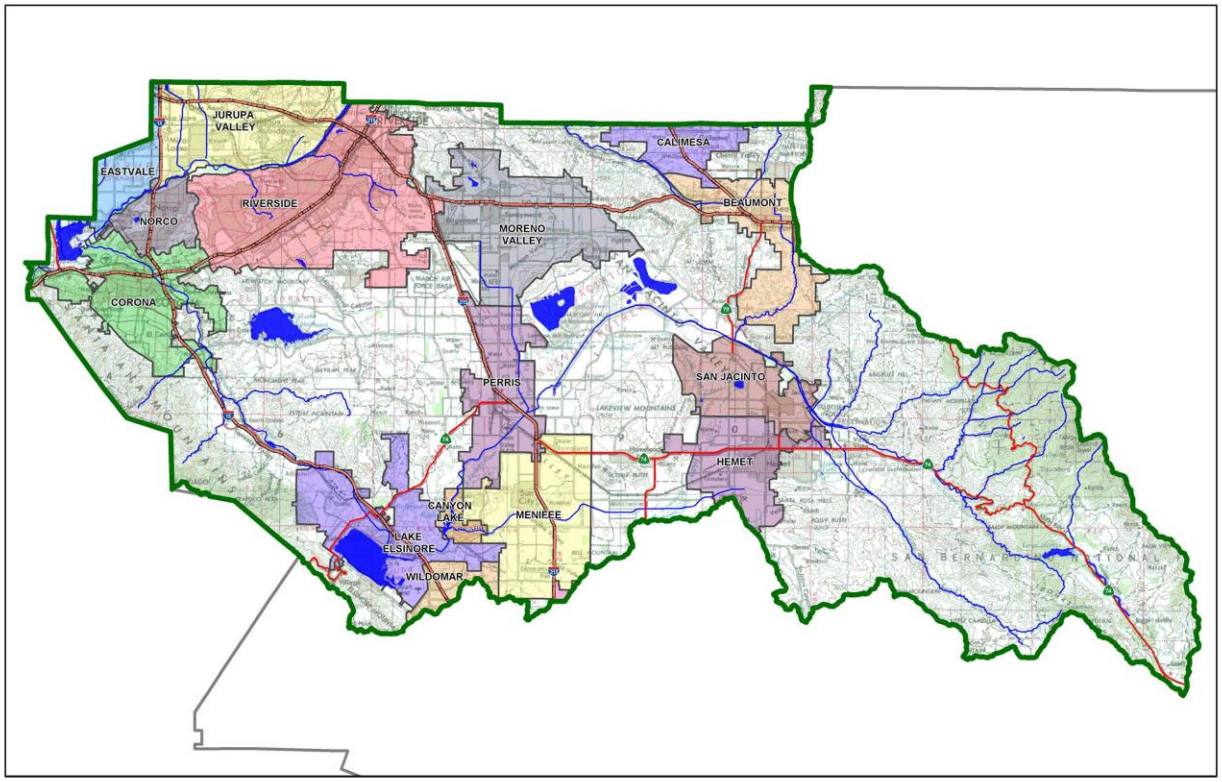
Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: MAGNOLIA AVENUE BUSINESS CENTER

Development No: PP2022-0003

Design Review/Case No: PWWQ2022-0015 WQ22-014P



☒ **Preliminary**
☐ **Final**

Original Date Prepared: 10-24-2022

Revision Date(s): 11-14-2022, 2-15-2023, 5-19-2023, 9-21-2023, 10-13-2023

Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**

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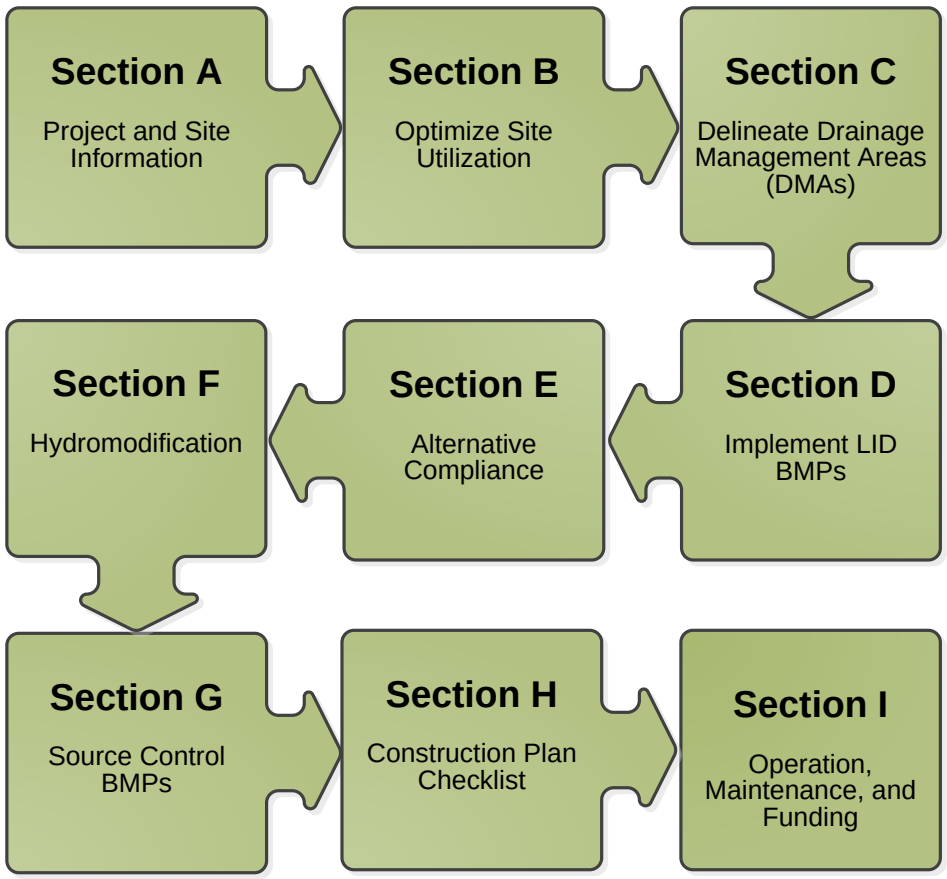
A Brief Introduction

This Project-Specific WQMP Template for the **Santa Ana Region** has been prepared to help guide you in documenting compliance for your project. Because this document has been designed to specifically document compliance, you will need to utilize the WQMP Guidance Document as your "how-to" manual to help guide you through this process. Both the Template and Guidance Document go hand-in-hand, and will help facilitate a well prepared Project-Specific WQMP. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for B9 Magnolia Owner by KWC Engineers for the Magnolia Avenue Business Center project.

This WQMP is intended to comply with the requirements of City of Corona for Storm Water Quality Ordinance (Corona Municipal Code Section 15.36, Titla 13 Chapter 13.27 and City Council Ordinance No. 2291 and 2828) which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under City of Corona Water Quality Ordinance (Storm Water Quality Ordinance (Corona Municipal Code Section 15.36, Title 13 Chapter 13.27 and City Council Ordinance No. 2291 and 2828)).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

Owner's Signature	Date
Jeremey Mape	Owner
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

Preparer's Signature	Date
Nick Nguyen	Project Manager
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure: PE

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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	MIXED USE - Industrial/Commercial
Planning Area:	Business Park
Community Name:	City of Corona
Development Name:	Magnolia Avenue Business Center

PROJECT LOCATION

Latitude & Longitude (DMS): 33° 52’ 10’’ N, 117° 32’ 16’’ W

Project Watershed and Sub-Watershed: Santa Ana River

APN(s): 107-030-022-3

Map Book and Page No.: Book 20, Page 3

PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Industrial/Commercial
Proposed or Potential SIC Code(s)	SIC 39
Area of Impervious Project Footprint (SF)	721,663
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	721,663
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N

EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	619,025 sf
Is the project located within any MSHCP Criteria Cell?	☐ Y ☒ N
If so, identify the Cell number:	N/A
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	N/A
What is the Water Quality Design Storm Depth for the project?	0.72

Project Description:

The Magnolia Avenue Business Center project is comprised of 16.68 acres. Most of the site is currently occupied with various improvements, including several large industrial/warehouse type buildings, office buildings, material racks, loading docks, asphalt pavements, concrete slabs, unpaved areas that appears to have been constructed several decades ago. The site has chain link fenced along the property line with the flood control channel Temescal Wash to the north and east and along Magnolia Avenue to the south. A rail line and a shallow dirt ditch extends along the western boundary line. Existing underground utilities such as sewer, water, gas electricity and storm drainpipes are present throughout the site. Overhead electric lines are also present on site. The site is currently active. The site is at 1375 Magnolia Ave in the City of Corona in Riverside County, in the State of California. Figure 1 in Appendix 1 shows a location map of the general area. All existing improvements around the site are fully developed.

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the local vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Co-Permittee plan reviewer must be able to easily analyze your project utilizing this template and its associated site plans and maps.

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the receiving waters that the project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated beneficial uses, and proximity, if any, to a RARE beneficial use. Include a map of the receiving waters in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Temescal Creek – Reach 1B		REC1, REC2, WILD	N/A
Temescal Creek – Reach 1A		AGR, GWR, IND, RARE, REC1, REC2, SPWN, WARM, WILD	3 Miles
Prado Dam	pH	RARE, REC1, REC2, WARM, WILD	8 Miles
Santa Ana River – Reach 3	Copper, Indicator Bacteria, Lead	AGR, GWR, RARE, REC1, REC2, WARM, WILD	8 Miles
Santa Ana River – Reach 2		AGR, GWR, RARE, REC1, REC2, WARM, WILD	29 Miles
Santa Ana River – Reach 1		BIOL, REC1, REC2, WARM, WILD	N/A
Pacific Ocean	N/A	N/A	

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ Y	☒ N
US Army Corps of Engineers, CWA Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)* City of Corona Grading, Improvement, and Building Permits.	☒ Y	☐ N

If yes is answered to any of the questions above, the Co-Permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, **constraints** might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. **Opportunities** might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your LID design and explain your design decisions to others.

The 2010 Santa Ana MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

The existing drainage patterns of the site were identified and preserved. Existing drainage patterns flow from south to the northwest corner of the project site. The existing flows are discharged from the site through existing 24" RCP storm drain outlets. The outflow is discharged into the Temescal Wash adjacent to the northeast side of the project. The proposed site development drains in the same general direction of the existing drainage pattern. The flows will be treated prior to being discharged from the existing storm drain outlets into the Temescal Wash.

Half-width street improvements to Magnolia Avenue will be implemented as a part of this project. Runoff will be collected in the gutter and treated prior to being discharged into the existing 30" RCP storm drain on Sherborn Street.

Did you identify and protect existing vegetation? If so, how? If not, why?

The site has been developed decades ago as industrial/warehouse buildings with paved parking and paved areas. There are small patches of unpaved areas within the site that has been disturbed over the year. Existing trees along the property line are to be protected in place. The proposed condition will preserve the trees along the property lines. On site trees and shrubs that are in the way of developing the site, will be removed. The remainder of the site will be properly graded to make way for the new development and the proposed landscaping.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

Onsite soils contain elevated concentrations of metals, PCBs, and hydrocarbons. Therefore, the area of the site containing PCBs will be retained on Site under a Toxic Substances Control Act (TSCA) Cap which will be at least a 6-inch concrete. Infiltration is not recommended and the 6-inch concrete cap will prevent discharge at the surface level from penetrating through the ground and contaminating the groundwater.

Did you identify and minimize impervious area? If so, how? If not, why?

This project has maximized the pervious area possible in the design of the parking lots, sidewalks, and drive aisles. The landscape areas have been maximized to minimize the impervious area. The proposed impervious area has been minimized in relation to the size of the site and relative density of the development. The proposed impervious area almost matches the existing impervious areas. The site design proposes private roadways, industrial/warehouse lots, parking and landscaped areas.

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Yes, runoff adjacent to the proposed landscape areas will drain towards the pervious areas when able. Drainage from the proposed buildings is directed to impervious and pervious areas away from the building. Wherever possible the onsite runoff has been designated to drain into the pervious landscape areas. Roof runoff has been designed to drain into roof down drains that will discharge the water into the drive aisle/gutter system. The flow enters the catch basins that will capture the water and direct the flow through storm drains into the MWS Units for treatment. The treated flow will be discharged into the Temescal Wash through the existing 24" RCP storm drain outlets.

Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
DMA 1	Roofs, Concrete/Asphalt, Landscaping, Natural	231,711	Type D
1A	Roofs	90,157	Type D
1B	Concrete/Asphalt	122,680	Type D
1C	Landscaping	18,874	Type D
DMA 2	Roofs, Concrete/Asphalt, Landscaping, Natural	292,961	Type D
2A	Roofs	144,086	Type D
2B	Concrete/Asphalt	140,107	Type D
2C	Landscaping	8,768	Type D
DMA 3	Roofs, Concrete/Asphalt, Landscaping, Natural	170,879	Type D
3A	Roofs	87,285	Type D
3B	Concrete/Asphalt	79,014	Type D
3C	Landscaping	4,580	Type D
DMA 4	Concrete/Asphalt, Landscaping, Natural	66,616	Type D
4A	Concrete/Asphalt	58,335	Type D
4B	Landscaping	8,281	Type D

[1]*Reference Table 2-1 in the WQMP Guidance Document to populate this column*

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
N/A			

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name/ ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]
N/A						

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					**Receiving Self-Retaining DMA**		
DMA Name/ ID	Area (square feet) [A]	Post-project surface type	Runoff factor [B]	Product [C] = [A] x [B]	DMA name /ID	Area (square feet) [D]	Ratio [C]/[D]
N/A							

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
DMA 1	Bio-Treatment MWS 1
DMA 2	Bio-Treatment MWS 2
DMA 3	Bio-Treatment MWS 3
DMA 4	Bio-Treatment MWS 4

Note: More than one drainage management area can drain to a single LID BMP, however, one drainage management area may not drain to more than one BMP.

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? ☐ Y ☒ N

If yes has been checked, Infiltration BMPs shall not be used for the site. If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
X If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?	X	
If Yes, list affected DMAs: DMA 1, DMA 2, AND DMA 3		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		X
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?	X	
If Yes, list affected DMAs: DMA 1, DMA 2, AND DMA 3		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?	X	
Describe here: Screening for corrosive material is needed.		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

D.2 Harvest and Use Assessment

Please check what applies*:*

- ☐ Reclaimed water will be used for the non-potable water demands for the project.
- ☐ Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).
- ☐ The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If neither of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: 0.93 ac

Type of Landscaping (Conservation Design or Active Turf): Conservation Design

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 16.57 ac

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: 1.32

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: 21.95 ac

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
21.87 ac	0.93 ac

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: 890

Project Type: Industrial / Commercial. Business Park

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: 16.57 ac

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-1 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: 198

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: 3,280

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	**Projected number of toilet users (Step 1)**
3,280	890

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

N/A

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand:

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces:

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-3 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-3:

Step 4: Multiply the unit value obtained from Step 4 by the total of impervious areas from Step 3 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use:

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required non-potable use (Step 4)	**Projected average daily use (Step 1)**

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

☒ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

D.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
DMA 1	☐	☐	☐	☒	☐
DMA 2	☐	☐	☐	☒	☐
DMA 3	☐	☐	☐	☒	☐

D.5 LID BMP Sizing

Each LID BMP must be designed to ensure that the Design Capture Volume will be addressed by the selected BMPs. First**,** calculate the Design Capture Volume for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second**,** design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.3 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D.3 DCV Calculations for LID BMPs

DMA Type/ID	DMA Area (sqft)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*MWS UNIT - 1*		
DMA 1	[A]		[B]	[C]	[A] x [C]	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
Roofs	*90,157*	*Roofs*	*1*	*0.89*	*80,420*			
Street	*122,680*	*Concrete or Asphalt*	*1*	*0.89*	*109,431*			
Landscape	*18,874*	*Ornamental Landscaping*	*0.1*	*0.11*	*2,085*			
	A_T = 231,711				Σ= 191,935	[E] = 0.2	0.9	0.9

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
BMP Design Flow Rate (QBMP) worksheets are included in Appendix 6

DMA Type/ID	DMA Area (sqft)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*MWS UNIT - 2*		
DMA 2	[A]		[B]	[C]	[A] x [C]	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
Roofs	*144,086*	*Roofs*	*1*	*0.89*	*128,524*			
Street	*140,107*	*Concrete or Asphalt*	*1*	*0.89*	*124,976*			
Landscape	*8,768*	*Ornamental Landscaping*	*0.1*	*0.11*	*969*			
	A_T = 292,961				Σ= 254,468	[E] = 0.2	1.2	1.3

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
BMP Design Flow Rate (QBMP) worksheets are included in Appendix 6

DMA Type/ID	DMA Area (sqft)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor	*MWS UNIT – 3*		
DMA 3	[A]		[B]	[C]	[A] x [C]	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
Roofs	87,285	*Roofs*	*1*	*0.89*	*77,858*			
Street	*79,014*	*Concrete or Asphalt*	*1*	*0.89*	*70,481*			
Landscape	*4,580*	*Ornamental Landscaping*	*0.1*	*0.11*	*506*			
	A_T = 170,879				Σ= 148,845	[E] = 0.2	0.7	0.9

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
BMP Design Flow Rate (QBMP) worksheets are included in Appendix 6

DMA Type/ID	DMA Area (sqft)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor	*MWS UNIT – 4*		
DMA 4	[A]		[B]	[C]	[A] x [C]			
Street	*58,335*	*Concrete or Asphalt*	*1*	*0.89*	*52,035*	***Design Rainfall Intensity (in/hr)***	***Design Flow Rate (cfs)***	***Proposed Flow Rate (cfs)***
Landscape	*8,281*	*Ornamental Landscaping*	*0.1*	*0.11*	*915*			
	A_T = 66,616				Σ= 52,949	[E] = 0.2	0.2	***0.3***

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

BMP Design Flow Rate (QBMP) worksheets are included in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- *Or* -

☐ The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

E.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P(2)
☒ Commercial/Industrial Development	P(3)	P	P(1)	P(1)	P(5)	P(1)	P	P
☐ Automotive Repair Shops	N	P	N	N	P(4, 5)	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☒ Parking Lots (>5,000 ft^2)	P(6)	P	P(1)	P(1)	P(4)	P(1)	P	P
☐ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☒	☒	☒	☒	☒	☒	☒	☒

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement smart growth principles are potentially eligible for Stormwater Credits. Utilize Table 3-8 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

Table E.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
N/A	
Total Credit Percentage[1]	

[1]*Cannot Exceed 50%*
[2]*Obtain corresponding data from Table 3-8 in the WQMP Guidance Document*

E.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your project, utilize Table E.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.2 of the WQMP Guidance Document for further information.

Table E.3 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor	*MWS UNIT*			
	[A]		[B]	[C]	[A] x [C]				
N/A						*Design Storm Depth (in)*	*Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12
[H] is from the Total Credit Percentage as Calculated from Table E.2 above
[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table E.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
MWS Unit 1	Bacteria, Metals, Nutrients, Pesticides, Toxic Organic, Compounds, Sediment, Trash and Debris, Oil and Grease	60% Medium
MWS Unit 2	Bacteria, Metals, Nutrients, Pesticides, Toxic Organic, Compounds, Sediment, Trash and Debris, Oil and Grease	60% Medium
MWS Unit 3	Bacteria, Metals, Nutrients, Pesticides, Toxic Organic, Compounds, Sediment, Trash and Debris, Oil and Grease	60% Medium
MWS Unit 4	Bacteria, Metals, Nutrients, Pesticides, Toxic Organic, Compounds, Sediment, Trash and Debris, Oil and Grease	60% Medium

[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.

[2] Cross Reference Table E.1 above to populate this column.

[3] As documented in a Co-Permittee Approved Study and provided in Appendix 6.

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

Once you have determined that the LID design is adequate to address water quality requirements, you will need to assess if the proposed LID Design may still create a HCOC. Review Chapters 2 and 3 (including Figure 3-7) of the WQMP Guidance Document to determine if your project must mitigate for Hydromodification impacts. If your project meets one of the following criteria which will be indicated by the check boxes below, you do not need to address Hydromodification at this time. However, if the project does not qualify for Exemptions 1, 2 or 3, then additional measures must be added to the design to comply with HCOC criteria. This is discussed in further detail below in Section F.2.

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration	-	-	-
Volume (Cubic Feet)	-	-	-

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, Santa Ana River, or other lake, reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

Does the project qualify for this HCOC Exemption? ☒ Y ☐ N

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier:

The outflow from the projects drains into the Temescal Wash and will eventually reach Prado Dam approximately 5 miles northwest of the site. Refer to Appendix 7-HCOC Applicability Map indicating that the project site is located within a "Not Applicable Area".

F.2 HCOC Mitigation

If none of the above HCOC Exemption Criteria are applicable, HCOC criteria is considered mitigated if they meet one of the following conditions:

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

Section G: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources*:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit*:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative*:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
On-site Storm Drain Inlets	• Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers shall be per local agency requirements	• Maintain and periodically repaint or replace inlet markings. • Provide Stormwater pollution prevention informations to new site owners, lessees, or operators. • See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com • Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
Landscape/ Outdoor Pesticide Use	Final landscape plans will accomplish all of the following: • Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. • Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. • Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. • Consider using pest-resistant plants, especially adjacent to hardscape. • To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	• Maintain landscaping using minimum or no pesticides. • See applicable operational BMPs in "What you should know for…..landscape and Gardening" at http://rcflood.org/stormwater/ • Provide IPM information to new owners, lessees and operators.

Refuse Areas	• Post signs on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	• Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Loading Docks		• Move loaded and unloaded items indoors as soon as possible • See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmhandbooks.com
Fire Sprinkler Test Water	• Provide a means to drain fire sprinkler water to the sanitary sewer.	• See the note in Fact Sheets SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
Miscellaneous Drain or Wash Water of Other Sources Roofing, gutters, and trim	• Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff	
Plazas, sidewalks, and parking lots		• Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris.

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)
MWS Unit 1	Modular Wetland System Unit	Precise Plan Sheet 2
MWS Unit 2	Modular Wetland System Unit	Precise Plan Sheet 2
MWS Unit 3	Modular Wetland System Unit	Precise Plan Sheet 2
MWS Unit 4	Modular Wetland System Unit	Precise Plan Sheet 2

Section I: Operation, Maintenance and Funding

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: BMPs will be maintained by the Property Owner Association and a WQMP Maintenance Agreement will be executed with the City.

Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

☒ Y ☐ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

LEGEND

- S_ DENOTES ROUTINE STRUCTURAL SOURCE CONTROL BMPs
- S1 STORM DRAIN INLETS
- S2 LANDSCAPE/OUTDOOR PESTICIDE USE
- S3 FIRE SPRINKLER TEST WATER
- S4 STREET SWEEPING PLAZAS, SIDEWALKS AND PARKING LOTS
- S5 LOADING DOCKS
- S6 REFUSE AREAS

WQMP TREATMENT SUMMARY TABLE

UNIT	DMA AREA (AC)	IMPERVIOUS (AC)	PERVIOUS (AC)	DESIGN FLOW RATE (CFS)	PROP FLOW RATE (CFS)	MWS UNIT TYPE
1	5.32	4.89	0.43	0.9	0.9	MWS-L-8-24-C-HC
2	6.73	6.53	0.20	1.2	1.3	2x MWS-L-8-20-V-HC
3	3.92	3.81	0.11	0.7	0.9	MWS-L-8-24-V-HC
4	1.53	1.34	0.19	0.3	0.3	MWS-L-8-8-V-HC
TOTAL	17.50	16.57	0.93	–	–	–
FAR = 7.39/15.91 = 0.46				EFFECTIVE AREA = 768 SF		

LEGEND

- ROOF AREA
- STREET AREA
- CONCRETE AREA
- LANDSCAPING AREA
- MWS UNIT (EFFECTIVE AREA)
- TRIBUTARY AREA BOUNDARY
- DMA 1A / 0.30 — DMA NUMBER / TRIBUTARY AREA (ACRES)
- PROPOSED STORM DRAIN
- PROPOSED CATCH BASIN
- DRAINAGE FLOW DIRECTION

CATCH BASIN STENCIL DETAIL

NOT TO SCALE

N

80 0 80 160 240

SCALE IN FEET

DMA PLAN
MAGNOLIA AVENUE BUSINESS CENTER
CITY OF CORONA

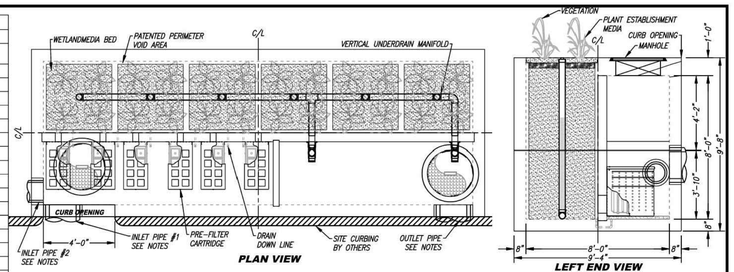
PREPARED FOR:
WESTERN REALCO
500 NEWPORT CENTER DR #630
NEWPORT BEACH, CA 92660

PREPARED BY:
KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 CORONA, CA. 92881-3370 951-734-2130

SHEET 1 OF 3 SHEET

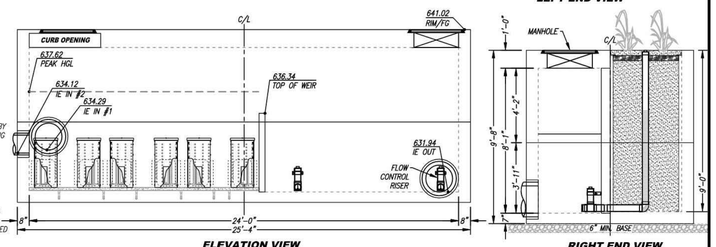
J.N. 19.1895.2

SITE SPECIFIC DATA			
PROJECT NUMBER		728823-010	
PROJECT NAME		MAGNOLIA AVENUE BUSINESS CENTER (BCE 15046)	
PROJECT LOCATION		CORONA, CA	
STRUCTURE ID		DMA 1	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.90	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			16.87
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	634.29	RCP	18"
INLET PIPE 2	634.12	RCP	12"
OUTLET PIPE	631.94	RCP	18"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	641.02	641.02	641.02
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	ø30"	OPEN PLANTER	ø30"
WETLANDMEDIA VOLUME (CY)			27.37
ORIFICE SIZE (DIA. INCHES)			ø2.84 EA
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			



PLAN VIEW

LEFT END VIEW



ELEVATION VIEW

RIGHT END VIEW

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS' SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL PIPES SHALL BE SEALED WATERTIGHT PER MANUFACTURER'S STANDARD CONNECTION DETAIL.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO USE GROUT AND/OR BRICKS TO MATCH COVERS WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. VEGETATION SUPPLIED AND INSTALLED BY OTHERS. ALL UNITS WITH VEGETATION MUST HAVE DRIP OR SPRAY IRRIGATION SUPPLIED AND INSTALLED BY OTHERS.
7. CONTRACTOR RESPONSIBLE FOR CONTACTING BIO CLEAN FOR ACTIVATION OF UNIT. MANUFACTURER'S WARRANTY IS VOID WITHOUT PROPER ACTIVATION BY A BIO CLEAN REPRESENTATIVE.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS AND ACCESSORIES PLEASE CONTACT BIO CLEAN.

INTERNAL BYPASS DISCLOSURE:

THE DESIGN AND CAPACITY OF THE PEAK CONVEYANCE METHOD TO BE REVIEWED AND APPROVED BY THE ENGINEER OF RECORD. HGL(S) AT PEAK FLOW SHALL BE ASSESSED TO ENSURE NO UPSTREAM FLOODING. PEAK HGL AND BYPASS CAPACITY SHOWN ON DRAWING ARE USED FOR GUIDANCE ONLY.

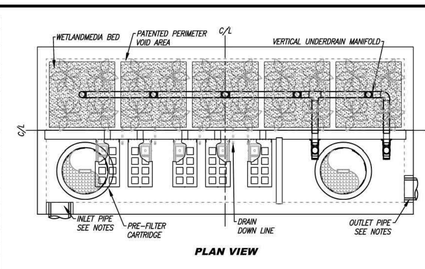
TREATMENT FLOW (CFS)	0.90
OPERATING HEAD (FT)	4.4
PRETREATMENT LOADING RATE (GPM/SF)	1.8
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS — FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

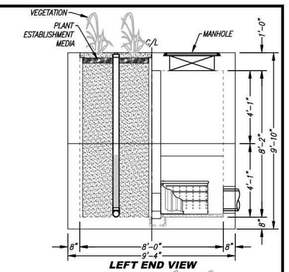
CONTECH ENGINEERED SOLUTIONS LLC — www.ContechES.com

MWS-L-8-24-9'-0"-C-HC
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

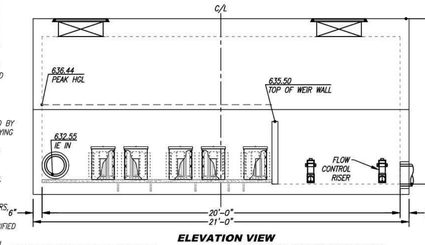
SITE SPECIFIC DATA			
PROJECT NUMBER		728823-020	
PROJECT NAME		MAGNOLIA AVENUE BUSINESS CENTER (BCE 15046)	
PROJECT LOCATION		CORONA, CA	
STRUCTURE ID		DMA 2B	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.60	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			10.30
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	632.55	RCP	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	632.00	RCP	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	641.25	641.25	641.25
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	ø30"	OPEN PLANTER	ø30"
WETLANDMEDIA VOLUME (CY)			23.24
ORIFICE SIZE (DIA. INCHES)			ø2.45 EA
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			



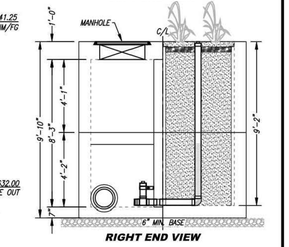
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

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1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS' SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
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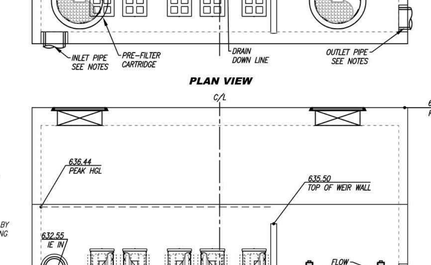
TREATMENT FLOW (CFS)	0.60
OPERATING HEAD (FT)	3.5
PRETREATMENT LOADING RATE (GPM/SF)	2.1
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS — FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

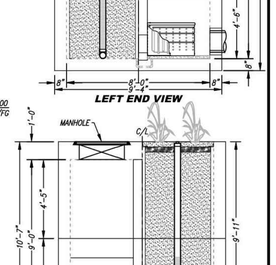
CONTECH ENGINEERED SOLUTIONS LLC — www.ContechES.com

MWS-L-8-20-9'-2"-V-HC
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

SITE SPECIFIC DATA			
PROJECT NUMBER		728823-015	
PROJECT NAME		MAGNOLIA AVENUE BUSINESS CENTER (BCE 15046)	
PROJECT LOCATION		CORONA, CA	
STRUCTURE ID		DMA 2A	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.60	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			10.30
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	632.55	RCP	12"
OUTLET PIPE	632.00	RCP	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	642.00	642.00	642.00
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	ø30"	OPEN PLANTER	ø30"
WETLANDMEDIA VOLUME (CY)			25.14
ORIFICE SIZE (DIA. INCHES)			ø2.45 EA
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			



PLAN VIEW



LEFT END VIEW

ELEVATION VIEW

RIGHT END VIEW

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TREATMENT FLOW (CFS)	0.60
OPERATING HEAD (FT)	3.5
PRETREATMENT LOADING RATE (GPM/SF)	2.1
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS — FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

CONTECH ENGINEERED SOLUTIONS LLC — www.ContechES.com

MWS-L-8-20-9'-11"-V-HC
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

DMA PLAN
MAGNOLIA AVENUE BUSINESS CENTER
CITY OF CORONA

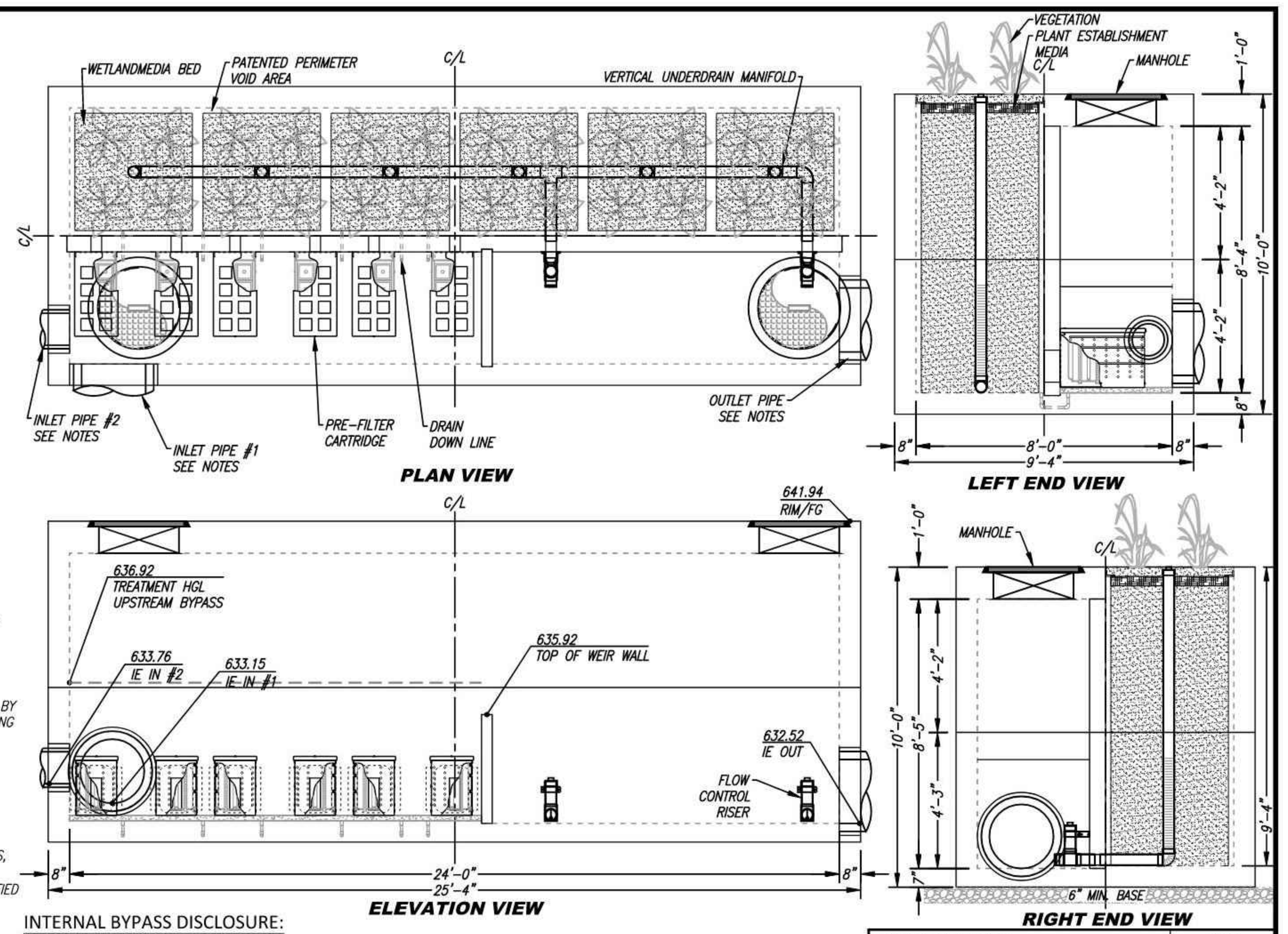
PREPARED FOR:
WESTERN REALCO
500 NEWPORT CENTER DR #630
NEWPORT BEACH, CA 92660

PREPARED BY:
KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 CORONA, CA. 92881-3370 951-734-2130

SHEET 2 OF 3 SHEET

J.N. 19-1895.2

SITE SPECIFIC DATA			
PROJECT NUMBER		728823-025	
PROJECT NAME		MAGNOLIA AVENUE BUSINESS CENTER (BCE 15046)	
PROJECT LOCATION		CORONA, CA	
STRUCTURE ID		DMA #3	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.70	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) - IF APPLICABLE			11.27
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	633.15	RCP	24"
INLET PIPE 2	633.76	RCP	12"
OUTLET PIPE	632.52	RCP	24"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	641.94	641.94	641.94
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	ø30"	OPEN PLANTER	ø30"
WETLANDMEDIA VOLUME (CY)			28.40
ORIFICE SIZE (DIA. INCHES)			ø2.66 EA
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			



TREATMENT FLOW (CFS)	0.70
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

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4/13/23BEN BOEGEMAN

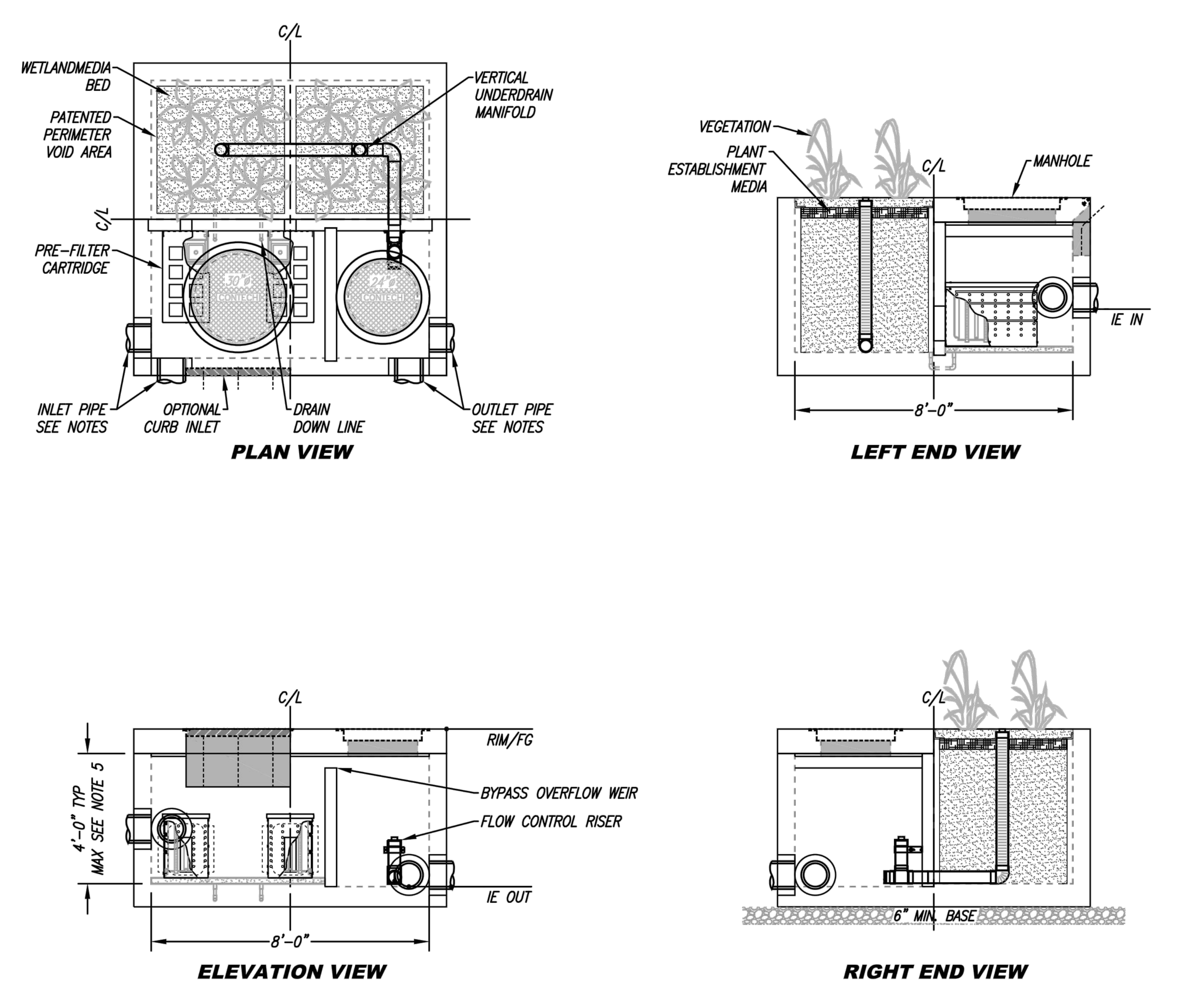
MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-8-24-9'-4"-V-HC
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME		MAGNOLIA AVE	
PROJECT LOCATION		CORONA, CA	
STRUCTURE ID		DMA #4	
TREATMENT REQUIRED			
TREATMENT FLOW (CFS)			0.300
PRETREATMENT LOADING RATE (GPM/SF)			2.1 GPM/SF
WETLAND MEDIA LOADING RATE (GPM/SF)			1.0
PEAK BYPASS REQUIRED (CFS) - IF APPLICABLE			_____ (C
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE		RCP	18"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PEDESTRIAN		
NOTES:			

* PRELIMINARY ONLY - NOT FOR CONSTRUCTION



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5. VERTICAL HEIGHT VARIES BASED ON SITE SPECIFIC REQUIREMENTS.

8/14/23SCOTT.SERTICH

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 7,425,262; 7,470,362; 7,674,378; 8,303,816; RELATED FOREIGN PATENTS OR OTHER PATENTS PENDING

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-8-8-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

DMA PLAN
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CITY OF CORONA

PREPARED FOR:
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500 NEWPORT CENTER DR #630
NEWPORT BEACH, CA 92660

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SHEET 3 OF 3 SHEET

J.N. 19.1995.2

Santa Ana River Watershed Basin Plan Reaches within the City of Corona

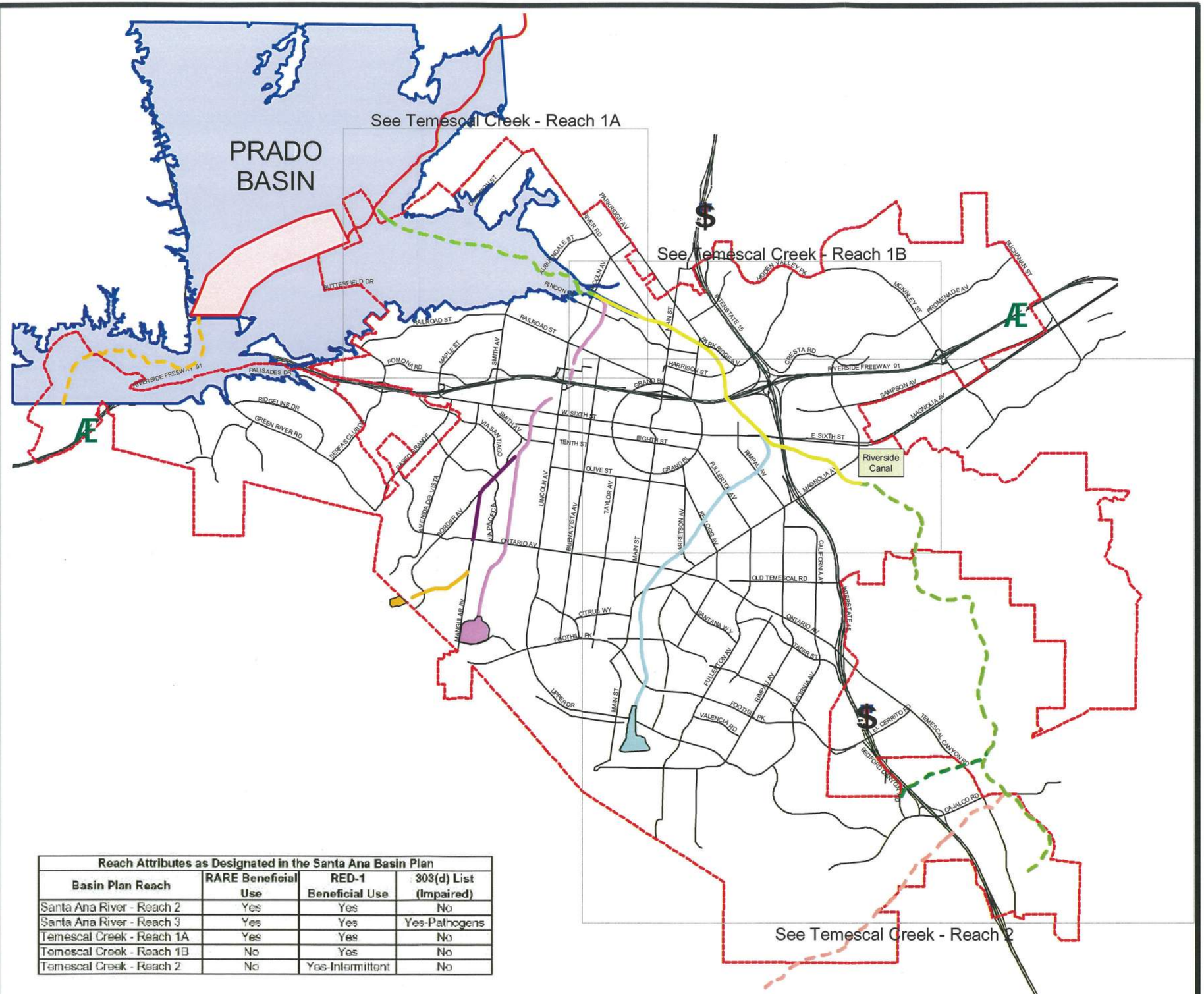
Legend

- Santa Ana River - Reach 2
- Santa Ana River - Reach 3
- Temescal Creek - Reach 1A
- Temescal Creek - Reach 1B
- Temescal Creek - Reach 2
- Joseph Canyon Wash
- Bedford Canyon Wash
- Main Street Debris Basin
- Main Street Channel
- Oak Street Debris Basin
- Oak Street Channel
- Mabey Canyon Debris Basin
- Mabey Channel
- Mangular / Oak Street Channel
- City Boundary
- Prado Basin
- Approximate Extent of Santa Ana River - Reach 3

Scale

4000 0 4000 8000 Feet

N



Reach Attributes as Designated in the Santa Ana Basin Plan			
Basin Plan Reach	RARE Beneficial Use	RED-1 Beneficial Use	303(d) List (Impaired)
Santa Ana River - Reach 2	Yes	Yes	No
Santa Ana River - Reach 3	Yes	Yes	Yes-Pathogens
Temescal Creek - Reach 1A	Yes	Yes	No
Temescal Creek - Reach 1B	No	Yes	No
Temescal Creek - Reach 2	No	Yes-Intermittent	No

Santa Ana River Watershed Basin Plan Reaches within the City of Corona

Legend

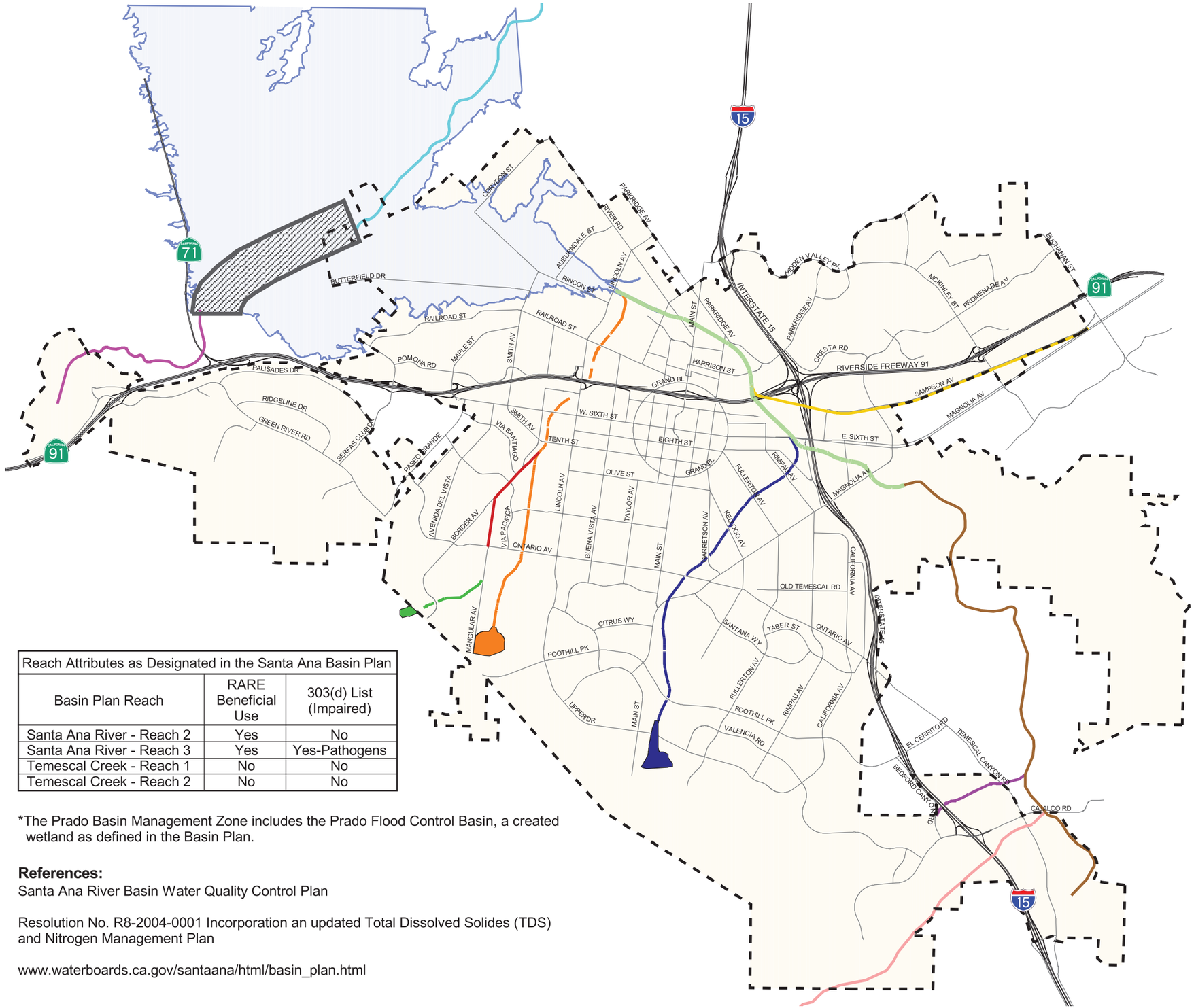
Basin Plan Reaches
- Santa Ana River - Reach 2
- Santa Ana River - Reach 3
- Approximate Extent of Santa Ana River - Reach 3
- Temescal Creek - Reach 1
- Temescal Creek - Reach 2
- Bedford Canyon Wash
- Joseph Canyon Wash

Other Tributaries
- Arlington Channel
- Mangular/Oak Street Channel
- Mabey Canyon Debris Basin
- Mabey Channel
- Main Street Debris Basin
- Main Street Channel
- Oak Street Debris Basin
- Oak Street Channel

Wetlands (Inland)
- Prado Basin Management Zone*

- City Boundary
- Street Centerline

N



Reach Attributes as Designated in the Santa Ana Basin Plan		
Basin Plan Reach	RARE Beneficial Use	303(d) List (Impaired)
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Santa Ana River - Reach 3	Yes	Yes-Pathogens
Temescal Creek - Reach 1	No	No
Temescal Creek - Reach 2	No	No

*The Prado Basin Management Zone includes the Prado Flood Control Basin, a created wetland as defined in the Basin Plan.

References:

Santa Ana River Basin Water Quality Control Plan

Resolution No. R8-2004-0001 Incorporation an updated Total Dissolved Solides (TDS) and Nitrogen Management Plan

www.waterboards.ca.gov/santaana/html/basin_plan.html

Appendix 2: Construction Plans

Grading and Drainage Plans

DPR 2022-0008

MAGNOLIA AVENUE BUSINESS CENTER
1375 MAGNOLIA AVENUE
PRELIMINARY GRADING PLAN

IN THE CITY OF CORONA, COUNTY OF RIVERSIDE
FEBRUARY 2022

LEGAL DESCRIPTION:

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE CITY OF CORONA, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

THAT PORTION OF THE NORTHWEST QUARTER OF SECTION 32, TOWNSHIP 3 SOUTH, RANGE 6 WEST, AS SHOWN BY SECTIONALIZED SURVEY OF THE RANCHO EL SOBRANTE DE SAN JACINTO, AND OF LOT 13 IN BLOCK 63 OF THE LANDS OF THE RIVERSIDE LAND AND IRRIGATING COMPANY, AS SHOWN BY MAP ON FILE IN BOOK 1 PAGE 70 OF MAPS, SAN BERNARDINO COUNTY RECORDS, BOUNDED AS FOLLOWS: ON THE SOUTHEAST BY THE SOUTHWESTERLY EXTENSION OF THE NORTHWEST LINE OF MAGNOLIA AVENUE, AS SHOWN ON RECORD OF SURVEY ENTITLED "RECORD OF SURVEY OF A PORTION OF LOTS 11, 12, 13, 14, 15, IN BLOCK 63 OF RIVERSIDE LAND AND IRRIGATING COMPANY, AND A PORTION OF SECTIONS 29 AND 32, TOWNSHIP 3 SOUTH, RANGE 6 WEST, SAN BERNARDINO BASE AND MERIDIAN" ON FILE IN BOOK 20, PAGE 3 OF RECORD OF SURVEY, RIVERSIDE COUNTY RECORDS; ON THE WEST BY THE EASTERLY LINE OF THE PROPERTY SPUR OF THE ATCHISON, TOPEKA, AND SANTA FE RAILWAY COMPANY; AND ON THE NORTHEAST BY THE SOUTHERLY AND SOUTHWESTERLY LINE OF PARCELS 5 TO 11, INCLUSIVE, OF SAID RECORD OF SURVEY ON FILE IN BOOK 20, PAGE 3 OF RECORDS OF SURVEY, RIVERSIDE COUNTY RECORDS.

EXCEPTING THEREFROM THAT PORTION GRANTED TO THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER DISTRICT CONSERVATION DISTRICT, BY DEED RECORDED OCTOBER 22, 1984 AS INSTRUMENT NO. 84-227367 AND RE-RECORDED FEBRUARY 11, 1985 AS INSTRUMENT NO. 85-028214 BOTH OF OFFICIAL RECORDS.

APN: 107-030-022-3

EASEMENTS:

ITEMS SHOWN HEREON WERE PLOTTED FROM RECORD DATA BASED ON DOCUMENTS FROM THE TICOR TITLE, REPORT ORDER NO. 00852012-021-DN1, DATED AUGUST 31, 2021.

PLOTTABLE EASEMENTS ARE INDICATED BY A " ⬡ ", NON-PLOTTABLE EASEMENTS ARE INDICATED BY " □ " ALL WITHIN THE "EXCEPTION" ITEMS OF THE TITLE REPORT.

[6] AN EASEMENT FOR PIPELINES, DITCHES AND FLUMES, AS RESERVED IN FAVOR OF JOHN FLETCHER MOULTON AND HERBERT BULKLEY PRAED, RECORDED APRIL 4, 1906 IN BOOK 216, PAGE 171, OF DEEDS.
AFFECTS PARCEL: EASEMENT CANNOT BE LOCATED PER RECORD.

[7] AN EASEMENT FOR ROADS, PIPE LINES, WATER CONDUITS, POWER LINES, TELEPHONE AND TELEGRAPH LINES, AS RESERVED IN FAVOR OF JOHN FLETCHER MOULTON AND HERBERT BULKLEY PRAED, RECORDED FEBRUARY 7, 1911 IN BOOK 324, PAGE 389, OF DEEDS.
AFFECTS PARCEL: EASEMENT CANNOT BE LOCATED PER RECORD.

[8] AN EASEMENT FOR PIPELINE AND MAINTENANCE PURPOSES, IN FAVOR OF CYNTHIA L MORGAN, PER DEED RESERVATION RECORDED JANUARY 16, 1947, IN BOOK 780, PAGE 380, OFFICIAL RECORDS.
AFFECTS PARCEL: EASEMENT CANNOT BE LOCATED PER RECORD.

[10] AN EASEMENT FOR POLE PURPOSES, IN FAVOR OF CALIFORNIA ELECTRIC POWER COMPANY, RECORDED OCTOBER 21, 1954 IN BOOK 1643 PAGE 578, OF OFFICIAL RECORDS.
AFFECTS PARCEL: C/L OF EASEMENT PLOTTED HEREON.

[11] AN EASEMENT FOR POLE PURPOSES, IN FAVOR OF CALIFORNIA ELECTRIC POWER COMPANY, RECORDED APRIL 6, 1956 IN BOOK 1892, PAGE 488, OF OFFICIAL RECORDS.
AFFECTS PARCEL: C/L OF EASEMENT PLOTTED HEREON.

[12] AN EASEMENT FOR POLE LINES AND CONDUITS PURPOSES, IN FAVOR OF SOUTHERN CALIFORNIA EDISON COMPANY, RECORDED JUNE 27, 1966 AS INSTRUMENT NO. 66163, OF OFFICIAL RECORDS.
AFFECTS PARCEL: PLOTTED HEREON

[13] AN EASEMENT FOR UNDERGROUND ELECTRICAL SUPPLY SYSTEMS AND COMMUNICATION SYSTEMS, IN FAVOR OF SOUTHERN CALIFORNIA EDISON COMPANY, RECORDED OCTOBER 22, 2003 AS INSTRUMENT NO. 2003-839824, OF OFFICIAL RECORDS.
AFFECTS PARCEL: PLOTTED HEREON

BASIS OF BEARINGS:

THE BASIS OF BEARINGS AND COORDINATES FOR THIS SURVEY IS THE CALIFORNIA STATE PLANE COORDINATE SYSTEM NORTH AMERICAN DATUM 1983 (NAD 83), ZONE 6 (EPOCH 2010.00) BASED LOCALLY ON CONTROL STATIONS CNPP, LORS, AND NOCO AS SHOWN ON THE CONTROL GROUND FILE. ALL DISTANCES SHOWN ARE GROUND DISTANCES, UNLESS SPECIFIED OTHERWISE. GRID DISTANCES MAY BE OBTAINED BY MULTIPLYING THE GROUND DISTANCES BY AN AVERAGE COMBINATION FACTOR OF 0.999971525.

BENCHMARK:

BENCH MARK NO. C-114; ELEVATION: 645.350; VERTICAL DATUM: NGVD 29. A 2-1/2" BRASS DISK STAMPED "C-114" SET IN THE TOP OF CURB, LOCATED 5' WEST OF THE B.C.R. OF THE SOUTHWESTERLY CURB RETURN OF THE INTERSECTION OF SIXTH STREET AND MAGNOLIA AVENUE.

ASSESSOR PARCEL NO:

107-030-022-3

LEGEND:

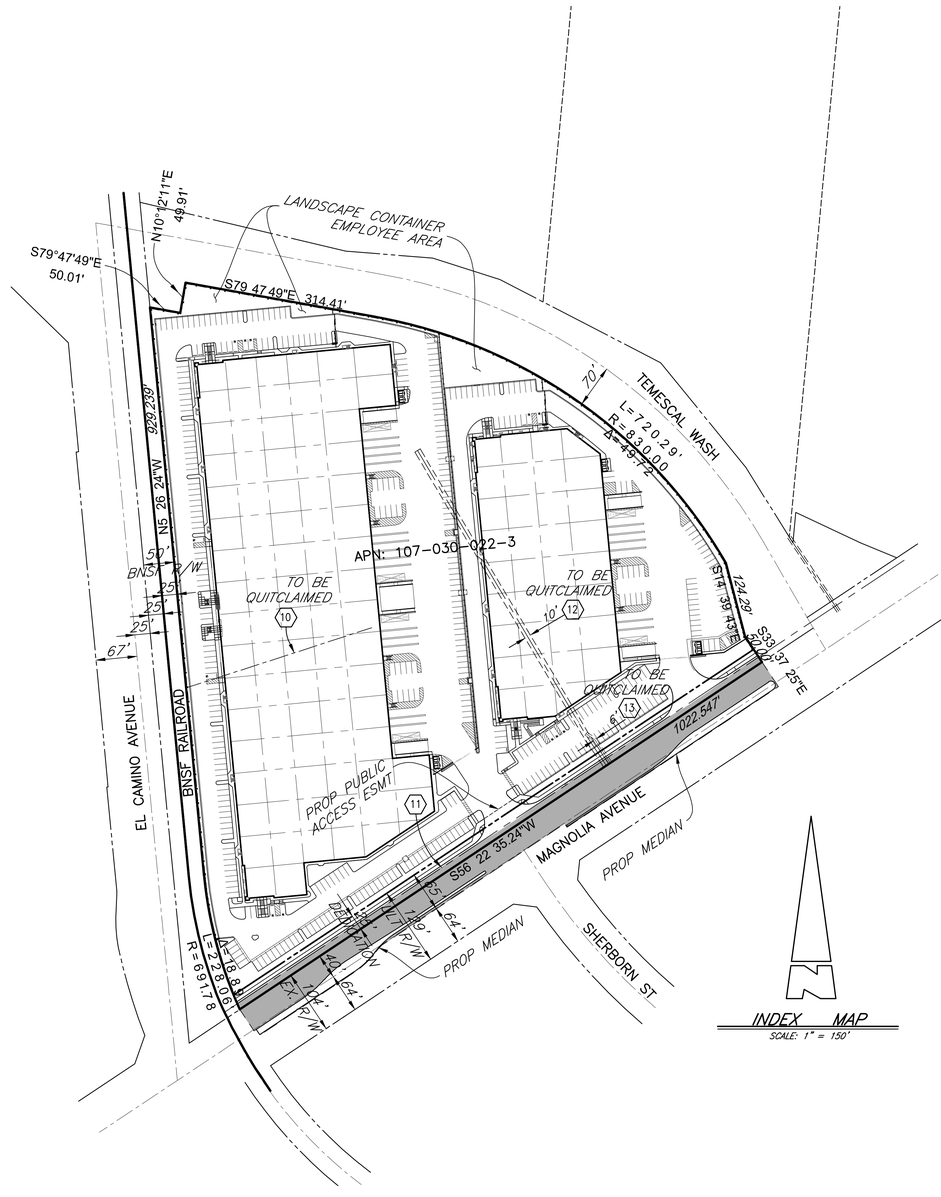
SYMBOLS

○-☼	STREET LIGHT	HP	HIGH POINT
☼	LIGHT	ICV	IRRIGATION CONTROL VALVE
☼ TS	TRAFFIC SIGNAL	IRRG	IRRIGATION
□ CB	CATCH BASIN	LP	LOW POINT
□ DI	DROP INLET	LS	LANDSCAPE
○ S	SIGN	N'LY	NORTHERLY
FH	FIRE HYDRANT	(OH)	OVERHEAD UTILITY
○- PP	POWER POLE	OFF	OFFSITE
○- TPP	TEMPORARY POWER POLE	OFS	OFFSET
□ M	METER	PAV	PAVEMENT
○	POST	PCC	PORTLAND CONCRETE CEMENT
○V	VALVE	PL	PROPERTY LINE
B.O.	BLOW OFF	PP	POWER POLE
A/V	AIR RELEASE VALVE	PT	POINT
○ MH	MANHOLE	PROP	PROPOSED
□ UB	UTILITY BOX	RCP	REINFORCED CONCRETE PIPE
○ U/O	UNDEFINED OBJECT ROUND	RET	RETAINING
□ U/O	UNDEFINED OBJECT SQUARE	RR	RAILROAD
AB	AGGREGATE BASE	RW	RIGHT-OF-WAY
ASPH	ASPHALT	SW	SIDEWALK
BLDG	BUILDING	SMH	SEWER MANHOLE
BNSF	BURLINGTON NORTHERN SANTA FE	SD	STORM DRAIN
CAP	SITE CAPPED WITH CONCRETE	S'LY	SOUTHERLY
C&G	CURB & GUTTER	TC	TOP OF CURB
CB	CATCH BASIN	TG	TOP OF GRATE
CF	CURB FACE	TS	TUBESTEEL
CL	CENTERLINE	VCP	VITRIFIED CLAY PIPE
CLF	CHAIN LINK FENCE	W'LY	WESTERLY
CML	CEMENT MORTAR LINING	WIF	WROUGHT IRON FENCE
CONC	CONCRETE		
COR	CORNER		
DCDA	DOUBLE CHECK DETECTOR ASSEMBLY		
DF	DEEPENED FOOTING		
DWY	DRIVEWAY		
ESMT	EASEMENT		
E'LY	E'LY = EASTERLY		
EP	EDGE OF PAVEMENT		
EX	EXISTING		
EG	EXISTING GRADE		
FDC	FIRE DEPARTMENT CONNECTION		
FF	FINISHED FLOOR		
FL	FLOW LINE		
FS	FINISHED SURFACE		
GB	GRADE BREAK		

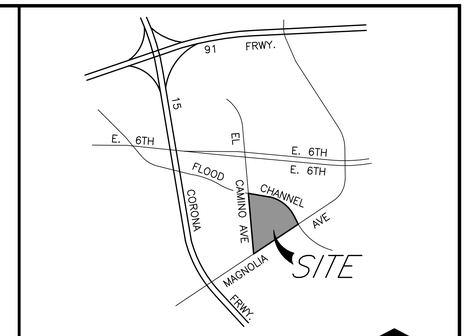
NOTE: NOT ALL SYMBOLS/ ABBREVIATIONS MAY BE USED.

LINE TYPES

- RIGHT OF WAY/PARCEL LINE
- BOUNDARY
- BUILDING SETBACK
- CENTERLINE
- EASEMENT
- FENCE
- RETAINING WALL
- PROP. CURB AND GUTTER
- PROP. CURB
- PROP. V-GUTTER
- PROP. WATER
- PROP. SEWER
- PROP. STORM DRAIN
- AC PAVEMENT



INDEX MAP
SCALE: 1" = 150'



VICINITY MAP
NOT TO SCALE

TTM SHEET INDEX

GENERAL NOTES:

PREPARED: FEBRUARY 2022

1. TOTAL PROJECT GROSS ACREAGE IS 16.576 ACRES
2. PROPOSED NO. OF LOTS: 1 LOT
3. EXISTING GENERAL PLAN LAND USE: MIXED USE - INDUSTRIAL/COMMERCIAL (MU 2)
4. PROPOSED GENERAL PLAN LAND USE: NO CHANGE
5. ZONING: BUSINESS PARK, PLANNING AREA 5 OF THE CORONA MAGNOLIA SPECIFIC PLAN
6. ADJACENT LAND USE:

NORTH:
84' WIDE RECTANGULAR CHANNEL WITH 28' WIDE ACCESS ROAD BETWEEN PROPERTY LINE AND THE CHANNEL

EAST:
84' WIDE RECTANGULAR CHANNEL WITH 28' WIDE ACCESS ROAD BETWEEN PROPERTY LINE AND THE CHANNEL

SOUTH:
MAGNOLIA AVENUE (EXISTING 104' ROW; ULTIMATE 129' ROW)

WEST:
ATCHISON, TOPEKA AND SANTA FE RAILWAY (50' ROW)

11. SOURCE OF TOPOGRAPHY IS AERIAL TOPOGRAPHY FLOWN ON DECEMBER 02, 2019 BY KWC ENGINEERS.
12. ALL EXISTING EASEMENTS AND IRREVOCABLE OFFERS OF DEDICATION THAT AFFECT THE PROPERTY ARE SHOWN ON THIS PARCEL MAP.
13. ALL EXISTING EASEMENTS ARE TO REMAIN IN THEIR DESIGNATED LOCATIONS UNLESS NOTED OTHERWISE.
14. ALL CONC. GUTTERS AND SWALES SHALL HAVE A MINIMUM GRADE OF: 0.5%
15. ALL A.C. PAVING SHALL HAVE A MINIMUM GRADE OF: 1.0%
16. CONCRETE PAVEMENT SHALL BE PROVIDED FOR ALL ROADWAYS THAT HAVE STREET GRADES EXCEEDING 10% OR AS APPROVED BY THE CITY OF CORONA.
17. ALL SLOPES ADJACENT TO STREET R.O.W. TO BE MAINTAINED BY P.O.A.
18. ALL SLOPES SHOWN HEREON ARE 3:1 MAXIMUM UNLESS OTHERWISE NOTED.
19. ALL MAJOR SLOPES OR COMMON AREAS, OPEN SPACE, PRIVATE DRAINAGE FACILITIES, FUEL MODIFICATION, ROAD ACCESS EASEMENTS, AND ANY OTHER COMMON AMENITIES SHALL BE MAINTAINED BY A PROPERTY OWNER ASSOCIATION OR ESTABLISHED SUBJECT TO CURRENT STATE LAWS AND BE SUBJECT TO THE APPROVAL OF THE CITY OF CORONA WHO SHALL REVIEW ALL CC&R'S AND RULES FOR THEIR CC&R'S, PROPERTY OWNER ASSOCIATION DOCUMENTS AND ALL DOCUMENTS TO CONVEY TITLE TO THE PROPERTY OWNER ASSOCIATION.
20. FENCING SHALL BE INSTALLED ON SITE AS NECESSARY TO RESTRICT PUBLIC ACCESS TO PROPOSED OPEN SPACE AREAS. REFER TO WALL AND FENCE PLAN FOR LOCATIONS.
21. THERE ARE NO KNOWN ACTIVE EARTHQUAKE FAULTS IMPACTING THE PROJECT SITE. REFER TO SOILS REPORT FOR ADDITIONAL INFORMATION.
22. PROPOSED WATER TO HAVE TWO POINTS OF CONNECTION TO EXISTING WATER SYSTEM.
23. DRAINAGE SYSTEM WILL BE DEVELOPED IN ACCORDANCE WITH THE CITY OF CORONA AND RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT STANDARDS AND SPECIFICATIONS. DRAINAGE ON THIS SITE WILL BE CONVEYED BY MEANS OF A STORM DRAIN SYSTEM CONSISTING OF VARYING SIZES OF STORM DRAIN PIPES. STORM FLOWS TRIBUTARY TO THE SITE SHALL BE INTERCEPTED AND CONVEYED AROUND THE SITE VIA THE STORM DRAIN SYSTEMS SHOWN HEREON. ALL STORM DRAIN SHOWN HEREON ARE PRELIMINARY.
24. THE SUBJECT PROPERTY IS WITHIN A FLOOD ZONE X - 0.2 PERCENT ANNUAL CHANCE OF FLOOD HAZARD PER FIRM PANEL NO. 06065C1356G EFFECTIVE DATE OF AUGUST 28, 2008.
25. THE SUBJECT PROPERTY IS WITHIN A SANTA ANA RIVER WATERSHED.

DATE IDENTIFIER
DATE OF LATEST CHANGE TO THIS MAP
10/13/23 BY: NVN
DATE OF THIS PLOT
10/13/23

TOTAL SITE ESTIMATED CUT/FILL VOLUMES

CUT VOLUME (RAW)	30,500 CY
FILL VOLUME (RAW)	36,900 CY
NET TOTAL (UNADJUSTED)	6,400 CY (FILL)

NOTES:
1) EARTHWORK VOLUMES ARE ESTIMATED BASED ON-SITE AND OFFSITE GRADING BOUNDARIES.

OWNER:

MCWANE, INC. A DELAWARE CORPORATION
2900 HIGHWAY 280, SUITE 300
BIRMINGHAM, AL 35223
(949) 720-0369
CONTACT: JEREMY MAPE

DEVELOPER:

WESTERN REALCO
500 NEWPORT CENTER DR #630
NEWPORT BEACH, CA 92660
(949) 720-0369
CONTACT: JEREMY MAPE

ENGINEER:

KWC ENGINEERS
1880 COMPTON AVENUE
CORONA, CA. 92881-3370
(951) 734-2130
CONTACT: BRANDON M. BARNETT, P.E.

SOILS ENGINEER:

PETRA GEOSCIENCES, INC
40880-M COUNTY CENTER DRIVE
TEMECULA, CA 92591
(661) 425-9410
CONTACT: PAUL THERIAULT

ARCHITECT:

BASTIEN AND ASSOCIATES, INC
15661 RED HILL AVENUE, STE 150
TUSTIN, CA. 92780-7324
(714) 617-8600
CONTACT: STEVE MARTINEZ

UTILITY NOTES:

WATER: CITY OF CORONA DEPARTMENT OF WATER AND POWER
815 W. 6th STREET
CORONA, CA. 91720
(909) 736-2321

SEWER: CITY OF CORONA DEPARTMENT OF WATER AND POWER
815 W. 6th STREET
CORONA, CA. 91720
(909) 736-2321

POWER: SOUTHERN CALIFORNIA EDISON CO.
1351 E. FRANCIS
ONTARIO, CA. 91761
(800) 930-8591

GAS: SOUTHERN CALIFORNIA GAS CO.
P.O. BOX 3003
REDLANDS, CA. 92373
(800) 427-2200

PHONE: AT&T
1265 N. VAN BUREN ST., #180
ANAHEIM, CA 92807
(714) 666-5423

CABLE TV: TIME WARNER CABLE
1500 AUTO CENTER DRIVE
ONTARIO, CA 91761
(909) 975-3396

STATEMENT OF PREPARER

I HEREBY STATE THAT THIS MAP WAS PREPARED UNDER MY SUPERVISION AND THAT THE OWNER OF RECORD HAS KNOWLEDGE OF AND CONSENTS TO THE FILING OF THIS MAP.

BRANDON M. BARNETT, P.E. DATE

REGISTERED PROFESSIONAL ENGINEER
BRANDON M. BARNETT
No. 78472
CIVIL
STATE OF CALIFORNIA

PRELIMINARY GRADING PLAN
MAGNOLIA AVENUE BUSINESS CENTER
CITY OF CORONA

PREPARED FOR:
WESTERN REALCO
500 NEWPORT CENTER DR #630
NEWPORT BEACH, CA 92660

PREPARED BY:
KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 CORONA, CA. 92881-3370 951-734-2130

SHEET 1 OF 4 SHEET

J.N. 19.1995.2 \\KWC-FS\Vol3\19\1995\PRELIM\MAPS\PREC PLAN\1995 PRECISE PLAN 01.dwg 10/13/23 10:15am

PRELIMINARY GRADING PLAN
MAGNOLIA AVENUE BUSINESS CENTER
CITY OF CORONA

PREPARED FOR:
WESTERN REALCO
500 NEWPORT CENTER DR #630
NEWPORT BEACH, CA 92660

PREPARED BY:
KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 CORONA, CA 92881-3370 951-734-2130

SHEET 2 OF 4 SHEET

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UTILITY PLAN
MAGNOLIA AVENUE BUSINESS CENTER
CITY OF CORONA

PREPARED FOR:

WESTERN REALCO
500 NEWPORT CENTER DR #630
NEWPORT BEACH, CA 92660

PREPARED BY:

KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 CORONA, CA 92881-3370 951-734-2130

SHEET 3 OF 4 SHEET

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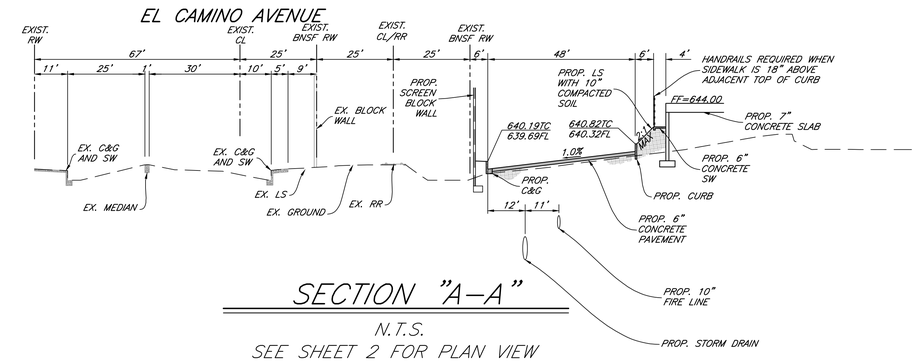

SECTION "A–A"

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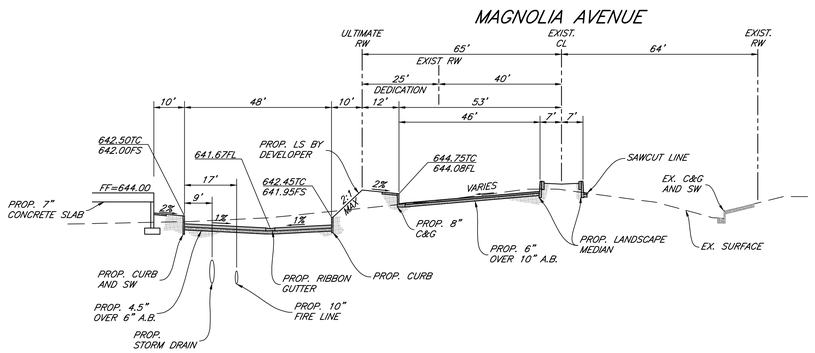
SEE SHEET 2 FOR PLAN VIEW



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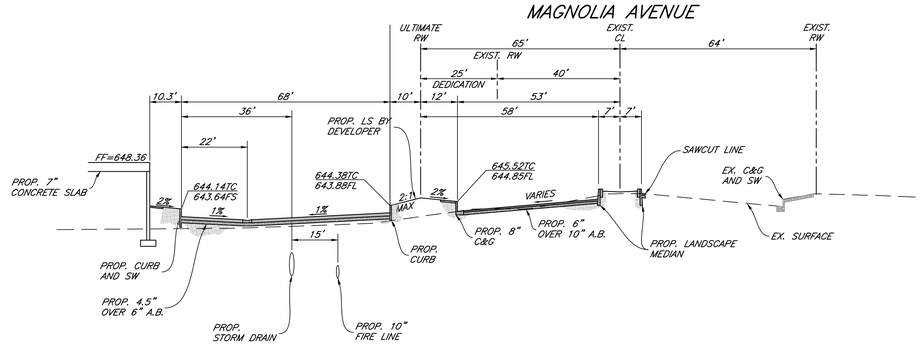

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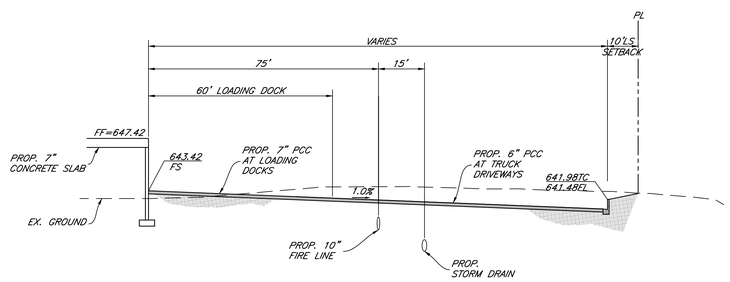

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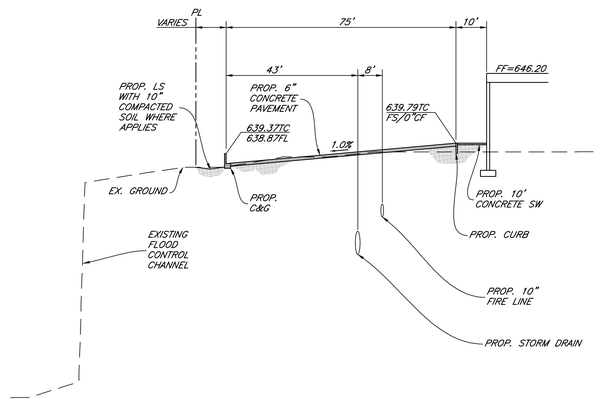

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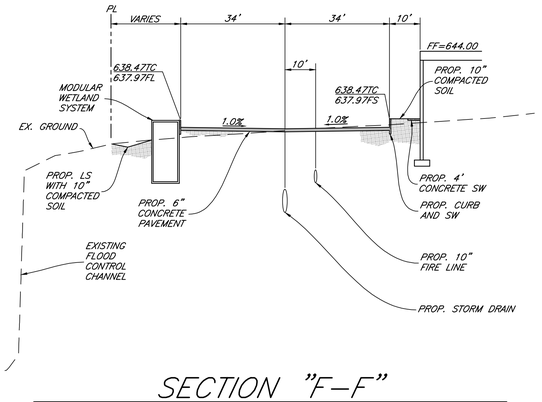

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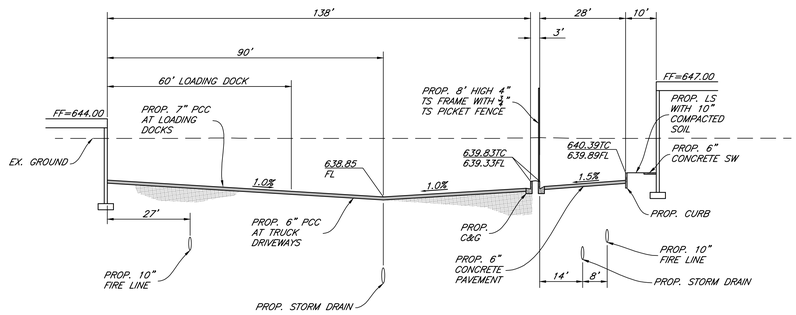

SECTION "G–G"

N.T.S.

SEE SHEET 2 FOR PLAN VIEW

SECTIONS
MAGNOLIA AVENUE BUSINESS CENTER
CITY OF CORONA

PREPARED FOR:
WESTERN REALCO
500 NEWPORT CENTER DR #630
NEWPORT BEACH, CA 92660

PREPARED BY:
KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 CORONA, CA 92881-3370 951-734-2130

SHEET 4 OF 4 SHEET

J.N. 19.1995.2 \\KWC-FS\Vol3\19\1995\PRELIM\MAPS\PREC PLAN\1995 PRECISE PLAN 04.dwg 10/13/23 10:06am

Appendix 3: Soils Information

Geotechnical Study

PETRA GEOSCIENCES INC.

SOLID AS A ROCK

ENGINEERS + GEOLOGISTS + ENVIRONMENTAL SCIENTISTS

UPDATED PRELIMINARY GEOTECHNICAL EVALUATION PROPOSED MAGNOLIA AVENUE BUSINESS CENTER 16.5-ACRE SITE AT 1375 MAGNOLIA AVENUE CITY OF CORONA, RIVERSIDE COUNTY, CALIFORNIA

WESTERN REALCO

December 9, 2022
J.N. 19-433

December 9, 2022
J.N. 19-433

WESTERN REALCO
500 Newport Center Drive, Suite #630
Newport Beach, California 92660

Attention: Mr. Jeremy Mape

Subject: Updated Preliminary Geotechnical Evaluation, Proposed Magnolia Avenue Business Center, 16.5-Acre Site at 1375 Magnolia Avenue, City of Corona, Riverside County, California

Dear Mr. Mape:

Petra Geosciences, Inc. (Petra) is submitting an update of our previous Preliminary Geotechnical Evaluation report, dated February 19, 2020, for the proposed business center facility in the city of Corona, California. The original work was performed in accordance with the scope of work outlined in our Proposal No. 19-433P dated December 20, 2019. This supplemental work is based on the new Preliminary Grading Plan, prepared by KWC Engineers. As with our previous report, this update is based on the requirements of the 2019 California Building Code (CBC), as well as our findings, engineering judgment, opinions, conclusions, and recommendations pertaining to geotechnical design aspects of the proposed development. It should be noted that this geotechnical and geological evaluation does not address soil contamination or other environmental issues, which may affect the property.

It has been a pleasure to be of service to you on this project. Please contact us if you have any questions regarding the contents of this report or require additional information.

Respectfully submitted,

PETRA GEOSCIENCES, INC.

Douglass Johnston, CEG
Senior Associate Geologist

Grayson Walker, GE
Principal Engineer

TABLE OF CONTENTS

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ATTACHMENTS

UPDATED PRELIMINARY GEOTECHNICAL EVALUATION
PROPOSED MAGNOLIA AVENUE BUSINESS CENTER
16.5-ACRE SITE AT 1375 MAGNOLIA AVENUE
CITY OF CORONA, RIVERSIDE COUNTY, CALIFORNIA

INTRODUCTION

Petra Geosciences, Inc. (Petra) is presenting herein the results of our updated preliminary geotechnical evaluation for the proposed re-development of an approximately 16.5-acre property situated at the northeasterly corner of Magnolia and El Camino Avenues, in the city of Corona, California. The purpose of this study was to obtain preliminary information on the general geologic and geotechnical conditions within the project area in order to provide conclusions and recommendations for the feasibility of the proposed project, and preliminary geotechnical recommendations for site grading and assumed improvements.

SCOPE OF WORK

The scope of our evaluation consisted of the following.

- Both an initial and update site reconnaissance of surface conditions and review of the recent preliminary grading plan prepared by KWC Engineers.
- Review of available published and unpublished reports, maps and data concerning geologic and soil conditions within the site and nearby area that could have an impact on the proposed development (see References).
- Review readily available satellite imagery of the site and surrounding area.
- Coordinate with Underground Service Alert [USA] and representatives of the onsite tenant to obtain an underground-utility clearance, prior to commencement of the subsurface exploration.
- Geotechnical drilling, logging, and sampling of five (5) exploratory soil borings utilizing a hollow-stem auger drill rig and advance five (5) Cone Penetrometer Test soundings (CPT). Log and visually classify soil and materials encountered in the borings in accordance with the Unified Soil Classification System (USCS).
- Conduct preliminary laboratory testing of representative samples (bulk and undisturbed) obtained from the borings to determine their engineering properties.
- Engineering and geologic analysis of the research, field exploration findings and laboratory data with respect to the proposed site development.
- Preparation of this geotechnical report presenting the results of our evaluation and providing recommendations for the proposed site development in general conformance with the requirements of the 2019 CBC, as well as in accordance with applicable state and local jurisdictional requirements.

LOCATION AND SITE DESCRIPTION

The subject property is irregularly shaped and approximately 16.5 acres in size, situated north-northwest of Magnolia Avenue, east of El Camino Avenue and south-southwest of Temescal Wash flood control channel in the city of Corona, California. The property is also identified as Assessor Parcel Number 107-030-022. Figure 1 depicts the general site location. Temescal Wash adjacent to the site consists of a concrete-lined flood control channel along the north-northeast boundary built several decades ago. A rail line is present between the site westerly boundary and El Camino Avenue. Existing commercial/industrial developments are located in the general area.

The majority of the site is currently occupied with various improvements, including several large industrial/warehouse type buildings, office buildings, material racks, loading docks, asphalt pavements, concrete slabs etc. that appear to have been constructed several decades ago. Lesser, unimproved areas expose soil materials at grade. Chain link fencing is present along the property line with the flood control channel and along Magnolia Avenue. We estimate the north-northeast property line is setback approximately 25 to 30 feet from the top of the flood control channel. A rail line extends into a portion of the site at the west-central boundary and a shallow drainage ditch is present along the northwestern property line. Existing underground utilities such as sewer, water, gas, electric and possibly storm drain liens are present throughout the property and based on the previous site usage, it is possible that other buried structures could be present. Overhead electric lines are also present in the central portion of the site. The site was an active business operation at the time of our 2020 fieldwork.

Mature trees are randomly present within the site, predominantly on the property boundaries, as well as minor landscaping. The property is relatively flat, sloping very gently towards the north/northwest with site elevations ranging from approximately 645 feet above mean sea level (msl) in the southeast corner to approximately 640 feet in the northwest corner.

Based on the recent site reconnaissance, this site remains essentially unchanged since our last work in January 2020, with the exception of some minor new pavements as generally described by Geotechnical Professionals Inc. last year (GPI, 2021)

PROPOSED DEVELOPMENT

Based on the recent preliminary grading plan prepared by KWC Engineers, the planned development will consist of two commercial buildings with ancillary site improvements including underground utilities (sewer, water, storm drain and dry utilities), loading docks, asphalt and/or concrete pavements, perimeter

masonry walls, sidewalks and landscaping. The westerly Building No. 1 will be approximately 231,4000 square feet in size and the easterly Building No. 2 will be approximately 90,100 square feet in size. The buildings are presumed to be of concrete tilt-up construction and although foundation loads are currently unknown, we have assumed 2- to 5-kip per foot line loads for continuous footings and 25- to 50-kip point loads for columns.

Review of the KWC earthwork exhibit indicates the proposed site grading will generally entail fills on the order of 2 to 7 feet from existing grades to create the two buildings pads and cuts up to approximately 2.5 feet maximum in the parking lot/driveway areas, remedial grading notwithstanding. Raw earthwork quantities indicate about 36,000 cubic yards of import. No notable cut or fill slopes, or retaining walls are currently anticipated.

Literature and Online Imagery Review

Petra researched and reviewed available published and unpublished geologic data and reports pertaining to regional geology, groundwater, faulting and geologic hazards that may affect the site. The results of this review are included in this report and noted references are attached. Based on readily available online aerial imagery, the site's current conditions/existing improvements appear to be in a similar condition for at least the past several decades with the exception of some remedial excavations and new pavements as described by Geotechnical Professionals Inc. last year (GPI, 2021).

Field Exploration

A subsurface exploration program was conducted under the supervision of an engineering geologist from Petra on January 2, 2020. Subsurface exploration involved the drilling of five (5) exploratory borings, designated B-1 through B-5, to depths between 19 to 25.5 feet below existing site grades where refusal to drilling occurred at all locations by the presence of cobbles or boulders. Drilling was performed with a conventional truck-mounted drill rig equipped with 8-inch outside diameter, hollow-stem augers. Earth materials encountered within the exploratory borings were classified and logged in accordance with the visual-manual procedures of the Unified Soil Classification System (USCS). Additionally, five (5) Cone Penetration Test (CPT) soundings, designated CPT-1 through CPT-5 were advanced to approximate depths between 22 and 23 feet below surface grades utilizing a truck-mounted CPT rig. The CPT soundings also encountered refusal at all locations. The approximate locations of the exploratory test borings and CPT soundings are shown on the attached Figure 2. Descriptive logs of the borings/CPT logs are presented in Appendix A.

Subsurface exploration also included the collection of bulk samples and relatively undisturbed samples of soil materials for classification, laboratory testing and geotechnical engineering analyses. Bulk samples consisted of selected soil materials obtained from the exploratory borings. Relatively undisturbed samples were obtained using a 3-inch outside diameter modified California split-spoon soil sampler lined with brass rings. The sampler was mechanically driven to a depth of 18 inches with successive 30-inch drops of a 140-pound automatic trip hammer and the number of blows required to drive the sampler for each 6-inch increment inches are noted in the boring logs in Appendix A. The driven core samples were placed in sealed containers and transported to Petra's laboratory for laboratory testing.

Standard Penetration Tests (SPT) were also performed at selected depth intervals in accordance with ASTM D1586. This method consists of mechanically driving an unlined, 2.0-inch outside diameter (OD) standard penetrometer split-barrel sampler 18 inches into the soil with successive 30-inch drops of the 140-pound automatic trip hammer. Incremental blow counts are also noted on the exploration logs. Disturbed soil samples from the unlined standard split-spoon samplers were placed in sealed plastic bags and transported to our laboratory for testing.

Laboratory Testing

Laboratory testing for selected samples of onsite soils materials included in-situ dry density and moisture content, maximum dry density and optimum moisture content, expansion index, grain-size sieve analysis and #200 wash, shear strength and general soil corrosivity potential (sulfate content, chloride content, pH/resistivity). A description of laboratory test methods and laboratory testing are presented in Appendix B and the results of in-situ moisture content and dry density tests are summarized on the boring logs presented in Appendix A.

FINDINGS

Regional Geologic Setting

Geologically, the site lies within the northerly portion of the Peninsular Ranges Geomorphic Province (CGS, 2002). The Peninsular Range Province extends from the tip of Baja California north to the Transverse Ranges Geomorphic Province and is characterized by northwest trending mountain ranges separated by subparallel fault zones. The San Bernardino Mountains, located on the north side of the valley, provides the boundary between the Peninsula Range Province and the Transverse Ranges Province. In general, the province is underlain primarily of plutonic rock of the Southern California Batholith. These rocks formed from the cooling of molten magma deep within the earth's crust. Intense heat associated with the plutonic

magma metamorphosed the ancient sedimentary rocks into which the plutons intruded. The Peninsular Range Geomorphic Province is generally characterized by alluviated basins and elevated erosional surfaces.

Local Geology and Subsurface Soil Conditions

The geologic map of the Corona North and South quadrangles depicts the subject property near the central portion of a relatively narrow northwesterly trending active alluvial valley, Temescal Wash, locally underlain by alluvial fan deposits and at depth, granitic bedrock. The local hillsides further to the north, east and southeast are generally comprised of Cretaceous-aged granitic bedrock units. Subsurface conditions observed in our exploratory borings, and a well boring near our B-3 boring (Ferro Engineering, 2006) indicates the surface of the site is mantled by undocumented fill soils on the order of 5 to 7.5 feet thick, that are underlain by Holocene to Late Pleistocene alluvium to depths of at least 65 feet below the ground surface (bgs). A general description of the units is provided below.

Undocumented Fill – Undocumented fill soils, presumably placed with the existing development, are present within the upper approximately 5 to 7.5 feet of the subject property. These fills may also be variable in depth at other random areas throughout the site. Additionally, any active or abandoned utility lines will likely encounter localized undocumented trench backfill that could be deeper than 5 to 7 feet bgs. The fills soils encountered in the exploratory borings generally consisted of dry to slightly moist, medium dense, fine- to coarse-grained sand with gravels and lesser occurrences of silty sand.

Alluvium – Alluvium of Holocene age is present beneath the undocumented fills across the site, to depths of at least 19 to 25 feet. These upper alluvial soils predominantly consisted of slightly moist to occasional moist, medium dense to occasionally dense, sand with gravel with minor interbeds of silty sands and clayey sands to possible sandy silts. A concentrated layer of cobbles to possibly boulders was encountered at approximately 19 to 25.5 feet bgs where refusal was encountered to all of our borings and CPT soundings. Below the approximate depths of 19 to 25 feet bgs, Fero Engineering's boring log FB1 (FE, 2006), near our boring B-3, generally encountered very dense sands with gravel and minor interbeds of silty sand to a depth of 49± feet bgs and dense, saturated sands with some gravel from 50 to 65 feet bgs. A copy of Fero's FB1 boring/well log is included in Appendix A. Based on the reported density of the sandy soils below the layer of cobble/boulders, we interpret this lower alluvial unit as either older alluvium and/or older alluvial fan deposits, likely of Late Pleistocene age.

Groundwater

Although we didn't encounter in our exploration to a maximum of 25.5 feet bgs, Fero Engineering (FE, 2009) measured groundwater at monitoring well FB1 generally between 45.0 and 50.3 feet bgs between October 2006 and February 2009. Based on Figures 26 and 27 from Todd Engineers' (TE, 2008) groundwater management plan for the City of Corona, the historic high groundwater levels beneath the site may have been around 65± feet bgs in the spring of 1964 and may have been as shallow as 40± feet bgs in the spring of 1984. Subsurface groundwater flow direction beneath the subject site is likely to be northwesterly within the general trend of Temescal Wash valley.

Groundwater is not likely to be encountered, however, as with any project site, there is the possibility of encountering localized perched water and/or minor seepage during remedial grading.

Faulting

Based on our review of published and unpublished geotechnical maps and literature pertaining to site geology, no active or potentially active faults are known to project through the site and the site does not lie within the bounds of an "Earthquake Fault Zone" as defined by the State of California in the Alquist-Priolo (AP) Earthquake Fault Hazard Zoning Act (Bryant and Hart, 2007) nor a Riverside County fault zone. In addition, we did not observe any features in the field that would indicate active faulting. The closest known active faults is the Elsinore Fault zone which lies approximately 3.4 miles to the southwest. The potential for active fault rupture at the site is considered to be very low.

Secondary Seismic Effects

Secondary effects of seismic activity normally considered as possible hazards to a site include several types of ground failure and seismically induced flooding. Various general types of ground failures, which might occur as a consequence of severe ground shaking at the site, include landsliding, ground subsidence, ground lurching and lateral spreading. The probability of occurrence of each type of ground failure depends on the severity of the earthquake, distance from faults, topography, subsurface soil and groundwater conditions, in addition to other factors. The subject property proposed for development exhibits nearly level topography that is not subject to landsliding, and the potential for ground lurching and lateral spreading are considered very low. The potential for seismically-induced flooding due to tsunami or seiche (i.e., a wave-like oscillation of the surface of water in an enclosed basin) is considered negligible at this site.

Liquefaction and Seismically Induced Settlement

Liquefaction occurs when strong seismic shaking of a saturated sand or silt causes intergranular fluid (pore-water) pressures to increase to levels where grain-to-grain contact is lost, and material temporarily behaves as a viscous fluid. Liquefaction can cause settlement of the ground surface, loss of bearing, settlement and tilting of structures, flotation and buoyancy of buried structures and fissuring of the ground surface. A common surface manifestation of liquefaction is the formation of sand boils – short-lived fountains of soil and water that emerge from fissures or vents and leave freshly deposited, usually conical mounds of sand or silt on the ground surface.

For sandy soils above the water table, strong seismic shaking can also result in rearrangement of the granular soil structure leading to densification of sandy soils, ground settlement and settlement and tilting of superstructures.

Assessment of liquefaction or dry sand settlement potential for a particular site requires knowledge of a number of regional as well as site-specific parameters, including the estimated design earthquake magnitude, and the associated probable peak horizontal ground acceleration at the site, subsurface stratigraphy and soil characteristics. Parameters such as estimated probable peak horizontal ground acceleration can readily be determined using published references, or by utilizing a commercially available computer program specifically designed to perform a probabilistic analysis. On the other hand, stratigraphy and soil characteristics can only be accurately determined by means of a site-specific subsurface investigation combined with appropriate laboratory analysis of representative samples of onsite soils.

Riverside County has identified located the subject property area within a high liquefaction zone. Groundwater has been reported at depths between 45 and 50 feet bgs (FE, 2009), and historic high groundwater may have been as shallow as 40 feet bgs (TE, 2008). Beneath the surface fills, medium dense to occasionally dense alluvium was encountered in our borings to depths ranging from 19 to 25.5 feet bgs, underlain by an estimated 5- to 6-foot layer of concentrated cobbles to boulders. Beneath the layer of cobbles, Fero (FE, 2006) reported very dense sandy soils to approximately 49 feet bgs and dense, saturated sandy soils from 50 to 65 feet bgs, which we interpret as an older alluvial unit.

Based upon the very dense nature of the older alluvial soils below the cobble/boulder zone, the liquefaction potential at the site is considered low. As such, surface manifestation of liquefaction such as ground fissures, sand boils, loss of bearing, liquefaction-induced settlement, etc. is considered very low.

Due to the very dense alluvial soils reported by Fero (FE, 2006) below 25 feet, the most likely scenario for dynamic settlements is the dry sand settlement within the upper 25 feet of the site. This is due primarily to the presence of unconsolidated granular sandy soils and to the proximity of seismic sources. For this reason, a site-specific dry sand settlement analysis was performed as part of this study.

Dry Sand Settlement

Propagating earthquake waves induce shearing stresses and strains in soil materials during strong ground shaking. This process rearranges the structure of granular soils such that there is an increase in density, with a corresponding decrease in volume, which results in vertical settlement. Dynamic settlement has been well documented in wet, sandy deposits undergoing liquefaction (see Tokimatsu and Seed, 1987) and in relatively dry sediments as well (Stewart et al, 1996). Specific methods to analyze potential wet and dry dynamic settlement are reported in Tokimatsu and Seed (1987), and specifically dry settlement in Pradel (1998) and Stewart et al. (2001; 2002) respectively. Most of the referenced papers focus on the seismic effects on dry, clean sands of a uniform grain size, though several reports extend the literature to fine-grained soils (Stewart et al., 2001 & 2002). State guidelines for evaluating dynamic settlement are provided in the California Geological Survey Special Publication 117A (CGS, 2008).

Dry sand settlement was calculated with the continuous CPT data utilizing the computer program GeoLogismiki, Cliq V.3.0.1.6 based on. The largest calculated settlement was in the order of 0.3 inch (CPT-5) based on the PGA of 0.87g and an earthquake magnitude of 6.47. Tabulated results of the estimated settlements are provided in Appendix C of this report. It should be noted that our estimated settlement is for free field condition. Depending on proposed structures foundation, height and stiffness, the dynamic settlement during the design earthquake may vary from those estimated herein due to soil-structure interaction.

Differential Dynamic Settlement

As stated above total seismic settlements are estimated to be less than 0.3 inches. Differential dynamic settlement is estimated to be less than 0.2 inches over a span of 30 feet.

Compressible Soils

A geotechnical factor affecting the project site is the presence of existing fill soils ranging in depth from approximately 5 to 7.5 feet bgs across the site. In view of the undocumented nature of the fill, and likely disturbance with site demolition, these materials in their current state are not considered suitable for support of proposed fills or fill or structural loads. Accordingly, these materials will require removal (over-

excavation) to expose the underlying competent alluvial deposits, to be verified in the field by the geotechnical consultant. The removed soils are considered to be suitable for re-use as engineered fill.

CONCLUSIONS AND RECOMMENDATIONS

Development Feasibility

Based on our preliminary field exploration, research and review of pertinent geologic literature, and preliminary laboratory testing and analysis, development of the project site is considered feasible for the proposed commercial development from a geotechnical standpoint. The following geotechnical factors should be considered during the design process.

Seismic Shaking

The site is located within an active tectonic area of southern California with several significant faults capable of producing moderate to strong earthquakes. The site will likely be subjected to very strong seismically related ground shaking during the anticipated life span of the project and structures within the site should therefore be designed and constructed to resist the effects of strong ground motion in accordance with the most current edition of the 2019 California Building Code.

Seismically Induced Settlement Analysis

The minimum goal of dynamic (i.e., seismic) settlement mitigation should be to provide a foundation system that can withstand the expected movement without causing such structural damage, so as to pose a life-safety hazard (such as structural collapse from excessive drift). The conclusions expressed herein are reached based on conventional boring and continuous CPT data.

As noted previously, the data retrieved from the CPTs was utilized in our dynamic settlement analysis. The results of our preliminary analysis using available subsurface data indicate that the highest total seismically induced settlement at the site is anticipated to be to be less than 0.3 inches at CPT-5 and the analysis are presented in Appendix C. Liquefaction nor dynamic settlement is not a significant factor in site development.

Soil Settlement and Remedial Grading

The upper site soils consisting of undocumented artificial fill and the roughly upper one foot of native alluvial soils are inconsistent due to their variable nature and are subject to static settlement due to dead and live loading conditions of structures. Accordingly, remedial grading of the all of the undocumented fill soils and the upper 1± foot of native alluvium will be necessary for support of engineered fills for the

structure foundation system. In general, in all areas where structures are proposed, all existing undocumented fill and any subsurface compressible alluvial soils will need to be removed (over-excavated), to be subsequently placed as properly compacted (engineered) fill.

Earthwork Recommendations

General Recommendations

Earthwork should be performed in accordance with the Grading Code of the City of Corona, to the applicable provisions of the 2019 CBC and should also be performed in accordance with the following site-specific recommendations prepared by Petra herein based on the proposed construction.

Geotechnical Observations and Testing

Prior to the start of earthwork, a meeting should be held at the site with the owner, contractor and geotechnical consultant to discuss the work schedule and geotechnical aspects of the grading. Earthwork, which in this instance will generally entail removal and re-compaction of existing unsuitable soils and/or over-excavation, should be accomplished under full-time observation and testing of the geotechnical consultant. A representative of the project geotechnical consultant should be present onsite during all earthwork operations to document proper placement and compaction of fills, as well as to document compliance with the other recommendations presented herein.

Demolition, Clearing and Grubbing

All existing buildings, foundations, asphalt or concrete pavements, vegetation and subsurface utility lines throughout the site should be demolished and removed from the site. Following demolition, clearing operations should also include the removal of any remaining trash, debris, vegetation and similar deleterious materials including the root balls for any trees. Any cavities or excavations created upon removal of any unknown subsurface structures should be cleared of loose soil, shaped to provide access for backfilling and compaction equipment and then backfilled with engineered fill. Note that buried deleterious materials are likely to be encountered within the site (i.e., buried organics or debris) due to the past site usage and may need to be removed by hand (i.e. root pickers), during grading operations.

The project geotechnical consultant should provide periodic observation and testing services during final clearing and grubbing operations to document compliance with the above recommendations. In addition, should unusual or adverse soil conditions or buried structures be encountered during grading that are not described herein, these conditions should be brought to the immediate attention of the project geotechnical consultant for corrective recommendations.

Boundary Conditions

Average remedial removals within the building pad areas of the subject site are anticipated to be on the order of 6 to 8 feet± below the existing ground surface, although locally deeper over-excavation may be warranted. Temporary backcut slopes adjacent to the tract boundaries should generally be restricted to a slope ratio of 1:1 (horizontal to vertical) or flatter to protect adjacent offsite improvements (including pavement, sidewalks, walls, buried utilities, etc.) along the property boundaries. Depending on the actual horizontal extent of remedial grading that is achievable by the grading contractor, it is likely that a wedge of unsuitable soil will remain in place along the site perimeter that will extend into the site to a horizontal distance equal to twice the depth of remedial removals (i.e., approximately 10 feet). Since new perimeter site improvements are anticipated to be within this zone, such improvements may need to be designed and constructed with deepened and/or strengthened foundation systems designed to withstand relative movement that is likely to result from settlement of these likely compressible surficial soils. More specific recommendations for remedial grading or alternative foundation design would be provided as field conditions are better defied during grading.

Suitability of On-Site Materials for Use as Engineered Fill

Based on our field observations and subsurface soil conditions encountered in our borings, the onsite soil materials would be suitable for use as engineered fill, provided they are clean of organics, construction debris or other deleterious materials. Boulders greater than 12 inches in diameter, if encountered during remedial grading, may be placed in an engineered fashion is fills as recommended further herein. Soils exposed at or near the surface will likely require significant moisture-conditioning, i.e. pre-watering, to near optimum moisture for use as engineered fill during the onset of grading.

Excavation Characteristics

The existing site soils consisting of undocumented fill and native alluvium are expected to be readily excavated with conventional earthmoving equipment.

Ground Preparation

Geotechnical Observations

A representative of the project geotechnical consultant should also be present on site during major grading operations to document that proper placement and adequate compaction of fills has been achieved, as well as to observe compliance with the other recommendations presented herein. Exposed bottom surfaces in remedial removal areas should be observed and approved by a representative of the project geotechnical

consultant ***prior to the placement of fill***. It is the grading contractor's responsibility to notify the project geotechnical consultant at least 24 hours prior to requiring observation (including excavation bottom verification).

Unsuitable Soil Removals and Bottom Processing

The existing surficial undocumented fills and roughly the upper 1 foot of native alluvial soils are considered unsuitable for support of proposed fills, structures, flatwork, pavement or other improvements and should be removed to underlying competent alluvial materials as approved by the project geotechnical consultant. The estimated depth of removal of alluvial soils is recommended to be approximately 6 to 8 feet below the existing ground surface in proposed building areas, but *no less than 4 feet below bottom of the proposed footings*. Soil removals may need to be locally deeper depending upon the exposed conditions encountered during grading. The actual depths and horizontal limits of removals and over-excavations should be evaluated during grading on the basis of observations and testing performed by the project geotechnical consultant.

Prior to placing engineered fill, the exposed bottom surfaces in the removal areas should be approved by a representative of project geotechnical consultant. The exposed bottom(s) should be scarified to a minimum depth of 12 inches, moisture-conditioned or air-dried to achieve approximately two percent above optimum moisture content and then compacted with a heavy construction equipment prior to placement of fill. Minimum compaction of the upper 12 inches of the removal bottom should meet or exceed 90 percent relative compaction. The laboratory maximum dry density, the standard for determining relative compaction, and optimum moisture content for each change in soil type should be determined in accordance with Test Method ASTM D1557.

Fill Placement

Fill materials should be placed in approximately 6- to 8-inch thick loose lifts, watered or air-dried as necessary to achieve a moisture content of at least above optimum moisture condition, and then compacted in-place to a minimum relative compaction of 90 percent with the exception of the building foundation zone. *All engineered fill to be placed within the building foundation zone shall be compacted to no less than 95 percent relative compaction.* The foundation zone is defined as extending vertically from the top of the footing to the bottom of the over-excavation (minimum 4 feet) and laterally a distance of 5 feet beyond the sides of the footing. The laboratory maximum dry density and optimum moisture content for each change in soil type should be determined in accordance with ASTM D 1557.

Disposal of Oversize Rock

If oversize rock (rock greater than 12 inches in dimension) is encountered, it may be disposed of onsite by placing the rock in the lower portions of the deeper fills in a manner to avoid nesting. Placement of oversize rock should be restricted from the upper 10 feet of building pads, within 15 feet of a slope face, and areas to receive deep utilities.

Where placed in deep fill areas, the oversize rock should be placed individually or in windrows and then completely covered with clean finer-grained (SE equal to or greater than 30), onsite earth materials. The finer-grained materials should be thoroughly watered and rolled to infill voids. A typical rock disposal detail is shown on Plate SG-2 (Appendix D). Oversize rock shall not be placed shallower than 10 feet from pad grade or less than 15 feet, measured horizontally, from a slope face. Petra recommends that rock no greater than 8 inches be placed in the upper 3 feet of the building pad to facilitate excavating for building foundations and utilities.

Temporary Excavations

Temporary excavations varying up to a depth of up to roughly 8 feet below existing grades may be required to accomplish the recommended over-excavation of existing soils. Based on the physical properties of the onsite soils, temporary excavations which are constructed exceeding 4 feet in height should be cut back to an inclination of 1:1 (h:v) or flatter for the duration of the over-excavation of unsuitable soil material and replacement as compacted fill, as well as placement of underground utilities. The 1:1 (h:v) recommendation may possibly be steepened, depending of conditions observed by a representative of the project geotechnical consultant. Other factors which should be considered with respect to the stability of the temporary slopes include construction traffic and/or storage of materials on or near the tops of the slopes, construction scheduling, presence of nearby walls or structures on adjacent properties and weather conditions at the time of construction. Applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health act of 1970 and the Construction Safety Act should also be followed.

Slot Cutting

To mitigate potential off-site ground instability due to over-excavation operations along the project boundaries, a slot cutting technique, commonly referred to as the "ABC" method, may be utilized. This method consists of first excavating a temporary excavation at a 1:1 (h:v) maximum inclination along the length of the existing fencing/block wall or toe-of-slope, with the top of the temporary backcut slope located a minimum of approximately 3 feet horizontally from the outside edge of the existing boundary

improvements. The 1:1 (h:v) backcut slope is then divided into approximately equal sections not exceeding a width of approximately 10 feet, depending largely upon the nature of the exposed alluvial soils. Every third section is then excavated at a vertical inclination and the section then brought to design grade with compacted fill prior to excavating the next series of 10-foot wide slot cuts.

Continuous observations should be provided by the project geotechnical consultant during excavation of the initial 1:1 (h:v) backcut slope. If any evidence of potential instability is observed, revised recommendations such as flatter (h:v) backcut slopes and/or narrower slot cuts may be necessary. Continuous observations should also be provided by the project geotechnical consultant during excavation of the individual vertical slot cuts. If any evidence of potential instability is observed, immediate revised recommendations for performing the slot cuts may become necessary.

Import Soils for Grading

If import soils are needed to achieve final design grades the soils should be free of deleterious materials, oversize rock and any hazardous materials. The soils should also be non-expansive, consistent with the on-site soils, and essentially non-corrosive and approved by the project geotechnical consultant *prior* to being brought onsite. The geotechnical consultant should visit the potential borrow site and conduct testing of the soil at least three days before the commencement of import operations.

Volumetric Changes - Shrinkage and Subsidence

Volumetric changes in earth quantities will occur when onsite soils are excavated and replaced as properly compacted fill. Based on our observations of earth materials encountered in the borings, a shrinkage factor on the order of 5 to 10 percent may be considered during removal and re-compaction for the undocumented fills and native alluvial soils. The actual shrinkage that will occur during grading will depend on the average degree of relative compaction achieved. A subsidence of approximately 0.1 to 0.2 feet may be anticipated as a result of the scarification and re-compaction of the exposed bottom surfaces within the removal areas.

The above estimates of shrinkage and subsidence are intended for use by project planners in estimating earthwork quantities and should not be considered absolute values. Contingencies should be made for balancing earthwork quantities based on actual shrinkage and subsidence that will occur during site grading.

Tentative Foundation Design Considerations

Seismic Design Coefficients

Earthquake loads on earthen structures and buildings are a function of ground acceleration which may be determined from the site-specific ground motion analysis. Alternatively, a design response spectrum can be developed for certain sites based on the code guidelines. To provide the design team with the parameters necessary to construct the design acceleration response spectrum for this project, we used two computer applications. Specifically, the first computer application, which was jointly developed by Structural Engineering Association of California (SEAOC) and California's Office of Statewide Health Planning and Development (OSHPD), the SEA/OSHPD Seismic Design Maps Tool website, https://seismicmaps.org, is used to calculate the ground motion parameters. The second computer application, the United Stated Geological Survey (USGS) Unified Hazard Tool website, https://earthquake.usgs.gov/hazards/interactive/, is used to estimate the earthquake magnitude and the distance to surface projection of the fault.

To run the above computer applications, site latitude and longitude, seismic risk category and knowledge of site class are required. The site class definition depends on the direct measurement of certain soil properties and the ASCE 7-16 recommended procedure for calculating the average value within the upper 30 meters (approximately 100 feet) of site soils. One such parameter is the soil strength/resistance as measured by standard blow count of the standard soil sampler, commonly referred to as standard penetration testing (SPT) blow count.

Based on an analysis of the field sampler penetration resistance from our borings, the boring FB1 reported by Fero (FE, 2006), or N-Value per Table 20.3-1 and Section 20.4.2 of ASCE 7-16, and our CPT and shear wave data, Site Class D has been assigned to the subject site. A seismic risk category of II was assigned to the proposed buildings in accordance with 2019 CBC, Table 1604.5. The following table provides parameters required to construct the design acceleration response spectrum based the 2019 CBC guidelines.

While the Fero FB1 boring only extends to a depth of 65 feet, it is our opinion that the soil consistency and density would be higher with increasing depth. Therefore, it is our professional opinion that the geotechnical data obtained is a reasonable representation of the upper 100 feet of existing ground with respect to shear wave velocity.

TABLE 1

Seismic Design Parameters

Ground Motion Parameters	Specific Reference	Parameter Value	Unit
Site Latitude (North)	-	33.8699	°
Site Longitude (West)	-	-117.5377	°
Site Class Definition	Section 1613.2.2 (1), Chapter 20 (2)	D (4)	-
Assumed Risk Category	Table 1604.5 (1)	II	-
M_w - Earthquake Magnitude	USGS Unified Hazard Tool (3)	6.5 (3)	-
R – Distance to Surface Projection of Fault	USGS Unified Hazard Tool (3)	5.4 (3)	km
S_s - Mapped Spectral Response Acceleration Short Period (0.2 second)	Figure 1613.2.1(1) (1)	1.872 (4)	g
S_1 - Mapped Spectral Response Acceleration Long Period (1.0 second)	Figure 1613.2.1(2) (1)	0.732 (4)	g
F_a – Short Period (0.2 second) Site Coefficient	Table 1613.2.3(1) (1)	1 (4)	-
F_v – Long Period (1.0 second) Site Coefficient	Table 1613.2.3(2) (1)	Null (4)	-
S_{MS} – MCE_R Spectral Response Acceleration Parameter Adjusted for Site Class Effect (0.2 second)	Equation 16-36 (1)	1.872 (4)	g
S_{M1} - MCE_R Spectral Response Acceleration Parameter Adjusted for Site Class Effect (1.0 second)	Equation 16-37 (1)	Null (4)	g
S_{DS} - Design Spectral Response Acceleration at 0.2-s	Equation 16-38 (1)	1.248 (4)	g
S_{D1} - Design Spectral Response Acceleration at 1-s	Equation 16-39 (1)	Null (4)	g
$T_o = 0.2\ S_{D1}/\ S_{DS}$	Section 11.4.6 (2)	Null	s
$T_s = S_{D1}/\ S_{DS}$	Section 11.4.6 (2)	Null	s
T_L - Long Period Transition Period	Figure 22-14 (2)	8 (4)	s
PGA - Peak Ground Acceleration at MCE_G (*)	Figure 22-9 (2)	0.788 (4)	g
F_{PGA} - Site Coefficient Adjusted for Site Class Effect (2)	Table 11.8-1 (2)	1.1 (4)	-
PGA_M –Peak Ground Acceleration (2) Adjusted for Site Class Effect	Equation 11.8-1 (2)	0.867 (4)	g
Design PGA ≈ (⅔ PGA_M) - Slope Stability (†)	Similar to Eqs. 16-38 & 16-39 (2)	0.57	g
Design PGA ≈ (0.4 S_{DS}) – Short Retaining Walls (‡)	Equation 11.4-5 (2)	0.50	g
C_{RS} - Short Period Risk Coefficient	Figure 22-18A (2)	0.918 (4)	-
C_{R1} - Long Period Risk Coefficient	Figure 22-19A (2)	0.905 (4)	-
SDC - Seismic Design Category (§)	Section 1613.2.5 (1)	Null (4)	-

References:

(1) California Building Code (CBC), 2019, California Code of Regulations, Title 24, Part 2, Volume I and II.

(2) American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI), 2016, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Standards 7-16.

(3) USGS Unified Hazard Tool - https://earthquake.usgs.gov/hazards/interactive/

(4) SEI/OSHPD Seismic Design Map Application – https://seismicmaps.org

Related References:

Federal Emergency Management Agency (FEMA), 2015, NEHERP (National Earthquake Hazards Reduction Program) Recommended Seismic Provision for New Building and Other Structures (FEMA P-1050).

Notes:

* PGA Calculated at the MCE return period of 2475 years (2 percent chance of exceedance in 50 years).

† PGA Calculated at the Design Level of ⅔ of MCE; approximately equivalent to a return period of 475 years (10 percent chance of exceedance in 50 years).

‡ PGA Calculated for short, stubby retaining walls with an infinitesimal (zero) fundamental period.

§ The designation provided herein may be superseded by the structural engineer in accordance with Section 1613.2.5.1, if applicable.

Discussion

Owing to the characteristics of the subsurface soils, as defined by Site Class D-Stiff Soil designation, and proximity of the site to the sources of major ground shaking, the site is expected to experience strong ground shaking during its anticipated life span. Under these circumstances, where the code-specified design response spectrum may not adequately characterize site response, the 2019 CBC typically requires a site-specific seismic response analysis to be performed. This requirement is signified/identified by the "null" values that are output using SEA/OSHPD software in determination of short period, but mostly, in determination of long period seismic parameters, see Table 1.

For conditions where a "null" value is reported for the site, a variety of design approaches are permitted by 2019 CBC and ASCE 7-16 in lieu of a site-specific seismic hazard analysis. For any specific site, these alternative design approaches, which include Equivalent Lateral Force (ELF) procedure, Modal Response Spectrum Analysis (MRSA) procedure, Linear Response History Analysis (LRHA) procedure and Simplified Design procedure, among other methods, are expected to provide results that may or may not be more economical than those that are obtained if a site-specific seismic hazards analysis is performed. These design approaches and their limitations should be evaluated by the project structural engineer.

Notwithstanding the above discussion, should the Equivalent Lateral Force (ELF) method is used for seismic design of structural elements, the value of Constant Velocity Domain Transition Period, T_s, is estimated to be 0.674 and the value of Long Period Transition Period, T_L, is provided in Table 1 for construction of Seismic Response Coefficient – Period (C_s -T) curve that is used in the ELF procedure.

Please note that the Seismic Design Category, SDC, is also designated as "null" in Table 1. For condition where the mapped spectral response acceleration parameter at 1 – second period, S_1, is less than 0.75, the 2019 CBC, Section 1613.2.5.1 allows that seismic design category to be determined from Table 1613.2.5(1) alone provided that all 4 requirements concerning fundamental period of structure, story drift, seismic response coefficient, and relative rigidity of the diaphragms are met. Our interpretation of ASCE 7-16 is that for conditions where one or more of these 4 conditions are not met, seismic design category should be assigned based on: 1) 2019 CBC, Table 1613.2.5(1), 2) structure's risk category and 3) the value of S_{DS}, at the discretion of the project structural engineer.

As stated herein, the subject site is within a Site Class D-Stiff Soil. A site-specific ground motion hazard analysis is not required for structures on Site Class D-Stiff Soil with $S_1 \geq 0.2$ provided that the Seismic Response Coefficient C_s is determined in accordance with ASCE 7-16, Article 12.8 and structural design is performed in accordance with Equivalent Lateral Force (ELF) procedure.

Expansive Soil Conditions

Based on our initial laboratory test, near-surface soils encountered in our borings are granular and Very Low in expansion potential (Expansion Index less than 20). Additional sampling and testing should be performed during site grading for determining actual expansion potential of the supporting building pad soils.

Foundation System

In consideration of the existing granular soils and the recommended remedial grading herein, conventional shallow foundations, consisting of isolated column footings and continuous footings, may be used for support of the commercial structures. Foundation loads for the presumed two-story concrete tilt-up buildings are currently unknown, however Petra has assumed 2- to 5-kip per foot line loads for continuous footings and 25- to 50-kip point loads for columns.

Allowable Soil Bearing Capacity

Isolated Column Footings

A basic allowable soil bearing capacity of 2,500 pounds per square foot, including dead and live loads, may be utilized for design of minimum 24-inch square pad footing founded no less than 18 inches below lowest adjacent finish grade. The bearing capacity may be increased by 20 percent for each additional foot of embedment and/or 10 percent for each additional foot of width to a maximum of 3,500 pounds per square foot. The recommended allowable bearing value includes both dead and live loads, and may be increased by one-third for short-duration wind and seismic forces.

Continuous Footings

A basic allowable soil bearing capacity of 2,000 pounds per square foot, including dead and live loads, may be utilized for design of minimum 12-inch wide continuous footing founded no less than 18 inches below lowest adjacent finish grade. The bearing capacity may be increased by 20 percent for each additional foot of embedment and/or 10 percent for each additional foot of width to a maximum of 3,000 pounds per square foot. The recommended allowable bearing value includes both dead and live loads, and may be increased by one-third for short-duration wind and seismic forces.

Lateral Resistance

A passive earth pressure of 350 pounds per square foot per foot of depth, to a maximum value of 2,000 pounds per square foot, may be used to determine lateral bearing resistance for footings. In addition, a coefficient of friction of 0.40 times the dead load forces may be used between concrete and the supporting

soils to determine lateral sliding resistance. The above values may be increased by one-third when designing for transient wind or seismic forces. It should be noted that the above values are based on the condition where footings are cast in direct contact with compacted fill. In cases where the footing sides are formed, all backfill placed against the footings upon removal of forms should be compacted to at least 90 percent of the applicable maximum dry density.

Static Settlement

Based on the allowable bearing values provided above, total settlement of the footings is anticipated to be less than 1 inch. Differential settlement is expected to be approximately two-thirds of the total settlement over 40 feet (angular distortion of 1:720). The majority of static settlement is likely to take place as footing loads are applied or shortly thereafter.

Dynamic Settlement

As previously noted, the total seismic settlements are estimated to be less than 0.3 inches. Differential dynamic settlement is estimated to be less than 0.2 inches over a span of 30 feet.

Building Floor Slabs

1. Concrete floor slabs should be a minimum 5 inches thick and reinforced with a minimum No. 3 bars spaced a maximum of 18 inches on centers, both ways. All slab reinforcement should be properly supported to ensure placement near mid-depth.

2. Where a moisture barrier is not needed, as is likely the case in the warehouse and manufacturing areas of the buildings, the concrete may be placed directly upon the prepared subgrade soils. The preparation shall include compaction of the subgrade soils to achieve 95 percent relative per ASTM D1557 prior to foundation trenching, as described in the Fill Placement section. Following the construction of foundations and installation of interior utilities, the backfill of excavations shall be compacted to no less than 90 percent relative compaction prior to slab concrete placement.

3. Concrete floor slabs to receive moisture sensitive floor covering should be underlain with a moisture vapor retarder consisting of a minimum 10-mil-thick polyethylene or polyolefin membrane that meets the minimum requirements of ASTM E96 and ASTM E1745 for vapor retarders (such as Husky Yellow Guard®, Stego® Wrap, or equivalent). All laps within the membrane should be sealed, and at least 2 inches of clean sand should be placed over the membrane to promote uniform curing of the concrete. To reduce the potential for punctures, the membrane should be placed on a pad surface that has been graded smooth without any sharp protrusions. If a smooth surface cannot be achieved by grading, consideration should be given to lowering the pad finished grade an additional inch and then placing a 1-inch-thick leveling course of sand across the pad surface prior to the placement of the membrane.

   At the present time, some slab designers, geotechnical professionals and concrete experts view the sand layer below the slab (blotting sand) as a place for entrapment of excess moisture that could adversely impact moisture-sensitive floor coverings. As a preventive measure, the potential for moisture intrusion into the concrete slab could be reduced if the concrete is placed

directly on the vapor retarder. However, if this sand layer is omitted, appropriate curing methods must be implemented to ensure that the concrete slab cures uniformly. A qualified materials engineer with experience in slab design and construction should provide recommendations for alternative methods of curing and supervise the construction process to ensure uniform slab curing. Additional steps would also need to be taken to prevent puncturing of the vapor retarder during concrete placement.

4. Prior to placing concrete, the subgrade soils below the slab should be pre-watered to achieve a moisture content that is at least optimum moisture content, but not overly wet.

5. Slab dimension, reinforcement type, size and spacing need to account for internal concrete forces (e.g., thermal, shrinkage and expansion) as well as external forces (e.g., applied loads), as deemed necessary. The minimum dimensions and reinforcement recommended herein for building floor slabs may be modified (increased or decreased) by the structural engineer responsible for foundation design based on his/her calculations and engineering experience and judgment. A modulus of subgrade reaction of 125 pci may be used for slab design.

General Corrosivity Screening

As a screening level study, limited chemical and electrical tests were performed on representative samples of onsite soils to identify potential corrosive characteristics of these soils. The following sections present the test results and an interpretation of current codes and guidelines that are commonly used in our industry as they relate to the adverse impact of chemical contents and electrical resistance of the site soils on various components of the proposed structures in contact with site soils.

A variety of test methods are available to quantify corrosive potential of soils for various elements of construction materials. Depending on the test procedures adopted, characteristics of the leachate that is used to extract the target chemicals from the soils and the test equipment; the results can vary appreciably for different test methods in addition to those caused by variability in soil composition. The testing procedures referred to herein are considered to be typical for our industry and have been adopted and/or approved by many public or private agencies. In drawing conclusions from the results of our chemical and electrical laboratory testing and providing mitigation guidelines to reduce the detrimental impact of corrosive site soils on various components of the structure in contact with site soils, heavy references were made to 2016 California Building Code (2016 CBC) and American Concrete Institute publication (2014 Building Code Requirements for Structural Concrete, ACI 318-14). Where relevant information was not available in these codes, references were made to guidelines developed by California Department of Transportation (Caltrans), Post-Tensioning Institute (PTI DC10.5-12) and other reputable institutions and/or publications. Specifically, the reference to Caltrans approach were made because their risk management protocol for highway bridges are considered comparable to those for residential or commercial structures and that Post

Tensioning Institute (PTI), in part, accepts and uses Caltrans' relevant corrosivity criteria for post-tensioned slabs on-grade.

It should be noted that Petra does not practice corrosion engineering; therefore, the test results, opinion and engineering judgment provided herein should be considered as general guidelines only. Additional analyses would be warranted, especially, for cases where buried metallic building materials (such as copper and cast or ductile iron pipes) in contact with site soils are planned for the project. In many cases, the project geotechnical engineer may not be informed of these choices. Therefore, for conditions where such elements are considered, we recommend that other, relevant project design professionals (e.g., the architect, landscape architect, civil and/or structural engineer) also consider recommending a qualified corrosion engineer to conduct additional sampling and testing of near-surface soils during the final stages of site grading to provide a complete assessment of soil corrosivity. Recommendations to mitigate the detrimental effects of corrosive soils on buried metallic and other building materials that may be exposed to corrosive soils should be provided by the corrosion engineer as deemed appropriate.

Concrete in Contact with Site Soils

Soils containing soluble sulfates beyond certain threshold levels as well as acidic soils are considered to be detrimental to long-term integrity of concrete placed in contact with such soils. For the purpose of this study, soluble sulfates (SO_4^{2-}) concentration in soils determined in accordance with California Test Method No. 417. Soil acidity, as indicated by hydrogen-ion concentration (pH), was determined in accordance with California Test Method No. 643. The soil acid severity rating is adopted from The United States Department of Agriculture, Natural Resources Conservation Service classification.

Article 1904.1 of Section 1904 of the 2016 CBC indicates that structural concrete shall conform to the durability requirements of ACI 318. Concrete durability is impacted by exposure to water soluble chemicals and its resistance to fluid penetration. Section 19.3 of Chapter 19 of ACI 318-14 provides guidelines for assigning exposure categories and classes for various conditions. **Exposure Category S**, which is subdivided to four Exposure Classes of S0, S1, S2 and S3, applies to concrete in contact with soil or water containing deleterious amounts of water soluble ions.

The results of our limited in-house laboratory testing indicates that on-site soils contain a water-soluble ***sulfate content of 0.005 to 0.0006 percent by weight***. Based on Table 19.3.1.1 of ACI 318-14, the **Exposure Class S0** is appropriate for onsite soils. For this exposure class, Table 19.3.2.1 of ACI 318-14 provides that no restriction for cement type or maximum water-cement ratio for the fresh concrete would be required.

Further, this table indicates that the concrete minimum unconfined strength should not be less than 2,500 psi.

The results of limited in-house testing of a representative sample indicates that soils exhibit a ***moderately alkaline pH of 8.6 to 8.7***. Based on this finding and according to Table 8.22.2 of Caltrans' 2003 Bridge Design Specifications (2003 BDS) requirements (which consider the combined effects of soluble sulfates and soil pH), a commercially available Type II Modified cement may be used.

The guidelines provided herein should be evaluated and confirmed, or modified, in its entirety by the project structural engineer and the contractor responsible for concrete placement for structural concrete used in exterior and interior footings, interior slabs on-ground, garage slabs, walls foundation and concrete exposed to weather such as driveways, patios, porches, walkways, ramps, steps, curbs, etc.

Metals Encased in Concrete

Soils containing a soluble chloride concentration beyond a certain threshold level are considered corrosive to metallic elements such as reinforcement bars, tendons, cables, bolts, anchors, etc. that are encased in concrete that, in turn, is in contact with such soils. For the purpose of this study, soluble chlorides (Cl) in soils were determined in accordance with California Test Method No. 422.

As stated Earlier, Article 1904.1 of Section 1904 of the 2016 CBC indicates that structural concrete shall conform to the durability requirements of ACI 318. Concrete durability is impacted by exposure to water soluble chemicals and its resistance to fluid penetration. Section 19.3 of Chapter 19 of ACI 318-14 provides guidelines for assigning exposure categories and classes for various conditions. **Exposure Category C**, which is subdivided to three Exposure Classes of C0, C1, and C2, applies to nonprestressed and prestressed concrete exposed to conditions that require additional protection against corrosion of reinforcement.

According to Table 19.3.1.1 of ACI 318-14, the **Exposure Class C0** is appropriate for reinforced concrete that remains dry or protected from moisture. Similarly, the **Exposure Class C1** is appropriate for reinforced concrete that is exposed to moisture but not to external sources of chlorides. And, lastly, the **Exposure Class C2** is appropriate for reinforced concrete that is exposed to moisture and external sources of chlorides as "deicing chemicals, salt, brackish water, seawater, or spray from these sources".

Based on our understanding of the project, it is our professional opinion that the **Exposure Class C1** is appropriate for reinforced concrete, to be placed at the site, that are in contact with site soils.

The results of our limited laboratory testing indicate that onsite soils contain a water-soluble ***chloride concentration of 66 to 99 parts per million (ppm)***. No maximum water/cement ratio for the fresh concrete is prescribed by ACI 318 for **Exposure Class C1** condition. Table 19.3.2.1 of ACI 318-14 indicates that concrete minimum unconfined compressive strength, f'_c, should not be less than 2,500 psi.

The guidelines provided herein should be evaluated and confirmed, or modified, in its entirety by the project structural engineer for reinforced concrete placement for structural concrete used in exterior and interior footings, interior slabs on-ground, garage slabs, walls foundation and concrete exposed to weather such as driveways, patios, porches, walkways, ramps, steps, curbs, etc.

Metallic Elements in Contact with Site Soils

Elevated concentrations of soluble salts in soils tend to induce low level electrical currents in metallic objects in contact with such soils. This process promotes metal corrosion and can lead to distress to building metallic components that are in contact with site soils. The minimum electrical resistivity measurement provides a simple indication of relative concentration of soluble salts in the soil and, therefore, is widely used to estimate soil corrosivity with regard to metals. For the purpose of this investigation, the minimum resistivity in soils is measured in accordance with California Test Method No. 643. The soil corrosion severity rating is adopted from the Handbook of Corrosion Engineering by Pierre R. Roberge.

The onsite soils were found to exhibit a ***minimum electrical resistivity of 4,800 to 15,000 ohm-cm*** based on limited testing. The result indicates that on-site soils are **moderately to mildly Corrosive** to ferrous metals and copper. As such, any ferrous metal or copper components of the subject buildings (such as cast iron or ductile iron piping, copper tubing, etc.) that are expected to be placed in direct contact with site soils should be protected against detrimental effects of corrosive soils. Such protection could include the use of galvanized tubing, coated pipes, wrapping or encasing these metallic objects in special protection wrappings or conduits or devising a cathodic protection system. It should be noted that at this time Petra is not aware of any plans to incorporate such items for the proposed buildings. Should such elements be considered for these building, we recommend that a qualified corrosion engineer to be consulted to provide appropriate recommendations for long term protection of metallic elements in contact with site soils.

Post-Grading Considerations

Utility Trenches

All utility trench backfill should be compacted to a minimum relative compaction of 90 percent. Trench backfill materials should be free of oversize rock and placed in lifts no greater than approximately 12 inches

in thickness, watered or air-dried as necessary to achieve near optimum moisture conditions, and then mechanically compacted in place to a minimum relative compaction of 90 percent. A representative of the project geotechnical consultant should probe and test the backfills to verify adequate compaction.

As an alternative for shallow trenches where pipe or utility lines may be damaged by mechanical compaction equipment, such as under building floor slabs, clean sand having a sand equivalent (SE) value of 30 or greater may be utilized. The sand backfill materials should be watered to achieve near optimum moisture conditions and then tamped into place. No specific relative compaction will be required; however, observation, probing, and if deemed necessary, testing should be performed by a representative of the project geotechnical consultant to verify an adequate degree of compaction.

If clean, imported sand is to be used for backfill of exterior utility trenches, it is recommended that the upper 12 inches of trench backfill materials consist of properly compacted onsite soil materials. This is to mitigate infiltration of irrigation and rainwater into granular trench backfill materials.

Where an exterior and/or interior utility trench is proposed in a direction parallel to a building footing, the bottom of the trench should not extend below a 1:1 (horizontal to vertical) plane projected downward from the bottom edge of the adjacent footing. Where this condition occurs, the adjacent footing should be deepened or the utility constructed and the trench backfilled and compacted prior to footing construction. Where utility trenches cross under a building footing, these trenches should be backfilled with on-site soils at the point where the trench crosses under the footing to reduce the potential for water to migrate under the floor slabs.

Site Drainage

Positive surface drainage systems consisting of a combination of sloped concrete flatwork/asphalt pavement, sheet flow gradients, swales and surface area drains (where needed) should be provided around the building and within the planter areas to collect and direct all surface waters to an appropriate drainage facility as determined by the project civil engineer. The ground surfaces of planter and landscape areas that are located within 10 feet of building foundations should be sloped at a minimum gradient of 5 percent away from the foundations and towards the nearest area drains. The ground surface of planter and landscape areas that are located more than 10 feet away from building foundations may be sloped at a minimum gradient of 2 percent away from the foundations and towards the nearest area drains.

Concrete flatwork surfaces that are located within 10 feet of building foundations should be inclined at a minimum gradient of one percent away from the building foundations and towards the nearest area drains.

Concrete flatwork surfaces that are located more than 10 feet away from building foundations may be sloped at a minimum gradient of 1 percent towards the nearest area drains. Surface waters should not be allowed to collect or pond against building foundations and within the level areas of the site. All drainage devices should be properly maintained throughout the lifetime of the development. Future changes to site improvements, or planting and watering practices, should not be allowed to cause over-saturation of site soils adjacent to the structures.

Masonry Screen Walls

Construction on Level Ground

Where masonry walls are proposed on level ground and 5 feet or more from the tops of descending slopes, the footings for these walls may be founded 18 inches or more below the lowest adjacent final grade. These footings should also be reinforced with two No. 4 bars, one near top and one near bottom.

Construction Joints

In order to reduce the potential for unsightly cracking related to the effects of differential settlement, positive separations (construction joints) should be provided in the walls at horizontal intervals of approximately 20 to 25 feet and at each corner. The separations should be provided in the blocks only and not extend through the footings. The footings should be placed monolithically with continuous rebars to serve as effective "grade beams" along the full lengths of the walls.

Exterior Concrete Flatwork

General

Near-surface compacted fill soils within the site are expected to exhibit an expansion index of 0 to 20, i.e. non-expansive. We recommend that all exterior concrete flatwork such as sidewalks, patio slabs, large decorative slabs, concrete subslabs that will be covered with decorative pavers, private and/or public vehicular driveways and/or access roads within and adjacent to the site be designed by the project architect and/or structural engineer with consideration given to mitigating the potential cracking and uplift that can develop in soils exhibiting expansion index values that fall in the very low category.

The guidelines that follow should be considered as minimums and are subject to review and revision by the project architect, structural engineer and/or landscape consultant as deemed appropriate.

Thickness and Joint Spacing

To reduce the potential of unsightly cracking, concrete walkways, patio-type slabs, large decorative slabs and concrete subslabs to be covered with decorative pavers should be at least 4 inches thick and provided with construction joints or expansion joints every 6 feet or less.

Reinforcement

All concrete flatwork having their largest plan-view panel dimension exceeding 10 feet should be reinforced with a minimum of No. 3 bars spaced 24 inches on centers, both ways. Alternatively, the slab reinforcement may consist of welded wire mesh of the sheet type (not rolled) with 6x6/W1.4xW1.4 designation in accordance with the Wire Reinforcement Institute (WRI). The reinforcement should be properly positioned near the middle of the slabs.

> *The reinforcement recommendations provided herein are intended as guidelines to achieve adequate performance for anticipated soil conditions. The project architect, civil and/or structural engineer should make appropriate adjustments in reinforcement type, size and spacing to account for concrete internal (e.g., shrinkage and thermal) and external (e.g., applied loads) forces as deemed necessary.*

Subgrade Preparation

Compaction

To reduce the potential for distress to concrete flatwork, the subgrade soils below concrete flatwork areas to a minimum depth of 12 inches (or deeper, as either prescribed elsewhere in this report or determined in the field) should be moisture conditioned to at least equal to, or slightly greater than, the optimum moisture content and then compacted to a relative compaction of no less than 90 percent. Where concrete public roads, concrete segments of roads and/or concrete access driveways are proposed, the upper 6 inches of subgrade soil should be compacted to no less than 95 percent relative compaction.

Pre-Moistening

As a further measure to reduce the potential for concrete flatwork cracking, subgrade soils should be thoroughly moistened prior to placing concrete. The moisture content of the soils should be approximately 1.2 times the optimum moisture content and penetrate to a minimum depth of 12 inches into the subgrade. Flooding or ponding of the subgrade is not considered feasible to achieve the above moisture conditions since this method would likely require construction of numerous earth berms to contain the water. Therefore, moisture conditioning should be achieved with a light spray applied to the subgrade over a period

of few to several days just prior to pouring concrete. Pre-watering of the soils is intended to promote uniform curing of the concrete, reduce the development of shrinkage cracks and reduce the potential for differential expansion pressure on freshly poured flatwork. A representative of the project geotechnical consultant should observe and verify the density and moisture content of the soils, and the depth of moisture penetration prior to pouring concrete.

Drainage

Drainage from patios and other flatwork areas should be directed to local area drains and/or graded earth swales designed to carry runoff water to the adjacent streets or other approved drainage structures. The concrete flatwork should be sloped at a minimum gradient of one percent, or as prescribed by project civil engineer or local codes, away from building foundations, retaining walls, masonry garden walls and slope areas.

Tree Wells

Tree wells are not recommended in concrete flatwork areas since they introduce excessive water into the subgrade soils and allow root invasion, both of which can cause heaving and cracking of the flatwork.

Preliminary Pavement Design Recommendations

The final pavement section should be designed once rough grading has occurred and the R-Value of the resulting subgrade can be determined. For the purposes of this preliminary evaluation, we assumed an R-value of 50 based on the soil types encountered. The following pavement sections have been computed in accordance with Caltrans design procedures and presented in the following table, Table 2. Based upon our experience, the thicker pavement section is provided below is recommended due to increased performance and life.

TABLE 2

Preliminary Structural Pavement Sections

Location	Design R-value	Traffic Index	Pavement Section
Auto Parking Spaces	50	4.5	3 in. AC / 4 in. AB
Auto Driveways	50	5.0	3 in. AC / 4 in. AB
Truck Driveways/Parking	50	8.0	4.5 in. AC / 6 in. AB

Notes: AC = Asphalt Concrete AB = Aggregate Base

Final pavement design recommendations should be provided based on sampling and testing at the completion of rough grading and the values of traffic indices that should be provided by the project civil engineer. Subgrade soils should be properly compacted, smooth, and non-yielding prior to pavement construction. The subgrade soils should be compacted to at least 95 percent of ASTM D 1557.

Aggregate base materials should be Crushed Aggregate Base, Crushed Miscellaneous Base, or Processed Miscellaneous Base conforming to Section 200-2 of the Standard Specifications for Public Works Construction (Greenbook). The base materials should be brought to uniform moisture near optimum moisture then compacted to at least 95 percent of the applicable maximum density standard as determined per ASTM D 1557. Asphaltic concrete materials and construction should conform to Section 203 of the Greenbook.

Loading Docks

1. The slab subgrade should be graded such that it accommodates placement of 7-inch thick concrete pavement section. Subgrade compaction shall be no less than 95 percent relative compaction with reference to ASTM D1557.

2. Prior to placing concrete, the subgrade soils below the slab should be pre-watered to achieve a moisture content that is at least optimum moisture content, but not overly wet.

3. The concrete pavement section should be a minimum 7 inches thick and reinforced with No. 3 bars spaced a maximum of 18 inches on centers (both ways). The reinforcement should be properly positioned near the middle of the slabs.

4. Concrete shall exhibit an unconfined compressive strength of no less than 3,250 psi.

5. The minimum dimensions and reinforcement recommended herein for equipment slab may be modified (increased or decreased subject to the constraints of the 2019 CBC) by the Structural Engineer based on his/her calculations, engineering experience and judgment.

GRADING AND STRUCTURAL PLAN REVIEW

This report is based on the existing site conditions as we understand and the preliminary conceptual grading plan by KWC Engineers. We recommend that our firm be retained to review the grading plan and structural foundation plans once when they become available. Additional recommendations and/or modification of the recommendations provided herein will be provided if necessary, depending on the results of the plan reviews.

If additional or alternative improvements are considered in the future, our firm should be notified so that we may provide design recommendations. It is further recommended that we be engaged to review the final

design drawings, specifications and grading plan prior to any new construction. If we are not provided the opportunity to review these documents with respect to the geotechnical aspects of new construction and grading, it should not be assumed that the recommendations provided herein are wholly or in part applicable to the proposed construction.

We recommend that Petra be retained to provide soil-engineering services during excavation, grading, construction and foundation phases of the work. This is to observe compliance with the design, specifications or recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

REPORT LIMITATIONS

This report is based on the project site and our ten preliminary subsurface borings/CPT's, laboratory testing and geotechnical analysis. The materials encountered on the project site and utilized in our laboratory evaluation are believed representative of the total area; however, soil and groundwater conditions can vary in characteristics between excavations, both laterally and vertically, especially when considering the historical site undocumented grading, development and use.

The conclusions and opinions contained in this report are based on the results of the described geotechnical evaluations and represent our professional judgment. This report has been prepared consistent with that level of care being provided by other professionals providing similar services at the same locale and in the same time period. The contents of this report are professional opinions and as such, are not to be considered a guaranty or warranty. This report has not been prepared for use by parties or projects other than those named or described herein. This report may not contain sufficient information for other parties or other purposes. In addition, this report should be reviewed and updated after a period of 1 year or if the site ownership or project concept changes from that described herein.

It has been a pleasure to be of service to you on this project. Should you have questions regarding the contents of this report or should you require additional information, please contact this office.

Respectfully submitted,

PETRA GEOSCIENCES, INC.

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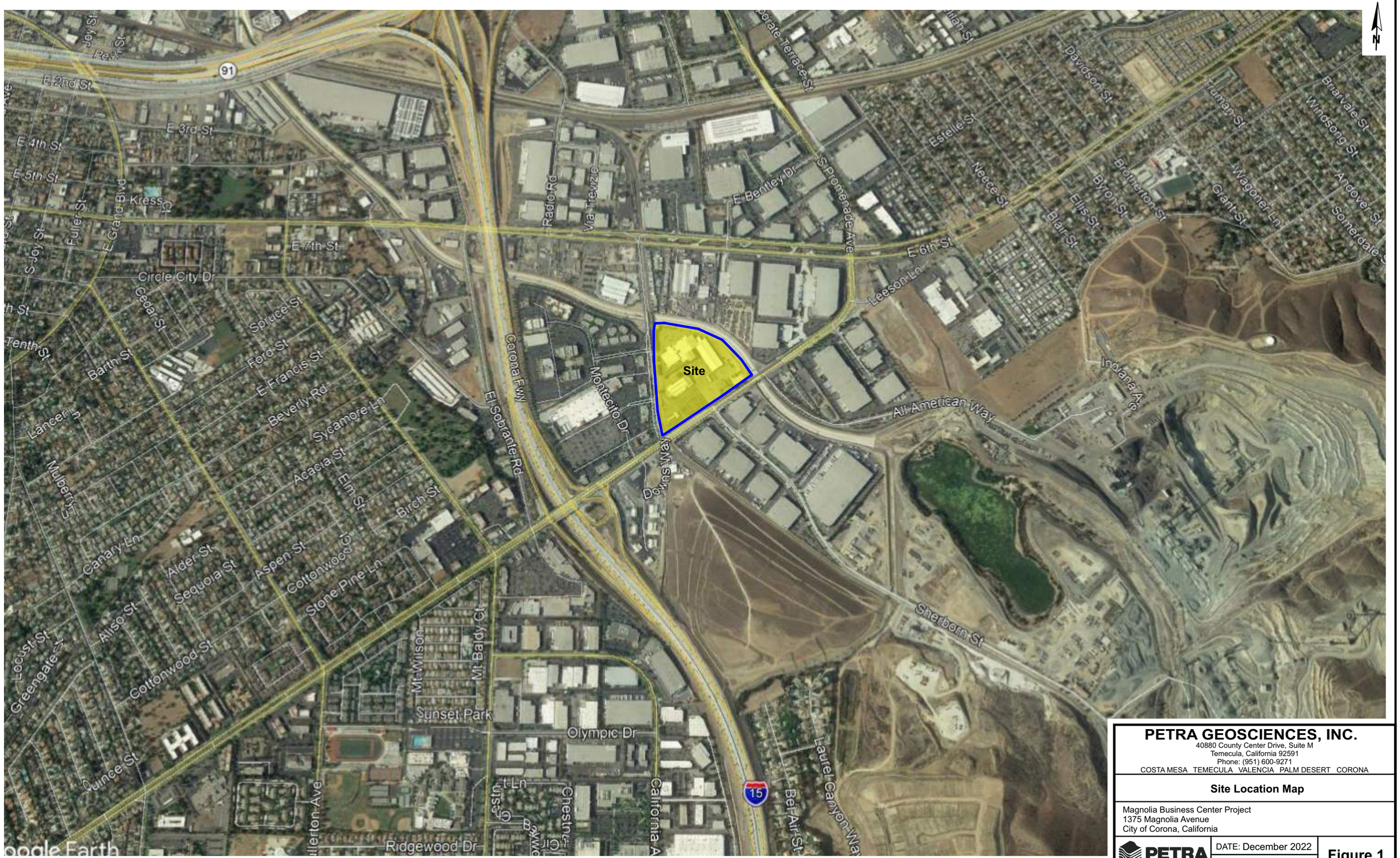
FIGURES



Reference: Google Earth, 2020 Image

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COSTA MESA TEMECULA VALENCIA PALM DESERT CORONA

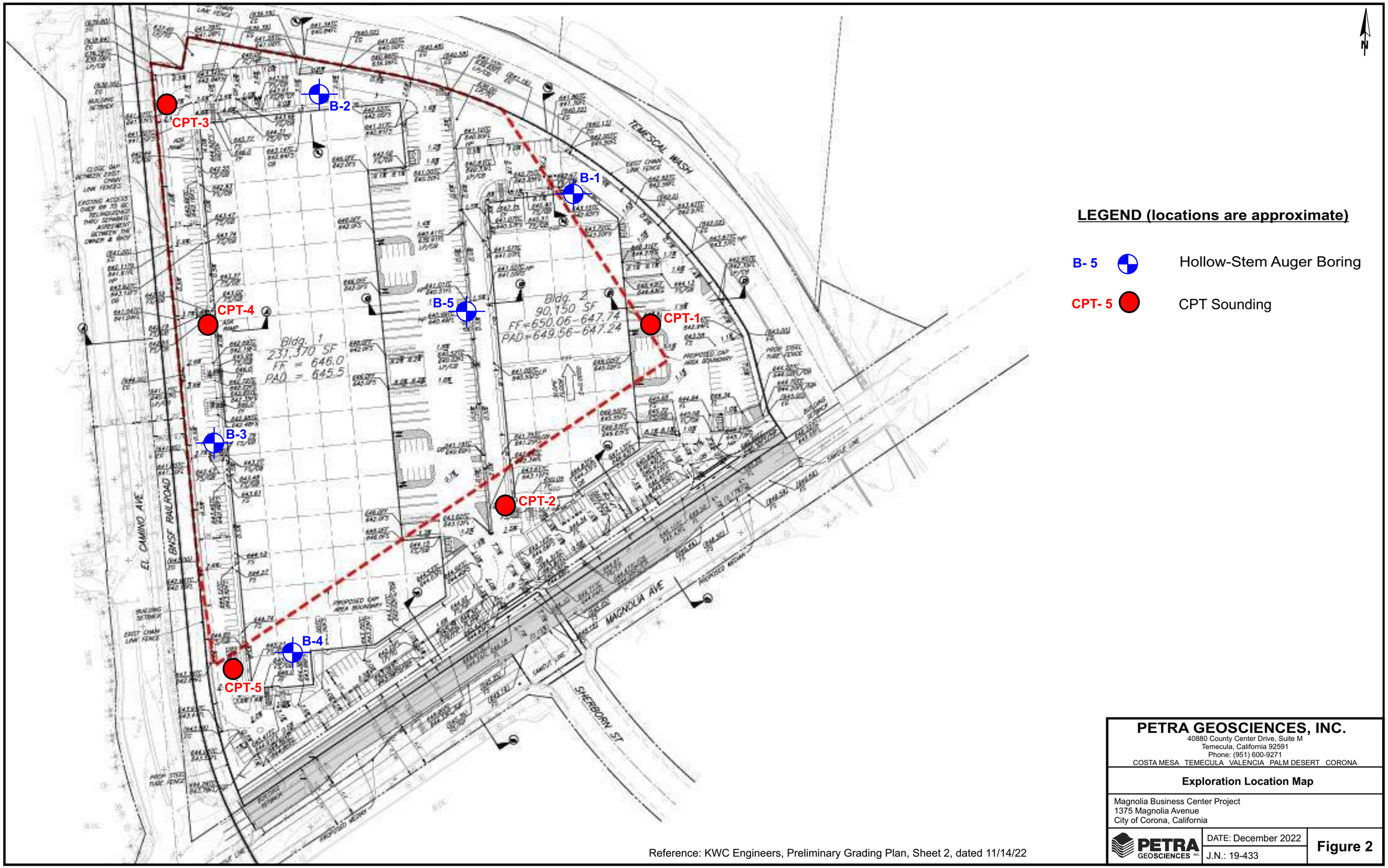
Site Location Map

Magnolia Business Center Project
1375 Magnolia Avenue
City of Corona, California

PETRA GEOSCIENCES INC.

DATE: December 2022
J.N.: 19-433

Figure 1



LEGEND (locations are approximate)

B- 5 — Hollow-Stem Auger Boring

CPT- 5 — CPT Sounding

Reference: KWC Engineers, Preliminary Grading Plan, Sheet 2, dated 11/14/22

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Exploration Location Map

Magnolia Business Center Project
1375 Magnolia Avenue
City of Corona, California

PETRA GEOSCIENCES INC.

DATE: December 2022

J.N.: 19-433

Figure 2

APPENDIX A

EXPLORATION LOGS

EXPLORATION LOG

Project:	**1375 Magnolia Ave.**		Boring No.: **B-1**
Location:	**Corona**		Elevation: **±643'**
Job No.:	**19-433**	Client: **Western Realco**	Date: **1/2/2020**
Drill Method:	**8" Hollow Stem Auger**	Driving Weight: **140lbs/30"**	Logged By: **KTM**

Depth (Feet)	Lith-ology	Material Description	WATER	Samples: Blows per foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		**ARTIFICIAL FILL, undocumented (afu)**							
		Sand (SP): Dark brown, moist, loose to medium-dense, fine- to coarse-grained sand.							MAX, S04, CL, RES, pH, DSR
				12 17 23			6.2	101.4	
5		Becomes dark yellowish-brown.		11 15 24			4.9	120.3	
		YOUNGER ALLUVIUM (Qya)		18 18 20			3.3	116.6	
10		Sand (SP): Yellowish-brown to gray, dry to slighlu moist, medium-dense to dense, fine- to coarse-grained sand, poorly graded, trace gravel up to 0.5" in diameter.							
		Same as above.		11 18 30			5.5	111.6	
15		Same as above.		7 7 10			8.2	129.7	
		Silty Sand (SM): Brown, moist, medium-dense, fine- to coarse-grained sand, trace gravel up to 2.5" in diameter.							
		Gravelly Sand (SP/GP): Yellowish-brown, moist, medium-dense, fine- to ocarse-grained sand, gravel up to 3" in diameter.							
20		Disturbed sample, same as above.		26 23 43			3.4	107.3	
		Drill begins to chatter.							
25		Becomes very dense with trace cobbles up to 4" in diameter.		27 50/1"			3.2	107.7	
		Total Depth= 25'7" No groundwater encountered Boring backfilled with cuttings and tamped.							
30									

PLATE A-1

Petra Geosciences, Inc.

EXPLORATION LOG

Project:	**1375 Magnolia Ave.**		Boring No.: **B-2**
Location:	**Corona**		Elevation: **±641'**
Job No.:	**19-433**	Client: **Western Realco**	Date: **1/2/2020**
Drill Method:	**8" Hollow Stem Auger**	Driving Weight: **140lbs/30"**	Logged By: **KTM**

Depth (Feet)	Lith-ology	Material Description	WATER	Samples: Blows per foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		**ASPHALT** 3" thick.							
		ARTIFICIAL FILL, undocumented (afu) Sand (SP): Dark brown to black, moist, loose to medium-dense, fine- to coarse-grained sand, few gravel up to 2" in diameter, trace brick debris.							
		Becomes brown.		9 10 13	■		1.6	106.8	
		Concrete storm drain pipe encountered, obstruction was not identified until after drilling of B-2 had completed.							
5		Becomes medium-dense to dense.		11 19 21	■		2.3	118.0	
		Becomes gray and dry.							
		YOUNGER ALLUVIUM (Qya) Sand (SP): Yellowish-brown to gray, slightly moist, medium-dense to dense, medium- to coarse-grained sand.		13 17 19	■		1.7	115.2	
10		Same as above with few gravel up to 2" in diameter No recovery.		13 19 19	▨				
15		Becomes yellowish-brown to brown, slightly moist, dense to very dense, fine-grained, no gravel.		19 30 46	■		2.2	111.6	
20		Gravelly Sand (SP/GP): Yellowish-brown to brown, dry, very dense, fine- to coarse-grained sand, gravel up to 3" in diameter No recovery Drill begins to chatter.		50/3"	▨				
25		Same as above with few cobbles up to 6" in diameter No recovery.		50/2"	▨				
		Total Depth= 25'2" Refusal due to cobble content No groundwater encountered Boring backfilled with cuttings and capped with asphalt patch.							
30									

PLATE A-2

Petra Geosciences, Inc.

EXPLORATION LOG

Project:	**1375 Magnolia Ave.**		Boring No.: **B-3**
Location:	**Corona**		Elevation: **±644'**
Job No.:	**19-433**	Client: **Western Realco**	Date: **1/2/2020**
Drill Method:	**8" Hollow Stem Auger**	Driving Weight: **140lbs/30"**	Logged By: **KTM**

Depth (Feet)	Lith-ology	Material Description	WATER	Samples: Blows per foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		**ASPHALT** 3.5" thick.							
		ARTIFICIAL FILL, undocumented (afu) Sand (SP): Dark grayish-brown, moist, medium-dense, fine- to coarse-grained sand, poorly graded, few gravel up to 3" in diameter. Becomes brown.		19 23 20	■	■	4.4	116.8	EI, S04, CL, RES, pH, DSR
5		**YOUNGER ALLUVIUM (Qya)** Sand (SP): Yellowish-brown to brown, very moist, medium-dense, medium- to coarse-grained sand, trace cobbles up to 4" in diameter.		8 11 11	■		3.7	104.1	
		Becomes very dense. Strong hydrocarbon odor.		9 40 50	■		4.5	98.1	
10		Becomes gray, fine- to coarse-grained, dense, poorly graded, strong hydrocarbon odor.		10 19 20	■		8.1	108.4	
15		Becomes reddish-brown, moist, fine- to medium-grained, medium-dense, strong hydrocarbon odor.		9 16 13	■		7.2	117.8	
		Silty Sand (SM): Dark gray, moist, medium-dense, fine-grained sand, strong hydrocarbon odor. Drill begins to struggle Cobbles encountered.							
20		Total Depth= 19' Refusal due to cobble content No groundwater encountered Boring backfilled with cuttings and capped with asphalt patch.							
25									
30									

PLATE A-3

Petra Geosciences, Inc.

EXPLORATION LOG

Project:	**1375 Magnolia Ave.**		Boring No.: **B-4**
Location:	**Corona**		Elevation: **±646'**
Job No.:	**19-433**	Client: **Western Realco**	Date: **1/2/2020**
Drill Method:	**8" Hollow Stem Auger**	Driving Weight: **140lbs/30"**	Logged By: **KTM**

Depth (Feet)	Lith-ology	Material Description	WATER	Samples: Blows per foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		**ASPHALT** 3.5" thick.							
		ARTIFICIAL FILL, undocumented (afu) Sand (SP): Grayish-brown, moist, medium-dense, fine- to coarse-grained sand, few gravel up to 2" in diameter. Becomes brown.							
5		**YOUNGER ALLUVIUM (Qya)** Sand (SP): Yellowish-brown to brown, slightly moist, dense, fine- to coarse-grained sand.		12 16 20	■		2.5	122.6	
		Same as above.		18 20 34	■		2.3	107.4	
10		Same as above.		18 18 29	■		4.0	122.6	
15		Sandy Clay (CL): Brown, very moist, soft to firm, fine- to medium-grained sand, trace gravel up to 3" in diameter Disturbed sample.		2 4 12	■		6.2		
		Sand (SP): Brown, moist, medium-dense, fine- to coarse-grained sand, few gravel up to 3" in diameter.							
20		Same same as above with trace cobbles up to 6" in diameter No recovery.		50/3"	▨				
		Total Depth= 20'5" Refusal due to cobble content No groundwater encountered Boring backfilled with cuttings and capped with asphalt patch.							
25									
30									

PLATE A-4

Petra Geosciences, Inc.

EXPLORATION LOG

Project:	**1375 Magnolia Ave.**		Boring No.: **B-5**
Location:	**Corona**		Elevation: **±642'**
Job No.:	**19-433**	Client: **Western Realco**	Date: **1/2/2020**
Drill Method:	**8" Hollow Stem Auger**	Driving Weight: **140lbs/30"**	Logged By: **KTM**

Depth (Feet)	Lith-ology	Material Description	WATER	Samples: Blows per foot	Samples: Core	Samples: Bulk	Laboratory Tests: Moisture Content (%)	Laboratory Tests: Dry Density (pcf)	Laboratory Tests: Other Lab Tests
0		**ASPHALT** 3.5" thick.							
		ARTIFICIAL FILL, undocumented (afu) Sand (SP): Yellowish-brown, to grayish-brown, moist, medium-dense, fine- to coarse-grained sand, few gravel up to 2" in diameter.							
5		**YOUNGER ALLUVIUM (Qya)** Sand (SP): Yellowish-brown, moist, medium-dense, fine- to coarse-grained sand, poorly graded, trace gravel up to 2" in diameter.		12 15 16	■	■	3.9	118.8	
		Becomes fine- to medium-grained.		11 18 14	■	■	3.1	110.0	#200
10		Silty Sand (SM): Brown, moist, medium-dense, fine- to coarse-grained sand, trace gravel up to 2" in diameter.		5 7 7	■		5.5	105.3	
15		Becomes silty fine-grained sand, and very dense.		5 11 50/5"	■		6.8	129.1	
20		Sand (SP): Gray, slightly moist, very dense, fine- to coarse-grained sand, poorly graded, few gravel up to 3" in diameter Disturbed sample.		28 50/4"	■		2.3		
		Total Depth= 23' Refusal due to cobble content No groundwater encountered Boring backfilled with cuttings and capped with asphalt patch.							
25									
30									

PLATE A-5

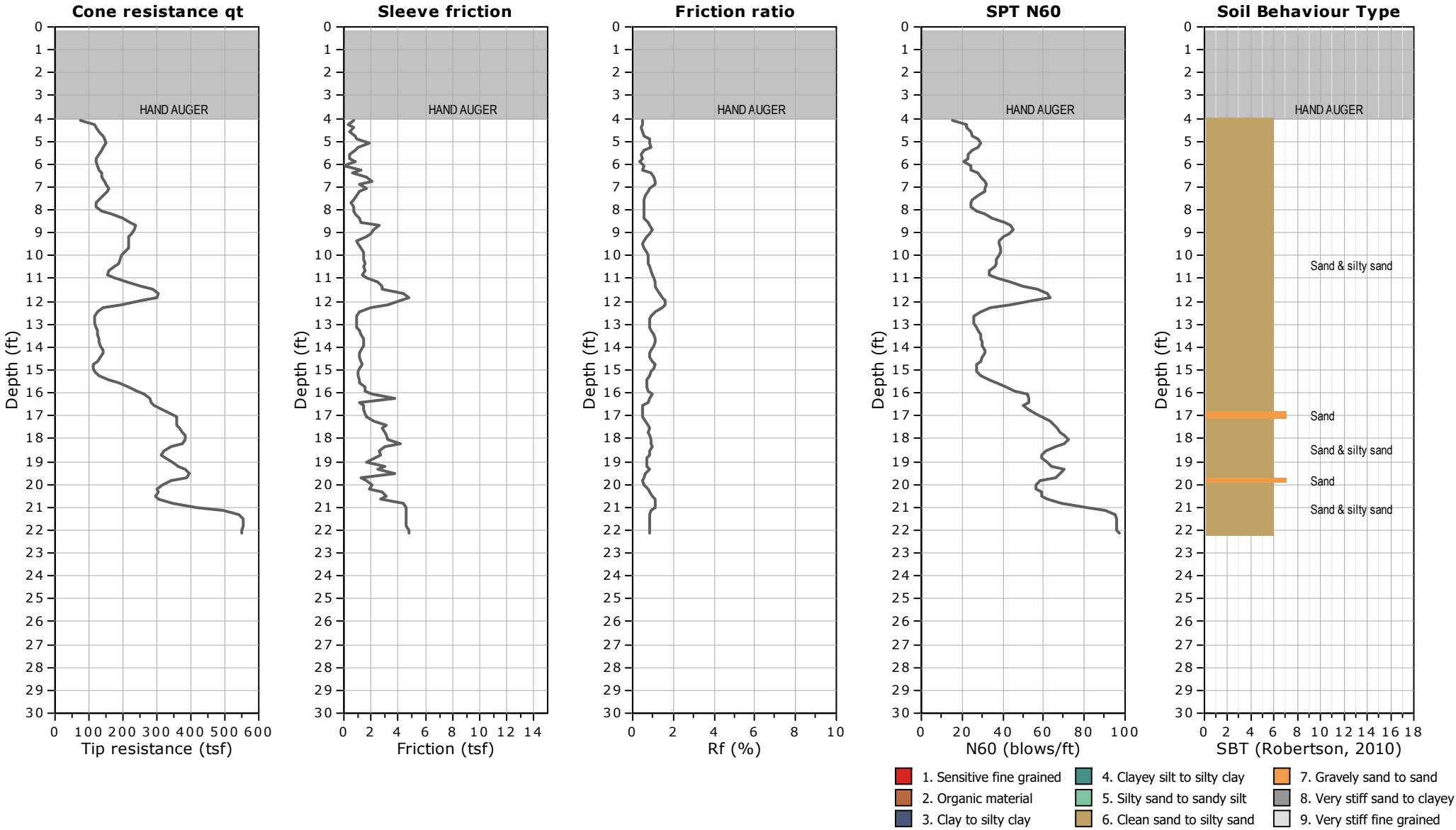
Petra Geosciences, Inc.

Gregg Drilling, LLC
www.greggdrilling.com

CPT: CPT-1

CLIENT: PETRA GEOSCIENCES
SITE: CLOW VALVE, CORONA, CA

FIELD REP: KURT
Total depth: 22.15 ft, Date: 1/2/2020

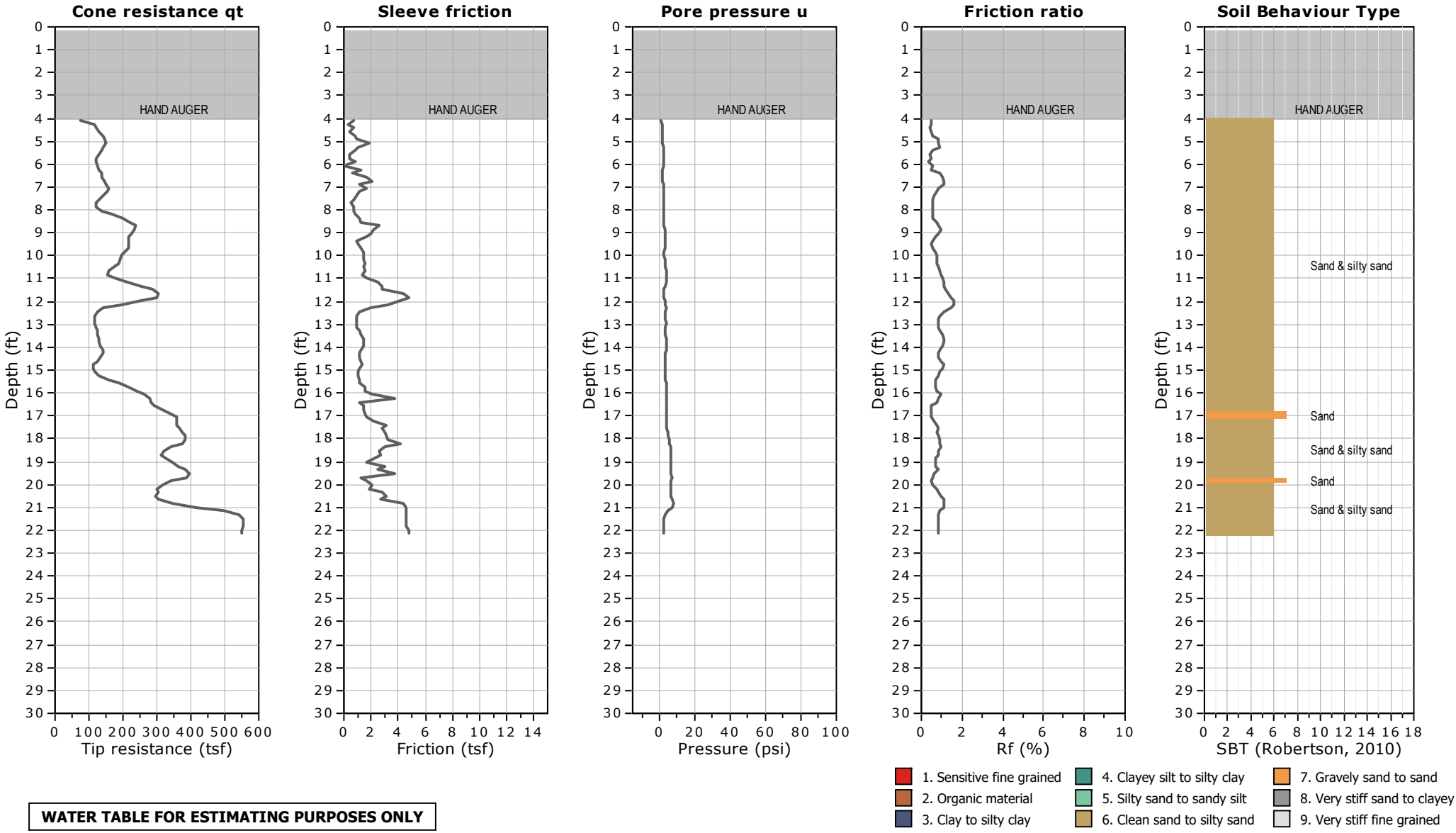


Gregg Drilling, LLC
www.greggdrilling.com

CPT: CPT-1

CLIENT: PETRA GEOSCIENCES
SITE: CLOW VALVE, CORONA, CA

FIELD REP: KURT
Total depth: 22.15 ft, Date: 1/2/2020



WATER TABLE FOR ESTIMATING PURPOSES ONLY

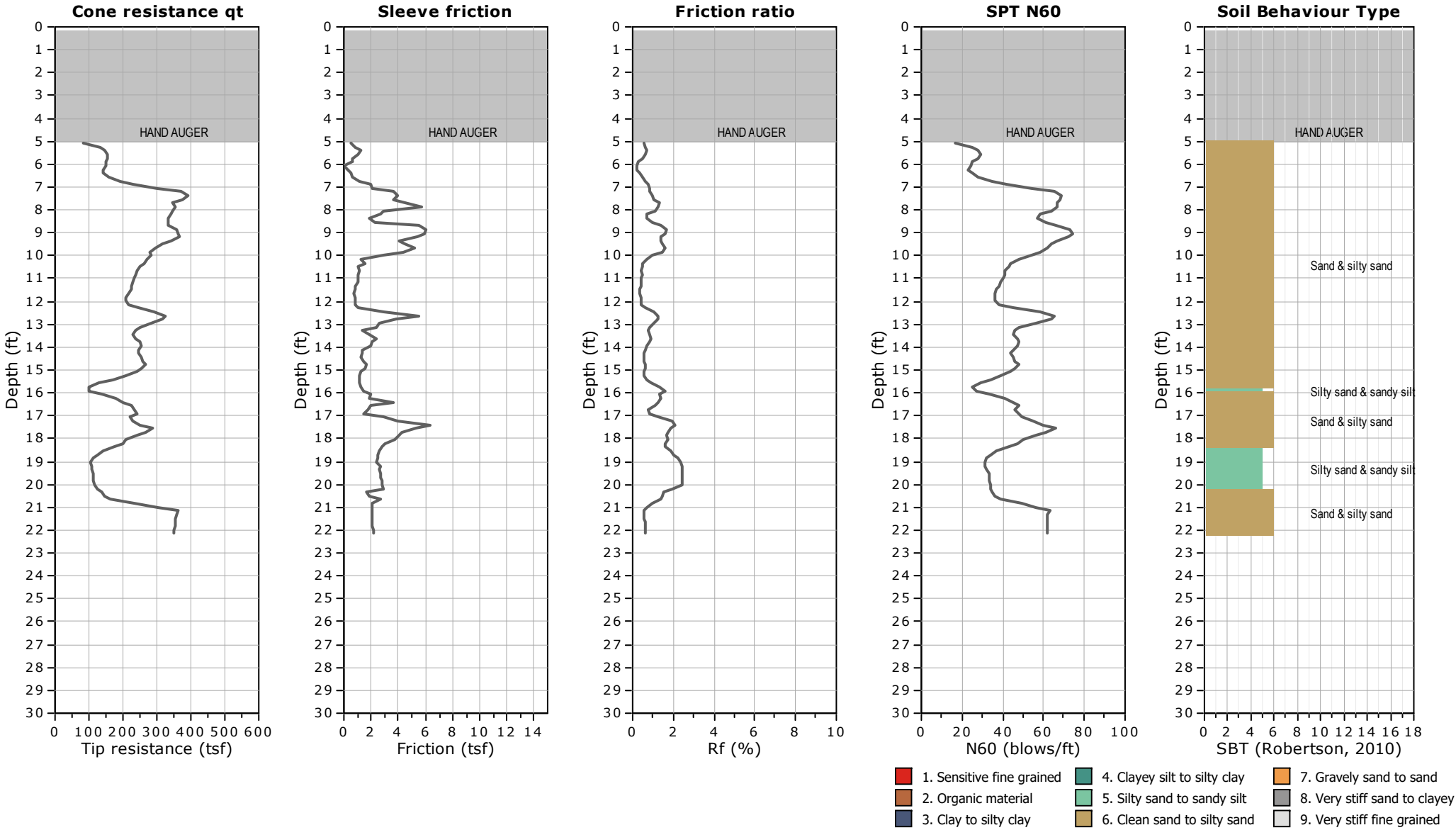
CPT: CPT-3

CLIENT: PETRA GEOSCIENCES

SITE: CLOW VALVE, CORONA, CA

FIELD REP: KURT

Total depth: 22.15 ft, Date: 1/2/2020

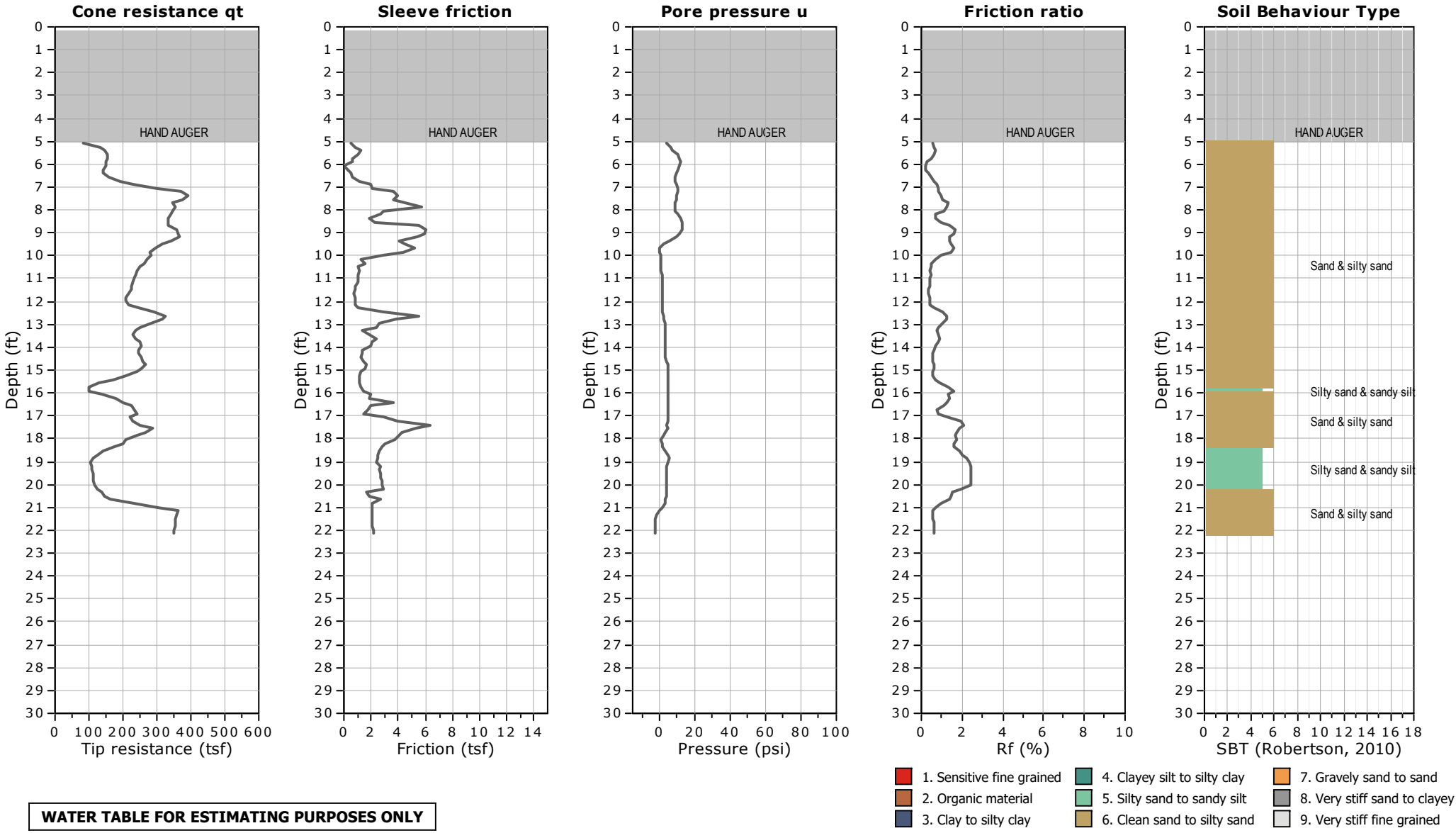


Gregg Drilling, LLC
www.greggdrilling.com

CPT: CPT-3

CLIENT: PETRA GEOSCIENCES
SITE: CLOW VALVE, CORONA, CA

FIELD REP: KURT
Total depth: 22.15 ft, Date: 1/2/2020



WATER TABLE FOR ESTIMATING PURPOSES ONLY

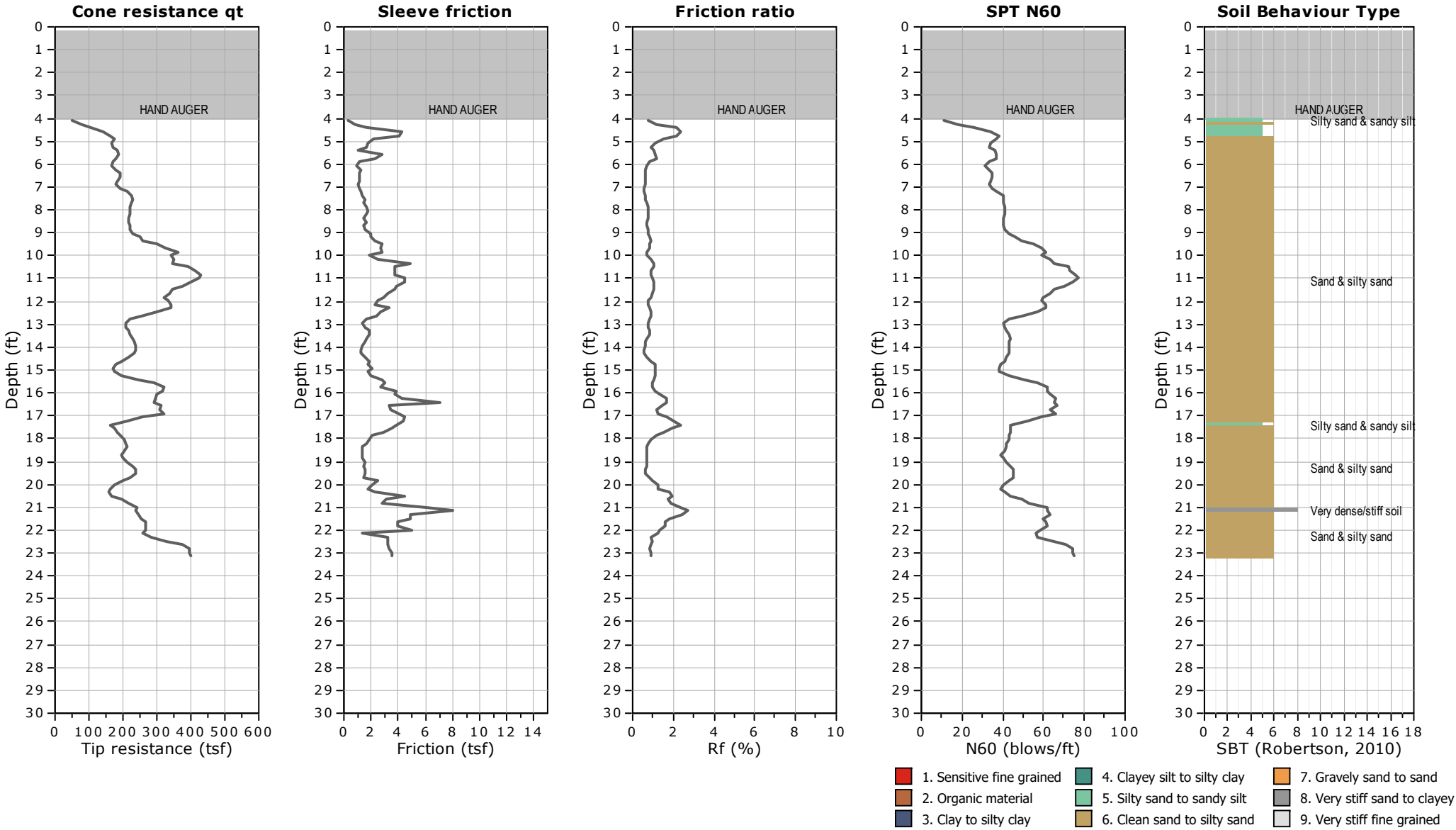
CPT: CPT-4

CLIENT: PETRA GEOSCIENCES

SITE: CLOW VALVE, CORONA, CA

FIELD REP: KURT

Total depth: 23.13 ft, Date: 1/2/2020



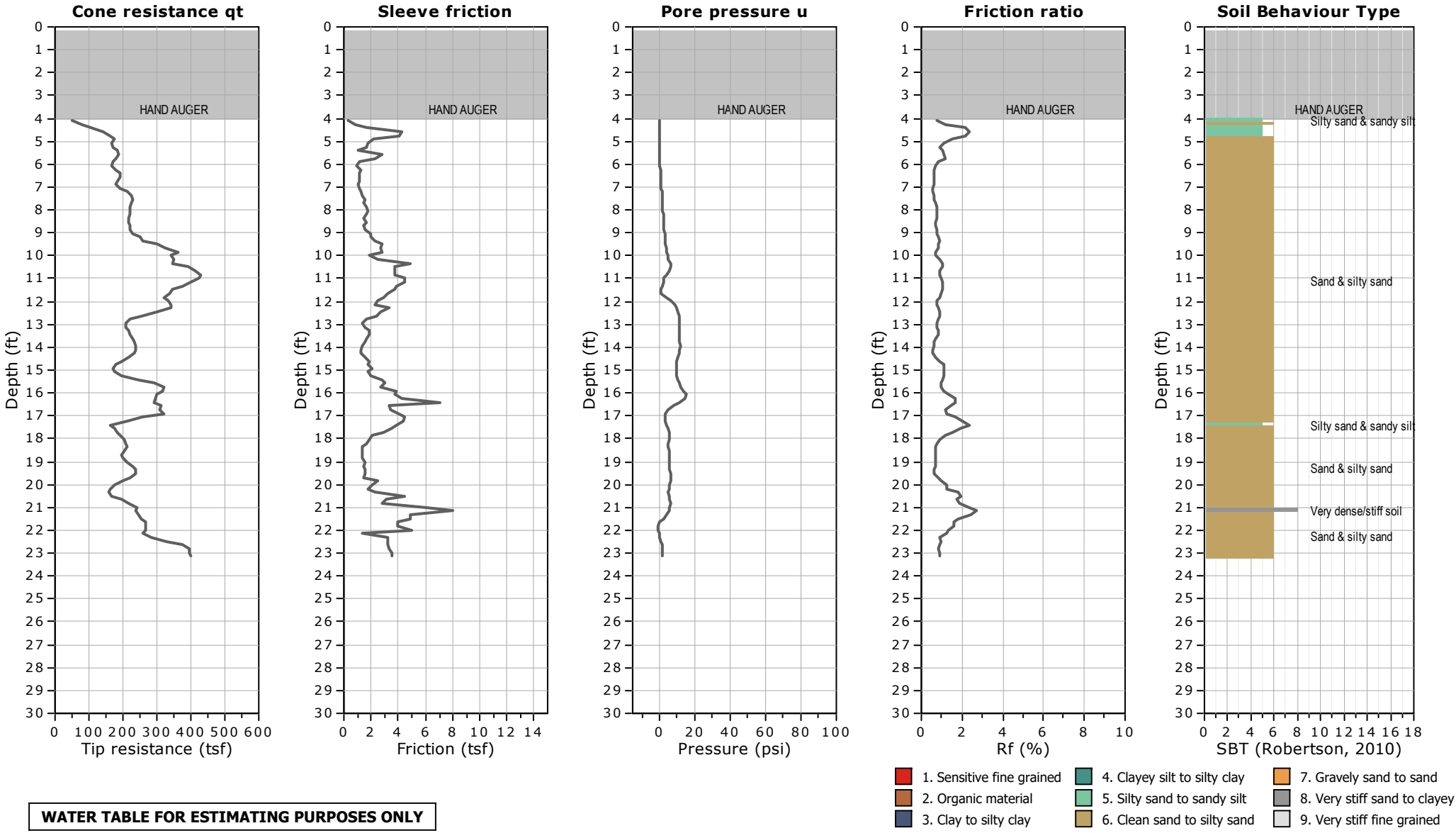
CPT: CPT-4

CLIENT: PETRA GEOSCIENCES

SITE: CLOW VALVE, CORONA, CA

FIELD REP: KURT

Total depth: 23.13 ft, Date: 1/2/2020



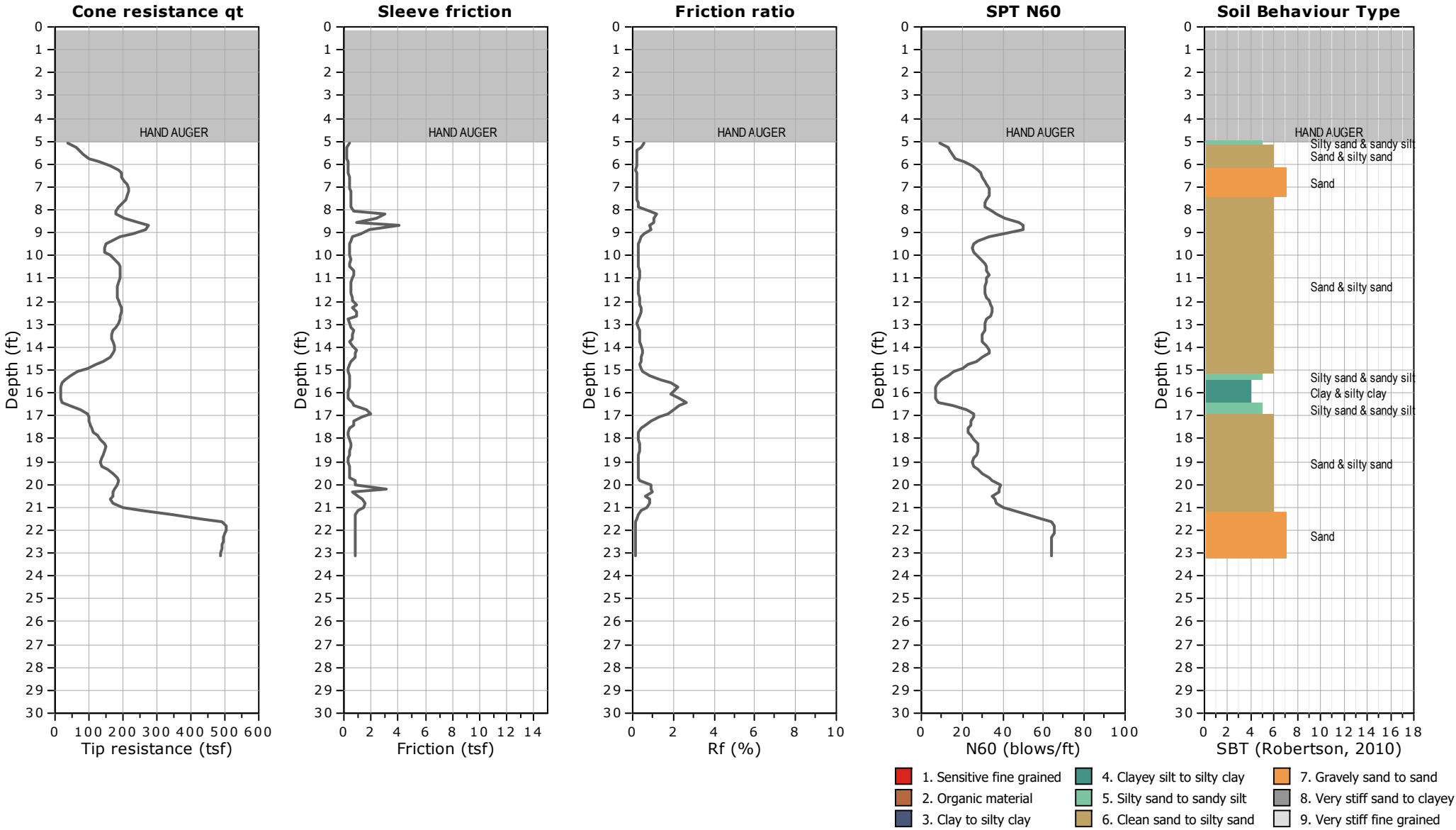
WATER TABLE FOR ESTIMATING PURPOSES ONLY

Gregg Drilling, LLC
www.greggdrilling.com

CPT: CPT-5

CLIENT: PETRA GEOSCIENCES
SITE: CLOW VALVE, CORONA, CA

FIELD REP: KURT
Total depth: 23.13 ft, Date: 1/2/2020

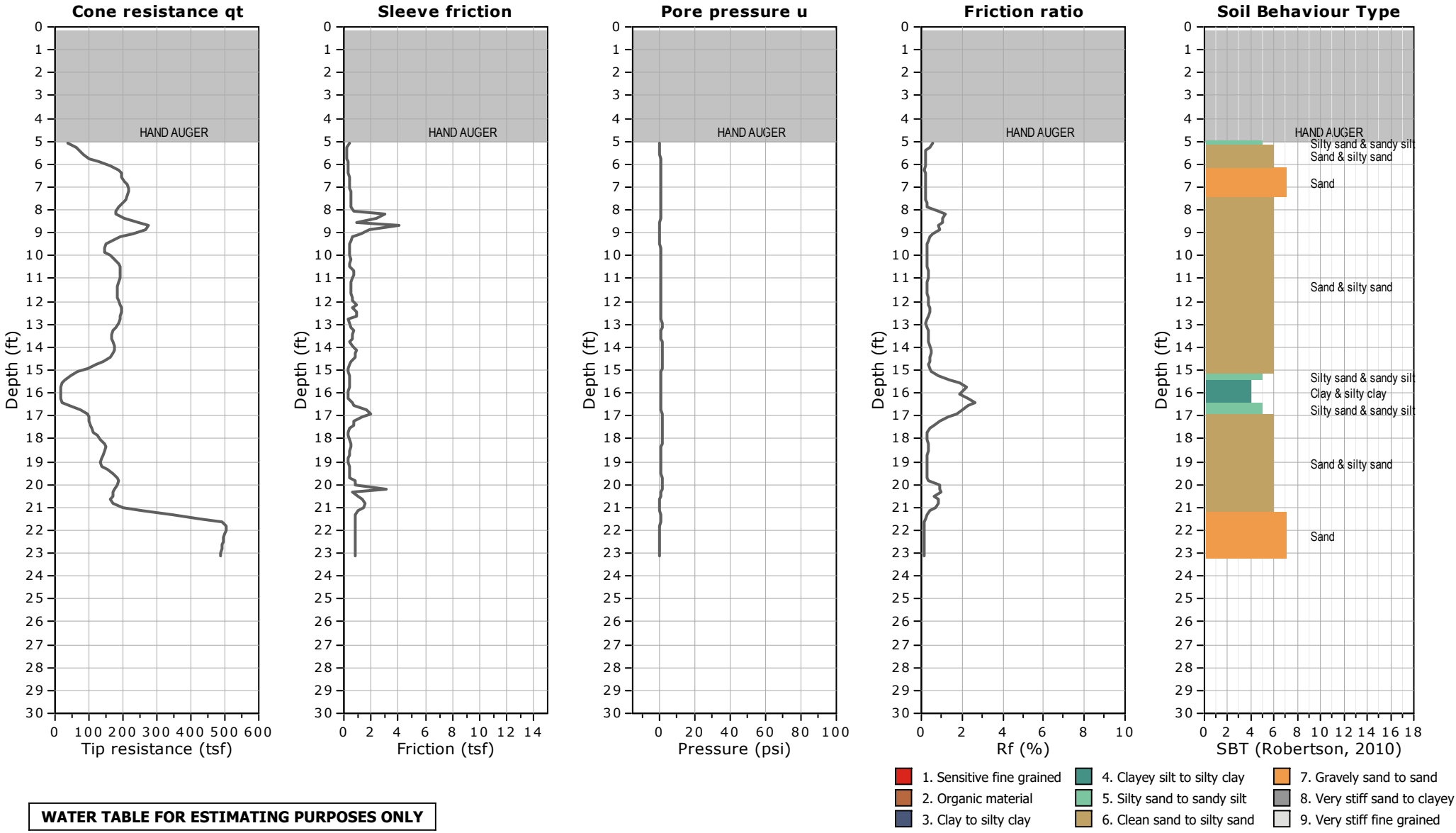


Gregg Drilling, LLC
www.greggdrilling.com

CPT: CPT-5

CLIENT: PETRA GEOSCIENCES
SITE: CLOW VALVE, CORONA, CA

FIELD REP: KURT
Total depth: 23.13 ft, Date: 1/2/2020



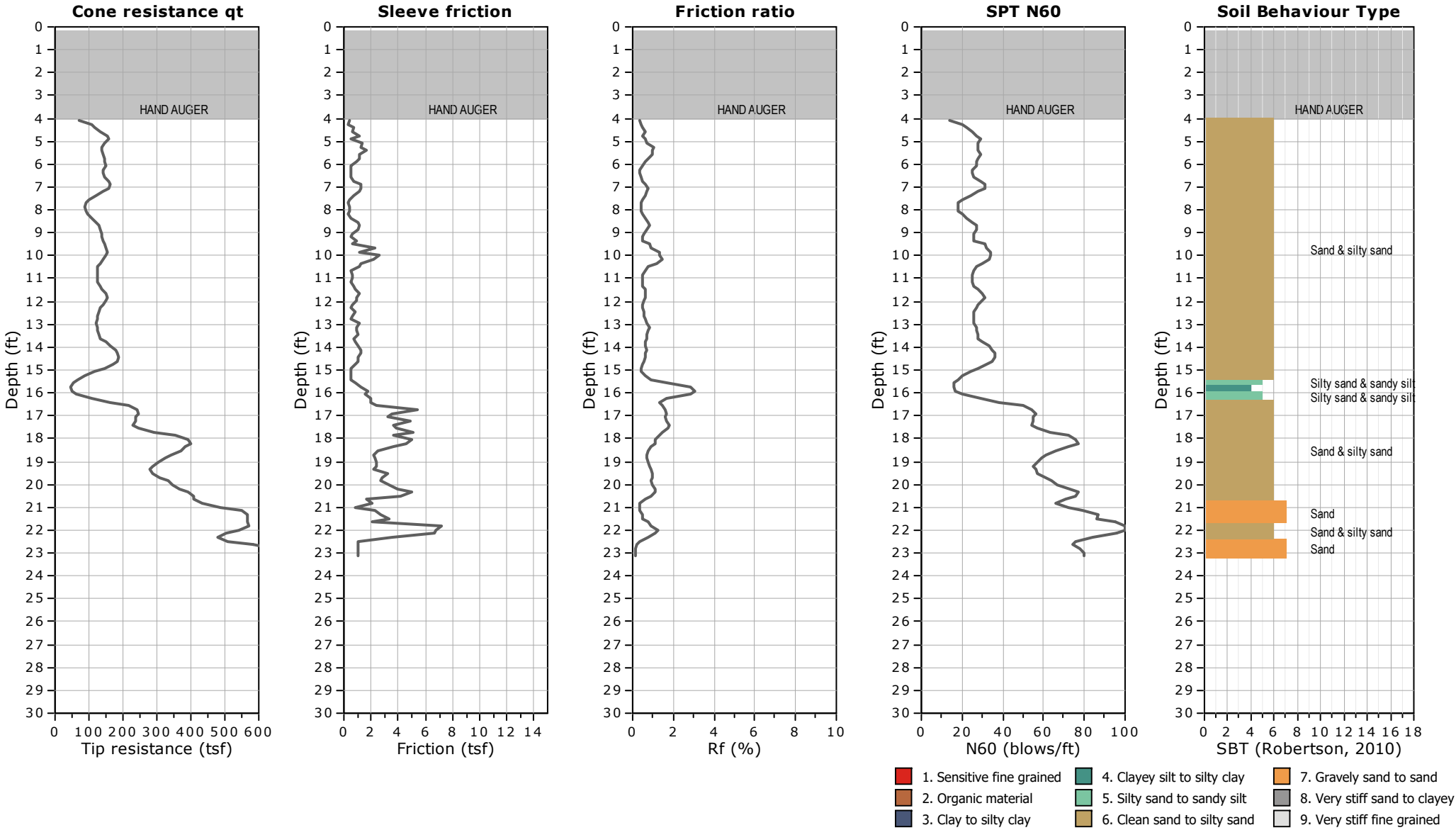
WATER TABLE FOR ESTIMATING PURPOSES ONLY

Gregg Drilling, LLC
www.greggdrilling.com

CPT: SCPT-2

CLIENT: PETRA GEOSCIENCES
SITE: CLOW VALVE, CORONA, CA

FIELD REP: KURT
Total depth: 23.13 ft, Date: 1/2/2020

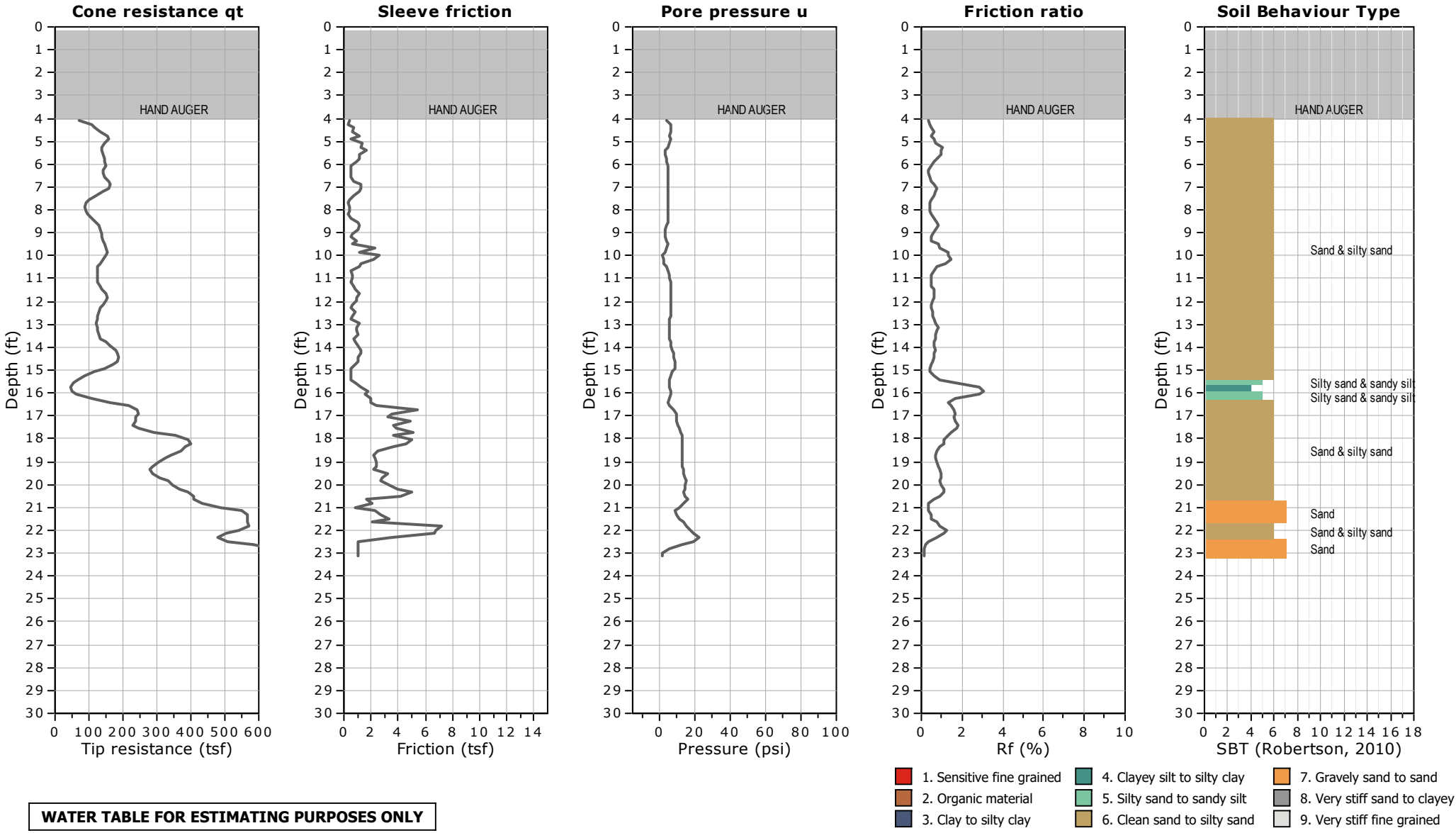


Gregg Drilling, LLC
www.greggdrilling.com

CPT: SCPT-2

CLIENT: PETRA GEOSCIENCES
SITE: CLOW VALVE, CORONA, CA

FIELD REP: KURT
Total depth: 23.13 ft, Date: 1/2/2020



WATER TABLE FOR ESTIMATING PURPOSES ONLY

FERO ENGINEERING
ENVIRONMENTAL ENGINEERING & CONSULTING

BORING LOG

PROJECT: Clow Valve Co.
SITE: 1375 Magnolia Ave., Corona, Ca.

JOB NO. 06-640
BORING AOC1-FB1 **SHEET** 1 of 3
DATE 9/21/06 **BY** J. Petersen
SAMPLE METHOD Drive/ Undisturbed

BORING LOCATION/CONDITIONS: see Figrue 1

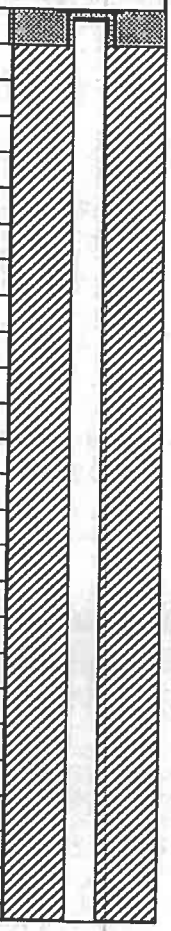
OBSERVERS/SAMPLERS: JBP
EQUIPMENT: PID for H&S monitoring

DRILLERS: Layne Christensen Co.
EQUIPMENT: Percussion Rig with Split Spoon Sampler

Casing: 4" PVC flush thread w/ .02" slots
Vault: 12" traffic rated, water tight, bolt

- Concrete
- Cement Grout
- No. 3 Sand

DEPTH (FT.)	SAMPLE: BULK	SAMPLE: UNDISTURBED	SAMPLE: BLOWS/ FT	USCS CLASSIFICATION	MONITORING BACKGROUND/ SAMPLE	DESCRIPTION
					ppm	0-20' see B13
5'						
10'						
15'						
20'						
25'		X	50/60	SP	0	Tan fine to medium sand, very dense, slightly moist, no odor



FERO ENGINEERING
ENVIRONMENTAL ENGINEERING & CONSULTING

BORING LOG

PROJECT: Clow Valve Co.
JOB NO. 06-640
SITE: 1375 Magnolia Ave., Corona, Ca.
BORING AOC1-FB1 **SHEET** 2 of 3
DATE 9/21/06 **BY** J. Petersen
BORING LOCATION/CONDITIONS: See figure 1
SAMPLE METHOD Drive/ Undisturbed
OBSERVERS/SAMPLERS: JBP
DRILLERS: Layne Christensen Co.
EQUIPMENT: PID for H&S monitoring
EQUIPMENT: Percussion Rig with Split Spoon Sampler

Casing: 4" PVC flush thread w/ .02" slots
Vault: 12" traffic rated, water tight, bolt

- Concrete
- Cement Grout
- No. 3 Sand

DEPTH (FT.)	SAMPLE: BULK	SAMPLE: UNDISTURBED	SAMPLE: BLOWS/ FT	USCS CLASSIFICATION	MONITORING BACKGROUND/ SAMPLE	DESCRIPTION
					ppm	
30'		X	50	SP	0	No sample retained (rock in the shoe)
35'		X	35/55	SM	0	Medium brown silty fine to coarse sand with some gravel, very dense, slightly moist, no odor
40'		X	50/50	SP	0	Tan fine to medium sand with gravel, very dense, slightly moist, no odor
45'		X	50/60	SP		Tan fine to coarse sand, very dense, slightly moist, no odor
50'		X		SP		Light brown fine to coarse sand w/gravel, dense, saturated, no odor

FERO ENGINEERING
ENVIRONMENTAL ENGINEERING & CONSULTING

BORING LOG

PROJECT: Clow Valve Co. **JOB NO.** 06-640

SITE: 1375 Magnolia Ave., Corona, Ca. **BORING** AOC1-FB1 **SHEET** 3 of 3

DATE 9/21/06 **BY** J. Petersen

BORING LOCATION/CONDITIONS: see figure 1 **SAMPLE METHOD** Drive/ Undisturbed

OBSERVERS/SAMPLERS: JBP **DRILLERS:** Layne Christensen Co.

EQUIPMENT: PID for H&S monitoring **EQUIPMENT:** Percusion Rig with Split Spoon Sampler

Casing: 4" PVC flush thread w/ .02" slots
Vault: 12" traffic rated, water tight, bolt

- Concrete
- Cement Grout
- No. 3 Sand

DEPTH (FT.)	SAMPLE: BULK	SAMPLE: UNDISTURBED	SAMPLE: BLOWS/ FT	USCS CLASSIFICATION	MONITORING BACKGROUND/ SAMPLE	DESCRIPTION
					ppm	
55'		X		SP	0	Light brown fine to medium sand with some coarse sand, dense, saturated, no odor
60'		X		SP	0	Tan fine to coarse sand withe some gravel, dense, saturated, no odor
65'		X		SP	0	Tan fine to coarse sand with some gravel, dense, saturated, no odor
70'						
75'						

APPENDIX B

LABORATORY TEST PROCEDURES

LABORATORY DATA SUMMARY

LABORATORY TEST PROCEDURES

Soil Classification

Soils encountered within the exploration borings were initially classified in the field in general accordance with the visual-manual procedures of the Unified Soil Classification System (ASTM D 2488). The samples were re-examined in the laboratory and the classifications revised if appropriate.

In-Situ Moisture and Density

Moisture content and unit dry density of in-place soil were determined in representative strata and are depicted on the Exploration Logs, Appendix A.

Maximum Dry Density

Maximum dry density and optimum moisture content were determined for selected samples of soil in accordance with ASTM D 1557. Pertinent test values are given on Plate B-1.

Expansion Index

An expansion index test was performed on a selected sample of soil in accordance with ASTM D 4829. The expansion potential classification was determined from 2010 CBC Section 1802.3.2 on the basis of the expansion index value. The test result and expansion potentials are presented on Plate B-1.

Soil Corrosivity

Chemical analyses were performed on a selected sample of soil to determine concentrations of soluble sulfate and chloride, as well as pH and resistivity. These tests were performed in accordance with California Test Method Nos. 417 (sulfate), 422 (chloride) and 643 (pH and resistivity). Test results are included on Plate B-1.

Grain-Size Analysis

Grain-size analyses were performed on selected samples to verify visual classifications performed in the field. These tests were performed in accordance with ASTM C136 and C117. Test results are presented on Plate B-2.

Direct Shear

The Coulomb shear strength parameters, i.e., angle of internal friction and cohesion, were determined for a remolded sample of onsite soil. This test was performed in general accordance with the current version of Test Method ASTM D 3080. Three specimens were prepared for each test. The test specimens were inundated and then sheared under various normal loads at a constant strain rate of 0.005 inch per minute. The results of the direct shear test are graphically presented on Plate B-3.

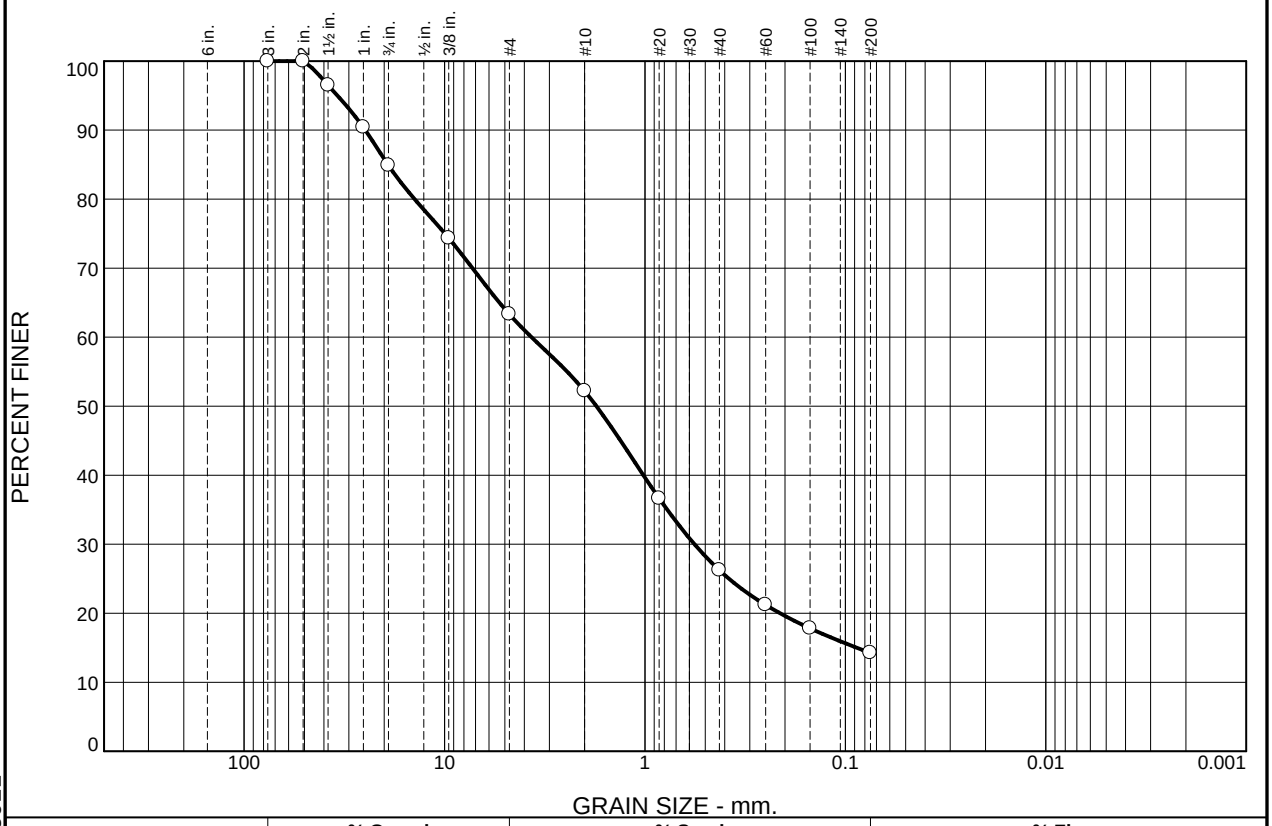
LABORATORY DATA SUMMARY													
Boring Number	**Sample Depth (ft)**	**Soil Description**	**Max. Dry Density [1] (pcf)**	**Optimum Moisture[1] (%)**	**Expansion Index[2]**	**USCS Soil Classification[3]**	**Atterberg Limits[4]**			**Sulfate Content[5] (%)**	**Chloride Content[6] (ppm)**	**pH[7]**	**Minimum Resistivity[7] (ohm-cm)**
							LL	**PL**	**PI**				
B-1	0-5	Sand, trace Silt (SP)	133.5	6.5	--	Non-Expansive	--	--	--	0.0006	99	8.7	15,000
B-3	0-5	Silty Sand (SM)	--	--	0	Non-Expansive	--	--	--	0.005	66	8.6	4,800

(--) Tests Not Performed

Test Procedures:

[1] Per ASTM Test Method D 1557
[2] Per ASTM Test Method D 4829
[3] Per ASTM Test Method D 2487
[4] Per ASTM Test Method D 4318
[5] Per Caltrans Test Method 417
[6] Per Caltrans Test Method 422
[7] Per Caltrans Test Method 643

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	15.1	21.6	11.1	26.0	11.9	14.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1 1/2	96.5		
1	90.4		
3/4	84.9		
.375	74.3		
#4	63.3		
#10	52.2		
#20	36.7		
#40	26.2		
#60	21.2		
#100	17.8		
#200	14.3		

* (no specification provided)

Material Description

Dark Gray, Silty fine to coarse Sand with fine to coarse Gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 24.8455 D_{85}= 19.1685 D_{60}= 3.6820
D_{50}= 1.7456 D_{30}= 0.5659 D_{15}= 0.0876
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO=

Remarks

Source of Sample: B-3 **Depth:** 0-5

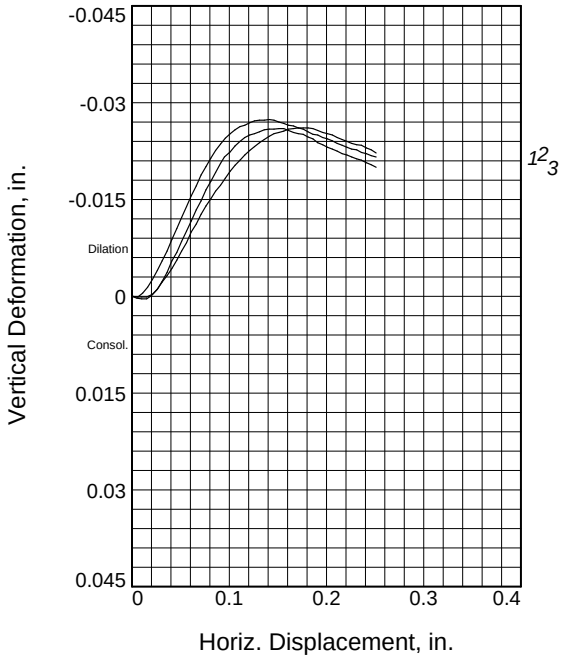
Date: 1-7-20

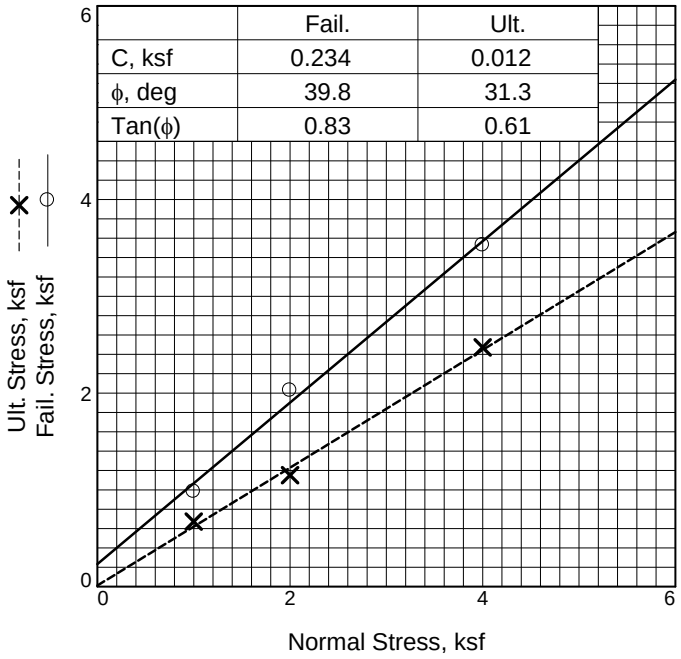
Laboratory:
1251 West Pomona Road, Unit #103, Corona, Ca 92882 Phone #: 714.549.8921

PETRA GEOSCIENCES INC.

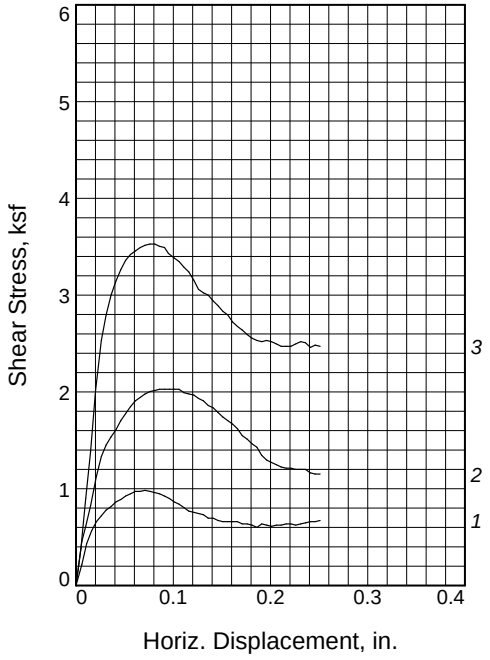
Client: Western RealCo
Project: 1375 Magnolia

Project No: 19-433 **Figure** B-2





	Fail.	Ult.
C, ksf	0.234	0.012
ϕ, deg	39.8	31.3
Tan(ϕ)	0.83	0.61



Sample No.		1	2	3
Initial	Water Content, %	8.0	8.0	8.0
	Dry Density, pcf	114.7	114.3	114.5
	Saturation, %	47.8	47.4	47.6
	Void Ratio	0.4429	0.4468	0.4449
	Diameter, in.	2.416	2.416	2.416
	Height, in.	1.000	1.000	1.000
At Test	Water Content, %	13.5	14.2	13.5
	Dry Density, pcf	114.7	114.3	114.5
	Saturation, %	80.7	84.5	80.5
	Void Ratio	0.4429	0.4468	0.4449
	Diameter, in.	2.416	2.416	2.416
	Height, in.	1.000	1.000	1.000
Normal Stress, ksf		1.000	2.000	4.000
Fail. Stress, ksf		0.984	2.028	3.528
Displacement, in.		0.071	0.086	0.076
Ult. Stress, ksf		0.672	1.152	2.472
Displacement, in.		0.251	0.251	0.251
Strain rate, in./min.		0.010	0.010	0.010

Sample Type: Remolded to 90% RC
Description: Brown, Silty fine to coarse Sand

Assumed Specific Gravity= 2.65
Remarks:

Client: Western RealCo

Project: 1375 Magnolia

Source of Sample: B-1 **Depth:** 0-5

Proj. No.: 19-433 **Date Sampled:** 1-3-20

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Figure B-3

APPENDIX C

EARTHQUAKE-INDUCED SETTLEMENT ANALYSIS AND SEISMIC DESIGN PARAMETERS

U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition

Dynamic: Conterminous U.S. 2014 (update) (v4.2.0)

Spectral Period

Peak Ground Acceleration

Latitude

Decimal degrees

33.86988

Time Horizon

Return period in years

2475

Longitude

Decimal degrees, negative values for western longitudes

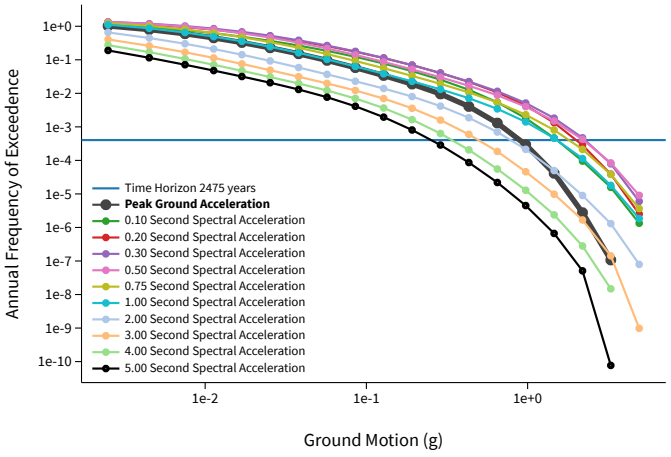
-117.537768

Site Class

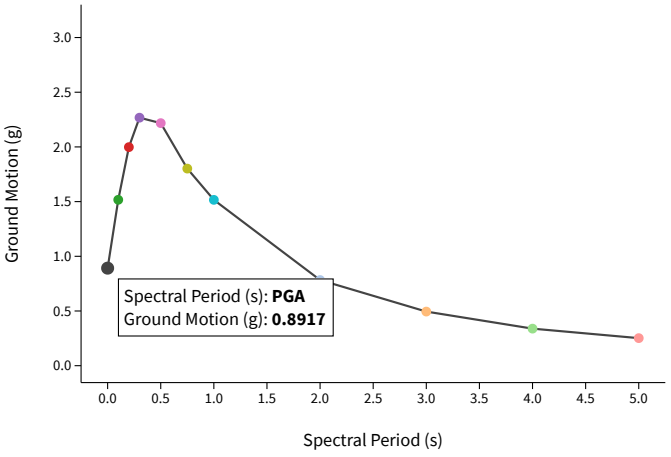
259 m/s (Site class D)

Hazard Curve

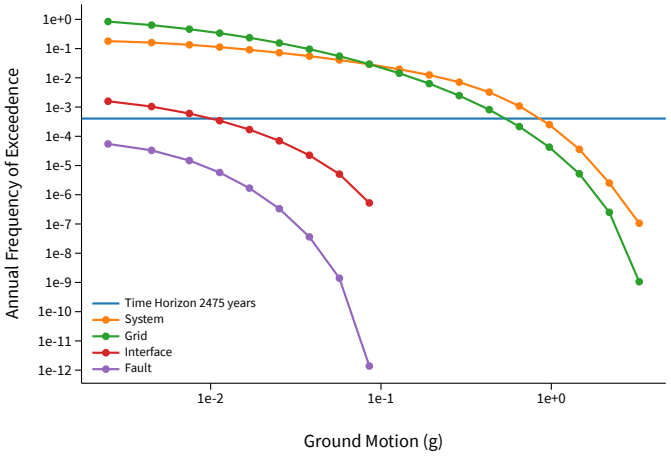
Hazard Curves



Uniform Hazard Response Spectrum



Component Curves for Peak Ground Acceleration

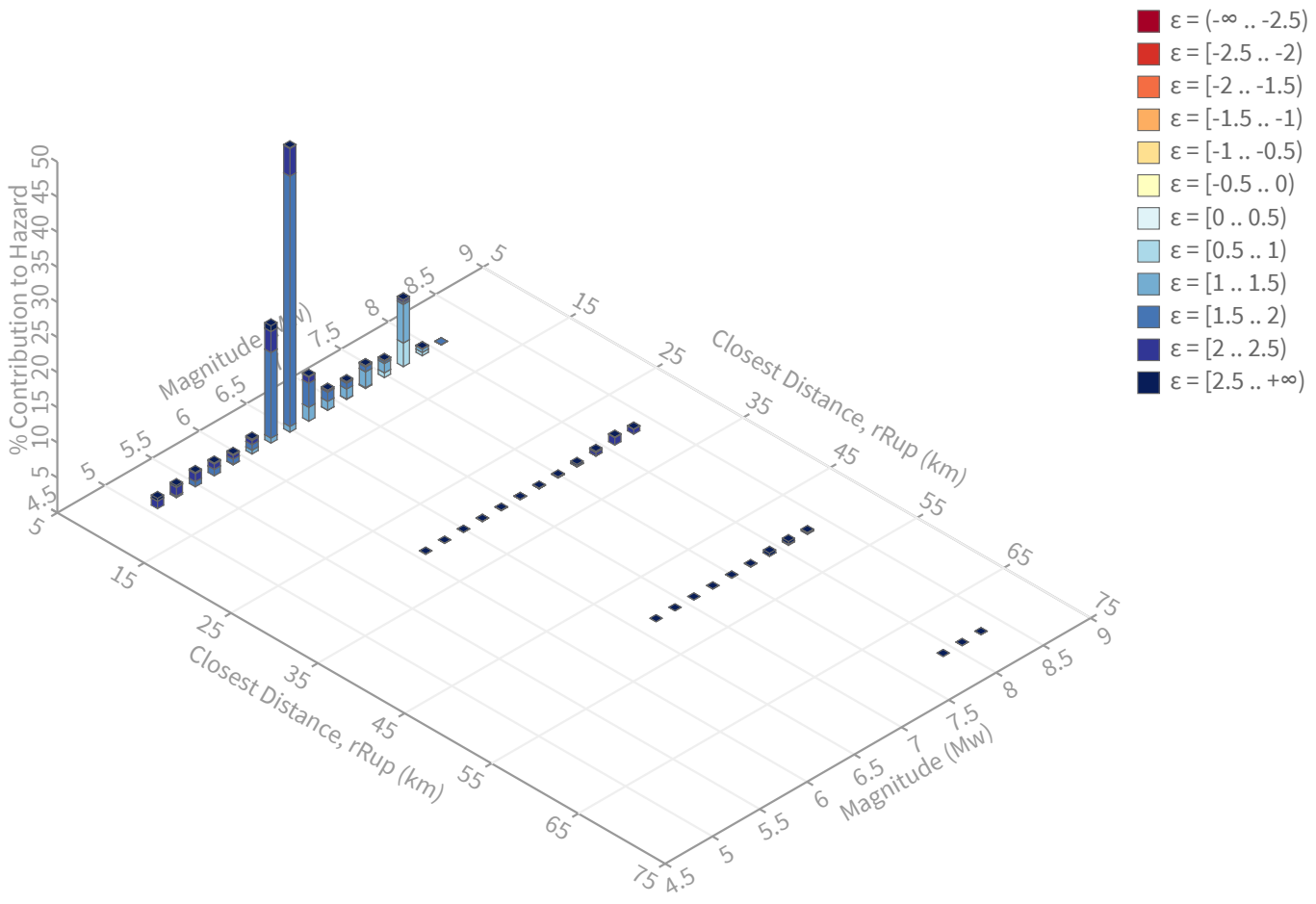


View Raw Data

Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.89168659 g

Recovered targets

Return period: 2970.0995 yrs
Exceedance rate: 0.00033668906 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.07 %

Mean (over all sources)

m: 6.64
r: 8.07 km
ε₀: 1.73 σ

Mode (largest m-r bin)

m: 6.47
r: 6.39 km
ε₀: 1.74 σ
Contribution: 40.5 %

Mode (largest m-r-ε₀ bin)

m: 6.47
r: 6.34 km
ε₀: 1.7 σ
Contribution: 35.66 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM31	System							43.64
Elsinore (Glen Ivy) rev [0]		6.30	6.71	1.62	117.563°W	33.819°N	202.01	35.62
Elsinore (Glen Ivy) rev [1]		7.99	6.53	1.90	117.531°W	33.799°N	175.38	1.90
Whittier alt 1 [0]		6.30	6.54	1.39	117.588°W	33.833°N	228.26	1.54
San Jacinto (San Bernardino) [4]		31.69	8.09	2.32	117.276°W	34.055°N	49.47	1.28
UC33brAvg_FM32	System							43.00
Elsinore (Glen Ivy) rev [0]		6.30	6.69	1.63	117.563°W	33.819°N	202.01	32.54
Chino alt 2 [3]		6.04	6.93	1.54	117.584°W	33.833°N	226.27	4.14
Elsinore (Glen Ivy) rev [1]		7.99	6.56	1.89	117.531°W	33.799°N	175.38	2.02
San Jacinto (San Bernardino) [4]		31.69	8.08	2.32	117.276°W	34.055°N	49.47	1.26
UC33brAvg_FM31 (opt)	Grid							6.77
PointSourceFinite: -117.538, 33.910		6.63	5.73	1.79	117.538°W	33.910°N	0.00	1.46
PointSourceFinite: -117.538, 33.910		6.63	5.73	1.79	117.538°W	33.910°N	0.00	1.46
UC33brAvg_FM32 (opt)	Grid							6.59
PointSourceFinite: -117.538, 33.910		6.63	5.74	1.78	117.538°W	33.910°N	0.00	1.43
PointSourceFinite: -117.538, 33.910		6.63	5.74	1.78	117.538°W	33.910°N	0.00	1.43

19-433 (1375 Magnolia Avenue, Corona, CA)

Latitude, Longitude: 33.86988, -117.537768

Date	1/7/2020, 8:51:00 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.872	MCE_R ground motion. (for 0.2 second period)
S_1	0.732	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.872	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.248	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.788	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.867	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.128	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.319	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.872	Factored deterministic acceleration value. (0.2 second)
S1RT	0.752	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.831	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.732	Factored deterministic acceleration value. (1.0 second)
PGAd	0.788	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.918	Mapped value of the risk coefficient at short periods
C_{R1}	0.905	Mapped value of the risk coefficient at a period of 1 s

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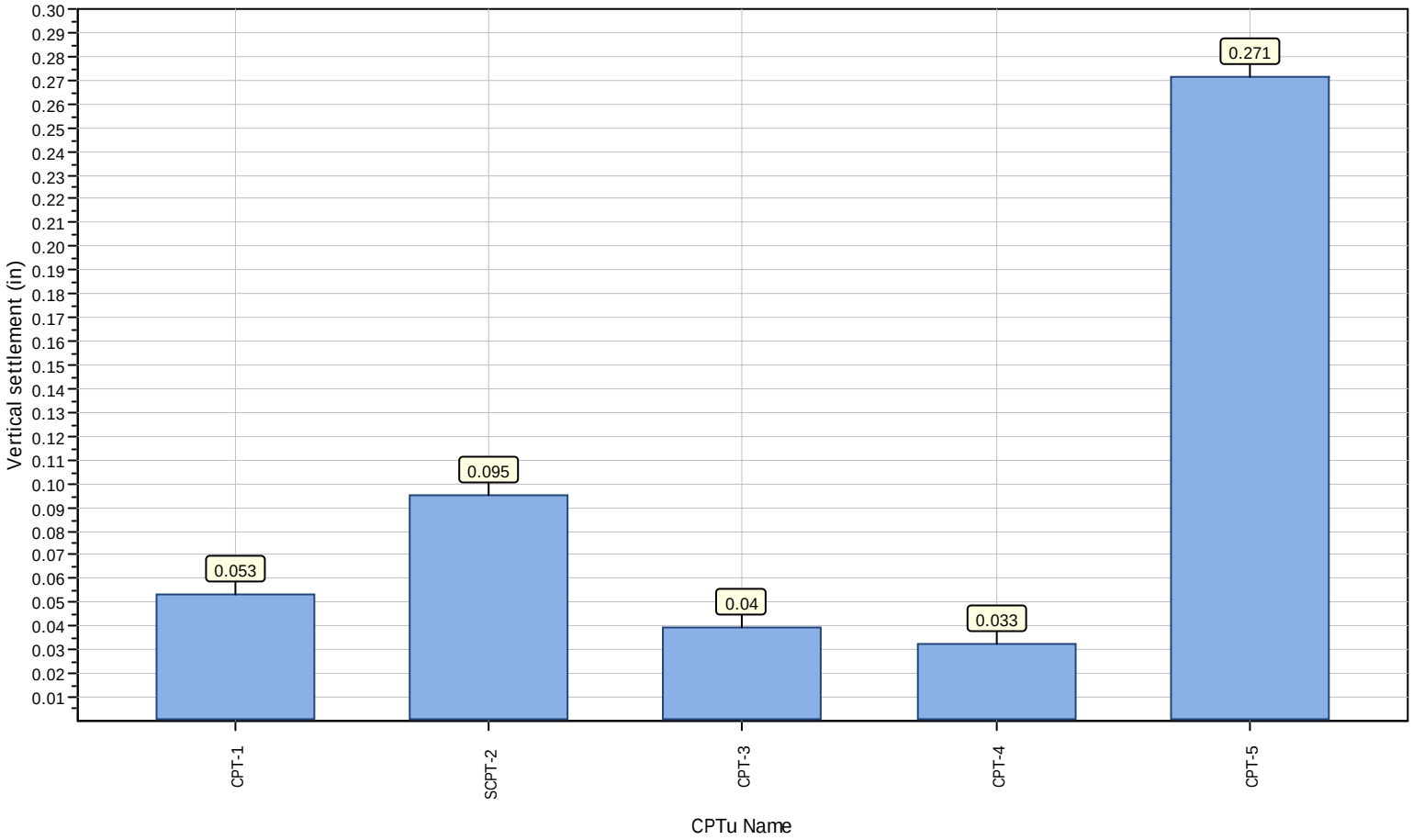
Costa Mesa, CA 92626
www.petra-inc.com

Project title : 19-433, Western Realco

Location : 1375 Magnolia Avenue, Corona, CA

Overall vertical settlements report



Petra Geosciences, Inc.
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Costa Mesa, CA 92626
www.petra-inc.com

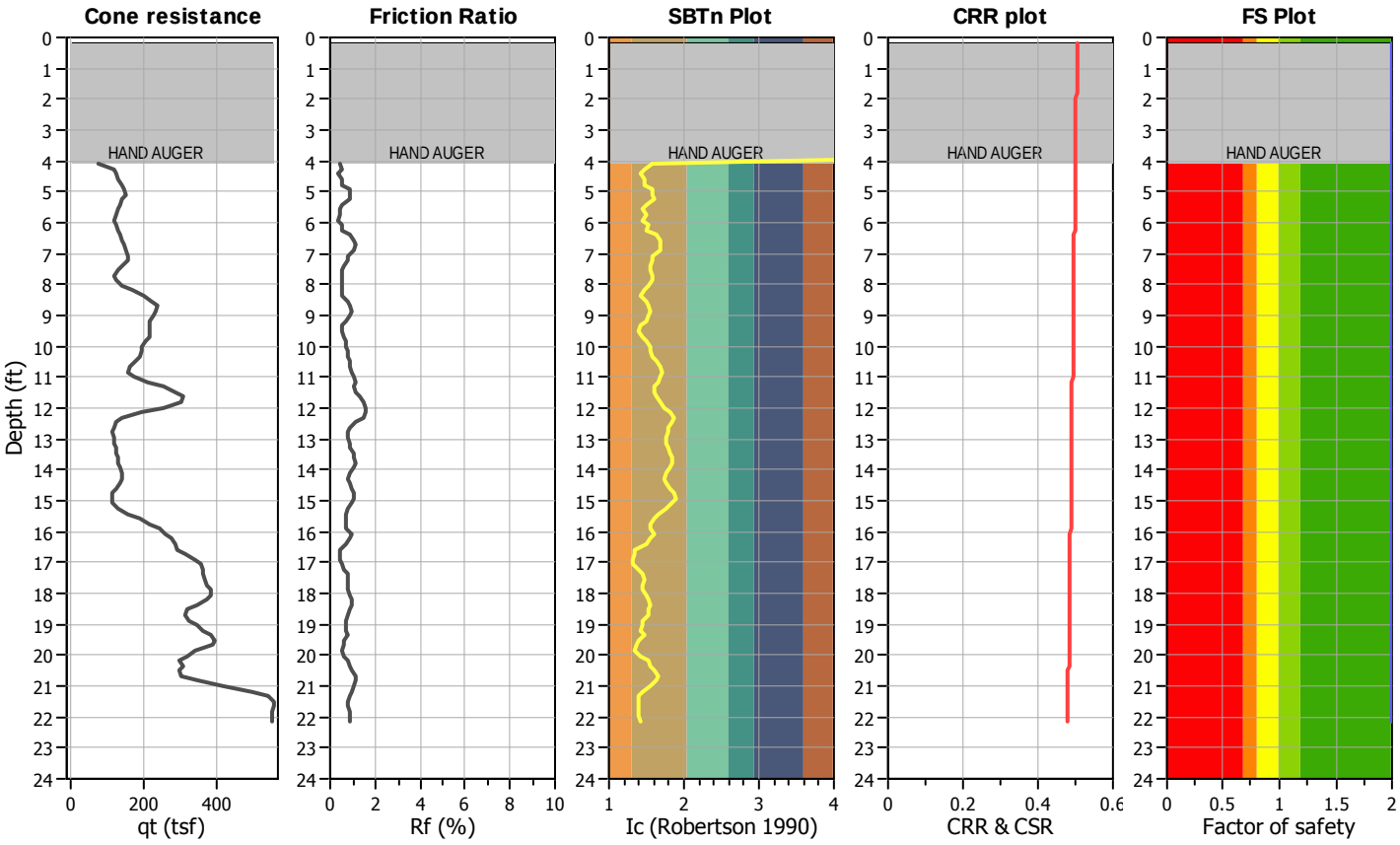
LIQUEFACTION ANALYSIS REPORT

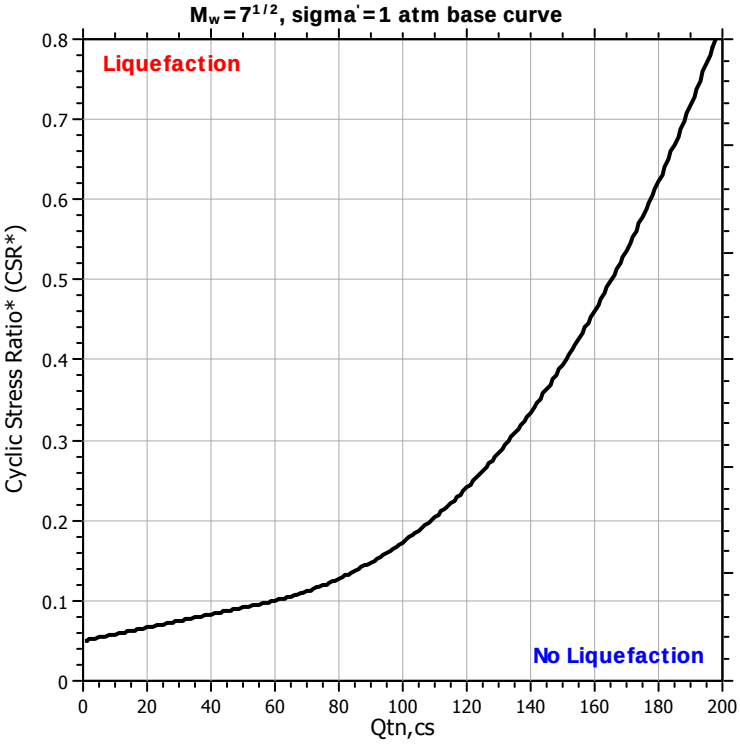
Project title : 19-433, Western Realco **Location : 1375 Magnolia Avenue, Corona, CA**

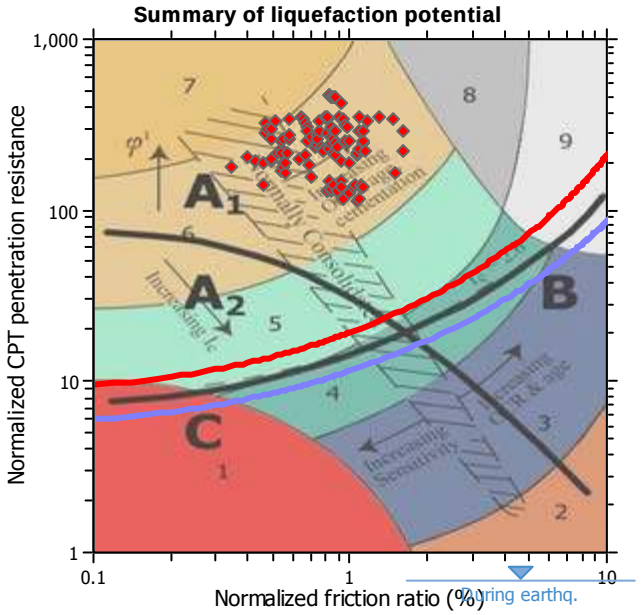
CPT file : CPT-1

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	45.00 ft	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	6.47	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.87	Unit weight calculation:	Based on SBT	K_σ applied:	No	MSF method:	Method based

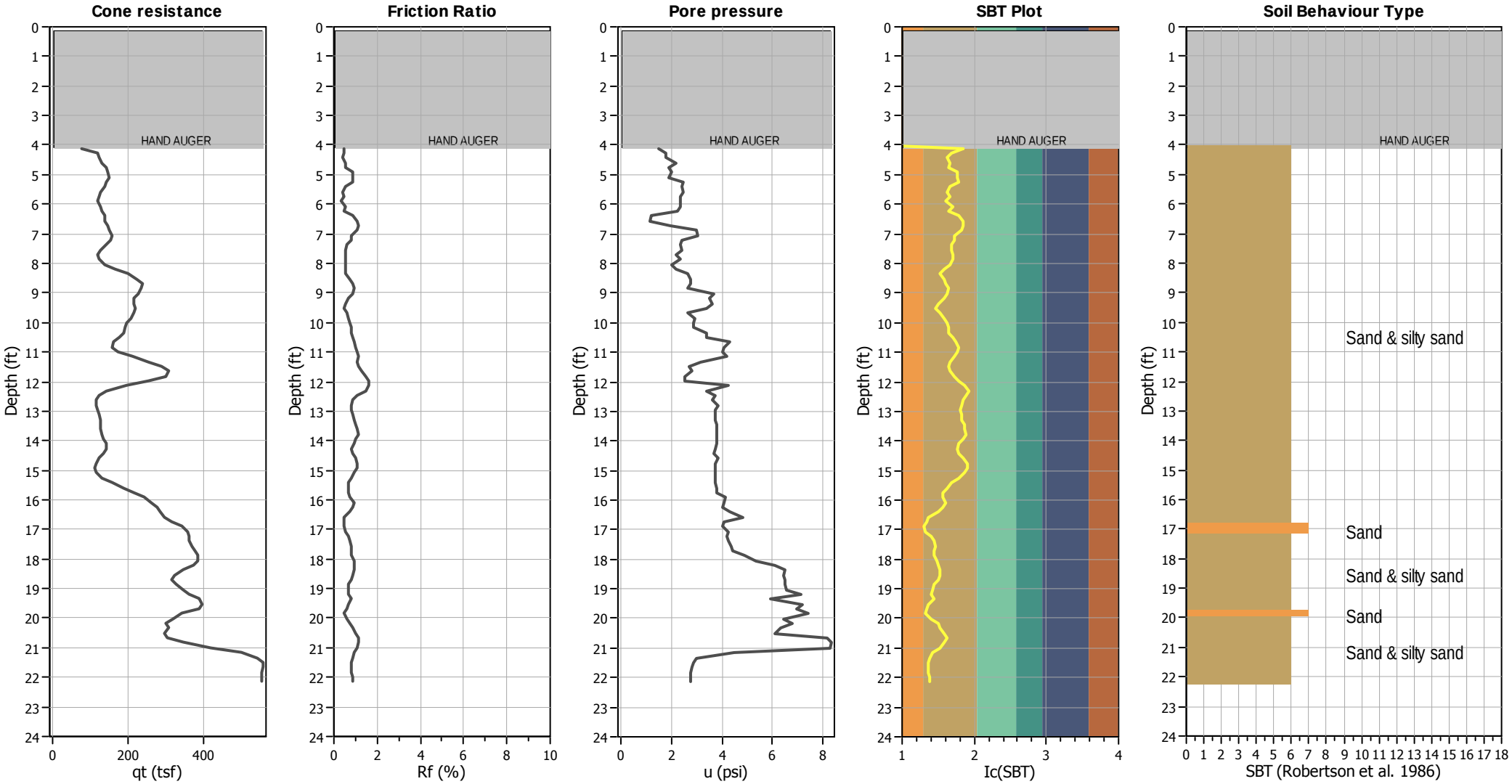






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



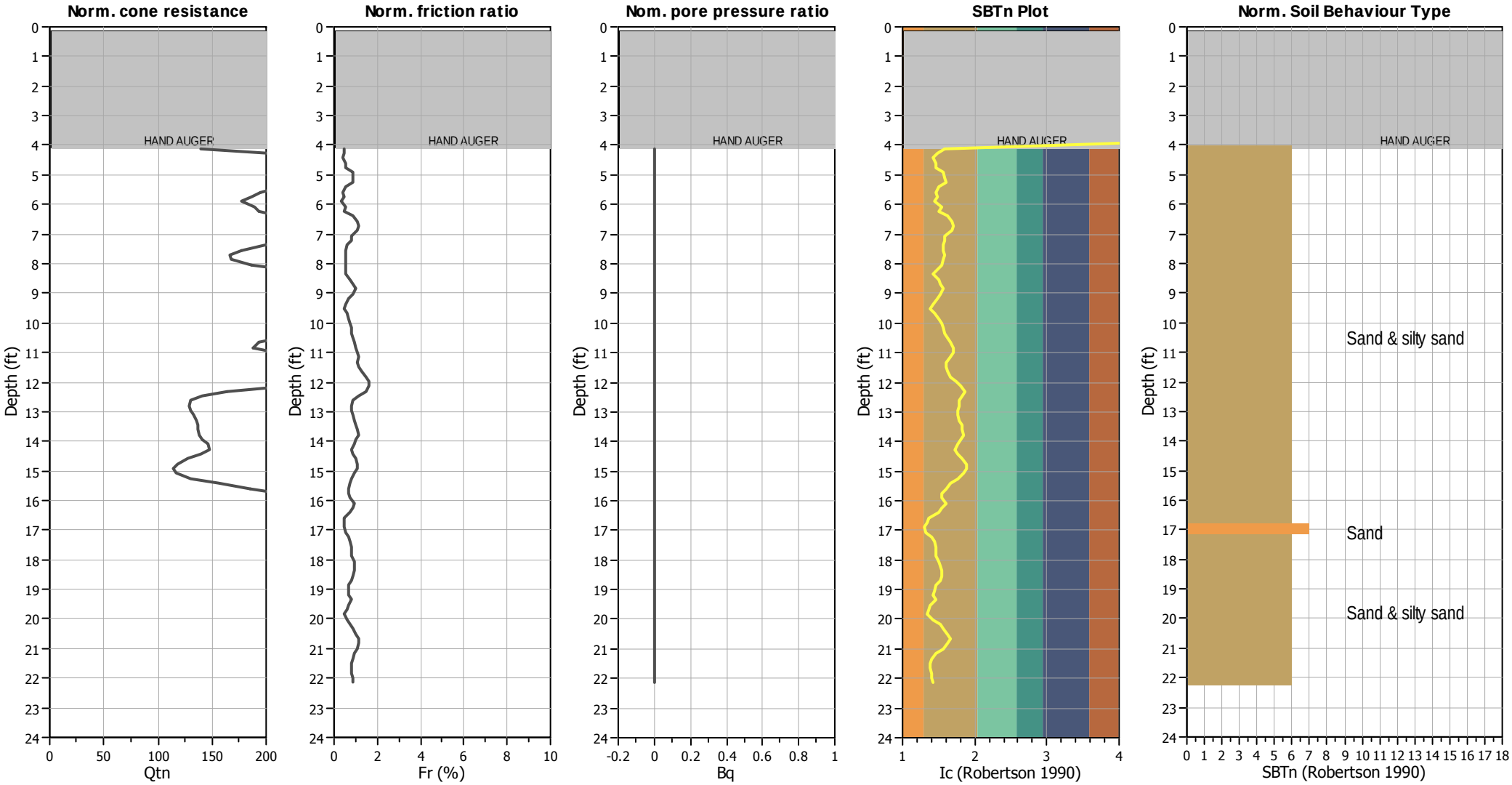
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



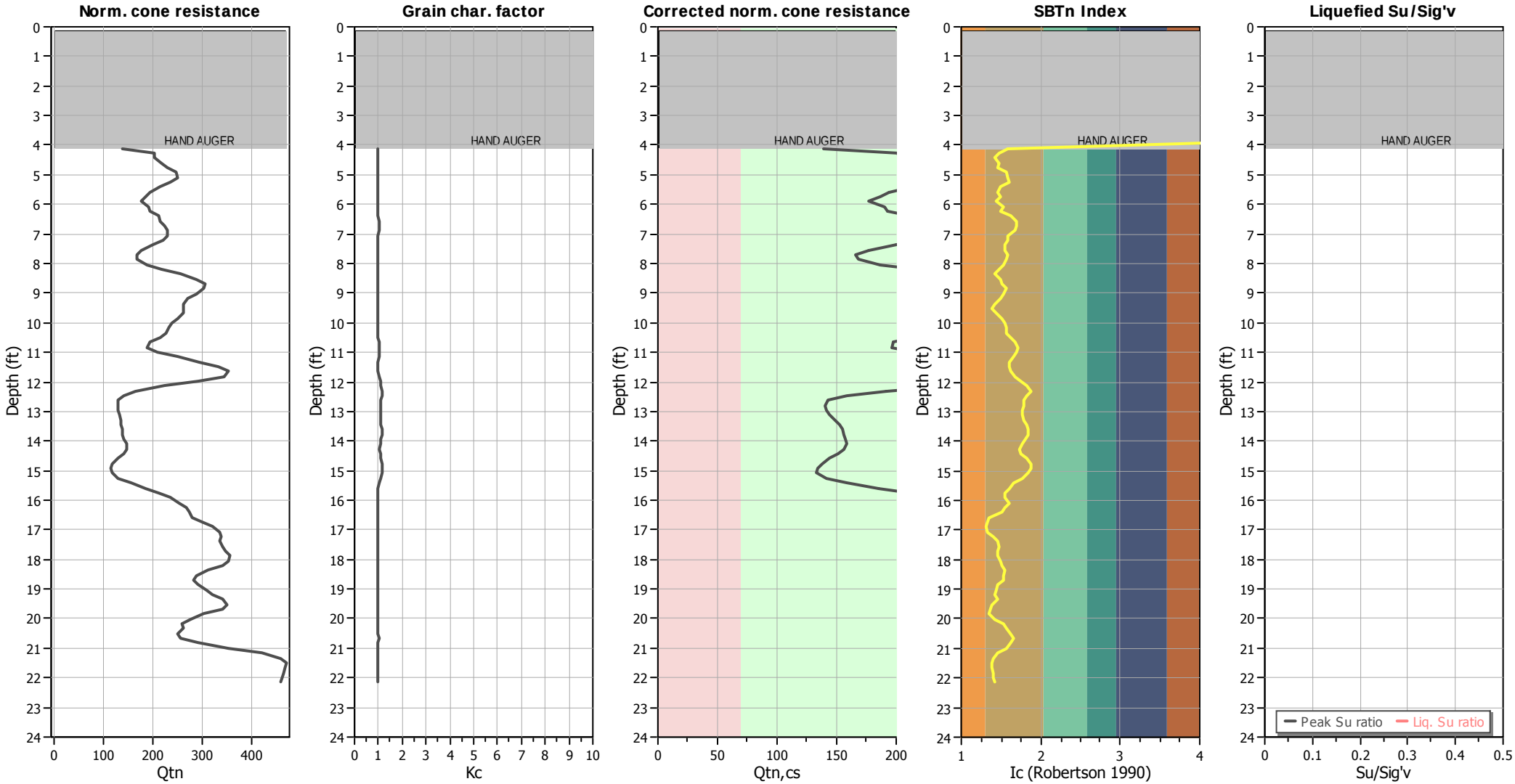
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

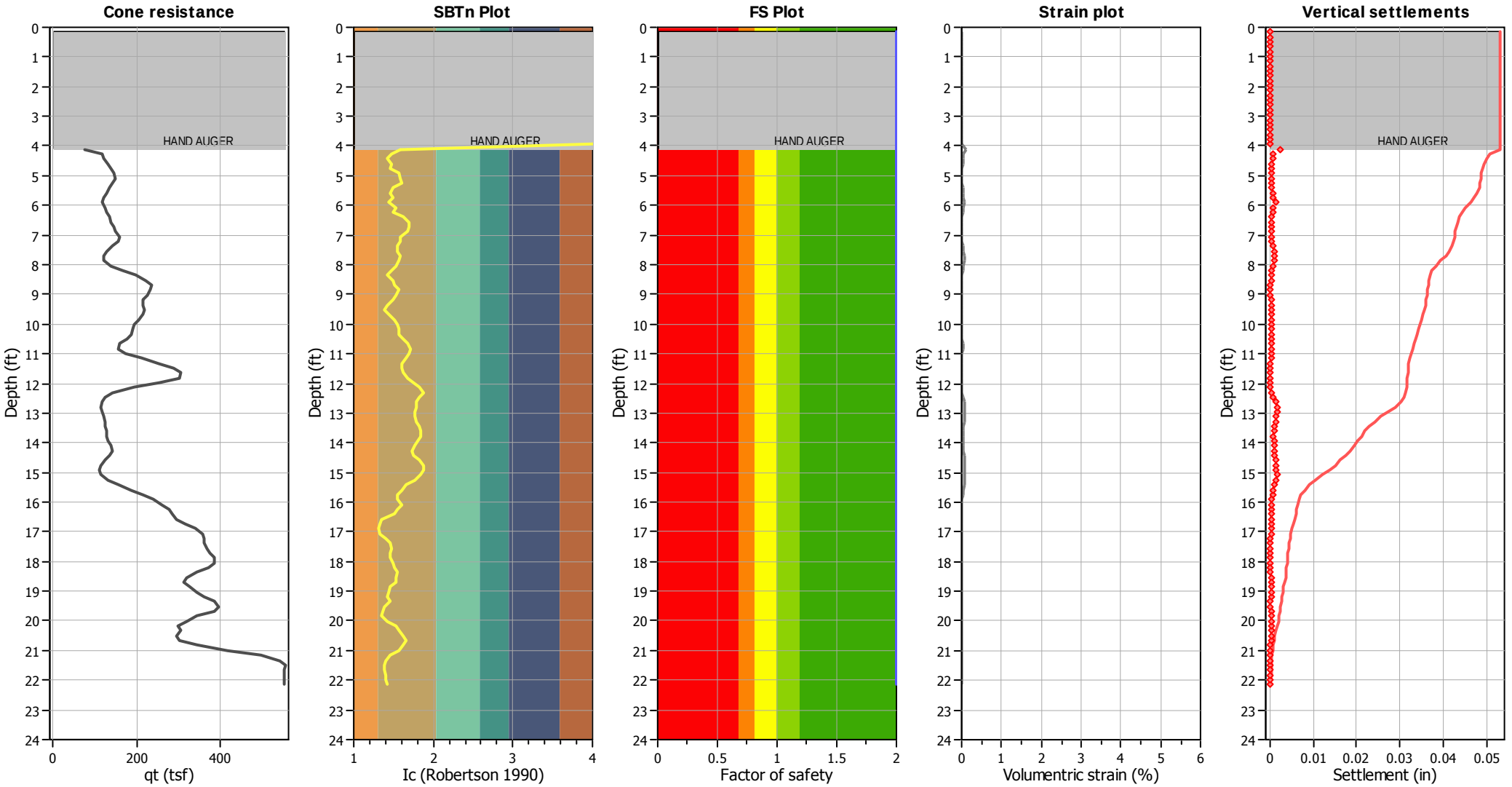
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement of dry sands ::

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
0.16	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.33	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.49	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.66	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.82	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.98	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.15	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.31	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.48	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.64	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.80	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.97	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.13	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.30	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.46	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.62	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.79	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.95	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.12	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.28	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.44	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.61	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.77	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.94	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.10	1.59	139.40	1.00	139.40	25	504	0.50	0.244	0.19	7.11	0.12	0.002
4.27	1.48	201.59	1.00	201.59	35	685	0.50	0.076	0.04	7.11	0.03	0.001
4.43	1.42	202.05	1.00	202.05	34	668	0.50	0.090	0.05	7.11	0.03	0.001
4.59	1.47	216.82	1.00	216.82	37	752	0.50	0.065	0.03	7.11	0.02	0.000
4.76	1.46	228.42	1.00	228.42	39	799	0.50	0.057	0.03	7.11	0.02	0.000
4.92	1.57	246.98	1.00	246.98	44	956	0.50	0.038	0.01	7.11	0.01	0.000
5.09	1.58	250.29	1.00	250.29	45	988	0.50	0.037	0.01	7.11	0.01	0.000
5.25	1.60	236.44	1.00	236.44	43	965	0.50	0.041	0.02	7.11	0.01	0.000
5.41	1.50	214.64	1.00	214.64	37	817	0.50	0.068	0.03	7.11	0.02	0.000
5.58	1.46	194.22	1.00	194.22	33	723	0.50	0.109	0.06	7.11	0.04	0.001
5.74	1.49	186.47	1.00	186.47	32	720	0.50	0.117	0.07	7.11	0.04	0.001
5.91	1.44	177.11	1.00	177.11	30	663	0.50	0.171	0.10	7.11	0.07	0.001
6.07	1.53	189.91	1.00	189.91	34	781	0.50	0.098	0.05	7.11	0.03	0.001
6.23	1.49	192.67	1.00	192.67	34	773	0.50	0.106	0.06	7.11	0.04	0.001
6.40	1.63	211.05	1.00	211.05	38	966	0.50	0.056	0.03	7.11	0.02	0.000
6.56	1.69	215.09	1.03	221.50	41	1050	0.50	0.047	0.02	7.11	0.01	0.000
6.73	1.70	223.70	1.04	231.71	43	1114	0.50	0.043	0.02	7.11	0.01	0.000
6.89	1.68	227.96	1.02	232.92	43	1129	0.50	0.043	0.02	7.11	0.01	0.000
7.05	1.59	230.39	1.00	230.39	41	1065	0.50	0.052	0.02	7.11	0.01	0.000
7.22	1.58	221.84	1.00	221.84	40	1033	0.50	0.058	0.03	7.11	0.02	0.000
7.38	1.55	199.71	1.00	199.71	35	913	0.50	0.086	0.04	7.11	0.03	0.001
7.55	1.56	177.09	1.00	177.09	31	818	0.50	0.130	0.08	7.11	0.05	0.001
7.71	1.58	166.41	1.00	166.41	30	793	0.50	0.153	0.09	7.11	0.06	0.001
7.87	1.57	168.41	1.00	168.41	30	802	0.50	0.152	0.09	7.11	0.06	0.001

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
8.04	1.53	187.01	1.00	187.01	33	871	0.50	0.119	0.06	7.11	0.04	0.001
8.20	1.48	217.93	1.00	217.93	38	969	0.50	0.087	0.04	7.11	0.02	0.000
8.37	1.43	254.44	1.00	254.44	43	1085	0.50	0.065	0.03	7.11	0.02	0.000
8.53	1.50	286.69	1.00	286.69	50	1319	0.49	0.042	0.01	7.11	0.01	0.000
8.69	1.51	304.58	1.00	304.58	53	1440	0.49	0.036	0.01	7.11	0.01	0.000
8.86	1.56	302.94	1.00	302.94	54	1515	0.49	0.034	0.01	7.11	0.01	0.000
9.02	1.53	288.47	1.00	288.47	51	1412	0.49	0.040	0.01	7.11	0.01	0.000
9.19	1.49	270.45	1.00	270.45	47	1277	0.49	0.051	0.02	7.11	0.01	0.000
9.35	1.42	262.62	1.00	262.62	45	1168	0.49	0.065	0.02	7.11	0.01	0.000
9.51	1.39	262.04	1.00	262.04	44	1135	0.49	0.073	0.03	7.11	0.02	0.000
9.68	1.44	261.29	1.00	261.29	45	1199	0.49	0.065	0.02	7.11	0.01	0.000
9.84	1.50	250.85	1.00	250.85	44	1240	0.49	0.061	0.02	7.11	0.01	0.000
10.01	1.55	238.76	1.00	238.76	42	1243	0.49	0.063	0.03	7.11	0.02	0.000
10.17	1.56	233.24	1.00	233.24	42	1249	0.49	0.064	0.03	7.11	0.02	0.000
10.33	1.58	227.02	1.00	227.02	41	1239	0.49	0.067	0.03	7.11	0.02	0.000
10.50	1.63	213.24	1.00	213.24	39	1238	0.49	0.069	0.03	7.11	0.02	0.000
10.66	1.67	193.37	1.02	197.03	36	1190	0.49	0.078	0.04	7.11	0.02	0.000
10.83	1.71	188.15	1.04	195.95	37	1210	0.49	0.077	0.04	7.11	0.02	0.000
10.99	1.70	208.04	1.04	215.44	40	1336	0.49	0.061	0.03	7.11	0.02	0.000
11.15	1.66	248.58	1.01	251.44	46	1548	0.49	0.045	0.02	7.11	0.01	0.000
11.32	1.61	293.28	1.00	293.28	53	1730	0.49	0.037	0.01	7.11	0.01	0.000
11.48	1.60	331.30	1.00	331.30	60	1954	0.49	0.030	0.01	7.11	0.00	0.000
11.65	1.62	351.27	1.00	351.27	64	2147	0.49	0.027	0.01	7.11	0.00	0.000
11.81	1.67	344.69	1.02	351.16	65	2241	0.49	0.025	0.01	7.11	0.00	0.000
11.98	1.74	290.22	1.07	309.98	59	2064	0.49	0.029	0.01	7.11	0.00	0.000
12.14	1.81	223.34	1.12	249.53	48	1732	0.49	0.041	0.01	7.11	0.01	0.000
12.30	1.88	163.72	1.17	191.05	38	1373	0.49	0.070	0.03	7.11	0.02	0.000
12.47	1.83	140.51	1.13	158.71	31	1127	0.49	0.124	0.07	7.11	0.04	0.001
12.63	1.79	130.38	1.10	143.22	28	1004	0.49	0.188	0.13	7.11	0.07	0.001
12.80	1.78	128.34	1.09	139.99	27	983	0.49	0.208	0.15	7.11	0.08	0.002
12.96	1.77	130.56	1.08	141.36	27	994	0.49	0.206	0.14	7.11	0.08	0.002
13.12	1.77	132.30	1.09	143.69	27	1020	0.49	0.192	0.13	7.11	0.07	0.001
13.29	1.79	135.43	1.10	148.48	29	1069	0.49	0.167	0.11	7.11	0.06	0.001
13.45	1.82	136.28	1.12	152.38	30	1122	0.49	0.145	0.09	7.11	0.05	0.001
13.62	1.83	136.99	1.13	155.10	30	1160	0.49	0.133	0.08	7.11	0.04	0.001
13.78	1.84	137.62	1.14	156.42	31	1182	0.49	0.129	0.08	7.11	0.04	0.001
13.94	1.81	141.41	1.11	157.36	31	1178	0.49	0.133	0.08	7.11	0.04	0.001
14.11	1.76	146.66	1.08	158.09	30	1161	0.49	0.143	0.09	7.11	0.05	0.001
14.27	1.73	147.05	1.06	155.75	29	1133	0.49	0.158	0.10	7.11	0.05	0.001
14.44	1.76	139.88	1.08	150.72	29	1120	0.49	0.168	0.11	7.11	0.06	0.001
14.60	1.83	127.93	1.13	144.16	28	1119	0.49	0.172	0.11	7.11	0.06	0.001
14.76	1.88	117.64	1.17	137.77	27	1106	0.49	0.184	0.13	7.11	0.07	0.001
14.93	1.89	113.57	1.18	133.65	27	1083	0.49	0.202	0.14	7.11	0.08	0.002
15.09	1.84	117.04	1.14	133.23	26	1063	0.49	0.221	0.16	7.11	0.09	0.002
15.26	1.77	130.68	1.08	141.41	27	1088	0.49	0.208	0.14	7.11	0.08	0.002
15.42	1.67	155.98	1.01	158.17	29	1156	0.49	0.172	0.11	7.11	0.06	0.001
15.58	1.60	184.81	1.00	184.81	33	1276	0.49	0.128	0.07	7.11	0.04	0.001
15.75	1.55	211.66	1.00	211.66	38	1377	0.49	0.105	0.05	7.11	0.03	0.001

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
15.91	1.55	234.37	1.00	234.37	42	1522	0.49	0.082	0.03	7.11	0.02	0.000
16.08	1.60	253.65	1.00	253.65	46	1783	0.49	0.058	0.02	7.11	0.01	0.000
16.24	1.55	268.32	1.00	268.32	48	1773	0.49	0.060	0.02	7.11	0.01	0.000
16.40	1.50	273.90	1.00	273.90	48	1716	0.49	0.065	0.02	7.11	0.01	0.000
16.57	1.36	280.34	1.00	280.34	47	1465	0.49	0.097	0.03	7.11	0.02	0.000
16.73	1.34	299.63	1.00	299.63	50	1539	0.49	0.087	0.03	7.11	0.01	0.000
16.90	1.31	321.67	1.00	321.67	53	1602	0.49	0.080	0.02	7.11	0.01	0.000
17.06	1.33	336.51	1.00	336.51	56	1715	0.49	0.069	0.02	7.11	0.01	0.000
17.22	1.40	337.88	1.00	337.88	57	1904	0.49	0.056	0.02	7.11	0.01	0.000
17.39	1.45	335.85	1.00	335.85	58	2022	0.49	0.051	0.01	7.11	0.01	0.000
17.55	1.47	342.05	1.00	342.05	59	2115	0.49	0.047	0.01	7.11	0.01	0.000
17.72	1.46	346.06	1.00	346.06	60	2122	0.48	0.047	0.01	7.11	0.01	0.000
17.88	1.46	354.40	1.00	354.40	61	2184	0.48	0.046	0.01	7.11	0.01	0.000
18.04	1.50	352.67	1.00	352.67	62	2298	0.48	0.042	0.01	7.11	0.01	0.000
18.21	1.51	340.31	1.00	340.31	60	2278	0.48	0.043	0.01	7.11	0.01	0.000
18.37	1.55	311.53	1.00	311.53	55	2181	0.48	0.047	0.01	7.11	0.01	0.000
18.54	1.54	289.10	1.00	289.10	51	2008	0.48	0.056	0.02	7.11	0.01	0.000
18.70	1.52	281.62	1.00	281.62	50	1929	0.48	0.062	0.02	7.11	0.01	0.000
18.86	1.46	291.40	1.00	291.40	50	1844	0.48	0.069	0.02	7.11	0.01	0.000
19.03	1.44	307.85	1.00	307.85	53	1912	0.48	0.065	0.02	7.11	0.01	0.000
19.19	1.42	321.73	1.00	321.73	55	1961	0.48	0.062	0.02	7.11	0.01	0.000
19.36	1.47	341.33	1.00	341.33	59	2212	0.48	0.050	0.01	7.11	0.01	0.000
19.52	1.38	349.16	1.00	349.16	59	2041	0.48	0.059	0.02	7.11	0.01	0.000
19.69	1.36	342.10	1.00	342.10	57	1935	0.48	0.067	0.02	7.11	0.01	0.000
19.85	1.34	301.64	1.00	301.64	50	1685	0.48	0.093	0.03	7.11	0.01	0.000
20.01	1.42	277.39	1.00	277.39	47	1727	0.48	0.088	0.03	7.11	0.01	0.000
20.18	1.52	257.84	1.00	257.84	45	1841	0.48	0.077	0.03	7.11	0.01	0.000
20.34	1.56	261.70	1.00	261.70	47	1974	0.48	0.067	0.02	7.11	0.01	0.000
20.51	1.62	251.19	1.00	251.19	46	2051	0.48	0.063	0.02	7.11	0.01	0.000
20.67	1.66	255.11	1.01	257.39	47	2210	0.48	0.055	0.02	7.11	0.01	0.000
20.83	1.62	289.90	1.00	289.90	53	2411	0.48	0.047	0.01	7.11	0.01	0.000
21.00	1.56	351.90	1.00	351.90	63	2693	0.48	0.039	0.01	7.11	0.00	0.000
21.16	1.46	421.60	1.00	421.60	73	2825	0.48	0.037	0.01	7.11	0.00	0.000
21.33	1.40	459.52	1.00	459.52	78	2877	0.48	0.036	0.01	7.11	0.00	0.000
21.49	1.39	470.25	1.00	470.25	79	2894	0.48	0.036	0.01	7.11	0.00	0.000
21.65	1.39	466.88	1.00	466.88	79	2892	0.48	0.037	0.01	7.11	0.00	0.000
21.82	1.40	463.78	1.00	463.78	78	2911	0.48	0.037	0.01	7.11	0.00	0.000
21.98	1.41	460.53	1.00	460.53	78	2932	0.48	0.037	0.01	7.11	0.00	0.000
22.15	1.41	457.82	1.00	457.82	78	2957	0.48	0.037	0.01	7.11	0.00	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)

Total estimated settlement: 0.05

Abbreviations

Q_{tn}: Equivalent clean sand normalized cone resistance
K_c: Fines correction factor
$Q_{tn,cs}$: Post-liquefaction volumentric strain
G_{max}: Small strain shear modulus
CSR: Soil cyclic stress ratio
γ: Cyclic shear strain
$e_{vol(15)}$: Volumetric strain after 15 cycles
N_c: Equivalent number of cycles
e_v: Volumetric strain
Settle.: Calculated settlement

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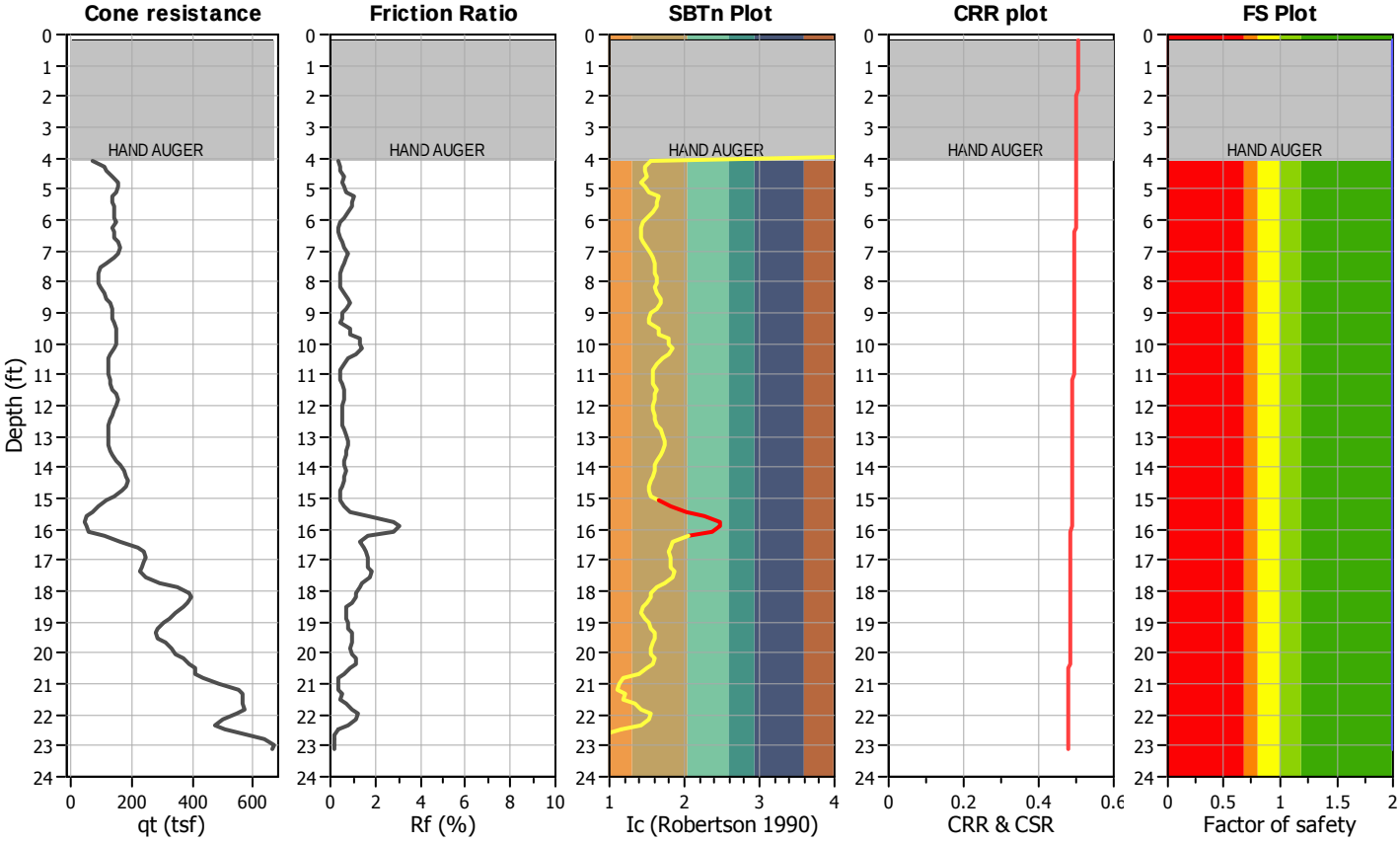
LIQUEFACTION ANALYSIS REPORT

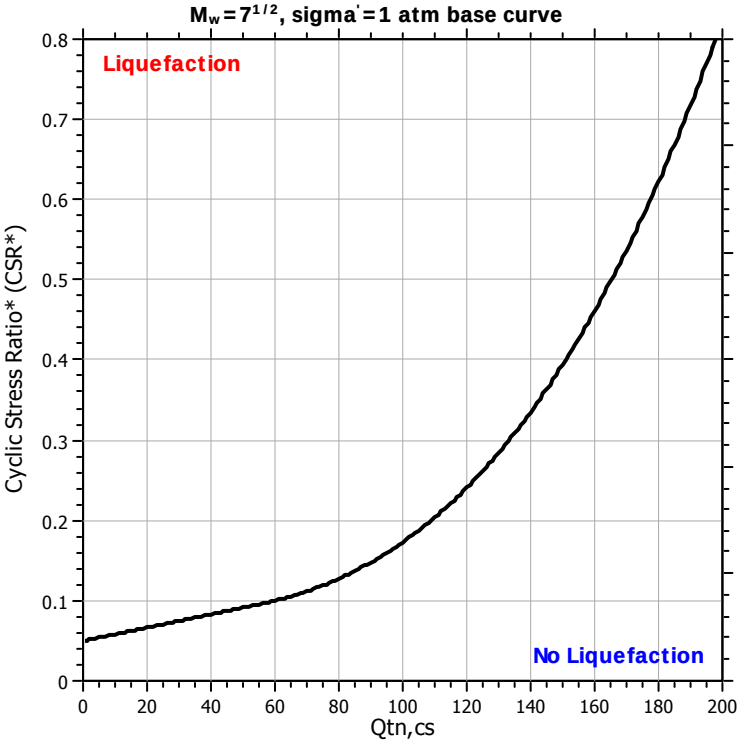
Project title : 19-433, Western Realco **Location : 1375 Magnolia Avenue, Corona, CA**

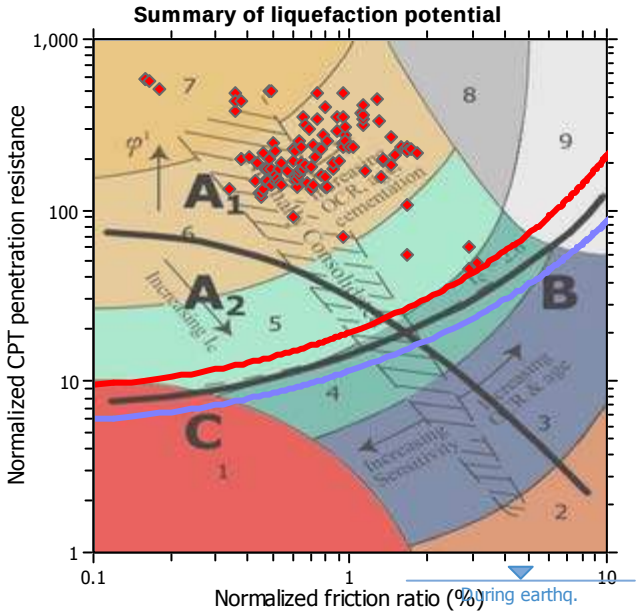
CPT file : SCPT-2

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	45.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.47	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.87	Unit weight calculation:	Based on SBT	K_σ applied:	No		

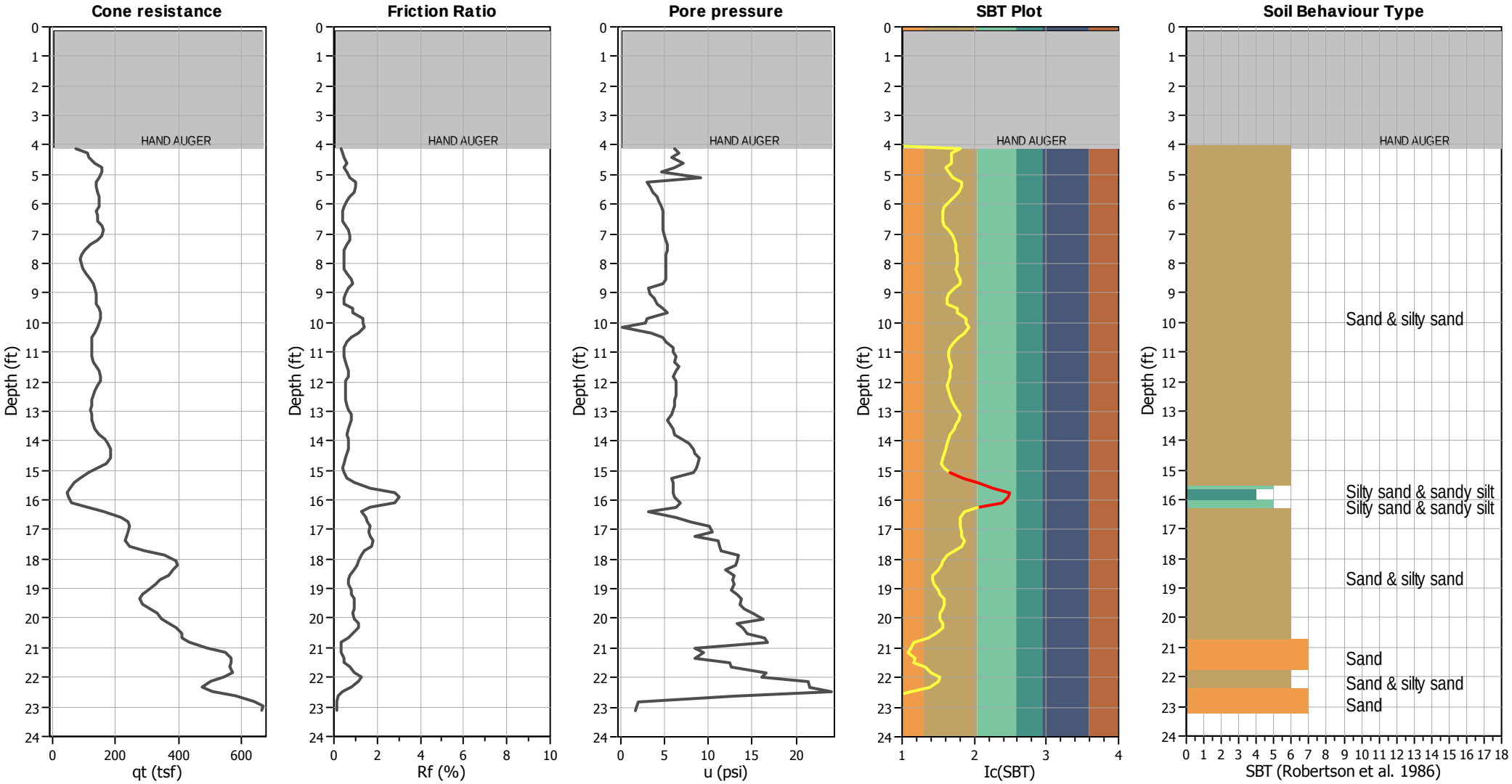






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



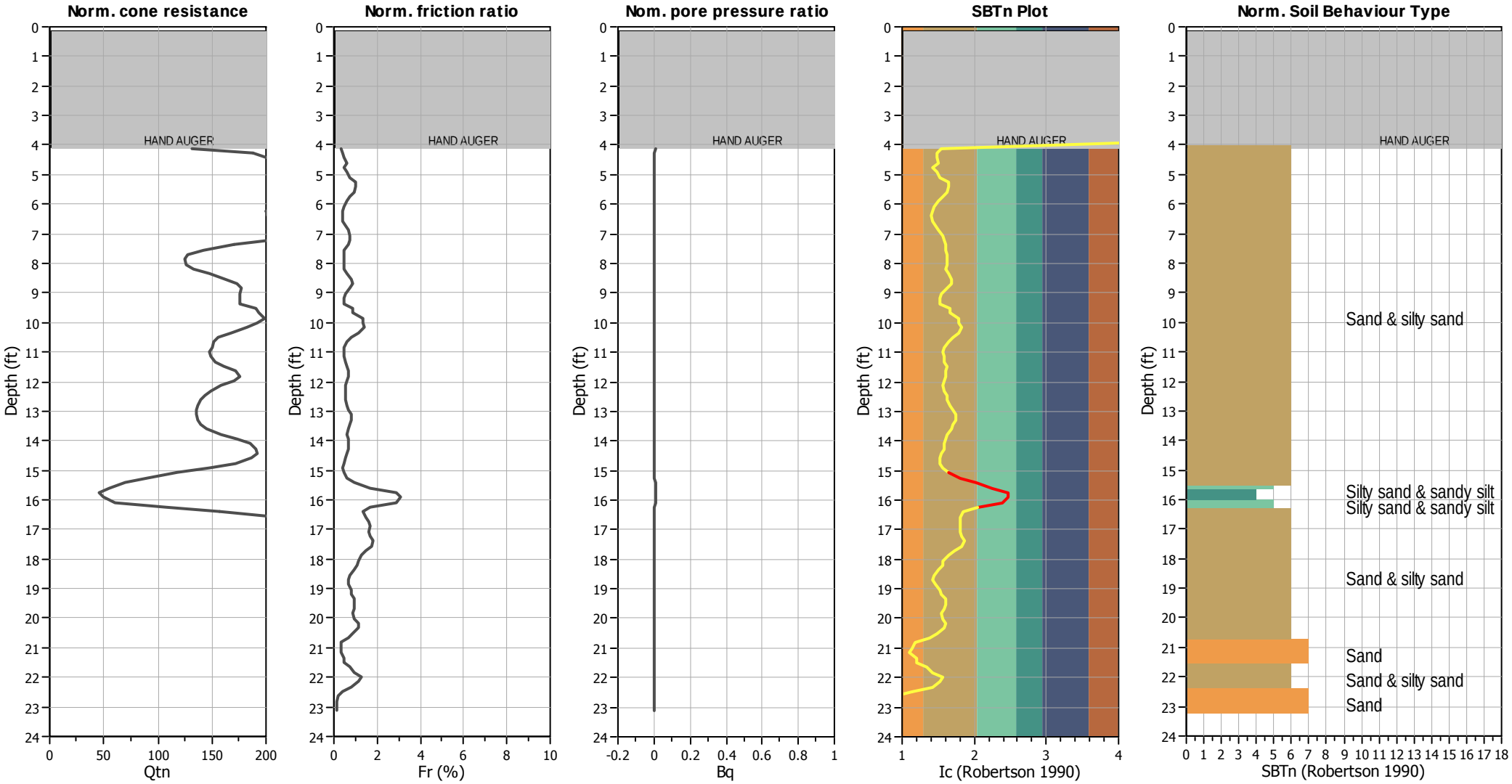
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



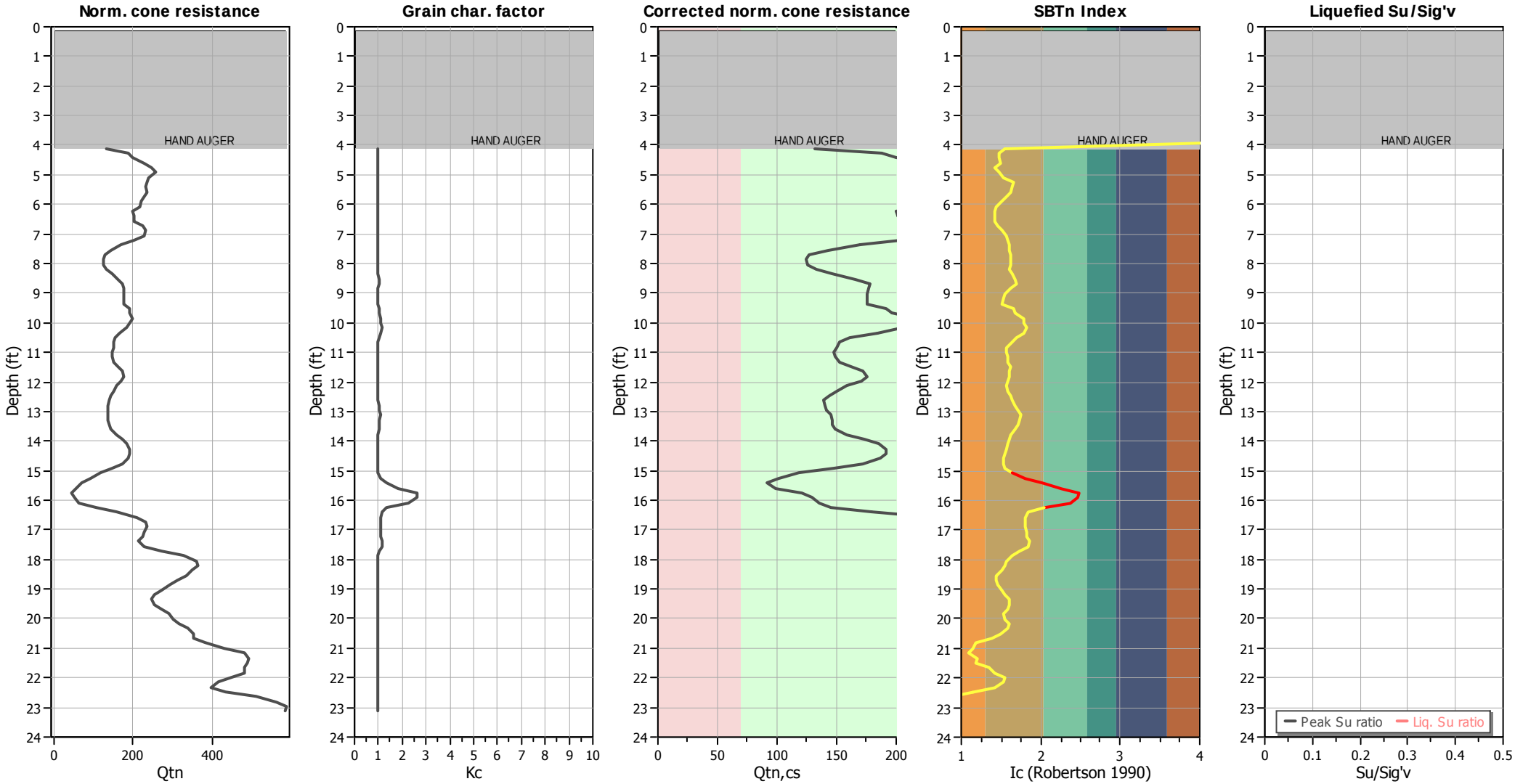
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

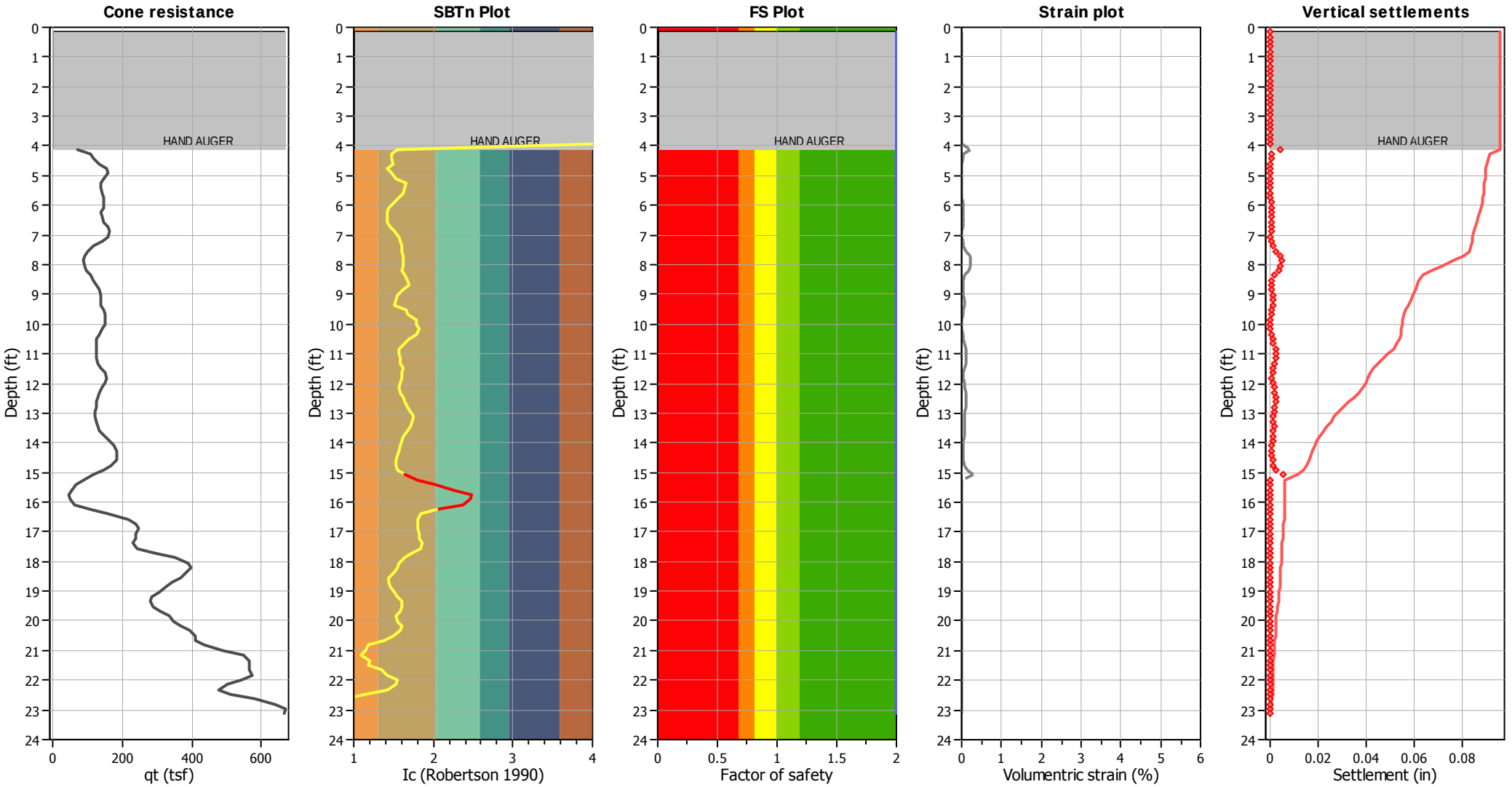
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement of dry sands ::

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
0.16	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.33	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.49	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.66	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.82	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.98	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.15	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.31	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.48	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.64	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.80	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.97	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.13	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.30	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.46	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.62	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.79	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.95	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.12	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.28	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.44	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.61	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.77	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.94	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.10	1.55	131.71	1.00	131.71	23	460	0.50	0.385	0.32	7.11	0.21	0.004
4.27	1.47	187.72	1.00	187.72	32	634	0.50	0.100	0.06	7.11	0.04	0.001
4.43	1.48	199.49	1.00	199.49	35	687	0.50	0.081	0.04	7.11	0.03	0.001
4.59	1.50	227.85	1.00	227.85	40	807	0.50	0.052	0.02	7.11	0.02	0.000
4.76	1.42	247.05	1.00	247.05	42	835	0.50	0.051	0.02	7.11	0.01	0.000
4.92	1.47	256.36	1.00	256.36	44	918	0.50	0.042	0.02	7.11	0.01	0.000
5.09	1.53	241.00	1.00	241.00	43	917	0.50	0.044	0.02	7.11	0.01	0.000
5.25	1.65	236.45	1.00	237.27	44	1003	0.50	0.037	0.01	7.11	0.01	0.000
5.41	1.64	232.64	1.00	232.18	42	996	0.50	0.040	0.02	7.11	0.01	0.000
5.58	1.62	235.32	1.00	235.32	43	1005	0.50	0.041	0.02	7.11	0.01	0.000
5.74	1.57	230.12	1.00	230.12	41	950	0.50	0.049	0.02	7.11	0.01	0.000
5.91	1.51	221.75	1.00	221.75	39	884	0.50	0.063	0.03	7.11	0.02	0.000
6.07	1.44	217.01	1.00	217.01	37	822	0.50	0.083	0.04	7.11	0.03	0.001
6.23	1.41	200.29	1.00	200.29	34	751	0.50	0.119	0.06	7.11	0.04	0.001
6.40	1.41	201.23	1.00	201.23	34	761	0.50	0.120	0.06	7.11	0.04	0.001
6.56	1.42	203.77	1.00	203.77	35	786	0.50	0.112	0.06	7.11	0.04	0.001
6.73	1.46	223.78	1.00	223.78	39	898	0.50	0.076	0.03	7.11	0.02	0.000
6.89	1.51	232.82	1.00	232.82	41	992	0.50	0.060	0.03	7.11	0.02	0.000
7.05	1.56	228.27	1.00	228.27	41	1031	0.50	0.056	0.02	7.11	0.02	0.000
7.22	1.59	204.26	1.00	204.26	37	952	0.50	0.073	0.04	7.11	0.02	0.000
7.38	1.61	169.98	1.00	169.98	31	817	0.50	0.125	0.07	7.11	0.05	0.001
7.55	1.60	142.27	1.00	142.27	26	688	0.50	0.259	0.19	7.11	0.12	0.002
7.71	1.62	127.22	1.00	127.22	23	628	0.50	0.419	0.35	7.11	0.22	0.004
7.87	1.63	124.57	1.00	124.57	23	629	0.50	0.436	0.37	7.11	0.23	0.005

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
8.04	1.62	125.55	1.00	125.55	23	636	0.50	0.434	0.37	7.11	0.23	0.004
8.20	1.61	132.93	1.00	132.93	24	669	0.50	0.357	0.29	7.11	0.18	0.003
8.37	1.64	147.04	1.00	146.87	27	774	0.50	0.198	0.14	7.11	0.09	0.002
8.53	1.68	162.72	1.02	166.44	31	894	0.49	0.121	0.07	7.11	0.04	0.001
8.69	1.69	172.82	1.03	177.74	33	967	0.49	0.097	0.05	7.11	0.03	0.001
8.86	1.62	177.27	1.00	177.27	32	940	0.49	0.110	0.06	7.11	0.04	0.001
9.02	1.54	175.94	1.00	175.94	31	869	0.49	0.150	0.09	7.11	0.05	0.001
9.19	1.53	175.46	1.00	175.46	31	860	0.49	0.161	0.10	7.11	0.06	0.001
9.35	1.52	175.57	1.00	175.57	31	856	0.49	0.171	0.10	7.11	0.06	0.001
9.51	1.66	190.11	1.01	191.84	35	1081	0.49	0.082	0.04	7.11	0.02	0.000
9.68	1.67	193.46	1.02	196.54	36	1121	0.49	0.076	0.04	7.11	0.02	0.000
9.84	1.79	198.67	1.10	218.05	42	1316	0.49	0.052	0.02	7.11	0.01	0.000
10.01	1.80	192.36	1.10	212.20	41	1297	0.49	0.056	0.02	7.11	0.01	0.000
10.17	1.83	182.78	1.13	206.65	40	1294	0.49	0.057	0.02	7.11	0.01	0.000
10.33	1.79	167.69	1.10	183.99	35	1142	0.49	0.082	0.04	7.11	0.02	0.000
10.50	1.70	155.13	1.04	161.11	30	972	0.49	0.139	0.08	7.11	0.05	0.001
10.66	1.64	152.29	1.00	152.29	28	899	0.49	0.190	0.13	7.11	0.07	0.001
10.83	1.57	150.03	1.00	150.03	27	832	0.49	0.266	0.19	7.11	0.11	0.002
10.99	1.57	148.05	1.00	148.05	26	827	0.49	0.284	0.20	7.11	0.12	0.002
11.15	1.58	148.33	1.00	148.33	27	837	0.49	0.278	0.20	7.11	0.11	0.002
11.32	1.59	152.86	1.00	152.86	27	879	0.49	0.235	0.16	7.11	0.09	0.002
11.48	1.62	161.66	1.00	161.66	29	971	0.49	0.166	0.10	7.11	0.06	0.001
11.65	1.61	172.01	1.00	172.01	31	1025	0.49	0.142	0.08	7.11	0.05	0.001
11.81	1.61	175.46	1.00	175.46	32	1052	0.49	0.134	0.08	7.11	0.04	0.001
11.98	1.58	170.41	1.00	170.41	31	995	0.49	0.167	0.10	7.11	0.06	0.001
12.14	1.57	158.98	1.00	158.98	28	928	0.49	0.222	0.15	7.11	0.08	0.002
12.30	1.59	149.59	1.00	149.59	27	901	0.49	0.257	0.18	7.11	0.10	0.002
12.47	1.62	143.78	1.00	143.78	26	894	0.49	0.272	0.20	7.11	0.11	0.002
12.63	1.63	139.30	1.00	139.30	25	889	0.49	0.288	0.22	7.11	0.12	0.002
12.80	1.67	137.33	1.02	139.99	26	922	0.49	0.255	0.19	7.11	0.10	0.002
12.96	1.71	134.91	1.05	141.13	26	954	0.49	0.229	0.16	7.11	0.09	0.002
13.12	1.75	135.94	1.07	145.55	28	1010	0.49	0.190	0.13	7.11	0.07	0.001
13.29	1.74	137.04	1.07	145.97	28	1015	0.49	0.192	0.13	7.11	0.07	0.001
13.45	1.71	140.05	1.04	146.12	27	1006	0.49	0.204	0.14	7.11	0.08	0.002
13.62	1.68	145.23	1.02	148.49	27	1013	0.49	0.204	0.14	7.11	0.08	0.002
13.78	1.62	158.25	1.00	158.25	29	1036	0.49	0.192	0.12	7.11	0.07	0.001
13.94	1.61	173.37	1.00	173.37	31	1130	0.49	0.146	0.09	7.11	0.05	0.001
14.11	1.59	185.72	1.00	185.72	33	1195	0.49	0.125	0.07	7.11	0.04	0.001
14.27	1.57	191.09	1.00	191.09	34	1208	0.49	0.124	0.07	7.11	0.04	0.001
14.44	1.55	192.02	1.00	192.02	34	1187	0.49	0.134	0.07	7.11	0.04	0.001
14.60	1.53	187.11	1.00	187.11	33	1132	0.49	0.159	0.09	7.11	0.05	0.001
14.76	1.53	172.15	1.00	172.15	30	1043	0.49	0.217	0.13	7.11	0.07	0.001
14.93	1.55	147.58	1.00	147.58	26	932	0.49	0.348	0.25	7.11	0.13	0.003
15.09	1.65	118.23	1.00	118.23	22	838	0.49	0.577	0.52	7.11	0.28	0.005
15.26	1.81	90.38	1.12	100.93	0	0	0.49	0.000	0.00	0.00	0.00	0.000
15.42	2.02	69.34	1.32	91.77	0	0	0.49	0.000	0.00	0.00	0.00	0.000
15.58	2.25	54.87	1.81	99.33	0	0	0.49	0.000	0.00	0.00	0.00	0.000
15.75	2.47	45.59	2.64	120.18	0	0	0.49	0.000	0.00	0.00	0.00	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
15.91	2.47	49.81	2.60	129.45	0	0	0.49	0.000	0.00	0.00	0.00	0.000
16.08	2.38	60.86	2.23	135.81	0	0	0.49	0.000	0.00	0.00	0.00	0.000
16.24	2.04	107.24	1.36	145.35	0	0	0.49	0.000	0.00	0.00	0.00	0.000
16.40	1.85	156.71	1.14	179.33	0	0	0.49	0.000	0.00	0.00	0.00	0.000
16.57	1.80	211.82	1.11	234.96	45	1918	0.49	0.051	0.02	7.11	0.01	0.000
16.73	1.80	231.71	1.10	256.04	49	2097	0.49	0.043	0.01	7.11	0.01	0.000
16.90	1.81	235.67	1.11	262.75	51	2182	0.49	0.041	0.01	7.11	0.01	0.000
17.06	1.82	227.42	1.12	254.25	49	2130	0.49	0.043	0.01	7.11	0.01	0.000
17.22	1.83	224.06	1.13	252.37	49	2142	0.49	0.044	0.01	7.11	0.01	0.000
17.39	1.87	215.30	1.16	249.42	49	2177	0.49	0.043	0.01	7.11	0.01	0.000
17.55	1.83	228.54	1.13	258.81	51	2234	0.49	0.042	0.01	7.11	0.01	0.000
17.72	1.73	271.14	1.06	286.24	54	2324	0.48	0.039	0.01	7.11	0.01	0.000
17.88	1.64	327.80	1.00	327.80	60	2527	0.48	0.035	0.01	7.11	0.00	0.000
18.04	1.57	361.27	1.00	361.27	64	2549	0.48	0.035	0.01	7.11	0.00	0.000
18.21	1.56	366.19	1.00	366.19	65	2563	0.48	0.035	0.01	7.11	0.00	0.000
18.37	1.51	351.04	1.00	351.04	61	2318	0.48	0.042	0.01	7.11	0.01	0.000
18.54	1.44	336.83	1.00	336.83	58	2059	0.48	0.052	0.01	7.11	0.01	0.000
18.70	1.43	311.73	1.00	311.73	53	1886	0.48	0.063	0.02	7.11	0.01	0.000
18.86	1.46	294.86	1.00	294.86	51	1859	0.48	0.066	0.02	7.11	0.01	0.000
19.03	1.52	272.94	1.00	272.94	48	1863	0.48	0.067	0.02	7.11	0.01	0.000
19.19	1.55	255.72	1.00	255.72	45	1832	0.48	0.070	0.03	7.11	0.01	0.000
19.36	1.61	247.11	1.00	247.11	45	1912	0.48	0.065	0.02	7.11	0.01	0.000
19.52	1.61	253.37	1.00	253.37	46	1970	0.48	0.062	0.02	7.11	0.01	0.000
19.69	1.58	271.91	1.00	271.91	49	2059	0.48	0.057	0.02	7.11	0.01	0.000
19.85	1.54	292.97	1.00	292.97	52	2104	0.48	0.056	0.02	7.11	0.01	0.000
20.01	1.56	303.39	1.00	303.39	54	2234	0.48	0.050	0.02	7.11	0.01	0.000
20.18	1.59	318.74	1.00	318.74	57	2485	0.48	0.042	0.01	7.11	0.01	0.000
20.34	1.58	339.50	1.00	339.50	61	2605	0.48	0.039	0.01	7.11	0.00	0.000
20.51	1.49	355.04	1.00	355.04	62	2425	0.48	0.045	0.01	7.11	0.01	0.000
20.67	1.39	355.14	1.00	355.14	60	2121	0.48	0.058	0.02	7.11	0.01	0.000
20.83	1.18	382.00	1.00	382.00	60	1729	0.48	0.092	0.02	7.11	0.01	0.000
21.00	1.14	430.15	1.00	430.15	67	1861	0.48	0.078	0.02	7.11	0.01	0.000
21.16	1.10	483.62	1.00	483.62	75	1989	0.48	0.069	0.01	7.11	0.01	0.000
21.33	1.20	492.20	1.00	492.20	78	2322	0.48	0.051	0.01	7.11	0.00	0.000
21.49	1.19	491.09	1.00	491.09	78	2300	0.48	0.053	0.01	7.11	0.00	0.000
21.65	1.35	481.60	1.00	481.60	80	2791	0.48	0.038	0.01	7.11	0.00	0.000
21.82	1.43	481.85	1.00	481.85	82	3136	0.48	0.032	0.01	7.11	0.00	0.000
21.98	1.55	450.66	1.00	450.66	80	3493	0.48	0.028	0.01	7.11	0.00	0.000
22.15	1.53	416.45	1.00	416.45	73	3144	0.48	0.033	0.01	7.11	0.00	0.000
22.31	1.42	397.73	1.00	397.73	68	2578	0.48	0.045	0.01	7.11	0.00	0.000
22.47	1.15	435.32	1.00	435.32	68	1958	0.48	0.078	0.02	7.11	0.01	0.000
22.64	0.90	511.41	1.00	511.41	75	1635	0.48	0.123	0.03	7.11	0.01	0.000
22.80	0.84	562.82	1.00	562.82	81	1674	0.48	0.117	0.02	7.11	0.01	0.000
22.97	0.82	589.85	1.00	589.85	84	1692	0.48	0.115	0.02	7.11	0.01	0.000
23.13	0.82	584.58	1.00	584.58	84	1692	0.48	0.116	0.02	7.11	0.01	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)

Total estimated settlement: 0.10

Abbreviations

Q_{tn}: Equivalent clean sand normalized cone resistance
K_c: Fines correction factor
$Q_{tn,cs}$: Post-liquefaction volumentric strain
G_{max}: Small strain shear modulus
CSR: Soil cyclic stress ratio
γ: Cyclic shear strain
$e_{vol(15)}$: Volumetric strain after 15 cycles
N_c: Equivalent number of cycles
e_v: Volumetric strain
Settle.: Calculated settlement

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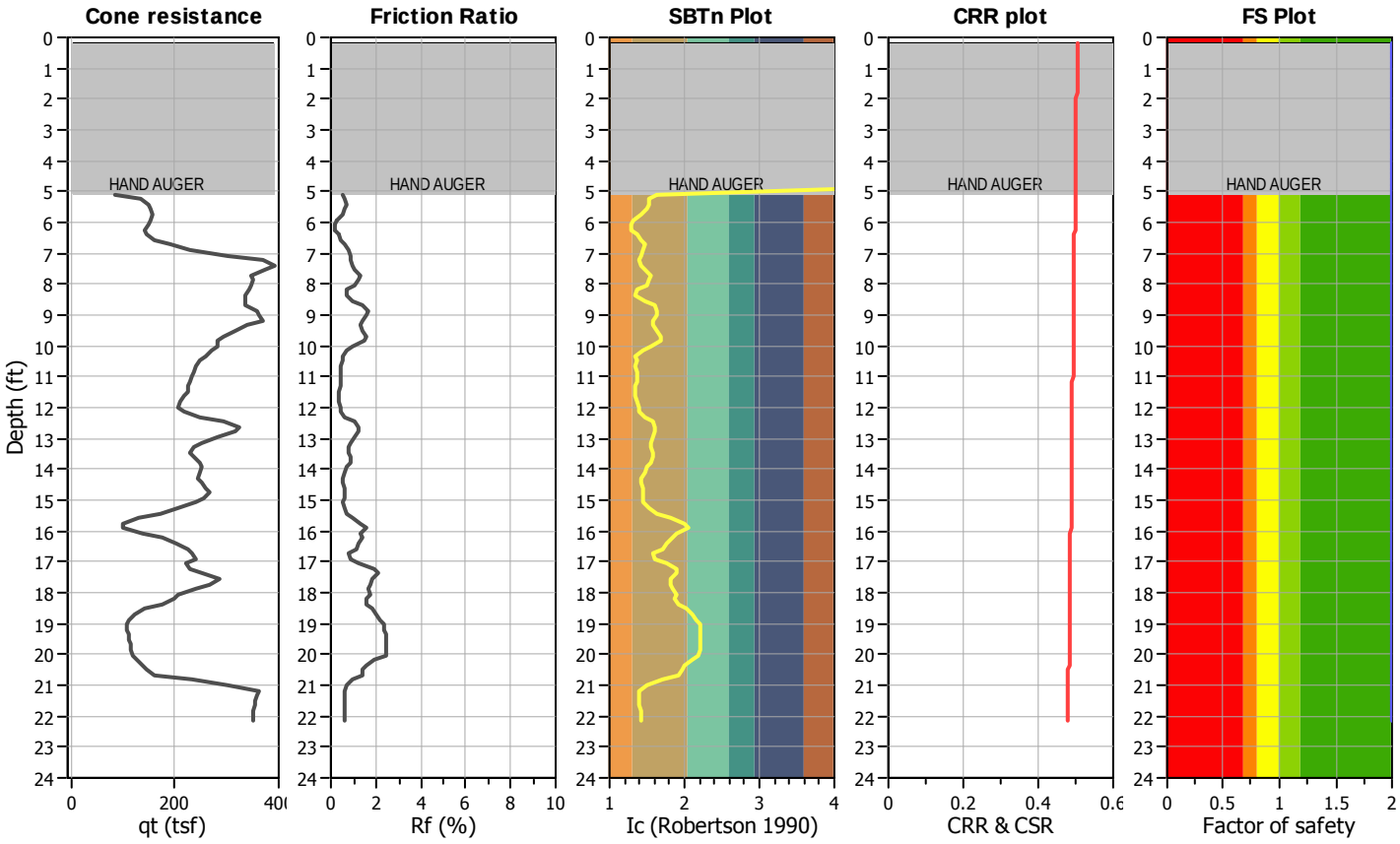
LIQUEFACTION ANALYSIS REPORT

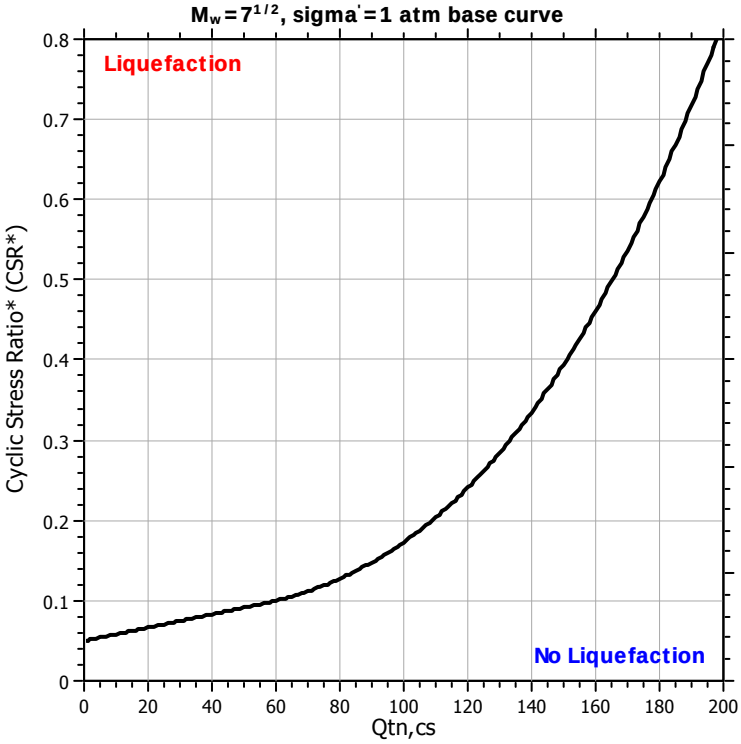
Project title : 19-433, Western Realco **Location : 1375 Magnolia Avenue, Corona, CA**

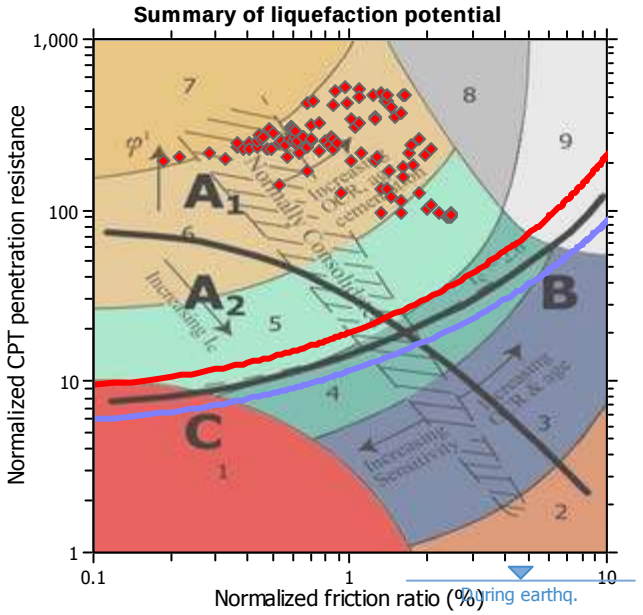
CPT file : CPT-3

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	45.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.47	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.87	Unit weight calculation:	Based on SBT	K_σ applied:	No		

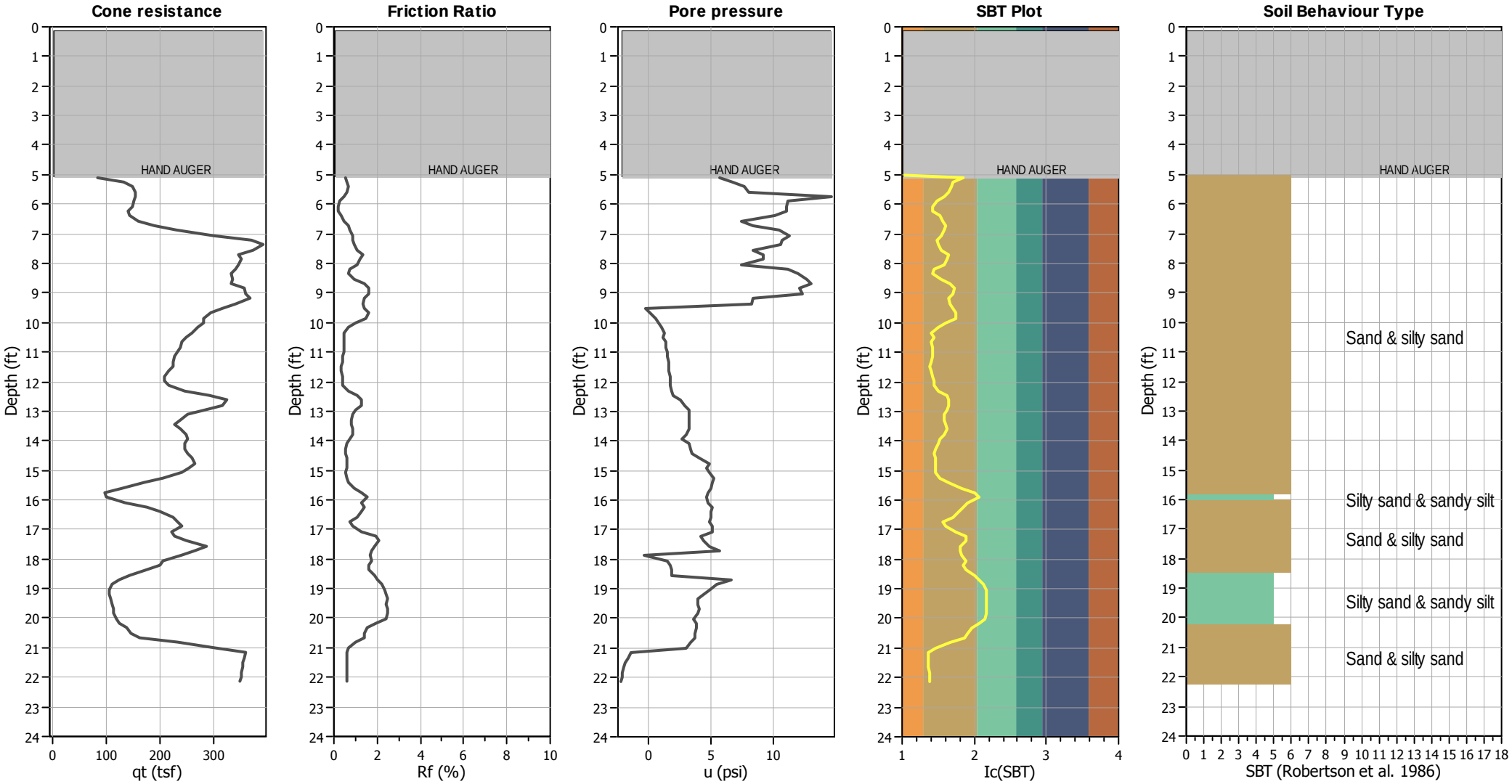






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



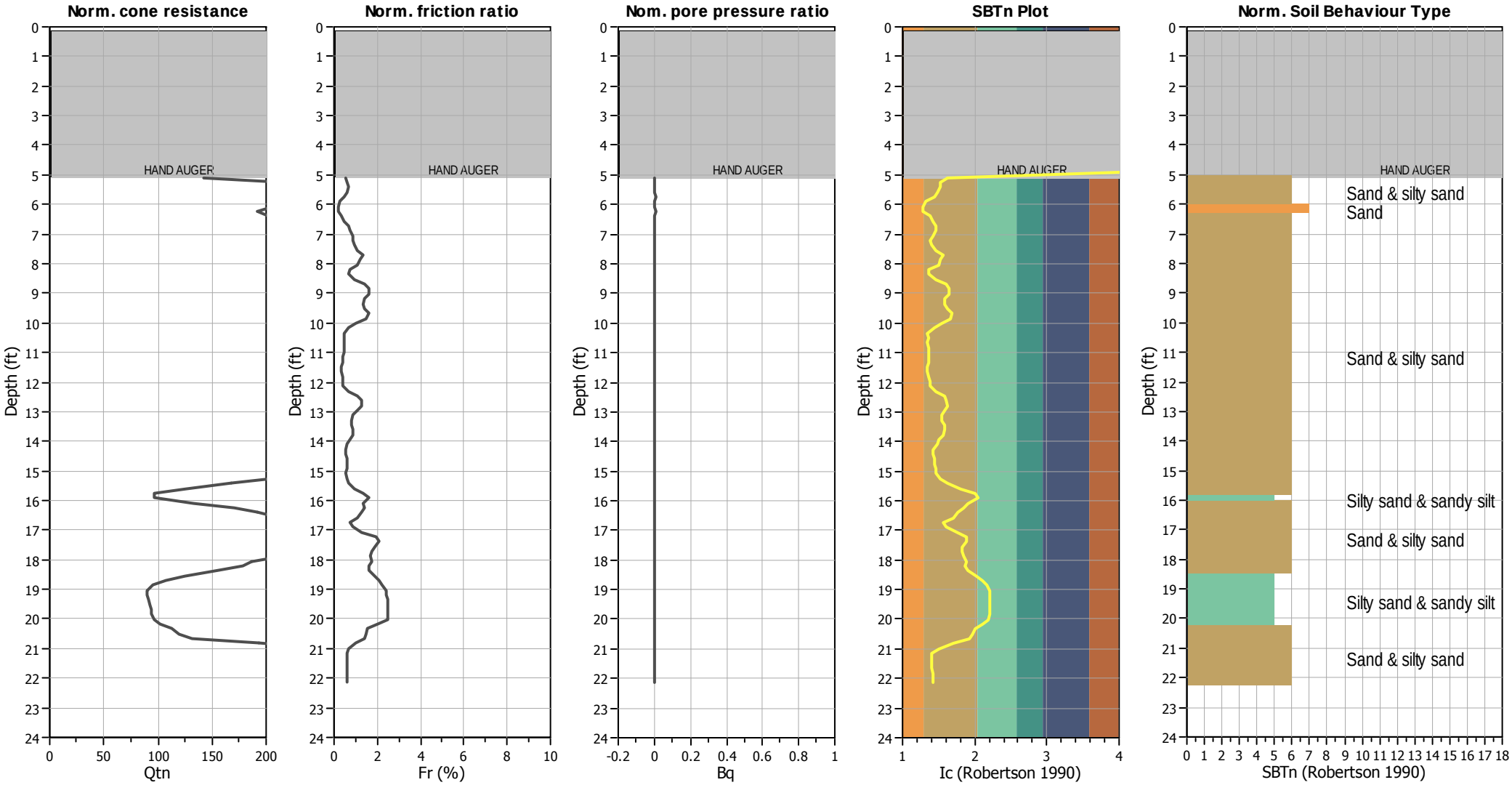
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



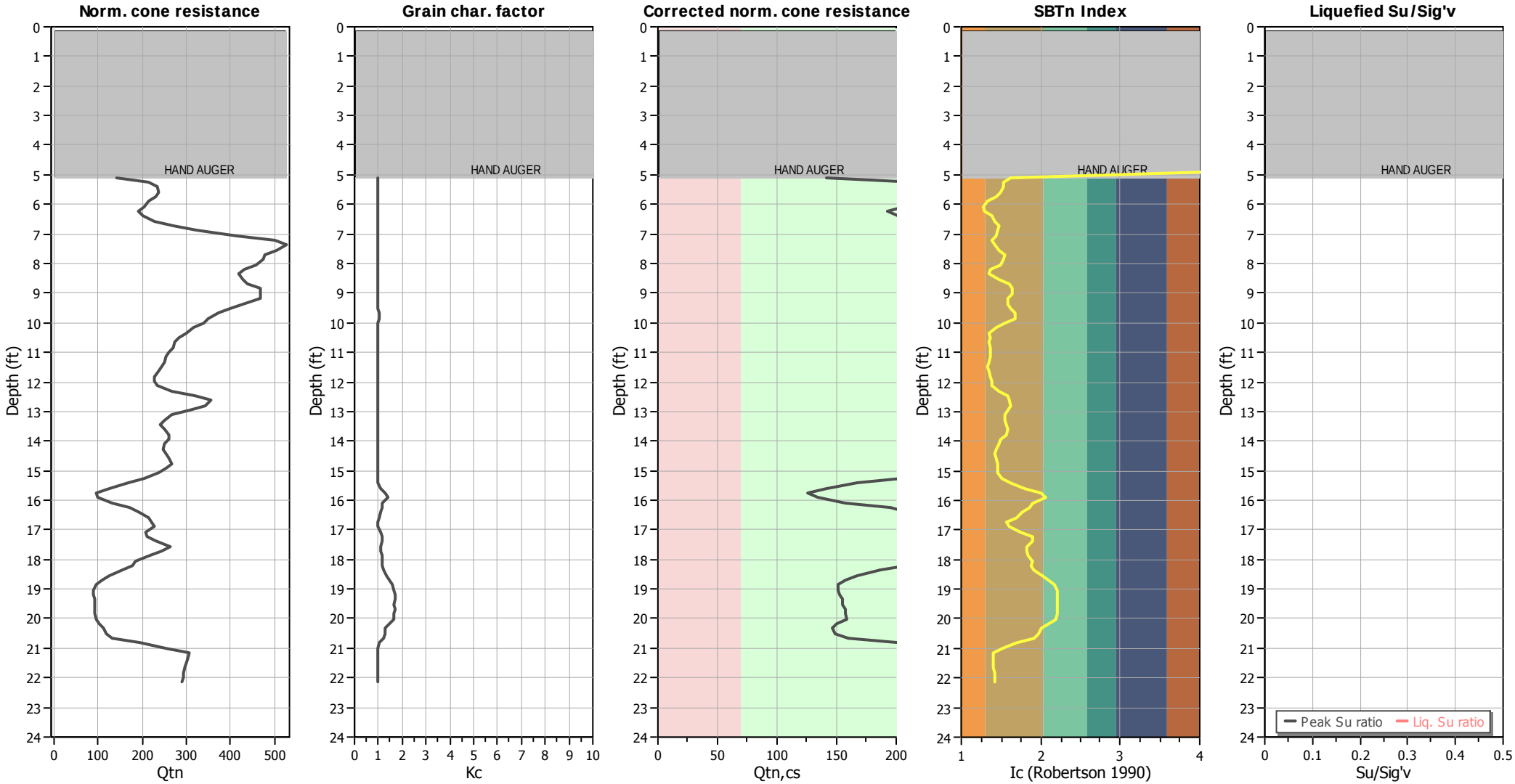
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

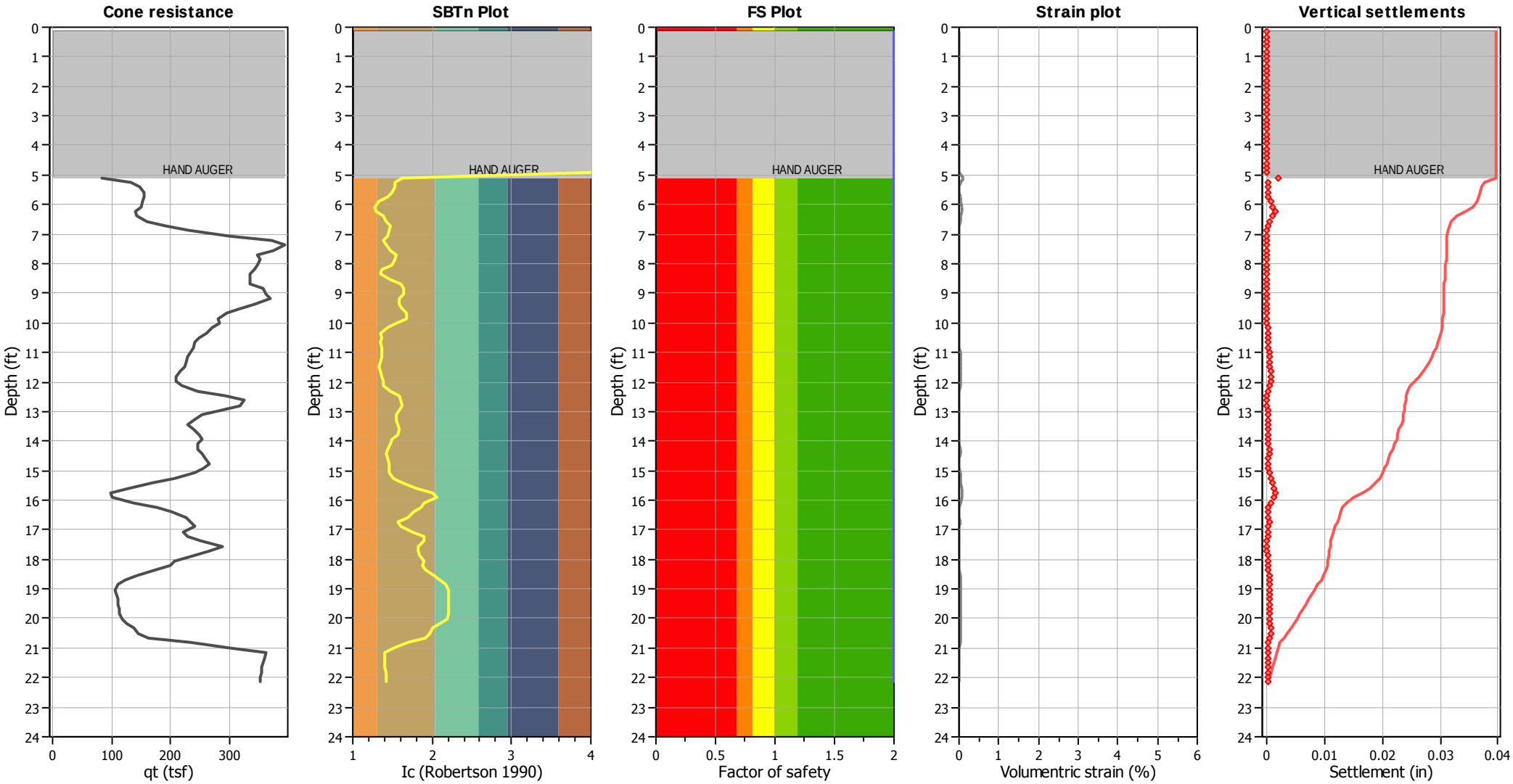
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement of dry sands ::

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
0.16	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.33	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.49	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.66	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.82	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.98	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.15	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.31	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.48	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.64	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.80	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.97	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.13	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.30	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.46	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.62	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.79	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.95	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.12	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.28	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.44	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.61	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.77	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.94	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.10	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.27	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.43	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.59	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.76	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.92	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
5.09	1.62	141.67	1.00	141.67	26	580	0.50	0.216	0.16	7.11	0.10	0.002
5.25	1.53	215.06	1.00	215.06	38	828	0.50	0.062	0.03	7.11	0.02	0.000
5.41	1.52	235.17	1.00	235.17	41	913	0.50	0.050	0.02	7.11	0.01	0.000
5.58	1.49	238.07	1.00	238.07	41	910	0.50	0.053	0.02	7.11	0.01	0.000
5.74	1.43	231.01	1.00	231.01	39	853	0.50	0.067	0.03	7.11	0.02	0.000
5.91	1.32	213.93	1.00	213.93	35	728	0.50	0.119	0.06	7.11	0.04	0.001
6.07	1.28	205.91	1.00	205.91	34	682	0.50	0.162	0.09	7.11	0.06	0.001
6.23	1.28	192.25	1.00	192.25	31	644	0.50	0.219	0.13	7.11	0.08	0.002
6.40	1.38	200.85	1.00	200.85	34	738	0.50	0.133	0.07	7.11	0.05	0.001
6.56	1.43	225.94	1.00	225.94	39	875	0.50	0.078	0.04	7.11	0.02	0.000
6.73	1.47	270.90	1.00	270.90	47	1096	0.50	0.044	0.02	7.11	0.01	0.000
6.89	1.46	323.32	1.00	323.32	56	1312	0.50	0.031	0.01	7.11	0.01	0.000
7.05	1.43	414.46	1.00	414.46	71	1659	0.50	0.021	0.00	7.11	0.00	0.000
7.22	1.39	500.35	1.00	500.35	84	1948	0.50	0.017	0.00	7.11	0.00	0.000
7.38	1.41	527.65	1.00	527.65	90	2114	0.50	0.015	0.00	7.11	0.00	0.000
7.55	1.47	505.97	1.00	505.97	87	2155	0.50	0.016	0.00	7.11	0.00	0.000
7.71	1.56	478.64	1.00	478.64	85	2244	0.50	0.015	0.00	7.11	0.00	0.000
7.87	1.53	476.42	1.00	476.42	84	2206	0.50	0.016	0.00	7.11	0.00	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
8.04	1.49	458.16	1.00	458.16	80	2062	0.50	0.018	0.00	7.11	0.00	0.000
8.20	1.36	433.15	1.00	433.15	72	1730	0.50	0.024	0.01	7.11	0.00	0.000
8.37	1.35	417.79	1.00	417.79	70	1666	0.50	0.027	0.01	7.11	0.00	0.000
8.53	1.47	428.69	1.00	428.69	74	1932	0.49	0.021	0.00	7.11	0.00	0.000
8.69	1.59	438.70	1.00	438.70	79	2266	0.49	0.017	0.00	7.11	0.00	0.000
8.86	1.64	469.09	1.00	468.21	86	2568	0.49	0.015	0.00	7.11	0.00	0.000
9.02	1.63	469.26	1.00	469.26	86	2573	0.49	0.015	0.00	7.11	0.00	0.000
9.19	1.58	467.81	1.00	467.81	84	2452	0.49	0.017	0.00	7.11	0.00	0.000
9.35	1.59	430.33	1.00	430.33	77	2297	0.49	0.019	0.00	7.11	0.00	0.000
9.51	1.63	399.35	1.00	399.35	73	2242	0.49	0.020	0.00	7.11	0.00	0.000
9.68	1.68	373.35	1.02	382.53	71	2230	0.49	0.020	0.00	7.11	0.00	0.000
9.84	1.67	350.59	1.02	357.10	66	2094	0.49	0.023	0.01	7.11	0.00	0.000
10.01	1.54	340.19	1.00	340.19	60	1785	0.49	0.030	0.01	7.11	0.00	0.000
10.17	1.44	317.08	1.00	317.08	54	1504	0.49	0.043	0.01	7.11	0.01	0.000
10.33	1.34	299.07	1.00	299.07	50	1287	0.49	0.063	0.02	7.11	0.01	0.000
10.50	1.37	284.04	1.00	284.04	48	1267	0.49	0.067	0.02	7.11	0.01	0.000
10.66	1.35	273.65	1.00	273.65	46	1197	0.49	0.080	0.03	7.11	0.02	0.000
10.83	1.37	268.86	1.00	268.86	45	1205	0.49	0.081	0.03	7.11	0.02	0.000
10.99	1.37	261.63	1.00	261.63	44	1182	0.49	0.088	0.03	7.11	0.02	0.000
11.15	1.37	254.20	1.00	254.20	43	1156	0.49	0.096	0.04	7.11	0.02	0.000
11.32	1.35	250.41	1.00	250.41	42	1126	0.49	0.106	0.04	7.11	0.03	0.001
11.48	1.33	245.67	1.00	245.67	41	1088	0.49	0.121	0.05	7.11	0.03	0.001
11.65	1.35	236.61	1.00	236.61	39	1068	0.49	0.132	0.06	7.11	0.03	0.001
11.81	1.37	228.43	1.00	228.43	38	1067	0.49	0.136	0.06	7.11	0.04	0.001
11.98	1.39	226.27	1.00	226.27	38	1082	0.49	0.134	0.06	7.11	0.04	0.001
12.14	1.39	235.54	1.00	235.54	40	1137	0.49	0.117	0.05	7.11	0.03	0.001
12.30	1.47	267.96	1.00	267.96	46	1421	0.49	0.065	0.02	7.11	0.01	0.000
12.47	1.58	321.30	1.00	321.30	58	1947	0.49	0.035	0.01	7.11	0.01	0.000
12.63	1.61	354.76	1.00	354.76	64	2234	0.49	0.028	0.01	7.11	0.00	0.000
12.80	1.62	342.97	1.00	342.97	62	2202	0.49	0.029	0.01	7.11	0.00	0.000
12.96	1.58	305.33	1.00	305.33	55	1891	0.49	0.039	0.01	7.11	0.01	0.000
13.12	1.55	268.12	1.00	268.12	48	1610	0.49	0.055	0.02	7.11	0.01	0.000
13.29	1.55	250.90	1.00	250.90	45	1516	0.49	0.064	0.02	7.11	0.01	0.000
13.45	1.57	240.10	1.00	240.10	43	1501	0.49	0.067	0.03	7.11	0.01	0.000
13.62	1.59	249.94	1.00	249.94	45	1596	0.49	0.059	0.02	7.11	0.01	0.000
13.78	1.56	259.13	1.00	259.13	46	1622	0.49	0.058	0.02	7.11	0.01	0.000
13.94	1.50	260.40	1.00	260.40	45	1521	0.49	0.068	0.03	7.11	0.01	0.000
14.11	1.47	251.49	1.00	251.49	44	1427	0.49	0.081	0.03	7.11	0.02	0.000
14.27	1.43	248.71	1.00	248.71	42	1348	0.49	0.096	0.04	7.11	0.02	0.000
14.44	1.43	254.29	1.00	254.29	43	1382	0.49	0.092	0.04	7.11	0.02	0.000
14.60	1.44	260.27	1.00	260.27	45	1443	0.49	0.084	0.03	7.11	0.02	0.000
14.76	1.45	265.71	1.00	265.71	46	1494	0.49	0.078	0.03	7.11	0.02	0.000
14.93	1.46	254.84	1.00	254.84	44	1454	0.49	0.085	0.03	7.11	0.02	0.000
15.09	1.46	237.84	1.00	237.84	41	1366	0.49	0.102	0.04	7.11	0.02	0.000
15.26	1.52	203.81	1.00	203.81	36	1265	0.49	0.131	0.06	7.11	0.03	0.001
15.42	1.63	167.63	1.00	167.63	31	1201	0.49	0.157	0.09	7.11	0.05	0.001
15.58	1.81	126.73	1.12	141.32	27	1142	0.49	0.190	0.13	7.11	0.07	0.001
15.75	2.00	96.71	1.30	125.55	26	1106	0.49	0.217	0.16	7.11	0.08	0.002

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
15.91	2.05	97.31	1.38	133.84	28	1198	0.49	0.168	0.11	7.11	0.06	0.001
16.08	1.90	132.36	1.19	157.30	32	1355	0.49	0.117	0.07	7.11	0.04	0.001
16.24	1.85	170.37	1.15	195.18	38	1652	0.49	0.071	0.03	7.11	0.02	0.000
16.40	1.77	192.10	1.09	209.14	40	1704	0.49	0.068	0.03	7.11	0.02	0.000
16.57	1.70	213.71	1.04	222.08	41	1740	0.49	0.066	0.03	7.11	0.01	0.000
16.73	1.57	220.33	1.00	220.33	39	1532	0.49	0.090	0.04	7.11	0.02	0.000
16.90	1.60	227.06	1.00	227.06	41	1647	0.49	0.077	0.03	7.11	0.02	0.000
17.06	1.76	206.39	1.08	222.04	42	1830	0.49	0.062	0.03	7.11	0.01	0.000
17.22	1.89	211.94	1.18	250.53	50	2249	0.49	0.042	0.01	7.11	0.01	0.000
17.39	1.90	230.62	1.18	273.22	55	2472	0.49	0.036	0.01	7.11	0.01	0.000
17.55	1.82	263.14	1.12	295.47	58	2583	0.49	0.034	0.01	7.11	0.00	0.000
17.72	1.82	242.69	1.12	271.35	53	2377	0.48	0.040	0.01	7.11	0.01	0.000
17.88	1.84	218.06	1.13	247.33	48	2207	0.48	0.046	0.02	7.11	0.01	0.000
18.04	1.89	186.02	1.18	219.99	44	2038	0.48	0.054	0.02	7.11	0.01	0.000
18.21	1.87	178.78	1.16	208.12	41	1919	0.48	0.062	0.03	7.11	0.01	0.000
18.37	1.91	155.54	1.20	187.14	38	1774	0.48	0.074	0.03	7.11	0.02	0.000
18.54	2.03	124.79	1.34	166.81	35	1657	0.48	0.088	0.04	7.11	0.02	0.000
18.70	2.10	107.19	1.46	156.72	34	1584	0.48	0.100	0.05	7.11	0.03	0.001
18.86	2.16	95.77	1.58	151.14	34	1536	0.48	0.110	0.06	7.11	0.03	0.001
19.03	2.20	90.25	1.67	150.75	34	1535	0.48	0.112	0.06	7.11	0.03	0.001
19.19	2.21	90.25	1.68	151.95	34	1556	0.48	0.110	0.06	7.11	0.03	0.001
19.36	2.21	91.80	1.69	155.10	35	1598	0.48	0.104	0.05	7.11	0.03	0.000
19.52	2.20	92.94	1.67	155.38	35	1613	0.48	0.103	0.05	7.11	0.03	0.000
19.69	2.21	93.32	1.68	156.76	35	1637	0.48	0.100	0.05	7.11	0.02	0.000
19.85	2.20	93.78	1.68	157.20	36	1653	0.48	0.099	0.05	7.11	0.02	0.000
20.01	2.19	96.55	1.64	158.59	36	1681	0.48	0.096	0.05	7.11	0.02	0.000
20.18	2.10	102.66	1.46	150.25	33	1605	0.48	0.110	0.06	7.11	0.03	0.001
20.34	2.00	112.54	1.30	146.84	31	1546	0.48	0.124	0.07	7.11	0.03	0.001
20.51	1.96	119.23	1.25	149.28	31	1555	0.48	0.123	0.07	7.11	0.03	0.001
20.67	1.92	132.17	1.21	159.69	32	1640	0.48	0.108	0.06	7.11	0.03	0.001
20.83	1.70	192.96	1.04	200.79	38	1798	0.48	0.087	0.04	7.11	0.02	0.000
21.00	1.51	254.86	1.00	254.86	45	1828	0.48	0.085	0.03	7.11	0.01	0.000
21.16	1.40	305.94	1.00	305.94	52	1893	0.48	0.079	0.03	7.11	0.01	0.000
21.33	1.40	302.74	1.00	302.74	51	1891	0.48	0.081	0.03	7.11	0.01	0.000
21.49	1.40	299.55	1.00	299.55	51	1889	0.48	0.082	0.03	7.11	0.01	0.000
21.65	1.41	296.83	1.00	296.83	50	1889	0.48	0.083	0.03	7.11	0.01	0.000
21.82	1.41	294.36	1.00	294.36	50	1896	0.48	0.083	0.03	7.11	0.01	0.000
21.98	1.42	292.16	1.00	292.16	50	1903	0.48	0.083	0.03	7.11	0.01	0.000
22.15	1.42	290.33	1.00	290.33	49	1911	0.48	0.083	0.03	7.11	0.01	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)

Total estimated settlement: 0.04

Abbreviations

Q_{tn}: Equivalent clean sand normalized cone resistance
K_c: Fines correction factor
$Q_{tn,cs}$: Post-liquefaction volumentric strain
G_{max}: Small strain shear modulus
CSR: Soil cyclic stress ratio
γ: Cyclic shear strain
$e_{vol(15)}$: Volumetric strain after 15 cycles
N_c: Equivalent number of cycles
e_v: Volumetric strain
Settle.: Calculated settlement

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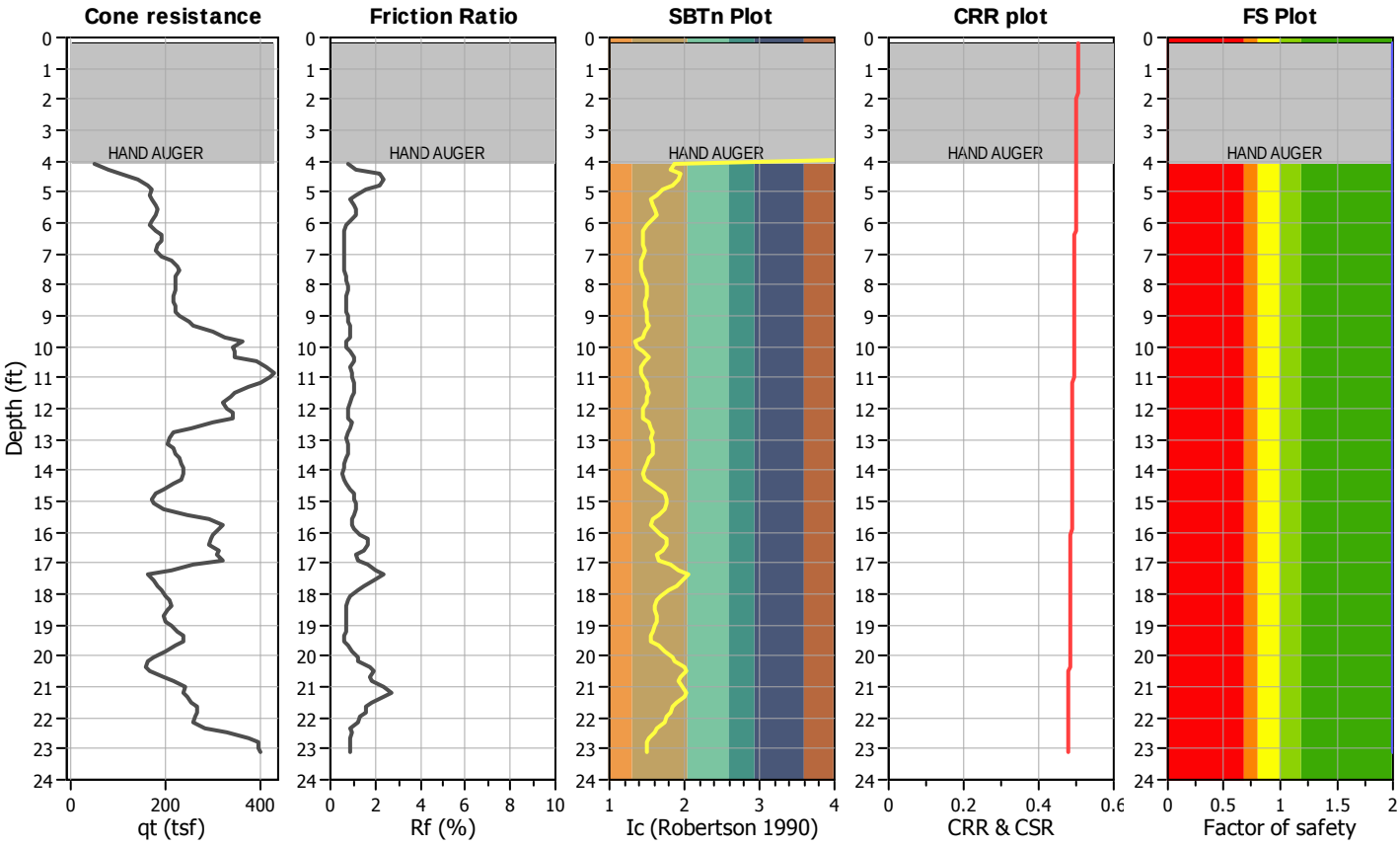
LIQUEFACTION ANALYSIS REPORT

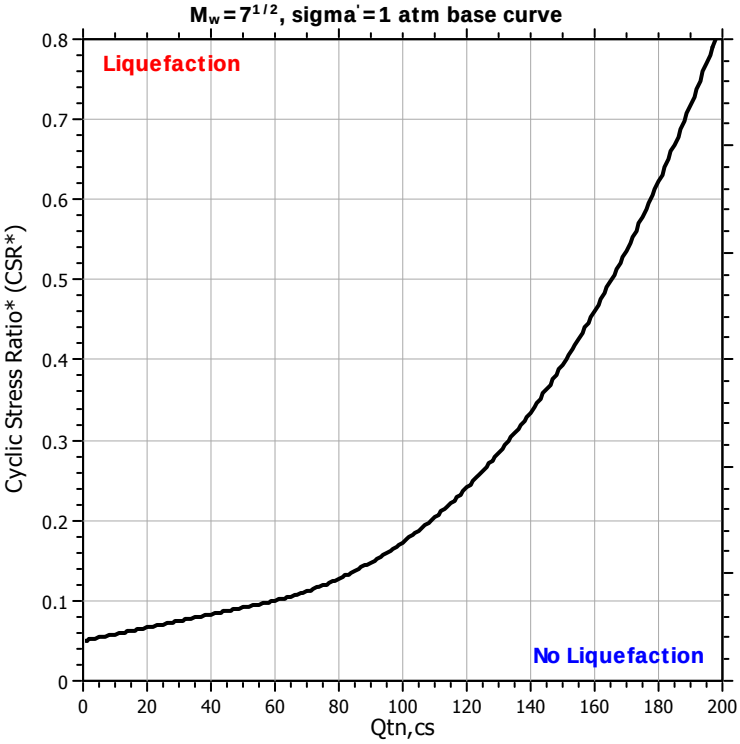
Project title : 19-433, Western Realco **Location : 1375 Magnolia Avenue, Corona, CA**

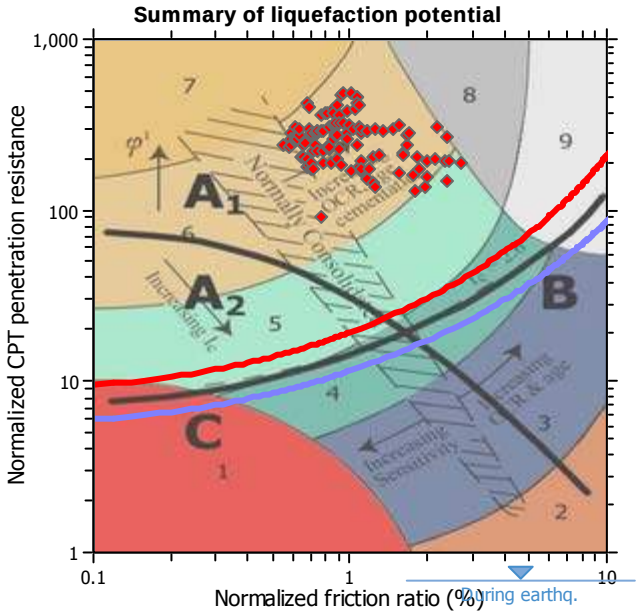
CPT file : CPT-4

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	45.00 ft	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	6.47	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.87	Unit weight calculation:	Based on SBT	K_σ applied:	No	MSF method:	Method based

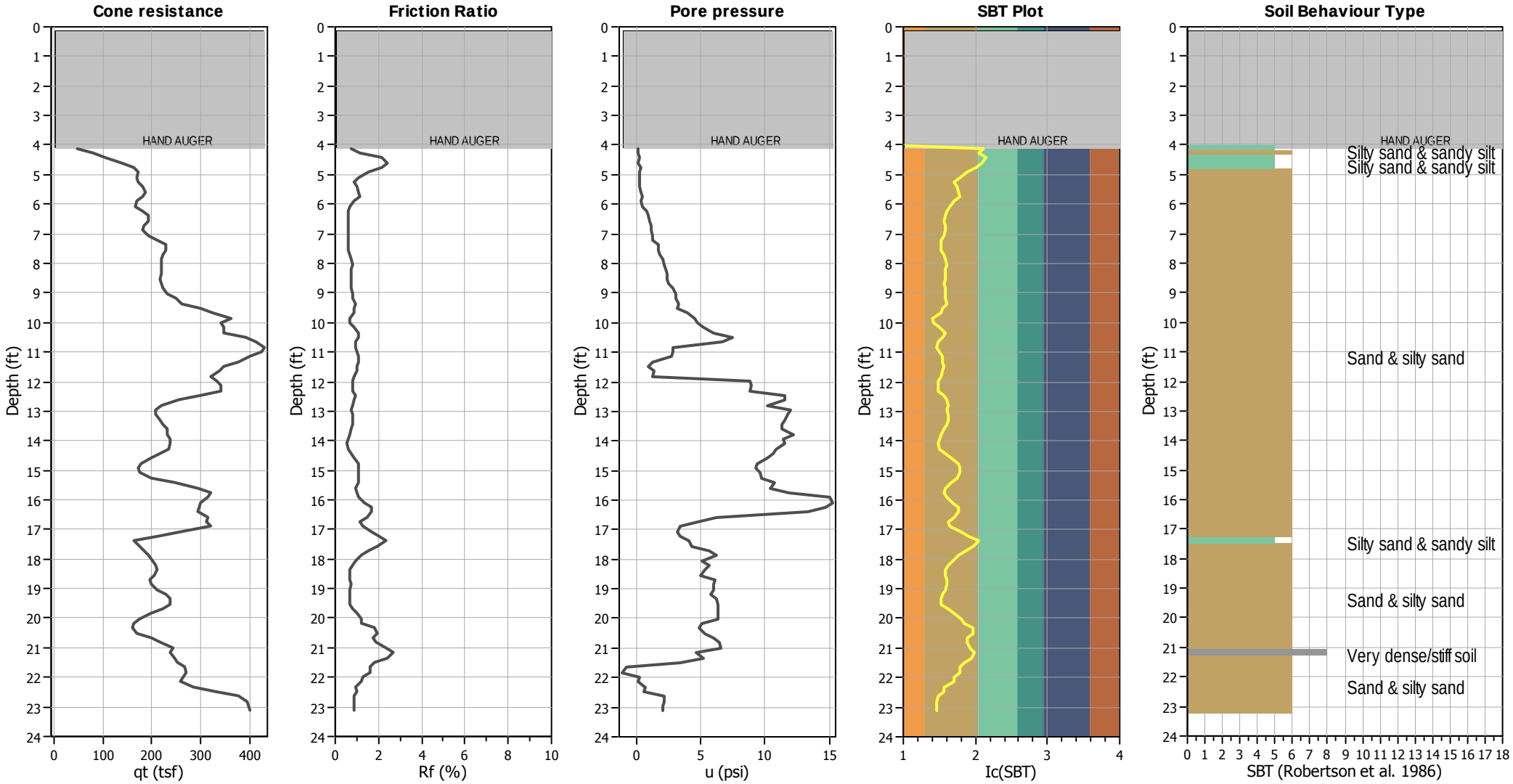






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



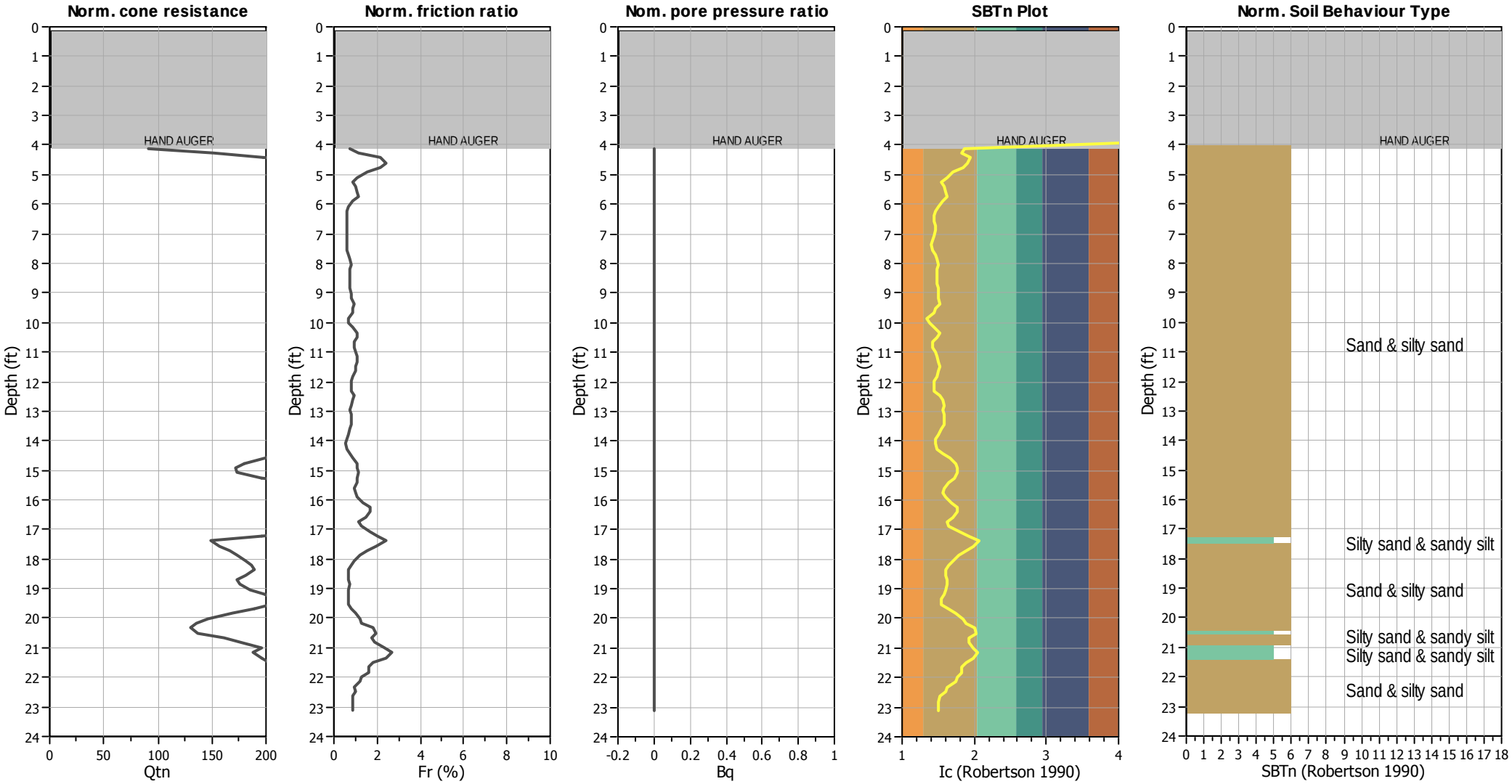
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



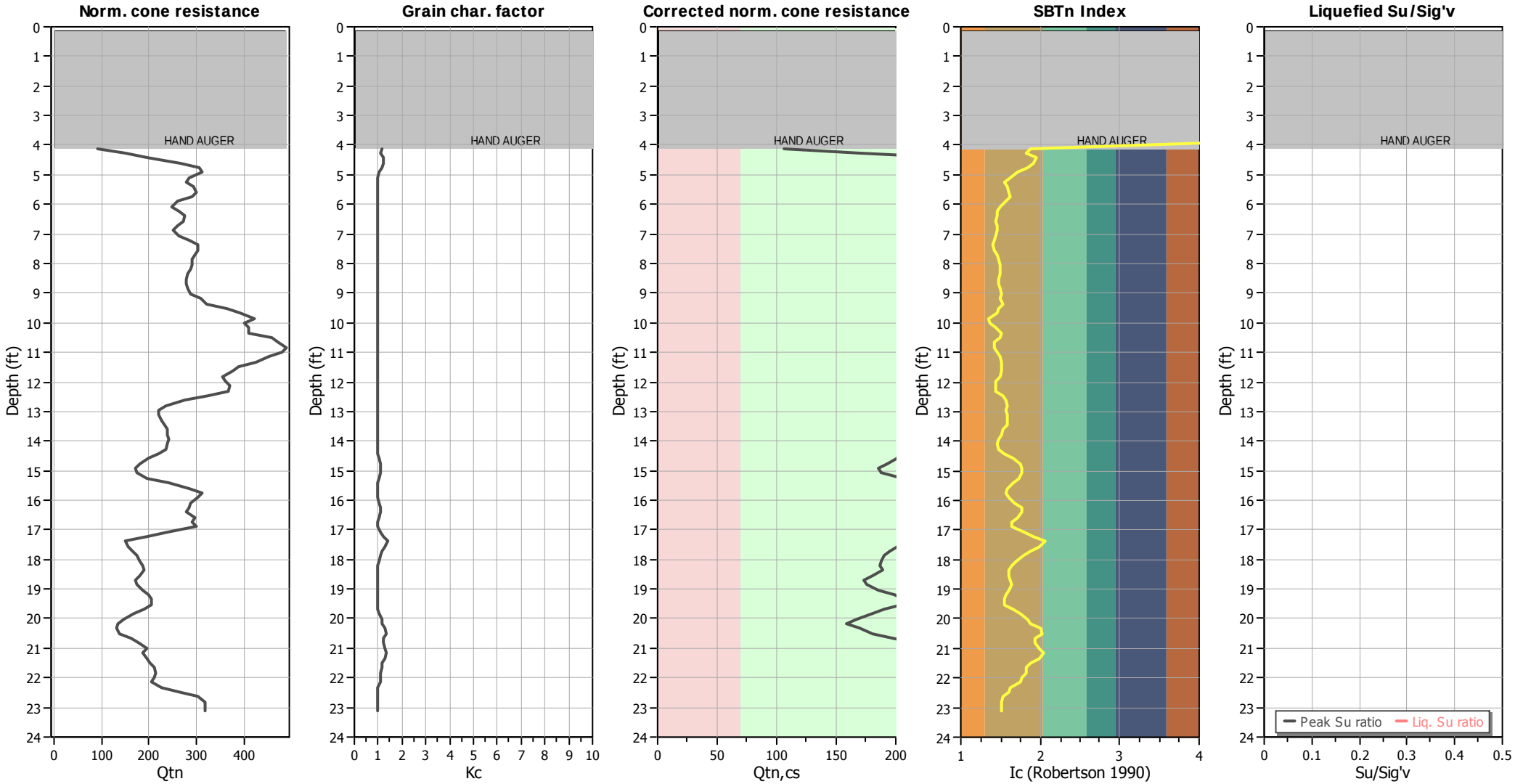
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

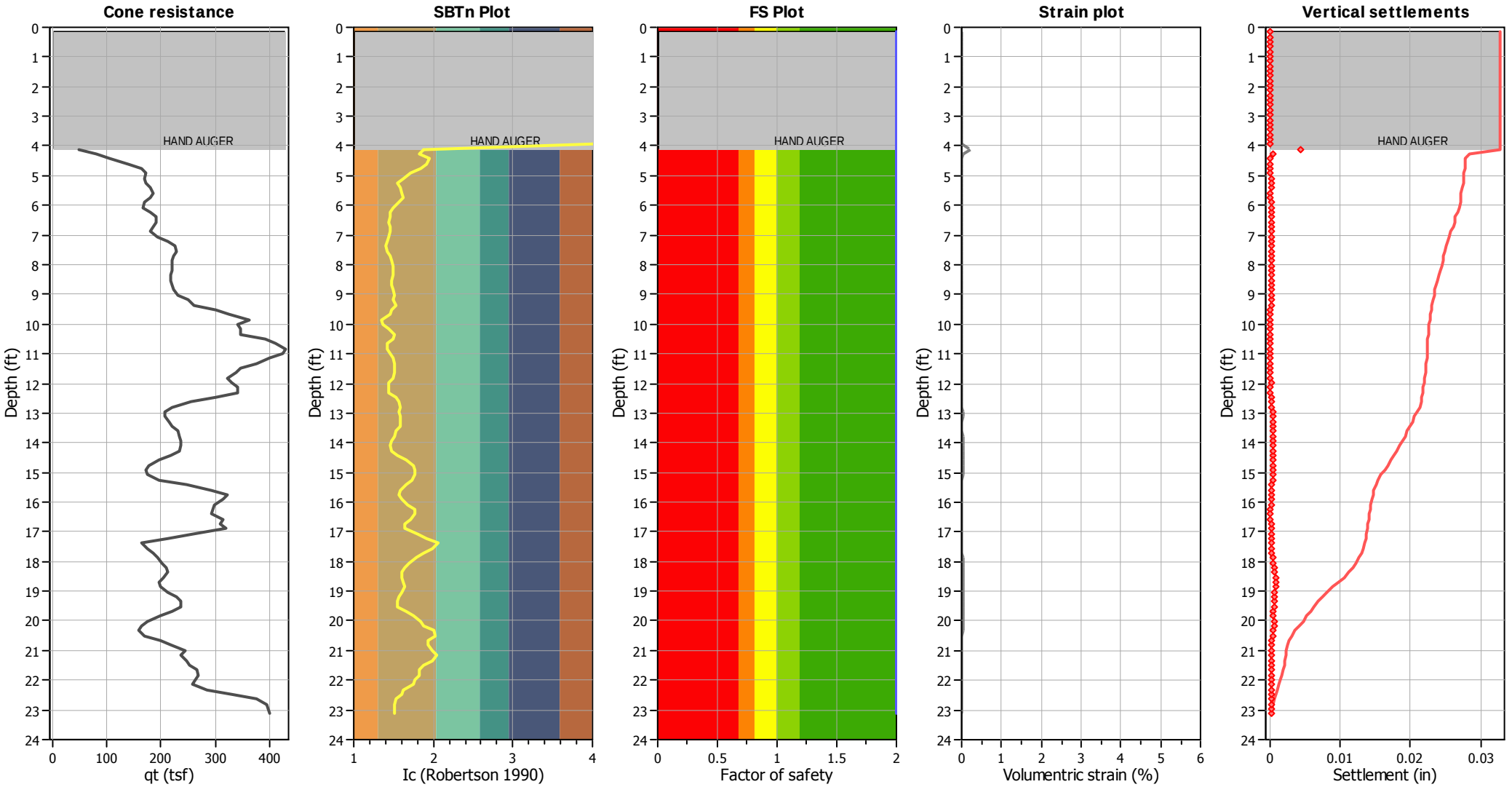
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement of dry sands ::

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
0.16	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.33	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.49	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.66	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.82	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.98	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.15	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.31	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.48	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.64	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.80	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.97	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.13	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.30	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.46	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.62	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.79	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.95	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.12	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.28	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.44	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.61	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.77	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.94	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.10	1.87	91.65	1.16	106.47	21	466	0.50	0.361	0.34	7.11	0.23	0.004
4.27	1.82	151.26	1.12	169.66	33	722	0.50	0.064	0.04	7.11	0.02	0.000
4.43	1.95	197.11	1.24	244.14	50	1107	0.50	0.024	0.01	7.11	0.01	0.000
4.59	1.91	265.17	1.20	318.13	64	1420	0.50	0.016	0.00	7.11	0.00	0.000
4.76	1.84	307.98	1.14	349.92	69	1505	0.50	0.015	0.00	7.11	0.00	0.000
4.92	1.71	313.20	1.05	327.64	61	1358	0.50	0.019	0.00	7.11	0.00	0.000
5.09	1.62	286.37	1.00	286.37	52	1174	0.50	0.026	0.01	7.11	0.01	0.000
5.25	1.55	277.86	1.00	277.86	49	1094	0.50	0.031	0.01	7.11	0.01	0.000
5.41	1.58	295.04	1.00	295.04	53	1211	0.50	0.027	0.01	7.11	0.01	0.000
5.58	1.61	300.90	1.00	300.90	54	1276	0.50	0.025	0.01	7.11	0.00	0.000
5.74	1.63	291.17	1.00	291.17	53	1277	0.50	0.026	0.01	7.11	0.01	0.000
5.91	1.56	261.82	1.00	261.82	47	1099	0.50	0.037	0.01	7.11	0.01	0.000
6.07	1.50	249.41	1.00	249.41	43	1001	0.50	0.049	0.02	7.11	0.01	0.000
6.23	1.46	262.78	1.00	262.78	45	1032	0.50	0.047	0.02	7.11	0.01	0.000
6.40	1.45	274.84	1.00	274.84	47	1084	0.50	0.043	0.02	7.11	0.01	0.000
6.56	1.44	271.28	1.00	271.28	47	1073	0.50	0.046	0.02	7.11	0.01	0.000
6.73	1.46	260.29	1.00	260.29	45	1052	0.50	0.051	0.02	7.11	0.01	0.000
6.89	1.47	252.39	1.00	252.39	44	1039	0.50	0.054	0.02	7.11	0.01	0.000
7.05	1.44	263.83	1.00	263.83	45	1075	0.50	0.052	0.02	7.11	0.01	0.000
7.22	1.42	284.49	1.00	284.49	48	1142	0.50	0.046	0.02	7.11	0.01	0.000
7.38	1.41	302.41	1.00	302.41	51	1214	0.50	0.042	0.01	7.11	0.01	0.000
7.55	1.42	301.90	1.00	301.90	51	1241	0.50	0.041	0.01	7.11	0.01	0.000
7.71	1.46	296.11	1.00	296.11	51	1266	0.50	0.041	0.01	7.11	0.01	0.000
7.87	1.48	291.85	1.00	291.85	51	1290	0.50	0.040	0.01	7.11	0.01	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
8.04	1.50	291.41	1.00	291.41	51	1320	0.50	0.040	0.01	7.11	0.01	0.000
8.20	1.49	286.87	1.00	286.87	50	1304	0.50	0.042	0.01	7.11	0.01	0.000
8.37	1.49	282.50	1.00	282.50	49	1293	0.50	0.044	0.01	7.11	0.01	0.000
8.53	1.48	277.54	1.00	277.54	48	1272	0.49	0.047	0.02	7.11	0.01	0.000
8.69	1.48	279.03	1.00	279.03	48	1288	0.49	0.047	0.02	7.11	0.01	0.000
8.86	1.49	281.58	1.00	281.58	49	1327	0.49	0.045	0.02	7.11	0.01	0.000
9.02	1.51	289.25	1.00	289.25	51	1391	0.49	0.042	0.01	7.11	0.01	0.000
9.19	1.50	310.20	1.00	310.20	54	1497	0.49	0.037	0.01	7.11	0.01	0.000
9.35	1.52	322.56	1.00	322.56	57	1602	0.49	0.034	0.01	7.11	0.01	0.000
9.51	1.47	365.74	1.00	365.74	63	1734	0.49	0.030	0.01	7.11	0.00	0.000
9.68	1.45	390.76	1.00	390.76	67	1828	0.49	0.028	0.01	7.11	0.00	0.000
9.84	1.35	423.96	1.00	423.96	71	1793	0.49	0.029	0.01	7.11	0.00	0.000
10.01	1.37	399.95	1.00	399.95	67	1750	0.49	0.031	0.01	7.11	0.00	0.000
10.17	1.45	409.74	1.00	409.74	70	1956	0.49	0.027	0.01	7.11	0.00	0.000
10.33	1.52	409.31	1.00	409.31	72	2123	0.49	0.024	0.01	7.11	0.00	0.000
10.50	1.49	458.69	1.00	458.69	80	2313	0.49	0.021	0.00	7.11	0.00	0.000
10.66	1.43	472.32	1.00	472.32	81	2249	0.49	0.023	0.00	7.11	0.00	0.000
10.83	1.42	490.35	1.00	490.35	84	2345	0.49	0.022	0.00	7.11	0.00	0.000
10.99	1.45	481.84	1.00	481.84	83	2398	0.49	0.021	0.00	7.11	0.00	0.000
11.15	1.49	454.10	1.00	454.10	79	2372	0.49	0.022	0.00	7.11	0.00	0.000
11.32	1.51	425.52	1.00	425.52	74	2277	0.49	0.024	0.00	7.11	0.00	0.000
11.48	1.52	390.72	1.00	390.72	69	2128	0.49	0.027	0.01	7.11	0.00	0.000
11.65	1.50	376.76	1.00	376.76	66	2037	0.49	0.030	0.01	7.11	0.00	0.000
11.81	1.49	355.91	1.00	355.91	62	1907	0.49	0.034	0.01	7.11	0.01	0.000
11.98	1.44	362.33	1.00	362.33	62	1836	0.49	0.037	0.01	7.11	0.01	0.000
12.14	1.44	370.29	1.00	370.29	63	1890	0.49	0.036	0.01	7.11	0.01	0.000
12.30	1.45	368.33	1.00	368.33	63	1912	0.49	0.036	0.01	7.11	0.01	0.000
12.47	1.53	325.88	1.00	325.88	57	1870	0.49	0.038	0.01	7.11	0.01	0.000
12.63	1.56	275.22	1.00	275.22	49	1646	0.49	0.050	0.02	7.11	0.01	0.000
12.80	1.58	235.52	1.00	235.52	42	1455	0.49	0.067	0.03	7.11	0.02	0.000
12.96	1.56	221.75	1.00	221.75	40	1353	0.49	0.082	0.04	7.11	0.02	0.000
13.12	1.58	219.31	1.00	219.31	39	1378	0.49	0.080	0.04	7.11	0.02	0.000
13.29	1.59	227.17	1.00	227.17	41	1444	0.49	0.073	0.03	7.11	0.02	0.000
13.45	1.58	232.21	1.00	232.21	42	1466	0.49	0.071	0.03	7.11	0.02	0.000
13.62	1.54	239.17	1.00	239.17	42	1446	0.49	0.075	0.03	7.11	0.02	0.000
13.78	1.51	239.97	1.00	239.97	42	1404	0.49	0.083	0.03	7.11	0.02	0.000
13.94	1.47	242.35	1.00	242.35	42	1370	0.49	0.090	0.04	7.11	0.02	0.000
14.11	1.45	240.13	1.00	240.13	41	1334	0.49	0.099	0.04	7.11	0.02	0.000
14.27	1.47	236.07	1.00	236.07	41	1352	0.49	0.097	0.04	7.11	0.02	0.000
14.44	1.56	220.23	1.00	220.23	39	1401	0.49	0.090	0.04	7.11	0.02	0.000
14.60	1.65	199.58	1.01	200.90	37	1437	0.49	0.086	0.04	7.11	0.02	0.000
14.76	1.75	180.24	1.07	192.62	37	1459	0.49	0.084	0.04	7.11	0.02	0.000
14.93	1.77	171.73	1.08	185.87	35	1433	0.49	0.090	0.05	7.11	0.02	0.000
15.09	1.76	173.78	1.08	187.95	36	1457	0.49	0.087	0.04	7.11	0.02	0.000
15.26	1.73	195.60	1.06	206.59	39	1576	0.49	0.073	0.03	7.11	0.02	0.000
15.42	1.65	242.21	1.00	243.31	45	1789	0.49	0.056	0.02	7.11	0.01	0.000
15.58	1.58	285.31	1.00	285.31	51	1932	0.49	0.049	0.02	7.11	0.01	0.000
15.75	1.56	311.90	1.00	311.90	56	2081	0.49	0.043	0.01	7.11	0.01	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
15.91	1.60	304.27	1.00	304.27	55	2141	0.49	0.042	0.01	7.11	0.01	0.000
16.08	1.68	287.61	1.03	295.12	55	2260	0.49	0.038	0.01	7.11	0.01	0.000
16.24	1.77	284.12	1.09	308.79	59	2512	0.49	0.033	0.01	7.11	0.00	0.000
16.40	1.77	277.99	1.09	302.08	58	2473	0.49	0.034	0.01	7.11	0.00	0.000
16.57	1.71	296.49	1.04	309.40	58	2449	0.49	0.035	0.01	7.11	0.01	0.000
16.73	1.63	291.52	1.00	291.52	53	2196	0.49	0.043	0.01	7.11	0.01	0.000
16.90	1.65	299.78	1.00	300.57	55	2322	0.49	0.039	0.01	7.11	0.01	0.000
17.06	1.81	240.00	1.11	267.20	52	2293	0.49	0.041	0.01	7.11	0.01	0.000
17.22	1.92	196.21	1.21	237.47	48	2179	0.49	0.045	0.02	7.11	0.01	0.000
17.39	2.06	148.98	1.39	206.39	44	1985	0.49	0.055	0.02	7.11	0.01	0.000
17.55	1.98	157.67	1.27	200.84	41	1908	0.49	0.060	0.02	7.11	0.01	0.000
17.72	1.88	166.78	1.17	195.52	39	1792	0.48	0.070	0.03	7.11	0.02	0.000
17.88	1.79	173.25	1.10	190.30	37	1659	0.48	0.084	0.04	7.11	0.02	0.000
18.04	1.70	181.68	1.03	187.95	35	1549	0.48	0.102	0.05	7.11	0.03	0.001
18.21	1.64	186.82	1.00	186.82	34	1488	0.48	0.115	0.06	7.11	0.03	0.001
18.37	1.60	188.69	1.00	188.69	34	1439	0.48	0.129	0.07	7.11	0.03	0.001
18.54	1.60	181.06	1.00	181.06	33	1392	0.48	0.144	0.08	7.11	0.04	0.001
18.70	1.63	172.71	1.00	172.71	31	1378	0.48	0.151	0.09	7.11	0.04	0.001
18.86	1.63	175.47	1.00	175.47	32	1410	0.48	0.143	0.08	7.11	0.04	0.001
19.03	1.60	185.57	1.00	185.57	34	1444	0.48	0.135	0.07	7.11	0.04	0.001
19.19	1.58	198.57	1.00	198.57	36	1495	0.48	0.124	0.06	7.11	0.03	0.001
19.36	1.55	206.46	1.00	206.46	37	1512	0.48	0.122	0.06	7.11	0.03	0.001
19.52	1.55	205.36	1.00	205.36	36	1506	0.48	0.125	0.06	7.11	0.03	0.001
19.69	1.65	189.82	1.00	190.63	35	1603	0.48	0.107	0.05	7.11	0.03	0.001
19.85	1.74	169.53	1.07	180.78	34	1623	0.48	0.105	0.06	7.11	0.03	0.001
20.01	1.85	145.64	1.14	166.71	33	1617	0.48	0.108	0.06	7.11	0.03	0.001
20.18	1.88	135.08	1.17	157.96	31	1568	0.48	0.119	0.07	7.11	0.03	0.001
20.34	2.00	130.31	1.30	169.80	35	1795	0.48	0.085	0.04	7.11	0.02	0.000
20.51	2.02	136.59	1.32	180.76	38	1932	0.48	0.073	0.03	7.11	0.02	0.000
20.67	1.94	161.19	1.22	197.24	40	2051	0.48	0.065	0.03	7.11	0.01	0.000
20.83	1.93	176.46	1.22	214.54	43	2235	0.48	0.056	0.02	7.11	0.01	0.000
21.00	1.98	195.44	1.27	248.98	51	2671	0.48	0.041	0.01	7.11	0.01	0.000
21.16	2.04	188.21	1.35	254.81	54	2804	0.48	0.038	0.01	7.11	0.01	0.000
21.33	1.99	195.67	1.29	252.08	52	2748	0.48	0.040	0.01	7.11	0.01	0.000
21.49	1.88	202.05	1.17	237.27	47	2466	0.48	0.049	0.02	7.11	0.01	0.000
21.65	1.83	212.61	1.13	240.03	47	2421	0.48	0.051	0.02	7.11	0.01	0.000
21.82	1.83	213.30	1.13	240.49	47	2435	0.48	0.051	0.02	7.11	0.01	0.000
21.98	1.76	210.55	1.08	226.99	43	2199	0.48	0.062	0.02	7.11	0.01	0.000
22.15	1.75	205.05	1.07	219.66	42	2122	0.48	0.068	0.03	7.11	0.01	0.000
22.31	1.62	227.88	1.00	227.88	41	1985	0.48	0.079	0.03	7.11	0.01	0.000
22.47	1.60	264.04	1.00	264.04	48	2249	0.48	0.061	0.02	7.11	0.01	0.000
22.64	1.53	302.84	1.00	302.84	53	2329	0.48	0.058	0.02	7.11	0.01	0.000
22.80	1.51	317.65	1.00	317.65	56	2386	0.48	0.056	0.02	7.11	0.01	0.000
22.97	1.51	317.98	1.00	317.98	56	2419	0.48	0.055	0.02	7.11	0.01	0.000
23.13	1.51	320.04	1.00	320.04	56	2441	0.48	0.055	0.02	7.11	0.01	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)

Total estimated settlement: 0.03

Abbreviations

Q_{tn}: Equivalent clean sand normalized cone resistance
K_c: Fines correction factor
$Q_{tn,cs}$: Post-liquefaction volumentric strain
G_{max}: Small strain shear modulus
CSR: Soil cyclic stress ratio
γ: Cyclic shear strain
$e_{vol(15)}$: Volumetric strain after 15 cycles
N_c: Equivalent number of cycles
e_v: Volumetric strain
Settle.: Calculated settlement

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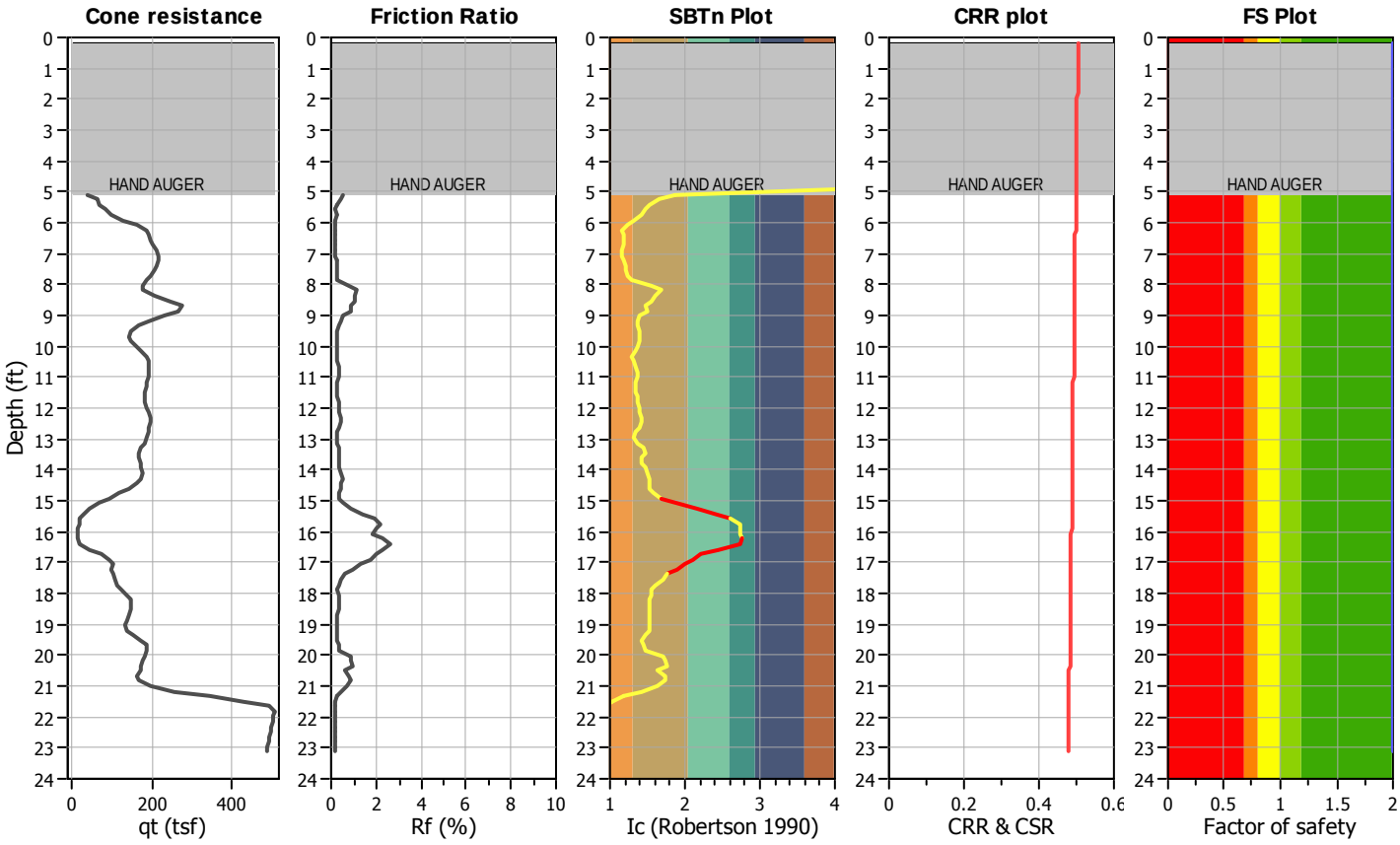
LIQUEFACTION ANALYSIS REPORT

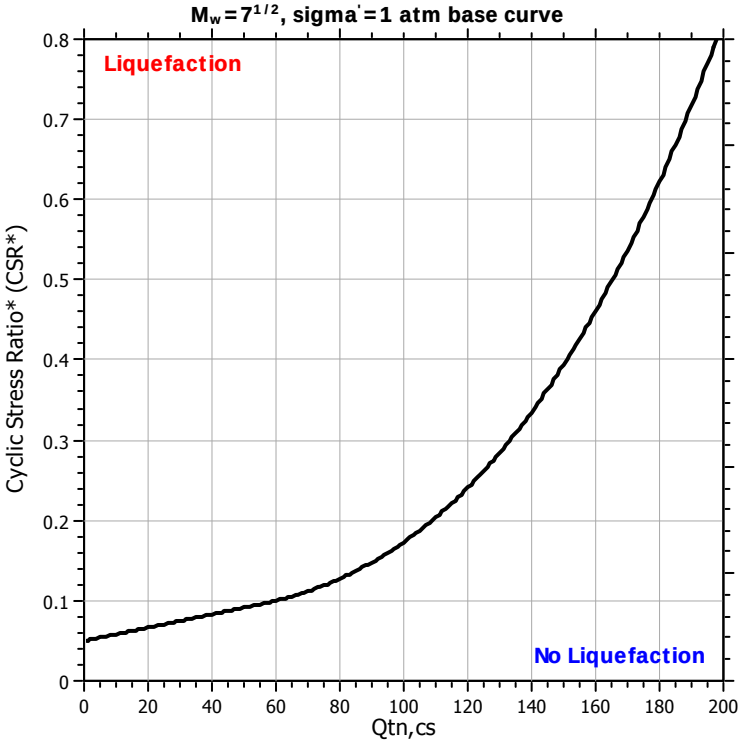
Project title : 19-433, Western Realco **Location : 1375 Magnolia Avenue, Corona, CA**

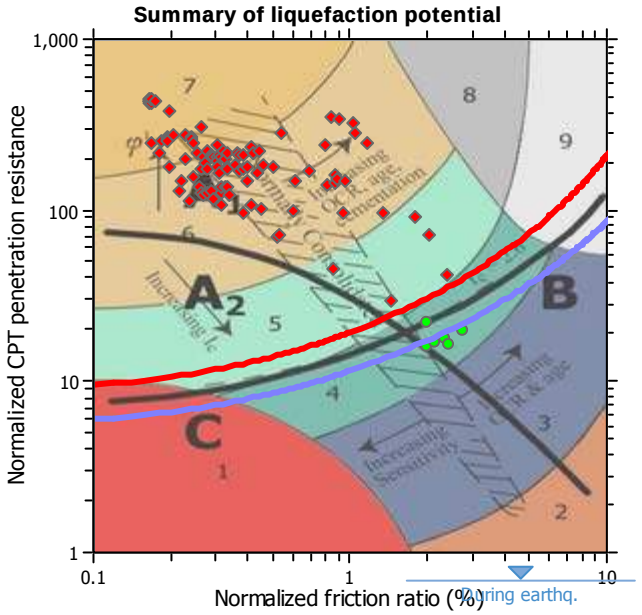
CPT file : CPT-5

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	45.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	45.00 ft	Fill height:	N/A		
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth applied:	No
Earthquake magnitude M_w:	6.47	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	Limit depth:	N/A
Peak ground acceleration:	0.87	Unit weight calculation:	Based on SBT	K_σ applied:	No	MSF method:	Method based

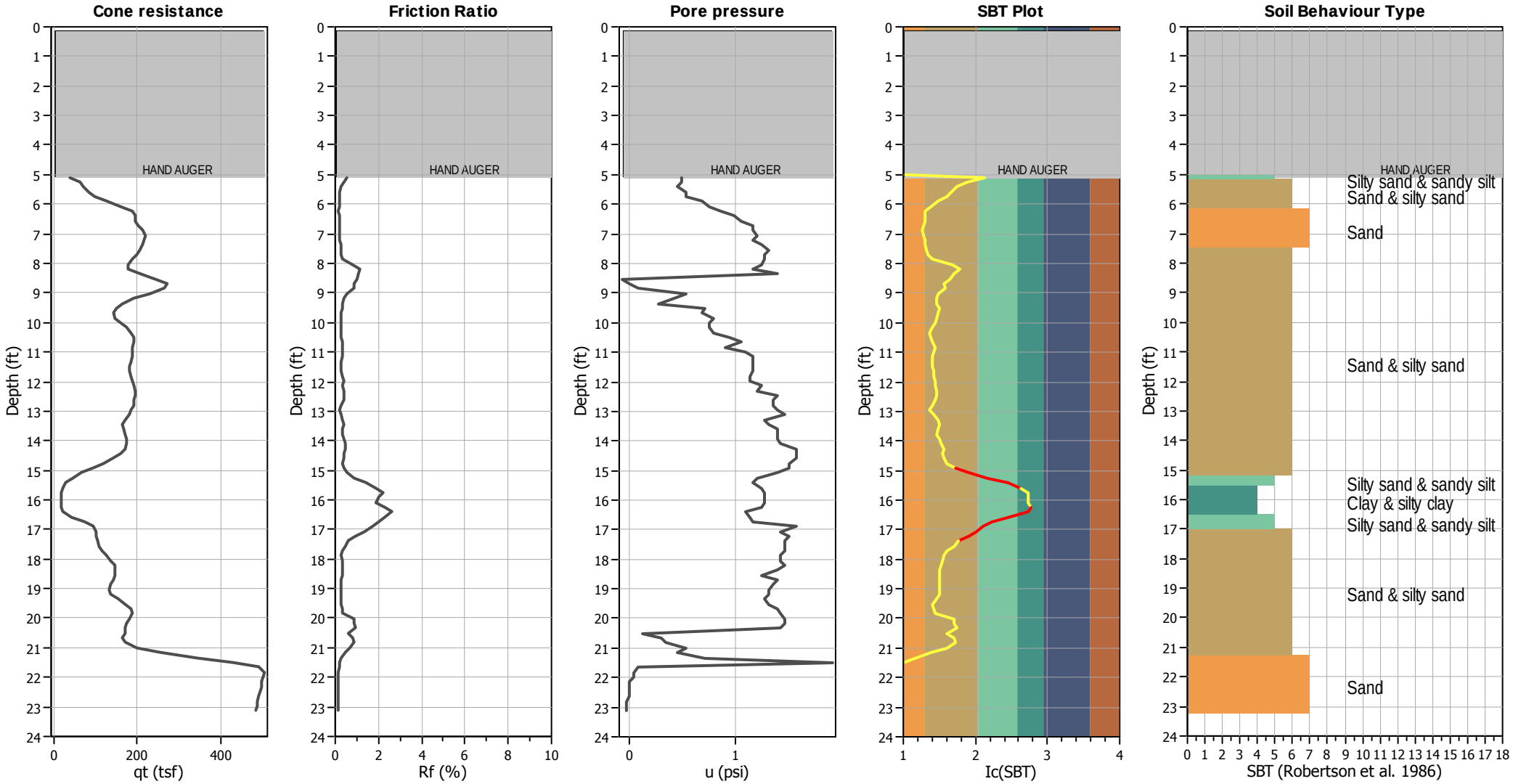






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and strength loss possible depending on soil plasticity, brittleness/sensitivity, strain to peak undrained strength and ground geometry

CPT basic interpretation plots



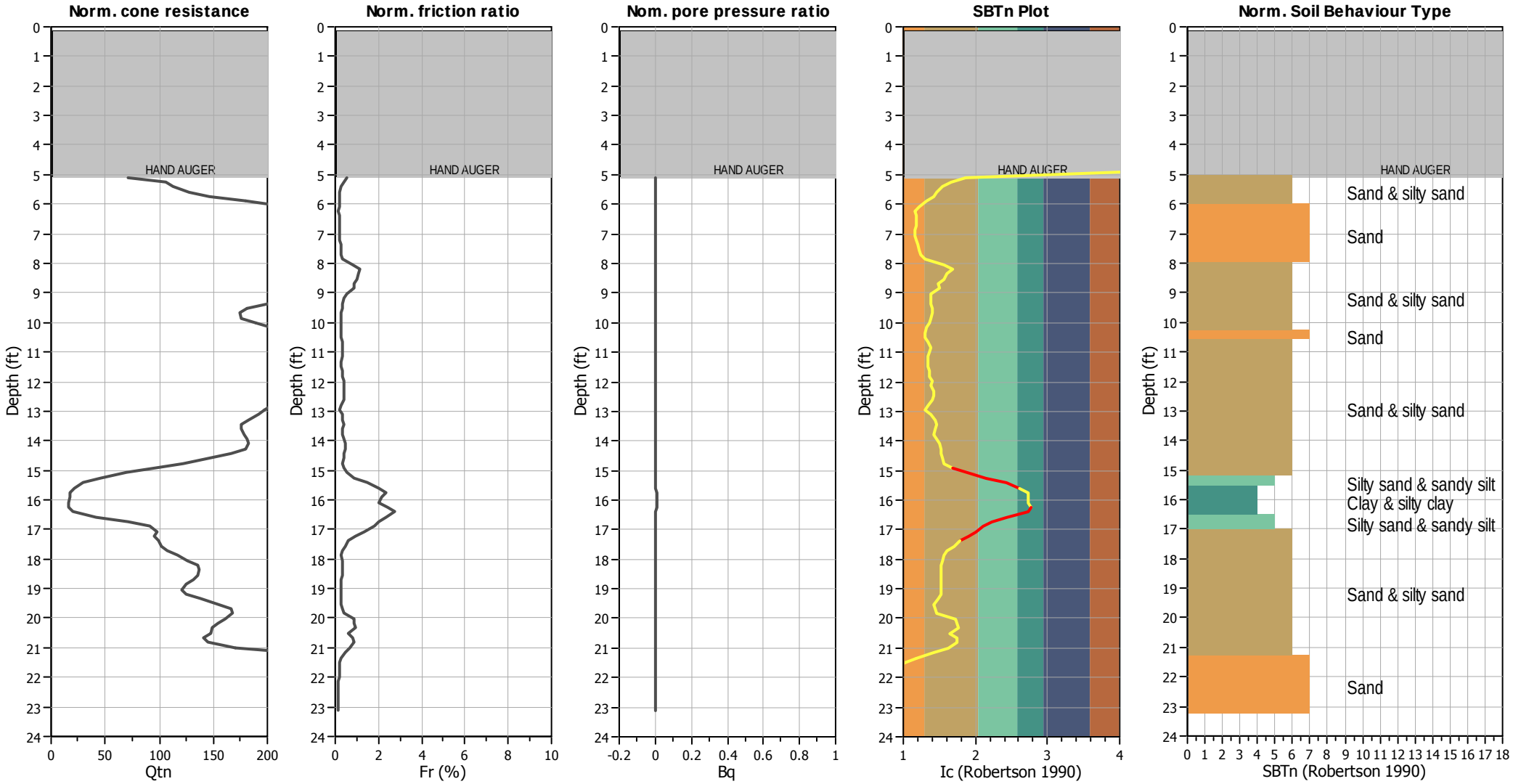
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

CPT basic interpretation plots (normalized)



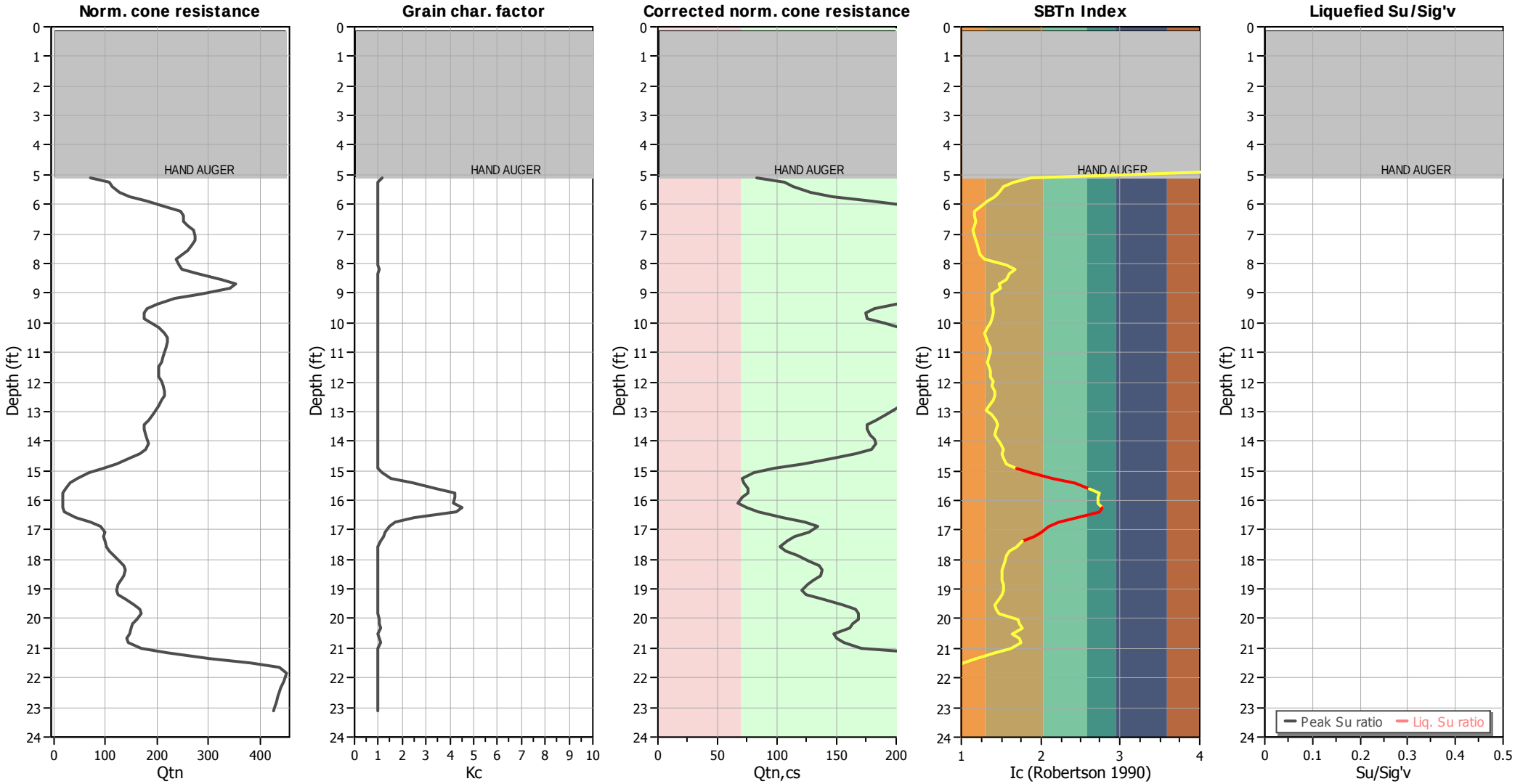
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to
9. Very stiff fine grained

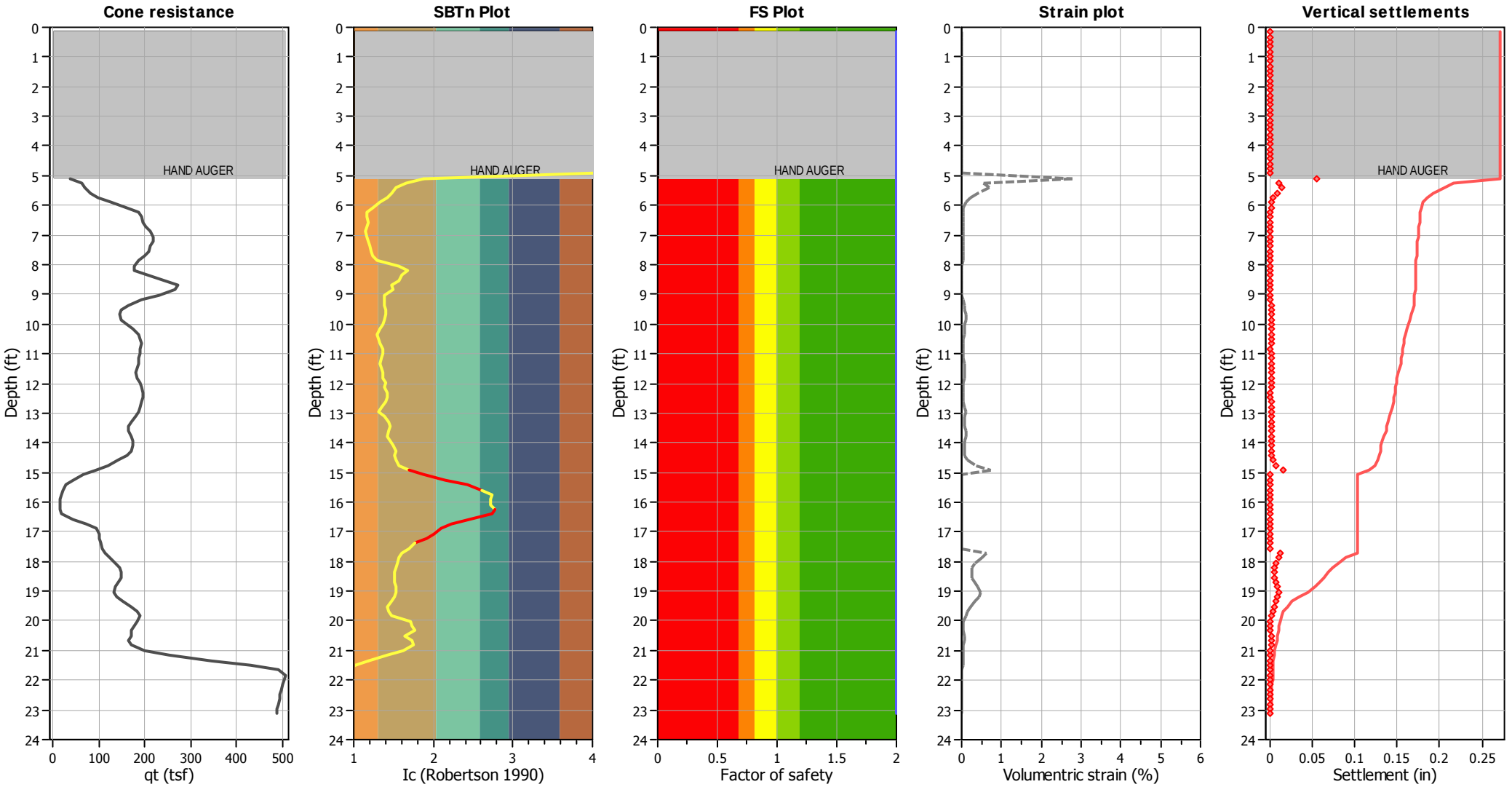
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	45.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	3	Transition detect. applied:	Yes
Points to test:	Based on Ic value	Ic cut-off value:	2.60	K_σ applied:	No
Earthquake magnitude M_w:	6.47	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.87	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	45.00 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements



Abbreviations

q_t:	Total cone resistance (cone resistance q_c corrected for pore water effects)
I_c:	Soil Behaviour Type Index
FS:	Calculated Factor of Safety against liquefaction
Volumentric strain:	Post-liquefaction volumentric strain

:: Post-earthquake settlement of dry sands ::

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
0.16	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.33	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.49	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.66	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.82	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
0.98	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.15	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.31	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.48	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.64	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.80	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
1.97	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.13	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.30	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.46	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.62	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.79	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
2.95	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.12	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.28	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.44	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.61	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.77	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
3.94	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.10	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.27	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.43	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.59	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.76	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
4.92	4.06	-1.00	26.61	-26.61	0	0	0.50	0.000	0.00	0.00	0.00	0.000
5.09	1.87	71.08	1.16	82.69	16	362	0.50	3.356	4.26	7.11	2.78	0.055
5.25	1.67	106.44	1.00	106.44	20	457	0.50	0.800	0.82	7.11	0.53	0.010
5.41	1.54	113.08	1.00	113.08	20	443	0.50	1.052	1.05	7.11	0.68	0.013
5.58	1.47	127.96	1.00	127.96	22	481	0.50	0.699	0.62	7.11	0.40	0.008
5.74	1.42	146.50	1.00	146.50	25	533	0.50	0.428	0.33	7.11	0.21	0.004
5.91	1.32	179.87	1.00	179.87	30	607	0.50	0.243	0.15	7.11	0.10	0.002
6.07	1.23	217.79	1.00	217.79	35	687	0.50	0.153	0.08	7.11	0.05	0.001
6.23	1.17	246.18	1.00	246.18	39	740	0.50	0.122	0.05	7.11	0.04	0.001
6.40	1.17	252.42	1.00	252.42	40	770	0.50	0.111	0.05	7.11	0.03	0.001
6.56	1.18	252.83	1.00	252.83	40	783	0.50	0.110	0.05	7.11	0.03	0.001
6.73	1.17	259.22	1.00	259.22	41	801	0.50	0.106	0.05	7.11	0.03	0.001
6.89	1.16	270.06	1.00	270.06	42	828	0.50	0.100	0.04	7.11	0.03	0.001
7.05	1.16	275.27	1.00	275.27	43	854	0.50	0.094	0.04	7.11	0.02	0.000
7.22	1.18	273.63	1.00	273.63	43	873	0.50	0.092	0.04	7.11	0.02	0.000
7.38	1.20	268.50	1.00	268.50	43	876	0.50	0.094	0.04	7.11	0.02	0.000
7.55	1.21	260.81	1.00	260.81	42	867	0.50	0.102	0.04	7.11	0.03	0.001
7.71	1.24	249.55	1.00	249.55	40	853	0.50	0.113	0.05	7.11	0.03	0.001
7.87	1.30	238.11	1.00	238.11	39	870	0.50	0.110	0.05	7.11	0.03	0.001

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
8.04	1.56	242.41	1.00	242.41	43	1151	0.50	0.051	0.02	7.11	0.01	0.000
8.20	1.68	248.78	1.02	254.44	47	1333	0.50	0.038	0.01	7.11	0.01	0.000
8.37	1.61	279.63	1.00	279.63	51	1416	0.50	0.034	0.01	7.11	0.01	0.000
8.53	1.56	325.45	1.00	325.45	58	1582	0.49	0.029	0.01	7.11	0.00	0.000
8.69	1.47	351.92	1.00	351.92	61	1587	0.49	0.029	0.01	7.11	0.00	0.000
8.86	1.50	341.32	1.00	341.32	60	1599	0.49	0.030	0.01	7.11	0.00	0.000
9.02	1.39	285.23	1.00	285.23	48	1205	0.49	0.056	0.02	7.11	0.01	0.000
9.19	1.38	235.67	1.00	235.67	40	988	0.49	0.100	0.04	7.11	0.03	0.001
9.35	1.38	200.54	1.00	200.54	34	847	0.49	0.176	0.09	7.11	0.06	0.001
9.51	1.40	181.39	1.00	181.39	31	789	0.49	0.242	0.14	7.11	0.09	0.002
9.68	1.40	174.42	1.00	174.42	29	761	0.49	0.293	0.18	7.11	0.11	0.002
9.84	1.38	175.76	1.00	175.76	30	761	0.49	0.306	0.19	7.11	0.11	0.002
10.01	1.36	189.65	1.00	189.65	32	807	0.49	0.247	0.14	7.11	0.08	0.002
10.17	1.33	202.53	1.00	202.53	34	840	0.49	0.217	0.12	7.11	0.07	0.001
10.33	1.30	214.75	1.00	214.75	35	864	0.49	0.201	0.10	7.11	0.06	0.001
10.50	1.31	219.75	1.00	219.75	36	901	0.49	0.177	0.09	7.11	0.05	0.001
10.66	1.34	221.72	1.00	221.72	37	941	0.49	0.156	0.08	7.11	0.04	0.001
10.83	1.37	218.39	1.00	218.39	37	970	0.49	0.145	0.07	7.11	0.04	0.001
10.99	1.36	216.01	1.00	216.01	36	949	0.49	0.161	0.08	7.11	0.05	0.001
11.15	1.35	211.48	1.00	211.48	35	922	0.49	0.185	0.09	7.11	0.05	0.001
11.32	1.34	207.81	1.00	207.81	34	901	0.49	0.208	0.11	7.11	0.06	0.001
11.48	1.35	203.74	1.00	203.74	34	899	0.49	0.216	0.11	7.11	0.07	0.001
11.65	1.36	202.59	1.00	202.59	34	911	0.49	0.212	0.11	7.11	0.06	0.001
11.81	1.36	204.37	1.00	204.37	34	930	0.49	0.202	0.11	7.11	0.06	0.001
11.98	1.39	209.05	1.00	209.05	35	989	0.49	0.166	0.08	7.11	0.05	0.001
12.14	1.39	212.47	1.00	212.47	36	1003	0.49	0.162	0.08	7.11	0.05	0.001
12.30	1.41	215.05	1.00	215.05	37	1052	0.49	0.142	0.07	7.11	0.04	0.001
12.47	1.42	214.95	1.00	214.95	37	1059	0.49	0.142	0.07	7.11	0.04	0.001
12.63	1.40	208.90	1.00	208.90	35	1018	0.49	0.167	0.08	7.11	0.05	0.001
12.80	1.35	204.07	1.00	204.07	34	941	0.49	0.230	0.12	7.11	0.07	0.001
12.96	1.31	197.06	1.00	197.06	32	874	0.49	0.319	0.18	7.11	0.10	0.002
13.12	1.38	191.63	1.00	191.63	32	925	0.49	0.260	0.15	7.11	0.08	0.002
13.29	1.44	182.86	1.00	182.86	31	947	0.49	0.244	0.14	7.11	0.08	0.002
13.45	1.46	175.61	1.00	175.61	30	945	0.49	0.252	0.15	7.11	0.08	0.002
13.62	1.43	175.17	1.00	175.17	30	913	0.49	0.297	0.18	7.11	0.10	0.002
13.78	1.43	177.85	1.00	177.85	30	925	0.49	0.289	0.18	7.11	0.10	0.002
13.94	1.46	181.17	1.00	181.17	31	987	0.49	0.230	0.13	7.11	0.07	0.001
14.11	1.50	182.87	1.00	182.87	32	1043	0.49	0.192	0.11	7.11	0.06	0.001
14.27	1.52	179.29	1.00	179.29	32	1063	0.49	0.184	0.11	7.11	0.06	0.001
14.44	1.52	166.43	1.00	166.43	29	982	0.49	0.254	0.16	7.11	0.09	0.002
14.60	1.54	147.33	1.00	147.33	26	897	0.49	0.378	0.28	7.11	0.15	0.003
14.76	1.57	121.99	1.00	121.99	22	778	0.49	0.761	0.69	7.11	0.37	0.007
14.93	1.69	96.97	1.00	96.97	18	714	0.49	1.238	1.40	7.11	0.75	0.015
15.09	1.88	69.13	1.17	80.94	0	0	0.49	0.000	0.00	0.00	0.00	0.000
15.26	2.15	45.94	1.55	71.00	0	0	0.49	0.000	0.00	0.00	0.00	0.000
15.42	2.43	29.77	2.43	72.26	0	0	0.49	0.000	0.00	0.00	0.00	0.000
15.58	2.61	22.05	3.40	75.01	0	0	0.49	0.000	0.00	0.00	0.00	0.000
15.75	2.73	17.89	4.22	75.50	0	0	0.49	0.000	0.00	0.00	0.00	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)
15.91	2.73	16.90	4.19	70.87	0	0	0.49	0.000	0.00	0.00	0.00	0.000
16.08	2.72	16.14	4.18	67.40	0	0	0.49	0.000	0.00	0.00	0.00	0.000
16.24	2.77	16.47	4.51	74.24	0	0	0.49	0.000	0.00	0.00	0.00	0.000
16.40	2.74	19.64	4.27	83.78	0	0	0.49	0.000	0.00	0.00	0.00	0.000
16.57	2.44	42.13	2.48	104.39	0	0	0.49	0.000	0.00	0.00	0.00	0.000
16.73	2.22	71.52	1.72	123.10	0	0	0.49	0.000	0.00	0.00	0.00	0.000
16.90	2.11	91.63	1.47	134.37	0	0	0.49	0.000	0.00	0.00	0.00	0.000
17.06	2.00	97.57	1.30	127.26	0	0	0.49	0.000	0.00	0.00	0.00	0.000
17.22	1.91	95.76	1.19	114.38	0	0	0.49	0.000	0.00	0.00	0.00	0.000
17.39	1.78	99.92	1.09	108.84	0	0	0.49	0.000	0.00	0.00	0.00	0.000
17.55	1.70	102.16	1.00	102.16	0	0	0.49	0.000	0.00	0.00	0.00	0.000
17.72	1.61	107.27	1.00	107.27	19	780	0.48	1.204	1.25	7.11	0.62	0.012
17.88	1.56	116.51	1.00	116.51	21	804	0.48	1.047	1.00	7.11	0.50	0.010
18.04	1.55	126.25	1.00	126.25	22	856	0.48	0.779	0.68	7.11	0.34	0.007
18.21	1.53	135.07	1.00	135.07	24	904	0.48	0.612	0.50	7.11	0.25	0.005
18.37	1.52	137.22	1.00	137.22	24	909	0.48	0.607	0.49	7.11	0.24	0.005
18.54	1.52	136.11	1.00	136.11	24	902	0.48	0.644	0.52	7.11	0.26	0.005
18.70	1.51	131.02	1.00	131.02	23	868	0.48	0.796	0.67	7.11	0.33	0.006
18.86	1.53	125.18	1.00	125.18	22	845	0.48	0.929	0.83	7.11	0.40	0.008
19.03	1.53	121.31	1.00	121.31	21	825	0.48	1.075	0.99	7.11	0.48	0.009
19.19	1.52	124.62	1.00	124.62	22	839	0.48	1.006	0.90	7.11	0.44	0.009
19.36	1.47	137.76	1.00	137.76	24	880	0.48	0.806	0.65	7.11	0.31	0.006
19.52	1.42	154.45	1.00	154.45	26	924	0.48	0.650	0.47	7.11	0.22	0.004
19.69	1.44	166.00	1.00	166.00	28	1021	0.48	0.423	0.28	7.11	0.13	0.003
19.85	1.47	168.39	1.00	168.39	29	1087	0.48	0.333	0.21	7.11	0.10	0.002
20.01	1.72	160.66	1.05	168.80	32	1438	0.48	0.130	0.08	7.11	0.04	0.001
20.18	1.73	153.74	1.06	163.18	31	1412	0.48	0.140	0.08	7.11	0.04	0.001
20.34	1.77	148.63	1.08	161.13	31	1434	0.48	0.136	0.08	7.11	0.04	0.001
20.51	1.64	147.85	1.00	147.53	27	1214	0.48	0.236	0.16	7.11	0.08	0.002
20.67	1.74	140.94	1.06	149.84	28	1318	0.48	0.181	0.12	7.11	0.06	0.001
20.83	1.75	145.30	1.07	155.56	30	1386	0.48	0.157	0.10	7.11	0.05	0.001
21.00	1.63	170.40	1.00	170.40	31	1392	0.48	0.157	0.09	7.11	0.04	0.001
21.16	1.42	220.88	1.00	220.88	38	1375	0.48	0.166	0.08	7.11	0.04	0.001
21.33	1.18	303.61	1.00	303.61	48	1370	0.48	0.170	0.06	7.11	0.03	0.001
21.49	1.03	382.39	1.00	382.39	58	1413	0.48	0.157	0.04	7.11	0.02	0.000
21.65	0.95	438.63	1.00	438.63	65	1462	0.48	0.144	0.03	7.11	0.02	0.000
21.82	0.93	452.01	1.00	452.01	67	1472	0.48	0.143	0.03	7.11	0.02	0.000
21.98	0.93	448.12	1.00	448.12	66	1469	0.48	0.146	0.03	7.11	0.02	0.000
22.15	0.93	445.09	1.00	445.09	66	1463	0.48	0.149	0.04	7.11	0.02	0.000
22.31	0.93	441.43	1.00	441.43	65	1458	0.48	0.153	0.04	7.11	0.02	0.000
22.47	0.94	437.59	1.00	437.59	65	1454	0.48	0.156	0.04	7.11	0.02	0.000
22.64	0.94	434.29	1.00	434.29	64	1450	0.48	0.160	0.04	7.11	0.02	0.000
22.80	0.94	431.28	1.00	431.28	64	1450	0.48	0.162	0.04	7.11	0.02	0.000
22.97	0.95	428.38	1.00	428.38	63	1452	0.48	0.164	0.04	7.11	0.02	0.000
23.13	0.95	426.36	1.00	426.36	63	1455	0.48	0.165	0.04	7.11	0.02	0.000

:: Post-earthquake settlement of dry sands :: (continued)

Depth (ft)	Ic	Q_{tn}	Kc	$Q_{tn,cs}$	$N_{1,60}$ (blows)	G_{max} (tsf)	CSR	Shear, γ (%)	$e_{vol(15)}$ (%)	N_c	e_v (%)	Settle. (in)

Total estimated settlement: 0.27

Abbreviations

Q_{tn}: Equivalent clean sand normalized cone resistance
K_c: Fines correction factor
$Q_{tn,cs}$: Post-liquefaction volumentric strain
G_{max}: Small strain shear modulus
CSR: Soil cyclic stress ratio
γ: Cyclic shear strain
$e_{vol(15)}$: Volumetric strain after 15 cycles
N_c: Equivalent number of cycles
e_v: Volumetric strain
Settle.: Calculated settlement

APPENDIX D

STANDARD GRADING SPECIFICATIONS

STANDARD GRADING SPECIFICATIONS

These specifications present the usual and minimum requirements for projects on which Petra Geosciences, Inc. (Petra) is the geotechnical consultant. No deviation from these specifications will be allowed, except where specifically superseded in the preliminary geology and soils report, or in other written communication signed by the Soils Engineer and Engineering Geologist of record (Geotechnical Consultant).

I. GENERAL

A. The Geotechnical Consultant is the Owner's or Builder's representative on the project. For the purpose of these specifications, participation by the Geotechnical Consultant includes that observation performed by any person or persons employed by, and responsible to, the licensed Soils Engineer and Engineering Geologist signing the soils report.

B. The contractor should prepare and submit to the Owner and Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" and the estimated quantities of daily earthwork to be performed prior to the commencement of grading. This work plan should be reviewed by the Geotechnical Consultant to schedule personnel to perform the appropriate level of observation, mapping, and compaction testing as necessary.

C. All clearing, site preparation, or earthwork performed on the project shall be conducted by the Contractor in accordance with the recommendations presented in the geotechnical report and under the observation of the Geotechnical Consultant.

D. It is the Contractor's responsibility to prepare the ground surface to receive the fills to the satisfaction of the Geotechnical Consultant and to place, spread, mix, water, and compact the fill in accordance with the specifications of the Geotechnical Consultant. The Contractor shall also remove all material considered unsatisfactory by the Geotechnical Consultant.

E. It is the Contractor's responsibility to have suitable and sufficient compaction equipment on the job site to handle the amount of fill being placed. If necessary, excavation equipment will be shut down to permit completion of compaction to project specifications. Sufficient watering apparatus will also be provided by the Contractor, with due consideration for the fill material, rate of placement, and time of year.

F. After completion of grading a report will be submitted by the Geotechnical Consultant.

II. SITE PREPARATION

A. Clearing and Grubbing

1. All vegetation such as trees, brush, grass, roots, and deleterious material shall be disposed of offsite. This removal shall be concluded prior to placing fill.

2. Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipe lines, etc., are to be removed or treated in a manner prescribed by the Geotechnical Consultant.

III. FILL AREA PREPARATION

A. Remedial Removals/Overexcavations

1. Remedial removals, as well as overexcavation for remedial purposes, shall be evaluated by the Geotechnical Consultant. Remedial removal depths presented in the geotechnical report and shown on the geotechnical plans are estimates only. The actual extent of removal should be determined by the Geotechnical Consultant based on the conditions exposed during grading. All soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as determined by the Geotechnical Consultant.

2. Soil, alluvium, or bedrock materials determined by the Soils Engineer as being unsuitable for placement in compacted fills shall be removed from the site. Any material incorporated as a part of a compacted fill must be approved by the Geotechnical Consultant.

3. Should potentially hazardous materials be encountered, the Contractor should stop work in the affected area. An environmental consultant specializing in hazardous materials should be notified immediately for evaluation and handling of these materials prior to continuing work in the affected area.

B. Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide sufficient survey control for determining locations and elevations of processed areas, keys, and benches.

C. Processing

After the ground surface to receive fill has been declared satisfactory for support of fill by the Geotechnical Consultant, it shall be scarified to a minimum depth of 6 inches and until the ground surface is uniform and free from ruts, hollows, hummocks, or other uneven features which may prevent uniform compaction.

The scarified ground surface shall then be brought to optimum moisture, mixed as required, and compacted to a minimum relative compaction of 90 percent.

D. Subdrains

Subdrainage devices shall be constructed in compliance with the ordinances of the controlling governmental agency, and/or with the recommendations of the Geotechnical Consultant. (Typical Canyon Subdrain details are given on Plate SG-1).

E. Cut/Fill & Deep Fill/Shallow Fill Transitions

In order to provide uniform bearing conditions in cut/fill and deep fill/shallow fill transition lots, the cut and shallow fill portions of the lot should be overexcavated to the depths and the horizontal limits discussed in the approved geotechnical report and replaced with compacted fill. (Typical details are given on Plate SG-7.)

IV. COMPACTED FILL MATERIAL

A. General

Materials excavated on the property may be utilized in the fill, provided each material has been determined to be suitable by the Geotechnical Consultant. Material to be used for fill shall be essentially free of organic material and other deleterious substances. Roots, tree branches, and other matter missed during clearing shall be removed from the fill as recommended by the Geotechnical Consultant. Material that is spongy, subject to decay, or otherwise considered unsuitable shall not be used in the compacted fill.

Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

B. Oversize Materials

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 12 inches in diameter, shall be taken offsite or placed in accordance with the recommendations of the Geotechnical Consultant in areas designated as suitable for rock disposal (Typical details for Rock Disposal are given on Plate SG-4).

Rock fragments less than 12 inches in diameter may be utilized in the fill provided, they are not nested or placed in concentrated pockets; they are surrounded by compacted fine grained soil material and the distribution of rocks is approved by the Geotechnical Consultant.

C. Laboratory Testing

Representative samples of materials to be utilized as compacted fill shall be analyzed by the laboratory of the Geotechnical Consultant to determine their physical properties. If any material other than that previously tested is encountered during grading, the appropriate analysis of this material shall be conducted by the Geotechnical Consultant as soon as possible.

D. Import

If importing of fill material is required for grading, proposed import material should meet the requirements of the previous section. The import source shall be given to the Geotechnical Consultant at least 2 working days prior to importing so that appropriate tests can be performed and its suitability determined.

V. FILL PLACEMENT AND COMPACTION

A. Fill Layers

Material used in the compacting process shall be evenly spread, watered, processed, and compacted in thin lifts not to exceed 6 inches in thickness to obtain a uniformly dense layer. The fill shall be placed and compacted on a horizontal plane, unless otherwise approved by the Geotechnical Consultant.

B. Moisture Conditioning

Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly above optimum moisture content.

C. Compaction

Each layer shall be compacted to 90 percent of the maximum density in compliance with the testing method specified by the controlling governmental agency. (In general, ASTM D 1557-02, will be used.)

If compaction to a lesser percentage is authorized by the controlling governmental agency because of a specific land use or expansive soils condition, the area to received fill compacted to less than 90 percent shall either be delineated on the grading plan or appropriate reference made to the area in the soils report.

D. Failing Areas

If the moisture content or relative density varies from that required by the Geotechnical Consultant, the Contractor shall rework the fill until it is approved by the Geotechnical Consultant.

E. Benching

All fills shall be keyed and benched through all topsoil, colluvium, alluvium or creep material, into sound bedrock or firm material where the slope receiving fill exceeds a ratio of 5 horizontal to 1 vertical, in accordance with the recommendations of the Geotechnical Consultant.

VI. SLOPES

A. Fill Slopes

The contractor will be required to obtain a minimum relative compaction of 90 percent out to the finish slope face of fill slopes, buttresses, and stabilization fills. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment, or by any other procedure that produces the required compaction.

B. Side Hill Fills

The key for side hill fills shall be a minimum of 15 feet within bedrock or firm materials, unless otherwise specified in the soils report. (See detail on Plate SG-5.)

C. Fill-Over-Cut Slopes

Fill-over-cut slopes shall be properly keyed through topsoil, colluvium or creep material into rock or firm materials, and the transition shall be stripped of all soils prior to placing fill. (see detail on Plate SG-6).

D. Landscaping

All fill slopes should be planted or protected from erosion by other methods specified in the soils report.

E. Cut Slopes

1. The Geotechnical Consultant should observe all cut slopes at vertical intervals not exceeding 10 feet.

2. If any conditions not anticipated in the preliminary report such as perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints or fault planes are encountered during grading, these conditions shall be evaluated by the Geotechnical Consultant, and recommendations shall be made to treat these problems (Typical details for stabilization of a portion of a cut slope are given in Plates SG-2 and SG-3.).

3. Cut slopes that face in the same direction as the prevailing drainage shall be protected from slope wash by a non-erodible interceptor swale placed at the top of the slope.

4. Unless otherwise specified in the soils and geological report, no cut slopes shall be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies.

5. Drainage terraces shall be constructed in compliance with the ordinances of controlling governmental agencies, or with the recommendations of the Geotechnical Consultant.

VII. GRADING OBSERVATION

A. General

All cleanouts, processed ground to receive fill, key excavations, subdrains, and rock disposals must be observed and approved by the Geotechnical Consultant prior to placing any fill. It shall be the Contractor's responsibility to notify the Geotechnical Consultant when such areas are ready.

B. Compaction Testing

Observation of the fill placement shall be provided by the Geotechnical Consultant during the progress of grading. Location and frequency of tests shall be at the Consultants discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations may be selected to verify adequacy of compaction levels in areas that are judged to be susceptible to inadequate compaction.

C. Frequency of Compaction Testing

In general, density tests should be made at intervals not exceeding 2 feet of fill height or every 1000 cubic yards of fill placed. This criteria will vary depending on soil conditions and the size of the job. In any event, an adequate number of field density tests shall be made to verify that the required compaction is being achieved.

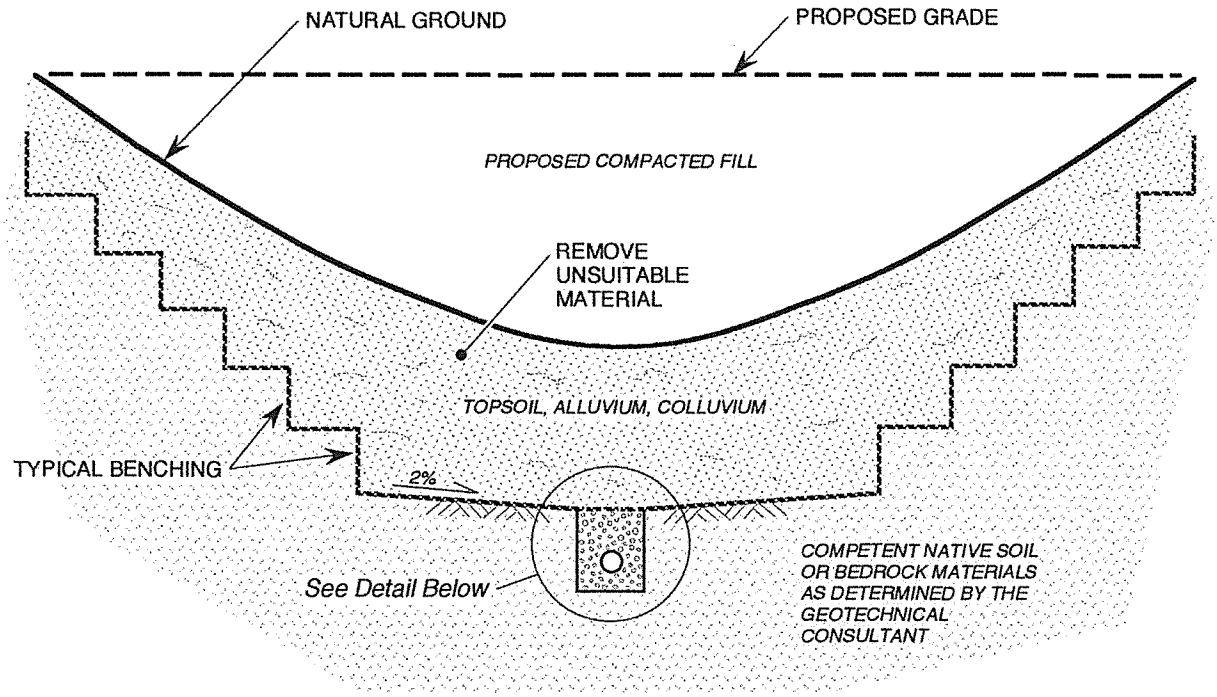
VIII. CONSTRUCTION CONSIDERATIONS

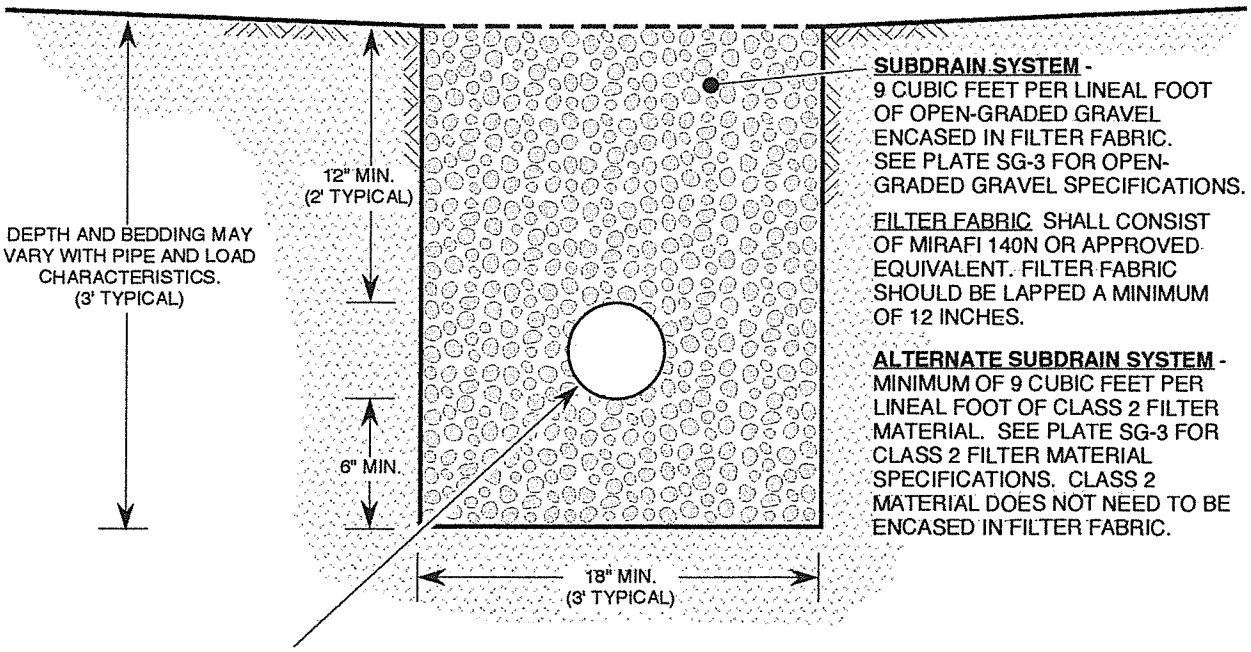
A. Erosion control measures, when necessary, shall be provided by the Contractor during grading and prior to the completion and construction of permanent drainage controls.

B. Upon completion of grading and termination of observations by the Geotechnical Consultant, no further filling or excavating, including that necessary for footings, foundations, large tree wells, retaining walls, or other features shall be performed without the approval of the Geotechnical Consultant.

C. Care shall be taken by the Contractor during final grading to preserve any berms, drainage terraces, interceptor swales, or other devices of permanent nature on or adjacent to the property.

S:\!BOILERS-WORK\REPORT INSERTS\STANDARD GRADING SPECS





SUBDRAIN SYSTEM - 9 CUBIC FEET PER LINEAL FOOT OF OPEN-GRADED GRAVEL ENCASED IN FILTER FABRIC. SEE PLATE SG-3 FOR OPEN-GRADED GRAVEL SPECIFICATIONS.

FILTER FABRIC SHALL CONSIST OF MIRAFI 140N OR APPROVED EQUIVALENT. FILTER FABRIC SHOULD BE LAPPED A MINIMUM OF 12 INCHES.

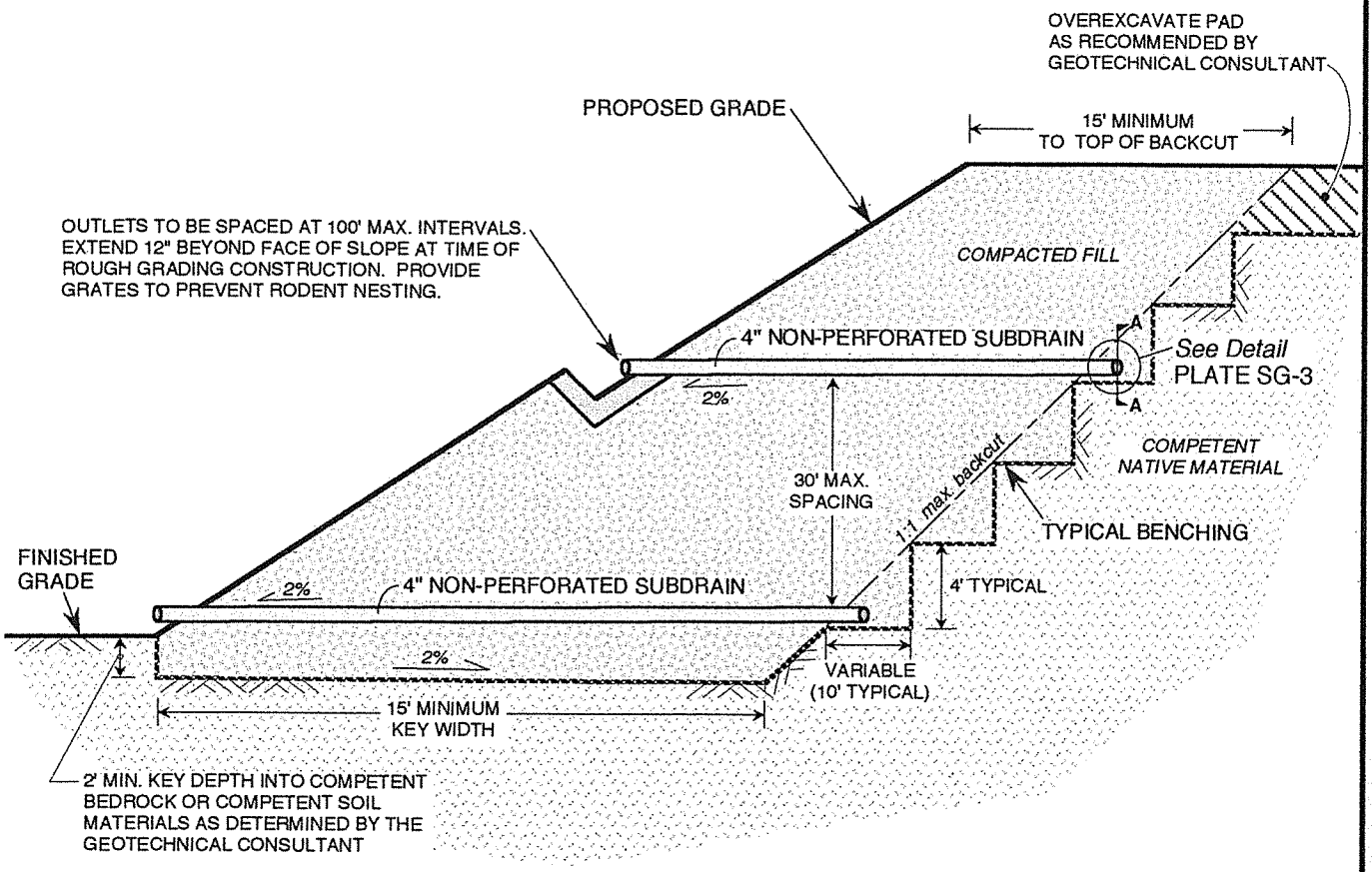
ALTERNATE SUBDRAIN SYSTEM - MINIMUM OF 9 CUBIC FEET PER LINEAL FOOT OF CLASS 2 FILTER MATERIAL. SEE PLATE SG-3 FOR CLASS 2 FILTER MATERIAL SPECIFICATIONS. CLASS 2 MATERIAL DOES NOT NEED TO BE ENCASED IN FILTER FABRIC.

MINIMUM 6-INCH DIAMETER PVC SCHEDULE 40, OR ABS SDR-35 WITH A MINIMUM OF EIGHT 1/4-INCH DIAMETER PERFORATIONS PER LINEAL FOOT IN BOTTOM HALF OF PIPE. PIPE TO BE LAID WITH PERFORATIONS FACING DOWN.

NOTES:

1. FOR CONTINUOUS RUNS IN EXCESS OF 500 FEET USE 8-INCH DIAMETER PIPE.
2. FINAL 20 FEET OF PIPE AT OUTLET SHALL BE NON-PERFORATED AND BACKFILLED WITH FINE-GRAINED MATERIAL.

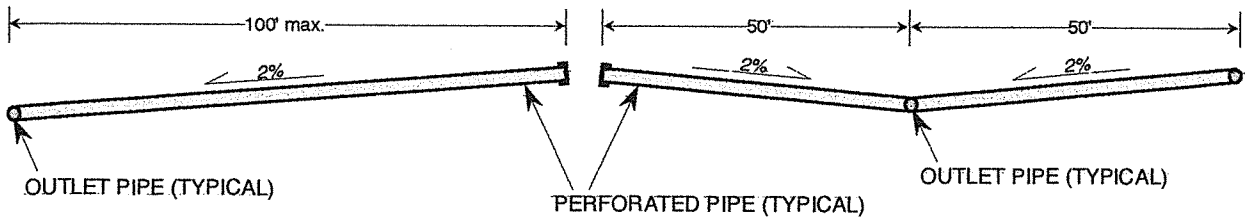
PETRA	CANYON SUBDRAIN DETAIL	PLATE SG-1



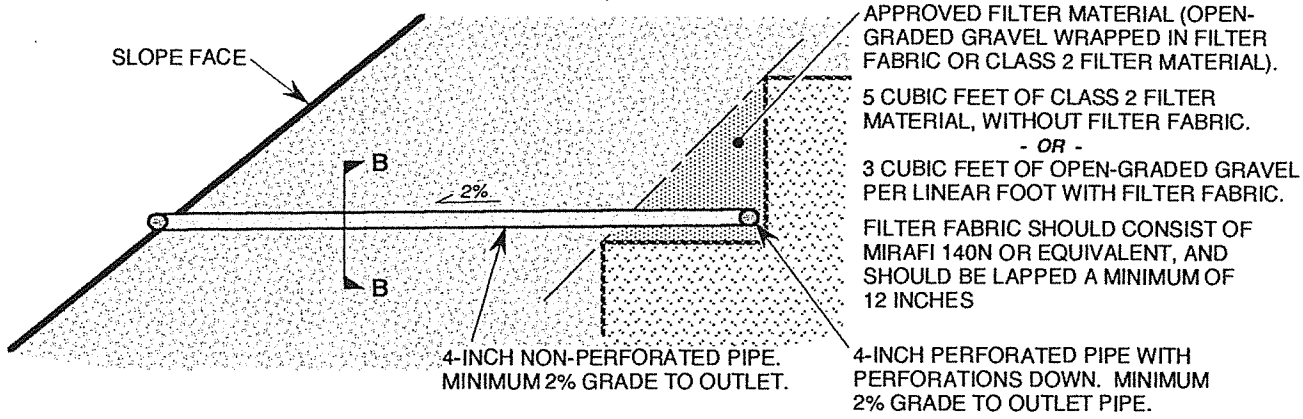
NOTES:

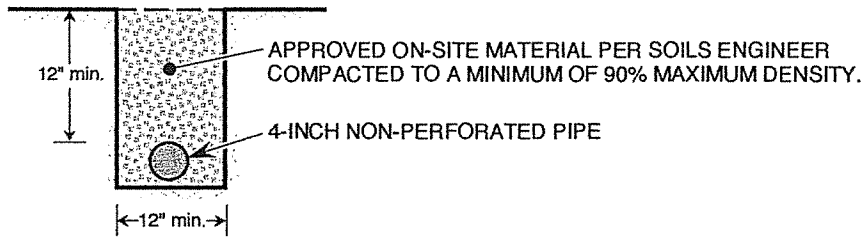
1. 30' MAXIMUM VERTICAL SPACING BETWEEN SUBDRAIN SYSTEMS.
2. 100' MAXIMUM HORIZONTAL DISTANCE BETWEEN NON-PERFORATED OUTLET PIPES. *(See Below)*
3. MINIMUM GRADIENT OF 2% FOR ALL PERFORATED AND NON-PERFORATED PIPE.

SECTION A-A (PERFORATED PIPE PROFILE)



PETRA	BUTTRESS OR STABILIZATION FILL DETAIL	PLATE SG-2





SECTION B-B (OUTLET PIPE)

PIPE SPECIFICATIONS:

1. 4-INCH MINIMUM DIAMETER, PVC SCHEDULE 40 OR ABS SDR-35.
2. FOR PERFORATED PIPE, MINIMUM 8 PERFORATIONS PER FOOT ON BOTTOM HALF OF PIPE.

FILTER MATERIAL/FABRIC SPECIFICATIONS:

OPEN-GRADED GRAVEL ENCASED IN FILTER FABRIC.
(MIRAFI 140N OR EQUIVALENT)

OPEN-GRADED GRAVEL

SIEVE SIZE	PERCENT PASSING
1 1/2-INCH	88 - 100
1-INCH	5 - 40
3/4-INCH	0 - 17
3/8-INCH	0 - 7
No. 200	0 - 3

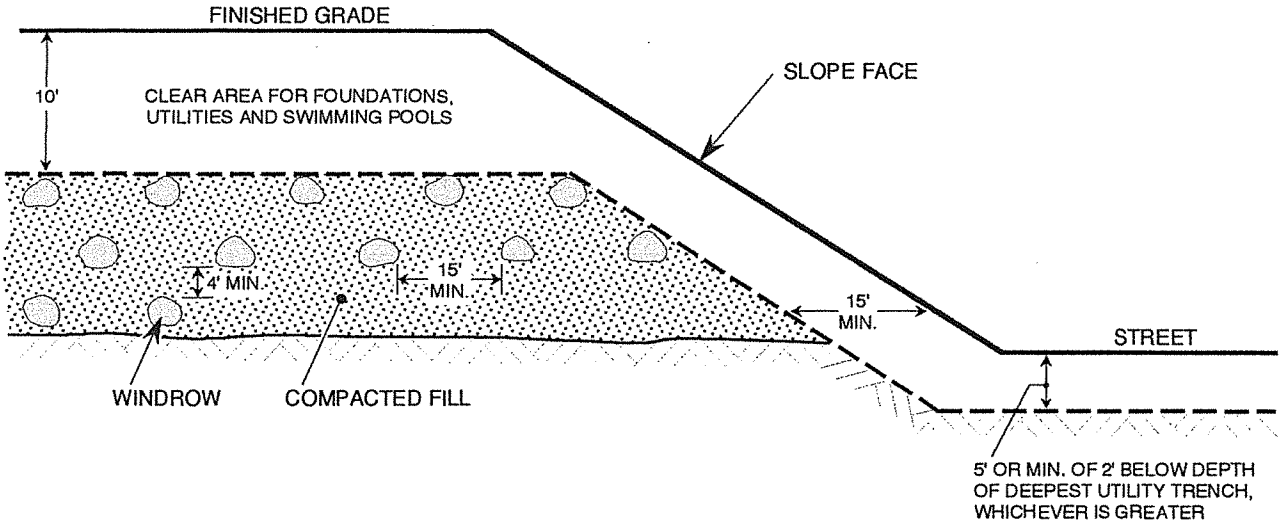
ALTERNATE:

CLASS 2 PERMEABLE FILTER MATERIAL PER CALTRANS STANDARD SPECIFICATION 68-1.025.

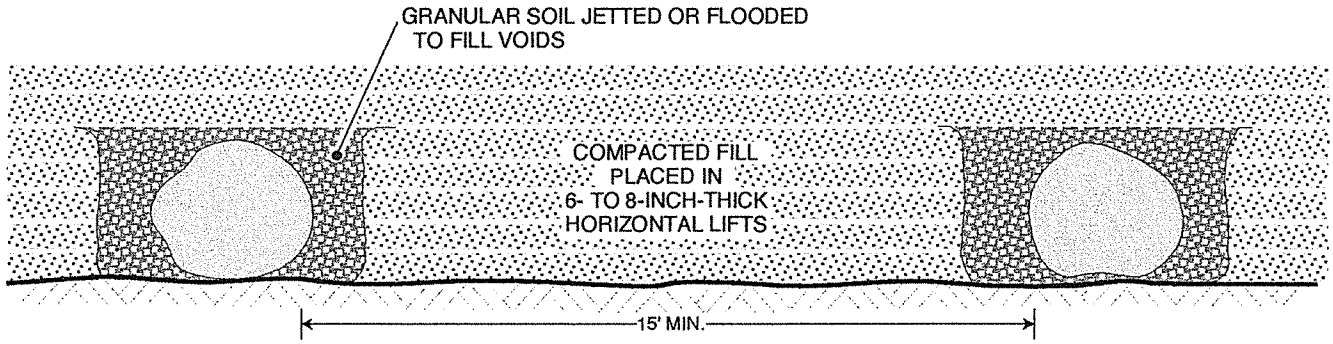
CLASS 2 FILTER MATERIAL

SIEVE SIZE	PERCENT PASSING
1-INCH	100
3/4-INCH	90 - 100
3/8-INCH	40 - 100
No. 4	25 - 40
No. 8	18 - 33
No. -30	5 - 15
No. -50	0 - 7
No. 200	0 - 3

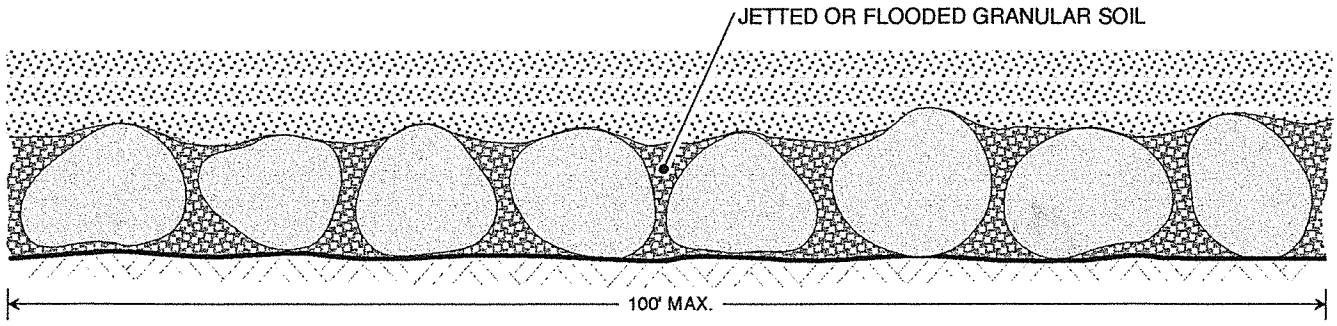
PETRA	BUTTRESS OR STABILIZATION FILL SUBDRAIN	PLATE SG-3



TYPICAL WINDROW DETAIL (END VIEW)

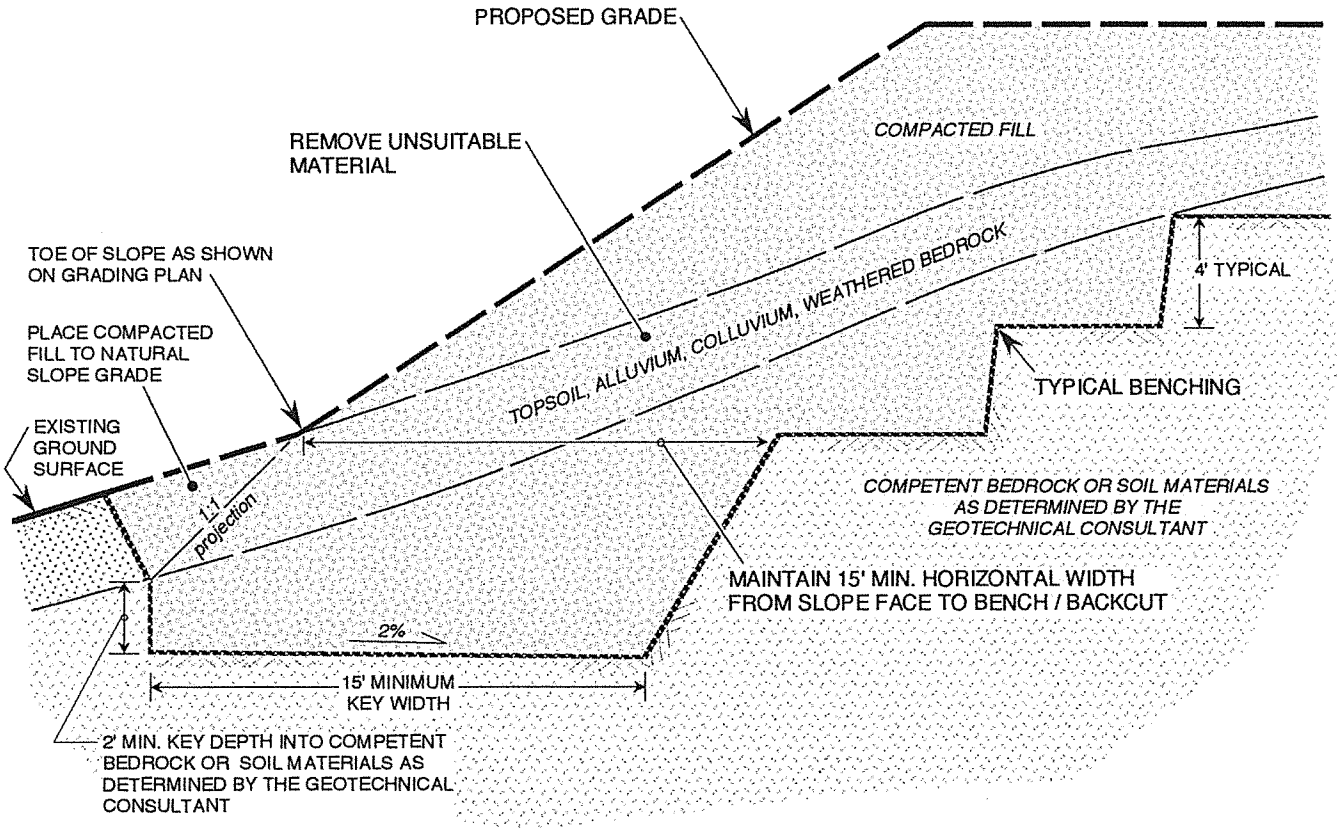


TYPICAL WINDROW DETAIL (PROFILE VIEW)



NOTE: OVERSIZE ROCK IS DEFINED AS CLASTS HAVING A MAXIMUM DIMENSION OF 12" OR LARGER

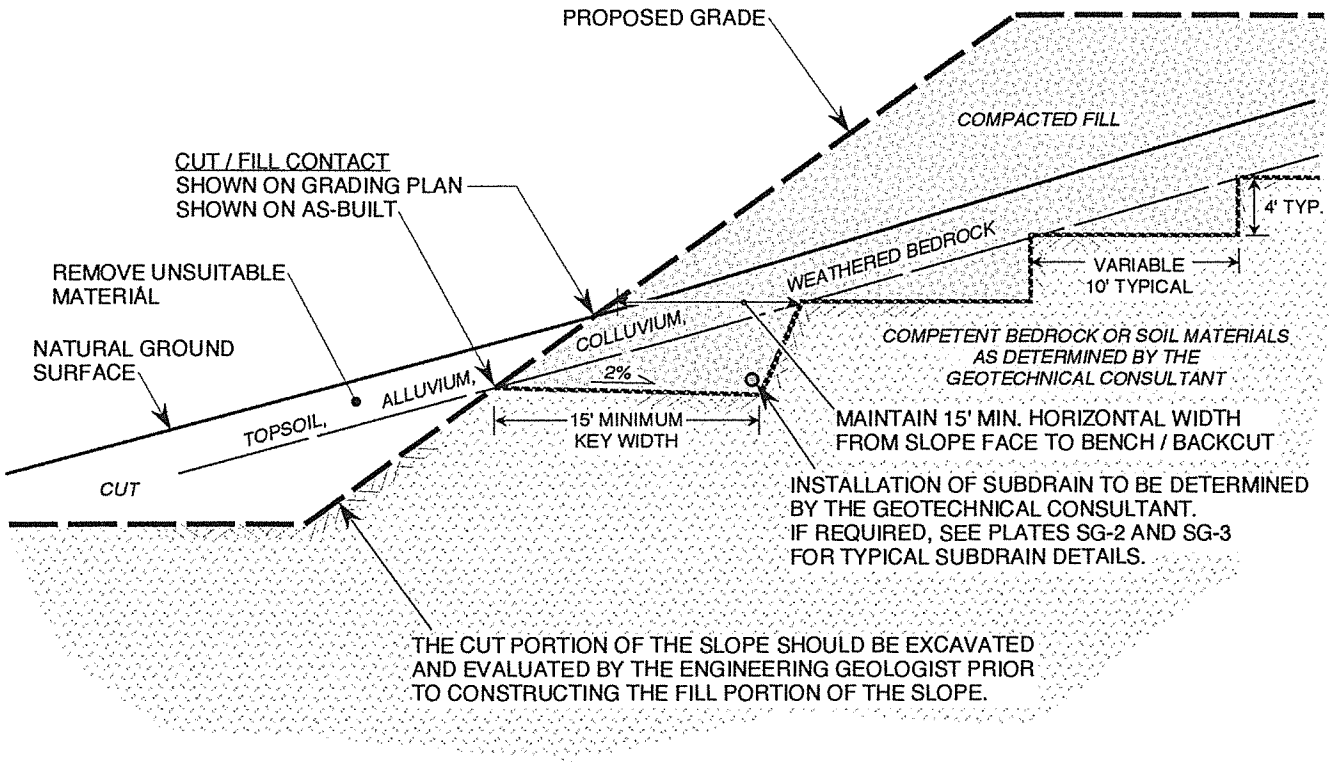
PETRA	TYPICAL ROCK DISPOSAL DETAIL	PLATE SG-4



NOTES:

1. WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, BENCHING IS NOT NECESSARY; HOWEVER, FILL IS NOT TO BE PLACED ON COMPRESSIBLE OR UNSUITABLE MATERIAL.
2. SOILS ENGINEER TO DETERMINE IF SUBDRAIN IS REQUIRED.

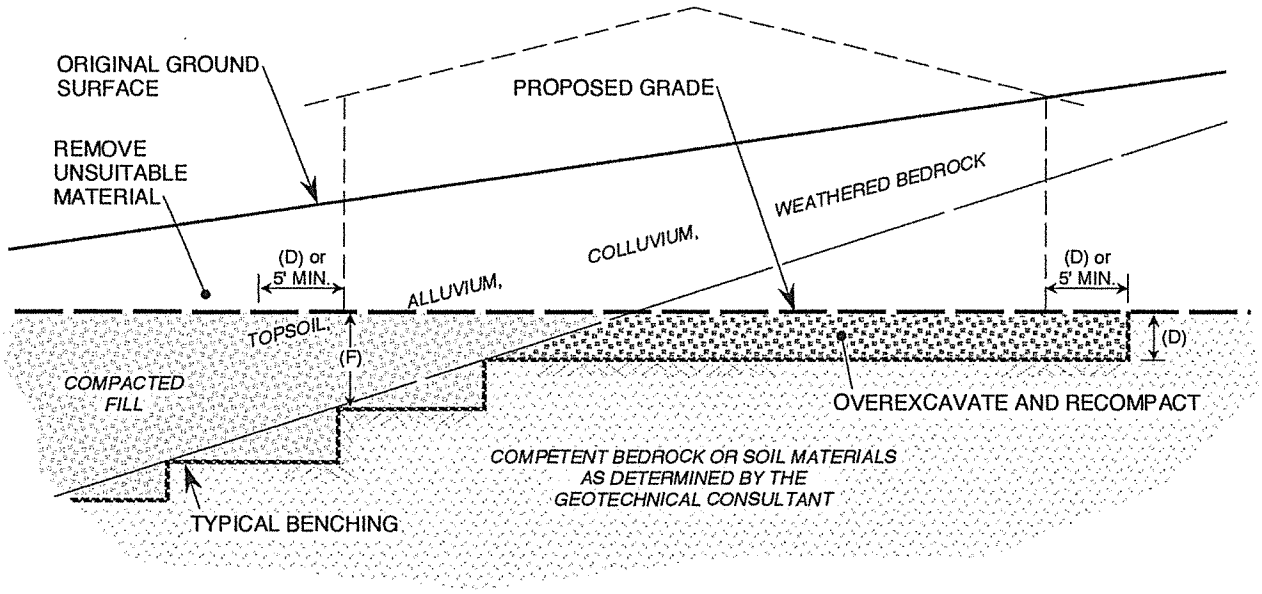
PETRA	FILL SLOPE ABOVE NATURAL SLOPE	PLATE SG-5



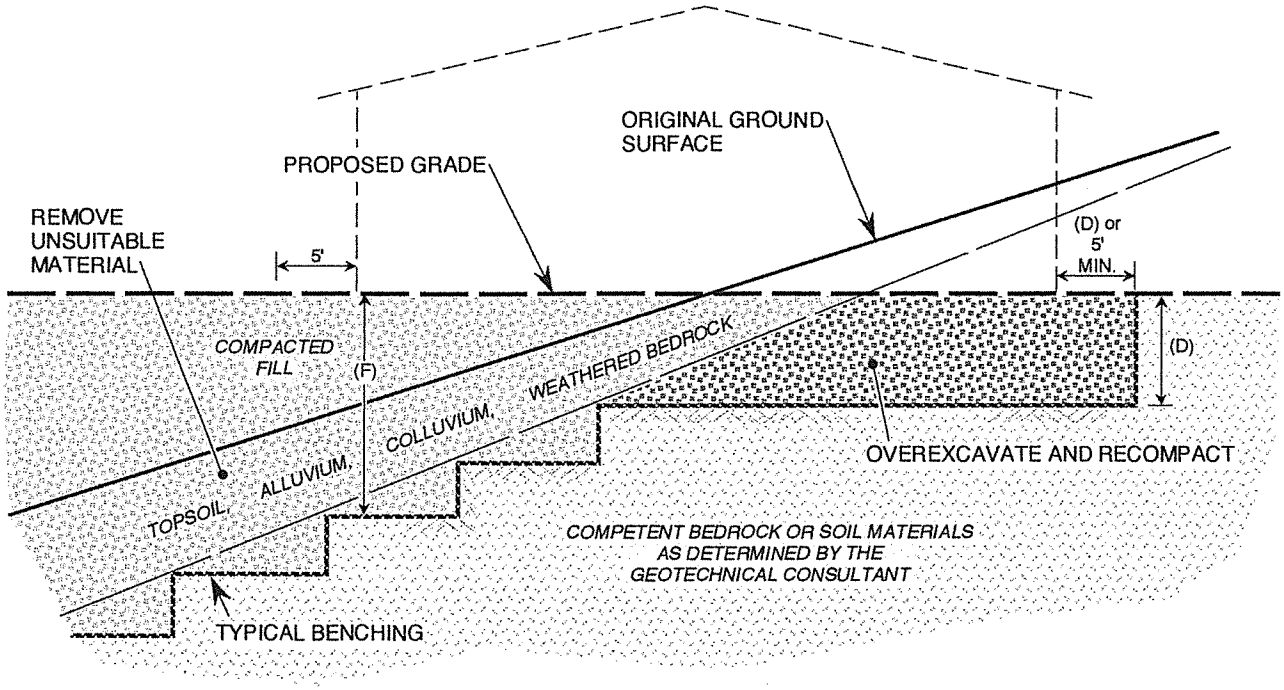
PETRA	FILL SLOPE ABOVE CUT SLOPE	PLATE SG-6

CUT LOT

UNSUITABLE MATERIAL EXPOSED IN PORTION OF CUT PAD

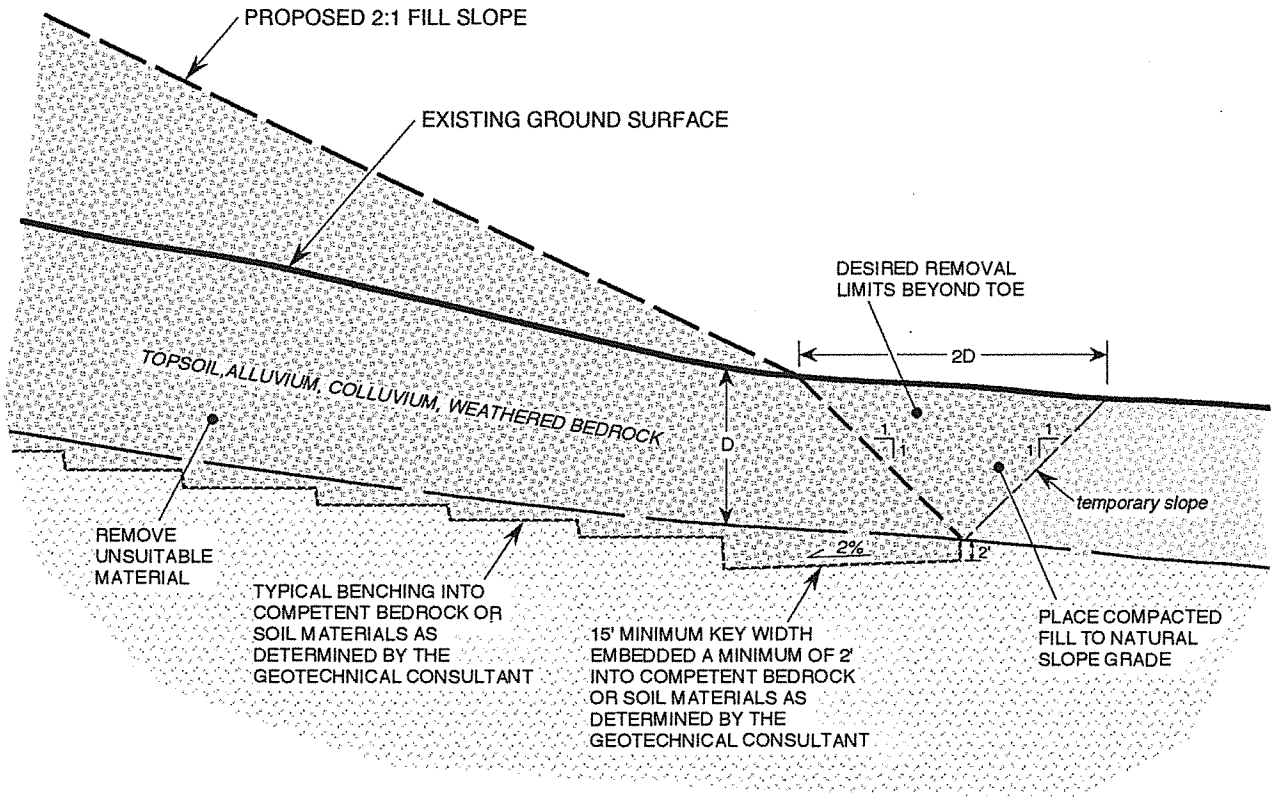


CUT-FILL TRANSITION LOT



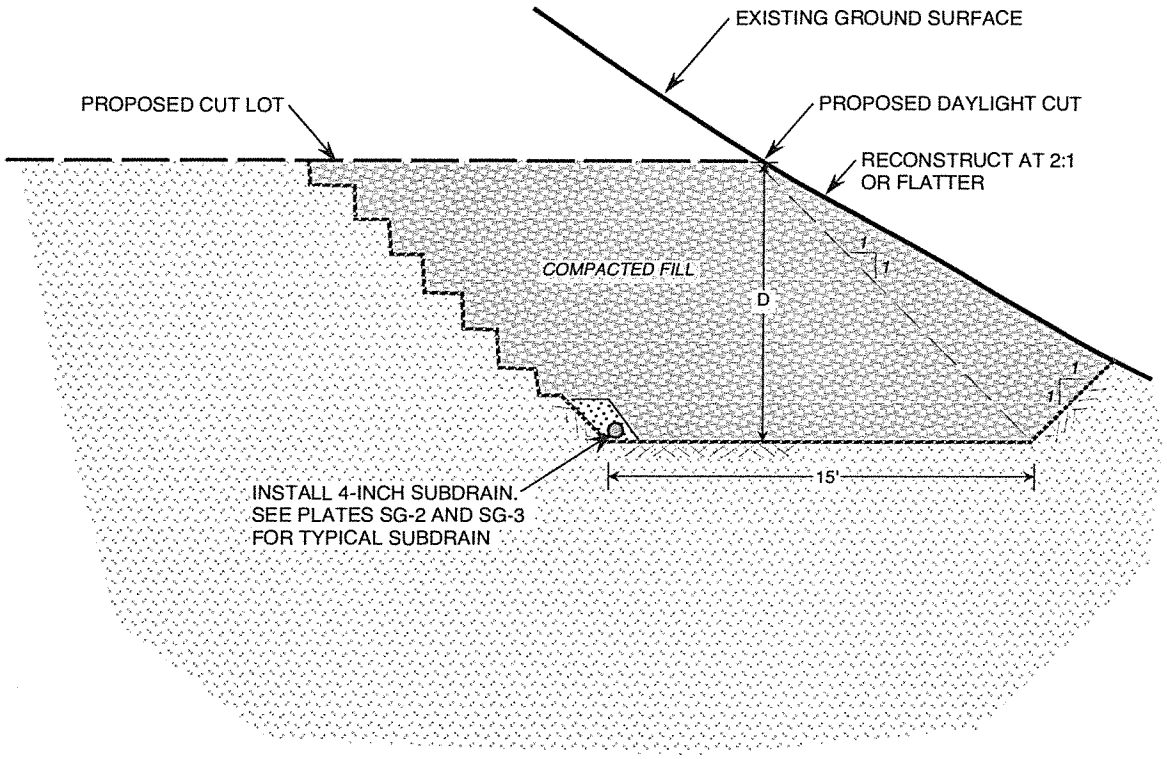
MAXIMUM FILL THICKNESS (F)	DEPTH OF OVEREXCAVATION (D)
FOOTING DEPTH TO 3 FEET	EQUAL DEPTH
3 TO 6 FEET	3 FEET
GREATER THAN 6 FEET	1/2 THE THICKNESS OF DEEPEST FILL PLACED WITHIN THE "FILL" PORTION (F) TO 15 FEET MAXIMUM

PETRA	CUT LOTS AND CUT-FILL TRANSITION LOTS	PLATE SG-7



D = RECOMMENDED DEPTH OF REMOVAL PER GEOTECHNICAL REPORT

PETRA	TYPICAL REMOVALS BEYOND TOE OF PROPOSED FILL SLOPE	PLATE SG-8



NOTE:

1. "D" SHALL BE 10 FEET MINIMUM OR AS DETERMINED BY SOILS ENGINEER.

PETRA	SHEAR KEY ON DAYLIGHT CUT LOTS	PLATE SG-9

April 25, 2023
J.N. 19-433

WESTERN REALCO
500 Newport Center Drive, Suite #630
Newport Beach, California 92660

Attention: Mr. Jeremy Mape

Subject: Geotechnical Response to City of Corona Comment, Magnolia Avenue Business Center, 1375 Magnolia Avenue, City of Corona, Riverside County, California

References: See Attached List

Dear Mr. Mape:

At the request of the City of Corona, **Petra Geosciences, Inc. (Petra)** is submitting this response to the Planning and Development Department email comment on April 24, 2023. The comment and response are as follows:

City Paraphrased Email Comment (April 24, 2023)

To finalize the WQMP, please provide the infiltration rates.

Petra Response

We understand that due to environmental concerns as addressed by others, a Corrective Action Plan (CAP) has been established to provide a barrier between the impacted subsurface materials and the environment. As such, onsite percolation or infiltration of stormwater is not allowed into the subsurface. Therefore, field percolation testing and rates have not been, nor will they be determined due to the environmental mitigation superseding geotechnical purview regarding stormwater infiltration.

We appreciate this opportunity to be of service. If you have questions, please contact this office.

Respectfully submitted,
PETRA GEOSCIENCES, INC.

4/25/23

Grayson R. Walker
Principal Engineer
GE 871

REGISTERED PROFESSIONAL ENGINEER
GRAYSON R. WALKER
GE 871
GEOTECHNICAL
STATE OF CALIFORNIA

DJ/GRW/lv

W:\2014-2019\2019\400\19-433\Reports\19-433 450 City of Corona 4-24-23 Comment Response.docx

REFERENCES

CLOW Valve Company, 2021, Land Use Covenant and Agreement, Environmental Restrictions, County of Riverside, Assessor Parcel Number(s): 107-030-022-3 (Department Site Code 600876-48), DOC #2021-06597735, November 23.

Earthcon Consultants CA, Inc. (Earthcon), 2019, Risk-Based Approval Application, 40 CFR 761.61 c(1), CLOW Valve Company, 1375 Magnolia Avenue, Corona, California, Project No. 04.20150013.17, dated April 19.

_____, 2020, Corrective Measures Implementation Workplan, CLOW Valve Company, 1375 Magnolia Avenue, Corona, California, Project No. 04.20150013.17, dated March 26.

_____, 2021a, Operations and Maintenance Plan, CLOW Valve Company, 1375 Magnolia Avenue, Corona, California, Project No. 04.20150013.17, dated June 18.

_____, 2021b, Soil Management Plan, CLOW Valve Company, 1375 Magnolia Avenue, Corona, California, Project No. 04.20150013.17, dated July 23.

_____, 2021c, PCB Soil Investigation, CLOW Valve Company, 1375 Magnolia Avenue, Corona, California, Project No. 04.20150013.19, dated October 29.

_____, revised 2022, Corrective Measures Implementation Report, 1375 Magnolia Avenue, Corona, California, Project No. 04.20150013.19, dated April 1.

Hazard Management Consulting (HMC), revised 2023, Phase I Environmental Site Assessment, Proposed Magnolia Business Center, Former CLOW Manufacturing Facility, 1375 Magnolia Avenue, Corona, California, revision dated January 12.

KWC Engineers, 2022, Preliminary Grading Plan, Magnolia Avenue Business Center, 1375 Magnolia Avenue, City of Corona, County of Riverside, California, J.N. 19.1995.2, plot date December 22.

Petra Geosciences, Inc., 2020, Preliminary Geotechnical Evaluation, Proposed Magnolia Avenue Commercial Development, 17±-Acre Site at 1375 Magnolia Avenue, City of Corona, Riverside County, California, J.N. 19-433, dated February 20.

_____, 2022a, Response to Plan Check Comment, Preliminary Grading Plan, Sheet 3 of 4, Magnolia Avenue Business Center, 1375 Magnolia Avenue, City of Corona, Riverside County, California, J.N. 19-433, dated September 12.

_____, 2022b, Updated Preliminary Geotechnical Evaluation, Proposed Magnolia Avenue Business Center, 16.5-Acre Site at 1375 Magnolia Avenue, City of Corona, Riverside County, California, J.N. 19-433, dated December 9.

_____, 2023a, Addendum to Preliminary Geotechnical Evaluation, Proposed Magnolia Avenue Business Center, 16.5-Acre Site at 1375 Magnolia Avenue, City of Corona, Riverside County, California, J.N. 19-433, dated January 26.

_____, 2023b, Geotechnical Response to City of Corona Plan Check Comment No. 9, 2nd Review Letter for Precise Plans (PP2022-003), Magnolia Avenue Business Center, 1375 Magnolia Avenue, City of Corona, Riverside County, California, J.N. 19-433, February 17.

WSP USA, 2022, Risk-Based Approval Modification Application, 40 CFR 761.61 c(1), CLOW Valve Company, 1375 Magnolia Avenue, Corona, California, U.S. EPA ID: CATSCA102301, Version 1m Project No. ECA04.20150013 Task 3, dated April.

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Not Applicable

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Not Applicable

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

R 07 W | R 06 W | R 05 W | R 04 W | R 03 W | R 02 W | R 01 W | R 01 E | R 02 E | R 03 E | R 04 E | R 05 E

T 01 S
T 02 S
T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S

06	05	04	03	02	01
07	08	09	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

0.85 MiraLoma
0.61 RiversideNorth
0.54 RiversideSouth
0.68 PigeonPass
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.50 LakeMathews
0.68 PerrisReservoir
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.90 HurkeyCreek
0.70 ElsinoreNWS
1.11 ElCarisoStation
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley

SITE

Santa Ana River Watershed
Santa Margarita Watershed

JURUPA VALLEY, EASTVALE, NORCO, CORONA, RIVERSIDE, MORENO VALLEY, CALIMESA, BEAUMONT, SAN JACINTO, PERRIS, CANYON LAKE, LAKE ELSINORE, WILDOMAR, MENIFEE, HEMET, MURRIETA, TEMECULA

N

Rain Gage Locations

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Isohyetal Map for the 85th Percentile 24 hour Storm Event

July 2011

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name KWC ENGINEERS
Date 9/18/2023
Designed by
Case No
Company Project Number/Name

BMP Identification

BMP NAME / ID DMA 1

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
1	*90157*	*Roofs*	*1*	*0.89*	*80420*			
1	*122680*	*Concrete or Asphalt*	*1*	*0.89*	*109431*			
1	*18874*	*Ornamental Landscaping*	*0.1*	*0.11*	*2085*			
	231711	***Total***			**191935**	**0.20**	**0.9**	**0.9**

Notes:

SITE SPECIFIC DATA

PROJECT NUMBER		728823-010	
PROJECT NAME		MAGNOLIA AVENUE BUSINESS CENTER (BCE 15046)	
PROJECT LOCATION		CORONA, CA	
STRUCTURE ID		DMA 1	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.90	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			16.87
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	634.29	RCP	18"
INLET PIPE 2	634.12	RCP	12"
OUTLET PIPE	631.94	RCP	18"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	641.02	641.02	641.02
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	ø30"	OPEN PLANTER	ø30"
WETLANDMEDIA VOLUME (CY)			27.37
ORIFICE SIZE (DIA. INCHES)			ø2.84 EA
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			

INSTALLATION NOTES

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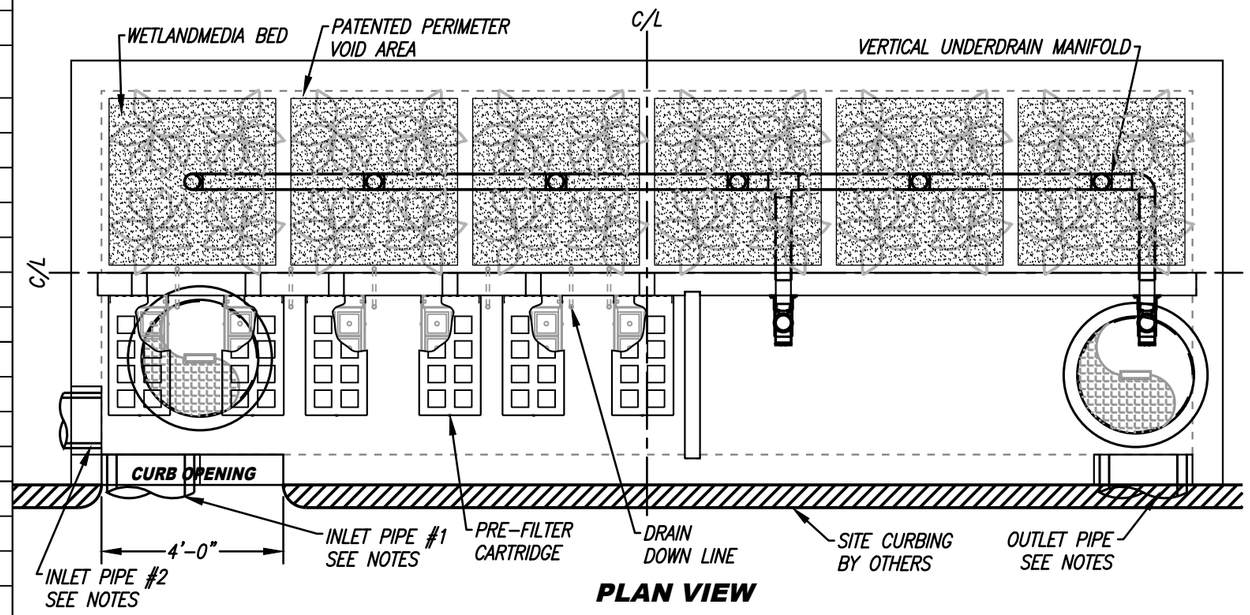
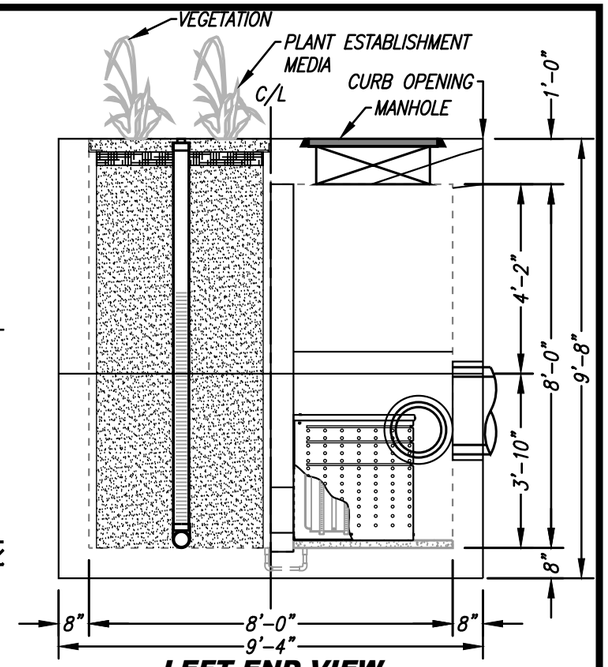
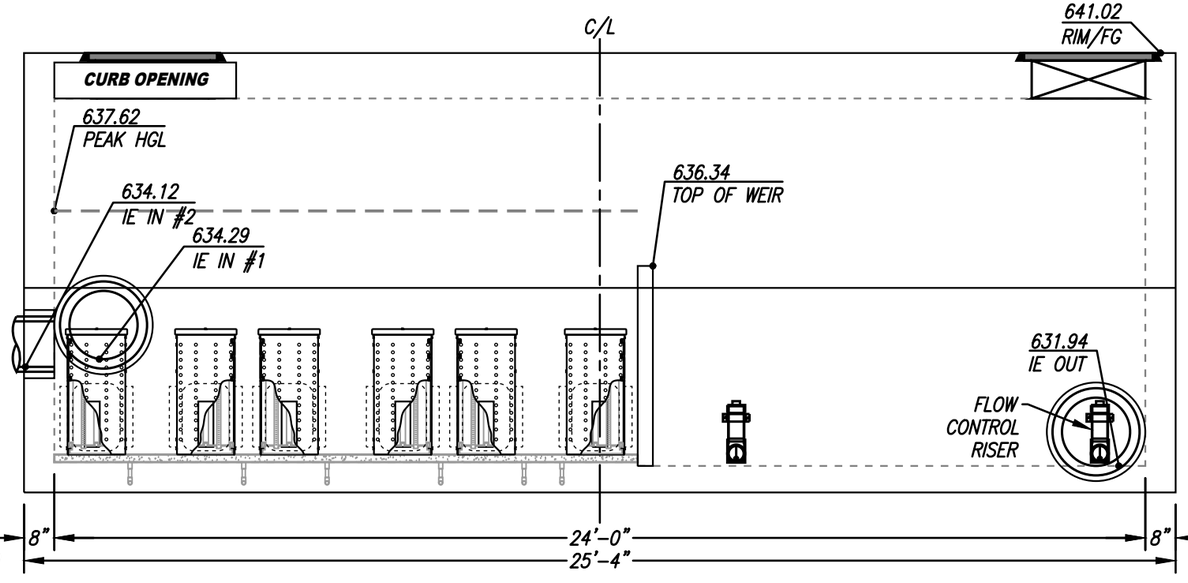


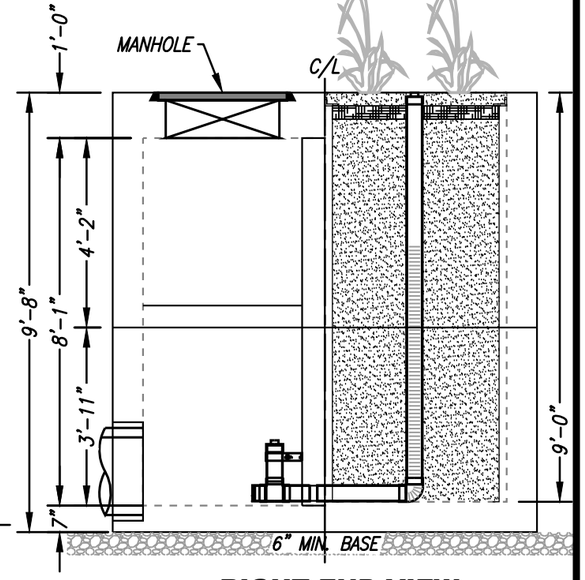
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

INTERNAL BYPASS DISCLOSURE:

THE DESIGN AND CAPACITY OF THE PEAK CONVEYANCE METHOD TO BE REVIEWED AND APPROVED BY THE ENGINEER OF RECORD. HGL(S) AT PEAK FLOW SHALL BE ASSESSED TO ENSURE NO UPSTREAM FLOODING. PEAK HGL AND BYPASS CAPACITY SHOWN ON DRAWING ARE USED FOR GUIDANCE ONLY.

TREATMENT FLOW (CFS)	0.90
OPERATING HEAD (FT)	4.4
PRETREATMENT LOADING RATE (GPM/SF)	1.8
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-8-24-9'-0"-C-HC
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

4.13.23 BEN.BOEGEMAN

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name KWC ENGINEERS — Date 9/18/2023

Designed by — Case No

Company Project Number/Name

BMP Identification

BMP NAME / ID DMA 2

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imprevious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
2	*144086*	*Roofs*	*1*	*0.89*	*128524*			
2	*140107*	*Concrete or Asphalt*	*1*	*0.89*	*124976*			
2	*8768*	*Ornamental Landscaping*	*0.1*	*0.11*	*969*			
	292961	***Total***			**254468**	**0.20**	**1.2**	**1.3**

Notes:

SITE SPECIFIC DATA			
PROJECT NUMBER		728823-020	
PROJECT NAME		MAGNOLIA AVENUE BUSINESS CENTER (BCE 15046)	
PROJECT LOCATION		CORONA, CA	
STRUCTURE ID		DMA 2B	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.60	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			10.30
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	632.55	RCP	12"
INLET PIPE 2	N/A	N/A	N/A
OUTLET PIPE	632.00	RCP	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	641.25	641.25	641.25
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	ø30"	OPEN PLANTER	ø30"
WETLANDMEDIA VOLUME (CY)			23.24
ORIFICE SIZE (DIA. INCHES)			ø2.45 EA
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			

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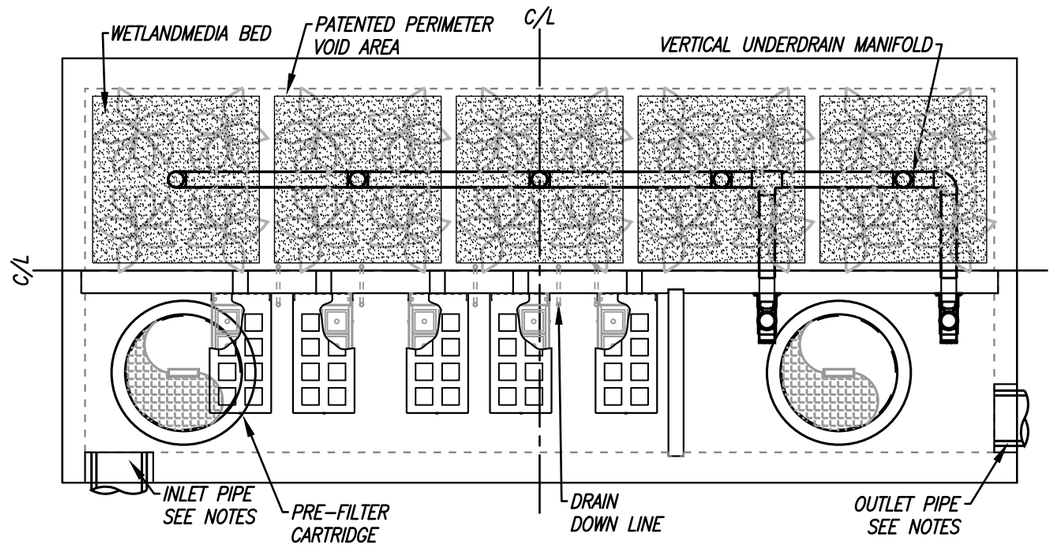
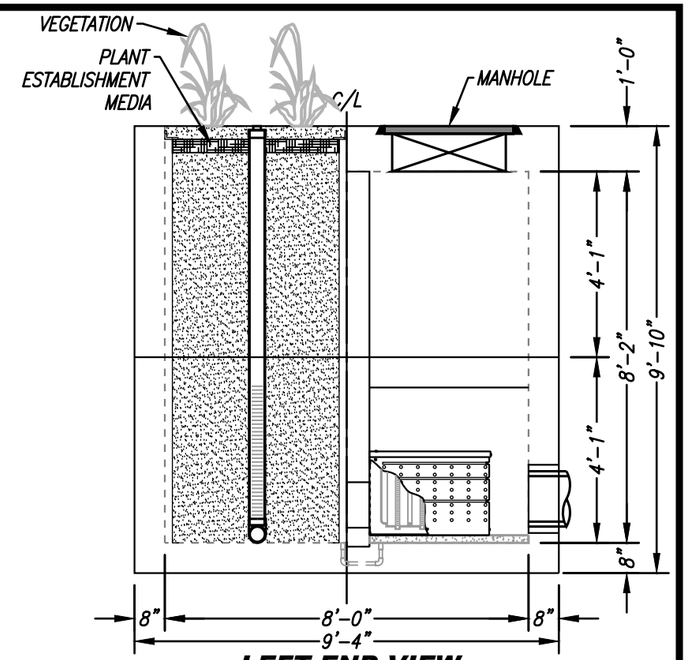
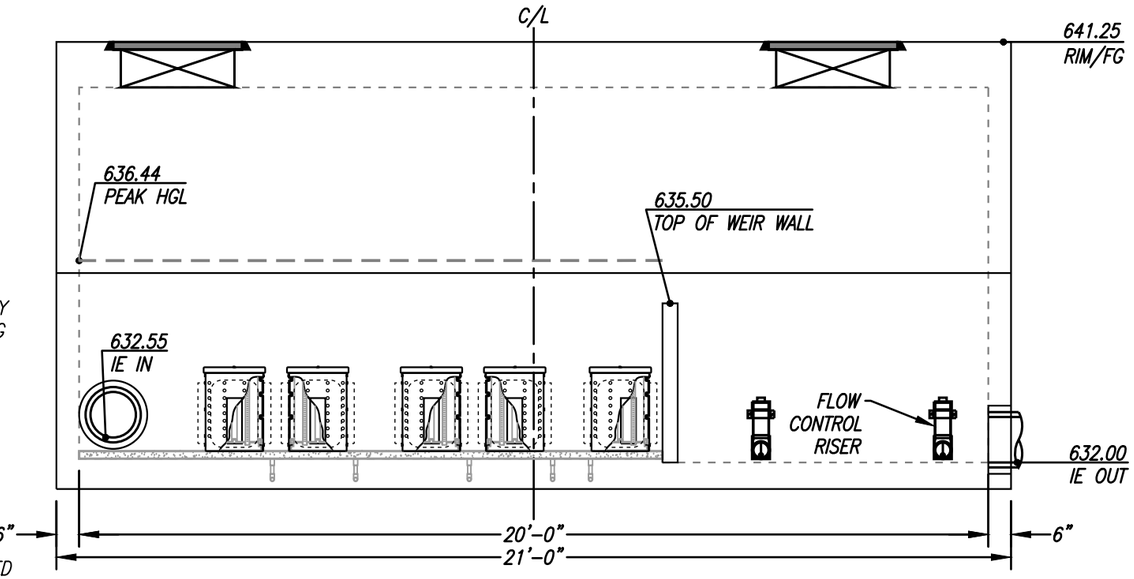


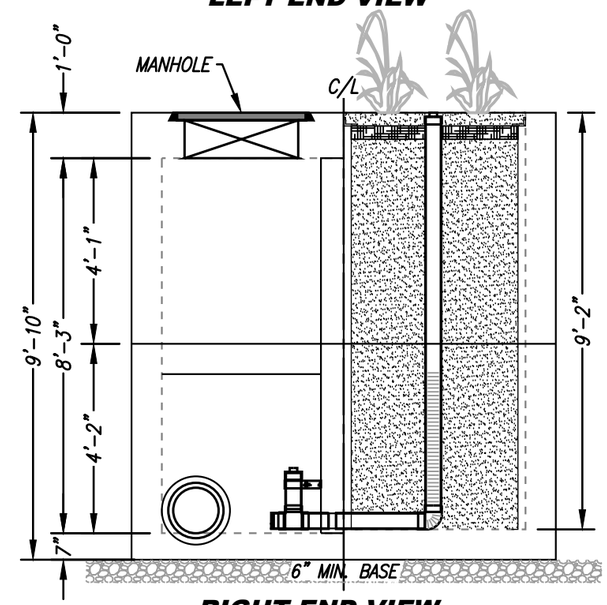
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

LOW INFLOW PIPE DISCLOSURE:

IT IS RECOMMENDED THAT A SUFFICIENT VARIATION IN ELEVATION BETWEEN THE INLET AND OUTLET BE PROVIDED TO ALLOW FOR ACCUMULATION OF SEDIMENT IN THE PRE-TREATMENT CHAMBER. FAILURE TO DO SO MAY RESULT IN BLOCKAGE AT INFLOW POINT(S) WHICH MAY CAUSE UPSTREAM FLOODING.

INTERNAL BYPASS DISCLOSURE:

THE DESIGN AND CAPACITY OF THE PEAK CONVEYANCE METHOD TO BE REVIEWED AND APPROVED BY THE ENGINEER OF RECORD. HGL(S) AT PEAK FLOW SHALL BE ASSESSED TO ENSURE NO UPSTREAM FLOODING. PEAK HGL AND BYPASS CAPACITY SHOWN ON DRAWING ARE USED FOR GUIDANCE ONLY.

TREATMENT FLOW (CFS)	0.60
OPERATING HEAD (FT)	3.5
PRETREATMENT LOADING RATE (GPM/SF)	2.1
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

CONTECH ENGINEERED SOLUTIONS LLC
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MWS-L-8-20-9'-2"-V-HC
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

4/13/23BEN.ROEGMAN

SITE SPECIFIC DATA			
PROJECT NUMBER		728823-015	
PROJECT NAME		MAGNOLIA AVENUE BUSINESS CENTER (BCE 15046)	
PROJECT LOCATION		CORONA, CA	
STRUCTURE ID		DMA 2A	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.60	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			10.30
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	632.55	RCP	12"
OUTLET PIPE	632.00	RCP	12"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	642.00	642.00	642.00
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	ø30"	OPEN PLANTER	ø30"
WETLANDMEDIA VOLUME (CY)			25.14
ORIFICE SIZE (DIA. INCHES)			ø2.45 EA
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			

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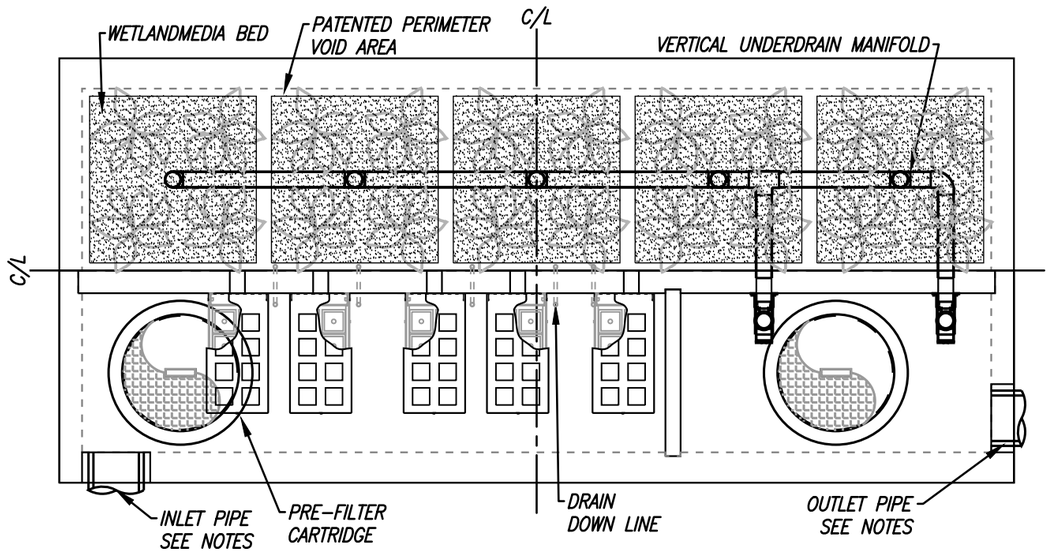
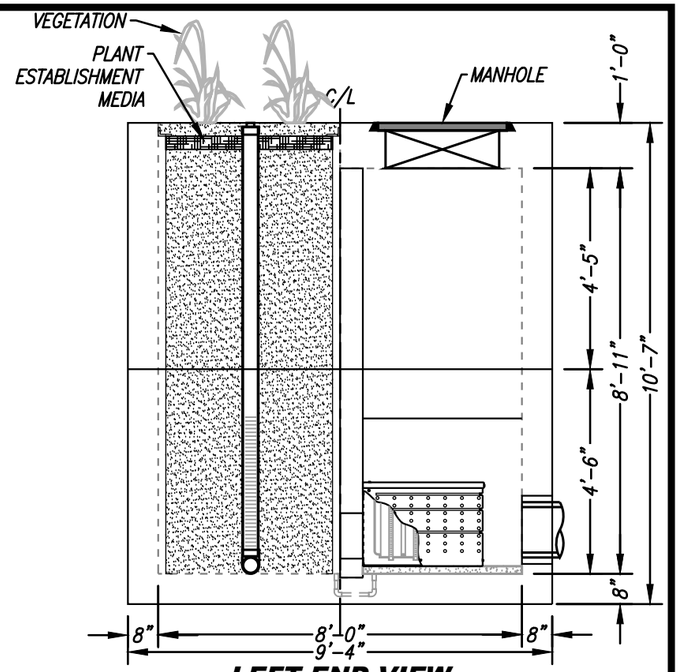
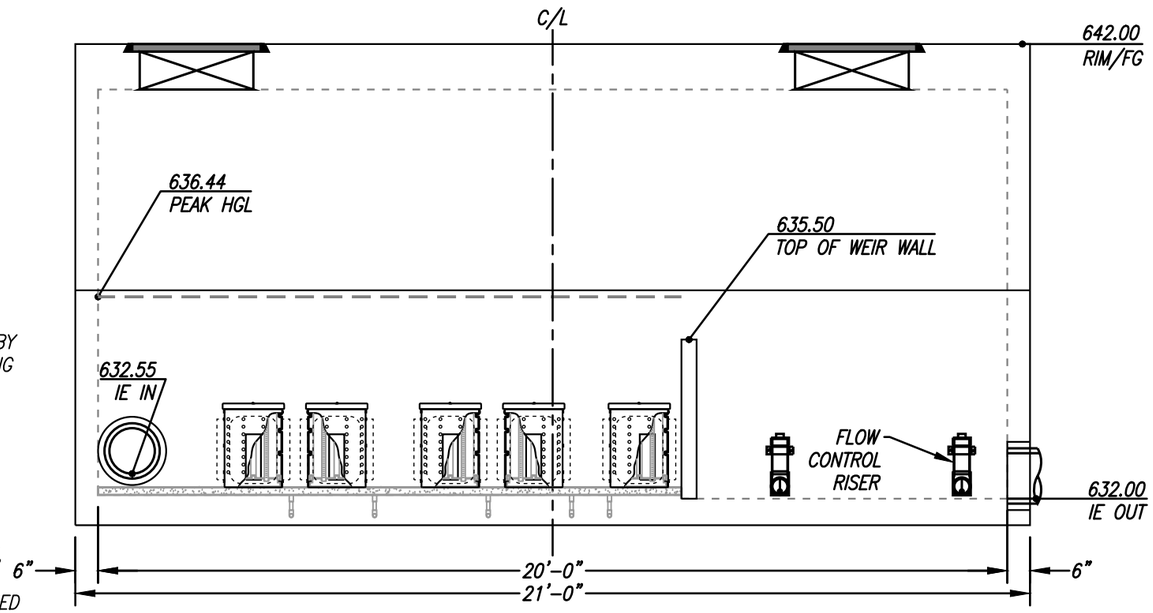


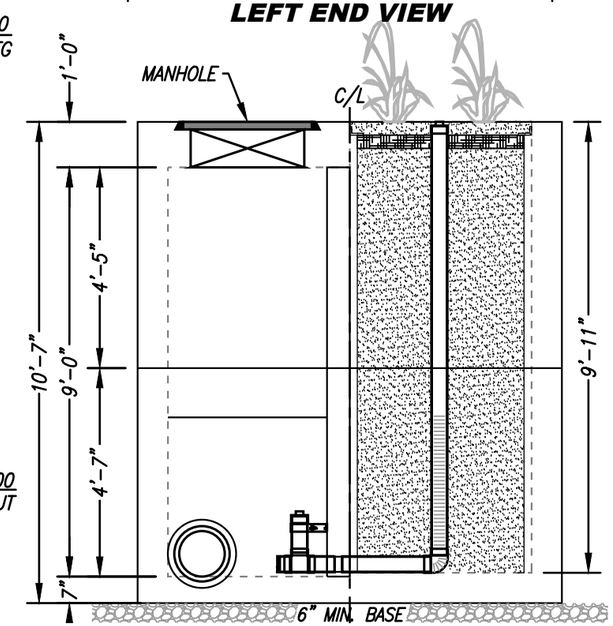
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

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TREATMENT FLOW (CFS)	0.60
OPERATING HEAD (FT)	3.5
PRETREATMENT LOADING RATE (GPM/SF)	2.1
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

MWS-L-8-20-9'-11"-V-HC
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

4/13/23BEN.ROEGEMAN

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name KWC ENGINEERS — Date 9/18/2023

Designed by — Case No

Company Project Number/Name

BMP Identification

BMP NAME / ID DMA 3

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

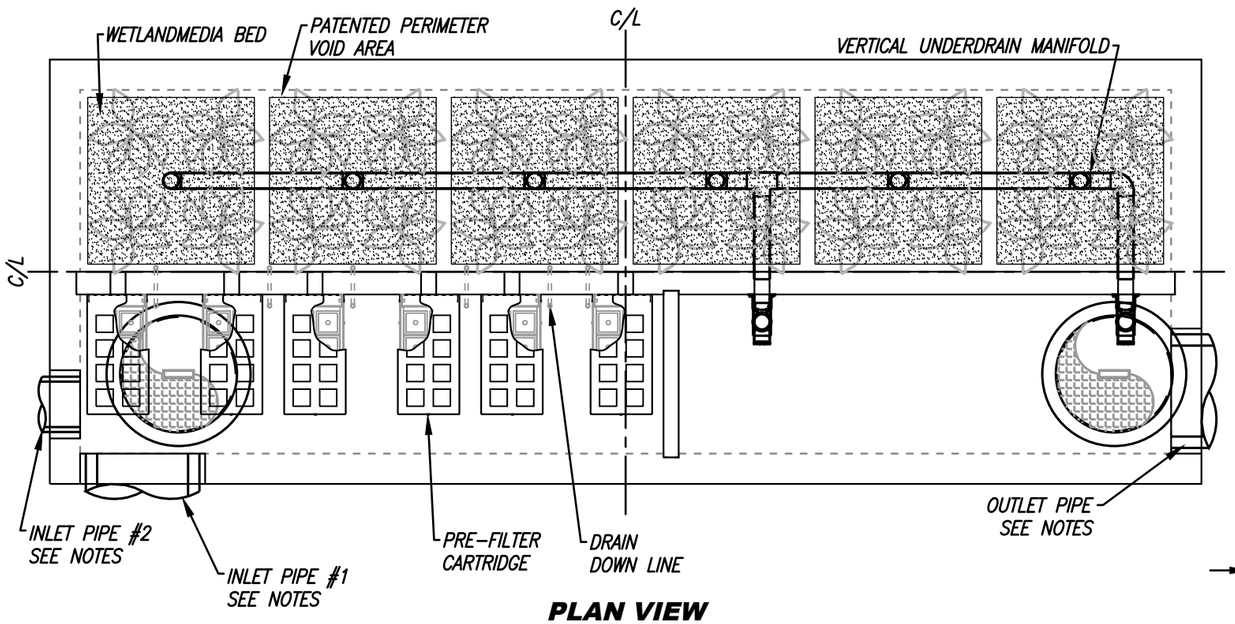
DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
3	*87285*	*Roofs*	*1*	*0.89*	*77858*			
3	*79014*	*Concrete or Asphalt*	*1*	*0.89*	*70481*			
3	*4580*	*Ornamental Landscaping*	*0.1*	*0.11*	*506*			
	170879	**Total**			**148845**	**0.20**	**0.7**	**0.9**

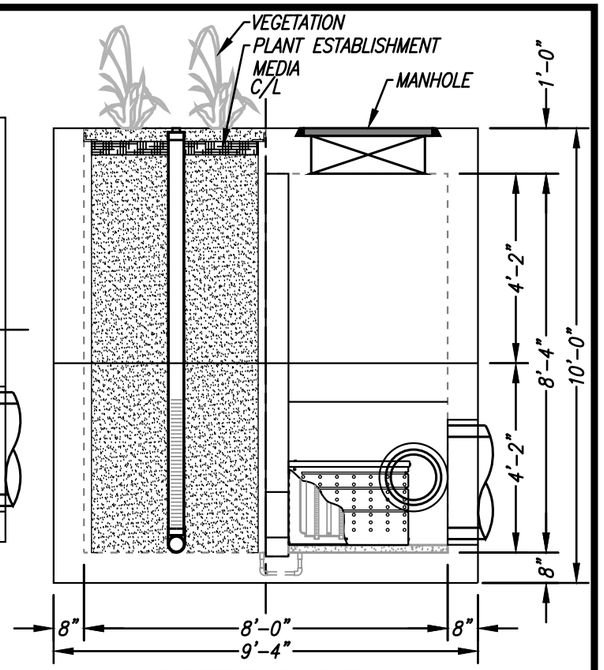
Notes:

SITE SPECIFIC DATA

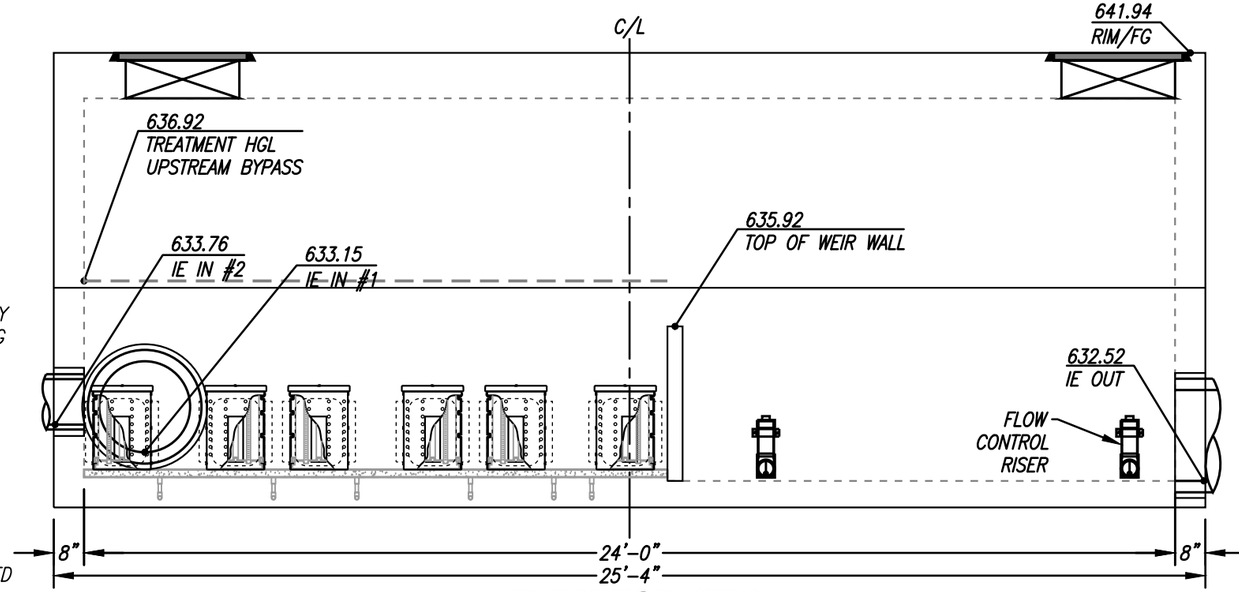
PROJECT NUMBER		728823-025	
PROJECT NAME		MAGNOLIA AVENUE BUSINESS CENTER (BCE 15046)	
PROJECT LOCATION		CORONA, CA	
STRUCTURE ID		DMA #3	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.70	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			11.27
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	633.15	RCP	24"
INLET PIPE 2	633.76	RCP	12"
OUTLET PIPE	632.52	RCP	24"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	641.94	641.94	641.94
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	ø30"	OPEN PLANTER	ø30"
WETLANDMEDIA VOLUME (CY)			28.40
ORIFICE SIZE (DIA. INCHES)			ø2.66 EA
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			



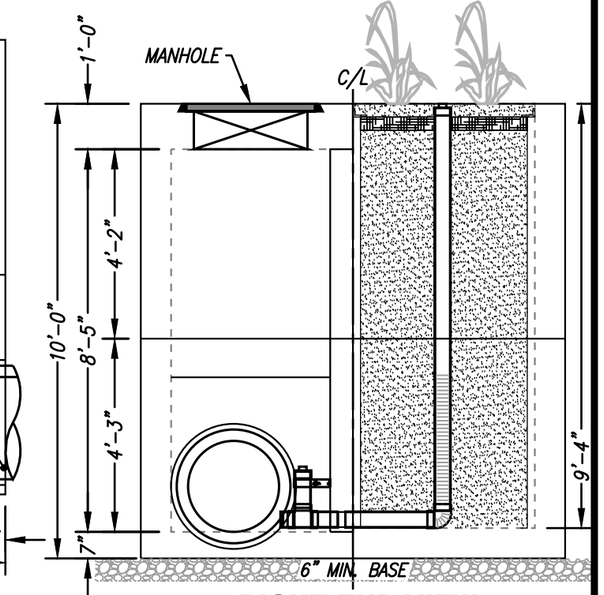
PLAN VIEW



LEFT END VIEW



ELEVATION VIEW



RIGHT END VIEW

INSTALLATION NOTES

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2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE FOR VERIFYING PROJECT ENGINEER'S RECOMMENDED BASE SPECIFICATIONS.
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5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL PIPES, RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO USE GROUT AND/OR BRICKS TO MATCH COVERS WITH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
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TREATMENT FLOW (CFS)	0.70
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	2.0
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS
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MWS-L-8-24-9'-4"-V-HC
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

A.13.23BEN.BOEGEMAN

<u>Santa Ana Watershed</u> - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name KWC ENGINEERS — Date 9/18/2023

Designed by — Case No

Company Project Number/Name

BMP Identification

BMP NAME / ID DMA 4

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imprevious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
4	*58335*	*Concrete or Asphalt*	*1*	*0.89*	*52035*			
4	*8281*	*Ornamental Landscaping*	*0.1*	*0.11*	*915*			
	66616	***Total***			**52949**	**0.20**	***0.2***	***0.3***

DMAs

Notes:

SITE SPECIFIC DATA

PROJECT NUMBER		728823-025	
PROJECT NAME		MAGNOLIA AVENUE BUSINESS CENTER (BCE 15046)	
PROJECT LOCATION		CORONA, CA	
STRUCTURE ID		DMA #3	
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
N/A		0.70	
TREATMENT HGL AVAILABLE (FT)			N/K
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			11.27
PIPE DATA	I.E.	MATERIAL	DIAMETER
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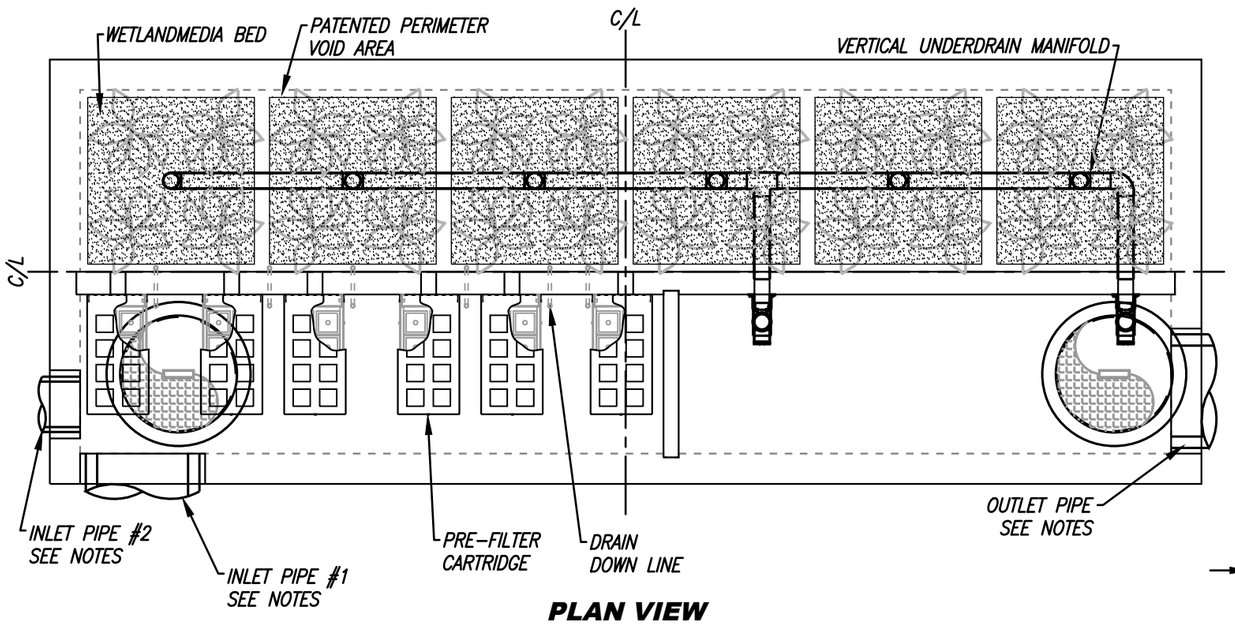
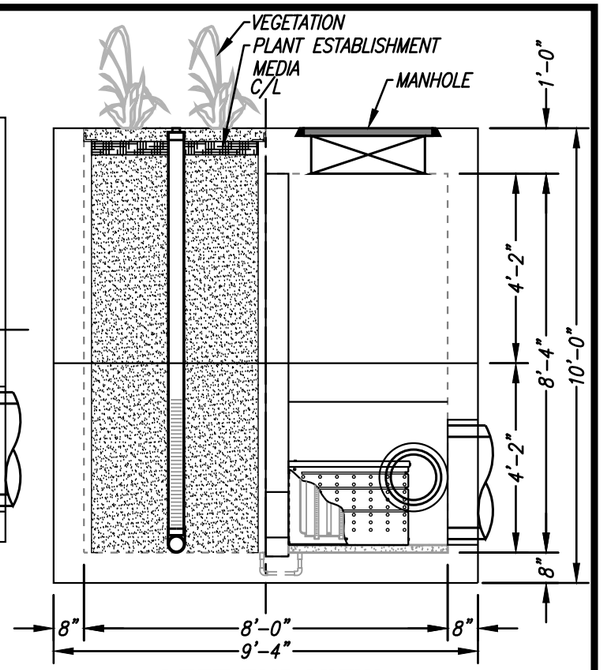
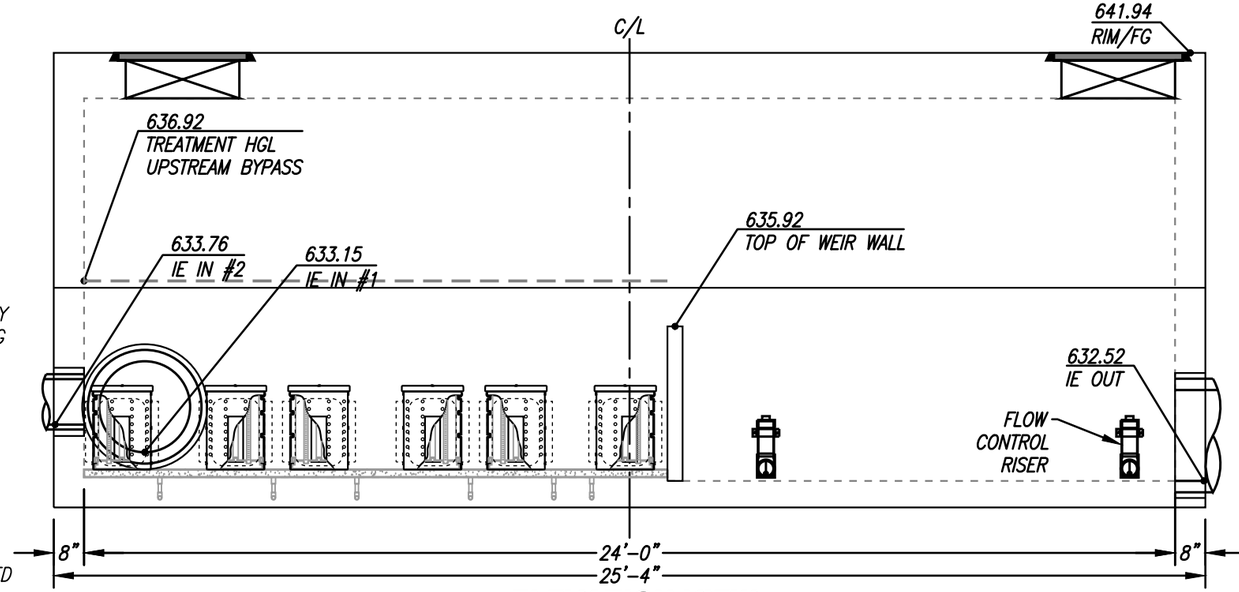
INLET PIPE 2	633.76	RCP	12"
OUTLET PIPE	632.52	RCP	24"
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION	641.94	641.94	641.94
SURFACE LOAD	PEDESTRIAN	N/A	PEDESTRIAN
FRAME & COVER	ø30"	OPEN PLANTER	ø30"
WETLANDMEDIA VOLUME (CY)			28.40
ORIFICE SIZE (DIA. INCHES)			ø2.66 EA
NOTES: PRELIMINARY NOT FOR CONSTRUCTION.			



PLAN VIEW



LEFT END VIEW



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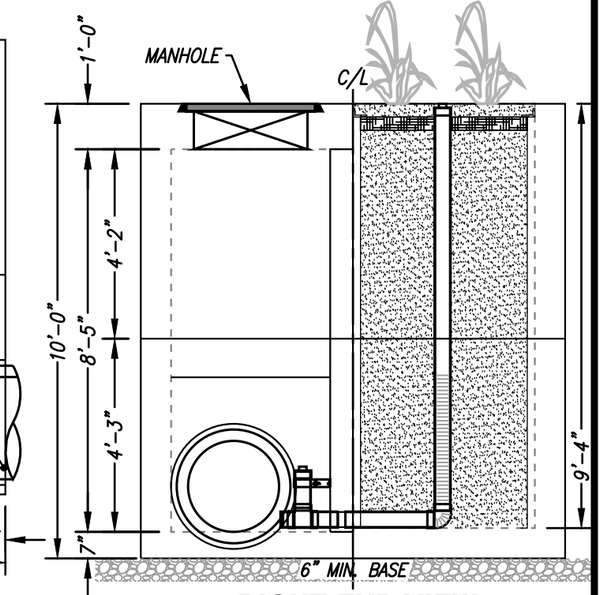

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WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

MODULAR WETLANDS
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

CONTECH ENGINEERED SOLUTIONS LLC
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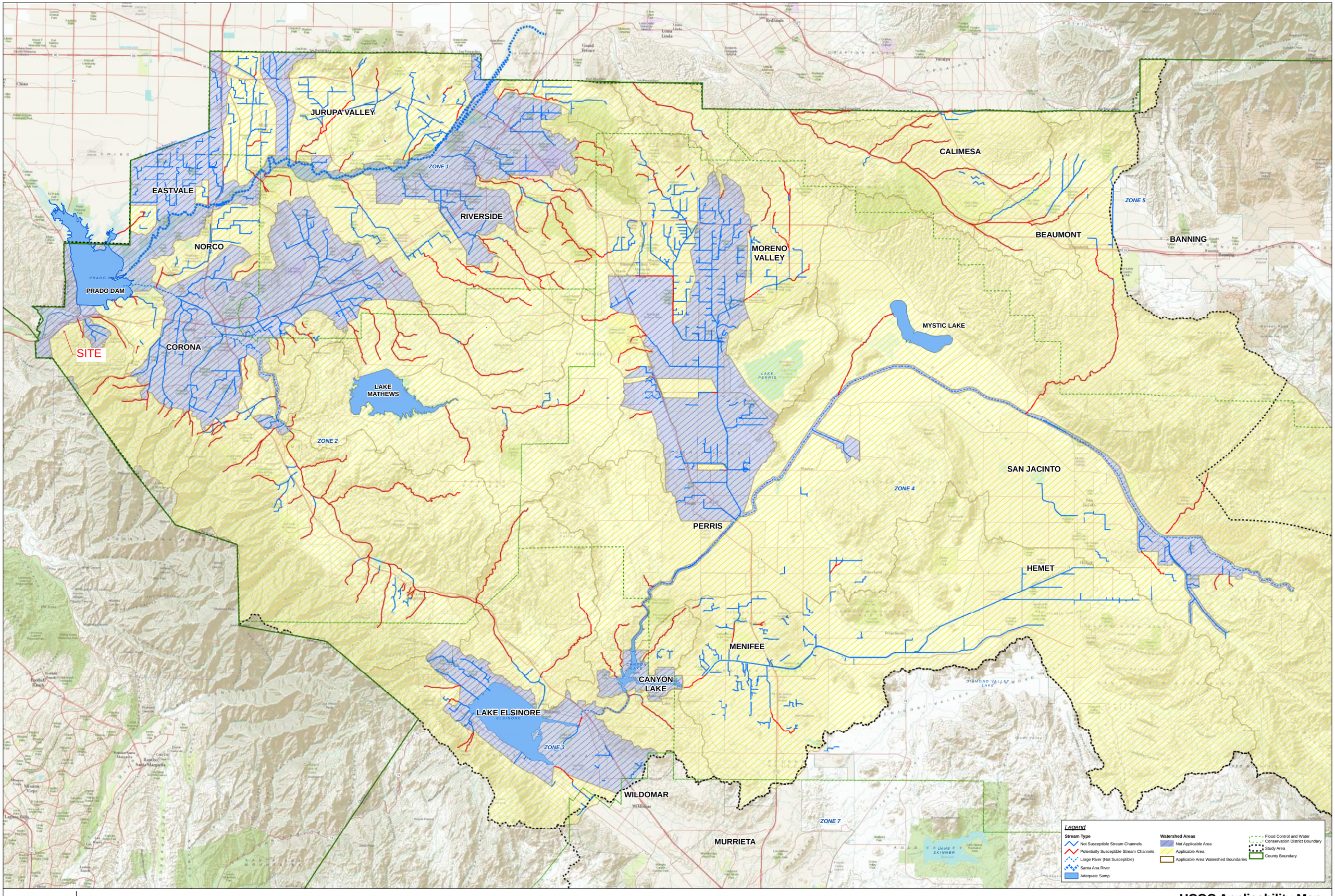
MWS-L-8-24-9'-4"-V-HC
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

A.13.23BEN.BOEGEMAN

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern



HCOC Applicability Map

Hydromodification Susceptibility Documentation Report and Mapping
Riverside County Flood Control and Water Conservation District

Map 2

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ A. **On-site storm drain inlets**	☒ **Locations of inlets.**	☒ **Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.**	☒ **Maintain and periodically repaint or replace inlet markings.** ☒ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.** ☒ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ☒ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
☐ B. **Interior floor drains and elevator shaft sump pumps**		☐ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**
☐ C. **Interior parking garages**		☐ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	☐ **Inspect and maintain drains to prevent blockages and overflow.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☐ D1. **Need for future indoor & structural pest control**		☐ **Note building design features that discourage entry of pests.**	☐ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☒ D2. **Landscape/ Outdoor Pesticide Use**	☐ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☐ **Show self-retaining landscape areas, if any.** ☒ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	**State that final landscape plans will accomplish all of the following.** ☒ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☒ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution.** ☐ **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.** ☒ **Consider using pest-resistant plants, especially adjacent to hardscape.** **To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.**	☒ **Maintain landscaping using minimum or no pesticides.** ☒ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening"** at http://rcflood.org/stormwater/**Error! Hyperlink reference not valid.** ☒ **Provide IPM information to new owners, lessees and operators.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ E. **Pools, spas, ponds, decorative fountains, and other water features.**	❑ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	❑ **See applicable operational BMPs in** "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
❑ F. **Food service**	❑ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ❑ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	❑ **Describe the location and features of the designated cleaning area.** ❑ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	❑ **See the brochure, "**The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ **Provide this brochure to new site owners, lessees, and operators.**
☒ G. **Refuse areas**	☒ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ☒ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ☒ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	☒ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ☒ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	☒ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ H. **Industrial processes.**	❑ **Show process area.**	❑ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	❑ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	❑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ❑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ❑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	**Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank** **www.cchealth.org/groups/hazmat/**	❑ **See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ J. **Vehicle and Equipment Cleaning**	❑ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	❑ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ❑ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ ❑ **Car dealerships and similar may rinse cars with water only.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ K. **Vehicle/Equipment Repair and Maintenance**	❑ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ❑ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ❑ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	❑ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ❑ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ❑ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ❑ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ❑ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ❑ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.** Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ L. **Fuel Dispensing Areas**	❑ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.** ❑ **Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		❑ **The property owner shall dry sweep the fueling area routinely.** ❑ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

[6] **The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ M. **Loading Docks**	☒ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ☒ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ☒ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		☒ **Move loaded and unloaded items indoors as soon as possible.** ☒ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ N. **Fire Sprinkler Test Water**		☒ **Provide a means to drain fire sprinkler test water to the sanitary sewer.**	☒ **See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
O. **Miscellaneous Drain or Wash Water or Other Sources** ❑ **Boiler drain lines** ❑ **Condensate drain lines** ❑ **Rooftop equipment** ❑ **Drainage sumps** ❑ **Roofing, gutters, and trim.** ❑ **Other sources**		❑ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ❑ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ❑ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ❑ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ❑ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.** **Include controls for other sources as specified by local reviewer.**	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ P. **Plazas, sidewalks, and parking lots.**			☒ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

CITY OF CORONA
WATER QUALITY MANAGEMENT PLAN AND STORMWATER BMP MAINTENANCE AND RIGHT OF ENTRY AGREEMENT WITH B9 MAGNOLIA OWNER, LLC

1. PARTIES AND DATE.

THIS WATER QUALITY MANAGEMENT PLAN AND STORMWATER BMP MAINTENANCE AND RIGHT OF ENTRY AGREEMENT ("Agreement") is made and entered into in the City of Corona, California, this ____day of _____, ____ by and between the City of Corona, a California municipal corporation ("City"), and B9 MAGNOLIA OWNER, a LIMITED LIABILITY COMPANY, with its principal place of business at 9550 W HIGGINS RD STE 550, ROSEMONT, IL 60018 ("Owner"). This Agreement applies to property located at 1375 MAGNOLIA AVENUE, CORONA, CA 92879, APN No. 107-030-022-3 in the County of Riverside, State of California.

2. RECITALS.

2.1 The Owner owns real property ("Property") in the City of Corona, County of Riverside, State of California, more specifically described in Exhibit "A" and depicted in Exhibit "B", each of which exhibits is attached hereto and incorporated herein by this reference.

2.2 At the time of initial approval of Owner's development project known as MAGNOLIA AVENUE BUSINESS CENTER within the Property, the City required the project to employ Best Management Practices, hereinafter referred to as "BMPs," to minimize pollutants in urban runoff.

2.3 The Owner has chosen to install and/or implement BMPs as described in the Water Quality Management Plan, on file with the City, hereinafter referred to as "WQMP", to minimize pollutants in urban runoff and to minimize other adverse impacts of urban runoff.

2.4 The WQMP has been certified by the Owner and reviewed and approved by the City.

2.5 The BMPs, with installation and/or implementation on private property and draining only private property, are part of a private facility with all maintenance or replacement, therefore, the sole responsibility of the Owner in accordance with the terms of this Agreement.

2.6 The Owner is aware that periodic and continuous maintenance, including, but not necessarily limited to, filter material replacement and sediment removal, is

required to assure peak performance of all BMPs in the WQMP and that, furthermore, such maintenance activity will require compliance with all Local, State, or Federal laws and regulations, including those pertaining to confined space and waste disposal methods, in effect at the time such maintenance occurs

3. TERMS.

3.1 Responsibility for Operation and Maintenance of BMPs. Owner shall diligently maintain all BMPs in a manner assuring peak performance at all times. All reasonable precautions shall be exercised by Owner and Owner's representative or contractor in the removal and extraction of any material(s) from the BMPs and the ultimate disposal of the material(s) in a manner consistent with all relevant laws and regulations in effect at the time. As may be requested from time to time by the City, the Owner shall provide the City with documentation identifying the material(s) removed, the quantity, and disposal destination.

3.2 Right of Access. Owner hereby provides the City or City's designee complete access, of any duration, to the BMPs and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by City's Director of Public Works ("Director"), no advance notice, for the purpose of inspection, sampling, testing of the BMPs, and in case of emergency, to undertake, in the City's sole discretion, necessary repairs or other preventative measures at Owner's expense as provided in paragraph 3 below. City shall make every effort at all times to minimize or avoid interference with Owner's use of the Property.

3.3 City Maintenance at Owner's Expense. In the event Owner, or its successors or assigns, fails to accomplish the necessary maintenance contemplated by this Agreement, within five (5) days of being given written notice by the City, the City is hereby authorized to cause any maintenance necessary to be done and charge the entire cost and expense to the Owner or Owner's successors or assigns, including administrative costs, attorneys fees and interest thereon at the maximum rate authorized by the Civil Code from the date of the notice of expense until paid in full. The City, at its sole election, may make these costs to be a lien upon the property that may be collected at the same time and in the same manner as ordinary municipal taxes as provided in Government Code section 38773.5. Nothing in this section or this Agreement creates an obligation by the City to maintain or repair any BMP, nor does this section prohibit the City from pursuing other legal recourse against Owner.

3.4 Recording. This Agreement shall be recorded in the Office of the Recorder of Riverside County, California, at the expense of the Owner and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth, and also a lien in such amount as will fully reimburse the City, including interest as herein above set forth, subject to foreclosure in event of default in payment.

3.5 Attorney's Fees. In event of legal action occasioned by any default or action of the Owner, or its successors or assigns, the Owner and its successors or assigns agree(s) to pay all costs incurred by the City in enforcing the terms of this Agreement, including reasonable attorney's fees and costs, and that the same shall become a part of the lien against said Property.

3.6 Covenant. It is the intent of the parties hereto that burdens and benefits herein undertaken shall constitute covenants that run with said Property and constitute a lien there against.

3.7 Binding on Successors. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto. The term "Owner" shall include not only the present Owner, but also its heirs, successors, executors, administrators, and assigns. Owner shall notify any successor to title of all or part of the Property about the existence of this Agreement. Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. Owner shall provide a copy of such notice to the City at the same time such notice is provided to the successor.

3.8 Indemnity and Insurance. The Owner, its heirs, successors, executors, administrators and assigns agree to defend, indemnify and holds harmless the City, its officials, employees and its authorized agents from any and all damages, accidents, casualties, occurrences or claims (collectively, "Claims") which might arise or be asserted against the City and which are in any way connected with the construction, operation, presence, existence or maintenance of the BMP by the Owner, or from any personal injury or property damage that may result from the City or other public entities entering the Property under Sections 2 or 3 of this Agreement; provided, however, that in no event shall Owner, its heirs, successors, executors, administrators and assigns be obligated to defend, indemnify or hold harmless the City, its officials, employees, and its authorized agents from any Claims arising from the City's or its officials, employees, and its authorized agents active negligence or willful misconduct while the City enters the Property under Section 2 or 3 of this Agreement.. The Owner shall maintain liability insurance in commercially reasonable amounts, but not less than $1,000,000.00, covering the BMP and City. The City shall require proof of insurance to be provided to City on a regular basis as determined by the City.

3.9 Time of the Essence. Time is of the essence in the performance of this Agreement.

3.10 Notice. Any notice to a party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A party may change a notice address only by providing written notice thereof to the other party.

IF TO CITY:

City of Corona
400 South Vicentia Avenue
Corona, CA 92882
Attn: Sylvia Edwards

IF TO OWNER:

Attn:

[SIGNATURES ON FOLLOWING PAGE]

[REMAINDER OF PAGE LEFT INTENTIONALLY BLANK]

SIGNATURE PAGE TO
CITY OF CORONA
WATER QUALITY MANAGEMENT PLAN AND STORMWATER BMP
MAINTENANCE AND RIGHT OF ENTRY AGREEMENT
WITH B9 MAGNOLIA OWNER, LLC

IN WITNESS THEREOF, the parties hereto have executed this Agreement as of the date first written above.

CITY OF CORONA
a California municipal corporation

By: _____
Savat Khamphou
Public Works Director

ATTEST:

_____
City Clerk

B9 MAGNOLIA OWNER
a Limited Liability Company (LLC)

By: _____
Signature

_____
Name (Print)

_____
Title (Print)

By: _____
Signature

_____
Name (Print)

_____
Title (Print)

ATTEST:

_____

NOTARY ACKNOWLEDGEMENT OF CITY

STATE OF CALIFORNIA)
COUNTY OF _____)

On _____ before me, (here insert name and title of the officer), personally appeared _____, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under penalty of perjury under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature of Notary Public: (Seal)

_____

_____

NOTARY ACKNOWLEDGEMENT OF CITY

STATE OF CALIFORNIA)
COUNTY OF _____)

On _____ before me, (here insert name and title of the officer), personally appeared _____, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under penalty of perjury under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature of Notary Public: (Seal)

_____

_____

NOTARY ACKNOWLEDGEMENT OF OWNER

STATE OF CALIFORNIA)
COUNTY OF _____)

On _____ before me, (here insert name and title of the officer), personally appeared _____, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under penalty of perjury under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature of Notary Public: (Seal)

_____

_____

NOTARY ACKNOWLEDGEMENT OF OWNER

STATE OF CALIFORNIA)
COUNTY OF _____)

On _____ before me, (here insert name and title of the officer), personally appeared _____, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under penalty of perjury under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature of Notary Public: (Seal)

_____

_____

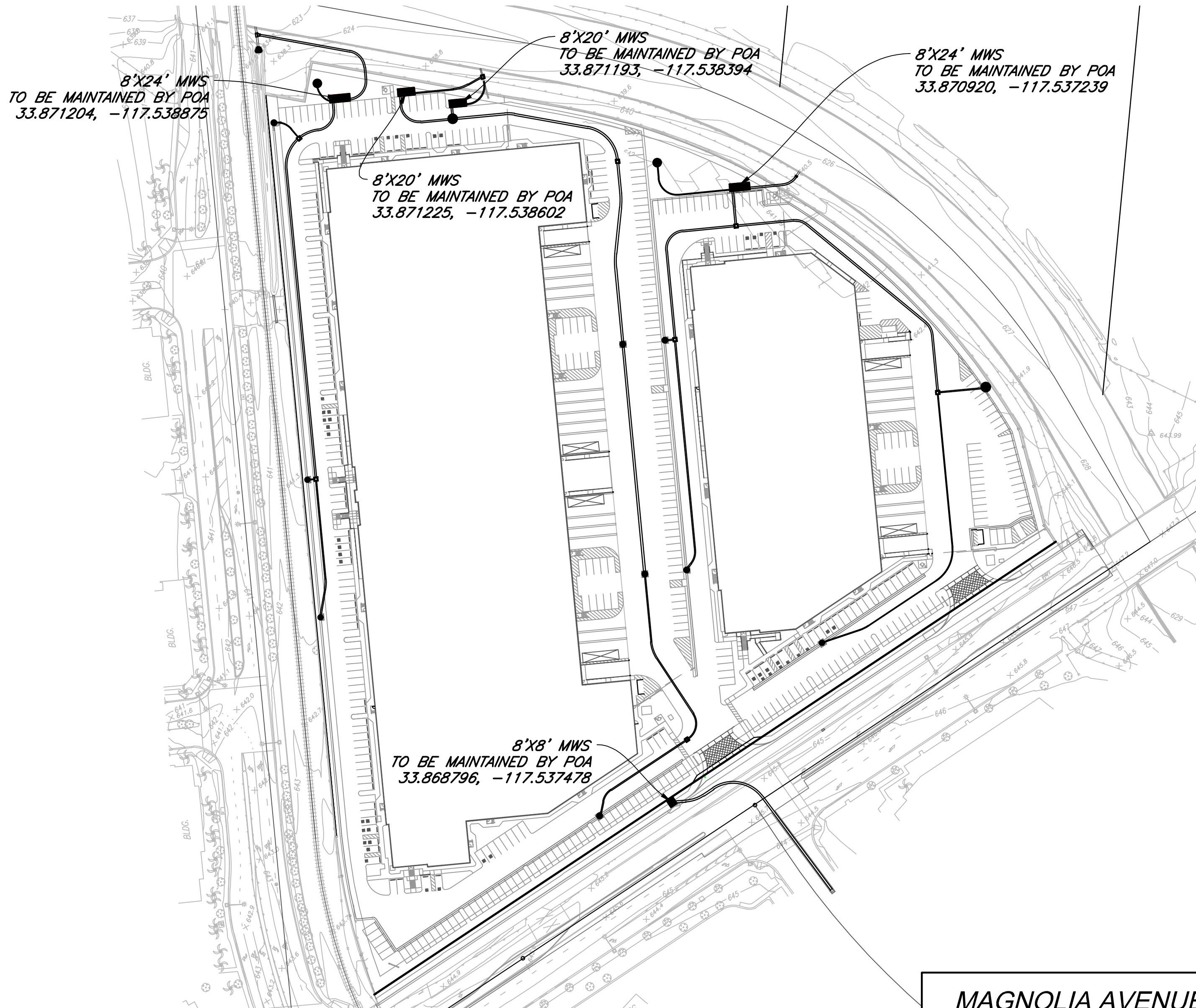
EXHIBIT "A"
(LEGAL DESCRIPTION)

THE LAND REFERRED TO HEREIN BELOW IS SITUATED IN THE CITY OF CORONA, COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

THAT PORTION OF THE NORTHWEST QUARTER OF SECTION 32, TOWNSHIP 3 SOUTH, RANGE 6 WEST, AS SHOWN BY SECTIONALIZED SURVEY OF THE RANCHO EL SOBRANTE DE SAN JACINTO AND OF LOT 13 IN BLOCK 63 OF THE LANDS OF THE RIVERSIDE LAND AND IRRIGATING COMPANY, AS SHOWN BY MAP ON FILE IN BOOK 1 PAGE 70 OF MAPS, SAN BERNARDINO COUNTY RECORDS, BOUNDED AS FOLLOWS: ON THE SOUTHEAST BY THE SOUTHWESTERLY EXTENSION OF THE NORTHWEST LINE OF MAGNOLIA AVENUE, AS SHOWN ON RECORD OF SURVEY ENTITLED "RECORD OF SURVEY OF A PORTION OF LOTS 11, 12, 13, 14, 15, IN BLOCK 63 OF RIVERSIDE LAND AND IRRIGATING COMPANY AND A PORTION OF SECTIONS 29 AND 32, TOWNSHIP 3 SOUTH, RANGE 6 WEST, SAN BERNARDINO BASE AND MERIDIAN" ON FILE IN BOOK 20, PAGE 3 OF RECORD OF SURVEY, RIVERSIDE COUNTY RECORDS; ON THE WEST BY THE EASTERLY LINE OF THE PROPERTY SPUR OF THE ATCHISON, TOPEKA, AND SANTA FE RAILWAY COMPANY; AND ON THE NORTHEAST BY THE SOUTHERLY AND SOUTHWESTERLY LINE OF PARCELS 5 TO 11, INCLUSIVE, OF SAID RECORD OF SURVEY ON FILE IN BOOK 20, PAGE 3 OF RECORDS OF SURVEY, RIVERSIDE COUNTY RECORDS.

EXCEPTING THEREFROM THAT PORTION GRANTED TO THE RIVERSIDE COUNTY FLOOD CONTROL AND WATER DISTRICT CONSERVATION DISTRICT BY DEED RECORDED OCTOBER 22, 1984 AS INSTRUMENT NO. 84-227367 AND RE-RECORDED FEBRUARY 11, 1985 AS INSTRUMENT NO. 85-028214 BOTH OF OFFICIAL RECORDS.

EXHIBIT "B"
(MAP/ILLUSTRATION)



SCALE 1"=200'

LEGEND

▬	MWS
●	CATCH BASIN/ GRATE INLET

MAGNOLIA AVENUE BUSINESS CENTER
BMP MAINTENANCE AGREEMENT
EXHIBIT B

PREPARED BY:

KWC ENGINEERS
CIVIL ENGINEERS • PLANNERS • SURVEYORS
1880 COMPTON AVENUE, SUITE 100 CORONA, CA. 92881-3370 951-734-2130

SHEET
1 OF 1

Operations and Maintenance (O&M) Plan

Water Quality Management Plan

for

Magnolia Avenue Business Center

APN: 107-030-022-3

Prepared for:

Contact: Anthony Nelson

B9 Magnolia Owner, LLC

9550 W Higgins Rd Ste 550

Rosemont, IL 60018 (312) 798-5465

Prepared by:

KWC Engineers

1880 Compton Ave, Suite 100.

Corona, CA 92881

Tel: 951-734-2130

Contact: Nick Nguyen, P.E.

Prepared on:

October 2023

Operations and Maintenance Plan

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Non-Structural Source Control BMPs			
Yes	**Education for Property Owners, Tenants and Occupants** All owners & tenants will be given a copy of the recorded CC&R's which will contain a section outlining the environmental awareness education materials. Educational materials will be provided to residents/tenants, including education materials and restrictions to reduce pollutants from reaching the storm drain system.	Prior to occupancy and annually thereafter. Frequency: Annually	*Owner or POA*
Yes	**Activity Restriction** Activity restriction shall be clearly noted within the CC&R's or lease agreement. The POA shall restrict activities that have the potential to create adverse impacts on water quality. Activities include but are not limited to: prohibiting vehicle maintenance activities within parking areas and stalls, prohibiting long-term parking without prior authorization, and prohibiting outdoor vehicle washing. Restriction shall begin upon occupancy	The Owner will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Restrictions include, but are not limited to, prohibiting vehicle maintenance or vehicle washing. Frequency: Ongoing	*Owner or POA*

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	**Common Area Landscape Management** Common area landscape management that includes minimizing fertilizer and pesticide application, use of slow-release fertilizers, maintenance activities, providing education to homeowners and tenants (via project owner and/or POA), and providing education and training for employees on management of landscape materials and storm water management. *Landscape Management Includes:* • *Mitigation of the potential dangers of fertilizer and pesticide usage through the incorporation of an Integrated Pest Management Program (IPM).* • *Monitor for runoff and efficiency regularly.* • *Implementation of a water budget.* • *Irrigation systems shall be automatically controlled and designed, installed, and maintained so as to minimize overspray and runoff onto streets, sidewalks, driveways, structures, windows, walls, and fences.* • *Use of native and drought tolerant species when replanting*	Maintenance shall be consistent with City requirements. Fertilizer and/or pesticide usage shall be consistent with City/County Management Guidelines for Use of Fertilizers. Maintenance includes mowing, weeding, and debris removal on a weekly basis. Trimming, replanting, and replacement of mulch shall be performed on an as-needed basis to prevent exposure of erodible surfaces. Trimmings, clippings, and other landscape wastes shall be properly disposed of in accordance with local regulations. Materials temporarily stockpiled during maintenance activities shall be placed away from water courses and storm drains inlets. Frequency: Monthly	*Owner or POA*

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	**BMP Maintenance** The POA will be responsible for the implementation and maintenance of each applicable non-structural BMP, as well as scheduling inspections and maintenance of all applicable structural BMP facilities through its staff, landscape contractor, and/or any other necessary maintenance contractors.	Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in this WQMP. Records of inspections and BMP maintenance shall be kept by the Owner and shall be available for review upon request. Frequency: Ongoing	*Owner or POA*
No	**Title 22 CCR Compliance**	Not Applicable	Not Applicable
No	**Spill Contingency Plan**	Not Applicable	Not Applicable
No	**Underground Storage Tank Compliance** There are no underground storage tanks.	Not Applicable	Not Applicable
No	**Hazardous Materials Disclosure Compliance** There are no hazardous materials stored on site.	Not Applicable	Not Applicable
No	**Uniform Fire Code Implementation**	Not Applicable	Not Applicable

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	**Common Area Litter Control** The POA will be responsible for performing trash pickup and sweeping of littered common areas as needed and weekly at a minimum. Any trash/debris waste collected shall be properly disposed of in accordance with local regulations. Responsibilities will also include noting improper disposal of materials by the public and reporting such violations for further investigation.	Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities. Frequency: Weekly	*Owner or POA*
Yes	**Employee Training** All employees of the POA and any contractors will require training to ensure that employees are aware this WQMP and of maintenance activities that may result in pollutants reaching the storm drain. Training will include, but not be limited to, spill cleanup procedures, proper waste disposal, housekeeping practices, etc	Educate all new employees/ managers on storm water pollution prevention, particularly good housekeeping practices, prior to the start of the rainy season (October 1). Refresher courses shall be conducted on an as needed basis. Frequency: Annually	*Owner or POA*
Yes	**Housekeeping of Loading Docks** No below-grade loading docks are proposed. Housekeeping measures will be implemented to keep any delivery areas clean and orderly condition. Includes sweeping, removal of trash & debris on a weekly basis, and use of dry methods for cleanup.	Sweep delivery areas weekly and remove any trash/debris. Keep area clean of trash and debris at all times. Spills shall be cleaned up immediately using dry methods. Frequency: Weekly	*Owner or POA*

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
Yes	**Common Area Catch Basin Inspection** All on-site storm drain inlets, curb and gutters and ribbon gutter systems shall be inspected and cleaned out by the HOA at least once a year, prior to the rainy season, no later than October 1st of each year. All public drainage facilities will be maintained by the City.	Catch basin inlets and other drainage facilities shall be inspected after each storm event and once per year. Inlets and other facilities shall be cleaned prior to the rainy season, by October 1st each year. Frequency: Annually	Private Areas: Owner or POA Public Areas: City
Yes	**Street Sweeping Private Streets and Parking Lots** The POA shall be responsible for the street sweeping of all private street, drive aisles and parking areas within the project quarterly, and prior to the rainy season, no later than October 1st each year. The City shall be responsible for sweeping of public streets	Streets & parking lots must be swept at least quarterly (every 3 months), including prior to the start of the rainy season (October 1st). Frequency: Quarterly	Private Areas: Owner or POA Public Areas: City
No	**Retail Gasoline Outlets** There are no gasoline stations proposed.	Not Applicable	Not Applicable
Structural Source Control BMPs			
Yes	**Provide Storm Drain System Stenciling and Signage** The phrase “NO DUMPING! DRAINS TO OCEAN” or an equally effective phrase approved by the City, will be stenciled on all major storm drain inlets within the project site to alert the public to the destination of pollutants discharged into storm water. Stencils shall be in place by completion of construction	Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1st each year. Those determined to be illegible will be restenciled as soon as possible. Frequency: Annually	Private Areas: Owner or POA Public Areas: City

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	**Design and Construct Outdoor Material Storage Areas to Reduce Pollutant Introduction** Outdoor storage prohibited.	Not Applicable	Not Applicable
Yes	**Design and Construct Trash and Waste Storage Areas to Reduce Pollutant Introduction** All trash and waste shall be stored in containers that have lids or tarps to minimize direct precipitation into the containers. Any trash storage areas will be paved, covered, and either be sloped to landscaping areas or include a barrier to keep drainage out of the storm drain.	Sweep trash area at least once per week and before October 1st each year. Maintain area clean of trash and debris at all times. Frequency: Weekly	*Owner or POA*
Yes	**Use Efficient Irrigation Systems & Landscape Design** Irrigation systems would be designed to meet City standards for water efficient landscaping, as applicable in accordance with City Municipal Code. Where feasible, includes incorporation of native tolerant species for landscaping, protection of slopes and efficient irrigation. May be used in conjunction with educational materials to homeowners/tenants as well as activity restrictions.	In conjunction with routine maintenance activities, verify that landscape design continues to function properly by adjusting properly to eliminate overspray to hardscape areas, and to verify that irrigation timing and cycle lengths are adjusted in accordance with water demands, given time of year, weather, and day or night time temperatures. Frequency: Monthly	*Owner or POA*

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	**Protect Slopes and Channels and Provide Energy Dissipation** All disturbed slopes will be re-vegetated and stabilized to prevent erosion.	To be performed in conjunction with maintenance activities. Maintain vegetative cover and/or mulch to eliminate exposed soils. Any eroded surfaces to be repaired immediately. Inspections to be performed twice each year (spring and fall) and after major storm events to check for signs of erosion, gullies, and sloughing. Frequency: Monthly	*Owner or POA*
Yes	**Loading Docks** No below-grade loading docks are proposed. Housekeeping measures will be implemented to keep any delivery areas clean and orderly condition. Includes sweeping, removal of trash & debris on a weekly basis, and use of dry methods for cleanup.	Sweep delivery areas weekly and remove any trash/debris. Keep area clean of trash and debris at all times. Spills shall be cleaned up immediately using dry methods. Frequency: Weekly	*Owner or POA*
No	**Maintenance Bays** There will be no maintenance bays	Not Applicable	Not Applicable
No	**Vehicle Wash Areas** There will be no vehicle wash areas	Not Applicable	Not Applicable
No	**Outdoor Processing Areas** There will be no outdoor processing areas	Not Applicable	Not Applicable
No	**Equipment Wash Areas** There will be no equipment wash areas	Not Applicable	Not Applicable

BMP Applicable? Yes/No	BMP Name and BMP Implementation, Maintenance, and Inspection Procedures	Implementation, Maintenance, and Inspection Frequency and Schedule	Person or Entity with Operation & Maintenance Responsibility
No	**Fueling Areas** There will be no fueling areas	Not Applicable	Not Applicable
No	**Hillside Landscaping**	Not Applicable	Not Applicable
No	**Wash Water Controls for Food Preparation Areas** There will be no food processing areas	Not Applicable	Not Applicable
No	**Community Car Wash Racks** There will be no community car wash areas.	Not Applicable	Not Applicable
Treatment Control BMPs			
Yes	**Treatment Control BMP** Biotreatment BMP - MWS Units	Maintenance should be done during dry weather conditions when no flow is entering the system. A person can open the manhole on the MWS Unit and inspect the system to determine the need for maintenance. If needed remove sediment and trash, replace cartridge and draw down filter media, and trim vegetation as recommended by manufacturer. Frequency: Annually or bi-annually, Before storm season or after rain event as needed.	*Owner or POA*

Responsible Party

The responsible party for implementation of this WQMP is:

name of person/ or POA Property Manager, etc.

address:

phone number:

24-Hour Emergency Contact #:

Email:

Required Permits

There are no permits required for the implementation, operation, and maintenance of the BMPs.

Forms to Record BMP Implementation, Maintenance, and Inspection

The owner shall be responsible for BMP implementation, maintenance, and inspection. See Table for BMP Implementation, maintenance, and inspection requirements. The form "Record of BMP Implementation, Maintenance, and Inspection attached and shall be used to record implementation, maintenance, and Inspection of BMPs. The inspection form shall include the date of the inspection, the name of person and signature of the person who performed the inspection, the BMP that was inspected/maintained, and description of the activity performed. Forms shall be regularly completed and kept with this Operations and Maintenance Plan.

Recordkeeping

All records must be maintained for at least five (5) years and must be made available for review upon request.

Employee Training Program

Staff reviewing plans, inspecting and maintaining Water Quality/Stormwater BMPs shall be appropriately trained and qualified to implement and maintain Water Quality/stormwater BMPs. New staff shall receive training within 6 months of hiring.

The Owner will develop a training program for staff that includes the use of the educational materials, training on litter patrol, contingency plans for spill clean-up, good housekeeping of the site, BMP maintenance, etc. the Owner is responsible for supply of materials at the time of initial employment training and on an annual basis (at a minimum).

Revisions to Operations & Maintenance Plan

The Owner will be responsible for revisions to the O&M Plan in the event of a substantial change to the project BMP due to construction. Modifications to the O&M Plan may be necessary if project changes result in a potential increase in pollutant discharge to storm water or if inspection and monitoring indicates that existing BMPs are ineffective. Any revisions shall

be made by the Engineer of Record or other qualified person(s) and shall obtain appropriate approvals by the local agency that has jurisdiction over the subject property.

Funding

The Owner, as listed below, will be responsible for funding the installation and on-going maintenance for the BMPs. An appropriate mechanism for the long-term operation and maintenance will be developed by the Owner or Property Owner Association, as applicable.

Owner/Responsible Party information:

B9 Magnolia Owner, LLC
9550 W Higgins Rd Ste 550
Rosemont, IL 60018
(312) 798-5465

RECORD OF BMP IMPLEMENTATION, MAINTENANCE, AND INSPECTION

Today's Date: _____

Name of Person Performing Activity (Printed): _____

Signature: _____

BMP Name (As Shown in O&M Plan)	Brief Description of Implementation, Maintenance, and Inspection Activity Performed

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

RIVERSIDE COUNTY
WATERSHED PROTECTION

Riverside's Solution
to Runoff Pollution

What is Runoff?

When water from rain and outdoor water use runs off roofs, driveways, and sidewalks, it brings everything it touches with it. This runoff can include trash, fertilizer, pet waste, home solvents, and other pollutants which ends up in Riverside County's waterways.

Water that goes into Riverside County's storm drains is NOT TREATED

Whether residents or businesses intentionally or accidentally let runoff flow into storm drains, it can harm our creeks, rivers, lakes, and eventually the ocean. While wastewater from toilets, sinks, and showers gets treated, water that flows into the storm drain goes untreated into our waterways.

What Common Pollutants are Found in Runoff?

Here are some common pollutants and actions you can take to prevent them from flowing into Riverside County's storm drains and waterways.

Pollutants and Prevention

Pet Waste

Pet waste has harmful bacteria that can contaminate Riverside County's bodies of water and neighboring ecosystems. This can lead to residents getting sick, algal blooms, and plants and animals dying. Always pick up after your pet on walks and in your yard, especially before it rains.

Trash

Litter like cigarette butts, candy and food wrappers/containers, and straws can harm our waterways and cause drainage issues. Make sure to place all trash in covered trash cans to prevent wind or rain from taking it into the storm drain system.

Automotive Chemicals

Liquids like motor oil, fuels, lubricants, and antifreeze can damage water quality and harm wildlife if they get into our creeks, rivers, and lakes. Make sure to repair leaking vehicles as soon as possible and clean spills with absorbents available at home and auto supply shops. Used engine oil can be recycled at the Murrieta, Beaumont, or Moreno Valley ABOP and PaintCare Facilities or where the oil was purchased.

Yard Clippings

If yard clippings aren't properly disposed of, they can cause erosion, flooding, and prevent stormwater drainage. Collect all clippings after doing yard work and properly dispose of them by composting or placing them in a green waste bin.

Fertilizers and Pesticides

These can enter the storm drain after it rains or when landscaped areas are over irrigated. Limit your pesticide, fertilizer, and herbicide use by using non-chemical methods whenever possible. If they are necessary, follow the manufacturer's instructions and do not apply them 48 hours before predicted rain.

Soapy Car Wash Water

Dirt and debris from your car, along with chemicals in the soap, can harm our creeks, rivers, and lakes if they flow untreated into our waterways. Wash your car over a gravel or grassy area, or take it to a commercial car wash to limit runoff pollution.

Household Chemicals

Paint and other household chemicals like solvents, degreasers, and drain cleaners are hazardous to aquatic life and human health if they get into the storm drain system. Make sure to follow the manufacturer's instructions, clean spills with absorbents, and dispose of unused paints and household chemicals at the Murrieta, Beaumont, or Moreno Valley ABOP and PaintCare Facilities (rcwaste.org/hhw).

For more information about keeping our waterways clean, visit: **rcwatershed.org/about/stormwater-pollution-prevention**.

Who We Are

Riverside County Watershed Protection is a partnership program between Riverside County, the Flood Control & Water Conservation District, Coachella Valley Water District, and 27 cities that manage watershed programs which protect, preserve, and enhance the quality of the water and the natural environment of our watersheds.

What We Do

The partnership uses a combination of public education, best management practices, evaluation, and water quality monitoring to eliminate stormwater pollution in our waterways and comply with all federal, state, and local regulations. Our aim is to empower residents with information about pollution prevention and implement tactics that keep our watersheds healthy.

Contact Us:

To report pollution:

Call **(800) 506-2555**

Visit **rcwatershed.org/get-involved/report-pollution**

For emergencies, dial **911**

RIVERSIDE COUNTY
WATERSHED PROTECTION

RIVERSIDE COUNTY
WATERSHED PROTECTION

Irrigation Runoff Stormwater Fact Sheet

Report Irrigation Runoff or Stormwater Pollution
800.506.2555

Be the Solution.
Prevent Runoff Pollution.

The water that flows into storm drains is not treated before flowing into Riverside County's creeks, rivers, lakes, and eventually the ocean (unlike the sanitary sewer system). It should never contain washwater or pollutants like pesticides, fertilizer, dirt, leaves, and other hazardous substances generated by irrigation runoff. If these pollutants are not properly contained, they can runoff into the storm drain and harm our waterways.

Preventing runoff pollution while maintaining your property protects aquatic life, water quality, and keeps our waterways thriving. To take care of your green spaces, make sure to only use pesticides and fertilizers when absolutely necessary and never before rain, prevent overwatering, and sweep debris regularly.

Irrigation Pollutant Sources

Overwatering
Overwatering can cause dirt, pesticides, fertilizers, pet waste, and organic waste to flow into the storm drain.

Pesticide, Fertilizer, or Herbicide Use
Pesticide, fertilizer, or herbicide use 48 hours before or during rain can lead to these chemicals going untreated into our waterways.

Improper Maintenance Before Rain
Leaving pet waste, leaves, grass clippings, and chemicals on the ground (from property neglect or landscape maintenance) before or during rain can cause them to flow into the storm drain.

Runoff From Commercial Properties
Commercial properties, like golf courses, can cause pesticides, dirt, oil, and other hazardous waste to runoff.

Best Management Practices for Irrigation

Protect our waterways while maintaining your green spaces by implementing these BMPs (best management practices):

For more information about stormwater-safe irrigation practices, visit: **rcwatershed.org/residents/at-home/overwatering/**.

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Visit **rcwatershed.org/get-involved/report-pollution**

For emergencies, dial **911**

Prevent Overwatering

- Only give your lawn and garden the amount of water it needs, and use drip irrigation, soaker hoses, or micro-spray systems. Do not water when it is raining and use an irrigation timer to pre-set watering times.
- Conduct a Sprinkler Spruce Up regularly to ensure overwatering and runoff aren't occurring. If you notice a leak in your irrigation system, repair it immediately.
- Redirect your downspout to a rain garden, dry creek bed, rain barrel, or underwatered part of your lawn.

Plant Riverside County-Native Vegetation

- Plant native vegetation like foothill penstemon and red bush monkeyflower to reduce the amount of water, fertilizers, and pesticides needed.
- Plant fast-growing and dense ground covering plants like California fuscia and Angelita daisy to prevent erosion. For landscaping ideas visit: www.bewaterwise.com.

Utilize Business Best Practices

- Wash golf carts and lawn mowers over permeable surfaces.
- Cover storm drains when conducting washing and maintenance activities to prevent washwater from flowing into the storm drain.
- If your golf course handles reportable quantities of hazardous waste, you are required to submit a Hazardous Materials Business Plan through the California Environmental Reporting System. Visit rcwaste.org/business/hw for more info.
- Keep stockpiles at least 50 feet from concentrated flows of stormwater, drainage courses, and inlets.
- Regularly inspect and maintain oil storage tanks, drums, and areas to keep them in good condition.
- Utilize a commercial water broom to wash hard surfaces like tennis courts, patios, parking areas, and sidewalks, and make sure washwater never enters the storm drain system.

RIVERSIDE COUNTY
WATERSHED PROTECTION

Prevent Water Pollution:

Landscape & Gardening Maintenance Guide

Be the Solution.
Prevent Runoff Pollution.

The water that flows into storm drains is not treated before flowing into Riverside County's creeks, rivers, lakes, and eventually the ocean (unlike the sanitary sewer system). It should never contain washwater or pollutants like pesticides, fertilizer, dirt, leaves, and other hazardous substances generated by landscape and gardening maintenance. If these pollutants are not properly contained, they can runoff into the storm drain and harm our waterways.

Preventing runoff pollution while maintaining your property protects aquatic life, water quality, and keeps our waterways thriving. While taking care of your lawn and garden, make sure to only use pesticides and fertilizers when absolutely necessary and never before rain, clean up spills immediately, and sweep debris regularly.

Landscape & Gardening Pollutant Sources

Overwatering

Dirt, pesticides, fertilizers, pet waste, and organic waste can run off into the storm drain when overwatering occurs.

Lack of Maintenance Before Rain

Pet waste, leaves, grass clippings, and chemicals left on the ground (from property neglect or landscape maintenance) before or during rain can be washed into the storm drain.

Pesticide, Fertilizer, or Herbicide Use Before Rain

Using pesticides, fertilizers, or herbicides 48 hours before or during rain can cause these chemicals to go untreated into our waterways.

Best Management Practices for Landscape & Gardening Maintenance

Protect our waterways while maintaining your lawn and garden by implementing these BMPs (best management practices):

Who We Are

Riverside County Watershed Protection is a partnership program between Riverside County, the Flood Control & Water Conservation District, Coachella Valley Water District, and 27 cities that manage watershed programs which protect, preserve, and enhance the quality of the water and the natural environment of our watersheds.

What We Do

The partnership uses a combination of public education, best management practices, evaluation, and water quality monitoring to eliminate stormwater pollution in our waterways and comply with all federal, state, and local regulations. Our aim is to empower residents with information about pollution prevention and implement tactics that keep our watersheds healthy.

Contact Us

To report pollution:

Call **(800) 506-2555**

Visit **rcwatershed.org/get-involved/report-pollution**

For emergencies, dial **911**

Maintain Your Property

- Prevent overwatering/runoff by only giving your lawn and garden the amount of water it needs. Do not water when it's raining and if you find a leak in your sprinkler system, fix it right away.
- Use a broom (not a hose) to clean regularly. Collect leaves, clippings, and pruning waste and compost them or dispose of them in your organic waste bin.
- Pick up dog waste and dispose of it in a trash can before it rains.
- Schedule large projects for dry weather and do not apply pesticides, herbicides, fungicides or fertilizers before rain events.
- Prevent erosion and runoff pollution during projects by covering piles of soil and stockpiled materials with tarps.

Sweep and Absorb Spills

- Clean solid material spills (i.e., mulch, soils, fertilizer) by sweeping or using a vacuum before disposing in the proper receptacle.
- Clean liquid spills (i.e., pesticides or herbicides) by using absorbents like rags.
- Dispose of hazardous waste (pesticides, garden chemicals, chemical-soaked rags) at collection centers. Visit rcwaste.org/hhw for more information.
- Report any spills that have entered the street, gutter, or storm drain by calling 800-506-2555 or going to rcwatershed.org/get-involved/report-pollution/.

Plan Ahead & Use Less-Toxic Alternatives

- Only use pesticides, fertilizers, or herbicides when absolutely necessary and always follow the instructions on the label. Use less-toxic alternatives, like predatory insects and mulch, whenever possible.
- If chemical use is necessary, check the weather before and only apply them to your lawn or garden when it's not windy and rain is not predicted in the next 48 hours.

For more information about stormwater-safe gardening and landscape maintenance, visit: **rcwatershed.org/residents/at-home/gardening**.

Stormwater Pollution

What you should know for...

Industrial & Commercial Facilities

Best Management Practices (BMPS) for:

- Industrial Facilities
- Commercial Facilities

Riverside County Stormwater Program Members

City of Banning
(951) 922-3105

City of Beaumont
(951) 769-8520

City of Calimesa
(909) 795-9801

City of Canyon Lake
(951) 244-2955

City of Cathedral City
(760) 770-0340

City of Coachella
(760) 398-3502

City of Corona
(951) 736-2447

City of Desert Hot Springs
(760) 329-6411

City of Eastvale
(951) 361-0900

City of Hemet
(951) 765-2300

City of Indian Wells
(760) 346-2489

City of Indio
(760) 391-4000

City of Jurupa Valley
(951) 332-6464

City of Lake Elsinore
(951) 674-3124

City of La Quinta
(760) 777-7000

City of Menifee
(951) 672-6777

City of Moreno Valley
(951) 413-3000

City of Murrieta
(951) 304-2489

City of Norco
(951) 270-5607

City of Palm Desert
(760) 346-0611

City of Palm Springs
(760) 323-8299

City of Perris
(951) 943-6100

City of Rancho Mirage
(760) 324-4511

City of Riverside
(951) 826-5311

City of San Jacinto
(951) 487-7330

City of Temecula
(951) 694-6444

City of Wildomar
(951) 677-7751

Coachella Valley Water District
(760) 398-2651

County of Riverside
(951) 955-1000

Riverside County Flood Control District
(951) 955-1200

YOU can prevent Stormwater Pollution following these practices...

Industrial and Commercial Facilities

The Riverside County Stormwater Program has identified a number of Best Management Practices (BMPs) for Industrial and Commercial Facilities. These BMPs control and reduce stormwater pollutants from reaching our storm drain system and ultimately our local water bodies. City and County ordinances require businesses to use these BMPs to protect our water quality. Local cities and the County are required to verify implementation of these BMPs by performing regular facility inspections.

Prohibited Discharges

Discontinue all non-stormwater discharges to the storm drain system. It is *prohibited* to discharge any chemicals, paints, debris, wastes or wastewater into the gutter, street or storm drain.

Outdoor Storage BMPs

- Install covers and secondary containment areas for all hazardous materials and wastes stored outdoors in accordance with County and/or City standards.
- Keep all temporary waste containers covered, at all times when not in use.
- Sweep outdoor areas instead of using a hose or pressure washer.
- Move all process operations including vehicle/equipment maintenance inside of the building or under a covered and contained area.
- Wash equipment and vehicles in a contained and covered wash bay which is closed-loop or connected to a clarifier sized to local standards and discharged to a sanitary sewer or take them to a commercial car wash.

Spills and Clean Up BMPs

- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep up the area.
- Clean up spills immediately when they occur, using dry clean up methods such as absorbent materials or sweep followed by proper disposal of materials.
- Always have a spill kit available near chemical loading dock doors and vehicle maintenance and fueling areas.
- Follow your Business Emergency Plan, as filed with the local Fire Department.
- Report all prohibited discharges and non-implementation of BMPs to your local Stormwater Coordinator as listed on the back of this pamphlet.
- Report hazardous materials spills to 951-358-5055 or call after hours to 951-782-2973 or, if an emergency, call the Fire Department's Haz Mat Team at 911.

Plastic Manufacturing Facilities BMPs

AB 258 requires plastic product manufacturers to use BMPs, such as safe storage and clean-up procedures to prevent plastic pellets (nurdles) from entering the waterway. The plastic pellets are released into the environment during transporting, packaging and processing and migrate to waterways through the storm drain system. AB 258 will help protect fish and wildlife from the hazards of plastic pollution.

Training BMPs

As prescribed by your City and County Stormwater Ordinance(s), train employees in spill procedures and prohibit non-stormwater discharges to the storm drain system. Applicable BMP examples can be found at www.cabmphandbooks.com.

Permitting

Stormwater discharges associated with specific categories for industrial facilities are regulated by the State Water Resources Control Board through an Industrial Stormwater General Permit. A copy of this General Permit and application forms are available at: www.waterboards.ca.gov, select stormwater then the industrial quick link.

To report illegal dumping or for more information on stormwater pollution prevention call: 1-800-506-2555 or e-mail us at: fcnpdes@rcflood.org.

Pressure Washing
Best Management Practice (BMP) Program
Mobile Vehicle and Equipment
Washing and Detailing

What is Mobile Pressure Washing?

Pressure washing is defined as "*power washing, steam cleaning, and any other mobile cosmetic cleaning operation (with or <u>without</u> detergents or chemical additives) of various surfaces including, but not limited to, transportation-related, structural and food-related cleaning engaged in for commercial purposes.*"

What are the potential hazards from mobile pressure washing?

Wash water from vehicle and equipment operations contains a variety of pollutants, which can harm aquatic life and the environment and contaminate recreational sites and drinking water supplies, *even if cleaning solutions are labeled nontoxic or biodegradable*.

The activity of vehicle/equipment washing/steam cleaning has the potential to contribute metals, oil and grease, detergents, degreasing chemicals, solvents, phosphates, organics, acids, caustics and suspended solids to the storm water drainage system and receiving waters.

Disposing of these materials into storm drains, ditches, and gutters is **<u>prohibited</u>** by law.

Regulations Prohibiting Non-Storm Water Surface Discharge:

- Corona Municipal Code Section 13.27.050
- State of California Porter-Cologne Water Quality Control Act, Division 7, Chapter 5.5, Section 13376
- Federal Clean Water Act, 40 CFR Parts 122-124
- City's NPDES Storm Water Permit

What are Best Management Practices (BMP's)?

Best Management Practices (BMP's) are procedures that help prevent pollutants from entering our storm drains. BMP requirements for mobile vehicle/equipment washing include:

Minimize Pollutants Generated.

- Use a mop or rags to pre-clean the vehicle or equipment.
- Minimize water use by using high pressure, low volume nozzles.
- Use the minimal amount and least toxic detergents (Phosphate Free or Biodegradable) and degreasers to complete the job.

Contain and Collect Wash Water.

- All wash water containment and removal equipment shall be installed and operational prior to commencement of any cleaning processes or wastewater generation activities.
- Common equipment used for containing and collecting wastewater generated during pressure washing activities includes: vacuum pumps, booms/berms, portable containment areas/mats, weighted storm drain covers, inflatable plumber's plugs, oil/water separators, holding tanks, portable sump pumps, hoses, and absorbents.
- Storm drain inlets located within or down grade of wash areas shall be covered or otherwise protected to prevent entry of wash water.
- Vacuum booms shall be used at all times and arranged in such a fashion to direct all wastewater generated in the vacuum ports in the vacuum boom.
- All wastewater recovery equipment shall be used in accordance with manufacturer's recommendations.

Properly Dispose of Wash Water.

- All wastewater generated from cleaning activities shall be collected and treated for reuse or drained to the sanitary sewer through an interior building drain, sink or private sewer clean-out ***with the owner's permission***.
- <u>All discharges to the sanitary sewer must be in accordance with local sanitary sewer disposal regulations</u>.
- Treatment to remove solids, oil and grease residual may be required.
- No hazardous waste, such as engine degreasers or toxic wheel cleaners, shall be discharged to the sanitary sewer system.
- **Contact City of Corona Source Control (951) 279-3594** for proper sewer disposal methods if you are unsure of the constituents.

Only Rain Down the Storm Drain.

- At no time shall any wastewater be discharged to the storm drain system. This includes driveways, streets, and gutters.

Leave No Residue Behind.

- Any wash chemical residue generated shall be rinsed from the surface and removed with the wastewater.
- No wash chemical residue is to remain on the washing surface.

Businesses conducting pressure washing activities within the City must comply with all above BMP's. Businesses that do not adequately implement these BMP's are in violation of Corona Municipal Code and are subject to enforcement actions.

For More Information

Please call City of Corona's Storm Water Section at **(951) 736-2248** for questions regarding proper implement-ation of the BMP's.

Remember to Keep Corona Clean…
ONLY RAIN DOWN THE STORM DRAIN!

CONTECH®
ENGINEERED SOLUTIONS

Modular Wetlands® Linear Stormwater Biofiltration

The experts you need to solve your stormwater challenges

Contech is the leader in stormwater solutions, helping engineers, contractors and owners with infrastructure and land development projects throughout North America.

With our responsive team of stormwater experts, local regulatory expertise and flexible solutions, Contech is the trusted partner you can count on for stormwater management solutions.

Your Contech Team

STORMWATER CONSULTANT

It's my job to recommend the best solution to meet permitting requirements.

STORMWATER DESIGN ENGINEER

I work with consultants to design the best approved solution to meet your project's needs.

REGULATORY MANAGER

I understand the local stormwater regulations and what solutions will be approved.

SALES ENGINEER

I make sure our solutions meet the needs of the contractor during construction.

Contech is your partner in stormwater management solutions

Restoring Nature's Presence in Urban Areas – Modular Wetlands® Linear

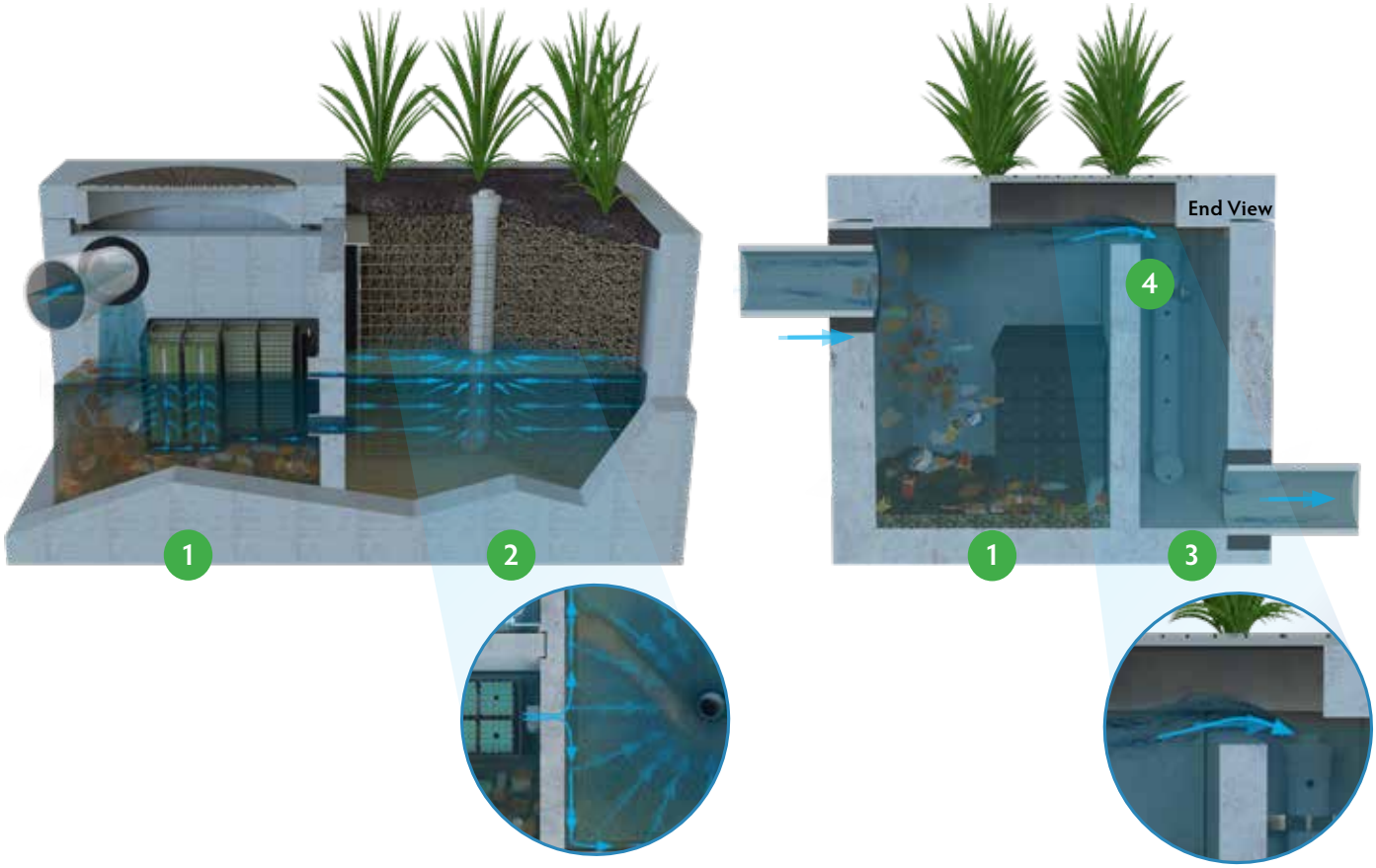
As cities grow, there is less space for natural solutions to treat stormwater. Contech understands this and is committed to providing compact, Low Impact Development (LID) solutions like the Modular Wetlands Linear to protect our nation's waterways.

The Modular Wetlands® Linear is the only biofiltration system to utilize patented horizontal flow, allowing for a small footprint, high treatment capacity, and design versatility. It is also the only biofiltration system that can be routinely installed downstream of storage for additional volume control and treatment.

With numerous regulatory approvals, the system's aesthetic appeal and superior pollutant removal make it the ideal solution for a wide range of stormwater applications, including urban development projects, commercial parking lots, residential streets, mixed-use developments, streetscapes, and more.

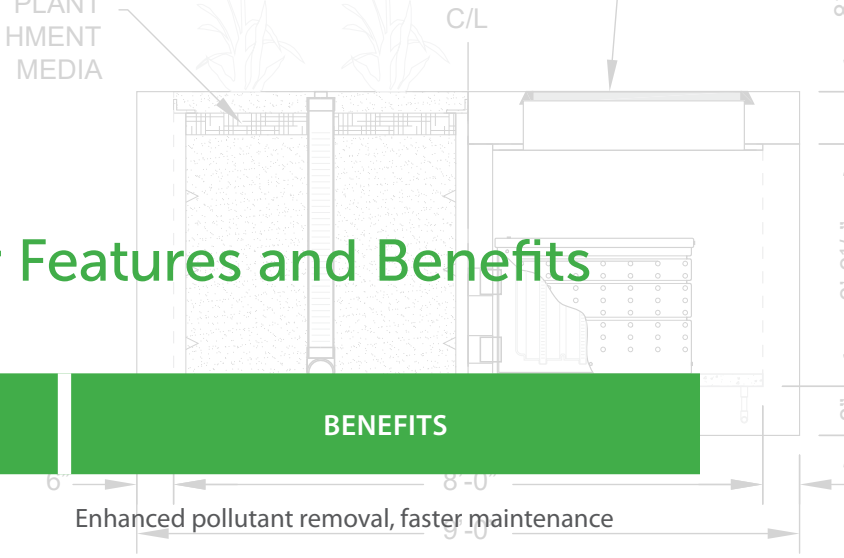
MODULAR WETLANDS®

How the Modular Wetlands® Linear Works



1. **PRETREATMENT** | Stormwater enters the pretreatment chamber where total suspended solids settle, and trash and debris are contained within the chamber. Stormwater then travels through the pretreatment filter boxes that provide additional treatment.
2. **BIOFILTRATION** | As water enters the biofiltration chamber, it fills the void space in the chamber's perimeter. Horizontal forces push the water inward through the biofiltration media, where nutrients and metals are captured. The water then enters the drain pipe to be discharged.
3. **DISCHARGE** | The specially designed vertical drain pipe and orifice control plate control the flow of water through the media to a level lower than the media's capacity, ensuring media effectiveness. The water then enters the horizontal drain pipe to be discharged.
4. **BYPASS** | During peak flows, an internal weir in the side-by-side configuration allows high flows to bypass treatment, eliminating flooding and the need for a separate bypass structure. Bypass is not provided in the end-to end configuration.

Using horizontal flow to improve performance



Modular Wetlands® Linear Features and Benefits

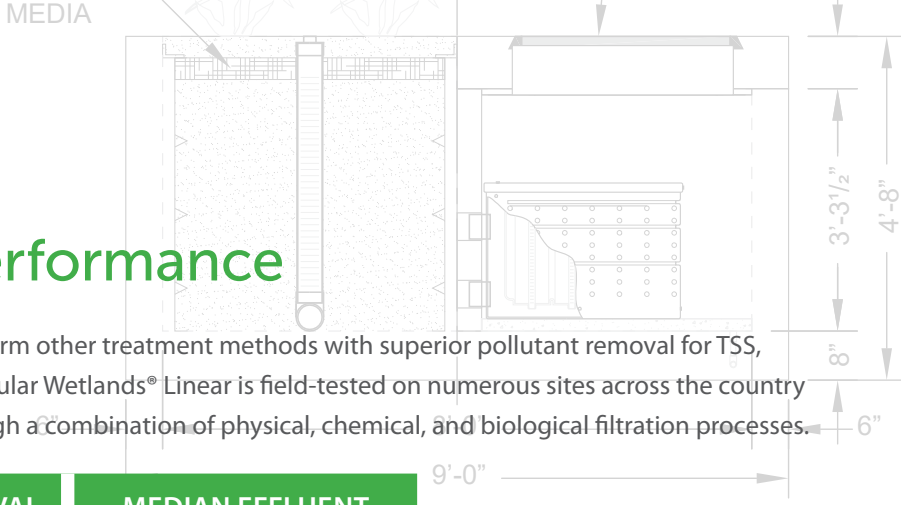
FEATURE	BENEFITS
Pretreatment chamber	Enhanced pollutant removal, faster maintenance
Horizontal flow biofiltration	Greater filter surface area
Performance verified by both the WA DOE and NJ DEP	Superior pollutant capture with confidence
Built-in high flow bypass	Eliminates flooding and the need for a separate bypass structure
Available in multiple configurations and sizes	Flexibility to meet site-specific needs

The Modular Wetlands system offers many different configurations.

Select Modular Wetlands® Linear Approvals

Modular Wetlands Linear is approved through numerous local, state and federal programs, including but not limited to:

- Washington State Department of Ecology TAPE
- California Water Resources Control Board, Full Capture Certification
- Virginia Department of Environmental Quality (VA DEQ)
- New Jersey Department of Environmental Protection (NJDEP)
- Maryland Department of the Environment - Environmental Site Design (ESD)
- Rhode Island Department of Environmental Management BMP
- Texas Commission on Environmental Quality (TCEQ)
- Atlanta Regional Commission Certification



Modular Wetlands® Performance

The Modular Wetlands® Linear continues to outperform other treatment methods with superior pollutant removal for TSS, heavy metals, nutrients, and hydrocarbons. The Modular Wetlands® Linear is field-tested on numerous sites across the country and is proven to effectively remove pollutants through a combination of physical, chemical, and biological filtration processes.

POLLUTANT OF CONCERN	MEDIAN REMOVAL EFFICIENCY	MEDIAN EFFLUENT CONCENTRATION (MG/L)
Total Suspended Solids (TSS)	89%	12
Total Phosphorus - TAPE (TP)	61%	0.041
Nitrogen (TN)	23%	1
Total Copper (TCu)	50%	0.006
Total Dissolved Copper	37%	0.006
Total Zinc (TZn)	66%	0.019
Dissolved Zinc	60%	0.0148
Motor Oil	79%	0.8

Sources:
TAPE Field Study - 2012
TAPE Field Study - 2013

Note: Some jurisdictions recognize higher removal rates. Contact your Contech Stormwater Consultant for performance expectations.

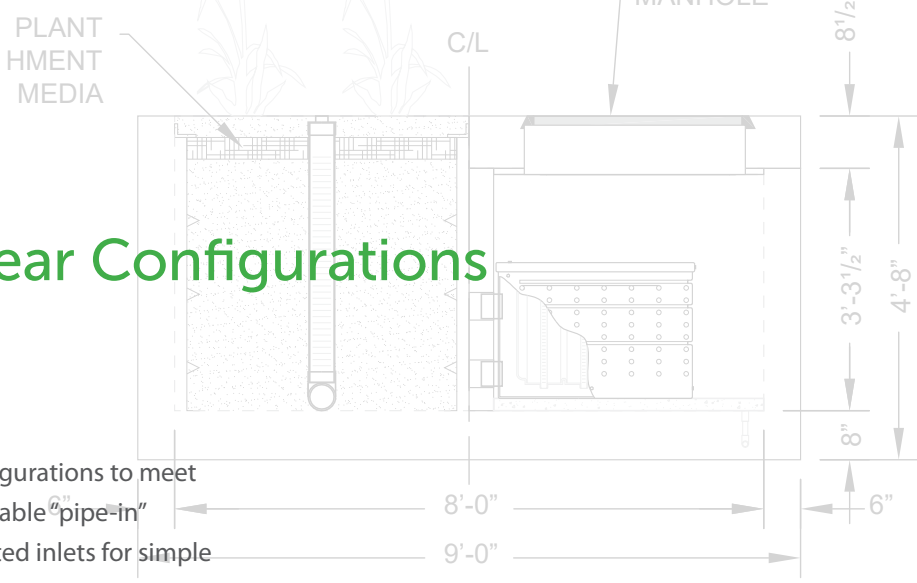
Modular Wetlands® Linear Maintenance

The Modular Wetlands® Linear is a self-contained treatment train. Maintenance requirements for the unit consist of five simple steps that can be completed using a vacuum truck. The system can also be cleaned by hand.

- Remove trash from the screening device
- Remove sediment from the separation chamber
- Periodically replace the pretreatment cartridge filter media
- Replace the drain down filter media
- Trim vegetation

Most Modular Wetland Linear systems can be cleaned in about thirty minutes.

Multiple configurations allow for easy site integration



Modular Wetlands® Linear Configurations

Multiple system configurations integrate with site hydraulic design and layout ...

The Modular Wetlands Linear is offered in multiple configurations to meet site specific needs. This highly versatile system has available "pipe-in" options on most models, along with built-in curb or grated inlets for simple integration into your storm drain design.

Curb Inlet

The Curb Inlet configuration accepts sheet flow through a curb opening and is commonly used along roadways and parking lots. It can be used in sump or flow-by conditions.

Vault

The Vault configuration can be used in end-of-the-line installations. Another benefit of the "pipe-in" design is the ability to install the system downstream of underground detention systems to meet water quality volume requirements, or for traffic-rated designs (no plants).

Downspout

The Downspout configuration is designed to accept a vertical downspout pipe from rooftop and podium areas. Some models have the option of utilizing an internal bypass, simplifying the overall design. The system can be installed as a raised planter, and the exterior can be stuccoed or covered with other finishes to match the look of adjacent buildings.

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PIPE SOLUTIONS

STRUCTURES SOLUTIONS

Few companies offer the wide range of high-quality stormwater resources you can find with us — state-of-the-art products, decades of expertise, and all the maintenance support you need to operate your system cost-effectively.

THE CONTECH WAY

Contech® Engineered Solutions provides innovative, cost-effective site solutions to engineers, contractors, and developers on projects across North America. Our portfolio includes bridges, drainage, erosion control, retaining wall, sanitary sewer and stormwater management products.

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