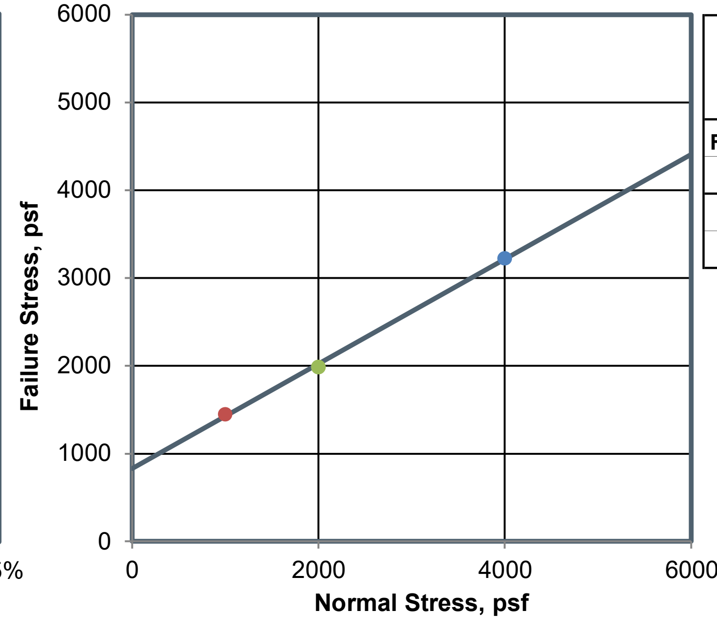
APPENDIX C

Laboratory Testing (YCG 2024)

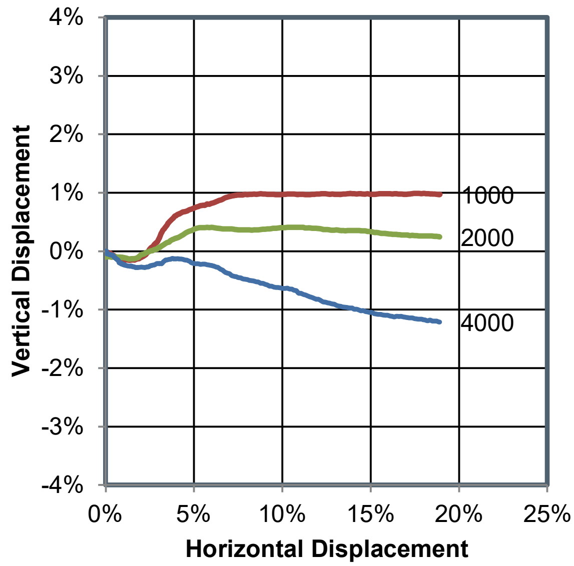
Direct Shear Test
Expansion Index Tests
Atterberg Limit Test
Sieve Analysis Test
Modified Proctor Test
R-Value Tests
Corrosivity Tests

Direct Shear Test of Soils Under Consolidated Drained Conditions, ASTM D3080





Direct Shearbox Results
Friction Angle
30.8°
Cohesion
830 psf



Test No.		1	2	3
Initial	Wet Density, pcf	131.6	132.3	133.4
	Dry Density, pcf	112.8	113.0	113.3
	Moisture Content, %	16.7	17.1	17.7
	Diameter, in	2.38	2.38	2.38
	Height, in	1.00	1.01	1.01
Pre Shear	Wet Density, pcf	140.4	142.0	145.2
	Dry Density, pcf	114.1	115.0	117.3
	Moisture Content, %*	23.0	23.5	23.8
	Diameter, in	2.38	2.38	2.38
	Height, in	0.99	0.99	0.97
Normal Stress, psf		1000	2000	4000
Failure Stress, psf		1449	1985	3223
Failure Strain, %		3.16	4.04	3.54
Rate, in/min			0.002	

*Based on post shear moisture content

Sample Type: Insitu

Material Description: **Brown Sandy CLAY**

Source:

Notes:

Sample No./Depth: B-4 @ 6-6.5'	USCS Class.	Liquid Limit	Plasticity Index	% Greater than No. 4	% Less than No. 200
Date Sampled: 2/15/2024 — Date Test Started: 3/1/2024					

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Project: **Dunisch Property GES**

Project No.:	**E24033.001**			Figure
Reviewed By:	DN	Date:	3/5/2024	C-1

Expansion Index of Soils, ASTM D4829

Test Results

Expansion Index	109
Dry Density, as molded, pcf	102.1
Moisture Content, as molded, %	12.3
Final Moisture Content, %	28.4
Initial Saturation, as molded, %	51
Final Degree of Saturation, %	92

Classification of Potentially Expansive Soil

Expansion Index, EI	Potential Expansion
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
Above 130	Very High

Material Description: **Olive Brown Fat CLAY with Sand**

Source:

Notes:

Sample No./Depth:	B-2 @ 2.5-4'	USCS Class.	Liquid Limit	Plasticity Index	% Greater than No. 4	% Less than No. 200
Date Sampled: 2/15/2024	Date Test Started: 3/1/2024				0	

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Project:	**Dunisch Property GES**		
Project No.:	**E24033.001**		Figure
Reviewed By: DN	Date: 3/5/2024		C-2

Expansion Index of Soils, ASTM D4829

Test Results

Expansion Index	100
Dry Density, as molded, pcf	99.1
Moisture Content, as molded, %	12.5
Final Moisture Content, %	31.0
Initial Saturation, as molded, %	48
Final Degree of Saturation, %	96

Classification of Potentially Expansive Soil

Expansion Index, EI	Potential Expansion
0 - 20	Very Low
21 - 50	Low
51 - 90	Medium
91 - 130	High
Above 130	Very High

Material Description: **Olive Brown CLAY with Sand**

Source:

Notes:

Sample No./Depth:	TP-1 @ 0-2'			USCS Class.	Liquid Limit	Plasticity Index	% Greater than No. 4	% Less than No. 200
Date Sampled:	2/20/2024	Date Test Started:	3/5/2024				1	

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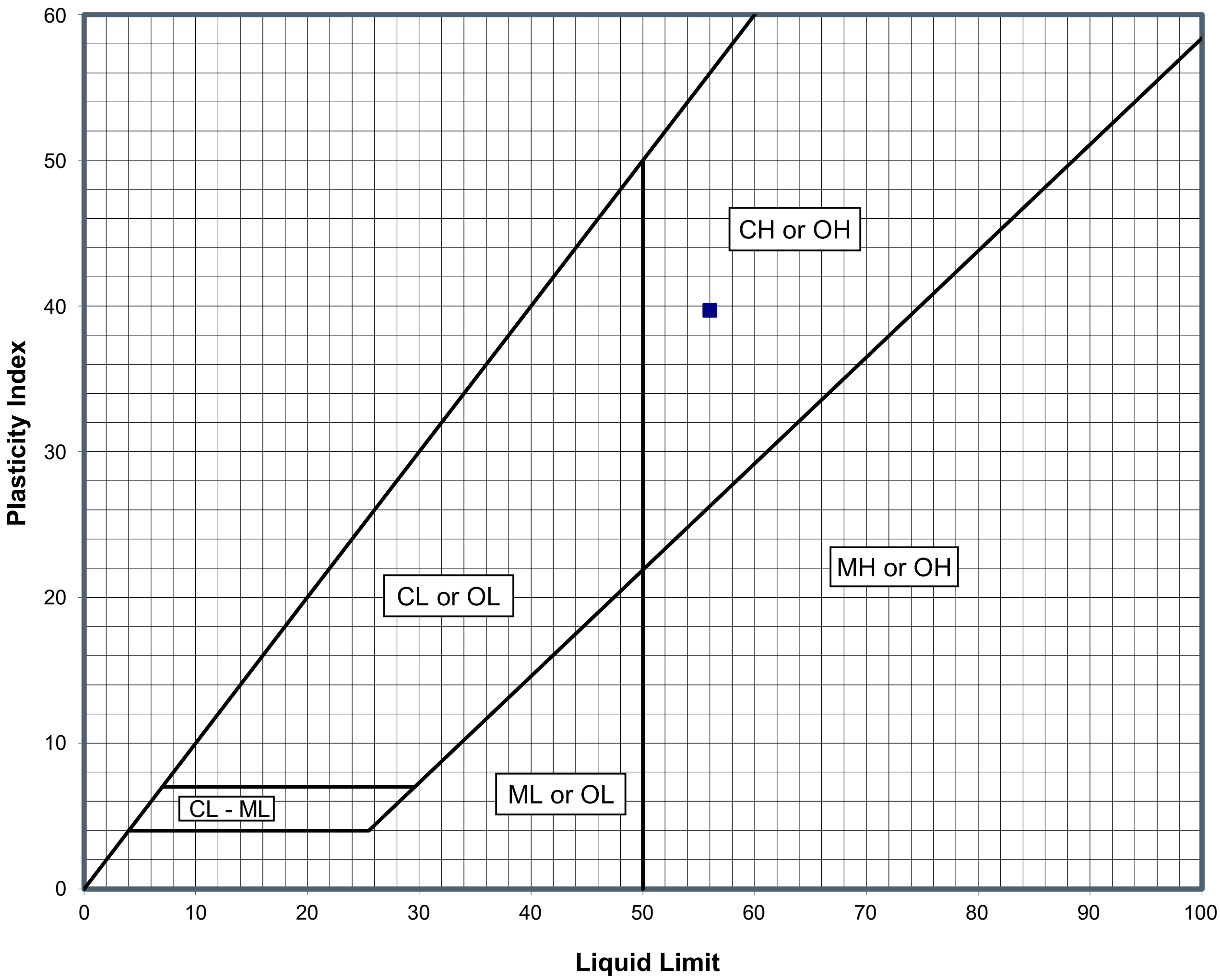
Project:	**Dunisch Property GES**		
Project No.:	**E24033.001**		Figure
Reviewed By: JLC	Date: 3/8/2024		C-3

Liquid Limit, Plastic Limit, and Plasticity Index of Soils, ASTM D4318, Method A



Liquid Limit	Plastic Limit	Plasticity Index	Unified Soil Classification, ASTM D2487
56	16	40	CH

Material Description:	**Olive Brown Fat CLAY with Sand**
Source:	
Notes:	

Sample No./Depth:	B-2 @ 2.5-4'			USCS Class.	Liquid Limit	Plasticity Index	% Greater than No. 4	% Less than No. 200
Date Sampled:	2/15/2024	Date Test Started:	4/11/2024	CH	56	40	0	75.8

YOUNGDAHL CONSULTING GROUP, INC.
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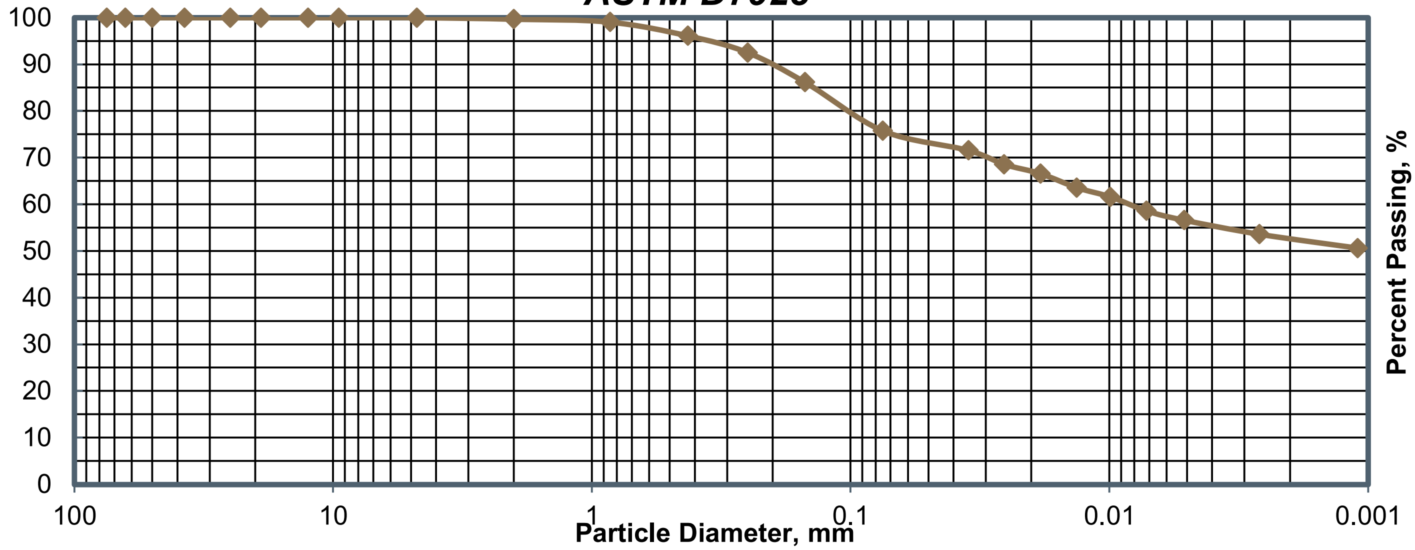
youngdahl.net

Project:	**Dunisch Property GES**		
Project No.:	**E24033.001**		Figure
Reviewed By: DN	Date: 4/12/2024		C-4

Particle-Size Distribution of Fine-Grained Soils Using the Sedimentation Analysis, ASTM D7928



Sieve Analysis	
US Standard Sieve Size	Percent Passing
3 Inch (75 mm)	100
2 1/2 Inch (63.5 mm)	100
2 Inch (50 mm)	100
1 1/2 Inch (37.5 mm)	100
1 Inch (25 mm)	100
3/4 Inch (19 mm)	100
1/2 Inch (12.5 mm)	100
3/8 Inch (9.5 mm)	100
No. 4 (4.75 mm)	100
No. 10 (2 mm)	100
No. 20 (850 μm)	99
No. 40 (425 μm)	96
No. 60 (250 μm)	93
No.100 (150 μm)	86
No. 200 (75 μm)	75.8

Hydrometer Analysis	
Particle Diameter, mm	Percent Passing
0.035	71.6
0.026	68.6
0.018	66.6
0.013	63.6
0.010	61.6
0.007	58.6
0.005	56.6
0.003	53.6
0.001	50.6

Material Description: **Olive Brown Fat CLAY with Sand**

Source:

Notes:

				USCS Class.	Liquid Limit	Plasticity Index	% Greater than No. 4	% Less than No. 200
Sample No./Depth:	B-2 @ 2.5-4'							
Date Sampled:	2/15/2024	Date Test Started:	4/10/2024	CH	56	40	0	75.8

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youngdahl.net

Project:	**Dunisch Property GES**		
Project No.:	**E24033.001**		Figure
Reviewed By: DN		Date: 4/12/2024	C-5

Laboratory Compaction Characteristics of Soil
Using Modified Effort (56,000 lf-lbf/ft3), ASTM D1557, Method A

Maximum Dry Density, pcf:	**118.9**	Optimum Moisture Content, %:	**11.5**

Material Description: **Dark Brown Clayey SAND**

Source: TP-1 @ 0-4'

Notes:

Sample No./Depth: Curve 1		USCS Class.	Liquid Limit	Plasticity Index	% Greater than No. 4 :	% Less than No. 200
Date Sampled: 2/20/2024	Date Test Started: 3/5/2024				2	

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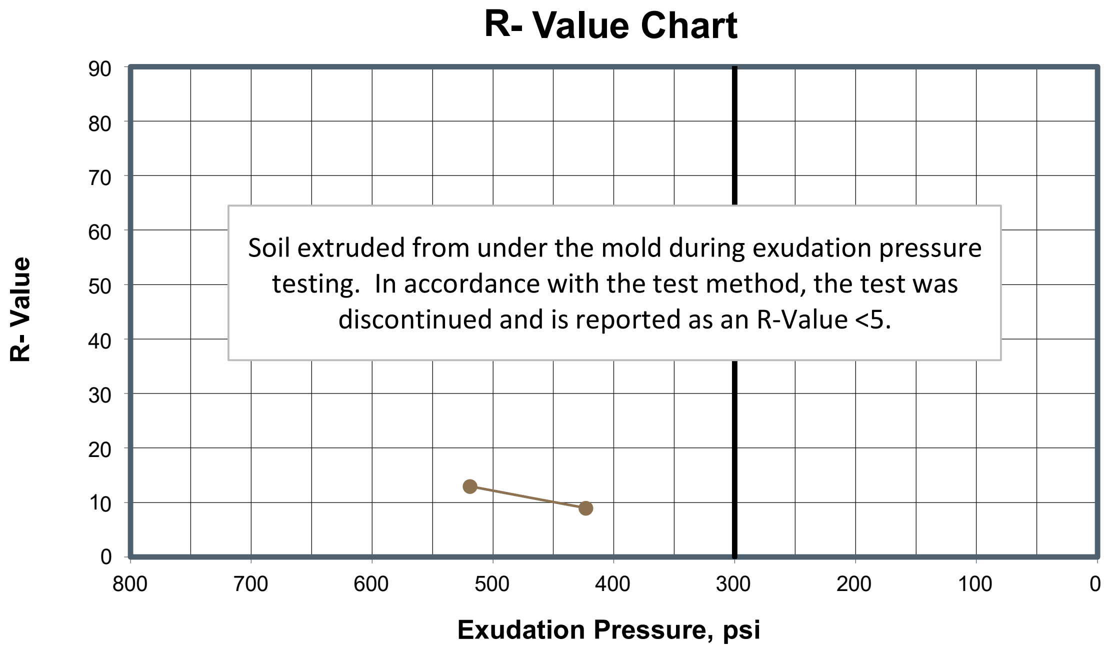
Project:	**Dunisch Property**		
Project No.:	**E24033.001**		Figure
Reviewed By: JLC	Date: 3/6/2024		C-6

Resistance "R" Value of Soil and Soil-Aggregate Mixtures, CTM 301



Test Specimen No.:	1	2	3
Moisture Content at Test, %	9.9	11.9	14.4
Dry Density at Test, pcf	118.0	113.4	107.0
Expansion Pressure, psf	113	22	
Exudation Pressure, psi	519	423	
Resistance "R" Value	13	9	
"R" Value at 300 psi Exudation Pressure			**<5**

Material Description: **Brown CLAY**

Source: TP-4 @ 1-4'

Notes:

Sample No./Depth: RV-1		USCS Class.	Liquid Limit	Plasticity Index	% Greater than No. 4	% Less than No. 200
Date Sampled: 2/20/2024	Date Test Started: 3/7/2024				0	

YOUNGDAHL CONSULTING GROUP, INC.
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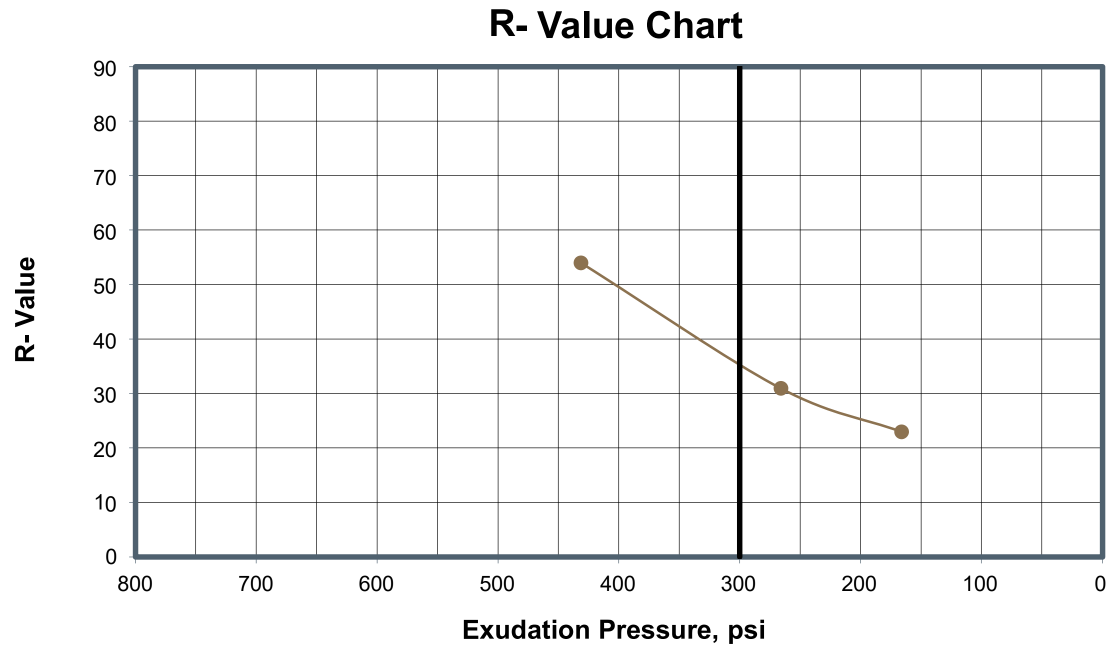
youngdahl.net

Project:	**Dunisch Property**		
Project No.:	**E24033.001**		Figure
Reviewed By: JLC	Date: 3/8/2024		C-7

Resistance "R" Value of Soil and Soil-Aggregate Mixtures, CTM 301



Test Specimen No.:	1	2	3
Moisture Content at Test, %	14.1	15.2	15.7
Dry Density at Test, pcf	119.6	116.1	115.2
Expansion Pressure, psf	255	56	61
Exudation Pressure, psi	431	266	166
Resistance "R" Value	54	31	23
"R" Value at 300 psi Exudation Pressure			**35**

Material Description: **Olive Brown Sandy Clay**

Source: HA-1 & HA-2 @ 0-3'

Notes:

Sample No./Depth:	RV-2			USCS Class.	Liquid Limit	Plasticity Index	% Greater than No. 4	% Less than No. 200
Date Sampled:	3/22/2024	Date Test Started:	3/26/2024				6	

YOUNGDAHL CONSULTING GROUP, INC.
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916.933.0633
youngdahl.net

Project:	**Dunsch Property**		
Project No.:	**E24033.001**		Figure
Reviewed By: JLC	Date: 3/27/2024		C-8

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

RECEIVED MAR 0 8 2024

Date Reported 03/06/2024
Date Submitted 02/28/2024

To: Jeffry Cannon
Youngdahl Consulting Group
1234 Glenhaven Ct.
El Dorado Hills, CA 95630

From: Gene Oliphant, Ph.D. \ Randy Horney RH
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : E24033.001 Site ID : TP-1 @ 0-4FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 91639-189901.

EVALUATION FOR SOIL CORROSION

Soil pH	7.57		
Minimum Resistivity	1.15	ohm-cm (x1000)	
Chloride	14.7 ppm	00.00147	%
Sulfate	46.0 ppm	00.00460	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 03/06/2024
Date Submitted 02/28/2024

To: Jeffry Cannon
Youngdahl Consulting Group
1234 Glenhaven Ct.
El Dorado Hills, CA 95630

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : E24033.001 Site ID : TP-4 @ 1-4FT.
Thank you for your business.

* For future reference to this analysis please use SUN # 91639-189902.

EVALUATION FOR SOIL CORROSION

Soil pH	7.63		
Minimum Resistivity	1.07 ohm-cm (x1000)		
Chloride	4.8 ppm	00.00048	%
Sulfate	21.1 ppm	00.00211	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422m

APPENDIX D
Laboratory Testing (WKA 2015)

EXPANSION INDEX TEST RESULTS

ASTM D4829

MATERIAL DESCRIPTION: Brown, sandy clay fill

LOCATION: S1 from top of fill stockpile

Sample Depth	Pre-Test Moisture (%)	Post-Test Moisture (%)	Dry Density (pcf)	Expansion Index
1' - 4'	12.5	27.6	99	**40**

CLASSIFICATION OF EXPANSIVE SOIL *

EXPANSION INDEX	POTENTIAL EXPANSION
0 - 20	Very Low
21 - 50	**Low**
51 - 90	Medium
91 - 130	High
Above 130	Very High

* From ASTM D4829, Table 1

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EXPANSION INDEX

LAGUNA GATEWAY

Elk Grove, California

FIGURE	A1
DRAWN BY	RWO
CHECKED BY	DCD
PROJECT MGR	MMW
DATE	08/15

WKA NO. 10665.01

RESISTANCE VALUE TEST RESULTS

(California Test 301)

MATERIAL DESCRIPTION: Brown, sandy clay fill

LOCATION: S1 from top of stockpile

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (dial, inches x 1000)	Expansion Pressure (psf)	R Value
1	111	18.1	571	0	108	5

Sample extruded, therefore R-Value ≤ 5

MATERIAL DESCRIPTION: Brown, sandy clay

LOCATION: S2 (1' - 4')

Specimen No.	Dry Unit Weight (pcf)	Moisture @ Compaction (%)	Exudation Pressure (psi)	Expansion Pressure (dial, inches x 1000)	Expansion Pressure (psf)	R Value
1	111	18.2	276	110	173	15
2	113	17.0	217	102	217	17
3	116	16.1	462	92	589	27

R-Value at 300 psi exudation pressure = 15

WallaceKuhl & ASSOCIATES

RESISTANCE VALUE TEST RESULTS

LAGUNA GATEWAY

Elk Grove, California

FIGURE	A2
DRAWN BY	RWO
CHECKED BY	DCD
PROJECT MGR	MMW
DATE	08/15
WKA NO.	10665.01

Sunland Analytical

11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/05/2015
Date Submitted 07/30/2015

To: David Dickey
Wallace-Kuhl & Assoc.
3050 Industrial Blvd
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 10665.01-LAGUNA Site ID : D1-1II.
Your purchase order number is 3717.
Thank you for your business.

* For future reference to this analysis please use SUN # 70135-146184.

EVALUATION FOR SOIL CORROSION

Soil pH	7.35			
Minimum Resistivity	1.51	ohm-cm (x1000)		
Chloride	11.0	ppm	00.00110	%
Sulfate	28.5	ppm	00.00285	%

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/05/2015
Date Submitted 07/30/2015

To: David Dickey
Wallace-Kuhl & Assoc.
3050 Industrial Blvd
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following:
Location : 10665.01-LAGUNA Site ID : D1-1II.
Your purchase order number is 3717. Thank you for your business.

* For future reference to this analysis please use SUN # 70135-146185.

Extractable Sulfate in Water

TYPE OF TEST	RESULTS	UNITS
Sulfate-SO4	24.33	mg/kg

ASTM D-516 from sat.paste extract-reported based on dry wt.

CORROSION TEST RESULTS	FIGURE	A4
LAGUNA GATEWAY	DRAWN BY	RWO
Elk Grove, California	CHECKED BY	DCD
	PROJECT MGR	MMW
	DATE	08/15
	WKA NO.	10665.01

WallaceKuhl & ASSOCIATES

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/05/2015
Date Submitted 07/30/2015

To: David Dickey
Wallace-Kuhl & Assoc.
3050 Industrial Blvd
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following location:
Location : 10665.01-LAGUNA Site ID : D4-1II.
Your purchase order number is 3717.
Thank you for your business.

* For future reference to this analysis please use SUN # 70135-146186.

EVALUATION FOR SOIL CORROSION

Soil pH	7.29	
Minimum Resistivity	1.10 ohm-cm (x1000)	
Chloride	16.7 ppm	00.00167 %
Sulfate	18.0 ppm	00.00180 %

METHODS
pH and Min.Resistivity CA DOT Test #643
Sulfate CA DOT Test #417, Chloride CA DOT Test #422

WallaceKuhl & ASSOCIATES

CORROSION TEST RESULTS

LAGUNA GATEWAY

Elk Grove, California

FIGURE	A5
DRAWN BY	RWO
CHECKED BY	DCD
PROJECT MGR	MMW
DATE	08/15
WKA NO.	10665.01

Sunland Analytical
11419 Sunrise Gold Circle, #10
Rancho Cordova, CA 95742
(916) 852-8557

Date Reported 08/05/2015
Date Submitted 07/30/2015

To: David Dickey
Wallace-Kuhl & Assoc.
3050 Industrial Blvd
West Sacramento, CA 95691

From: Gene Oliphant, Ph.D. \ Randy Horney
General Manager \ Lab Manager

The reported analysis was requested for the following:
Location : 10665.01-LAGUNA Site ID : D4-1II.
Your purchase order number is 3717. Thank you for your business.

* For future reference to this analysis please use SUN # 70135-146187.

Extractable Sulfate in Water

TYPE OF TEST	RESULTS	UNITS
Sulfate-SO4	18.05	mg/kg

ASTM D-516 from sat.paste extract-reported based on dry wt.

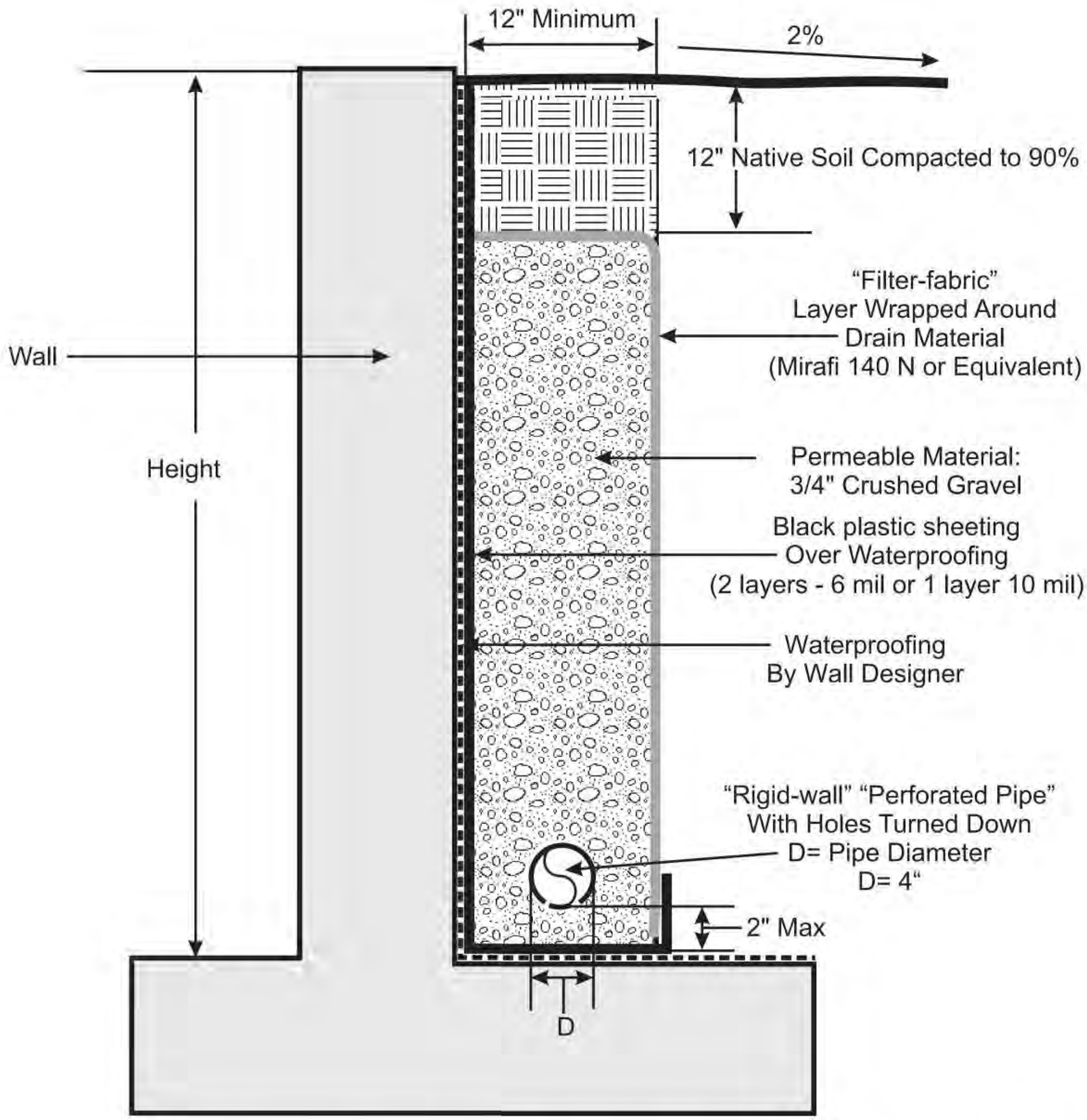
WallaceKuhl & ASSOCIATES	CORROSION TEST RESULTS LAGUNA GATEWAY Elk Grove, California	FIGURE A6
		DRAWN BY: RWO
		CHECKED BY: DCD
		PROJECT MGR: MMW
		DATE: 08/15
		WKA NO. 10665.01

APPENDIX E
Details

Site Wall Drainage
Subdrain

Retaining Wall With
"Perforated Pipe Sub-Drain"

(Typical Cross Section)

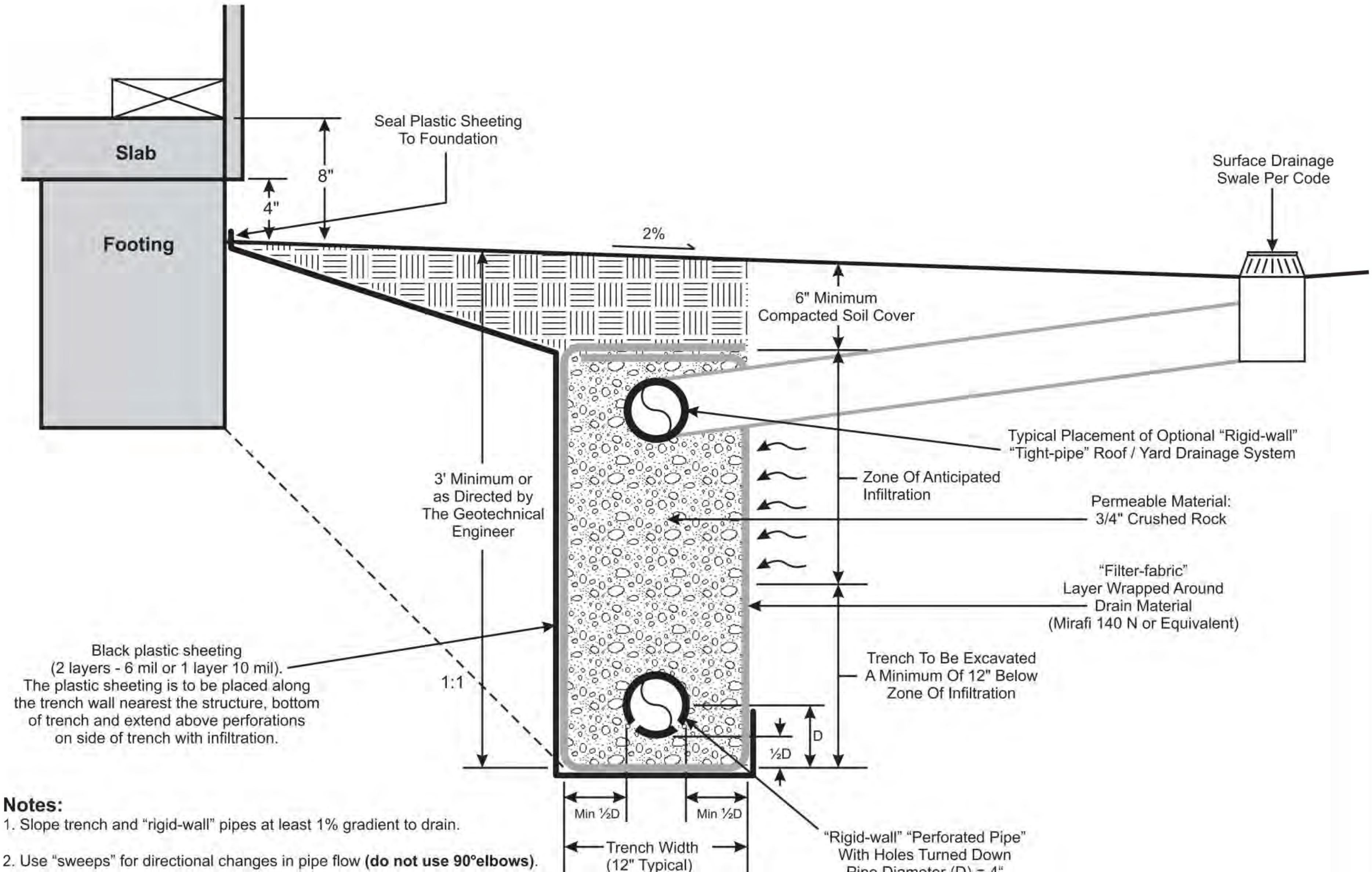


Notes:

1. Slope footing and "rigid-wall" pipes along flow line parallel to wall at least 1% gradient to drain to an appropriate outfall area away from residence.
2. Use "sweeps" for directional changes in pipe flow **(do not use 90°elbows)**.
3. Provide periodic "clean-outs".
4. Washed clean permeable material.

Not To Scale

YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E24033.001 **March 2024**	**RETAINING WALL DRAIN DETAIL** **Dunisch Property Subdivision** Elk Grove, California	**FIGURE** **E-1**



Notes:

1. Slope trench and "rigid-wall" pipes at least 1% gradient to drain.
2. Use "sweeps" for directional changes in pipe flow **(do not use 90°elbows)**.
3. Provide sweeps to periodic "clean-outs".
4. Washed clean permeable material.

YOUNGDAHL CONSULTING GROUP, INC. GEOTECHNICAL • ENVIRONMENTAL • MATERIALS TESTING	Project No.: E24033.001 **March 2024**	**SUB-DRAIN DETAIL** **Dunisch Property Subdivision** Elk Grove, California	**FIGURE** **E-2**

APPENDIX F

PHASE I ENVIRONMENTAL SITE ASSESSMENT

PHASE I ENVIRONMENTAL SITE ASSESSMENT

VACANT LOT
DUNISCH ROAD AND WEST STOCKTON BOULEVARD
ELK GROVE, CALIFORNIA 95758
(SACRAMENTO COUNTY APN 116-0050-013, 116-0050-027, 116-0050-030, 116-0050-031,116-0050-010, 116-0050-011, 116-0050-034)

BSK PROJECT E1505801S

PREPARED FOR:

Pappas Gateway, LP
2020 L Street, 5th Floor
Sacramento, California 95811

September 16, 2015

PHASE I ENVIRONMENTAL SITE ASSESSMENT

VACANT LOT
DUNISCH ROAD AND WEST STOCKTON BOULEVARD
ELK GROVE, CA
(SACRAMENTO COUNTY APN 116-0050-013, 116-0050-027, 116-0050-030, 116-0050-031, 116-0050-010, 116-0050-011, 116-0050-034)

Prepared for:

Pappas Gateway, LP
2020 L Street, 5th Floor
Sacramento, CA 95811

BSK Project E1505801S

September 16, 2015

Prepared by:

Kevin Grove
Staff Planner

Kurt Balasek, P.G.
Senior Hydrogeologist

BSK Associates
3140 Gold Camp Drive, Suite 160
Rancho Cordova, CA 95670
(916) 853-9293
(916) 853-9297 FAX
www.bskassociates.com

BSK

EXECUTIVE SUMMARY

Site Description

BSK Associates (BSK) performed a Phase I Environmental Site Assessment (ESA) in accordance with the scope and limitations of the American Society for Testing and Materials (ASTM) Practice E 1527-13 of the property located on a 14.37 acre property at Dunisch Road and West Stockton Boulevard, Elk Grove, California (Site). Any exceptions to, or deletions from, this practice are described in Section 1.6 of this Report.

The Site is further defined as Sacramento County Assessor's Parcel Numbers (APN) 116-0050-013, 116-0050-027, 116-0050-030, 116-0050-031, 116-0050-010, 116-0050-011, 116-0050-034 (see Appendix A). The property is located in a commercial and residential area along West Stockton Boulevard in Elk Grove, Sacramento County, California. The Site is a vacant semi-rectangular shaped parcel approximately 1,350 ft. x 450 ft. located in a commercial district, near residential development.

Retail buildings are immediately south of the site. Rural residential properties and Elk Grove Creek are west of the Site. West Stockton Boulevard is directly east of the Site, beyond which are commercial buildings, and Dunisch Road is directly north of the site, beyond which is a residential neighborhood and Elk Grove/Laguna Creek. Elk Grove/Laguna Creek is located 1,300 feet to the North. The property elevation is approximately 30 feet above sea level (ASL) according to the Attached EDR Radius Map Report (Appendix C). The Site and the surrounding area appear, through historical topographic maps and aerial photos, to have been used for residential and agricultural purposes.

Recognized Environmental Conditions

The goal of the ASTM E 1527-13 Standard practice is to identify Recognized Environmental Conditions (RECs), as defined in the Standard and in Section 1 of this Report. The term recognized environmental conditions means the presence or likely presence of any hazardous substances or petroleum products in, on, or at a property: (1) due to any release to the environment; (2) under conditions indicative of a release to the environment; or (3) under conditions that pose a material threat of a future release to the environment. De minimis conditions are not recognized environmental conditions. This assessment revealed evidence of a REC related to the fill dirt present on site from an unknown source. On August 11, 2015, BSK conducted sampling and analysis of the fill dirt. A report of findings dated September 16, 2015 is appended (Appendix F). If during future site development activities, evidence of contamination is discovered from this REC, the signatories of this report should be contacted immediately and the soil should be sampled and analyzed. As a result of conclusions outlined in the September 16, 2015 report of findings (Appendix F), further investigation is not warranted at this time.

Controlled Recognized Environmental Conditions

The ASTM E 1527-13 Standard requires identification of Controlled Recognized Environmental Conditions (CRECs) resulting from a past release of hazardous substances or petroleum products that have been addressed to the satisfaction of the applicable regulatory authority and allowed to remain in place subject to the implementation of required controls. The assessment has revealed no evidence of CRECs in connection with the subject Site.

Historical RECs and Known or Suspect Environmental Conditions

The ASTM E 1527-13 Standard also requires identification of historical RECs (HRECs) and other known or suspect environmental conditions, as defined in the Standard and in Section 1 of this Report. The assessment has revealed no evidence of HRECs or formerly known environmental conditions in connection with the subject Site.

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Figures

Appendices

1. INTRODUCTION

BSK Associates (BSK) has performed a Phase I Environmental Site Assessment (ESA) for a 14.37 acre property at the southwest corner of Dunisch Road and West Stockton Boulevard, Elk Grove, California (Site). The Site is further defined as Sacramento County Assessor's Parcel Numbers (APN) 116-0050-013, 116-0050-027, 116-0050-030, 116-0050-031, 116-0050-010, 116-0050-011, 116-0050-034 (Site). The property is located in a commercial district near residential development in Elk Grove, Sacramento County, California (the Site) (see Figure 1). This ESA was conducted as authorized by Pappas Gateway, LP (Client, User).

The property was initially developed as rural residence with some small crops and the surrounding area was largely agricultural. Later the surrounding area developed around the Site, but the Site became a vacant lot.

1.1 Purpose

The purpose of this ESA is to identify, to the extent feasible, recognized environmental conditions (RECs) in connection with the property. Typical RECs include the possible presence of hazardous substances or petroleum products on the site (or adjoining properties) under conditions including migration potential that indicate an existing release, a past release, or a material threat of a release of the substance/product into structures, the ground, groundwater, or surface water of the property. An additional use of the ESA is to permit the user to satisfy one of the requirements to qualify for what is commonly known as the "innocent landowner" defense to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) liability as described by 42 U.S.C. Section 9601 (35)(B).

1.2 Scope of Services

BSK conducted this ESA in accordance with the methods described in the American Society for Testing and Materials (ASTM) Standard E1527-13, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.* The scope of services provided for this ESA included:

- A general description of the property
- Review of the property's history using aerial photography, USGS topographic maps, directories, and other readily available information
- Review of the reasonably ascertainable regulatory information published by local, state, and federal agencies
- Site reconnaissance
- Interviews with the current owner of the property
- Preparation of this Report

1.3 Non-Scope Issues

Non-scope issues are those conditions and concerns that are beyond the scope of services of this ESA and include, but are not limited to: asbestos containing materials, radon, lead-based paint, lead in drinking water, wetlands delineation or identification, regulatory compliance, cultural concerns, industrial hygiene, ecological resources, endangered species, indoor air quality, and high voltage power lines. Sampling and analytical testing of groundwater, air, radon gas, radioactive materials, urea-formaldehyde, mold, pesticides or polychlorinated biphenyls (PCBs) are also considered non-scope issues. No non-scope issues were discovered during the course of BSK's assessment.

1.4 Significant Assumptions

No significant assumptions were made regarding this ESA.

1.5 Limitations

The findings presented in this Report were based upon field observations during a Site reconnaissance conducted on August 11, 2015, discussions with persons knowledgeable of the property, and review of historical data. Observations describe only the conditions present at the time of this investigation. The data reviewed and observations made are limited to accessible areas and available records searched during the course of this investigation. BSK cannot guarantee the completeness or accuracy of the regulatory agency records reviewed. Unless BSK otherwise expressly agrees in writing, no other party is entitled to rely upon the observations, research information, or conclusions presented in this report or in any other material obtained by BSK from the sources identified in this Report. Additionally, in evaluating the property, BSK has relied in good faith upon information provided by the interview sources noted in the report with respect to existing property conditions, and the historic uses of the property. It must also be understood that changing circumstances in the property usage, proposed property usage, property zoning, and changes in the environmental status of the other nearby properties can alter the validity of conclusions and information contained in this Report. Therefore, the data obtained are clear and accurate only to the degree implied by the sources and methods used.

This ESA report provides neither certification nor guarantee that the property is free of hazardous-material and/or petroleum-product contamination or that there are no RECs associated with the property that potentially pose an environmental risk/liability or that the property is in compliance with current applicable federal, state, or local regulations. Findings of this ESA may have a potential for negative impact on the value or suitability of the property for the purpose intended. BSK cannot assume liability for such negative impact. No warranties, expressed or implied, are made as to the findings or conclusions presented in this report. Sampling and analytical testing of soil, groundwater, air, radon gas, biological agents and/or construction/building materials was not part of the scope of services for this ESA. This assessment did not include non-scope issues identified in Section 1.3 of this Report.

1.6 Exceptions

No other significant exceptions or data gaps that would raise reasonable concerns regarding our opinions and conclusions in the Report were made or noted.

1.7 Special Terms and Conditions

There were no special terms or contractual conditions for this assessment.

1.8 User Reliance

This Report may be distributed and relied upon by the Client (Pappas Gateway, LP). Reliance on the information and conclusions in this Report by any other person or entity is not authorized without the written consent of BSK.

2. PROPERTY DESCRIPTION

2.1 Location and Legal Description

The Site is comprised of the property located at the southwest corner of Dunisch Road and West Stockton Boulevard, in the City of Elk Grove, Sacramento County, California. The Site is further defined as Sacramento Assessor's Parcel Numbers (APN) 116-0050-013, 116-0050-027, 116-0050-030, 116-0050-031, 116-0050-010, 116-0050-011, 116-0050-034. A complete legal description is contained in the Preliminary Title Report, dated July 29, 2015 and prepared by Stewart Title Company (Appendix A).

2.2 Property Vicinity and General Characteristics

Properties surrounding the Site are used for residential and commercial purposes. The Site is currently vacant, and is covered in mixed dry grass. Two (2) low lying, large soil piles are present on site (Appendix D).

2.3 Current Use of the Property and Property Improvements

The Site is an approximately 14.37 acre property at Dunisch Road and West Stockton Boulevard, Elk Grove, California (see Appendix A). According to the Sacramento County Tax Assessor's website, the property land use is designated as vacant with a proposed use of retail/commercial (Sacramento County, 2015).

2.4 Current Uses of Adjoining Properties

Based on observations by John Coburn and Kevin Grove of BSK during the site and vicinity reconnaissance on August 11, 2015, Table 1 summarizes the current use of properties immediately adjacent to the Site.

Table 1: Observed Adjoining Property Uses	
Direction	**Adjoining Property Use**
North	Dunisch Road, beyond which is single family residential
South	Commercial buildings
East	West Stockton Boulevard, beyond which is commercial buildings
West	Single family rural residence

A series of retail buildings including Home Depot are present to the south of the Site. A Chevron gas station is approximately 1,300 feet south of the Site. West Stockton Boulevard is directly east of the Site with more commercial and retail buildings beyond.

2.5 Migration

Activities on the Site appear not to have the potential for hazardous substances migration that could affect the Site. Migration refers to the movement of hazardous substances or petroleum products in any form, including, for example, solid and liquid at the surface or subsurface, and vapor in the subsurface. A Vapor Encroachment Screen was conducted to comply with the requirements of ASTM E2600-10, "Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions." A search of the available records was conducted by EDR as part of the screening evaluation. The evaluation did not result in a potential for vapor encroachment to the Site from *off-site sources*.

2.6 Physical Setting

The following sections describe the Geologic and Hydrologic conditions of the Site. The topics summarized include General Geologic Conditions, Surface Soils and Hydrogeologic Conditions.

2.6.1 Topography

The Site is located in the City of Elk Grove. The geographic coordinates of the property are latitude 38.4265000/ longitude -121.4011000 (EDR, 2015). According to the United State Geologic Survey (USGS) Florin 7.5 Minute Topographic Quadrangle Map dated 1968, the topography at the site can be interpolated to be approximately 30 feet above mean sea level (msl). According Executive Summary Page 1 of the Appended EDR Radius Map Report with GeoCheck, the site is at an elevation of 30 feet msl. The topography on the referenced quadrangle map slopes gently downhill from the southeast to the northwest.

2.6.2 Geologic Information

The Site area is located in the Great Valley Geomorphic Province of California. The Great Valley of California is generally considered to be an elongated sedimentary trough, approximately 450 miles long that averages 50 miles in width. The topography of the Sacramento Valley is dominated by coalescing alluvial fans and flood plains derived from rivers and streams emerging from the Sierra Nevada and Coastal Ranges east and west of the valley, respectively. Valley fill consists of a thick sequence of marine and overlying continental rocks and sediments, Jurassic to Holocene in age. According to the Geologic Map of the Late Cenozoic Deposits of the Sacramento Valley and Northern Sierra Foothills, California, the Site is underlain by Quaternary-aged alluvium (Helley and Harwood, 1985).

2.6.3 Ground Water and Surface Water Information

The Site is within the South American sub-basin of the Sacramento Valley groundwater basin. General movement of groundwater within the Sacramento Valley is from the flanks of the valley to the axis of the trough on the western side of the valley and subsequently south toward the Sacramento Delta area.

The stratigraphic sequence of much of the Sacramento Valley consists of a pre Tertiary basement complex overlain by variably consolidated upper-Mesozoic to Pliocene continental and marine sediments and unconsolidated Pliocene to Recent alluvial sediments.

Information obtained from the California Department of Water Resources Water Data Library (http://www.water.ca.gov/waterdatalibrary/index.cfm) for a known well within the site boundary indicates that groundwater in the vicinity was approximately 53 feet below ground surface (bgs) in April 2012. This well was destroyed on November 16, 2012. According to the California Waterboard's Geotracker database, groundwater flow direction was identified as flowing to the northeast at a site approximately 1.25 miles to the south of the Project site at 8451 Elk Grove Boulevard. Specific depth to groundwater and groundwater flow direction beneath the site is unknown. Elk Grove/Laguna Creek is located approximately 0.28 miles to the north of the Site.

3. USER-PROVIDED INFORMATION

As part of the All Appropriate Inquiry (AAI) requirements, Mr. Travis Batts of Pappas Gateway, LP, provided BSK with a completed user questionnaire dated September 14, 2015. A copy of the questionnaire is included in Appendix E.

4. RECORDS REVIEW

The purpose of the records review is to examine historic records concerning conditions on surrounding properties, including the Site, which may represent a Recognized Environmental Concern (REC) in relation to the Site.

4.1 Standard Environmental Record Sources

Federal, State, and local regulatory agencies maintain databases of businesses and properties that handle, store, and dispose of hazardous materials and/or wastes, and locations known to have had unauthorized releases of hazardous substances to soil and/or groundwater. These databases are available for review at the various regulatory agencies, or the information may be obtained from commercial data collection services. BSK Associates retained Environmental Data Resources (EDR) to perform the regulatory agency database search. The record search meets the government records search requirements of ASTM E 1527-13. EDR's findings are documented in The EDR-Radius Map™ Report, dated August 17, 2015, which is included in Appendix C.

4.2 Database Search Findings

The subject property was identified in the radius map search as Laguna Phase 4 Stock and is listed in the National Pollutant Discharge Elimination System (NPDES) database included in the EDR-Radius Map Report. This listing was for the Laguna Phase 4 Stockpile project as identified in documents provided by the client. The subject property status was updated in 2012 and is now "Terminated." This does not qualify as a REC. The database search lists the following facilities:

- Bed Bath & Beyond #4 – The databases reviewed revealed that Bed Bath and Beyond is listed on the Sacramento County Master List (SCML). Any business that has hazardous materials on site – hazardous materials storage sites, underground storage tanks, or waste generators are on the SCML. There has been no reporting for this facility on the SCML. Bed Bath & Beyond has facility and manifest data under the HAZNET list, but no manifest materials have been reported. There has been no known release at this facility and does not qualify as a REC for the Site at this time.
- The Home Depot Store – The Home Depot Store is listed on the SCML. No reporting under SCML has been recorded for this facility. The Home Depot Store has facility and manifest data under the HAZNET list. Included on this manifest are alkaline solutions without metals and pesticides. This facility is also listed on the Resource Conservation and Recovery Act (RCRA), as a small quantity generator (SQG). This facility generates more than 100 and less than 1000 kg of hazardous waste during any calendar month and accumulates less than 6000 kg of hazardous waste at any time. No violations have been found in association with this facility. There has been no known release at this facility and does not qualify as a REC for the Site at this time.
- TJ Maxx – TJ Maxx is listed on the SCML. No reporting under SCML has been recorded for this facility. There has been no known release at this facility and does not qualify as a REC for the Site at this time.
- Sage Pools – Sage Pools is listed on the SCML. No reporting under SCML has been recorded for this facility. There has been no known release at this facility and does not qualify as a REC for the Site at this time.

No recognized environmental conditions (RECs) were identified within the EDR search radius database.

4.3 Other Records Reviewed

BSK reviewed the online databases for the following regulatory agencies to obtain reasonably ascertainable and practically reviewable documentation regarding RECs present at the subject property and adjacent facilities:

- State Water Resources Control Board (SWRCB), GeoTracker Website
- Department of Toxic Substances Control (DTSC), EnviroStor Website and Record Search
- Sacramento County Environmental Management Department - Environmental Management Records Search

The Site is not identified on DTSC's EnviroStor or SWRCB GeoTracker databases. There are no surrounding facilities identified on the online regulatory agency web sites within 1,000 feet that may represent a potential for migration to the Site.

4.4 Previous Assessments

A Phase I and Phase II Environmental Assessment was conducted for the most eastern half of the subject Site in 2007 (WKA 2007). According to this assessment, two wells were identified on the site, while one was in the process of being destroyed, but was delayed due to flooding. Subsequently, these wells were destroyed properly. This assessment also identified that an application for a septic system destruction permit for 8282 Dunisch Road was filed in 2006. This assessment did not reveal evidence of historical or existing RECS in connection with the site (WKA 2007).

5. HISTORICAL RECORDS REVIEW

BSK researched historical topographic maps, historical aerial photographs, City Directory, Sanborn maps, and an environmental lien report to assess the history of the Site. The following sections summarize the findings.

5.1 Historical Sanborn Fire Insurance Maps

According to EDR's Certified Sanborn® Map Report dated August 17, 2015, no fire insurance maps covering the Site were found in their collection. A copy of the Certified Sanborn® Map Report is included in Appendix C.

5.2 Historical Topographic Maps

BSK reviewed available historical topographic maps obtained from EDR for the years 1894, 1909, 1947, 1953, 1968, 1975, and 1980 to gather information regarding the developmental history and land use of the Site and immediate vicinity. Appendix C includes a copy of the Historical Topographic Map Report, dated August 17, 2015. Table 2 summarizes information obtained from the review of historical topographic maps. Since the historical topographic maps do not provide detail of structures or other features, no specific description is provided of the Site and adjacent properties.

Table 2: Review of Historical Topographic Maps

Year	Property and Adjoining Property Observations
1894	Information on the 1894 map does not indicate the site use, although the property appears undeveloped. The map indicates that a road extended along the same general course as the present day Highway 99. Small towns, including Arno, are labeled along the railroad and a network of surface roads has been established throughout the region. The Cosumnes River is visible south of the Site in generally the same location as current day. The town of Elk Grove is indicated southeast of the Site; *Lodi 1:125000*.
1909	No significant changes from the 1894 map besides additional roads and more detail. Elk Grove School is labeled; *Florin 1:31680.*
1947	No significant changes from the 1902 with the exception of additional roads having been constructed, including Dunisch Road, and Highway 99 labeled; *Galt 1:50000.*
1953	Several small structures have been built in the vicinity of the Site; *Florin 1:24000.*
1968	The East Lawn Southgate Cemetery is now labeled, to the east of Highway 99. Highway 99 entrances and exits have been constructed. No new development is evident in the immediate vicinity of the Site; *Florin 1:24000.*
1975	No significant changes from the 1968 map; *Florin 1:24000.*
1980	No significant changes from the 1975 map; Florin *1:24000.*

5.3 Historical Aerial Photographs

BSK reviewed available historical aerial photographs obtained from EDR for the years 1937, 1947, 1957, 1964, 1966, 1972, 1984, 1993, 1998, 2005, 2006, 2009, 2010, and 2012 to gather information regarding the developmental history and land use of the Site and vicinity. Appendix C includes a copy of EDR's Aerial Photo Decade Package, dated August 20, 2015. Table 3 summarizes information obtained from the review of the subject aerial photographs:

Table 3: Review of Historical Aerial Photographs

Year	Observed Property Use	Property and Adjoining Property Observations (*Scale: 1"=500'*)
1937	Agricultural	Most of the surrounding properties appear to be primarily used for agricultural farming. To the north east of the Site is an orchard. The Site remains mostly vacant with a few small structures on the northeast portion of the property. 1:500
1947	Agricultural	No significant changes from the 1937 map.
1957	Agricultural	Most of the surrounding properties appear to be primarily used for agricultural farming. A rural residence appears to be on the northeast corner of the site. Some development has occurred west of the site. The Site remains mostly vacant. 1:500
1964	Agricultural	No significant changes from the 1957 map. 1:500
1966	Vacant Lot	No significant changes from the 1964 map. 1:500
1972	Vacant Lot	No significant changes from the 1966 map. 1:500
1984	Vacant Lot	The middle of the site contains buildings and what appear to be two ponds or pools. A structure on the most western parcel of the site is constructed. A large storage lot is located south of the site; 1:500
1993	Vacant Lot	Laguna Boulevard and West Stockton Boulevard are constructed. The site has no significant changes. 1:500
1998	Vacant Lot	No significant changes from the 1993 photo. 1:500
2005	Vacant Lot	A large residential development is constructed north of the Site. South and East of the Site now have multiple commercial buildings with large parking lots. The two ponds or pools on the Site appear to be dry. The residence on the most western parcel have been demolished. 1:500
2006	Vacant Lot	Multiple buildings at the Site appear to have been demolished on parcel 116-0050-013. 1:500
2009	Vacant Lot	The Site is mostly vacant with only a few small structures remaining on parcel 116-0050-011. 1:500
2010	Vacant Lot	No significant changes from the 2009 photo. 1:500
2012	Vacant Lot	Parcel 116-0050-013 appears to have had vehicle use entering and exiting from Dunisch Road. It appears soil is being brought onto the site. No other significant changes from the 2010 photo. 1:500

5.4 Historical Directories

BSK reviewed several directory reports provided by EDR to obtain information regarding former property occupants and to provide an indication of the property's former use. The parcel and adjoining property were searched in the available directories including: Hanes Criss-Cross Directories from 1970, 1974, 1980, 1985, and 1989; and Cole Information Services from 1992, 1995, 1999, 2003, 2008, and 2013. The EDR-

City Directory Image Report is dated August 21, 2015 and is included in Appendix C. No uses were identified for the specific addresses.

6. SITE RECONNAISSANCE

A site reconnaissance, which included an observation of the Site and adjacent properties, was conducted by John Coburn and Kevin Grove of BSK on August 11, 2015. Site photographs are included in Appendix D. The objective of the site reconnaissance was to obtain information indicating the likelihood of identifying RECs, including hazardous substances and petroleum products, in connection with the Site and/or adjacent properties (including soils, surface waters, and groundwater). It should be noted that the structures identified in the 2012 aerial photo are no longer present.

The site reconnaissance included observations of the Site and adjacent properties. Furthermore, BSK completed a soil sampling and analytical testing report (BSK 2015) to evaluate the soil piles present on site. These soil piles contain soil from an unknown source. The soil samples collected contained low levels of TPH-Motor Oil and naturally occurring Arsenic. The levels of TPH-Motor Oil and Arsenic are at concentrations that are below environmental screening levels (BSK 2015). Based on the Soil Sampling and Analytical testing, both soil samples across the Site and those collected from the stockpiles do not appear to pose significant environmental risk for the proposed commercial land use (Appendix F).

In addition, BSK personnel conducted a windshield survey of nearby properties to determine if any adverse impacts to the Site from these properties could be ascertained. Table 4 provides a brief description of site observations.

Table 4: Site Observations

Observations or environmental conditions that may involve the use, storage, disposal or generation of hazardous substances or petroleum products	Observed	Not Observed	Description
Aboveground storage tank (AST)		X	
Air Emissions		X	
Below grade vaults		X	
Burned or buried debris		X	
Chemical storage		X	
Chemical mixing areas		X	
Discolored soil or water		X	
Ditches, streams		X	
Drains and piping (e.g. floor drains, floor trenches, bay drains, sand traps, grease traps)		X	

Table 4: Site Observations			
Observations or environmental conditions that may involve the use, storage, disposal or generation of hazardous substances or petroleum products	**Observed**	**Not Observed**	**Description**
Drums		X	
Electrical or hydraulic equipment (Polychlorinated biphenyls [PCBs])		X	
Fill dirt from unknown source	X		Two soil piles were observed on site. The eastern pile is approximately 400’ X 200’ X 6-8’ and the western pile is approximately 150’ X 100’ X 2’.
Fill dirt from known source		X	
Hazardous chemical and petroleum products in connection with unknown use		X	
Non-hazardous containers with contents		X	
Hazardous Waste Storage		X	
Heating and cooling system and fuel source		X	
Industrial waste treatment equipment		X	
Loading and unloading areas		X	
Odors		X	
Pits, Ponds, or Lagoons		X	None present at the time of our site reconnaissance.
Pools of Liquid		X	
Process wastewater		X	
Sanitary Sewer System		X	
Septic system (e.g. tank and leach fields)		X	
Soil piles	X		Two soil piles were observed on site. The eastern pile is approximately 400’ X 200’ X 4’ and the western pile is approximately 150’ X 100’ X 2’.
Solid Waste/Evidence of Unauthorized Dumping		X	
Stained pavement, soil or concrete		X	
Stains or corrosion (interior, non-water)		X	

Table 4: Site Observations

Observations or environmental conditions that may involve the use, storage, disposal or generation of hazardous substances or petroleum products	Observed	Not Observed	Description
Storm drains/catch basins		X	
Stressed vegetation		X	
Sumps and clarifiers		X	
Surface Water		X	
Underground storage tank(s) including heating oil tanks and oil/water separators		X	
Unidentified substance containers		X	
Utilities		X	
Wastewater Discharge		X	
Water supplies (potable and process)		X	
Wells (irrigation, monitoring, or domestic)		X	None present at the time of our site reconnaissance.
Wells (dry)		X	
Wells (Oil and Gas)		X	

7. INTERVIEWS

The Owner/Occupant Questionnaire was prepared by Mr. Travis Batts on September 14, 2015. According to Mr. Batts responses, there are no underground storage tanks, ponds, pits, lagoons, storm drains, septic tanks, above-ground storage tanks, stationary hydraulic lifts, pipelines, stained soil or sheen on water, use of pesticides on site, electric transformers, or rail line/spurs at this time. However, the ponds identified from aerial photographs between the years of 1984-2005 were identified as koi ponds after discussing the site with the previous owner. Mr. Batts identified that a well or wells, exist or existed on site. As stated previously, the wells were identified in the previous assessment and were properly destroyed. Mr. Batts also states there is no wash rack area on site, no asbestos/lead-based paint survey(s), and no environmental violations or liens related to the property (Appendix E).

8. FINDINGS

The Site is located at Dunisch Road and West Stockton Boulevard in the City of Elk Grove, CA. The Site is further defined as Sacramento County Assessor's Parcel Numbers (APN) 116-0050-013, 116-0050-027, 116-0050-030, 116-0050-031, 116-0050-010, 116-0050-011, 116-0050-034 (Site). The Site consists of an approximately 14.37 acre vacant lot. This assessment revealed evidence of a REC directly related to the on-site soil piles. These soil piles are from an unknown source and are therefore classified as a REC. These soil piles were analyzed and determined to contain TPH-Motor Oil and naturally occurring Arsenic but at concentrations below environmental screening levels (BSK 2015). No historic RECs were identified in connection with the Site.

9. OPINION

The two fill dirt piles do not appear to contain any debris (chemical containers, oil cans, etc.) that are hazardous in nature. Additionally, limited sampling and analysis of the soil was conducted by BSK and is detailed in a separate report (BSK 2015). Although these piles qualify as a REC, no further investigation is proposed as it relates to the piles.

No wells were identified during the site reconnaissance, however if identified during construction and are to remain in use, they should be tested in accordance with that use. If they are no longer to remain in use, they should be properly abandoned in accordance with local and state regulation.

On properties with a history of agricultural use, such as the project site, many underground irrigation pipelines may exist. It was common for said pipelines to contain asbestos (e.g. Transite pipe). Subsurface exploration is not a part of a typical Phase I Environmental Site Assessment scope of work. In the event that any subsurface structures are encountered during site development or excavation on site, care should be exercised in determining whether or not the subsurface structures contain asbestos. If they contain asbestos, they should be removed, handled, transported and disposed of in accordance with local, state, and federal laws and regulations. Additionally, if suspect materials are encountered, the signatories of this report should be notified immediately.

The previous assessment identified that an application for the destruction of a septic system on site was filed in 2006. If any septic system components (tanks, leach field, etc.) are identified during construction activities, the signatories of this report should be contacted immediately and the soil should be sampled and analyzed.

If during future site development activities, evidence of contamination is discovered, the signatories of this report should be contacted immediately and the soil should be sampled and analyzed.

10. CONCLUSIONS

We have performed a Phase I ESA in conformance with the scope and limitations of ASTM practice E 1527-13 of the property located at Dunisch Road and West Stockton Boulevard, Elk Grove, California, Sacramento County Assessor's Parcel Number (APN) 116-0050-013, 116-0050-027, 116-0050-030, 116-0050-031, 116-0050-010, 116-0050-011, 116-0050-034. Any exceptions to, or deletions from, this practice are described in Section 1.6 of this Report. This assessment revealed evidence of a RECs related to the fill dirt present on site from an unknown source. If during future site development activities, evidence of contamination is discovered from this REC, the signatories of this report should be contacted immediately and the soil should be sampled and analyzed. Further investigation is not warranted at this time. No historic RECs were identified in connection with the Site.

11. DATA GAPS AND DEVIATIONS

No significant exceptions or data gaps that would raise reasonable concerns regarding our opinions and conclusions in the Report were made or noted.

12. REFERENCES

American Society for Testing and Materials (ASTM) E1527-13 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, 2013.

BSK 2015. Soil Sampling and Analytical Testing: Vacant Lots, Dunisch Road and West Stockton Boulevard, Elk Grove, California. September 16, 2015.

DTSC, 2015 EnviroStor Web Site, http://www.envirostor.dtsc.ca.gov/public/, visited September 2015.

Environmental Data Resources, Inc. (EDR), The Radius Map ™ Report with GeoCheck; August 17, 2015.

EDR, Aerial Photographs dated 1937, 1947, 1957, 1964, 1966, 1972, 1984, 1993, 1998, 2005, 2006, 2009, 2010 and 2012; August 20, 2015.

EDR, Historical Topographic Map Report, dated 1894, 1909, 1947, 1953, 1968, 1975, and 1980; August 17, 2015

EDR, The EDR-City Directory Image Report; August 21, 2015.

EDR, Certified Sanborn® Map Report; August 17, 2015.

Google Earth 2014; visited August 2015.

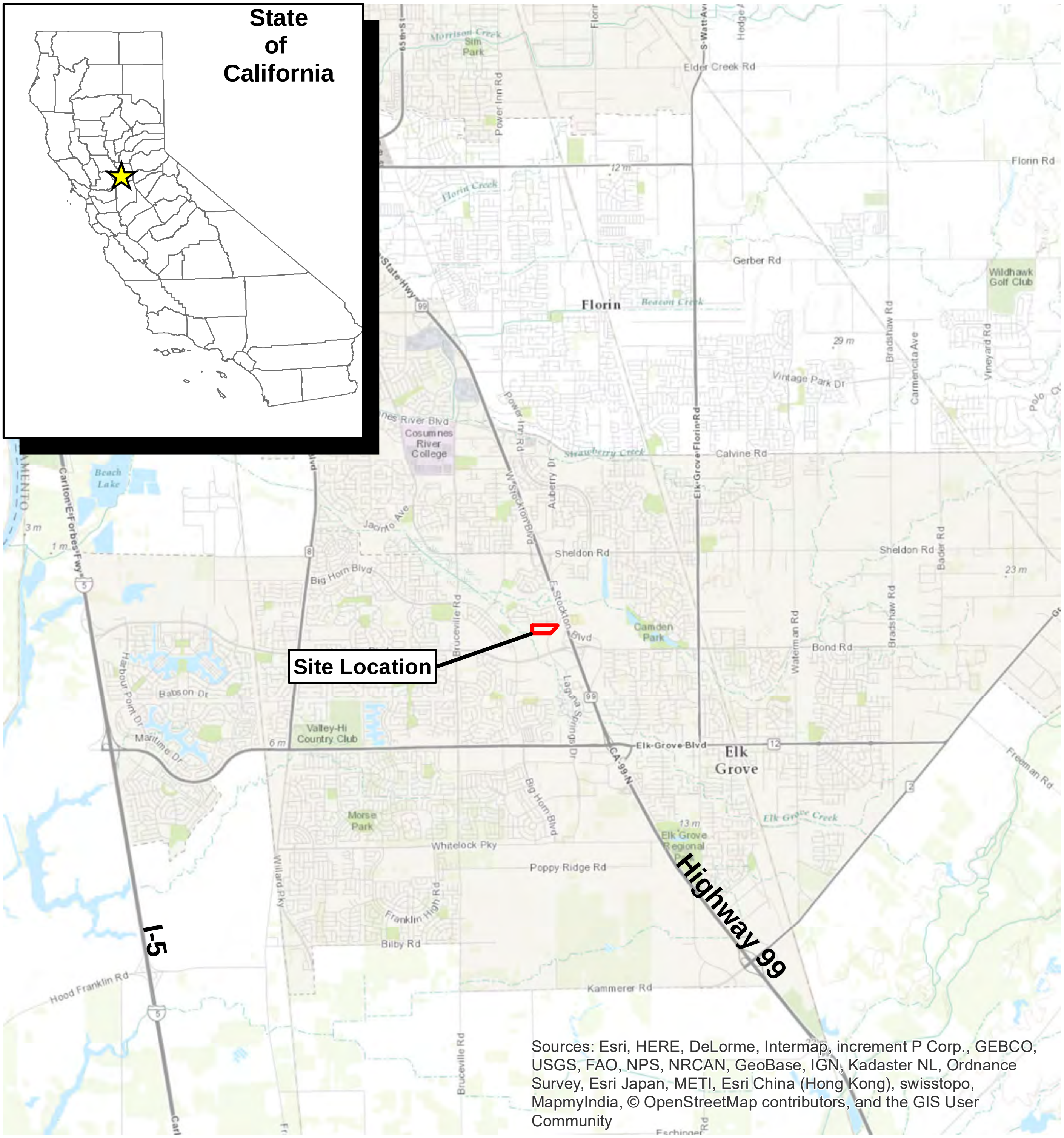
RWQCB, GeoTracker Web Site, http://www.geotracker.waterboards.ca.gov, visited June, 2015.

Sacramento County, 2015. Sacramento County Assessor Parcel Viewer, Assessor Parcel # 0570293007000; © 2015 Sacramento County; http://assessorparcelviewer.saccounty.net/JSViewer/assessor.html#

Wallace Kuhl and Associates, 2007. Phase 1/Phase 2 Environmental Site Assessment, Laguna Gateway Phase 3: Elk Grove, California. March 14, 2007.

13. ENVIRONMENTAL PROFESSIONAL STATEMENT AND SIGNATURES

The signatories of this report declare that to the best of our professional knowledge and belief, we meet the definition of Environmental Professional as defined in §312.10 of 40 CFR 312. We have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property. We have developed and performed the all appropriate inquiries in general conformance with the standards and practices set forth in 40 CFR Part 312.



Document Path: J:\GIS_Data_Files\Projects\E1505801S - Pappas Gateway LLC\Figure 1 Vicinity Map.mxd

Map Date: 9/16/2015
By: KG

Legend

Project Area

BSK Associates Engineers & Laboratories

APNs 116-0050-013, 116-0050-027, 116-0050-030, 116-0050-031, 116-0050-010, 116-0050-011, and 116-0050-034
Vacant Lot, Dunisch Rd and W. Stockton Blvd
Elk Grove, California

Figure 1
Site Vicinity Map
BSK Project E1505801S

Document Path: J:\GIS_Data_Files\Projects\E1505801S - Pappas Gateway LLC\Figure 2 Site Map_no borings.mxd

Map Date: 9/15/2015
By: KG
***All locations are approximate**

N W E S

0 75 150 300 Feet

Legend

Project Site

BSK Associates Engineers & Laboratories

APNs 116-0050-013, 116-0050-027, 116-0050-030, 116-0050-031, 116-0050-010, 116-0050-011, and 116-0050-034
Vacant Lots, Dunisch Road and West Stockton Boulevard
Elk Grove, California

Figure 2
Site Map
BSK Project E1505801S

APPENDIX G

PRELIMINARY DRAINAGE ANALYSIS

Memorandum

WOOD RODGERS
BUILDING RELATIONSHIPS ONE PROJECT AT A TIME

To:	Su Mishra; City of Elk Grove
From:	Philip Roberts P.E., Associate Matt Spokely, P.E., Vice President
Date:	June 6th, 2024
Subject:	Dunisch Property – Low Impact Design, Hydromodification Applicability, & Preliminary Drainage Analysis

Purpose

The purpose of this memorandum is to provide an overview of the Low Impact Design (LID) measures incorporated into the project design, to review Hydromodification applicability, per the 'Stormwater Quality Design Manual for Sacramento Region' and will adequately convey storm drainage to existing storm drainage facilities.

Subject Property Location

The Dunisch Property (Subject Property) is in the City of Elk Grove and is bound by: A private residential property (APN 116-0050-008) to the west; Dunisch Road to the north; West Stockton Boulevard to the east; and an existing commercial parcel that houses Home Depot to the south. The Subject Property can also be described as Assessor Parcel Numbers: 116-0050-011, -013, -027, -030, -031, and -034, Sacramento County, California. The subject property is, in its existing state, an undeveloped property with native grasses growing across the entirety of the property. There are a few existing trees scattered throughout the site as well. The historic zoning of the site is Shopping Center (SC). The project entitlements propose to rezone the site to Medium Density Residential (RD-10). The existing topography of the site generally slopes from south the north, and existing site drainage sheets flows from the south to the north into a city maintained roadside swale. An existing drainage culvert conveys drainage flows from the roadside swale into an existing drainage system that routes through the existing Park Meadows neighborhood and conveys flows into a city-owned detention basin that is north of the existing Park Meadows subdivision. The site vicinity is depicted in **Figure 1**.

Figure 1 - Vicinity Map[1]

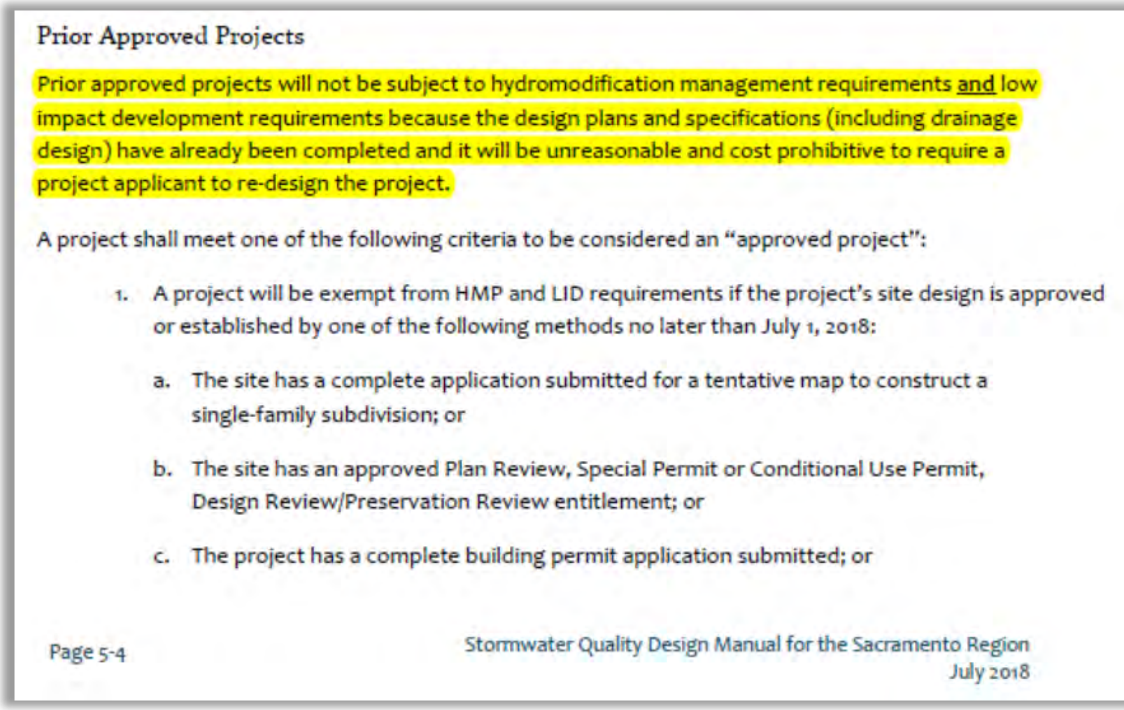
Drainage Design History

The drainage for the underlying parcels of the subject project were originally accounted for in the Park Meadows Drainage Study, prepared by Wood Rodgers, Inc. in August 1999. The drainage study shed map shows two 18-inch drainage stubs to serve the project that are designed to handle a total Nolte flow of 7.8 cubic feet per second (cfs) from the subject project. This flowrate was established assuming the existing zoning for the project, Shopping Center (SC). The Park Meadows project constructed a flood control detention basin designed to accommodate all the Nolte and 100-year storm event flows for the Park Meadows Project, including the subject project. **Attachment 1**, the shed map for the Park Meadows Drainage Study, is attached to the back of this memo.

[1] Source: Google Earth Pro

Hydromodification and LID Applicability

The Stormwater Quality Design Manual for Sacramento Region, July 2018 (SQDM) outlines planning tools and requirements to reduce urban runoff pollution to the maximum extent practicable (MEP) from new development and redevelopment projects.[2] However, the SQDM allows for prior approved projects to be exempt from the requirements set forth within the SQDM if it meets certain criteria. After consultation with other MS4 municipalities, it was determined that this project meets those criteria and will not be required to do onsite water quality and low impact development (LID). See the excerpts below (**Figure 2**) from Chapter 5 (pages 5-4 & 5-5) of the SQDM. **Attachment 2** within this memo provides the tech memo stating such provided to the City of Elk Grove from Wood Rodgers, Inc. Additionally, this exemption was confirmed via email from the City of Elk Grove Development Services Director, Darren Wilson. See **Attachment 3** at the back of this memo for the email from Darren Wilson.



Prior Approved Projects

Prior approved projects will not be subject to hydromodification management requirements <u>and</u> low impact development requirements because the design plans and specifications (including drainage design) have already been completed and it will be unreasonable and cost prohibitive to require a project applicant to re-design the project.

A project shall meet one of the following criteria to be considered an "approved project":

1. A project will be exempt from HMP and LID requirements if the project's site design is approved or established by one of the following methods no later than July 1, 2018:
   a. The site has a complete application submitted for a tentative map to construct a single-family subdivision; or
   b. The site has an approved Plan Review, Special Permit or Conditional Use Permit, Design Review/Preservation Review entitlement; or
   c. The project has a complete building permit application submitted; or

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July 2018

Chapter 5: Hydromodification, LID, and Treatment Control Measures

d. The project has a set of improvement plans submitted; or

e. A project being issued a new building permit to complete work commenced under a prior permit may be considered exempt from HMP requirements at the discretion of the local Permitting Agency.

f. A Project in a large specific or community plan area that has a drainage master plan approved on or after July 1, 2017.

2. A project discharging directly to a segment of a channel or creek with permitted improvements under a 404 permit or 401 certification from the relevant Federal or State regulatory agencies. The applicant's 404 permit and 401 certification must be currently valid or obtained no later than July 1, 2018. This exemption does not apply for projects with 404 permits or 401 certifications that require hydromodification management.

3. A public agency project for which design has been completed (final bid documents submitted) and/or a contract has been advertised no later than July 1, 2018.

Figure 2 – Excerpts from SQDM[3]

Preliminary Nolte Hydraulic Drainage Analysis

The onsite storm drainage will utilize two existing 18-inch storm drainage stubs in the existing Dunisch Road to provide underwater hydraulic drainage for the project. These 18-inch drainage stubs are shown in **Attachment 1**. The Park Meadows Drainage Study modeled and calculated drainage flows to be approximately 7.8 cfs in the Nolte storm event for the combined capacity of the two pipes. When compared to the Nolte flowrate of the subject project size (14.4 AC) for a commercial project using the City of Elk Grove Standard Drawing SD-1A for a commercial project, this is consistent with the city standard for the size and type of project.

The proposed project is changing the existing zoning of Shopping Center (SC) to Medium Density Residential (RD-10). Again, utilizing standard drawing SD-1A, the proposed project under the zone of RD-10 will produce drainage flows of approximately 3.6 cfs in the Nolte storm event. Rezoning the subject project from SC to RD-10 decreases the Nolte runoff form the site and decreases the total Nolte flow into the Park Meadows flood control basin by approximately 4.2 cfs, improving the overall drainage condition for the surrounding area. Please refer to **Attachment 4**, the City of Elk Grove Standard Drawing SD-1A.

A comprehensive Nolte analysis of the proposed storm drain pipe system for the subject project will be provided per the City of Elk Grove Standards for drainage analysis in the improvement plan stage of the project.

Preliminary 100-year Drainage Analysis

The Park Meadows Drainage Study Shed Map does not indicate the 100-year flowrate coming from the subject project drainage sheds. However, utilizing the City of Elk Grove Standard Drawing SD-3, 100-year flows for the projects original zoning of SC (95% imperviousness) were approximately 27 cfs. Using the new proposed zoning of

[3] Figure 3-1, Stormwater Quality Design Manual for Sacramento Region, 2018, Chapter 3

RD-10 (80% Imperviousness), 100-year flows should reduce to approximately 25 cfs, an overall reduction of 2 cfs in the 100-year storm event. Please refer to **Attachment 5**, the City of Elk Grove Standard Drawing SD-3.

A preliminary analysis of the existing terrain surrounding the project led to the conclusion that the subject project overland releases in large storm events to the north through the existing Park Meadows neighborhood and eventually releases into Laguna Creek. Through analysis utilizing HEC-RAS for representing existing topography and Sacramento County design rainfall to approximate maximum 100-year water surface elevations overland, it was determined that it is likely that the existing water ponding in a 100-year storm event within the path of the existing overland release direction of the subject project through Park Meadows may not meet and may currently exceed the maximum ponding depth per the City of Elk Grove Drainage Standards in streets. Because of this analysis, the proposed project will be graded such that the primary overland release path for project drainage will flow westbound on the Existing Dunisch Road and release into Elk Grove Creek, relieving pressure on the existing development to the north. Development runoff from the site should be accounted for in the capacities of the downstream drainage facilities along Laguna Creek and the Laguna Creek Bypass Channel. See **Attachment 6** for the proposed grading and drainage layout for the subject project.

A comprehensive, dynamic modeling 100-year storm event analysis of the proposed storm drain pipe system and overland release for the subject project will be provided per the City of Elk Grove Standards for drainage analysis in the improvement plan stage of the project.

Conclusion

The subject project is included within the Park Meadows Drainage Study, written by Wood Rodgers, Inc., and dated August 1999 as a parcel zoned SC. The subject parcel will be rezoned to RD-10, which decreases its runoff in both the Nolte and 100-year storm events. This decreases the overall drainage load on the regional drainage system and existing drainage basin that serves the project.

The Sacramento Area Stormwater Quality Design Manual allows for exemption to the regulation of "Prior Approved Projects." Through coordination with the city of Elk Grove and nearby MS4 municipalities, it was determined that this project is exempt from onsite water quality, hydromodification, and low impact development (LID) requirements.

Attachments

1 – Park Meadows Drainage Study Shed Map

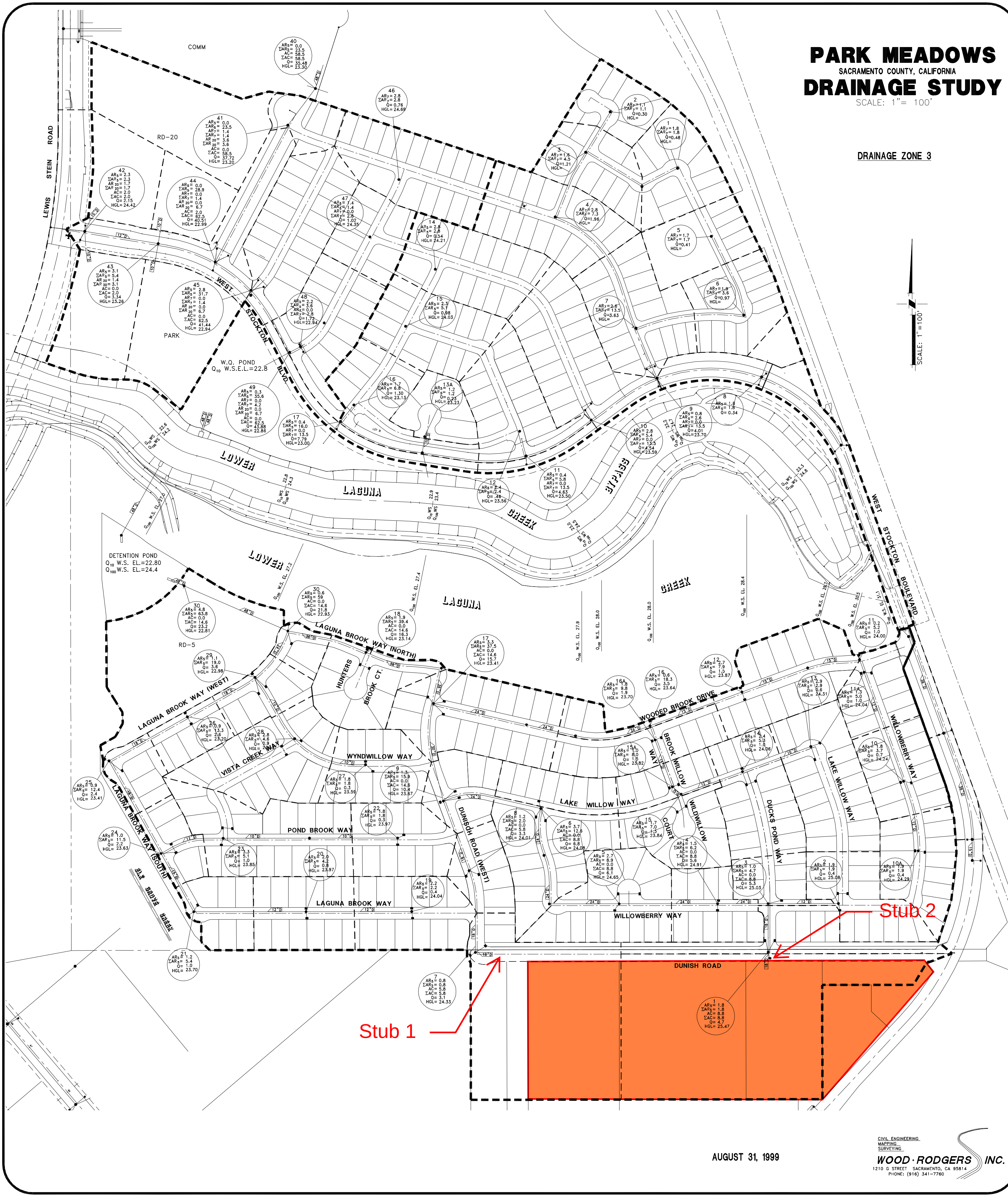
2 – Dunisch Property Elk Grove LID/WQ and Hydromodification Summary

3 – Confirmation email from Darren Wilson

4 – City of Elk Grove Standard Drawing SD-1A

5 – City of Elk Grove Standard Drawing SD-3

6 – Dunisch Property Grading and Drainage Exhibit



PARK MEADOWS
SACRAMENTO COUNTY, CALIFORNIA
DRAINAGE STUDY
SCALE: 1"= 100'
DRAINAGE ZONE 3
LEWIS STEIN ROAD
WEST STOCKTON BLVD.
WEST STOCKTON BOULEVARD
LOWER LAGUNA CREEK
BYPASS
DETENTION POND
W.Q. POND
LAGUNA BROOK WAY (NORTH)
LAGUNA BROOK WAY (WEST)
LAGUNA BROOK WAY (SOUTH)
LAGUNA BROOK WAY
VISTA CREEK WAY
WYNDWILLOW WAY
POND BROOK WAY
HUNTERS BROOK CT.
DUNISH ROAD (WEST)
DUNISH ROAD
WOODED BROOK DRIVE
BROOK WILLOW WAY
LAKE WILLOW WAY
WILDWILLOW COURT
DUCKS POND WAY
WILLOWBERRY WAY
Stub 1
Stub 2
AUGUST 31, 1999
CIVIL ENGINEERING
MAPPING
SURVEYING
WOOD·RODGERS INC.
1210 G STREET SACRAMENTO, CA 95814
PHONE: (916) 341-7760

WOOD RODGERS
DEVELOPING INNOVATIVE DESIGN SOLUTIONS

TECHNICAL MEMORANDUM

To: City of Elk Grove

From: Matthew Spokely, PE

Date: August 24, 2023

Subject: Dunisch Property Elk Grove
LID/WQ and Hydromodification Summary

Introduction

The purpose of this memorandum is to summarize the requirements of the Water Quality (WQ) and Low Impact Development (LID) for the proposed Dunisch Road Development Project. The property is approximately 14 acres and is a part of a master planned development, Park Meadows, where the majority of the project was developed and constructed in the early 2000's. The Dunisch Rd project is a 14 acre site that was planned for commercial development and is being proposed for a rezone to a medium density residential project. The overall Park Meadows project area is approximately 204 Acres.

As a part of this overall project there were two drainage pipes (2-18" pipes) that were stubbed out to serve the proposed site. These pipes will convey onsite runoff from the project through existing downstream infrastructures to an existing detention basin designed to serve the site. Run off from the overall project discharges into the Lower Laguna Creek Bypass which was permitted and constructed back in the early 2000's.

<u>Stormwater Quality Design Manual</u>

The current Stormwater Quality Design Manual (July 2018) for the Sacramento Region Includes a section that outlines the exemptions for projects that have previously been approved and or constructed (infrastructure already installed). After consultation with other MS4 municipalities it was determined that this project meets those requirements and will not be required to do onsite water quality and low impact development (WQ/LID). See excerpts from chapter 5 (page 5-4) of the Stormwater Quality Design Manual below.

Prior Approved Projects

Prior approved projects will not be subject to hydromodification management requirements <u>and</u> low impact development requirements because the design plans and specifications (including drainage design) have already been completed and it will be unreasonable and cost prohibitive to require a project applicant to re-design the project.

A project shall meet one of the following criteria to be considered an "approved project":

1. A project will be exempt from HMP and LID requirements if the project's site design is approved or established by one of the following methods no later than July 1, 2018:

   a. The site has a complete application submitted for a tentative map to construct a single-family subdivision; or

   b. The site has an approved Plan Review, Special Permit or Conditional Use Permit, Design Review/Preservation Review entitlement; or

   c. The project has a complete building permit application submitted; or

Page 5-4 Stormwater Quality Design Manual for the Sacramento Region July 2018

   d. The project has a set of improvement plans submitted; or

   e. A project being issued a new building permit to complete work commenced under a prior permit may be considered exempt from HMP requirements at the discretion of the local Permitting Agency.

   f. A Project in a large specific or community plan area that has a drainage master plan approved on or after July 1, 2017.

2. A project discharging directly to a segment of a channel or creek with permitted improvements under a 404 permit or 401 certification from the relevant Federal or State regulatory agencies. The applicant's 404 permit and 401 certification must be currently valid or obtained no later than July 1, 2018. This exemption does not apply for projects with 404 permits or 401 certifications that require hydromodification management.

3. A public agency project for which design has been completed (final bid documents submitted) and/or a contract has been advertised no later than July 1, 2018.

From: Matt Spokely <mspokely@WoodRodgers.com>
Sent: Wednesday, May 15, 2024 5:04 PM
To: Philip Roberts
Subject: FW: Dunisch Rd Drainage TM

Matthew Spokely, PE, QSD/QSP | Vice President

Wood Rodgers, Inc. | www.woodrodgers.com |
916.440.8065 Direct
916.416.8840 Mobile
mspokely@WoodRodgers.com

From: Darren Wilson <dwilson@elkgrovecity.org>
Sent: Saturday, December 9, 2023 5:55 AM
To: Matt Spokely <mspokely@WoodRodgers.com>
Cc: Sarah Kirchgessner <skirchgessner@elkgrovecity.org>
Subject: RE: Dunisch Rd Drainage TM

Good morning Matt,

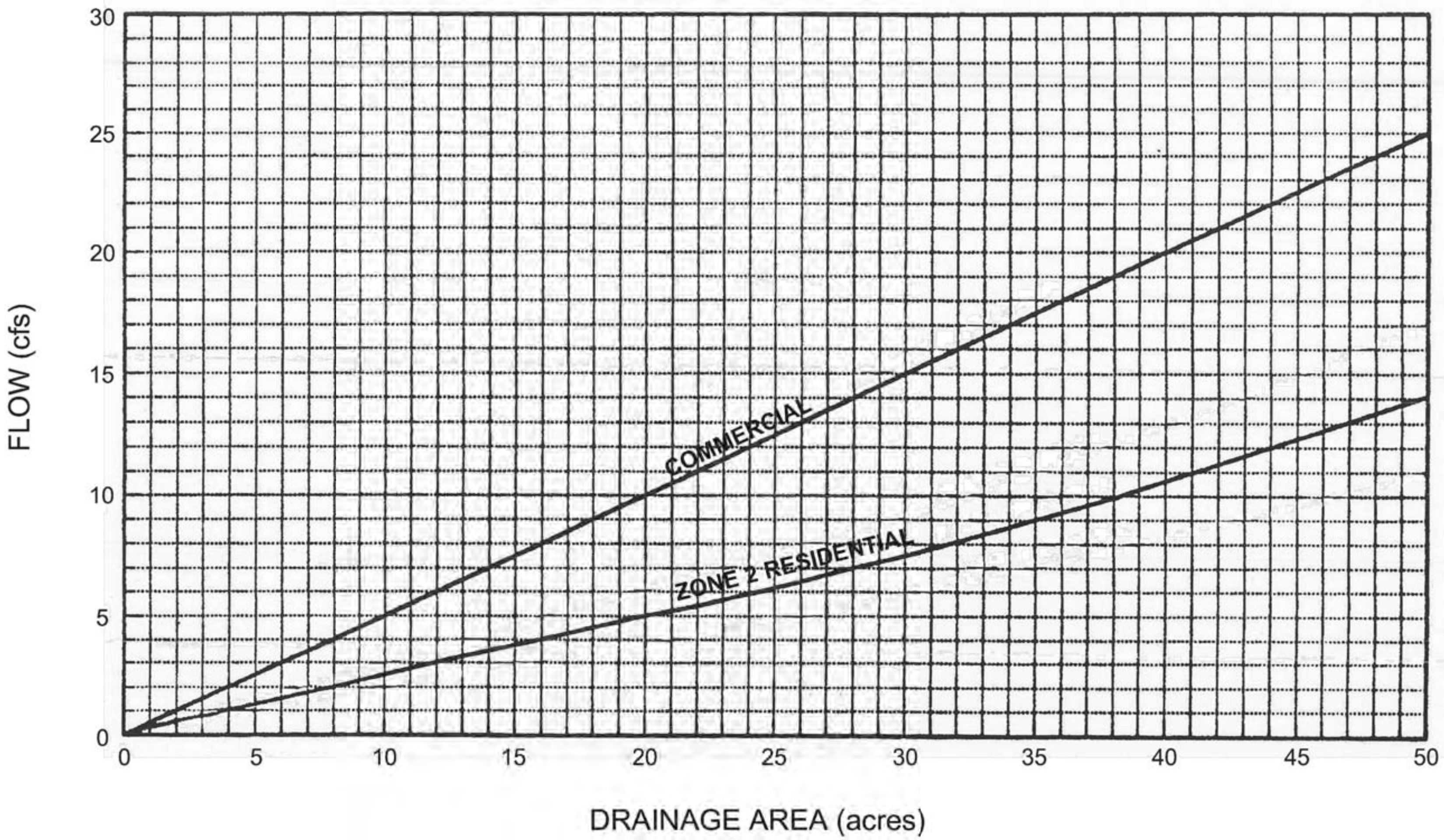
This letter provides adequate justification and satisfies the intent of the stormwater quality requirements for this project. If you have any questions, please feel free to contact me.

Darren

From: Matt Spokely <mspokely@WoodRodgers.com>
Sent: Friday, December 8, 2023 5:09 PM
To: Darren Wilson <dwilson@elkgrovecity.org>
Cc: Sarah Kirchgessner <skirchgessner@elkgrovecity.org>
Subject: FW: Dunisch Rd Drainage TM

Darren,

I added the last sentence that speaks to adding runoff reduction measures to the project. Let me know if you have any questions.



NOTE: Design runoff for multiple family development shall be based on the following formula:

Qm = Qr+(Qc-Qr)(I-50)/40

Where:

RD-7	I = 60
RD-10	I = 70
RD-20	I = 80
RD-30	I = 90

Source: County of Sacramento Master Drainage Plan, Part 1, County-wide Hydrology, Nolte and Assoc.

DATE: 09/22/2007	NOT TO SCALE		
REVISION	BY	APPROVED	DATE

CITY OF ELK GROVE - PUBLIC WORKS

DESIGN RUNOFF
NOLTE METHOD
DRAINAGE AREAS, <50 ACRES

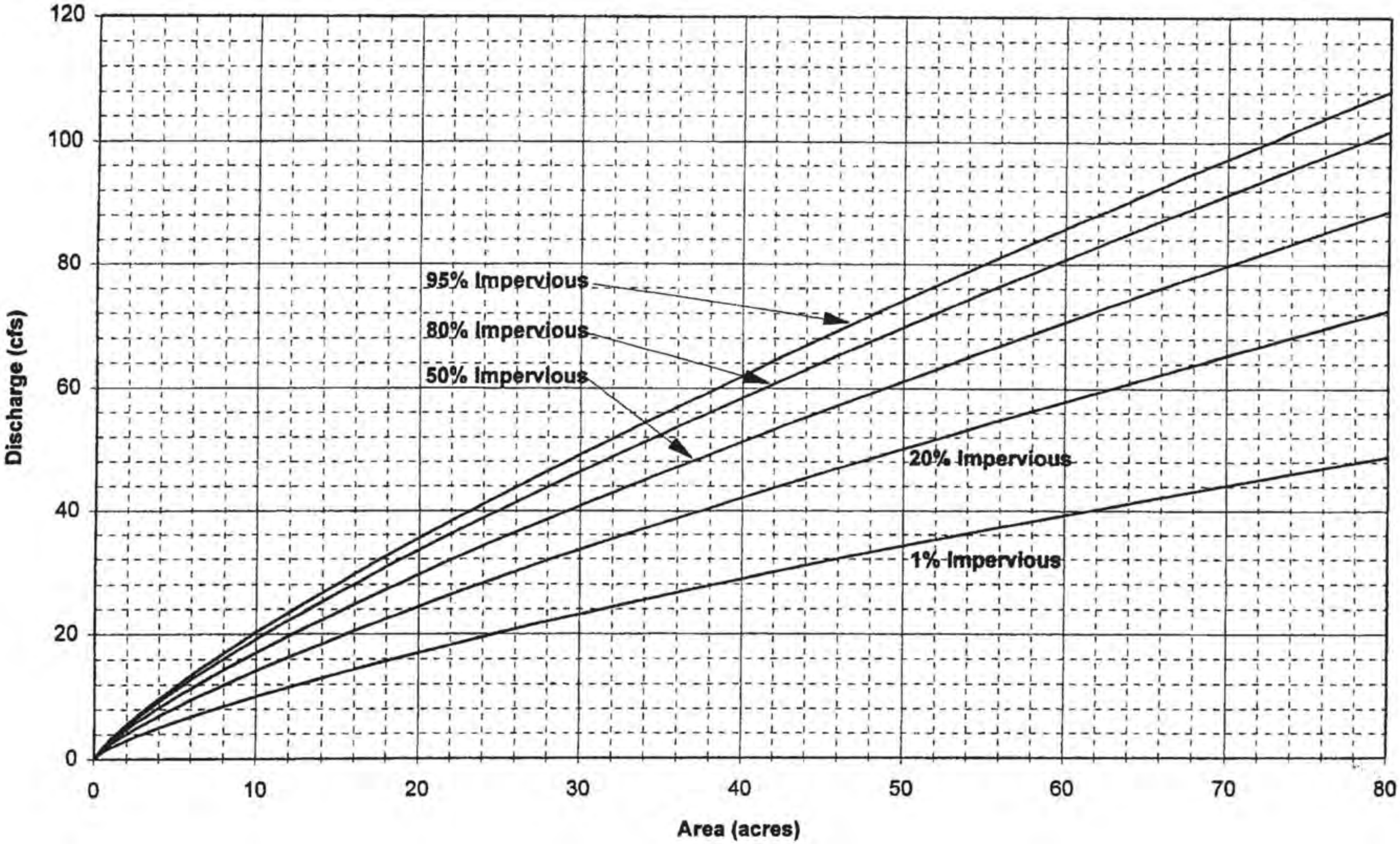
APPROVED BY:

Robert Murdoch 10/24/2018

CITY ENGINEER DATE

DRAWING NUMBER

SD - 1A



NOTE:

REFER TO VOLUME 2 HYDROLOGY STANDARDS OF THE CITY/COUNTY DRAINAGE MANUAL FOR ASSUMPTIONS MADE IN DERIVING THIS FIGURE.

DATE: 09/22/2007	NOT TO SCALE		
REVISION	BY	APPROVED	DATE

CITY OF ELK GROVE - PUBLIC WORKS

100-YEAR PEAK FLOW
SACRAMENTO METHOD
RAINFALL ZONE 2, <80 ACRES

APPROVED BY:

Robert Murdoch — 10/24/2018

CITY ENGINEER — DATE

DRAWING NUMBER

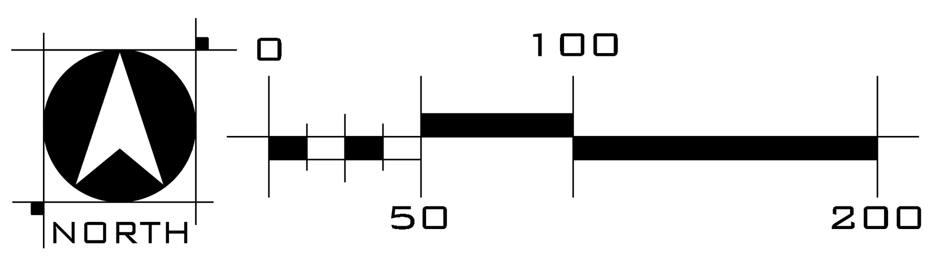
SD - 3

GRADING AND DRAINAGE EXHIBIT

DUNISCH PROPERTY

CITY OF ELK GROVE, CALIFORNIA

MAY 2ND, 2024



ELEVATION NOTE:
THE BASIS OF VERTICAL DATUM FOR THIS PROJECT IS NAVD 88

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Fax 916.341.7767

APPENDIX H

NOISE ASSESSMENT
VMT ANALYSIS

Noise Assessment

Dunisch Property Residential Development

Elk Grove, California

BAC Job # 2023-066

Prepared For:

Pappas Investments

Thad Johnson
2020 L Street, 5th Floor
Sacramento, CA 95811

Prepared By:

Bollard Acoustical Consultants, Inc.

Paul Bollard, President

June 17, 2024

BOLLARD
Acoustical Consultants

Introduction

The Dunisch Property (project) is located in Elk Grove, California, adjacent to Dunisch Road to the north, West Stockton Boulevard to the east, and an existing Home Depot to the south. The project proposes the development of 111 single-family residential lots on the approximately 14.4-acre property. The project location and site plan are shown on Figure 1. The project also proposes a General Plan Amendment which would provide the City of Elk Grove with increased flexibility in assessing potential noise impacts related to new projects affected by existing non-transportation noise sources. The specific language of the proposed GPA is provided in the Criteria section of this report.

Due to the noise-sensitivity of the proposed project and the proximity of the project site to the Home Depot store, West Stockton Boulevard and Highway 99, Bollard Acoustical Consultants, Inc. (BAC) was retained by the project applicant to prepare this noise assessment. Specifically, the purposes of this assessment are to quantify noise levels associated with Home Depot operations, project construction, and traffic on Highway 99 and West Stockton Boulevard, to compare those levels against the applicable Elk Grove noise standards for acceptable noise exposure, and to recommend noise mitigation measures where needed to achieve satisfaction with those standards. This report contains BAC's evaluation.

Noise Fundamentals and Terminology

Noise is often described as unwanted sound. Sound is defined as any pressure variation in air that the human ear can detect. If the pressure variations occur frequently enough (at least 20 times per second), they can be heard, and thus are called sound. Measuring sound directly in terms of pressure would require a very large and awkward range of numbers. To avoid this, the decibel scale was devised. The decibel scale allows a million-fold increase in pressure to be expressed as 120 dB. Another useful aspect of the decibel scale is that changes in levels (dB) correspond closely to human perception of relative loudness. Appendix A contains definitions of Acoustical Terminology. Figure 2 shows common noise levels associated with various sources.

The perceived loudness of sounds is dependent upon many factors, including sound pressure level and frequency content. However, within the usual range of environmental noise levels, perception of loudness is relatively predictable, and can be approximated by weighing the frequency response of a sound level meter by means of the standardized A-weighing network. There is a strong correlation between A-weighted sound levels (expressed as dBA) and community response to noise. For this reason, the A-weighted sound level has become the standard tool of environmental noise assessment. All noise levels reported in this section are in terms of A-weighted levels in decibels.

Community noise is commonly described in terms of the "ambient" noise level, which is defined as the all-encompassing noise level associated with a given noise environment. A common statistical tool to measure the ambient noise level is the average, or equivalent, sound level (L_{eq}) over a given time period (usually one hour). The L_{eq} is the foundation of the Day-Night Average Level noise descriptor, L_{dn} or DNL, and shows very good correlation with community response to noise.

Legend

- Required Sound Wall: 12 feet tall
- Required Sound Wall: 10 feet tall
- Required Sound Wall: 8 feet tall
- Recommended STC 35 Bedroom Windows (south, east and west-facing windows)
- Recommended STC 32 Bedroom Windows (second-floor, facing Highway 99)
- Noise Survey Location
- Required Traffic Sound Wall: 8 feet tall
- Required Traffic Sound Wall: 6 feet tall

N

Scale (Feet)

0 100 200

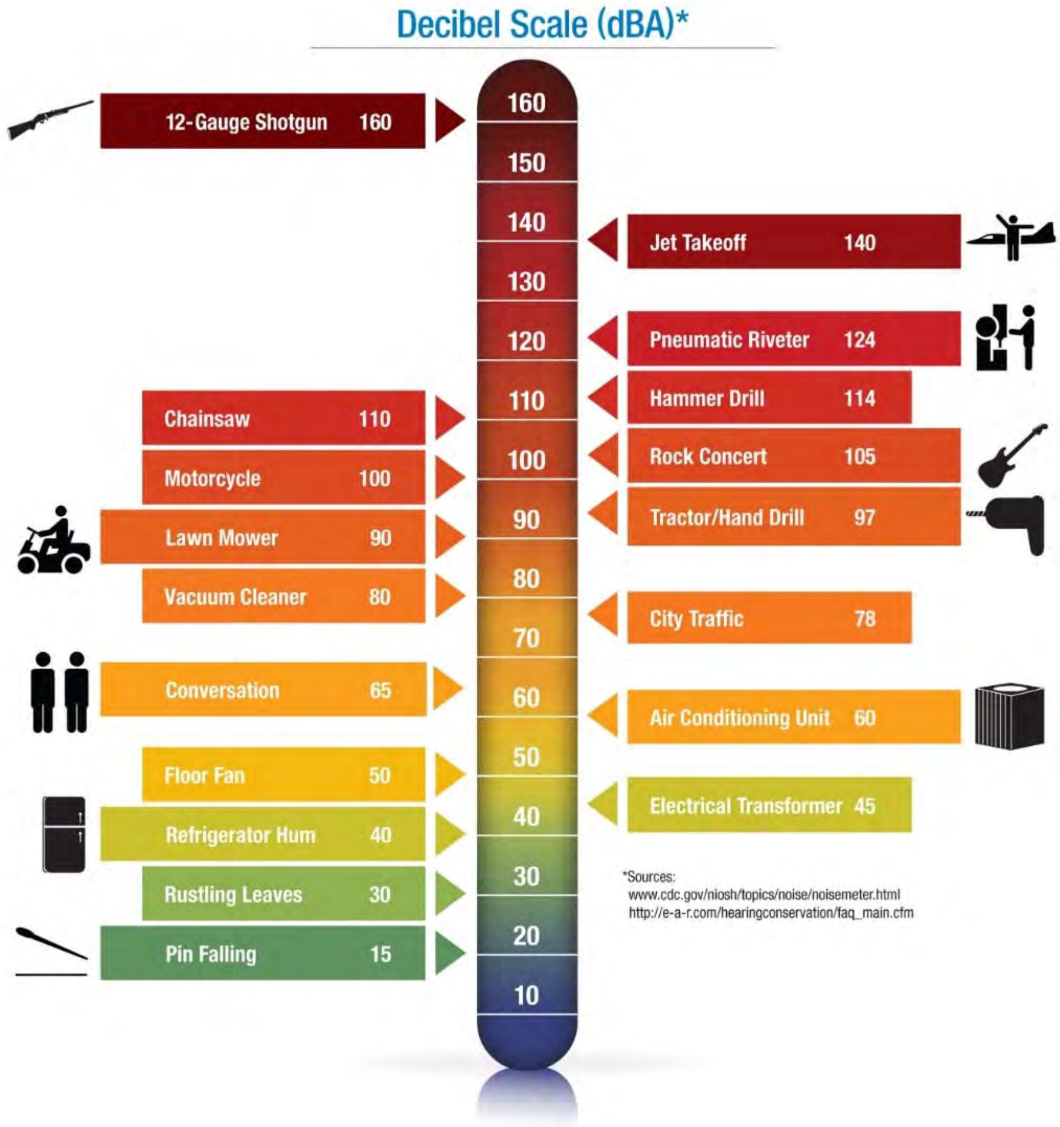
Site Plan & Required Mitigation for Home Depot Operations

Dunisch Property
Elk Grove, California

Figure 1

BOLLARD Acoustical Consultants

Figure 2
Typical A-Weighted Sound Levels of Common Noise Sources



The Day-Night Average Level (DNL) is based upon the average noise level over a 24-hour day, with a +10-decibel weighting applied to noise occurring during nighttime (10:00 p.m. to 7:00 a.m.) hours. The nighttime penalty is based upon the assumption that people react to nighttime noise exposures as though they were twice as loud as daytime exposures. Because DNL represents a 24-hour average, it tends to disguise short-term variations in the noise environment. DNL-based noise standards are commonly used to assess noise impacts associated with traffic, railroad, and aircraft noise sources.

Criteria for Acceptable Noise Exposure

Elk Grove General Plan

Transportation Noise Sources (Traffic)

The Services, Health and Safety Element (Chapter 8) of the Elk Grove General Plan establishes an exterior noise level standard of 60 dB DNL at outdoor activity areas of residential land uses exposed to transportation noise sources (i.e., traffic). The intent of this standard is to provide an acceptable exterior noise environment for outdoor activities. Where it is not possible to reduce noise in outdoor activity areas to 60 dB DNL through a practical application of the best available noise-reduction means, an exterior noise environment of up to 65 dB DNL may be allowed provided that available exterior noise level reduction measures have been implemented and applicable General Plan interior noise level criteria are satisfied. The General Plan utilizes an interior noise level standard of 45 dB DNL or less within interior spaces of residential uses.

Non-Transportation Noise Sources

The Elk Grove General Plan noise level standards applicable to non-transportation noise sources, such as those associated with the existing commercial uses to the south, are reproduced below in Table 1.

Table 1
Noise Level Performance Standards for New Projects Affected by or Including Non-Transportation Noise Sources*

Standards	Noise Level Descriptor	Daytime (7am to 10pm)	Nighttime (10pm to 7am)
Typical stationary noise sources[a]	Hourly L_{eq}, dB	55[c,d]	45[c,d]
Stationary noise sources which are tonal, impulsive, repetitive, or consist primarily of speech or music[b]	Hourly L_{eq}, dB	50[c,d]	40[c,d]

Notes

*Applies to noise-sensitive land uses only.

1. These standards will apply generally to noise sources that are not tonal, impulsive, or repetitive in nature. Typical noise sources in this category would include HVAC systems, cooling towers, fans and blowers.
2. These standards apply to noises which are tonal in nature, impulsive, repetitive, or which consist primarily of speech or music. Typical noise sources in this category include: pile drivers, drive-through speakers, punch presses, steam valves, and transformer stations. HVAC/pool equipment is exempt from these standards.
3. These noise levels do not apply to residential units established in conjunction with industrial or commercial uses (e.g., caretaker dwelling). HVAC/pool equipment are exempt from these standards.
4. The City may impose noise level standards which are more or less restrictive based upon determination of existing low or high ambient noise levels.

Source: Elk Grove General Plan, Table 8-4.

Construction

Policy N-1-7 of the Elk Grove General Plan states that The standards outlined in Table 8-4 shall not apply to transportation- and City infrastructure-related construction activities as long as construction occurs between the hours of 7 a.m. and 7 p.m., Monday through Friday, and 8 a.m. and 5 p.m. on weekends and federally recognized holidays. Work may occur beyond these time frames for construction safety or because of existing congestion that makes completing the work during these time frames infeasible.

Proposed Elk Grove General Plan Amendment

As part of this project, a General Plan Amendment is proposed which would modify footnote 4 of Table 1 to read as follows:

4. The City may impose noise level standards which are more or less restrictive based upon either of the following determinations:
    - Existing low or high ambient noise levels; or
    - Site-specific conditions or considerations as determined applicable by the designated approving authority only for new projects affected by existing non-transportation sources.

This amendment would provide the City of Elk Grove with additional flexibility in making land use determinations for new projects affected by existing non-transportation noise sources, such as the proposed project.

Evaluation of Home Depot Operations Noise at the Project Site

Home Depot Noise Survey

Noise-generating activities at the exterior of the Home Depot include truck circulation, loading dock operations, forklift activity, leaf-blowers, etc. These activities can occur throughout the day but the focus of this study is on the Home Depot noise-generation during nighttime hours.

To quantify noise generated by Home Depot operations, Saxelby Acoustics and Bollard Acoustical Consultants, Inc. (BAC) conducted noise surveys at various times on the project site between April and December of 2023 from the same location. The noise survey location is shown in Figure 1. Photographs of the noise survey location are provided in Appendix B.

Larson-Davis Laboratories (LDL) precision integrating sound level meters were used to complete the noise surveys. The meters were calibrated before and after use with an LDL Model CAL200 acoustical calibrator to ensure the accuracy of the measurements. The equipment used meets all pertinent specifications of the American National Standards Institute for Type 1 sound level meters (ANSI S1.4).

The nighttime noise survey results from both BAC and Saxelby Acoustics are summarized in Table 2. The detailed results of the BAC noise survey are contained in Appendix C in tabular format and graphically in Appendix D.

Table 2
Nighttime Hourly Noise Survey Results at Site LT-2

Source	Date	Hourly Leq [dBA] during hours monitored									Highest Leq
		0:00	1:00	2:00	3:00	4:00	5:00	6:00	22:00	23:00	
Saxelby	**4/12/23**	-	-	-	-	-	-	-	54	51	**54**
Saxelby	**4/13/23**	50	57	63	66	57	59	60	59	57	**66**
Saxelby	**4/14/23**	60	60	54	56	57	56	62	-	-	**62**
BAC	**5/31/23**	-	-	-	-	-	-	-	52	46	**52**
BAC	**6/1/23**	49	53	48	51	57	61	56	57	48	**61**
BAC	**6/2/23**	54	48	56	54	58	57	53	54	53	**58**
BAC	**6/3/23**	58	46	54	56	57	63	60	-	-	**63**
BAC	**10/2/23**	-	-	-	-	55	51	50	-	-	**55**
BAC	**10/3/23**	-	-	-	-	59	50	48	-	-	**59**
Saxelby	**11/27/23**	-	-	-	-	-	-	-	53	52	**53**
Saxelby	**11/28/23**	54	52	52	53	52	56	58	54	54	**58**
Saxelby	**11/29/23**	50	52	53	50	50	59	58	53	53	**59**
Saxelby	**11/30/23**	51	51	49	49	51	57	53	60	54	**60**
Saxelby	**12/1/23**	53	50	48	53	55	56	53	-	-	**56**
Average Leq		**55**	**54**	**56**	**58**	**56**	**58**	**58**	**56**	**53**	
Highest Leq		**60**	**60**	**63**	**66**	**59**	**63**	**62**	**60**	**57**	

Notes
a. Nighttime hours: 22:00 to 7:00 (10:00 p.m. to 7:00 a.m.)
Source: BAC and Saxelby Acoustics.

The noise survey results indicate that Home Depot operations exceeded the City of Elk Grove's nighttime noise levels standard of 45 dBA Leq at the project site during the noise survey period. As a result, mitigation of Home Depot operational noise would be required to achieve compliance with the City's nighttime hourly standards. A discussion of the development of noise mitigation measures for this project is provided in the following section.

Home Depot Noise Mitigation

Methodology

BAC utilized the SoundPlan 3D noise modeling software (Version 9), to predict the noise barrier heights required to achieve compliance with City of Elk Grove noise standards at the project site. Inputs to the SoundPlan model include local topography, the locations of existing and proposed buildings, noise source and receiver locations, noise barrier locations, and the reference source noise level of the Home Depot operations. Locations of noise sources, buildings, receivers, and barriers were obtained from site plans provided by the project developer and aerial imagery.

Regarding the reference sound level of the Home Depot operations, the Table 2 data indicate that there was considerable variability in the measured hourly average noise levels during the survey periods. Specifically, hourly Leq values ranged from a low of 46 to a high of 66 dBA Leq. This range represents a 100-fold difference in sound energy between the quietest and loudest hours. Over the course of the 87 hours of nighttime noise monitoring, the average of all of the hours computes to 54 dBA Leq. The median of all the nighttime hours was also 54 dBA Leq.

In 25 years of preparing noise analysis in California Cities and Counties, it has been BAC's experience that absolute worst-case conditions are not used for the evaluation of compliance with the local jurisdiction's noise standards. For example, industry-standard convention is that annual average conditions are used for the assessment of noise generated by traffic, not the busiest traffic days of the year. If noise generated during the busiest traffic day of the year were utilized, most residential developments within California would be surrounded by very tall sound walls. Similarly, noise mitigation developed for school playgrounds and daycare centers is not based on the loudest occurrence of a single child yelling within the play area during the year. Rather, compliance with local noise standards is based on the typical noise generation of the source in question, whether it be a truck arriving at a loading dock, a child playing within a park playground, railroad warning horns, traffic on local roadways, or other sources. This approach recognizes that, during the worst-case noise generation of these sources the local noise standards could be exceeded, but the majority of time the standards would be satisfied.

For this reason, the use of the absolute loudest measured hours of Home Depot operations are not recommended for the determination of noise barrier heights required to satisfy the City's noise standards, as this would result in exceedingly and unrealistically tall noise barriers. That said, using the lowest, or even the average measured reference noise levels for the Home Depot are also not recommended, as barriers designed utilizing these lower reference levels would likely not provide adequate protection to future residents of the Dunisch development.

To determine the appropriate source noise level for use in modelling noise barriers at the Dunisch project site, BAC conducted extensive statistical analysis of the noise level data collected during the 87 nighttime hours of the surveys. That analysis indicates that the single highest hourly average noise level (66 dBA Leq) was only present one (1) time out of 87 hours of nighttime noise monitoring (1% of the survey period), and that Home Depot noise levels were below 60 dBA Leq during 94% of the noise survey period.

Consistent with industry standard practices, this analysis does not use the highest or lowest measured sound levels to represent Home Depot's noise generation. Based on the extensive nighttime noise monitoring and statistical analysis of that nighttime noise survey data prepared for this project, this analysis conservatively utilizes 60 dBA Leq as the reference sound level for the evaluation of Home Depot noise mitigation requirements at the Dunisch residential project site. Using this approach, it is recognized that the City's 45 dBA Leq nighttime noise standards could occasionally be exceeded within the backyard spaces of the nearest residences. However, such exceedances would be minor (likely 1-6 dBA when exceedances occur), infrequent, and would occur during periods when backyard usage is typically at a minimum (10 pm to 7 am). As such, the relatively infrequent occurrence when Home Depot noise levels could exceed 45 dBA Leq within some backyards of the development is not expected to result in adverse noise impacts at those residences.

In addition, the proposed General Plan Amendment cited in the criteria section of this report would specifically allow for such circumstances, stating the City may impose noise level standards which are more or less restrictive depending on site-specific conditions or considerations as determined applicable by the designated approving authority only for new projects affected by existing non-transportation sources.

Predicted Noise Levels with and without Noise Barriers

Given the above-described reference noise level of 60 dBA Leq at the nearest proposed residential backyard areas resulting from Home Depot noise sources, the SoundPlan noise model was used to predict hourly average noise exposure at each proposed residential lots both with and without the construction of a solid property-line noise barrier. The results of the SoundPlan noise barrier analysis are summarized in Table 3. The predicted noise contours for the proposed sound wall are also shown graphically in Figure 3.

Table 3
Predicted Maximum Noise Levels and Sound Wall Height

Receiver	Predicted Maximum Hourly Noise Level, Leq [dBA][1]		Required Sound Wall Height [ft]
	With No Mitigation	With Proposed Sound Wall	
R-11	60	45	12
R-12	60	45	12
R-13	59	45	12
R-14	58	44	12
R-15	56	43	12
R-16	52	43	10
R-17	52	43	10
R-18	52	43	8
R-19	52	43	8
R-20	52	43	8
R-21	51	42	8
R-22	51	42	8
R-23	50	41	8
R-24	49	41	8
R-25	47	40	8
R-26	45	38	8
R-27	43	36	8

1. *Predicted levels are based on a reference hourly average sound level of 60 dBA Leq at the nearest proposed residential backyards (R-11 and R-12) prior to installation of noise barriers.*

Source: Bollard Acoustical Consultants, 2024

Table 3 indicates that construction of a 12-foot-tall sound wall would reduce average Home Depot noise levels of 60 dBA Leq to a state of compliance with the City of Elk Grove's 45 dBA Leq nighttime noise level standard of 45 dBA Leq at the nearest proposed residences (Lots R-11 through R-15). The barrier heights would decrease in height to the east with increasing distance from the Home Depot truck unloading area. Figure 1 shows the location and height of the required sound wall for the Home Depot operations based on a conservative reference source noise level of 60 dBA Leq.

As noted previously, based on the noise surveys conducted for this project, the potential exists for infrequent periods when Home Depot noise levels could exceed 60 dBA Leq, thereby resulting in exceedance of the 45 dBA Leq nighttime exterior (backyard), noise standard of the City of Elk Grove during those infrequent periods. Also as mentioned previously, however, such exceedances would be minor (likely 1-6 dBA when exceedances occur), infrequent, and would occur during periods when backyard usage is typically at a minimum (10 pm to 7 am).

In addition, shielding provided by the residences themselves could result in even lower sound levels that those reported in Table 3. Also, the future residents of the development would be fully disclosed of the potential for increased exterior (backyard), noise generation during nighttime activities at Home Depot prior to purchasing the residence. As such, the relatively infrequent occurrence when Home Depot noise levels could exceed 45 dBA Leq within some backyards of the development is not expected to result in adverse noise impacts at those residences. Finally, the proposed General Plan Amendment language would provide the City flexibility in applying an increased noise level standard to this development to account for the occasional potential for exceedance of the City's 45 dBA Leq exterior noise standard.

In addition to the required sound wall, BAC recommends that all south, east and west-facing bedroom windows of residences constructed on Lots 9-17 provide a minimum Sound Transmission Class (STC) rating of 35. This measure will further reduce the potential for annoyance and sleep disturbance during nighttime Home Depot operations.

Figure 3

Predicted Noise Level with Sound Wall

Dunisch Property
Elk Grove, California

Legend

Contour Scale, Leq [dBA]

>=	60
55 -	60
50 -	55
45 -	50
40 -	45

Objects

- Receiver
- Noise Survey Location
- Sound Wall

Scale

N 0 50 100 200 feet

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Evaluation of Future Traffic Noise Environment at Project Site

Due to the proximity of the project site to West Stockton Boulevard and Highway 99, an analysis of traffic noise analysis was also prepared for this project. The traffic noise analysis methodology and results are presented below.

Traffic Noise Prediction Methodology

The Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA-RD-77-108) was used to predict traffic noise levels at project. The model is based upon the CALVENO noise emission factors for automobiles, medium trucks, and heavy trucks, with consideration given to vehicle volume, speed, roadway configuration, distance to the receiver, and the acoustical characteristics of the site. The FHWA Model was developed to predict hourly Leq values for free-flowing traffic conditions and is considered to be accurate within 1.5 dB in most situations.

The FHWA Model was used with traffic volume data obtained from Caltrans to predict future traffic noise levels from Highway 99. According to published Caltrans traffic data, the segment of Highway 99 adjacent to the project site currently experiences an average daily traffic (ADT) of approximately 134,000 (year 2022). This traffic volume was conservativity estimated to increase by 50% in the future to approximately 201,000 daily vehicles.

Traffic Noise Prediction Model Calibration

The FHWA Model provides reasonably accurate traffic noise predictions under “ideal” roadway conditions. Ideal conditions are generally considered to be long straight roadway segments with uniform vehicle speeds, a flat roadway surface, good pavement conditions, a statistically large volume of traffic, and an unimpeded view of the roadway from the receiver location. To calibrate the FHWA Model to better reflect the local traffic environment, BAC utilized the long-term (24-hour) noise survey at site LT-1 completed by Saxelby Acoustics on April 13, 2023.

Detailed results of the FHWA Model calibration procedure are included in Appendix E. As indicated in Appendix E, the FHWA Model was found to overpredict Highway 99 traffic noise levels at the project site by approximately 4.4 dB. This is mostly likely due to the shielding provided by the surrounding buildings in the project vicinity. To provide traffic noise level predictions more representative of local conditions, a calibration offset of -4.0 dB was applied to the FHWA Model for future first-floor locations. Because the upper floors will have a direct view of Highway 99 traffic noise, upper floor levels were predicted to be 2 dBA higher than first-floor levels.

Predicted Future Traffic Noise Levels at Proposed Residences

The predicted future traffic noise levels were projected to the noise-sensitive areas of the development based on a 4.5 dB decrease per doubling of distance from the noise source. The results of those projections are summarized below in Table 4. The data shown in Table 4 includes the aforementioned offsets for the FHWA Model calibration as well as additional offset for shielding provided by proposed intervening buildings. The FHWA Model inputs are shown in Appendix F.

Table 4
Predicted Future Traffic Noise Levels at the Project

Roadway	Lots[1]	Location	Offsets[2,3] [dBA]	Predicted Exterior DNL [dBA]	Additional Mitigation Required?[4]
Hwy 99	93	Backyard	-11[a]	59	No
		1st floor façade	-11[a]	59	-
		2nd floor façade	-9	61	-
Hwy 99	92	Backyard	-10[b]	60	No
		1st floor façade	-10[b]	60	-
		2nd floor façade	-8	62	-
Hwy 99	71	Backyard	-4	68	**Yes**
		1st floor façade	-4	68	-
		2nd floor façade	-2	70	-
Hwy 99	70	Backyard	-4	68	**Yes**
		1st floor façade	-4	68	-
		2nd floor façade	-2	70	-
Hwy 99	68, 69	Backyard	-4	67	**Yes**
		1st floor façade	-4	67	-
		2nd floor façade	-2	69	-
Hwy 99	66, 67	Backyard	-4	66	**Yes**
		1st floor façade	-4	66	-
		2nd floor façade	-2	68	-
Hwy 99	64, 65	Backyard	-4	66	**Yes**
		1st floor façade	-4	66	-
		2nd floor façade	-2	68	-
Hwy 99	61 - 63	Backyard	-4	65	**Yes**
		1st floor façade	-4	65	-
		2nd floor façade	-2	67	-

Notes

1. Lots are shown on Figure 1.
2. A traffic calibration offset of -4 dB applied to all lots.
3. A +2 dB offset was applied at all upper-floor building facades to account for reduced ground absorption of sound at elevated positions.
4. The exterior noise level standard is only applicable to the backyards.

a. A -7dB offset was applied for shielding provided by proposed intervening buildings.
b. A -6 dB offset was applied for shielding provided by proposed intervening buildings.

Source: Bollard Acoustical Consultants, 2024

Analysis of Future Exterior Traffic Noise Exposure at Outdoor Activity Areas

As indicated in Table 4, future traffic noise levels at the proposed primary outdoor activity areas (backyards) at lots 92 and 93 are predicted to be satisfactory relative to the City of Elk Grove exterior noise level standard of 60 dB DNL. However, the exterior noise levels of lots nearest to Highway 99 (Lots 61 – 71) are predicted to exceed the 60 dB DNL noise level standard. As a result, further consideration of exterior Highway 99 traffic noise mitigation measures would be warranted for the project.

BAC evaluated the effectiveness of noise barriers constructed along West Stockton Blvd for the purposes of reducing future West Stockton Boulevard and Highway 99 traffic noise exposure to a state of compliance with the City's 60 dBA DNL exterior noise level standard. Table 5 shows the predicted noise level for various barrier heights.

Table 5
Predicted Future Traffic Noise Levels with Noise Barriers

Roadway	Lots	Receiver Location[1]	Barrier Height [ft]	Predicted DNL [dBA]
Hwy 99	71	Backyard	6	63
			7	62
			8	**60**
Hwy 99	70	Backyard	6	62
			7	61
			8	**59**
Hwy 99	68, 69	Backyard	6	62
			7	**60**
			8	59
Hwy 99	66, 67	Backyard	6	61
			7	**59**
			8	58
Hwy 99	64, 65	Backyard	**6**	**60**
			7	59
			8	57
Hwy 99	61 - 63	Backyard	**6**	**59**
			7	58
			8	57

Notes
1. Location of barrier is shown on Figure 1.

Source: Bollard Acoustical Consultants, 2024

Table 5 indicates that an 8-foot-tall noise barrier would be required for southern lots 70 and 71, and 7-foot-tall barrier is required for lots 66 – 69, and a 6-foot-tall barrier is required for lots 61 – 65. However, it is recommended that an 8-foot-tall wall be constructed for all lots (61-71) to provide a margin of safety and to match the 8-foot-tall wall required along at the southern project site boundary. Furthermore, it is recommended that a 6-foot-tall barrier be constructed for lot 92 to shield the backyard of that lot from excessive traffic noise.

Figure 1 shows the location of the required noise barriers. The traffic noise barriers could take the form of masonry wall, earthen berm, or a combination of the two. Other barrier materials may be acceptable but should be reviewed by an acoustical consultant prior to construction.

Analysis of Future Interior Traffic Noise Exposure within Residences

Standard residential construction (stucco siding, STC-27 windows, door weather-stripping, exterior wall insulation, composition plywood roof) typically attenuates exterior noise levels by 25 dB. Table 4 shows that future exterior traffic noise levels at the nearest *first-floor* building facades would range from 59 to 68 dB DNL. With standard residential construction, the first-floor building interiors would range from 34 to 43 dB DNL. The proposed traffic noise barriers would further reduce the predicted interior traffic noise level.

However, due to reduced ground absorption of sound at elevated positions and the fact that *second-floor* exterior facades would not be shielded by the proposed noise barrier, exterior noise exposure is estimated to be appreciably higher within second floor rooms with Highway 99 exposure. To ensure compliance with the City's 45 dB DNL interior noise levels standard with a margin of safety, it is recommended that upgrades are made to the second-floor windows of the lots proposed nearest to Highway 99. Specifically, window assembly upgrades of STC 32 are recommended for the second-floor facades of lots 61 – 72, 92, and 93 from which Highway 99 or West Stockton Boulevard would be visible.

It should be noted that mechanical ventilation (air conditioning) will be provided for all residences in this development to allow the occupants to close doors and windows as desired to achieve additional acoustical isolation.

Predicted Increases in Traffic Noise Levels at Existing Residences Resulting from the Project

The project proposes the development of 111 single family residences. Based on an assumed trip generation of 10 daily vehicle trips per residence, the project would generate approximately 1,100 daily vehicle trips. Because the project site access will be from Dunisch Road, it was assumed for purposes of this analysis that all 1,110 daily trips would traverse Dunisch Road.

The Federal Highway Administration Highway Traffic Noise Prediction Model (FHWA-RD-77-108) was again used to predict the traffic noise generated by the project at the nearest residences to the north of the project site. A day/night distribution of project traffic was assumed to be 80%/20% and project-generated truck trips were assumed to be negligible. Vehicle speeds on Dunisch Road were estimated to be approximately 35 mph. Finally, a 5 dB offset was applied to the model to account for the presence of an existing 6-foot tall sound wall located along the north side of Dunisch Road. The FHWA Model Results, which are provided in Appendix G, indicate project-generated traffic noise levels would be approximately 50 dB DNL within the nearest backyards of the residences to the north of the project site.

The predicted project-generated traffic noise level of 50 dB DNL within the backyard areas of the nearest residences to the project site is well within compliance with the City of Elk Grove 60 dB DNL exterior noise standard. In addition, the predicted level of 50 dB DNL is well below measured exisiting ambient noise levels measured in the immediate project vicinity. As a result, the project is not predicted to either cause traffic noise levels in excess of General Plan noise standards or a substantial increase in ambient noise levels at the nearest residences. As a result, no adverse noise impacts are identified for project-generated traffic noise.

Evaluation of Project Construction Noise

During project construction, heavy equipment would be used for site grading, excavation, paving, and building construction. These activities could increase ambient noise levels in the immediate project vicinity. Construction noise levels generated at the project site would vary depending on the type and number of equipment in use at any time, the location where that equipment is operating, and how well the equipment is maintained. Noise exposure at existing, off-site, sensitive receptors would also vary depending on the proximity of equipment activities to the receptor, the degree of shielding present between the construction equipment and receptor (i.e., soundwalls), etc.

Table 6 provides the range of maximum noise levels for equipment commonly used in general construction projects at full-power operation at a distance of 50 feet. Not all of these construction activities would be required of this project.

Table 6
Maximum Reference Noise Levels for Common Construction Equipment

Equipment Description	Maximum Noise Level at 50 Feet [dBA]
Air compressor	80
Backhoe	80
Compactor	82
Concrete mixer	85
Concrete pump	82
Concrete vibrator	76
Dozer	85
Generator	82
Grader	85
Loader	80
Paver	85
Pneumatic tools	85
Pump	77
Saw	76
Scraper	85
Truck	84

Source: Federal Transit Administration Noise and Vibration Impact Assessment Manual, Table 7-1 (2018)

The nearest sensitive receptors (existing residences) to the project site are located to the north, approximately 50 feet from proposed construction activities. For a general assessment of potential construction noise impacts, the FTA recommends utilizing the noise emission levels shown in Table 6, adjusting those levels for the percentage of the hour the equipment would be operating, correcting for distance by assuming mobile equipment operates at the center of the project, and considering ground effects where appropriate.

For this project, there will be periods of time when the construction equipment is located closer to existing residences than the effective center of the project site, so calculating construction noise from the center of the site is not considered appropriate for this evaluation. However, because the noisiest construction equipment tends to be mobile (i.e. earthmoving equipment), calculating construction noise levels using the closest point of construction activity to existing residences is also not considered appropriate. For this evaluation, a distance of 100 feet was conservatively assumed for the construction noise evaluation distance.

After correction for usage and multiple equipment operating concurrently, worst-case project construction noise was calculated using the Federal Highway Administration's Roadway Construction Noise Model (RCNM), to be approximately 75 dBA at the nearest residences to the north. The RCNM analysis conservatively assumed concurrent operation of a dozer, front loader, compactor, backhoe, and grader at a distance of 100 feet from the nearest residence. While an estimated construction noise is exempt from the City's noise standards during daytime hours, this level of noise would be considered excessive during nighttime hours.

Because project construction would occur for a finite duration, and because the existing ambient noise environment in the project vicinity is currently elevated due to local and distant traffic noise, as well as noise generated by Home Depot operations, provided project construction is limited to daytime hours significant adverse construction noise impacts are not anticipated for this project.

Conclusions

The Dunisch project site is exposed to noise generated during Home Depot operations in excess of the Elk Grove hourly nighttime performance standard of 45 dBA Leq. To comply with the Elk Grove's nighttime exterior noise level non-transportation standard at the project site, a noise barrier would be required at the heights and locations shown on Figure 1. In addition, window upgrades are strongly recommended for the residences proposed nearest to the Home Depot truck unloading area, as indicated on Figure 1. Finally, disclosure statements should be provided to all prospective residents of Lots 9-17 within the Dunisch development notifying them of the potential for elevated noise levels during Home Depot operations, including nighttime hours.

Furthermore, without additional mitigation measures, future traffic noise levels are predicted to exceed the City of Elk Grove exterior and interior transportation noise level standards at some locations within this development. To satisfy the exterior and interior transportation noise level criteria, the following noise mitigation are required for the project:

1. Noise barriers should be constructed as shown on Figure 1. The noise barrier height shown is relative to the building pad elevation.
2. Upgraded windows with STC ratings as shown on Figure 1. This applies only to windows and doors that face the Highway 99.
3. A suitable form of forced-air mechanical ventilation or air-conditioning shall be provided so that windows can be kept closed as desired for additional acoustical isolation.
4. Project construction should be limited to daytime hours.

These conclusions are based on the noise level data described herein, the reference source level, on noise reduction data for standard residential dwellings, on typical noise attenuation provided by new residential construction, and on the project site plan shown on Figure 1. Deviations from the above-mentioned resources could cause future noise levels to differ from those predicted in this assessment. In addition, BAC is not responsible for degradation in acoustic performance of the residential construction due to poor construction practices, failure to comply with applicable building code requirements, or for failure to adhere to the minimum building practices cited in this report.

This concludes BAC's noise assessment of the Dunisch Property project in Elk Grove, California. Please contact BAC at (530) 537-2328 or paulb@bacnoise.com with any comments or questions regarding this report.

Appendix A
Acoustical Terminology

Acoustics	The science of sound.
Ambient Noise	The distinctive acoustical characteristics of a given space consisting of all noise sources audible at that location. In many cases, the term ambient is used to describe an existing or pre-project condition such as the setting in an environmental noise study.
Attenuation	The reduction of an acoustic signal.
A-Weighting	A frequency-response adjustment of a sound level meter that conditions the output signal to approximate human response.
Decibel or dB	Fundamental unit of sound. A Bell is defined as the logarithm of the ratio of the sound pressure squared over the reference pressure squared. A Decibel is one-tenth of a Bell.
CNEL	Community Noise Equivalent Level. Defined as the 24-hour average noise level with noise occurring during evening hours (7 - 10 p.m.) weighted by a factor of three and nighttime hours weighted by a factor of 10 prior to averaging.
Frequency	The measure of the rapidity of alterations of a periodic signal, expressed in cycles per second or hertz.
IIC	Impact Insulation Class (IIC): A single-number representation of a floor/ceiling partition's impact generated noise insulation performance. The field-measured version of this number is the FIIC.
L_{dn}	Day/Night Average Sound Level. Similar to CNEL but with no evening weighting.
L_{eq}	Equivalent or energy-averaged sound level.
L_{max}	The highest root-mean-square (RMS) sound level measured over a given period of time.
Loudness	A subjective term for the sensation of the magnitude of sound.
Masking	The amount (or the process) by which the threshold of audibility is for one sound is raised by the presence of another (masking) sound.
Noise	Unwanted sound.
Peak Noise	The level corresponding to the highest (not RMS) sound pressure measured over a given period of time. This term is often confused with the "Maximum" level, which is the highest RMS level.
RT_{60}	The time it takes reverberant sound to decay by 60 dB once the source has been removed.
STC	Sound Transmission Class (STC): A single-number representation of a partition's noise insulation performance. This number is based on laboratory-measured, 16-band (1/3-octave) transmission loss (TL) data of the subject partition. The field-measured version of this number is the FSTC.

A

B

C

Legend

A Site LT-2 October 2, 2023

B Site LT-2 October 3, 2023

C Site LT-2 May 31, 2023

Microphone Location

Noise Survey Photographs

Dunisch Property
Elk Grove, California

Appendix B

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Appendix C-1
Ambient Noise Monitoring Results
Dunisch Property - Elk Grove, California
Wednesday, May 31, 2023

Hour	Leq	Lmax	L50	L90
12:00 AM				
1:00 AM				
2:00 AM				
3:00 AM				
4:00 AM				
5:00 AM				
6:00 AM				
7:00 AM				
8:00 AM				
9:00 AM				
10:00 AM				
11:00 AM				
12:00 PM				
1:00 PM				
2:00 PM				
3:00 PM				
4:00 PM	55	84	47	44
5:00 PM	49	67	47	44
6:00 PM	51	72	47	45
7:00 PM	64	93	50	47
8:00 PM	51	73	49	48
9:00 PM	52	64	49	48
10:00 PM	52	69	49	46
11:00 PM	46	61	44	41

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	64	49	57	52	46	50
Lmax (Maximum)	93	64	75	69	61	65
L50 (Median)	50	47	48	49	44	46
L90 (Background)	48	44	46	46	41	43

Computed DNL	58
% Daytime Energy	90%
% Nighttime Energy	10%

GPS Coordinates
38°25'33.40"N
121°24'10.65"W

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Appendix C-2
Ambient Noise Monitoring Results
Dunisch Property - Elk Grove, California
Thursday, June 1, 2023

Hour	Leq	Lmax	L50	L90
12:00 AM	49	65	46	43
1:00 AM	53	79	44	40
2:00 AM	48	69	42	39
3:00 AM	51	72	43	39
4:00 AM	57	81	46	40
5:00 AM	61	85	51	45
6:00 AM	56	78	50	44
7:00 AM	60	83	49	45
8:00 AM	54	70	49	46
9:00 AM	57	85	48	45
10:00 AM	57	81	49	45
11:00 AM	55	84	47	44
12:00 PM	52	74	47	44
1:00 PM	55	81	46	43
2:00 PM	61	79	50	45
3:00 PM	68	89	47	45
4:00 PM	54	74	48	45
5:00 PM	50	80	47	45
6:00 PM	50	71	48	46
7:00 PM	64	94	50	47
8:00 PM	56	79	51	49
9:00 PM	55	75	50	48
10:00 PM	57	82	51	48
11:00 PM	48	68	46	45

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	68	50	60	61	48	55
Lmax (Maximum)	94	70	80	85	65	75
L50 (Median)	51	46	48	51	42	47
L90 (Background)	49	43	45	48	39	42

Computed DNL	63
% Daytime Energy	83%
% Nighttime Energy	17%

GPS Coordinates
38°25'33.40"N
121°24'10.65"W

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Appendix C-3
Ambient Noise Monitoring Results
Dunisch Property - Elk Grove, California
Friday, June 2, 2023

Hour	Leq	Lmax	L50	L90
12:00 AM	54	73	46	43
1:00 AM	48	64	45	42
2:00 AM	56	80	47	40
3:00 AM	54	75	45	41
4:00 AM	58	87	48	41
5:00 AM	57	84	51	45
6:00 AM	53	75	47	44
7:00 AM	54	73	49	47
8:00 AM	53	76	48	46
9:00 AM	57	75	50	43
10:00 AM	57	85	48	44
11:00 AM	65	88	59	43
12:00 PM	63	83	50	41
1:00 PM	52	80	44	41
2:00 PM	48	72	43	41
3:00 PM	51	75	44	41
4:00 PM	47	66	43	41
5:00 PM	47	64	45	43
6:00 PM	49	64	48	46
7:00 PM	51	64	50	48
8:00 PM	57	77	49	48
9:00 PM	59	83	51	49
10:00 PM	54	74	49	48
11:00 PM	53	75	48	46

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	65	47	57	58	48	55
Lmax (Maximum)	88	64	75	87	64	76
L50 (Median)	59	43	48	51	45	47
L90 (Background)	49	41	44	48	40	43

Computed DNL	62
% Daytime Energy	75%
% Nighttime Energy	25%

GPS Coordinates
38°25'33.40"N
121°24'10.65"W

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Appendix C-4
Ambient Noise Monitoring Results
Dunisch Property - Elk Grove, California
Saturday, June 3, 2023

Hour	Leq	Lmax	L50	L90
12:00 AM	58	83	51	46
1:00 AM	46	61	46	42
2:00 AM	54	72	47	43
3:00 AM	56	77	46	39
4:00 AM	57	75	50	40
5:00 AM	63	88	53	44
6:00 AM	60	79	53	44
7:00 AM	65	80	50	44
8:00 AM	59	81	45	42
9:00 AM	61	83	50	41
10:00 AM	55	76	46	42
11:00 AM	54	83	45	42
12:00 PM	53	84	43	40
1:00 PM	49	74	42	40
2:00 PM	51	70	44	42
3:00 PM	48	69	45	43
4:00 PM				
5:00 PM				
6:00 PM				
7:00 PM				
8:00 PM				
9:00 PM				
10:00 PM				
11:00 PM				

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	65	48	58	63	46	58
Lmax (Maximum)	84	69	78	88	61	77
L50 (Median)	50	42	45	53	46	49
L90 (Background)	44	40	42	46	39	43

Computed DNL	65
% Daytime Energy	63%
% Nighttime Energy	37%

GPS Coordinates
38°25'33.40"N
121°24'10.65"W

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Appendix C-5
Ambient Noise Monitoring Results
Dunisch Property - Elk Grove, California
Monday, October 2, 2023

Hour	Leq	Lmax	L50	L90
12:00 AM				
1:00 AM				
2:00 AM				
3:00 AM				
4:00 AM	55	70	46	41
5:00 AM	51	76	47	44
6:00 AM	50	67	48	46
7:00 AM				
8:00 AM				
9:00 AM				
10:00 AM				
11:00 AM				
12:00 PM				
1:00 PM				
2:00 PM				
3:00 PM				
4:00 PM				
5:00 PM				
6:00 PM				
7:00 PM				
8:00 PM				
9:00 PM				
10:00 PM				
11:00 PM				

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	0	0		55	50	53
Lmax (Maximum)	0	0		76	67	71
L50 (Median)	0	0		48	46	47
L90 (Background)	0	0		46	41	44

GPS Coordinates
38°25'33.40"N
121°24'10.65"W

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Appendix C-6
Ambient Noise Monitoring Results
Dunisch Property - Elk Grove, California
Tuesday, October 3, 2023

Hour	Leq	Lmax	L50	L90
12:00 AM				
1:00 AM				
2:00 AM				
3:00 AM				
4:00 AM	59	88	49	44
5:00 AM	50	68	47	45
6:00 AM	48	59	47	46
7:00 AM				
8:00 AM				
9:00 AM				
10:00 AM				
11:00 AM				
12:00 PM				
1:00 PM				
2:00 PM				
3:00 PM				
4:00 PM				
5:00 PM				
6:00 PM				
7:00 PM				
8:00 PM				
9:00 PM				
10:00 PM				
11:00 PM				

	Statistical Summary					
	Daytime (7 a.m. - 10 p.m.)			Nighttime (10 p.m. - 7 a.m.)		
	High	Low	Average	High	Low	Average
Leq (Average)	0	0		59	48	55
Lmax (Maximum)	0	0		88	59	72
L50 (Median)	0	0		49	47	48
L90 (Background)	0	0		46	44	45

GPS Coordinates
38°25'33.40"N
121°24'10.65"W

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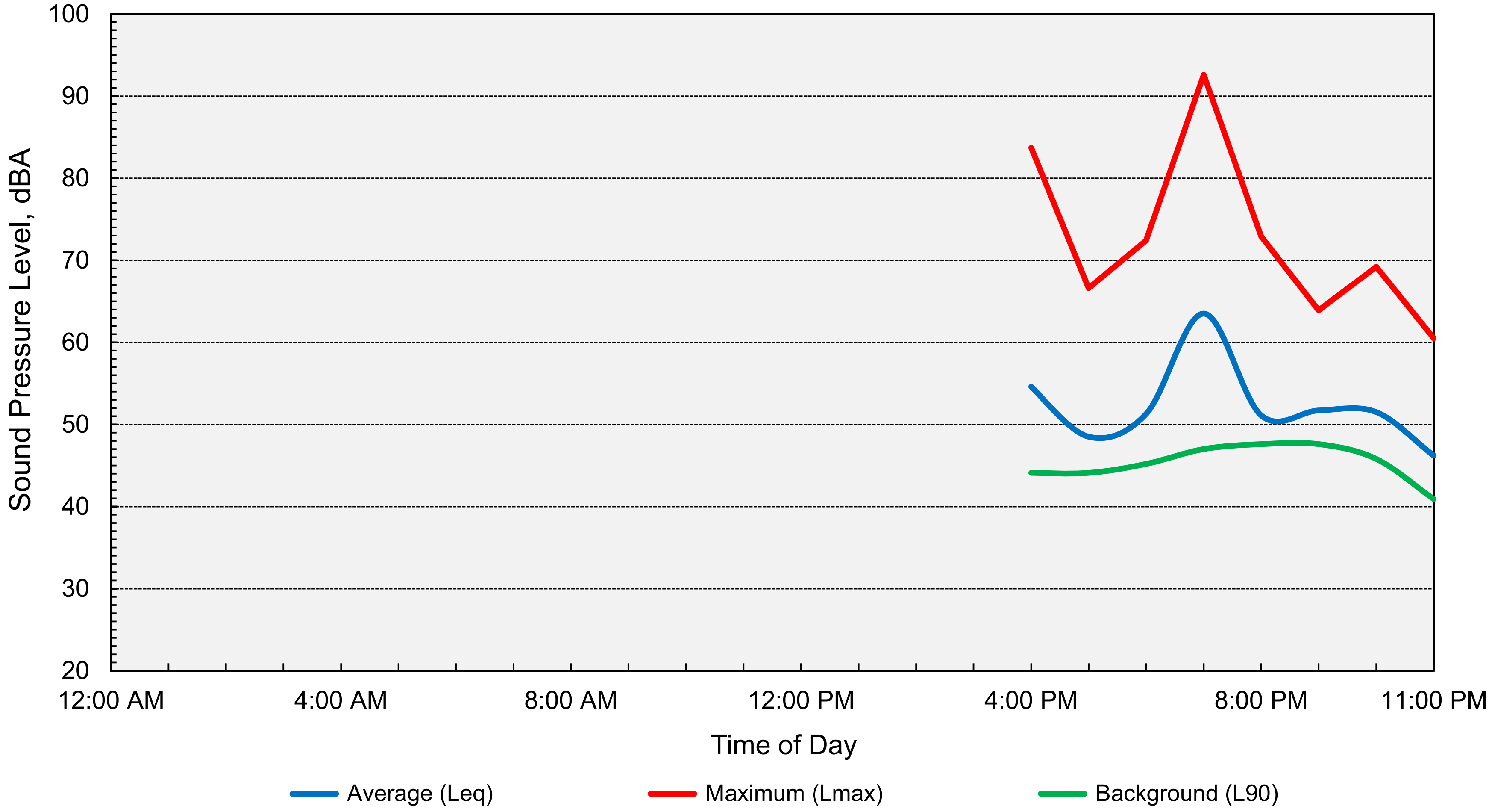
Appendix D-1
Ambient Noise Monitoring Results
Dunisch Property - Elk Grove, California
Wednesday, May 31, 2023



Computed DNL = 58 dB

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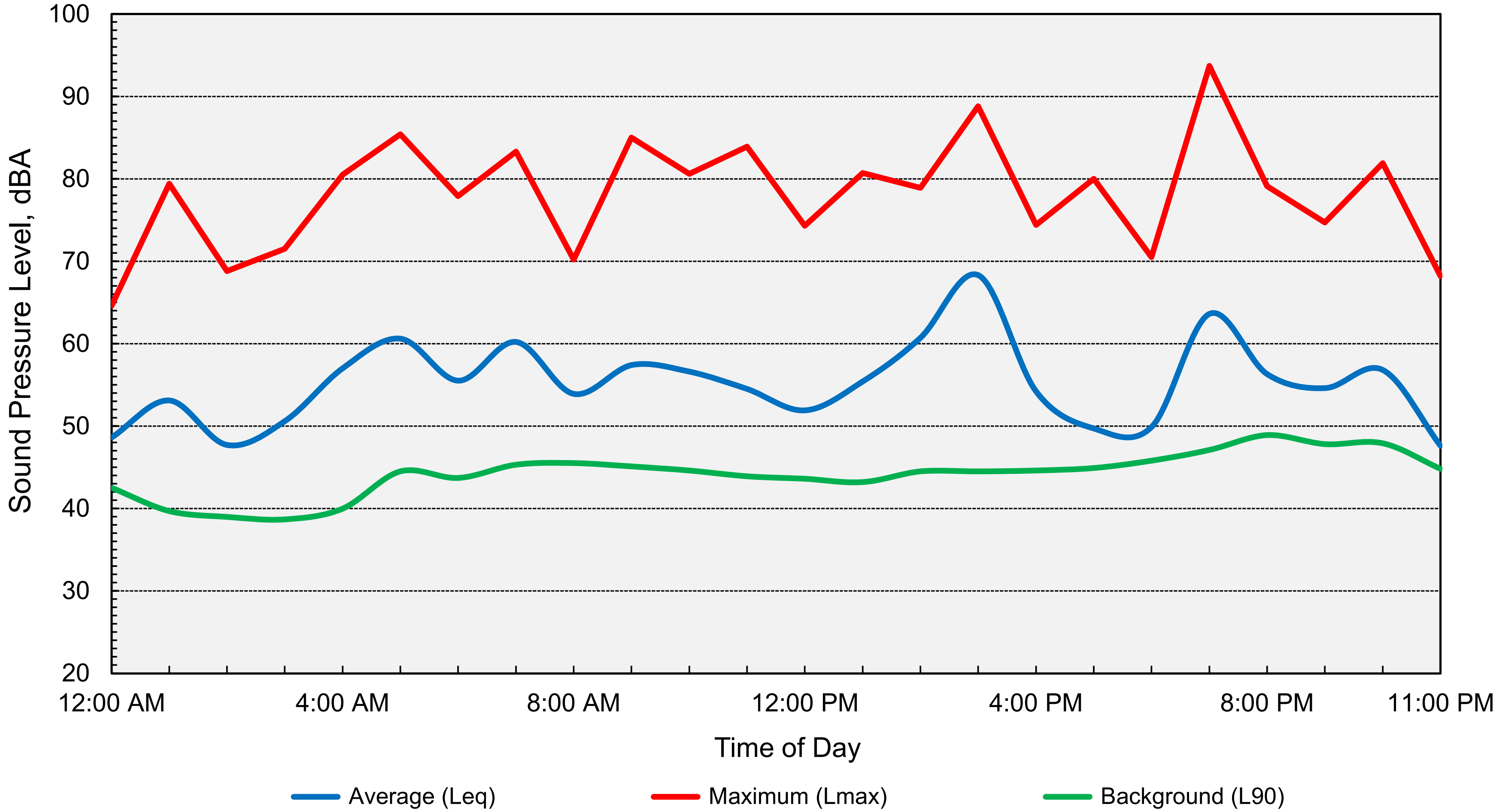
Appendix D-2
Ambient Noise Monitoring Results
Dunisch Property - Elk Grove, California
Thursday, June 1, 2023



Computed DNL = 63 dB

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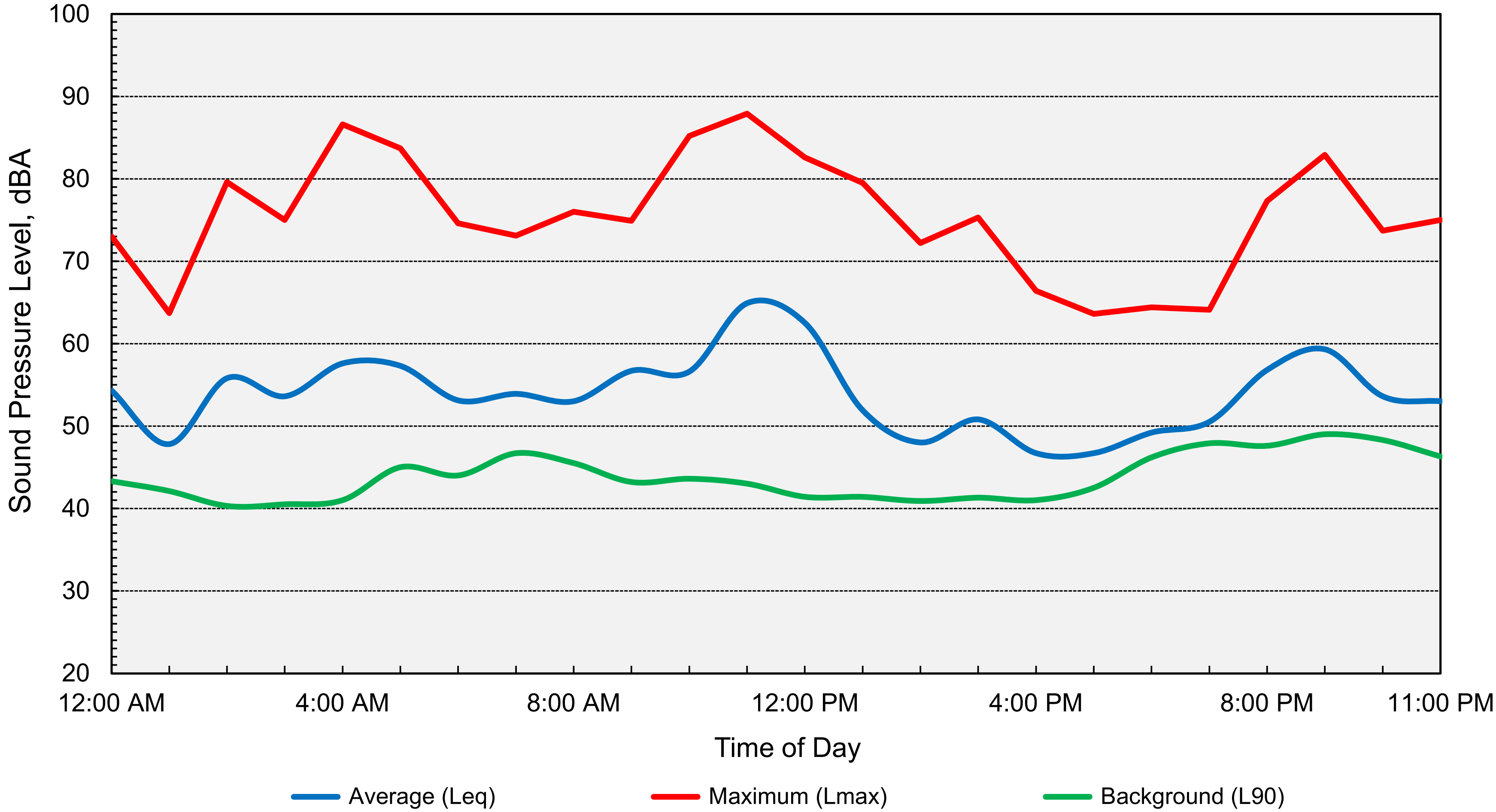
Appendix D-3
Ambient Noise Monitoring Results
Dunisch Property - Elk Grove, California
Friday, June 2, 2023



Computed DNL = 62 dB

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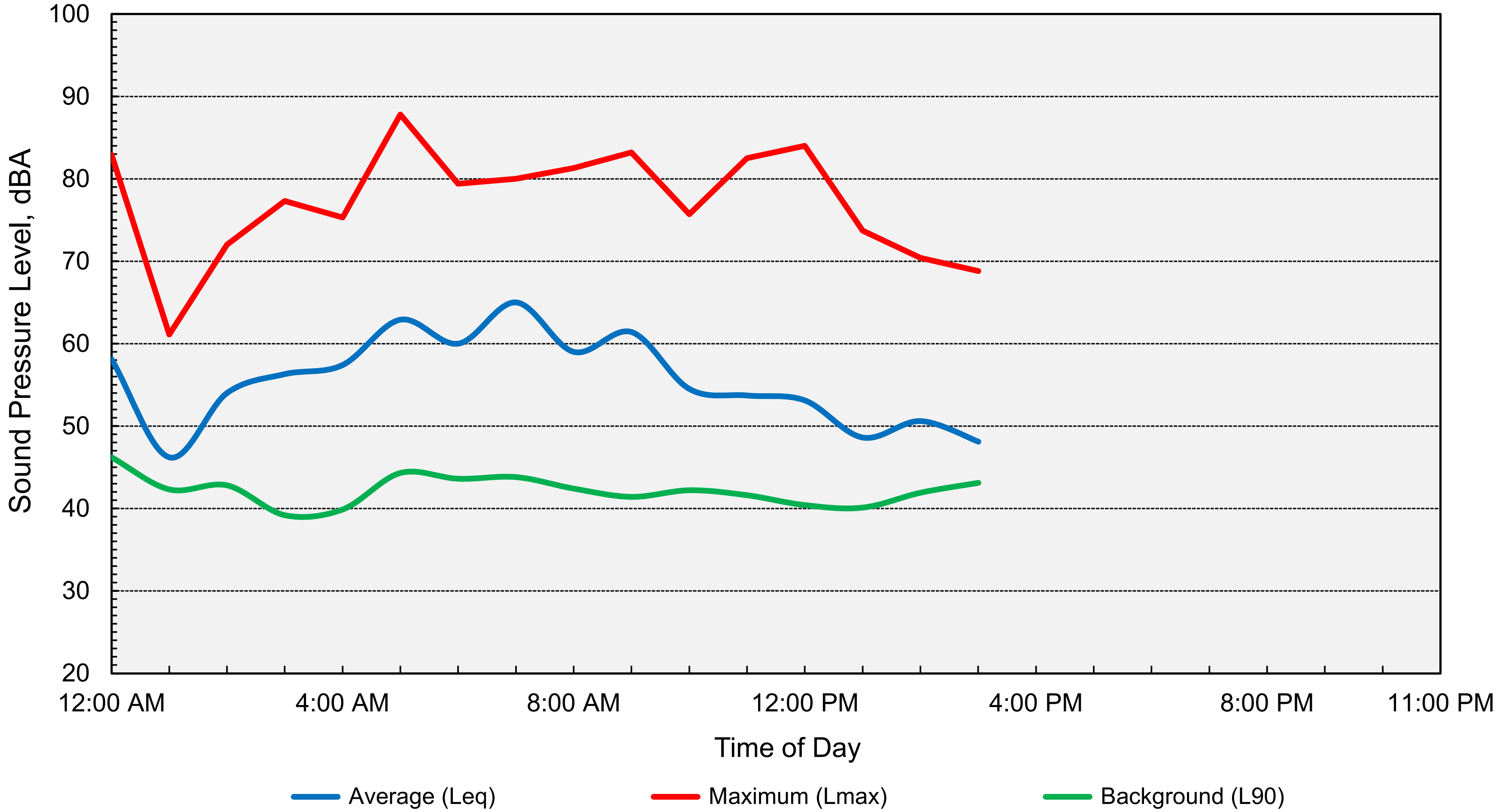
Appendix D-4
Ambient Noise Monitoring Results
Dunisch Property - Elk Grove, California
Saturday, June 3, 2023



Computed DNL = 65 dB

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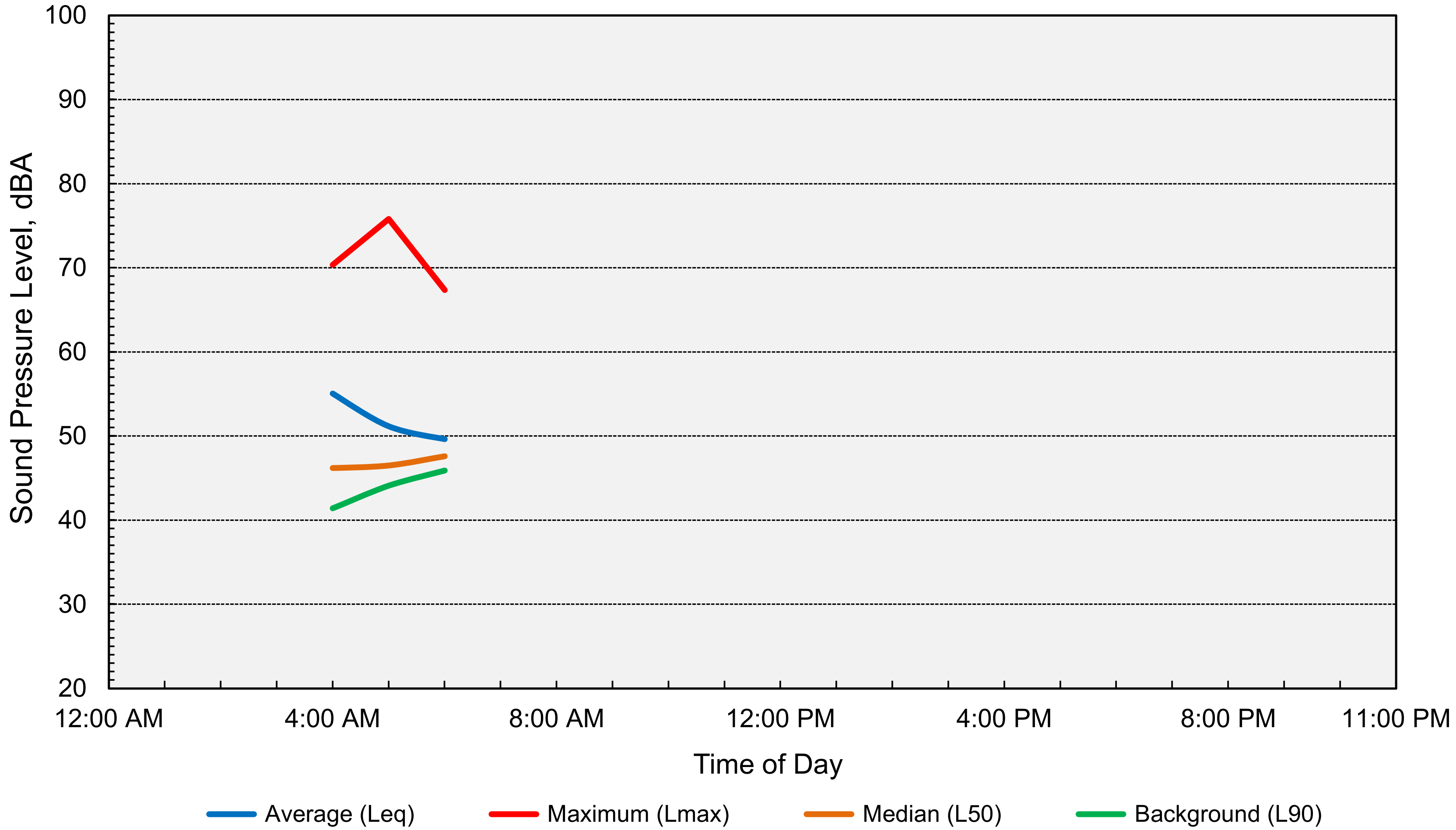
Appendix D-5
Ambient Noise Monitoring Results
Dunisch Property - Elk Grove, California
Monday, October 2, 2023



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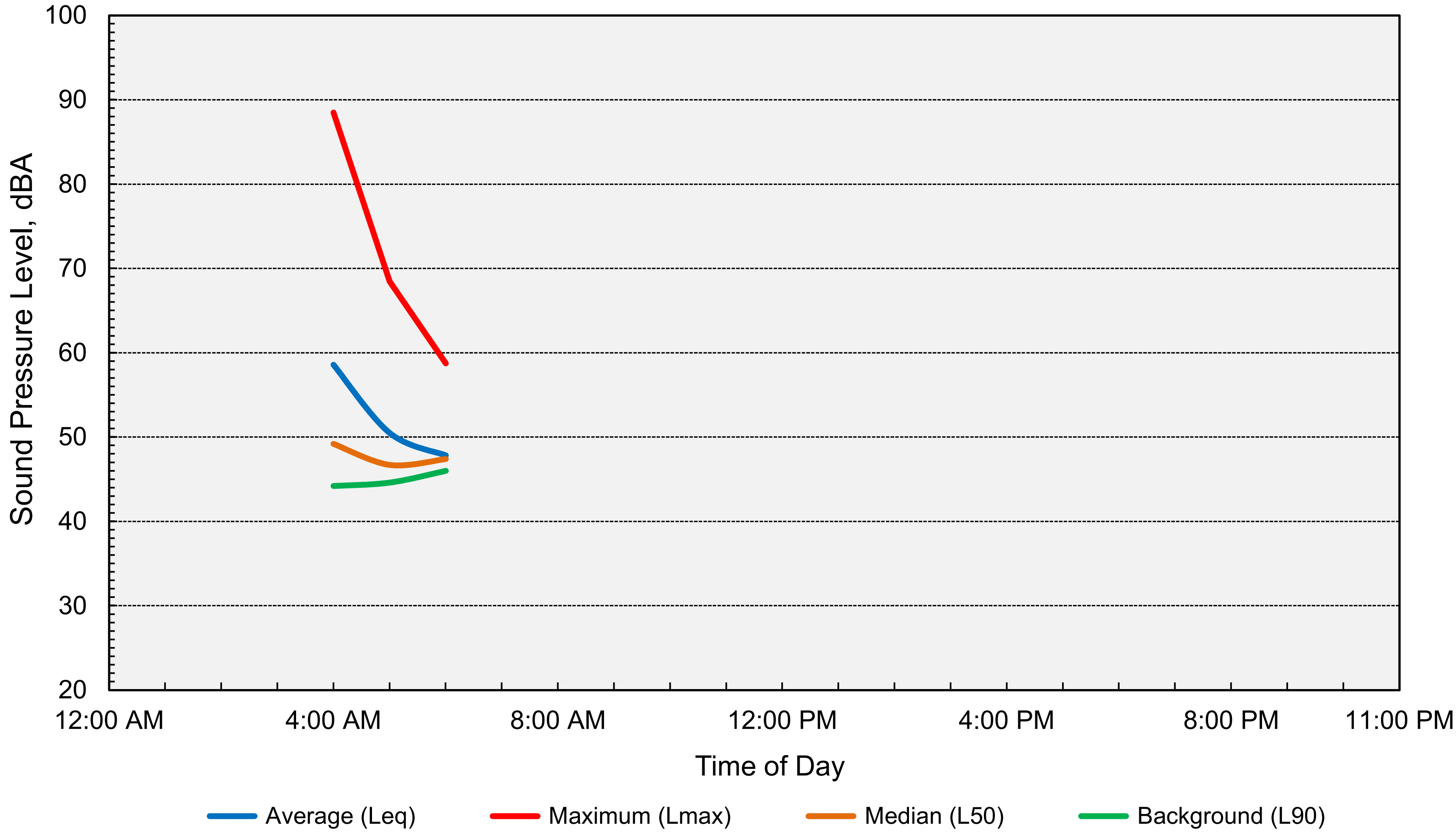
Appendix D-6
Ambient Noise Monitoring Results
Dunisch Property - Elk Grove, California
Tuesday, October 3, 2023



Computed DNL = 0 dB

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Appendix E
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number:	2023-066
Project Name:	Dunsich Property
Roadway Name:	Highway 99

Traffic Data:

Year:	2023, Existing
Average Daily Traffic Volume:	134,000
Percent Daytime Traffic:	76
Percent Nighttime Traffic:	24
Percent Medium Trucks (2 axle):	3.4
Percent Heavy Trucks (3+ axle):	7.2
Assumed Vehicle Speed (mph):	65
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				----------------- DNL (dB) ------------------			
Location	**Description**	**Distance**	**Offset (dB)**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
1	Calibration of LT-1 Data	700		66	58	64	68.4

Traffic Noise Contours (No Calibration Offset):

DNI Contour (dB)	Distance from Centerline (ft)
75	253
70	546
65	1176
60	2533

Notes: Model over-predicts by 4.4 dB. Applying -4 dB offset to account for shielding by existing surrounding buildings.

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Appendix F
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number:	2023-066
Project Name:	Dunsich Property
Roadway Name:	Highway 99

Traffic Data:

Year:	Future
Average Daily Traffic Volume:	201,000
Percent Daytime Traffic:	76
Percent Nighttime Traffic:	24
Percent Medium Trucks (2 axle):	3.4
Percent Heavy Trucks (3+ axle):	7.2
Assumed Vehicle Speed (mph):	65
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				----------------- DNL (dB) ------------------			
Lot	**Description**	**Distance**	**Offset (dB)**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
93	Backyard	760	-11	56	48	55	59
	Buidling façade	760	-11	56	48	55	59
92	Backyard	680	-10	58	49	56	60
	Buidling façade	680	-10	58	49	56	60
71	Backyard	500	-4	66	58	64	68
	Buidling façade	500	-4	66	58	64	68
70	Backyard	550	-4	65	57	64	68
	Buidling façade	550	-4	65	57	64	68
68, 69	Backyard	610	-4	64	56	63	67
	Buidling façade	610	-4	64	56	63	67
66, 67	Backyard	690	-4	63	55	62	66
	Buidling façade	690	-4	63	55	62	66
64, 65	Backyard	770	-4	63	55	61	66
	Buidling façade	770	-4	63	55	61	66
61 - 63	Backyard	850	-4	62	54	61	65
	Buidling façade	850	-4	62	54	61	65

Traffic Noise Contours (No Calibration Offset):

DNl Contour (dB)	Distance from Centerline (ft)
75	332
70	715
65	1541
60	3320

Notes:
1. Future ADT volume from increasing existing (2022) Caltrans traffi counts by a factor of 1.5.
2. A calibration offset of -4 dB applies to all Lots. Some lots have additional offsets based on shielding provided by proposed buildlings.

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Appendix G
FHWA Traffic Noise Prediction Model (FHWA-RD-77-108)
Noise Prediction Worksheet

Project Information:

Job Number:	2023-066
Project Name:	Dunsich Property
Roadway Name:	Project Traffic on Dunisch Road

Traffic Data:

Year:	Project Traffic
Average Daily Traffic Volume:	1,110
Percent Daytime Traffic:	80
Percent Nighttime Traffic:	20
Percent Medium Trucks (2 axle):	0
Percent Heavy Trucks (3+ axle):	0
Assumed Vehicle Speed (mph):	35
Intervening Ground Type (hard/soft):	**Soft**

Traffic Noise Levels:

				----------------- DNL (dB) ------------------			
Lot	**Description**	**Distance**	**Offset (dB)**	**Autos**	**Medium Trucks**	**Heavy Trucks**	**Total**
North	Backyards	45	-5	50	0	0	**50**

Traffic Noise Contours (No Calibration Offset):

DNI Contour (dB)	Distance from Centerline (ft)
75	2
70	4
65	10
60	21

Notes:
1. Future ADT volume based on 10 trips per residence and 111 proposed residences.
2. A calibration offset of -5 dB was applied to account for shielding provided by the existing sound wall located on the north side of Dunisch Road.

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APPENDIX I

VMT ANALYSIS

FEHR & PEERS

Memorandum

Date: March 22, 2024

To: Rod Stinson, RANEY Planning & Management, Inc.

From: David B. Robinson, Fehr & Peers

Subject: **Dunisch Road Residential – VMT Analysis**

SA23-0193

Fehr & Peers completed a vehicle miles of travel (VMT) analysis of the Dunisch Road Residential project. The purpose of the VMT analysis is to support the application for entitlements of the Project by determining if the project would result in new significant impacts or a substantial increase in the severity of impacts relative to development of the project site based on the land use designation of the City of Elk Grove General Plan. This memorandum outlines SB 743, the proposed Project, the analysis methodology, the evaluation criteria, presents the analysis results that include an evaluation of bicycle, pedestrian, transit, and roadway facilities.

SB 743

SB 743 (Stats. 2013, ch. 386) resulted in several statewide CEQA changes. It required the Governor's Office of Planning and Research (OPR) to establish new metrics for determining the significance of transportation impacts of projects within transit priority areas (TPAs) and allows OPR to extend use of the metrics beyond TPAs. OPR selected VMT as the preferred transportation impact metric and applied their discretion to require its use statewide. This legislation also established that aesthetic and parking effects of a residential, mixed-use residential, or employment center projects on an infill site within a TPA are not significant impacts on the environment. The revised CEQA Guidelines that implement this legislation became effective on December 28, 2018, and state that vehicle level of service (LOS) and similar measures related to delay shall not be used as the sole basis for determining the significance of transportation impacts.

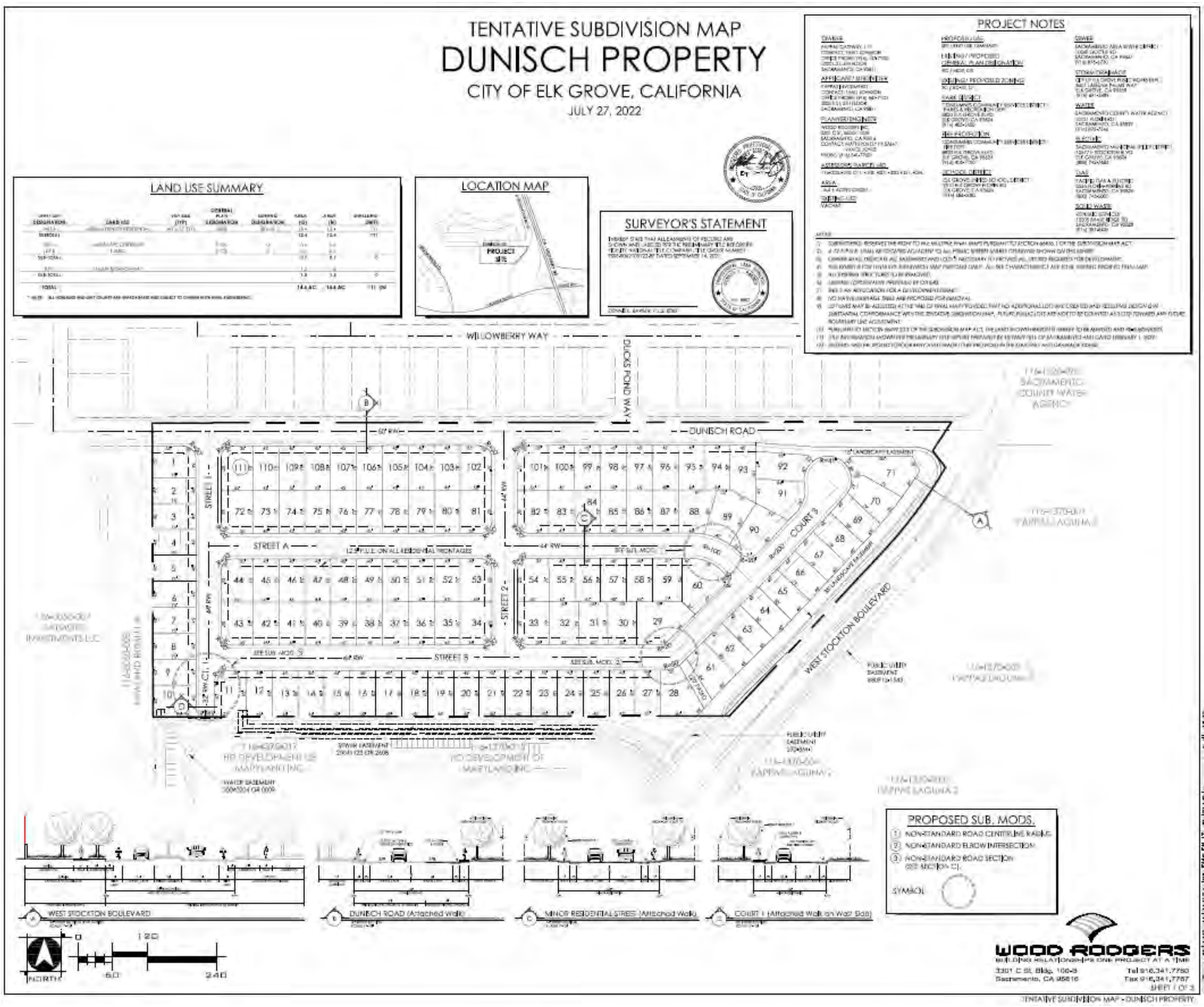
Proposed Project

The Project is located at the southwest corner of the intersection of the West Stockton Boulevard/Dunisch Road intersection in the City of Elk Grove, California. The Project site is approximately 14.4 acres and consists of two the following contiguous parcels:

- APN 116-0050-010
- APN 116-0050-011
- APN 116-0050-013

- APN 116-0050-027
- APN 116-0050-030
- APN 116-0050-031
- APN 116-0050-034

Figure 1 – Tentitive Subdivision Map (Dunisch Property)



The Project site is undeveloped south of Dunisch Road and west of W. Stockton Boulevard. Adjacent existing uses include single-family residences to the north (i.e., across Dunisch Road) and commercial development to the south and east (i.e., across W. Stockton Boulevard). The City of Elk Grove General Plan designates Project area as Regional Commercial (RC) and is zoned Shopping Center (SC).

As shown in **Figure 1**, the Project includes the creation of 111 single-family residential lots with a typical lot size of 3,375 square feet. Access to the Project site would be provided by two roadway connections to Dunisch Road, west of the Dunisch Road/Ducks Pond Way intersection, and a 20-foot paseo that connects the project to the W. Stockton Boulevard just north of the W. Stockton Boulevard/Laguna Gateway intersection.

The proposed Project will require the approval of the following entitlements:

- Tentative Subdivision Map – Merge existing parcels and subdivide the site into 111 single family residential lots.
- General Plan Amendment – Change the land use designation from Regional Commercial (RC) to Medium Density Residential (MDR).
- Rezone – Change the zoning district from Shopping Center (SC) to Medium-Density Residential (RD-10).

VMT Analysis Methodology

The estimation of the Project's VMT performance follows the methods documented in *EGSIM20 – Model Development Report and VMT Methodology* (October 5, 2022).

VMT Performance Metrics

The EGSIM20 Travel Demand Model is a tool for implementing the General Plan (i.e., like General Plan policy and actions). Consistent with CEQA Guidelines, § 15064.7, the City selected VMT per service population as the preferred performance metric, for implementing its VMT policy. Of the performance metrics considered, VMT per service population was the most intuitive to the decision makers and supported implementation of the General Plan by incentivizing development in the City's core and not in sensitive resource areas that the community values. A key emphasis of the General Plan was to plan and develop a better job-to-housing balance so residents can work where they live, and to support more mixed-use development to reduce the need to travel by car for goods and services. The VMT per service population metric is useful since it captures these trip reduction benefits and accounts for travel from the full range of users and not just residents or just workers. In addition, the City of Elk Grove uses VMT performance targets by General Plan land use category and VMT limits for the City and study areas, which is an additional step to ensure consistency with the General Plan.

VMT Efficiency Components - Definitions

Trips

Trip is defined as a travel between two points using a certain mode of travel. In an activity-based model, individuals make multiple trips per day. The model tracks each trip, including their characteristics (e.g., trip length, purpose, time, location etc.). The model includes four major types of trips that are included in various VMT calculations:

- Trips by SACOG residents to destinations within the SACOG region. These are known as internal-internal, or II trips. These trips are modeled by the DAYSIM submodel.
- Trips by SACOG residents to destinations outside the SACOG region, known as internal-external, or IX trips. These trips are modeled by the IX-XI submodel.
- Trips by non-SACOG residents to destinations in the SACOG region, known as external-internal, or XI trips. These trips are modeled by the IX-XI submodel.

- Trips that do not stop within the SACOG region are known as external-external (XX) or through trips. These are generally not included in VMT efficiency calculations but are typically included in VMT estimates used for emissions analysis. They offer the full picture of VMT within a certain region.

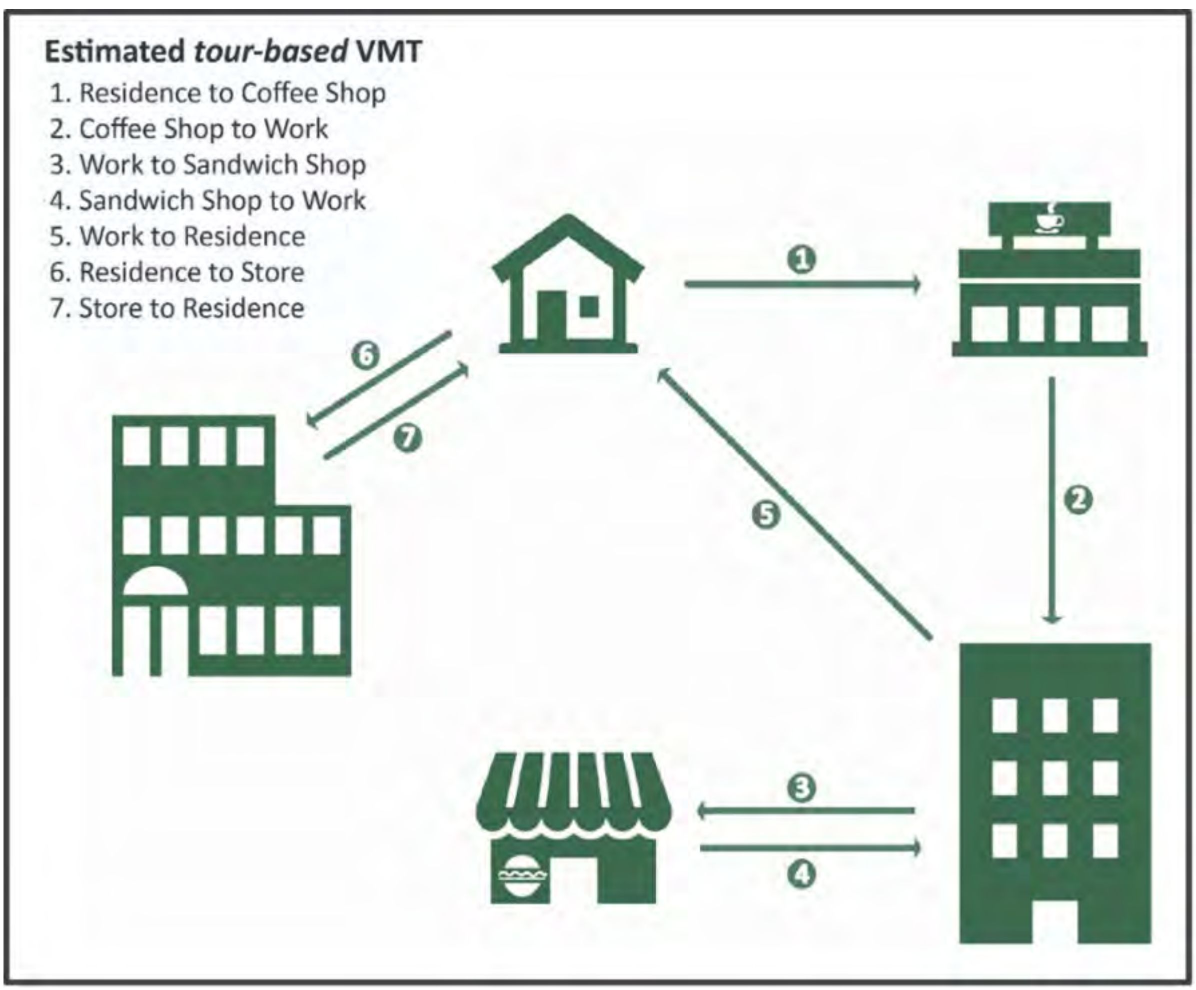
Tours

A tour is defined as a chain of trips that, typically occurring in sequence, start and end at a specific location. By definition, tours in activity-based models refer to chain of trips that begin and end at a home location. Any trip-chaining that does not begin or end at home location are called subtours.

Travel Diary

Activity-based models create a travel diary for each individual in the model area. **Figure 2** shows a travel diary of a typical day for a household member within the SACOG region. Each leg of the arrow indicates an individual trip. This example includes 7 trips and 2 tours between home, coffee shop, work, and store location. Work location can be Office/Industrial/Retail/Public facilities etc. **Trips 1-2-5** is a home-based tour. **Trip 3-4** is a work-based subtour.

Figure 2: EGSIM20 Example Travel Diary



Full Accounting

Full Accounting of VMT accounts for vehicle travel that occurs outside of the model area. This is done in the EGSIM20 by using IX-XI trips and average trip distance outside SACOG region. The average trip length outside of the SACOG region was calculated using Replica (Spring 2019) mobility data.

Household Generated VMT

Household Generated VMT applies to all residential land uses. This includes All VMT from vehicle tours (both work/commute vehicle tours and non-work vehicle tours) that start and end at residential units. **Tours *1-2-5* and *6-7*** in **Figure 2** are examples of such tours. Trips made by a household resident that do not begin or end at home (e.g., midday travel from a worksite for lunch or personal business) are also included in the household generated VMT estimates. **Subtour *3-4*** from **Figure 2** is an example of non-home-based tour.

Employment Center Generated Work Tour VMT

Employment Center Generated Work Tour VMT applies to office/business professional and industrial employment land uses. This VMT includes all work/commute vehicle tours that start and end at the worksite (including intermediate stops). **Tour *1-2-5*** in **Figure 2** is an example of a commute tour. Work-based subtours tours that start and end at employment locations are also included. **Tour *3-4*** in **Figure 2** is an example of work based sub-tour.

Retail/Public facilities Generated VMT

Retail/Public facilities Generated VMT applies to retail or public facilities projects. This VMT includes all work/commute vehicle tours that start and end at the retail/public facility site (including intermediate stops). **Tour *1-2-5*** in **Figure 2** is an example of a commute tour. Work based subtours tours that start and end at employment location are also included. **Tour *3-4*** in **Figure 2** is an example of work based sub-tour. VMT associated with retail/public facility uses that are not commute tours are also included. **Tour *6-7*** in **Figure 2** is an example of "Other" tours. Other tours are only included for the following trip purposes only:

- Shopping
- Meal
- Personal Business/ Medical

VMT Efficiency by Land Use Category

VMT Efficiency by Land Use Category is the ratio of total VMT for each parcel containing a specific land use designation and total service population for that parcel. For example, sum all the VMT from parcels designated as "Low density household" within City of Elk Grove and divide it by the total service population within the City for the same parcels to get VMT per service population for the Low-Density Household category.

VMT Efficiency Metric Calculation Methodology

Internal-Internal (II) VMT for EGSIM20 is calculated by using the trip and tour diaries created through the activity generation portion of the model (DaySim) and added to IX-XI VMT, calculated using additional processes outside of DaySIM. The main steps in calculating the VMT efficiency metrics are discussed below.

Run Scripts

When the EGSIM20 run completes, it produces the *_trips.tsv* file, which is a table of all internal-internal trips. However, because the trip distance in the original table is estimated based on the congested speed prior to the last global iteration, the user must run a Cube Voyage script[1], to estimate the distance based on the final iteration network congestion. The output of this supplementary Cube script is a CSV file, "_trip_1_1.csv," which has the same table as _trips.tsv but with the following attributes added to each trip:

- timeau – Updated travel time by auto
- distau – Updated trip distance by auto
- distcong – Congested distance

After running the first script, another Cube Voyager script[1] is run to compute VMT and other variables for both IX-XI and commercial trips. The following files are the output of the second script:

- *ixxi_taz.dbf* – This includes trips and VMT on Gateways for each TAZ.
- *cveh_taz.dbf* – This includes commercial vehicle trips for each TAZ.

Internal-Internal VMT

Using the trips_1_1.csv file, each vehicle trip's VMT is calculated using the following formulas. Factors are applied to the trip distance based on trip MODE.

- If MODE = 3 (DA), $VMT = distau$
- If MODE = 4 (HOV2), $VMT = distau * 0.5$
- If MODE = 5 (HOVE3+), $VMT = distau * 0.3$

Where,

distau = updated trip distance by auto
DA = Drive Alone
HOV2 = High Occupancy Vehicle or Shared Drive 2
HOV3+ = High Occupancy Vehicle or Shared Drive 3 or more

[1] SACOG, VMT Computation Procedures – DRAFT, https://www.sacog.org/sites/main/files/file-attachments/draft_sacsim_vmt_calculation_procedures_0.pdf?1601488966

IX-XI VMT by TAZ

SACOG methodology for calculating VMT outside the region[2] were followed for this process. The file Outside_sacog_vmt_estimation_steps_0_new_method.xlsx excel tool created by SACOG[3] was modified to incorporate new TAZ, land use, and external worker data. The output of this tool includes the following:

- Total IX-XI VMT by TAZ for external household generated VMT. This is completed by multiplying all external trips for each TAZ with the average estimated trip distance outside the region, which was estimated using Replica (Spring 2019) mobility data.
- Household generated IX-XI VMT or External Travel by residents for each TAZ is calculated using the following formula:

$$IXXI_{VMT_{RES}} = \left(IX_{VMT\_I} + XI_{VMT\_I}\right) * \left(\frac{HH}{(1 + HH + 1.1 * (EMPTOT - FOOD - RET - 0.25 * SVC))}\right.$$

Where:

$IXXI_{VMT\_RES}$ = internal-external VMT made by SACOG residents
IX_{VMT_I} = VMT originating at zone I
IX_{VMT_I} = VMT ending at zone I
HH = Households in zone I
EMPTOT = Jobs in zone I
FOOD = Jobs in Food sector in zone I
RET = Retail jobs in zone I
SVC = Service Jobs in zone I

- Work tour IX-XI VMT by TAZ for external employment/retail VMT. This is completed by multiplying the vehicle trips by external worker for each TAZ with the average estimated trip distance outside the region using Replica (Spring 2019) mobility data. Vehicle trips by external worker are calculated using the following formula.

$$Vehicle\ Trips\ by\ External\ Worker\ =\ External\ Worker\ *\ 1.7\ *\ (0.89 + 0.11/2.34)$$

Where:

1.7 – Person to Vehicle Trip Factor
0.89 – drive alone trip mode share
0.11 – shared ride trip mode share
2.34- shared ride vehicle occupancy factor

[2] SACOG, SACOG Outside the Region VMT Estimation, https://www.sacog.org/sites/main/files/file-attachments/draft_vmt_ixxi_documentation_0.pdf?1622243676
[3] https://www.sacog.org/sites/main/files/file-attachments/outside_sacog_vmt_estimation_steps_0_0.xlsx?1626798833

Household Generated VMT by Parcel

All household generated II VMT are summed for each parcel as described above.

All household generated IX-XI VMT or external travel by residents for each TAZ (as described above) are divided by total population of each TAZ to calculate Household generated IX-XI VMT per person per TAZ.

- Household generated IX-XI VMT for each parcel is then calculated multiplying household size for the parcel and Household generated IX-XI VMT rate for the TAZ that the parcel belongs to.
- Finally, the II and IX-XI VMT for each parcel is summed to get total household generated VMT.

Employment Center Generated Work Tour

- VMT from II work tours as described above are summed for each employment parcel.
- Work tour IX-XI or VMT by external workers (as described above) for each TAZ is divided by external employees for respective TAZ. This results in the rate of IX-XI VMT by external workers for each TAZ.
- Employment center generated IX-XI work VMT for each parcel is then calculated multiplying the number of employees and rate of IX-XI VMT by external workers for the respective TAZ that the parcel belongs to.
- Finally, the II and IX-XI VMT for each employment center parcel is summed to get total employment center generated VMT.

Retail/Public facilities Generated VMT

VMT from II tours as described above are summed for each retail or public facilities parcel.

Work tour IX-XI or VMT by external workers (as described above) for each TAZ is divided by external employees for respective TAZ. This results in the rate of IX-XI VMT by external workers for each TAZ.

Retail/public facilities generated IX-XI work VMT for each parcel is then calculated multiplying number of employees and rate of IX-XI VMT by external workers for respective TAZ that the parcel belongs to.

Finally, the II and IX-XI VMT for each retail/public facility parcel is summed to get total retail/public facilities generated VMT.

Table 1 compares the three major types of VMT metrics calculated using EGSIM20.

Table 1: VMT Methodology Comparison by Project Type

VMT Analysis		Residential Projects	Office/ Industrial Projects	Retail/ Public Facilities Projects
Analysis Methodology		Household generated VMT per service population	Work Tour VMT per service population (1)	Retail/Public facilities Generated VMT per service population
HBW (2)	1-2-5	Y	Y	Y
HBO (3)	6-7	Y	N	Y(8)
NHB (4)	3-4	Y	Y	Y
IX-XI (5)	External travel by residents	Y	N	N
	Travel by external workers	N	Y	Y
XX (6)		N	N	N
Commercial Vehicle (7)		N	N	N

Notes
1 - Service Population = Residents + Employees + Students
2 - HBW = Home-based work tour, includes intermediate stops
3 - HBO = Home-based other tour (shopping, personal business, medical, school, recreational etc.), includes intermediate stops
4 - NHB = Non-Home-based tour (tour that begin and end at a non-home location i.e., subtours), includes intermediate stops
5 - IX-XI = Internal-External / External-Internal,
External work travel by residents who reside within SACOG but work outside the region.
Travel by workers that reside outside SACOG region but work within the region.
6 - XX = External-External Travel, Trips that do not have any stops within SACOG region
7 - Commercial Vehicle = Trips by commercial vehicles (small-large trucks)
1 - Only includes Customer/Visitor Tour (Tours at employment location by people who do not work there). The following trip purposes are included:
-- Personal Business/ Medical
-- Shop
-- Meal

VMT Per Service Population by Land Use Type

All the VMT generated by the three types of projects are summed to get total VMT by each parcel. Then the total VMT is divided by service population to get VMT per service population or each parcel. The data is then summarized by land use type to get the VMT per service population by LU type.

VMT Threshold Estimation

All the VMT generated by the three types of projects are summed to get total VMT by each parcel. Then the total VMT is divided by service population to get VMT per service population or each parcel. The data is then summarized by land use type to get the VMT per service population by LU type.

The EGSIM20 Travel Demand Model is a tool for implementing the General Plan (i.e., like General Plan policy and actions), like Policy MOB-1-1. Consistent with CEQA Guidelines, § 15064.7, the City selected VMT per service population as the preferred performance metric, for implementing its VMT policy. The

VMT per service population metric is useful since it captures these trip reduction benefits and accounts for travel from the full range of users and not just residents or just workers.

With the development of EGSIM20 and associated calibration and revalidation, the VMT performance measures were re-estimated to provide a consistent basis of evaluating the Project, a key requirement of SB 743, to ensure that the effects of the Project are accurately identified. **Tables 2 and 3** summarize the VMT limits at General Plan Buildout (i.e., for the City limits and study areas) and VMT by General Plan land use category, respectively, using the VMT calculation methodology outlined above.

Table 2: Daily VMT Limit by Study Area (Re-estimated)

City Limit and Study Areas	VMT Limit
City Limit	8,066,247
North Study Area	27,383
East Study Area	584,786
South Study Area	1,594,674
West Study Area	773,103

Source: Fehr & Peers, 2024

Table 3: Daily VMT Per Service Population by Land Use Category (Re-estimated)

Land Use Designation	VMT Per Service Population	
	Base Year (2020)	VMT Limit[1]
Commercial and Employment		
Community Commercial (CC)	31.4	26.7
Regional Commercial (RC)	31.7	27.0
Employment Center (EC)	23.8	20.2
Light Industrial/Flex (LI/FX)		22.5
Light Industrial (LI)	26.4	22.5
Heavy Industrial (HI)	31.2	26.5
Mixed Use		
Village Center Mixed Use (VCMU)	-	19.7
Residential Mixed Use (RMU)	-	18.8
Transect		
General Neighborhood Residential (T3-R)	-	20.7
Neighborhood Center Low (T3)	-	21.1
Neighborhood Center Medium (T4)	-	20.2
Neighborhood Center High (T5)	-	15.7
Public/Quasi Public and Open Space		
Parks and Open Space(P/OS)	-	NA[2]
Resource Management and Conservations (RMC)	-	NA[2]
Public Services (PS)	-	-
Residential		
Rural Residential (RR)	29.6	25.2
Estate Residential (ER)	24.2	20.6
Low Density Residential (LDR)	22.7	19.3
Medium Density Residential (MDR)	21.0	17.9
High Density Residential (HDR)	20.8	17.7
Other		
Agriculture (AG)	-	-

Notes

1 - VMT Limit is 85% of average base year VMT per service population for parcels with land use designation or VMT per service population at buildout for land use designation that do not exist in the base year.

2 - These land use designations are not anticipated to produce substantial VMT, as they have no residents and few to not employees.

Source: Fehr & Peers, 2024

The analysis of Project vehicle miles traveled (VMT), relative to the re-estimated VMT limits and VMT by General Plan land use category presented in **Tables 2 and 3** above, is discussed above.

VMT Screening

The proposed Project does not qualify for VMT screening due to the Project size and consistency with the General Plan land uses (i.e., type and intensity) analyzed to set the VMT study area and land use limits.

VMT by General Plan Land Use Category

Table 4 compares the Project's VMT per service population (i.e., employees, students, patients, and visitors) to the City's VMT limit for that land use (which incorporates a 15% reduction in total VMT from the 2020 baseline). As shown in **Table 4**, the Project's residential land uses would perform better than the established VMT limit for medium density residential land use.

Table 4: VMT by Land Use Designation Limits – Buildout Conditions

General Plan Land Use Designation	VMT Per Service Population		Limit Exceeded
	Limit	Project	
Medium Density Residential	17.9	17.2	No

Source: Fehr & Peers, 2024

VMT by Study Area Limits

Table 5 compares the City Limit total VMT limit to the City Limit VMT limit with buildout of the proposed Project. As shown in **Table 5**, the addition of the Project would not cause cumulative VMT to exceed the established City Limit Total VMT.

Table 5: Study Area VMT Limit – Buildout Conditions

Study Area	VMT Per Service Population		Limit Exceeded
	Limit	Project	
City Limit	8,066,247	8,060,760	No

Source: Fehr & Peers, 2024

Other CEQA Considerations

The following discusses the conditions of bicycle facilities, pedestrian facilities, transit service, and roadway design targets with the addition of the proposed Project.

Table 6 compares the daily, AM peak hour, and PM peak hour trip generation with the Elk Grove General Plan and the proposed Project land uses. As shown, the proposed Project would generate fewer daily, AM peak hour, and PM peak hour trips.

Table 6: Trip Generation Comparison

Lane Use		Units	Quantity	Trip Generation[1]		
				Daily	Peak Hour	
					AM	PM
Elk Grove General Plan Buildout	Regional Commercial (RC)[2]	1,000 Square Feet	157	5,811	132	534
Proposed Project	Medium Density Residential (RD-10[3]	Dwelling Units	111	1,047	78	104
Difference (Proposed Project – Elk Grove General Plan)				**-4,764**	**-54**	**-430**

1 Trip Generation Manual, 11th Edition
2 ITE Code 820 – Shopping Center (>150k). Square footage based on acreage of project site and a floor-to-area (FAR) of 0.25.
3 ITE Code 210 – Single Family Detached Housing
Source: Fehr & Peers, 2024

Bicycle Facilities

Bicycle LTS refers to the comfort associated with roadways, or the mental ease people experience riding on them. Metrics for bicycling LTS were developed at the Mineta Transportation Institute (MTI) and published in the report "Low-Stress Bicycling and Network Connectivity."4 The criteria establish a "weakest link" approach, as roadways are classified based on their segments with the highest level of traffic stress, assuming that only those that are comfortable riding under the higher stress would travel on that road. Factors influencing LTS include:

- Number of travel lanes
- Speed of traffic
- Number of vehicles
- Presence of bike lanes

[4] Mekuria, Maaza C., Peter G. Furth, and Hilary Nixon, (2012). *Low-Stress Bicycling and Network Connectivity*. San Jose, California: Mineta Transportation Institute.

- Width of bike lanes
- Presence of physical barrier

Bicycle riders vary in experience, skill, ability, and confidence. As such, they rely on the bikeway system to cater to their specific needs and abilities. Some cyclists are more comfortable riding in traffic and value bikeways and routes that are direct and limit unnecessary delay. They more comfortably utilize facilities that share the roadway with automobiles or have limited bicycle infrastructure. People with limited bicycling confidence and lower or developing skill levels such as children and older adult riders may desire more separation from traffic to feel comfortable enough to ride. Different bicycle types also require more space in bicycle facilities, such as trailers for children or cargo or adult tricycles. For these reasons, facilities should be designed to accommodate the lowest skill levels, especially in heavily traveled areas.

Recent research has correlated these different bicycle riders with the level of "traffic stress" they are willing to experience while cycling. Bicycle LTS criteria span from 1 to 4, with 1 being the least stressful and 4 being the most stressful:

- **LTS 1:** Most children and elderly riders can tolerate this level of stress and feel safe and comfortable. LTS 1 roadways typically require more separation from traffic.
- **LTS 2:** This is the highest level of stress that the mainstream adult population will tolerate while still feeling safe.
- **LTS 3:** Bicyclists who are considered "enthused and confident" but still prefer having their own dedicated space for riding will tolerate this level of stress and feel safe while bicycling.
- **LTS 4:** For bicyclists, this is tolerated only by those characterized as "strong and fearless," which comprises a small percentage of the population. These roadways have high speed limits, multiple travel lanes, limited or non-existent bike lanes and signage, and large distances to cross at intersections.

Class II bike lanes (on-street with signage and striping) are provided in both directions on W. Stockton Boulevard. Bike lanes are not currently provided on Dunisch Road. The City of Elk Grove Bicycle, Pedestrian, & Trails Master Plan (May 2021) identifies W. Stockton Boulevard as Bicycle LTS 3. With lower trip generation and VMT, the proposed Project would not worsen the Bicycle LTS. Also, the proposed Project will improve the Project frontages, consistent with the existing street sections on Dunisch Road and W. Stockton Boulevard. In addition, the Project's 20-foot paseo connects the project to W. Stockton Boulevard just north of the W. Stockton Boulevard/Laguna Gateway intersection, which will provide a more direct connection between the project and the Laguna Gateway commercial area.

Pedestrian Facilities

The Pedestrian Streetscore+ Level of Traffic Stress (LTS) refers to the pedestrian comfort associated with a roadway or intersection.

The Pedestrian LTS methodology builds on Mekuria, Furth, and Nixon's 2012 Low Stress Bicycling and Network Connectivity report and LTS methodology with a corresponding index for pedestrian comfort. A tool to evaluate Pedestrian and Bicycle LTS called Streetscore+ was developed by Fehr & Peers and includes recommended parameters for the pedestrian environment provided by the NACTO Urban Streets Design Guide (USDG) and additional considerations of comfort informed by practitioner and best practice experience. Roadway segments and intersection approaches receive individual scores based on different considerations. The following factors are considered in developing the Pedestrian Streetscore+ for roadways and intersections:

Roadways	**Intersections**
Usable sidewalk space	Crossing distance
Driveways	Accessibility
Pedestrian-scale lighting	Channelized right-turns
Street trees and landscaping	Leading pedestrian intervals (LPIs) and pedestrian scrambles
Speed	
Sidewalk quality	
Number of travel lanes	
Heavy vehicle volumes	
Crosswalk frequency	

The Pedestrian Streetscore+ uses a scale that ranges from 1 to 4:

- **Streetscore+ 1:** Highly comfortable, pedestrian-friendly, and easily navigable for pedestrians of all ages and abilities, including seniors or school-aged children walking unaccompanied to school. These streets provide an ideal "pedestrian-friendly" environment.

- **Streetscore+ 2:** Generally comfortable for many pedestrians, but parents may not feel comfortable with children walking alone. Seniors may have concerns about the walking environment and take more caution. These streets may be part of a "pedestrian-friendly" environment where it intersects with a more auto-oriented roadway or other environmental constraints.

- **Streetscore+ 3:** Walking is uncomfortable but possible. Minimum sidewalk and crossing facilities may be present, but barriers are also present that make the walking experience uninviting and uncomfortable.

- **Streetscore+ 4:** Walking is a barrier and is very uncomfortable or even impossible. Streets have limited or no accommodation for pedestrians and are inhospitable and possibly unsafe environment for pedestrians.

Pedestrian facilities are provided along improved frontages on W. Stockton Boulevard and Dunisch Road. Most sidewalks are buffered from the roadway by landscape planters. **Table 7** summarizes pedestrian LTS with the addition of the proposed Project. As shown in **Table 7**, the addition of the proposed Project will not degrade the Pedestrian Streetscore LTS.

Table 7: Pedestrian Streetscore LTS

Roadway Segment	LTS	
	Current Conditions	With Project
W. Stockton Boulevard	3	3

Source: Fehr & Peers, 2024

Transit Service

Transit service within the study area is provided by Regional Transit. Currently, the closest service to the proposed Project is Commuter Route E19, Local Route E110, and Local Route E113. Near the Project site, these routes run on Laguna Boulevard and Big Horn Boulevard with service to/from the Laguna Town Hall/Butterfield Light Rail Station (Route E19), Cosumnes River College Light Rail Station/Sky River Casino (E110), and Laguna Town Hall/Elk Grove City Hall/Elk Grove Library/Elk Grove High School/Elk Grove Corp Yard (Route E113).

Elk Grove Transit (e-tran), which is currently operated by Sacramento Regional Transit, receives funding from state sources (Transit Development Act [TDA] funds), federal sources (Federal Transportation Administration), and through fare collection. State and federal funds are generally allocated based on population, with a portion of TDA funds derived from a ¼-cent general sales tax and a sales tax on diesel fuel. Therefore, development of the proposed Project would increase funding for transit, through these sources, because of population growth.

The Federal Transit Administration maintains a database of transit system performance. The City of Elk Grove 2021 Annual Agency Profile5 identifies that local bus service had unlinked trips per vehicle revenue hour of 2.2, or about 2 passengers per hour. Generally, this level of performance is indicative of low demand and productivity. Routes performing at this level would have excess seated and standing capacity. Consequently, the proposed Project would not create demand for public transit services above the crush load capacity of the transit system.

Roadways

General Plan Policy MOB-1-4 includes performance targets for intersections and roadways. The objective of the policy is to balance the effectiveness of design requirements to achieve the targets with the character of the surrounding area, cost, and maintenance. The General Plan Transportation Network Diagram reflects the implementation of roadway performance targets at General Plan Buildout. W. Stockton Boulevard is four lanes from Laguna Boulevard through the Laguna Gateway commercial center that transitions to two lanes prior to Dunisch Road. W. Stockton Boulevard is not specifically identified in the General Plan Transportation Network Diagram (Figure 3-6).

[5] https://www.transit.dot.gov/sites/fta.dot.gov/files/transit_agency_profile_doc/2021/90205.pdf

As outlined above, the proposed Project would generate fewer daily trips, AM peak hour, and PM peak hour trips. Therefore, since the Project would result in less daily and peak hour traffic compared to the trip generation compared to the trip generation of the General Plan Regional Commercial (RC) land use designation, the Project would not change the classification of W. Stockton Boulevard (i.e., or other adjacent roadways) needed to accommodate buildout of the General Plan.