DOCKETED	
Docket Number:	24-OPT-02
Project Title:	Compass Battery Energy Storage
TN #:	255584
Document Title:	Appendix 4-15A_Stormwater Management Plan Part 1
Description:	The appendix describes the proposed stormwater management plan and analysis in accordance with the requirements set forth by the Technical Guidance Document (TGD) (Reference 6.1) for South Orange County, the Orange County Local Drainage Manual (Reference 6.2) and the City of San Juan Capistrano.
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Organization:	Dudek
Submitter Role:	Applicant Consultant
Submission Date:	4/8/2024 4:30:51 PM
Docketed Date:	4/8/2024

Appendix 4.15A
Stormwater Management Plan

PRELIMINARY DRAINAGE AND HYDROLOGY STUDY FOR THE COMPASS BATTERY STORAGE PROJECT

ENGINEER CERTIFICATION:

I HEREBY CERTIFY THAT ALL PROPOSED WORK SHOWN ON THESE DOCUMENTS WAS PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA, LICENSE NO.72627, EXPIRATION DATE: 6/30/2024

_____ _____

SIGNATURE DATE

BRIAN C. WOOD

PREPARED BY: GRANT JARRETT DATE: 02/23/2024

REVIEWED BY: NIKHIL PATEL DATE: 02/23/2024

This is to confirm that this Stormwater Management Report has been prepared, reviewed, and approved in accordance with Sargent & Lundy's Standard Operating Procedure SOP-0405, which is based on ANSI/ISO/ASQC Q9001 Quality Management Systems.

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LIST OF ATTACHMENTS

1. PURPOSE

Sargent & Lundy has prepared this Stormwater Management report to support the construction of the Compass Battery Storage Project. The site is located in Orange County, California and falls under the jurisdictional area of the San Diego Region. This report describes the proposed stormwater management plan and analysis in accordance with the requirements set forth by the Technical Guidance Document (TGD) (Reference 6.1) for South Orange County, the Orange County Local Drainage Manual (Reference 6.2) and the City of San Juan Capistrano. The site is located in an area of minimal flood hazard (Zone X) outside of the 100-year flood boundary, as shown on FEMA Flood Insurance Map # 06059C0441J, dated December 3, 2009, in Attachment 11.

Existing Site Description:

The existing site is located south of the Saddleback Church at 29251 Camino Capistrano, San Juan Capistrano, California. Positioned at the base of a steep hill, 58.62 acres of offsite and 10.18 acres of onsite flow drains eastward into Oso Creek with a combined total of 68.80 acres. (Attachments 6 and 8). With hill grades as high as 50% near the top, the combined catchments can be characterized as having high discharge rates and low times of concentration.

Proposed Site Description:

The proposed site modifications will utilize 11.84 acres within the limits of the Battery Storage project. The site will consist of gravel, impervious surfaces, pavement, two seeded drainage channels, a level spreader, and a 20-foot vegetative buffer around the perimeter of the site. Gravel surfacing is for equipment islands, pavement surfacing is for roads, and impervious surfaces are for foundations and buildings. Site surfacing can be seen in Attachment 7.

10.18 acres of this development will be considered as the onsite drainage area while the remaining 1.66 acres of development used to implement drainage structures that manage flows unintended for subterranean storage will be counted as part of the offsite drainage area. Stormwater runoff from 10.18 acres of the site and 13.91 acres of offsite flow will be collected by a storm drain system and conveyed to an underground detention basin. The storm drain system will intake stormwater via gravity flow and a force main system will be used to discharge the collected stormwater. The buried underground detention basin is being provided by the vendor Advanced Drainage Systems (ADS) and will be implemented in accordance with the South Orange County TGD (Reference 6.1) and the South Orange County WQMP checklist (Reference 6.4), to meet the stormwater management requirements for an underground detention basin on the project site. The below grade detention system will discharge into a sump and be pumped north to an existing outfall. Water pumped to the existing outfall will then discharge into a channelized segment of Oso Creek. Table 1 summarizes the pre-construction and post-construction surface conditions of the site.

Offsite Drainage Area:

Runoff from the 58.62 acres west of the site that currently drains through the proposed site to Oso Creek will be subdivided into three sub catchments known as Offsite Drainage Area North, Offsite Drainage Area West, and Offsite Drainage Area South. 13.91 acres of runoff from Offsite Drainage Area North, as noted above, will be collected via a storm drain system and incorporated into the underground detention system along with the Onsite runoff. 16.98 acres of runoff from Offsite Drainage Area West and 27.70 acres of runoff from Offsite Drainage Area South will be intercepted and rerouted using a drainage ditch to prevent these flows from draining through the site. A high point in the drainage ditch will be used to separate flows from Offsite Drainage Area West and Offsite Drainage Area South. Offsite Drainage Area West will be collected in one portion of the drainage ditch and will flow into a double barrel box culvert that runs at grade underneath the site. The double barrel box culvert will then discharge into a riprap protected grass lined swale that then terminates into the northern portion of the proposed level spreader. Offsite Drainage Area South will be collected in the other portion of the drainage ditch and will wrap around the south of the site, discharging into the midpoint of the proposed level spreader. The proposed level spreader will receive flow from both Drainage area West and South and will maintain offsite peak flow at or below predeveloped peak flow rates to prevent increased erosion caused by discharge into Oso Creek. The areas and surface conditions of the offsite drainage areas are summarized in Table 1A (Attachment 9).

Table 1 – Surface Condition Site Area Summary

Area Type	Existing Area (ac) (Attachment 6)	Proposed Area (ac) (Attachment 7)
Total Area	10.18	10.18
Grass	8.38	0.00
Gravel	0.82	6.58
Pavement	0.00	3.55
Impervious	0.98	0.05

Table 1A – Surface Condition Offsite Area Summary

Area Type	Existing Area (ac) (Attachment 8)	Offsite Drainage Area North (ac) (Attachment 9)	Offsite Drainage Area West (ac) (Attachment 9)	Offsite Drainage Area South (ac) (Attachment 9)
Total Area	58.62	13.91	17.01	27.70
Grass (Good)	0.00	0.10	0.85	0.41
Grass (Fair)	56.83	13.57	15.45	26.27
Exposed Soil	1.79	0.24	0.61	0.92
Water Impoundment	0.00	0.00	0.10	0.10

2. METHODOLOGY AND ACCEPTANCE CRITERIA

The area of disturbance for the proposed development is approximately 11.84 acres. Per Section 1.2.4 (a) of the TGD, "new development projects that create 10,000 square feet or more of impervious surfaces (collectively over the entire project site)" is a priority project. The proposed development project is therefore classified as a priority project and thus require Hydromodification Control.

This report specifically addresses the stormwater management plan for the proposed Battery Storage project and describes the plan/analysis in accordance with the TGD.

An underground detention basin was selected in order to maximize the utilization of land within the proposed site limits. Due to higher percolation rates of the top five feet of soil compared to the soil below, there is the potential for perched water. This perched water can allow lateral movement, and therefore the basin will not allow infiltration. This can be seen on page 10 of the Geotechnical Report in Attachment 12.

Stormwater Analysis:
PondPack Connect Edition was used in the stormwater analysis. The PondPack model output provided peak runoff rates and total runoff volumes for the site under both pre and post construction conditions, based on the rainfall data provided in Attachment 1.

Runoff volumes and rates were calculated using curve numbers considering the soil type and cover type, as provided in Technical Release 55 (Reference 6.3). Soil types were determined using NRCS soil survey maps. The NRCS soil maps used are contained in Attachment 10.

According to the TGD (Reference 6.1), a detention basin shall have a 36–48-hour drawdown time. This will be managed by the pumping structure outside of the basin. The underground detention basin will discharge to Oso Creek. This will be accomplished by pumping the stormwater north of the proposed site to an existing outfall that discharges to a channelized portion of Oso Creek using an underground force main.

Stormwater conditions for the 25-year and 100-year storm events were simulated using PondPack on S&L PC No. PL14854. Because the site is below 2,000 feet in elevation, the rainfall depths used were from Figure B-3 in the Orange County Hydrology Manual. This data is contained within the report as Attachment 1.

The Storm Sewer Analysis

The onsite storm sewer system was designed to convey the 10.18 acres of flow from within the Battery Storage area to the underground detention basin. The offsite storm sewer system was designed to convey the 13.91 acres of flow from the Offsite Drainage Area North sub catchment. The standards for the storm sewer design are established by Orange County Local Drainage Manual in Section 4.2.1.2 (Reference 6.2). Sheet flow across the site will be collected by inlets spaced along the eastern edge of the site that direct flow to the underground detention basin while sheet flow from the northern drainage area will be collected by inlets spaced along the northern limits of grading that also direct flow to the underground detention basin.

The Orange County Local Drainage Manual specified a minimum of 18” diameter pipes, as well as a minimum velocity of 3 ft/s for the 25-year storm event. The county requirements also specify using a minimum cover of 30” for Reinforced Concrete Pipe, which has a manning’s n value of 0.013.

3. DESIGN ASSUMPTIONS AND INPUTS

Groundwater Elevations:

Based on the subsurface investigation prepared by Terracon Consultants in Attachment 12, groundwater seepage was not indicated within the exploration test pit. Test pits I-1, and I-2 are near the area where the underground detention basin will be placed, Borings B-002 and B-003 are also near footprint of the underground detention basin. The site was relocated further north from the time the borings were taken so there are not borings taken at the northern portion of the site, however, the borings included in the report are representative of the overall site soils. According to the subsurface investigation, groundwater was not observed in the test pits within the basin limits (see pages 114 through 119 of the Geotechnical Report in Attachment 12) which extend to EL. 199.00.

Permeability Rates:

The subsurface investigation shows that the lowest infiltration rate between P-3, P-4, P-7, and P-8 was 0.04 in/hr (as shown in Attachment 12). As stated on page 10 of the Geotechnical Report, percolation rates were higher in the surface soils than the deeper soils, which could lead to perched water conditions on top of the underlying less permeable soils. This perched water could move laterally, and therefore, infiltration will not be considered within the underground storage design.

Land Cover Type

The existing site is a combination of Hydrologic Soil Groups (HSG) A, C and D. The existing site is covered by grass, gravel, and an impervious surface. This can be seen in Attachments 6 and 10. Curve numbers are taken from the NRCS TR-55 (Reference 6.3). Because the site is a combination of soil types and surfacing, a composite curve number was used. Below are tables outlining these calculations.

Table 2A – Pre-Existing Composite Curve Number Onsite

Onsite Drainage Area						
HSG	Impervious		Dirt		Grass (Fair)	
	CN	Acres	CN	Acres	CN	Acres
A	98	0.98	72	0.42	49	3.39
C	98	0.00	87	0.40	79	4.29
D	98	0.00	89	0.00	84	0.71
Composite	71.212					

Table 2B – Pre-Construction Composite Curve Number Offsite

OffSite Drainage Area				
HSG	Grass (Fair)		Dirt	
	CN	Acres	CN	Acres
A	49	1.00	72	0.04
C	79	7.34	87	0.36
D	84	48.49	89	1.38
Composite	82.906			

Table 2B.1 – Post-Construction Composite Curve Number Offsite Drainage Area North

OffSite Drainage Area North						
HSG	Grass (Good)		Grass (Fair)		Dirt	
	CN	Acres	CN	Acres	CN	Acres
A	39	0.04	49	0.43	72	0.04
C	74	0.06	79	1.75	87	0.16
D	80	0.00	84	11.38	89	0.04
Composite	82.131					

Table 2B.2 – Post-Construction Composite Curve Number Offsite Drainage Area West

OffSite Drainage Area West								
HSG	Grass (Good)		Grass (Fair)		Dirt		Water Impoundment	
	CN	Acres	CN	Acres	CN	Acres	CN	Acres
A	39	0.22	49	0.00	72	0.00	100	0.10
C	74	0.24	79	1.01	87	0.00	100	0.00
D	80	0.39	84	14.44	89	0.61	100	0.00
Composite	83.171							

Table 2B.2 – Post-Construction Composite Curve Number Offsite Drainage Area South

OffSite Drainage Area South								
HSG	Grass (Good)		Grass (Fair)		Dirt		Water Impoundment	
	CN	Acres	CN	Acres	CN	Acres	CN	Acres
A	39	0.04	49	0.00	72	0.00	100	0.10
C	74	0.37	79	3.97	87	0.19	100	0.00
D	80	0.00	84	22.30	89	0.73	100	0.00
Composite	83.299							

Table 2C – Post-Construction Composite Curve Number Onsite

Onsite Drainage Area Post-Dev						
HSG	Impervious		Gravel		Pavement	
	CN	Acres	CN	Acres	CN	Acres
A	98	0.00	76	3.00	98	2.00
C	98	0.05	89	3.47	98	1.34
D	98	0.00	91	0.11	98	0.21
Composite	88.375					

Project Area:

The project site area of 11.84 acres is being reconstructed with an onsite drainage area of 10.18 acres and an offsite drainage area of 13.91 acres going to underground storage. The remaining offsite drainage area of 44.71 acres are being rerouted into a level spreader. The additional 1.66 acres of reconstructed area that is not part of the onsite drainage area are allocated to the construction the drainage ditch, grass swale, and level spreader that manage the access stormwater not intended for underground storage. The onsite and offsite area summary is shown in Table 1 and 1A.

4. COMPUTATION AND RESULTS

Pump Discharge

A pump structure consisting of multiple pumps will be provided. The pump structure will be able to provide a maximum pump rate of 1580 GPM (3.520 cfs) and also be capable of pumping at lower rates to accommodate small rainfall events. At the maximum pump rate, a 100-year rainfall event will drawdown within approximately 34.7 hours as shown in attachment 14. The pump design rate will be confirmed in detailed design.

Time of Concentration:

Time of concentration for the pre-construction condition was calculated to be 22.44 minutes for the onsite drainage area and 15.04 minutes for the offsite drainage area. For the post developed condition, the onsite catchment has a calculated time of 5.91 minutes. The northern, western, and southern offsite catchments had an estimated time of concentration of 14.976 minutes, 4.334 minutes, and 7.101 minutes respectively. A minimum of 5 minutes was assumed for time of concentration and was therefore used in the calculation of Offsite Drainage Area West. The time of concentration was calculated per E.2.3 in the TGD as found in Attachment 13.

Twenty-Five-Year Storm:

Modeling of the 25-year storm event shows that the pre-construction stormwater runoff peak discharge is 104.270 cfs from offsite and 9.141 cfs from onsite. The combined post-construction runoff volume from Offsite Drainage Area West and South is 10.867 ac-ft. The combined post-construction runoff volume from Offsite Drainage Area North and Onsite Drainage Area is 6.158 ac-ft from onsite. Calculations for the 25-year pre-construction stormwater runoff modeling are included as Attachment 2, and the 25-year post-construction stormwater runoff modeling results are included as Attachment 4.

One Hundred-Year Storm:

Modeling of the 100-year storm event shows that the pre-construction stormwater runoff peak discharge is 141.775 cfs from offsite and 13.891 cfs from onsite. The combined post-construction runoff volume from Offsite Drainage Area West and South is 14.607 ac-ft. The combined post-construction runoff volume from Offsite Drainage Area North and Onsite Drainage Area is 8.2 ac-ft. Calculations for the 100-year pre-construction stormwater runoff modeling are included as Attachment 3, and the 100-year post-construction stormwater runoff modeling results are included as Attachment 5. Pre- and Post-Construction runoff rates are compared in Table 3 below:

Table 3: Discharge Summary Onsite

Storm Event	Pre-Const. Runoff Rate (cfs)	Post-Const. Peak Discharge (cfs)	Peak Discharge Check	% Reduction in Peak Discharge
25-Yr.	9.141	3.520	OK	61.49%
100-Yr.	13.891	3.520	OK	74.66%

***Post-Const. Peak Discharge = 3.520 cfs under maximum pump capacity**

Table 3B: Discharge Summary Offsite

Storm Event	Pre-Const. Runoff Rate (cfs)	Post-Const. Level Spreader Out (cfs)	Post-Const. PO-7 Out (cfs)	Total Post-Const. Peak Discharge (cfs)	Peak Discharge Check	% Reduction in Peak Discharge
25-Yr.	104.270	98.642	3.520	102.162	OK	2.02%
100-Yr.	141.775	134.034	3.520	137.554	OK	2.98%

5. CONCLUSIONS OF STORMWATER ANALYSIS

Stormwater runoff from the site along with runoff from Offsite Drainage Area North will be pumped to the north of the site to an existing outfall that discharges into Oso Creek. The underground storage provided will have the capacity to handle a 100-year rainfall event and dewater within 36 hours shown in attachment 14. Proposed peak runoff rates, as shown in Tables 3 and 3B, will be maintained at or below existing rates, and thus have a positive impact on the offsite drainage systems.

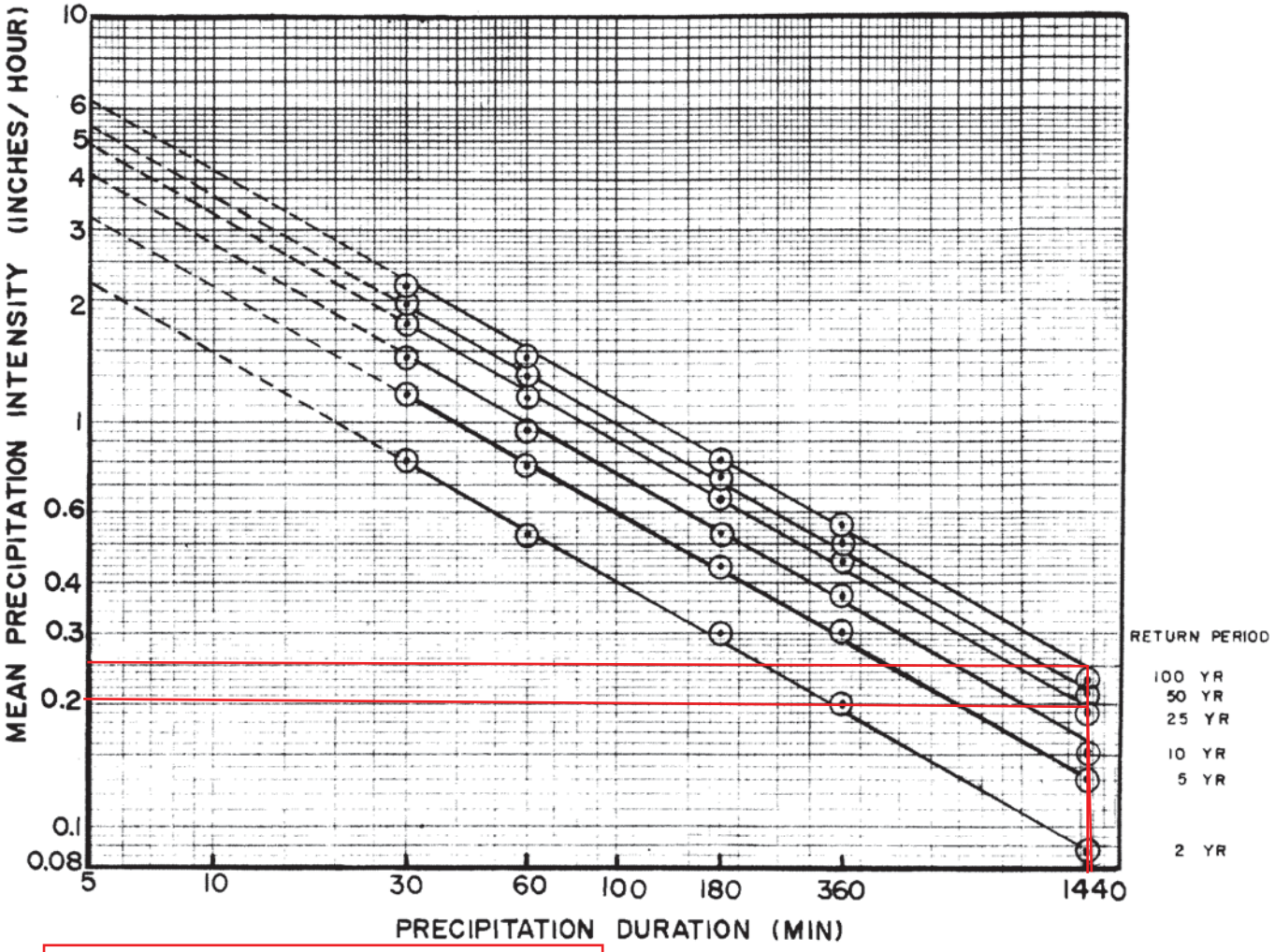
6. REFERENCES

6.1 Technical Guidance Document for South Orange County, Orange County Public Works, December 2018.
6.2 Orange County Local Drainage Manual, Orange County Public Works, August 2021
6.3 Technical Release 55 (TR-55), Urban Hydrology for Small Watersheds, US Department of Agriculture, Natural Resources Conservation Service.
6.4 South Orange County WQMP checklist

Regression Equations: $I(t) = at^b$

(I= Intensity in inches/hour, t= duration in minutes)

Return Frequency (years)	a	b	
2	5.702	-0.574	
5	7.870	-0.562	
10	10.209	-0.573	
25	11.995	-0.566	I(t)= 11.995(1440^(-0.566)) = 0.196 in/hr
50	13.521	-0.566	
100	15.560	-0.573	I(t)= 15.560(1440^(-0.573)) = 0.241 in/hr



100 yr storm = 0.241 in/hr or 5.787 in

25 yr storm = 0.196 in/hr or 4.694 in

ORANGE COUNTY
HYDROLOGY MANUAL

MEAN PRECIPITATION INTENSITIES FOR NONMOUNTAINOUS AREAS

Figure B-3

Scenario Calculation Summary

Scenario Summary	
ID	78
Label	Pre-Dev 25 Year
Notes	
Active Topology	Pre-Dev Active Topology
Hydrology	Pre-Dev Hydrology
Rainfall Runoff	25 Year
Physical	Pre-Dev Physical
Initial Condition	Pre-Dev Initial Condition
Boundary Condition	Pre-Dev Boundary Condition
Infiltration and Inflow	Pre-Dev Infiltration and Inflow
Output	Pre-Dev Output
User Data Extensions	Pre-Dev User Data Extensions
PondPack Engine Calculation Options	Base Calculation Options

Output Summary			
Output Increment	0.025 hours	Duration	36.000 hours

Rainfall Summary			
Return Event Tag	25	Rainfall Type	Time-Depth Curve
Total Depth	4.690 in	Storm Event	25yr_24hr

Executive Summary (Nodes)

Label	Scenario	Return Event (years)	Truncation	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Offsite Drainage Area	Pre-Dev 25 Year	25	None	14.101	10.025	104.270	(N/A)	(N/A)
Onsite Draiange Area	Pre-Dev 25 Year	25	None	1.613	10.125	9.141	(N/A)	(N/A)
Oso Creek	Pre-Dev 25 Year	25	None	15.714	10.050	112.479	(N/A)	(N/A)
Outfall1_Area	Pre-Dev 25 Year	25	None	3.263	10.075	20.721	(N/A)	(N/A)
Outfall2_Area	Pre-Dev 25 Year	25	None	0.495	9.975	3.947	(N/A)	(N/A)
Outfall_1	Pre-Dev 25 Year	25	None	3.263	10.075	20.721	(N/A)	(N/A)
Outfall_2	Pre-Dev 25 Year	25	None	0.495	9.975	3.947	(N/A)	(N/A)

Executive Summary (Links)

Label	Type	Location	Hydrograph Volume (ac-ft)	Peak Time (hours)	Peak Flow (ft^3/s)	End Point	Node Flow Direction

Scenario Calculation Summary

Scenario Summary	
ID	80
Label	Pre-Dev 100 Year
Notes	
Active Topology	Pre-Dev Active Topology
Hydrology	Pre-Dev Hydrology
Rainfall Runoff	100 Year
Physical	Pre-Dev Physical
Initial Condition	Pre-Dev Initial Condition
Boundary Condition	Pre-Dev Boundary Condition
Infiltration and Inflow	Pre-Dev Infiltration and Inflow
Output	Pre-Dev Output
User Data Extensions	Pre-Dev User Data Extensions
PondPack Engine Calculation Options	Base Calculation Options

Output Summary			
Output Increment	0.025 hours	Duration	36.000 hours

Rainfall Summary			
Return Event Tag	100	Rainfall Type	Time-Depth Curve
Total Depth	5.790 in	Storm Event	100yr_24hr

Executive Summary (Nodes)

Label	Scenario	Return Event (years)	Truncation	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Offsite Drainage Area	Pre-Dev 100 Year	100	None	18.990	10.025	141.775	(N/A)	(N/A)
Onsite Draiange Area	Pre-Dev 100 Year	100	None	2.333	10.125	13.891	(N/A)	(N/A)
Oso Creek	Pre-Dev 100 Year	100	None	21.323	10.050	154.099	(N/A)	(N/A)
Outfall1_Area	Pre-Dev 100 Year	100	None	4.633	10.075	30.535	(N/A)	(N/A)
Outfall2_Area	Pre-Dev 100 Year	100	None	0.691	9.975	5.661	(N/A)	(N/A)
Outfall_1	Pre-Dev 100 Year	100	None	4.633	10.075	30.535	(N/A)	(N/A)
Outfall_2	Pre-Dev 100 Year	100	None	0.691	9.975	5.661	(N/A)	(N/A)

Executive Summary (Links)

Label	Type	Location	Hydrograph Volume (ac-ft)	Peak Time (hours)	Peak Flow (ft^3/s)	End Point	Node Flow Direction

Attachment 4

Scenario Calculation Summary

Scenario Summary	
ID	84
Label	Post-Dev 25 Year
Notes	
Active Topology	Post-Dev Active Topology
Hydrology	Post-Dev Hydrology
Rainfall Runoff	25 Year
Physical	Post-Dev Physical
Initial Condition	Post-Dev Initial Condition
Boundary Condition	Post-Dev Boundary Condition
Infiltration and Inflow	Post-Dev Infiltration and Inflow
Output	Post-Dev Output
User Data Extensions	Post-Dev User Data Extensions
PondPack Engine Calculation Options	Base Calculation Options

Output Summary			
Output Increment	0.025 hours	Duration	36.000 hours

Rainfall Summary			
Return Event Tag	25	Rainfall Type	Time-Depth Curve
Total Depth	4.690 in	Storm Event	25yr_24hr

Executive Summary (Nodes)

Label	Scenario	Return Event (years)	Truncation	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Level Spreader (IN)	Post-Dev 25 Year	25	None	10.866	9.925	99.147	(N/A)	(N/A)
Level Spreader (OUT)	Post-Dev 25 Year	25	None	10.594	9.925	98.642	208.18	0.307
Offsite Drainage Area North	Post-Dev 25 Year	25	None	3.263	10.050	24.119	(N/A)	(N/A)
Offsite Drainage Area South	Post-Dev 25 Year	25	None	6.748	9.950	60.310	(N/A)	(N/A)
Offsite Drainage Area West	Post-Dev 25 Year	25	None	4.119	9.925	39.393	(N/A)	(N/A)
Onsite Drainage area	Post-Dev 25 Year	25	None	2.895	9.925	27.144	(N/A)	(N/A)
Oso Creek	Post-Dev 25 Year	25	None	10.594	9.925	98.642	(N/A)	(N/A)
Outfall1_Area	Post-Dev 25 Year	25	None	3.263	10.075	20.721	(N/A)	(N/A)

Scenario Calculation Summary

Executive Summary (Nodes)

Label	Scenario	Return Event (years)	Truncation	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Outfall2_Area	Post-Dev 25 Year	25	None	0.495	9.975	3.947	(N/A)	(N/A)
Outfall_1	Post-Dev 25 Year	25	None	3.263	10.075	20.721	(N/A)	(N/A)
Outfall_2	Post-Dev 25 Year	25	None	6.653	9.975	7.467	(N/A)	(N/A)
PO-7 (IN)	Post-Dev 25 Year	25	None	6.158	9.950	46.484	(N/A)	(N/A)
PO-7 (OUT)	Post-Dev 25 Year	25	None	6.158	8.875	3.520	3.36	2.273

Executive Summary (Links)

Label	Type	Location	Hydrograph Volume (ac-ft)	Peak Time (hours)	Peak Flow (ft^3/s)	End Point	Node Flow Direction
Outlet-5	Pond Outlet	Upstream	6.158	9.950	46.484	PO-7	Pond Inflow
Outlet-5	Pond Outlet	Outflow	6.158	8.875	3.520	PO-7	Pond Outflow
Outlet-5	Pond Outlet	Link	6.158	8.875	3.520		
Outlet-5	Pond Outlet	Downstream	6.653	9.975	7.467	Outfall_2	
Weir	Pond Outlet	Upstream	10.866	9.925	99.147	Level Spreader	Pond Inflow
Weir	Pond Outlet	Outflow	10.594	9.925	98.642	Level Spreader	Pond Outflow
Weir	Pond Outlet	Link	10.594	9.925	98.642		
Weir	Pond Outlet	Downstream	10.594	9.925	98.642	Oso Creek	

Scenario Calculation Summary

Scenario Summary	
ID	86
Label	Post-Dev 100 Year
Notes	
Active Topology	Post-Dev Active Topology
Hydrology	Post-Dev Hydrology
Rainfall Runoff	100 Year
Physical	Post-Dev Physical
Initial Condition	Post-Dev Initial Condition
Boundary Condition	Post-Dev Boundary Condition
Infiltration and Inflow	Post-Dev Infiltration and Inflow
Output	Post-Dev Output
User Data Extensions	Post-Dev User Data Extensions
PondPack Engine Calculation Options	Base Calculation Options

Output Summary			
Output Increment	0.025 hours	Duration	36.000 hours

Rainfall Summary			
Return Event Tag	100	Rainfall Type	Time-Depth Curve
Total Depth	5.790 in	Storm Event	100yr_24hr

Executive Summary (Nodes)

Label	Scenario	Return Event (years)	Truncation	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Level Spreader (IN)	Post-Dev 100 Year	100	None	14.607	9.925	134.446	(N/A)	(N/A)
Level Spreader (OUT)	Post-Dev 100 Year	100	None	14.335	9.925	134.034	208.22	0.315
Offsite Drainage Area North	Post-Dev 100 Year	100	None	4.413	10.050	32.908	(N/A)	(N/A)
Offsite Drainage Area South	Post-Dev 100 Year	100	None	9.068	9.950	81.585	(N/A)	(N/A)
Offsite Drainage Area West	Post-Dev 100 Year	100	None	5.539	9.925	53.328	(N/A)	(N/A)
Onsite Drainage area	Post-Dev 100 Year	100	None	3.787	9.925	35.413	(N/A)	(N/A)
Oso Creek	Post-Dev 100 Year	100	None	14.335	9.925	134.034	(N/A)	(N/A)
Outfall1_Area	Post-Dev 100 Year	100	None	4.633	10.075	30.535	(N/A)	(N/A)

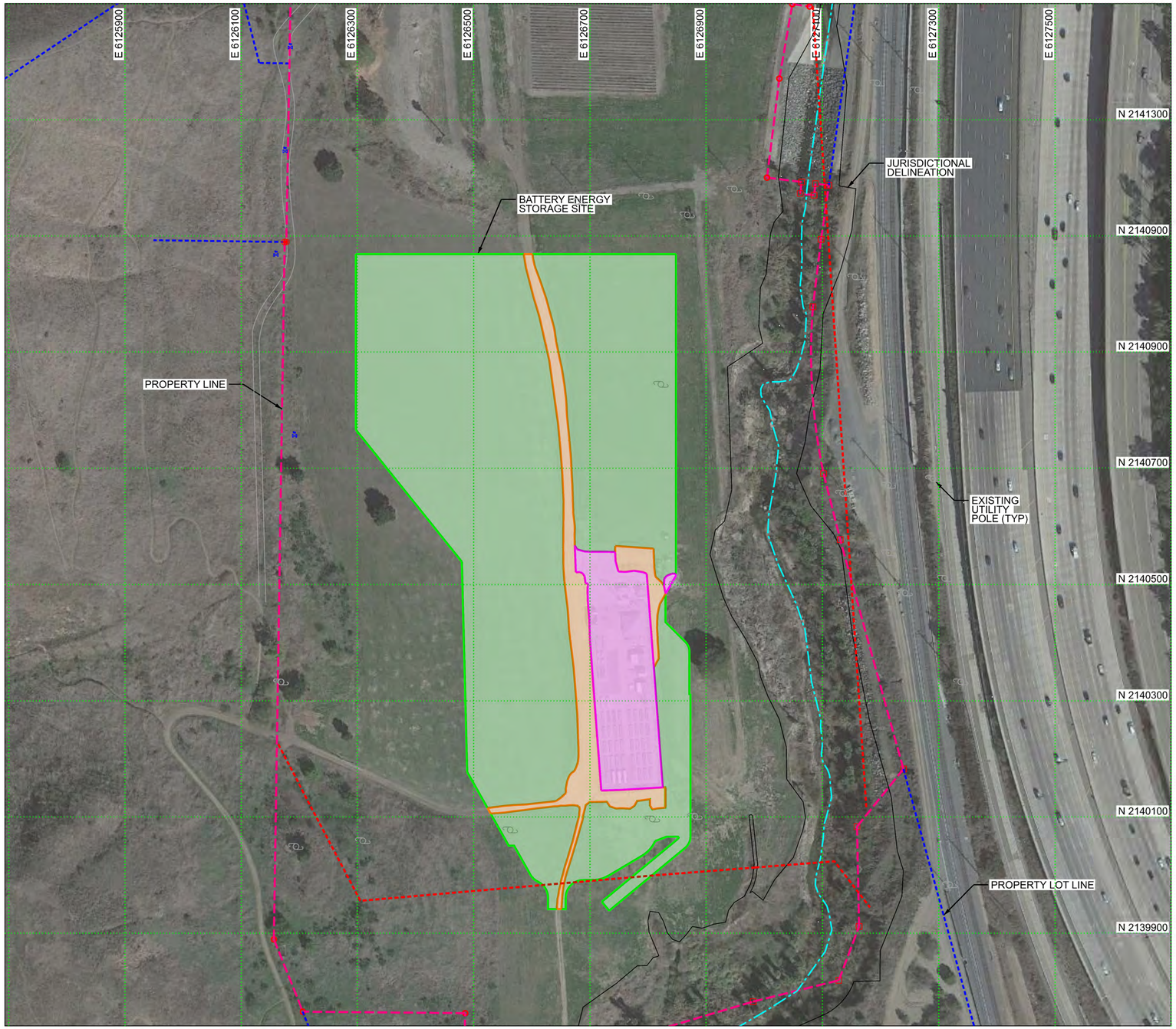
Scenario Calculation Summary

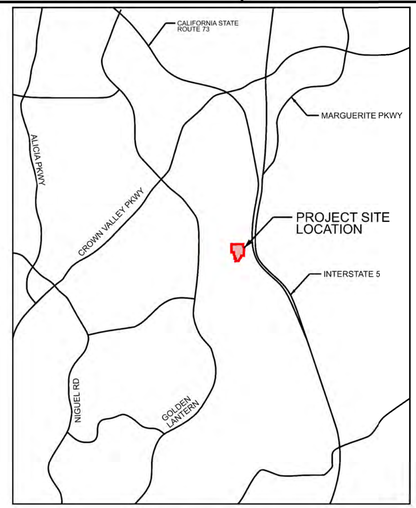
Executive Summary (Nodes)

Label	Scenario	Return Event (years)	Truncation	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
Outfall2_Area	Post-Dev 100 Year	100	None	0.691	9.975	5.661	(N/A)	(N/A)
Outfall_1	Post-Dev 100 Year	100	None	4.633	10.075	30.535	(N/A)	(N/A)
Outfall_2	Post-Dev 100 Year	100	None	8.891	9.975	9.181	(N/A)	(N/A)
PO-7 (IN)	Post-Dev 100 Year	100	None	8.200	9.950	62.115	(N/A)	(N/A)
PO-7 (OUT)	Post-Dev 100 Year	100	None	8.200	8.450	3.520	5.70	3.627

Executive Summary (Links)

Label	Type	Location	Hydrograph Volume (ac-ft)	Peak Time (hours)	Peak Flow (ft^3/s)	End Point	Node Flow Direction
Outlet-5	Pond Outlet	Upstream	8.200	9.950	62.115	PO-7	Pond Inflow
Outlet-5	Pond Outlet	Outflow	8.200	8.450	3.520	PO-7	Pond Outflow
Outlet-5	Pond Outlet	Link	8.200	8.450	3.520		
Outlet-5	Pond Outlet	Downstream	8.891	9.975	9.181	Outfall_2	
Weir	Pond Outlet	Upstream	14.607	9.925	134.446	Level Spreader	Pond Inflow
Weir	Pond Outlet	Outflow	14.335	9.925	134.034	Level Spreader	Pond Outflow
Weir	Pond Outlet	Link	14.335	9.925	134.034		
Weir	Pond Outlet	Downstream	14.335	9.925	134.034	Oso Creek	





KEY PLAN
SCALE: 1" = 800'

PERMIT ONLY
NOT FOR CONSTRUCTION

LEGEND

- PROPERTY LINE
- PROPERTY LOTS
- EASEMENT
- IMPERVIOUS SURFACING (0.98 AC)
- DIRT SURFACING (0.82 AC)
- GRASS FAIR SURFACING (8.38 AC)

NOTES

1. GEOTECHNICAL ENGINEERING REPORT PREPARED BY TERRACON CONSULTANTS, INC. "BROAD REACH POWER COMPASS BESS, SAN JAUN CAPISTRANO, ORANGE COUNTY, CA", NOVEMBER 3, 2021, REVISION 1.
2. FOR GENERAL NOTES, ABBREVIATIONS AND LEGEND, SEE DRAWING CSK-002.

REFERENCE DRAWINGS

UNDERGROUND OR EMBEDDED UTILITIES MAY BE LOCATED WITHIN OR ADJACENT TO THE AREA IN WHICH EXCAVATION, DEMOLITION, FOUNDATION, OR MODIFICATION WORK IS TO BE PERFORMED.

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NORTH

100' 0' 100' 150'
GRAPHIC SCALE
1" = 100'

HOLD INFORMATION

NO.	DESCRIPTION

CONTRACTOR/INSTALLER SHALL TAKE ALL APPROPRIATE PRECAUTIONS TO ENSURE THE SAFETY OF ALL PEOPLE LOCATED ON THE WORK SITE, INCLUDING CONTRACTOR'S/ INSTALLER'S PERSONNEL (OR THAT OF ITS SUB-CONTRACTOR(S)) PERFORMING THE WORK.

RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0A	04-22-2022	ISSUED FOR PERMIT
0B	06-17-2022	ISSUED FOR PERMIT
0C	02-23-2024	ISSUED FOR PERMIT

ISSUE PURPOSE:	PERMIT
SPECIFICATION:	-
PROJECT NO.:	14089-012

I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF CALIFORNIA.

CAD FILE NAME:	EXHIBIT-CMP-002.DWG
PREPARED BY:	JC
REVIEWED BY:	MT
APPROVED BY:	--

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55 EAST MONROE STREET
CHICAGO, ILLINOIS 60603-5780

BROAD REACH POWER

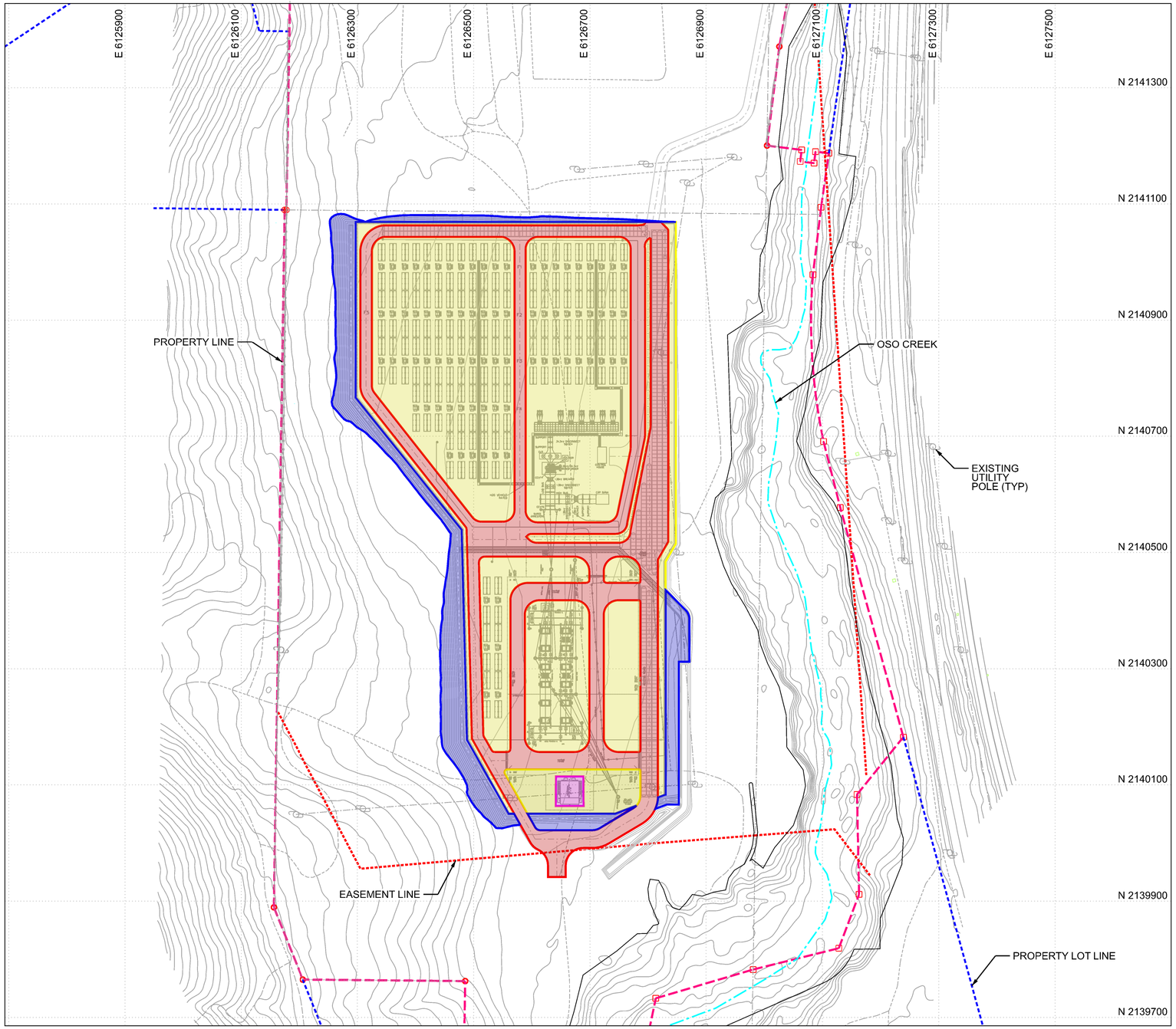
PROJECT

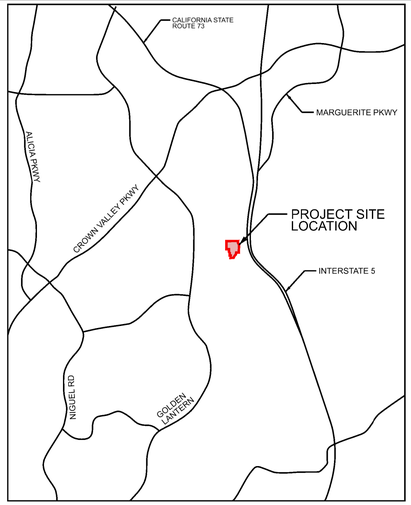
COMPASS
BATTERY ENERGY STORAGE

DRAWING TITLE

PRE-DEVELOPED PLAN

DRAWING NUMBER	REVISION
EXHIBIT-CMP-002	0C
SHEET 1 OF 1	





KEY PLAN
SCALE: 1" = 800'

PERMIT ONLY
NOT FOR CONSTRUCTION

LEGEND

- PROPERTY LINE
- PROPERTY LOTS
- EASEMENT
- IMPERVIOUS AREA (0.05 AC)
- GOOD GRASS CONDITION SURFACING (1.66 AC)
- GRAVEL SURFACING (6.58 AC)
- PAVEMENT SURFACING (3.55 AC)

NOTES

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NORTH

100' 0' 100' 150'
GRAPHIC SCALE
1" = 100'

HOLD INFORMATION

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SPECIFICATION:	-
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CAD FILE NAME:	EXHIBIT-CMP-003.DWG
PREPARED BY:	JC
REVIEWED BY:	MT
APPROVED BY:	--

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BROAD REACH POWER

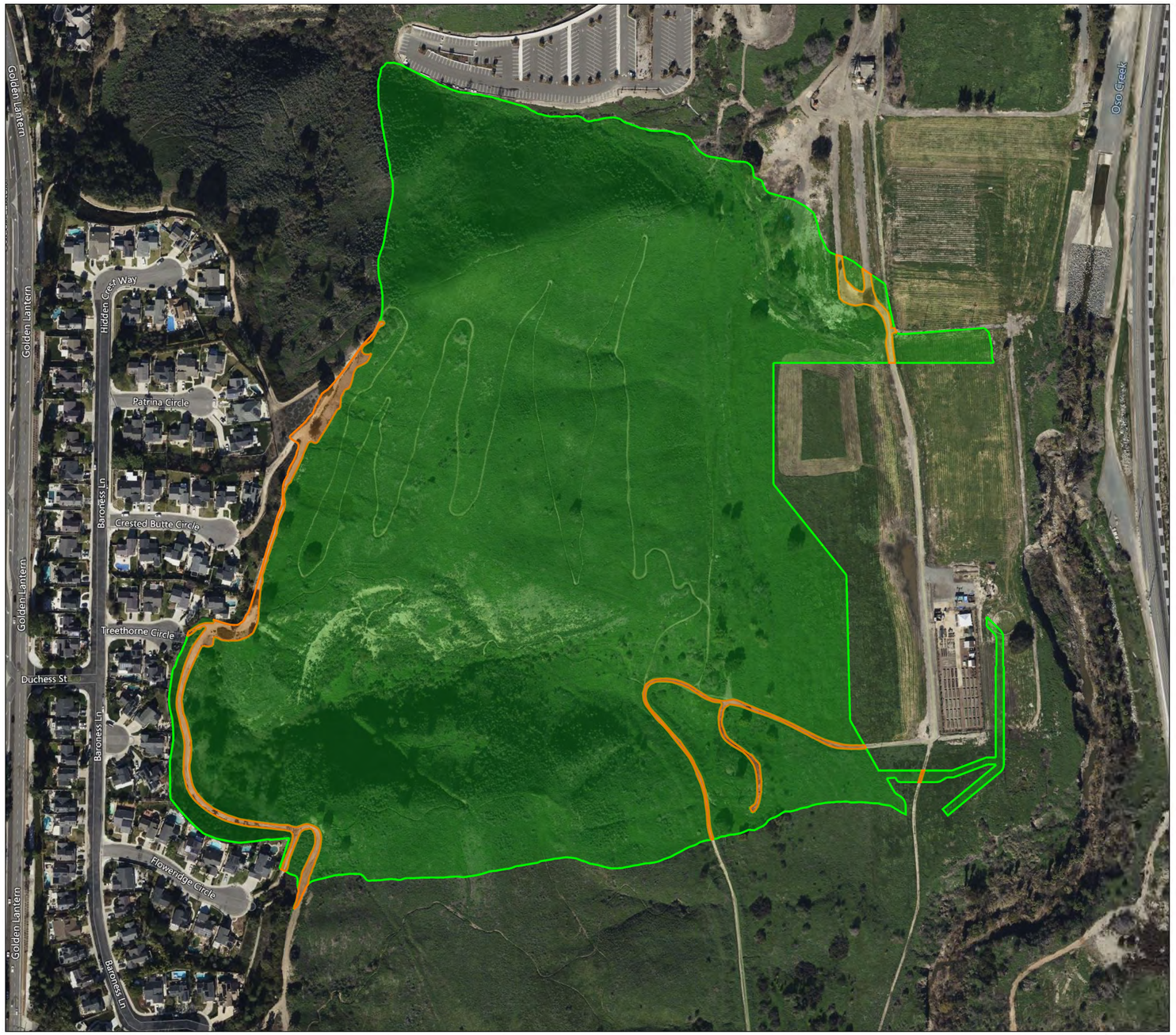
PROJECT

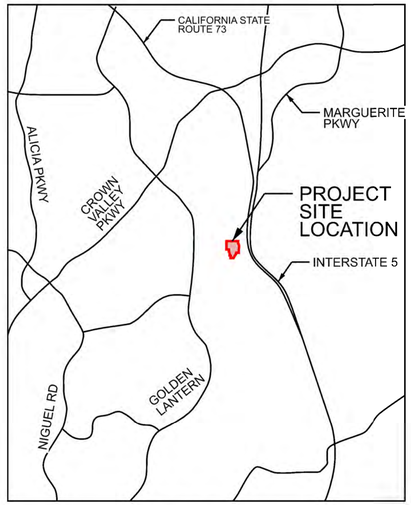
COMPASS
BATTERY ENERGY STORAGE

DRAWING TITLE

POST DEVELOPED PLAN

DRAWING NUMBER	REVISION
EXHIBIT-CMP-003	0C
SHEET 1 OF 1	





KEY PLAN
SCALE: 1" = 800'

LEGEND

- GRASS FAIR SURFACING (56.83 AC)
- DIRT SURFACING (1.79 AC)

NOTES

REFERENCE DRAWINGS

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PERMIT ONLY
NOT FOR CONSTRUCTION

NORTH

150' 0' 150' 200'
GRAPHIC SCALE
1" = 150'

HOLD INFORMATION	
NO.	DESCRIPTION

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RELEASE INFORMATION		
REV.	DATE	DESCRIPTION
0A	02-23-2024	ISSUED FOR PERMIT

ISSUE PURPOSE:	PERMIT
SPECIFICATION:	-
PROJECT NO.:	14089-012

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CAD FILE NAME:	EXHIBIT-CMP-005.DWG
PREPARED BY:	JC
REVIEWED BY:	MT
APPROVED BY:	--

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CHICAGO, ILLINOIS 60603-5780

BROAD REACH POWER

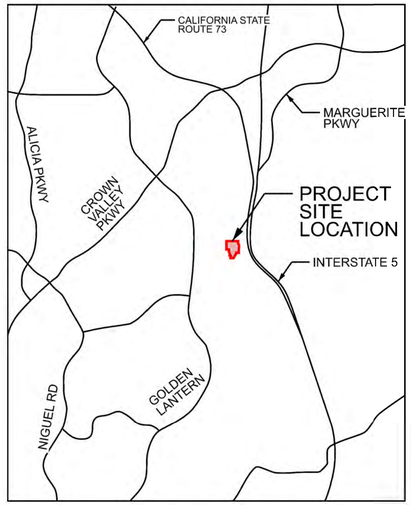
PROJECT

COMPASS
BATTERY ENERGY STORAGE

DRAWING TITLE

OFFSITE PRE-DEVELOPED PLAN

DRAWING NUMBER	REVISION
EXHIBIT-CMP-005	0A
SHEET 1 OF 1	



KEY PLAN
SCALE: 1" = 800'

LEGEND

- GOOD GRASS CONDITION SURFACING (0.98 AC)
- GRASS FAIR SURFACING (56.83 AC)
- DIRT SURFACING (0.82 AC)
- WATER IMPOUNDMENT (0.20 AC)

OFFSITE DRAINAGE AREA NORTH POST DEVELOPED
GRASS (GOOD) = 0.10 AC
GRASS (FAIR) = 13.57 AC
DIRT = 0.24 AC
TOTAL = 13.91 AC

OFFSITE DRAINAGE AREA WEST POST DEVELOPED
GRASS (GOOD) = 0.85 AC
GRASS (FAIR) = 15.45 AC
DIRT = 0.61 AC
WATER IMPOUNDMENT = 0.10 AC
TOTAL= 17.01 AC

OFFSITE DRAINAGE AREA SOUTH POST DEVELOPED
GRASS (GOOD) = 0.41 AC
GRASS (FAIR) = 26.27 AC
DIRT = 0.92 AC
WATER IMPOUNDMENT = 0.10 AC
TOTAL= 27.70 AC

NOTES

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PERMIT ONLY
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NORTH
150' 0' 150' 200'
GRAPHIC SCALE
1" = 150'

HOLD INFORMATION

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RELEASE INFORMATION

REV.	DATE	DESCRIPTION
0A	02-23-2024	ISSUED FOR PERMIT

ISSUE PURPOSE:	PERMIT
SPECIFICATION:	-
PROJECT NO.:	14089-012

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CAD FILE NAME:	EXHIBIT-CMP-006.DWG
PREPARED BY:	JC
REVIEWED BY:	MT
APPROVED BY:	--

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CHICAGO, ILLINOIS 60603-5780

BROAD REACH POWER

PROJECT

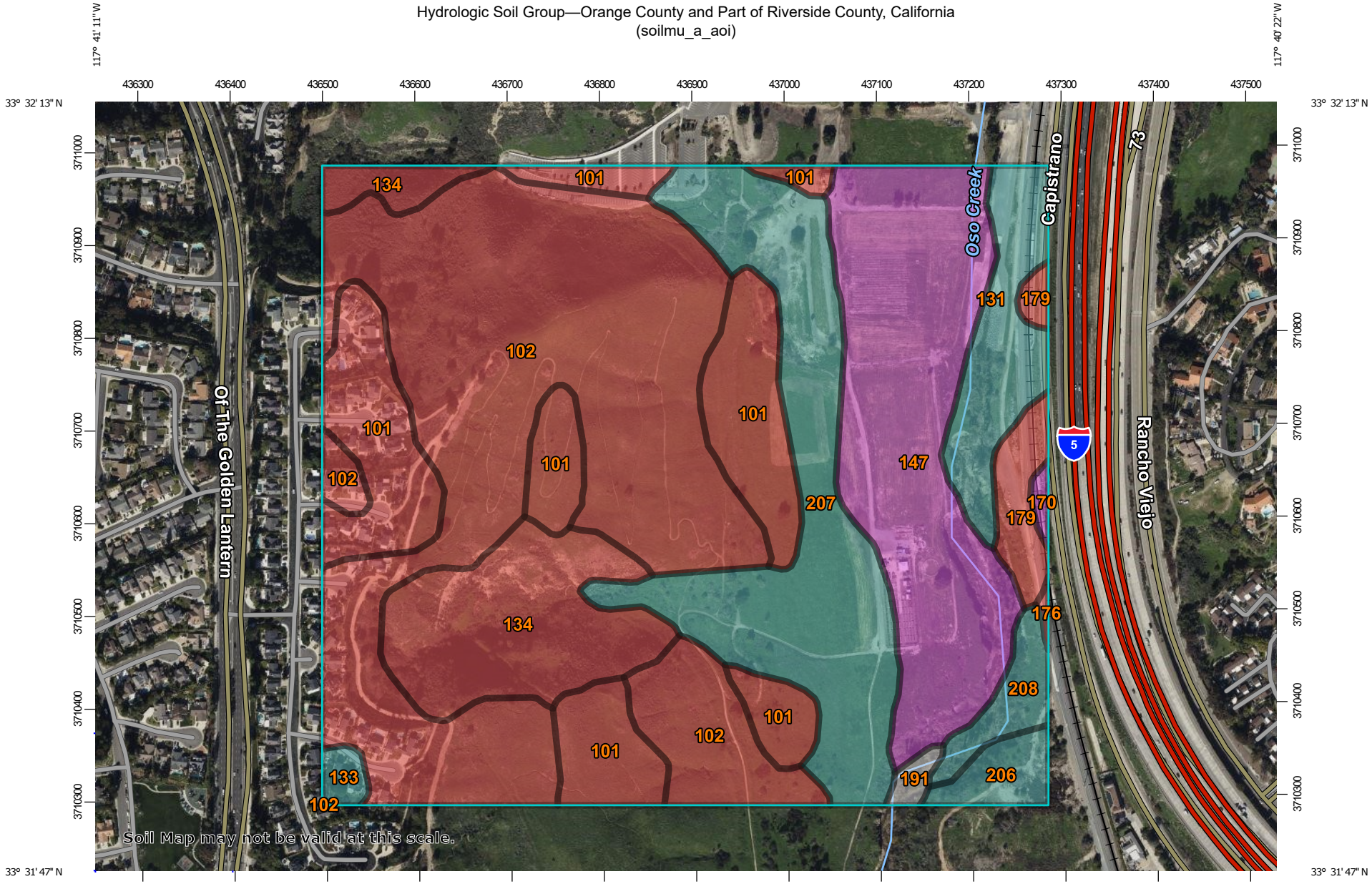
COMPASS
BATTERY ENERGY STORAGE

DRAWING TITLE

OFFSITE DEVELOPED PLAN

DRAWING NUMBER	REVISION
EXHIBIT-CMP-006	0A
SHEET 1 OF 1	

Hydrologic Soil Group—Orange County and Part of Riverside County, California
(soilmu_a_aoi)



Map Scale: 1:5,850 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Orange County and Part of Riverside County, California
Survey Area Data: Version 17, Aug 30, 2023

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

Date(s) aerial images were photographed: Jan 17, 2023—Feb 8, 2023

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
101	Alo clay, 15 to 30 percent slopes, dry	D	19.6	14.6%
102	Alo clay, 30 to 50 percent slopes, warm MAAT, MLRA 20	D	47.9	35.6%
131	Botella loam, 2 to 9 percent slopes, warm MAAT, lower MAP, MLRA 19	C	6.0	4.5%
133	Botella clay loam, 9 to 15 percent slopes	C	0.7	0.5%
134	Calleguas clay loam, 50 to 75 percent slopes, eroded	D	12.5	9.3%
147	Corralitos loamy sand, moderately fine substratum	A	21.0	15.6%
170	Modjeska gravelly loam, 9 to 15 percent slopes	A	0.3	0.2%
176	Myford sandy loam, 15 to 30 percent slopes	D	0.1	0.1%
179	Myford sandy loam, thick surface, 2 to 9 percent slopes	D	2.8	2.0%
191	Riverwash		0.5	0.4%
206	Sorrento loam, 0 to 2 percent slopes, warm MAAT, MLRA 19	C	1.9	1.4%
207	Sorrento loam, 2 to 9 percent slopes, warm MAAT, MLRA 19	C	19.2	14.2%
208	Sorrento clay loam, 0 to 2 percent slopes, warm MAAT, MLRA 19	C	2.2	1.6%
Totals for Area of Interest			**134.7**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

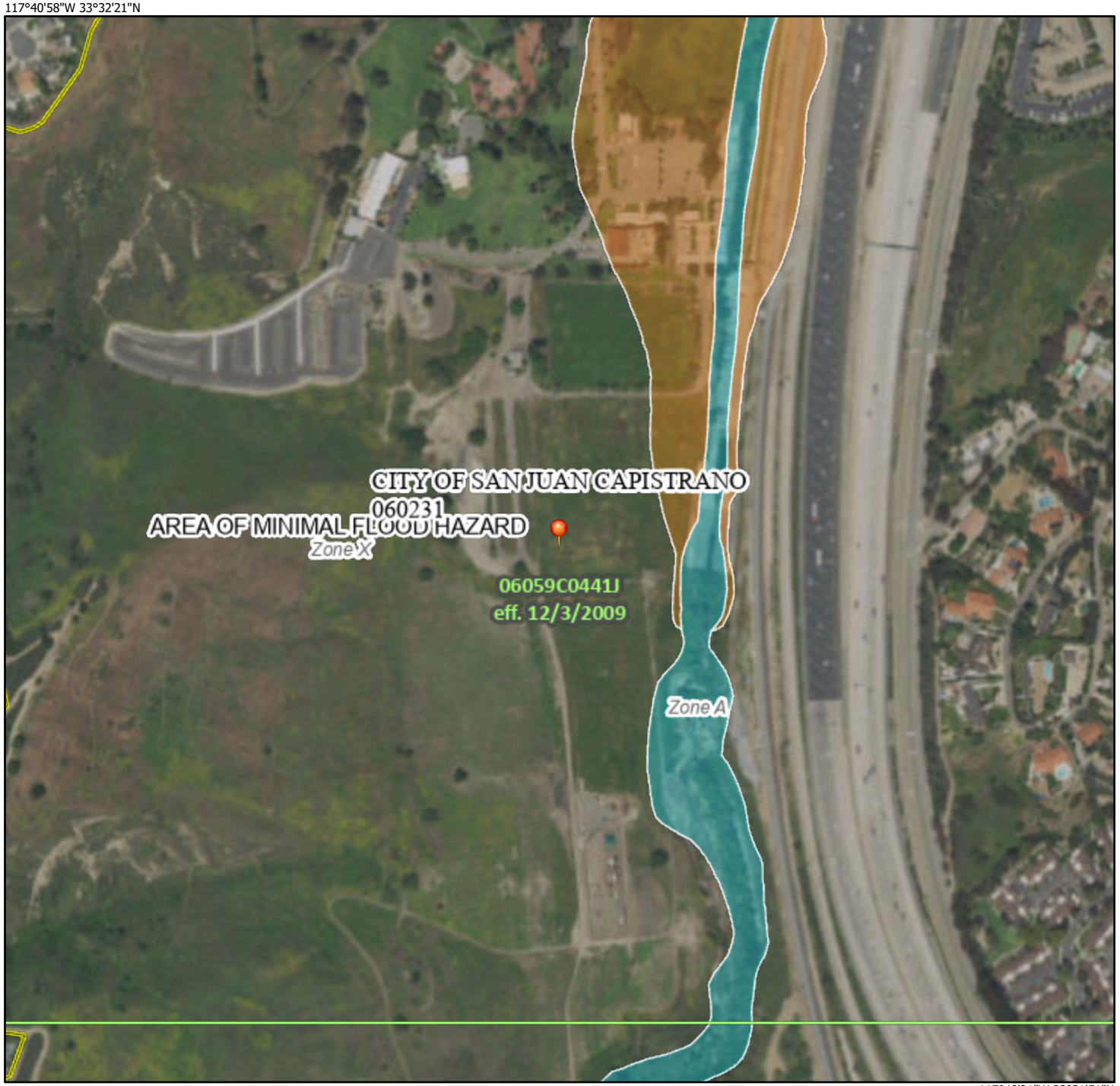
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

FEMA

117°40'58"W 33°32'21"N



117°40'21"W 33°31'51"N

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/14/2021 at 4:09 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Geotechnical Engineering Report

Broad Reach Power Compass BESS
San Juan Capistrano, Orange County, CA
November 3, 2021
Terracon Project No. 60215170

Prepared for:
Sargent & Lundy
Chicago, Illinois

Prepared by:
Terracon Consultants, Inc.
Tustin, California

November 3, 2021

Sargent & Lundy
55 E. Monroe
Chicago, Illinois 60603

Attn: Mr. Matthew A. Braet
P: (312) 269-2642
E: Matthew.A.Braet@SargentLundy.com

Re: Geotechnical Engineering Report
Broad Reach Power Compass BESS
San Juan Capistrano, Orange County, CA
Terracon Project No. 60215170

Dear Mr. Braet:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. P60215170 dated June 30, 2021. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, access roads, and infiltration systems for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Victor V. Nguyen, E.I.T.
Staff Engineer

Scott G. Lawson, P.E., G.E.
Senior Geotechnical Engineer

APR Review by F. Fred Buhamdan, P.E

REGISTERED PROFESSIONAL ENGINEER
SCOTT G. LAWSON
No. GE 2829
Exp. 9/30/23
GEOTECHNICAL
STATE OF CALIFORNIA

REPORT TOPICS

Note: This report was originally delivered in a web-based format. Orange Bold text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the *GeoReport* logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Geotechnical Engineering Report
Broad Reach Power Compass BESS
San Juan Capistrano, Orange County, CA
Terracon Project No. 60215170
November 3, 2021

INTRODUCTION

This report presents the results of our geotechnical engineering services performed for the proposed Compass Battery Energy Storage System (BESS) facility for Broad Reach Power to be located in San Juan Capistrano, Orange County, California. Approximate coordinates for the center of the site are 33.53205°N, 117.67753°W. The purpose of these services is to provide information and geotechnical engineering recommendations relative to subsurface conditions and construction of the proposed BESS and infiltration systems.

Terracon's geotechnical engineering scope of work for this project included the advancement of 30 test borings to approximate depths ranging between 5 and 101½ feet below existing ground surface (bgs) within and adjacent to the proposed BESS facility footprint.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The proposed project consists of design and construction of the new Compass BESS facility to be located in the City of San Juan Capistrano, Orange County, California. Approximate coordinates for the center of the site are 33.53205 °N, 117.67753 °W.
Existing Improvements	Site is mostly undeveloped with native grasses and trees. A garden center with several small buildings is located near the center of the site.
Current Ground Cover	Exposed soils with sparse vegetation, and denser vegetation on the hillside to the west.

Item	Description
Existing Topography (from Google Earth Pro)	Within the footprint of the proposed facility, the eastern half is relatively flat with approximate elevations ranging from 206 to 212 feet above mean sea level (MSL). The western half has a gradual slope down towards the east with approximate elevations ranging from 230 feet to 212 feet MSL. Immediately to the west of the facility footprint are tall slopes ascending several hundred feet. Immediately to the east of the facility footprint is Oso Creek which steeply descends as much as 40 feet to an approximate bottom elevation of 169 feet MSL. Stability assessment of the eastern and western surrounding slopes is not included in our scope of work and is being evaluated by Sargent & Lundy (S&L) based on data provided by Terracon.

PROJECT DESCRIPTION

Item	Description
Proposed Structures	■ 138/34kV transformers supported on mat foundations. ■ Batteries supported on slabs or mat foundations. ■ A 138kV transmission line pole supported by a drilled pier may be included in the project, but the location is currently unknown. ■ A San Diego Gas & Electric (SDG&E) substation will be constructed within the project footprint, with equipment foundations similar to those described above. We understand that a "buried" retaining wall will be constructed near the eastern edge of the project site to limit the impact of erosion occurring along the banks of the adjacent Oso Creek. In addition, we understand based on discussions with S&L that other retaining walls are being considered to achieve final site grades. Details regarding these walls were not available at the time this report was prepared. We understand that geotechnical engineers with S&L will be responsible for the geotechnical design and evaluation of these walls, using geotechnical data and recommendations provided in this report.
Finished Grade Elevation	Finished grade elevation was not provided at the time of preparation of this report.
Grading	Grading plans were not provided at the time of preparation of this report. Based on our understanding of the conceptual site plan and the existing topography of the site, we anticipate that cuts as much as 20 feet and fill on the order of 5 may be required in order to reach final grade elevation.
Infiltration Systems	Based on our communications with S&L, infiltration systems (such as retention basins or bio-swales) are anticipated for on-site stormwater management.
Access Roads	We understand that unpaved roads will be constructed onsite to access BESS areas.

GEOTECHNICAL CHARACTERIZATION

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Geologic Conditions

The site is situated on a stream terrace west of and adjacent to Oso Creek in Orange County, California. Oso Creek forms a canyon that dissects a portion of the San Joaquin Hills - a coastal range of southern California. The hills are formed in layered sedimentary formations that include the Capistrano Formation. The Capistrano Formation consists of poorly-consolidated, fossiliferous, marine sandy-siltstone and mudstone. Capistrano beds are susceptible to landsliding as evidenced by landslide deposits mapped west of the site. The stream terrace area of the site is underlain by colluvium derived from adjacent hillsides and alluvial stream deposits of Oso Creek. A regional geologic map is included in the **Site Location** section.

Earthquake faults are not mapped within or projecting toward the site. The buried San Joaquin Hills thrust fault underlies the San Joaquin Hills approximately 5 kilometers northwest of the site. More distant faults include the Newport-Inglewood fault zone and the Elsinore fault zone located approximately 10 kilometers southwest and 29 kilometers northeast of the site, respectively.

Subsurface Conditions

Based on the results of the borings performed for our subsurface exploration, alluvial and colluvial soils were encountered extending to approximate boring depths of 26½ to 76½ feet bgs. Landslide deposits (Qls) were encountered in borings B-4, B-5, B-6, and B-11 extending to approximate depths of 10 to 50 feet bgs. Capistrano Formation (Tc) bedrock was encountered beneath alluvial/colluvial and landslide deposits beginning at approximate boring depths ranging from 26½ to 62 feet bgs. Soil deposits generally consisted of interbedded layers of soft to hard lean clay with variable amounts of sand and gravel, silt with varying amounts of sand, and silty clay with varying amounts of sand and gravel. Interbedded layers of loose to very dense sand with varying amounts of silt and clay were encountered in borings B-2, B-3, B-10, and B-17 from depths of approximately 31½ to 40, 51½ to 65, 51½ to 76½, and 50 to 76½ feet bgs, respectively. Materials of the Capistrano Formation were generally recovered as interbedded layers of very stiff to hard elastic silt with trace sand, lean clay with varying amounts of sand and silt, and silty clay with varying amounts of sand. The following table summarizes the approximate depth to Capistrano formational materials.

Boring ID	Depth to Capistrano Formation Materials (ft, bgs)	Corresponding Elevation at Top of Formation (feet, MSL)	Boring Termination Depth (ft, bgs)
B-4	50	197	91½
B-5	62	192	76½
B-6	40	194	51
B-11	55	185	91½
B-12	40	192	76½
B-13	60	189	76½
B-14	30	194	51½
B-15	60	153	101½
B-19	26½	190½	51½
B-24	35	181	76½
B-25	41½	167½	76½

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Lab Results

Laboratory tests were conducted on selected soil formational material samples and the test results are presented in the **Exploration Results** section and on the boring logs. Atterberg limits test results indicate that the on-site soils generally have low to medium plasticity. A modified proctor test conducted in accordance with ASTM D1557 indicates that the near surface sandy lean clay soil tested has a maximum dry density of 120.8 pcf and corresponding optimum moisture content of 13.3 percent. Expansion index testing on near surface soils from borings B-1 and B-17 indicate that these soils have expansion indices of 39 and 64 corresponding to low to medium expansion potential as determined by ASTM D4829. Consolidation testing performed on four samples collected from borings within the upper 10 feet indicated negligible to moderate swell. R-value testing conducted on a near surface silty clay soil sample indicated an R-Value of 27.

The following tables summarize the results of direct shear and unconsolidated undrained triaxial testing. Additional information for these tests is provided in the **Exploration Results** section.

Direct Shear Strength Test Results

Boring ID	Depth (ft, bgs)	USCS Material Type	Friction Angle (degree)[1]	Cohesion (psf)[1]
B-10	10	CL	25	300
B-12	10	CL	33	650
B-13	10	CL	32	1,050

1. Values are peak values.

Unconsolidated Undrained Triaxial Test Results

Boring ID	Depth (ft, bgs)	USCS Material Type	Ultimate Undrained Shear Strength (ksf) [1]
B-5	60	CL-ML	4.16
B-13	30	CL	3.87
B-19	45	CL-ML[2]	3.29

1. Unconsolidated undrained conditions.
2. Capistrano Formation material recovered as CL-ML.

Electrical Resistivity Testing

Terracon performed field measurements of soil electrical resistivity for the support of grounding design. Soil resistivity data was obtained along three traverses selected by the client and shown in the **Exploration Plan**. The testing was performed in general accordance with ASTM G57 - Wenner Four Electrode Method. The Wenner arrangement (equal electrode spacing) was used with the 'a'-spacing of 3, 5, 7, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, 120, 140, and 160 feet. The "a" spacing is generally considered to be the depth of influence of the test. The electrical resistivity test results are presented in **Exploration Results**.

Groundwater Conditions

Groundwater was encountered in 4 of the 30 borings advanced at the site. Boring specific groundwater observations can be found on the logs in the **Exploration Results** section of this report. These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times, or at other locations.

Boring ID	Depth to Groundwater (feet, bgs)	Groundwater Elevation (feet, MSL)
B-3	70.4	139
B-10	47.3	162
B-17	47.0	161
B-19	47.5	170

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structures may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

In clayey soils with low permeability, the accurate determination of groundwater level may not be possible without long term observation. Long term observation after drilling could not be performed as borings were backfilled immediately upon completion due to safety concerns. Groundwater levels can best be determined by implementation of a groundwater monitoring plan.

Based on review of Plate 1.2 of the Seismic Hazard Zone Report (SHZP) for the San Juan Capistrano 7.5-Minute Quadrangle (CDMG)[1], historic shallow groundwater depth in the vicinity of the project site is reported at approximately 5 feet bgs in the area of the creek on the east side of the site. However, the creek level is approximately 40 feet below the elevation of the site.

SEISMIC CONSIDERATIONS

The 2019 California Building Code (CBC) Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16 and 2019 CBC. The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than or equal 0.2.

However, Section 11.4.8 of ASCE 7-16 includes an exception from such analysis for specific structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section C11 of ASCE 7-16) states that “In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites.” Based on our understanding of the proposed structures, it is our assumption that the

[1] California Department of Conservation Division of Mines and Geology (CDMG), *“Seismic Hazard Zone Report for the San Juan Capistrano 7.5 Minute Quadrangle, Orange County, California”*, 2001.

exception in Section 11.4.8 applies to the proposed structures for this project. However, the structural engineer should verify the applicability of this exception.

Based on this exception, the spectral response accelerations presented below were calculated using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 1613 of the 2019 CBC.

Description	Value
2019 California Building Code Site Classification (CBC) [1]	D
Site Latitude (°N)	33.53205
Site Longitude (°W)	117.67753
S_s Spectral Acceleration for a 0.2-Second Period	1.2
S_1 Spectral Acceleration for a 1-Second Period	0.431
F_a Site Coefficient for a 0.2-Second Period	1.02
F_v Site Coefficient for a 1-Second Period	1.872

1. Seismic site classification in general accordance with the *2019 California Building Code*.

Typically, a site-specific ground motion study may generate less conservative coefficients and acceleration values which may reduce construction costs. We recommend consulting with a structural engineer to evaluate the need for such study and its potential impact on construction costs. Terracon should be contacted if a site-specific ground motion study is desired.

Faulting and Estimated Ground Motions

The site is located in southern California, which is a seismically active area. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. As calculated using the USGS Unified Hazard Tool, the San Joaquin Hills Fault, which is considered to have the most significant effect at the site from a design standpoint has a modelled earthquake magnitude of 7.53 and is located approximately 5 kilometers from the site.

Based on the SEAOC/OSHPD Seismic Design Maps Tool, using the American Society of Civil Engineers (ASCE 7-16) standard, the modified peak ground acceleration (PGA_M) at the project site is expected to be 0.563g. Based on the USGS Unified Hazard Tool, the project site has a deaggregated modal magnitude of 7.69. Furthermore, the site is not located within an Alquist-Priolo Earthquake Fault Zone based on our review of the State Fault Hazard Maps.[2]

[2] https://maps.conservation.ca.gov/cgs/informationwarehouse/regulatorymaps/.

LIQUEFACTION

Liquefaction is a mode of ground failure that results from the generation of high pore water pressures during earthquake ground shaking, causing loss of shear strength. Liquefaction is typically a hazard where loose sandy soils exist below groundwater. The California Geological Survey (CGS) has designated certain areas as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table.

The site is located within a State-designated Seismic Hazard Zone for liquefaction potential. A seismic hazard map is included in the **Site Location** section.

Subsurface soils generally consisted of interbedded layers of soft to hard lean clay, silt with varying amounts of sand, and silty clay. An interbedded layer of loose silty sand was encountered in borings B-2 from a depth of approximately 31½ to 40 feet bgs, respectively. Materials encountered from the Capistrano Formation were generally recovered as interbedded layers of very stiff to hard elastic silt with trace sand, lean clay with varying amounts of sand and silt, and silty clay with varying amounts of sand.

We understand that liquefaction analysis for the project will be performed by Sargent & Lundy. Terracon performed a preliminary liquefaction analysis for the site in general accordance with the DMG Special Publication 117. The liquefaction study utilized the software "LiquefyPro" by CivilTech Software. This analysis was based on soil data from the borings B-2, B-3, B-7, and B-15. A PGA_M of 0.563 g and a modal magnitude of 7.69 for the project site were used. Calculations utilized a depth to groundwater of 45 feet bgs based on review of available data and the depth to groundwater encountered in our borings. Settlement analysis used the Tokimatsu, M-correction method and the fines percentage were corrected for liquefaction using the Stark/Olson method.

Based on calculation results, seismically induced settlement of saturated and unsaturated sands was found to occur in one of the four borings (B-2). Settlement at the location of boring B-2 is estimated to be approximately ½ inch or less. The detailed liquefaction potential analysis results are attached to this report in **Supporting Documents** section of the **Appendix**.

LANDSLIDE

Based on our review of a geologic hazards map designated by the California Geologic Survey, the battery and equipment pads do not appear to be located within a mapped seismically-induced landslide zone. However, landslide deposits are mapped directly west of the proposed pads. Landslide deposits were encountered in boring B-4, B-5, B-6, and B-11 extending to approximate depths of 10 to 50 feet bgs. A seismic hazard map is included in the **Site Location** section.

It is our understanding that stability assessment of the surrounding slopes is excluded from our scope of work and is being evaluated by Sargent & Lundy (S&L) based on data provided by Terracon.

CORROSIVITY

Results of laboratory soluble sulfate, soluble chloride, electrical resistivity, and pH testing are included in the **Exploration Results** section of this report. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary						
Boring	**Sample Depth (ft)**	**USCS Material Type**	**Soluble Sulfate (ppm)**	**Chlorides (ppm)**	**Electrical Resistivity (Ω-cm)**	**pH**
B-1	0-5	CL	50	27	1,867	8.0
B-3	0-5	CL/ML	46	40	2,215	8.0
B-12	0-5	CL	64	23	1,461	8.0
B-25	0-5	CL	91	36	1,313	8.1

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 19.3.1.1 of the ACI Design Manual. Concrete should be designed in accordance with the exposure class S0 provisions of the ACI Design Manual, Section 318, Chapter 19.

STORMWATER MANAGEMENT

Eight (8) in-situ percolation tests were performed from approximate depths of 0 to 5 and 5 to 10 feet bgs. A 2-inch thick layer of gravel was placed in the bottom of each boring after the borings were drilled to investigate the soil profile. A 3-inch diameter perforated pipe was installed on top of the gravel layer in each boring. Gravel was used to backfill between the perforated pipes and the boring sidewall. The borings were then filled with water for a pre-soak period of 24 hours. Testing began after a pre-soak period. At the beginning of the test, the pipes were refilled with water and readings were taken at standardized time intervals. Percolation rates are provided in the following table:

TEST RESULTS				
Test Location (depth, feet bgs)	**Soil Classification**	**Final Measured Percolation Rate (in/hr.)**	**Correlated Infiltration Rate[1] (in/hr.)**	**Water Head (in)**
P-1 (5 – 10)	Silty clay	1.4	0.03	97
P-2 (5 – 10)	Lean clay with sand	1.2	0.04	63
P-3 (0 – 5)	Silty clay with sand	3.1	0.41	14
P-4 (5 – 10)	Silty clay with sand	3.4	0.18	36
P-5 (0 – 5)	Silty clay	5.0	0.63	14
P-6 (5 – 10)	Silty clay	1.2	0.05	44
P-7 (0 – 5)	Silty clay with sand	7.2	0.97	31
P-8 (5 – 10)	Lean clay	1.4	0.04	66

[1]If proposed infiltration system will mainly rely on vertical downward seepage, the correlated infiltration rates should be used. The infiltration rates were correlated using the Porchet method.

It is apparent that percolation rates were relatively higher in near surface soils within the upper 5 feet than the deeper soils. Infiltration within shallow systems will likely create perched water conditions on top on the underlying less permeable soils. Therefore, perched water could move laterally and manifest at the face of the descending slopes east of the site, which may cause scour and ultimately slope failures. We recommend that measures be taken to mitigate this type of occurrence, if onsite infiltration is implemented. In the event infiltration systems onsite will be utilized, the following paragraphs include design and construction considerations.

With time, the bottoms of infiltration systems tend to plug with organics, sediments, and other debris. Long term maintenance will likely be required to remove these deleterious materials to help reduce decreases in actual percolation rates.

The percolation tests were performed with clear water, whereas the storm water will likely not be clear, but may contain organics, fines, and grease/oil. The presence of these deleterious materials will tend to decrease the rate that water percolates from the infiltration systems. Design of the stormwater infiltration systems should account for the presence of these materials and should incorporate structures/devices to remove these deleterious materials. A safety factor should be applied to these measured rates.

Based on the soils encountered in our borings, we expect the percolation rates of the soils could be different than measured in the field due to variations in fines and gravel content. The design elevation and size of the proposed infiltration system should account for this expected variability in infiltration rates.

Infiltration testing should be performed after construction of the infiltration system to verify the design infiltration rates. It should be noted that siltation and vegetation growth along with other factors may affect the infiltration rates of the infiltration areas. The actual infiltration rate may vary from the values reported here. Infiltration systems should be located a minimum of 10 feet from any existing or proposed foundation system.

GEOTECHNICAL OVERVIEW

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the findings and recommendations presented in this report are incorporated into project design and construction.

The site is bounded from the east and west by steep slopes and mapped landslide potential areas. Stability assessment of the eastern and western surrounding slopes is not included in our scope of work and is being evaluated by Sargent & Lundy (S&L) based on the findings of this report.

Expansive soils are present on this site. This report provides recommendations to help mitigate the effects of soil shrinkage and expansion; however, even if these procedures are followed, some movement and at least minor cracking in the structures should be anticipated. The severity of cracking and other cosmetic damage such as uneven floor slabs will probably increase if any modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and cosmetic distress may not be feasible, but it may be possible to further reduce the risk of movement if significantly more expensive measures are used during construction. We would be pleased to discuss other construction alternatives with you upon request.

Based on our explorations, review of geologic maps, and areas designated by the California Geologic Survey, landslide deposits were encountered in multiple borings extending to approximate depths of 10 to 50 feet bgs. Based on the provided outline of the proposed project, the landslide deposits were encountered outside the outline of the proposed structures. In the event additional structures will be constructed west of the outline of the project and within the landslide deposits area, these deposits should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Batteries, transformers, and associated equipment should be supported on a mat foundation system. Mat foundations should bear on a minimum of 2 foot of engineered fill beneath the bottom of the foundations, or 4 feet below existing grades, whichever is greater. Engineered fill supporting mat foundations should comprise of low volume change materials conforming to the specifications of our ***Fill Materials and Placement*** section of this report.

It is our understanding that a proposed 138kV transmission line pole will be supported on a drilled pier.

Estimated movements described in this report are based on effective drainage for the life of the structures and cannot be relied upon if effective drainage is not maintained. Exposed ground, extending at least 10 feet from the perimeter, should be sloped a minimum of 5% away from the structures to provide positive drainage away from the structures. Grades around the structures should be periodically inspected and adjusted as part of the structure's maintenance program.

Geotechnical engineering recommendations for foundation systems and other earth connected phases of the project are outlined below. The recommendations contained in this report are based upon the results of test borings, laboratory testing, engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

The following presents recommendations for site preparation, excavation, subgrade preparation, and placement of engineered fills on the project. The recommendations presented are for the design and construction of foundations and are contingent upon following the recommendations outlined in this section.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

Site Preparation

Strip and remove existing vegetation, debris, pavements and other deleterious materials from proposed building and roadway areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. The site should be initially graded to create a relatively level surface to receive fill and provide for a relatively uniform thickness of fill beneath proposed building structures.

Demolition of the existing structures should include complete removal of all foundation systems and remaining underground utilities within the proposed construction area. This should include removal of any loose backfill found adjacent to existing foundations. All materials derived from the demolition of existing structures and pavements should be removed from the site and not be allowed for use as on-site fill, unless processed in accordance with the fill requirements included in this report.

Based on our explorations, review of geologic maps, and areas designated by the California Geologic Survey, landslide deposits were encountered in multiple borings extending to approximate depths of 10 to 50 feet bgs. Based on the provided outline of the proposed project, the landslide deposits were encountered outside the outline of the proposed structures. In the event additional

structures will be constructed west of the outline of the project and within the landslide deposits area, these deposits should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Although no evidence of fills, utilities, or underground facilities such as septic tanks, cesspools, basements, and utilities was observed during the site reconnaissance, such features could be encountered during construction. If unexpected fills, utilities, or underground facilities are encountered, such features should be removed, and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Subgrade Preparation

Strip and remove existing vegetation, debris, and other deleterious materials from proposed foundation areas.

Mat foundations should be supported on engineered fill extending 2 feet beneath the bottom of the foundations, or 4 feet below existing grades, whichever is greater. Engineered fill supporting mat foundations should consist of low volume change materials conforming to the specifications of our **Fill Materials and Placement** section of this report. The lateral extent of the overexcavation should extend a minimum of 2 foot beyond the edge of the foundation. Subsequent to the surface clearing and over-excavation efforts, the exposed subgrade soils which will support engineered fill areas constructed at grade, should be prepared to a minimum depth of 10 inches. Subgrade preparation should generally include scarification, moisture conditioning, and compaction. The moisture content and compaction of subgrade soils should be maintained until construction.

Based upon the subsurface conditions determined from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively workable. However, the workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

Excavation

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

We recommend that the walls of the proposed excavations for the trenches be shored or sloped in conformance with OSHA excavation and trench safety standards. Based on the soils encountered onsite, it is our opinion that these soils can be classified as OSHA Type B or C, depending on the materials exposed during grading. If any excavation is extended to a depth of

more than 20 feet, it will be necessary to have the side slopes designed by a professional engineer.

Soils from the excavation should not be stockpiled higher than six 6 feet or within ten 10 feet of the edge of an open trench. Construction of open cuts adjacent to existing structures, including underground pipes, is not recommended within a 1½ H:1V plane extending beyond and down from the perimeter of the structure.

It may be necessary for the contractor to retain a geotechnical engineer to monitor the soils exposed in all excavations and provide engineering services for slopes. This will provide an opportunity to monitor the soils encountered and to modify the excavation slopes as necessary. It also offers an opportunity to verify the stability of the excavation slopes during construction.

Individual contractors are responsible for designing and constructing stable, temporary excavations. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Fill Materials and Placement

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than three inches in size. Pea gravel or other open-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Due to the on-site soil's expansion potential, they are not recommended for use as engineered fill beneath foundations. Such soils may be used as fill materials for the following:

- general site grading
- exterior slabs
- roadway areas

Imported low volume change soils should be used as engineered fill supporting shallow foundations.

Imported soils for use as fill material within proposed structure areas should conform to low volume change materials as indicated in the following specifications:

Gradation	Percent Finer by Weight (ASTM C 136)
3"	100
No. 4 Sieve	50-100
No. 200 Sieve	10-30

- Liquid Limit ..... 30 (max)
- Plasticity Index ..... 15 (max)
- Maximum Expansion Index* ..... 20 (max)

*ASTM D4829

The contractor shall notify the Geotechnical Engineer of import sources sufficiently ahead of their use so that the sources can be observed and approved as to the physical characteristic of the import material. For all import material, the contractor shall also submit current verified reports from a recognized analytical laboratory indicating that the import has a "not applicable" (Class S0) potential for sulfate attack based upon current ACI criteria and is "mildly corrosive" to ferrous metal and copper. The reports shall be accompanied by a written statement from the contractor that the laboratory test results are representative of all import material that will be brought to the job.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed 10 inches loose thickness.

Compaction Requirements

Recommended compaction and moisture content criteria for engineered fill materials are as follows:

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement	Range of Moisture Contents for Compaction Above Optimum	
		Minimum	Maximum
Approved imported low volume change fill soils:			
Beneath foundations:	90%	-2%	+2%
Utility trenches (structural areas)*:	90%	-2%	+2%
On-site native soils			
Beneath access roads:	95%	+1%	+4%
Utility trenches (Landscape areas):	90%	+1%	+4%
Exterior slabs:	90%	+1%	+4%
Miscellaneous backfill:	90%	+1%	+4%

* Upper 12 inches should be compacted to 95% within structural areas.

Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction. Backfill against foundations and in utility line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

We recommend a minimum horizontal setback distance of 10 feet from the perimeter of any building and the high-water elevation of the nearest storm-water retention basin.

Utility Trenches

It is anticipated that the on-site soils will provide suitable support for underground utilities and piping that may be installed. Any soft and/or unsuitable material encountered at the bottom of excavations should be removed and be replaced with an adequate bedding material. A non-expansive granular material with a sand equivalent greater than 30 should be used for bedding and shading of utilities, unless allowed or specified otherwise by the utility manufacturer.

On-site materials are considered suitable for backfill of utility and pipe trenches from one foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances. Imported low volume change soils should be used for trench backfill in structural areas.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. If trenches are placed beneath footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, or disturbed, the affected material should be removed, or these materials should be scarified, moisture conditioned, and recompacted prior to construction.

On-site clay and silt soils may pump and unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. The use of light construction equipment would aid in reducing subgrade disturbance. The use of remotely operated equipment, such as a backhoe, would be beneficial to perform cuts and reduce subgrade disturbance.

Should unstable subgrade conditions develop stabilization measures will need to be employed. Stabilization measures may include placement of aggregate base and multi-axial geogrid. Use of lime, fly ash, kiln dust or cement could also be considered as a stabilization technique. Laboratory evaluation is recommended to determine the effect of chemical stabilization on subgrade soils prior to construction.

We recommend that the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically November through April) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork operations may require additional mitigative measures beyond that which

would be expected during the drier summer and fall months. This could include diversion of surface runoff around exposed soils and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.

Construction Observation and Testing

The exposed subgrade and each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the geotechnical engineer's representative prior to placement of additional lifts. We recommend that each lift of fill be tested for density and moisture content at a frequency of one test for every 2,500 square feet of compacted fill in the structural areas. We recommend one density and moisture content test for every 50 linear feet of compacted utility trench backfill. This testing frequency criteria may be adjusted during construction as allowed by the geotechnical engineer of record.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

The geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation; proof-rolling; placement and compaction of controlled compacted fills; backfilling of excavations to the completed subgrade.

FOUNDATIONS

The proposed batteries, transformers, and associated equipment may be supported on mat foundations bearing on engineered fill. Recommendations for foundations for the proposed structures and related structural elements are presented in the following paragraphs.

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

Mat Foundation Design Recommendations

DESCRIPTION	RECOMENDATION
Foundation Type	Mat foundations
Bearing Material[3]	A minimum 2-foot of engineered fill beneath the bottom of the foundations, or 4 feet below existing grades, whichever is greater. Low volume change materials should be used as engineered fill for support of proposed mat.
Allowable Bearing Pressure[1,7]	1-inch settlement ■ 1,800 psf for mat foundation (Up to 10 feet wide) ■ 1,000 psf for mat foundation (Up to 20 feet wide) ■ 800 psf for mat foundation (Up to 30 feet wide) 2-inch settlement ■ 4,000 psf for mat foundation (Up to 10 feet wide) ■ 2,700 psf for mat foundation (Up to 20 feet wide) ■ 1,900 psf for mat foundation (Up to 30 feet wide)
Minimum Foundation Width	2 feet
Ultimate Coefficient of Sliding Friction [4]	0.30
Minimum Embedment Depth Below Finished Grade	12 inches
Estimated Total Settlement from Structural Loads [2]	See **Allowable Bearing Pressure**
Estimated Differential Settlement[2,6]	½ of total settlement

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied.
2. Unsuitable or loose/soft, dry, and low-density soils should be removed and replaced per the recommendations presented in the **Earthwork**.
3. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face.
4. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions.
5. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure. The designer should select an appropriate factor of safety during design.
6. Differential settlements are as measured over a span of 40 feet.
7. Maximum width is based on settlement analysis with allowable settlement of 1 and 2 inches.

Settlement calculations were performed utilizing Westergaard and Hough's methods[5] to estimate the static settlement for various foundation widths with an allowable settlement of 1 and 2 inches.

[5] FHWA Geotechnical Engineering Circular No. 6 – Shallow Foundations, FHWA-SA-02-054.

Since there are several factors that will control the design of mat foundations besides vertical load, Terracon should be consulted when the final foundation depth and width are determined to assist the structural designer in the evaluation of anticipated settlement.

For structural design of mat foundations, a modulus of subgrade reaction (Kv_1) of 120 pounds per cubic inch (pci) may be used. Other details including treatment of loose foundation soils, superstructure reinforcement and observation of foundation excavations as outlined in the Earthwork section of this report are applicable for the design and construction of a mat foundation at the site.

The subgrade modulus (K_v) for the mat is affected by the size of the mat foundation and would vary according the following equation:

$$K_v = K_{v1}/B$$

Where: K_v is the modulus for the size footing being analyzed
B is the width of the mat foundation.

Shallow Foundation Design Considerations

Finished grade is defined as the lowest adjacent grade within five feet of the foundation for perimeter (or exterior) footings.

The allowable foundation bearing pressure applies to dead loads plus design live load conditions. The design bearing pressure may be increased by one-third when considering total loads that include wind or seismic conditions. The weight of the foundation concrete below grade may be neglected in dead load computations.

Foundations should be reinforced as necessary to reduce the potential for distress caused by differential foundation movement. The use of joints at openings or other discontinuities in masonry walls is recommended.

Foundation excavations should be observed by the geotechnical engineer. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

DEEP FOUNDATIONS

The proposed transmission tower can be supported on drilled shafts. The location of the proposed transmission tower was not available at the time of preparation of this report. Based on correspondence with S&L, we understand that the transmission tower may be situated within the central area of the site. Design recommendations for foundations for the proposed structures and related structural elements are presented in the following paragraphs.

Total required embedment of the drilled shafts should be determined by the structural engineer based on structural loading and parameters provided in this report.

Drilled Shaft Axial Capacity

The allowable axial capacity for a range of drilled shafts diameters was evaluated and is presented in the graph provided in the **Supporting Documents** section of this report. The allowable total downward (compressive) capacity is based on a factor of safety of 2.5 for side resistance and 3.0 for end bearing. The analysis considered the depth to top of shaft to be 2 feet below existing ground surface. The depth below ground surface indicated in the graphs is referenced from the existing ground surface at the site at the time of the field exploration. The capacity presented is based on a minimum shaft spacing of 3 shaft diameters. Allowable tension capacity may be taken as 60 percent of the allowable compressive capacity, plus the weight of the shaft. Tensile reinforcement should extend to the bottom of shafts subjected to uplift loading.

Drilled Shaft Lateral Capacity

The required depths of shaft embedment should also be determined for design axial loads, lateral loads, and overturning moments to determine the most critical design condition. To support the designer, parameters for use in MFAD software have been tabulated and are presented in the following table.

MFAD 5.0 Recommended Engineering Properties of Soils				
Top Depth Bottom Depth	Effective Unit Weight (pcf)	MFAD Soil Group	Cohesion (psf)	MFAD Modulus of deformation (ksi)
2 10	115	CLAY	1,000	0.65
10 30	120	CLAY	1,000	0.65
30 45	120	CLAY	2,000	1.30
45 50	63	CLAY	3,000	1.95

It should be noted that the load capacities provided herein are based on the stresses induced in the supporting soils. The structural capacity of the shafts should be checked to assure that they can safely accommodate the combined stresses induced by axial and lateral forces. Furthermore, the response of the drilled shaft foundations to lateral loads is dependent upon the soil/structure interaction as well as the shaft's actual diameter, length, stiffness and "fixity" (fixed or free-head condition).

Lateral and axial capacity of soils within the upper 2 feet should be neglected due to utilities and disturbance around piers. We recommend that Terracon review the final drilled shaft design to verify that sufficient embedment is achieved.

Drilled Shaft Construction Considerations

All shafts should be reinforced full-depth for the applied axial, lateral and uplift stresses imposed. If multiple shafts are proposed at the transmission tower location, special sequencing of drilled shaft construction should be specified when the center to center spacing between adjacent shafts is less than three diameters. A minimum of 24 hours should be allowed between placement of concrete and initiation of drilling in shafts less than five diameters (center to center spacing) apart from each other.

Drilling to design depths should be possible with conventional single flight power augers. Formation of mushrooms or enlargements at the tops of shafts should be avoided during shaft drilling. If mushrooms develop at the tops of the shafts during drilling, sono-tubes should be placed at the shaft tops to help isolate the shafts.

Groundwater was encountered in some of the exploratory borings. Therefore, seepage or groundwater may be encountered during drilling for the shafts. To control groundwater seepage, the use of temporary steel casing and/or slurry drilling procedures may be required for construction of the drilled shaft foundations. The drilled shaft contractor and foundation design engineer should be informed of these risks.

If shafts are constructed below the groundwater level, the “Wet” shafts should be constructed by slurry displacement techniques. In this process, the shaft excavation is filled with approved polymer-based slurry to counter-balance the hydraulic forces below the water level and stabilize the wall of the shaft. Concrete would then be placed using a tremie extending to within 6 inches of the shaft base of the slurry-filled excavation. The tremie remains inserted several feet into the fresh concrete as it displaces the slurry upward and until placement is complete. The slurry should have a sand content no greater than 1% at the time concrete placement commences. The maximum unit weight of the slurry should be established in consultation with Terracon.

For drilled shaft depths above the depth of groundwater, temporary steel casing may be required to properly drill and clean shafts prior to concrete placement. If disturbed soils are present at the bottom of the drilled shafts, the sloughed materials must be removed, and bottom should be cleaned.

If casing is used for foundation construction, it should be withdrawn in a slow continuous manner maintaining a sufficient head of concrete to prevent caving or the creation of voids in pier concrete. Foundation concrete should have a relatively high fluidity when placed in cased pier holes or through a tremie. Foundation concrete with slump in the range of 6 to 8 inches is recommended when temporary casing is utilized.

Foundation concrete should be placed immediately after completion of drilling and cleaning. If foundation concrete cannot be placed in dry conditions, a tremie should be used for concrete placement. Due to potential sloughing and raveling, foundation concrete quantities may exceed calculated geometric volumes.

Free-fall concrete placement in drilled shafts will only be acceptable if provisions are taken to avoid striking the concrete on the sides of the hole or reinforcing steel. The use of a bottom-dump hopper, or an elephant's trunk discharging near the bottom of the hole where concrete segregation will be minimized, is recommended.

Drilled shaft bearing surfaces must be cleaned prior to concrete placement. A representative of the geotechnical engineer should observe the bearing surface and foundation shaft configuration. If the subsurface soil conditions encountered differ significantly from those presented in this report, supplemental recommendations may be required.

We recommend that all drilled shaft installations be observed on a full-time basis by an experienced geotechnical engineer in order to evaluate that the soils encountered are consistent with the recommended design parameters.

The contractor should check for gas and/or oxygen deficiency prior to any workers entering the excavation for observation and manual cleanup. All necessary monitoring and safety precautions as required by OSHA, State or local codes should be strictly enforced.

LATERAL EARTH PRESSURES

Design Parameters

For engineered fill comprised of on-site soils or imported low volume change materials (required behind retaining walls) above any free water surface, recommended equivalent fluid pressures for unrestrained foundation elements are:

ITEM	VALUE[a, b]
Active Case	38 psf/ft[c]
Passive Case	375 psf/ft
At-Rest Case	58 psf/ft
Surcharge Pressure	0.32 x (Surcharge)
Coefficient of Friction	0.35

[a]Note: The values are based on low volume change engineered fill materials used as backfill behind retaining walls.
[b]Note: Uniform, horizontal backfill, compacted to at least 90% of the ASTM D 1557 maximum dry density, rendering a maximum unit weight of 120 pcf.
[c]Note: Earth pressures should be increased by 40 percent for a slope of 2H:1V behind walls and should be increased by 120 percent for a slope of 1.5H:1V.

The lateral earth pressures herein do not include any factor of safety and are not applicable for submerged soils/hydrostatic loading. Additional recommendations may be necessary if such conditions are to be included in the design.

Total lateral earth pressures acting on the wall, where it is retaining greater than 6 feet, during a seismic event should include the active static forces and a dynamic increment. The active dynamic increment should be applied to unrestrained walls as a resultant force acting at 0.6H height from the base of the wall. Such increment should be added to the static earth pressures. The dynamic lateral earth resultant force (for a 0.56g peak ground acceleration estimated based on the current 2019 California Building Code) is $13H^2$ (in units of pounds per linear foot (plf), where H (in units of feet) is the height of the soil behind the wall.

Adequate drainage should be provided behind the retaining walls to collect water from irrigation, landscaping, surface runoff, or other sources, to achieve a free-draining backfill condition. The wall back drain should consist of Class 2 permeable materials[3] that are placed behind the entire wall height to within 18 inches of ground surface at the top of the wall. As a minimum, the width of Class 2 permeable materials behind the wall should be two feet. As an alternative, drainage panels/mats may be used in lieu of the Class 2 permeable materials. Water collected by the back drain should be directed to an appropriate outlet, such as perforated pipes or weep holes, for disposal.

Fill against foundation and retaining walls should be compacted to densities specified in the Earthwork section of this report. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors.

[3] In accordance with the requirements and specifications of the State of California Department of Transportation.

The design of any shoring system should consider surcharge loads imposed by the existing structures and vehicular loads in the vicinity of the shoring. In general, surcharge loads should be considered where they are located within a horizontal distance behind the shoring equal to the height of the shoring.

Surcharge loads acting at the top of the shoring should be applied to the shoring over the backfill as a uniform pressure over the entire shoring height and should be added to the static earth pressures. Surcharge stresses due to point loads, line loads, and those of limited extent, such as compaction equipment, should be evaluated using elastic theory.

The design of the shored excavation should be performed by an engineer knowledgeable and experienced with the on-site soil conditions. The contractor should be aware that slope height, slope inclination or excavation depths should in no case exceed those specified in local, state or federal safety regulations, e.g. OSHA Health and Safety Standards for Excavation, 29 CFR Part 1926, or successor regulations. Such regulations are strictly enforced and, if not followed, the owner or the contractor could be liable for substantial penalties.

ACCESS ROADWAYS

Compacted Native Soils Access Road Design Recommendations

Based upon the soil conditions encountered in the test borings, the use of on-site soils for construction of on-site roads is considered acceptable. Without the use of asphalt concrete or other hardened material to surface the roadways, there is an increased potential for erosion and deep rutting of the roadway to occur, however, post construction traffic is anticipated to only consist of pickup trucks for operations and maintenance personnel. Therefore, construction of the un-surfaced native roadways should consist of a minimum of 10-inches of compacted on-site soils.

It is our understanding that proposed compacted native roadway grades will match adjacent existing grades so that the existing natural drainage patterns are generally unchanged. The un-surfaced roads are expected to function with periodic maintenance.

Aggregate Surface Roadway Design Recommendations

Aggregate surface roadway design was conducted in general accordance with the Army Corps of Engineers (ACOE) Technical Manual TM-5-822, Design of Aggregate Surface Roads and Airfields (1990). The design was based on Category III, traffic containing as much as 15% trucks, but with not more than 1% of the total traffic composed of trucks having three or more axles (Group 3 vehicles), and Road Class G (Under 70 vehicles per day). This assumed traffic loading is for the operations of the proposed facility but not for construction traffic. Based on the Category and Road Class, a Design Index of 1 was utilized, along with a correlated CBR of 5. Terracon should be contacted if significant changes in traffic loads or in the characteristics described are anticipated.

As a minimum, the aggregate surface course should have a minimum thickness of 6 inches and should be constructed over a minimum of 10 inches of scarified, moisture conditioned, and compacted native soils to 90% of the maximum dry density using ASTM D 1557. The recommended thicknesses should be measured after full compaction. The width of the roadway should extend a minimum distance of 1 foot on each side of the desired surface width.

It is our understanding that aggregate surfaced roads and parking areas will be utilized during the construction of this project. Aggregate materials should conform to the specifications of Class II aggregate base in accordance with the requirements and specifications of the State of California Department of Transportation (Caltrans), or other approved local governing specifications.

Positive drainage should be provided during construction and maintained throughout the life of the roadways. Proposed roadway design should maintain the integrity of the road and eliminate ponding.

Roadway Design and Construction Considerations

Regardless of the design, un-surfaced roadways will display varying levels of wear and deterioration. We recommend an implementation of a site inspection program at a frequency of at least once per year to verify the adequacy of the roadways. Preventative measures should be applied as needed for erosion control and re-grading. An initial site inspection should be completed approximately three months following construction.

Preventative maintenance should be planned and provided for through an on-going management program to enhance future roadway performance. Preventative maintenance activities are intended to slow the rate of deterioration, and to preserve the roadway investment.

Surfacing materials should not be placed when the surface is wet. Surface drainage should be provided away from the edge of roadways to reduce lateral moisture transmission into the subgrade.

If rut depths become excessive as construction work progresses, re-grading and re-compaction should be performed as necessary. Care should be taken to reduce or eliminate trafficking of the unpaved access road when the subgrade is wet as this will result in accelerated rutting conditions. Scarification, moisture treatment as necessary, and re-compaction of the roadways will likely be necessary as the roadways deteriorate.

Materials and construction of roadways for the project should be in accordance with the requirements and specifications of the California Department of Transportation or the applicable local governing body.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. The findings and recommendations presented in this report were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of its profession completing similar studies and practicing under similar conditions in the geographic vicinity and at the time these services have been performed. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Boring ID	Depth (feet)	Location
B-1 to B-3, B-7 to B-10, B-15 to B-17, B-20, B-21, B-25	41½ to 101½	Battery storage and transformer areas
P-1 to P-8	5 to 10	Potential infiltration areas
B-4 to B-6, B-11 to B-14, B-19, B-24	51 to 91½	On or along existing hillside

Note: Proposed borings B-18, B-22, B-23, and B-26 were not drilled based on direction from the client.

Boring Layout and Elevations: Boring layout was provided by S&L. Several locations were shifted by Terracon during site reconnaissance based on drill rig accessibility. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and elevations are based on a site topographic KMZ file (1-foot contours) provided by S&L. If a more precise boring layout is desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted drill rig using hollow stem augers. Four samples were generally obtained in the upper 10 feet of the borings and at intervals of 5 feet thereafter. A standard 2-inch outer diameter split-barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. A 3-inch O.D. split-barrel sampling spoon with 2.5-inch I.D. ring lined sampler was also used for sampling. Ring-lined, split-barrel sampling procedures are similar to standard split spoon sampling procedure; however, blow counts are typically recorded for 6-inch intervals for a total of 18 inches of penetration. We observed and recorded groundwater levels during drilling and sampling.

In accordance with Orange County well permit requirements, all borings extending beyond 50 feet or into groundwater regardless of depth were backfilled cement grout slurry. All other borings were backfilled with auger cuttings. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our field geologist prepared field boring logs as part of the excavation operations. These field logs include visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil and rock strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D1140 Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing
- ASTM D3080 Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions
- ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
- ASTM D4829 Standard Test Method for Expansion Index of Soils
- ASTM D2844 Standard Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils
- ASTM D2850 Standard Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils
- Corrosivity testing included pH, chlorides, sulfates, and electrical lab resistivity

The laboratory testing program often included examination of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

Terracon GeoReport

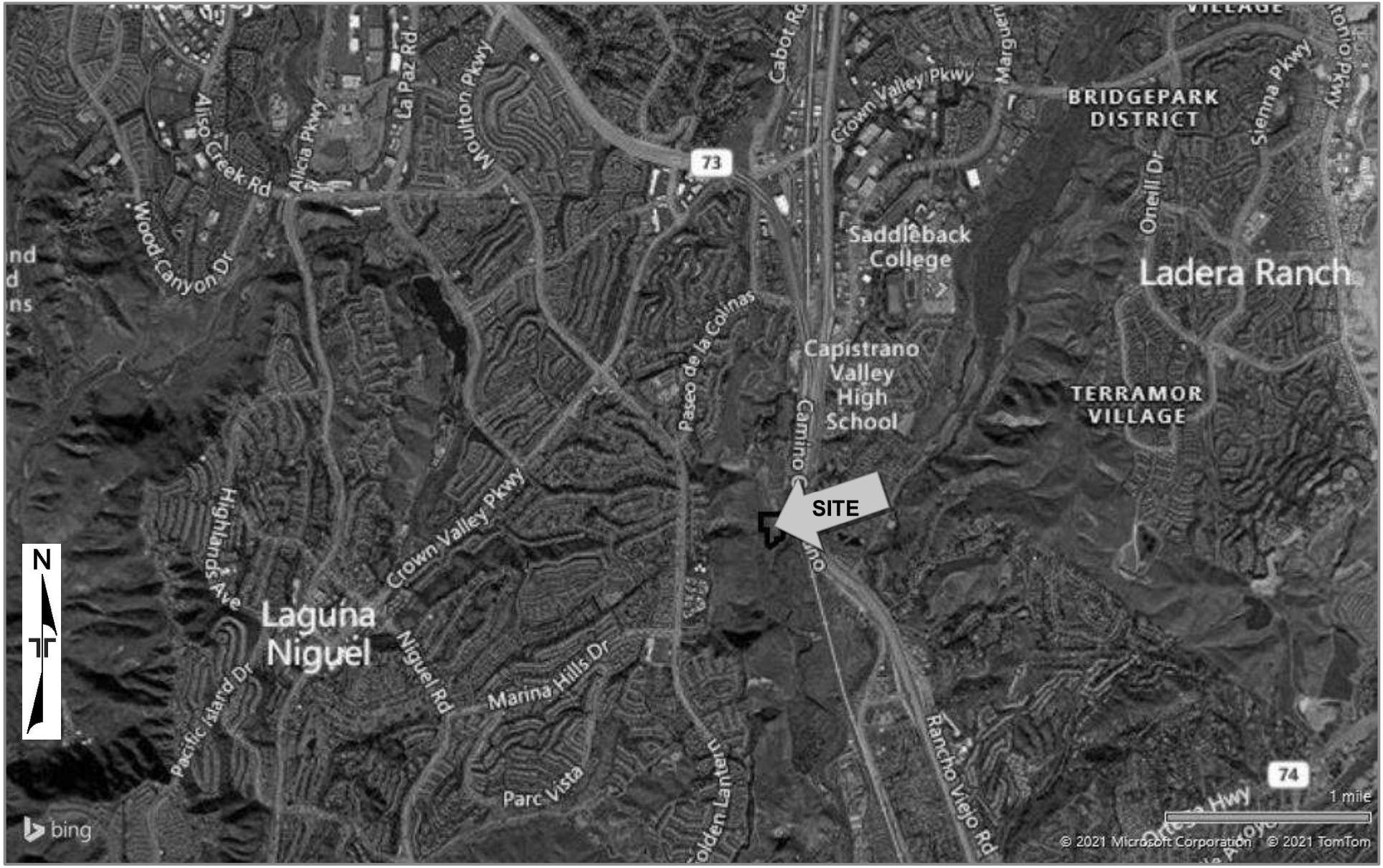
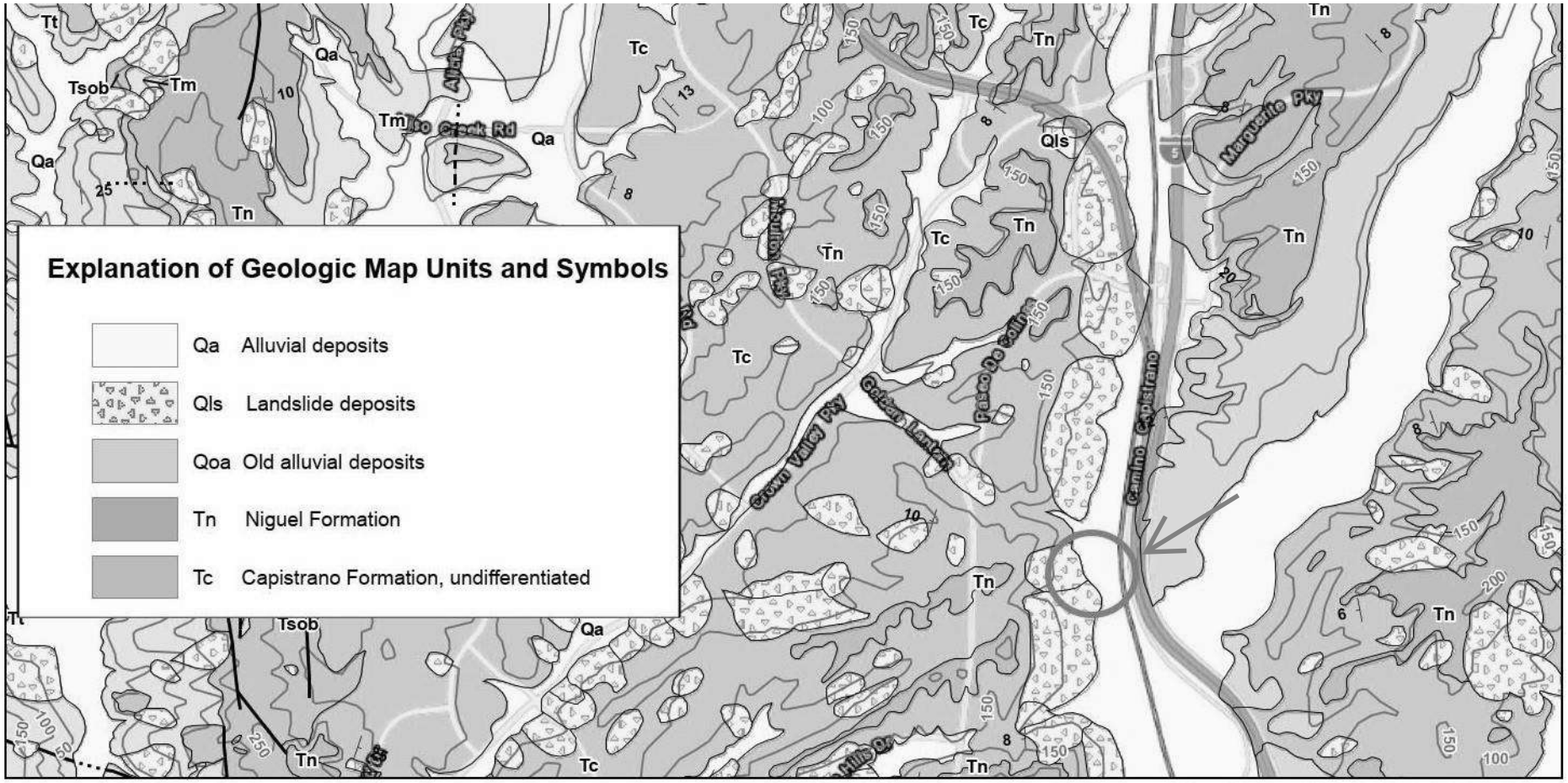


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY QUADRANGLES INCLUDE: SAN JUAN CAPISTRANO, CA (1/1/1981).



From: Morton and Miller, 2006, Geologic Map of the San Bernardino and Santa Ana 30' x 60' Quadrangles, California: U.S. Geological Survey, Open-File Report 2006-1217, version 1.0, scale 1:100,000

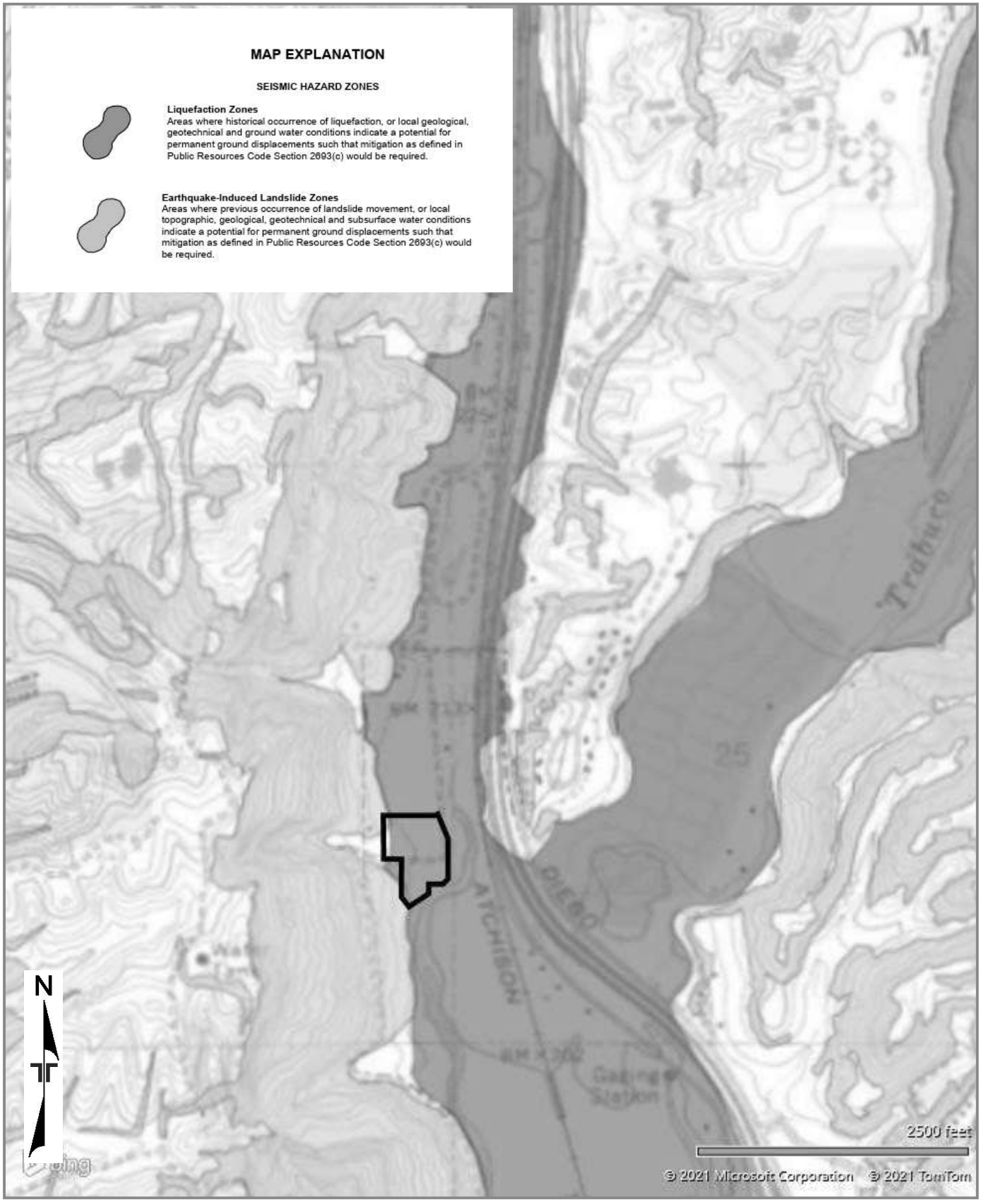


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

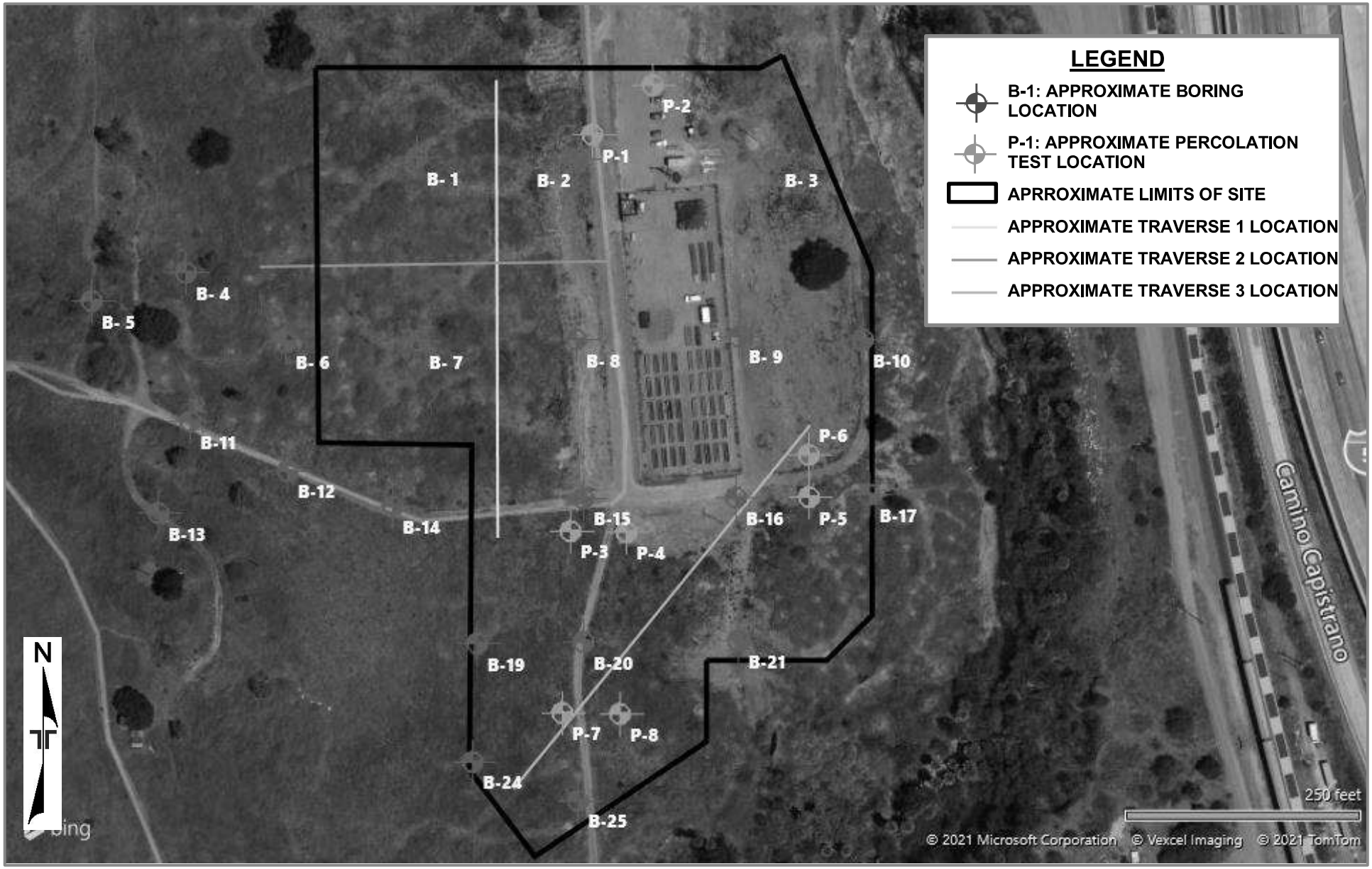


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

BORING LOG NO. B- 1

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5328° Longitude: -117.6781°

Surface Elev.: 217 (Ft.)

DEPTH ELEVATION (Ft.)

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	EXPANSION INDEX	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
		LEAN CLAY WITH SAND (CL), olive-brown to brown								
			64						37-22-15	85
		stiff								
		7-5-5								
		trace silt, olive-brown to gray-brown								
5		3-5-6					18.7	100		
		white mottling								
		4-6-7								
10		6-8-8								
15		4-5-6								
20		soft to medium stiff								
		2-2-2 N=4								
25										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-17-2021 | Boring Completed: 09-17-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 1

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 33.5328° Longitude: -117.6781° Surface Elev.: 217 (Ft.) DEPTH / ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	EXPANSION INDEX	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	LEAN CLAY WITH SAND (CL), olive-brown to brown *(continued)* medium stiff to stiff				2-2-6 N=8								
	wet, stiff	30			2-4-6 N=10								
	medium stiff	35			1-3-4 N=7								
	stiff	40			2-4-5 N=9								
	41.5 / 175.5												
	Boring Terminated at 41.5 Feet												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-17-2021 | Boring Completed: 09-17-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 2

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5328° Longitude: -117.6776°

Surface Elev.: 210 (Ft.)

DEPTH	ELEVATION (Ft.)
7.5	202.5

DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
		15-14-14				13.4	110		
5		5-7-7						27-20-7	
		3-5-7							
10		4-5-8				26.7	98		
15		3-4-4				33.9	88		
20		2-4-4							
25									

SILTY CLAY (CL-ML), trace sand, olive-brown to brown

olive-brown to gray-brown, very stiff

stiff

LEAN CLAY (CL)
trace silt and sand, olive-brown to gray-brown, stiff

medium stiff

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-17-2021 | Boring Completed: 09-17-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 2

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5328° Longitude: -117.6776°

Surface Elev.: 210 (Ft.)

DEPTH	ELEVATION (Ft.)	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	EXPANSION INDEX	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL) *(continued)* medium stiff					2-3-4 N=7								
			30											
						2-3-3 N=6								
31.5	178.5													
	SILTY SAND (SM), gray-brown loose		35			2-3-4 N=7								25
40.0	170													
	LEAN CLAY (CL), trace sand, olive-brown to gray-brown, stiff		40			3-4-6 N=10								
41.5	168.5													
	Boring Terminated at 41.5 Feet													

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-17-2021 | Boring Completed: 09-17-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 3

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5328° Longitude: -117.6769°

Surface Elev.: 209 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	Sample	Field Test Results	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI
0	209	**SILT WITH SAND (ML)**, trace clay, olive-brown to light-brown					
2.5	206.5	**LEAN CLAY WITH SAND (CL)**, olive-brown to dark-brown, very stiff		9-16-16			
				5-8-12	17.4	103	
7.5	201.5	**LEAN CLAY (CL)**, white mottling trace silt and sand, olive-brown to dark-brown, very stiff		10-13-15			34-22-12
				8-13-20	22.5	101	
				5-8-10 N=18			
				9-7-12			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement-grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *At completion of drilling*

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-17-2021 | Boring Completed: 09-17-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 3

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5328° Longitude: -117.6769°

Surface Elev.: 209 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	LEAN CLAY (CL), white mottling *(continued)* stiff			4-5-7 N=12							
		30		4-6-8				33.6	88		
	and gray-brown, medium stiff	35		2-2-3 N=5							
	stiff	40		4-6-6							
	wet, medium stiff	45		2-2-5 N=7							
50.0	159	50									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement-grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *At completion of drilling*

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-17-2021 | Boring Completed: 09-17-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 3

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5328° Longitude: -117.6769°

Surface Elev.: 209 (Ft.)

DEPTH	ELEVATION (Ft.)	Description	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	PERCENT FINES
		SANDY LEAN CLAY (CL), gray-brown, stiff			5-8-8	
51.5	157.5					
		POORLY GRADED SAND WITH SILT (SP-SM), gray-brown				
		medium dense	55		7-7-4 N=11	10
		trace clay	60		9-14-15	
65.0	144					
		SANDY LEAN CLAY (CL), dark-brown to gray-brown, medium stiff	65		1-2-3 N=5	
		stiff	70		4-7-9	
			75			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

EXPANSION INDEX	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement-grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *At completion of drilling*

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-17-2021 | Boring Completed: 09-17-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 3

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5328° Longitude: -117.6769°

Surface Elev.: 209 (Ft.)

DEPTH ELEVATION (Ft.)

GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	EXPANSION INDEX	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
				2-5-5 N=10								

SANDY LEAN CLAY (CL), dark-brown to gray-brown, medium stiff *(continued)*

76.5 132.5

Boring Terminated at 76.5 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement-grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *At completion of drilling*

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-17-2021 | Boring Completed: 09-17-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 4

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5325° Longitude: -117.6789°

Surface Elev.: 247 (Ft.)

DEPTH	ELEVATION (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			4-5-7	5.3			
5.0	242						
			5-15-15			39-26-13	
			11-16-24				90
			9-14-21	16.7	99		
15.0	232						
			9-15-22				
20.0	227						
			2-3-8 N=11				
25.0	222						

LANDSLIDE DEPOSITS (Qls), SILTY CLAYEY SAND, trace gravel, light brown, loose

LANDSLIDE DEPOSITS (Qls), SILT, trace sand, olive-brown to gray-brown, very stiff

white mottling and orange rust staining

LANDSLIDE DEPOSITS (Qls), SILTY CLAY (CL-ML), trace sand, olive-brown with white mottling and orange rust staining, very stiff

LEAN CLAY (CL), trace silt and sand, olive-brown to gray-brown, stiff

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement-grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-10-2021 | Boring Completed: 09-10-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 4

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5325° Longitude: -117.6789°

Surface Elev.: 247 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)
SILTY CLAY (CL-ML), olive-brown, very stiff				8-14-21		
30.0	217	30				
LEAN CLAY (CL), trace sand, light-gray to gray-brown with white mottling, very stiff				4-10-11 N=21		
		35		9-16-25		
		40		2-6-11 N=17		
		45		11-17-23	22.8	104
50.0	197	50				

EXPANSION INDEX | STRENGTH TEST (TEST TYPE, COMPRESSIVE STRENGTH (tsf), STRAIN (%)) | ATTERBERG LIMITS (LL-PL-PI) | PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement-grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-10-2021 | Boring Completed: 09-10-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 4

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5325° Longitude: -117.6789°

Surface Elev.: 247 (Ft.)

DEPTH ELEVATION (Ft.)

GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	EXPANSION INDEX	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES

CAPISTRANO FORMATION (Tc) recovered as SILTY CLAY with trace SAND, dark-brown to dark-gray
very stiff

3-10-20
N=30

hard

55

35-50/4"

60

9-19-27
N=46

65

42-50/3"

70

10-20-29
N=49

75

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement-grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-10-2021 | Boring Completed: 09-10-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 4

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

GRAPHIC LOG	LOCATION / DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	EXPANSION INDEX	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
	LOCATION See Exploration Plan Latitude: 33.5325° Longitude: -117.6789° Surface Elev.: 247 (Ft.) DEPTH / ELEVATION (Ft.)												
	CAPISTRANO FORMATION (Tc) recovered as SILTY CLAY with trace SAND, dark-brown to dark-gray *(continued)* hard				27-50/5"								
		80			15-19-29 N=48								
		85			30-50/5"								
		90			17-23-35 N=58								
	91.5 / 155.5 ***Boring Terminated at 91.5 Feet***												

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement-grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-10-2021 | Boring Completed: 09-10-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 5

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5324° Longitude: -117.6793°

Surface Elev.: 254 (Ft.)

DEPTH ELEVATION (Ft.)

GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	EXPANSION INDEX	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
				5-8-11								
	5			8-13-16					10.9	103		
				9-12-14								
	10			5-8-12					12.4	97		
	15			1-2-4 N=6							42-23-19	
	20			4-9-12					20.2	97		
	25											

LANDSLIDE DEPOSITS (Qls), LEAN CLAY
trace silt and sand, gray-brown to olive-brown

very stiff

light-brown to olive-brown with white mottling

medium stiff

very stiff

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement-grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-08-2021 | Boring Completed: 09-08-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 5

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5324° Longitude: -117.6793°

Surface Elev.: 254 (Ft.)

DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS
	LANDSLIDE DEPOSITS (Qls), LEAN CLAY *(continued)* olive-brown with white mottling, medium stiff			1-2-4 N=6
	stiff	30		4-7-9
	medium stiff	35		1-2-3 N=5
	very stiff	40		3-8-14
45.0	209	45		2-3-8 N=11
	LANDSLIDE DEPOSITS (Qls), SILTY CLAY, trace sand, olive-brown to light-gray with white mottling and orange rust stains, stiff			
50.0	204	50		

EXPANSION INDEX	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement-grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-08-2021 | Boring Completed: 09-08-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170

BORING LOG NO. B- 5

PROJECT: Broad Reach Power Compass BESS

CLIENT: Sargent & Lundy LLC
Chicago, IL

SITE: San Juan Capistrano, CA

LOCATION See Exploration Plan

Latitude: 33.5324° Longitude: -117.6793°

Surface Elev.: 254 (Ft.)

DEPTH	ELEVATION (Ft.)	SAMPLE TYPE	FIELD TEST RESULTS
SILTY CLAY (CL-ML), trace sand, dark-gray to dark-brown with white mottling and orange rust stains, very stiff			9-14-22
stiff to very stiff			2-5-10 N=15
gray-brown, hard			13-27-45
62.0	192		
CAPISTRANO FORMATION (Tc) recovered as SILTY CLAY with trace SAND, dark-gray to dark-brown with white mottling, very stiff			4-9-16 N=25
dark-gray to dark-brown, hard			40-50/4"

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	EXPANSION INDEX	STRENGTH TEST: TEST TYPE	STRENGTH TEST: COMPRESSIVE STRENGTH (tsf)	STRENGTH TEST: STRAIN (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS: LL-PL-PI	PERCENT FINES
55									
60			UU						
65									
70									
75									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Boring backfilled with cement-grout upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1421 Edinger Ave, Ste C
Tustin, CA

Boring Started: 09-08-2021 | Boring Completed: 09-08-2021

Drill Rig: CME-75 | Driller: 2R Drilling

Project No.: 60215170