11.8 Hydrology and Water Quality Technical Studies

Preliminary Hydrology Report

PREPARED BY:

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Project Number:
1100-04
LIDO HOUSE HOTEL
City of Newport Beach

Newport Beach, CA

Supervising Engineer:
Mark Nero, P.E.

Date Prepared
November 2013
Rev. January 2014

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Appendix 7 Hydrology Maps (In Pocket)

1.0 INTRODUCTION

1.1 GEOGRAPHIC SETTING

The proposed 4.2 acre (5.2 Ac Study Area) project is located on the old City of Newport Beach city hall site, in the City of Newport Beach. The site is bounded by Via Lido Plaza on the north and northeast, Newport Blvd on the west, 32 Street on the south and Fire Station No. 2 on the east. See Figure 1, Vicinity Map

1.2 PROJECT DESCRIPTION

The project proposes constructing a 3-story, 130 room hotel with meeting rooms, retail spaces, a restaurant, rooftop bar and guest pool in a central courtyard area. Parking is located on the perimeter of the complex with the majority of the parking located on the north and northeast arc. Street parking is located on 32nd street in angled spaces similar to the present condition. Extensive use of permeable pavements is likely for water quality purposes.

The project is located in Flood zone X (shaded) per Flood Insurance Rate Map (FIRM) Number 06059C0381J, revised December 3, 2009. Flood zone X (shaded) is defined by FEMA as "Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. Flood zone X (shaded) are also used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile."

1.3 PURPOSE OF THIS REPORT

The purpose of this report is to accomplish the following objectives:

To determine pre-developed and developed storm water discharges generated within the project area for determination of design feasibility, constructability and impact on existing facilities. (See Hydrology Studies in Appendix 1).

To demonstrate that the "storm water" and "flood" protection goals as outlined in Addendum No. 1 to the O.C. Design Manual can be been met.

To establish that there are no significant impacts to the surrounding facilities and properties as a result of this development.

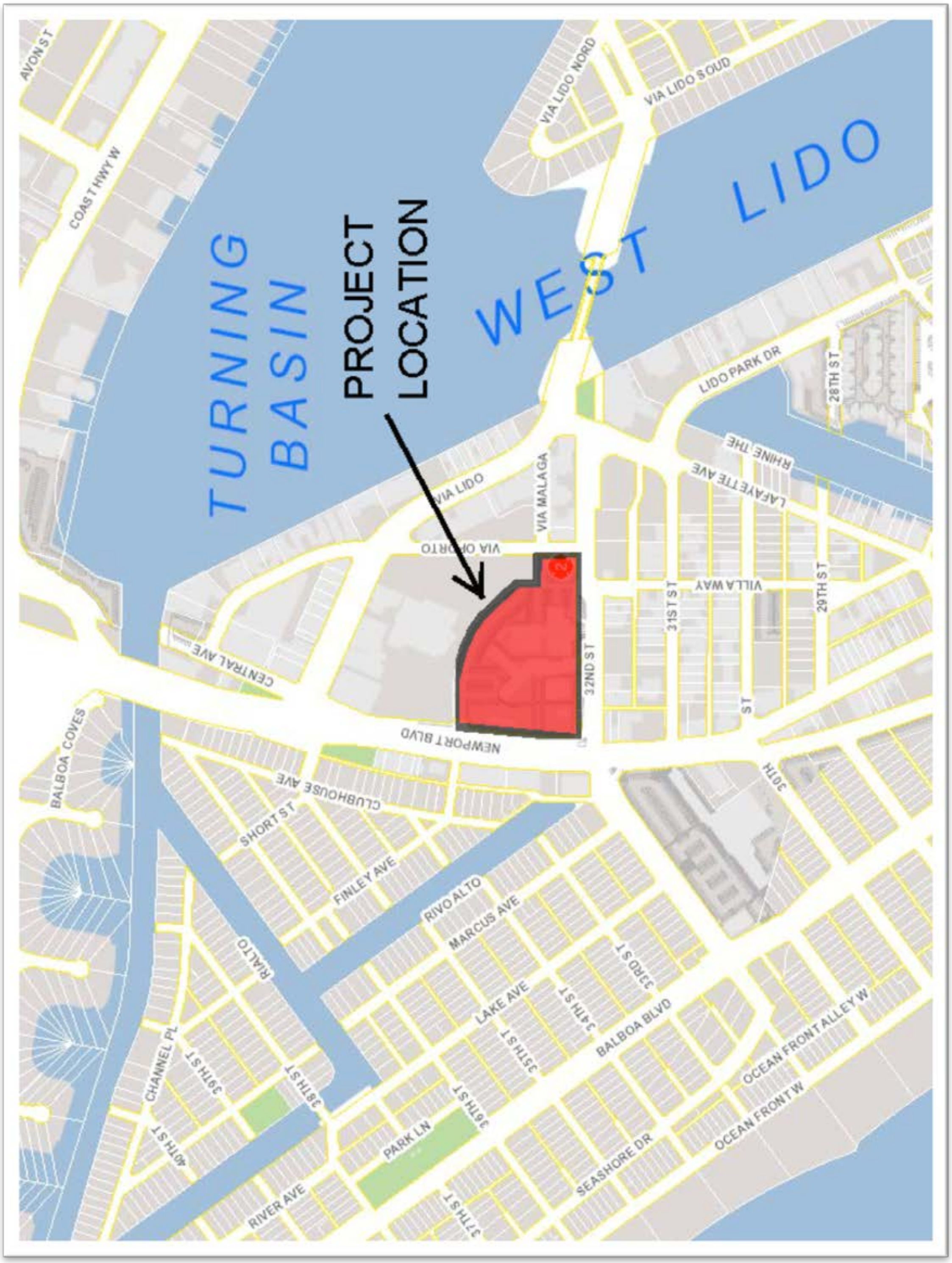
To determine site detention requirements, if any, for the project.

To size storm water inlet/outlet and conveyance facilities to support the project.

1.4 REFERENCES

- Orange County Hydrology Manual, 1986
- Orange County Local Drainage Manual, 1986
- Record Plans, documents and GIS information from the City of Newport Beach.
- Preliminary design documents for the project.
- Geotechnical Investigation, Dated Dec 4, 2013 by GMU Geotechnical. GMU project no. 13-160-00

Project Site Location Map



2.0 EXISTING TOPOGRAPHIC & HYDROLOGIC CONDITIONS

2.1 EXISTING TOPOGRAPHY

The project site is relatively flat with the highest point being in the center of the site where the existing city hall buildings are located. The site drops off on all sides to the adjacent parking and roadway areas. Existing elevations vary from a high of approximately 10.1 feet in the center of the site to 8.8 feet in the adjacent streets. The catch basins on Newport Blvd. are at a flow line elevation of 6.6 feet.

2.2 EXISTING ON-SITE DRAINAGE PATTERN AND FACILITIES

Refer to the Hydrology Maps in Appendix 7 and Figure 1 in appendix 4 for graphical locations of the items described in the following sections.

Drainage on the site follows the topography of the land, with existing drainage patterns flowing westerly to Newport Blvd, northerly to Via Lido Plaza and southerly to Villa Way.

The majority of flow is taken westerly to the existing catch basins in Newport Blvd. There are three (3) relatively shallow catch basins in Newport Blvd. with depths on the order of two (2) feet deep.

The most northerly catch basin (Designated CB 1) captures flow from the southwest portion of the Via Lido Plaza and a portion of the existing northerly arced parking lot. This basin is connected via two 12-inch connecting pipes to the existing catch basin at the southeast corner of the intersection of the main entry and Newport Blvd (Designated CB 2).

Catch basin 2 collects drainage from most of the northerly portion of the project site in addition to the drainage from catch basin 1 and directs flows via two (2) 12-inch PVC connecting pipes, westerly across Newport Boulevard to the existing municipal storm drain system.

The most southerly catch basin (Designated CB 3, is located at the northeast corner of Newport Blvd. and 32nd Street. This basin collects drainage from the majority of the southern portion of the site, and a basin on the southeast corner of Newport Blvd and 32nd Street and directs flow westerly across Newport Blvd. via a 15-inch RCP connecting pipe to the municipal storm drain system on the west side of Newport Boulevard.

Both existing municipal storm drain systems on the westerly side of Balboa Boulevard discharge to the Rivo Alto channel, part of Lower Newport Bay.

Drainage to the north is directed through the existing Via Lido Plaza parking lot to an existing municipal storm drain system on the north side of that site. This flow discharges to the northwest upper end of Lower Newport Bay.

The southeast portion of the site drains southerly in Villa Way to the existing municipal storm drain system serving 30th, 31st and 32nd streets. This system connects to the existing 36" RCP in 30th Street which discharges to the Rhine Canal in Lower Newport Bay.

Infiltration testing was performed by the project Geotechnical consultant, GMU Geotechnical, Inc. Infiltration rates ranged from 1.4 to 12.3 inches per hour. Ground water was encountered at depths of 4.5 to 5 feet below existing grades. Per the Geotechnical report, groundwater levels were observed to fluctuate with the tide in the bay, indicating that the groundwater is tidally influenced. Infiltration on this site as a BMP will only be for water quality purposes and not for ground water recharging since the ground water is from the ocean/bay.

2.3 EXISTING OFF-SITE MUNICIPAL STORM DRAIN FACILITIES

Figure 1, excerpted from the City of Newport Beach Geographic Information System (GIS) depicts the existing layout and sizes of the municipal storm drain system serving the area of the proposed development. A City project to realign the easterly curb line of Newport Boulevard will require that basins 1 through 3 be reconstructed and possibly reconfigured. Per discussions with City of Newport Beach staff, the final alignment and design of the Newport Boulevard improvements are currently being designed by City consultants and are not available at this time. It is anticipated that the design of the future improvements for Newport Boulevard will be sufficiently established to allow a more precise analysis of terminal drainage points for the proposed hotel development. The connecting pipes crossing Newport Boulevard will most likely remain in place as-is.

3.0 PROPOSED ON-SITE DRAINAGE FACILITIES

Overall the project reduces runoff to the off-site storm drain facilities by slightly less than 2%. The proposed development will maintain the historic drainage patterns with the exception that flows are no longer routed north through the Via Lido Shopping area. Due to the shallow depths of the adjacent public storm drain catch basins and the need to treat low flows to conform to the requirements of Low Impact Development and the County of Orange Drainage Area Management Plan (DAMP), this project is proposing using primarily surface flow with localized area drains to drain the site. This method maximizes the potential for runoff infiltration which is the primary Best Management Practice for water quality purposes. Infiltration is also the preferred methodology for mitigating pollutants of concern per the County DAMP.

Localized area drains are proposed to be used along landscaping adjacent to the building and to drain the courtyard/pool area. All other flows are anticipated to be overland.

The basic flow pattern of the existing site is maintained but quantities to the downstream off-site areas are slightly different. See Table 1 below. The drive approach area from the northerly parking area of the site to the Via Lido Plaza is anticipated to be re-graded to prevent runoff from Via Lido Plaza onto the site. Runoff would be diverted westerly within the Via Lido Plaza to the westerly inlet in the parking area connected to catch basin 1. This only alters the routing of the flow not the destination and there is not a significant difference in flow path length, hence there should be no significant impact due to this alteration. This alteration is being proposed primarily to reduce the impact of off-site runoff on the on-site water quality BMP's.

3.1 DETENTION

Since the project results in a net reduction in runoff, detention is not anticipated for this project. If necessary, downstream capacities can be analyzed as part of the final hydrology/hydraulics report for the project. Preliminary calculations in this report (see discussion and summary in section 6.4 and calculations in Appendix 4) indicate that impacts to offsite developments and existing facilities are less than significant. Should the site plan design change significantly, altering the proposed drainage pattern, on-site detention facilities can be provided in the landscape areas fronting Newport Boulevard and underground in the parking areas easterly. This is not anticipated.

4.0 HYDROLOGY STUDY
(LOCAL AREA DRAINS)

4.1 STORM FREQUENCY

This study is intended to determine "local" discharges for use in the design of drainage pipes and storm runoff control structures. The site designed to infiltrate runoff to the greatest extent possible by utilizing the native soils. A "25-year" storm frequency was chosen as the minimum design criteria for overflow conditions within the courtyard area. Pipe sizing for basins and area drains outside the courtyard area is designed for the 10-year event. As part of the EIR requirements, 100 year rain fall events are included in this report.

4.2 METHODOLOGY

This study was prepared in conformance with the Orange County Hydrology Manual.

A.E.S. Computer Software (2013) was utilized to compile the hydrologic data and to determine the peak discharges and hydrographs.

Manning's equation was used to determine conveyance device sizing (pipes, culverts, etc.).

Copies of the computer print-outs for hydrologic results are included within this report in Appendix's 1 & 3 for the 2, 10, 25 & 100-year return frequency storm. The preliminary Water Quality Management Plan (PWQMP) outlines the BMP's anticipated for this project and their required sizing.

5.0 DESIGN CRITERIA

The proposed area drain system(s) will be designed to be consistent with the following goals and guidelines as presented in the Orange County Hydrology and the Orange County Local Drainage Manuals.

Soil type 'A' as shown on the Orange County Hydrology Manual, Plate 'B' is justified by the relatively high infiltration rates obtained from on-site testing.

All habitable buildings shall be protected from flooding during a 100-year frequency storm. This site is in flood zone 'X' per FEMA maps and flooding is not considered an issue on this site. (See section 1.2)

Onsite design storm is based on a 10-year frequency for overflow conditions outside the overall building envelope and 25-year frequency for areas within the courtyard.

Recommended design water surface elevations inside area drains shall be 0.5' below inlet grate elevation when possible.

Pipe size may not be decreased downstream without the City's approval.

Branching of flow is not allowed.

Area drains and appurtenant piping shall be designed in conformance with the Orange County Hydraulics manual.

6.0 RESULTS AND CONCLUSIONS

6.1 SUMMARY OF EXISTING FLOWS, 2 THROUGH 100 YEAR EVENT

Existing Conditions

Area ID (Node)	Area (Acres)	Flow (cfs)	Notes
A & B & E (13)	2.72	Q_2 = 3.7 Q_{10} = 6.8 Q_{25} = 8.2 Q_{100} =8.6	Confluence CB #2 Newport Blvd. (includes flow to CB #1)
C (41)	0.62	Q_2 = 1.0 Q_{10} = 1.9 Q_{25} = 2.2 Q_{100} =2.9	Drainage to Via Lido Shopping Center
D (33)	1.73	Q_2 = 2.4 Q_{10} = 4.5 Q_{25} = 5.4 Q_{100} =6.9	Confluence CB #3 Newport Blvd.
F (51)	0.18	Q_2 = 0.4 Q_{10} = 0.7 Q_{25} = 0.8 Q_{100} =1.0	Flow to Villa Way

Proposed Conditions

Area ID	Area (Acres)	Flow (cfs)	Notes
A (13)	2.28	Q_2 = 3.3 Q_{10} = 6.1 Q_{25} = 7.3 Q_{100} =9.4	CB #3 Newport Blvd
B & C & D (23)	2.04	Q_2 = 2.7 Q_{10} = 4.9 Q_{25} = 5.9 Q_{100} =6.4	Confluence CB #2 Newport Blvd.
E (51)	0.24	Q_2 = 0.4 Q_{10} = 0.7 Q_{25} = 0.8 Q_{100} =1.1	Via Lido Shopping Center at driveway off main entry. Flow remains on Shopping Center Site.
F (62)	0.68	Q_2 = 1.1 Q_{10} = 1.9 Q_{25} = 2.3 Q_{100} =3.0	Flow to Villa Way

COMPARISON OF FLOWS - TABLE 1

LIDO HOUSE HOTEL - NEWPORT BEACH

STORM EVENT	2	YEAR		
NODE NO. Exist/Prop	EXIST FLOW (cfs)	PROPOSED FLOW (cfs)	DIFFERENCE (cfs)	NODE DESCRIPTION
13/23	3.7	2.7	-1	Catch basin at southeast corner of main shared entry intersection
33/13	2.4	3.3	0.9	Catch basin at southwest corner of project
41/ n.a	1	0	-1	Flow to existing lido shopping area. This is eliminated in the proposed design
51/62	0.4	1.1	0.7	Flow to Villa Way
61/43	0.7	0.5	-0.2	Flow to Newport Blvd. (n'ly side main entry). Not included with total, Confluenced at node 13
n.a /51	0	0.4	0.4	Flow contained in lido shopping area
Sums	7.5	7.5	0	

STORM EVENT	10	YEAR		
NODE NO.	EXIST FLOW (cfs)	PROPOSED FLOW (cfs)	DIFFERENCE (cfs)	NODE DESCRIPTION
13/23	6.8	4.9	-1.9	Catch basin at southeast corner of main shared entry intersection
33/13	4.5	6.1	1.6	Catch basin at southwest corner of project
41/ n.a	1.9	0	-1.9	Flow to existing lido shopping area. This is eliminated in the proposed design
51/62	0.7	1.9	1.2	Flow to Villa Way
61/43	1.3	0.8	-0.5	Flow to Newport Blvd. (n'ly side main entry). Not included with total, Confluenced at node 13
n.a /51	0	0.7	0.7	Flow contained in lido shopping area
Sums	13.9	13.6	-0.3	

STORM EVENT	25	YEAR		
NODE NO.	EXIST FLOW (cfs)	PROPOSED FLOW (cfs)	DIFFERENCE (cfs)	NODE DESCRIPTION
13/23	8.2	5.9	-2.3	Catch basin at southeast corner of main shared entry intersection
33/13	5.4	7.3	1.9	Catch basin at southwest corner of project
41/ n.a	2.2	0	-2.2	Flow to existing lido shopping area. This is eliminated in the proposed design
51/62	0.8	2.3	1.5	Flow to Villa Way
61/43	1.5	1	-0.5	Flow to Newport Blvd. (n'ly side main entry). Not included with total, Confluenced at node 13
n.a /51	0	0.8	0.8	Flow contained in lido shopping area
Sums	16.6	16.3	-0.3	

STORM EVENT	100	YEAR		
NODE NO.	EXIST FLOW (cfs)	PROPOSED FLOW (cfs)	DIFFERENCE (cfs)	NODE DESCRIPTION
13/23	8.6	6.4	-2.2	Catch basin at southeast corner of main shared entry intersection
33/13	6.9	9.4	2.5	Catch basin at southwest corner of project
41/ n.a	2.9	0	-2.9	Flow to existing lido shopping area. This is eliminated in the proposed design
51/62	1	3	2	Flow to Villa Way
61/43	2	1.2	-0.8	Flow to Newport Blvd. (n'ly side main entry). Not included with total, Confluenced at node 13
n.a /51	0	1.1	1.1	Flow contained in lido shopping area
Sums	19.4	19.9	0.5	

6.2 EXISTING DRAINAGE & FLOOD PLAIN STUDIES

The project is located in Flood zone X (shaded) per Flood Insurance Rate Map (FIRM) Number 06059C0381J, revised December 3, 2009. Flood zone X (shaded) is defined by FEMA as "Area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods. Are also used to designate base floodplains of lesser hazards, such as areas protected by levees from 100-year flood, or shallow flooding areas with average depths of less than one foot or drainage areas less than 1 square mile."

The City of Newport Beach does not have a master plan of drainage for the project area. In discussions with City staff in the public works department, flooding from rainfall events has not been an issue in this area.

6.3 CONCLUSIONS

The analysis provided in this report provides the following conclusions:

1. The project is feasible from a drainage standpoint and will have less than significant impact on the existing storm drain infrastructure. See discussion in section 3.0 for discussions of drainage facilities and project impacts.
2. Newport Bay is a tidally influenced estuary of the Pacific Ocean and is not subject to Hyromodification, flooding, or lack of capacity as a result of rainfall events.
3. The project is protected from flooding by allowing overflow from central courtyard areas to 32nd street. The proposed finish floor is over one-foot above the highest top of curb elevation of adjacent public street curbs.
4. Preliminary calculations in this report suggest that the adjacent public storm drain facilities will not be adversely affected by this development.

These results indicate that the proposed project can be constructed in a manner that minimizes the impact of the proposed storm flow to the existing surrounding areas and neighborhood while providing safe and adequate drainage operation for the proposed project.

Catch basin sizing and hydraulic calculations will be derived for each drainage area serviced by an area drain and area drain pipe for the cumulative storm flows. Hydraulics is based on the 25 year event for overflow from the courtyard areas and 10-year event for all others.

6.4 IMPACTS TO EXISTING OFF-SITE MUNICIPAL STORM DRAIN FACILITIES & STREETS

6.4.1 NEWPORT BLVD.

There is a slight net drop in flows to Newport Boulevard as a result of this development. Although the balance of flows to the existing catch basins is changing (Basin 1 getting less flow, basin 2 getting more) this should not affect the gross ability of the existing storm drain system.

The existing system has a built in balancing mechanism due to the very flat nature of Newport Boulevard. Should one basin be overwhelmed with flow, the excess flow will overtop the high point in Newport Blvd, located about midpoint along the frontage of the project, before the water surface elevation can reach the top of curb elevation. This would keep any excess flow within the streets and hydraulically balance the basins. Calculations indicate that this condition occurs currently at the 10-year event and will continue to occur. (See calculations in appendix 3.) Since the net proposed tributary flow to Newport Boulevard from the proposed project is less than existing flows, and the street geometry allows for a balancing of flows, it can be concluded that this project will not significantly impact the existing storm drain system in Newport Blvd.

6.4.2 VILLA WAY

The project increases flows to Villa Way and the head water of the storm drain system at Villa Way and 31st Street. The area is developed as light commercial and multifamily apartments. Calculations indicated that at any storm event greater than the 10-year event, flows in the narrow portion of Villa Way, south of the east-west alley between 31st and 32nd streets will overtop the crown of the street and split flows in Villa Way will occur. The table below illustrates the impact of these added flows to Villa Way at the narrow portion near 31st street. The calculations show that for the 100-year event the added flows increase the depth of flow in Villa Way by only 0.01-feet (1/8") and that flow depths remain below the top of curb elevations. The added depth will have a less than significant impact on the sump catch basins on the northerly side of 31st and Villa Way and hence will not appreciably alter the flow characteristics of the existing storm drain system. The most likely effect will be slightly longer stream detention in the streets.

TABLE OF FLOW CHARACTURISTICS IN VILLA WAY
CHANGE IN HEIGHT FROM 32ND TO 31ST STREET = 9.4-8.0=1.6' (City of Newport Beach GIS elevation data)
LENGTH OF VILLA WAY = 160
CALCULATED SLOPE OF VILLA WAY = 0.01
ESTIMATED AREA IMPERVIOUS = 80% (Figure C-4, OCHM)
TIME OF CONCENTRATION = 6.2min (Figure D-1, OCHM)
AREA OF STUDY 2.2 Acres (City of Newport Beach GIS)

YEAR EVENT	EXIST FLOW RATE cfs	CONVEYANCE (street tables)	FLOW DEPTH (ft)	PROP FLOW RATE (cfs)	CONVEYANCE (street tables)	FLOW DEPTH (ft)	CHANGE IN DEPTH (ft)	NOTES
10	7.0	70	0.37	8.2	82	0.37	+0.00	SPLIT FLOWS EXISTING & PROPOSED CONDITIONS
25	8.3	83	0.37	9.8	98	0.38	+0.01	SPLIT FLOWS EXISTING & PROPOSED CONDITIONS
100	10.7	107	0.39	12.7	127	0.40	+0.01	SPLIT FLOWS EXISTING & PROPOSED CONDITIONS

See attached worksheets for calculation of above flow quantities in Villa Way by the rational method.

7.0 APPENDICES

Appendix 1	2, 10, 25 & 100-Year Hydrology Studies, Existing
Appendix 2	2, 10,25 & 100-Year Hydrology Studies, Proposed
Appendix 3	Figure 1 (Existing municipal storm drain system and drainage area S'ly
Appendix 4	Newport Blvd and Villa Way calculations
Appendix 5	FIRM Map
Appendix 6	Soils Map Excerpt
Appendix 7	Hydrology Maps (In Pocket)

APPENDIX 1

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| |  DESCRIPTION OF STUDY:                                                                                        | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                                    | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                                        | |
| |  2 YEAR EXIST. CONDITIONS;  FILE NO. 11004X02.RES                                                             | |
| |-----------------------------------------[ORANGE COUNTY]-------------------------------------------------------| |
| |  FILE NAME:11004X02.DAT                   *ENGLISH UNITS*            | CALCULATED BY:                         | |
| |  TIME/DATE OF STUDY: 11:45  11/26/2013                               |    CHECKED BY:                         | |
| |   2.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)              | PAGE NUMBER   1 OF                     | |
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]--------------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS    | |
| | POINT NUMBER|SUBAREA|  SUM  |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES    | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 160|.0037| .. |INITIAL SUBAREA| |
| |        11.00|    0.6|   0.6| A | Com |----|  7.1|1.85|0.04|0.040|   0.9|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 210|.0052| 1.5|Qest.=   1.1   | |
| | 60.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.31;D*V= 0.5| |
| | FLOW TO PT.#|       |      |          | 2.4|     |    |    |     |      |    |     |    |FLOODWIDTH= 8.1| |
| |        12.00|    0.3|  0.87| A | Com |----|  9.5|1.57|0.04|0.040|   1.2|----|-----|----|---------------| |
| |        12.00|    0.4|  1.29| A | Com |----|  9.5|1.57|0.04|0.040|   1.8|----|-----|----|  ADD SUBAREA  | |
| |             |       |      |   |     | .. |     |    |    |     |      ( 160|.0125) .. | (AND COMPUTE  | |
| |             |       |      |   |     |    (  5.6|2.13|0.04|0.040|   0.8)    |     | .. INITIAL SUBAREA)| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0110| 2.2|Qest.=   1.9   | |
| | 60.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.32;D*V= 0.7| |
| | FLOW TO PT.#|       |      |          | 0.8|     |    |    |     |      |    |     |    |FLOODWIDTH= 8.7| |
| |        13.00|    0.2|  1.45| A | Com |----| 10.2|1.50|0.04|0.040|   1.9|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        13.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                                    |                 | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 250|.0084| .. |INITIAL SUBAREA| |
| |        22.00|    0.5|   0.5| A | Com |----|  7.2|1.84|0.04|0.040|   0.8|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0060| 1.6|Qest.=   1.0   | |
| | 60.ft-STREET|       |      |               |     |    |    |     |      |    |     |    |D=0.29;D*V= 0.5| |
| | FLOW TO PT.#|       |      |          | 1.1|     |    |    |     |      |    |     |    |FLOODWIDTH= 7.4| |
| |        13.00|    0.3|  0.81| A | Com |----|  8.3|1.69|0.04|0.040|   1.2|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        13.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                               |                 | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                 | |
| |             |    2.96      8.29    0.400     0.10    0.040      1.69      1.99     20.0|                 | |
| |             |    2.97     10.22    0.400     0.10    0.040      1.50      2.26     10.0|                 | |
| |             |     TOTAL AREA=      2.260                                                 |                 | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        13.00|     MEMORY BANK # 1 CLEARED                                                    |                 | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                 | |
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| |  DESCRIPTION OF STUDY:                                                                                   | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                               | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                                   | |
| |  2 YEAR EXIST. CONDITIONS;  FILE NO. 11004X02.RES                                                        | |
| |-------------------------------------------[ORANGE COUNTY]------------------------------------------------| |
| |  FILE NAME:11004X02.DAT                    *ENGLISH UNITS*             | CALCULATED BY:                  | |
| |  TIME/DATE OF STUDY: 11:45  11/26/2013                                 |    CHECKED BY:                  | |
| |   2.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                | PAGE NUMBER   2 OF              | |
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]---------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES    | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        13.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                                 |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 300|.0067| .. |INITIAL SUBAREA| |
| |        61.00|    0.5|   0.5| A | Com |----|  8.1|1.72|0.04|0.040|   0.7|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0020| 1.9|Qpipe=     0.71| |
| |             |       |      |               |     |    |    |     |      |    |     |    |n=.0130 D= 0.48| |
| |        13.00|       |      |         | 0.9|     |    |    |     |      |    |     |    |    12.0"-PIPE  | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        13.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                            |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |    3.64      8.29    0.400     0.10    0.040      1.69      2.42     20.0|                | |
| |             |    3.67      8.98    0.400     0.10    0.040      1.62      2.56     60.0|                | |
| |             |    3.63     10.22    0.400     0.10    0.040      1.50      2.73     10.0|                | |
| |             |     TOTAL AREA=      2.730                                               |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 210|.0076| .. |INITIAL SUBAREA| |
| |        31.00|    0.6|   0.6| A | Com |----|  6.8|1.89|0.04|0.040|   1.0|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------|  90|.0111| 2.1|Qest.=   1.2    | |
| | 3.0ft-GUTTER|       |      |               |     |    |    |     |      |    |     |    | XFALL= 0.02000| |
| | FLOW TO PT.#|       |      |         | 0.7|     |    |    |     |      |    |     |    |n=.0150 D= 0.18| |
| |        32.00|    0.3|  0.89| A | Com |----|  7.6|1.78|0.04|0.040|   1.4|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 160|.0056| 1.7|Qest.=   2.0    | |
| | 3.0ft-GUTTER|       |      |               |     |    |    |     |      |    |     |    | XFALL= 0.02000| |
| | FLOW TO PT.#|       |      |         | 1.6|     |    |    |     |      |    |     |    |n=.0150 D= 0.23| |
| |        33.00|    0.8|  1.73| A | Com |----|  9.2|1.59|0.04|0.040|   2.4|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 220|.0086| .. |INITIAL SUBAREA| |
| |        41.00|    0.6|   0.6| A | Com |----|  6.8|1.90|0.04|0.040|   1.0|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 110|.0100| .. |INITIAL SUBAREA| |
| |        51.00|    0.2|   0.2| A | Com |----|  5.0|2.26|0.04|0.040|   0.4|----|-----|----|----------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
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DESCRIPTION OF STUDY:
LIDO HOUSE HOTEL; R.D. OLSON DEVELOPMENT
3300 NEWPORT BLVD., NEWPORT BEACH, CA
2 YEAR EXIST. CONDITIONS; FILE NO. 11004X02.RES

[ORANGE COUNTY]

FILE NAME:11004X02.DAT *ENGLISH UNITS* | CALCULATED BY:
TIME/DATE OF STUDY: 11:45 11/26/2013 | CHECKED BY:
2.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 3 OF

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I (in/hr)	Fm	Fm (Avg)	Q-SUM (cfs)	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
51.00		0.2			----	5.0				0.4	----	-----	----	STREAM SUMMARY

EFFECTIVE AREA = 0.18 Acres TOTAL AREA = 0.18 Acres PEAK FLOW RATE = 0.36 cfs
TIME OF CONCENTRATION(MIN.)= 5.01 MEAN VALUES: Fp = 0.400 (in/hr); Ap = 0.100; Fm = 0.040 (in/hr)

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| |  DESCRIPTION OF STUDY:                                                                                         | |
| |  LIDO HOUSE HOTEL;   R.D. OLSON DEVELOPMENT                                                                    | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                                         | |
| |  10 YEAR EXIST. CONDITIONS;  FILE NO. 11004X10.OUT                                                             | |
| |---------------------------------------------[ORANGE COUNTY]---------------------------------------------------| |
| |  FILE NAME:11004X10.DAT                       *ENGLISH UNITS*             | CALCULATED BY:                     | |
| |  TIME/DATE OF STUDY: 10:11  11/26/2013                                    |    CHECKED BY:                     | |
| |  10.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                   | PAGE NUMBER   1 OF                 | |
| |------------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]------------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc  | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 160|.0037| .. |INITIAL SUBAREA| |
| |        11.00|    0.6|   0.6| A | Com |----|  7.1|3.33|0.04|0.040|   1.7|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 210|.0052| 1.7|Qest.=   2.1    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.36;D*V= 0.6| |
| | FLOW TO PT.#|       |      |         | 2.1|     |    |    |     |      |    |     |    |FLOODWIDTH=10.9| |
| |        12.00|    0.3|  0.87| A | Com |----|  9.2|2.87|0.04|0.040|   2.2|----|-----|----|----------------| |
| |        12.00|    0.4|  1.29| A | Com |----|  9.2|2.87|0.04|0.040|   3.3|----|-----|----|  ADD SUBAREA   | |
| |             |       |      |   |     | .. |     |    |    |     |      ( 160|.0125) .. | (AND COMPUTE   | |
| |             |       |      |   |     |    (  5.6|3.82|0.04|0.040|   1.4)     |     | .. INITIAL SUBAREA)| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0110| 2.5|Qest.=   3.5    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.37;D*V= 0.9| |
| | FLOW TO PT.#|       |      |         | 0.7|     |    |    |     |      |    |     |    |FLOODWIDTH=11.6| |
| |        13.00|    0.2|  1.45| A | Com |----|  9.8|2.75|0.04|0.040|   3.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        13.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                                    |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 250|.0084| .. |INITIAL SUBAREA| |
| |        22.00|    0.5|   0.5| A | Com |----|  7.2|3.29|0.04|0.040|   1.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0060| 1.8|Qest.=   1.9    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.34;D*V= 0.6| |
| | FLOW TO PT.#|       |      |         | 1.0|     |    |    |     |      |    |     |    |FLOODWIDTH=10.1| |
| |        13.00|    0.3|  0.81| A | Com |----|  8.2|3.06|0.04|0.040|   2.2|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        13.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                               |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |    5.48      8.17    0.400     0.10    0.040      3.06      2.01     20.0|                | |
| |             |    5.52      9.85    0.400     0.10    0.040      2.75      2.26     10.0|                | |
| |             |     TOTAL AREA=      2.260                                               |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        13.00|     MEMORY BANK # 1 CLEARED                                                    |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
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| |  DESCRIPTION OF STUDY:                                                                                   | |
| |  LIDO HOUSE HOTEL;   R.D. OLSON DEVELOPMENT                                                              | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                                   | |
| |  10 YEAR EXIST. CONDITIONS;  FILE NO. 11004X10.OUT                                                       | |
| |-----------------------------------------[ORANGE COUNTY]-------------------------------------------------| |
| |  FILE NAME:11004X10.DAT                    *ENGLISH UNITS*             | CALCULATED BY:                  | |
| |  TIME/DATE OF STUDY: 10:11  11/26/2013                                 |    CHECKED BY:                  | |
| |  10.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                | PAGE NUMBER   2 OF              | |
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]-------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        13.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                                   |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 300|.0067| .. |INITIAL SUBAREA| |
| |        61.00|    0.5|   0.5| A | Com |----|  8.1|3.08|0.04|0.040|   1.3|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0020| 2.2|Qpipe=     1.28| |
| |             |       |      |               |     |    |    |     |      |    |     |    |n=.0130 D= 0.71| |
| |        13.00|       |      |          | 0.8|     |    |    |     |      |    |     |    |    12.0"-PIPE  | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        13.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                              |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |     6.72      8.17    0.400     0.10    0.040      3.06       2.44     20.0|                | |
| |             |     6.78      8.88    0.400     0.10    0.040      2.92       2.59     60.0|                | |
| |             |     6.73      9.85    0.400     0.10    0.040      2.75       2.73     10.0|                | |
| |             |    TOTAL AREA=      2.730                                                  |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 210|.0076| .. |INITIAL SUBAREA| |
| |        31.00|    0.6|   0.6| A | Com |----|  6.8|3.39|0.04|0.040|   1.8|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------|  90|.0111| 2.3|Qest.=   2.2    | |
| | 3.0ft-GUTTER|       |      |               |     |    |    |     |      |    |     |    | XFALL= 0.02000| |
| | FLOW TO PT.#|       |      |          | 0.7|     |    |    |     |      |    |     |    |n=.0150 D= 0.21| |
| |        32.00|    0.3|  0.89| A | Com |----|  7.5|3.21|0.04|0.040|   2.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 160|.0056| 1.9|Qest.=   3.6    | |
| | 3.0ft-GUTTER|       |      |               |     |    |    |     |      |    |     |    | XFALL= 0.02000| |
| | FLOW TO PT.#|       |      |          | 1.5|     |    |    |     |      |    |     |    |n=.0150 D= 0.27| |
| |        33.00|    0.8|  1.73| A | Com |----|  9.0|2.90|0.04|0.040|   4.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 220|.0086| .. |INITIAL SUBAREA| |
| |        41.00|    0.6|   0.6| A | Com |----|  6.8|3.40|0.04|0.040|   1.9|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 110|.0100| .. |INITIAL SUBAREA| |
| |        51.00|    0.2|   0.2| A | Com |----|  5.0|4.06|0.04|0.040|   0.7|----|-----|----|----------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
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DESCRIPTION OF STUDY:
LIDO HOUSE HOTEL;   R.D. OLSON DEVELOPMENT
3300 NEWPORT BLVD., NEWPORT BEACH, CA
10 YEAR EXIST. CONDITIONS; FILE NO. 11004X10.OUT

[ORANGE COUNTY]

FILE NAME:11004X10.DAT *ENGLISH UNITS* | CALCULATED BY:
TIME/DATE OF STUDY: 10:11 11/26/2013 | CHECKED BY:
10.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER   3 OF

[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I (in/hr)	Fm	Fm (Avg)	Q-SUM (cfs)	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
51.00		0.2			----	5.0				0.7	----	-----	----	STREAM SUMMARY

EFFECTIVE AREA =   0.18 Acres TOTAL AREA =   0.18 Acres PEAK FLOW RATE =   0.65 cfs
TIME OF CONCENTRATION(MIN.)=   5.01 MEAN VALUES: Fp = 0.400 (in/hr); Ap = 0.100; Fm = 0.040 (in/hr)

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| |  DESCRIPTION OF STUDY:                                                                                  | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                              | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                                  | |
| |  25 YEAR EXIST. CONDITIONS;  FILE NO. 1100X25.RES                                                       | |
| |-----------------------------------------[ORANGE COUNTY]-------------------------------------------------| |
| |  FILE NAME:11004X25.DAT                  *ENGLISH UNITS*             | CALCULATED BY:                   | |
| |  TIME/DATE OF STUDY: 11:40  11/26/2013                               |    CHECKED BY:                   | |
| |  25.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)              | PAGE NUMBER   1 OF               | |
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]--------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc  | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 160|.0037| .. |INITIAL SUBAREA| |
| |        11.00|    0.6|   0.6| A | Com |----|  7.1|3.96|0.04|0.040|   2.0|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 210|.0052| 1.8|Qest.=   2.5    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.37;D*V= 0.7| |
| | FLOW TO PT.#|       |      |         | 2.0|     |    |    |     |      |    |     |    |FLOODWIDTH=11.8| |
| |        12.00|    0.3|  0.87| A | Com |----|  9.1|3.44|0.04|0.040|   2.7|----|-----|----|----------------| |
| |        12.00|    0.4|  1.29| A | Com |----|  9.1|3.44|0.04|0.040|   3.9|----|-----|----|  ADD SUBAREA   | |
| |             |       |      |   |     | .. |     |    |    |     |      ( 160|.0125) .. | (AND COMPUTE   | |
| |             |       |      |   |     |    (  5.6|4.54|0.04|0.040|   1.7)    |     | .. INITIAL SUBAREA)| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0110| 2.6|Qest.=   4.2    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.39;D*V= 1.0| |
| | FLOW TO PT.#|       |      |         | 0.6|     |    |    |     |      |    |     |    |FLOODWIDTH=12.6| |
| |        13.00|    0.2|  1.45| A | Com |----|  9.7|3.31|0.04|0.040|   4.3|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        13.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                                |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 250|.0084| .. |INITIAL SUBAREA| |
| |        22.00|    0.5|   0.5| A | Com |----|  7.2|3.92|0.04|0.040|   1.8|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0060| 1.8|Qest.=   2.3    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.36;D*V= 0.7| |
| | FLOW TO PT.#|       |      |         | 0.9|     |    |    |     |      |    |     |    |FLOODWIDTH=11.0| |
| |        13.00|    0.3|  0.81| A | Com |----|  8.1|3.66|0.04|0.040|   2.6|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        13.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                           |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |    6.58      8.13    0.400     0.10    0.040      3.66      2.02     20.0|                | |
| |             |    6.64      9.75    0.400     0.10    0.040      3.31      2.26     10.0|                | |
| |             |     TOTAL AREA=      2.260                                                 |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        13.00|     MEMORY BANK # 1 CLEARED                                                |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
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| |  DESCRIPTION OF STUDY:                                                                               | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                           | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                               | |
| |  25 YEAR EXIST. CONDITIONS;  FILE NO. 1100X25.RES                                                    | |
| |-------------------------------------------[ORANGE COUNTY]--------------------------------------------| |
| |  FILE NAME:11004X25.DAT                    *ENGLISH UNITS*             | CALCULATED BY:              | |
| |  TIME/DATE OF STUDY: 11:40  11/26/2013                                 |    CHECKED BY:              | |
| |  25.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                | PAGE NUMBER   2 OF          | |
| |-----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]----------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|   AND NOTES    | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        13.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                                |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 300|.0067| .. |INITIAL SUBAREA| |
| |        61.00|    0.5|   0.5| A | Com |----|  8.1|3.67|0.04|0.040|   1.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0020| 2.0|Qpipe=     1.54| |
| |             |       |      |                |     |    |    |*velocity=(total flow)/(pipe|n=.0130 D= 1.00| |
| |        13.00|       |      |          | 0.9|     |    |    |            cross section area)|    12.0"-PIPE  | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        13.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                           |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |    8.06      8.13    0.400     0.10    0.040      3.66      2.45     20.0|                | |
| |             |    8.15      8.96    0.400     0.10    0.040      3.47      2.61     60.0|                | |
| |             |    8.10      9.75    0.400     0.10    0.040      3.31      2.73     10.0|                | |
| |             |     TOTAL AREA=      2.730                                             |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 210|.0076| .. |INITIAL SUBAREA| |
| |        31.00|    0.6|   0.6| A | Com |----|  6.8|4.04|0.04|0.040|   2.1|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------|  90|.0111| 2.3|Qest.=   2.6    | |
| | 3.0ft-GUTTER|       |      |          |    |     |    |    |     |      |    |     |    | XFALL= 0.02000| |
| | FLOW TO PT.#|       |      |          | 0.7|     |    |    |     |      |    |     |    |n=.0150 D= 0.22| |
| |        32.00|    0.3|  0.89| A | Com |----|  7.5|3.83|0.04|0.040|   3.0|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 160|.0056| 2.0|Qest.=   4.3    | |
| | 3.0ft-GUTTER|       |      |          |    |     |    |    |     |      |    |     |    | XFALL= 0.02000| |
| | FLOW TO PT.#|       |      |          | 1.4|     |    |    |     |      |    |     |    |n=.0150 D= 0.29| |
| |        33.00|    0.8|  1.73| A | Com |----|  8.9|3.48|0.04|0.040|   5.4|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 220|.0086| .. |INITIAL SUBAREA| |
| |        41.00|    0.6|   0.6| A | Com |----|  6.8|4.05|0.04|0.040|   2.2|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 110|.0100| .. |INITIAL SUBAREA| |
| |        51.00|    0.2|   0.2| A | Com |----|  5.0|4.82|0.04|0.040|   0.8|----|-----|----|----------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
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DESCRIPTION OF STUDY:
LIDO HOUSE HOTEL; R.D. OLSON DEVELOPMENT
3300 NEWPORT BLVD., NEWPORT BEACH, CA
25 YEAR EXIST. CONDITIONS; FILE NO. 1100X25.RES

[ORANGE COUNTY]

FILE NAME:11004X25.DAT *ENGLISH UNITS* | CALCULATED BY:
TIME/DATE OF STUDY: 11:40 11/26/2013 | CHECKED BY:
25.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 3 OF

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I (in/hr)	Fm	Fm (Avg)	Q-SUM (cfs)	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
51.00		0.2			----	5.0				0.8	----	-----	----	STREAM SUMMARY

EFFECTIVE AREA = 0.18 Acres TOTAL AREA = 0.18 Acres PEAK FLOW RATE = 0.77 cfs
TIME OF CONCENTRATION(MIN.)= 5.01 MEAN VALUES: Fp = 0.400 (in/hr); Ap = 0.100; Fm = 0.040 (in/hr)

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| |  DESCRIPTION OF STUDY:                                                                                  | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                              | |
| |  3300 NEWPORT BLVD.  NEWPORT BEACH, CA                                                                  | |
| |  100 YEAR EXIST. CONDITIONS; FILE NO. 11004X0C.RES                                                      | |
| |-------------------------------------------[ORANGE COUNTY]-----------------------------------------------| |
| |  FILE NAME:11004X0C.DAT                     *ENGLISH UNITS*              | CALCULATED BY:               | |
| |  TIME/DATE OF STUDY: 14:17   1/27/2014                                   |    CHECKED BY:               | |
| | 100.0-YEAR STORM RATIONAL METHOD STUDY (AMC III LOSSES)                  | PAGE NUMBER   1 OF           | |
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]-------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS  | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES  | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 160|.0037| .. |INITIAL SUBAREA| |
| |        11.00|    0.6|   0.6| A | Com |----|  7.1|5.07|0.04|0.040|   2.6|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 210|.0052| 1.8|Qest.=   3.2   | |
| | 60.ft-STREET|       |      |              |     |    |    |     |      |    |     |    |D=0.40;D*V= 0.7| |
| | FLOW TO PT.#|       |      |          | 1.9|     |    |    |     |      |    |     |    |FLOODWIDTH=13.2| |
| |        12.00|    0.3|  0.87| A | Com |----|  9.0|4.42|0.04|0.040|   3.4|----|-----|----|---------------| |
| |        12.00|    0.4|  1.29| A | Com |----|  9.0|4.42|0.04|0.040|   5.1|----|-----|----|  ADD SUBAREA  | |
| |             |       |      |   |     | .. |     |    |    |     |      ( 160|.0125) .. | (AND COMPUTE  | |
| |             |       |      |   |     |    (  5.6|5.82|0.04|0.040|   2.2)    |     |    .. INITIAL SUBAREA)| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0110| 2.7|Qest.=   5.4   | |
| | 60.ft-STREET|       |      |              |     |    |    |     |      |    |     |    |D=0.41;D*V= 1.1| |
| | FLOW TO PT.#|       |      |          | 0.6|     |    |    |     |      |    |     |    |FLOODWIDTH=14.1| |
| |        13.00|    0.2|  1.45| A | Com |----|  9.6|4.26|0.04|0.040|   5.5|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        13.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                                  |               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 250|.0084| .. |INITIAL SUBAREA| |
| |        22.00|    0.5|   0.5| A | Com |----|  7.2|5.02|0.04|0.040|   2.3|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0060| 2.0|Qest.=   2.9   | |
| | 60.ft-STREET|       |      |              |     |    |    |     |      |    |     |    |D=0.38;D*V= 0.7| |
| | FLOW TO PT.#|       |      |          | 0.9|     |    |    |     |      |    |     |    |FLOODWIDTH=12.3| |
| |        13.00|    0.3|  0.81| A | Com |----|  8.1|4.70|0.04|0.040|   3.4|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        13.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                             |               | |
| |             |    Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |     8.51      8.08    0.400     0.10    0.040      4.70      2.03     20.0|               | |
| |             |     8.57      9.61    0.400     0.10    0.040      4.26      2.26     10.0|               | |
| |             |      TOTAL AREA=      2.260                                               |               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        13.00|     MEMORY BANK # 1 CLEARED                                              |               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |               | |
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| |  DESCRIPTION OF STUDY:                                                                                  | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                              | |
| |  3300 NEWPORT BLVD.  NEWPORT BEACH, CA                                                                  | |
| |  100 YEAR EXIST. CONDITIONS; FILE NO. 11004X0C.RES                                                      | |
| |--------------------------------------------[ORANGE COUNTY]--------------------------------------------| |
| |  FILE NAME:11004X0C.DAT                     *ENGLISH UNITS*            | CALCULATED BY:                 | |
| |  TIME/DATE OF STUDY: 14:17   1/27/2014                                 |    CHECKED BY:                 | |
| | 100.0-YEAR STORM RATIONAL METHOD STUDY (AMC III LOSSES)                | PAGE NUMBER   2 OF             | |
| |-----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc  | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        13.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                            |               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 300|.0067| .. |INITIAL SUBAREA| |
| |        61.00|    0.5|   0.5| A | Com |----|  8.1|4.69|0.04|0.040|   2.0|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0020| 2.5|Qpipe=     1.97| |
| |             |       |      |         |    |     |    |    |*velocity=(total flow)/(pipe|n=.0130 D= 1.00| |
| |        13.00|       |      |         | 0.7|     |    |    |         cross section area)|    12.0"-PIPE | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |        13.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                      |               | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |               | |
| |             |   10.41      8.08    0.400     0.10    0.040      4.70      2.46     20.0|               | |
| |             |   10.51      8.77    0.400     0.10    0.040      4.48      2.60     60.0|               | |
| |             |   10.44      9.61    0.400     0.10    0.040      4.26      2.73     10.0|               | |
| |             |     TOTAL AREA=      2.730                                            |               | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 210|.0076| .. |INITIAL SUBAREA| |
| |        31.00|    0.6|   0.6| A | Com |----|  6.8|5.17|0.04|0.040|   2.7|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------|  90|.0111| 2.5|Qest.=   3.4   | |
| | 3.0ft-GUTTER|       |      |         |    |     |    |    |     |      |    |     |    | XFALL= 0.02000| |
| | FLOW TO PT.#|       |      |         | 0.6|     |    |    |     |      |    |     |    |n=.0150 D= 0.24| |
| |        32.00|    0.3|  0.89| A | Com |----|  7.5|4.92|0.04|0.040|   3.9|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 160|.0056| 2.1|Qest.=   5.6   | |
| | 3.0ft-GUTTER|       |      |         |    |     |    |    |     |      |    |     |    | XFALL= 0.02000| |
| | FLOW TO PT.#|       |      |         | 1.3|     |    |    |     |      |    |     |    |n=.0150 D= 0.31| |
| |        33.00|    0.8|  1.73| A | Com |----|  8.8|4.47|0.04|0.040|   6.9|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 220|.0086| .. |INITIAL SUBAREA| |
| |        41.00|    0.6|   0.6| A | Com |----|  6.8|5.19|0.04|0.040|   2.9|----|-----|----|---------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|---------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 110|.0100| .. |INITIAL SUBAREA| |
| |        51.00|    0.2|   0.2| A | Com |----|  5.0|6.18|0.04|0.040|   1.0|----|-----|----|---------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |               | |
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DESCRIPTION OF STUDY:
LIDO HOUSE HOTEL; R.D. OLSON DEVELOPMENT
3300 NEWPORT BLVD. NEWPORT BEACH, CA
100 YEAR EXIST. CONDITIONS; FILE NO. 11004X0C.RES

[ORANGE COUNTY]

FILE NAME:11004X0C.DAT *ENGLISH UNITS* | CALCULATED BY:
TIME/DATE OF STUDY: 14:17 1/27/2014 | CHECKED BY:
100.0-YEAR STORM RATIONAL METHOD STUDY (AMC III LOSSES) |

[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I (in/hr)	Fm	Fm (Avg)	Q-SUM (cfs)	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
51.00		0.2			----	5.0				1.0	----	-----	----	STREAM SUMMARY

EFFECTIVE AREA = 0.18 Acres TOTAL AREA = 0.18 Acres PEAK FLOW RATE = 1.00 cfs
TIME OF CONCENTRATION(MIN.)= 5.01 MEAN VALUES: Fp = 0.400 (in/hr); Ap = 0.100; Fm = 0.040 (in/hr)

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APPENDIX 2

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| |  DESCRIPTION OF STUDY:                                                                                       | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                                   | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                                       | |
| |  2 YEAR PROPOSED CONDITION;  FILE NO.:  11004P02.RES                                                         | |
| |-------------------------------------------[ORANGE COUNTY]---------------------------------------------------| |
| |  FILE NAME:11004P02.DAT                     *ENGLISH UNITS*              | CALCULATED BY:                    | |
| |  TIME/DATE OF STUDY: 10:12  11/27/2013                                   |    CHECKED BY:                    | |
| |   2.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                  | PAGE NUMBER   1 OF                | |
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]------------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc  | I  | Fm | Fm  |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS    | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES    | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 140|.0043| .. |INITIAL SUBAREA| |
| |        11.00|    0.8|   0.8| A | Com |----|  6.5|1.94|0.04|0.040|   1.4|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 160|.0169| 5.0|Qpipe=     1.40| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |n=.0130 D= 0.46| |
| |        12.00|       |      |   |     | 0.5|     |    |    |     |      |    |     |    |     9.0"-PIPE  | |
| |        12.00|    0.5|  1.36| A | Com |----|  7.1|1.86|0.04|0.040|   2.2|----|-----|----|  ADD SUBAREA   | |
| |             |       |      |   |     | .. |     |    |    |     |      ( 240|.0138) .. | (AND COMPUTE    | |
| |             |       |      |   |     |    (  6.4|1.96|0.04|0.040|   0.9)    |     |    .. INITIAL SUBAREA)| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 175|.0051| 1.8|Qest.=   2.9    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.39;D*V= 0.7| |
| | FLOW TO PT.#|       |      |         | 1.7|     |    |    |     |      |    |     |    |FLOODWIDTH=12.7| |
| |        13.00|    0.9|  2.27| A | Com |----|  8.7|1.65|0.04|0.040|   3.3|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 217|.0051| .. |INITIAL SUBAREA| |
| |        21.00|    0.4|   0.4| A | Com |----|  7.5|1.79|0.04|0.040|   0.7|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0055| 1.4|Qest.=   0.9    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.28;D*V= 0.4| |
| | FLOW TO PT.#|       |      |         | 1.2|     |    |    |     |      |    |     |    |FLOODWIDTH= 6.8| |
| |        22.00|    0.2|  0.66| A | Com |----|  8.7|1.65|0.04|0.040|   1.0|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 170|.0132| 2.2|Qest.=   1.3    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.28;D*V= 0.6| |
| | FLOW TO PT.#|       |      |         | 1.3|     |    |    |     |      |    |     |    |FLOODWIDTH= 6.5| |
| |        23.00|    0.4|  1.11| A | Com |----| 10.0|1.52|0.04|0.040|   1.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                                |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 218|.0206| .. |INITIAL SUBAREA| |
| |        23.00|    0.6|   0.6| A | Com |----|  5.7|2.10|0.04|0.040|   1.1|----|-----|----|----------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
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| |  DESCRIPTION OF STUDY:                                                                                   | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                               | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                                   | |
| |  2 YEAR PROPOSED CONDITION;  FILE NO.:  11004P02.RES                                                     | |
| |-------------------------------------------[ORANGE COUNTY]-----------------------------------------------| |
| |  FILE NAME:11004P02.DAT                    *ENGLISH UNITS*            | CALCULATED BY:                   | |
| |  TIME/DATE OF STUDY: 10:12  11/27/2013                                |    CHECKED BY:                   | |
| |   2.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)               | PAGE NUMBER   2 OF               | |
| |-----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                       |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |    2.25      5.69    0.400     0.10    0.040      2.10      1.21     30.0|                | |
| |             |    2.25      9.99    0.400     0.10    0.040      1.52      1.69     20.0|                | |
| |             |     TOTAL AREA=      1.690                                             |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MEMORY BANK # 1 CLEARED                                            |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                            |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 241|.0054| .. |INITIAL SUBAREA| |
| |        41.00|    0.1|   0.1| A | Com |----|  7.7|1.76|0.04|0.040|   0.2|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 130|.0038| 1.3|Qest.=   0.2    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.20;D*V= 0.3| |
| | FLOW TO PT.#|       |      |         | 1.6|     |    |    |     |      |    |     |    |FLOODWIDTH= 2.0| |
| |        42.00|    0.1|  0.17| A | Com |----|  9.4|1.58|0.04|0.040|   0.2|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 181|.0122| 2.4|Qest.=   0.4    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.20;D*V= 0.5| |
| | FLOW TO PT.#|       |      |         | 1.3|     |    |    |     |      |    |     |    |FLOODWIDTH= 2.0| |
| |        43.00|    0.2|  0.35| A | Com |----| 10.6|1.47|0.04|0.040|   0.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------|  80|.0016| 1.6|Qpipe=     0.45| |
| |             |       |      |         |    |     |    |    |     |      |    |     |    |n=.0130 D= 0.40| |
| |        23.00|       |      |         | 0.9|     |    |    |     |      |    |     |    |    12.0"-PIPE  | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                       |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |    2.59      5.69    0.400     0.10    0.040      2.10      1.39     30.0|                | |
| |             |    2.68      9.99    0.400     0.10    0.040      1.52      1.99     20.0|                | |
| |             |    2.53     11.48    0.400     0.10    0.040      1.40      2.04     40.0|                | |
| |             |     TOTAL AREA=      2.040                                             |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
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DESCRIPTION OF STUDY:
LIDO HOUSE HOTEL; R.D. OLSON DEVELOPMENT
3300 NEWPORT BLVD., NEWPORT BEACH, CA
2 YEAR PROPOSED CONDITION; FILE NO.: 11004P02.RES

[ORANGE COUNTY]

FILE NAME:11004P02.DAT *ENGLISH UNITS* | CALCULATED BY:
TIME/DATE OF STUDY: 10:12 11/27/2013 | CHECKED BY:
2.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 3 OF

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I (in/hr)	Fm	Fm (Avg)	Q-SUM (cfs)	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
23.00	MEMORY BANK # 1 CLEARED													
					..						213	.0061	..	INITIAL SUBAREA
51.00	0.2	0.2	A	Com	----	7.2	1.84	0.04	0.040	0.4	----	-----	----	
					..						175	.0091	..	INITIAL SUBAREA
61.00	0.5	0.5	A	Com	----	6.1	2.01	0.04	0.040	0.9	----	-----	----	
											75	.0013	0.8	Qest.= 1.1
3.0ft-GUTTER														XFALL= 0.02000
FLOW TO PT.#					1.5									n=.0150 D= 0.23
62.00	0.2	0.68	A	Com	----	7.7	1.77	0.04	0.040	1.1	----	-----	----	
62.00		0.7			----	7.7				1.1	----	-----	----	STREAM SUMMARY

EFFECTIVE AREA = 0.68 Acres TOTAL AREA = 0.68 Acres PEAK FLOW RATE = 1.06 cfs
TIME OF CONCENTRATION(MIN.)= 7.68 MEAN VALUES: Fp = 0.400 (in/hr); Ap = 0.100; Fm = 0.040 (in/hr)

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| |  DESCRIPTION OF STUDY:                                                                                  | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                              | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                                  | |
| |  10 YEAR PROPOSED CONDITION;  FILE NO. 11004P10.RES                                                     | |
| |-------------------------------------------[ORANGE COUNTY]-----------------------------------------------| |
| |  FILE NAME:11004P10.DAT                       *ENGLISH UNITS*             | CALCULATED BY:               | |
| |  TIME/DATE OF STUDY: 10: 5  11/27/2013                                    |    CHECKED BY:               | |
| |  10.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                   | PAGE NUMBER   1 OF           | |
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]-------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc  | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 140|.0043| .. |INITIAL SUBAREA| |
| |        11.00|    0.8|   0.8| A | Com |----|  6.5|3.48|0.04|0.040|   2.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 160|.0169| 5.8|Qpipe=     2.54| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |n=.0130 D= 0.55| |
| |        12.00|       |      |   |     | 0.5|     |    |    |     |      |    |     |    |    12.0"-PIPE  | |
| |        12.00|    0.5|  1.36| A | Com |----|  7.0|3.35|0.04|0.040|   4.1|----|-----|----|  ADD SUBAREA   | |
| |             |       |      |   |     | .. |     |    |    |     |      ( 240|.0138) .. | (AND COMPUTE   | |
| |             |       |      |   |     |    (  6.4|3.52|0.04|0.040|   1.7)    |     |    | .. INITIAL SUBAREA)| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 175|.0051| 2.1|Qest.=   5.3   | |
| | 60.ft-STREET|       |      |                |     |    |    |     |      |    |     |    |D=0.45;D*V= 1.0| |
| | FLOW TO PT.#|       |      |           | 1.4|     |    |    |     |      |    |     |    |FLOODWIDTH=16.4| |
| |        13.00|    0.9|  2.27| A | Com |----|  8.4|3.01|0.04|0.040|   6.1|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 217|.0051| .. |INITIAL SUBAREA| |
| |        21.00|    0.4|   0.4| A | Com |----|  7.5|3.21|0.04|0.040|   1.3|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0055| 1.6|Qest.=   1.6   | |
| | 60.ft-STREET|       |      |                |     |    |    |     |      |    |     |    |D=0.33;D*V= 0.5| |
| | FLOW TO PT.#|       |      |           | 1.0|     |    |    |     |      |    |     |    |FLOODWIDTH= 9.4| |
| |        22.00|    0.2|  0.66| A | Com |----|  8.6|2.98|0.04|0.040|   1.7|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 170|.0132| 2.5|Qest.=   2.3   | |
| | 60.ft-STREET|       |      |                |     |    |    |     |      |    |     |    |D=0.33;D*V= 0.8| |
| | FLOW TO PT.#|       |      |           | 1.2|     |    |    |     |      |    |     |    |FLOODWIDTH= 9.2| |
| |        23.00|    0.4|  1.11| A | Com |----|  9.7|2.77|0.04|0.040|   2.7|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                                 |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 218|.0206| .. |INITIAL SUBAREA| |
| |        23.00|    0.6|   0.6| A | Com |----|  5.7|3.77|0.04|0.040|   1.9|----|-----|----|----------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
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| |  DESCRIPTION OF STUDY:                                                                                    | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                                | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                                    | |
| |  10 YEAR PROPOSED CONDITION;  FILE NO. 11004P10.RES                                                       | |
| |-------------------------------------------[ORANGE COUNTY]-----------------------------------------------| |
| |  FILE NAME:11004P10.DAT                     *ENGLISH UNITS*             | CALCULATED BY:                   | |
| |  TIME/DATE OF STUDY: 10: 5  11/27/2013                                   |    CHECKED BY:                   | |
| |  10.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                  | PAGE NUMBER   2 OF               | |
| |----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]--------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I   | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                          |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE  |                | |
| |             |    4.12      5.69    0.400     0.10    0.040      3.77      1.23     30.0|                | |
| |             |    4.15      9.73    0.400     0.10    0.040      2.77      1.69     20.0|                | |
| |             |     TOTAL AREA=      1.690                                              |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MEMORY BANK # 1 CLEARED                                               |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                               |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 241|.0054| .. |INITIAL SUBAREA| |
| |        41.00|    0.1|   0.1| A | Com |----|  7.7|3.16|0.04|0.040|   0.3|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 130|.0038| 1.1|Qest.=   0.4    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.24;D*V= 0.3| |
| | FLOW TO PT.#|       |      |         | 1.9|     |    |    |     |      |    |     |    |FLOODWIDTH= 4.2| |
| |        42.00|    0.1|  0.17| A | Com |----|  9.7|2.78|0.04|0.040|   0.4|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 181|.0122| 2.0|Qest.=   0.6    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.23;D*V= 0.5| |
| | FLOW TO PT.#|       |      |         | 1.5|     |    |    |     |      |    |     |    |FLOODWIDTH= 3.5| |
| |        43.00|    0.2|  0.35| A | Com |----| 11.1|2.56|0.04|0.040|   0.8|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------|  80|.0016| 1.8|Qpipe=     0.80| |
| |             |       |      |         |    |     |    |    |     |      |    |     |    |n=.0130 D= 0.55| |
| |        23.00|       |      |         | 0.7|     |    |    |     |      |    |     |    |    12.0"-PIPE  | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                          |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE  |                | |
| |             |    4.71      5.69    0.400     0.10    0.040      3.77      1.40     30.0|                | |
| |             |    4.89      9.73    0.400     0.10    0.040      2.77      1.98     20.0|                | |
| |             |    4.49     11.89    0.400     0.10    0.040      2.47      2.04     40.0|                | |
| |             |     TOTAL AREA=      2.040                                              |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
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DESCRIPTION OF STUDY:
LIDO HOUSE HOTEL; R.D. OLSON DEVELOPMENT
3300 NEWPORT BLVD., NEWPORT BEACH, CA
10 YEAR PROPOSED CONDITION; FILE NO. 11004P10.RES

[ORANGE COUNTY]

FILE NAME:11004P10.DAT *ENGLISH UNITS* | CALCULATED BY:
TIME/DATE OF STUDY: 10: 5 11/27/2013 | CHECKED BY:
10.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 3 OF

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I (in/hr)	Fm	Fm (Avg)	Q-SUM (cfs)	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
23.00	MEMORY BANK # 1 CLEARED													
					..						213	.0061	..	INITIAL SUBAREA
51.00	0.2	0.2	A	Com	----	7.2	3.30	0.04	0.040	0.7				
					..						175	.0091	..	INITIAL SUBAREA
61.00	0.5	0.5	A	Com	----	6.1	3.61	0.04	0.040	1.7				
											75	.0013	0.9	Qest.= 1.9
3.0ft-GUTTER														XFALL= 0.02000
FLOW TO PT.#					1.4									n=.0150 D= 0.28
62.00	0.2	0.68	A	Com	----	7.5	3.21	0.04	0.040	1.9				
62.00		0.7			----	7.5				1.9	----	-----	----	STREAM SUMMARY

EFFECTIVE AREA = 0.68 Acres TOTAL AREA = 0.68 Acres PEAK FLOW RATE = 1.94 cfs
TIME OF CONCENTRATION(MIN.)= 7.52 MEAN VALUES: Fp = 0.400 (in/hr); Ap = 0.100; Fm = 0.040 (in/hr)

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| |  DESCRIPTION OF STUDY:                                                                                         | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                                     | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                                         | |
| |  25 YEAR PROPOSED EVENT;  FILE NAME:  11004P25.RES                                                             | |
| |--------------------------------------------[ORANGE COUNTY]----------------------------------------------------| |
| |  FILE NAME:11004P25.DAT                      *ENGLISH UNITS*            | CALCULATED BY:                       | |
| |  TIME/DATE OF STUDY: 10: 9  11/27/2013                                  |    CHECKED BY:                       | |
| |  25.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                 | PAGE NUMBER   1 OF                   | |
| |-----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]-------------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc  | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS    | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES    | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 140|.0043| .. |INITIAL SUBAREA| |
| |        11.00|    0.8|   0.8| A | Com |----|  6.5|4.15|0.04|0.040|   3.0|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 160|.0169| 6.0|Qpipe=     3.03| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |n=.0130 D= 0.61| |
| |        12.00|       |      |   |     | 0.4|     |    |    |     |      |    |     |    |    12.0"-PIPE | |
| |        12.00|    0.5|  1.36| A | Com |----|  7.0|4.00|0.04|0.040|   4.8|----|-----|----|  ADD SUBAREA   | |
| |             |       |      |   |     | .. |     |    |    |     |      ( 240|.0138) .. | (AND COMPUTE   | |
| |             |       |      |   |     |    (  6.4|4.19|0.04|0.040|   2.0)    |     |    .. INITIAL SUBAREA)| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 175|.0051| 2.2|Qest.=   6.3    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.48;D*V= 1.0| |
| | FLOW TO PT.#|       |      |         | 1.4|     |    |    |     |      |    |     |    |FLOODWIDTH=17.6| |
| |        13.00|    0.9|  2.27| A | Com |----|  8.3|3.61|0.04|0.040|   7.3|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 217|.0051| .. |INITIAL SUBAREA| |
| |        21.00|    0.4|   0.4| A | Com |----|  7.5|3.83|0.04|0.040|   1.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 100|.0055| 1.7|Qest.=   1.9    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.35;D*V= 0.6| |
| | FLOW TO PT.#|       |      |         | 1.0|     |    |    |     |      |    |     |    |FLOODWIDTH=10.3| |
| |        22.00|    0.2|  0.66| A | Com |----|  8.5|3.56|0.04|0.040|   2.1|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 170|.0132| 2.6|Qest.=   2.8    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.34;D*V= 0.9| |
| | FLOW TO PT.#|       |      |         | 1.1|     |    |    |     |      |    |     |    |FLOODWIDTH=10.0| |
| |        23.00|    0.4|  1.11| A | Com |----|  9.7|3.32|0.04|0.040|   3.3|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                                  |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 218|.0206| .. |INITIAL SUBAREA| |
| |        23.00|    0.6|   0.6| A | Com |----|  5.7|4.48|0.04|0.040|   2.3|----|-----|----|----------------| |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
| |             |       |      |   |     |    |     |    |    |     |      |    |     |    |                | |
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| |  DESCRIPTION OF STUDY:                                                                                   | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                               | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                                   | |
| |  25 YEAR PROPOSED EVENT;  FILE NAME:  11004P25.RES                                                       | |
| |--------------------------------------------[ORANGE COUNTY]-----------------------------------------------| |
| |  FILE NAME:11004P25.DAT                        *ENGLISH UNITS*            | CALCULATED BY:               | |
| |  TIME/DATE OF STUDY: 10: 9  11/27/2013                                    |    CHECKED BY:               | |
| |  25.0-YEAR STORM RATIONAL METHOD STUDY (AMC  II LOSSES)                   | PAGE NUMBER   2 OF           | |
| |-----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]--------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS   | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                           |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |    4.93      5.69    0.400     0.10    0.040      4.48      1.23     30.0|                | |
| |             |    4.99      9.66    0.400     0.10    0.040      3.32      1.69     20.0|                | |
| |             |     TOTAL AREA=      1.690                                               |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MEMORY BANK # 1 CLEARED                                             |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                             |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 241|.0054| .. |INITIAL SUBAREA| |
| |        41.00|    0.1|   0.1| A | Com |----|  7.7|3.76|0.04|0.040|   0.4|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 130|.0038| 1.1|Qest.=   0.5    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.25;D*V= 0.3| |
| | FLOW TO PT.#|       |      |         | 1.9|     |    |    |     |      |    |     |    |FLOODWIDTH= 5.0| |
| |        42.00|    0.1|  0.17| A | Com |----|  9.7|3.32|0.04|0.040|   0.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 181|.0122| 2.0|Qest.=   0.7    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.24;D*V= 0.5| |
| | FLOW TO PT.#|       |      |         | 1.5|     |    |    |     |      |    |     |    |FLOODWIDTH= 4.5| |
| |        43.00|    0.2|  0.35| A | Com |----| 11.2|3.06|0.04|0.040|   1.0|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------|  80|.0016| 1.9|Qpipe=     0.95| |
| |             |       |      |         |    |     |    |    |     |      |    |     |    |n=.0130 D= 0.62| |
| |        23.00|       |      |         | 0.7|     |    |    |     |      |    |     |    |    12.0"-PIPE  | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                           |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |    5.63      5.69    0.400     0.10    0.040      4.48      1.40     30.0|                | |
| |             |    5.86      9.66    0.400     0.10    0.040      3.32      1.97     20.0|                | |
| |             |    5.39     11.87    0.400     0.10    0.040      2.96      2.04     40.0|                | |
| |             |     TOTAL AREA=      2.040                                               |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
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DESCRIPTION OF STUDY:
LIDO HOUSE HOTEL; R.D. OLSON DEVELOPMENT
3300 NEWPORT BLVD., NEWPORT BEACH, CA
25 YEAR PROPOSED EVENT; FILE NAME: 11004P25.RES

[ORANGE COUNTY]

FILE NAME:11004P25.DAT *ENGLISH UNITS* | CALCULATED BY:
TIME/DATE OF STUDY: 10: 9 11/27/2013 | CHECKED BY:
25.0-YEAR STORM RATIONAL METHOD STUDY (AMC II LOSSES) | PAGE NUMBER 3 OF

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I (in/hr)	Fm	Fm (Avg)	Q-SUM (cfs)	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
23.00	MEMORY BANK # 1 CLEARED													
					..						213	.0061	..	INITIAL SUBAREA
51.00	0.2	0.2	A	Com	----	7.2	3.93	0.04	0.040	0.8	----	-----	----	
					..						175	.0091	..	INITIAL SUBAREA
61.00	0.5	0.5	A	Com	----	6.1	4.30	0.04	0.040	2.0	----	-----	----	
											75	.0013	0.9	Qest.= 2.3
3.0ft-GUTTER														XFALL= 0.02000
FLOW TO PT.#					1.3									n=.0150 D= 0.29
62.00	0.2	0.68	A	Com	----	7.5	3.84	0.04	0.040	2.3	----	-----	----	
62.00		0.7			----	7.5				2.3	----	-----	----	STREAM SUMMARY

EFFECTIVE AREA = 0.68 Acres TOTAL AREA = 0.68 Acres PEAK FLOW RATE = 2.33 cfs
TIME OF CONCENTRATION(MIN.)= 7.47 MEAN VALUES: Fp = 0.400 (in/hr); Ap = 0.100; Fm = 0.040 (in/hr)

* *

DESCRIPTION OF STUDY:
LIDO HOUSE HOTEL; R.D. OLSON DEVELOPMENT
3300 NEWPORT BLVD., NEWPORT BEACH, CA
100 YEAR PROPOSED CONDITIONS; FILE NO. 11004P0C.RES

[ORANGE COUNTY]

FILE NAME:11004P0C.DAT *ENGLISH UNITS* | CALCULATED BY:
TIME/DATE OF STUDY: 14:30 1/27/2014 | CHECKED BY:
100.0-YEAR STORM RATIONAL METHOD STUDY (AMC III LOSSES) | PAGE NUMBER 1 OF

[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I (in/hr)	Fm	Fm (Avg)	Q-SUM (cfs)	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
					..						140	.0043	..	INITIAL SUBAREA
11.00	0.8	0.8	A	Com	----	6.5	5.31	0.04	0.040	3.9				
											160	.0169	6.3	Qpipe= 3.89
														n=.0130 D= 0.73
12.00					0.4									12.0"-PIPE
12.00	0.5	1.36	A	Com	----	7.0	5.12	0.04	0.040	6.2				ADD SUBAREA
					..						(240	.0138)	..	(AND COMPUTE
						(6.4	5.36	0.04	0.040	2.6)			..	INITIAL SUBAREA)
											175	.0051	2.3	Qest.= 8.1
60.ft-STREET														D=0.51;D*V= 1.2
FLOW TO PT.#					1.3									FLOODWIDTH=19.5
13.00	0.9	2.27	A	Com	----	8.2	4.65	0.04	0.040	9.4				
					..						217	.0051	..	INITIAL SUBAREA
21.00	0.4	0.4	A	Com	----	7.5	4.90	0.04	0.040	2.0				
											100	.0055	1.8	Qest.= 2.4
60.ft-STREET														D=0.37;D*V= 0.7
FLOW TO PT.#					1.0									FLOODWIDTH=11.5
22.00	0.2	0.66	A	Com	----	8.5	4.57	0.04	0.040	2.7				
											170	.0132	2.8	Qest.= 3.5
60.ft-STREET														D=0.36;D*V= 1.0
FLOW TO PT.#					1.1									FLOODWIDTH=11.3
23.00	0.4	1.11	A	Com	----	9.5	4.27	0.04	0.040	4.2				
23.00	MAIN-STREAM COPIED ONTO MEMORY BANK # 1													
					..						218	.0206	..	INITIAL SUBAREA
23.00	0.6	0.6	A	Com	----	5.7	5.74	0.04	0.040	3.0				

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| |  DESCRIPTION OF STUDY:                                                                                       | |
| |  LIDO HOUSE HOTEL;  R.D. OLSON DEVELOPMENT                                                                   | |
| |  3300 NEWPORT BLVD., NEWPORT BEACH, CA                                                                       | |
| |  100 YEAR PROPOSED CONDITIONS;  FILE NO. 11004P0C.RES                                                        | |
| |--------------------------------------------[ORANGE COUNTY]---------------------------------------------------| |
| |  FILE NAME:11004P0C.DAT                      *ENGLISH UNITS*             | CALCULATED BY:                    | |
| |  TIME/DATE OF STUDY: 14:30   1/27/2014                                   |    CHECKED BY:                    | |
| | 100.0-YEAR STORM RATIONAL METHOD STUDY (AMC III LOSSES)                  | PAGE NUMBER   2 OF                | |
| |-----------------------------[(c) 1983-2003 ADVANCED ENGINEERING SOFTWARE]------------------------------------| |
| |CONCENTRATION| AREA (ACRES) |SOIL|DEV.| Tt |  Tc | I  | Fm |  Fm |Q-SUM |PATH|SLOPE| V  |   HYDRAULICS    | |
| | POINT NUMBER|SUBAREA|  SUM |TYPE|TYPE|MIN.| MIN.| (in/hr) |(Avg)|(cfs) |(ft)|ft/ft|FPS.|    AND NOTES    | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                          |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |    6.37      5.69    0.400     0.10    0.040      5.74      1.24     30.0|                | |
| |             |    6.44      9.55    0.400     0.10    0.040      4.27      1.69     20.0|                | |
| |             |     TOTAL AREA=      1.690                                             |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MEMORY BANK # 1 CLEARED                                               |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MAIN-STREAM COPIED ONTO MEMORY BANK # 1                               |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |             |       |      |   |     | .. |     |    |    |     |      | 241|.0054| .. |INITIAL SUBAREA| |
| |        41.00|    0.1|   0.1| A | Com |----|  7.7|4.81|0.04|0.040|   0.5|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 130|.0038| 1.2|Qest.=   0.6    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.27;D*V= 0.3| |
| | FLOW TO PT.#|       |      |         | 1.9|     |    |    |     |      |    |     |    |FLOODWIDTH= 6.1| |
| |        42.00|    0.1|  0.17| A | Com |----|  9.6|4.25|0.04|0.040|   0.6|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------| 181|.0122| 2.1|Qest.=   1.0    | |
| | 60.ft-STREET|       |      |         |    |     |    |    |     |      |    |     |    |D=0.26;D*V= 0.6| |
| | FLOW TO PT.#|       |      |         | 1.5|     |    |    |     |      |    |     |    |FLOODWIDTH= 5.6| |
| |        43.00|    0.2|  0.35| A | Com |----| 11.1|3.92|0.04|0.040|   1.2|----|-----|----|----------------| |
| |-------------|-------|------|---|-----|    |-----|----|----|-----|------|  80|.0016| 2.0|Qpipe=     1.22| |
| |             |       |      |         |    |     |    |    |     |      |    |     |    |n=.0130 D= 0.74| |
| |        23.00|       |      |         | 0.7|     |    |    |     |      |    |     |    |   12.0"-PIPE   | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
| |        23.00|     MEMORY BANK # 1 CONFLUENCED WITH MAIN-STREAM                          |                | |
| |             |   Q(cfs)   Tc(min)  Fp(avg)  Ap(avg)  Fm(avg)  I(in/hr)  Ae(Acres)  NODE |                | |
| |             |    7.27      5.69    0.400     0.10    0.040      5.74      1.41     30.0|                | |
| |             |    7.55      9.55    0.400     0.10    0.040      4.27      1.97     20.0|                | |
| |             |    6.92     11.78    0.400     0.10    0.040      3.79      2.04     40.0|                | |
| |             |     TOTAL AREA=      2.040                                             |                | |
| |-------------|-------|------|---|-----|----|-----|----|----|-----|------|----|-----|----|----------------| |
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DESCRIPTION OF STUDY:
LIDO HOUSE HOTEL; R.D. OLSON DEVELOPMENT
3300 NEWPORT BLVD., NEWPORT BEACH, CA
100 YEAR PROPOSED CONDITIONS; FILE NO. 11004P0C.RES

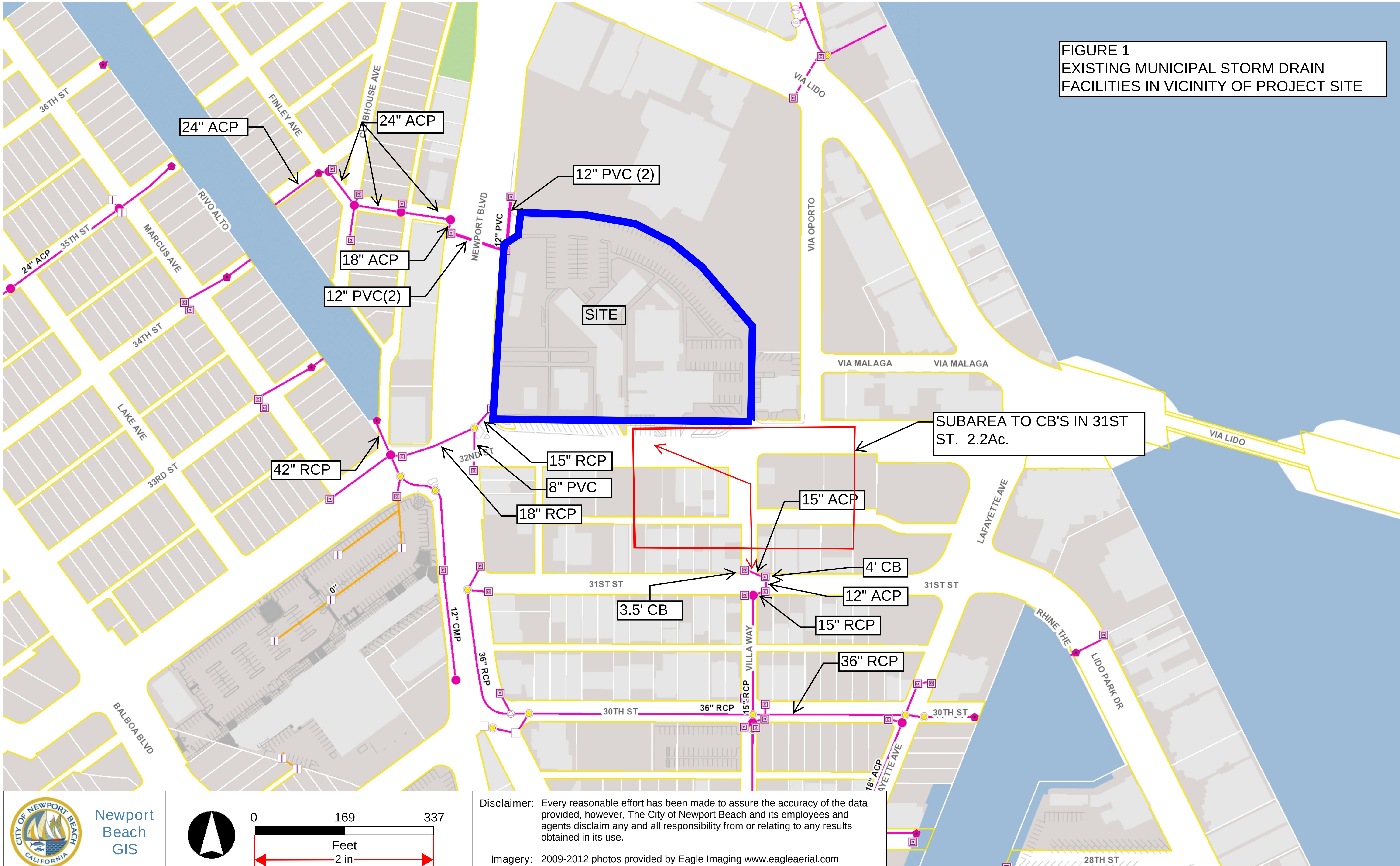
[ORANGE COUNTY]

FILE NAME:11004P0C.DAT *ENGLISH UNITS* | CALCULATED BY:
TIME/DATE OF STUDY: 14:30 1/27/2014 | CHECKED BY:
100.0-YEAR STORM RATIONAL METHOD STUDY (AMC III LOSSES) | PAGE NUMBER 3 OF

CONCENTRATION POINT NUMBER	AREA (ACRES) SUBAREA	SUM	SOIL TYPE	DEV. TYPE	Tt MIN.	Tc MIN.	I (in/hr)	Fm	Fm (Avg)	Q-SUM (cfs)	PATH (ft)	SLOPE ft/ft	V FPS.	HYDRAULICS AND NOTES
23.00	MEMORY BANK # 1 CLEARED													
51.00	0.2	0.2	A	Com	..	7.2	5.02	0.04	0.040	1.1	213	.0061	..	INITIAL SUBAREA
61.00	0.5	0.5	A	Com	..	6.1	5.50	0.04	0.040	2.6	175	.0091	..	INITIAL SUBAREA
3.0ft-GUTTER FLOW TO PT.# 62.00	0.2	0.68	A	Com	1.3	7.4	4.94	0.04	0.040	3.0	75	.0013	1.0	Qest.= 2.9 XFALL= 0.02000 n=.0150 D= 0.32
62.00		0.7			----	7.4				3.0	----	-----	----	STREAM SUMMARY

EFFECTIVE AREA = 0.68 Acres TOTAL AREA = 0.68 Acres PEAK FLOW RATE = 3.00 cfs
TIME OF CONCENTRATION(MIN.)= 7.40 MEAN VALUES: Fp = 0.400 (in/hr); Ap = 0.100; Fm = 0.040 (in/hr)

APPENDIX 3



Disclaimer: Every reasonable effort has been made to assure the accuracy of the data provided, however, The City of Newport Beach and its employees and agents disclaim any and all responsibility from or relating to any results obtained in its use.

Imagery: 2009-2012 photos provided by Eagle Imaging www.eagleaerial.com

1/24/2014

APPENDIX 4

FUSCOE
ENGINEERING

Project: LIDO HOUSE HOTEL		Project #: 1100-04	
By: MN	Date: 1/26/14	Check:	Date:
STREET FLOW DEPTH NEWPORT BLVD.			Page of

STREET 1/2 WIDTH 50±

@ CB #2 $\Delta H = 7.2 - 6.3 = 0.9$
$L = 165$
$S = 0.9/165 = 0.005$

@ CB #3 $\Delta H = 7.2 - 6.8 = 0.4$
$L = 141$
$S = 0.4/141 = 0.003$

@ CB#2

$Q_{10} = 4.9$ cfs

PROPOSED

CONVEYANCE $= 4.9/\sqrt{0.005} = 69$
FLOW DEPTH $= 0.44'$ (TABLE 5.2 OCHM STREET TABLES)
FLOW STAYS W/ CB #2

EXIST

$Q_{10} = 6.8$ cfs
CONVEYANCE $= 6.8/\sqrt{0.005} = 96$
FLOW DEPTH $= 0.49$
FLOW STAYS W/CB #2

@ CB #3

PROPOSED

$Q_{10} = 6.1$ cfs
Conveyance $= 6.1/\sqrt{0.003} = 111$
FLOW DEPTH $= 0.50'$
THIS EXCEEDS ΔH TO HIGHPOINT. OVER FLOW TO CB#2

EXIST

$Q_{10} = 5.4$ cfs
CONVEYANCE $= 5.4/\sqrt{0.003} = 99$
FLOW DEPTH $= 0.49'$
THIS EXCEEDS ΔH TO HIGHPOINT. OVER FLOW TO CB #2

16795 Von Karman, Suite100, Irvine, California 92606 ○ tel 949.474.1960 ○ fax 949.225.6090 www.fuscoe.com
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2850 Inland Empire Blvd., Suite B, Ontario, California 91764 ○ tel 909.581.0676 ○ fax 909.581.0696
901 E. Tahquitz Canyon Way, Suite B-200, Palm Springs, California 92262 ○ tel 760.327.3375 ○ fax 760.406.5945
801 S. Grand Ave., Suite 1020, Los Angeles, California 90017 ○ tel 213.542.4260 ○ fax 213.542.4263
111 North 6th Street, El Centro, California 92243 ○ tel 760.482.0089 ○ fax 760.897.2144

OCEMA
STREET FLOW TABLES

Street Half Width = 51'
Curb Type = A2-8"

Flow Depth ft	Flow Area sqft	Flooded Widths Street ft	Flooded Widths Parkway ft	Maximum S for Y*V=6	Conveyance Q/S**.5
0.20	0.2	2.1	0.0	2.055	4.6
0.21	0.2	2.7	0.0	2.223	4.7
0.22	0.3	3.3	0.0	2.239	5.0
0.23	0.3	3.8	0.0	2.153	5.5
0.24	0.3	4.4	0.0	2.007	6.2
0.25	0.4	5.0	0.0	1.835	7.0
0.26	0.5	5.6	0.0	1.656	8.1
0.27	0.5	6.2	0.0	1.484	9.3
0.28	0.6	6.8	0.0	1.323	10.7
0.29	0.6	7.4	0.0	1.177	12.3
0.30	0.7	8.0	0.0	1.047	14.1
0.31	0.8	8.6	0.0	0.931	16.1
0.32	0.9	9.2	0.0	0.830	18.4
0.33	1.0	9.8	0.0	0.740	20.9
0.34	1.1	10.3	0.0	0.662	23.6
0.35	1.2	10.9	0.0	0.594	26.6
0.36	1.3	11.5	0.0	0.533	29.8
0.37	1.4	12.1	0.0	0.480	33.4
0.38	1.5	12.7	0.0	0.434	37.2
0.39	1.7	13.3	0.0	0.393	41.2
0.40	1.8	13.9	0.0	0.356	45.6
0.41	2.0	14.5	0.0	0.324	50.3
0.42	2.1	15.1	0.0	0.296	55.3
0.43	2.3	15.7	0.0	0.270	60.7
0.44	2.4	16.3	0.0	0.247	66.3
0.45	2.6	16.8	0.0	0.227	72.3 69
0.46	2.8	17.4	0.0	0.209	78.7
0.47	2.9	18.0	0.0	0.192	85.4
0.48	3.1	18.6	0.0	0.177	92.5
0.49	3.3	19.2	0.0	0.164	99.9
0.50	3.5	19.8	0.0	0.152	107.8
0.51	3.7	20.4	0.0	0.141	116.0
0.52	3.9	21.0	0.0	0.131	124.6
0.53	4.1	21.6	0.0	0.122	133.7
0.54	4.3	22.2	0.0	0.114	143.1
0.55	4.6	22.8	0.0	0.106	153.0
0.56	4.8	23.3	0.0	0.099	163.3
0.57	5.0	23.9	0.0	0.093	174.0
0.58	5.3	24.5	0.0	0.087	185.2
0.59	5.5	25.1	0.0	0.081	196.8
0.60	5.8	25.7	0.0	0.076	208.9
0.61	6.0	26.3	0.0	0.072	221.4
0.62	6.3	26.9	0.0	0.068	234.5
0.63	6.6	27.5	0.0	0.064	248.0
0.64	6.9	28.1	0.0	0.060	261.9
0.65	7.1	28.7	0.0	0.057	276.4
0.66	7.4	29.3	0.0	0.054	291.4
0.67	7.7	29.8	0.0	0.051	306.9

E X C E E D S   T O P   O F   C U R B

OCEMA
STREET FLOW TABLES

Street Half Width = 51'
Curb Type = A2-8"

Flow Depth ft	Flow Area sqft	Flooded Widths Street ft	Parkway ft	Maximum S for Y*V=6	Conveyance Q/S**.5
E X C E E D S		T O P O F	C U R B		
0.68	8.0	30.4	0.5	0.049	319.8
0.69	8.3	31.0	1.0	0.047	333.5
0.70	8.7	31.6	1.4	0.046	347.8
0.71	9.0	32.2	1.9	0.044	362.9
0.72	9.3	32.8	2.4	0.042	378.8
0.73	9.7	33.4	2.9	0.041	395.4
0.74	10.1	34.0	3.4	0.039	412.7
0.75	10.4	34.5	3.8	0.038	430.8
0.76	10.8	35.1	4.3	0.036	449.7
0.77	11.2	35.7	4.8	0.035	469.4
0.78	11.6	36.3	5.3	0.033	489.8
0.79	12.1	36.9	5.8	0.032	511.1
0.80	12.5	37.5	6.2	0.031	533.2
0.81	12.9	38.1	6.7	0.030	556.1
0.82	13.4	38.7	7.2	0.029	579.9
0.83	13.9	39.3	7.7	0.027	604.5
0.84	14.3	39.8	8.2	0.026	630.0
0.85	14.8	40.4	8.6	0.025	656.3
0.86	15.3	41.0	9.1	0.024	683.6

E X C E E D S R I G H T - O F - W A Y

ORANGE COUNTY HYDROLOGY RUNOFF - RATIONAL METHOD
SITE RUNOFF
PROJECT NAME: **Lido House Hotel - Sly off site estimate**

Fp=	0.4	in\hr
ai=	0.8	
ap=	0.2	
I=	3.59	in\hr
Area=	2.20	Ac
Fm=	0.08	

C= **0.880**

Q= 6.95 cfs

Flow Summary	
Q(2)=	3.8
Q(5)=	5.4
Q(10)=	6.9
Q(25)=	8.3
Q(50)=	9.4
Q(100)=	10.7

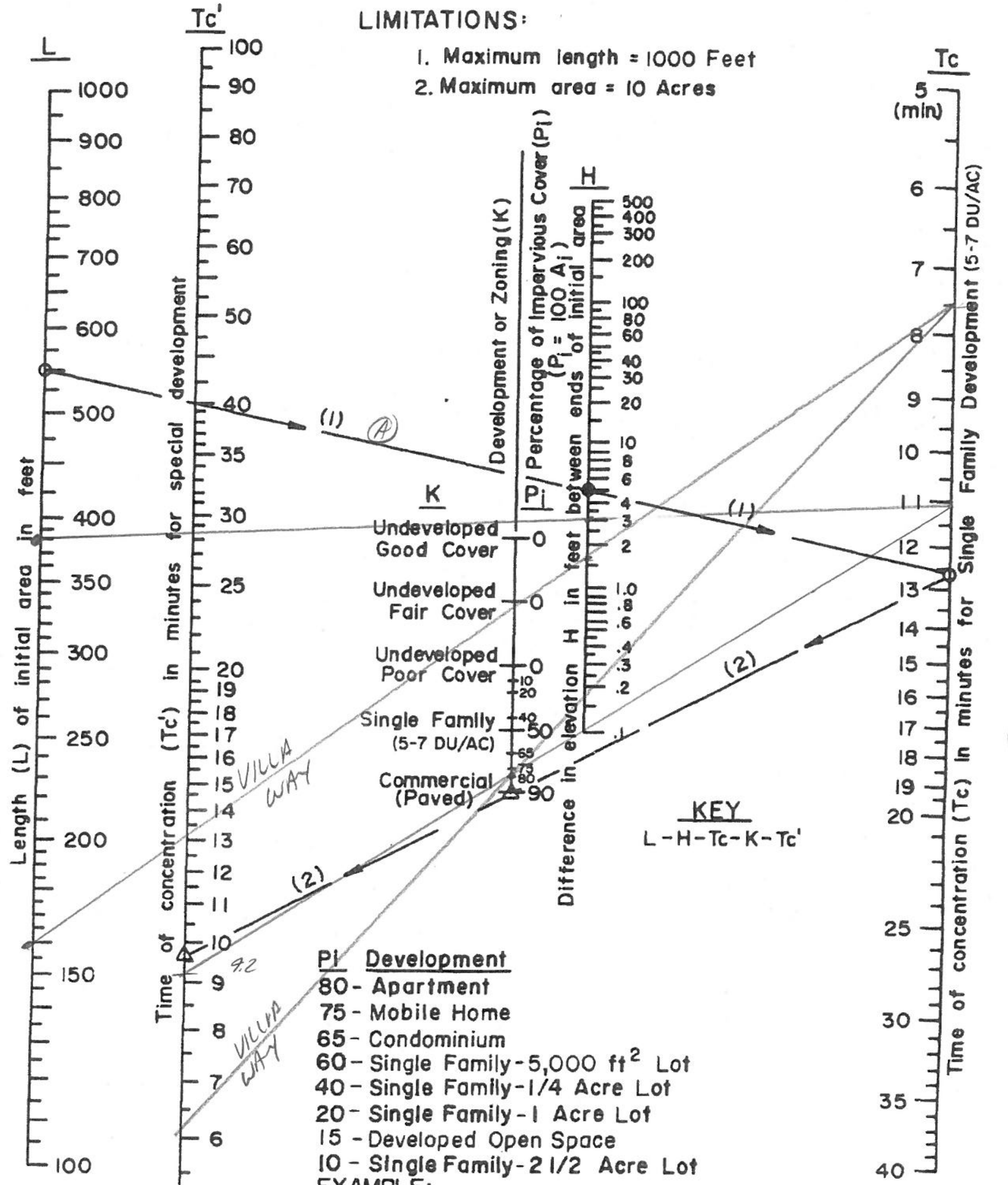
soil type	A	B	C	D
Fp	0.4	0.3	0.25	0.2

Tc = 6.2 min

			a	b
I(2) =	2.00	in/hr	5.702	-0.574
I(5) =	2.82	in/hr	7.87	-0.562
I(10) =	3.59	in/hr	10.209	-0.573
I(25) =	4.27	in/hr	11.995	-0.566
I(50) =	4.81	in/hr	13.521	-0.566
I(100) =	5.47	in/hr	15.56	-0.573

LIMITATIONS:

1. Maximum length = 1000 Feet
2. Maximum area = 10 Acres



Pi	Development
80	Apartment
75	Mobile Home
65	Condominium
60	Single Family-5,000 ft^2 Lot
40	Single Family-1/4 Acre Lot
20	Single Family-1 Acre Lot
15	Developed Open Space
10	Single Family-2 1/2 Acre Lot

EXAMPLE:

(1) L = 550', H = 5.0', K = Single Family (5-7 DU/AC) Development, Tc = 12.6 min.

(2) L = 550', H = 5.0', K = Commercial Development, Tc = 9.7 min.

ORANGE COUNTY

HYDROLOGY MANUAL

TIME OF CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA

Figure D-1

OCEMA

STREET FLOW TABLES

Street Half Width = 14'

Curb Type = A2-6"

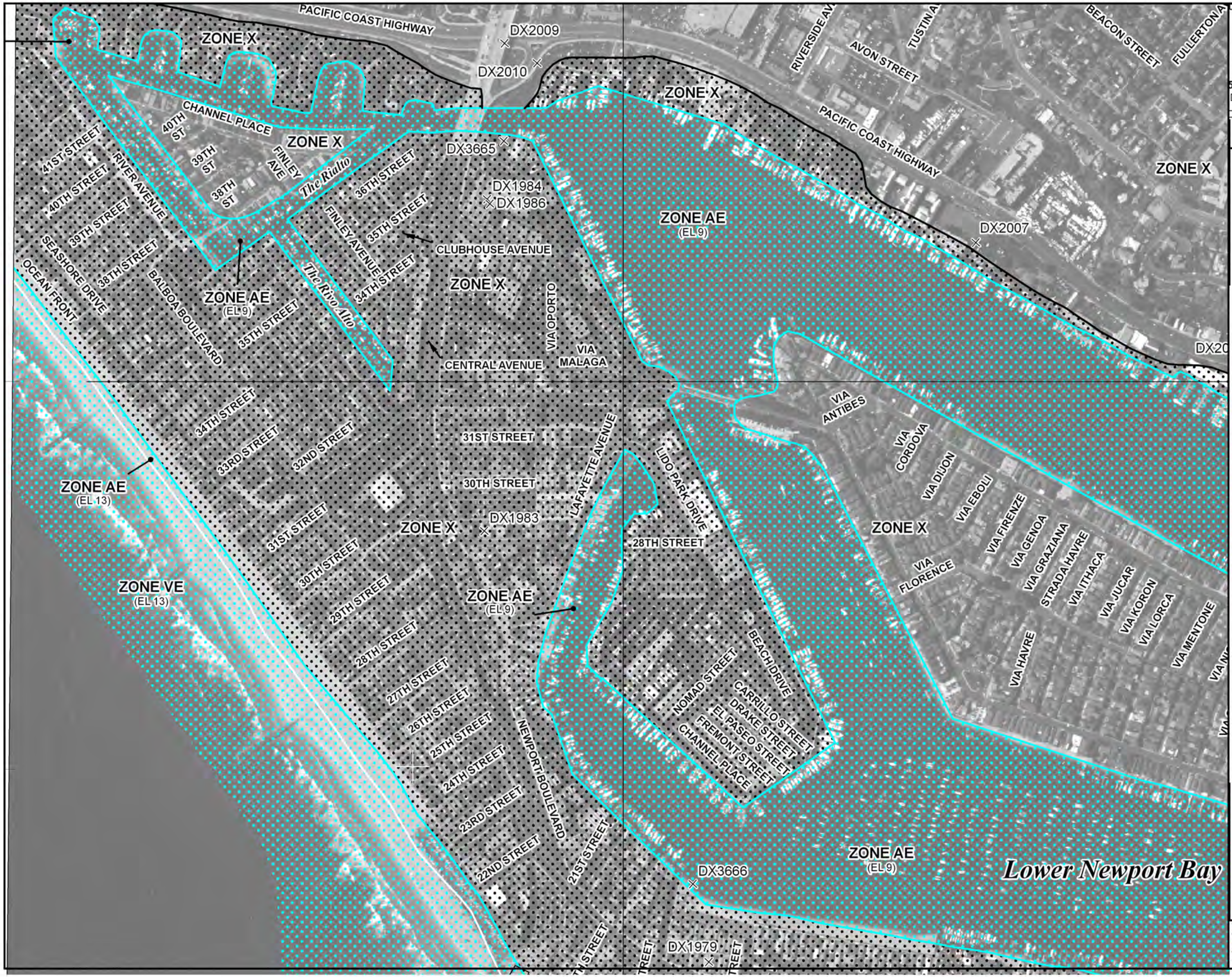
Flow Depth ft	Flow Area sqft	Flooded Widths Street ft	Flooded Widths Parkway ft	Maximum S for Y*V=6	Conveyance Q/S**.5	
0.20	0.3	4.1	0.0	3.933	3.8	
0.21	0.3	4.7	0.0	3.440	4.6	
0.22	0.3	5.3	0.0	2.980	5.5	
0.23	0.4	5.8	0.0	2.571	6.5	
0.24	0.5	6.4	0.0	2.215	7.8	
0.25	0.5	7.0	0.0	1.912	9.2	
0.26	0.6	7.6	0.0	1.654	10.8	
0.27	0.7	8.2	0.0	1.436	12.7	
0.28	0.8	8.8	0.0	1.251	14.7	
0.29	0.9	9.4	0.0	1.094	17.0	
0.30	1.0	10.0	0.0	0.961	19.5	
0.31	1.1	10.6	0.0	0.847	22.3	
0.32	1.2	11.2	0.0	0.750	25.3	
0.33	1.3	11.8	0.0	0.666	28.6	
0.34	1.4	12.3	0.0	0.594	32.1	
0.35	1.5	12.9	0.0	0.532	36.0	
0.36	1.7	13.5	0.0	0.477	40.1	
E X C E E D S		C R O W N				79 83
0.37	3.6	27.9	0.0	0.424	89.6	
0.38	3.9	27.9	0.0	0.364	101.5	
0.39	4.2	27.9	0.0	0.315	113.9	
0.40	4.4	28.0	0.0	0.275	126.9	127
0.41	4.7	28.0	0.0	0.242	140.4	
0.42	5.0	28.0	0.0	0.213	154.5	
0.43	5.3	28.0	0.0	0.190	169.1	
0.44	5.6	28.0	0.0	0.169	184.2	
0.45	5.8	28.0	0.0	0.152	199.8	
0.46	6.1	28.0	0.0	0.136	216.0	
0.47	6.4	28.0	0.0	0.123	232.6	
0.48	6.7	28.0	0.0	0.112	249.7	
0.49	7.0	28.0	0.0	0.102	267.2	
0.50	7.2	28.0	0.0	0.093	285.3	
E X C E E D S		T O P O F	C U R B			
0.51	7.5	28.0	0.5	0.088	297.7	
0.52	7.8	28.0	1.0	0.084	310.7	
0.53	8.1	28.0	1.4	0.080	324.4	
0.54	8.4	28.0	1.9	0.076	338.7	
0.55	8.8	28.0	2.4	0.073	353.7	
0.56	9.1	28.0	2.9	0.069	369.4	
0.57	9.4	28.0	3.4	0.066	385.8	
0.58	9.8	28.0	3.8	0.063	402.9	
0.59	10.1	28.0	4.3	0.060	420.7	
0.60	10.5	28.0	4.8	0.057	439.2	
0.61	10.9	28.0	5.3	0.055	458.4	
0.62	11.3	28.0	5.0	0.052	470.1	

E X C E E D S R I G H T - O F - W A Y

VILLA WAY

APPENDIX 5

tional Flood Insurance Program at 1-800-638-6620.



MAP SCALE 1" = 500'

50 0 500 1000 FEET

METERS

NFIP

PANEL 0381J

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

ORANGE COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 381 OF 539

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
NEWPORT BEACH, CITY OF	060227	0381	J

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

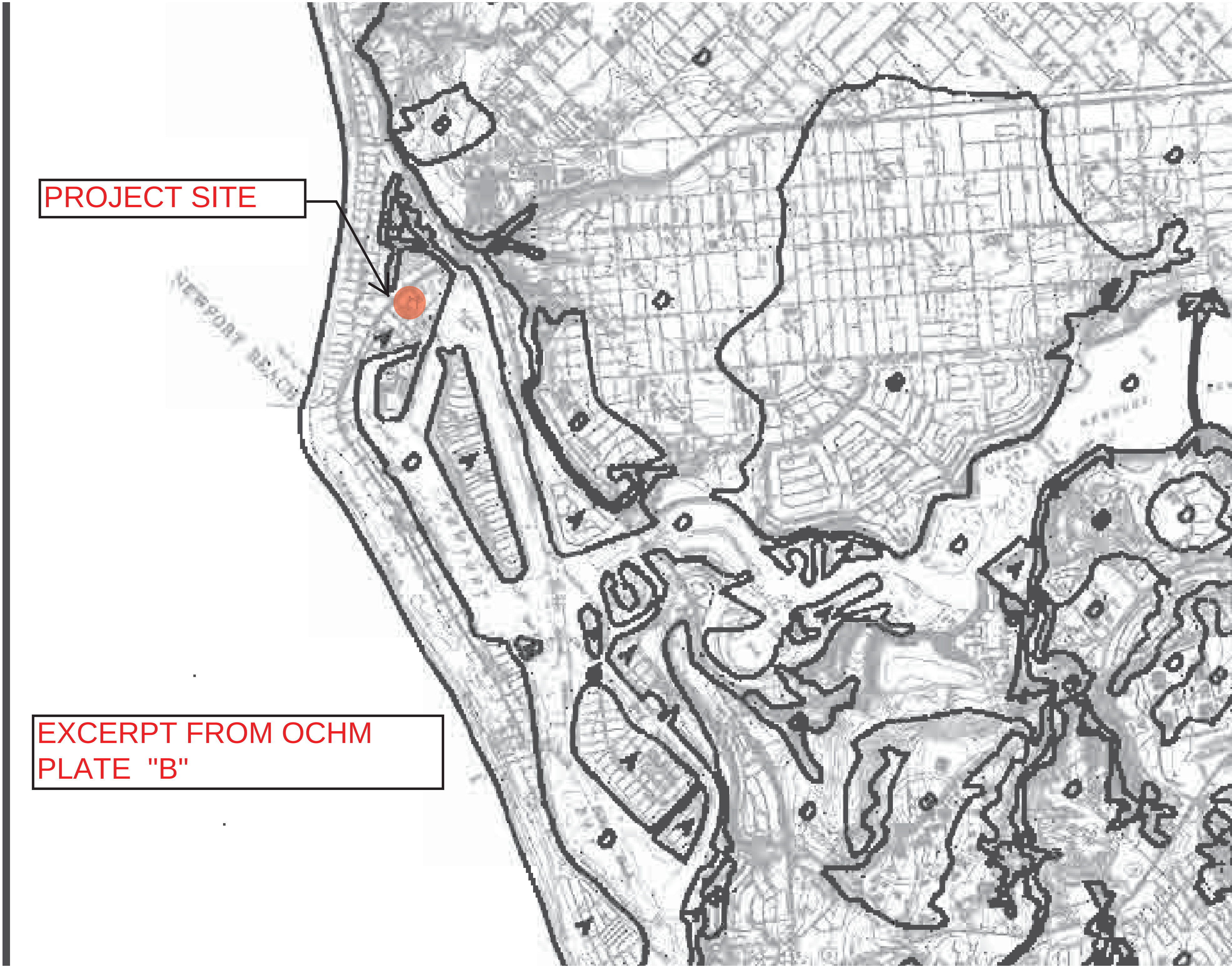
MAP NUMBER
06059C0381J

MAP REVISED
DECEMBER 3, 2009

Federal Emergency Management Agency

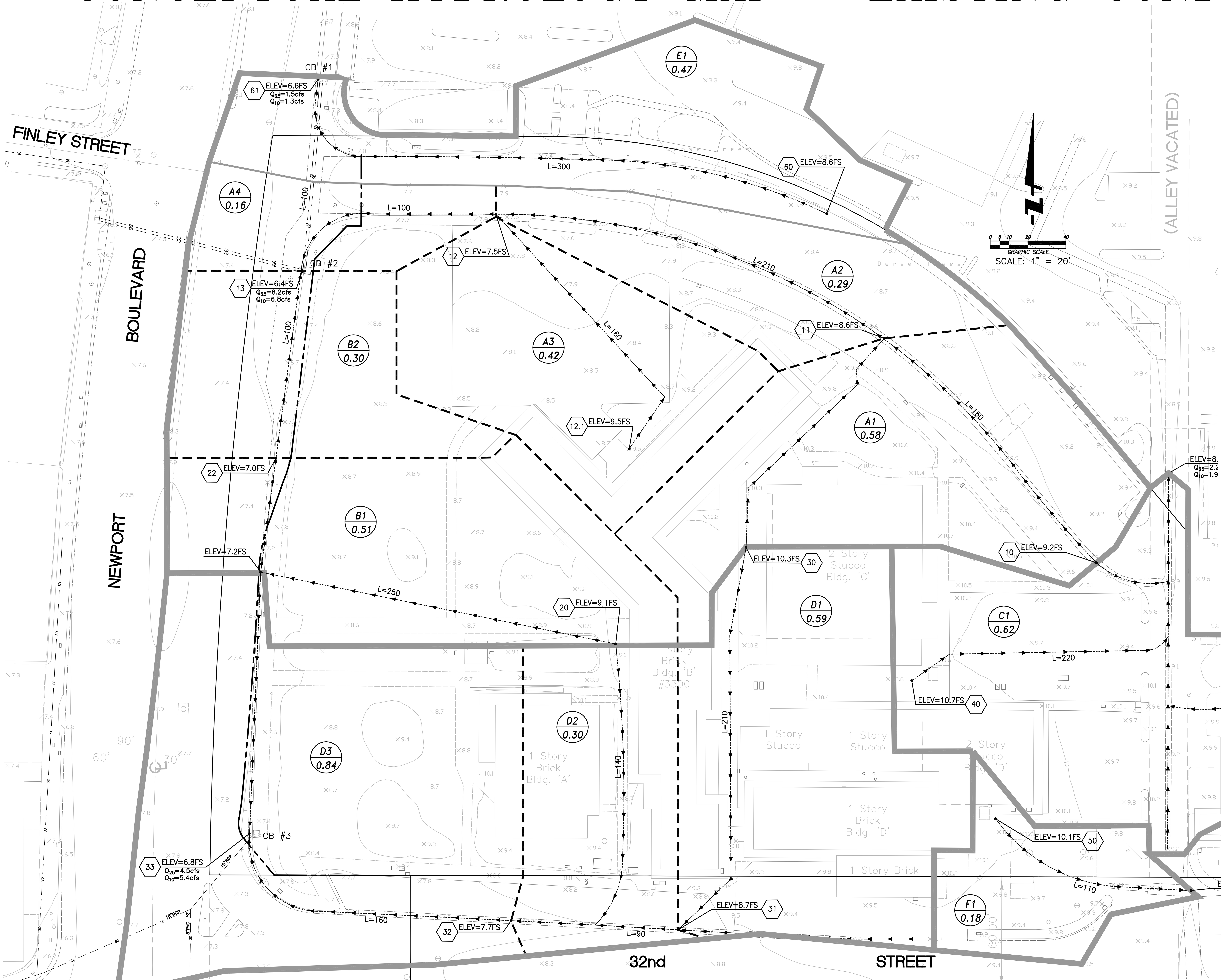
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

APPENDIX 6


PROJECT SITE
NEWPORT BEACH
EXCERPT FROM OCHM
PLATE "B"

APPENDIX 7

CONCEPTUAL HYDROLOGY MAP – EXISTING CONDITIONS



HYDROLOGIC DATA:

SOIL TYPE 'A' (PLATE 'B' OCHM)
COMMERCIAL DEVELOPMENT

TOTAL STUDY AREA	5.25Ac
TOTAL SITE Q_{25}	16.6cfs
TOTAL YIELD Q_{25}	3.2cfs/Ac
TOTAL SITE Q_{10}	13.9cfs
TOTAL YIELD Q_{10}	2.6cfs/Ac
TOTAL SITE Q_2	7.5cfs
TOTAL YIELD Q_2	1.4cfs/Ac

BENCHMARK: O.C.S. VERTICAL CONTROL POINT "NB3-17-77" NAVD88/1995 OCS

DESCRIBED BY OCS 2002 – FOUND 3 3/4" OCS ALUMINUM BENCHMARK DISK STAMPED "NB3-17-77" SET IN THE TOP OF A CONCRETE BRIDGE ABUTMENT. MONUMENT IS LOCATED IN THE SOUTHEAST CORNER OF THE INTERSECTION OF VIA LIDO AND THE WEST LIDO CHANNEL, 22.3 FT. SOUTHERLY OF THE CENTERLINE OF VIA LIDO AND 0.35 MILES SOUTHEASTERLY OF NEWPORT BOULEVARD. MONUMENT IS SET LEVEL WITH THE SIDEWALK.

ELEVATION = 24.503 FT. (NAVD88)

TOPOGRAPHY NOTE:

THE TOPOGRAPHY SHOWN HEREON IS BY:

EARTH GRAPHICS
1370 EAST EDINGER AVE.
SANTA ANA, CA 92705
PHOTO DATE: 9/30/02

LEGEND:

A	DRAINAGE AREA DESIGNATION
0.86	ACRES
	DRAINAGE AREA BOUNDARY
	DRAINAGE AREA SUB BOUNDARY
	FLOW DIRECTION
Q_{25}	CALCULATED RUNOFF (CFS) FOR 25 YR FREQUENCY
Q_{10}	CALCULATED RUNOFF (CFS) FOR 10 YR FREQUENCY
Q_2	CALCULATED RUNOFF (CFS) FOR 2 YR FREQUENCY
Tc	TIME OF CONCENTRATION (MIN)
X	NODE NUMBER FOR AES HYDROLOGY CALCULATIONS
L	LENGTH OF FLOW
FS	FINISHED SURFACE
FL	FLOW LINE
INV	INVERT ELEVATION
cfs	CUBIC FEET PER SECOND
min	MINUTES

EXISTING HYDROLOGY

FUSCOE ENGINEERING
full circle thinking

NO.	DATE	REVISION

CONCEPTUAL HYDROLOGY

of: OLD CITY HALL
3300 NEWPORT BOULEVARD
NEWPORT BEACH, CALIFORNIA

for: R.D. OLSON DEVELOPENT

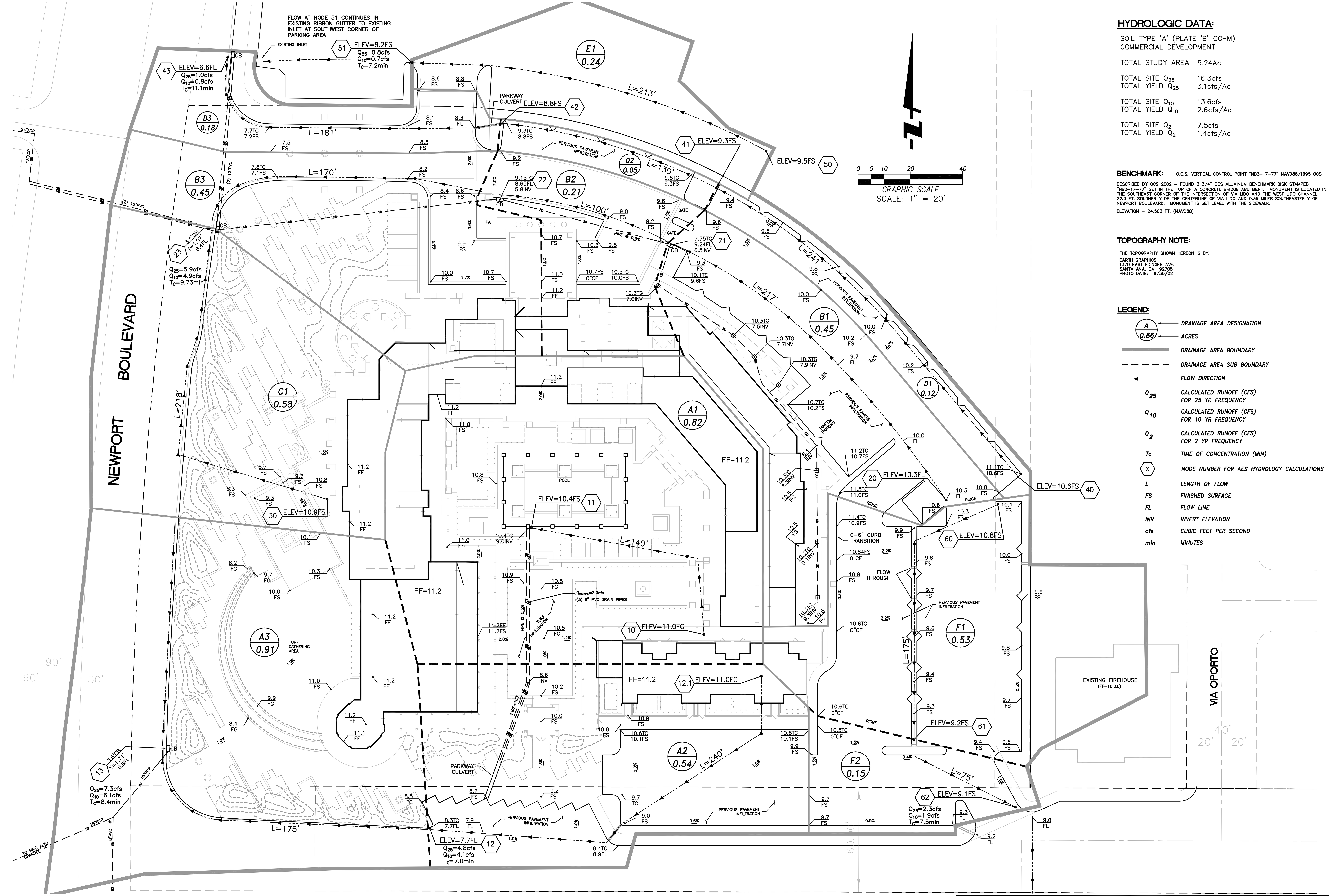
FUSCOE ENGINEERING
16795 Von Karman, Suite 100, Irvine, California 92606
tel 949.474.1960 ∘ fax 949.474.5315 ∘ www.fuscoe.com

Name Date

DATE: NOVEMBER 21, 2013
SCALE: 1"= 30'
DRAWN BY: J.C.
CHECKED BY: M.N.
SHEET 1 OF 1

P:\PROJECTS\1100\04\ENG\ENTITLEMENTS\PRELIM HYDROLOGY

CONCEPTUAL HYDROLOGY MAP – PROPOSED CONDITIONS



HYDROLOGIC DATA:

SOIL TYPE 'A' (PLATE 'B' OCHM)
COMMERCIAL DEVELOPMENT

TOTAL STUDY AREA	5.24Ac
TOTAL SITE Q_{25}	16.3cfs
TOTAL YIELD Q_{25}	3.1cfs/Ac
TOTAL SITE Q_{10}	13.6cfs
TOTAL YIELD Q_{10}	2.6cfs/Ac
TOTAL SITE Q_2	7.5cfs
TOTAL YIELD Q_2	1.4cfs/Ac

BENCHMARK: O.C.S. VERTICAL CONTROL POINT "NB3-17-77" NAVD88/1995 OCS

DESCRIBED BY OCS 2002 – FOUND 3 3/4" OCS ALUMINUM BENCHMARK DISK STAMPED "NB3-17-77" SET IN THE TOP OF A CONCRETE BRIDGE ABUTMENT. MONUMENT IS LOCATED IN THE SOUTHEAST CORNER OF THE INTERSECTION OF VIA LIDO AND THE WEST LIDO CHANNEL, 22.3 FT. SOUTHERLY OF THE CENTERLINE OF VIA LIDO AND 0.35 MILES SOUTHEASTERLY OF NEWPORT BOULEVARD. MONUMENT IS SET LEVEL WITH THE SIDEWALK.

ELEVATION = 24.503 FT. (NAVD88)

TOPOGRAPHY NOTE:

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EARTH GRAPHICS
1370 EAST EDINGER AVE.
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PHOTO DATE: 9/30/02

LEGEND:

A / 0.86	DRAINAGE AREA DESIGNATION / ACRES
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	DRAINAGE AREA SUB BOUNDARY
	FLOW DIRECTION
Q_{25}	CALCULATED RUNOFF (CFS) FOR 25 YR FREQUENCY
Q_{10}	CALCULATED RUNOFF (CFS) FOR 10 YR FREQUENCY
Q_2	CALCULATED RUNOFF (CFS) FOR 2 YR FREQUENCY
Tc	TIME OF CONCENTRATION (MIN)
X	NODE NUMBER FOR AES HYDROLOGY CALCULATIONS
L	LENGTH OF FLOW
FS	FINISHED SURFACE
FL	FLOW LINE
INV	INVERT ELEVATION
cfs	CUBIC FEET PER SECOND
min	MINUTES

PROPOSED HYDROLOGY

FUSCOE ENGINEERING
full circle thinking

NO.	DATE	REVISION

CONCEPTUAL HYDROLOGY

of: LIDO HOUSE HOTEL
3300 NEWPORT BOULEVARD
NEWPORT BEACH, CALIFORNIA

for: R.D. OLSON DEVELOPENT

FUSCOE ENGINEERING
16795 Von Karman, Suite 100, Irvine, California 92606
tel 949.474.1960 ∘ fax 949.474.5315 ∘ www.fuscoe.com
Name Date

DATE: NOVEMBER 21, 2013
SCALE: 1"= 20'
DRAWN BY: J.C.
CHECKED BY: M.N.
SHEET 1 OF 1

Preliminary Water Quality Management Plan

PRELIMINARY
WATER QUALITY MANAGEMENT PLAN (PWQMP)

LIDO HOUSE HOTEL

REDEVELOPMENT PROJECT

Newport Beach, California

Prepared For

R.D. OLSON DEVELOPMENT
2955 Main Street, Third Floor
Irvine, California 92614
949.574.8500

Prepared By

Fuscoe Engineering, Inc.
16795 Von Karman, Suite 100
Irvine, California 92606
949.474.1960
www.fuscoe.com

Project Manager:
Mark Nero, PE

Date Prepared: December 4, 2013
Date Revised: January 28, 2014
Job Number: 1100.004.01

full circle thinking®

PRELIMINARY
WATER QUALITY MANAGEMENT PLAN
(PWQMP)

LIDO HOUSE HOTEL

3300 Newport Boulevard
City of Newport Beach, County of Orange

APN 423-111-02

Prepared for:

R.D. OLSON DEVELOPMENT
2955 Main Street, Third Floor
Irvine, California 92614
949.574.8500

Prepared by:

FUSCOE ENGINEERING, INC.
16795 Von Karman, Suite 100
Irvine, CA 92618
949.474.1960

Date Prepared: December 4, 2013
Date Revised: January 28, 2014

PROJECT OWNER'S CERTIFICATION			
Permit/Application No.:	Pending	**Grading Permit No.:**	Pending
Tract/Parcel Map and Lot(s)No.:	N/A	**Building Permit No.:**	Pending
Address of Project Site and APN:	3300 Newport Boulevard, Newport Beach, CA 92663 423-111-02		

This Water Quality Management Plan (WQMP) has been prepared for R.D. OLSON DEVELOPMENT by FUSCOE ENGINEERING, INC. The WQMP is intended to comply with the requirements of the County of Orange NPDES Stormwater Program requiring the preparation of the plan.

The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan , including the ongoing operation and maintenance of all best management practices (BMPs), and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with the current Orange County Drainage Area Management Plan (DAMP) and the intent of the non-point source NPDES Permit for Waste Discharge Requirements for the County of Orange, Orange County Flood Control District and the incorporated Cities of Orange County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors-in-interest shall bear the aforementioned responsibility to implement and amend the WQMP. An appropriate number of approved and signed copies of this document shall be available on the subject site in perpetuity.

OWNER:	
Name:	
Title:	
Company:	
Address:	
Email:	
Telephone:	
Signature:	**Date:**

TABLE OF CONTENTS

APPENDICES

EXHIBITS & BMP DETAILS (INCLUDED IN SECTION VI)

EDUCATIONAL MATERIALS (INCLUDED IN APPENDIX C)

- SC-43 Parking/Storage Area Maintenance
- SD-10 Site Design & Landscape Planning
- SD-12 Efficient Irrigation
- SD-13 Storm Drain Signage
- SD-32 Trash Storage Areas

SECTION I DISCRETIONARY PERMITS AND WATER QUALITY CONDITIONS

PROJECT INFORMATION			
Permit/Application No.:	Pending	**Tract/Parcel Map No.:**	N/A
Address of Project Site and APN:	3300 Newport Boulevard, Newport Beach, CA 92663 423-111-02		
WATER QUALITY CONDITIONS			
Discretionary Permit(s):	Pending – to be provided in Final WQMP upon issuance.		
Water Quality Conditions:	Pending issuance by the City of Newport Beach. To be provided in Appendix F of the Final WQMP upon issuance.		
WATERSHED-BASED PLAN CONDITIONS			
Applicable conditions from watershed - based plans including WIHMPs and TMDLs:	Lower Newport Bay: ▪ Metals ▪ Nutrients ▪ Pathogens ▪ Pesticides ▪ Priority Organics ▪ Siltation		

SECTION II PROJECT DESCRIPTION

II.1 PROJECT DESCRIPTION

The proposed Lido House Hotel project site encompasses approximately 4.27 acres in the City of Newport Beach. The project site is bounded by Newport Boulevard to the west, 32nd Street to the south, Villa Way to the east and Finley Avenue to the north. A Vicinity Map is included in Section VI.

Under existing conditions, the project site consists of the former Newport Beach City Hall complex. Adjacent land uses include retail commercial to the north, east, and south, and residential to the west. The site is located on the Balboa Peninsula in the Lido Village area of Newport Beach.

The table below summarizes the proposed project.

DESCRIPTION OF PROPOSED PROJECT	
WQMP Development Category:	8. All significant redevelopment projects, where significant redevelopment is defined as the addition or replacement of 5,000 or more square feet of impervious surface on an already developed site. Redevelopment does not include routine maintenance activities that are conducted to maintain original line and grade, hydraulic capacity, original purpose of the facility, or emergency redevelopment activity required to protect public health and safety. Since the proposed project includes the addition and replacement of more than 5,000 square feet of impervious surfaces on an already developed site, the project is considered a "Priority Project" in accordance with the Model WQMP and OC DAMP.
Project Area (ft^2):	186,183 ft^2 (4.27 acres)
# of Dwelling Units:	Not Applicable (hotel property).
SIC Code:	7011 Hotels and Motels
Narrative Project Description:	The proposed project will include the demolition of the existing buildings for the construction of a 130-room hotel in one three-story building. The hotel would also include meeting rooms, accessory retail spaces, a restaurant, lobby bar, rooftop bar, guest pool and recreational areas. In addition, the project includes public open spaces consisting of a pedestrian plaza with landscape areas, decorative paving, benches and other features located along Newport Boulevard and 32nd Street. Additional parking, utility and infrastructure improvements are also proposed. Low Impact Development (LID) features and best management practices (BMPs) will be incorporated into the project, and will include pervious pavement, infiltration trenches and an infiltration gallery. Further details on the proposed BMPs can be found in Section VI of this WQMP.

DESCRIPTION OF PROPOSED PROJECT				
Project Area:	Pervious Area	Pervious Area Percentage	Impervious Area	Impervious Area Percentage
Pre-Project Conditions:	1.2 ac	28%	3.07 ac	72%
Post-Project Conditions:	0.99 ac	23%	3.28 ac	77%
Drainage Patterns/ Connections:	Drainage on the site follows the topography of the land, with existing drainage patterns flowing westerly to Newport Blvd, northerly to Via Lido Plaza and southerly to Villa Way. The majority of flow is taken westerly to the existing catch basins in Newport Blvd. There are three (3) relatively shallow catch basins in Newport Blvd. The most northerly catch basin (CB 1) captures flow from the southwest portion of the Via Lido Plaza and a portion of the existing northerly arced parking lot. This basin is connected via two 12-inch connecting pipes to the existing catch basin at the southeast corner of the intersection of the main entry and Newport Blvd (CB 2). CB 2 collects drainage from most of the northerly portion of the project site in addition to the drainage from CB 1 and directs flows via two (2) 12-inch PVC connecting pipes, westerly across Newport Boulevard to the existing municipal storm drain system. The most southerly catch basin (CB 3), is located at the northeast corner of Newport Blvd. and 32nd Street. This basin collects drainage from the majority of the southern portion of the site, and a basin on the southeast corner of Newport Blvd and 32nd Street and directs flow westerly across Newport Blvd. via a 15-inch RCP connecting pipe to the municipal storm drain system on the west side of Newport Boulevard. Both existing municipal storm drain systems on the westerly side of Balboa Boulevard discharge to the Rivo Alto channel, part of Lower Newport Bay. Drainage to the north is directed through the existing Via Lido Plaza parking lot to the existing municipal storm drain system on the north side of that site. This flow discharges to the northwest upper end of Lower Newport Bay. The southeast portion of the site drains southerly in Villa Way to the existing municipal storm drain system serving 30th, 31st and 32nd streets. This system connects to the existing 36" RCP in 30th Street which discharges to the Rhine Canal in Lower Newport Bay. Overall the project reduces runoff to the off-site storm drain facilities by slightly less than 2%. The proposed development will maintain the historic drainage patterns with the exception that flows are no longer routed north through the Via Lido Shopping area. Localized area drains are proposed to be used along landscaping adjacent to the building and to drain the courtyard/pool area. All other flows are anticipated to be overland. The drive approach area from the northerly parking area of the site to the Via Lido Plaza is anticipated to be re-graded to prevent runoff from Via Lido Plaza onto the site. Runoff would be diverted westerly within the Via Lido Plaza to the westerly inlet in the parking area connected to CB 1. This alteration is being proposed primarily to reduce the impact of off-site runoff on the on-site water quality BMPs. See also Section III.2 for further drainage descriptions.			

PROJECT FEATURES	
Building Summary:	The proposed hotel building will be 3 levels with 130 guest rooms. The proposed guestrooms will include both queen and king guestrooms, extended stay suites and two-story villas. A lighthouse-style observation tower is proposed in the northwest corner of the site. The existing fire station located in the southeast corner of the site will remain under proposed conditions.
Amenities:	Proposed guest amenities within the hotel include meeting rooms, accessory retail spaces, a restaurant, lobby bar, rooftop bar, fitness center, guest pool and private outdoor recreational area. Specifically, the outdoor private recreational area will include a pool, spa, outdoor fireplace, focal water feature, formal lawn area and decorative landscaping. The western portion of the site along Newport Boulevard will include a public plaza, and will feature decorative paving, wood decking, reclaimed wood benches, a lawn terrace with preserved existing trees, native landscaping throughout the plaza.
Landscaped Areas:	Landscaping will be proposed around the perimeter of the site, within the central guest recreational area/courtyard, as planters on the rooftop lounge area, within the parking lot, and within the public plaza along Newport Boulevard. Approximately 1 acre of the site will be landscaped.
Hardscaped Areas:	Hardscaped areas will be located throughout the site, and will include asphalt and permeable paved drive aisles and parking areas (~0.84 ac), concrete paver outdoor courtyards and concrete sidewalks (~1.71 ac).
Parking Facilities:	Parking will be provided as surface spaces surrounding the proposed building. A total of 143 surface spaces are proposed. The existing metered surface parking spaces along 32nd Street will remain under proposed conditions (10 spaces to remain).
Other Project Features:	A restaurant is proposed within the building, with additional seating provided in an outdoor courtyard. All food preparation will be handled indoors. A grease interceptor will be located in the sanitary sewer system in accordance with local requirements. A trash enclosure is proposed, located in the southeastern portion of the site near the existing fire station. The area will be walled and covered to preclude precipitation and runoff consistent with City standards. An at-grade delivery area will be located in the southeast corner of the building. No below-grade loading docks are proposed. The site will not have any additional outdoor storage areas, vehicle/ community car wash racks or vehicle/equipment wash areas.

PROJECT FEATURES	
Outdoor Activities:	Outdoor areas throughout the site will be used for vehicle parking (in designated spaces), pedestrian access, recreational and event purposes. The proposed private recreation area will include a pool, spa, fireplace, formal lawn and other landscaping for guest uses. An arrival court with focal water feature and motorcourt gateway will be located on the northern side of the building. Paved parking will be located along the northern, eastern, and southern portions of the site. A public plaza will be located on the western side of the project along Newport Boulevard, and will feature decorative paving, wood decking, reclaimed wood benches, a lawn terrace with preserved existing trees, native landscaping throughout the plaza. The outdoor space will be for passive recreational uses.
Materials Used & Stored:	No outdoor storage of materials is anticipated (materials will be stored indoors). Materials anticipated to be utilized and stored on-site include those associated with commercial/hotel uses (including cleaning and maintenance products, hotel linens, guestroom amenity supplies, office supplies, retail inventory, etc.) and restaurant uses (food preparation equipment, service supplies, food items, table settings, etc). Pool cleaning materials and chemical swill be stored indoors or off-site (via pool cleaning contractor).
Wastes Generated:	The project is not anticipated to generate any wastes other than landscaping clippings and trash & debris. Outdoor trash receptacles will be provided throughout the common areas of the site for the visitors to dispose of their refuse in a proper manner, and property maintenance will provide trash and waste material removal to maintain a trash-free property. All wastes shall be collected and properly disposed of off-site (see Sections IV.3.8 & IV.3.9 for source control BMPs related to these features).

II.2 POTENTIAL STORM WATER POLLUTANTS

The table below, derived from Table 2 of the Countywide Model WQMP Technical Guidance Document (May 2011), summarizes the categories of land use or project features of concern and the general pollutant categories associated with them.

ANTICIPATED & POTENTIAL POLLUTANTS GENERATED BY LAND USE TYPE								
Priority Project Categories and/or Project Features	General Pollutant Categories							
	Suspended Solid/ Sediments	Nutrients	Heavy Metals	Pathogens (Bacteria/ Virus)	Pesticides	Oil & Grease	Toxic Organic Compounds	Trash & Debris
Detached Residential Development	E	E	N	E	E	E	N	E
Attached Residential Development	E	E	N	E	E	E(2)	N	E
Commercial/Industrial Development	E(1)	E(1)	E(5)	E(3)	E(1)	E	E	E
Automotive Repair Shops	N	N	E	N	N	E	E	E
Restaurants	E(1)(2)	E(1)	E(2)	E	E(1)	E	N	E
Hillside Development >5,000 ft^2	E	E	N	E	E	E	N	E
Parking Lots	E	E(1)	E	E(4)	E(1)	E	E	E
Streets, Highways, & Freeways	E	E(1)	E	E(4)	E(1)	E	E	E
Retail Gasoline Outlets	N	N	E	N	N	E	E	E

Notes:
E = expected to be of concern N = not expected to be of concern
(1) Expected pollutant if landscaping exists on-site, otherwise not expected.
(2) Expected pollutant if the project includes uncovered parking areas, otherwise not expected.
(3) Expected pollutant if land use involves food or animal waste products, otherwise not expected.
(4) Bacterial indicators are routinely detected in pavement runoff.
(5) Expected if outdoor storage or metal roofs, otherwise not expected.
Source: County of Orange. (2011, May 19). Technical Guidance Document for the Preparation of Conceptual/ Preliminary and/or Project Water Quality Management Plans (WQMPs). Table 2.1.

Priority Project Categories and/or Features:

- Commercial/Industrial Development
- Parking Lots

POLLUTANTS OF CONCERN		
Pollutant	E = Expected to be of concern N =Not Expected to be of concern	Additional Information and Comments
Suspended Solid/ Sediment	E	303(d) listed impairment / TMDL
Nutrients	E	303(d) listed impairment / TMDL
Heavy Metals	E	303(d) listed impairment / TMDL
Pathogens (Bacteria/Virus)	E	303(d) listed impairment / TMDL
Pesticides	E	303(d) listed impairment / TMDL
Oil & Grease	E	
Toxic Organic Compounds	E	
Trash & Debris	E	

II.3 HYDROLOGIC CONDITIONS OF CONCERN

The purpose of this section is to identify any hydrologic conditions of concern (HCOC) with respect to downstream flooding, erosion potential of natural channels downstream, impacts of increased flows on natural habitat, etc. As specified in Section 2.3.3 of the 2011 Model WQMP, projects must identify and mitigate any HCOCs. A HCOC is a combination of upland hydrologic conditions and stream biological and physical conditions that presents a condition of concern for physical and/or biological degradation of streams.

In the North Orange County permit area, HCOCs are considered to exist if any streams located downstream from the project are determined to be potentially susceptible to hydromodification impacts and either of the following conditions exists:

- Post-development runoff volume for the 2-yr, 24-hr storm exceeds the pre-development runoff volume for the 2-yr, 24-hr storm by more than 5 percent

or

- Time of concentration (Tc) of post-development runoff for the 2-yr, 24-hr storm event exceeds the time of concentration of the pre-development condition for the 2-yr, 24-hr storm event by more than 5 percent.

If these conditions do not exist or streams are not potentially susceptible to hydromodification impacts, an HCOC does not exist and hydromodification does not need to be considered further. In the North Orange County permit area, downstream channels are considered not susceptible to hydromodification, and therefore do not have the potential for a HCOC, if all downstream conveyance channels that will receive runoff from the project are engineered, hardened, and regularly maintained to ensure design flow capacity, and no sensitive habitat areas will be affected.

Is the proposed project potentially susceptible to hydromodification impacts?

☐ Yes ☒ No (show map)

In accordance with updated Susceptibility Analysis, Newport Bay, Newport Coastal Streams exhibit within the 2011 TGD, the project lies in a location not subject to hydromodification impacts or HCOC's.

II.4 POST DEVELOPMENT DRAINAGE CHARACTERISTICS

Overall the project reduces runoff to the off-site storm drain facilities by slightly less than 2%. The proposed development will maintain the historic drainage patterns with the exception that flows are no longer routed north through the Via Lido Shopping area. Due to the shallow depths of the adjacent public storm drain catch basins and the need to treat low flows to conform to the requirements of Low Impact Development and the County of Orange Drainage Area Management Plan (DAMP), this project is proposing using primarily surface flow with localized area drains to drain the site. This method maximizes the potential for runoff infiltration which is the primary Best Management Practice for water quality purposes.

Localized area drains are proposed to be used along landscaping adjacent to the building and to drain the courtyard/pool area. All other flows are anticipated to be overland.

II.5 PROPERTY OWNERSHIP/MANAGEMENT

PROPERTY OWNERSHIP/MANAGEMENT	
Public Streets:	City of Newport Beach
Private Streets:	Not Applicable
Landscaped Areas:	City of Newport Beach (public areas) R.D. Olson Development (private areas)
Open Space:	City of Newport Beach (public areas) R.D. Olson Development (private areas)
Easements:	City of Newport Beach (public access/right-of-way) Southern California Edison (various utilities)
Parks:	Not Applicable
Buildings:	R.D. Olson Development
Structural BMPs:	R.D. Olson Development

R.D. Olson Development shall assume all BMP maintenance and inspection responsibilities for the proposed project. Inspection and maintenance responsibilities are outlined in Section V of this report.

SECTION III SITE DESCRIPTION

III.1 PHYSICAL SETTING

Planning Area/ Community Name:	Lido House Hotel
Address:	3300 Newport Boulevard, Newport Beach, CA
Project Area Description:	Northeast corner of Newport Boulevard and 32nd Street on the Balboa Peninsula in the Lido Village area of Newport Beach
Land Use:	Existing: Public Facilities (PF) Proposed: Mixed Use (MU-H5)
Zoning:	Existing: Public Facilities (PF) Proposed: Mixed Use-Lido Village (MU-LV)
Acreage:	4.27 ac
Predominant Soil Type:	A[1]
Impervious Conditions:	Existing Impervious Area: ~3.07 acres (72%) Proposed Impervious Area: ~3.28 acres (77%)
Pervious Conditions:	Existing Pervious Area: ~1.2 acres (28%) Proposed Pervious Area: ~0.99 acres (23%)

III.2 SITE CHARACTERISTICS

Precipitation Zone:	0.7 inches per Figure XVI-1 of the TGD (see Appendix A)
Topography:	The project site is relatively flat with the highest point being in the center of the site where the existing city hall buildings are located. The site drops off on all sides to the adjacent parking and roadway areas. Existing elevations vary from a high of approximately 10.1 feet to 8.8 in the adjacent street with the catch basins on Newport Blvd. at 6.6 feet at the flow line. Drainage on the site follows the topography of the land, with existing drainage patterns flowing westerly to Newport Blvd, northerly to Via Lido Plaza and southerly to Villa Way.

[1] Source: County of Orange Environmental Management Agency. (1986, October). Orange County Hydrology Manual.

Existing Drainage Patterns/ Connections:	The majority of flow is taken westerly to the existing catch basins in Newport Blvd. There are three (3) relatively shallow catch basins in Newport Blvd. with depths on the order of two (2) feet deep. The most northerly catch basin (designated CB 1) captures flow from the southwest portion of the Via Lido Plaza and a portion of the existing northerly arced parking lot. This basin is connected via two 12-inch connecting pipes to the existing catch basin at the southeast corner of the intersection of the main entry and Newport Blvd (designated CB 2). Catch basin 2 collects drainage from most of the northerly portion of the project site in addition to the drainage from catch basin 1 and directs flows via two (2) 12-inch PVC connecting pipes, westerly across Newport Boulevard to the existing municipal storm drain system. The most southerly catch basin (designated CB 3, is located at the northeast corner of Newport Blvd. and 32nd Street. This basin collects drainage from the majority of the southern portion of the site, and a basin on the southeast corner of Newport Blvd and 32nd Street and directs flow westerly across Newport Blvd. via a 15-inch RCP connecting pipe to the municipal storm drain system on the west side of Newport Boulevard. Both existing municipal storm drain systems on the westerly side of Balboa Boulevard discharge to the Rivo Alto channel, part of Lower Newport Bay. Drainage to the north is directed through the existing Via Lido Plaza parking lot to the existing municipal storm drain system on the north side of that site. This flow discharges to the northwest upper end of Lower Newport Bay. The southeast portion of the site drains southerly in Villa Way to the existing municipal storm drain system serving 30th, 31st and 32nd streets. This system connects to the existing 36" RCP in 30th Street which discharges to the Rhine Canal in Lower Newport Bay.

Proposed Drainage Patterns/ Connections:	Overall the project reduces runoff to the off-site storm drain facilities by slightly less than 2%. The proposed development will maintain the historic drainage patterns with the exception that flows are no longer routed north through the Via Lido Shopping area. Due to the shallow depths of the adjacent public storm drain catch basins and the need to treat low flows to conform to the requirements of Low Impact Development and the County of Orange Drainage Area Management Plan (DAMP), this project is proposing using primarily surface flow with localized area drains to drain the site. This method maximizes the potential for runoff infiltration which is the primary BMP for water quality purposes. Infiltration is also the preferred methodology for mitigating pollutants of concern per the County DAMP. Localized area drains are proposed to be used along landscaping adjacent to the building and to drain the courtyard/pool area. All other flows are anticipated to be overland. The basic flow pattern of the existing site is maintained but quantities to the downstream off-site areas are slightly different. The drive approach area from the northerly parking area of the site to the Via Lido Plaza is anticipated to be re-graded to prevent runoff from Via Lido Plaza onto the site. Runoff would be diverted westerly within the Via Lido Plaza to the westerly inlet in the parking area connected to CB 1. This only alters the routing of the flow not the destination and there is not a significant difference in flow path length, hence there should be no significant impact due to this alteration. This alteration is being proposed primarily to reduce the impact of off-site runoff on the on-site water quality BMPs. A City project to realign the easterly curb line of Newport Boulevard will require that basins 1 through 3 be reconstructed and possibly reconfigured. Per discussions with City of Newport Beach staff, the final alignment and design of the Newport Boulevard improvements are currently being designed by City consultants and are not available at this time. It is anticipated that the design of the future improvements for Newport Boulevard will be sufficiently established to allow a more precise analysis of terminal drainage points for the proposed hotel development. The connecting pipes crossing Newport Boulevard will most likely remain in place as-is.
Soil Type, Geology, and Infiltration Properties:	The site is underlain by approximately 5 to 6 feet of dredged fill overlying alluvial soil materials. The dredged fill materials are highly variable and consist of intermixed layers of silts, sands, and silty sands, and clayey sands while the alluvial materials consist of loose to medium dense sands to silty sands to with occasional thick layers of moderately firm to very stiff silts and clays.

Hydrogeologic (Groundwater) Conditions:	During geotechnical investigations conducted on-site, the water table varied from 4.5 to 6 feet below the existing surface, which correlates to a water table/seawater elevation varying from 3.5 MSL to 4.0 MSL across the site. During the geotechnical investigation, the groundwater levels were observed to fluctuate with the tide in the bay, indicating that the groundwater is tidally influenced. In addition, the Santa Ana River Basin Plan identifies groundwaters in the lower Newport Bay are excepted from MUN (Municipal and Domestic Supply) beneficial uses.
Geotechnical Conditions (relevant to infiltration):	Two infiltration tests were performed in general accordance with the Santa Ana Regional Water Quality Control Board Technical Guidance Document (TGD) Appendices dated March 2011, utilizing the shallow percolation test procedure contained in Section VII.3.8. To comply with the requirements of the TGD, two (2) 8-inch-diameter test holes were excavated in the northern and southern portions of the site to a depth of approximately 5 feet using a hollow stem auger drill rig. The average permeability rate varied from 1.4 inches per hour at DH-1 to 12.3 inches per hour at DH-5 (with safety factor of 2 included). Since the measured infiltration rates are greater than 0.3 inches per hour required or feasibility, infiltration is considered feasible on the project site. Although depths to the water table are relatively shallow on the site (<10 feet below ground surface), the water table is tidally influenced due to the proximity to the bay, and is not a source of drinking water supply (excepted from MUN beneficial use designation). Infiltration on this site as a BMP will only be for water quality purposes and not for ground water recharging since the ground water is from the ocean/bay.
Off-Site Drainage:	Under existing conditions, the project site receives a small amount of runoff from the parking lot and driveway immediately north of the site. Under proposed conditions, on-site runoff will be infiltrated prior to co-mingling with any off-site drainage that enters the site.
Utility and Infrastructure Information:	Dry and wet utilities will be incorporated into the proposed project and will tie into existing facilities associated with the existing development.

III.3 WATERSHED DESCRIPTION

Receiving Waters:	Lower Newport Bay
303(d) Listed Impairments:	Per the 2010 List for Lower Newport Bay: ▪ Chlordane ▪ Copper ▪ DDT ▪ Indicator Bacteria ▪ Nutrients ▪ PCBs ▪ Pesticides ▪ Sediment Toxicity
Applicable TMDLs:	For Lower Newport Bay: ▪ Metals ▪ Nutrients ▪ Pathogens ▪ Pesticides ▪ Priority Organics ▪ Siltation
Pollutants of Concern for the Project:	Per Section II.2 ▪ Suspended Solids/Sediment ▪ Nutrients ▪ Heavy Metals ▪ Pathogens (Bacteria/Virus) ▪ Pesticides ▪ Oil & Grease ▪ Toxic Organic Compounds ▪ Trash & Debris
Hydrologic Conditions of Concern (HCOCs):	None. Refer to Section II.3 for details.
Environmentally Sensitive and Special Biological Significant Areas:	The project site is not located within 200 ft of an Environmentally Sensitive Area (ESA) or Areas of Special Biological Significance (ASBS).

SECTION IV BEST MANAGEMENT PRACTICES (BMPs)

IV.1 PROJECT PERFORMANCE CRITERIA

Is there an approved WIHMP or equivalent for the project area that includes more stringent LID feasibility criteria or if there are opportunities identified for implementing LID on regional or sub-regional basis?

☐ Yes ☒ No

PROJECT PERFORMANCE CRITERIA	
Hydromodification Control Performance Criteria: **(Model WQMP Section 7.II-2.4.2.2)**	If a hydrologic condition of concern (HCOC) exists, priority projects shall implement onsite or regional hydromodification controls such that: ▪ Post-development runoff volume for the two-year frequency storm does not exceed that of the predevelopment condition by more than five percent, and ▪ Time of concentration of post-development runoff for the two-year storm event is not less than that for the predevelopment condition by more than five percent. Where the Project WQMP documents that excess runoff volume from the two-year runoff event cannot feasibly be retained and where in-stream controls cannot be used to otherwise mitigate HCOCs, the project shall implement on-site or regional hydromodification controls to: ▪ Retain the excess volume from the two-year runoff event to the MEP, and ▪ Implement on-site or regional hydromodification controls such that the post-development runoff two-year peak flow rate is no greater than 110 percent of the predevelopment runoff two-year peak flow rate.
LID Performance Criteria: **(Model WQMP Section 7.II-2.4.3)**	Infiltrate, harvest and use, evapotranspire, or biotreat/biofilter, the 85th percentile, 24-hour storm event (Design Capture Volume). LID BMPs must be designed to retain, on-site, (infiltrate, harvest and use, or evapotranspire) storm water runoff up to 80 percent average annual capture efficiency
Treatment Control BMP Performance Criteria: **(Model WQMP Section 7.II-3.2.2)**	If it is not feasible to meet LID performance criteria through retention and/or biotreatment provided on-site or at a sub-regional/regional scale, then treatment control BMPs shall be provided on-site or offsite prior to discharge to waters of the US. Sizing of treatment control BMP(s) shall be based on either the unmet volume after claiming applicable water quality credits, if appropriate.

PROJECT PERFORMANCE CRITERIA	
LID Design Storm Capture Volume:	Total Site (excludes fire station) = 4.274 acres (90% impervious) Simple Method DCV = 8,959.7 ft^3 *Refer to Section IV.2.2 for specific Drainage Manage Area (DMA) breakdown and Appendix A for detailed calculations (Worksheet B).*

IV.2 SITE DESIGN AND DRAINAGE PLAN

The following section describes the site design BMPs used in this project and the methods used to incorporate them. Careful consideration of site design is a critical first step in storm water pollution prevention from new developments and redevelopments.

IV.2.1 Site Design BMPs

Minimize Impervious Area

Impervious surfaces have been minimized by incorporating landscaped areas throughout the site surrounding the proposed building and within the interior courtyard. Additionally, pervious pavement will be incorporated into the proposed parking lot to further reduce impervious areas and detain runoff for infiltration into the subsoils. The proposed building will also feature multiple stories, building vertically rather than horizontally, with an interior courtyard, to minimize building footprint.

Maximize Natural Infiltration Capacity

Portions of the proposed parking lot will be constructed with pervious pavement. In addition, runoff will be routed to landscaped areas to maximize natural infiltration capacity. Locations of the infiltration BMPs (landscaped areas and pervious pavement) were selected based on drainage patterns, locations with reduced traffic and loading (e.g., in the perimeter parking lot versus the main entryway/driveway) and proximity to the building. Refer to Section IV.3.2 for details on the proposed infiltration BMPs.

Preserve Existing Drainage Patterns and Time of Concentration

Overall the project reduces runoff to the off-site storm drain facilities by slightly less than 2%. The proposed development will maintain the historic drainage patterns with the exception that flows are no longer routed north through the Via Lido Shopping area. Due to the shallow depths of the adjacent public storm drain catch basins and the need to treat low flows to conform to the requirements of Low Impact Development and the OC DAMP, this project is proposing using primarily surface flow with localized area drains to drain the site. This method maximizes the potential for runoff infiltration and reduces runoff rates and volumes, and results in longer Tc values.

Disconnect Impervious Areas

Runoff form the impervious areas of the project site, including sidewalks, rooftops, and other impervious areas will drain to landscaping areas and pervious pavement areas for infiltration into the sub-soils. In addition, runoff from the proposed parking lot will drain to pervious pavement to further disconnect impervious areas.

Protect Existing Vegetation and Sensitive Areas, and Revegetate Disturbed Areas

The site is fully developed under existing conditions, and all disturbed areas on the site will either be paved or landscaped. The existing shade trees located along the western portion of the site will be preserved and incorporated into the landscape design of the public pedestrian plaza. There are no sensitive areas on the project site to be preserved.

Soil Stockpiling and Site Generated Organics

Construction of the project will only require small amounts of grading and fill placement to support the proposed building structure. Temporary soil stockpiles utilized during construction activities will be stabilized consistent with the requirements of the General Construction Permit (SWRCB Order No. 2009-0009-DWQ) and local requirements to prevent erosion/sedimentation and potential transport of pollutants.

Firescaping

The project site is not located in a high risk wildfire zone. The project will comply with all requirements of the local fire authority for landscaping, building setbacks, and other requirements of the Uniform Fire Code, City Codes, County of Orange Fire Authority, and other local standards.

Xeriscape Landscaping

Within the public plaza along Newport Boulevard and portions of 32nd Street, the landscaping plan will include mounded native grasses and dune planting, with low water and fertilizer/pesticide requirements. Additional native and/or drought-tolerant landscaping will be incorporated throughout the remainder of the site consistent with City and County landscaping guidelines.

Slopes and Channel Buffers

There are no slopes or channels on the project site and therefore, this site design BMP will not be utilized as part of the project.

IV.2.2 Drainage Management Areas

In accordance with the MS4 permit and the 2011 Model WQMP, the project site has been divided into Drainage Management Areas (DMAs) to be utilized for defining drainage areas and sizing LID and other treatment control BMPs. DMAs have been delineated based on the proposed site grading patterns, drainage patterns, storm drain and catch basin locations. As a result, the sum of the drainage areas may be slightly different than the legal property boundary acreage.

The design capture volumes (DCV) and treatment flow rates (Q_{Design}) for each DMA are summarized in the table below. These have been derived utilizing the "Simple Method" in accordance with the TGD Section III.1.1. Actual BMP sizing requirements, including 80 percent capture design volumes, flow rates, depths, and other design details for the specific BMPs proposed are provided in Section IV.3.2. Locations of DMAs and associated LID and treatment BMPs are identified on the exhibits in Section VI. Additional calculations and TGD Worksheets are provided in Appendix A.

DRAINAGE MANAGEMENT AREAS (DMAs)						
Drainage Area Name / DMA[(1)]	**BMP**	**Drainage Area (acres)**	**% imp.**	**Runoff Coefficient**	**Design Storm Depth[(2)] (in)**	**Simple Method DCV[(3)] (ft^3)**
A1	Gravel Bed Infiltration Gallery	0.824	90%	0.825	0.7	1,727.4
A2.1	Pervious Pavement	0.488	90%	0.825	0.7	1,023.0
A3.1	Infiltration Trench	0.540	90%	0.825	0.7	1,132.0
B1	Pervious Pavement	0.447	90%	0.825	0.7	937.1
B2	Pervious Pavement	0.206	90%	0.825	0.7	431.8
B3.1	Infiltration Planter	0.173	90%	0.825	0.7	362.7
B3.2	Pervious Pavement	0.212	90%	0.825	0.7	444.4
C1.1	Infiltration Trench	0.363	90%	0.825	0.7	761.0
D1	Pervious Pavement	0.121	90%	0.825	0.7	253.7
D2	Pervious Pavement	0.052	90%	0.825	0.7	109.0
D3.1	Infiltration Planter	0.088	90%	0.825	0.7	184.5
F1	Pervious Pavement	0.535	90%	0.825	0.7	1,119.4
F2	Pervious Pavement	0.147	90%	0.825	0.7	308.2
TOTAL	**--**	**4.196**	**90%**	**0.825**	**0.7**	**8,794.2**
TOTAL PROPERTY	**--**	**4.274**	**90%**	**0.825**	**0.7**	**8,959.7**

Notes:

1. Refer to exhibits in Section VI for locations of each DMA.
2. Per Figure XVI-1 of the Technical Guidance Document, dated May 19, 2011. See also Appendix A.
3. Per Section III.1.1 of the Technical Guidance Document.

IV.3 LID BMP SELECTION AND PROJECT CONFORMANCE ANALYSIS

Low Impact Development (LID) BMPs are required in addition to site design measures and source controls to reduce pollutants in storm water discharges. LID BMPs are engineered facilities that are designed to retain or biotreat runoff on the project site. The 4th Term MS4 Storm Water Permit (Order R8-2009-0030) requires the evaluation and use of LID features using the following hierarchy of treatment: infiltration, evapotranspiration, harvest/reuse, and biotreatment. The following sections summarize the LID BMPs proposed for the project in accordance with the permit hierarchy and performance criteria outlined in Section IV.1.

IV.3.1 Hydrologic Source Controls (HSCs)

Hydrologic source controls (HSCs) can be considered to be a hybrid between site design practices and LID BMPs. HSCs are distinguished from site design BMPs in that they do not reduce the tributary area or reduce the imperviousness of a drainage area; rather they reduce the runoff volume that would result from a drainage area with a given imperviousness compared to what would result if HSCs were not used.

HYDROLOGIC SOURCE CONTROLS		
ID	Name	Included?
HSC-1	Localized on-lot infiltration	☐
HSC-2	Impervious area dispersion (e.g. roof top disconnection)	☐
HSC-3	Street trees (canopy interception)	☐
HSC-4	Residential rain barrels (not actively managed)	☐
HSC-5	Green roofs/Brown roofs	☐
HSC-6	Blue roofs	☐
HSC-7	Impervious area reduction (e.g. permeable pavers, site design)	☐

HSCs were not incorporated into the project's design at this stage in the project's development. Any HSC's will be accounted for during final design and the cumulative volume of the HSC's will be subtracted from the required treatment volume in the Final WQMP.

IV.3.2 Infiltration BMPs

Infiltration BMPs are LID BMPs that capture, store and infiltrate storm water runoff. These BMPs are engineered to store a specified volume of water and have no design surface discharge (underdrain or outlet structure) until this volume is exceeded. Examples of infiltration BMPs include infiltration trenches, bioretention without underdrains, drywells, permeable pavement, and underground infiltration galleries.

INFILTRATION		
ID	Name	Included?
INF-3 INF-4	Bioretention Without Underdrains	☐
	Rain Gardens	☐
	Porous Landscaping	☐
	Infiltration Planters	☒

INFILTRATION		
ID	Name	Included?
	Retention Swales	☐
INF-2	Infiltration Trenches	☒
INF-1	Infiltration Basins	☐
INF-5	Drywells	☐
INF-7	Subsurface Infiltration Galleries	☐
--	French Drains	☐
INF-6	Permeable Asphalt	☒
	Permeable Concrete	☒
	Permeable Concrete Pavers	☒
	Other:	☐

The project will utilize infiltration BMPs throughout the site, taking advantage of the sandy soils and the open landscaping areas. Permeable pavers are proposed for portions of the parking lot. Infiltration storm water planters will be located within the landscaping near the main entrance to the site off Finley Street. Runoff from the central recreation area will be diverted to a proposed gravel bed infiltration gallery located below the formal lawn area. Runoff from the remaining landscaped areas and public walkways along Newport Boulevard will infiltrate via proposed infiltration trench drains located along the perimeter of the site.

Pervious Pavement
Permeable pavement, such as permeable pavers, grass pavers, porous concrete, and porous asphalt, provides a surface suitable for light-loads and parking areas in which water can drain through pore spaces to an underlying rock reservoir (approximately 8"-12" inches deep) underneath. The sub-surface base allows for physical and microbial filtering processes to take place thereby removing pollutants such as particulates, organics, hydrocarbons and total suspended sediments, including attached heavy metals. The pervious pavement sections proposed for the project will have an average rock reservoir depth of 12 inches; however, depths may be increased during the final design to achieve minimum required treatment design volumes for each drainage area.

Bioinfiltration Planters

Bioretention planters with underdrains are plant-based biotreatment systems that typically consist of a shallow ponding area (typically 6"), mulch layer (2-3"), planting soils and plants. As storm water passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded and sequestered by the soil and plants. A 12-inch gravel bed is located below the planter to temporarily store runoff for infiltration into the subsoils.

Gravel Bed Infiltration Gallery

An underground infiltration gallery typically consists of a vault or chamber system, or gravel bed with an open bottom that is used to store runoff and percolate into the subsoils. Runoff enters the gravel bed through perforated pipes, is stored in the void space and pipe and infiltrates through the bottom. The infiltration gallery will be designed to be approximately 15-20' wide with an average rock reservoir depth of 18 inches, and will be covered with approximately 6-8" of turf and topsoil.

Infiltration Trench Drain

Infiltration trench drains, also called French drains, typically consist of a perforated pipe surrounded by gravel that allows spreading and infiltration of runoff into the subsoils. Runoff is stored in the void space and pipe and infiltrates through the bottom and sides of the trench. The rock may be exposed at the surface, or covered with approximately 6-8" of topsoil or pervious vegetation. The infiltration trench drains will be designed to be approximately 18-24" wide with an average rock reservoir depth of 18 inches, consistent with City of Newport Beach Standard Drawing STD-184-L (Private Drains Through Curb).

Infiltration BMP Sizing Calculations

In accordance with the MS4 permit and the new Model WQMP, the Design Capture Volumes (DCVs) presented in the following table represent the minimum volume of storm water runoff required to be treated by LID and/or treatment control BMPs for the proposed project. Due to the shallow design depths, the infiltration BMPs will drain in less than 48 hours, and therefore the BMPs were sized utilizing the Capture Efficiency, Constant Drawdown BMP sizing methodology to achieve the target capture efficiency of 80% in accordance with Section III.3.2 and Worksheet C of the TGD. Results are summarized in the following table based on preliminary footprints and depths required by each BMP (pending final design). Detailed calculations are provided in Appendix A.

INFILTRATION BMP DESIGN SUMMARY									
BMP Type	DMA ID(1)	Drainage Area (ac)	BMP Effective Depth(2)	Design Infiltration Rate (in/hr)	Draw-down (hr)	80% Capture DCV(3) (ft^3)	Minimum Footprint Needed (ft^2)	Footprint Provided (ft^2)	GIS Coordinate
Pervious Pavement(4)	A2.1	0.488	0.4	6.15	3.00	255.8	639.4	3,221	33.616114 -117.929346
	B1	0.447	0.4	0.70	6.86	374.8	937.1	4,919	33.616726 -117.928946
	B2+B3.2	0.418	0.4	0.70	6.86	350.5	876.3	1,053	33.617002 -117.929810
	D1	0.121	0.4	0.70	6.86	101.5	253.7	3,914	33.616878 -117.928885
	D2	0.052	0.4	0.70	6.86	43.6	109.0	1,976	33.617160 -117.929395
	F1	0.543	0.4	6.15	3.00	279.9	699.6	4,211	33.616414 -117.928827
	F2	0.147	0.4	6.15	3.00	77.0	160	1,219	33.616122 -117.928904
Bioinfiltration Planters(5)	B3.1	0.173	0.9	0.70	15.43	224.9	249.8	260	33.617077 -117.930050
	D3.1	0.088	0.9	0.70	15.43	114.4	127.1	141	33.617222 -117.929892
Gravel Bed Infiltration Gallery(6)	A1	0.824	0.6	6.15	3.00	431.8	719.7	750	33.616359 -117.929502
Infiltration Trench Drain(7)	A3.1	0.540	0.6	6.15	3.00	283.0	471.7	506	33.616280 -117.930202
	C1.1	0.363	0.6	6.15	3.00	190.2	317.1	360	33.616801 -117.930167

Notes:
1. Refer to WQMP Exhibit in Section VI for locations of DMAs and BMPs.
2. Includes reservoir storage depth adjusted for porosity.
3. Per Worksheet C, "Determining Capture Efficiency of Volume Based, Constant Drawdown BMPs." Copies of completed worksheets with detailed calculations are included in Appendix A.
4. Pervious pavement gravel reservoir storage depth = 12 inches (40% porosity).
5. Infiltration planter ponding depth = 6 inches. Gravel reservoir storage depth = 12 inches (40% porosity).
6. Gravel bed storage depth = 18 inches (40% porosity).
7. Infiltration trench storage depth = 18 inches (40% porosity).

IV.3.3 Evapotranspiration & Rainwater Harvesting BMPs

Evapotranspiration BMPs are a class of retention BMPs that discharges stored volume predominately to ET, though some infiltration may occur. ET includes both evaporation and transpiration, and ET BMPs may incorporate one or more of these processes. BMPs must be designed to achieve the maximum feasible ET, where required to demonstrate that the maximum amount of water has been retained on-site. Since ET is not the sole process in these BMPs, specific design and sizing criteria have not been developed for ET-based BMPs.

EVAPOTRANSPIRATION		
ID	Name	Included?
--	HSCs, *see Section IV.3.1*	☐
--	Surface-based infiltration BMPs	☐
--	Biotreatment BMPs, see *Section VI.3.4*	☐
	Other:	☐

Harvest and use (aka. Rainwater Harvesting) BMPs are LID BMPs that capture and store storm water runoff for later use. These BMPs are engineered to store a specified volume of water and have no design surface discharge until this volume is exceeded. Harvest and use BMPs include both above-ground and below-ground cisterns. Examples of uses for harvested water include irrigation, toilet and urinal flushing, vehicle washing, evaporative cooling, industrial processes and other non-potable uses.

HARVEST & REUSE / RAINWATER HARVESTING		
ID	Name	Included?
HU-1	Above-ground cisterns and basins	☐
HU-2	Underground detention	☐
--	Other:	☐

Since infiltration BMPs will be utilized on-site, evapotranspiration and harvest and reuse BMPs were not evaluated for the project.

IV.3.4 Biotreatment BMPs

Biotreatment BMPs are a broad class of LID BMPs that reduce storm water volume to the maximum extent practicable, treat storm water using a suite of treatment mechanisms characteristic of biologically active systems, and discharge water to the downstream storm drain system or directly to receiving waters. Treatment mechanisms include media filtration (though biologically-active media), vegetative filtration (straining, sedimentation, interception, and stabilization of particles resulting from shallow flow through vegetation), general sorption processes (i.e., absorption, adsorption, ion-exchange, precipitation, surface complexation), biologically-mediated transformations, and other processes to address both suspended and dissolved constituents. Examples of biotreatment BMPs include bioretention with underdrains, vegetated swales, constructed wetlands, and proprietary biotreatment systems.

BIOTREATMENT		
ID	Name	Included?
BIO-1	Bioretention with underdrains	☐
	Storm Water planter boxes with underdrains	☐
	Rain gardens with underdrains	☐
BIO-5	Constructed wetlands	☐
BIO-2	Vegetated swales	☐
BIO-3	Vegetated filter strips	☐
BIO-7	Proprietary vegetated biotreatment systems	☐
BIO-4	Wet extended detention basin	☐
BIO-6	Dry extended detention basins	☐
--	Other:	☐

Since infiltration BMPs will be utilized on-site, biotreatment BMPs were not evaluated for the project.

IV.3.5 Hydromodification Control BMPs

Not applicable. Refer to Section II.3 for further information.

IV.3.6 Regional/Sub-Regional LID BMPs

Not applicable. LID BMPs will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

IV.3.7 Treatment Control BMPs

Treatment control BMPs can only be considered if the project conformance analysis indicates that it is not feasible to retain the full design capture volume with LID BMPs.

TREATMENT CONTROL BMPs		
ID	Name	Included?
TRT-1	Sand Filters	☐
TRT-2	Cartridge Media Filter	☐
PRE-1	Hydrodynamic Separation Device	☐
PRE-2	Catch Basin Insert	☐

TREATMENT CONTROL BMPs		
ID	Name	Included?
	Other:	☐

Not applicable. LID BMPs will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

IV.3.8 Non-Structural Source Control BMPs

The table below indicates all BMPs to be incorporated in the project. For those designated as not applicable (N/A), a brief explanation why is provided.

NON-STRUCTURAL SOURCE CONTROL BMPs				
ID	Name	Included?	Not Applicable?	If Not Applicable, Provide Brief Reason
N1	Education for Property Owners, Tenants and Occupants	☐	☒	Non-residential development
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	Non-industrial development
N6	Local Water Quality Permit Compliance	☐	☒	The City of Newport Beach does not issue water quality permits.
N7	Spill Contingency Plan	☐	☒	Non-industrial development
N8	Underground Storage Tank Compliance	☐	☒	No USTs proposed
N9	Hazardous Materials Disclosure Compliance	☐	☒	Hazardous materials will not be stored on-site.
N10	Uniform Fire Code Implementation	☐	☒	Hazardous materials will not be stored on-site.
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	No loading docks are proposed.

NON-STRUCTURAL SOURCE CONTROL BMPs				
ID	Name	Included?	Not Applicable?	If Not Applicable, Provide Brief Reason
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	No retail gasoline outlets are proposed.

N2, Activity Restrictions

R.D. Olson Development shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance in non-designated areas, as well as any other activities that may potentially contribute to water pollution.

N3, Common Area Landscape Management

Management programs will be designed and implemented by the Owner/Operator to maintain all the common areas within the project site. These programs will cover how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices and proper disposal of landscape wastes by the owner/developer and/or contractors. Programs shall be implemented on an ongoing basis, and maintained on a monthly basis at a minimum.

N4, BMP Maintenance

The Owner/Operator 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. Details on BMP maintenance are provided in Section V of this WQMP, and the O&M Plan is included in Appendix D.

N11, Common Area Litter Control

The Owner/Operator will be responsible for performing trash pickup and sweeping of littered common areas on a weekly basis or whenever necessary. Responsibilities will also include noting improper disposal materials by the public and reporting such violations for investigation.

N12, Employee Training

All employees of the Owner/Operator and any contractors will require training to ensure that employees are aware 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. Training shall be performed upon hire and annually thereafter.

N14, Common Area Catch Basin Inspection

All privately-maintained on-site catch basin inlets and drainage facilities shall be inspected and maintained by the Owner/Operator at least once a year, prior to the rainy season, no later than October 1st of each year. The City of Newport Beach shall be responsible for inspection and maintenance of all public catch basins and drainage facilities associated with the project.

N15, Street Sweeping Private Streets and Parking Lots

The Owner/Operator shall be responsible for sweeping all on-site drive aisles and uncovered parking areas within the project on a quarterly basis.

IV.3.9 Structural Source Control BMPs

The table below indicates all BMPs to be incorporated in the project. For those designated as not applicable (N/A), a brief explanation why is provided.

STRUCTURAL SOURCE CONTROL BMPs				
ID	**Name**	**Included?**	**Not Applicable?**	**If Not Applicable, Provide Brief Reason**
S1 SD-13	Provide storm drain system stenciling and signage	☒	☐	
S2 SD-34	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	No outdoor storage areas are proposed.
S3 SD-32	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4 SD-12	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	There are no slopes or channels on the project site.
S6 SD-31	Properly Design: Dock areas	☐	☒	No loading docks are proposed.
S7 SD-31	Properly Design: Maintenance bays	☐	☒	No maintenance bays are proposed.
S8 SD-33	Properly Design: Vehicle wash areas	☐	☒	No vehicle wash areas are proposed.
S9 SD-36	Properly Design: Outdoor processing areas	☐	☒	No outdoor material storage areas are proposed.
S10	Properly Design: Equipment wash areas	☐	☒	No equipment wash areas are proposed.

STRUCTURAL SOURCE CONTROL BMPs				
ID	Name	Included?	Not Applicable?	If Not Applicable, Provide Brief Reason
S11 SD-30	Properly Design: Fueling areas	☐	☒	No fueling areas are proposed.
S12 SD-10	Properly Design: Hillside landscaping	☐	☒	Project is not located on a hillside.
S13	Properly Design: Wash water control for food preparation areas	☒	☐	
S14	Properly Design: Community car wash racks	☐	☒	No community car wash racks are proposed.

S1/SD-13, 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 prior to release of certificate of occupancy. Stencils shall be inspected for legibility on an annual basis and re-stenciled as necessary.

S3/SD-32, Design and construct trash and waste storage areas to reduce pollution introduction

All trash and waste shall be stored in containers that have lids or tarps to minimize direct precipitation into the containers. One trash enclosure will be located in the southeast corner of the site. The trash storage areas will be designed to City standards, and will be walled, roofed, have gates and proper drainage per City standards.

S4/SD-12, Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control

The Owner/Operator will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. The Owner/Operator will be responsible for implementing all efficient irrigation systems for common area landscaping including, but not limited to, provisions for water sensors and programmable irrigation cycles. This includes smart timers, rain sensors, and moisture shut-off valves. The irrigation systems shall be in conformance with water efficiency guidelines. Systems shall be tested twice per year, and water used during testing/flushing shall not be discharged to the storm drain system.

S13, Properly Design: Wash water control for food preparation areas

All wash water from food prep areas will be controlled and proper staff training conducted by the site operator. Food preparation facilities shall meet all health and safety, building and safety and any other applicable regulations, codes requirements, including installation of a grease interceptor where required. Sinks shall be contained with sanitary sewer connections for disposal of wash waters containing kitchen and food wastes.

IV.4 ALTERNATIVE COMPLIANCE PLAN

IV.4.1 Water Quality Credits

Local jurisdictions may develop a water quality credit program that applies to certain types of development projects after they first evaluate the feasibility of meeting LID requirements on-site. If it is not feasible to meet the requirements for on-site LID, project proponents for specific project types can apply credits that would reduce project obligations for selecting and sizing other treatment BMPs or participating in other alternative programs.

WATER QUALITY CREDITS	
Credit	**Applicable?**
Redevelopment projects that reduce the overall impervious footprint of the project site.	☐
Brownfield redevelopment, meaning redevelopment, expansion, or reuse of real property which may be complicated by the presence or potential presence of hazardous substances, pollutants or contaminants, and which have the potential to contribute to adverse ground or surface water quality if not redeveloped.	☐
Higher density development projects which include two distinct categories (credits can only be taken for one category): those with more than seven units per acre of development (lower credit allowance); vertical density developments, for example, those with a Floor to Area Ratio (FAR) of 2 or those having more than 18 units per acre (greater credit allowance)	☐
Mixed use development, such as a combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that can demonstrate environmental benefits that would not be realized through single use projects (e.g. reduced vehicle trip traffic with the potential to reduce sources of water or air pollution).	☐
Transit-oriented developments, such as a mixed use residential or commercial area designed to maximize access to public transportation; similar to above criterion, but where the development center is within one half mile of a mass transit center (e.g. bus, rail, light rail or commuter train station). Such projects would not be able to take credit for both categories, but may have greater credit assigned	☐
Redevelopment projects in an established historic district, historic preservation area, or similar significant city area including core City Center areas (to be defined through mapping).	☐
Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.	☐
Developments in a city center area.	☐
Developments in historic districts or historic preservation areas.	☐
Live-work developments, a variety of developments designed to support residential and vocational needs together – similar to criteria to mixed use development; would not be able to take credit for both categories.	☐

WATER QUALITY CREDITS	
Credit	Applicable?
In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.	☐

Not applicable. Water quality credits will not be applied for the project. LID BMPs will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

IV.4.2 Alternative Compliance Plan Information

Not applicable. LID BMPs will be utilized for water quality treatment on-site in accordance with the MS4 Permit hierarchy identified at the beginning of this Section.

SECTION V INSPECTION/MAINTENANCE RESPONSIBILITY FOR BMPs

It has been determined that R.D. Olson Development shall assume all BMP inspection and maintenance responsibilities for the Lido House Hotel project.

Contact Name:	Anthony Wrzosek
Title:	Vice President, Planning & Development
Company:	R.D. Olson Development
Address:	2955 Main Street, Third Floor, Irvine, California 92614
Phone:	949.574.8500
Email:	

Should the maintenance responsibility be transferred at any time during the operational life of Lido House Hotel, such as when an HOA or POA is formed for a project, a formal notice of transfer shall be submitted to the City of Newport Beach at the time responsibility of the property subject to this WQMP is transferred. The transfer of responsibility shall be incorporated into this WQMP as an amendment.

R.D. Olson Development shall verify BMP implementation and ongoing maintenance through inspection, self-certification, survey, or other equally effective measure. The certification shall verify that, at a minimum, the inspection and maintenance of all structural BMPs including inspection and performance of any required maintenance in the late summer / early fall, prior to the start of the rainy season. A form that may be used to record implementation, maintenance, and inspection of BMPs is included in Appendix D.

The City of Newport Beach may conduct verifications to assure that implementation and appropriate maintenance of structural and non-structural BMPs prescribed within this WQMP is taking place at the project site. The Owner/Operator shall retain operations, inspections and maintenance records of these BMPs and they will be made available to the City or County upon request. All records must be maintained for at least five (5) years after the recorded inspection date for the lifetime of the project.

Long-term funding for BMP maintenance will be provided by R.D. Olson Development.

The Operations and Maintenance (O&M) Plan can be found in Appendix D.

Any waste generated from maintenance activities will be disposed of properly. Wash water and other waste from maintenance activities is not to be discharged or disposed of into the storm drain system. Clippings from landscape maintenance (i.e. prunings) will be collected and disposed of properly off-site, and will not be washed into the streets, local area drains/conveyances, or catch basin inlets.

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	Inspection/Maintenance Activities	Minimum Frequency	Responsible Party
INFILTRATION BMPs				
INF-2	Infiltration Trench Drains	Infiltration trench should be inspected post-construction and after first major storm event for damages. Afterwards, maintenance should occur semi-annually, at the beginning and end of rainy season, for erosion or visible damage. Inspection and maintenance of clogging and gravel bed should occur on an annual basis. Presence of excess ponded water or clogging may require replacement of gravel as needed. Removal of surface trash and debris shall be performed in conjunction with routine maintenance activities, on a weekly basis at a minimum.	2x per year	R.D. Olson Development
INF-4	Bioinfiltration Planters	Inspections should occur semi-annually or after major storm events to check for the following and remove accordingly: standing water, sediment, and trash & debris. Inspections should also look for potential clogging and clean planters or, if necessary, replace the entire filter bed. Inspect for weeds, and prune shrubs and/or replace plants in accordance with routine landscape maintenance activities. Replace mulch as necessary, typically once per year.	2x per year	R.D. Olson Development

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	**Inspection/Maintenance Activities**	**Minimum Frequency**	**Responsible Party**
INF-6	Pervious Pavement	Keep pavement clean and free from debris and sediment. Minor maintenance should be conducted monthly consists of vacuum cleaning surface using a commercially available sweeper. If routine cleaning does not restore infiltration rates, then more invasive maintenance should occur as needed but no more than every 15-20 years, which may involve the following: Reconstruction of part of or entire pervious surface, lifting area and inspection of internal material, and replacement of surface materials, geotextiles, or sub-surface layers.	Monthly	R.D. Olson Development
INF-7	Gravel Bed Infiltration Gallery	Infiltration gallery should be inspected post-construction and after first major storm event for damages. Afterwards, maintenance should occur semi-annually, at the beginning and end of rainy season, for erosion or visible damage. Inspection and maintenance of clogging and gravel bed should occur on an annual basis. Presence of excess ponded water or clogging may require replacement of gravel as needed. Removal of surface trash & debris shall be performed in conjunction with routine maintenance activities, weekly at a minimum.	2x per year	R.D. Olson Development
NON-STRUCTURAL SOURCE CONTROL BMPs				
N1	Education for Property Owners, Tenants and Occupants	Not Applicable		

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	**Inspection/Maintenance Activities**	**Minimum Frequency**	**Responsible Party**
N2	Activity Restrictions	The owner and/or developer 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.	Ongoing	R.D. Olson Development
N3	Common Area Landscape Management	Maintenance shall be consistent with City requirements. Fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (OC DAMP Section 5.5) as well as local requirements. 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 drain inlets.	Monthly	R.D. Olson Development
N4	BMP Maintenance	Maintenance of structural BMPs implemented at the project site shall be performed at the frequency prescribed in the O&M Plan included in this WQMP (Appendix D). Records of inspections and BMP maintenance shall be kept by the owner/developer and shall be available for review upon request.	Ongoing	R.D. Olson Development
N5	Title 22 CCR Compliance (How development will comply)	Not Applicable		
N6	Local Industrial Permit Compliance	Not Applicable		

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	**Inspection/Maintenance Activities**	**Minimum Frequency**	**Responsible Party**
N7	Spill Contingency Plan	Not Applicable		
N8	Underground Storage Tank Compliance	Not Applicable		
N9	Hazardous Materials Disclosure Compliance	Not Applicable		
N10	Uniform Fire Code Implementation	Not Applicable		
N11	Common Area Litter Control	Litter patrol, violations investigations, reporting and other litter control activities shall be performed on a weekly basis and in conjunction with routine maintenance activities.	Weekly	R.D. Olson Development
N12	Employee Training	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.	Annually	R.D. Olson Development
N13	Housekeeping of Loading Docks	Not Applicable		
N14	Common Area Catch Basin Inspection	Catch basin inlets and other drainage facilities shall be inspected after each storm event and once per year. Storm drain inlets and other drainage facilities shall be cleaned prior to the rainy season, by October 1 each year.	Annually	R.D. Olson Development (private) City of Newport Beach (public)
N15	Street Sweeping Private Streets and Parking Lots	Drive aisles and parking areas must be swept at least quarterly (every 3 months), including prior to the start of the rainy season (October 1).	Quarterly	R.D. Olson Development
N16	Retail Gasoline Outlets	Not Applicable		

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	Inspection/Maintenance Activities	Minimum Frequency	Responsible Party
STRUCTURAL SOURCE CONTROL BMPs				
S1 SD-13	Provide storm drain system stenciling and signage	Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1 each year. Those determined to be illegible will be re-stenciled as soon as possible.	Annually	R.D. Olson Development (private) City of Newport Beach (public)
S2 SD-34	Design and construct outdoor material storage areas to reduce pollution introduction	Not Applicable		
S3 SD-32	Design and construct trash and waste storage areas to reduce pollution introduction	Sweep trash area at least once per week and before October 1st each year. Maintain area clean of trash and debris at all times.	Weekly	R.D. Olson Development
S4 SD-12	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	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. System testing shall occur twice per year. Water from testing/flushing shall be collected and properly disposed to the sewer system and shall not discharge to the storm drain system.	2x per year	R.D. Olson Development (private) City of Newport Beach (public)
S5	Protect slopes and channels and provide energy dissipation	Not Applicable		
S6 SD-31	Properly Design: Dock areas	Not Applicable		

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX				
	BMP	Inspection/Maintenance Activities	Minimum Frequency	Responsible Party
S7 SD-31	Properly Design: Maintenance bays	Not Applicable		
S8 SD-33	Properly Design: Vehicle wash areas	Not Applicable		
S9 SD-36	Properly Design: Outdoor processing areas	Not Applicable		
S10	Properly Design: Equipment wash areas	Not Applicable		
S11 SD-30	Properly Design: Fueling areas	Not Applicable		
S12 SD-10	Properly Design: Hillside landscaping	Not Applicable		
S13	Properly Design: Wash water control for food preparation areas	Inspection / maintenance shall occur at least once in the late summer / early fall, prior to the start of the rainy season. Maintenance includes using dry cleanup methods for cleaning (i.e., sweeping), keeping spill kits on-site and stocked, properly storing and hauling used oil and grease, and disposing wash water to sanitary sewer. Wash water shall not discharge to storm drain system. Mats shall be cleaned indoors or with dry cleaning methods only.	Annually	R.D. Olson Development
S14	Properly Design: Community car wash racks	Not Applicable		

SECTION VI SITE PLAN AND DRAINAGE PLAN

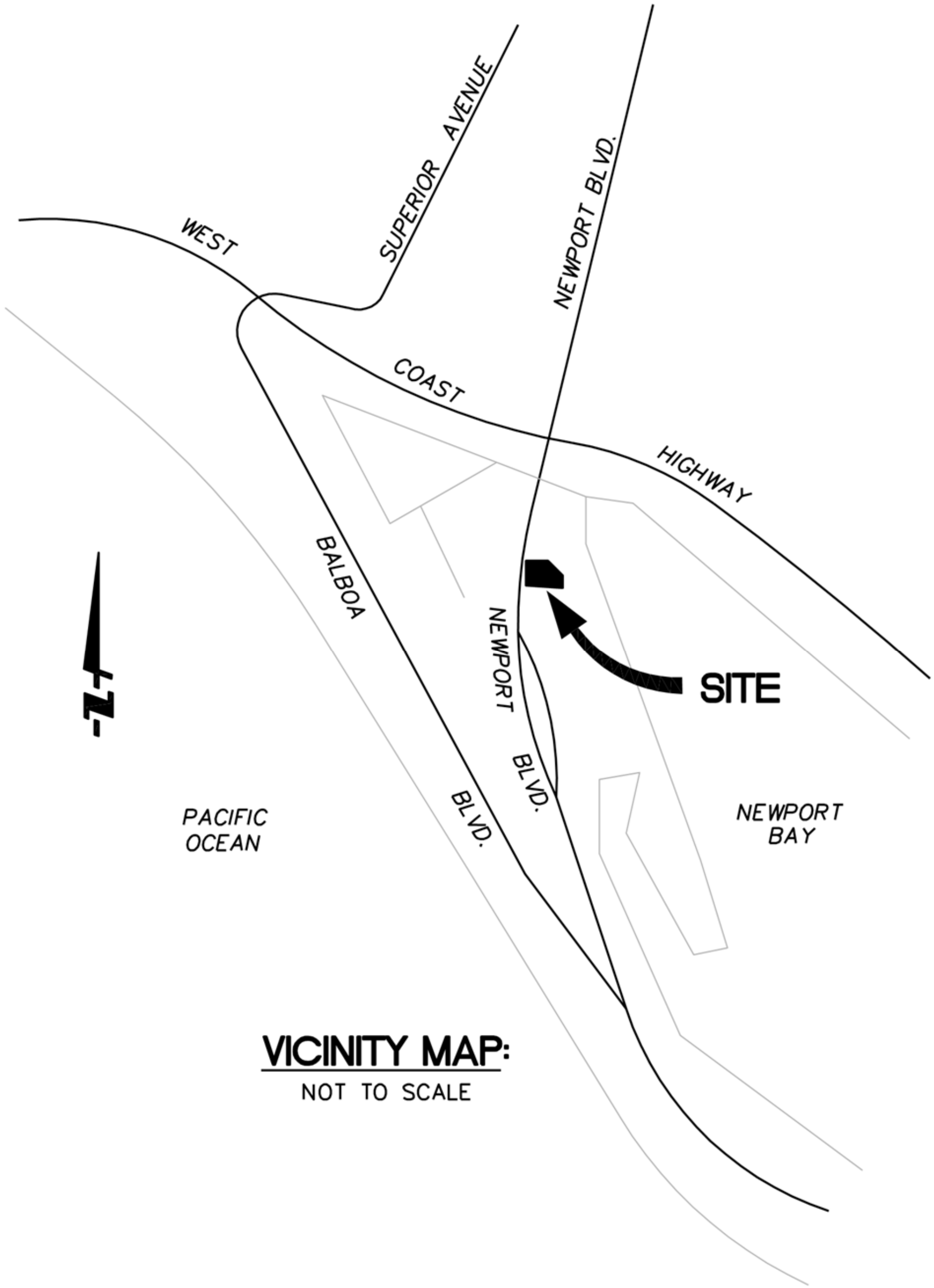
The exhibits provided in this section are to illustrate the post construction BMPs prescribed within this WQMP. Drainage flow information of the proposed project, such as general surface flow lines, concrete or other surface drainage conveyances, and storm drain facilities are also depicted. All structural source control and treatment control BMPs are shown as well.

EXHIBITS

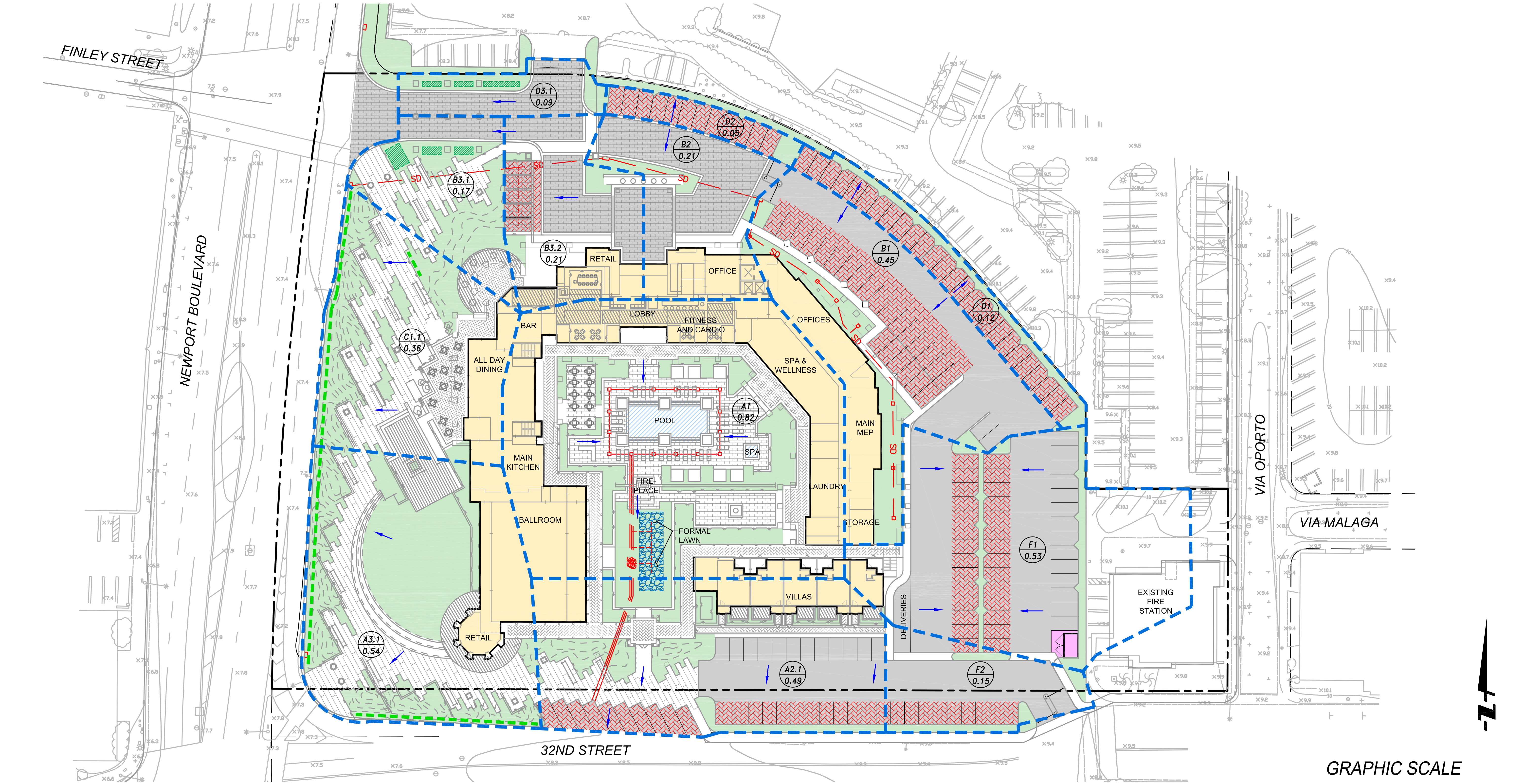
- Vicinity Map
- Preliminary WQMP Exhibit
- Typical Cross Sections

BMP DETAILS & FACT SHEETS

- Infiltration Trench (INF-2)
- Bioinfiltration (INF-4)
- Pervious Pavement (INF-6)
- Underground Infiltration (INF-7)



VICINITY MAP:
NOT TO SCALE



LEGEND

- PARCEL BOUNDARY
- EXISTING STORM DRAIN (PUBLIC)
- PROPOSED STORM DRAIN (PRIVATE)
- PROPOSED AREA DRAIN SYSTEM (PRIVATE)
- BMP DRAINAGE AREA BOUNDARY
- DIRECTION OF FLOW
- PROPOSED LANDSCAPING COMMON AREA LANDSCAPE MANAGEMENT
- PROPOSED BUILDING
- PROPOSED POOL/SPA (DRAINS TO SEWER)
- PROPOSED CATCH BASIN STENCILING (PRIVATE)
- A2.1 0.49 BMP SUB-DRAINAGE AREA AND ACREAGE
- PROPOSED TRASH ENCLOSURE
- PRIVATE PARKING LOT SWEEPING
- PERVIOUS PAVEMENT
- GRAVEL INFILTRATION BED (UNDERGROUND)
- BIOINFILTRATION PLANTER
- PERIMETER INFILTRATION TRENCH DRAIN

GRAPHIC SCALE

60 0 30 60 120

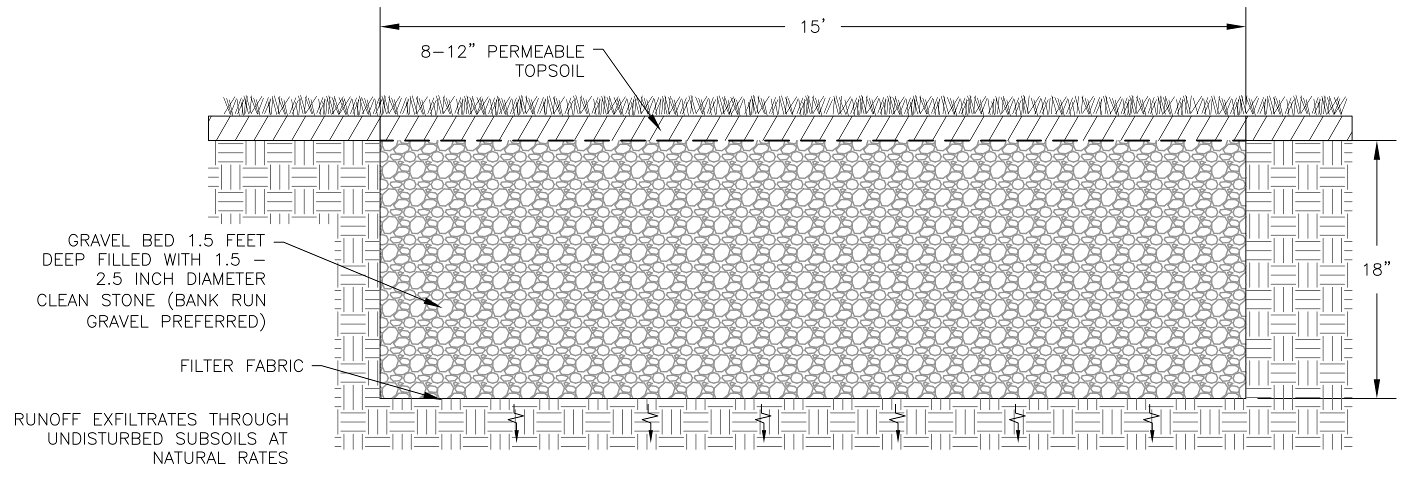
(IN FEET)
1 inch = 60 ft.

FUSCOE
ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315
www.fuscoe.com

Scale: 1" = 60'
Exhibit Date: 1/28/2014

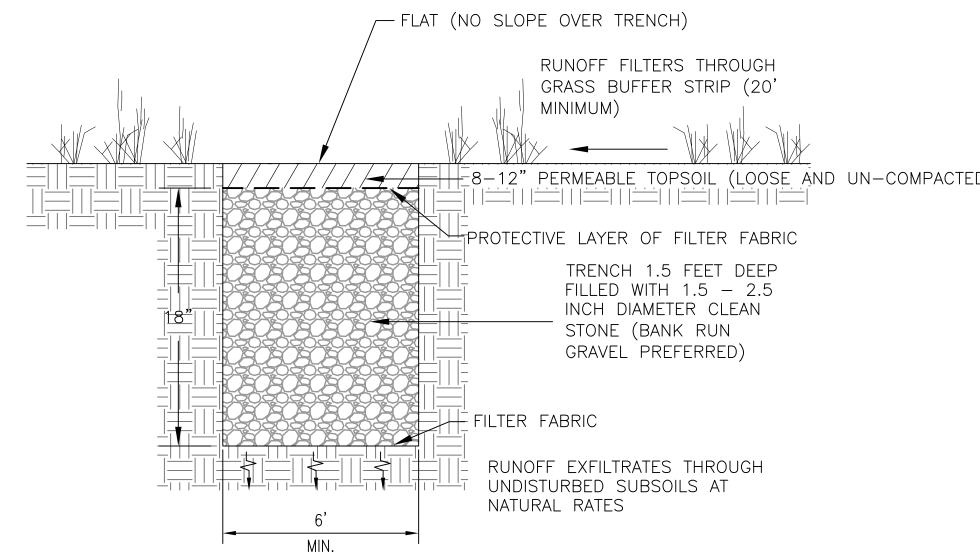
PRELIMINARY WQMP
LIDO HOUSE HOTEL
NEWPORT BEACH, CA

P:\PROJECTS\1100\04\ENG\EXHIBITS\110004XH_PRELIMWQMP_140128.DWG (01-28-14 10:30:04AM) Plotted by: April McMillian



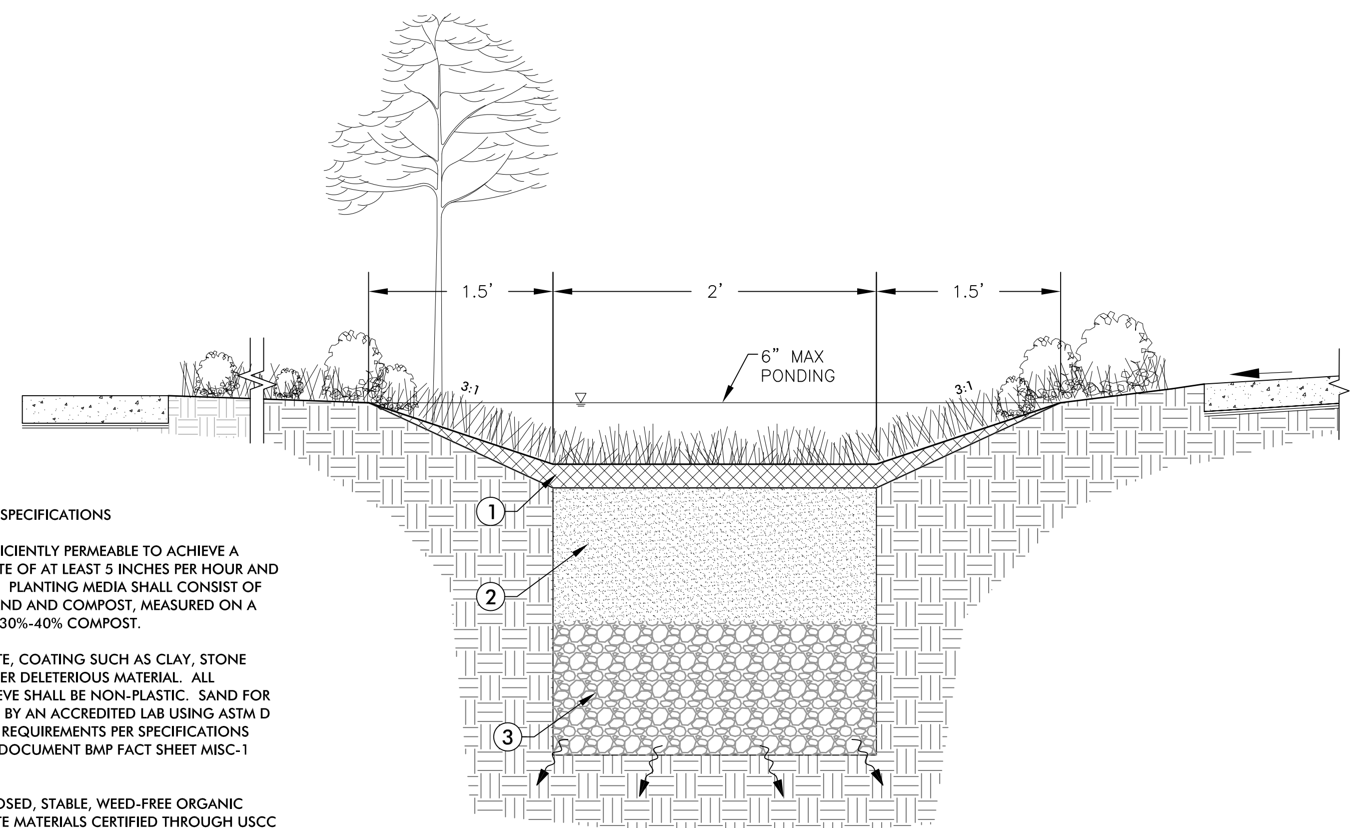
GRAVEL BED INFILTRATION - TYPICAL SECTION

NOT TO SCALE



INFILTRATION TRENCH - TYPICAL SECTION

NOT TO SCALE



PLANTER NOTES:

① 3-4" MULCH PER LANDSCAPE PLANS & SPECIFICATIONS

② 12-18" PLANTING MEDIA THAT IS SUFFICIENTLY PERMEABLE TO ACHIEVE A LONG TERM, IN-PLACE FILTRATION RATE OF AT LEAST 5 INCHES PER HOUR AND SUPPORT VIGOROUS PLANT GROWTH. PLANTING MEDIA SHALL CONSIST OF THE FOLLOWING MIXTURE OF FINE SAND AND COMPOST, MEASURED ON A VOLUME BASIS: 60%-70% SAND, AND 30%-40% COMPOST.

SAND SHALL BE FREE OF WOOD, WASTE, COATING SUCH AS CLAY, STONE DUST, CARBONATE, ETC. OR ANY OTHER DELETERIOUS MATERIAL. ALL AGGREGATE PASSING THE NO. 200 SIEVE SHALL BE NON-PLASTIC. SAND FOR PLANTING MEDIA SHALL BE ANALYZED BY AN ACCREDITED LAB USING ASTM D 422, AND COMPLY WITH GRADATION REQUIREMENTS PER SPECIFICATIONS INCLUDED IN TECHNICAL GUIDANCE DOCUMENT BMP FACT SHEET MISC-1 (PLANTING MEDIA).

COMPOST SHALL BE A WELL DECOMPOSED, STABLE, WEED-FREE ORGANIC MATTER SOURCE DERIVED FROM WASTE MATERIALS CERTIFIED THROUGH USCC SEAL OF TESTING ASSURANCE (STA) PROGRAM. ORGANIC MATTER CONTENT SHALL BE 35%-75% BY DRY WEIGHT, AND PH BETWEEN 6.5 AND 8. REFER TO PECIFICATIONS INCLUDED IN TECHNICAL GUIDANCE DOCUMENT BMP FACT SHEET MISC-1 (PLANTING MEDIA) FOR ADDITIONAL SPECIFICATIONS AND TESTING REQUIREMENTS.

③ 12" ROCK RESERVOIR, WASHED NO. 57 STONE (1.5" ROCK)

INFILTRATION PLANTER - TYPICAL SECTION

NOT TO SCALE

FUSCOE
ENGINEERING
16795 Von Karman, Suite 100
Irvine, California 92606
tel 949.474.1960 • fax 949.474.5315
www.fuscoe.com

Not-to-Scale

Exhibit Date: 12/4/2013

TYPICAL DETAILS
LIDO HOUSE HOTEL
NEWPORT BEACH, CA

INF-2: Infiltration Trench Fact Sheet

Also known as:

- *French Drains*
- *Rock Trenches*
- *Exfiltration Trenches*
- *Soak-aways*
- *Soakage Trenches*

Infiltration Trench

Source: www.dot.ca.gov

An infiltration trench is a long, narrow, rock-filled trench with no outlet other than an overflow outlet. Runoff is stored in the void space between stones and infiltrates through the bottom and sides of the trench. Infiltration trenches provide the majority of their pollutant removal benefits through volume reduction. Pretreatment is important for limiting amounts of coarse sediment entering the trench which can clog and render the trench ineffective. *Note: if an infiltration trench is "deeper than its widest surface dimension," or includes an assemblage of perforated pipes, drain tiles, or other similar mechanisms intended to distribute runoff below the surface of the ground, it would probably be considered a "Class V Injection Well" under the federal Underground Injection Control (UIC) Program, which is regulated in California by U.S. EPA Region 9. A UIC permit may be required for such a facility (for details see* **http://www.epa.gov/region9/water/groundwater/uic-classv.html**).

Feasibility Screening Considerations

- Infiltration trenches shall pass infeasibility screening criteria to be considered for use
- Infiltration trenches, particularly deeper designs, may not provide significant attenuation of stormwater pollutants if underlying soils have high permeability; potential risk of groundwater contamination.
- The potential for groundwater mounding should be evaluated if depth to seasonally high groundwater (unmounded) is less than 15 feet.

Opportunity Criteria

- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Drainage area area is ≤ 5 acres and has low to moderate sediment production.
- 2-3 percent of drainage area available for infiltration (generally requires less surface area than infiltration basins and bioretention areas without underdrain).
- Space available for pretreatment (biotreatment or treatment control BMP as described below).
- Potential for groundwater contamination can be mitigated through isolation of pollutant sources, pretreatment of inflow, and/or demonstration of adequate treatment capacity of underlying soils.
- Infiltration is into native soil, or depth of engineered fill is ≤ 5 feet from the bottom of the facility to native material and infiltration into shallow fill is approved by a geotechnical professional.
- Tributary area land uses include open areas adjacent to parking lots, driveways, and buildings, and roadway medians and shoulders.

OC-Specific Design Criteria and Considerations

☐ Must comply with local, state, and federal UIC regulations if applicable; a permit may be required.

- ☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc.)
- ☐ For facilities with tributary area less than 1 acre and less than 3 foot depth, minimum separation to mounded seasonally high groundwater of 5 feet shall be observed.
- ☐ For facilities with tributary area greater than 1 acre or deeper than 3 feet, minimum separation to mounded seasonally high groundwater of 10 feet shall be observed.
- ☐ Minimum pretreatment should be provided upstream of the infiltration trench, and water bypassing pretreatment should <u>not</u> be directed to the infiltration trench.
- ☐ Infiltration trenches should not be used for drainage areas with high sediment production potential unless preceded by full treatment control with a BMP effective for sediment removal.
- ☐ Ponded water should not persist within 1 foot of the surface of the facility for longer than 72 hours following the end of a storm event (observation well is needed to allow observation of drain time).
- ☐ Energy dissipators should be provided at inlet and outlet to prevent erosion.
- ☐ An overflow device must be provided if basin is on-line.
- ☐ A minimum freeboard of one foot should be provided above the overflow device (for an on-line basin) or the outlet (for an off-line basin).
- ☐ Longitudinal trench slope should not exceed 3%.
- ☐ Side slopes above trench fill should not be steeper than 3:1.

Simple Sizing Method for Infiltration Trenches

If the Simple Design Capture Volume Sizing Method is used to size an infiltration trench, the user calculates the DCV and then designs the geometry required to draw down the DCV in 48 hours. The sizing steps are as follows:

Step 1: Determine Infiltration Basin DCV

Calculate the DCV using the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1**.

Step 2: Determine the 48-hour Effective Depth

The depth of water that can be drawn down in 48 hours can be calculated using the following equation:

$$d_{48} = K_{DESIGN} \times SACF \times 48 \text{ hours}$$

Where:

d_{48} = trench effective 48-hour depth, ft

K_{DESIGN} = basin design infiltration rate, in/hr (See **Appendix VII**)

SACF = Surface Area Correction Factor = ranges from 1.0 (sides insignificant or not accounted) to 2.0 (sides plus bottom are 2 times the surface area of the bottom at mid depth) to account for the ratio of infiltration through the sides of the trench to the bottom footprint of the trench; should be based on anticipated trench geometry and wetted surface area at mid-depth.

This is the maximum effective depth of the trench below the overflow device to achieve drawdown in 48 hours.

Step 3: Determine the Trench Ponding Depth and Trench Depth

The depth of water stored in the ponding depth (i.e. above the trench fill) and within the trench itself should be equal or less than d_{48}. Determine the ponding depth and the trench fill depth such that:

$d_{48} \geq (n_T \times d_T + d_P)$

Where:

d_{48} = trench effective 48-hour depth, ft (from Step 2)

n_T = porosity of trench fill; 0.35 may be assumed where other information is not available

d_T = depth of trench fill, ft

d_P = ponding depth, ft (should not exceed 1 ft)

Step 4: Calculate the Required Infiltrating Area

The required footprint area can be calculated using the following equation:

$A = DCV / ((n_T \times d_T) + d_P)$

Where:

A = required trench footprint area, sq-ft

DCV = design capture volume, cu-ft (see Step 1)

n_T = porosity of trench fill; 0.35 may be assumed where other information is not available

d_T = depth of trench fill, ft

d_P = ponding depth, ft

Capture Efficiency Method for Infiltration Trenches

If BMP geometry has already been defined and deviates from the 48 hour drawdown time, the designer can use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (**Appendix** III.3.2) to determine the fraction of the DCV that must be provided to manage 80 percent of average annual runoff volume. This method accounts for drawdown time different than 48 hours.

Step 1: Determine the drawdown time associated with the selected trench geometry

$DD = ((n_T \times d_T) + d_P) / (K_{DESIGN} \times SACF) \times 12$

Where:

DD = time to completely drain infiltration basin ponding depth, hours

n_T = porosity of trench fill; 0.35 may be assumed where other information is not available

d_T = depth of trench fill, ft

d_P = ponding depth, ft

SACF = Surface Area Correction Factor = ranges from 1.0 (sides insignificant or not accounted) to 2.0 (sides plus bottom are 2 times the surface area of the bottom at mid depth) to account for the ratio of infiltration through the sides of the trench to the bottom footprint of the trench; should be based on anticipated trench geometry and wetted surface area at mid-depth.

K_{DESIGN} = basin design infiltration rate, in/hr (See Appendix VII)

Step 2: Determine the Required Adjusted DCV for this Drawdown Time

Use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (**Appendix** III.3.2) to calculate the required fraction of the DCV the basin must hold to achieve 80 percent capture of average annual stormwater runoff volume based on the trench drawdown time calculated above.

Step 3: Determine the Trench Infiltrating Area Needed

The required footprint area can be calculated using the following equation:

$$A = DCV / ((n_T \times d_T) + d_P)$$

Where:

A = required trench footprint area, sq-ft

DCV = design capture volume, cu-ft (see Step 1)

n_T = porosity of trench fill; 0.35 may be assumed where other information is not available

d_T = depth of trench fill, ft

d_P = ponding depth, ft

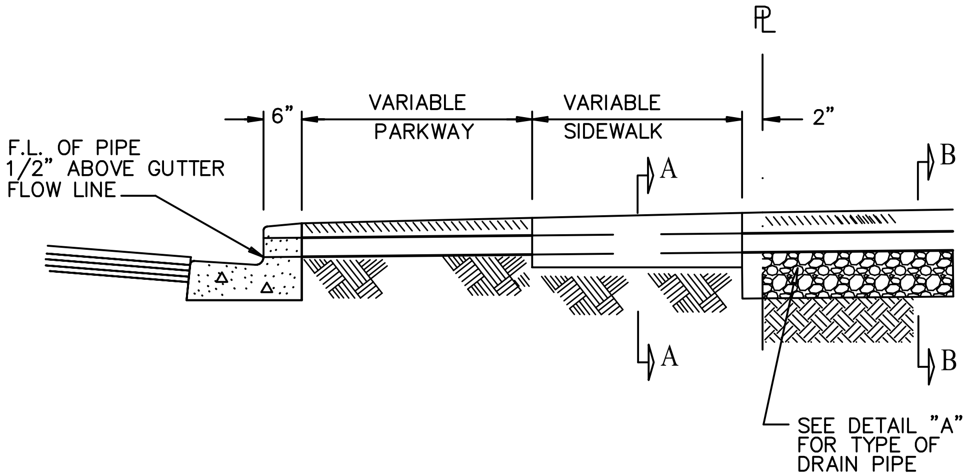
If the area required is greater than the selected trench area, adjust surface area or adjust ponding and/or trench depth and recalculate required area until the required area is achieved.

Configuration for Use in a Treatment Train

- Infiltration trenches may be preceeded in a treatment train by HSCs in the drainage area, which would reduce the required volume of the trench.
- Infiltration trenches must be preceeded by some form of pretreatment which may be biotreatment or a treatment control BMP; if an approved biotreatment BMP is used as pretreatment, the overflow from the infiltration trench may be considered “biotreated” for the purposes of meeting the LID requirments
- The overflow or bypass from an infiltration trench can be routed to a downstream biotreatment BMP and/or a treatment control BMP if additional control is required to achieve LID or treatment control requirements

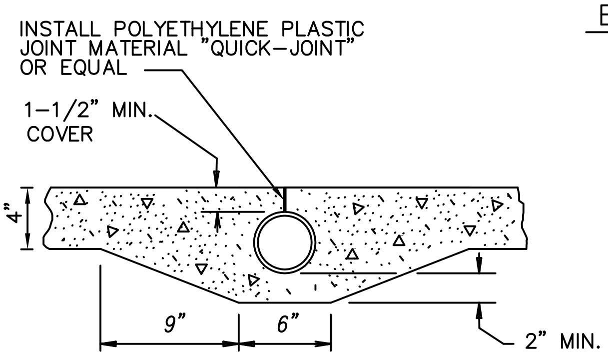
Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment: http://www.cabmphandbooks.com/Documents/Development/TC-10.pdf
- SMC LID Manual (pp 141): http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 6: http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandrainageareaintenance.pdf
- City of Portland Stormwater Management Manual (Soakage Trenches, page 2-82) http://www.portlandonline.com/bes/index.cfm?c=47954&a=202883
- San Diego County LID Handbook Appendix 4 (Factsheet 1): http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf

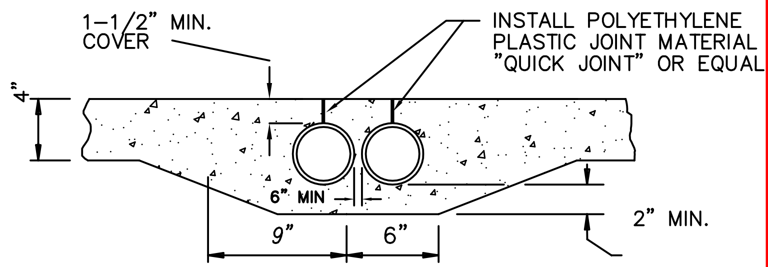


1– DRAINS WITH SLOPE GREATER THAN 10% MAY REQUIRE AN ENERGY REDUCER.
2– ALL DRAINS MUST BE INSTALLED 90° TO THE CURB FACE UNLESS APPROVED BY THE CONSTRUCTION ENGINEER.

ELEVATION

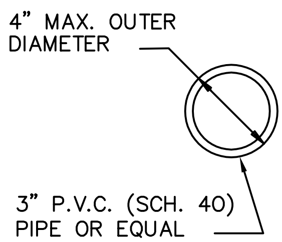


SECTION A-A
RESIDENTIAL

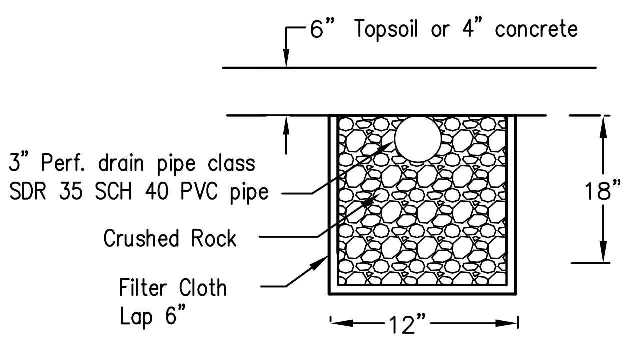


SECTION A-A
COMMERCIAL

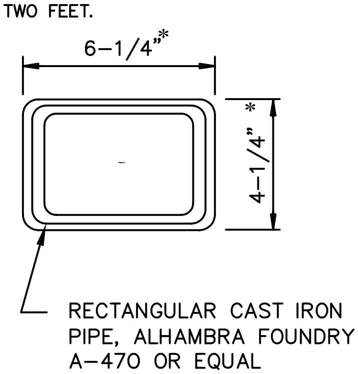
NOTE: IF CURB/GUTTER IS REMOVED JOIN TO THE NEAREST JOINT WITHIN TWO FEET.



DETAIL A



SECTION "B-B"



ALTERNATE
TO DETAIL A

DRAIN PIPE SECTIONS

* OUTSIDE HUB DIMENSIONS

CITY OF NEWPORT BEACH
PUBLIC WORKS DEPARTMENT

APPROVED:

RCE NO. 36106

PUBLIC WORKS DIRECTOR

PRIVATE DRAINS THROUGH CURB

Drawn: P. Arciniega	Scale: N.T.S.
Date: June 2005/rev RO	F:\USERS\PBW\Share\CAD_PI\STD Details\2003_std
DRAWING NO.	STD-184-L

INF-4: Bioinfiltration Fact Sheet

Also known as:

- *Rain gardens*
- *Infiltration planter*

Bioretention

Source: Geosyntec Consultants

Bioinfiltration facilities are designed for partial infiltration of runoff and partial biotreatment. These facilities are similar to bioretention devices with underdrains but they include a raised underdrain above a gravel sump designed to facilitate infiltration. These facilities can be used in areas where there are no hazards associated with infiltration, but infiltration of the full DCV may not be feasible due to low infiltration rates or high depths of fill. These facilities may not result in retention of the full DCV but they can be used to achieve the maximum feasible infiltration and ET.

Feasibility Screening Considerations

- Bioinfiltration shall pass infeasibility screening criteria for infiltration BMPs (**TGD Section 2.4.2.4**) to be considered for use.
- Infiltration rates are allowed to be less than 0.3 inches per hour.

Opportunity Criteria

- Land use may include commercial, residential, mixed use, institutional, and subdivisions. Bioretention may also be applied in parking lot islands, cul-de-sacs, traffic circles, road shoulders, and road medians.
- Drainage area is ≤ 5 acres, preferrably ≤ 1 acre.
- Area is available for infiltration.
- Site slope is less than 15 percent.

OC-Specific Design Criteria and Considerations

- ☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc.)
- ☐ Depth to mounded seasonally high groundwater shall not be less than 5 feet.
- ☐ If sheet flow is conveyed to the treatment area over stabilized grassed areas, the site must be graded in such a way that minimizes erosive conditions; sheet flow velocities should not exceed 1 foot per second.
- ☐ Ponding depth should not exceed 18 inches; fencing may be required if ponding depth exceeds 6 inches to mitigate the risk of drowning.
- ☐ Planting/storage media shall be based on the recommendations contained in MISC-1: Planting/Storage Media
- ☐ The minimum amended soil depth is 1.5 feet (3 feet is preferred).
- ☐ The depth of gravel below the underdrain elevation must be designed so that the effective depth that would infiltrate in 48 hours is stored in the gravel layer.
- ☐ Underdrain should be placed at the top of the gravel drainage layer to facilitate infiltration.

- ☐ Infiltration pathways may need to be restricted due to the close proximity of roads, foundations, or other infrastructure. A geomembrane liner, or other equivalent water proofing, may be placed along the vertical walls to reduce lateral flows. This liner should have a minimum thickness of 30 mils.
- ☐ Plant materials should be tolerant of summer drought, ponding fluctuations, and saturated soil conditions for 48 hours; native plant species and/or hardy cultivars that are not invasive and do not require chemical fertilizers or pesticides should be used to the maximum extent feasible
- ☐ The bioinfiltration area should be covered with 2-4 inches (average 3 inches) of mulch at startup and an additional placement of 1-2 inches of mulch should be added annually.
- ☐ An overflow device is required at the top of the ponding depth.
- ☐ Dispersed flow or energy dissipation (i.e. splash rocks) for piped inlets should be provided at basin inlet to prevent erosion.
- ☐ Planting/storage media shall be based on the recommendations contained in MISC-1: Planting/Storage Media
- ☐ Ponding area side slopes shall be 3H:1V.

Simple Sizing Method for Bioinfiltration

If the Simple Design Capture Volume Sizing Method described in **Appendix III.3.1** is used to size a bioinfiltration facility, the user selects the basin geometry and then determines the volume retained. The sizing steps are as follows:

Step 1: Select Bioinfiltration Geometry

Determine the desired ponding depth (not to exceed 1.5 ft), gravel depth, surface area, and media saturated hydraulic conductivity. A target media hydraulic conductivity of 5 inches per hour is recommended.

Step 2: Verify that the Ponding Depth will Draw Down within 48 Hours

The ponding area drawdown time can be calculated using the following equation:

$$DD_P = (d_P / K_{MEDIA}) \times 12$$

Where:

DD_P = time to drain ponded water, hours

$d_{EFFECTIVE}$ = total effective depth of water stored in bioretention area, ft (from Step 3)

K_{MEDIA} = media design infiltration rate, in/hr (equivalent to the media hydraulic conductivity with a factor of safety of 2; K_{MEDIA} of 2.5 in/hr should be used as a default unless other information is available to support an alternative value.)

If the drawdown time exceeds 48 hours, adjust ponding depth and/or media filter until 48 hour drawdown time is achieved.

Step 3: Verify That Gravel Depth is Designed for 48 Hour Drawdown

In order to demonstrate that bioinfiltration systems have been designed to achieve the maximum feasible retention (See Appendix XI), the gravel depth below the underdrains must be designed with a thickness such that it draws down in 48 hours.

$$DD_G = ((d_G \times n_G) / K_{DESIGN}) \times 12$$

Where:

DD_G = time to drain gravel layer, hours

n_G = bioretention gravel layer porosity; 0.35 may be assumed where other information is not available

d_G = bioretention gravel layer depth, ft

K_{DESIGN} = bioretention design infiltration rate, in/hr (See **Appendix VII**)

If DD_G is less than 48 hours, adjust d_G until DD_G is at least 48 hours or greater.

Step 4: Determine the BMP Area Needed

The required infiltrating area (i.e. the surface area of the top of the media layer) can be calculated using the following equation:

$A = DCV/ d_{EFFECTIVE}$

Where:

A = required infiltrating area, sq-ft (measured at the media surface)

DCV = design capture volume, cu-ft (see Step 1)

$d_{EFFECTIVE}$ = total effective depth of water stored in bioretention area, ft

$d_{EFFECTIVE} = (d_P + n_M d_M + n_G d_G)$

d_P = bioretention ponding depth, ft (should be less than or equal to 1.5 ft)

n_M = bioretention media porosity

d_M = bioretention media depth, ft

n_G = bioretention gravel layer porosity; 0.35 may be assumed where other information is not available

d_G = bioretention gravel layer depth, ft

This does not include the side slopes, access roads, etc. which would increase bioretention footprint. If the area required is greater than the selected basin area, adjust surface area or adjust ponding depth and recalculate required area until the required area is achieved.

Capture Efficiency Method for Bioinfiltration

Option 1: Accounting for Retention plus Biotreatment in Capture Efficiency Calculation

To size bioinfiltration facilities using the Capture Efficiency Method, the system should be divided into its retention and biotreatment components and analyzed as a treatment train per instructions in **Appendix III.5** Sizing Approaches for Treatment Trains and Hybrid Systems.

- Retention Storage: Water stored in gravel below underdrains.
- Biotreatment Storage: Water stored in surface ponding and media pore space.

The retention component should be analyzed as the first component of the treatment train, and will yield a capture efficiency that is used as an input to the biotreatment sizing approach.

The retention component should be sized such that the depth of gravel drains in 48 hours at the design infiltration rate.

Option 2: Sizing of Biotreatment Only; Presumptive Approach for Retention

Alternatively, bioinfiltration BMPs can be sized accounting for only the capture efficiency of the biotreatment component (See BIO-1: Bioretention with Underdrains for sizing methods). The retention component should be sized such that the depth of gravel drains in 48 hours or greater at the design infiltration rate. This provides presumption that water is infiltrated without quantifying the volume that is infiltrated. It is inherently a conservative sizing method.

Configuration for Use in a Treatment Train

- Bioinfiltration areas are inherently a treatment train BMP because they include both retention and biotreatment components.
- Bioinfiltration areas may be preceded in a treatment train by HSCs in the drainage area, which would reduce the required volume of the bioretention cell.
- Bioinfiltration areas can be incorporated in a treatment train to provide enhanced water quality treatment and reductions in runoff volume and rate.

Additional References for Design Guidance

- CASQA BMP Handbook for New and Redevelopment: http://www.cabmphandbooks.com/Documents/Development/TC-32.pdf
- SMC LID Manual (pp 68): http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf
- Los Angeles County Stormwater BMP Design and Maintenance Manual, Chapter 5: http://dpw.lacounty.gov/DES/design_manuals/StormwaterBMPDesignandMaintenance.pdf
- San Diego County LID Handbook Appendix 4 (Factsheet 7): http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf
- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 4: http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850
- County of Los Angeles Low Impact Development Standards Manual, Chapter 5: http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf

INF-6: Permeable Pavement (concrete, asphalt, and pavers)

Also known as:

- *Pervious pavement*
- *Porous concrete*
- *Pavers*
- *Permeable asphalt*

Permeable Pavement
Source: Geosyntec Consultants

Permeable pavements contain small voids that allow water to pass through to a gravel base. They come in a variety of forms; they may be a modular paving system (concrete pavers, grass-pave, or gravel-pave) or poured in place pavement (porous concrete, permeable asphalt). All permeable pavements treat stormwater and remove sediments and metals to some degree within the pavement pore space and gravel base. While conventional pavement result in increased rates and volumes of surface runoff, properly constructed and maintained porous pavements, allow stormwater to percolate through the pavement and enter the soil below. This facilitates groundwater recharge while providing the structural and functional features needed for the roadway, parking lot, or sidewalk. The paving surface, subgrade, and installation requirements of permeable pavements are more complex than those for conventional asphalt or concrete surfaces. For porous pavements to function properly over an expected life span of 15 to 20 years, they must be properly sited and carefully designed and installed, as well as periodically maintained. Failure to protect paved areas from construction-related sediment loads can result in their premature clogging and failure.

Feasibility Screening Considerations

- Permeable pavement shall pass infiltration infeasibility screening to be considered for use.
- Permeable pavements pose a potential risk of groundwater contamination; they may not provide significant attenuation of stormwater pollutants if underlying soils have high permeability.

Opportunity Criteria

- Permeable pavement areas can be applied to individual lot driveways, walkways, parking lots, low-traffic roads, high-traffic (with low speeds) roads/lots, golf cart paths, within road right-of-ways, and in parks and along open space edges. Impervious surfaces draining to the BMP are limited to surfaces immediately adjacent to the permeable pavement, rooftop runoff, and other nearby surfaces that do not contain significant sediment loads.
- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Infiltration is into native soil, or depth of engineered fill is ≤ 5 feet from the bottom of the facility to native material and infiltration into fill is approved by a geotechnical professional.

OC-Specific Design Criteria and Considerations

☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc)

☐ Minimum separation to mounded seasonally high groundwater of 5 feet shall be observed.

☐ A biotreatment BMP should be provided for all runoff from off-site sources that are not directly adjacent to the permeable pavement, with the exception of rooftops.

☐ Permeable pavement should not be used for drainage areas with high sediment production potential (e.g., landscape areas) unless preceded by full treatment control with a BMP effective for sediment removal

☐ All aggregate used to construct permeable pavement shall be thoroughly washed before being delivered to the construction site.

☐ The top or wearing layer course (permeable pavement course) should consist of asphalt or concrete with greater than normal percentage of voids, or paving stones.

☐ A layer of washed fine aggregate (e.g., No. 8) just under the permeable pavement course may be installed to provide a level surface for installing the permeable pavement and also acts as a filter to trap particles and help prevent the reservoir layer from clogging. This layer can also act as interstitial media between pavers.

☐ Below this layer, the bedding and filter course course should be 1.5 to 3 inches deep and may be underlain by choking stone to prevent the smaller sized aggregate from migrating into the large aggregate base layer.

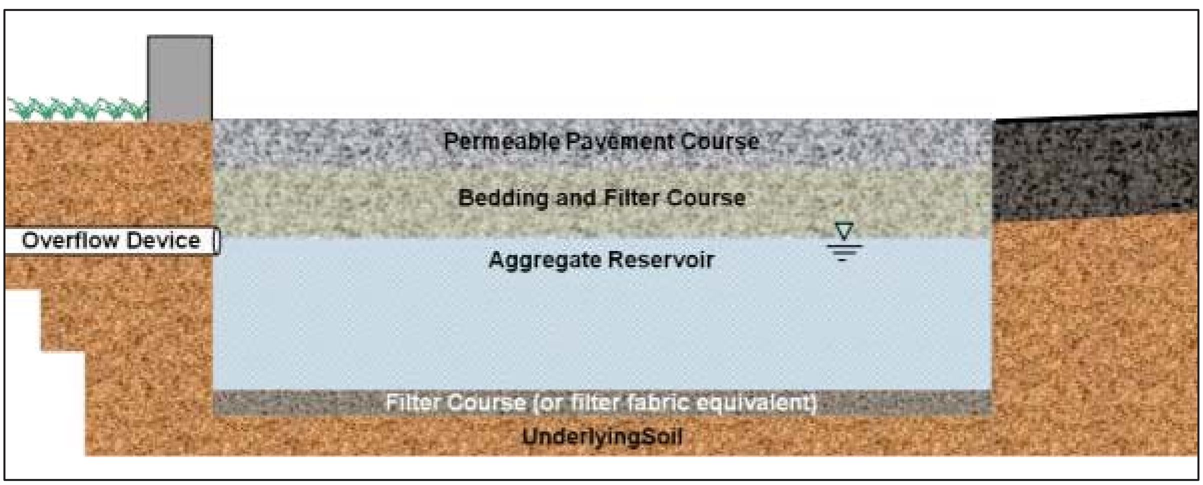
☐ The bedding, filter, and choke stone layers, as applicable, are referred to collectively as the bedding and filter course.

☐ The aggregate reservoir layer should be designed to function as a support layer as well as a reservoir layer the reservoir layer should be washed, open-graded No. 57 aggregate without any fine sands.

☐ The type of pedestrian traffic should be considered when determining which type of permeable pavement to use in particular locations (e.g., pavers may not be a good option for locations where people wearing high heels will be walking).

☐ An overflow device is required in the form of perimeter control or overflow pipes. This should generally be set at an elevation to prevent ponding of water into the bedding and filter course.

Figure XIV.1: Schematic Diagram of Permeable Pavement without Underdrains



Simple Sizing Method for Permeable Pavement

Permeable pavement that manages only direct rainfall and runoff from adjacent impermeable surfaces less than 50 percent the size of the permeable pavement are are not required to conduct sizing calculations. These areas are assumed to be self-retaining for the purpose of drainage planning.For permeable pavement with larger tributary area ratios, sizing calculations must be performed.

If the Simple Design Capture Volume Sizing Method described in **Appendix** III.3.1 is used to size permeable pavement, the user calculates the DCV, designs the geometry required to draw down the DCV in 48 hours, then determines the area that is needed for the BMP. The area of the porous pavement itself as well as the area of the tributary areas should be considered in calculating the DCV. The sizing steps are as follows:

Step 1: Determine Permeable Pavement DCV

Calculate the DCV using the Simple Design Capture Volume Sizing Method described in **Appendix** III.3.1.

Step 2: Determine the 48-hour Effective Depth

The depth of water that can be drawn down in 48 hours can be calculated using the following equation:

$d_{48} = K_{DESIGN} \times 48 \text{ hours} \times 1 \text{ ft}/12 \text{ inches}$

Where:

d_{48} = pavement effective 48-hour drawdown depth, ft

K_{DESIGN} = basin design infiltration rate, in/hr (See Appendix VII)

This is the maximum effective depth of water storage in the aggregate reservoir to achieve drawdown in 48 hours.

Step 3: Determine the Aggregate Reservoir Depth

The depth of water stored in the gravel reservoir should be equal or less than d_{48}. Determine the reservoir depth such that:

$d_{48} \geq (n_R \times d_R)$

Where:

d_{48} = trench effective 48-hour depth, ft (from Step 2)

n_R = porosity of aggregate reservoir fill; 0.35 may be assumed where other information is not available

d_R = depth of trench fill, ft

Step 4: Calculate the Required Infiltrating Area

The required infiltrating area can be calculated using the following equation:

$A = DCV / (n_R \times d_R)$

Where:

A = required footprint area, sq-ft

DCV = design capture volume, cu-ft (see Step 1)

n_R = porosity of trench fill; 0.35 may be assumed where other information is not available

d_R = depth of trench fill, ft

This area is equal to the required pavement area.

The ratio total tributary area (including the porous pavement) to the area of the porous pavement should not exceed 4:1.

Capture Efficiency Method for Permeable Pavement

If BMP geometry has already been defined and deviates from the 48 hour drawdown time, the designer can use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix** III.3.2) to determine the fraction of the DCV that must be provided to manage 80 percent of average annual runoff volume. This method accounts for drawdown time different than 48 hours.

Option 1: Pavement Geometry is Predefined

Step 1: Determine the Drawdown Time Associated with the Selected Pavement Geometry

$DD = ((n_R \times d_R) / K_{DESIGN}) \times 12$ in/ft

Where:

DD = time to completely drain pavement, hours

n_R = porosity of reservoir fill; 0.35 may be assumed where other information is not available

d_R = depth of reservoir, ft

K_{DESIGN} = basin design infiltration rate, in/hr (See Appendix VII)

Step 2: Determine the Required Adjusted DCV for this Drawdown Time

Use the Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs (See **Appendix** III.3.2) to calculate the draw-down adjusted DCV that the basin must hold to achieve 80 percent capture of average annual stormwater runoff volume based on the pavement drawdown time calculated above.

Step 3: Determine the Pavement Infiltrating Area Needed

The required infiltrating area can be calculated using the following equation:

$A = DCV / (n_R \times d_R)$

Where:

A = required footprint area, sq-ft

DCV = design capture volume, cu-ft (see Step 1)

n_R = porosity of reservoir fill; 0.35 may be assumed where other information is not available

d_R = depth of reservoir, ft

If the area required is greater than the selected pavement area, adjust reservoir depth and recalculate required area until the required area is achieved.

Configuration for Use in a Treatment Train

- Permeable pavement may be preceded in a treatment train by HSCs in the drainage area, which would reduce the runoff volume to be infiltrated by the permeable pavement
- Permeable pavement areas can be designed to be self-retaining to lessen the pollutant and volume load on downstream BMPs.

Additional References for Design Guidance

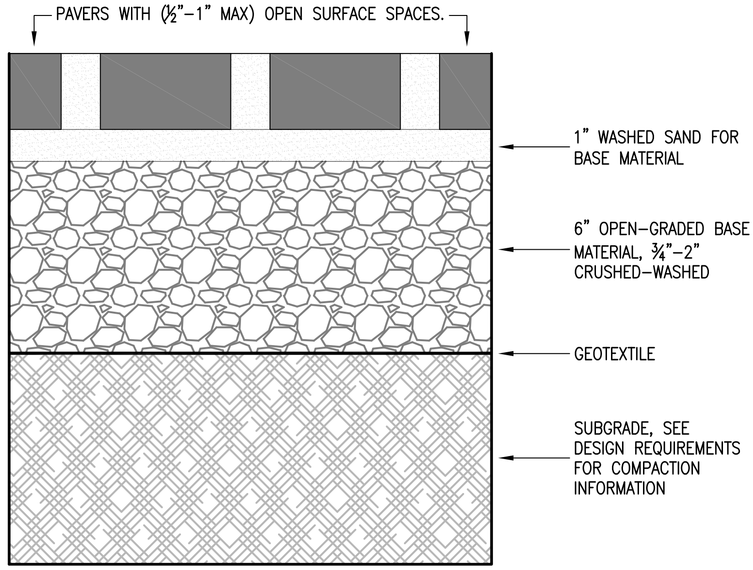
- SMC LID Manual (pp 84): http://www.lowimpactdevelopment.org/guest75/pub/All_Projects/SoCal_LID_Manual/SoCalLID_Manual_FINAL_040910.pdf

- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 5: http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850
- City of Portland Stormwater Management Manual (Pervious Pavement, page 2-40) http://www.portlandonline.com/bes/index.cfm?c=47954&a=202883

  San Diego County LID Handbook Appendix 4 (Factsheets 8, 9 & 10): http://www.sdcounty.ca.gov/dplu/docs/LID-Appendices.pdf

  City of Santa Barbara Storm Water BMP Guidance Manual, Chapter 6: http://www.santabarbaraca.gov/NR/rdonlyres/91D1FA75-C185-491E-A882-49EE17789DF8/0/Manual_071008_Final.pdf

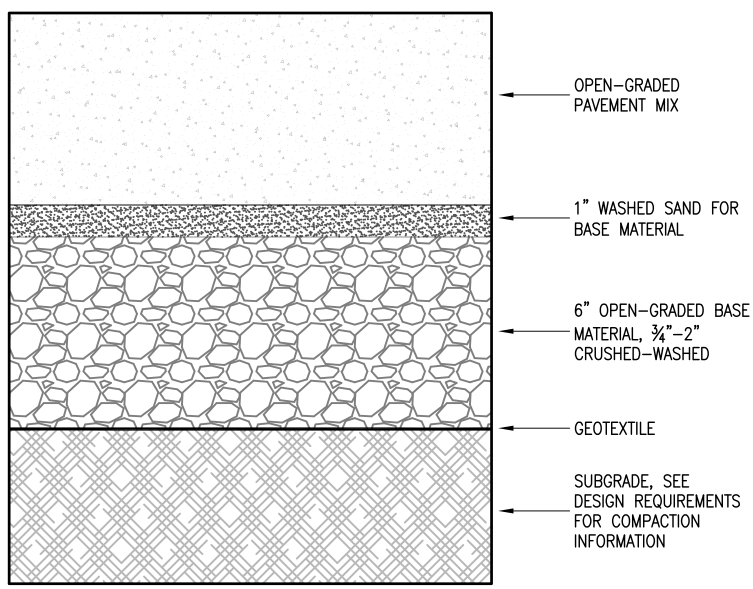
  County of Los Angeles Low Impact Development Standards Manual, Chapter 5: http://dpw.lacounty.gov/wmd/LA_County_LID_Manual.pdf



PERMEABLE CONCRETE BLOCK OR "PAVER" SYSTEMS

	RESIDENTIAL DRIVEWAY OR PEDESTRIAN ONLY	PRIVATE STREET, PARKING LOT, OR FIRE LANE	PUBLIC STREET
CONCRETE	4"	4"	7"
ASPHALT	2 ½"	3"	6"
PAVERS	2 ⅜"	3 ⅛"	3 ⅛"
ENGINEERING REQ'D	NO	YES	YES
COMPACTION REQ'D	NO	YES	95%

EXHIBIT 2-8
PERVIOUS PAVEMENT REQUIREMENTS FOR TOP LIFT DEPTH, ENGINEERING, AND COMPACTION.



PERVIOUS (OPEN GRADED) CONCRETE AND ASPHALT SYSTEMS

- DRAWING NOT TO SCALE -

STORMWATER MANAGEMENT MANUAL TYPICAL DETAILS

- Simplified / Presumptive / Performance Design Approach -

Pervious Pavement

NUMBER

SW-110

Bureau of Environmental Services

INF-7: Underground Infiltration

Underground infiltration is a vault or chamber with an open bottom that used to store runoff and percolate into the subsurface. A number of vendors offer proprietary infiltration products that allow for similar or enhanced rates of infiltration and subsurface storage while offering durable prefrabricated structures. There are many varieties of proprietary infiltration BMPs that can be used for roads and parking lots, parks and open spaces, single and multi-family residential, or mixed-use and commercial uses.

Also known as:

- *Infiltration vault*
- *Recharge vault*

Underground Infiltration

Source: http://www.contech-cpi.com

Feasibility Screening Considerations

- Infiltration bains shall pass infeasible screening criteria to be considered for use.
- Underground infiltration galleries pose a potential risk of groundwater contamination; pretreatment should be used.

Opportunity Criteria

- Soils are adequate for infiltration or can be amended to provide an adequate infiltration rate.
- Appropriate for sites with limited surface space.
- Can be placed beneath roads, parking lots, parks, and athletic fields.
- Potential for groundwater contamination can be mitigated through isolation of pollutant sources, pretreatment of inflow, and/or demonstration of adequate treatment capacity of underlying soils.
- Infiltration is into native soil, or depth of engineered fill is ≤ 5 feet from the bottom of the facility to native material and infiltration into fill is approved by a geotechnical professional.
- Tributary area land uses include mixed-use and commercial, sngle-family and multi-family, roads and parking lots, and parks and open spaces. High pollutant land uses should not be tributary to infiltration BMPs.

OC-Specific Design Criteria and Considerations

☐ Placement of BMPs should observe geotechnical recommendations with respect to geological hazards (e.g. landslides, liquefaction zones, erosion, etc.) and set-backs (e.g., foundations, utilities, roadways, etc.)

☐ Minimum separation to mounded seasonally high groundwater of 10 feet shall be observed.

☐ Minimum pretreatment should be provided upstream of the infiltration facility, and water bypassing pretreatment should <u>not</u> be directed to the facility.

☐ Underground infiltration should not be used for drainage areas with high sediment production potential unless preceded by full treatment control with a BMP effective for sediment removal.

☐ Design infiltration rate should be determined as described **in Appendix VII**.

☐ Inspection ports or similar design features shall be provided to verify continued system performance and identify need for major maintenance.

☐ For infiltration facilities beneath roads and parking areas, structural requirements should meet H-20 load requirements.

Computing Underground Infiltration Device Size

Underground infiltration devices vary by design and by proprietary designs. The sizing method selected for use must be based on the BMP type it most strongly resembles.

- For underground infiltration devices with open pore volume (e.g., vaults, crates, pipe sections, etc), sizing will be most similar to infiltration basins.
- For underground infiltration devices with pore space (e.g., aggregate reservoirs), sizing will be most similar to permeable pavement.

Additional References for Design Guidance

- Los Angeles Unified School District (LAUSD) Stormwater Technical Manual, Chapter 5: http://www.laschools.org/employee/design/fs-studies-and-reports/download/white_paper_report_material/Storm_Water_Technical_Manual_2009-opt-red.pdf?version_id=76975850

SECTION VII EDUCATIONAL MATERIALS

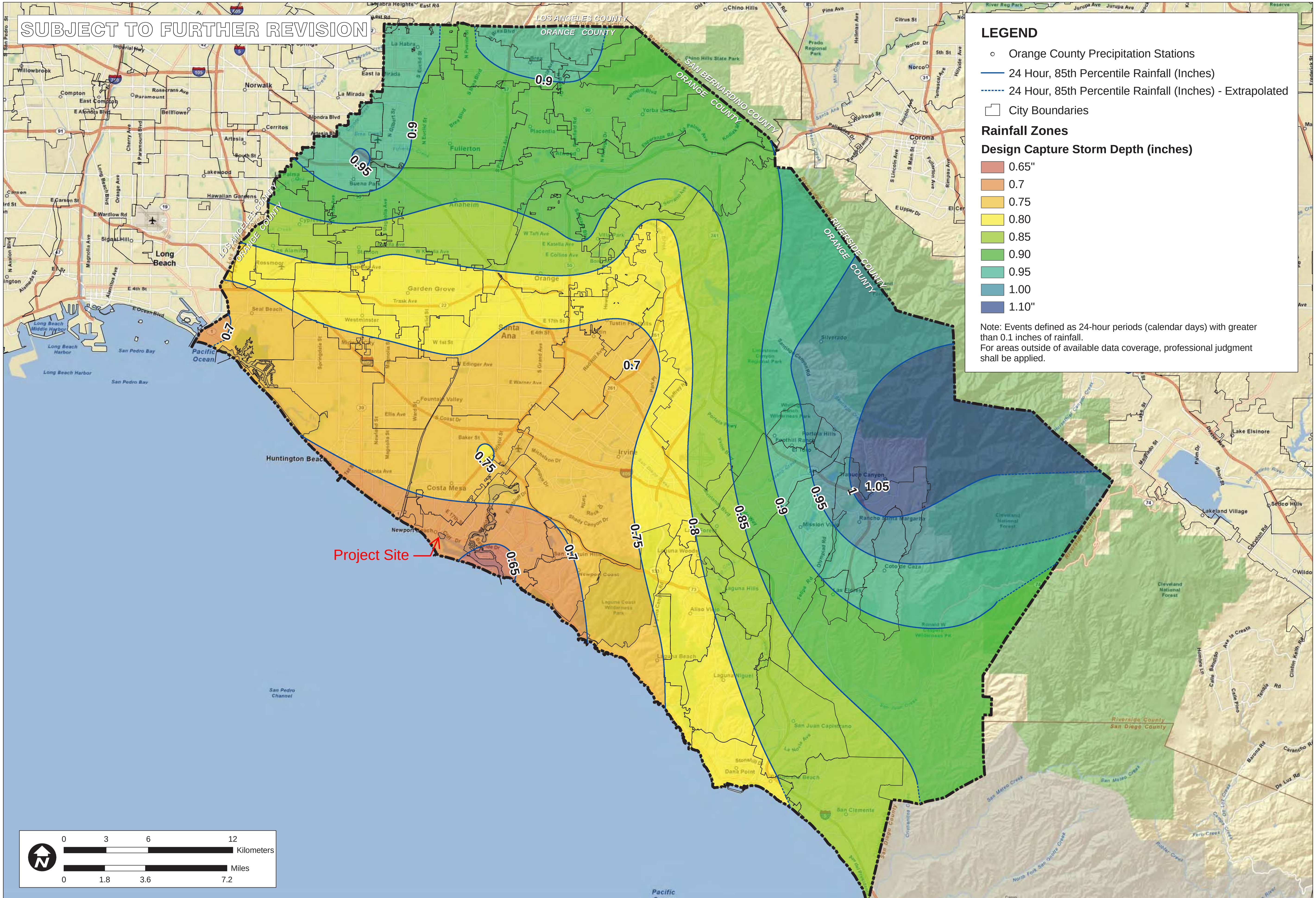
The educational materials included in this WQMP are provided to inform people involved in future uses, activities, or ownership of the site about the potential pitfalls associated with careless storm water management. "The Ocean Begins at Your Front Door" provides users with information about storm water that is/will be generated on site, what happens when water enters a storm drain, and its ultimate fate, discharging into the ocean. Also included are activities guidelines to educate anyone who is or will be associated with activities that have a potential to impact storm water runoff quality, and provide a menu of BMPs to effectively reduce the generation of storm water runoff pollutants from a variety of activities. The educational materials that may be used for the proposed project are included in Appendix C of this WQMP and are listed below.

EDUCATION MATERIALS			
Residential Materials (http://www.ocwatersheds.com)	**Check If Attached**	**Business Materials (http://www.ocwatersheds.com)**	**Check If Attached**
The Ocean Begins at Your Front Door	☒	Tips for the Automotive Industry	☐
Tips for Car Wash Fund-raisers	☐	Tips for Using Concrete and Mortar	☐
Tips for the Home Mechanic	☐	Tips for the Food Service Industry	☒
Homeowners Guide for Sustainable Water Use	☐	Proper Maintenance Practices for Your Business	☒
Household Tips	☐	**Other Materials (http://www.ocwatersheds.com) (http://www.cabmphandbooks.com)**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	☐		
Recycle at Your Local Used Oil Collection Center (North County)	☐	DF-1 Drainage System Operation & Maintenance	☒
Recycle at Your Local Used Oil Collection Center (Central County)	☒	IC-3 Building Maintenance	☒
Recycle at Your Local Used Oil Collection Center (South County)	☐	IC-7 Landscape Maintenance	☒
Tips for Maintaining Septic Tank Systems	☐	IC-16 Pool & Fountain Cleaning	☒
Responsible Pest Control	☒	IC-22 Eating & Drinking Establishments	☒
Sewer Spill	☒	SC-11 Spill Prevention, Control, Cleanup	☐
Tips for the Home Improvement Projects	☐	SC-34 Waste Handling & Disposal	☐
Tips for Horse Care	☐	SC-41 Building & Grounds Maintenance	☒
Tips for Landscaping and Gardening	☒	SC-43 Parking/Storage Area Maintenance	☒
Tips for Pet Care	☐	SD-10 Site Design & Landscape Planning	☒
Tips for Pool Maintenance	☒	SD-11 Roof Runoff Controls	☐
Tips for Residential Pool, Landscape and Hardscape Drains	☐	SD-12 Efficient Irrigation	☒
Tips for Projects Using Paint	☐	SD-13 Storm Drain Signage	☒
Tips for Protecting Your Watershed	☐	SD-31 Maintenance Bays & Docs	☐
Other: Children's Brochure	☐	SD-32 Trash Storage Areas	☒

APPENDICES

APPENDIX A

SUPPORTING CALCULATIONS



TITLE
RAINFALL ZONES

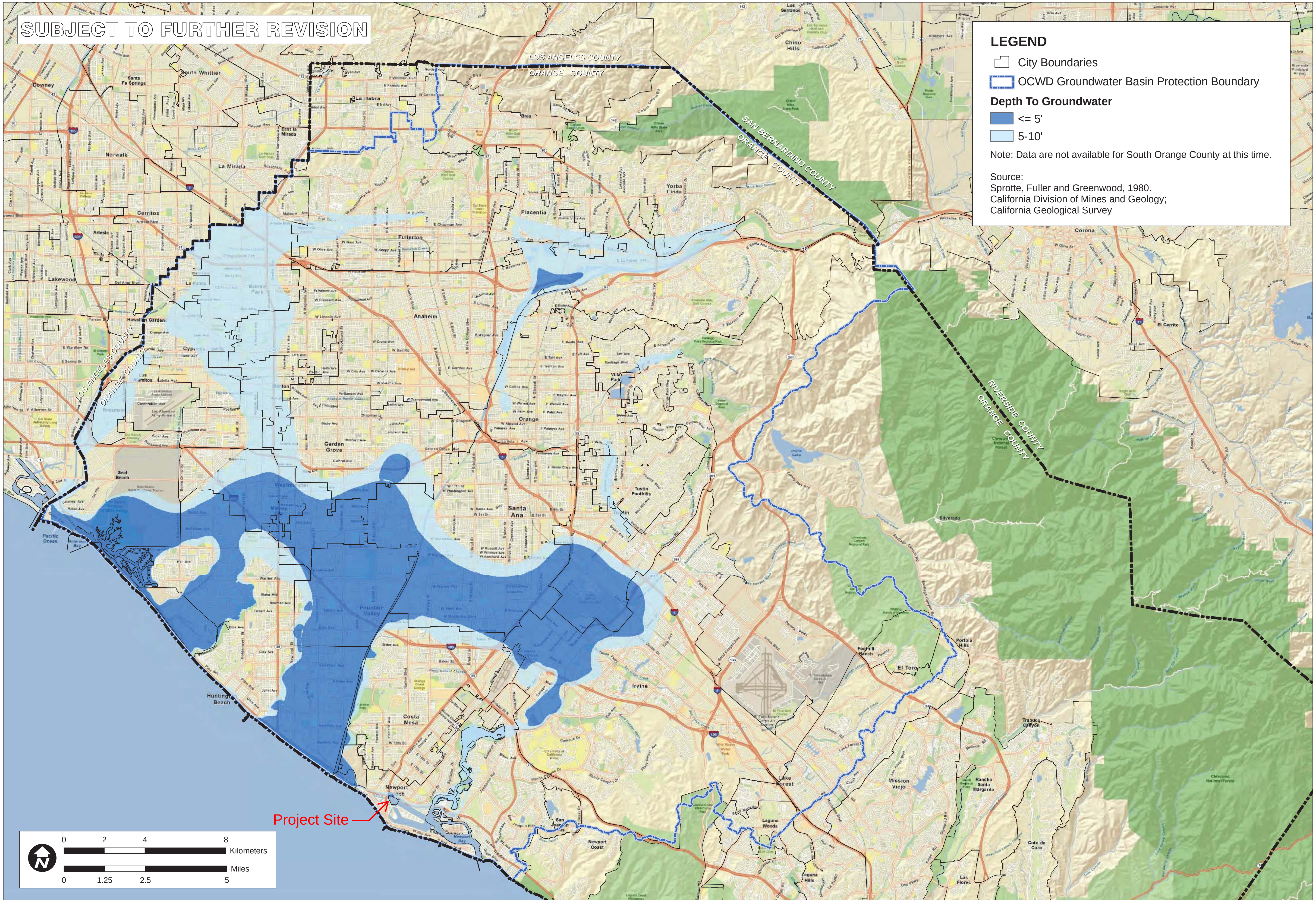
JOB
ORANGE COUNTY TECHNICAL GUIDANCE DOCUMENT
ORANGE CO. CA

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE
XVI-1

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-1_RainfallZones_20110215.mxd



P:\9526E16-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2e_DepthToGroundwaterLt5ft_20110215.mxd

TITLE: NORTH ORANGE COUNTY MAPPED SHALLOW GROUNDWATER

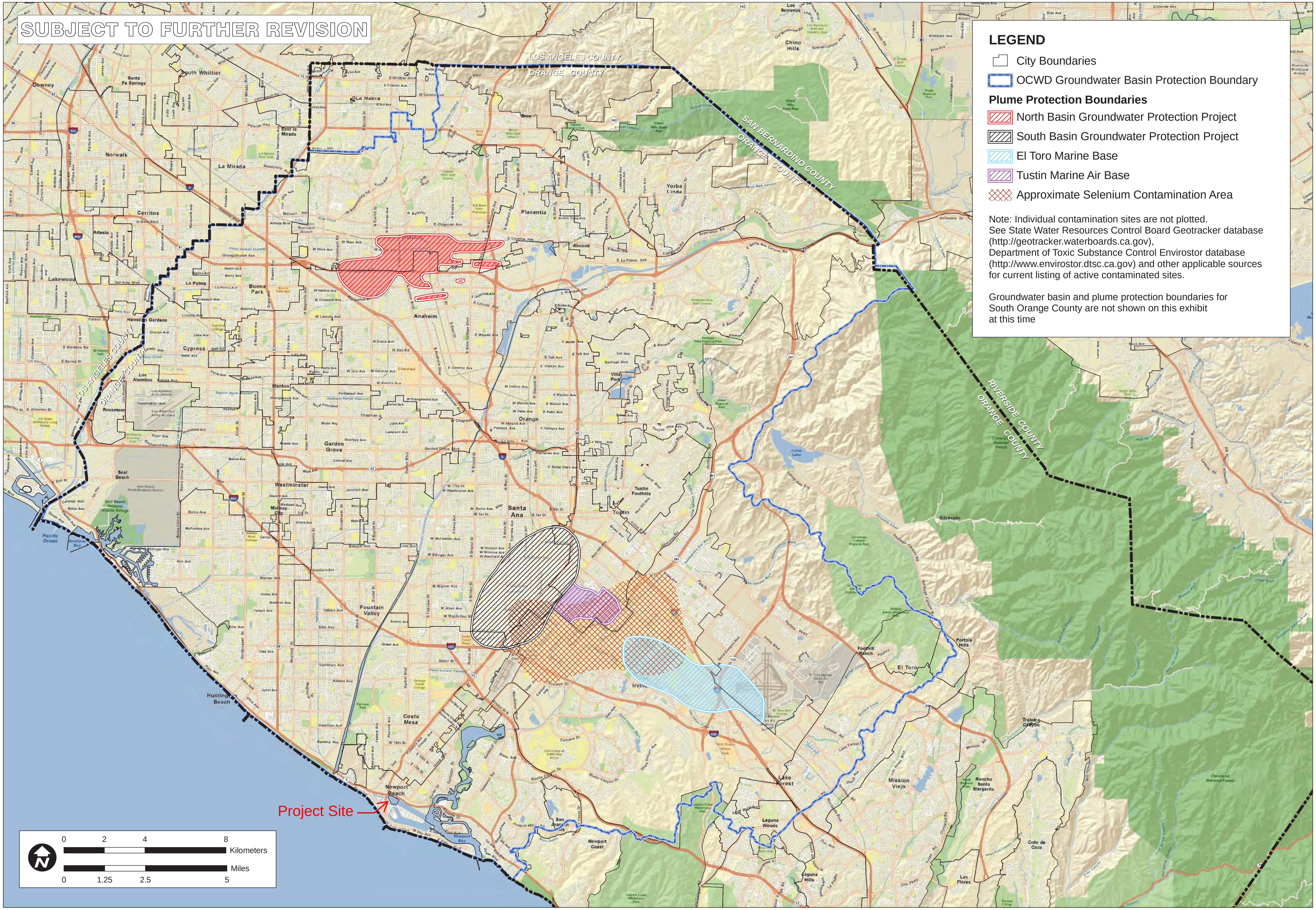
JOB: ORANGE COUNTY INFILTRATION STUDY

ORANGE CO. CA

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE XVI-2e



TITLE
NORTH ORANGE COUNTY GROUNDWATER PROTECTION AREAS

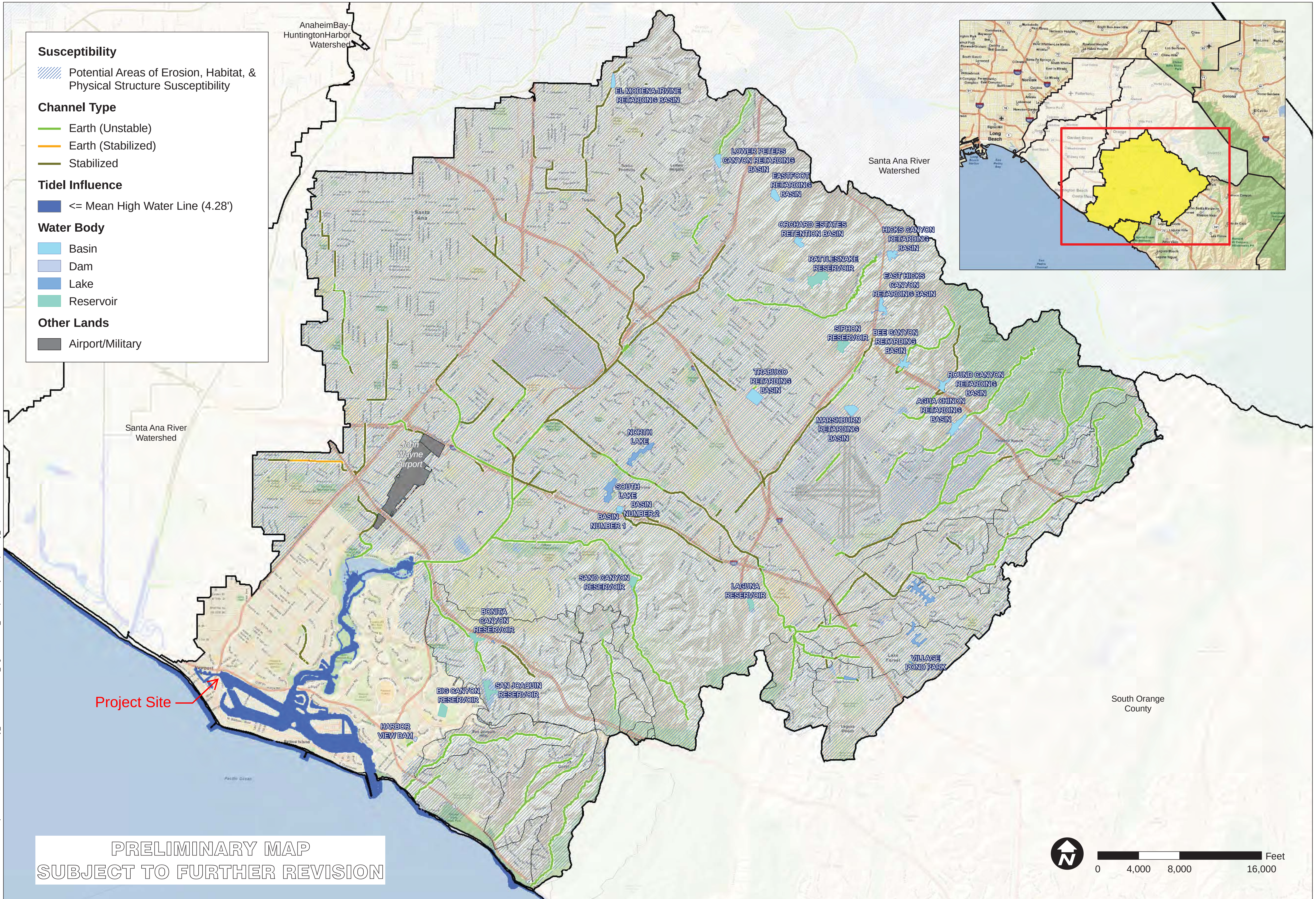
JOB
ORANGE COUNTY INFILTRATION STUDY
ORANGE CO. CA

SCALE	1" = 1.25 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/22/10
JOB NO.	9526-E

PACE Advanced Water Engineering

FIGURE
XVI-2f

P:\9528E16-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2f_NorthOCGroundwaterProtectionAreasStreetMap_20110215.mxd



TITLE

SUSCEPTIBILITY ANALYIS
NEWPORT BAY-
NEWPORT COASTAL STREAMS

JOB

ORANGE COUNTY
WATERSHED
MASTER PLANNING

ORANGE CO. CA

SCALE	1" = 4000'
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	04/30/10
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-3d

P:\9526E\6-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-3d_NewportBaySusceptibility_20100430.mxd

Table 2.7: Infiltration BMP Feasibility Worksheet

<table>
<tr><th></th><th>Infeasibility Criteria</th><th>Yes</th><th>No</th></tr>
<tr><td>1</td><td>Would Infiltration BMPs pose significant risk for groundwater related concerns? Refer to Appendix VII (Worksheet I) for guidance on groundwater-related infiltration feasibility criteria.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:

Due to the low elevation of the project site and proximity to the Lower Newport Bay, water table elevations in the vicinity of the site are affected and fluctuate by the tides and consist primarily of seawater. Groundwater in the vicinity of the site is not subject to drinking water standards (excepted from MUN beneficial use in the Basin Plan).

Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>2</td><td>Would Infiltration BMPs pose significant risk of increasing risk of geotechnical hazards that cannot be mitigated to an acceptable level? (Yes if the answer to any of the following questions is yes, as established by a geotechnical expert):
The BMP can only be located less than 50 feet away from slopes steeper than 15 percent
The BMP can only be located less than eight feet from building foundations or an alternative setback.
A study prepared by a geotechnical professional or an available watershed study substantiates that stormwater infiltration would potentially result in significantly increased risks of geotechnical hazards that cannot be mitigated to an acceptable level.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:

Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>3</td><td>Would infiltration of the DCV from drainage area violate downstream water rights?</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:

Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
</table>

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

<table>
<tr><th></th><th>Partial Infeasibility Criteria</th><th>Yes</th><th>No</th></tr>
<tr><td>4</td><td>Is proposed infiltration facility located on HSG D soils or the site geotechnical investigation identifies presence of soil characteristics which support categorization as D soils?</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:

According to the OC Hydrology Manual, soils on the project site are considered Type A. on-site geotechnical studies classified on-site soils consist primarily of sands and silty sands.

Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>5</td><td>Is measured infiltration rate below proposed facility less than 0.3 inches per hour? This calculation shall be based on the methods described in Appendix VII.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:

Measured infiltration rates range between 1.4 in/hr and 12.3 in/hr. See Appendix F for details.

Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>6</td><td>Would reduction of over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:

Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>7</td><td>Would an increase in infiltration over predeveloped conditions cause impairments to downstream beneficial uses, such as change of seasonality of ephemeral washes or increased discharge of contaminated groundwater to surface waters?</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible:

Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
</table>

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

Infiltration Screening Results (check box corresponding to result):		
8	Is there substantial evidence that infiltration from the project would result in a significant increase in I&I to the sanitary sewer that cannot be sufficiently mitigated? (See Appendix XVII) Provide narrative discussion and supporting evidence: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.	No
9	If any answer from row 1-3 is yes: infiltration of any volume is **not feasible** within the DMA or equivalent. Provide basis: Summarize findings of infeasibility screening	None
10	If any answer from row 4-7 is yes, infiltration is **permissible but is not presumed to be feasible for the entire DCV.** Criteria for designing biotreatment BMPs to achieve the maximum feasible infiltration and ET shall apply. Provide basis: Summarize findings of infeasibility screening	None
11	If all answers to rows 1 through 11 are no, infiltration of the full DCV is potentially feasible, BMPs must be designed to infiltrate the full DCV to the maximum extent practicable.	Infiltration is considered Feasible.

Worksheet B: Simple Design Capture Volume Sizing Method

Project: Lido House Hotel

Date: 1/16/2014

			TOTAL TRIBUTARY	
Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.70	inches
2	Enter the effect of provided HSCs, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
3	Calculate the remainder of the design capture storm depth, $d_{remainder}$ (inches) (Line 1 – Line 2)	$d_{remainder}$=	0.70	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP (s), *A* (acres)	A=	4.1960	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	90.0%	%
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.8250	
4	Calculate runoff volume, $V_{design} = (C \times d_{remainder} \times A \times 43560 \times (1/12))$	V_{design}=	8,796.2	cu-ft
Step 3: Design BMPs to ensure full retention of the DCV				
Step 3a: Determine design infiltration rate				
1	Enter measured infiltration rate, $K_{measured}$ (in/hr) (Appendix VII)	$K_{measured}$=	Safety Factor = 2 (provided by geotechnical consultant)	in/hr
2	Enter combined safety factor from Worksheet H, S_{final} (unitless)	S_{final}=		
3	Calculate design infiltration rate, $K_{design} = K_{measured} / S_{final}$	K_{design}=		in/hr
Step 3b: Determine minimum BMP footprint				
4	Enter drawdown time, *T* (max 48 hours)	T=	See Worksheet C for BMP Design Details	hours
5	Calculate max retention depth that can be drawn down within the drawdown time (feet), $D_{max} = K_{design} \times T \times (1/12)$	D_{max}=		feet
6	Calculate minimum area required for BMP (sq-ft), $A_{min} = V_{design} / d_{max}$	A_{min}=		sq-ft
Describe System: *See Worksheet C (4 sheets)*				

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

Project: Lido House Hotel

Date: 1/16/2014

			Infiltration Gallery A1	
Step 1: Determine the design capture storm depth used for calculating volume				
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.70	inches
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours)	T=	3.00	hours
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=	0.25	
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	inches
5	Enter capture efficiency corresponding to d_{HSC}, $Y_{2\ (Worksheet\ A)}$	Y_2=	0%	%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency (Y_2), X_2	X_2=	0	
7	Calculate the fraction of design volume that must be provided by BMP, *fraction* = $X_1 - X_2$	fraction=	0.25	
8	Calculate the resultant design capture storm depth (inches), $d_{fraction}$ = *fraction* × *d*	$d_{fraction}$=	0.1750	inches
Step 2: Calculate the DCV				
1	Enter Project area tributary to BMP(s), *A* (acres)	A=	0.8240	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	90.0%	%
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.8250	
4	Calculate runoff volume, $V_{design} = (C \times d_{rfraction} \times A \times 43560 \times (1/12))$	V_{design}=	431.8	cu-ft
Supporting Calculations				
Describe System:				
	Infiltration Bed (INF-2)		*A1*	
	Gravel Storage Depth (d_T) =		*1.5*	ft
	Porosity (n) =		*40%*	
	Design Infiltration Rate (K_{design}) =		*6.15*	in/hr
	Surface Area Needed (Amin) =		*719.7*	ft^2
	BMP Length =		*50.0*	ft
	BMP Width =		*15.0*	ft
	Surface Area Provided (A) =		*750*	ft^2
	Total Volume Infiltrated (V) =		*450*	ft^3
Provide drawdown time calculations per applicable BMP Fact Sheet:				
	Per Fact Sheet BIO-1, Drawdown (T) = $(d_p / K_{design}) \times 12$	*Drawdown (T) =*	*3.00*	hours

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

Project: Lido House Hotel

Date: 1/16/2014

			Infiltration Trench Drains		
			A3.1	**C1.1**	
Step 1: Determine the design capture storm depth used for calculating volume					
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.70	0.70	inches
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours)	T=	3.00	3.00	hours
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=	0.25	0.25	
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	0	inches
5	Enter capture efficiency corresponding to d_{HSC}, Y_2 *(Worksheet A)*	Y_2=	0%	0%	%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency (Y_2), X_2	X_2=	0	0	
7	Calculate the fraction of design volume that must be provided by BMP, *fraction* = $X_1 - X_2$	fraction=	0.25	0.25	
8	Calculate the resultant design capture storm depth (inches), $d_{fraction}$ = *fraction* × *d*	$d_{fraction}$=	0.1750	0.1750	inches
Step 2: Calculate the DCV					
1	Enter Project area tributary to BMP(s), *A* (acres)	A=	0.5400	0.3630	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	90.0%	90.0%	%
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.8250	0.8250	
4	Calculate runoff volume, V_{design} = $(C \times d_{rfraction} \times A \times 43560 \times (1/12))$	V_{design}=	283.0	190.2	cu-ft
Supporting Calculations					
Describe System:					
		Infiltration Trench Drain (INF-2)	*A3.1*	*C1.1*	
		Gravel Storage Depth (d_T) =	*1.5*	*1.5*	ft
		Porosity (n) =	*40%*	*40%*	
		Design Infiltration Rate (K_{design}) =	*6.15*	*6.15*	in/hr
		Surface Area Needed (Amin) =	*471.7*	*317.1*	ft^2
		BMP Length =	*253.0*	*180.0*	ft
		BMP Width =	*2.0*	*2.0*	ft
		Surface Area Provided (A) =	*506*	*360*	ft^2
		Total Volume Infiltrated (V) =	*303.6*	*216*	ft^3
Provide drawdown time calculations per applicable BMP Fact Sheet:					
	Per Fact Sheet BIO-1, Drawdown (T) = $(d_p / K_{design}) \times 12$	*Drawdown (T)* =	*3.00*	*3.00*	hours

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

Project: Lido House Hotel

Date: 1/16/2014

			Pervious Pavement BMPs							
			A2.1	B1	B2	B3.2	D1	D2	F1	
Step 1: Determine the design capture storm depth used for calculating volume										
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.70	0.70	0.70	0.70	0.70	0.70	0.70	inches
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours)	T=	3.00	6.86	6.86	6.86	6.86	6.86	3.00	hours
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=	0.25	0.40	0.40	0.40	0.40	0.40	0.25	
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	0	0	0	0	0	0	inches
5	Enter capture efficiency corresponding to d_{HSC}, $Y_{2\ (Worksheet\ A)}$	Y_2=	0%	0%	0%	0%	0%	0%	0%	%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency (Y_2), X_2	X_2=	0	0	0	0	0	0	0	
7	Calculate the fraction of design volume that must be provided by BMP, *fraction* = $X_1 - X_2$	fraction=	0.25	0.40	0.40	0.40	0.40	0.40	0.25	
8	Calculate the resultant design capture storm depth (inches), $d_{fraction} = fraction \times d$	$d_{fraction}$=	0.1750	0.2800	0.2800	0.2800	0.2800	0.2800	0.1750	inches
Step 2: Calculate the DCV										
1	Enter Project area tributary to BMP(s), *A* (acres)	A=	0.4880	0.4470	0.2060	0.2120	0.1210	0.0520	0.5340	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	90.0%	%
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	0.8250	
4	Calculate runoff volume, $V_{design} = (C \times d_{rfraction} \times A \times 43560 \times (1/12))$	V_{design}=	255.8	374.8	172.7	177.8	101.5	43.6	279.9	cu-ft
Supporting Calculations										
Describe System:										
		Pervious Pavement (INF-6)	*A2.1*	*B1*	*B2*	*B3.2*	*D1*	*D2*	*F1*	
		Gravel Storage Depth (d_T) =	*1*	*1*	*1*	*1*	*1*	*1*	*1*	ft
		Porosity (n) =	*40%*	*40%*	*40%*	*40%*	*40%*	*40%*	*40%*	
		Design Infiltration Rate (K_{design}) =	*6.15*	*0.7*	*0.7*	*0.7*	*0.7*	*0.7*	*6.15*	in/hr
		Surface Area Needed (Amin) =	*639.4*	*937.1*	*431.8*	*444.4*	*253.7*	*109.0*	*699.6*	ft^2
		Surface Area Provided (A) =	*3221*	*4919*	*0*	*1053*	*3914*	*1976*	*4211*	ft^2
		Total Volume Infiltrated (V) =	*1288.4*	*1967.6*	*0*	*421.2*	*1565.6*	*790.4*	*1684.4*	ft^3
Provide drawdown time calculations per applicable BMP Fact Sheet:										
	Per Fact Sheet BIO-1, Drawdown $(T) = (d_p / K_{design}) \times 12$	*Drawdown (T) =*	*3.00*	*6.86*	*6.86*	*6.86*	*6.86*	*6.86*	*3.00*	hours

Worksheet C: Capture Efficiency Method for Volume-Based, Constant Drawdown BMPs

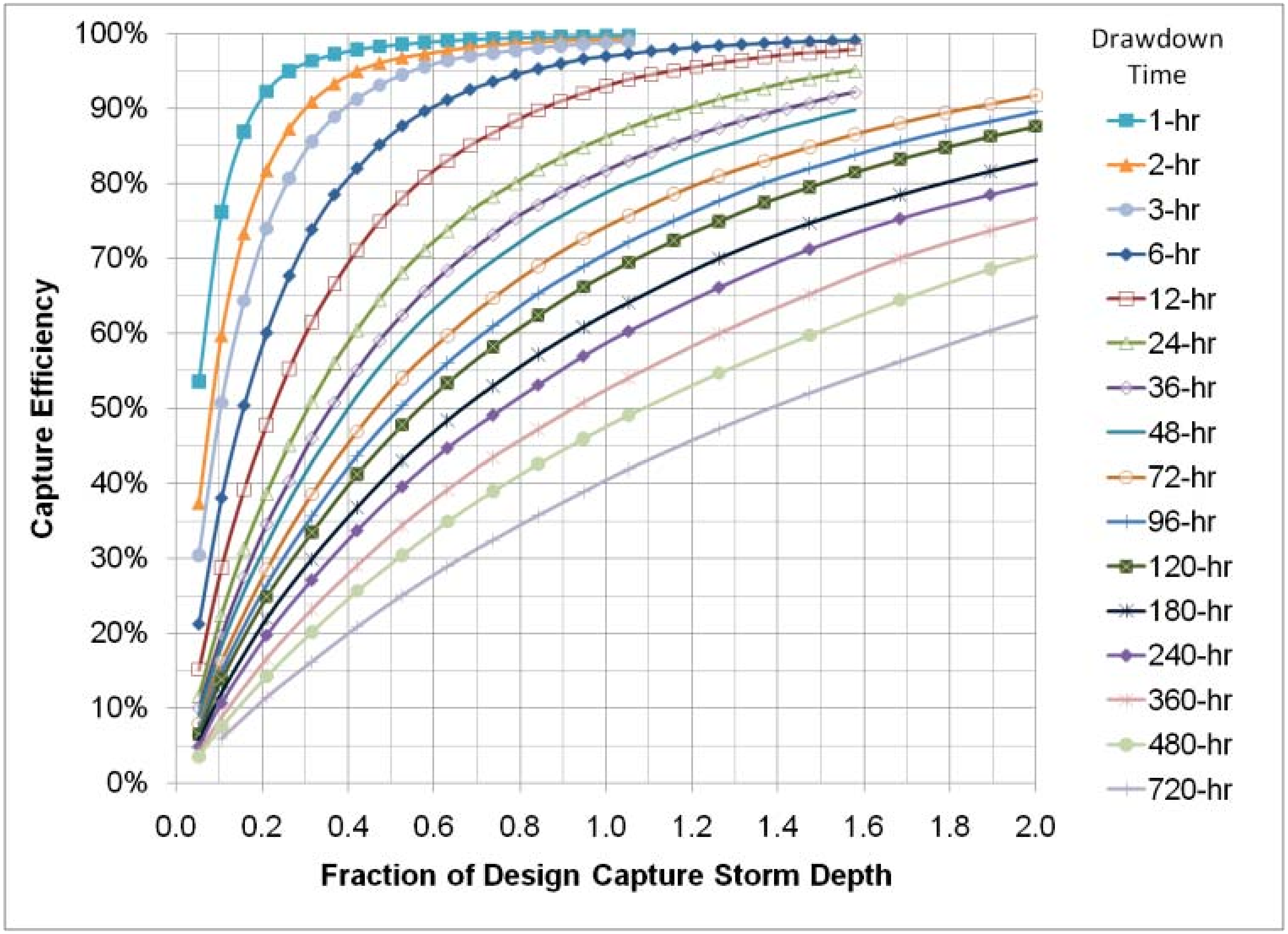
Project: Lido House Hotel

Date: 1/16/2014

Infiltration Planter BMPs

			B3.1	D3.1	
Step 1: Determine the design capture storm depth used for calculating volume					
1	Enter design capture storm depth from Figure III.1, *d* (inches)	d=	0.70	0.70	inches
2	Enter calculated drawdown time of the proposed BMP based on equation provided in applicable BMP Fact Sheet, *T* (hours)	T=	15.43	15.43	hours
3	Using Figure III.2, determine the "fraction of design capture storm depth" at which the BMP drawdown time (T) line achieves 80% capture efficiency, X_1	X_1=	0.62	0.62	
4	Enter the effect depth of provided HSCs upstream, d_{HSC} (inches) (Worksheet A)	d_{HSC}=	0	0	inches
5	Enter capture efficiency corresponding to d_{HSC}, $Y_{2\ (Worksheet\ A)}$	Y_2=	0%	0%	%
6	Using Figure III.2, determine the fraction of "design capture storm depth" at which the drawdown time (T) achieves the equivalent of the upstream capture efficiency (Y_2), X_2	X_2=	0	0	
7	Calculate the fraction of design volume that must be provided by BMP, *fraction* = $X_1 - X_2$	fraction=	0.62	0.62	
8	Calculate the resultant design capture storm depth (inches), $d_{fraction}$ = *fraction* × *d*	$d_{fraction}$=	0.4340	0.4340	inches
Step 2: Calculate the DCV					
1	Enter Project area tributary to BMP(s), *A* (acres)	A=	0.1730	0.0880	acres
2	Enter Project Imperviousness, *imp* (unitless)	imp=	90.0%	90.0%	%
3	Calculate runoff coefficient, *C= (0.75 x imp) + 0.15*	C=	0.8250	0.8250	
4	Calculate runoff volume, $V_{design} = (C \times d_{rfraction} \times A \times 43560 \times (1/12))$	V_{design}=	224.9	114.4	cu-ft
Supporting Calculations					
Describe System:					
		Bioinfiltration (INF-4)	*B3.1*	*D3.1*	
		Gravel Storage Depth (d_T) =	*1*	*1*	ft
		Porosity (n) =	*40%*	*40%*	
		Ponding Depth (d_P) =	*0.5*	*0.5*	ft
		Effective Depth =	*0.9*	*0.9*	ft
		Design Infiltration Rate (K_{design}) =	*0.7*	*0.7*	in/hr
		Surface Area Needed (Amin) =	*249.8*	*127.1*	ft^2
		BMP Length =	*52.0*	*47.0*	ft
		BMP Width =	*5.0*	*3.0*	ft
		Surface Area Provided (A) =	*260*	*141*	ft^2
		Total Volume Infiltrated (V) =	*234.0*	*126.9*	ft^3
Provide drawdown time calculations per applicable BMP Fact Sheet:					
	Per Fact Sheet BIO-1, Drawdown (T) = (d_p / K_{design}) x 12	*Drawdown (T) =*	*15.43*	*15.43*	hours

Figure III.2. Capture Efficiency Nomograph for Constant Drawdown Systems in Orange County



APPENDIX B

NOTICE OF TRANSFER OF RESPONSIBILITY

NOTICE OF TRANSFER OF RESPONSIBILITY

WATER QUALITY MANAGEMENT PLAN

Lido House Hotel
3300 Newport Boulevard, Newport Beach, CA

Submission of this Notice Of Transfer of Responsibility constitutes notice to the City of Newport Beach that responsibility for the Water Quality Management Plan ("WQMP") for the subject property identified below, and implementation of that plan, is being transferred from the Previous Owner (and his/her agent) of the site (or a portion thereof) to the New Owner, as further described below.

I. Previous Owner/ Previous Responsible Party Information

Company/ Individual Name:		Contact Person:	
Street Address:		Title:	
City:	State:	ZIP:	Phone:

II. Information about Site Transferred

Name of Project (if applicable):	
Title of WQMP Applicable to site:	
Street Address of Site (if applicable):	
Planning Area (PA) and/ or Tract Number(s) for Site:	Lot Numbers (if Site is a portion of a tract):
Date WQMP Prepared (and revised if applicable):	

III. New Owner/ New Responsible Party Information

Company/ Individual Name:		Contact Person:	
Street Address:		Title:	
City:	State:	ZIP:	Phone:

IV. Ownership Transfer Information

General Description of Site Transferred to New Owner:	General Description of Portion of Project/ Parcel Subject to WQMP Retained by Owner (if any):

Lot/ Tract Numbers of Site Transferred to New Owner:
Remaining Lot/ Tract Numbers Subject to WQMP Still Held by Owner (if any):
Date of Ownership Transfer:

Note: When the Previous Owner is transferring a Site that is a portion of a larger project/ parcel addressed by the WQMP, as opposed to the entire project/parcel addressed by the WQMP, the General Description of the Site transferred and the remainder of the project/ parcel no transferred shall be set forth as maps attached to this notice. These maps shall show those portions of a project/ parcel addressed by the WQMP that are transferred to the New Owner (the Transferred Site), those portions retained by the Previous Owner, and those portions previously transferred by Previous Owner. Those portions retained by Previous Owner shall be labeled as "Previously Transferred".

V. Purpose of Notice of Transfer

The purposes of this Notice of Transfer of Responsibility are: 1) to track transfer of responsibility for implementation and amendment of the WQMP when property to which the WQMP is transferred from the Previous Owner to the New Owner, and 2) to facilitate notification to a transferee of property subject to a WQMP that such New Order is now the Responsible Party of record for the WQMP for those portions of the site that it owns.

VI. Certifications

A. Previous Owner

I certify under penalty of law that I am no longer the owner of the Transferred Site as described in Section II above. I have provided the New Owner with a copy of the WQMP applicable to the Transferred Site that the New Owner is acquiring from the Previous Owner.

Printed Name of Previous Owner Representative:	Title:
Signature of Previous Owner Representative:	Date:

B. New Owner

I certify under penalty of law that I am the owner of the Transferred Site, as described in Section II above, that I have been provided a copy of the WQMP, and that I have informed myself and understand the New Owner's responsibilities related to the WQMP, its implementation, and Best Management Practices associated with it. I understand that by signing this notice, the New Owner is accepting all ongoing responsibilities for implementation and amendment of the WQMP for the Transferred Site, which the New Owner has acquired from the Previous Owner.

Printed Name of New Owner Representative:	Title:
Signature:	Date:

APPENDIX C

EDUCATIONAL MATERIALS

The Ocean Begins at Your Front Door

Even if you live miles from the Pacific Ocean, you may be unknowingly polluting it.

Dumping one quart of motor oil into a storm drain can contaminate 250,000 gallons of water.

Did You Know?

- Most people believe that the largest source of water pollution in urban areas comes from specific sources such as factories and sewage treatment plants. In fact, the largest source of water pollution comes from city streets, neighborhoods, construction sites and parking lots. This type of pollution is sometimes called "non-point source" pollution.
- There are two types of non-point source pollution: stormwater and urban runoff pollution.
- Stormwater runoff results from rainfall. When rainstorms cause large volumes of water to rinse the urban landscape, picking up pollutants along the way.
- Urban runoff can happen any time of the year when excessive water use from irrigation, vehicle washing and other sources carries trash, lawn clippings and other urban pollutants into storm drains.

Where Does It Go?

- Anything we use outside homes, vehicles and businesses – like motor oil, paint, pesticides, fertilizers and cleaners – can be blown or washed into storm drains.
- A little water from a garden hose or rain can also send materials into storm drains.
- Storm drains are separate from our sanitary sewer systems; unlike water in sanitary sewers (from sinks or toilets), water in storm drains is not treated before entering our waterways.

Sources of Non-Point Source Pollution

- Automotive leaks and spills.
- Improper disposal of used oil and other engine fluids.
- Metals found in vehicle exhaust, weathered paint, rust, metal plating and tires.
- Pesticides and fertilizers from lawns, gardens and farms.
- Improper disposal of cleaners, paint and paint removers.
- Soil erosion and dust debris from landscape and construction activities.
- Litter, lawn clippings, animal waste, and other organic matter.
- Oil stains on parking lots and paved surfaces.

The Effect on the Ocean

Non-point source pollution can have a serious impact on water quality in Orange County. Pollutants from the storm drain system can harm marine life as well as coastal and wetland habitats. They can also degrade recreation areas such as beaches, harbors and bays.

Stormwater quality management programs have been developed throughout Orange County to educate and encourage the public to protect water quality, monitor runoff in the storm drain system, investigate illegal dumping and maintain storm drains.

Support from Orange County residents and businesses is needed to improve water quality and reduce urban runoff pollution. Proper use and disposal of materials will help stop pollution before it reaches the storm drain and the ocean.

For More Information

California Environmental Protection Agency
www.calepa.ca.gov

- **Air Resources Board**
  www.arb.ca.gov
- **Department of Pesticide Regulation**
  www.cdpr.ca.gov
- **Department of Toxic Substances Control**
  www.dtsc.ca.gov
- **Integrated Waste Management Board**
  www.ciwmb.ca.gov
- **Office of Environmental Health Hazard Assessment**
  www.oehha.ca.gov
- **State Water Resources Control Board**
  www.waterboards.ca.gov

Earth 911 - Community-Specific Environmental Information 1-800-cleanup or visit www.1800cleanup.org

Health Care Agency's Ocean and Bay Water Closure and Posting Hotline
(714) 433-6400 or visit www.ocbeachinfo.com

Integrated Waste Management Dept. of Orange County (714) 834-6752 or visit www.oclandfills.com for information on household hazardous waste collection centers, recycling centers and solid waste collection

O.C. Agriculture Commissioner
(714) 447-7100 or visit www.ocagcomm.com

Stormwater Best Management Practice Handbook
Visit www.cabmphandbooks.com

UC Master Gardener Hotline
(714) 708-1646 or visit www.uccemg.com

The Orange County Stormwater Program has created and moderates an electronic mailing list to facilitate communications, take questions and exchange ideas among its users about issues and topics related to stormwater and urban runoff and the implementation of program elements. To join the list, please send an email to ocstormwaterinfo-join@list.ocwatersheds.com

Orange County Stormwater Program

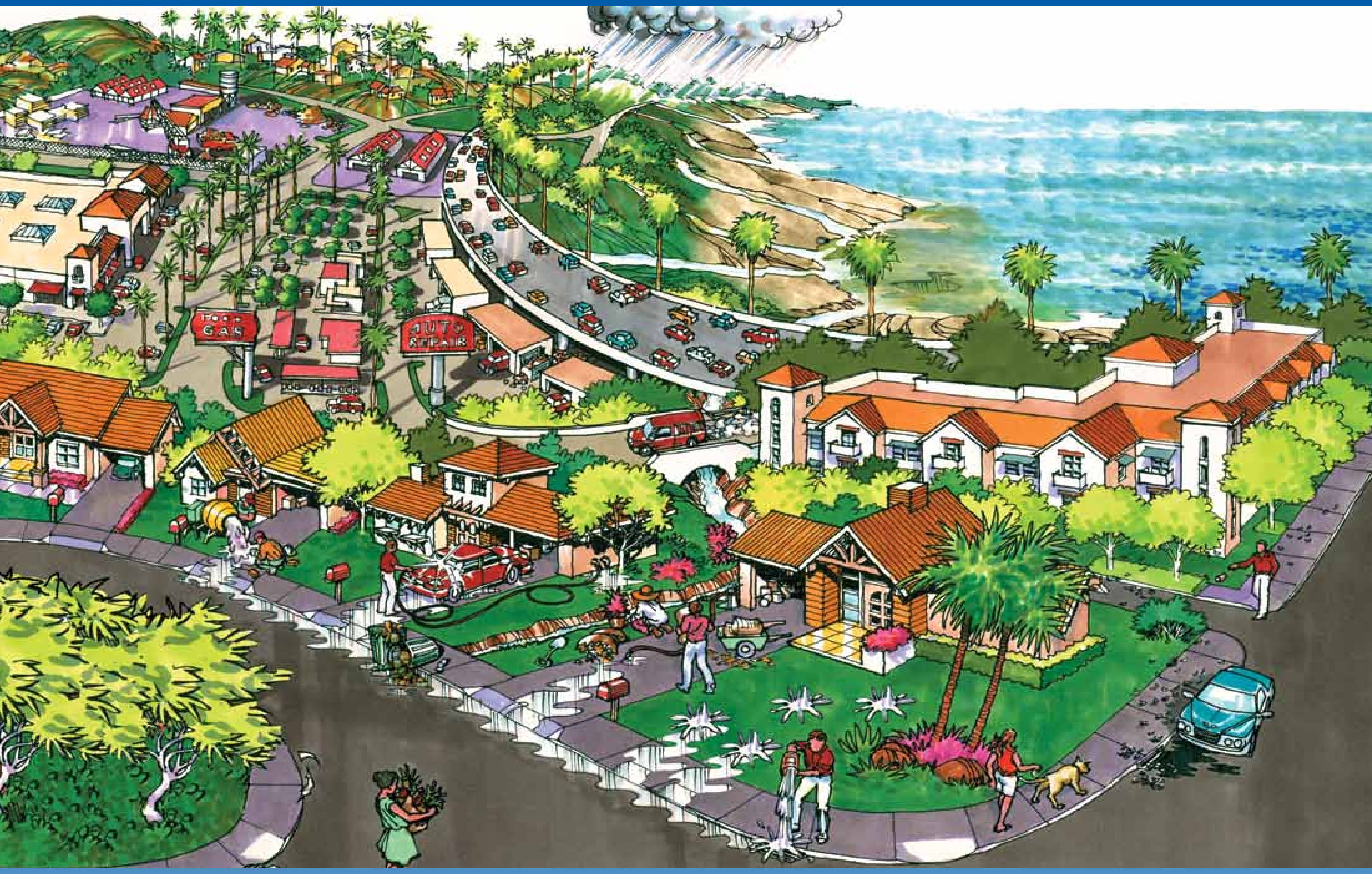
Aliso Viejo	(949)	425-2535
Anaheim Public Works Operations	(714)	765-6860
Brea Engineering	(714)	990-7666
Buena Park Public Works	(714)	562-3655
Costa Mesa Public Services	(714)	754-5323
Cypress Public Works	(714)	229-6740
Dana Point Public Works	(949)	248-3584
Fountain Valley Public Works	(714)	593-4441
Fullerton Engineering Dept.	(714)	738-6853
Garden Grove Public Works	(714)	741-5956
Huntington Beach Public Works	(714)	536-5431
Irvine Public Works	(949)	724-6315
La Habra Public Services	(562)	905-9792
La Palma Public Works	(714)	690-3310
Laguna Beach Water Quality	(949)	497-0378
Laguna Hills Public Services	(949)	707-2650
Laguna Niguel Public Works	(949)	362-4337
Laguna Woods Public Works	(949)	639-0500
Lake Forest Public Works	(949)	461-3480
Los Alamitos Community Dev.	(562)	431-3538
Mission Viejo Public Works	(949)	470-3056
Newport Beach, Code & Water Quality Enforcement	(949)	644-3215
Orange Public Works	(714)	532-6480
Placentia Public Works	(714)	993-8245
Rancho Santa Margarita	(949)	635-1800
San Clemente Environmental Programs	(949)	361-6143
San Juan Capistrano Engineering	(949)	234-4413
Santa Ana Public Works	(714)	647-3380
Seal Beach Engineering	(562)	431-2527 x317
Stanton Public Works	(714)	379-9222 x204
Tustin Public Works/Engineering	(714)	573-3150
Villa Park Engineering	(714)	998-1500
Westminster Public Works/Engineering	(714)	898-3311 x446
Yorba Linda Engineering	(714)	961-7138
Orange County Stormwater Program	(877)	897-7455

Orange County 24-Hour
Water Pollution Problem Reporting Hotline
1-877-89-SPILL (1-877-897-7455)

On-line Water Pollution Problem Reporting Form
www.ocwatersheds.com

Printed on Recycled Paper

The Ocean Begins at Your Front Door



Never allow pollutants to enter the street, gutter or storm drain!

Follow these simple steps to help reduce water pollution:

Household Activities

- Do not rinse spills with water. Use dry cleanup methods such as applying cat litter or another absorbent material, sweep and dispose of in the trash. Take items such as used or excess batteries, oven cleaners, automotive fluids, painting products and cathode ray tubes, like TVs and computer monitors, to a Household Hazardous Waste Collection Center (HHWCC).
- For a HHWCC near you call (714) 834-6752 or visit www.oclandfills.com.
- Do not hose down your driveway, sidewalk or patio to the street, gutter or storm drain. Sweep up debris and dispose of it in the trash.

Automotive

- Take your vehicle to a commercial car wash whenever possible. If you wash your vehicle at home, choose soaps, cleaners, or detergents labeled non-toxic, phosphate- free or biodegradable. Vegetable and citrus-based products are typically safest for the environment.
- Do not allow washwater from vehicle washing to drain into the street, gutter or storm drain. Excess washwater should be disposed of in the sanitary sewer (through a sink or toilet) or onto an absorbent surface like your lawn.
- Monitor your vehicles for leaks and place a pan under leaks. Keep your vehicles well maintained to stop and prevent leaks.
- Never pour oil or antifreeze in the street, gutter or storm drain. Recycle these substances at a service station, a waste oil collection center or used oil recycling center. For the nearest Used Oil Collection Center call 1-800-CLEANUP or visit www.1800cleanup.org.

Pool Maintenance

- Pool and spa water must be dechlorinated and free of excess acid, alkali or color to be allowed in the street, gutter or storm drain.
- When it is not raining, drain dechlorinated pool and spa water directly into the sanitary sewer.
- Some cities may have ordinances that do not allow pool water to be disposed of in the storm drain. Check with your city.

Landscape and Gardening

- Do not over-water. Water your lawn and garden by hand to control the amount of water you use or set irrigation systems to reflect seasonal water needs. If water flows off your yard onto your driveway or sidewalk, your system is over-watering. Periodically inspect and fix leaks and misdirected sprinklers.
- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of waste by composting, hauling it to a permitted landfill, or as green waste through your city's recycling program.
- Follow directions on pesticides and fertilizer, (measure, do not estimate amounts) and do not use if rain is predicted within 48 hours.
- Take unwanted pesticides to a HHWCC to be recycled. For locations and hours of HHWCC, call (714) 834-6752 or visit www.oclandfills.com.

Trash

- Place trash and litter that cannot be recycled in securely covered trash cans.
- Whenever possible, buy recycled products.
- Remember: Reduce, Reuse, Recycle.

Pet Care

- Always pick up after your pet. Flush waste down the toilet or dispose of it in the trash. Pet waste, if left outdoors, can wash into the street, gutter or storm drain.
- If possible, bathe your pets indoors. If you must bathe your pet outside, wash it on your lawn or another absorbent/permeable surface to keep the washwater from entering the street, gutter or storm drain.
- Follow directions for use of pet care products and dispose of any unused products at a HHWCC.

Common Pollutants

Home Maintenance

- Detergents, cleaners and solvents
- Oil and latex paint
- Swimming pool chemicals
- Outdoor trash and litter

Lawn and Garden

- Pet and animal waste
- Pesticides
- Clippings, leaves and soil
- Fertilizer

Automobile

- Oil and grease
- Radiator fluids and antifreeze
- Cleaning chemicals
- Brake pad dust

Help Prevent Ocean Pollution:

Recycle at Your Local Used Oil Collection Center

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

CENTRAL COUNTY

Did you know that just one quart of oil can pollute 250,000 gallons of water?

A clean ocean and healthy creeks, rivers, bays and beaches are important to Orange County. However, not properly disposing of used oil can lead to water pollution. If you pour or drain oil onto driveways, sidewalks or streets, it can be washed into the storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering the ocean. Help prevent water pollution by taking your used oil to a used oil collection center.

Included in this brochure is a list of locations that will accept up to five gallons of used motor oil at no cost. Many also accept used oil filters. Please contact the facility before delivering your used oil. This listing of companies is for your reference and does not constitute a recommendation or endorsement of the company.

Please note that used oil filters may not be disposed of with regular household trash. They must be taken to a household hazardous waste collection or recycling center in Anaheim, Huntington Beach, Irvine or San Juan Capistrano. For information about these centers, visit www.oclandfills.com.

Please do not mix your oil with other substances!

For more information, please call the Orange County Stormwater Program at 1-877-89-SPILL (1-877-897-7455) or visit www.watersheds.com.

For information about the proper disposal of household hazardous waste, call the Household Waste Hotline at (714) 834-6752 or visit www.oclandfills.com.

RECYCLE USED OIL

For additional information about the nearest oil recycling center, call the Used Oil Program at 1-800-CLEANUP or visit www.cleanup.org.

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Used Oil Collection Centers

Balboa

Hill's Boat Service
814 E Bay Ave., Balboa, CA 92661
(949)675-0740( )
CIWMB#: 30-C-03538

Balboa Island

Island Marine Fuel
406 S Bay Front, Balboa Island, CA 92662
(949)673-1103( )
CIWMB#: 30-C-03728

Corona Del Mar

Corona Del Mar 76
2201 E. Pacific Coast Hwy., Corona Del Mar, CA 92625
(949)673-3320( )
CIWMB#: 30-C-06620

Corona Del Mar Chevron
2546 E. Coast Hwy., Corona Del Mar, CA 92625
(949)495-0774(14)
CIWMB#: 30-C-06424

Mobil (Harbor View)
2500 San Joaquin Hills Rd., Corona Del Mar, CA 92625
(949)640-4759( )
CIWMB#: 30-C-03363

Costa Mesa

AutoZone #5520
744 W. 19th St., Costa Mesa, CA 92627
(901)495-7159( )
CIWMB#: 30-C-05992

Big O Tires #5571
3181 Harbor Blvd., Costa Mesa, CA 92626
(949)443-4155( )
CIWMB#: 30-C-04676

Big O Tires #694
322 E. 17th St., Costa Mesa, CA 92627
(949)642-4131( )
CIWMB#: 30-C-05811

Coast General Performance
2855 Harbor Blvd., Costa Mesa, CA 92626
(714)540-5710( )
CIWMB#: 30-C-05916

Connell Chevrolet
2828 Harbor Blvd., Costa Mesa, CA 92626
(714)546-1200( )
CIWMB#: 30-C-06286

EZ Lube Inc #15
3599 Harbor Blvd., Costa Mesa, CA 92626
(714)966-1647( )
CIWMB#: 30-C-03137

EZ Lube Inc #46
400 E 17th St., Costa Mesa, CA 92627
(714)556-1312( )
CIWMB#: 30-C-05779

EZ Lube Inc. #44
2248 Harbor Blvd., Costa Mesa, CA 92627
(714)556-1312( )
CIWMB#: 30-C-05737

Firestone Store #71T7
475 E 17th St., Costa Mesa, CA 92627
(949)646-2444( )
CIWMB#: 30-C-02120

Jiffy Lube #1969
300 E 17th St., Costa Mesa, CA 92627
(949)548-2505( )
CIWMB#: 30-C-05553

Jiffy Lube #1970
2175 Newport Blvd., Costa Mesa, CA 92627
(949)548-4150( )
CIWMB#: 30-C-05554

Jiffy Lube #607
2255 Fairview Rd., Costa Mesa, CA 92627
(949)650-5823( )
CIWMB#: 30-C-05551

Jiffy Lube #861
375 Bristol St., Costa Mesa, CA 92626
(714)557-5823( )
CIWMB#: 30-C-05552

Kragen Auto Parts #0725
1739 Superior Ave., Costa Mesa, CA 92627
(949)642-3384( )
CIWMB#: 30-C-02624

Kragen Auto Parts #0796
1175 Baker Blvd., Unit E, Costa Mesa, CA 92626
(714)662-2005( )
CIWMB#: 30-C-02664

Nabers Cadillac
2600 Harbor Blvd., Costa Mesa, CA 92626
(714)444-5200( )
CIWMB#: 30-C-05051

Oil Stop Inc.
Oil Stop Inc. Costa Mesa, CA 92626
(714)434-8350( )
CIWMB#: 30-C-06293

Pep Boys #660
2946 Bristol St., Costa Mesa, CA 92626
(714)549-1533( )
CIWMB#: 30-C-03416

Plaza Chevron Service Center
3048 Bristol Costa Mesa, CA 92626
(714)545-4257( )
CIWMB#: 30-C-01123

Scher Tire Inc #15 dba Goodyear Tire
1596 Newport Blvd., Costa Mesa, CA 92627
(949)548-9384( )
CIWMB#: 30-C-03034

Fountain Valley

Firestone Store #7147
17975 Magnolia Ave., Fountain Valley, CA 92708
(714)842-3341( )
CIWMB#: 30-C-01219

Golden Shell
8520 Warner Ave., Fountain Valley, CA 92708
(714)842-7150( )
CIWMB#: 30-P-05002

Kragen Auto Parts #0734
9880 Warner Ave., Fountain Valley, CA 92708
(714)964-6427( )
CIWMB#: 30-C-02609

Kragen Auto Parts #1505
16147 Harbor Blvd., Fountain Valley, CA 92708
(714)531-8525( )
CIWMB#: 30-C-04125

Oil Can Henry's
9525 Warner Ave., Fountain Valley, CA 92708
(714)473-7705( )
CIWMB#: 30-C-05843

Purrfect Auto Service #10
16780 Harbor Blvd., Fountain Valley, CA 92708
(714)839-3899( )
CIWMB#: 30-C-01380

Huntington Beach

AutoZone #5528
6800 Warner Ave., Huntington Beach, CA 92647
(714)891-8211( )
CIWMB#: 30-C-04777

Bella Terra Car Wash
16061 Beach Blvd., Huntington Beach, CA 92647
(714)847-4924( )
CIWMB#: 30-C-06195

Big O Tires #553
19411 Beach Blvd., Huntington Beach, CA 92648
(714)536-7571( )
CIWMB#: 30-C-00970

Econo Lube N' Tune #26
19961 Beach Blvd., Huntington Beach, CA 92648
(714)536-6519( )
CIWMB#: 30-C-06117

Expertec Automotive
7680 Talbert Ave Suite A & B, Huntington Beach, CA 92648
(714)848-9222( )
CIWMB#: 30-C-05914

EZ Lube Inc #16
7361 Edinger Ave., Huntington Beach, CA 92647
(714)899-3600( )
CIWMB#: 30-C-03289

EZ Lube Inc. #79
9862 Adams St., Huntington Beach, CA 92647
(714)556-1312( )
CIWMB#: 30-C-06547

Firestone Store #71T5
16171 Beach Blvd., Huntington Beach, CA 92647
(714)847-6081( )
CIWMB#: 30-C-02118

Huntington Beach Car Wash
18971 Beach Blvd., Huntington Beach, CA 92648
(714)847-4924( )
CIWMB#: 30-C-05303

Jiffy Lube #1857
8971 Warner Ave., Huntington Beach, CA 92647
(714)596-7213( )
CIWMB#: 30-C-05053

Kragen Auto Parts #1468
10072 Adams Ave., Huntington Beach, CA 92646
(714)593-6156( )
CIWMB#: 30-C-04284

Kragen Auto Parts #1511
7171 Warner Ave., Huntington Beach, CA 92647
(714)842-4531( )
CIWMB#: 30-C-04129

Kragen Auto Parts #1633
18888 Beach Blvd., Huntington Beach, CA 92648
(714)965-2353( )
CIWMB#: 30-C-02645

Oilmax 10 Minute Lube/Wash
9862 Adams Ave., Huntington Beach, CA 92646
(714)964-7110( )
CIWMB#: 30-C-03219

Pep Boys #799
19122 Brookhurst St., Huntington Beach, CA 92646
(714)964-0777( )
CIWMB#: 30-C-03439

Quik Change Lube & Oil
5841 Warner Ave., Huntington Beach, CA 92649
(714)840-2331( )
CIWMB#: 30-C-03208

R Kids Tire and Service #6
5062 Warner Ave., Huntington Beach, CA 92647
(714)846-1189( )
CIWMB#: 30-C-05691

Saturn of Huntington Beach
18801 Beach Blvd., Huntington Beach, CA 92648
(714)841-5428( )
CIWMB#: 30-C-05221

USA Express Tire & Service Inc
7232 Edinger Ave., Huntington Beach, CA 92647
(714)842-0717( )
CIWMB#: 30-C-04429

Zito's Auto Care
19002 Magnolia St., Huntington Beach, CA 92646
(714)968-8788( )
CIWMB#: 30-C-03251

Irvine

Firestone Store #71W4
51 Auto Center Dr., Irvine, CA 92618
(949)829-8710( )
CIWMB#: 30-C-03689

Irvine City Auto Parts
14427 Culver Dr., Irvine, CA 92604
(949)551-5588( )
CIWMB#: 30-C-02186

Jiffy Lube #1856 Irvine Spectrum
8777 Irvine Center Dr., Irvine, CA 92618
(949)753-0485( )
CIWMB#: 30-C-06094

Jiffy Lube #1988
3080 Main St., Irvine, CA 92614
(714)961-5491(27)
CIWMB#: 30-C-04450

Kragen Auto Parts #4174
15315 Culver Dr., Ste.#170, Irvine, CA 92604
(602)631-7115( )
CIWMB#: 30-C-06417

Newport Beach

Jiffy Lube #2811
1520 W Coast Hwy., Newport Beach, CA 92663
(949)764-9255( )
CIWMB#: 30-C-05629

Newport Landing Fuel Dock
503 E Edgewater Newport Beach, CA 92661
(949)673-7878( )
CIWMB#: 30-C-03628

Orange

AutoZone #5942
1330 N. Glassell Orange, CA 92867
(714)538-4551( )
CIWMB#: 30-C-04553

Big O Tires #570
1825 E Katella Ave., Orange, CA 92867
(714)538-0016( )
CIWMB#: 30-C-00974

David Wilsons Ford of Orange
1350 W Katella Ave., Orange, CA 92867
(714)633-6731( )
CIWMB#: 30-C-02341

EZ Lube #74
3232 Chapman Ave. #E, Orange, CA 92869
(714)556-1312(106)
CIWMB#: 30-C-06627

Firestone Store #7185
1690 N Tustin Ave., Orange, CA 92867
(714)282-8144( )
CIWMB#: 30-C-0122

Jiffy Lube #1457
433 W. Katella Ave., Orange, CA 92867
(714)720-5757( )
CIWMB#: 30-C-06280

Kragen Auto Parts #1764
910 Tustin St., Orange, CA 92867
(714)771-3000( )
CIWMB#: 30-C-02625

Managed Mobile, Inc.
1030 N Batavia St., #B, Orange, CA 92867
(714)400-0250( )
CIWMB#: 30-C-05776

Pep Boys #806
215 E Katella Ave., Orange, CA 92867
(714)997-1540( )
CIWMB#: 30-C-01759

Santiago Hills Car Care
8544 East Chapman Ave., Orange, CA 92869
(714)919-1060( )
CIWMB#: 30-C-05622

Scher Tire #33
1821 E. Katella Ave., Orange, CA 92867
(909)343-3100( )
CIWMB#: 30-C-06324

Tabassi Shell Service Station
830 E Katella Ave., Orange, CA 92867
(714)771-6990( )
CIWMB#: 30-C-00552

The Tune-up Center
193 S Main St., Orange, CA 92868
(714)633-1876( )
CIWMB#: 30-C-02091

Tony's Fuel and Towing
1650 W La Veta Ave., Orange, CA 92868
(714)953-7676( )
CIWMB#: 30-C-00868

Truck Lubrication Company
143 S. Pixley Orange, CA 92868
(714)997-7730( )
CIWMB#: 30-C-06001

Santa Ana

All Phase Environmental
910 E. Fourth St., Santa Ana, CA 92701
(714)731-5995( )
CIWMB#: 30-C-06116

Archie's Tire & Towing
4518 Westminster Ave., Santa Ana, CA 92703
(714)636-4518( )
CIWMB#: 30-C-02058

AutoZone #3320
2007 S. Main St., Santa Ana, CA 92707
(901)495-7217( )
CIWMB#: 30-C-06508

AutoZone #5232
430 W 17th Santa Ana, CA 92706
(714)547-7003( )
CIWMB#: 30-C-04609

AutoZone #5538
1101 S Bristol Santa Ana, CA 92704
(714)241-0335( )
CIWMB#: 30-C-00829

Big O Tires
1211 W. Warner Ave., Santa Ana, CA 92707
(714)540-8646( )
CIWMB#: 30-C-04679

Big O Tires #712
1302 E. 17th St., Santa Ana, CA 92705
(714)541-6811( )
CIWMB#: 30-C-05813

Firestone Store #7175
3733 S Bristol Santa Ana, CA 92704
(714)549-4015( )
CIWMB#: 30-C-01223

Firestone Store #71TA
101 S Main St., Santa Ana, CA 92701
(714)542-8857( )
CIWMB#: 30-C-02123

Firestone Store #71W6
2005 N Tustin Ave., Ste A, Santa Ana, CA 92705
(714)541-7977( )
CIWMB#: 30-C-03688

Guaranty Chevrolet Motors Inc.
711 E 17th St., Santa Ana, CA 92701
(714)973-1711(277)
CIWMB#: 30-C-06506

Jiffy Lube #1303
2025 N. Tustin Santa Ana, CA 92701
(714)720-5757( )
CIWMB#: 30-C-06283

John's Mobil
1465 S Main St., Santa Ana, CA 92707
(714)835-3266( )
CIWMB#: 30-C-00578

Kragen Auto Parts #0736
1302 E 17th St., Santa Ana, CA 92705
(714)953-6061( )
CIWMB#: 30-C-02610

Kragen Auto Parts #1253
1400 W Edinger Ave., Santa Ana, CA 92704
(714)754-1432( )
CIWMB#: 30-C-02627

Kragen Auto Parts #1376
521 W 17th St., Santa Ana, CA 92706
(714)543-4492( )
CIWMB#: 30-C-03901

Kragen Auto Parts #1516
2337 S Bristol Ave., Santa Ana, CA 92704
(714)557-0787( )
CIWMB#: 30-C-04106

Kragen Auto Parts #1648
1015 S Main St., Santa Ana, CA 92701
(714)568-1570( )
CIWMB#: 30-C-05664

Pep Boys #609
120 E 1st St., Santa Ana, CA 92701
(714)547-7477( )
CIWMB#: 30-C-01738

Pep Boys #802
1107 S Harbor Blvd., Santa Ana, CA 92704
(714)775-0828( )
CIWMB#: 30-C-01739

Purrfect Auto Service
2519 S Main St., Santa Ana, CA 92707
(714)549-7900( )
CIWMB#: 30-C-02085

Saturn of Santa Ana
1350 Auto Mall Dr., Santa Ana, CA 92705
(714)648-2444( )
CIWMB#: 30-C-05222

Scher Tire #28
1805 N Grand Ave., Santa Ana, CA 92705
(714)558-8644( )
CIWMB#: 30-C-03225

Tustin

Big O Tires #555
131 E 1st St., Tustin, CA 92780
(714)544-9431( )
CIWMB#: 30-C-00972

EZ Lube #42
12972 Newport Ave., Tustin, CA 92780
(714)556-1312( )
CIWMB#: 30-C-06408

Jiffy Lube #1406
3087 Edinger Ave., Tustin, CA 92780
(949)651-8814( )
CIWMB#: 30-C-03778

Kragen Auto Parts #1533
502 B E 1st St., Tustin, CA 92780
(714)544-9249( )
CIWMB#: 30-C-04128

Scher Tire Inc #17 dba Goodyear Tire
14511 Redhill Ave., Tustin, CA 92780
(714)832-6011( )
CIWMB#: 30-C-03035

Villa Park

Phil's Villa Park 76
17771 Santiago Blvd., Villa Park, CA 92861
(714)637-0854( )
CIWMB#: 30-C-06579

This information was provided by the County of Orange Integrated Waste Management Department and the California Integrated Waste Management Board (CIWMB).

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities such as pest control can lead to water pollution if you're not careful. Pesticide treatments must be planned and applied properly to ensure that pesticides do not enter the street, gutter or storm drain. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump pesticides into the ocean, so don't let it enter the storm drains. Pesticides can cause significant damage to our environment if used improperly. If you are thinking of using a pesticide to control a pest, there are some important things to consider.

For more information,
please call
University of California Cooperative
Extension Master Gardeners at
(714) 708-1646
or visit these Web sites:
www.uccemg.org
www.ipm.ucdavis.edu

For instructions on collecting a specimen sample visit the Orange County Agriculture Commissioner's website at:
http://www.ocagcomm.com/ser_lab.asp

To report a spill, call the
Orange County 24-Hour Water Pollution Problem Reporting Hotline at 1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

Information From:
Cheryl Wilen, Area IPM Advisor; Darren Haver, Watershed Management Advisor; Mary Louise Flint, IPM Education and Publication Director; Pamela M. Geisel, Environmental Horticulture Advisor; Carolyn L. Unruh, University of California Cooperative Extension staff writer. Photos courtesy of the UC Statewide IPM Program and Darren Haver.

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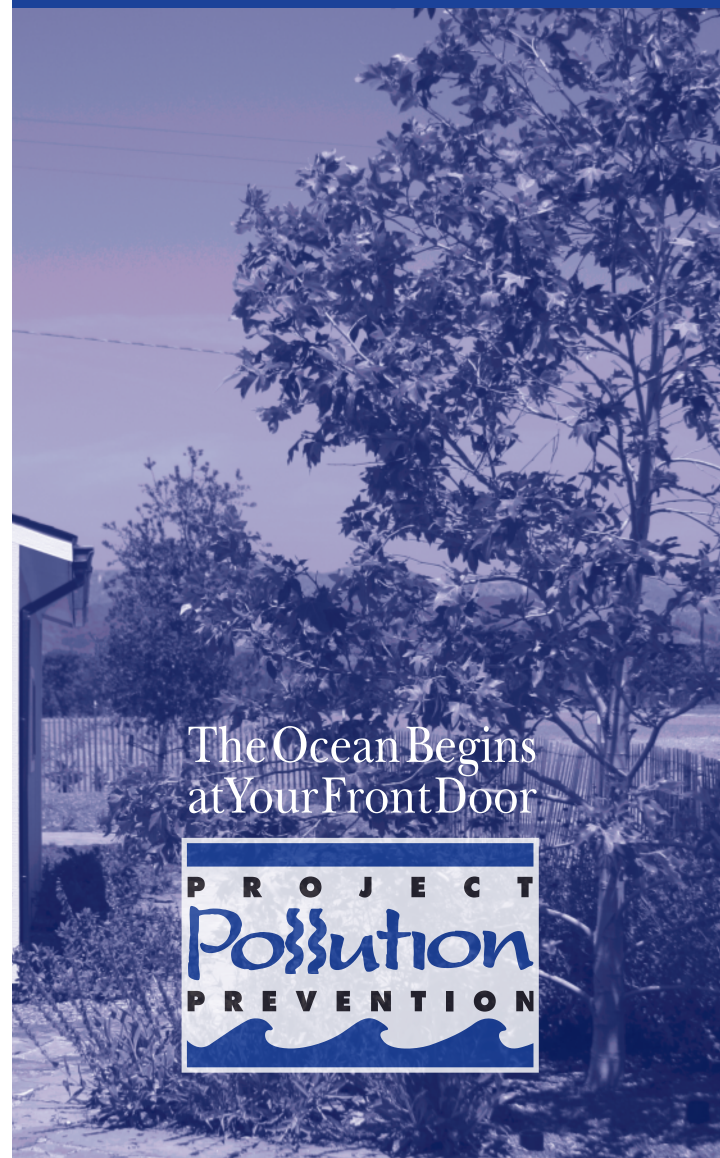
Help Prevent Ocean Pollution:

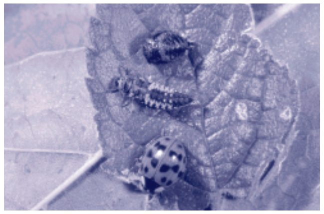
Responsible Pest Control



Tips for Pest Control

Key Steps to Follow:

Step 1: **Correctly identify the pest (insect, weed, rodent, or disease) and verify that it is actually causing the problem.**



Three life stages of the common lady beetle, a beneficial insect.

This is important because beneficial insects are often mistaken for pests and sprayed with pesticides needlessly.

Consult with a Certified Nursery Professional at a local nursery or garden center or send a sample of the pest to the Orange County Agricultural Commissioner's Office.

Determine if the pest is still present – even though you see damage, the pest may have left.

Step 2: **Determine how many pests are present and causing damage.**

Small pest populations may be controlled more safely using non-pesticide techniques. These include removing food sources, washing off leaves with a strong stream of water, blocking entry into the home using caulking and replacing problem plants with ones less susceptible to pests.

Integrated Pest Management (IPM) usually combines several least toxic pest control methods for long-term prevention and management of pest problems without harming you, your family, or the environment.

UC CE University of California Cooperative Extension

Step 3: **If a pesticide must be used, choose the least toxic chemical.**

Obtain information on the least toxic pesticides that are effective at controlling the target pest from the UC Statewide Integrated Pest Management (IPM) Program's Web site at www.ipm.ucdavis.edu.

Seek out the assistance of a Certified Nursery Professional at a local nursery or garden center when selecting a pesticide. Purchase the smallest amount of pesticide available.

Apply the pesticide to the pest during its most vulnerable life stage. This information can be found on the pesticide label.

Step 4: **Wear appropriate protective clothing.**

Follow pesticide labels regarding specific types of protective equipment you should wear. Protective clothing should always be washed separately from other clothing.

Step 5: **Continuously monitor external conditions when applying pesticides such as weather, irrigation, and the presence of children and animals.**

Never apply pesticides when rain is predicted within the next 48 hours. Also, do not water after applying pesticides unless the directions say it is necessary.

Apply pesticides when the air is still; breezy conditions may cause the spray or dust to drift away from your targeted area.

In case of an emergency call 911 and/or the regional poison control number at (714) 634-5988 or (800) 544-4404 (CA only).

For general questions you may also visit www.calpoison.org.

Step 6: **In the event of accidental spills, sweep up or use an absorbent agent to remove any excess pesticides. Avoid the use of water.**

Be prepared. Have a broom, dust pan, or dry absorbent material, such as cat litter, newspapers or paper towels, ready to assist in cleaning up spills.

Contain and clean up the spill right away. Place contaminated materials in a doubled plastic bag. All materials used to clean up the spill should be properly disposed of according to your local Household Hazardous Waste Disposal site.

Step 7: **Properly store and dispose of unused pesticides.**

Purchase Ready-To-Use (RTU) products to avoid storing large concentrated quantities of pesticides.

Store unused chemicals in a locked cabinet.

Unused pesticide chemicals may be disposed of at a Household Hazardous Waste Collection Center.

Empty pesticide containers should be triple rinsed prior to disposing of them in the trash.

Household Hazardous Waste Collection Center
(714) 834-6752
www.oclandfills.com

PROJECT POLLUTION PREVENTION

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Fertilizers, pesticides and other chemicals that are left on yards or driveways can be blown or washed into storm drains that flow to the ocean. Overwatering lawns can also send materials into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour gardening products into the ocean, so don't let them enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

UCCE Master Gardener Hotline:
(714) 708-1646

To report a spill,
call the
Orange County 24-Hour
Water Pollution Problem
Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while landscaping or gardening. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

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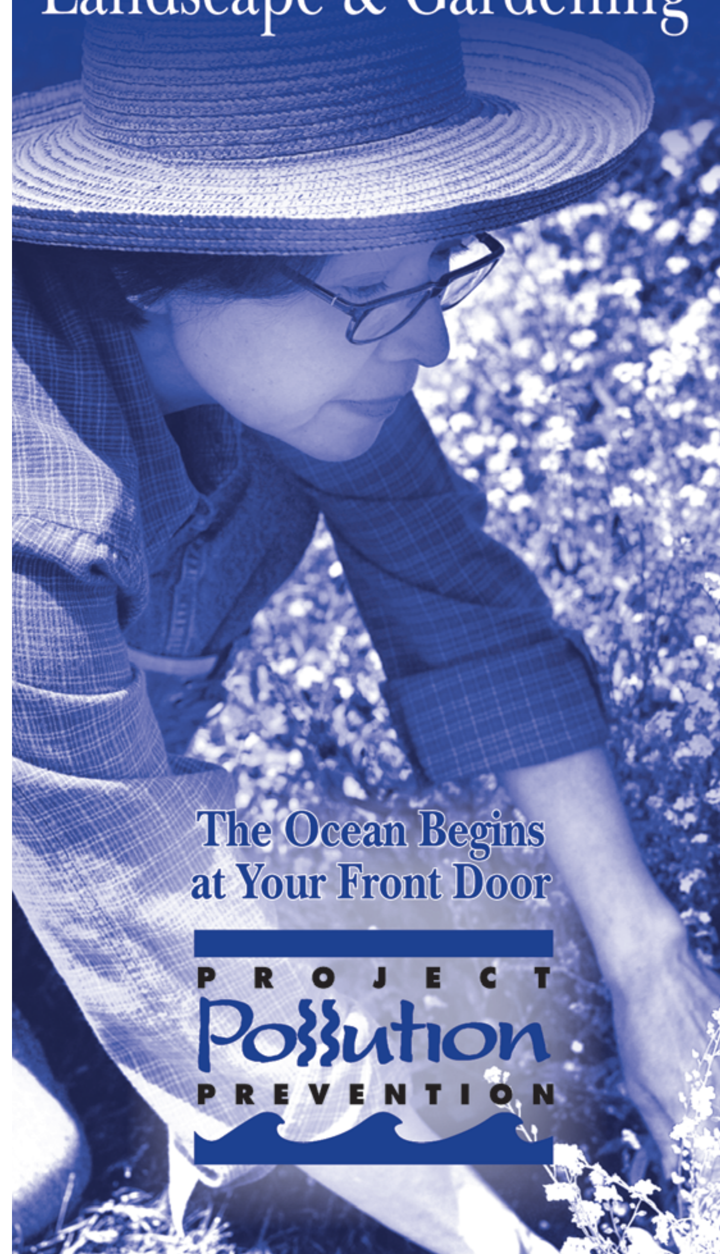
Help Prevent Ocean Pollution:

Tips for Landscape & Gardening



Tips for Landscape & Gardening

Never allow gardening products or polluted water to enter the street, gutter or storm drain.

General Landscaping Tips

- Protect stockpiles and materials from wind and rain by storing them under tarps or secured plastic sheeting.
- Prevent erosion of slopes by planting fast-growing, dense ground covering plants. These will shield and bind the soil.
- Plant native vegetation to reduce the amount of water, fertilizers, and pesticide applied to the landscape.

- Never apply pesticides or fertilizers when rain is predicted within the next 48 hours.

Garden & Lawn Maintenance

- Do not overwater. Use irrigation practices such as drip irrigation, soaker hoses or micro spray systems. Periodically inspect and fix leaks and misdirected sprinklers.

- Do not rake or blow leaves, clippings or pruning waste into the street, gutter or storm drain. Instead, dispose of green waste by composting, hauling it to a permitted landfill, or recycling it through your city's program.
- Use slow-release fertilizers to minimize leaching, and use organic fertilizers.
- Read labels and use only as directed. Do not over-apply pesticides or fertilizers. Apply to spots as needed, rather than blanketing an entire area.
- Store pesticides, fertilizers and other chemicals in a dry covered area to prevent exposure that may result in the deterioration of containers and packaging.

- Rinse empty pesticide containers and re-use rinse water as you would use the product. Do not dump rinse water down storm drains. Dispose of empty containers in the trash.
- When available, use non-toxic alternatives to traditional pesticides, and use pesticides specifically designed to control the pest you are targeting. For more information, visit **www.ipm.ucdavis.edu**.
- If fertilizer is spilled, sweep up the spill before irrigating. If the spill is liquid, apply an absorbent material such as cat litter, and then sweep it up and dispose of it in the trash.
- Take unwanted pesticides to a Household Hazardous Waste Collection Center to be recycled. Locations are provided below.

Household Hazardous Waste Collection Centers

Anaheim:	1071 N. Blue Gum St.
Huntington Beach:	17121 Nichols St.
Irvine:	6411 Oak Canyon
San Juan Capistrano:	32250 La Pata Ave.

For more information, call (714) 834-6752 or visit www.oclandfills.com

Sewage Spill Regulatory Requirements

Allowing sewage to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up efforts.

Here are the pertinent codes, fines, and agency contact information that apply.

Orange County Stormwater Program
24 Hour Water Pollution Reporting Hotline
1-877-89-SPILL (1-877-897-7455)

- County and city water quality ordinances prohibit discharges containing pollutants.

Orange County Health Care Agency Environmental Health
(714) 433-6419

California Health and Safety Code, Sections 5410-5416

- No person shall discharge raw or treated sewage or other waste in a manner that results in contamination, pollution or a nuisance.
- Any person who causes or permits a sewage discharge to any state waters:
  - must immediately notify the local health agency of the discharge.
  - shall reimburse the local health agency for services that protect the public's health and safety (water-contact receiving waters).
  - who fails to provide the required notice to the local health agency is guilty of a misdemeanor and shall be punished by a fine (between $500–$1,000) and/or imprisonment for less than one year.

Regional Water Quality Control Board
Santa Ana Region (951) 782-4130
San Diego Region (858) 467-2952

- Requires the prevention, mitigation, response to and reporting of sewage spills.

California Office of Emergency Services
(800) 852-7550

California Water Code, Article 4, Chapter 4, Sections 13268-13271
California Code of Regulations, Title 23, Division 3, Chapter 9.2, Article 2, Sections 2250-2260

- Any person who causes or permits sewage in excess of 1,000 gallons to be discharged to state waters **shall immediately notify the Office of Emergency Services.**
- Any person who fails to provide the notice required by this section is **guilty of a misdemeanor** and shall be punished by a fine (less than $20,000) and/or imprisonment for not more than one year.

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Sewage Spill
Reference Guide

Your Responsibilities as a Private Property Owner

Residences
Businesses
Homeowner/Condominium Associations
Federal and State Complexes
Military Facilities

Orange County Sanitation District

Health Care Agency
Environmental Health

PROJECT Pollution PREVENTION
www.ocwatersheds.com

This brochure was designed courtesy of the Orange County Sanitation District (OCSD). For additional information, call (714) 962-2411, or visit their website at www.ocsd.com

What is a Sewage Spill?

Sewage spills occur when the wastewater being transported via underground pipes overflows through a manhole, cleanout or broken pipe. Sewage spills can cause health hazards, damage to homes and businesses, and threaten the environment, local waterways and beaches.

Common Causes of Sewage Spills

Grease builds up inside and eventually blocks sewer pipes. Grease gets into the sewer from food establishments, household drains, as well as from poorly maintained commercial grease traps and interceptors.

Structure problems caused by tree roots in the lines, broken/cracked pipes, missing or broken cleanout caps or undersized sewers can cause blockages.

Infiltration and inflow (I/I) impacts pipe capacity and is caused when groundwater or rainwater enters the sewer system through pipe defects and illegal connections.

You Are Responsible for a Sewage Spill Caused by a Blockage or Break in Your Sewer Lines!

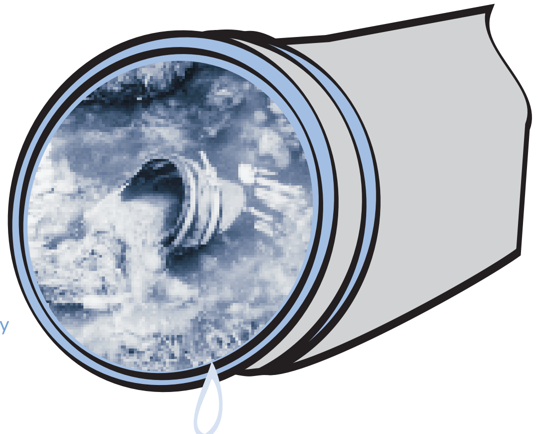
Time is of the essence in dealing with sewage spills. You are required to **immediately**:

Control and minimize the spill. Keep spills contained on private property and out of gutters, storm drains and public waterways by shutting off or not using the water.

Use sandbags, dirt and/or plastic sheeting to prevent sewage from entering the storm drain system.

Clear the sewer blockage. Always wear gloves and wash your hands. It is recommended that a plumbing professional be called for clearing blockages and making necessary repairs.

Always notify your city sewer/public works department or public sewer district of sewage spills. If the spill enters the storm drains also notify the Health Care Agency. In addition, if it exceeds 1,000 gallons notify the Office of Emergency Services. Refer to the numbers listed in this brochure.



Overflowing cleanout pipe located on private property

You Could Be Liable

Allowing sewage from your home, business or property to discharge to a gutter or storm drain may subject you to penalties and/or out-of-pocket costs to reimburse cities or public agencies for clean-up and enforcement efforts. See Regulatory Codes & Fines section for pertinent codes and fines that apply.

What to Look For

Sewage spills can be a very noticeable gushing of water from a manhole or a slow water leak that may take time to be noticed. Don't dismiss unaccounted-for wet areas.

Look for:

- Drain backups inside the building.
- Wet ground and water leaking around manhole lids onto your street.
- Leaking water from cleanouts or outside drains.
- Unusual odorous wet areas: sidewalks, external walls or ground/landscape around a building.

Caution

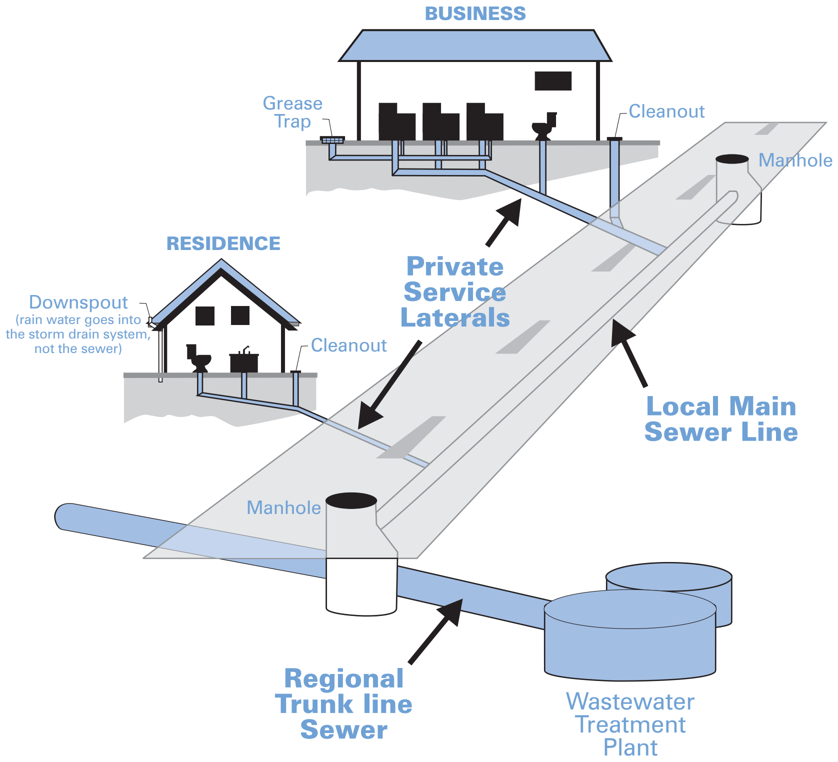
Keep people and pets away from the affected area. Untreated sewage has high levels of disease-causing viruses and bacteria. Call your local health care agency listed on the back for more information.

If You See a Sewage Spill Occurring, Notify Your City Sewer/Public Works Department or Public Sewer District IMMEDIATELY!

How a Sewer System Works

A property owner's sewer pipes are called service laterals and are connected to larger local main and regional trunk lines. Service laterals run from the connection at the home to the connection with the public sewer (including the area under the street). These laterals are the responsibility of the property owner and must be maintained by the property owner. Many city agencies have adopted ordinances requiring maintenance of service laterals. Check with your city sewer/local public works department for more information.

Operation and maintenance of **local and regional sewer lines** are the responsibility of the city sewer/public works departments and public sewer districts.



How You Can Prevent Sewage Spills

1 **Never put grease down garbage disposals, drains or toilets.**

2 **Perform periodic cleaning to eliminate grease, debris and roots in your service laterals.**

3 **Repair any structural problems in your sewer system and eliminate any rainwater infiltration/inflow leaks into your service laterals.**

Preventing Grease Blockages

The drain is not a dump! Recycle or dispose of grease properly and never pour grease down the drain.

Homeowners should mix fats, oils and grease with absorbent waste materials such as paper, coffee grounds, or kitty litter and place it in the trash. Wipe food scraps from plates and pans and dump them in the trash.

Restaurants and commercial food service establishments should always use "Kitchen Best Management Practices." These include:

- Collecting all cooking grease and liquid oil from pots, pans and fryers in covered grease containers for recycling.
- Scraping or dry-wiping excess food and grease from dishes, pots, pans and fryers into the trash.
- Installing drain screens on all kitchen drains.
- Having spill kits readily available for cleaning up spills.
- Properly maintaining grease traps or interceptors by having them serviced regularly. Check your local city codes.

Orange County Agency Responsibilites

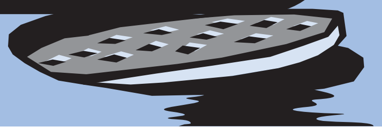
- **City Sewer/Public Works Departments—** Responsible for protecting city property and streets, the local storm drain system, sewage collection system and other public areas.
- **Public Sewer/Sanitation District—** Responsible for collecting, treating and disposing of wastewater.
- **County of Orange Health Care Agency—** Responsible for protecting public health by closing ocean/bay waters and may close food-service businesses if a spill poses a threat to public health.
- **Regional Water Quality Control Boards—** Responsible for protecting State waters.
- **Orange County Stormwater Program—** Responsible for preventing harmful pollutants from being discharged or washed by stormwater runoff into the municipal storm drain system, creeks, bays and the ocean.

You Could Be Liable for Not Protecting the Environment

Local and state agencies have legal jurisdiction and enforcement authority to ensure that sewage spills are remedied.

They may respond and assist with containment, relieving pipe blockages, and/or clean-up of the sewage spill, especially if the spill is flowing into storm drains or onto public property.

A property owner may be charged for costs incurred by these agencies responding to spills from private properties.



Report Sewage Spills!

City Sewer/Public Works Departments

Aliso Viejo	(949) 425-2500
Anaheim	(714) 765-6860
Brea	(714) 990-7691
Buena Park	(714) 562-3655
Costa Mesa	(949) 645-8400
Cypress	(714) 229-6760
Dana Point	(949) 248-3562
Fountain Valley	(714) 593-4600
Fullerton	(714) 738-6897
Garden Grove	(714) 741-5375
Huntington Beach	(714) 536-5921
Irvine	(949) 453-5300
Laguna Beach	(949) 497-0765
Laguna Hills	(949) 707-2650
Laguna Niguel	(949) 362-4337
Laguna Woods	(949) 639-0500
La Habra	(562) 905-9792
Lake Forest	(949) 461-3480
La Palma	(714) 690-3310
Los Alamitos	(562) 431-3538
Mission Viejo	(949) 831-2500
Newport Beach	(949) 644-3011
Orange	(714) 532-6480
Orange County	(714) 567-6363
Placentia	(714) 993-8245
Rancho Santa Margarita	(949) 635-1800
San Clemente	(949) 366-1553
San Juan Capistrano	(949) 443-6363
Santa Ana	(714) 647-3380
Seal Beach	(562) 431-2527
Stanton	(714) 379-9222
Tustin	(714) 962-2411
Villa Park	(714) 998-1500
Westminster	(714) 893-3553
Yorba Linda	(714) 961-7170

Public Sewer/Water Districts

Costa Mesa Sanitary District	(714) 393-4433/ (949) 645-8400
El Toro Water District	(949) 837-0660
Emerald Bay Service District	(949) 494-8571
Garden Grove Sanitary District	(714) 741-5375
Irvine Ranch Water District	(949) 453-5300
Los Alamitos/Rossmoor Sewer District	(562) 431-2223
Midway City Sanitary District (Westminster)	(714) 893-3553
Moulton Niguel Water District	(949) 831-2500
Orange County Sanitation District	(714) 962-2411
Santa Margarita Water District	(949) 459-6420
South Coast Water District	(949) 499-4555
South Orange County Wastewater Authority	(949) 234-5400
Sunset Beach Sanitary District	(562) 493-9932
Trabuco Canyon Sanitary District	(949) 858-0277
Yorba Linda Water District	(714) 777-3018

Other Agencies

Orange County Health Care Agency	(714) 433-6419
Office of Emergency Services	(800) 852-7550

Clean beaches and healthy creeks, rivers, bays, and ocean are important to Orange County. However, many common activities can lead to water pollution if you're not careful. Swimming pools and spas are common in Orange County, but they must be maintained properly to guarantee that chemicals aren't allowed to enter the street, where they can flow into the storm drains and then into the waterways. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never dump pool chemicals into the ocean, so don't let it enter the storm drains. Follow these easy tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

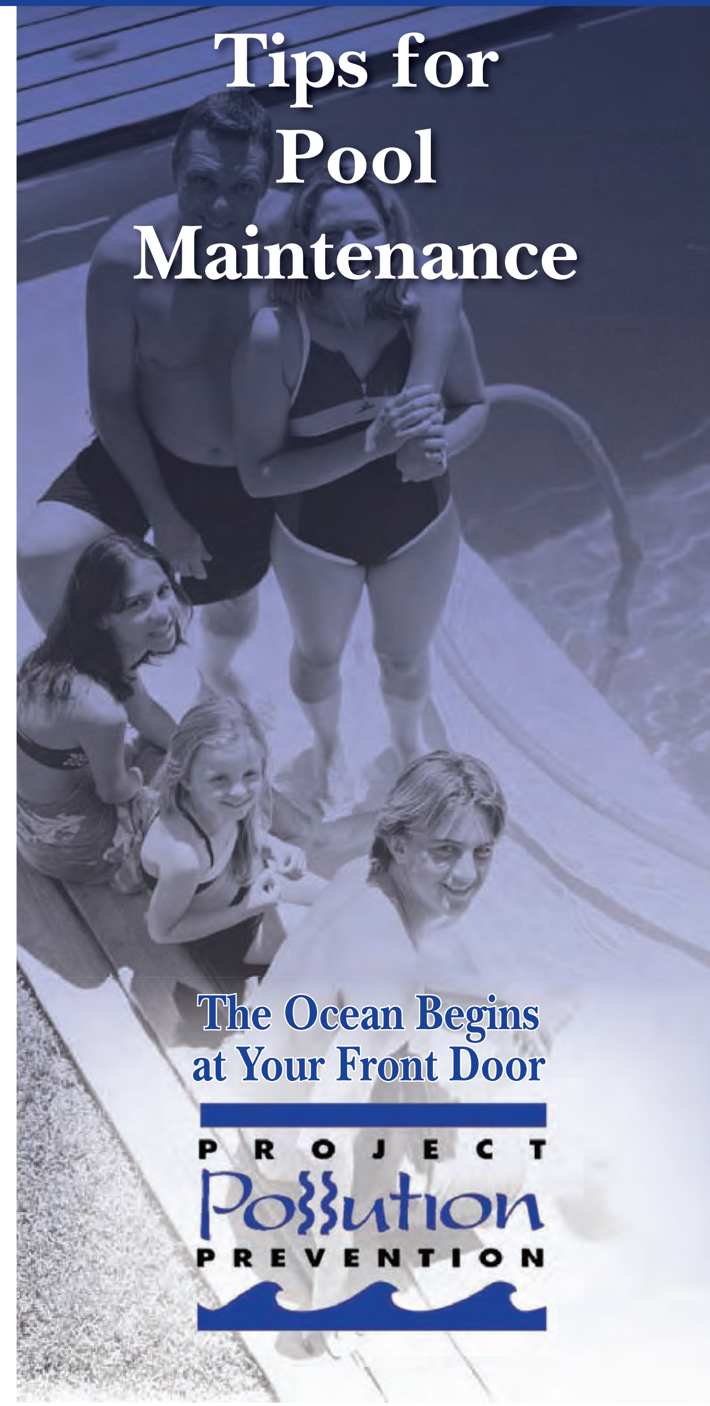
To report a spill,
call the
Orange County 24-Hour
Water Pollution Reporting Hotline
1-877-89-SPILL (1-877-897-7455).

For emergencies, dial 911.

The tips contained in this brochure provide useful information to help prevent water pollution while maintaining your pool. If you have other suggestions, please contact your city's stormwater representatives or call the Orange County Stormwater Program.

Help Prevent Ocean Pollution:

Tips for Pool Maintenance



The Ocean Begins at Your Front Door

PROJECT
Pollution
PREVENTION

Tips for Pool Maintenance

Many pools are plumbed to allow the pool to drain directly to the sanitary sewer. If yours is not, follow these instructions for disposing of pool and spa water.

Acceptable and Preferred Method of Disposal

When you cannot dispose of pool water in the sanitary sewer, the release of dechlorinated swimming pool water is allowed if all of these tips are followed:

- The residual chlorine does not exceed 0.1 mg/l (parts per million).
- The pH is between 6.5 and 8.5.
- The water is free of any unusual coloration, dirt or algae.
- There is no discharge of filter media.
- There is no discharge of acid cleaning wastes.
- Some cities may have ordinances that do not allow pool water to be disposed into a storm drain. Check with your city.

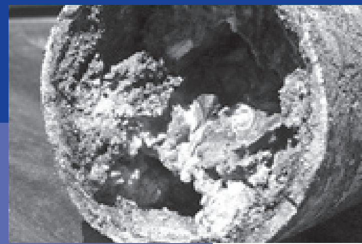
How to Know if You're Following the Standards

You can find out how much chlorine is in your water by using a pool testing kit. Excess chlorine can be removed by discontinuing the use of chlorine for a few days prior to discharge or by purchasing dechlorinating chemicals from a local pool supply company. Always make sure to follow the instructions that come with any products you use.

Doing Your Part

By complying with these guidelines, you will make a significant contribution toward keeping pollutants out of Orange County's creeks, streams, rivers, bays and the ocean. This helps to protect organisms that are sensitive to pool chemicals, and helps to maintain the health of our environment.

PROJECT Pollution PREVENTION



Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. Fats, oils and grease from restaurants and food service facilities can cause sewer line blockages that may result in sewage overflow into your facility and into storm drains. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways and should never contain washwater, trash, grease or other materials.

You would never dump oil and trash into the ocean, so don't let it enter the storm drains. Follow these tips to help prevent water pollution.

For more information,
please call the
Orange County Stormwater Program
at **1-877-89-SPILL** (1-877-897-7455)
or visit
www.ocwatersheds.com

Report sewage spills and discharges that are not contained to your site to the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** at **1-877-89-SPILL** (1-877-897-7455)

For emergencies, dial 911.

CALIFORNIA Restaurant ASSOCIATION SINCE 1906

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Help Prevent Ocean Pollution:

Tips for the Food Service Industry

The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

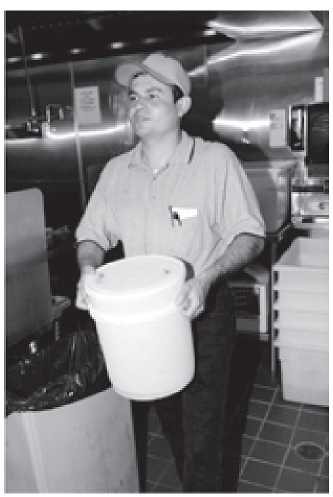
Best Kitchen Practices

Food Waste Disposal

- Scrape food waste off of plates, utensils, pots, food preparation and cooking areas and dispose of it in the trash.
- Never put food waste down the drain. Food scraps often contain grease, which can clog sewer pipes and result in sewage backups and overflows.

Grease & Oil Disposal

- Never put oil or grease down the drain. Contain grease and oil by using covered grease storage containers or installing a grease interceptor.
- Never overfill your grease storage container or transport it without a cover.
- Grease control devices must be emptied and cleaned by permitted companies.
- Keep maintenance records on site.



- For a list of oil/grease recycling companies, contact the CIWMB at **www.ciwmb.ca.gov/foodwaste/render.htm** or contact your local sanitation district.

Minor Spill Cleanup

- Always use dry cleanup methods, such as a rag, damp mop or broom.
- Never hose a spill into the street, gutter or storm drain.

Major Spill Cleanup

- Have spill containment and clean-up kits readily available, and train all employees on how to use them.
- Immediately contain and clean the spill using dry methods.
- If the spill leaves your site, call **(714) 567-6363**.

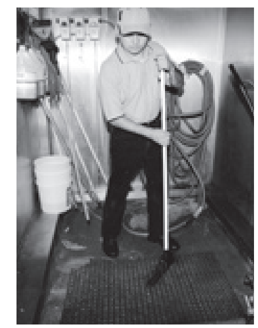
Dumpster Cleanup

- Pick up all debris around the dumpster.
- Always keep the lid on the dumpster closed.

- Never pour liquids into the dumpster or hose it out.

Floor Mat Cleaning

- Sweep the floor mats regularly, discarding the debris into the trash.
- Hose off the mats in a mop sink, at a floor drain, or in an outdoor area that can contain the water.



- Never hose the mats in an area where the wastewater can flow to the street, gutter or storm drain.

Washwater Disposal

- Dispose of washwater in a mop sink or an area with a floor drain.
- Never dispose of washwater in the street, gutter or storm drain.

PROJECT Pollution PREVENTION

Preventing water pollution at your commercial/industrial site

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, many landscape and building maintenance activities can lead to water pollution if you're not careful. Paint, chemicals, plant clippings and other materials can be blown or washed into storm drains that flow to the ocean. Unlike water in sanitary sewers (from sinks and toilets), water in storm drains is not treated before entering our waterways.

You would never pour soap or fertilizers into the ocean, so why would you let them enter the storm drains? Follow these easy tips to help prevent water pollution.

Some types of industrial facilities are required to obtain coverage under the State General Industrial Permit. For more information visit: **www.swrcb.ca.gov/stormwater/industrial.html**

For more information, please call the **Orange County Stormwater Program** at **1-877-89-SPILL** (1-877-897-7455) or visit **www.ocwatersheds.com**

To report a spill, call the **Orange County 24-Hour Water Pollution Problem Reporting Hotline** at **1-877-89-SPILL** (1-877-897-7455).

For emergencies, dial 911.

RECYCLE USED OIL

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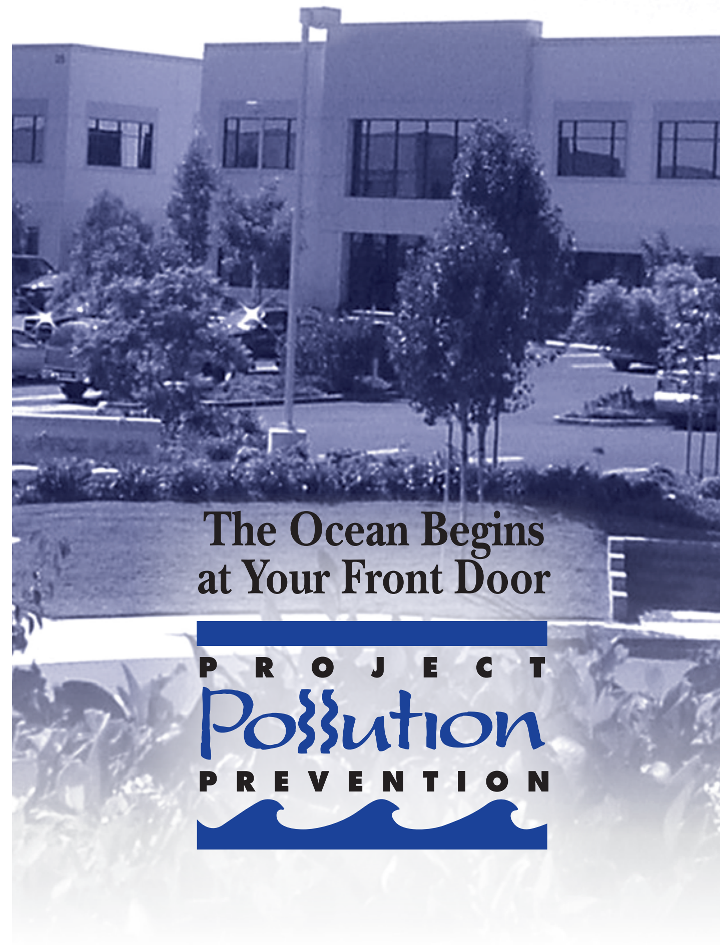
Help Prevent Ocean Pollution:

Proper Maintenance Practices for Your Business



The Ocean Begins at Your Front Door

PROJECT POLLUTION PREVENTION

Proper Maintenance Practices for your Business

Landscape Maintenance

- Compost grass clippings, leaves, sticks and other vegetation, or dispose of it at a permitted landfill or in green waste containers. Do not dispose of these materials in the street, gutter or storm drain.
- Irrigate slowly and inspect the system for leaks, overspraying and runoff. Adjust automatic timers to avoid overwatering.
- Follow label directions for the use and disposal of fertilizers and pesticides.
- Do not apply pesticides or fertilizers if rain is expected within 48 hours or if wind speeds are above 5 mph.
- Do not spray pesticides within 100 feet of waterways.
- Fertilizers should be worked into the soil rather than dumped onto the surface.
- If fertilizer is spilled on the pavement or sidewalk, sweep it up immediately and place it back in the container.

Building Maintenance

- Never allow washwater, sweepings or sediment to enter the storm drain.
- Sweep up dry spills and use cat litter, towels or similar materials to absorb wet spills. Dispose of it in the trash.
- If you wash your building, sidewalk or parking lot, you **must** contain the water. Use a shop vac to collect the water and contact your city or sanitation agency for proper disposal information. Do not let water enter the street, gutter or storm drain.
- Use drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of materials in the trash.
- Use a ground cloth or oversized tub for mixing paint and cleaning tools.
- Use a damp mop or broom to clean floors.
- Cover dumpsters to keep insects, animals, rainwater and sand from entering. Keep the area around the dumpster clear of trash and debris. Do not overfill the dumpster.
- Call your trash hauler to replace leaking dumpsters.
- Do not dump any toxic substance or liquid waste on the pavement, the ground, or near a storm drain. Even materials that seem harmless such as latex paint or biodegradable cleaners can damage the environment.

NEVER DISPOSE OF ANYTHING IN THE STORM DRAIN.

- Recycle paints, solvents and other materials. For more information about recycling and collection centers, visit **www.oclandfills.com**.
- Store materials indoors or under cover and away from storm drains.
- Use a construction and demolition recycling company to recycle lumber, paper, cardboard, metals, masonry, carpet, plastic, pipes, drywall, rocks, dirt, and green waste. For a listing of construction and demolition recycling locations in your area, visit **www.ciwmb.ca.gov/recycle.**
- Properly label materials. Familiarize employees with Material Safety Data Sheets.

PROJECT Pollution PREVENTION

DF-1
DRAINAGE FACILITY OPERATION AND MAINTENANCE

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and storm water that may contain certain pollutants. Consequently these pollutants may accumulate in the system and must be removed periodically. In addition, the systems must also be maintained to function properly hydraulically to avoid flooding. Maintaining the system may involve the following activities:

1. Inspection and Cleaning of Stormwater Conveyance Structures
2. Controlling Illicit Connections and Discharges
3. Controlling Illegal Dumping

This list of Model Maintenance Procedures can be utilized as an inspection checklist to determine where better compliance with Designated Minimum Best Management Practices (notated with checkmarks and capital letters) is needed, and to recommend Additional Best Management Practices (notated with bullet points and lower case letters) that may be applicable under certain circumstances, especially where there are certain Pollutant Constituents of Concern. BMPs applicable to certain constituents are notated as:

Bacteria (BACT) *Sediment (SED)* *Nutrients (NUT)* *Oil and Grease (O&G)* *Pesticides (PEST)*
OtherToxic Compounds (TOX) *Trash (TRASH)* *Hydrological Impacts (HYD)* *Any/All or General (ANY)*

Program/Facility Being Inspected: ______________________

Date: ____________ Inspector Name: ______________________

When completed, the checklist should be attached to the General Inspection Form Cover Sheet and copies should be provided to the Supervisor of the Facility/Program being inspected.

MAINTENANCE PROCEDURES:

1. Inspection and Cleaning of Drainage Facilities

Unsatisfactory / OK	General Guidelines
☐ ____________ ☐	T 1A. Annually inspect and clean drainage structures as needed.
☐ ____________ ☐	T 1B. Maintain appropriate records of cleaning and inspections.
☐ ____________ ☐	T 1C. Properly dispose of removed materials at a landfill or recycling facility.
☐ ____________ ☐	T 1D. Conduct intermittent supplemental visual inspections during the wet season to determine if there are problem inlets where sediment/trash or other pollutants accumulate, and provide for additional cleanouts as appropriate.
☐ ____________ ☐	T 1E. Prevent or clean up any discharges that may occur during the course of maintenance and cleaning procedures.
☐ ____________ ☐	T 1F. Verify that appropriate employees or subcontractors are trained in proper conductance of maintenance activities, including record keeping and disposal.
☐ ____________ ☐	T 1G. Annually inspect and clean v-ditches as needed, prior to the wet season. On shrub-covered slopes, vegetative debris may be placed on the downhill side of the ditch. Trash should be bagged and disposed at a landfill.

Unsatisfactory	OK	
☐	☐	

General Guidelines (cont.)

- 1a. Remove trash or debris as needed from open channels. It should be noted that major vegetative debris removal may require other regulatory permits prior to completing the work. (TRASH)
- 1b. Consider retrofitting energy dissipaters (e.g. riprap) below culvert outfalls to minimize potential for erosion. (SED)
- 1c. Repair any v-ditches that have cracked or displaced in a manner that accelerates erosion. (SED)
- 1d. If suspicious conditions appear to exist, test selected samples of the removed wastes for compliance with hazardous waste regulations prior to disposal. (TOX)
- 1e. Consider more frequent regular cleaning of selected drainage structures to help address ongoing specific impairments. (SED, BACT, NUT, TRASH)
- 1f. Consider structural retrofits to the MS4 to help address ongoing specific impairments (SED, BACT, NUT, TRASH, O&G)
- 1g. Consider cleaning out pipes at gradient breaks or other in-pipe debris accumulation points as identified/needed. (ANY, BACT, NUT, TRASH)

Storm Drain Flushing

- 1h. Flushing of storm drains or storm drain inlets should only be done when critically necessary and no other solution is practical. (SED, BACT, TRASH).
- 1i. If flushed, to the extent practical the material should be collected (vacuumed), treated with an appropriate filtering device to remove sand and debris and disposed of properly. (SED)

Waste Management

- 1H. Store wastes collected from cleaning activities of the drainage facilities in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- 1j. Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device to remove the sand and debris prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not permitted, water should be pumped or vacuumed to a tank and properly disposed of. Do not dewater near a storm drain or stream. (SED, TRASH)
- 1k. Provide for laboratory analysis of at least one randomly collected sediment (less the debris) sample per year from the storm drain inlet leaning program to ensure that it does not meet the EPA criteria for hazardous waste. If the sample is determined to be hazardous, the sediment must be disposed of as hazardous waste and the source should be investigated. (TOX).

2. Controlling Illicit Connections and Discharges		
Unsatisfactory	**OK**	**General Guidelines**
☐	☐	T 2A. Report prohibited discharges such as dumping, paint spills, abandoned oil containers, etc. observed during the course of normal daily activities so they can be investigated, contained, and cleaned up.
☐	☐	T 2B. Where field observations and/or monitoring data indicate significant problems, conduct field investigations to detect and eliminate existing illicit connections and improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)). (Refer to Appendices A-10 and A-11.)
☐	☐	T 2C. Report all observed illicit connections and discharges to the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐	☐	T 2D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline.
		Storm Drain Stenciling ("No Dumping—Drains to Ocean")
☐	☐	T 2E. Implement and maintain a storm drain stenciling program.
☐	☐	• 2a. Consider adding the hotline number to the storm drain stencils (BACT, TOX, TRASH).

3. Controlling Illegal Dumping		
		Field Investigation
☐	☐	T 3A. Report prohibited discharges such as dumpings observed during the course of normal daily activities so they can be investigated, contained and cleaned up.
☐	☐	T 3B. Conduct field investigations to detect and eliminate improper disposal of pollutants into the storm drain (i.e. identify problem areas where discharges or illegal connections may occur and follow up stream to determine the source(s)).
☐	☐	T 3C. Report all observed illegal dumping to the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐	☐	T 3D. Encourage public reporting of improper waste disposal by distributing public education materials and advertising the 24-hour water pollution problem reporting hotline.
☐	☐	T 3E. If perpetrator can be identified, take appropriate enforcement action.
☐	☐	• 3a. Consider posting "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs could also indicate fines and penalties for illegal dumping. (ANY)

Unsatisfactory OK	Training/Education/Outreach
☐ ____________ ☐	T 3F. Verify that appropriate employees and subcontractors are trained to recognize and report illegal dumping.
☐ ____________ ☐	T 3G. Encourage public reporting of illegal dumping by advertising the 24-hour water pollution problem reporting hotline (714) 567-6363.
☐ ____________ ☐	• 3b. Take extra steps to educate the public in neighborhoods where illegal dumping has occurred to inform them why illegal dumping is a problem, and that illegal dumping carries a significant financial penalty. (ANY)

LIMITATIONS:

Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.

IC3. BUILDING MAINTENANCE

Best Management Practices (BMPs)

A BMP is a technique, measure or structural control that is used for a given set of conditions to improve the quality of the stormwater runoff in a cost effective manner[1]. The minimum required BMPs for this activity are outlined in the box to the right. Implementation of pollution prevention/good housekeeping measures may reduce or eliminate the need to implement other more costly or complicated procedures. Proper employee training is key to the success of BMP implementation.

The BMPs outlined in this fact sheet target the following pollutants:

Targeted Constituents	
Sediment	x
Nutrients	x
Floatable Materials	
Metals	x
Bacteria	x
Oil & Grease	
Organics & Toxicants	
Pesticides	
Oxygen Demanding	

MINIMUM BEST MANAGEMENT PRACTICES

Pollution Prevention/Good Housekeeping

- Properly collect and dispose of water when pressure washing buildings, rooftops, and other large objects.
- Properly prepare work area before conducting building maintenance.
- Properly clean and dispose of equipment and wastes used and generated during building maintenance.
- Store toxic material under cover when not in use and during precipitation events.

Stencil storm drains

Training

- Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.
- Provide on-going employee training in pollution prevention.

Provided below are specific procedures associated with each of the minimum BMPs along with procedures for additional BMPs that should be considered if this activity takes place at a facility located near a sensitive waterbody. In order to meet the requirements for medium and high priority facilities, the owners/operators must select, install and maintain appropriate BMPs on site. Since the selection of the appropriate BMPs is a site-specific process, the types and numbers of additional BMPs will vary for each facility.

1. Properly collect and dispose of water when pressure washing buildings, rooftops, and other large objects.
    - If pressure washing where the surrounding area is paved, use a water collection device that enables collection of wash water and associated solids. Use a sump pump, wet vacuum or similarly effective device to collect the runoff and loose materials. Dispose of the collected runoff and solids properly. Refer to fact sheet *IC24 Wastewater Disposal* for guidance on appropriate methods for disposal of wash water to the sanitary sewer.
    - If pressure washing on a landscaped area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the landscaping and not drain to pavement.
2. Properly prepare work area before conducting building maintenance.
    - Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
    - Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.

[1] EPA " *Preliminary Data Summary of Urban Stormwater Best Management Practices"*

3. Properly clean and dispose of equipment and wastes used and generated during building maintenance.
    - Clean paint brushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
    - Properly dispose of wash water, sweepings, and sediments.
    - Properly store equipment, chemicals, and wastes.
    - Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.

    OPTIONAL:
    - Recycle residual paints, solvents, lumber, and other materials to the maximum extent practicable
4. Employ soil erosion and stabilization techniques when exposing large areas of soil.
    - Confine excavated materials to pervious surfaces away from storm drain inlets, sidewalks, pavement, and ditches. Material must be covered if rain is expected.
    - Use chemical stabilization or geosynthetics to stabilize bare ground surfaces.
5. Store toxic material under cover when not in use and during precipitation events.
6. Properly dispose of fluids from air conditioning, cooling tower, and condensate drains.
7. Regularly inspect air emission control equipment under AQMD permit.
8. Switch to non-toxic chemicals for maintenance when possible.
    - If cleaning agents are used, select biodegradable products whenever feasible
    - Consider using a waterless and non-toxic chemical cleaning method for graffiti removal (e.g. gels or spray compounds).
9. Use chemicals that can be recycled.
    - Buy recycled products to the maximum extent practicable

Training

1. Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.
2. Train employees on proper spill containment and cleanup.
    - Establish training that provides employees with the proper tools and knowledge to immediately begin cleaning up a spill.
    - Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
    - Fact sheet IC17 discusses Spill Prevention and Control in detail.
3. Establish a regular training schedule, train all new employees, and conduct annual refresher training.
4. Use a training log or similar method to document training.

Stencil storm drains

Storm drain system signs act as highly visible source controls that are typically stenciled directly adjacent to storm drain inlets. Stencils should read “No Dumping Drains to Ocean”.

References

California Storm Water Best Management Practice Handbook. Industrial and Commercial. 2003. www.cabmphandbooks.com

California Storm Water Best Management Practice Handbooks. Industrial/Commercial Best Management Practice Handbook. Prepared by Camp Dresser& McKee, Larry Walker Associates, Uribe and Associates, Resources Planning Associates for Stormwater Quality Task Force. March 1993.

King County Stormwater Pollution Control Manual. Best Management Practices for Businesses. King County Surface Water Management. July 1995. On-line: http://dnr.metrokc.gov/wlr/dss/spcm.htm

Stormwater Management Manual for Western Washington. Volume IV Source Control BMPs. Prepared by Washington State Department of Ecology Water Quality Program. Publication No. 99-14. August 2001.

For additional information contact:

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IC7. LANDSCAPE MAINTENANCE

Best Management Practices (BMPs)

A BMP is a technique, measure or structural control that is used for a given set of conditions to improve the quality of the stormwater runoff in a cost effective manner[1]. The minimum required BMPs for this activity are outlined in the box to the right. Implementation of pollution prevention/good housekeeping measures may reduce or eliminate the need to implement other more costly or complicated procedures. Proper employee training is key to the success of BMP implementation.

The BMPs outlined in this fact sheet target the following pollutants:

Targeted Constituents	
Sediment	x
Nutrients	x
Floatable Materials	x
Metals	
Bacteria	x
Oil & Grease	
Organics & Toxicants	
Pesticides	x
Oxygen Demanding	x

MINIMUM BEST MANAGEMENT PRACTICES

Pollution Prevention/Good Housekeeping

- Properly store and dispose of gardening wastes.
- Use mulch or other erosion control measures on exposed soils.
- Properly manage irrigation and runoff.
- Properly store and dispose of chemicals.
- Properly manage pesticide and herbicide use.
- Properly manage fertilizer use.

Stencil storm drains

Training

- Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.
- Provide on-going employee training in pollution prevention.

Provided below are specific procedures associated with each of the minimum BMPs along with procedures for additional BMPs that should be considered if this activity takes place at a facility located near a sensitive waterbody. In order to meet the requirements for medium and high priority facilities, the owners/operators must select, install and maintain appropriate BMPs on site. Since the selection of the appropriate BMPs is a site-specific process, the types and numbers of additional BMPs will vary for each facility.

1. Take steps to reduce landscape maintenance requirements.
    - Where feasible, retain and/or plant native vegetation with features that are determined to be beneficial. Native vegetation usually requires less maintenance than planting new vegetation.
    - When planting or replanting consider using low water use flowers, trees, shrubs, and groundcovers.
    - Consider alternative landscaping techniques such as naturescaping and xeriscaping.
2. Properly store and dispose of gardening wastes.
    - Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage at a permitted landfill or by composting.
    - Do not dispose of gardening wastes in streets, waterways, or storm drainage systems.
    - Place temporarily stockpiled material away from watercourses and storm drain inlets, and berm and/or cover.
3. Use mulch or other erosion control measures on exposed soils.

[1] EPA " *Preliminary Data Summary of Urban Stormwater Best Management Practices"*

4. Properly manage irrigation and runoff.
    - Irrigate slowly or pulse irrigate so the infiltration rate of the soil is not exceeded.
    - Inspect irrigation system regularly for leaks and to ensure that excessive runoff is not occurring.
    - If re-claimed water is used for irrigation, ensure that there is no runoff from the landscaped area(s).
    - If bailing of muddy water is required (e.g. when repairing a water line leak), do not put it in the storm drain; pour over landscaped areas.
    - Use automatic timers to minimize runoff.
    - Use popup sprinkler heads in areas with a lot of activity or where pipes may be broken. Consider the use of mechanisms that reduce water flow to broken sprinkler heads.
5. Properly store and dispose of chemicals.
    - Implement storage requirements for pesticide products with guidance from the local fire department and/or County Agricultural Commissioner.
    - Provide secondary containment for chemical storage.
    - Dispose of empty containers according to the instructions on the container label.
    - Triple rinse containers and use rinse water as product.
6. Properly manage pesticide and herbicide use.
    - Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of pesticides and herbicides and training of applicators and pest control advisors.
    - Follow manufacturers' recommendations and label directions.
    - Use pesticides only if there is an actual pest problem (not on a regular preventative schedule). When applicable use less toxic pesticides that will do the job. Avoid use of copper-based pesticides if possible. Use the minimum amount of chemicals needed for the job.
    - Do not apply pesticides if rain is expected or if wind speeds are above 5 mph.
    - Do not mix or prepare pesticides for application near storm drains. Prepare the minimum amount of pesticide needed for the job and use the lowest rate that will effectively control the targeted pest.
    - Whenever possible, use mechanical methods of vegetation removal rather than applying herbicides. Use hand weeding where practical.
    - Do not apply any chemicals directly to surface waters, unless the application is approved and permitted by the state. Do not spray pesticides within 100 feet of open waters.
    - Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.
    - When conducting mechanical or manual weed control, avoid loosening the soil, which could lead to erosion.
    - Purchase only the amount of pesticide that you can reasonably use in a given time period.
    - Careful soil mixing and layering techniques using a topsoil mix or composted organic material can be used as an effective measure to reduce herbicide use and watering.
7. Properly manage fertilizer use.
    - Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers.
    - Follow manufacturers' recommendations and label directions.
    - Employ techniques to minimize off-target application (e.g. spray drift) of fertilizer, including consideration of alternative application techniques. Calibrate fertilizer distributors to avoid excessive application.
    - Periodically test soils for determining proper fertilizer use.
    - Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
    - Sweep pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
    - Use slow release fertilizers whenever possible to minimize leaching

8. Incorporate the following integrated pest management techniques where appropriate:
    - Mulching can be used to prevent weeds where turf is absent.
    - Remove insects by hand and place in soapy water or vegetable oil. Alternatively, remove insects with water or vacuum them off the plants.
    - Use species-specific traps (e.g. pheromone-based traps or colored sticky cards).
    - Sprinkle the ground surface with abrasive diatomaceous earth to prevent infestations by soft-bodied insects and slugs. Slugs also can be trapped in small cups filled with beer that are set in the ground so the slugs can get in easily.
    - In cases where microscopic parasites, such as bacteria and fungi, are causing damage to plants, the affected plant material can be removed and disposed of (pruning equipment should be disinfected with bleach to prevent spreading the disease organism).
    - Small mammals and birds can be excluded using fences, netting, and tree trunk guards.
    - Promote beneficial organisms, such as bats, birds, green lacewings, ladybugs, praying mantis, ground beetles, parasitic nematodes, trichogramma wasps, seedhead weevils, and spiders that prey on detrimental pest species.

Training

1. Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.
2. Educate and train employees on the use of pesticides and pesticide application techniques. Only employees properly trained to use pesticides can apply them.
3. Train and encourage employees to use integrated pest management techniques.
4. Train employees on proper spill containment and cleanup.
    - Establish training that provides employees with the proper tools and knowledge to immediately begin cleaning up a spill.
    - Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
    - Fact sheet IC17 discusses Spill Prevention and Control in detail.
5. Establish a regular training schedule, train all new employees, and conduct annual refresher training.
6. Use a training log or similar method to document training.

Stencil storm drains

Storm drain system signs act as highly visible source controls that are typically stenciled directly adjacent to storm drain inlets. Stencils should read “No Dumping Drains to Ocean”.

References

California Storm Water Best Management Practice Handbook. Industrial and Commercial. 2003. www.cabmphandbooks.com

California Storm Water Best Management Practice Handbooks. Industrial/Commercial Best Management Practice Handbook. Prepared by Camp Dresser& McKee, Larry Walker Associates, Uribe and Associates, Resources Planning Associates for Stormwater Quality Task Force. March 1993.

King County Stormwater Pollution Control Manual. Best Management Practices for Businesses. King County Surface Water Management. July 1995. On-line: http://dnr.metrokc.gov/wlr/dss/spcm.htm

Stormwater Management Manual for Western Washington. Volume IV Source Control BMPs. Prepared by Washington State Department of Ecology Water Quality Program. Publication No. 99-14. August 2001.

Water Quality Handbook for Nurseries. Oklahoma Cooperative Extension Service. Division of Agricultural Sciences and Natural Resources. Oklahoma State University. E-951. September 1999.

For additional information contact:

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IC16. POOL AND FOUNTAIN CLEANING

Best Management Practices (BMPs)

A BMP is a technique, measure or structural control that is used for a given set of conditions to improve the quality of the stormwater runoff in a cost effective manner[1]. The minimum required BMPs for this activity are outlined in the box to the right. Implementation of pollution prevention/good housekeeping measures may reduce or eliminate the need to implement other more costly or complicated procedures. Proper employee training is key to the success of BMP implementation.

The BMPs outlined in this fact sheet target the following pollutants:

Targeted Constituents	
Sediment	x
Nutrients	x
Floatable Materials	x
Metals	
Bacteria	x
Oil & Grease	
Organics & Toxicants	x
Pesticides	x
Oxygen Demanding	x

MINIMUM BEST MANAGEMENT PRACTICES

Pollution Prevention/Good Housekeeping

- Prevent algae problems with regular cleaning, consistent adequate chlorine levels, and well-maintained water filtration and circulation systems.
- Discharge pool and fountain water properly.

Stencil storm drains

Training

- Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.
- Provide on-going employee training in pollution prevention.

Provided below are specific procedures associated with each of the minimum BMPs along with procedures for additional BMPs that should be considered if this activity takes place at a facility located near a sensitive waterbody. In order to meet the requirements for medium and high priority facilities, the owners/operators must select, install and maintain appropriate BMPs on site. Since the selection of the appropriate BMPs is a site-specific process, the types and numbers of additional BMPs will vary for each facility.

1. **Prevent algae problems with regular cleaning, consistent adequate chlorine levels, and well-maintained water filtration and circulation systems.**
    - Do not use copper-based algaecides.
    - Control algae with chlorine or other alternatives, such as sodium bromide.
2. **Manage pH and water hardness to minimize corrosion of copper pipes.**
3. **Discharge pool and fountain water properly.** Consider hiring a professional pool-draining service to collect all pool water for off-site disposal. If this is not feasible, adhere to the following:
    - When draining pools or fountains never discharge water to a street or storm drain, discharge to the sanitary sewer if permitted to do so. Refer to fact sheet *IC24 Wastewater Disposal* for guidance on appropriate methods for disposal of wash water to the sanitary sewer.
    - If draining a pool to the sanitary sewer, prevent backflow by maintaining an “air gap” between the discharge line and the sewer line (do not seal the connection between the hose and sewer line). Be sure to call the local sewer authority for guidance on flow rate restrictions, backflow prevention, and handling special cleaning waste (such as acid wash). Keep discharge flows to the low levels. Higher flow rates may be prohibited by local ordinance.

[1] EPA " *Preliminary Data Summary of Urban Stormwater Best Management Practices”*

- If water is dechlorinated with a neutralizing chemical or by allowing chlorine to dissipate for a few days (do not use the facility during this time), the water may be recycled/reused by draining it gradually onto a landscaped area. Water must be tested prior to discharge to ensure that chlorine is not present.
- Provide drip pans or buckets beneath drain pipe connections to catch leaks. This will be especially pertinent if pool or spa water that has not been dechlorinated is pumped through piping to a discharge location.

4. Properly clean and/or dispose of filters.
   - Never clean a filter in the street or near a storm drain.
   - Rinse cartridge filters onto a dirt area, and work filter residue into soil.
   - Backwash diatomaceous earth filters onto dirt. Dispose of spent diatomaceous earth in the garbage. Diatomaceous earth cannot be discharged to surface waters, storm drainage systems, septic systems, or on the ground.
   - If there is not a suitable dirt area, discharge filter backwash or rinsewater to the sanitary sewer if permitted to do so by the local sewering agency.

Training

1. Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.
2. Train employees on proper spill containment and cleanup.
   - Establish training that provides employees with the proper tools and knowledge to immediately begin cleaning up a spill.
   - Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
   - Fact sheet IC17 discusses Spill Prevention and Control in detail.
3. Train maintenance personnel on the proper techniques for testing chlorine levels and applying neutralizing chemicals.
4. Establish a regular training schedule, train all new employees, and conduct annual refresher training.
5. Use a training log or similar method to document training.

Stencil storm drains

Storm drain system signs act as highly visible source controls that are typically stenciled directly adjacent to storm drain inlets. Stencils should read "No Dumping Drains to Ocean".

References

California Storm Water Best Management Practice Handbook. Industrial and Commercial. 2003. www.cabmphandbooks.com

King County Stormwater Pollution Control Manual. Best Management Practices for Businesses. 1995. King County Surface Water Management. July. On-line: http://dnr.metrokc.gov/wlr/dss/spcm.htm

Los Angeles County Stormwater Quality. Public Agency Activities Model Program. On-line: http://ladpw.org/wmd/npdes/public_TC.cfm

Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality Control Board. July 1998 (Revised February 2002 by the California Coastal Commission).

Santa Clara Valley Urban Runoff Pollution Prevention Program. Maintenance Best Management Practices for the Construction Industry. Brochures: Landscaping, Gardening, and Pool; Roadwork and Paving; and Fresh Concrete and Mortar Application. June 2001.

For additional information contact:

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IC22. EATING AND DRINKING ESTABLISHMENTS

Best Management Practices (BMPs)

A BMP is a technique, measure or structural control that is used for a given set of conditions to improve the quality of the stormwater runoff in a cost effective manner[1]. The minimum required BMPs for this activity are outlined in the box to the right. Implementation of pollution prevention/good housekeeping measures may reduce or eliminate the need to implement other more costly or complicated procedures. Proper employee training is key to the success of BMP implementation.

The BMPs outlined in this fact sheet target the following pollutants:

Targeted Constituents	
Sediment	
Nutrients	x
Floatable Materials	x
Metals	
Bacteria	x
Oil & Grease	x
Organics & Toxicants	x
Pesticides	x
Oxygen Demanding	x

MINIMUM BEST MANAGEMENT PRACTICES

Pollution Prevention/Good Housekeeping

- Use dry cleaning methods instead of water
- Clean equipment (floor mats, grease filters, grills, garbage cans, etc.) indoors or in a covered outdoor wash area that is plumbed to the sanitary sewer or in an area that will contain the wash water (Refer to fact sheet *IC24 Wastewater Disposal* for guidance on appropriate methods for disposal of wash water to the sanitary sewer).
- Recycle and/or properly dispose of grease and oil.
- Block the storm drain when hosing or steam/pressure washing outside dumpster areas, sidewalks, and common areas.

Stencil storm drains

Training

- Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.

Provided below are specific procedures associated with each of the minimum BMPs along with procedures for additional BMPs that should be considered if this activity takes place at a facility located near a sensitive waterbody. In order to meet the requirements for medium and high priority facilities, the owners/operators must select, install and maintain appropriate BMPs on site. Since the selection of the appropriate BMPs is a site-specific process, the types and numbers of additional BMPs will vary for each facility.

1. Practice good housekeeping.
    - Conduct regular sweeping or vacuuming of outdoor areas: Dry sweep pavement areas including “drive-thru” areas, parking lots, sidewalks, outdoor eating areas and dumpster storage areas frequently.
    - Keep outside areas free of trash & debris.
    - Do not hose out dumpsters or fill them with liquid waste.
    - Regularly inspect, repair, and/or replace dumpsters.
2. Clean equipment (floor mats, grease filters, grills, garbage cans, etc.) indoors or in a covered outdoor wash area that is plumbed to the sanitary sewer.
    - Clean equipment in a mop sink if possible (never in a food preparation sink). If there is no mop sink, dedicate an indoor cleaning area where a drain is plumbed to the sanitary sewer.
    - Dispose mop water from cleaning floors in a mop sink, toilet or other drain that is plumbed to the sanitary sewer. Refer to fact sheet *IC24 Wastewater Disposal* for guidance on appropriate methods for disposal of wash water to the sanitary sewer.
    - Do not pour wash water outside or into a street, gutter, or storm drain.

[1] EPA " *Preliminary Data Summary of Urban Stormwater Best Management Practices”*

- Dispose of all wastewater containing oil and grease in a grease trap or interceptor.

3. **Recycle and/or properly dispose of grease and oil.** Collect and dispose of concentrated waste oil and grease and disposed of by a certified waste grease hauler. NEVER pour grease or oil into a sink, floor drain, storm drain or dumpster.
4. **Block storm drain(s) when cleaning (hosing or steam/pressure washing) outside dumpster areas, sidewalks, and common areas with hot water, soap, or other cleaning agent.** Collect water/waste and discharge to the sanitary sewer (with approval of the local sanitation district).

Training

1. **Train employees on these BMPs, storm water discharge prohibitions, and wastewater discharge requirements.**
2. **Train employees on proper spill containment and cleanup.**
   - Establish training that provides employees with the proper tools and knowledge to immediately begin cleaning up a spill.
   - Ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
   - Fact sheet IC17 discusses Spill Prevention and Control in detail.
3. **Establish a regular training schedule, train all new employees, and conduct annual refresher training.**
4. **Use a training log or similar method to document training.**

Stencil storm drains

Storm drain system signs act as highly visible source controls that are typically stenciled directly adjacent to storm drain inlets. Stencils should read "No Dumping Drains to Ocean".

References

California Storm Water Best Management Practice Handbook. Industrial and Commercial. 2003. www.cabmphandbooks.com

Carlsbad Jurisdictional Urban Runoff Management Plan. Best Management Practices for Restaurants. City of Carlsbad. February 2002. On-line: http://www.ci.carlsbad.ca.us/cserv/jurmp.html

Orange County Stormwater Program. 2001. Water Quality Guidelines for Exterior Restaurant Cleaning Operations. Brochure. June.

Orange County Stormwater Program. Good Cleaning Practices Food & Restaurant Industry. Poster. Courtesy of the City and County of LA.

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Building & Grounds Maintenance SC-41

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	
Organics	

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

CASQA California Stormwater Quality Association

- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.

- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Use mulch or other erosion control measures when soils are exposed.

- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.

- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.

- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.

- Do not use pesticides if rain is expected.

- Do not mix or prepare pesticides for application near storm drains.

- Use the minimum amount needed for the job.

- Calibrate fertilizer distributors to avoid excessive application.

- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.

- Apply pesticides only when wind speeds are low.

- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.

- Irrigate slowly to prevent runoff and then only as much as is needed.

- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.

- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.

- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.

- Train employees and contractors in proper techniques for spill containment and cleanup.

- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.

- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.

- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.

- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.

- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.

- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Parking/Storage Area Maintenance SC-43

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	☑
Oil and Grease	☑
Organics	☑
Oxygen Demanding	☑

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The following protocols are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook).
- Keep accurate maintenance logs to evaluate BMP implementation.

Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low concentrations.

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- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel and dispose of litter in the trash.

Surface cleaning

- Use dry cleaning methods (e.g. sweeping or vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- If water is used follow the procedures below:
  - Block the storm drain or contain runoff.
  - Wash water should be collected and pumped to the sanitary sewer or discharged to a pervious surface, do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- When cleaning heavy oily deposits:
  - Use absorbent materials on oily spots prior to sweeping or washing.
  - Dispose of used absorbents appropriately.

Surface Repair

- Pre-heat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination form contacting stormwater runoff.
- Cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc., where applicable. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.

- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of the parking facilities and stormwater conveyance systems associated with them on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, nad implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

Requirements

Costs

Cleaning/sweeping costs can be quite large, construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities on a regular basis to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination form contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and until all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Use only as much water as necessary for dust control, to avoid runoff.

References and Resources

http://www.stormwatercenter.net/

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

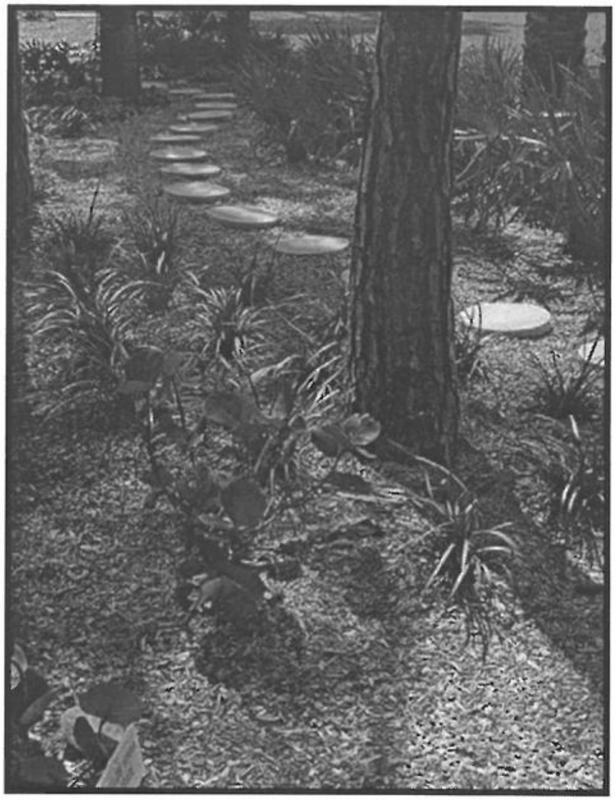
Model Urban Runoff Program: A How-To Guide for Developing Urban Runoff Programs for Small Municipalities. Prepared by City of Monterey, City of Santa Cruz, California Coastal Commission, Monterey Bay National Marine Sanctuary, Association of Monterey Bay Area Governments, Woodward-Clyde, Central Coast Regional Water Quality control Board. July 1998 (Revised February 2002 by the California Coastal Commission).

Orange County Stormwater Program
http://www.ocwatersheds.com/StormWater/swp_introduction.asp

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA) http://www.basma.org

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)
http://www.projectcleanwater.org/pdf/Model%20Program%20Municipal%20Facilities.pdf



Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

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Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.

- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.

- Promote natural vegetation by using parking lot islands and other landscaped areas.

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.

- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Efficient Irrigation SD-12

Design Objectives

☑ Maximize Infiltration

☑ Provide Retention

☑ Slow Runoff

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

Contain Pollutants

Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

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– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.
- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.

- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

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- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

APPENDIX D

BMP MAINTENANCE SUPPLEMENT / O&M PLAN

OPERATIONS AND MAINTENANCE (O&M) PLAN

Water Quality Management Plan

For

Lido House Hotel

3300 Newport Boulevard
Newport Beach, CA

423-111-02

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BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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			
No	N1. Education for Property Owners, Tenants and Occupants	Not Applicable	
Yes	N2. Activity Restrictions The owner and/or developer shall develop ongoing activity restrictions that include those that have the potential to create adverse impacts on water quality. Activities include, but are not limited to: handling and disposal of contaminants, fertilizer and pesticide application restrictions, litter control and pick-up, and vehicle or equipment repair and maintenance in non-designated areas, as well as any other activities that may potentially contribute to water pollution.	The owner and/or developer will prescribe activity restrictions to protect surface water quality, through lease terms or other equally effective measure, for the property. Frequency: Ongoing	R.D. Olson Development

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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	N3. Common Area Landscape Management Management programs will be designed and implemented by the Owner/Operator to maintain all the common areas within the project site. These programs will cover how to reduce the potential pollutant sources of fertilizer and pesticide uses, utilization of water-efficient landscaping practices and proper disposal of landscape wastes by the owner/developer and/or contractors.	Maintenance shall be consistent with City requirements. Fertilizer and/or pesticide usage shall be consistent with County Management Guidelines for Use of Fertilizers (OC DAMP Section 5.5) as well as local requirements. 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 drain inlets. Frequency: Monthly	R.D. Olson Development
Yes	N4. BMP Maintenance The Owner/Operator 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 the O&M Plan. Records of inspections and BMP maintenance shall be kept by the owner/developer and shall be available for review upon request. Frequency: Ongoing	R.D. Olson Development
No	N5. Title 22 CCR Compliance (How development will comply)	Not Applicable	
No	N6. Local Industrial Permit Compliance	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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	N7. Spill Contingency Plan	Not Applicable	
No	N8. Underground Storage Tank Compliance	Not Applicable	
No	N9. Hazardous Materials Disclosure Compliance	Not Applicable	
No	N10. Uniform Fire Code Implementation	Not Applicable	
Yes	N11. Common Area Litter Control e Owner/Operator will be responsible for performing trash pickup and sweeping of littered common areas on a weekly basis or whenever necessary. Responsibilities will also include noting improper disposal materials by the public and reporting such violations for 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	R.D. Olson Development
Yes	N12. Employee Training All employees of the Owner/Operator and any contractors will require training to ensure that employees are aware 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	R.D. Olson Development
No	N13. Housekeeping of Loading Docks	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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	N14. Common Area Catch Basin Inspection All privately-maintained on-site catch basin inlets and drainage facilities shall be inspected and maintained by the Owner/Operator at least once a year, prior to the rainy season, no later than October 1st of each year. The City of Newport Beach shall be responsible for inspection and maintenance of all public catch basins and drainage facilities associated with the project.	Catch basin inlets and other drainage facilities shall be inspected after each storm event and once per year. Storm drain inlets and other drainage facilities shall be cleaned prior to the rainy season, by October 1 each year. Frequency: Annually	R.D. Olson Development (private) City of Newport Beach (public)
Yes	N15. Street Sweeping Private Streets and Parking Lots The Owner/Operator shall be responsible for sweeping all on-site drive aisles and uncovered parking areas within the project site.	Drive aisles and parking areas must be swept at least quarterly (every 3 months), including prior to the start of the rainy season (October 1). Frequency: Quarterly	R.D. Olson Development
No	N16. Retail Gasoline Outlets	Not Applicable	
STRUCTURAL SOURCE CONTROL BMPs			
Yes	S1. Provide storm drain system stenciling & 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.	Storm drain stencils shall be inspected for legibility, at minimum, once prior to the storm season, no later than October 1 each year. Those determined to be illegible will be re-stenciled as soon as possible. Frequency: Annually	R.D. Olson Development (private) City of Newport Beach (public)

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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	S2. Design and construct outdoor material storage areas to reduce pollution introduction	Not Applicable	
Yes	S3. Design and construct trash and waste storage areas to reduce pollution introduction All trash and waste shall be stored in containers that have lids or tarps to minimize direct precipitation into the containers. One trash enclosure will be located in the southeast corner of the site. The trash storage areas will be designed to City standards, and will be walled, roofed, have gates and proper drainage per City standards.	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	R.D. Olson Development
Yes	S4. Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control The Owner/Operator will be responsible for the installation and maintenance of all common landscape areas utilizing similar planting materials with similar water requirements to reduce excess irrigation runoff. The Owner/Operator will be responsible for implementing all efficient irrigation systems for common area landscaping including, but not limited to, provisions for water sensors and programmable irrigation cycles. This includes smart timers, rain sensors, and moisture shut-off valves. The irrigation systems shall be in conformance with water efficiency guidelines.	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. System testing shall occur twice per year. Water from testing/flushing shall be collected and properly disposed to the sewer system and shall not discharge to the storm drain system. Frequency: 2x per year	R.D. Olson Development (private) City of Newport Beach (public)

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX			
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	S5. Protect slopes and channels and provide energy dissipation	Not Applicable	
No	S6. Dock areas	Not Applicable	
No	S7. Maintenance bays	Not Applicable	
No	S8. Vehicle wash areas	Not Applicable	
No	S9. Outdoor processing areas	Not Applicable	
No	S10. Equipment wash areas	Not Applicable	
No	S11. Fueling areas	Not Applicable	
No	S12. Hillside landscaping	Not Applicable	
Yes	S13. Wash water control for food preparation areas All wash water from food prep areas will be controlled and proper staff training conducted by the site operator. Food preparation facilities shall meet all health and safety, building and safety and any other applicable regulations, codes requirements, including installation of a grease interceptor where required. Sinks shall be contained with sanitary sewer connections for disposal of wash waters containing kitchen and food wastes.	Inspection / maintenance shall occur at least once in the late summer / early fall, prior to the start of the rainy season. Maintenance includes using dry cleanup methods for cleaning (i.e., sweeping), keeping spill kits on-site and stocked, properly storing and hauling used oil and grease, and disposing wash water to sanitary sewer. Wash water shall not discharge to storm drain system. Mats shall be cleaned indoors or with dry cleaning methods only. Frequency: Annually	R.D. Olson Development
No	S14. Community car wash racks	Not Applicable	

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
LOW IMPACT DEVELOPMENT BMPs		
Infiltration BMP # 1: Infiltration Trench Drains (INF-2) Infiltration trench drains, also called French drains, typically consist of a perforated pipe surrounded by gravel that allows spreading and infiltration of runoff into the subsoils. Runoff is stored in the void space and pipe and infiltrates through the bottom and sides of the trench. The rock may be exposed at the surface, or covered with approximately 6-8" of topsoil or pervious vegetation. The infiltration trench drains will be designed to be approximately 18" wide with an average rock reservoir depth of 18 inches.	Infiltration trench should be inspected post-construction and after first major storm event for damages. Afterwards, maintenance should occur semi-annually, at the beginning and end of rainy season, for erosion or visible damage. Inspection and maintenance of clogging and gravel bed should occur on an annual basis. Presence of excess ponded water or clogging may require replacement of gravel as needed. Removal of surface trash and debris shall be performed in conjunction with routine maintenance activities, on a weekly basis at a minimum. Frequency: 2x per year	R.D. Olson Development
Infiltration BMP # 2: Bioinfiltration Planters (INF-4) Bioretention planters with underdrains are plant-based biotreatment systems that typically consist of a shallow ponding area (typically 6"), mulch layer (2-3"), planting soils and plants. As storm water passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded and sequestered by the soil and plants. A 12-inch gravel bed is located below the planter to temporarily store runoff for infiltration into the subsoils.	Inspections should occur semi-annually or after major storm events to check for the following and remove accordingly: standing water, sediment, and trash & debris. Inspections should also look for potential clogging and clean planters or, if necessary, replace the entire filter bed. Inspect for weeds, and prune shrubs and/or replace plants in accordance with routine landscape maintenance activities. Replace mulch as necessary, typically once per year. Frequency: 2x per year	R.D. Olson Development

BMP INSPECTION & MAINTENANCE RESPONSIBILITY MATRIX		
BMP Name and BMP Implementation, Maintenance and Inspection Procedures	**Implementation, Maintenance, and Inspection Frequency and Schedule**	**Person or Entity with Operation & Maintenance Responsibility**
Infiltration BMP # 3: Pervious Pavement (INF-6) Permeable pavement, such as permeable pavers, grass pavers, porous concrete, and porous asphalt, provides a surface suitable for light-loads and parking areas in which water can drain through pore spaces to an underlying rock reservoir (approximately 8”-12” inches deep) underneath. The sub-surface base allows for physical and microbial filtering processes to take place thereby removing pollutants such as particulates, organics, hydrocarbons and total suspended sediments, including attached heavy metals.	Keep pavement clean and free from debris and sediment. Minor maintenance should be conducted monthly consists of vacuum cleaning surface using a commercially available sweeper. If routine cleaning does not restore infiltration rates, then more invasive maintenance should occur as needed but no more than every 15-20 years, which may involve the following: Reconstruction of part of or entire pervious surface, lifting area and inspection of internal material, and replacement of surface materials, geotextiles, or sub-surface layers. Frequency: Monthly	R.D. Olson Development
Infiltration BMP # 4: Underground Infiltration Gallery / Gravel Bed (INF-7) An underground infiltration gallery typically consists of a vault or chamber system, or gravel bed with an open bottom that is used to store runoff and percolate into the subsoils. Runoff enters the gravel bed through perforated pipes, is stored in the void space and pipe and infiltrates through the bottom. The infiltration trench drains will be designed to be approximately 18” wide with an average rock reservoir depth of 18 inches, and will be covered with approximately 6-8” of turf and topsoil.	Infiltration gallery should be inspected post-construction and after first major storm event for damages. Afterwards, maintenance should occur semi-annually, at the beginning and end of rainy season, for erosion or visible damage. Inspection and maintenance of clogging and gravel bed should occur on an annual basis. Presence of excess ponded water or clogging may require replacement of gravel as needed. Removal of surface trash & debris shall be performed in conjunction with routine maintenance activities, weekly at a minimum. Frequency: 2x per year	R.D. Olson Development

Required Permits

Permits are not required for the implementation, operation, and maintenance of the BMPs.

Forms to Record BMP Implementation, Maintenance, and Inspection

The form that will be used to record implementation, maintenance, and inspection of BMPs is attached.

Recordkeeping

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

Waste Management

Any waste generated from maintenance activities will be disposed of properly. Wash water and other waste from maintenance activities is not to be discharged or disposed of into the storm drain system. Clippings from landscape maintenance (i.e. prunings) will be collected and disposed of properly off-site, and will not be washed into the streets, local area drains/conveyances, or catch basin inlets.

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

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 E

Conditions of Approval

Placeholder – Pending issuance by the City of Newport Beach

APPENDIX F

INFILTRATION TEST RESULTS

GMU GEOTECHNICAL, INC.

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Report of Geotechnical Investigation,
Lido House Hotel - City Hall Site Reuse Project,
3300 Newport Boulevard,
City of Newport Beach, California

Prepared for R. D. OLSON DEVELOPMENT

December 4, 2013

GMU Project No. 13-160-00

GMU GEOTECHNICAL, INC.

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TRANSMITTAL

R. D. OLSON DEVELOPMENT
2955 Main Street, Third Floor
Irvine, CA 92614

DATE: December 4, 2013

GMU PROJECT: 13-160-00

ATTENTION: Mr. Anthony Wrzosek, Vice President of Planning & Development

SUBJECT: Geotechnical Investigation, Lido House Hotel - City Hall Site Reuse Project, 3300 Newport Boulevard, City of Newport Beach, California

WE ARE SENDING THE FOLLOWING:

Three (3) wet copies and One (1) Electronic copy of our "Report of Geotechnical Investigation, Lido House Hotel, City Hall Site Reuse Project, 3300 Newport Boulevard, City of Newport Beach, California," dated December 4, 2013.

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INTRODUCTION

PURPOSE

This report presents the results of our geotechnical investigation for the planned Lido House Hotel - City Hall Site Reuse Project, located at 3300 Newport Boulevard, in the City of Newport Beach, California (see Plate 1 – Location Map). The purpose of this report is to provide a review of the current site plans; provide a summary of our geotechnical investigation, laboratory testing, data analysis, and conclusions; and then provide geotechnical recommendations pertaining to site grading and design and construction of the proposed buildings and other site improvements (i.e., pool, driveways, parking lots, site walls, exterior concrete flatwork, etc.).

SCOPE

In preparing this report, the following scope of work was performed.

1. Reviewed background information pertaining to the site, including historic aerial photographs and published geologic maps. A search of the City of Newport Beach records yielded no previous geotechnical reports for the subject site.

2. Performed an initial site reconnaissance to access current surface conditions and mark the site for Underground Service Alert.

3. Conducted a subsurface exploration program that consisted of the advancement of five (5) Cone Penetration Test (CPT) soundings to a maximum depth of 100 feet, along with five (5) hollow-stem auger drill holes, one to a depth of approximately 75 feet, two to a depth of about 15 feet for infiltration testing, and two to a depth of about 5 feet for R-value testing and pavement design. The drill holes were logged by our project engineer and samples were collected for laboratory testing.

4. Performed laboratory testing on bulk and undisturbed samples that were collected during our subsurface exploration. Laboratory testing included the determination of in-situ moisture and density, maximum dry density and optimum moisture content, particle size, Atterberg limits, expansion potential, consolidation and shear strength characteristics, chemical and specialty corrosion testing, and R-value testing.

5. Interpreted and evaluated field conditions and laboratory data.

6. Performed geotechnical engineering analyses using the field and laboratory data in conjunction with the conceptual site plan. The analysis addressed site seismicity, seismic-induced liquefaction and lateral spreading, foundation design, anticipated static settlements, retaining wall evaluation, groundwater concerns, site infiltration potential, and pavement section design.

7. Prepared this report which summarizes the results of our research, subsurface exploration, laboratory and field testing, analyses, conclusions, and recommendations relative to the subject hotel design and general adjacent site development of the subject project.

SITE LOCATION AND DESCRIPTION

The former City Hall site, located on the northeast corner of Newport Boulevard and 32nd Street, is surrounded on all four sides by commercial and business developments. The general location of the site with respect to nearby roadways and landmarks is shown on the attached Plate 1 – Location Map. The existing site improvements include concrete curbs and gutters, asphalt paved streets, parking lot drives and bays, along with concrete driveways, three 2-story buildings and one 1-story building that are of wood-frame construction with conventional foundations, along with adjacent hardscape and landscape improvements. It should be noted that a previous 1-story building was removed at an unknown date along Newport Boulevard northwest of the existing City Hall buildings (near our DH-2 drill hole location). Also, previous gas pumps and underground gas tanks were removed near the southeast corner of the site between the existing 2-story building and 32nd Street in the early 2000's. The general locations of these removed structures are shown on the attached Plate 2 – Geotechnical Map.

The majority of the site is relatively flat and level and drains by sheet flow towards the west, from Via Oporto to Newport Boulevard, to existing storm drain catch basins. There are no slopes on the site. Elevations within the site range from a high of approximately 10.1 feet above mean sea level within the southeastern portion of the site to a low of approximately 7.3 feet above mean sea level within the southwestern portion of the site. The majority of the site is covered by either asphalt pavement or concrete flatwork; however, there are planter and landscape areas that contain large lawn areas, groundcover, shrubs and occasional trees.

BACKGROUND HISTORY AND GEOLOGIC REPORTS

In order to identify and describe the site history and geologic conditions; we reviewed historical aerial photographs and published geologic maps and reports.

AERIAL PHOTOGRAPHY REVIEW

An aerial photo review was performed for the subject site in order to assess historical land use and site development. Air photos reviewed ranged from 1938 through 2013. Photos taken in 1938 show Newport Boulevard paved, but the site itself and adjacent streets were undeveloped. Photos taken in 1953 show development of the site with three initial main buildings and parking lots, and 32nd Street paved and in use. By 1959, Finley Street was constructed. Future photos show little change to the site, except for the addition of several buildings over time and the widening of Newport Boulevard. A list of aerial photographs reviewed is included in the back of the "Reference" section of this report.

PLANNED IMPROVEMENTS AND GRADING

Based on our review of the preliminary site plans, it is proposed to reuse the former City of Newport Beach City Hall site as a 99,625 square-foot 130-room upscale boutique 4-story hotel, a 3,085 square-foot spa and fitness center, a 3,470 square-foot signature restaurant, a 1,735 square foot retail space, a 4,900 square foot conference center, an outdoor pool and spa, outdoor seating areas, and a covered front lobby entryway, and 150 surface parking stalls. The hotel will be surrounded by streets, parking, drives, and wide landscape and hardscape pedestrian areas.

The existing buildings within the former City Hall site will be demolished and removed to allow construction of a new boutique hotel and its related adjacent buildings and site improvements, as mentioned above. Other changes to the old City Hall area will consist of almost the improvement of existing street, drive, and parking stall features along 32nd Street, Via Oporto, and Finley Avenue. New concrete walkways, stairways, patios, and site walls will be constructed around the new buildings. Due to their poor existing condition, it is likely that the existing parking lot and drive aisle pavement sections will need to be removed and replaced with new sections.

Through the majority of the site, proposed grades will remain essentially the same as existing grades with only minor cuts and fills of a few inches up to 1 to 2 feet being required. However, local areas will require more significant grading. We understand that the proposed buildings will have a finish floor elevation of 10.0 feet.

SUBSURFACE EXPLORATION

Our recent subsurface investigation consisted of the advancement of five (5) Cone Penetration Test (CPT) soundings to a maximum depth of 100 feet, along with five (5) hollow-stem auger drill holes, one to a depth of approximately 75 feet, two to a depth of about 15 feet (the top 5 feet used for infiltration testing), and two to a depth of about 5 feet for R-value testing and pavement design.

The logs of each boring are contained in Appendix A-1 and the Legend to Logs is presented as Plate A-1. CPT soundings were performed with a 30-ton CPT rig and a 15-cm^2 cone with readings taken every 2 cm. The CPT logs and data are contained in Appendix A-2. The approximate locations of the drill holes, pavement core holes, and CPTs are shown on Plate 2 – Geotechnical Map.

INFILTRATION TESTING

Two infiltration tests were performed in general accordance with the Santa Ana Regional Water Quality Control Board Technical Guidance Document (TGD) Appendices dated March 2011, utilizing the shallow percolation test procedure contained in Section VII.3.8. To comply with the requirements of the TGD, two (2) 8-inch-diameter test holes were excavated adjacent to drill holes DH-1 and DH-5 to a depth of approximately 5 feet using a hollow stem auger drill rig. The infiltration test hole locations are shown for ease of reference on the attached Geotechnical Map, Plate 2.

Logs for DH-1 through DH-5 are contained within Appendix A-1 and indicate that the site is underlain by approximately 5 to 6 feet of dredged fill overlying alluvial soil materials. The dredged fill materials are highly variable and consist of intermixed layers of silts, sands, and silty sands, and clayey sands while the alluvial materials consist of loose to medium dense sands to silty sands to with occasional thick layers of moderately firm to very stiff silts and clays. The holes were drilled to depths of 5 feet and infiltration was monitored from depths ranging from approximately 2 to 5 feet below grade that corresponds to the infiltration zone of a potential infiltration system.

LABORATORY TESTING

Laboratory testing for the subject investigation was performed to determine soil engineering classifications and properties. Testing included the following: in-place moisture and dry density, maximum dry density and optimum moisture content, particle size distribution, Atterberg limits, chemical corrosion suite, consolidation characteristics, undisturbed and remolded shear strengths, subgrade R-Values, sand equivalent, and expansion index tests. Laboratory procedures and recent test results are presented in our Appendix B-1 – GMU Geotechnical Laboratory Procedures and Test Results. Pertinent laboratory test data is also shown on our drill hole logs.

Laboratory test results on samples collected at the site indicate that very low expansive soils are present. Visual descriptions indicate that the on-site dredge fill materials consist of sands and silty sands, while the underlying alluvial materials consist primarily of loose to medium dense sands to silty sands with occasional thick layers of moderately firm to very stiff silts and clays. Given the exploration and laboratory data, it is our opinion that the proposed improvements should be designed assuming very low expansion potential.

The results of chemical testing indicate that the on-site soils will be very mildly corrosive to ferrous metals. The results of sulfate tests indicate that the site will have a negligible sulfate exposure to concrete as defined by the 2013 California Building Code (2013 CBC).

GEOLOGIC FINDINGS

LOCAL GEOLOGY AND SUBSURFACE SOIL CONDITIONS

Published geologic maps indicate that prior to development (pre-1900s) the site was part of the marshy area at the mouth of the Santa Ana River before it shifted westward to its current location. This marshy area consisted of estuary deposits in the form of sand bars and shallow marsh/lagoonal areas. The Newport Bay area was developed into the current configuration in the early 1900s by dredging some areas and filling others to create the existing islands. Based on our research and subsurface investigation, the site is underlain by a thin veneer of these dredge materials overlying native estuary deposits. For ease of reference, these deposits are referred to as alluvial soil in this report.

Detailed descriptions of the geologic materials beneath the site as observed during our recent subsurface exploration are described below.

Dredged Fill (Qaf)

The dredged fill materials within the site originated from the estuary and near shore deposits in the bay. These materials consist of sand to silty sand that is moist to very moist, medium dense, with scattered shell fragments. Notable structure within these deposits was not observed during our investigation.

Alluvium (Qal)

Alluvial soils were encountered underlying the dredge fill materials across the site. Where encountered, these materials consist of gray and brown sands and silts with some clays. The materials are moist to wet and loose to medium dense, with no notable structure observed.

GROUNDWATER

Groundwater was encountered within our recent drill holes and CPT soundings at elevations of about 3.5 to 4 feet above MSL (depths of 4.5 to 5 feet below existing grades). Groundwater elevations across the site are likely primarily controlled by elevation of the water within the adjacent bay. It should be noted that the groundwater elevations measured during our exploration were affected by the time of day as it relates to the local tidal cycle, and therefore should be assumed to fluctuate with the tides, the lunar cycle, and recent rainfall events.

In order to better evaluate the groundwater data collected during our investigation, these depths to groundwater were compared to the depth of historically high groundwater shown within the Seismic Hazard Zone Report for the Newport Beach Quadrangle (CDMG, 1997). These maps indicate a historical high groundwater of less than 10 feet b.g.s. which is about 5 feet lower than the elevation of groundwater found during our investigation.

Based on the above findings, groundwater may be encountered as high as 4 feet b.g.s. Consequently, the groundwater may impact proposed corrective grading (i.e. at the bottom of the removals) as well as utility trenches deeper than 4 feet b.g.s.

FAULTING AND SEISMICITY

The site is not located within the published Newport Beach Quadrangle Alquist-Priolo Earthquake Fault Zone dated July 1, 1986, and no known active faults are shown on current geologic maps for the site (CDMG, 1986). Plate 4 shows the site location with respect to regional seismic sources. The nearest known active fault is the offshore segment of the Newport-Inglewood fault, which is located approximately 0.5 kilometers southwest of the site and is capable of generating a maximum earthquake magnitude (M_w) of 7.5. The site is also located over the surface projection of the San Joaquin Hills Blind Thrust and about 9 kilometers from its rupture surface, which is capable of generating a maximum earthquake magnitude (M_w) of 7.1. Given the proximity of the site to these and numerous other active and potentially active faults, the site will likely be subject to earthquake ground motions in the future.

The site is underlain by high plasticity alluvial silts 50 feet bgs, silty sand, and sandy alluvial deposits at the upper 50 feet bgs and a relatively shallow mantle of engineered fill. The shear wave velocities were measured at SCPT-3 for the upper 100 feet. Site V_{s30} was calculated to be 514 feet per second, which resulted in a Site Soil Profile Class E (S_E, soft site). Since the site is potentially liquefiable, the soil profile may be considered S_F. However, Section 20.3.1 of ASCE 7-10 provides an exception as follows: “For structures having fundamental periods of vibration equal or less than 0.5 s, site response analysis is not required to determine spectral accelerations for liquefiable soils. Rather, a site class is permitted to be determined in accordance with Section 20.3 and the corresponding values of F_a and F_v determined from Tables 11.4-1 and 11.4-2." Therefore, the Site Class S_E was used for determination of the site spectral accelerations.

The Maximum Considered Earthquake (MCE_G) Peak Horizontal Ground Acceleration ($PHGA_M$) is 0.63g as determined in accordance with the 2010 CBC. For the purposes of our liquefaction analysis, the USGS 2008 Interactive Deaggregation website was used to determine the modal magnitude and modal distance. The deaggregation resulted in a mode magnitude of 6.97 and mode distance of less than 2.5 miles.

If requested by the project structural engineer, GMU can also provide a site-specific ground motion hazard analysis per Chapter 21 of ASCE 7-10.

SEISMIC HAZARD ZONES

The subject property is not located within an area mapped as having the potential for seismic-induced landsliding; however, it is located within an area mapped as having the potential for seismic-induced liquefaction as shown in Seismic Hazard Zone Map for the Newport Beach Quadrangle (CDMG, 1998).

GEOTECHNICAL ENGINEERING FINDINGS

LIQUEFACTION, SEISMIC SETTLEMENT, AND LATERAL SPREADING

Liquefaction Investigation

The site is located within a zone mapped as having the potential for earthquake-induced liquefaction. In addition, groundwater was observed at depths of approximately 4.5 to 5 feet bgs and granular soils were encountered below the groundwater. Therefore, liquefaction and related hazards were quantitatively evaluated utilizing the subsurface data from our CPT soundings.

Design Earthquake and Mode Magnitude

Based on the 2013 CBC, a PGA of 0.63g and Modal Magnitude of 6.97 were used for this study.

Design Groundwater Level

The referenced seismic hazard evaluation report indicates a historically high groundwater level of 10 feet bgs. Actual groundwater levels encountered during our recent exploration ranged from approximately 4.5 to 5 feet below existing site grades and the site is expected to be raised about

1.5 to 2 feet at the building areas. Therefore our analysis was performed using a design groundwater table of 6 feet below the final grade.

Liquefaction Analyses

GMU utilized CLiq version 1.7.4.34 to evaluate CPT data for liquefaction. CLiq is a commercial computer software program that applies the latest Robertson (2009) method for liquefaction analysis including post-earthquake settlement and lateral displacement for liquefiable sands and softened clays.

Liquefaction, Seismic Settlement, and Lateral Spreading Potential

Our analysis indicates that relatively thin, discrete zones within the zone of artificial fill and alluvium below the water table may be subject to liquefaction during a design seismic event. Based on our analysis, the site has a moderate potential for any adverse effects of liquefaction due to seismic-induced settlement. Our liquefaction seismic settlement calculations indicate approximately 0.7 to 2.9 inches of settlement could occur during the MCE earthquake.

Considering the site flatness and distance from the Back Bay, the site has a low potential for adverse effects due to seismic-induced lateral spreading.

Tsunamis

Tsunamis or seismic sea waves that have affected coastal southern California are generally produced by submarine fault rupture. Historical records indicate that the coast, from San Pedro to Newport Bay, has been affected by six significant tsunamis since 1868 (Vasily Tito, National Oceanographic and Atmospheric Administration, Personal Communication, June 1998). The largest waves were on the order of 6 to 8 feet. The most extensive recent damage occurred in harbor areas such as Los Angeles (Alaska - 1964, Chile - 1960).

Legg et al. (2004) investigated the tsunami hazard associated with the Catalina fault offshore of Southern California. They simulated tsunamis based on coseismic deformation of the sea floor and estimated that coastal run-up values are 5 to 13 feet, although run-up could exceed 23 feet depending upon amplification due to bathymetry and coastal configuration. Large earthquakes on the Catalina fault are relatively infrequent, with recurrence intervals of several hundred to thousands of years (Legg et al., 2004).

Tsunami Inundation Maps

In 2009, the California Emergency Management Agency, California Geological Survey, and University of Southern California partnered in an effort to create tsunami inundation maps for California. The tsunami inundation maps were generated through a modeling process that utilizes the Method of Splitting Tsunamis (MOST). This computational program models tsunami evolution and inundation based on bathymetry and topography. The modeling also utilizes a variety of tsunami source events, including "realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides" (California Emergency Management Agency et al., 2009). Using the source, bathymetry, and topography, the tsunami modeling yields a maximum inundation line. It is important to note that the published map does not represent inundation from a single event. Rather, it is the result of combining inundation lines from multiple source events. Therefore, the entire inundation region will not likely be inundated during a single tsunami event (California Emergency Management Agency et al., 2009).

The Tsunami Inundation Map states that the "tsunami inundation map was prepared to assist cities and counties in identifying their tsunami hazard. It is intended for local jurisdictional, coastal evacuation planning uses only." Furthermore, the map conveys that it is not intended for regulatory purposes. With respect to probability, the map states that it contains "no information about the probability of any tsunami affecting any area within a specific period of time."

A Tsunami Inundation Map for Emergency Planning was published for the Newport Beach Quadrangle (California Emergency Management Agency et al., 2009). In considering the Tsunami Inundation Map with respect to the proposed Lido House development, it is critical to note three points: (1) the map is only intended for emergency planning and evacuation planning; (2) the map does not convey any information with respect to probability or timing of tsunami events; and (3) the inundation line is a conservative combination of multiple source events.

Tsunami Hazard Assessment

The proposed Lido House is located within the Tsunami inundation area, therefore, has a high potential for being affected by Tsunamis. An excerpt of the Tsunami Inundation Map for the Newport Beach Quadrangle is attached as Plate 5 to this report. However, the probability and severity of tsunami inundation in the lowland areas cannot be estimated based on current available information.

STATIC SETTLEMENT/COMPRESSIBILITY

In general, the upper 50 feet of subgrade soils were medium dense to dense granular sand materials with lenses of fine grain soils. The sand deposits are underlain by soft high plasticity silts. In addition, our laboratory testing indicated that the upper granular soils have low compressibility. Total static settlements are expected to range from 1 to 2 inches below the proposed buildings depending on the foundation bearing capacity; however, the majority of the static settlements will be completed by the end of construction.

SOIL EXPANSION

The expansion potential of the on-site dredged fill materials were assessed based on visual classifications, particle size distributions, Atterberg limits, expansion index, previous studies, and our local experience. The laboratory test summary table is contained in Appendix B-1. The dredged fills mantling the site have a very low expansion potential. Since the near surface fill materials have a predominantly very low expansion potential, the design of building slabs and exterior hardscape features that will be in contact with these materials should be designed assuming a very low expansion index.

SOIL CORROSION

To evaluate the corrosion potential of the on-site soils to both ferrous metals and concrete, representative samples were tested for pH, minimum resistivity, soluble chlorides, and soluble sulfates. The results of chemical testing (contained in Appendix B) indicate that the on-site soils should be considered very mildly corrosive to ferrous metals and possess a negligible sulfate exposure to concrete, however, <u>a moderate exposure to sulfates may be considered in design</u> for concrete placed in contact with on-site soils.

SOIL INFILTRATION RESULTS

As described previously, infiltration testing was performed within the site in general accordance with the Santa Ana Regional Water Quality Control Board Technical Guidance Document (TGD) Appendices dated March 2011, utilizing the shallow percolation test procedure contained in Section VII.3.8. Two locations were tested for infiltration between 2 to 4 feet in depth below the existing surface. The average infiltration rate varied from 1.4 inches per hour at DH-1 to 12.3 inches per hour at DH-5.

EXCAVATION CHARACTERISTICS

Rippability

The dredged fill materials and alluvial soils underlying the site can be easily excavated with conventional grading equipment such as dozers, loaders, excavators, and backhoes.

Trenching

We expect that excavation of new utility trenches can be accomplished utilizing conventional trenching machines and backhoes. Trench support requirements will be limited to those required by safety laws or other locations where trench slopes will need to be flattened or supported by shoring designed to suit the specific conditions exposed.

Volume Change

In order to aid planning for the anticipated grading, we estimate that the change in volume of on-site disturbed surficial dredged fills that are excavated and placed as new compacted fill at an average relative compaction of 92% will result in volume losses that will range from approximately 5 to 10 percent. For rough planning purposes only, an average volume loss of 7.5 percent may be assumed.

CONCLUSIONS

DEVELOPMENT FEASIBILITY

Based on the geologic and geotechnical findings, it is our opinion that proposed construction is feasible from a geotechnical standpoint. However, there are several hazards that must be mitigated to provide long-term site stability and proper support of proposed structures. The subject property will be suitable for the proposed grading and construction provided that the site hazards are mitigated in accordance with the recommendations of this report and with the City of Newport Beach grading and building requirements. It is also the opinion of GMU Geotechnical that proposed grading and construction will not adversely affect the geologic stability of adjoining properties provided grading and construction are performed in accordance with the recommendations provided in this report.

SITE PREPARATION AND GRADING RECOMMENDATIONS

GENERAL

The subject site should be precise graded in accordance with the City of Newport Beach grading code requirements (and all other applicable codes and ordinances) and the recommendations as outlined in the following sections of this report. The geotechnical aspects of future grading plans and improvement plans should be reviewed by GMU Geotechnical prior to grading and construction. Particular care should be taken to confirm that all project plans conform to the recommendations provided in this report. All planned and corrective grading should also be monitored by GMU Geotechnical to verify general compliance with the recommendations outlined in this report.

DEMOLITION AND CLEARING

Prior to the start of the planned improvements, all materials associated with the existing buildings to be removed, including footings, floor slabs, and underground utilities, should be demolished and hauled from the site. The existing asphalt pavement sections, which are inadequate and severely damaged, will also need to be demolished. Due to the limited amount of grading and fill placement that will occur, the old asphalt and base materials generated from the removal of the existing pavement sections should be either recycled or collected and hauled off-site.

The on-site dredge fill materials are suitable for use as new compacted fill from a geotechnical perspective if care is taken to remove all significant organic and other decomposable debris. Cavities and excavations created upon removal of subsurface obstructions, such as existing buried utilities, should be cleared of loose soil, shaped to provide access for backfilling and compaction equipment, and then backfilled with properly compacted fill.

The project geotechnical consultant should provide periodic observation and testing services during demolition 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.

CORRECTIVE GRADING – BUILDINGS

The foundations of these new buildings and structures will be supported on engineered fill underlying the mat slab foundation system. It is recommended the existing dredge fill materials be overexcavated to a depth of at least 4 feet below the existing grades and these excavated materials be replaced as properly compacted fill placed at a minimum relative compaction of at least 92% at 2% above optimum moisture content.

CORRECTIVE GRADING – EXTERIOR PARKING, DRIVEWAY AND HARDSCAPE AREAS

It is expected that the existing surficial dredged materials will be disturbed during the demolition of the existing building, hardscape, landscape, and asphalt pavement sections. Therefore, to provide adequate support of proposed exterior improvements such as parking lots and driveways, and hardscape features such as patios, walkways, stairways and planter walls, the existing ground surfaces in these areas should be overexcavated to a depth of at least 2 feet below the existing grades and shallow foundations. These excavated materials can then be replaced as properly compacted fill at a minimum relative compaction of at least 92% at 2% above optimum moisture content.

FILL MATERIAL AND PLACEMENT

Suitability

All on-site dredge fill soils are considered suitable for use as compacted fill from a geotechnical perspective if care is taken to remove all significant organic and other decomposable debris, and separate and stockpile rock materials larger than 6 inches in maximum diameter.

Compaction Standard and Methodology

All soil material used as compacted fill, or material processed in-place or used to backfill trenches, should be moistened, dried, or blended as necessary and densified to at least 92% relative compaction as determined by ASTM Test Method D 1557. It is recommended that fills be placed a minimum of 2% above optimum moisture content.

Material Blending

The existing surficial engineered fill materials are expected to be generally slightly below optimum moisture content but may have variable moisture content depending on the season in which work is performed. The majority of the materials to be handled during grading will require some blending and addition of water to meet acceptable moisture ranges for sufficient compaction (i.e., minimum 2% above optimum moisture content).

Use of Rock or Broken Concrete

Significant rock materials greater than 6 inches in diameter are not anticipated during the subject grading. Due to the limited amount of grading and fill placement that will occur, any oversize rock materials generated during grading should be collected and hauled off-site.

TEMPORARY SLOPE STABILITY

During site grading, temporary laid back slopes up to approximately 4 to 5 feet in height are expected to be created during the construction of proposed low retaining walls. The sidewalls of these temporary slopes are expected to expose newly placed engineered fill consisting of the existing dredge fill materials.

Based on the anticipated engineering characteristics of these materials, temporary slopes to a maximum height of 4 feet may be cut vertically without shoring subject to verification of safety by the contractor. Deeper excavations should be braced, shored or, for those portions of the sidewalls above a height of 4 feet, sloped back no steeper than 1:1 (horizontal to vertical). In addition, no surcharge loads should be allowed within 10 feet from the top of the temporary slopes.

We anticipate the slopes will be temporarily stable provided the above recommendations are followed. However, modifications to these recommendations may be required based on our observations of the actual conditions exposed in the field

Our temporary slope recommendations are provided only as general guidelines, and all work associated with temporary slopes should meet the minimal requirements as set forth by CAL-OSHA. Temporary slope construction, maintenance, and safety are the responsibility of the contractor.

POST-GRADING AND GROUND IMPROVEMENT CONSIDERATIONS

UTILITY TRENCHES

Utility Trench Excavations

The subject site is underlain by approximately 5 to 6.5 feet of dredged fill materials that consist of sands and silty sands. In general, the granular sand materials were found to be medium dense to dense while the fine-grained clay and silt materials were found to be predominantly firm to very firm. Furthermore, groundwater was encountered at relatively shallow depths (4.5 to 5 feet).

For this condition, the soils above the groundwater level can be considered as OSHA soil type C and should be laid back at a maximum slope ratio of 1.5:1, horizontal to vertical. In addition, surcharge loads should not be allowed within 10 feet of the top of the excavations.

For deeper trenches, groundwater will be encountered and the contractor should develop an approach for dewatering, shoring, and addressing shallow groundwater conditions. Sumping and pumping of free water from open excavations is not expected to result in dry and stable trench conditions due to the close proximity of the adjacent bay; therefore, a dewatering system will need to be designed, installed, and operated by an experienced company specializing in groundwater dewatering systems. The dewatering system should be capable of lowering the groundwater surface to a depth of 5 feet below the bottom of the trenches. Before implementing a dewatering system, we recommend that a dewatering test program be conducted to evaluate the feasibility and efficiency of the proposed dewatering system. Dewatering should be performed and confirmed by potholing or other means prior to trench excavation. Dewatering operations will also need to comply with all NPDES regulations.

Temporary shoring will be required below the water table where saturated soils are encountered or where vertical trench sidewalls are desired. Shoring should consist of metal, plywood, and/or timber sheeting supported by braces or shields. Trench walls lacking sheeting will be unstable and experience sloughing. Trench shields will only provide worker safety and will not provide full support of the trench walls unless the shields are installed tightly against the sidewalls. Lateral pressures considered applicable for the shoring design will depend on the type of shoring system selected by the contractor and whether the site is dewatered. GMU can provide specific design values once the type of shoring is determined.

The above recommendations are presented as guidelines only and are minimum requirements. Temporary trench excavation construction, maintenance, and safety are the responsibility of the pipeline contractor. The contractor should retain a qualified and experienced registered engineer to design any shoring systems in accordance with OSHA criteria. The shoring engineer should evaluate the adequacy of the shoring design parameters provided in this report and make appropriate modifications as necessary. The design should consider local groundwater levels as reported herein and that groundwater levels may change over time as a result of tidal influences.

Utility Trench Subgrade Stabilization

Prior to pipeline bedding placement, the trench subgrades should be firm and unyielding. If unsuitable subgrade soils are encountered, the contractor should consult with the project geotechnical engineer to provide subgrade stabilization. Stabilization may generally consist of the placement of crushed rock or processed miscellaneous base. Crushed rock, if used, would need to be encased in filter fabric. Specific recommendations would be dependent on actual conditions encountered.

Utility Trench Backfill Considerations

Backfill compaction of utility trenches should be such that no significant settlement will occur. Backfill for all of these trenches should be compacted to at least 92% relative compaction subject to sufficient observation and testing. Flooding in the trench zone is not recommended. If native material with a sand equivalent less than 30 is used for backfill, it should be placed at near-optimum moisture content and mechanically compacted. Jetting or flooding of granular material should not be used to consolidate backfill in trenches adjacent to any foundation elements.

Where trenches closely parallel a footing (i.e., for retaining walls) and the trench bottom is located within a 1 horizontal to 1 vertical plane projected downward and outward from any structure footing, a minimum 1½-sack concrete slurry backfill should be utilized to backfill the portion of the trench below this plane. The use of concrete slurry is not required for backfill where a narrow trench crosses a footing at about right angles.

We suggest that these recommendations be included as a specification in all subcontracts for underground improvements. In addition, the design of all underground conduits, pipelines, or utilities should also consider the potentially corrosive nature of the on-site groundwater to metals, as previously described in this report.

SURFACE DRAINAGE

Surface drainage should be carefully controlled to prevent runoff over graded sloping surfaces and ponding of water on flat pad areas. Positive drainage away from graded slopes is essential to reduce the potential for erosion or saturation of sloping surfaces. Maintaining positive drainage of all landscaping areas along with avoiding over-irrigation will help minimize the possibility of "perched" groundwater accumulating slightly below the graded surfaces. All drainage at the site should be in minimum conformance with the applicable City of Newport Beach codes and standards.

FOUNDATION DESIGN RECOMMENDATIONS

STRUCTURE SEISMIC DESIGN

The site is not within an Alquist-Priolo Earthquake Fault Zone, and no known active faults are shown on current geologic maps as crossing the site. The nearest known active fault is the offshore segment of the Newport-Inglewood fault, which is located approximately 0.5 kilometers southwest of the site and is capable of generating a maximum earthquake magnitude (M_w) of 7.5. The site is also located over the surface projection of the San Joaquin Hills Blind Thrust and about 9 kilometers from its rupture surface, which is capable of generating a maximum earthquake magnitude (M_w) of 7.1. Given the proximity of the site to these and numerous other active and potentially active faults, the site will likely be subject to significant earthquake ground motions in the future.

The average shear wave velocity for the upper 100 feet of subsurface soils (V_{s30}) was estimated to be 514 feet per second based on the shear wave velocity measurements at SCPT-3. We have assumed that the site is underlain by a S_E soil profile. The seismic design coefficients based on ASCE 7-10 and 2013 CBC are listed in Table 1.

Table 1. 2013 CBC Site Categorization and Site Coefficients

Categorization/Coefficient	**Design Value**
Soil Profile Type (Table 20.3-1)	S_E
Short Period Spectral Acceleration S_s **	1.704g
1-sec. Period Spectral Acceleration S_1 **	0.630g
Site Coefficient F_a (Table 11.4-1)**	0.9
Site Coefficient F_v (Table 11.4-2)**	2.4
Short Period MCE* Spectral Acceleration S_{MS} **	1.533g
1-sec. Period MCE Spectral Acceleration S_{M1} **	1.511g
Short Period Design Spectral Acceleration S_{DS} **	1.022g
1-sec. Period Design Spectral Acceleration S_{D1} **	1.008g
MCE Peak Ground Acceleration (PGA, Figure 22-7)	0.70
Site Coefficient F_{PGA} (Table 11.8-1)**	0.9
MCE Peak Ground Acceleration (PGA_M)	0.63
Modal Contributing Magnitude to MCE Event	6.97

* MCE: Maximum Considered Earthquake
** Values Obtained from USGS Earthquake Hazards Program website is based on the ASCE7-10 and 2013 CBC and site coordinates of N33.6165 ^{o} and W 117.929^o.

Based on the 2013 California Building Code (2013 CBC), the peak ground acceleration (PGA_M) for liquefaction evaluation is 0.63g for the MCE event. This PHGA is associated with a modal earthquake magnitude of 6.97 at a modal distance of 2.5 miles from the site using the USGS 2008 Interactive Deaggregation website.

It should be recognized that much of southern California is subject to some level of damaging ground shaking as a result of movement along the major active (and potentially active) fault zones that characterize this region.

If requested by the project structural engineer, GMU can also provide a site-specific ground motion hazard analysis per ASCE 7-10 Chapter 21.

GENERAL

The following preliminary foundation design recommendations are provided based on anticipated conditions at the completion of anticipated grading; however, these recommendations are based on conceptual plans that may be revised during the plan check process. Ultimate construction and grading within the site should be in accordance with all applicable provisions of the grading and building codes of the City of Newport Beach, the applicable CBC, and all of the recommendations of the project civil and geotechnical consultants involved in the final site development.

Geotechnical Design Parameters for Mat Foundations

To minimize the adverse effects of the earthquake-induced settlements and provide repairable foundation systems after the design earthquake, we recommend supporting the proposed structures by structural mat slab(s). The mat slab(s) will bridge over the potential localized deformations after the earthquake and may also be re-leveled after the earthquake without major costs.

Corrective Grading
We recommend that the existing fill and alluvial soils be excavated beneath the entire footprint of the structures to a minimum depth of at least 4 feet below the planned mat foundation. Removals should extend laterally to at least 5 feet from the base of the outside of the mat foundation. Artificial fill/alluvium derived from the excavated soils should be compacted to a minimum of 92% relative compaction per ASTM 1557.

Design Parameters
An allowable net static bearing capacity of 2,000 pounds per square foot may be used for design of the mat foundation(s). A lateral sliding coefficient of 0.35 is recommended. The mat thickness and amount of reinforcement should be determined by a Registered (Structural) Engineer in the State of California. For structures supported by mat foundations, we recommend using a subgrade reaction coefficient defined as:

$$K_b = K_{v1} * \left[\frac{(m + 0.5)}{1.5m} \right] * \left[\frac{(B + 1)}{2B} \right]^2$$

Where:

K_{v1}: Normalized subgrade reaction coefficient (namely, corresponding to a 1 foot square bearing plate), estimated at 100 pounds per cubic inch (pci) for engineered fill subgrade. It should be noted that this value applies to dry or moist materials, with groundwater at a depth of at least 1.5B below the base of the footing. If groundwater is at the base of the footing, use $K_{v1}/2$ to calculate settlements.

B: Width of the mat foundation measured in feet.

m: Ratio of length over width of a rectangular footing.

Circular, hexagonal, and octagonal foundation shapes can be approximated to an equivalent square. Based on the maximum bearing pressure of 2,000 psf below the mat slabs, we estimate that total static mat slab settlement should be less than approximately 2 inches, with 1 inch of post-construction total settlement, and a post-construction static differential movement of less than approximately ½-inch. The estimated settlements may be further refined when the final mat slab contact pressures become available.

MOISTURE VAPOR BARRIERS

Due to the existing shallow groundwater table, a vapor barrier equivalent to Stego 15 should be utilized. The barrier should be installed as follows:

- Below the slabs of all buildings with habitable areas or moisture-sensitive floor coverings.

- Installed per manufacture's specifications as well as with all applicable recognized installation procedures such as ASTM E 1643-98.

- Joints between the sheets and the openings for utility piping should be lapped and taped. If the barrier is not continuously placed across footings/ribs, the barrier should, as a minimum, be lapped into the sides of the footing/rib trenches down to the bottom of the trench.

- Punctures in the vapor barrier should be repaired prior to concrete placement.

- Prior to placing the barrier, a minimum of 4 inches of ¾-inch graded rock should be placed over the subgrade. The need for sand and/or the amount of sand above the moisture vapor retarder should be specified by the structural engineer. The selection of sand above the retarder is not a geotechnical engineering issue and is hence outside our purview. If the structural engineer requires sand above the barrier, it should consist of 1 to 2 inches of clean sand with a minimum sand equivalent of 30.

WATER VAPOR TRANSMISSION

As discussed above, placement of a moisture vapor barrier below certain slab areas is recommended. This moisture vapor barrier recommendation is intended only to reduce moisture vapor transmissions from the soil beneath the concrete and is consistent with the current standard of the industry for construction in Southern California. It is not intended to provide a "waterproof" or "vapor proof" barrier or reduce vapor transmission from sources above the barrier. Sources above the barrier include any sand placed on top of the barrier (i.e., to be determined by the project structural designer) and from the concrete itself (i.e., vapor emitted during the curing process). The evaluation of water vapor from any source and its effect on any aspect of the proposed living space above the slab (i.e., floor covering applicability, mold growth, etc.) is outside our purview and the scope of this report.

FLOOR COVERINGS

Prior to the placement of flooring, the floor slabs should be properly cured and tested to verify that the water vapor transmission rate (WVTR) is compatible with the flooring requirements.

CONCRETE

Based on the previously and recently performed laboratory testing, the onsite soils have negligible moderate concentrations of sulfates per Section 1904.3 of the 2013 CBC. In addition, concrete will have a potential exposure to seawater. Consequently, we recommend that minimum Type II/V cement along with a maximum water/cement ratio of 0.50 and a minimum compressive strength of 4,000 psi be used for all structural foundations in contact with the onsite soils. This recommendation will serve to minimize the potential of water and/or vapor transmission through the concrete and minimize the potential for physical attack to concrete from non-sulfate based salts. In addition, wet curing of the concrete as described in ACI Publication 308 should be considered.

The aforementioned recommendations in regards to concrete are made from a soils perspective only. Final concrete mix design as well as any concrete testing is outside our purview. All applicable codes, ordinances, regulations, and guidelines should be followed in regard to designing a durable concrete with respect to the potential for detrimental exposure from the on-site soils and/or changes in the environment.

CORROSION PROTECTION OF METAL STRUCTURES

The results of the laboratory chemical tests performed on soil samples collected within and adjacent to the subject area indicate that the on-site soils are very mildly corrosive to ferrous metals. Consequently, metal structures which will be in direct contact with the soil (i.e., underground metal conduits, pipelines, metal sign posts, metal door frames, etc.) and/or in close proximity to the soil (wrought iron fencing, etc.) may be subject to slight corrosion. The use of special coatings or cathodic protection around buried metal structures has been shown to be beneficial in reducing corrosion potential due to soil and groundwater. The potential for corrosion of ferrous metal reinforcing elements embedded in structural concrete will be reduced by the use of the recommended maximum water/cement ratio for concrete.

The laboratory testing program performed for this project does not address the potential for corrosion to copper piping. In this regard, a corrosion engineer should be consulted to perform more detailed testing and develop appropriate mitigation measures (if necessary). Otherwise, the on-site soils should be considered corrosive to copper.

The above discussion is provided for general guidance in regards to the corrosiveness of the on-site soils to typical metal structures used for construction. Detailed corrosion testing and recommendations for protecting buried ferrous metal and/or copper elements is beyond our purview.

SITE WALL AND RETAINING WALL DESIGN CRITERIA

General

Exterior site retaining and screen walls are proposed within landscape and parking areas. The criteria contained in the following sections may be used for the design and construction of these walls.

Retaining Wall Design Parameters

Recommendations are provided for the site exterior retaining walls. Recommendations are provided for both cantilever and restrained walls. Calculations to support the recommendations are contained in the attached Appendix D.

- Foundation: Cantilever wall with spread footings.
- Footing Width: 24 inches minimum.
- Minimum Depth: 18 inches below lowest outside adjacent grade
- Minimum Footing Reinforcement: Four #4 bars; two at top and two at bottom of footing (footings to be continuous across openings such as footpath gates).
- Allowable Bearing Capacity: 2000 psf with a minimum embedment of 18 inches (may be increased 15% for each additional foot of width or embedment to a maximum of 3,000 psf).
- Bearing Material: At least a 2-foot-thick section of engineered fill.
- Coefficient of Friction: 0.35
- Unit Weight of Backfill: 125 pcf
- Passive Earth Pressure: 300 psf/ft of depth (disregard top soil and upper 6 inches).
- Static Lateral Earth Pressures: 63 pcf (At-Rest).
  40 pcf (Active).
- Seismic Earth Pressure: 20 pcf (inverted triangular distribution).
- Traffic Loading Pressures: 120 psf (where applicable).
- Backdrainage: A backdrainage system should be placed behind all retaining walls and drain to an appropriate approved drainage facility.
- Waterproofing: All walls should be waterproofed. Detailed waterproofing recommendations are beyond our purview.
- Backfill: On-site, relatively non-expansive soil materials may be used to backfill retaining walls. The backfill materials should be approved by the geotechnical consultant with respect to their characteristics prior to placement. All wall backfill should be should be

moistened, dried, or blended as necessary to achieve a minimum of 2% over optimum moisture content, and compacted to at least 92% relative compaction as determined by ASTM Test Method D 1557.

- Control Joints: Control/construction joints should be implemented and designed by structural engineer. As a minimum, control/construction joints should be provided at maximum intervals of 15 to 20 feet and at all angle points and other locations where differential movement is likely to occur.

Screen Walls

For standard screen walls on flat ground, footings should be a minimum of 24 inches deep below the lowest outside adjacent grade. Wall foundations should be reinforced with two #4 bars top and bottom, and joints in the wall should be placed at regular intervals on the order of 10 to 20 feet. The wall foundation shall be underlain by at least a 2-foot-thick section of engineered fill.

POLE FOUNDATIONS

Pole foundations will be required for the light bollards for the new parking area. As a minimum, the pole foundations should be at least 18 inches in diameter and at least 3 feet deep; however, the actual dimensions should be determined by the project structural engineer based on the following design parameters.

<u>Bearing Materials</u>. The pole foundations may bear into engineered fill approved by a representative from GMU.

<u>Bearing Values</u>. End-bearing capacity and skin friction may be combined to determine the allowable bearing capacities of the pole foundations. An allowable bearing pressure of 2000 pounds per square foot (psf) may be used for pole foundations at least 18 inches in diameter and embedded a minimum of 3 feet below the lowest adjacent grade. A value of 350 pounds per square foot may be used to determine the skin friction between the concrete and surrounding soil.

<u>Lateral Load Design</u>. Lateral loads may be resisted by friction at the base of the foundations and by passive resistance within the adjacent earth materials. A coefficient of friction of 0.35 may be used between the foundations and the recommended bearing material. For passive resistance, an allowable passive earth pressure of 300 pounds per foot of pile diameter per foot of depth into competent bearing material may be used; however, passive resistance should be ignored within the upper foot due to possible disturbance during drilling. The passive resistance may be assumed to be acting over an area equivalent to two pile diameters.

SWIMMING POOL AND SPA RECOMMENDATIONS

Allowable Bearing and Lateral Earth Pressures

The pool and spa shells may be designed using an allowable bearing value of 1,500 pounds per square foot. Due to the low expansive nature of the onsite soils, pool and spa walls should be designed assuming that an earth pressure equivalent to a fluid having a density of 75 pounds per cubic foot is acting on the outer surface of the pool walls. Pool and spa walls should also be designed to resist lateral surcharge pressures imposed by any adjacent footings or structures in addition to the above lateral earth pressure.

Settlement

We understand that the proposed swimming pool will have a maximum depth of 4 feet. Considering that the site is expected to be raised 2 feet and the earthwork recommendations provided in this report, it is anticipated that the swimming pool will be underlain by engineered fill. We recommend supporting the swimming pool by a minimum of 2 feet of engineered fill. Based on these conditions, settlement of the pool is expected to be negligible. The project structural engineer shall consider resisting buoyancy forces due to the potential groundwater table oscillations, which may occur during the life time of the pool.

Temporary Access Ramps

It is essential that all backfill placed within temporary access ramps extending into the pool and spa excavations be properly compacted and tested. This is intended to mitigate excessive settlement of the backfill and subsequent damage to concrete decking or other structures placed on the backfill.

Pool and Spa Bottoms

If unsuitable soils are encountered, the bottom of the pool or spa excavation may need to be over-excavated and replaced to pool subgrade with compacted fill. As an alternative, the reinforcing steel in the area of a transition area may be increased to account for the differences in engineering properties and the potential differential behavior.

Plumbing

Leakage from the spa or from any of the appurtenant plumbing could create adverse saturated conditions of the surrounding subgrade soils. Localized areas of over-saturation can lead to differential expansion (heave) of the subgrade soils and subsequent raising and shifting of concrete flatwork. Therefore, it is essential that all plumbing and spa fixtures be absolutely leak-free. For similar reasons, drainage from deck areas should be directed to local area drains and/or graded earth swales designed to carry runoff water to the adjacent street.

Although the pool excavation may be free of water at the time of construction, future irrigation could result in the development of perched water zones which could affect subsurface improvements. Heavy-duty pipes and flexible couplings should be used for the pool plumbing system to minimize leaking which may produce additional pressures on the pool shell. In addition, installation of a pressure valve in the pool bottom should be used to mitigate potential buildup of pressure.

Cement Types

For moderately corrosive soils, cement shall be Type II/V and concrete shall have a minimum water to cement ratio of 0.50. Final concrete mix design is outside our purview.

Geotechnical Observations and Limitations

In general, all below grade improvements must be constructed by qualified professionals utilizing appropriate designs which account for the on-site (lot) geotechnical and geologic conditions. Observation/testing should be performed by GMU during pool/spa excavation to verify exposed soil conditions are consistent with the assumed design conditions.

It should be noted that implementation of the above recommendations only serve to reduce the subgrade adverse effects such as the potential for expansive soil related movements including slope creep and lateral fill extension. The recommendations are not intended to eliminate these types of movements. Consequently, some distortion should be anticipated if those conditions exist.

POOL AND SPA DECKING

Thickness and Joint Spacing

To reduce the potential for unsightly cracking, concrete pool and spa decking should be at least 5 inches thick and provided with construction joints or expansion joints every 6 feet or less. All open construction joints in pool and spa decking should be sealed with an approved waterproof, flexible joint sealer. Pool and spa decking should be underlain by a layer of crushed rock, gravel, or clean sand having a minimum thickness of 5 inches.

Reinforcement

Concrete pool and spa decking should be reinforced with No. 4 bars spaced 18 inches on centers, both ways. The reinforcement should be positioned near the middle of the slabs by means of concrete chairs or brick. Reinforcing bars should be provided across all joints to mitigate differential vertical movement of the slab sections. Structurally tying the decking to the pool wall is highly recommended. This will require structural reinforcement of the decking and consideration for additional loading on the pool wall. If doweling is not performed, differential movement should be anticipated.

Subgrade Preparation

As a further measure to mitigate cracking and/or shifting of concrete flatwork, the subgrade soils below concrete decking should be compacted to a minimum relative compaction of 92% and then thoroughly watered to achieve a moisture content that is at least 2% over optimum. This moisture content should extend to a depth of approximately 12 inches into the subgrade soils and be maintained in the subgrade during concrete placement to promote uniform curing of the concrete. 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 sprinklers or a light spray applied to the subgrade over a period of several days just prior to pouring concrete. Soil density and presoaking should be observed, tested, and accepted by GMU prior to pouring the concrete.

All concrete has a tendency to crack, and cracks in concrete can be caused by many different factors. When constructing concrete decks, patios, sidewalks, etc., it is important that the ground on which these improvements are to rest be properly prepared, including moisture conditioning. Slab thickness, location of joints, reinforcement, and concrete mixture must also be appropriate for the intended use. Proper placement, finishing, and curing of concrete are also very important factors in minimizing cracking.

CONCRETE FLATWORK DESIGN

Thickness and Joint Spacing

To reduce the potential for unsightly cracking and trip hazards, concrete walkways and patios should be at least 4 inches thick and provided with construction joints or expansion joints every 5 feet or less. Concrete walkways and patios should be underlain by a 4-inch-thick layer of Class 2 crushed aggregate base (CAB), crushed miscellaneous base (CMB), or clean sand having a sand equivalent of at least 30, which should then be placed on top of the soil subgrade, moisture conditioned to at least 2% over optimum moisture, and compacted to at least 90% relative compaction.

Reinforcement

Concrete walkways and patios should be reinforced with No. 3 bars spaced 18 inches on centers, both ways. The reinforcement should be positioned near the middle of the slabs by means of concrete chairs or brick. Reinforcing bars should be provided across all joints to mitigate differential vertical movement of the slab sections. Walkways and patios should also be dowelled into adjacent curbs using 9-inch speed dowels with No. 3 bars or ½-inch steel or fiberglass bars at 18 inches on centers. If doweling is not performed, differential movement should be anticipated.

Subgrade Preparation

As a further measure to mitigate cracking and/or shifting of concrete flatwork, the subgrade soils below concrete walkways and patios should be compacted to a minimum relative compaction of 92% and then thoroughly watered to achieve a moisture content that is at least 2% over optimum. This moisture content should extend to a depth of approximately 12 inches into the subgrade soils and be maintained in the subgrade during concrete placement to promote uniform curing of the concrete. 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 sprinklers or a light spray applied to the subgrade over a period of several days just prior to pouring concrete. Soil density and presoaking should be observed, tested, and accepted by GMU prior to pouring the concrete.

All concrete has a tendency to crack, and cracks in concrete can be caused by many different factors. When constructing concrete decks, patios, walkways, etc., it is important that the ground on which these improvements are to rest be properly prepared, including moisture conditioning. Slab thickness, location of joints, reinforcement, and concrete mixture must also be appropriate for the intended use. Proper placement, finishing, and curing of concrete are also very important factors in minimizing cracking.

PAVEMENT DESIGN CONSIDERATIONS

GENERAL

It is expected that the parking lots, the streets, and the driveways within the site will be constructed with both asphalt pavement and Portland cement concrete. Therefore, recommendations for both types of pavement are provided in the following sections. In order to accommodate City of Newport Beach fire-truck and trash truck loading, a traffic index (T.I.) of 5.5 has been assumed for the drive areas, whereas a T.I. of 4.0 has been assumed for the parking stall areas.

R-value tests were performed during our recent geotechnical subsurface investigation. The result of the current R-value test yielded a 69. For design purposes, we recommend utilizing an R-value of 40, which will need to be confirmed during specific grading activities in each pavement area of the site.

ASPHALT PAVEMENT DESIGN

Based on an anticipated R-value of 40 to be obtained after precise grading of pavement subgrade areas, the following pavement thicknesses should be anticipated:

Location	R-Value	Traffic Index	Asphalt Concrete (in.)	Aggregate Base (in.)
Car Parking Stalls	40	4.0	3.0	4.0
Drive Aisles	40	5.5	4.0	6.0

Asphalt pavement structural sections should consist of crushed miscellaneous base (CMB) or crushed aggregate base materials (CAB) and asphalt concrete materials (AC) of a type meeting the minimum City of Newport Beach requirements. The subgrade soils should be moisture conditioned to a minimum 2% above the optimum moisture content to a depth of at least 6 inches, and compacted to at least 92% relative compaction (per ASTM 1557). The CMB or CAB and AC should be compacted to at least 95% relative compaction (per ASTM 1557).

CONCRETE PAVEMENT DESIGN

Driveways and appurtenant concrete paving, such as trash receptacle bays, will require Portland cement concrete (PCC) pavement. Assuming a T.I. of 6 to 7, a design section of 8 inches of PCC over 6 inches aggregate base (AB) should be adequate. The AB should be Class 2 compacted to a minimum of 95% relative compaction as per ASTM D 1557.

FULL DEPTH RECLAMATION (FDR) ALTERNATIVE PAVEMENT FOR PARKING AREAS

Since minor grade changes are planned for the re-grading of the Planning Area 1 parking areas, and based on site conditions and our experience, we believe the most efficient pavement rehabilitation alternative to replacement with a conventional asphalt over base pavement section would be to utilize what is called "full depth reclamation" (FDR) utilizing a 12-inch-thick section of site reclaimed on-site AC and AB mixed with 6% cement to provide the new base for a new 4-inch-thick AC layer to be paved on top.

FDR has significant advantages over conventional pavement sections including the following major benefits:

- Savings in up-front costs (reusing materials, less excavation and import).
- Increased strength for weak in-place soils/long-term life (20- to 30-year design life).
- Reduced truck traffic to import and export materials.
- Environmental benefits and reduced community construction impact.
- Cautionary measures should be taken to avoid damaging existing utilities to ensure clearance for removal depths.

FDR can be performed in a similar construction schedule as presented below:

- Day 1 – Mill existing 1-inch top AC pavement surface and export. Light traffic can still drive on remaining AC section.
- Day 2 – Pulverize remaining AC and AB plus several inches of soil subgrade for a total of 12-inches of pulverization, mix in 6% Portland cement, moisture condition, and then compact to 95% relative compaction. Light traffic can drive on the FDR base layer at the end of the same day typically. Heavy truck traffic will be restricted.
- Day 3 – Curing FDR base layer. Closed to heavy truck traffic but light traffic can typically drive on FDR base.
- Day 4 – Micro crack FDR, place base 3-inch-thick or 4-inch-thick conventional Hot Mix Asphalt (HMA) AC layer and compact to 95% relative compaction. Light traffic can drive on base pavement section at the end of the same day.
- Day 5 – Heavier truck traffic can now be placed on new pavement section.

PERMEABLE INTERLOCKING CONCRETE PAVEMENT (PICP)

We understand that Permeable Interlocking Concrete Pavement (PICP) in the designated parking areas of Planning Area 1 may utilize permeable interlocking concrete pavers (such as “Eco-Stone”) and will assume subgrade soil conditions (R-value of at least 40) according to the “Design Manual for Permeable Interlocking Concrete Pavements” by ICPI (2011). The structural base thickness will need to be designed by the project civil engineer in order to meet storage requirements. This minimum section assumes a T.I. of up to 6.3 (GMU assumes a T.I. of 5.5 for the mixed use of the drive areas in this portion of the site) and calls for a 3⅛” (80 mm) concrete paver, over compacted layers of 2” of bedding course sand (ASTM No. 8 aggregate), over 4” of ASTM No. 57 stone as open-graded base, over 6” of ASTM No. 2 stone as open-graded sub base, over a Class 1 geotextile fabric* (highest strength) per AASHTO M-288.

*Due to the presence of fine-grained silts and seashells in the existing dredge fill soils that will likely function as subgrade support for the PICP, GMU recommends using a Class 1 geotextile fabric (highest strength) placed both vertically at the sides of all PICP excavations and on top of the compacted subgrade soil below the stone sub-base layer in order to protect the bottom and sides of the open-graded base and sub-base. This geotextile fabric must meet AASHTO M-288 Class 1 geotextile strength property and subsurface drainage requirements (see attached Table 3-3 and Table 3-4 from Page 31 of the ICPI Design Manual (2011) for AASHTO M-288 requirements).

CONCRETE INTERLOCKING VEHICULAR AND PEDESTRIAN PAVERS

We understand that portions of the project site will utilize 3⅛-inch-thick (80 mm.) vehicular concrete interlocking pavers placed on a section of at least 1-inch-thick bedding sand. These vehicular pavers are also planned as a part of the subject project in order to provide City of Newport Beach Fire Department vehicle access capable of supporting 72,000 pounds of imposed loading. GMU recommends that the on-site soil subgrade in these site vehicular areas be scarified to a depth of 6 inches, moisture conditioned to at least 2% above the optimum moisture content, and compacted to at least 92% relative compaction. A geotextile fabric such as Mirafi 600X or equivalent should be placed on top of the compacted subgrade across the entire vehicular interlocking paver area. Based upon the on-site soils having an estimated R-value of 40, a 12-inch-thick layer of Class 2 crushed aggregate base (CAB), crushed miscellaneous base (CMB), or equivalent should be moisture conditioned to at least optimum moisture and compacted to at least 95% relative compaction in order to support the interlocking pavers. Concrete bands adjacent to the vehicular interlocking pavers should consist of a design section of 8 inches of PCC over at least 6 inches of AB or equivalent, moisture conditioned to at least optimum moisture, and compacted to at least 95% relative compaction.

We further understand that in certain designated site pedestrian areas, 2⅜-inch-thick (60 mm.) concrete interlocking pavers placed on a section of at least 1-inch-thick bedding sand are planned. GMU recommends that prior to the installation of the pavers and bedding sand in these pedestrian areas, the on-site soil subgrade should be scarified to a depth of 6 inches, moisture conditioned to at least 2% above the optimum moisture content, and compacted to at least 92% relative compaction. A 4-inch-thick layer of Class 2 crushed aggregate base (CAB), crushed miscellaneous base (CMB), or equivalent should then be placed on top of the soil subgrade, moisture conditioned to at least optimum moisture, and compacted to at least 95% relative compaction in order to support the interlocking pavers in these pedestrian areas.

PLAN REVIEW/ GEOTECHNICAL TESTING AND OBSERVATIONS DURING CONSTRUCTION/ FUTURE REPORTS

Plan Review

Our office should review all future grading, foundation, and shoring plans for the site.

Geotechnical Observation and Testing

It is recommended that geotechnical observation and testing be performed by this firm during the following stages of construction and precise grading:

- During site clearing and grubbing.
- During all site grading and fill placement.
- During removal of any buried lines or other subsurface structures.
- During all phases of excavation.
- During shoring installation.
- During installation of foundation and floor slab elements.
- During all phases of corrective, ground improvement, and precise grading including removals, scarification, ground improvement and preparation, moisture conditioning, proof-rolling, over-excavation, FDR treatment, and placement and compaction of all fill materials.
- During backfill of structure walls and underground utilities.
- During pavement and hardscape section placement and compaction.
- When any unusual conditions are encountered.

Future Reports

GMU should perform geotechnical reviews and provide geotechnical response letters to support the permit process for the grading, shoring, and building department reviews to support this report. The final project precise grading plans and foundation plans for the project should also be reviewed by our office. In addition, geotechnical observation reports will be required following construction and grading.

LIMITATIONS

All parties reviewing or utilizing this report should recognize that the findings, conclusions, and recommendations presented represent the results of our professional geological and geotechnical engineering efforts and judgments. Due to the inexact nature of the state of the art of these professions and the possible occurrence of undetected variables in subsurface conditions, we cannot guarantee that the conditions actually encountered during grading and foundation installation will be identical to those observed and sampled during our study or that there are no unknown subsurface conditions which could have an adverse effect on the use of the property. We have exercised a degree of care comparable to the standard of practice presently maintained by other professionals in the fields of geotechnical engineering and engineering geology, and believe that our findings present a reasonably representative description of geotechnical conditions and their probable influence on the grading and use of the property.

Because our conclusions and recommendations are based on a limited amount of current and previous geotechnical exploration and analysis, all parties should recognize the need for possible revisions to our conclusions and recommendations during grading of the project. Additionally, our conclusions and recommendations are based on the assumption that our firm will act as the geotechnical engineer of record during precise grading and construction of the project to observe the actual conditions exposed, to verify our design concepts and the grading contractor's general compliance with the project geotechnical specifications, and to provide our revised conclusions and recommendations should subsurface conditions differ significantly from those used as the basis for our conclusions and recommendations presented in this report. It should be further noted that the recommendations presented herein are intended solely to minimize the effects of post-construction soil movements. Consequently, minor cracking and/or distortion of all on-site improvements should be anticipated.

The following services are outside our purview:

- Detailed corrosion testing and recommendations for protecting buried ferrous metal and/or copper elements.
- Environmental testing and/or evaluation of any kind.

CLOSURE

We are pleased to present the results of our geotechnical investigation for this project. The Plates and Appendices A through D which complete this report are listed in the Table of Contents.

If you have any questions concerning our findings or recommendations, please do not hesitate to contact us and we will be happy to discuss them with you.

Respectfully submitted,

GMU GEOTECHNICAL, INC.

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Director of Engineering

dra/13-160-00R (12-4-13)

TECHNICAL REFERENCES

California Division of Mines and Geology, 1986, "Special Studies Zones for Newport Beach 7.5-Minute Quadrangles, Orange County, California," CDMG Special Studies Zones Map.

California Division of Mines and Geology, 1997, "Seismic Hazard Zone Report for the Anaheim and Newport Beach 7.5-Minute Quadrangles, Orange County, California," CDMG Seismic Hazard Zone Report 03.

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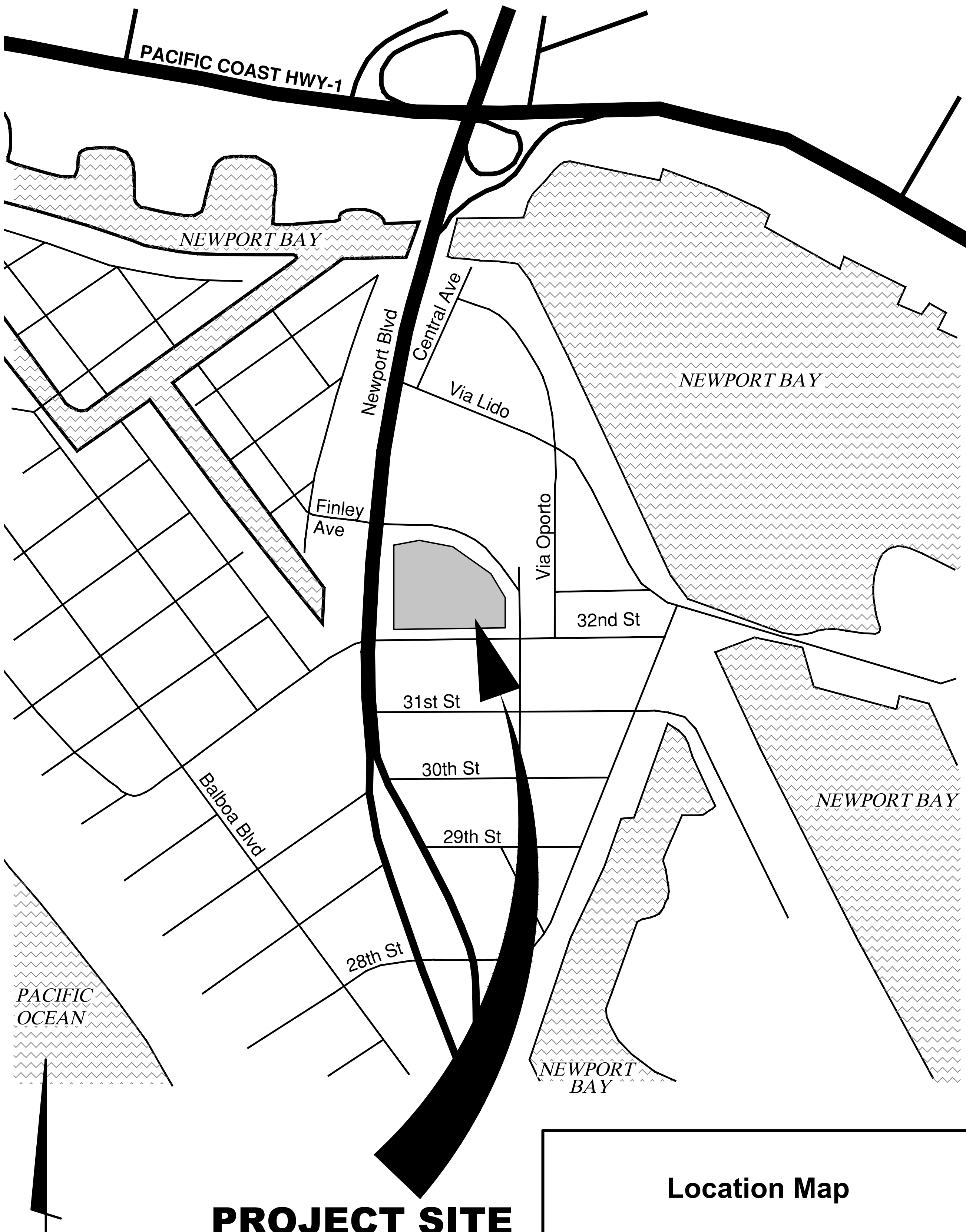
California Division of Mines and Geology, 2008, "Guidelines for Evaluating and Mitigating Seismic Hazards in California," CDMG Special Publication 117, 76pp.

"Permeable Interlocking Concrete Pavements, Selection, Design, Construction, and Maintenance," Interlocking Concrete Pavement Institute (ICPI), Second Edition 2001.

SCEC, 1999, "Recommended Procedure for Implementation of DMG Special Publication 117 Guidelines for Analyzing and Mitigating Liquefaction in California," Martin, G.R. and Lew, M., March 1999, 63 pp.

AERIAL PHOTOGRAPHS

DATE	FLIGHT	PHOTO
4-19-99	C136-41	58-59
9-23-97	C117-41	1-2
1-28-95	Cl02-40	142-143
2-2-93	C86-8	3-4
1-20-92	C85-13	22-23
11-14-87	C-1	0032-0034
1-9-87	F	265-266
3-30-83	218-6	28-29
1-31-81	211-5	21-22
2-26-80	80033	215-216
12-14-78	203-5	36-37
12-28-76	181-5	24-25
1-28-75	157-5	27-28
10-29-73	132-5	17-18
6-28-71	94	05-06
1-31-70	81-8	201-202
1-3-67	1	47-48
3-24-59	R12	142-143 (Eastern)
3-24-59	R11	136-137 (Western)
6-2-53	6K	66-67

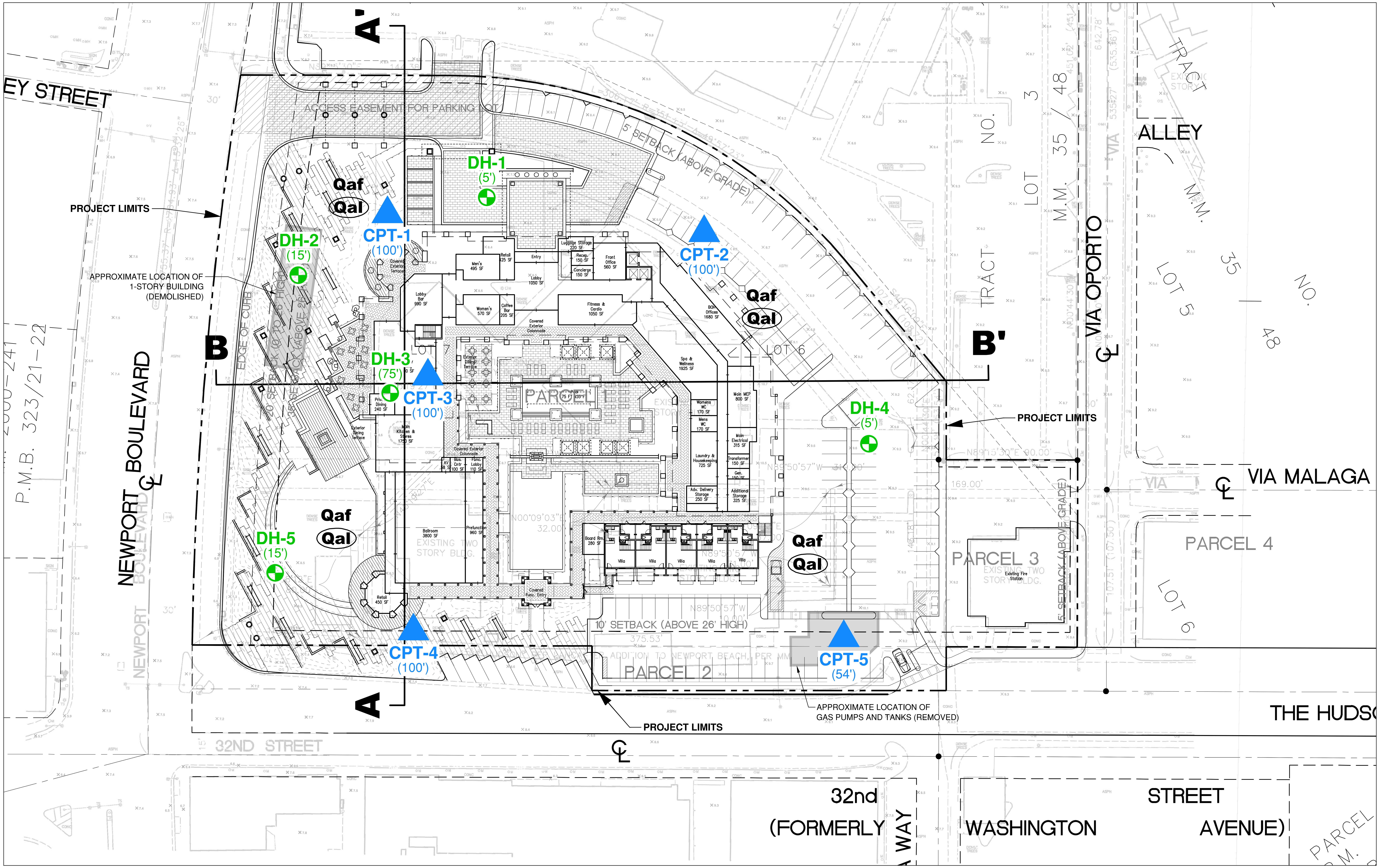


PROJECT SITE

Location Map

GMU GEOTECHNICAL, INC.	Date: December 4, 2013	Plate
	Project No.: 13-160-00	1

DRAWING: q:\2013\13-160-00\dwg\1316000_plate 1_location map.dwg PLOTTED: 11/20/2013 11:09 AM BY: Jesus Meza



GEOTECHNICAL LEGEND

Qaf	DREDGED FILL
Qal	ALLUVIUM (BURIED)
CPT-1	APPROXIMATE LOCATION OF CPT
DH-4	APPROXIMATE LOCTION OF DRILL HOLE
— · —	PROJECT LIMITS

SCALE: 1/8" = 1'-0"

DRAWING: q:\2013\13-160-00\dwg\1316000_plate 2_geo map.dwg PLOTTED: 12/3/2013 10:11 AM BY: Jesus Meza

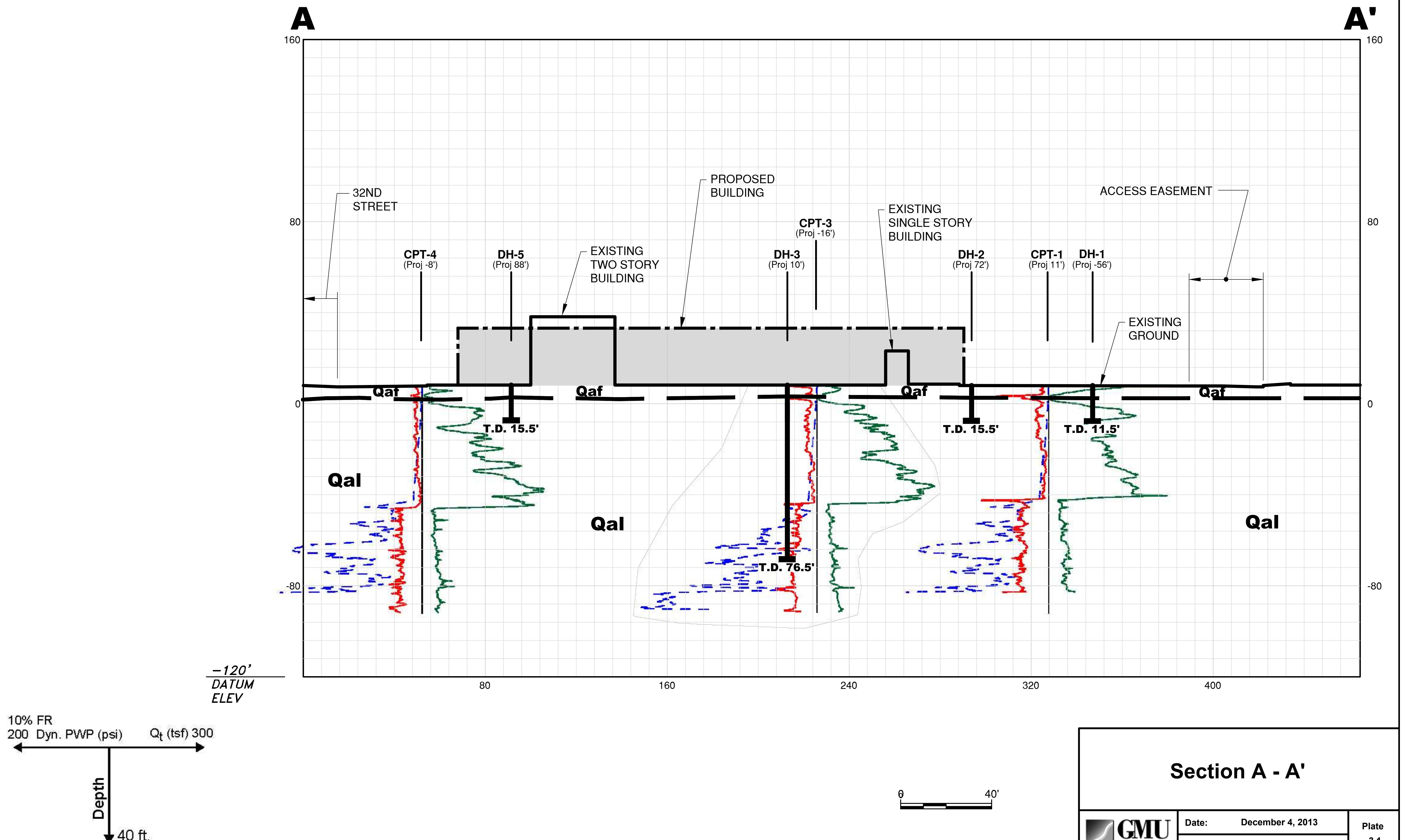
Geotechnical Map

GMU GEOTECHNICAL, INC.

Date: December 4, 2013

Project No.: 13-160-00

Plate 2



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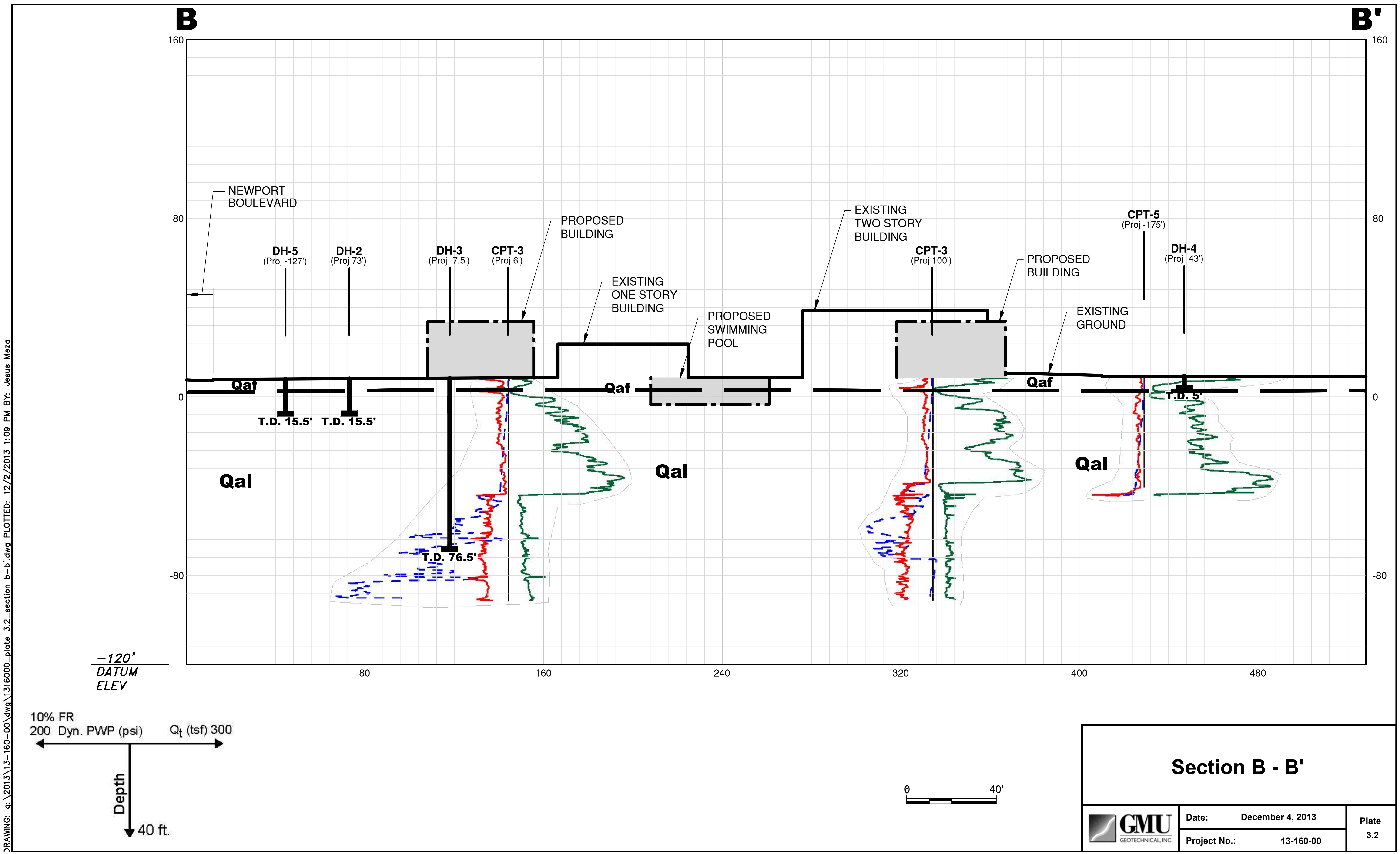
Section A - A'

GMU GEOTECHNICAL, INC.

Date:	December 4, 2013	Plate 3.1
Project No.:	13-160-00	



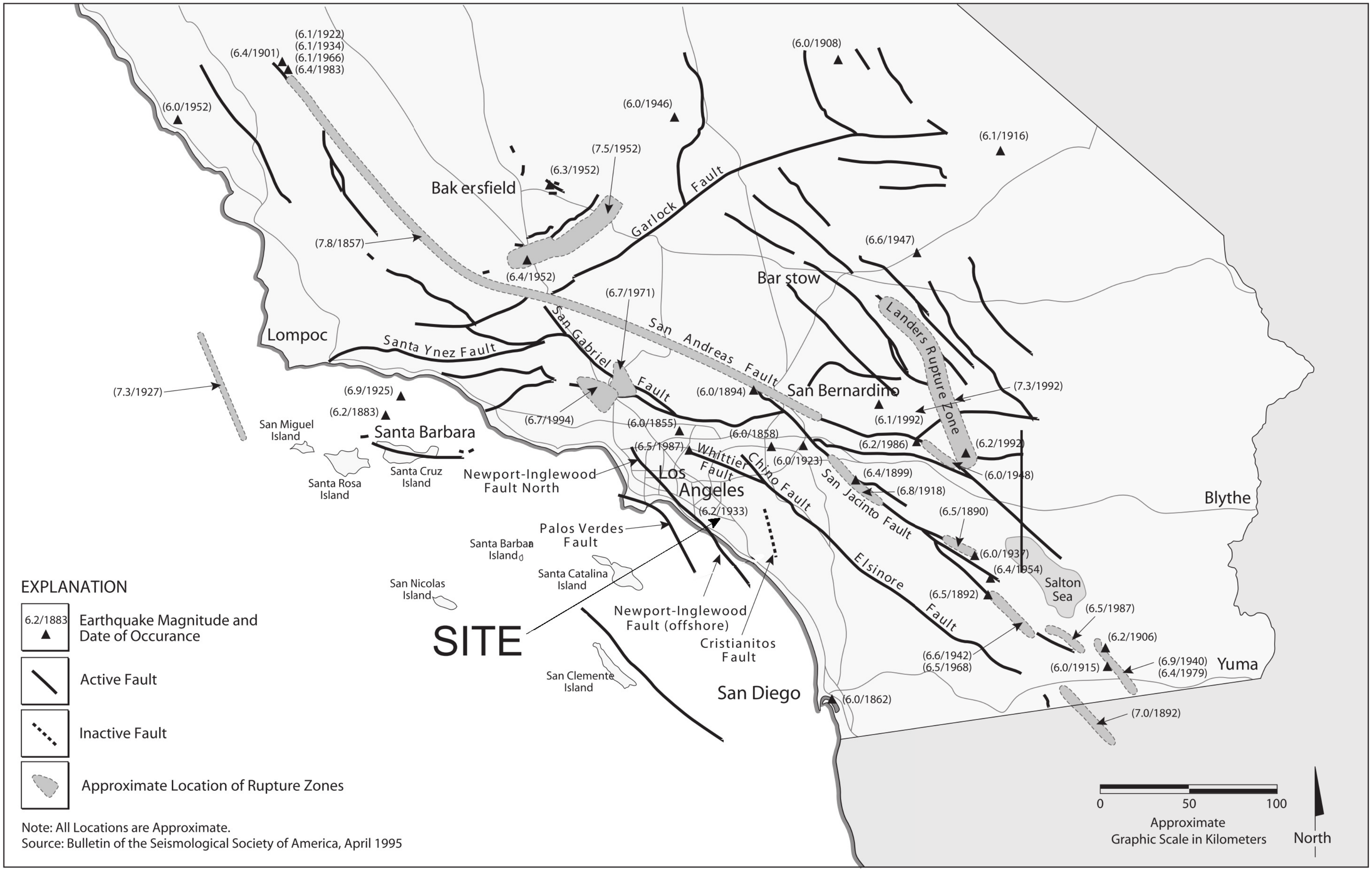
Section B - B'

GMU GEOTECHNICAL, INC.

Date: December 4, 2013

Project No.: 13-160-00

Plate 3.2

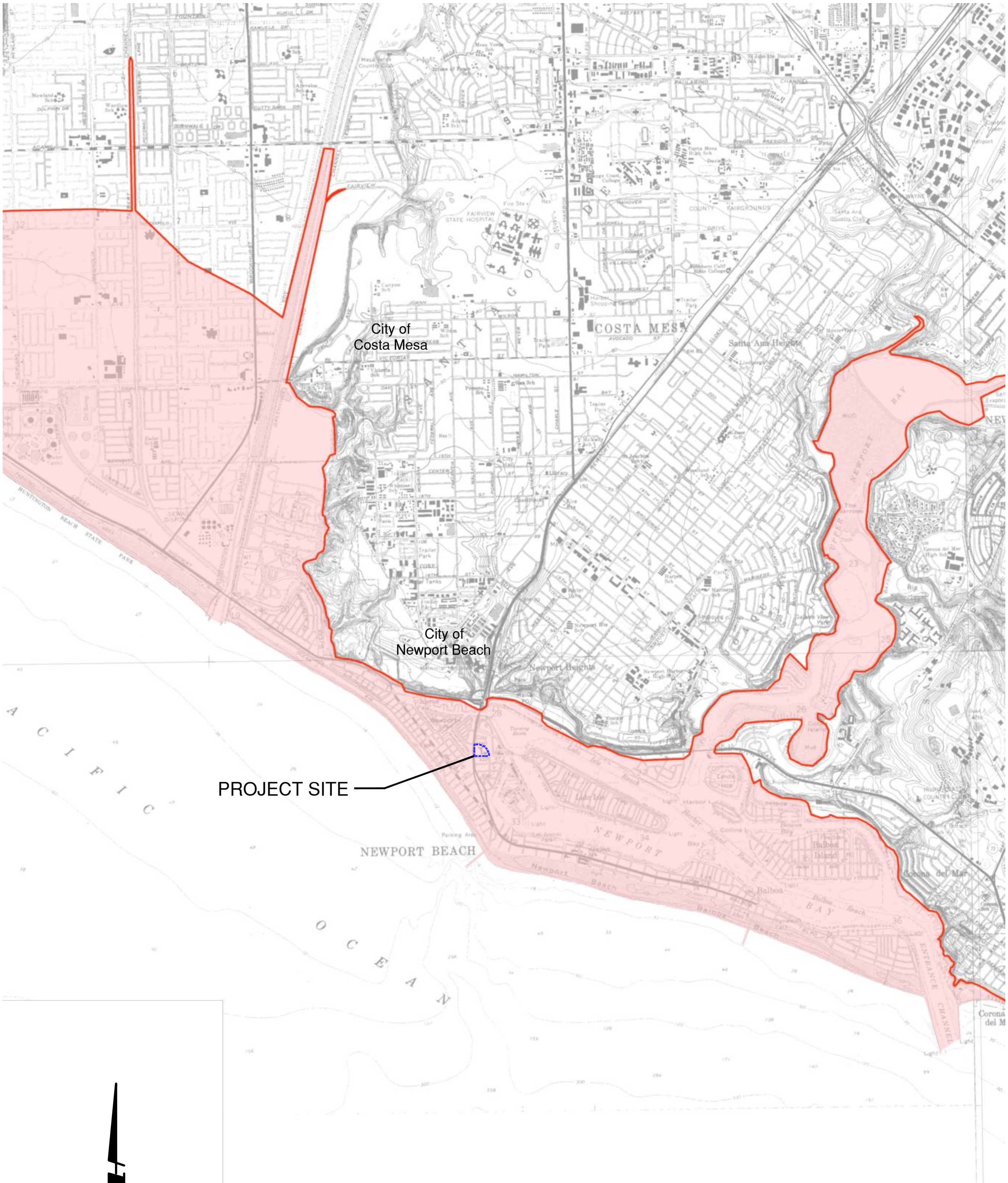


GMU GEOTECHNICAL, INC.

REGIONAL SEISMICITY:
Location of Major Active Surface Faults, Significant Inactive Faults, and Major Earthquake Epicenters (M>6.0)

Plate 4

P4-1/1/2002



MAP EXPLANATION

Tsunami Inundation Line

Tsunami Inundation Area

TSUNAMI INUNDATION MAP FOR EMERGENCY PLANNING

GMU GEOTECHNICAL, INC.

Date: DECEMBER 4, 2013		Plate
Project No.: 13-160-00		5

DRAWING: q:\2013\13-160-00\dwg\1316000_plate 5_inundation map.dwg PLOTTED: 12/2/2013 1:07 PM BY: Jesus Meza

APPENDIX A

GMU
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APPENDIX A-1

GMU Geotechnical Exploration Procedures
and Drill Hole Logs

GMU
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APPENDIX A-1

GMU GEOTECHNICAL EXPLORATION PROCEDURES AND LOGS

Our exploration within the subject site consisted of drilling 5 hollow stem auger drill holes (DH-1 through DH-5). There were also 5 CPT soundings (CPT-1 through CPT-5) advanced on the site. Approximate locations of the drill holes and CPTs are shown on Plate 2 – Geotechnical Map. Our drill holes were logged by a Certified Engineering Geologist and bulk and undisturbed samples of the excavated soils were collected. "Undisturbed" drive samples were taken using a 3.0-inch outside diameter split spoon sampler which contained 2.416-inch-diameter brass sample sleeves 6 inches in length. Standard Penetration Tests (SPT) using a 2.0-inch outside diameter split spoon sampler without liners were driven in the drill holes at select depths in between the relatively undisturbed samples. Blow counts recorded during sampling from the drive samplers are shown on the drill hole logs including SPT blow counts for each 6 inches of sample advancement ("N" values would be the blow counts for the last 12 inches of sampler advancement). The logs of each boring are contained in this Appendix A-1, and the Legend to Logs is presented as Plate A-1. CPT soundings were performed with a 30-ton CPT rig and a 15-cm^2 cone with readings taken every 2 cm. The CPT logs and data are contained in Appendix A-2.

The geologic and engineering field descriptions and classifications that appear on these logs are prepared according to Corps of Engineers and Bureau of Reclamation standards. Major soil classifications are prepared according to the Unified Soil Classification System as modified by ASTM Standard No. 2487. Since the descriptions and classifications that appear on the Log of Borings are intended to be that which most accurately describe a given interval of a boring (frequently an interval of several feet), discrepancies do occur in the Unified Soil Classification System nomenclature between that interval and a particular sample in that interval. For example, an 8-foot-thick interval in a log may be identified as silty sand (SM) while one sample taken within the interval may have individually been identified as sandy silt (ML). This discrepancy is frequently allowed to remain to emphasize the occurrence of local textural variations in the interval.

The descriptive terminology of the logs is modified from current ASTM Standards to suit the purposes of this study and is summarized as follows:

a. Soil Type - per Legend to Logs

b. Color - at field moisture

c. Moisture - (as estimated during exploration)
"dry" - very little or no moisture
"damp" - some moisture but less than optimum for compaction
"moist" - near optimum
"very moist - above optimum
"wet/saturated"- containing free moisture

d. Grain size - "fine", "medium" and "coarse"

e. Density (granular soils)
"very loose"
"loose"
"medium dense"
"dense"
"very dense"

f. Consistency (cohesive soils)
"very soft"
"soft"
"firm"
"stiff"
"very stiff"
"hard"

g. Seepage (as estimated during exploration)
"slight/minor" - < 0.3 gpm
"moderate" - 0.3 - 1 gpm
"heavy" - > 1 gpm

MAJOR DIVISIONS			Group Letter	Symbol	TYPICAL NAMES
COARSE-GRAINED SOILS More Than 50% Retained On No.200 Sieve Based on The Material Passing The 3-Inch (75mm) Sieve. Reference: ASTM Standard D2487	GRAVELS 50% or More of Coarse Fraction Retained on No.4 Sieve	Clean Gravels	GW		Well Graded Gravels and Gravel-Sand Mixtures, Little or No Fines.
			GP		Poorly Graded Gravels and Gravel-Sand Mixtures Little or No Fines.
		Gravels With Fines	GM		Silty Gravels, Gravel-Sand-Silt Mixtures.
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures.
	SANDS More Than 50% of Coarse Fraction Passes No.4 Sieve	Clean Sands	SW		Well Graded Sands and Gravelly Sands, Little or No Fines.
			SP		Poorly Graded Sands and Gravelly Sands, Little or No Fines.
		Sands With Fines	SM		Silty Sands, Sand-Silt Mixtures.
			SC		Clayey Sands, Sand-Clay Mixtures.
FINE-GRAINED SOILS 50% or More Passe The No.200 Sieve Based on The Material Passing The 3-Inch (75mm) Sieve. Reference: ASTM Standard D2487	SILTS AND CLAYS Liquid Limit Less Than 50%		ML		Inorganic Silts, Very Fine Sands, Rock Flour, Silty or Clayey Fine Sands or Clayey Silts With Slight Plasticity.
			CL		Inorganic Clays of Low To Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays.
			OL		Organic Silts and Organic Silty Clays of Low Plasticity
	SILTS AND CLAYS Liquid Limit 50% or Greater		MH		Inorganic Silts, Micaceous or Diatomaceous Fine Sandy or Silty Soils, Elastic Silts.
			CH		Inorganic Clays of High Plasticity, Fat Clays.
			OH		Organic Clays of Medium To High Plasticity, Organic Silts.
HIGHLY ORGANIC SOILS			PT		Peat and Other Highly Organic Soils.

The descriptive terminology of the logs is modified from current ASTM Standards to suit the purposes of this study

ADDITIONAL TESTS

- DS = Direct Shear
- HY = Hydrometer Test
- TC = Triaxial Compression Test
- UC = Unconfined Compression
- CN = Consolidation Test
- (T) = Time Rate
- EX = Expansion Test
- CP = Compaction Test
- PS = Particle Size Distribution
- EI = Expansion Index
- SE = Sand Equivalent Test
- AL = Atterberg Limits
- FC = Chemical Tests
- RV = Resistance Value
- SG = Specific Gravity
- SU = Sulfates
- CH = Chlorides
- MR = Minimum Resistivity
- pH
- (N) = Natural Undisturbed Sample
- (R) = Remolded Sample
- CS = Collapse Test/Swell-Settlement

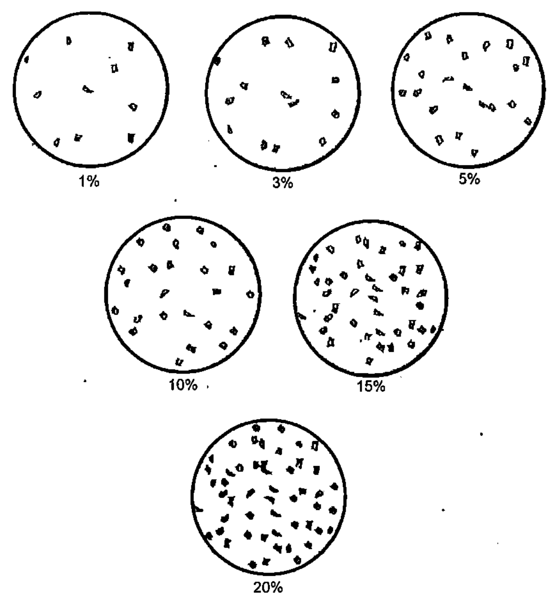
GEOLOGIC NOMENCLATURE

B = Bedding C = Contact J = Joint
F = Fracture Flt = Fault S = Shear
RS = Rupture Surface = Seepage
= Groundwater

SAMPLE SYMBOLS

- Undisturbed Sample (California Sample)
- Undisturbed Sample (Shelby Tube)
- Bulk Sample
- Unsuccessful Sampling Attempt
- SPT Sample

10: 10 Blows for 12-Inches Penetration
6/4: 6 Blows Per 4-Inches Penetration
P: Push
(13): Uncorrected Blow Counts ("N" Values) for 12-Inches Penetration- Standard Penetration Test (SPT)



GMU GEOTECHNICAL, INC.

LEGEND TO LOGS

ASTM Designation: D 2487
(Based on Unified Soil Classification System)

Plate

A-1

P8-11/16/2012

SOIL DENSITY/CONSISTENCY

FINE GRAINED

Consistency	Field Test	SPT (#blows/foot)	Mod (#blows/foot)
Very Soft	Easily penetrated by thumb, exudes between fingers	<2	<3
Soft	Easily penetrated one inch by thumb, molded by fingers	2-4	3-6
Firm	Penetrated over 1/2 inch by thumb with moderate effort	4-8	6-12
Stiff	Penetrated about 1/2 inch by thumb with great effort	8-15	12-25
Very Stiff	Readily indented by thumbnail	15-30	25-50
Hard	Indented with difficulty by thumbnail	>30	>50

COARSE GRAINED

Density	Field Test	SPT (#blows/foot)	Mod (#blows/foot)
Very Loose	Easily penetrated with 0.5" rod pushed by hand	<4	<5
Loose	Easily penetrated with 0.5" rod pushed by hand	4-10	5-12
Medium Dense	Easily penetrated 1' with 0.5" rod driven by 5lb hammer	10-30	12-35
Dense	Dificult to penetrat 1' with 0.5" rod driven by 5lb hammer	31-50	35-60
Very Dense	Penetrated few inches with 0.5" rod driven by 5lb hammer	>50	>60

BEDROCK HARDNESS

Density	Field Test	SPT (#blows/foot)
Soft	Can be crushed by hand, soil like and structureless	1-30
Moderately Hard	Can be grooved with fingernails, crumbles with hammer	30-50
Hard	Can't break by hand, can be grooved with knife	50-100
Very Hard	Scratches with knife, chips with hammer blows	>100

MODIFIERS

Trace	1%
Few	1-5%
Some	5-12%
Numerous	12-20%
Abundant	>20%

GRAIN SIZE

Description		Sieve Size	Grain Size	Approximate Size
Boulders		>12"	>12"	Larger than a basketball
Cobbles		3-12"	3-12"	Fist-sized to basketball-sized
Gravel	Coarse	3/4-3"	3/4-3"	Thumb-sized to fist-sized
	Fine	#4-3/4"	0.19-0.75"	Pea-sized to thumb-sized
Sand	Coarse	#10-#4	0.079-0.19"	Rock-salt-sized to pea-sized
	Medium	#40-#10	0.017-0.079"	Sugar-sized to rock salt-sized
	Fine	#200-#40	0.0029-0.017"	Flour-sized to sugar-sized
Fines		passing #200	<0.0029"	Flour-sized and smaller

MOISTURE CONTENT

Dry- Very little or no moisture
Damp- Some moisture but less than optimum
Moist- Near optimum
Very Moist- Above optimum
Wet/Saturated- Contains free moisture

GMU GEOTECHNICAL, INC.

LEGEND TO LOGS

Plate **A-2**

Project: Lido House Hotel	**Log of Drill Hole DH-1**
Project Location: Newport Beach	Sheet 1 of 1
Project Number: 13-160-00	

Date(s) Drilled	10/28/13	Logged By	RLD	Checked By	DRA
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	11.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	8.0
Groundwater Depth [Elevation], feet	4.5 [3.5]	Sampling Method(s)	Open drive sampler with 6-inch sleeve/SPT	Drill Hole Backfill	Cuttings
Remarks	Infiltration Test Hole			Driving Method and Drop	140 lb auto hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			ASPHALT PAVEMENT		3" AC / 2.5" AB						
			DREDGED FILL (Qaf)		SAND with some SILT (SP); brown, moist, medium dense, coarse grained, some seashell fragments		4 6 9	140	20	95	RV
5											
	5		ALLUVIUM (Qal)		SILTY SAND (SM); grayish brown, wet, medium dense, fine grained sand, low plasticity silt		5 3 2	140	51	69	
0					SILTY SAND (SM); dark gray, wet, medium dense, fine grained		5 10 17	140	26	104	
	10				SILTY SAND (SM); dark gray, wet, medium dense, fine grained		3 7 10	140			
					Total depth = 11.5 feet Groundwater @ 4.5 feet No caving						

DH_REV3 13-160-00.GPJ GMULAB.GPJ 12/2/13

GMU GEOTECHNICAL, INC.

Drill Hole DH-1

Project: Lido House Hotel	Log of Drill Hole DH-2
Project Location: Newport Beach	Sheet 1 of 1
Project Number: 13-160-00	

Date(s) Drilled	10/28/13	Logged By	RLD	Checked By	DRA
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	15.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	8.0
Groundwater Depth [Elevation], feet	4.0 [4.0]	Sampling Method(s)	Open drive sampler with 6-inch sleeve/SPT	Drill Hole Backfill	Cuttings
Remarks				Driving Method and Drop	140 lb auto hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
			GRASS AND SOD		Grass and rootlets						
			DREDGED FILL (Qaf)		SILTY SAND (SM); tan, moist, medium dense, coarse grained, trace seashells						SE
5							11 13 16	140	7	108	
	5		ALLUVIUM (Qal)		SILTY SAND to SANDY SILT (SM-ML); dark gray to dark brown, wet, medium dense, fine grained, low plasticity	▽	5 7 4	140	57	71	
0					SILTY SAND (SM); dark gray, wet, medium dense, fine grained		2 4 8	140			
	10				SILTY SAND (SM); dark gray, wet, medium dense, fine grained		4 11 17	140	24	104	
-5											
	15				SILTY SAND (SM); brown to dark gray, wet, medium dense, fine grained		4 11 19	140			
					Total depth = 15.5 feet Groundwater @ 4.0 feet No caving						

DH_REV3 13-160-00.GPJ GMULAB.GPJ 12/2/13

Project: Lido House Hotel **Project Location:** Newport Beach **Project Number:** 13-160-00	**Log of Drill Hole DH-3** Sheet 1 of 4

Date(s) Drilled	10/28/13	Logged By	RLD	Checked By	DRA
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	76.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	8.5
Groundwater Depth [Elevation], feet	5.0 [3.5]	Sampling Method(s)	Open drive sampler with 6-inch sleeve/SPT	Drill Hole Backfill	Cuttings
Remarks				Driving Method and Drop	140 lb auto hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			GRASS AND SOD		Grass and rootlets						
			DREDGED FILL (Qaf)		SILTY SAND (SM); light brown, damp to moist, medium dense, trace seashells						EI, FC
5					SAND with some SILT (SP); light brown, moist, medium dense, fine grained, trace seashells		3 4 4	140			
	5		ALLUVIUM (Qal)		SANDY CLAY (CL); dark brown, wet, soft, fine grained		4 3 2	140	51	64	DS
0					SILTY SAND (SM); dark brown, wet, loose, fine grained, trace rootlets and organics		1 3 5	140			
	10				SILTY SAND (SM); dark brown, wet, medium dense, fine grained		8 14 14	140	28	98	CN, TR
-5											
	15				SILTY SAND (SM); dark brown, wet, medium dense, fine grained		3 4 4	140	29		PS
-10											

DH_REV3 13-160-00.GPJ GMULAB.GPJ 12/2/13

Project: Lido House Hotel
Project Location: Newport Beach
Project Number: 13-160-00

Log of Drill Hole DH-3

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT, lbs	MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
					SAND with some SILT (SP); grayish brown, wet, dense, fine grained		5 16 40	140	24	101	
-15											
	25				SILTY SAND (SM); dark gray, wet, medium dense, fine grained		2 4 6	140	26		PS
-20											
	30				No Recovery		7 24 37	140			
-25											
	35				SILTY SAND (SM); dark gray, wet, medium dense, coarse grained		5 12 15	140			
-30											
	40				SAND with some SILT (SP); dark gray, wet, medium dense, coarse grained		6 10 22	140	24		
-35											

DH_REV3 13-160-00.GPJ GMULAB.GPJ 12/2/13

GMU GEOTECHNICAL, INC.

Project: Lido House Hotel	Log of Drill Hole DH-3
Project Location: Newport Beach	Sheet 3 of 4
Project Number: 13-160-00	

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	NUMBER OF BLOWS	DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	DRY UNIT WEIGHT, pcf	ADDITIONAL TESTS
					No Recovery		4 8 15	140			
-40											
	50				No Recovery		5 8 17	140			
-45											
	55				SILTY CLAY (CL); dark brown, wet, stiff, low plasticity		3 6 6	140			
-50											
	60				SILT (MH); dark brown, moist, very stiff, high plasticity		8 21 23	140	45	74	
-55											
	65				SILT (MH); dark brown, moist, very stiff, high plasticity		6 8 11	140	58		PS, HY, AL
-60											

DH_REV3 13-160-00.GPJ GMULAB.GPJ 12/2/13

GMU GEOTECHNICAL, INC.

Drill Hole DH-3

Project: Lido House Hotel Project Location: Newport Beach Project Number: 13-160-00	**Log of Drill Hole DH-3** Sheet 4 of 4

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
					SILT (MH); dark brown, moist, very stiff, high plasticity		12 20 27	140	54	68	
-65											
	75				SILT (MH); dark brown, wet, very stiff, high plasticity		8 15 15	140			
					Total depth = 76.5 feet Groundwater @ 5.0 feet Caving near 15 feet						

DH_REV3 13-160-00.GPJ GMULAB.GPJ 12/2/13

GMU GEOTECHNICAL, INC.

Drill Hole DH-3

Project: Lido House Hotel Project Location: Newport Beach Project Number: 13-160-00	**Log of Drill Hole DH-4** Sheet 1 of 1

Date(s) Drilled	10/28/13	Logged By	RLD	Checked By	DRA
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	6.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	9.5
Groundwater Depth [Elevation], feet	N/A [0.0]	Sampling Method(s)	Open drive sampler with 6-inch sleeve/SPT	Drill Hole Backfill	Cuttings
Remarks				Driving Method and Drop	140 lb auto hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			ASPHALT PAVEMENT		3.5" AC / 2.5" AB						
			DREDGED FILL (Qaf)								
					SAND with some SILT (SP); tanish brown, moist, medium dense, fine grained, some seashells		7 10 13	140	3	105	CP, DS, FC
5	5				No Recovery		9 3 3	140			
					Total depth = 6.5 feet No groundwater No caving						

DH_REV3 13-160-00.GPJ GMULAB.GPJ 12/2/13

GMU GEOTECHNICAL, INC.

Drill Hole DH-4

Project: Lido House Hotel **Project Location:** Newport Beach **Project Number:** 13-160-00	# Log of Drill Hole DH-5

Date(s) Drilled	10/28/13	Logged By	RLD	Checked By	DRA
Drilling Method	Hollow Stem Auger	Drilling Contractor	2R Drilling	Total Depth of Drill Hole	15.5 feet
Drill Rig Type	CME 75	Diameter(s) of Hole, inches	8	Approx. Surface Elevation, ft MSL	8.5
Groundwater Depth [Elevation], feet	5.0 [3.5]	Sampling Method(s)	Open drive sampler with 6-inch sleeve/SPT	Drill Hole Backfill	Cuttings
Remarks	Infiltration Test Hole			Driving Method and Drop	140 lb auto hammer

ELEVATION, feet	DEPTH, feet	GRAPHIC LOG	GEOLOGICAL CLASSIFICATION AND DESCRIPTION	ORIENTATION DATA	ENGINEERING CLASSIFICATION AND DESCRIPTION	SAMPLE DATA: SAMPLE	SAMPLE DATA: NUMBER OF BLOWS	SAMPLE DATA: DRIVING WEIGHT, lbs	TEST DATA: MOISTURE CONTENT, %	TEST DATA: DRY UNIT WEIGHT, pcf	TEST DATA: ADDITIONAL TESTS
			GRASS AND SOD		Grass and rootlets						
			DREDGED FILL (Qaf)		SAND (SP); tan, very moist, medium dense, coarse grained, trace seashells		7 15 12	140	3	104	
5			ALLUVIUM (Qal)		SANDY CLAY to SILT (CL-ML); tan to dark brown, wet, soft, coarse grained, low plasticity ∇		3 3 2	140	35	83	
	5										
0					SILTY SAND (SM); dark brown, wet, medium dense, fine grained, trace rootlets		2 4 6	140			
	10				SILTY SAND (SM); dark grayish black, wet, medium dense, fine graines		4 8 16	140	28	96	
-5					SILTY SAND (SM); dark gray, wet, medium dense, fine grained		3 7 10	140			
	15										
					Total depth = 15.5 feet Groundwater @ 5.0 feet No caving						

DH_REV3 13-160-00.GPJ GMULAB.GPJ 12/2/13

GMU GEOTECHNICAL, INC.

APPENDIX A-2

CPT Logs and Data by Kehoe
for GMU Geotechnical

GMU
GEOTECHNICAL, INC.

SUMMARY

OF

CONE PENETRATION TEST DATA

Project:

Lido House Hotel
3300 Newport Blvd.
Newport Beach, CA
October 23-24, 2013

Prepared for:

Mr. Dave Atkinson
GMU Geotechnical, Inc.
23241 Arroyo Vista
Rancho Santa Margarita, CA 92688-2611
Office (949) 888-6513 / Fax (949) 888-1380

Prepared by:

K T E

KEHOE TESTING & ENGINEERING
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www.kehoetesting.com

TABLE OF CONTENTS

SUMMARY

OF

CONE PENETRATION TEST DATA

1. INTRODUCTION

This report presents the results of a Cone Penetration Test (CPT) program carried out for the Lido House Hotel project located at 3300 Newport Blvd. in Newport Beach, California. The work was performed by Kehoe Testing & Engineering (KTE) on October 23-24, 2013. The scope of work was performed as directed by GMU Geotechnical, Inc. personnel.

2. SUMMARY OF FIELD WORK

The fieldwork consisted of performing CPT soundings at five locations to determine the soil lithology. Groundwater measurements and hole collapse depths provided in **TABLE 2.1** are for information only. The readings indicate the apparent depth to which the hole is open and the apparent water level (if encountered) in the CPT probe hole at the time of measurement upon completion of the CPT. KTE does not warranty the accuracy of the measurements and the reported water levels may not represent the true or stabilized groundwater levels.

LOCATION	DEPTH OF CPT (ft)	COMMENTS/NOTES:
CPT-1	91	Refusal, groundwater @ 6 ft
CPT-2	100	Groundwater @ 6 ft
CPT-3	100	Hole open to 5 ft (dry)
CPT-4	100	Groundwater @ 6 ft
CPT-5	54	Refusal, groundwater @ 6 ft

TABLE 2.1 - Summary of CPT Soundings

3. FIELD EQUIPMENT & PROCEDURES

The CPT soundings were carried out by **KTE** using an integrated electronic cone system manufactured by Vertek. The CPT soundings were performed in accordance with ASTM standards (D5778). The cone penetrometers were pushed using a 30-ton CPT rig. The cone used during the program was a 15 cm^2 cone and recorded the following parameters at approximately 2.5 cm depth intervals:

- Cone Resistance (qc)
- Sleeve Friction (fs)
- Dynamic Pore Pressure (u)
- Inclination
- Penetration Speed
- Pore Pressure Dissipation (at selected depths)

At location CPT-3, shear wave measurements were obtained at approximately 5-foot intervals. The shear wave is generated using an air-actuated hammer, which is located inside the front jack of the CPT rig. The cone has a triaxial geophone, which recorded the shear wave signal generated by the air hammer.

The above parameters were recorded and viewed in real time using a laptop computer. Data is stored at the KTE office for future analysis and reference. A complete set of baseline readings was taken prior to each sounding to determine temperature shifts and any zero load offsets. Monitoring base line readings ensures that the cone electronics are operating properly.

4. CONE PENETRATION TEST DATA & INTERPRETATION

The Cone Penetration Test data is presented in graphical form in the attached Appendix. These plots were generated using the CPeT-IT program. Penetration depths are referenced to ground surface. The soil classification on the CPT plots is derived from the attached CPT Classification Chart (Robertson) and presents major soil lithologic changes. The stratigraphic interpretation is based on relationships between cone resistance (qc), sleeve friction (fs), and penetration pore pressure (u). The friction ratio (Rf), which is sleeve friction divided by cone resistance, is a calculated parameter that is used along with cone resistance to infer soil behavior type. Generally, cohesive soils (clays) have high friction ratios, low cone resistance and generate excess pore water pressures. Cohesionless soils (sands) have lower friction ratios, high cone bearing and generate little (or negative) excess pore water pressures.

Tables of basic CPT output from the interpretation program CPeT-IT are provided for CPT data averaged over one foot intervals in the Appendix. Spreadsheet files of the averaged basic CPT output and averaged estimated geotechnical parameters are also included for use in further geotechnical analysis. We recommend a geotechnical engineer review the assumed input parameters and the calculated output from the CPeT-IT program. A summary of the equations used for the tabulated parameters is provided in the Appendix.

It should be noted that it is not always possible to clearly identify a soil type based on qc, fs and u. In these situations, experience, judgement and an assessment of the pore pressure data should be used to infer the soil behavior type.

If you have any questions regarding this information, please do not hesitate to call our office at (714) 901-7270.

Sincerely,

KEHOE TESTING & ENGINEERING

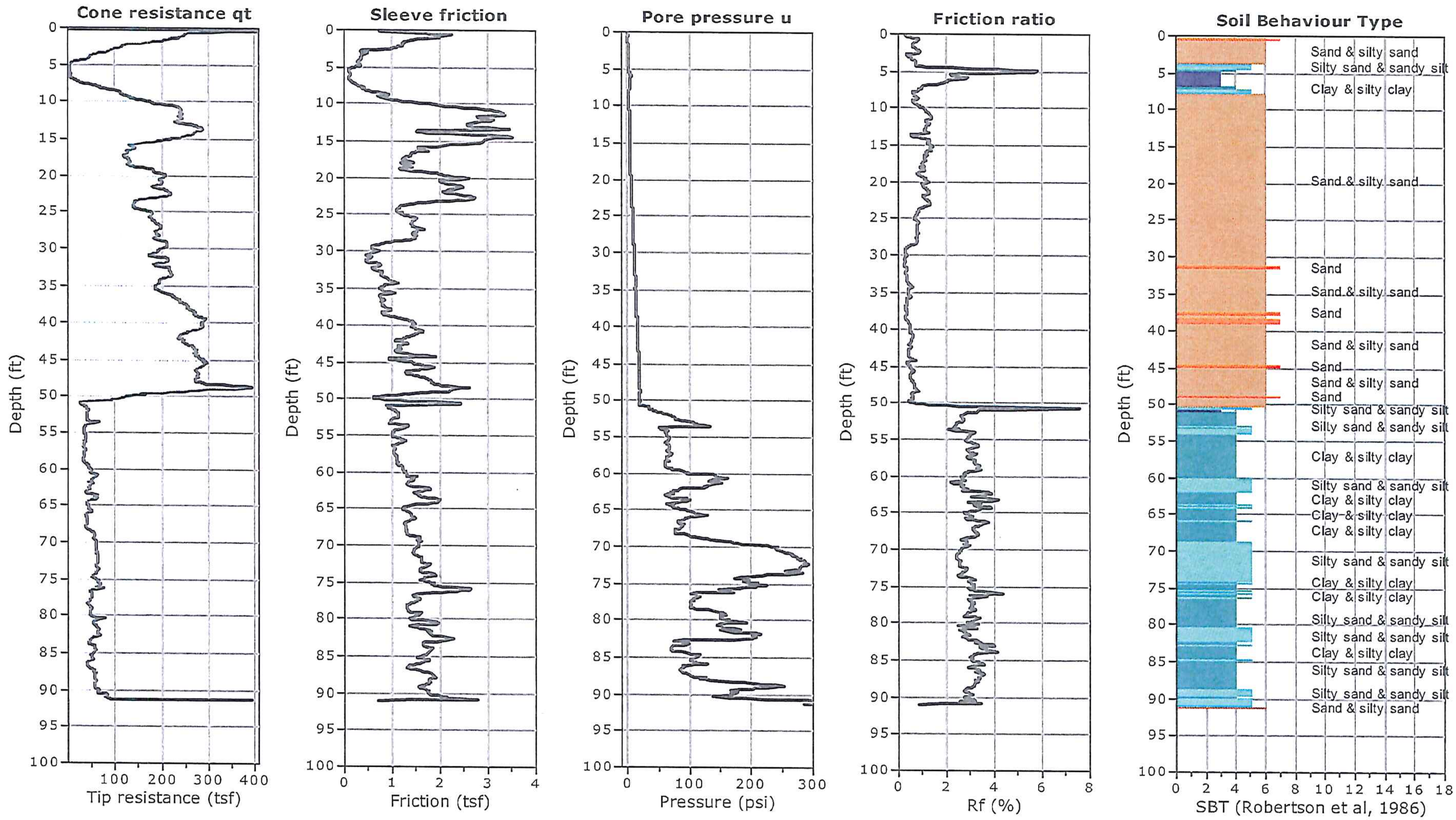
Richard W. Koester, Jr.
General Manager

APPENDIX

Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

Project: GMU Geotechnical/Lido House Hotel
Location: 3300 Newport Blvd. Newport Beach, CA

CPT: CPT-1
Total depth: 91.23 ft, Date: 10/23/2013
Cone Type: Vertek



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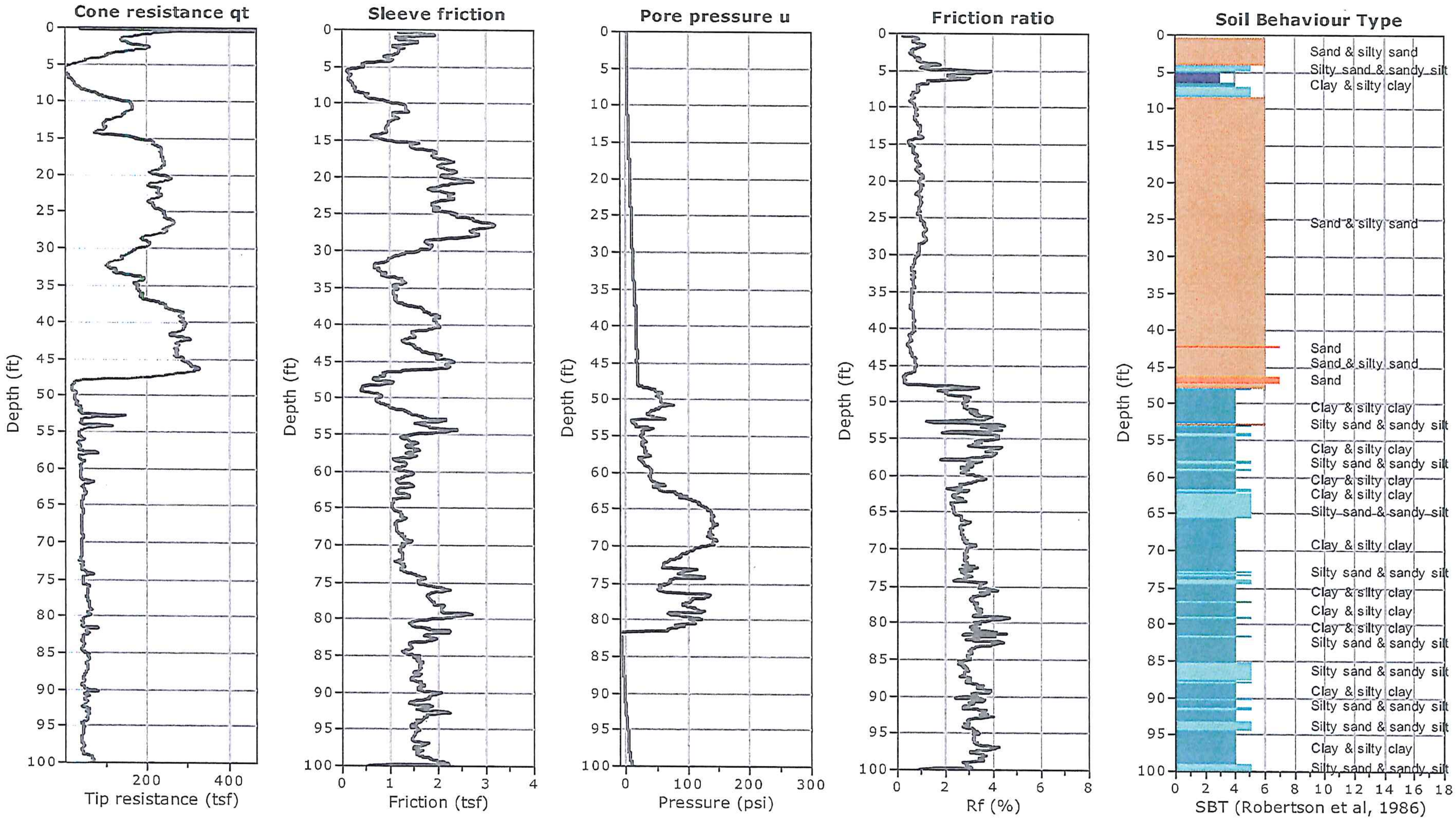
Project: GMU Geotechnical/Lido House Hotel
Location: 3300 Newport Blvd. Newport Beach, CA

CPT: CPT-2
Total depth: 100.13 ft, Date: 10/23/2013
Cone Type: Vertek



CPeT-IT v.1.7.6.3 - CPTU data presentation & interpretation software - Report created on: 10/24/2013, 7:05:45 AM
Project file: C:\GMUNewportBch10-13\CPeT Data\Plot Data\Plotss.cpt

Kehoe Testing and Engineering
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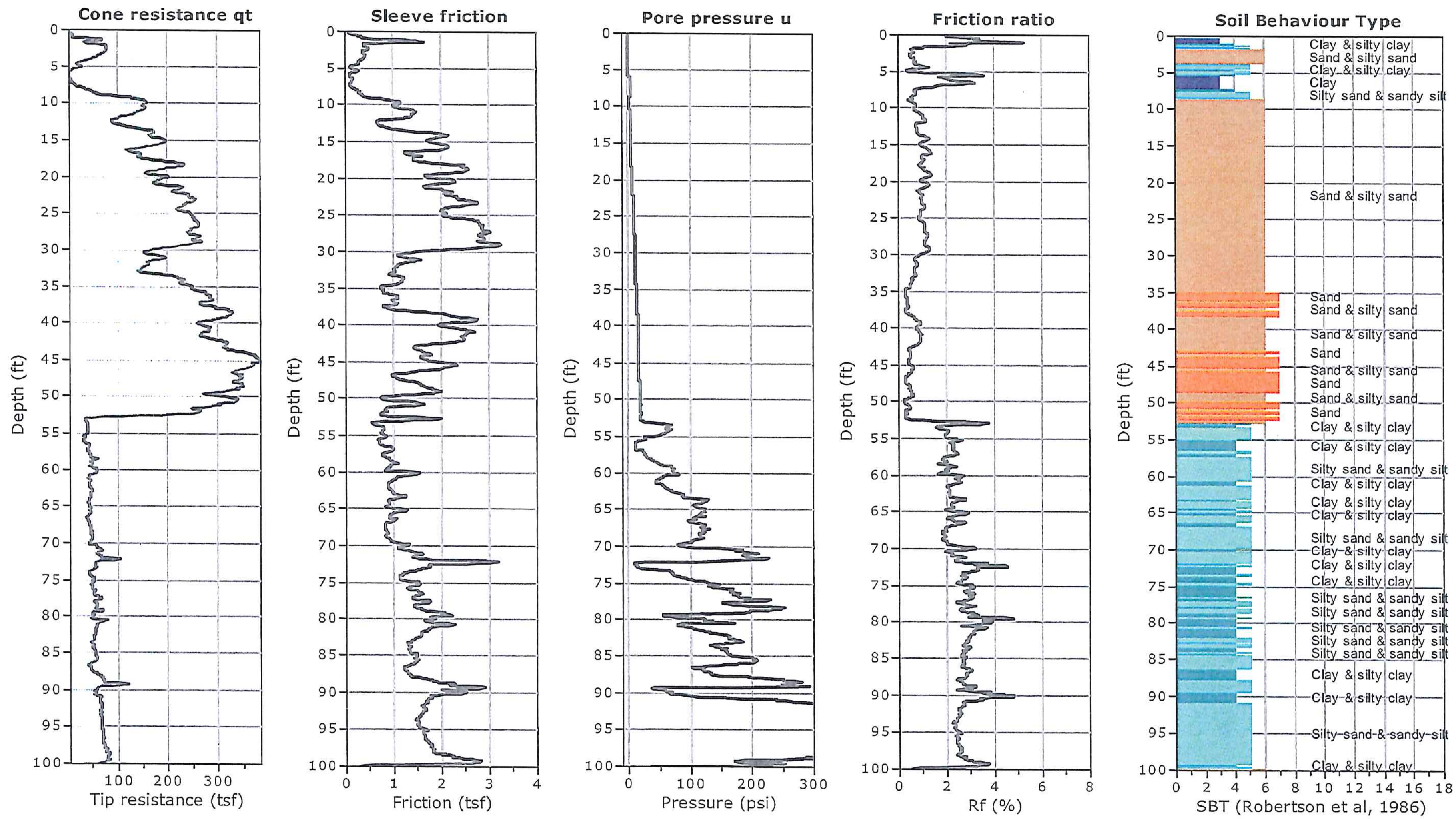
Project: GMU Geotechnical/Lido House Hotel
Location: 3300 Newport Blvd. Newport Beach, CA

CPT: CPT-3
Total depth: 100.07 ft, Date: 10/23/2013
Cone Type: Vertek



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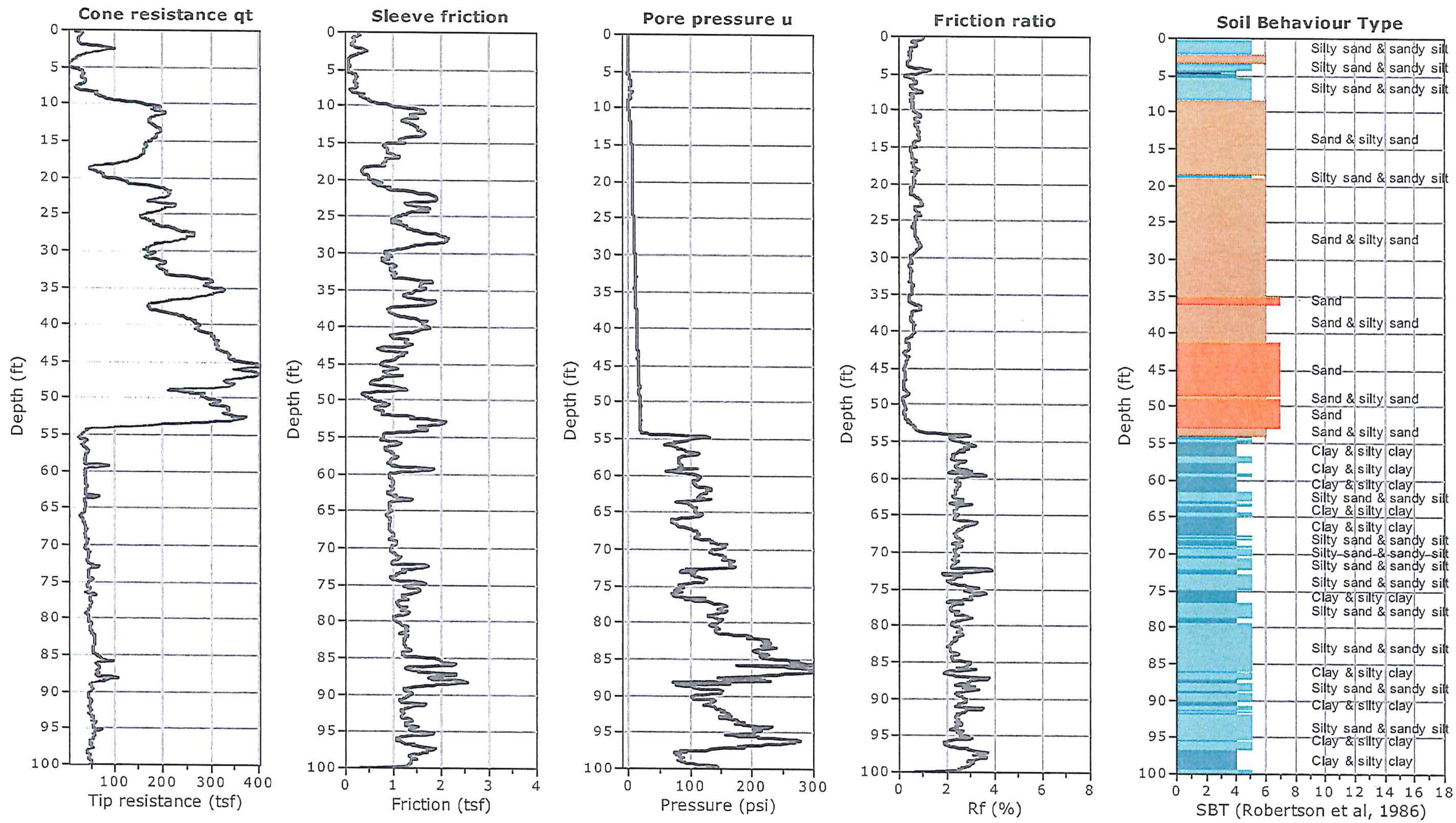
Project: GMU Geotechnical/Lido House Hotel
Location: 3300 Newport Blvd. Newport Beach, CA

CPT: CPT-4
Total depth: 100.19 ft, Date: 10/23/2013
Cone Type: Vertek



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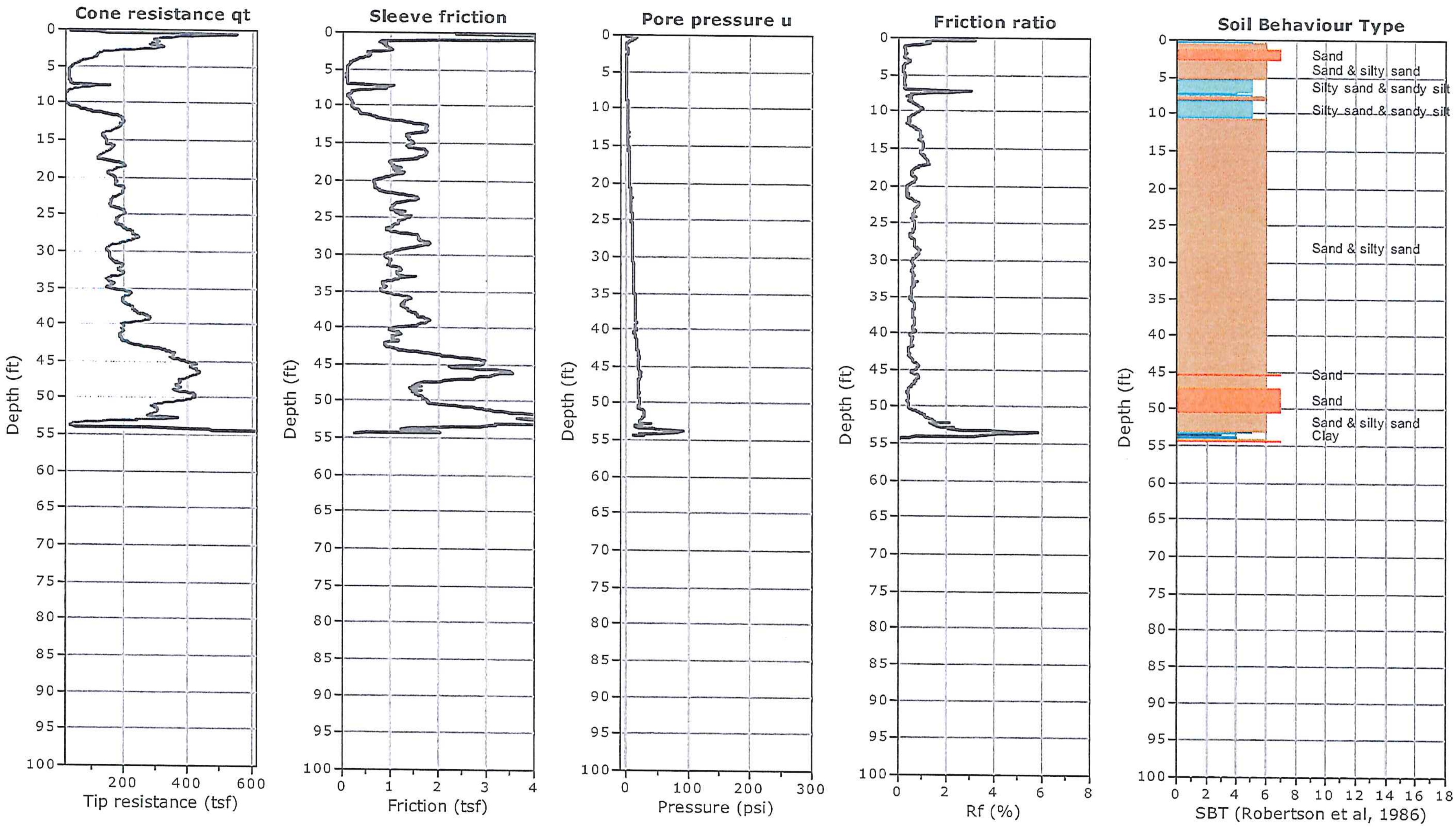
Project: GMU Geotechnical/Lido House Hotel
Location: 3300 Newport Blvd. Newport Beach, CA

CPT: CPT-5
Total depth: 54.46 ft, Date: 10/24/2013
Cone Type: Vertek



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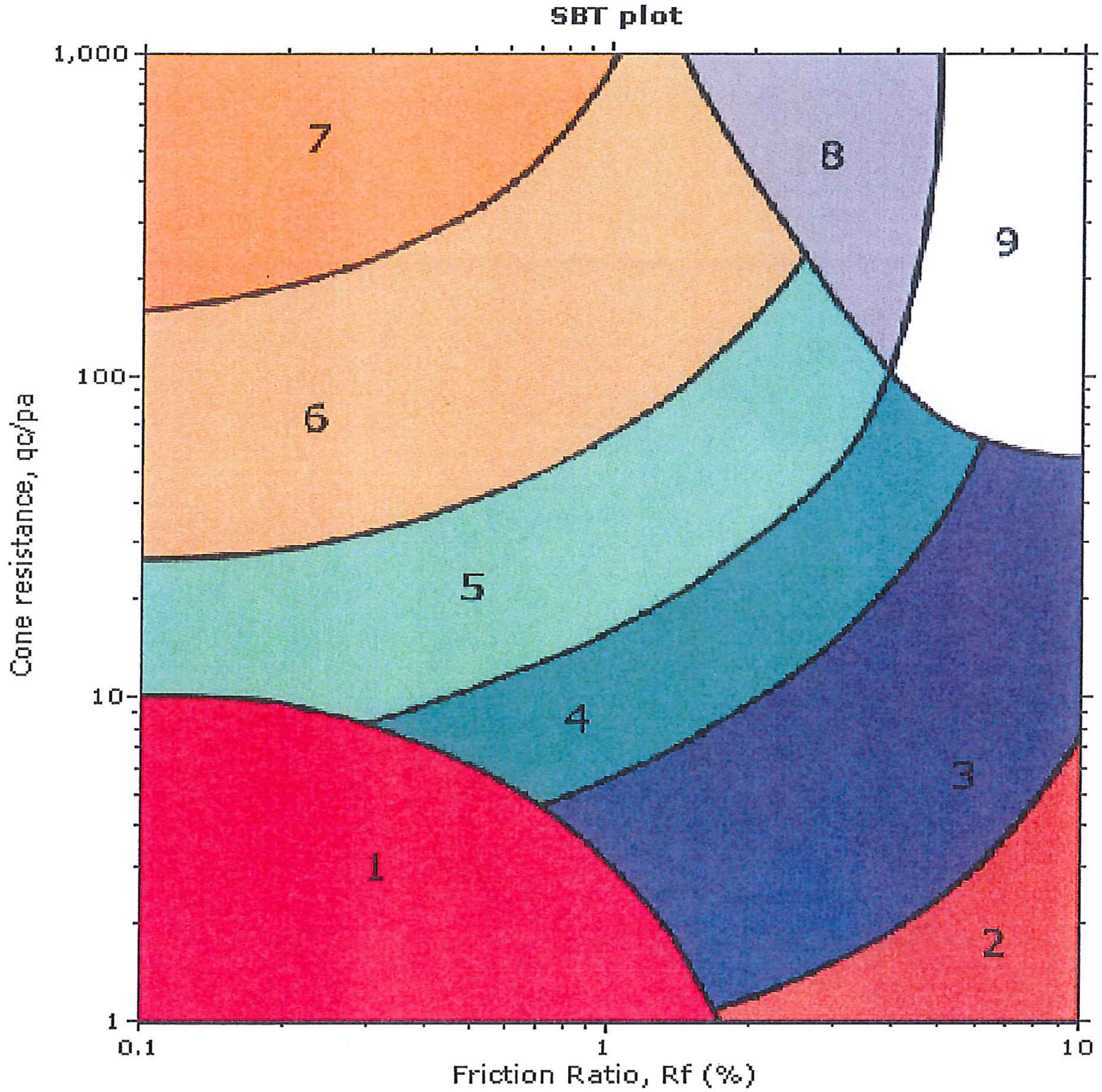


SBT legend

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

	CPT-1	In situ data										Basic output data								
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ā (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn
1	245.4	1.94	0.2	0.79	245.402	0.7905	6	1.57163	128.5418	0.06427	0	0.0643	3817.3	0.7908	6E-05	6	0.3777	2	1.377	463.7299
2	166.1	1.22	0.92	0.74	166.111	0.7345	6	1.67413	124.1961	0.12637	0	0.1264	1313.5	0.735	0.0004	6	0.4117	2	1.4586	313.739
3	87.3	0.34	1.5	0.39	87.3184	0.3894	6	1.75209	113.279	0.18301	0	0.183	476.13	0.3902	0.0012	6	0.4275	2	1.493	164.7003
4	45.3	0.33	1.16	0.72	45.3142	0.7283	5	2.13323	111.4607	0.23874	0	0.2387	188.81	0.7321	0.0019	6	0.5788	2	1.8832	85.20011
5	3.6	0.21	1.67	5.68	3.62044	5.8004	3	3.543	101.9901	0.28973	0	0.2897	11.496	6.305	0.0361	3	1	2	3.3486	6.29559
6	3.9	0.13	6.26	3.16	3.97662	3.2691	3	3.37481	98.70995	0.33909	0	0.3391	10.727	3.5739	0.1239	3	1	2	3.1741	6.87554
7	13.9	0.14	3.47	1.01	13.9425	1.0041	4	2.6488	102.3119	0.39024	0.0312	0.359	37.745	1.033	0.0161	5	0.7824	2	2.4027	25.61596
8	67.4	0.41	2.68	0.6	67.4328	0.608	6	1.9448	114.0185	0.44725	0.0624	0.3849	174.05	0.6121	0.002	6	0.5352	1.7182	1.7517	108.7705
9	113	0.77	2.11	0.68	113.026	0.6813	6	1.78521	119.8896	0.5072	0.0936	0.4136	272.05	0.6843	0.0005	6	0.4904	1.5851	1.6307	168.5591
10	172.8	1.7	2.49	0.99	172.83	0.9836	6	1.74665	126.7204	0.57056	0.1248	0.4458	386.44	0.9869	0.0003	6	0.4886	1.5256	1.6217	248.373
11	239.5	3.21	3.07	1.34	239.538	1.3401	6	1.74881	132.1675	0.63664	0.156	0.4806	497.04	1.3437	0.0003	6	0.4999	1.4836	1.6465	334.9606
12	228.3	2.91	3.59	1.27	228.344	1.2744	6	1.74551	131.3329	0.70231	0.1872	0.5151	441.93	1.2783	0.0003	6	0.5026	1.4359	1.6494	308.9255
13	254.3	2.75	3.96	1.08	254.348	1.0812	6	1.66085	131.1821	0.7679	0.2184	0.5495	461.47	1.0845	0.0003	6	0.4767	1.3666	1.5771	327.515
14	268.2	2.72	4.51	1.01	268.255	1.014	6	1.62464	131.2317	0.83352	0.2496	0.5839	457.98	1.0171	0.0003	6	0.468	1.3208	1.5499	333.807
15	216.8	2.91	4.43	1.34	216.854	1.3419	6	1.77712	131.2069	0.89912	0.2808	0.6183	349.26	1.3475	0.0002	6	0.5276	1.3277	1.702	270.976
16	132.2	1.56	3.71	1.18	132.245	1.1796	6	1.88524	125.4388	0.96184	0.312	0.6498	202.02	1.1883	-3E-04	6	0.568	1.319	1.804	163.6559
17	127.1	1.39	4.39	1.1	127.154	1.0932	6	1.87535	124.4988	1.02409	0.3432	0.6809	185.24	1.102	-2E-04	6	0.5684	1.2847	1.8011	153.1438
18	131.2	1.34	4.59	1.02	131.256	1.0209	6	1.84524	124.3082	1.08624	0.3744	0.7118	182.86	1.0294	-3E-04	6	0.5615	1.2493	1.7794	153.6909
19	165.4	1.33	4.76	0.8	165.458	0.8038	6	1.70111	124.8182	1.14865	0.4056	0.7431	221.13	0.8095	-4E-04	6	0.5127	1.1987	1.6472	186.1361
20	208.4	2.52	5.57	1.21	208.468	1.2088	6	1.7544	130.0579	1.21368	0.4368	0.7769	266.78	1.2159	-2E-04	6	0.5384	1.181	1.7104	231.3179
21	199.5	2.37	6.18	1.19	199.576	1.1875	6	1.76146	129.5025	1.27843	0.468	0.8104	244.68	1.1952	-1E-04	6	0.5448	1.1564	1.7232	216.7136
22	196.6	2.11	6.9	1.07	196.684	1.0728	6	1.73367	128.6167	1.34274	0.4992	0.8435	231.57	1.0802	-1E-05	6	0.5382	1.1297	1.7016	208.5614
23	180.9	2.44	7.04	1.35	180.986	1.3482	6	1.83076	129.477	1.40748	0.5304	0.8771	204.75	1.3587	-1E-04	6	0.579	1.1148	1.804	189.1928
24	140.1	1.16	7.67	0.83	140.194	0.8274	6	1.7638	123.4134	1.46919	0.5616	0.9076	152.85	0.8362	-7E-05	6	0.5568	1.0892	1.7421	142.8003
25	176.3	1.17	8.43	0.66	176.403	0.6633	6	1.62563	124.0365	1.5312	0.5928	0.9384	186.35	0.6691	8E-05	6	0.5081	1.0629	1.6107	175.6648
26	180.3	1.42	8.55	0.79	180.405	0.7871	6	1.667	125.5082	1.59396	0.624	0.97	184.35	0.7941	-5E-05	6	0.5275	1.047	1.6577	176.9253
27	199.1	1.63	9.12	0.82	199.212	0.8182	6	1.6468	126.7592	1.65734	0.6552	1.0021	197.13	0.8251	1E-05	6	0.5234	1.0289	1.643	192.0919
28	189.1	1.57	9.56	0.83	189.217	0.8297	6	1.66723	126.3593	1.72052	0.6864	1.0341	181.31	0.8374	1E-05	6	0.5347	1.0123	1.669	179.3863
29	201.7	0.84	10	0.42	201.822	0.4162	6	1.45585	121.9403	1.78149	0.7176	1.0639	188.03	0.4199	1E-05	6	0.4573	0.9975	1.4621	188.5849
30	196.2	0.72	10.73	0.37	196.331	0.3667	6	1.43488	120.7451	1.84186	0.7488	1.0931	177.93	0.3702	0.0001	6	0.4526	0.9854	1.4459	181.1252
31	174.4	0.51	11.09	0.29	174.536	0.2922	6	1.42804	117.9349	1.90083	0.78	1.1208	154.02	0.2954	0.0001	6	0.4533	0.9742	1.4444	158.9503
32	196.9	0.75	11.29	0.38	197.038	0.3806	6	1.44249	121.0526	1.96135	0.8112	1.1502	169.61	0.3845	1E-05	6	0.4616	0.9622	1.4625	177.3999
33	217.4	0.77	12.28	0.35	217.55	0.3539	6	1.38919	121.4867	2.0221	0.8424	1.1797	182.7	0.3573	0.0002	6	0.444	0.9529	1.4123	194.0891
34	200.1	0.97	12.13	0.48	200.248	0.4844	6	1.49751	122.9741	2.08358	0.8736	1.21	163.77	0.4895	0	6	0.489	0.9365	1.5267	175.3933
35	186.8	0.76	12.1	0.41	186.948	0.4065	6	1.47738	121.0213	2.14409	0.9048	1.2393	149.12	0.4113	-2E-04	6	0.4846	0.9263	1.512	161.7761
36	203	0.71	13.49	0.35	203.165	0.3495	6	1.41103	120.7262	2.20446	0.936	1.2685	158.43	0.3533	0.0002	6	0.4617	0.9197	1.4483	174.671
37	235.2	0.78	13.55	0.33	235.366	0.3314	6	1.34491	121.7731	2.26534	0.9672	1.2981	179.56	0.3346	4E-05	6	0.4384	0.9143	1.3834	201.4117
38	249	0.96	13.55	0.39	249.166	0.3853	6	1.36198	123.4313	2.32706	0.9984	1.3287	185.78	0.3889	-9E-05	6	0.4476	0.9031	1.4036	210.6815
39	271.7	1.16	15.1	0.43	271.885	0.4267	6	1.35887	125.0289	2.38957	1.0296	1.36	198.16	0.4304	0.0002	6	0.4487	0.8935	1.4027	227.5671
40	285.8	1.41	15.89	0.49	285.994	0.493	6	1.38243	126.5803	2.45286	1.0608	1.3921	203.68	0.4973	0.0003	6	0.4604	0.8814	1.4294	236.1791
41	263.6	1.56	15.67	0.59	263.792	0.5914	6	1.4614	127.1229	2.51643	1.092	1.4244	183.43	0.5971	0.0001	6	0.4945	0.8633	1.5148	213.1709
42	235.5	1.08	16.02	0.46	235.696	0.4582	6	1.42673	124.1576	2.5785	1.1232	1.4553	160.18	0.4633	0.0001	6	0.4853	0.8567	1.4868	188.7423
43	256.3	1.12	16.51	0.43	256.502	0.4366	6	1.38492	124.63	2.64082	1.1544	1.4864	170.79	0.4412	0.0001	6	0.4714	0.852	1.4464	204.4035
44	270.5	1.48	17.38	0.55	270.713	0.5467	6	1.4301	126.8009	2.70422	1.1856	1.5186	176.48	0.5522	0.0003	6	0.4912	0.8374	1.4944	212.1024
45	291.4	1.43	17.51	0.49	291.614	0.4904	6	1.37455	126.7308	2.76759	1.2168	1.5508	186.26	0.4951	0.0002	6	0.472	0.8349	1.44	227.9172
46	264.1	1.54	18.04	0.58	264.321	0.5826	6	1.45638	127.0334	2.8311	1.248	1.5831	165.18	0.5889	0.0002	6	0.5076	0.815	1.5296	201.4186
47	274.8	1.66	18.79	0.61	275.03	0.6036	6	1.45423	127.6793	2.89494	1.2792	1.6157	168.43	0.61	0.0003	6	0.5094	0.806	1.53	207.3064
48	279.2	1.97	18.32	0.7	279.424	0.705	6	1.49664	128.9707	2.95943	1.3104	1.649	167.65	0.7126	3E-05	6	0.5285	0.791	1.5762	206.664
49	303.4	1.86	18.49	0.61	303.626	0.6126	6	1.42791	128.7529	3.0238	1.3416	1.6822	178.7	0.6188	-3E-05	6	0.504	0.7916	1.5077	224.8956
50	120	0.63	19.81	0.52	120.242	0.5239	6	1.69794	118.5723	3.08309	1.3728	1.7103	68.503	0.5377	0.0005	6	0.6257	0.7405	1.8236	81.99006
51	25.5	0.85	34.87	3.27	25.9268	3.2785	4	2.70965	117.0218	3.1416	1.404	1.7376	13.113	3.7305	0.0486	3	1	0.609	2.957	13.11303
52	41.6	1.13	67.01	2.66	42.4202	2.6638	4	2.48862	120.3061	3.20175	1.4352	1.7666	22.201	2.8813	0.0864	4	0.9627	0.6105	2.7011	22.62868
53	39.1	0.97	105.4	2.38	40.3901	2.4016	4	2.4753	119.0693	3.26129	1.4664	1.7949	20.686	2.6125	0.1649	4	0.9633	0.6011	2.6991	21.09073
54	38.9	1.25	52.09	3.15	39.5376	3.1616	4	2.56098	120.8729	3.32172	1.4976	1.8241	19.854	3.4515	0.0622	4	1	0.5801	2.7944	19.85383
55	33.9	0.99	68.1	2.84	34.7335	2.8503	4	2.57342	118.8507	3.38115	1.5288	1.8524	16.926	3.1577	0.1076	4	1	0.5712	2.825	16.92574
56	34.9	1.19	65.53	3.33	35.7021	3.3331	4	2.60927	120.2641	3.44128	1.56	1.8813	17.148	3.6887	0.0979	3	1	0.5624	2.8621	17.14831
57	31.1	1.03	61.88	3.23	31.8574	3.2332	4	2.63761	118.9297	3.50075	1.5912	1.9096	14.85	3.6323	0.101	3	1	0.5541	2.9071	14.84994
58	33.9	1.1	59.72	3.17	34.631	3.1764	4	2.60525	119.6144	3.56055	1.6224	1.9382	16.031	3.5403	0.0862	3	1	0.5459	2.874	16.03093
59	32.7	1.12	60.24	3.35	33.4373	3.3496	4	2.63193	119.6607	3.62038	1.6536	1.9668	15.16	3.7563	0.09	3	1	0.538	2.909	15.16025
60	43.8	1.24	98.67	2.74	45.0077	2.7551	4	2.47916	121.1302	3.68095	1.6848	1.9962	20.703	3.0005	0.1311	4	0.9882	0.5341	2.7397	20.85847
61	51	1.44	115.82	2.73	52.4176	2.7472	5	2.42955	122.596	3.74225	1.716	2.0263	24.022	2.9584	0.1361	4	0.9674	0.5334	2.6808	24.53747
62	50.8	1.44	114.21	2.76	52.1979	2.7587	5	2.43213	122.5858	3.80354	1.7472	2.0563	23.534	2.9756	0.1338	4	0.9724	0.5241	2.6903	23.97053
63	38.8	1.6	61.66	4.04	39.5547	4.045	4	2.63392	122.6802	3.86488	1.7784	2.0865	17.105	4.4831	0.0746	3	1	0.5071	2.9166	17.10528
64	59.4	1.9	72.82	3.15	60.2913	3.1514	4	2.42734	124.9657	3.92736	1.8096	2.1178	26.615	3.371	0.0609	4	0.9728	0.5092	2.6838	27.12223
65	43.3	1.18	94.81	2.65	44.4605	2.654	4	2.47229	120.7375	3.98773	1.8408	2.1469	18.851	2.9155	0.1232	4	1	0.4929	2.7667	18.85143

66	41.9	1.41	87.95	3.27	42.9765	3.2809	4	2.54521	121.9576	4.04871	1.872	2.1767	17.884	3.6221	0.1146	3	1	0.4861	2.8429	17.88377
67	38.4	1.23	87.3	3.11	39.4686	3.1164	4	2.55736	120.7506	4.10909	1.9032	2.2059	16.03	3.4786	0.1239	3	1	0.4797	2.8693	16.02959
68	37.4	1.29	76.9	3.36	38.3413	3.3645	4	2.58904	121.0284	4.1696	1.9344	2.2352	15.288	3.7751	0.1054	3	1	0.4734	2.9074	15.28796
69	53.9	1.57	134.76	2.82	55.5495	2.8263	5	2.4197	123.37	4.23129	1.9656	2.2657	22.65	3.0593	0.1508	4	0.9922	0.4698	2.715	22.7844
70	56.3	1.55	243.26	2.6	59.2775	2.6148	5	2.37598	123.4346	4.293	1.9968	2.2962	23.946	2.819	0.2822	4	0.9758	0.4695	2.6696	24.39848
71	55.5	1.43	265.49	2.41	58.7496	2.4341	5	2.35749	122.8232	4.35441	2.028	2.3264	23.382	2.6289	0.3141	4	0.9729	0.4647	2.658	23.88671
72	59.7	1.6	286.97	2.52	63.2125	2.5311	5	2.34603	123.8237	4.41633	2.0592	2.3571	24.944	2.7213	0.3164	4	0.9691	0.4602	2.6441	25.56936
73	56.9	1.66	279.34	2.72	60.3191	2.752	5	2.3859	123.9788	4.47832	2.0904	2.3879	23.385	2.9727	0.3227	4	0.9909	0.4464	2.6959	23.55817
74	56.4	1.9	194.17	3.21	58.7766	3.2326	4	2.44297	124.9037	4.54077	2.1216	2.4192	22.419	3.5032	0.2187	4	1	0.4374	2.7577	22.41923
75	55.5	1.77	200.36	3.03	57.9524	3.0542	5	2.42995	124.3506	4.60294	2.1528	2.4501	21.774	3.3178	0.2301	4	1	0.4319	2.7525	21.77402
76	56.6	2.51	144.11	4.28	58.3639	4.3006	4	2.53434	126.9237	4.6664	2.184	2.4824	21.631	4.6743	0.1526	3	1	0.4262	2.8511	21.63124
77	48.1	1.43	103.3	2.9	49.3644	2.8968	4	2.46432	122.3987	4.7276	2.2152	2.5124	17.767	3.2036	0.117	4	1	0.4212	2.8121	17.76656
78	44.6	1.36	102.35	2.96	45.8528	2.966	4	2.49478	121.8515	4.78853	2.2464	2.5421	16.153	3.3119	0.1248	3	1	0.4162	2.8537	16.15348
79	47.3	1.28	153.68	2.6	49.181	2.6026	5	2.43401	121.5788	4.84932	2.2776	2.5717	17.238	2.8873	0.1982	4	1	0.4114	2.7951	17.23817
80	46.2	1.37	162.38	2.83	48.1875	2.8431	4	2.46646	122.0262	4.91033	2.3088	2.6015	16.635	3.1656	0.2168	3	1	0.4067	2.8316	16.63527
81	50.7	1.34	153.79	2.53	52.5824	2.5484	5	2.40639	122.0771	4.97137	2.34	2.6314	18.094	2.8145	0.1834	4	1	0.4021	2.7716	18.09362
82	61.5	1.78	207.25	2.77	64.0367	2.7797	5	2.37035	124.6353	5.03369	2.3712	2.6625	22.161	3.0168	0.2127	4	1	0.3974	2.7206	22.16087
83	47.9	1.95	93.76	3.96	49.0476	3.9757	4	2.5621	124.6524	5.09601	2.4024	2.6936	16.317	4.4367	0.0989	3	1	0.3928	2.9294	16.31696
84	53.2	1.81	69.26	3.34	54.0477	3.3489	4	2.47961	124.344	5.15819	2.4336	2.7246	17.944	3.7022	0.0522	3	1	0.3884	2.8477	17.94384
85	50.7	1.59	109.03	3.05	52.0345	3.0557	4	2.46364	123.3032	5.21984	2.4648	2.755	16.992	3.3964	0.115	3	1	0.3841	2.843	16.99239
86	47.2	1.5	111.71	3.07	48.5673	3.0885	4	2.48853	122.7087	5.28119	2.496	2.7852	15.542	3.4653	0.1282	3	1	0.3799	2.8789	15.54152
87	44.4	1.61	87.92	3.52	45.4761	3.5403	4	2.55013	123.0661	5.34273	2.5272	2.8155	14.254	4.0116	0.0948	3	1	0.3758	2.9476	14.25432
88	53.9	1.82	113.19	3.29	55.2855	3.292	4	2.46739	124.4395	5.40495	2.5584	2.8466	17.523	3.6487	0.1121	3	1	0.3717	2.8518	17.52317
89	54.7	1.56	231.04	2.7	57.5279	2.7117	5	2.3963	123.4086	5.46665	2.5896	2.8771	18.095	2.9965	0.2698	4	1	0.3678	2.7881	18.09537
90	61.7	1.7	167.7	2.66	63.7527	2.6666	5	2.3591	124.288	5.52879	2.6208	2.908	20.022	2.9198	0.1624	4	1	0.3639	2.7464	20.022
91	71.3	0	308.76	0	75.0792	0	0	0	769.6	5.91359	2.652	3.2616	21.206	0	0.2831	0	1	0.3244	0	0

Depth (ft)	CPT-2 qc (tsf)	In situ data fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	Basic output data ó'vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn
1	177.9	0.96	0.72	0.54	177.909	0.5396	6	1.56678	122.6098	0.0613	0	0.0613	2901	0.5398	0.0003	6	0.3636	2	1.3405	336.1614
2	154.5	1.27	0.96	0.82	154.512	0.8219	6	1.72985	124.3135	0.12346	0	0.1235	1250.5	0.8226	0.0005	6	0.4335	2	1.5161	291.8195
3	170.1	1.18	1.04	0.7	170.113	0.6937	6	1.65021	124.0102	0.18547	0	0.1855	916.21	0.6944	0.0004	6	0.4049	2	1.4335	321.1908
4	83.5	1.05	0.95	1.26	83.5116	1.2573	5	2.05294	121.4209	0.24618	0	0.2462	338.23	1.261	0.0008	6	0.5605	2	1.8344	157.3855
5	14.7	0.44	0.64	3.03	14.7078	2.9916	3	2.8794	110.8212	0.30159	0	0.3016	47.768	3.0542	0.0032	4	0.8757	2	2.6548	27.2302
6	5.9	0.15	1.75	2.52	5.92142	2.5332	3	3.16956	100.7281	0.35195	0	0.352	15.825	2.6933	0.0226	3	0.9914	2	2.9521	10.52722
7	17.2	0.16	1.99	0.92	17.2244	0.9289	5	2.55178	103.8046	0.40385	0.0312	0.3727	45.137	0.9512	0.0067	5	0.7454	2	2.3038	31.79355
8	33.8	0.29	1.83	0.85	33.8224	0.8574	5	2.27868	109.8019	0.45876	0.0624	0.3964	84.176	0.8692	0.0021	6	0.6517	1.8963	2.0521	59.79356
9	81	0.49	1.99	0.61	81.0244	0.6048	6	1.87571	115.7706	0.51664	0.0936	0.423	190.31	0.6086	0.0006	6	0.5203	1.6112	1.708	122.5894
10	151.7	1.13	2.38	0.75	151.729	0.7448	6	1.70812	123.4145	0.57835	0.1248	0.4536	333.26	0.7476	0.0003	6	0.4732	1.4932	1.5805	213.2963
11	165.6	1.37	2.66	0.83	165.633	0.8271	6	1.709	125.0376	0.64087	0.156	0.4849	340.28	0.8303	0.0002	6	0.4798	1.4542	1.5937	226.7463
12	137.2	1.16	3.25	0.85	137.24	0.8452	6	1.77684	123.3614	0.70255	0.1872	0.5154	264.94	0.8496	0.0003	6	0.5073	1.4405	1.6621	185.8738
13	96.8	0.95	3.51	0.98	96.843	0.981	6	1.93483	121.0498	0.76307	0.2184	0.5447	176.4	0.9888	0.0004	6	0.567	1.4572	1.8151	132.3223
14	78.8	0.85	3.59	1.08	78.8439	1.0781	6	2.03027	119.7345	0.82294	0.2496	0.5733	136.08	1.0895	0.0001	6	0.6056	1.4493	1.9125	106.864
15	174	1	3.73	0.57	174.046	0.5746	6	1.591	122.8549	0.88437	0.2808	0.6036	286.9	0.5775	-7E-05	6	0.4531	1.2896	1.5086	211.0512
16	226.3	1.46	4.39	0.65	226.354	0.645	6	1.53591	126.2649	0.9475	0.312	0.6355	354.69	0.6477	2E-05	6	0.4391	1.2509	1.4678	266.481
17	234.7	1.9	5.02	0.81	234.761	0.8093	6	1.59243	128.2812	1.01164	0.3432	0.6684	349.69	0.8128	8E-05	6	0.4648	1.238	1.5311	273.4906
18	239	2	5.56	0.84	239.068	0.8366	6	1.59712	128.7009	1.07599	0.3744	0.7016	339.22	0.8401	0.0001	6	0.4707	1.2134	1.5424	272.9197
19	235.9	2.22	6.12	0.94	235.975	0.9408	6	1.63785	129.4327	1.14071	0.4056	0.7351	319.46	0.9454	0.0002	6	0.49	1.1954	1.5887	265.3027
20	229	2.1	6.44	0.92	229.079	0.9167	6	1.63856	128.9538	1.20518	0.4368	0.7684	296.56	0.9216	0.0001	6	0.494	1.1712	1.595	252.2352
21	227.7	2.23	6.78	0.98	227.783	0.979	6	1.66096	129.3794	1.26987	0.468	0.8019	282.48	0.9845	9E-05	6	0.5063	1.1507	1.6233	246.3422
22	225.1	2.11	6.78	0.94	225.183	0.937	6	1.65058	128.9467	1.33435	0.4992	0.8352	268.04	0.9426	-5E-05	6	0.5062	1.1272	1.6187	238.4746
23	226	2.3	7.18	1.02	226.088	1.0173	6	1.67535	129.5874	1.39914	0.5304	0.8687	258.64	1.0236	-6E-05	6	0.5194	1.1079	1.6492	235.2515
24	215.4	1.96	7.59	0.91	215.493	0.9095	6	1.65462	128.2999	1.46329	0.5616	0.9017	237.36	0.9158	-7E-05	6	0.5153	1.0859	1.6339	219.6554
25	241.5	2.3	8.22	0.95	241.601	0.952	6	1.63462	129.7492	1.52816	0.5928	0.9354	256.66	0.958	0	6	0.5115	1.0651	1.62	241.6594
26	255.5	2.81	8.37	1.1	255.602	1.0994	6	1.66492	131.352	1.59384	0.624	0.9698	261.91	1.1063	-8E-05	6	0.5267	1.047	1.6558	251.3302
27	251.4	2.75	8.93	1.09	251.509	1.0934	6	1.66773	131.1547	1.65942	0.6552	1.0042	248.8	1.1007	-5E-05	6	0.5314	1.0282	1.6639	242.7802
28	227	2.78	9.41	1.22	227.115	1.2241	6	1.73379	130.9853	1.72491	0.6864	1.0385	217.03	1.2334	-4E-05	6	0.5603	1.0105	1.7355	215.2555
29	197.3	1.75	9.7	0.89	197.419	0.8864	6	1.67372	127.257	1.78854	0.7176	1.0709	182.67	0.8945	-1E-04	6	0.5412	0.9935	1.6813	183.6846
30	178.3	1.61	10.05	0.9	178.423	0.9024	6	1.71078	126.4001	1.85174	0.7488	1.1029	160.09	0.9118	-1E-04	6	0.5592	0.9771	1.7245	163.047
31	137.4	0.98	10.36	0.71	137.527	0.7126	6	1.72919	122.1327	1.91281	0.78	1.1328	119.72	0.7226	-3E-04	6	0.5707	0.9618	1.751	123.2728
32	109.7	0.68	10.74	0.62	109.831	0.6191	6	1.77123	118.9102	1.97226	0.8112	1.1611	92.897	0.6305	-4E-04	6	0.5914	0.9466	1.8018	96.48915
33	123.8	0.89	11.49	0.72	123.941	0.7181	6	1.76687	121.1742	2.03285	0.8424	1.1905	102.4	0.7301	-1E-04	6	0.5926	0.9326	1.8011	107.442
34	190.8	1.22	12.56	0.64	190.954	0.6389	6	1.58882	124.536	2.09512	0.8736	1.2215	154.61	0.646	0.0002	6	0.5254	0.9273	1.6207	165.5158
35	178.4	1.13	13.24	0.63	178.562	0.6328	6	1.60855	123.8117	2.15702	0.9048	1.2522	140.87	0.6406	0.0003	6	0.5367	0.9136	1.6465	152.3073
36	185.9	1.08	13.79	0.58	186.069	0.5804	6	1.571	123.581	2.21881	0.936	1.2828	143.32	0.5874	0.0003	6	0.5251	0.9038	1.6128	157.0429
37	208.1	1.19	14.33	0.57	208.275	0.5714	6	1.52875	124.5656	2.28109	0.9672	1.3139	156.78	0.5777	0.0003	6	0.5113	0.8952	1.5728	174.2793
38	247.5	1.69	14.92	0.68	247.683	0.6823	6	1.52391	127.5549	2.34487	0.9984	1.3465	182.21	0.6889	0.0003	6	0.5114	0.8841	1.5688	204.9798
39	280.1	2.01	15.64	0.72	280.291	0.7171	6	1.50098	129.1254	2.40944	1.0296	1.3798	201.39	0.7233	0.0004	6	0.5048	0.8746	1.5474	229.6833
40	289	1.9	16.33	0.66	289.2	0.657	6	1.46434	128.7899	2.47383	1.0608	1.413	202.92	0.6627	0.0004	6	0.4936	0.8669	1.514	234.9235
41	284.4	1.44	16.61	0.51	284.603	0.506	6	1.39148	126.7225	2.53719	1.092	1.4452	195.18	0.5105	0.0004	6	0.4689	0.864	1.445	230.3226
42	289.1	1.29	16.15	0.45	289.298	0.4459	6	1.35021	125.9575	2.60017	1.1232	1.477	194.11	0.45	0.0001	6	0.4559	0.859	1.4069	232.7376
43	272.7	1.49	16.78	0.55	272.905	0.546	6	1.42711	126.8698	2.6636	1.1544	1.5092	179.06	0.5514	0.0002	6	0.489	0.8406	1.4899	214.6877
44	267.8	2.05	17.47	0.77	268.014	0.7649	6	1.53463	129.1603	2.72819	1.1856	1.5426	171.97	0.7728	0.0003	6	0.5336	0.8178	1.6029	205.0311
45	284.5	2.3	17.18	0.81	284.71	0.8078	6	1.53386	130.1497	2.79326	1.2168	1.5765	178.83	0.8158	7E-05	6	0.5358	0.8077	1.6043	215.1895
46	308.3	1.83	18.27	0.59	308.524	0.5932	6	1.41311	128.673	2.8576	1.248	1.6096	189.9	0.5987	0.0002	6	0.4915	0.8137	1.4839	235.0589
47	257.6	0.81	18.33	0.31	257.824	0.3142	7	1.2991	122.2715	2.91873	1.2792	1.6395	155.47	0.3178	0.0002	6	0.4528	0.8201	1.3785	197.5732
48	30.4	0.98	19.07	3.19	30.6334	3.1991	4	2.64748	118.47	2.97797	1.3104	1.6676	16.584	3.5436	0.0023	3	1	0.6345	2.8627	16.58431
49	18.1	0.43	54.92	2.25	18.7722	2.2906	4	2.72565	111.2481	3.03359	1.3416	1.692	9.3018	2.7321	0.166	3	1	0.6254	3.0002	9.30184
50	25.5	0.72	55.22	2.72	26.1759	2.7506	4	2.65821	115.8306	3.09151	1.3728	1.7187	13.431	3.119	0.1128	3	1	0.6156	2.9021	13.43126
51	28.9	0.98	47.13	3.31	29.4769	3.3246	4	2.67105	118.3761	3.15069	1.404	1.7467	15.072	3.7225	0.0756	3	1	0.6058	2.9085	15.072
52	34.7	1.38	31.38	3.93	35.0841	3.9334	4	2.66339	121.3054	3.21135	1.4352	1.7762	17.945	4.3297	0.0259	3	1	0.5957	2.8909	17.94488
53	61.1	2.15	8.2	3.5	61.2004	3.5131	4	2.45645	125.9067	3.2743	1.4664	1.8079	32.041	3.7116	-0.015	4	0.9444	0.603	2.6477	33.00857
54	59.7	1.74	40.04	2.88	60.1901	2.8908	5	2.40148	124.3179	3.33646	1.4976	1.8389	30.918	3.0605	0.0244	4	0.9279	0.5988	2.6002	32.17485
55	33.9	1.43	22.49	4.19	34.1753	4.1843	4	2.69005	121.5018	3.39721	1.5288	1.8684	16.473	4.6462	0.0029	3	1	0.5663	2.9391	16.47286
56	48.5	1.57	26.69	3.22	48.8267	3.2155	4	2.49891	123.0554	3.45874	1.56	1.8987	23.894	3.4606	0.008	4	0.9796	0.5639	2.7292	24.17996
57	39.3	1.61	30.53	4.05	39.6737	4.0581	4	2.63395	122.7332	3.5201	1.5912	1.9289	18.743	4.4532	0.0168	3	1	0.5486	2.8844	18.74306
58	53.8	1.48	17.92	2.74	54.0193	2.7398	5	2.41921	122.8699	3.58154	1.6224	1.9591	25.745	2.9343	-0.007	4	0.9536	0.5558	2.6528	26.49192
59	50.1	1.34	28.88	2.64	50.4535	2.6559	5	2.43175	121.9763	3.64253	1.6536	1.9889	23.536	2.8626	0.0091	4	0.9647	0.544	2.6784	24.06655
60	41.7	1.38	42.39	3.27	42.2189	3.2687	4	2.54976	121.7569	3.70341	1.6848	2.0186	19.08	3.583	0.0355	3	1	0.5242	2.8181	19.08022
61	38.5	1.17	41.81	3	39.0118	2.9991	4	2.54999	120.3563	3.76358	1.716	2.0476	17.215	3.3193	0.0367	3	1	0.5168	2.8324	17.21451
62	55.2	1.47	40.2	2.63	55.6921	2.6395	5	2.39848	122.8947	3.82503	1.7472	2.0778	24.962	2.8342	0.0221	4	0.9597	0.5233	2.6541	25.65056
63	47.7	1.18	86.42	2.42	48.7578	2.4201	5	2.41572	120.9625	3.88551	1.7784	2.1071	21.296	2.6297	0.099	4	0.9752	0.5108	2.6916	21.6619
64	45.6	1.06	117.6	2.25	47.0394	2.2534	5	2.40703	120.0903	3.94556	1.8096	2.136	20.175	2.4598	0.1545	4	0.9772	0.5034	2.6931	20.50127
65	41.8	1.04	131.89	2.39	43.4143	2.3955	5	2.45074	119.7553	4.00544	1.8408	2.1646	18.206	2.639	0.1943	4	1	0.4888	2.7527	18.20579
66	43.6	1.22	139.52	2.67	45.3077	2.6927	4	2.47036	121.0274	4.06595	1.872	2.194	18.798	2.9582	0.1982	4	1	0.4823	2.7716	18.79796
67	40.3	1.09	147.24	2.56	42.1022	2.5889	4	2.48291	120.024	4.12596	1.9032	2.2228	17.085	2.8702	0.229	4	1	0.476	2.7967	17.08517
68	40	1.12	135.02	2.69	41.6526	2.6889	4	2.49726	120.1965	4.18606	1.9344	2.2517	16.64	2.9893	0.2078	4	1	0.4699	2.8164	16.63954
69	43.8	1.27	143.4	2.77	45.5552	2.7878	4	2.4787	121.3346	4.24673	1.9656	2.2811	18.109	3.0744	0.2024	4	1	0.4639	2.7946	18.10881
70	41.5	1.26	121.08	2.92	42.982	2.9315	4	2.51207	121.1349	4.30729	1.9968	2.3105	16.739	3.2579	0.1738	3	1	0.458	2.8371	16.73872
71	41.9	1.24	91.54	2.87	43.0205	2.8824	4	2.50686	121.02	4.3678	2.028	2.3398	16.52	3.2081	0.1181	3	1	0.4522	2.8375	16.5196
72	40.1	1.17	68	2.85	40.9323	2.8584	4	2.52053	120.4735	4.42804	2.0592	2.3688	15.41	3.2051	0.0777	3	1	0.4467	2.8613	15.41018
73	39.4	1.24	89.39	3.06	40.4941	3.0622	4	2.54398	120.8724	4.48848	2.0904	2.3981	15.014	3.4439	0.1207	3	1	0.4412	2.8892	15.01438
74	53	1.54	119.1	2.82	54.4578	2.8279	5	2.42611	123.1804	4.55007	2.1216	2.4285	20.551	3.0857	0.1293	4	1	0.4357	2.7523	20.55111
75	45.2	1.58	63.84	3.43	45.9814	3.4362	4	2.53768	122.9554	4.61155	2.1528	2.4588	16.826	3.8192	0.0591	3	1	0.4303	2.878	16.8256
76	58.1	2.29	50.78	3.89	58.7216	3.8998	4	2.5016	126.2674	4.67468	2.184	2.4907	21.7	4.2371	0.0272	3	1	0.4248	2.822	21.69965
77	55.6	1.79	111.07	3.14	56.9595	3.1426	4	2.44399	124.3907	4.73687	2.2152	2.5217	20.71	3.4276	0.1107	4	1	0.4196	2.7783	20.7095
78	58.7	2.05	93.66	3.41	59.8464	3.4254	4	2.45536	125.5036	4.79963	2.2464	2.5532	21.56	3.7241	0.0817	4	1	0.4144	2.7878	21.55969
79	64.8	2.09	75.34	3.17	65.7222	3.1801	5	2.40385	125.8735	4.86256	2.2776	2.585	23.544	3.4341	0.0517	4	1	0.4093	2.7359	23.5437
80	55.3	1.88	97.5	3.32	56.4934	3.3278	4	2.46405	124.7296	4.92493	2.3088	2.6161	19.712	3.6456	0.0914	3	1	0.4045	2.8119	19.71176
81	46.5	1.49	84.27	3.12	47.5315	3.1348	4	2.49977	122.6071	4.98623	2.34	2.6462	16.078	3.5022	0.0876	3	1	0.3999	2.8701	16.07767
82	53.3	1.82	-9.35	3.42	53.1856	3.422	4	2.49117	124.3451	5.0484	2.3712	2.6772	17.98	3.7809	-0.063	3	1	0.3952	2.8528	17.98038
83	43.6	1.69	-7.5	3.87	43.5082	3.8843	4	2.59195	123.313	5.11006	2.4024	2.7077	14.181	4.4013	-0.077	3	1	0.3908	2.9745	14.1813
84	46.1	1.43	-6.94	3.1	46.0151	3.1077	4	2.50745	122.2273	5.17117	2.4336	2.7376	14.92	3.5011	-0.072	3	1	0.3865	2.8957	14.91974
85	52.8	1.6	-6.46	3.03	52.7209	3.0349	4	2.45748	123.381	5.23286	2.4648	2.7681	17.156	3.3693	-0.062	3	1	0.3823	2.8376	17.15569
86	59.4	1.63	-5.42	2.75	59.3337	2.7472	5	2.39051	123.8052	5.29477	2.496	2.7988	19.308	3.0164	-0.053	4	1	0.3781	2.7675	19.30811

87	56.3	1.58	-4.95	2.8	56.2394	2.8094	5	2.41403	123.4466	5.35649	2.5272	2.8293	17.984	3.1052	-0.057	4	1	0.374	2.7996	17.98434
88	50.1	1.43	-3.75	2.85	50.0541	2.8569	4	2.45581	122.4325	5.41771	2.5584	2.8593	15.611	3.2037	-0.063	3	1	0.3701	2.8567	15.61091
89	46.5	1.7	-3.28	3.65	46.4599	3.6591	4	2.55343	123.5163	5.47946	2.5896	2.8899	14.181	4.1483	-0.069	3	1	0.3661	2.9584	14.18073
90	61.1	2.04	-2.64	3.35	61.0677	3.3406	4	2.44144	125.5171	5.54222	2.6208	2.9214	19.006	3.674	-0.051	3	1	0.3622	2.8262	19.0063
91	53.2	1.66	-2.07	3.12	53.1747	3.1218	4	2.46332	123.6713	5.60406	2.652	2.9521	16.114	3.4896	-0.059	3	1	0.3584	2.8684	16.11438
92	47.5	1.73	-0.06	3.64	47.4993	3.6422	4	2.54515	123.6982	5.66591	2.6832	2.9827	14.025	4.1355	-0.064	3	1	0.3548	2.9613	14.02529
93	53.2	1.8	0.34	3.39	53.2042	3.3832	4	2.48758	124.2651	5.72804	2.7144	3.0136	15.754	3.7914	-0.057	3	1	0.3511	2.8984	15.75374
94	55	1.64	1.43	2.98	55.0175	2.9809	5	2.43873	123.6657	5.78987	2.7456	3.0443	16.171	3.3315	-0.054	3	1	0.3476	2.8548	16.17057
95	46.6	1.59	2.11	3.42	46.6258	3.4101	4	2.53103	123.0355	5.85139	2.7768	3.0746	13.262	3.8995	-0.064	3	1	0.3442	2.9648	13.26174
96	46.4	1.48	4.2	3.18	46.4514	3.1861	4	2.51187	122.5018	5.91264	2.808	3.1046	13.057	3.6508	-0.062	3	1	0.3408	2.9528	13.05747
97	41.8	1.74	4.1	4.14	41.8502	4.1577	4	2.62467	123.4316	5.97436	2.8392	3.1352	11.443	4.8501	-0.071	3	1	0.3375	3.0736	11.44307
98	43.8	1.6	4.83	3.64	43.8591	3.648	4	2.57048	122.9322	6.03582	2.8704	3.1654	11.949	4.2302	-0.067	3	1	0.3343	3.0222	11.94889
99	64.5	1.82	6.85	2.82	64.5838	2.818	5	2.37191	124.8187	6.09823	2.9016	3.1966	18.296	3.1119	-0.041	4	1	0.331	2.7943	18.296
100	60.6	0	9.91	0	60.7213	0	0	0	769.6	6.48303	2.9328	3.5502	15.277	0	-0.041	0	1	0.298	0	0

	CPT-3	In situ data										Basic output data								
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn
1	31.3	1.08	-0.41	3.44	31.295	3.451	4	2.66207	119.2331	0.05962	0	0.0596	523.94	3.4576	-1E-03	4	0.7845	2	2.4453	59.04003
2	74.1	0.42	0.41	0.57	74.105	0.5668	6	1.89397	114.4249	0.11683	0	0.1168	633.3	0.5677	0.0004	6	0.4819	2	1.644	139.85
3	69.7	0.4	0.37	0.57	69.7045	0.5739	6	1.91957	113.9186	0.17379	0	0.1738	400.09	0.5753	0.0004	6	0.4942	2	1.6692	131.4247
4	40.4	0.29	0.33	0.72	40.404	0.7178	5	2.17317	110.2355	0.22891	0	0.2289	175.51	0.7218	0.0006	6	0.5927	2	1.9209	75.93768
5	26.4	0.09	-0.14	0.35	26.3983	0.3409	5	2.20537	100.636	0.27922	0	0.2792	93.542	0.3446	-4E-04	6	0.599	2	1.9312	49.36937
6	4.6	0.08	1.03	1.78	4.61261	1.7344	3	3.18454	95.51934	0.32698	0	0.327	13.107	1.8667	0.0173	3	0.9947	2	2.9639	8.10054
7	6.5	0.11	3.38	1.63	6.54137	1.6816	3	3.04408	98.70154	0.37633	0.0312	0.3451	17.863	1.7843	0.0344	4	0.9401	2	2.8182	11.65294
8	32.2	0.23	3.14	0.7	32.2384	0.7134	5	2.25763	107.9888	0.43033	0.0624	0.3679	86.452	0.7231	0.0052	6	0.6353	1.9564	2.0141	58.8104
9	89.1	0.4	2.73	0.45	89.1334	0.4488	6	1.77366	114.5183	0.48759	0.0936	0.394	225	0.4512	0.0012	6	0.4781	1.6038	1.6015	134.3615
10	154.9	0.97	2.57	0.63	154.931	0.6261	6	1.65378	122.3483	0.54876	0.1248	0.424	364.14	0.6283	0.0004	6	0.4485	1.5071	1.5194	219.8853
11	144.7	1.47	2.88	1.02	144.735	1.0157	6	1.81227	125.2241	0.61137	0.156	0.4554	316.5	1.02	0.0004	6	0.512	1.5398	1.6817	209.7321
12	100.6	0.51	3.13	0.5	100.638	0.5068	6	1.75517	116.592	0.66967	0.1872	0.4825	207.2	0.5102	0.0004	6	0.4894	1.4686	1.6197	138.7553
13	105.4	0.81	3.6	0.77	105.444	0.7682	6	1.84048	120.0908	0.72972	0.2184	0.5113	204.79	0.7735	0.0004	6	0.5271	1.4671	1.7146	145.1922
14	170.8	2.11	3.92	1.24	170.848	1.235	6	1.82014	128.2732	0.79385	0.2496	0.5443	312.45	1.2408	0.0002	6	0.531	1.4233	1.7203	228.7509
15	196.7	1.74	4.2	0.88	196.751	0.8844	6	1.67407	127.2068	0.85746	0.2808	0.5767	339.71	0.8882	0.0001	6	0.4821	1.34	1.5881	248.0782
16	151.8	2.06	4.23	1.36	151.852	1.3566	6	1.88504	127.8102	0.92136	0.312	0.6094	247.69	1.3649	-5E-05	6	0.5635	1.3647	1.7973	194.6645
17	143.9	1.53	4.55	1.06	143.956	1.0628	6	1.82739	125.5037	0.98411	0.3432	0.6409	223.08	1.0701	-1E-04	6	0.5457	1.3146	1.7466	177.6338
18	215.1	2	5.12	0.93	215.163	0.9295	6	1.66183	128.4439	1.04833	0.3744	0.6739	317.71	0.9341	-3E-05	6	0.491	1.248	1.5991	252.5299
19	179.3	2.46	5.51	1.37	179.367	1.3715	6	1.83889	129.5149	1.11309	0.4056	0.7075	251.95	1.3801	-5E-05	6	0.5608	1.2533	1.778	211.1286
20	200.8	1.77	5.86	0.88	200.872	0.8812	6	1.66652	127.3824	1.17678	0.4368	0.74	269.86	0.8864	-7E-05	6	0.5004	1.196	1.6155	225.7135
21	176	1.62	6.02	0.92	176.074	0.9201	6	1.72076	126.4131	1.23999	0.468	0.772	226.47	0.9266	-2E-04	6	0.5242	1.1797	1.6738	194.9223
22	203.1	2.03	7.42	1	203.191	0.9991	6	1.70161	128.4132	1.3042	0.4992	0.805	250.79	1.0055	0.0002	6	0.5216	1.1533	1.663	220.0454
23	255.5	2.55	8.14	1	255.6	0.9977	6	1.63322	130.6416	1.36952	0.5304	0.8391	302.97	1.003	0.0002	6	0.5005	1.1231	1.6034	269.8393
24	231.7	2.07	8.78	0.89	231.807	0.893	6	1.62678	128.8774	1.43396	0.5616	0.8724	264.08	0.8985	0.0003	6	0.5015	1.1016	1.6017	239.852
25	246.5	1.96	9.26	0.79	246.613	0.7948	6	1.57177	128.6289	1.49827	0.5928	0.9055	270.7	0.7996	0.0003	6	0.4845	1.0784	1.5527	249.8166
26	256.1	2.78	9.1	1.08	256.211	1.085	6	1.65994	131.2793	1.56391	0.624	0.9399	270.93	1.0917	0.0001	6	0.5217	1.0638	1.6463	256.0049
27	246.2	2.87	9.74	1.17	246.319	1.1652	6	1.69454	131.4164	1.62962	0.6552	0.9744	251.11	1.1729	0.0002	6	0.5385	1.0454	1.6861	241.7438
28	261.1	2.77	10.14	1.06	261.224	1.0604	6	1.64688	131.3002	1.69527	0.6864	1.0089	257.25	1.0673	0.0002	6	0.524	1.0253	1.6438	251.4777
29	258.7	3.23	10.46	1.25	258.828	1.2479	6	1.70354	132.4019	1.76147	0.7176	1.0439	246.26	1.2565	0.0001	6	0.5492	1.0075	1.7057	244.7637
30	168.2	1.53	10.46	0.91	168.328	0.9089	6	1.73139	125.8851	1.82441	0.7488	1.0756	154.8	0.9189	3E-05	6	0.5642	0.9908	1.741	155.9099
31	192.8	1.41	10.54	0.73	192.929	0.7308	6	1.62378	125.6202	1.88722	0.78	1.1072	172.54	0.7381	-1E-04	6	0.5262	0.9764	1.6376	176.2905
32	161.8	1.09	10.85	0.67	161.933	0.6731	6	1.65838	123.3095	1.94888	0.8112	1.1377	140.62	0.6813	-2E-04	6	0.5435	0.9614	1.6791	145.3555
33	140.9	0.97	11.27	0.68	141.038	0.6878	6	1.71106	122.1192	2.00994	0.8424	1.1675	119.08	0.6977	-2E-04	6	0.5678	0.9457	1.7389	124.2525
34	231.2	1.15	12.19	0.5	231.349	0.4971	6	1.45511	124.5717	2.07222	0.8736	1.1986	191.28	0.5016	2E-05	6	0.4708	0.943	1.4805	204.3305
35	248	0.7	12.49	0.28	248.153	0.2821	7	1.28802	121.1103	2.13278	0.9048	1.228	200.35	0.2845	-2E-05	7	0.4094	0.9409	1.3158	218.7615
36	278.5	1.02	13.52	0.36	278.665	0.366	7	1.30967	124.1478	2.19485	0.936	1.2589	219.62	0.3689	0.0001	6	0.42	0.9296	1.34	242.9014
37	280.7	1.06	13.49	0.38	280.865	0.3774	7	1.31495	124.4485	2.25708	0.9672	1.2899	216	0.3805	1E-05	6	0.425	0.9193	1.3491	242.0519
38	309.9	1.18	14.16	0.38	310.073	0.3806	7	1.28328	125.4745	2.31981	0.9984	1.3214	232.9	0.3834	7E-05	7	0.4152	0.9119	1.3194	265.2207
39	321.2	2.46	14.92	0.76	321.383	0.7654	6	1.48115	130.9373	2.38528	1.0296	1.3557	235.3	0.7712	0.0001	6	0.4938	0.8848	1.5217	266.7518
40	246.2	1.88	15	0.76	246.384	0.763	6	1.5595	128.3217	2.44944	1.0608	1.3886	175.66	0.7707	8E-05	6	0.5292	0.866	1.6104	199.6476
41	283.9	2.45	14.79	0.86	284.081	0.8624	6	1.55549	130.6066	2.51475	1.092	1.4228	197.9	0.8701	-1E-04	6	0.5297	0.8549	1.6073	227.4782
42	283	2.47	15.13	0.87	283.185	0.8722	6	1.56006	130.6583	2.58007	1.1232	1.4569	192.61	0.8802	-1E-04	6	0.5347	0.8428	1.6163	223.5147
43	316.3	1.43	15.54	0.45	316.49	0.4518	7	1.32437	126.9305	2.64354	1.1544	1.4891	210.76	0.4556	-1E-04	6	0.4462	0.8586	1.3799	254.6689
44	354.3	1.79	16.2	0.51	354.498	0.5049	7	1.32107	128.8501	2.70796	1.1856	1.5224	231.08	0.5088	-5E-05	6	0.4467	0.85	1.3771	282.6078
45	386.6	1.96	15.72	0.51	386.792	0.5067	7	1.29536	129.7266	2.77283	1.2168	1.556	246.79	0.5104	-2E-04	6	0.4388	0.8443	1.3523	306.4296
46	359.9	1.91	16.09	0.53	360.097	0.5304	7	1.3313	129.3631	2.83751	1.248	1.5895	224.76	0.5346	-3E-04	6	0.4564	0.8305	1.3942	280.4152
47	344.6	0.97	16.81	0.28	344.806	0.2813	7	1.16773	124.2995	2.89966	1.2792	1.6205	210.99	0.2837	-2E-04	7	0.3967	0.8444	1.2337	272.8588
48	329.8	1.57	17.46	0.48	330.014	0.4757	7	1.32584	127.716	2.96352	1.3104	1.6531	197.84	0.4801	-2E-04	6	0.461	0.8141	1.3984	251.6242
49	337.4	1.99	18.1	0.59	337.622	0.5894	6	1.38358	129.5061	3.02827	1.3416	1.6867	198.38	0.5948	-1E-04	6	0.4859	0.7973	1.4595	252.1152
50	327.1	0.67	18.75	0.2	327.33	0.2047	7	1.11426	121.4652	3.089	1.3728	1.7162	188.93	0.2066	-7E-05	7	0.3853	0.83	1.1916	254.3381
51	306.1	1.1	19.23	0.36	306.335	0.3591	7	1.27187	124.9312	3.15147	1.404	1.7475	173.5	0.3628	-6E-05	6	0.4498	0.798	1.3572	228.6501
52	262.1	0.74	19.42	0.28	262.338	0.2821	7	1.26746	121.6525	3.21229	1.4352	1.7771	145.81	0.2856	-1E-04	6	0.4533	0.7906	1.3625	193.6016
53	34.4	1.23	25.02	3.53	34.7062	3.544	4	2.63623	120.437	3.27251	1.4664	1.8061	17.404	3.913	0.0107	3	1	0.5859	2.8732	17.40408
54	33.8	0.79	64.14	2.29	34.5851	2.2842	4	2.51335	117.189	3.33111	1.4976	1.8335	17.046	2.5277	0.0998	4	0.9893	0.5805	2.7626	17.14699
55	36.2	0.85	33.12	2.31	36.6054	2.3221	4	2.49874	117.8631	3.39004	1.5288	1.8612	17.846	2.5591	0.0258	4	0.9854	0.5732	2.7489	17.9941
56	30.4	0.7	11.02	2.28	30.5349	2.2925	4	2.55664	116.0002	3.44804	1.56	1.888	14.347	2.5843	-0.028	4	1	0.5604	2.8312	14.34655
57	39.8	0.99	22.71	2.46	40.078	2.4702	4	2.48579	119.1997	3.50764	1.5912	1.9164	19.082	2.7071	0.0012	4	0.9845	0.5572	2.7398	19.2587
58	44.4	0.81	32.41	1.81	44.7967	1.8082	5	2.36219	118.0029	3.56664	1.6224	1.9442	21.206	1.9646	0.0173	4	0.9368	0.5656	2.6103	22.03789
59	44	0.94	55.07	2.1	44.6741	2.1041	5	2.40482	119.0853	3.62618	1.6536	1.9726	20.809	2.29	0.0563	4	0.957	0.551	2.6601	21.37446
60	55	1.55	73.02	2.76	55.8938	2.7731	5	2.41206	123.2913	3.68783	1.6848	2.003	26.063	2.969	0.0684	4	0.9553	0.5435	2.652	26.81719
61	39.5	1.03	45.84	2.56	40.0611	2.5711	4	2.49724	119.4885	3.74757	1.716	2.0316	17.875	2.8364	0.0436	4	1	0.5208	2.7779	17.87457
62	41.5	0.89	58.45	2.1	42.2154	2.1082	5	2.42427	118.5473	3.80685	1.7472	2.0597	18.648	2.3172	0.0641	4	0.9784	0.5212	2.7059	18.91794
63	43.9	0.99	87.6	2.2	44.9722	2.2014	5	2.41525	119.4808	3.86659	1.7784	2.0882	19.685	2.4084	0.1102	4	0.9761	0.515	2.6962	20.00738
64	39.7	0.86	120.82	2.09	41.1788	2.0885	5	2.43	118.2358	3.92571	1.8096	2.1161	17.605	2.3085	0.1849	4	0.9903	0.5034	2.728	17.72386
65	40.6	1.17	122.44	2.77	42.0987	2.7792	4	2.5033	120.542	3.98598	1.8408	2.1452	17.767	3.0698	0.183	4	1	0.4933	2.8008	17.76669
66	39.2	0.93	105.43	2.29	40.4905	2.2968	5	2.46199	118.7673	4.04536	1.872	2.1734	16.769	2.5518	0.1569	4	1	0.4869	2.7729	16.76901
67	38.2	0.82	119.12	2.07	39.658	2.0677	5	2.43993	117.7955	4.10426	1.9032	2.2011	16.153	2.3064	0.1877	4	1	0.4807	2.7606	16.15304
68	44.1	0.84	120.47	1.84	45.5746	1.8431	5	2.36158	118.311	4.16341	1.9344	2.229	18.578	2.0284	0.1627	4	0.9736	0.4841	2.6719	18.94774
69	45	0.92	111.04	1.97	46.3591	1.9845	5	2.37619	119.0183	4.22292	1.9656	2.2573	18.666	2.1834	0.1431	4	0.982	0.4752	2.6908	18.92248
70	38.1	1.27	87.5	3.22	39.171	3.2422	4	2.57133	120.9663	4.28341	1.9968	2.2866	15.257	3.6403	0.1233	3	1	0.4627	2.8984	15.25737
71	63.1	1.57	136.1	2.42	64.7659	2.4241	5	2.32545	123.7444	4.34528	2.028	2.3173	26.074	2.5985	0.1286	4	0.9555	0.4728	2.6131	26.9993
72	70.5	2.69	157.37	3.7	72.4262	3.7141	4	2.42397	127.957	4.40926	2.0592	2.3501	28.943	3.9549	0.1363	4	0.993	0.4528	2.7067	29.1052
73	52	1.73	17.93	3.31	52.2195	3.3129	4	2.48697	123.9293	4.47122	2.0904	2.3808	20.055	3.6232	-0.017	3	1	0.4444	2.8044	20.05537
74	41.6	1.18	76.63	2.76	42.538	2.774	4	2.49939	120.6296	4.53154	2.1216	2.4099	15.771	3.1047	0.0894	3	1	0.4391	2.8449	15.77072
75	46.2	1.49	130.31	3.11	47.795	3.1175	4	2.49637	122.6206	4.59285	2.1528	2.4401	17.705	3.4489	0.1673	3	1	0.4336	2.8331	17.70547
76	45.8	1.34	160.86	2.8	47.7689	2.8052	4	2.4653	121.8429	4.65377	2.184	2.4698	17.457	3.108	0.218	4	1	0.4284	2.8101	17.45717
77	47	1.38	187.97	2.79	49.3008	2.7992	4	2.45459	122.1351	4.71483	2.2152	2.4996	17.837	3.0952	0.2539	4	1	0.4233	2.8016	17.83697
78	49.4	1.42	179.92	2.74	51.6022	2.7518	5	2.43503	122.4555	4.77606	2.2464	2.5297	18.511	3.0325	0.2287	4	1	0.4183	2.7834	18.51083
79	51.4	1.63	183.87	3.02	53.6506	3.0382	4	2.45234	123.5596	4.83784	2.2776	2.5602	19.066	3.3393	0.2246	4	1	0.4133	2.7992	19.06567
80	46.1	1.83	120.53	3.82	47.5753	3.8465	4	2.56131	124.1133	4.8999	2.3088	2.5911	16.47	4.2882	0.1493	3	1	0.4084	2.9169	16.46999
81	56.6	1.92	86.38	3.32	57.6573	3.33	4	2.458	124.9334	4.96237	2.34	2.6224	20.094	3.6436	0.0736	3	1	0.4035	2.8053	20.09442
82	50.5	1.56	150.16	2.96	52.338	2.9806	4	2.45435	123.178	5.02395	2.3712	2.6528	17.836	3.2971	0.1784	4	1	0.3989	2.8185	17.8358
83	47.5	1.37	184.18	2.74	49.7544	2.7535	5	2.44683	122.1042	5.08501	2.4024	2.6826	16.651	3.067	0.2431	4	1	0.3944	2.8229	16.65147
84	48.1	1.33	153.98	2.64	49.9847	2.6608	5	2.43528	121.8987	5.14596	2.4336	2.7124	16.531	2.9662	0.193	4	1	0.3901	2.8167	16.53129
85	51.6	1.49	169.38	2.76	53.6732	2.7761	5	2.42516	122.9035	5.20741	2.4648	2.7426	17.671	3.0743	0.2008	4	1	0.3858	2.803	17.67143
86	52.9	1.43	187.29	2.58	55.1924	2.5909	5	2.39582	122.6709	5.26874	2.496	2.7727	18.005	2.8644	0.2201	4	1	0.3816	2.7779	18.00516

87	42.2	1.22	120.99	2.78	43.6809	2.793	4	2.49279	120.9382	5.32921	2.5272	2.802	13.687	3.1811	0.1613	3	1	0.3776	2.9006	13.6872
88	57.4	1.59	227.84	2.63	60.1888	2.6417	5	2.37425	123.6583	5.39104	2.5584	2.8326	19.345	2.9016	0.2527	4	1	0.3735	2.7566	19.34509
89	66.5	2.03	246.06	2.9	69.5118	2.9204	5	2.36037	125.7971	5.45394	2.5896	2.8643	22.364	3.169	0.2361	4	1	0.3694	2.7309	22.36391
90	56	2.54	68.28	4.45	56.8358	4.469	4	2.5544	126.946	5.51741	2.6208	2.8966	17.717	4.9495	0.0447	3	1	0.3653	2.9328	17.71667
91	60.7	1.71	240	2.67	63.6376	2.6871	5	2.36199	124.3265	5.57958	2.652	2.9276	19.831	2.9453	0.252	4	1	0.3614	2.752	19.83143
92	60.1	1.61	358.24	2.47	64.4849	2.4967	5	2.33567	123.9179	5.64154	2.6832	2.9583	19.891	2.7361	0.3927	4	1	0.3577	2.7315	19.89069
93	59.6	1.58	320.11	2.48	63.5182	2.4875	5	2.33929	123.7434	5.70341	2.7144	2.989	19.342	2.7329	0.3517	4	1	0.354	2.7408	19.34246
94	59.9	1.53	325.19	2.37	63.8803	2.3951	5	2.32618	123.522	5.76517	2.7456	3.0196	19.246	2.6327	0.3556	4	1	0.3504	2.7328	19.24618
95	61.3	1.67	330.14	2.53	65.3409	2.5558	5	2.3386	124.2178	5.82728	2.7768	3.0505	19.51	2.8061	0.3528	4	1	0.3469	2.7448	19.50962
96	63.3	1.63	321.5	2.41	67.2352	2.4243	5	2.31374	124.1101	5.88933	2.808	3.0813	19.909	2.6571	0.3316	4	1	0.3434	2.7234	19.90887
97	62.9	1.78	317.42	2.65	66.7852	2.6653	5	2.34454	124.7378	5.9517	2.8392	3.1125	19.545	2.926	0.329	4	1	0.34	2.7553	19.5449
98	70.1	1.8	404.93	2.37	75.0563	2.3982	5	2.27624	125.1044	6.01425	2.8704	3.1439	21.961	2.6071	0.3807	4	1	0.3366	2.6846	21.96098
99	76.2	2.39	227.01	3.02	78.9786	3.0261	5	2.33313	127.303	6.0779	2.9016	3.1763	22.951	3.2784	0.1844	4	1	0.3331	2.7315	22.95142
100	40.8	0	107.83	0	42.1198	0	0	0	769.6	6.4627	2.9328	3.5299	10.101	0	0.1355	0	1	0.2998	0	0

	CPT-4	In situ data										Basic output data								
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ã (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn
1	26	0.17	0	0.65	26	0.6539	5	2.32309	105.2525	0.05263	0	0.0526	493.05	0.6552	0	6	0.637	2	2.0592	49.04485
2	38.4	0.19	0.06	0.49	38.4007	0.4948	5	2.11778	107.0175	0.10613	0	0.1061	360.81	0.4962	0.0001	6	0.5608	2	1.8525	72.38316
3	53.2	0.26	0.1	0.49	53.2012	0.4887	6	1.98856	110.1076	0.16119	0	0.1612	329.06	0.4902	0.0001	6	0.516	2	1.7281	100.2545
4	14.5	0.05	0.14	0.37	14.5017	0.3448	5	2.45302	94.87413	0.20863	0	0.2086	68.511	0.3498	0.0007	5	0.6892	2	2.1768	27.01631
5	8.7	0.06	0.09	0.73	8.7011	0.6896	4	2.76557	94.9623	0.25611	0	0.2561	32.974	0.7105	0.0008	5	0.8174	2	2.5074	15.96244
6	33.7	0.23	1.95	0.69	33.7239	0.682	5	2.23113	108.0986	0.31016	0	0.3102	107.73	0.6883	0.0042	6	0.6177	2	1.9765	63.15747
7	38.5	0.22	3.33	0.56	38.5408	0.5708	5	2.14391	108.099	0.36421	0.0312	0.333	114.64	0.5763	0.0055	6	0.587	1.9711	1.892	71.11798
8	23.7	0.12	5.09	0.52	23.7623	0.505	5	2.31108	102.4844	0.41545	0.0624	0.3531	66.129	0.514	0.013	6	0.6473	2	2.049	44.12943
9	70.3	0.41	-2.81	0.58	70.2656	0.5835	6	1.92028	114.1189	0.47251	0.0936	0.3789	184.2	0.5875	-0.004	6	0.5256	1.7156	1.7274	113.161
10	160.6	0.98	0.12	0.61	160.601	0.6102	6	1.63461	122.511	0.53376	0.1248	0.409	391.4	0.6122	-7E-04	6	0.4395	1.5186	1.4978	229.7259
11	191.8	1.64	1.73	0.86	191.821	0.855	6	1.67184	126.7118	0.59712	0.156	0.4411	433.5	0.8576	-2E-04	6	0.4616	1.4976	1.5514	270.6488
12	171.7	1.08	3.17	0.63	171.739	0.6289	6	1.61994	123.3855	0.65881	0.1872	0.4716	362.76	0.6313	0.0002	6	0.4449	1.4327	1.5041	231.6406
13	181.6	1.49	3.67	0.82	181.645	0.8203	6	1.67686	125.877	0.72175	0.2184	0.5034	359.44	0.8236	0.0003	6	0.4719	1.4199	1.5705	242.7811
14	186.8	1.56	4.57	0.83	186.856	0.8349	6	1.67304	126.2819	0.78489	0.2496	0.5353	347.61	0.8384	0.0004	6	0.4754	1.3826	1.5757	243.1282
15	173.2	0.97	5.31	0.56	173.265	0.5598	6	1.58563	122.6211	0.8462	0.2808	0.5654	304.95	0.5626	0.0006	6	0.4458	1.3223	1.4944	215.4698
16	161.3	0.86	5.69	0.53	161.37	0.5329	6	1.59744	121.5669	0.90699	0.312	0.595	269.69	0.536	0.0006	6	0.4536	1.2984	1.511	196.9026
17	152.8	1.1	5.88	0.72	152.872	0.7196	6	1.69608	123.2359	0.9686	0.3432	0.6254	242.89	0.7241	0.0005	6	0.4945	1.297	1.6144	186.192
18	100.4	0.79	6.17	0.79	100.476	0.7863	6	1.86332	119.7902	1.0285	0.3744	0.6541	152.04	0.7944	0.0007	6	0.5581	1.3079	1.7776	122.9235
19	53	0.32	6.56	0.6	53.0803	0.6029	6	2.03271	111.6214	1.08431	0.4056	0.6787	76.61	0.6154	0.0013	6	0.6217	1.3179	1.9416	64.76394
20	84.1	0.5	6.67	0.6	84.1816	0.594	6	1.85749	116.0116	1.14231	0.4368	0.7055	117.7	0.6021	0.0005	6	0.5625	1.2561	1.7829	98.57643
21	151.3	0.82	6.68	0.54	151.382	0.5417	6	1.62401	121.0626	1.20285	0.468	0.7349	204.37	0.546	9E-05	6	0.482	1.1921	1.5678	169.1969
22	212.7	1.79	6.17	0.84	212.776	0.8413	6	1.63458	127.605	1.26665	0.4992	0.7675	275.6	0.8463	-3E-04	6	0.492	1.1712	1.59	234.1137
23	170.4	1.59	5.98	0.93	170.473	0.9327	6	1.73503	126.1975	1.32975	0.5304	0.7994	211.6	0.94	-6E-04	6	0.5329	1.1612	1.6932	185.62
24	205.9	1.75	6.68	0.85	205.982	0.8496	6	1.64765	127.3605	1.39343	0.5616	0.8318	245.95	0.8554	-4E-04	6	0.5044	1.129	1.6145	218.303
25	161.6	1.11	7.88	0.69	161.696	0.6865	6	1.66427	123.439	1.45515	0.5928	0.8624	185.82	0.6927	-2E-04	6	0.5136	1.1108	1.6348	168.2198
26	180	1.04	8.91	0.58	180.109	0.5774	6	1.58065	123.2254	1.51676	0.624	0.8928	200.05	0.5823	0.0001	6	0.4857	1.086	1.5579	183.3064
27	225.7	1.56	8.83	0.69	225.808	0.6909	6	1.55682	126.7437	1.58013	0.6552	0.9249	242.43	0.6957	-9E-05	6	0.4808	1.0668	1.5407	226.074
28	250.8	2.14	7.83	0.85	250.896	0.8529	6	1.58862	129.3137	1.64479	0.6864	0.9584	260.07	0.8586	-5E-04	6	0.4966	1.0504	1.578	247.431
29	185	1.44	9.19	0.78	185.112	0.7779	6	1.65527	125.6734	1.70762	0.7176	0.99	185.25	0.7852	-3E-04	6	0.5254	1.0356	1.6497	179.4963
30	167.7	0.78	10.23	0.46	167.825	0.4648	6	1.54895	120.9482	1.7681	0.7488	1.0193	162.91	0.4697	-7E-05	6	0.4883	1.0184	1.5489	159.8276
31	175.6	0.72	11.21	0.41	175.737	0.4097	6	1.50156	120.4749	1.82834	0.78	1.0483	165.89	0.414	0.0002	6	0.4734	1.0044	1.5063	165.0819
32	186.8	0.96	10.9	0.51	186.933	0.5136	6	1.53666	122.7305	1.8897	0.8112	1.0785	171.57	0.5188	-1E-04	6	0.49	0.9907	1.5461	173.2534
33	201.8	0.98	11.39	0.49	201.939	0.4853	6	1.49509	123.0697	1.95124	0.8424	1.1088	180.36	0.49	-1E-04	6	0.4772	0.9779	1.5087	184.8283
34	302.5	1.64	10.41	0.54	302.627	0.5419	6	1.39191	127.8238	2.01515	0.8736	1.1416	263.34	0.5456	-4E-04	6	0.4399	0.9672	1.4066	274.7739
35	305.6	1.61	10.26	0.53	305.726	0.5266	6	1.38018	127.7136	2.07901	0.9048	1.1742	258.6	0.5302	-6E-04	6	0.4386	0.9554	1.3989	274.1631
36	292.2	1.24	10.23	0.42	292.325	0.4242	6	1.33285	125.6936	2.14185	0.936	1.2059	240.65	0.4273	-7E-04	6	0.4238	0.9461	1.356	259.47
37	182.5	1.59	11.3	0.87	182.638	0.8706	6	1.69272	126.3656	2.20503	0.9672	1.2378	145.77	0.8812	-9E-04	6	0.5672	0.9149	1.7285	156.0058
38	177.3	0.93	14.13	0.52	177.473	0.524	6	1.55993	122.3715	2.26622	0.9984	1.2678	138.2	0.5308	0.0001	6	0.5197	0.9103	1.6005	150.7333
39	246.5	1.53	13.28	0.62	246.663	0.6203	6	1.49689	126.8171	2.32963	1.0296	1.3	187.94	0.6262	-3E-04	6	0.4965	0.9028	1.5357	208.4729
40	275	1.75	13.23	0.63	275.162	0.636	6	1.46981	128.0668	2.39366	1.0608	1.3329	204.65	0.6416	-4E-04	6	0.4886	0.8933	1.5107	230.2933
41	286.2	1.04	13.19	0.36	286.361	0.3632	7	1.29816	124.3564	2.45584	1.092	1.3638	208.17	0.3663	-5E-04	6	0.4255	0.8976	1.3412	240.8488
42	306.2	1.21	13.43	0.4	306.364	0.395	7	1.29746	125.6288	2.51866	1.1232	1.3955	217.74	0.3982	-5E-04	6	0.4276	0.8884	1.3428	255.1139
43	286.4	0.66	14.35	0.23	286.576	0.2303	7	1.18956	121.0309	2.57917	1.1544	1.4248	199.33	0.2324	-4E-04	7	0.3894	0.8906	1.239	239.0355
44	337.6	1.08	13.77	0.32	337.769	0.3198	7	1.20761	125.0352	2.64169	1.1856	1.4561	230.16	0.3223	-6E-04	7	0.3977	0.8808	1.2569	278.9523
45	368.1	0.71	15.44	0.19	368.289	0.1928	7	1.05684	122.1771	2.70278	1.2168	1.486	246.02	0.1942	-3E-04	7	0.3416	0.8905	1.1057	307.6711
46	351.5	0.76	15.21	0.21	351.686	0.2161	7	1.09866	122.5625	2.76406	1.248	1.5161	230.15	0.2178	-4E-04	7	0.3608	0.8783	1.1523	289.6366
47	350.7	0.75	15.86	0.21	350.894	0.2137	7	1.09711	122.4601	2.82529	1.2792	1.5461	225.13	0.2155	-4E-04	7	0.3628	0.8715	1.154	286.6662
48	347.6	0.81	17.1	0.23	347.809	0.2329	7	1.11951	123.0017	2.88679	1.3104	1.5764	218.81	0.2348	-2E-04	7	0.3742	0.8614	1.1801	280.8023
49	213.5	0.35	17.01	0.16	213.708	0.1638	7	1.24303	115.6741	2.94463	1.3416	1.603	131.48	0.1661	-6E-04	6	0.4302	0.8363	1.3237	166.5894
50	292.3	0.48	18.52	0.16	292.527	0.1641	7	1.11661	118.7509	3.004	1.3728	1.6312	177.49	0.1658	-1E-04	7	0.3801	0.8483	1.1886	232.115
51	316.7	0.58	18.62	0.18	316.928	0.183	7	1.10452	120.331	3.06417	1.404	1.6602	189.06	0.1848	-2E-04	7	0.377	0.8438	1.1769	250.2974
52	318.5	1.01	19.25	0.32	318.736	0.3169	7	1.22555	124.4034	3.12637	1.4352	1.6912	186.62	0.32	-2E-04	7	0.4264	0.8188	1.3027	244.22
53	337.4	2.03	18.23	0.6	337.623	0.6013	6	1.38977	129.6517	3.19119	1.4664	1.7248	193.9	0.607	-5E-04	6	0.4917	0.7864	1.4701	248.5627
54	58	1.53	20.72	2.62	58.2536	2.6265	5	2.38279	123.2971	3.25284	1.4976	1.7552	31.335	2.7818	-1E-04	4	0.9113	0.6305	2.5671	32.77318
55	29.4	0.8	99.62	2.6	30.6194	2.6127	4	2.59119	116.984	3.31133	1.5288	1.7825	15.32	2.9295	0.2067	4	1	0.5936	2.84	15.31976
56	36.1	1.01	76.97	2.73	37.0421	2.7266	4	2.53967	119.154	3.37091	1.56	1.8109	18.594	2.9996	0.1183	4	0.9944	0.5861	2.778	18.64983
57	40.5	0.95	104.88	2.26	41.7837	2.2736	5	2.4487	118.9996	3.43041	1.5912	1.8392	20.853	2.477	0.1554	4	0.9586	0.5886	2.6811	21.33586
58	37.4	0.95	80.98	2.45	38.3912	2.4745	4	2.50052	118.7931	3.48981	1.6224	1.8674	18.69	2.722	0.1206	4	0.9856	0.5713	2.7488	18.84308
59	36.6	0.93	87	2.47	37.6649	2.4691	4	2.50625	118.5908	3.5491	1.6536	1.8955	17.998	2.726	0.1351	4	0.9931	0.5605	2.7637	18.07095
60	36.5	0.93	111.64	2.43	37.8665	2.456	4	2.50299	118.6038	3.60841	1.6848	1.9236	17.809	2.7147	0.1855	4	0.9954	0.5516	2.7668	17.8583
61	38.3	1	104.29	2.52	39.5765	2.5268	4	2.49633	119.2426	3.66803	1.716	1.952	18.395	2.7849	0.1613	4	0.995	0.5437	2.7621	18.45198
62	40.8	1	132.02	2.34	42.4159	2.3576	5	2.45391	119.4116	3.72773	1.7472	1.9805	19.534	2.5848	0.2005	4	0.9794	0.5412	2.7183	19.78809
63	33.2	1	113.78	2.86	34.5927	2.8908	4	2.57875	118.9143	3.78719	1.7784	2.0088	15.335	3.2462	0.2082	3	1	0.5267	2.8663	15.33534
64	35.7	0.86	96.23	2.32	36.8779	2.332	4	2.49743	117.9667	3.84617	1.8096	2.0366	16.219	2.6036	0.155	4	1	0.5196	2.7897	16.21925
65	37.3	0.95	107.81	2.46	38.6196	2.4599	4	2.49689	118.8076	3.90558	1.8408	2.0648	16.812	2.7367	0.1706	4	1	0.5125	2.7899	16.81248
66	26.6	0.9	68.2	3.27	27.4348	3.2805	4	2.69102	117.5779	3.96437	1.872	2.0924	11.217	3.8346	0.1295	3	1	0.5057	3.0183	11.21716
67	35.5	0.91	92.79	2.46	36.6358	2.4839	4	2.51714	118.3642	4.02355	1.9032	2.1204	15.381	2.7904	0.1465	4	1	0.499	2.8261	15.38059
68	39.8	0.99	114.88	2.39	41.2061	2.4026	5	2.46879	119.2674	4.08318	1.9344	2.1488	17.276	2.6668	0.1707	4	1	0.4924	2.7737	17.27628
69	38.5	1.05	130.03	2.61	40.0916	2.619	4	2.50223	119.6311	4.143	1.9656	2.1774	16.51	2.9208	0.2058	4	1	0.486	2.8131	16.50988
70	38.8	0.95	138.34	2.34	40.4933	2.3461	5	2.4679	118.9231	4.20246	1.9968	2.2057	16.454	2.6177	0.2194	4	1	0.4797	2.7861	16.45351
71	45.5	1.07	147.21	2.24	47.3019	2.2621	5	2.40628	120.1725	4.26255	2.028	2.2346	19.261	2.4861	0.1992	4	0.991	0.4767	2.7153	19.39075
72	42.1	0.96	164.01	2.15	44.1075	2.1765	5	2.41851	119.2082	4.32215	2.0592	2.263	17.581	2.413	0.2451	4	1	0.4676	2.742	17.58119
73	64	1.19	84.12	1.82	65.0296	1.8299	5	2.2416	121.7266	4.38301	2.0904	2.2926	26.453	1.9622	0.0654	4	0.9209	0.4906	2.5244	28.12164
74	44.8	0.94	126.1	2.01	46.3435	2.0283	5	2.38238	119.1748	4.4426	2.1216	2.321	18.053	2.2434	0.1661	4	0.9938	0.4581	2.7125	18.14103
75	44.3	1.35	76.26	2.97	45.2334	2.9845	4	2.50096	121.7643	4.50348	2.1528	2.3507	17.327	3.3145	0.082	3	1	0.4501	2.8298	17.32686
76	48.4	1.5	79.5	3.04	49.3731	3.0381	4	2.47843	122.7488	4.56486	2.184	2.3809	18.82	3.3476	0.079	4	1	0.4444	2.8042	18.82021
77	47.3	1.27	112.87	2.6	48.6815	2.6088	5	2.43799	121.4965	4.6256	2.2152	2.4104	18.277	2.8827	0.1342	4	1	0.439	2.7744	18.2774
78	49	1.27	150.07	2.49	50.8369	2.4982	5	2.41141	121.6021	4.68641	2.2464	2.44	18.914	2.7519	0.1855	4	1	0.4337	2.7504	18.91407
79	40.5	1.25	129.37	2.97	42.0835	2.9703	4	2.5227	121.0251	4.74692	2.2776	2.4693	15.12	3.3479	0.1885	3	1	0.4285	2.8793	15.12019
80	44.1	1.05	143.63	2.29	45.858	2.2897	5	2.41992	119.9589	4.8069	2.3088	2.4981	16.433	2.5578	0.1957	4	1	0.4236	2.7806	16.43296
81	47.9	1.23	140.92	2.46	49.6249	2.4786	5	2.41691	121.3091	4.86755	2.34	2.5276	17.708	2.7482	0.1744	4	1	0.4186	2.7729	17.70777
82	51.1	1.26	193.75	2.35	53.4715	2.3564	5	2.37812	121.6675	4.92839	2.3712	2.5572	18.983	2.5956	0.2385	4	1	0.4138	2.7339	18.98302
83	55.2	1.2	210.14	2.06	57.7721	2.0771	5	2.31656	121.4992	4.98914	2.4024	2.5867	20.405	2.2735	0.2411	4	0.9912	0.4123	2.6717	20.56644
84	51.9	1.33	201.23	2.44	54.3631	2.4465	5	2.38376	122.1035	5.05019	2.4336	2.6166	18.846	2.6971	0.2445	4	1	0.4044	2.7464	18.84625
85	57.6	1.79	243.19	2.93	60.5767	2.9549	5	2.40617	124.5409	5.11246	2.4648	2.6477	20.948	3.2273	0.2713	4	1	0.3996	2.758	20.9484
86	62.1	2.1	235.9	3.22	64.9874	3.2314	5	2.41224	125.881	5.1754	2.496	2.6794	22.323	3.511	0.2422	4	1	0.3949	2.7598	22.32293

87	61.5	1.52	254.62	2.34	64.6166	2.3523	5	2.31719	123.502	5.23715	2.5272	2.71	21.912	2.5598	0.2662	4	0.9993	0.3907	2.6803	21.92549
88	89.6	2.34	203.77	2.53	92.0941	2.5409	5	2.23213	127.523	5.30091	2.5584	2.7425	31.647	2.6961	0.1396	4	0.9538	0.4032	2.5553	33.07225
89	47.9	1.26	120.1	2.53	49.37	2.5522	5	2.42707	121.4729	5.36165	2.5896	2.7721	15.876	2.8631	0.1377	4	1	0.3817	2.8216	15.87577
90	47.9	1.34	96.5	2.73	49.0812	2.7302	5	2.44867	121.909	5.4226	2.6208	2.8018	15.582	3.0693	0.0991	3	1	0.3777	2.8461	15.58232
91	45.9	1.17	132	2.44	47.5157	2.4624	5	2.42908	120.8373	5.48302	2.652	2.831	14.847	2.7836	0.163	4	1	0.3738	2.8378	14.84718
92	44.9	1.18	154.01	2.5	46.7851	2.5222	5	2.44104	120.8618	5.54345	2.6832	2.8603	14.419	2.8612	0.2038	3	1	0.3699	2.8551	14.41888
93	43.7	1.14	147.67	2.5	45.5075	2.5051	5	2.44809	120.5419	5.60372	2.7144	2.8893	13.811	2.8569	0.1984	3	1	0.3662	2.8699	13.81077
94	49.8	1.22	189.37	2.33	52.1179	2.3409	5	2.38448	121.3689	5.66441	2.7456	2.9188	15.915	2.6263	0.2344	4	1	0.3625	2.7986	15.91523
95	55.5	1.64	199.99	2.81	57.9479	2.8301	5	2.40687	123.7923	5.7263	2.7768	2.9495	17.705	3.1405	0.2226	4	1	0.3587	2.808	17.70521
96	53.1	1.05	278.06	1.84	56.5035	1.8583	5	2.29208	120.468	5.78654	2.808	2.9785	17.027	2.0703	0.3394	4	1	0.3552	2.7151	17.02746
97	47.2	1.51	183.12	3.03	49.4414	3.0541	4	2.47956	122.8008	5.84794	2.8392	3.0087	14.489	3.4638	0.2373	3	1	0.3517	2.903	14.48895
98	41.6	1.53	73.33	3.6	42.4976	3.6002	4	2.57642	122.5279	5.9092	2.8704	3.0388	12.04	4.1817	0.0659	3	1	0.3482	3.0166	12.04039
99	44.4	1.37	83.84	3.01	45.4262	3.0159	4	2.50268	121.8823	5.97014	2.9016	3.0685	12.858	3.4722	0.0795	3	1	0.3448	2.945	12.85824
100	44.1	0	107.17	0	45.4118	0	0	0	769.6	6.35494	2.9328	3.4221	11.413	0	0.1225	0	1	0.3092	0	0

	CPT-5	In situ data										Basic output data								
Depth (ft)	qc (tsf)	fs (tsf)	u (psi)	Other	qt (tsf)	Rf(%)	SBT	Ic SBT	ā (pcf)	ó,v (tsf)	u0 (tsf)	ó',vo (tsf)	Qt1	Fr (%)	Bq	SBTn	n	Cn	Ic	Qtn
1	323.8	2.48	1.64	0.77	323.82	0.7659	6	1.47914	131.0149	0.06551	0	0.0655	4942.3	0.766	0.0004	7	0.3478	2	1.2985	611.9499
2	279.4	0.94	0.34	0.34	279.404	0.3364	7	1.28716	123.5567	0.12729	0	0.1273	2194.1	0.3366	9E-05	7	0.2716	1.7773	1.0937	469.1114
3	139.6	0.51	-0.08	0.36	139.599	0.3653	6	1.56018	117.3902	0.18598	0	0.186	749.61	0.3658	-4E-05	6	0.3672	1.8933	1.3285	249.4562
4	91	0.19	-0.23	0.21	90.9972	0.2088	6	1.6276	109.1217	0.24054	0	0.2405	377.3	0.2094	-2E-04	6	0.3914	1.7858	1.394	153.1686
5	37.1	0.1	-0.34	0.26	37.0958	0.2696	6	2.03219	102.2367	0.29166	0	0.2917	126.19	0.2717	-7E-04	6	0.5333	1.9881	1.7565	69.15131
6	30.7	0.08	-0.45	0.25	30.6945	0.2606	5	2.10582	100.142	0.34173	0	0.3417	88.821	0.2636	-0.001	6	0.5713	1.9073	1.8467	54.71283
7	33	0.11	-0.34	0.34	32.9958	0.3334	5	2.11112	102.6484	0.39306	0.0312	0.3619	90.099	0.3374	-0.002	6	0.5785	1.8603	1.8681	57.31908
8	53.4	0.2	0.24	0.38	53.4029	0.3745	6	1.93694	108.1971	0.44715	0.0624	0.3848	137.64	0.3777	-9E-04	6	0.5278	1.7057	1.7329	85.36643
9	21	0.14	0.68	0.65	21.0083	0.6664	5	2.40989	103.3119	0.49881	0.0936	0.4052	50.615	0.6826	-0.002	5	0.6952	1.9489	2.1665	37.77637
10	22.2	0.19	1.91	0.84	22.2234	0.855	5	2.43714	105.6835	0.55165	0.1248	0.4269	50.771	0.8767	0.0006	5	0.7126	1.9096	2.2086	39.11195
11	82	0.35	1.75	0.43	82.0214	0.4267	6	1.79473	113.3384	0.60832	0.156	0.4523	179.99	0.4299	-4E-04	6	0.4957	1.5239	1.6403	117.2544
12	195.1	1.04	2.71	0.53	195.133	0.533	6	1.53178	123.4208	0.67003	0.1872	0.4828	402.76	0.5348	4E-05	6	0.4154	1.3853	1.4253	254.5952
13	185.7	1.72	2.83	0.93	185.735	0.9261	6	1.70596	126.9816	0.73352	0.2184	0.5151	359.14	0.9297	-8E-05	6	0.4848	1.4176	1.603	247.8613
14	126.8	1.33	2.22	1.05	126.827	1.0487	6	1.86412	124.1697	0.79561	0.2496	0.546	230.82	1.0553	-7E-04	6	0.544	1.4332	1.7544	170.7111
15	144.2	1.49	2.78	1.04	144.234	1.033	6	1.81838	125.3145	0.85826	0.2808	0.5775	248.29	1.0392	-6E-04	6	0.5331	1.381	1.7217	187.1339
16	163.4	1.74	3.03	1.06	163.437	1.0646	6	1.78799	126.7543	0.92164	0.312	0.6096	266.58	1.0707	-6E-04	6	0.5276	1.3377	1.7032	205.45
17	128	1.54	3.17	1.2	128.039	1.2028	6	1.90125	125.2655	0.98427	0.3432	0.6411	198.19	1.2121	-9E-04	6	0.5725	1.3323	1.8171	159.9753
18	180	1.05	4.05	0.58	180.05	0.5832	6	1.58343	123.2946	1.04592	0.3744	0.6715	266.56	0.5866	-5E-04	6	0.4596	1.2324	1.517	208.4935
19	165.2	1.24	4.16	0.75	165.251	0.7504	6	1.6819	124.3024	1.10807	0.4056	0.7025	233.66	0.7554	-7E-04	6	0.5002	1.2274	1.6195	190.403
20	170.4	0.65	4.73	0.38	170.458	0.3813	6	1.49567	119.6521	1.1679	0.4368	0.7311	231.56	0.384	-6E-04	6	0.4337	1.1739	1.4415	187.8153
21	171.4	0.67	5.61	0.39	171.469	0.3907	6	1.49921	119.8883	1.22784	0.468	0.7598	224.05	0.3936	-4E-04	6	0.4387	1.1563	1.4509	186.0436
22	196.2	1.33	7.43	0.68	196.291	0.6776	6	1.59637	125.2349	1.29046	0.4992	0.7913	246.44	0.6821	0.0002	6	0.48	1.1497	1.5553	211.8755
23	158.6	1.13	6.9	0.71	158.684	0.7121	6	1.68071	123.5238	1.35222	0.5304	0.8218	191.44	0.7182	-2E-04	6	0.5148	1.1389	1.6429	169.3488
24	165.7	1.02	7.36	0.61	165.79	0.6152	6	1.62595	122.8813	1.41366	0.5616	0.8521	192.92	0.6205	-2E-04	6	0.4979	1.1139	1.5947	173.0359
25	196.1	1.35	7.58	0.69	196.193	0.6881	6	1.60096	125.3429	1.47633	0.5928	0.8835	220.38	0.6933	-2E-04	6	0.4925	1.0929	1.5768	201.1131
26	174.6	1.09	7.92	0.63	174.697	0.6239	6	1.61203	123.4946	1.53808	0.624	0.9141	189.43	0.6295	-3E-04	6	0.5003	1.0759	1.5929	176.0773
27	207.9	1.15	8.41	0.56	208.003	0.5529	6	1.5201	124.3123	1.60024	0.6552	0.945	218.41	0.5572	-2E-04	6	0.469	1.0544	1.5071	205.685
28	242.8	1.54	9.12	0.63	242.912	0.634	6	1.50821	126.8274	1.66365	0.6864	0.9773	246.86	0.6384	-1E-04	6	0.468	1.0379	1.5006	236.6406
29	168.2	1.46	8.38	0.87	168.303	0.8675	6	1.7177	125.5421	1.72642	0.7176	1.0088	165.12	0.8765	-7E-04	6	0.5513	1.0267	1.7156	161.6233
30	150.3	0.89	9.35	0.59	150.414	0.5917	6	1.64906	121.6463	1.78725	0.7488	1.0385	143.12	0.5988	-5E-04	6	0.5288	1.01	1.6529	141.8653
31	156.2	0.97	10.45	0.62	156.328	0.6205	6	1.64831	122.3702	1.84843	0.78	1.0684	144.59	0.6279	-2E-04	6	0.5319	0.9949	1.6573	145.2439
32	192.6	1.22	10.75	0.63	192.732	0.633	6	1.58315	124.5586	1.91071	0.8112	1.0995	173.55	0.6393	-2E-04	6	0.51	0.9806	1.5958	176.8461
33	198.5	1.47	11.53	0.74	198.641	0.74	6	1.61802	125.9963	1.97371	0.8424	1.1313	173.84	0.7475	-6E-05	6	0.5266	0.9654	1.6355	179.4337
34	153.8	0.82	11.73	0.53	153.944	0.5327	6	1.61383	121.1035	2.03426	0.8736	1.1607	130.88	0.5398	-2E-04	6	0.5294	0.9522	1.6392	136.7049
35	157	0.8	12.18	0.51	157.149	0.5091	6	1.59508	120.9731	2.09475	0.9048	1.19	130.3	0.516	-2E-04	6	0.5255	0.9402	1.6251	137.7699
36	211.3	1.42	13.35	0.67	211.463	0.6715	6	1.56958	125.8956	2.15769	0.936	1.2217	171.32	0.6784	0.0001	6	0.5175	0.9283	1.6001	183.6291
37	198.7	1.18	13.36	0.59	198.864	0.5934	6	1.55469	124.3911	2.21989	0.9672	1.2527	156.98	0.6001	-3E-05	6	0.5153	0.9167	1.5908	170.3618
38	227.3	1.46	13.36	0.64	227.464	0.6419	6	1.53291	126.2768	2.28303	0.9984	1.2846	175.29	0.6484	-2E-04	6	0.5093	0.9059	1.5712	192.7926
39	279	1.82	14.77	0.65	279.181	0.6519	6	1.47282	128.3891	2.34722	1.0296	1.3176	210.1	0.6574	0.0001	6	0.4881	0.8985	1.5115	235.065
40	194.8	1.13	15.49	0.58	194.99	0.5795	6	1.55476	124.0263	2.40924	1.0608	1.3484	142.82	0.5868	0.0003	6	0.5255	0.8804	1.6056	160.2325
41	195.6	1.21	13.91	0.62	195.77	0.6181	6	1.57127	124.5366	2.4715	1.092	1.3795	140.12	0.626	-5E-04	6	0.535	0.8677	1.6267	158.5163
42	190.3	0.95	15.21	0.5	190.486	0.4987	6	1.52246	122.6998	2.53285	1.1232	1.4097	133.33	0.5054	-2E-04	6	0.5197	0.8615	1.5827	153.0315
43	255	1.13	17.28	0.44	255.212	0.4428	6	1.3904	124.6828	2.5952	1.1544	1.4408	175.33	0.4473	0.0004	6	0.4692	0.8652	1.4464	206.5511
44	346.5	2.38	19.47	0.69	346.738	0.6864	6	1.42389	130.8806	2.66064	1.1856	1.475	233.27	0.6917	0.0006	6	0.4822	0.852	1.4762	277.0549
45	392.2	2.89	19.21	0.74	392.435	0.7364	6	1.41182	132.6032	2.72694	1.2168	1.5101	258.06	0.7416	0.0004	6	0.4794	0.8432	1.4645	310.5681
46	419.9	3.48	22.36	0.83	420.174	0.8282	6	1.43325	134.1291	2.794	1.248	1.546	269.97	0.8338	0.0009	6	0.4899	0.8305	1.4878	327.5829
47	407.9	2.76	18.47	0.68	408.126	0.6763	6	1.37249	132.362	2.86018	1.2792	1.581	256.34	0.681	0.0001	6	0.47	0.828	1.431	317.1408
48	366.6	1.56	18.45	0.43	366.826	0.4253	7	1.25907	127.9271	2.92415	1.3104	1.6138	225.5	0.4287	5E-05	7	0.4305	0.8338	1.3233	286.7709
49	363.7	1.38	17.31	0.38	363.912	0.3792	7	1.2287	127.0106	2.98765	1.3416	1.6461	219.27	0.3824	-3E-04	7	0.4218	0.83	1.2963	283.1008
50	410.8	1.78	20.5	0.43	411.051	0.433	7	1.22848	129.1701	3.05224	1.3728	1.6794	242.94	0.4363	0.0003	7	0.423	0.8225	1.2952	317.1547
51	286.9	2.97	28.21	1.03	287.245	1.034	6	1.61179	132.0419	3.11826	1.404	1.7143	165.74	1.0453	0.0022	6	0.5784	0.7565	1.699	203.1356
52	285.6	4.18	25.39	1.46	285.911	1.462	6	1.73094	134.5311	3.18552	1.4352	1.7503	161.53	1.4785	0.0014	6	0.6275	0.7292	1.8234	194.8388
53	208.1	5.01	18.11	2.41	208.322	2.4049	5	1.98646	135.0842	3.25307	1.4664	1.7867	114.78	2.4431	-8E-04	5	0.7343	0.6807	2.0993	131.9178
54	147.8	1.72	78.34	1.16	148.759	1.1562	6	1.84229	126.4402	3.31629	1.4976	1.8187	79.971	1.1826	0.0285	6	0.6887	0.6886	1.9756	94.65678

3300 Newport Blvd
Newport Beach, CA

CPT Shear Wave Measurements

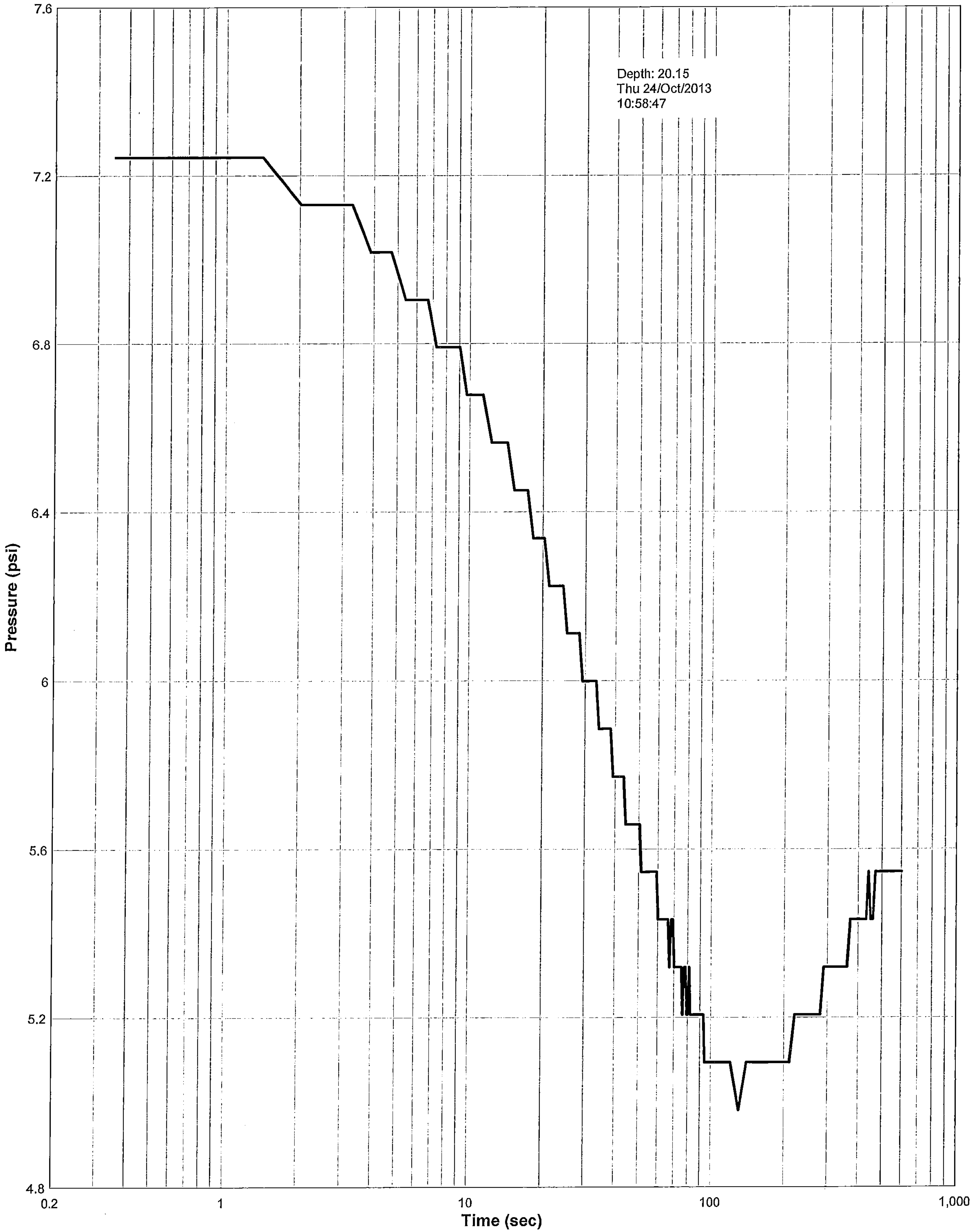
CPT-3	Tip Depth (ft)	Geophone Depth (ft)	Travel Distance (ft)	S-Wave Arrival (msec)	S-Wave Velocity from Surface (ft/sec)	Interval S-Wave Velocity (ft/sec)
	5.22	4.22	6.54	18.22	359.10	
	10.25	9.25	10.51	30.58	343.85	321.36
	15.16	14.16	15.02	38.11	394.04	597.87
	20.16	19.16	19.80	45.32	436.93	663.64
	25.12	24.12	24.63	53.19	463.11	613.87
	30.22	29.22	29.64	60.95	486.38	645.86
	36.46	35.46	35.81	70.81	505.73	625.36
	40.28	39.28	39.60	76.23	519.44	698.56
	45.17	44.17	44.45	83.24	534.02	692.60
	50.19	49.19	49.44	88.51	558.62	947.13
	55.00	54.00	54.23	95.17	569.83	718.85
	60.08	59.08	59.29	102.92	576.09	652.93
	65.42	64.42	64.61	110.01	587.34	750.71
	70.00	69.00	69.18	116.12	595.77	747.49
	75.13	74.13	74.30	122.86	604.74	759.27
	80.13	79.13	79.29	128.34	617.80	910.47
	85.04	84.04	84.19	134.03	628.13	861.30
	90.12	89.12	89.26	138.91	642.58	1039.25
	95.11	94.11	94.24	144.00	654.46	978.90
	100.07	99.07	99.20	149.85	661.97	846.73

Shear Wave Source Offset = 5 ft

S-Wave Velocity from Surface = Travel Distance/S-Wave Arrival
Interval S-Wave Velocity = (Travel Dist2-Travel Dist1)/(Time2-Time1)

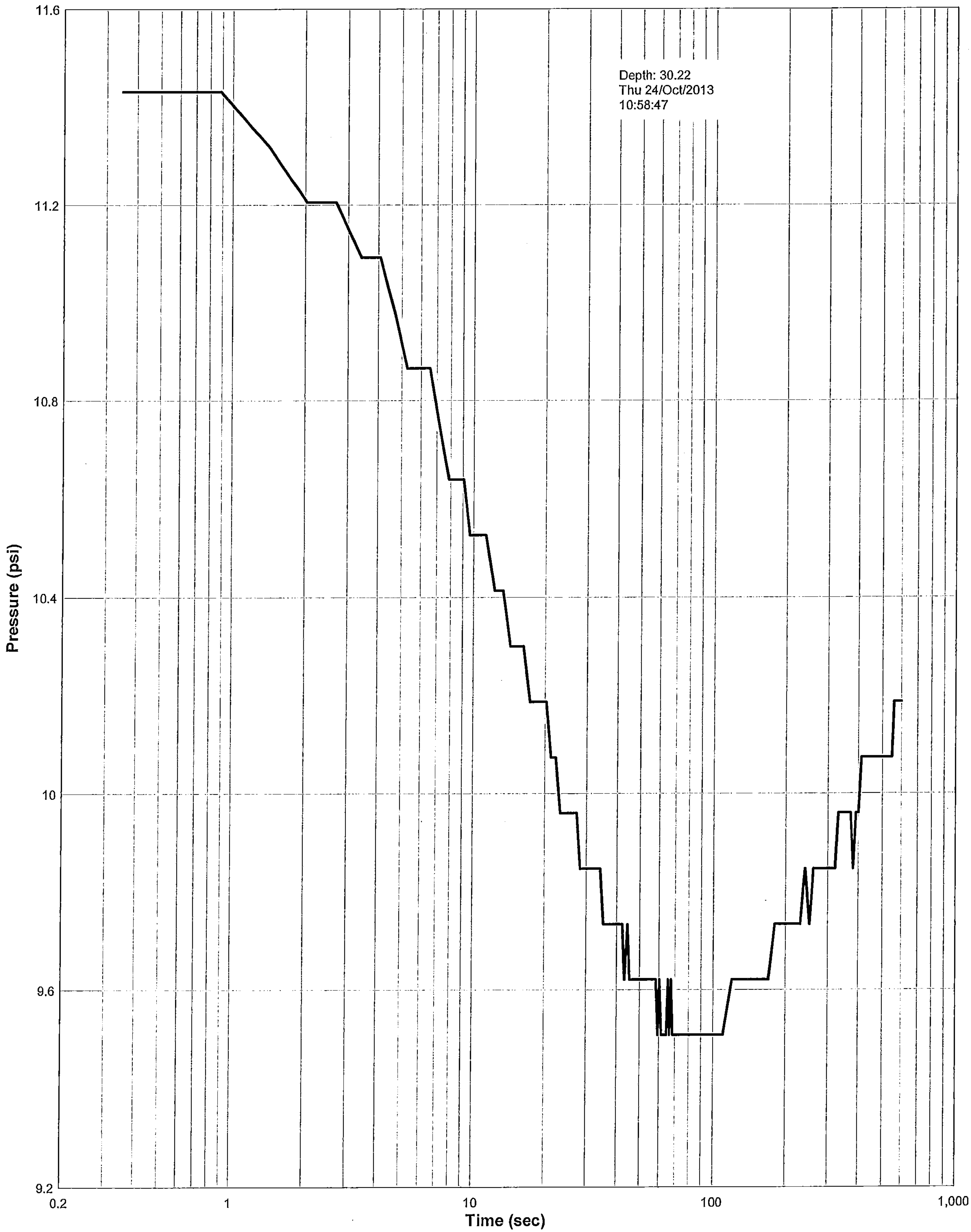
GMU Geotechnical, Inc. CPT-5

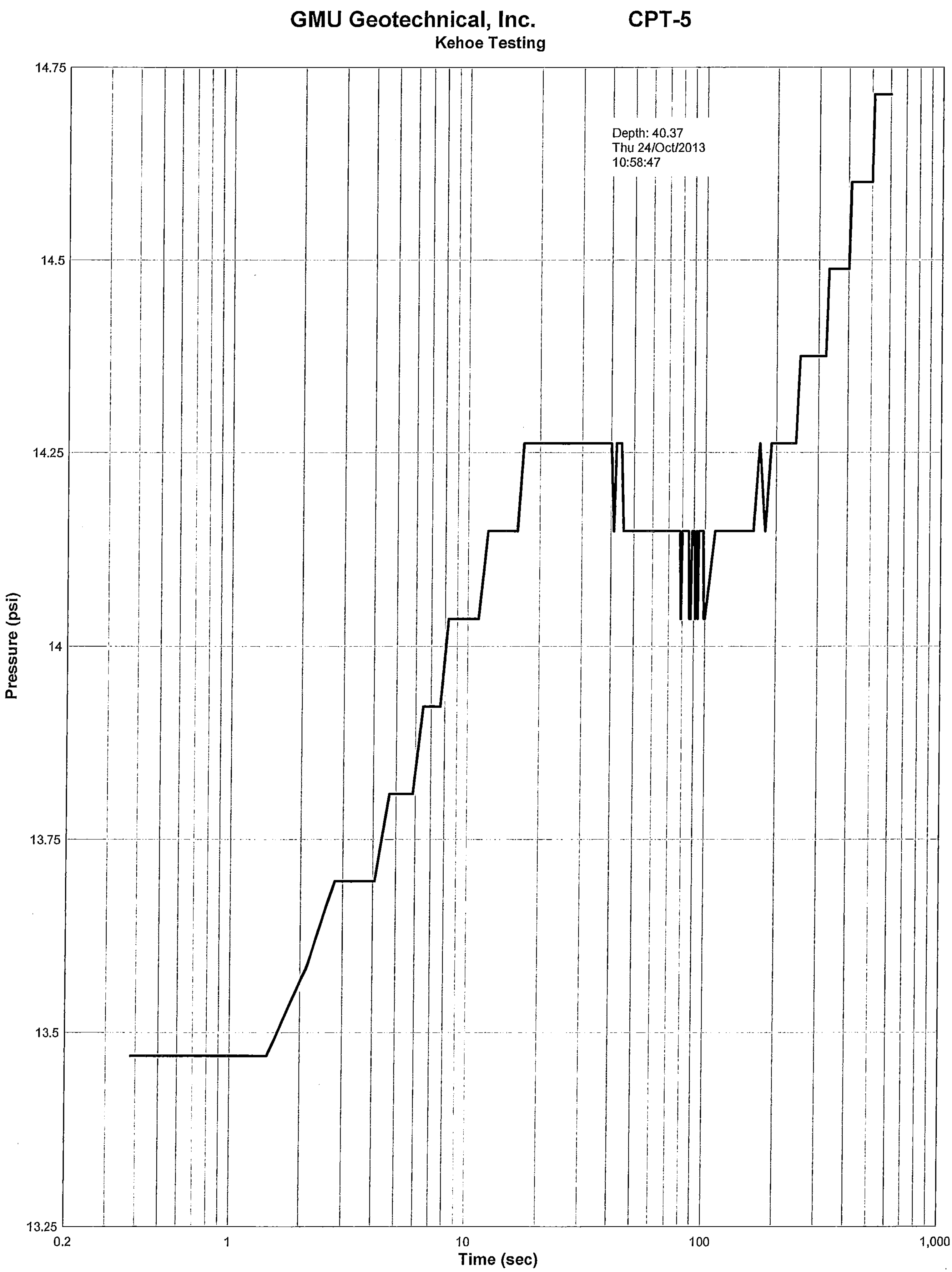
Kehoe Testing



GMU Geotechnical, Inc. CPT-5

Kehoe Testing

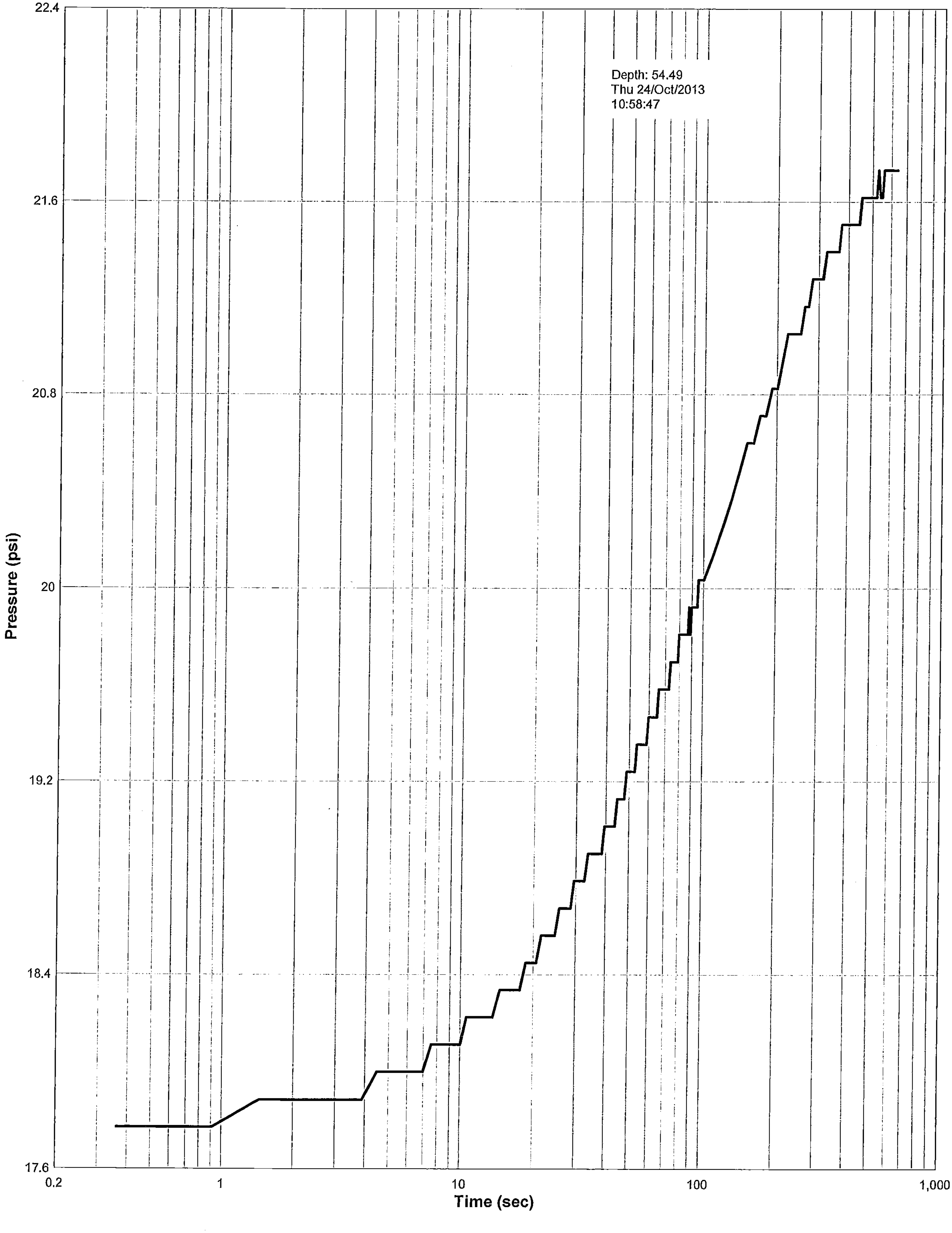




GMU Geotechnical, Inc.
CPT-5
Kehoe Testing
Depth: 40.37
Thu 24/Oct/2013
10:58:47
Pressure (psi)
14.75
14.5
14.25
14
13.75
13.5
13.25
Time (sec)
0.2
1
10
100
1,000

GMU Geotechnical, Inc. CPT-5

Kehoe Testing



Presented below is a list of formulas used for the estimation of various soil properties. The formulas are presented in SI unit system and assume that all components are expressed in the same units.

:: Unit Weight, g (kN/m³) ::

$$g = g_w \cdot \left(0.27 \cdot \log(R_f) + 0.36 \cdot \log(\frac{q_t}{p_a}) + 1.236\right)$$

where g_w = water unit weight

:: Permeability, k (m/s) ::

$I_c < 3.27$ and $I_c > 1.00$ then $k = 10^{0.952-3.04 \cdot I_c}$

$I_c \leq 4.00$ and $I_c > 3.27$ then $k = 10^{-4.52-1.37 \cdot I_c}$

:: N_{SPT} (blows per 30 cm) ::

$$N_{60} = \left(\frac{q_c}{P_a}\right) \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

$$N_{1(60)} = Q_{tn} \cdot \frac{1}{10^{1.1268-0.2817 \cdot I_c}}$$

:: Young's Modulus, Es (MPa) ::

$$(q_t - \sigma_v) \cdot 0.015 \cdot 10^{0.55 \cdot I_c + 1.68}$$

(applicable only to $I_c < I_{c\_cutoff}$)

:: Relative Density, Dr (%) ::

$$100 \cdot \sqrt{\frac{Q_{tn}}{k_{DR}}}$$

(applicable only to SBT_n: 5, 6, 7 and 8 or $I_c < I_{c\_cutoff}$)

:: State Parameter, ψ ::

$$\psi = 0.56 - 0.33 \cdot \log(Q_{tn,cs})$$

:: Peak drained friction angle, φ (°) ::

$$\varphi = 17.60 + 11 \cdot \log(Q_{tn})$$

(applicable only to SBT_n: 5, 6, 7 and 8)

:: 1-D constrained modulus, M (MPa) ::

If $I_c > 2.20$

$a = 14$ for $Q_{tn} > 14$

$a = Q_{tn}$ for $Q_{tn} \leq 14$

$M_{CPT} = a \cdot (q_t - \sigma_v)$

If $I_c \leq 2.20$

$M_{CPT} = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$

:: Small strain shear Modulus, Go (MPa) ::

$$G_0 = (q_t - \sigma_v) \cdot 0.0188 \cdot 10^{0.55 \cdot I_c + 1.68}$$

:: Shear Wave Velocity, Vs (m/s) ::

$$V_s = \left(\frac{G_0}{\rho}\right)^{0.50}$$

:: Undrained peak shear strength, Su (kPa) ::

$N_{kt} = 10.50 + 7 \cdot \log(F_r)$ or user defined

$$S_u = \frac{(q_t - \sigma_v)}{N_{kt}}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Remolded undrained shear strength, Su(rem) (kPa) ::

$S_{u(rem)} = f_s$ (applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Overconsolidation Ratio, OCR ::

$$k_{OCR} = \left[\frac{Q_{tn}^{0.20}}{0.25 \cdot (10.50 + 7 \cdot \log(F_r))}\right]^{1.25}$$ or user defined

$OCR = k_{OCR} \cdot Q_{tn}$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: In situ Stress Ratio, Ko ::

$$K_0 = 0.1 \cdot \left(\frac{q_t - \sigma_v}{\sigma'_{vo}}\right)$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Soil Sensitivity, S_t ::

$$S_t = \frac{N_S}{F_r}$$

(applicable only to SBT_n: 1, 2, 3, 4 and 9 or $I_c > I_{c\_cutoff}$)

:: Effective Stress Friction Angle, φ' (°) ::

$$\varphi' = 29.5° \cdot B_q^{0.121} \cdot (0.256 + 0.336 \cdot B_q + \log Q_t)$$

(applicable for $0.10 < B_q < 1.00$)

References

- Robertson, P.K., Cabal K.L., Guide to Cone Penetration Testing for Geotechnical Engineering, Gregg Drilling & Testing, Inc., 4th Edition, July 2010
- Robertson, P.K., Interpretation of Cone Penetration Tests - a unified approach., Can. Geotech. J. 46(11): 1337–1355 (2009)

APPENDIX B

GMU

GEOTECHNICAL, INC.

APPENDIX B-1

GMU Geotechnical Laboratory Procedures
and Test Results

GMU
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APPENDIX B

GMU GEOTECHNICAL LABORATORY PROCEDURES AND TEST RESULTS

GENERAL

The following are laboratory test procedures and laboratory test results performed by GMU.

MOISTURE AND DENSITY

Field moisture content and in-place density were determined for each 6-inch sample sleeve of undisturbed soil material obtained from the borings. The field moisture content was determined in general accordance with ASTM Test Method D 2216 by obtaining one-half the moisture sample from each end of the 6-inch sleeve. The in-place dry density of the sample was determined by using the wet weight of the entire sample.

At the same time the field moisture content and in-place density were determined, the soil material at each end of the sleeve was classified according to the Unified Soil Classification System. The results of the field moisture content and in-place density determinations are contained in a following section of this Appendix B. The results of the visual classifications were used for general reference.

SUMMARY OF MATERIAL PROPERTIES

Material properties of the representative soils at the site were determined by performing particle size distribution and Atterberg limit tests. Detailed test results are described in a following section of this Appendix B.

PARTICLE SIZE DISTRIBUTION

As part of the engineering classification of the materials underlying the site, representative samples were tested to determine the distribution of particle sizes. The distribution was determined in general accordance with ASTM Test Method D 422 using U.S. Standard Sieve Openings 3", 1.5", ¾, ⅜, and U.S. Standard Sieve Nos. 4, 10, 20, 40, 60, 100, and 200. In addition, standard hydrometer tests were performed to determine the distribution of particle sizes passing the No. 200 sieve (i.e., silt and clay-size particles). The results of the tests are contained in this Appendix B-1.

ATTERBERG LIMITS

As part of the engineering classification of the soil material, representative samples of the on-site soil materials were tested to determine relative plasticity. This relative plasticity is based on the Atterberg limits determined in general accordance with ASTM Test Method D 4318. The results of these tests are contained in this Appendix B.

CONSOLIDATION TESTS

The one-dimensional consolidation properties of "undisturbed" native soil and bedrock samples were evaluated according to the provisions of ASTM Test Method D 2435. Sample diameter was 2.416 inches and sample height was 1.00 inch. Water was added during the test at approximate insitu normal loads to evaluate the potential for hydro-collapse and to produce saturation during the remainder of the testing. Consolidation readings were taken regularly during each load increment until the change in sample height was less than approximately 0.0001 inch over a two-hour period. The graphic presentation of consolidation data is a representation of volume change in axial load. As a result, both expansion and consolidation are illustrated. The results of the consolidation load tests are summarized in this Appendix B.

COMPACTION TESTS

Selected bulk samples of representative soil materials were tested to determine the maximum dry density and optimum moisture content of the soil. These compactive characteristics were determined in general accordance with ASTM Test Method D 1557. The results of these tests are contained in this Appendix B.

DIRECT SHEAR STRENGTH TESTS

Direct shear tests were performed on "undisturbed" and remolded specimens of samples of the typical on-site soil materials obtained from our drill holes. The general philosophy and procedure of the tests were in accordance with ASTM Test Method D 3080 - "Direct Shear Tests for Soils Under Consolidated Drained Conditions".

The tests are single shear tests and are performed using a sample diameter of 2.416 inches and a height of 1.00 inch. The normal load is applied by a vertical dead load system. A constant rate of strain is applied to the upper one-half of the sample until failure occurs. Shear stress is monitored by a strain gauge-type precision load cell and deflection is measured with a digital dial indicator. This data is transferred electronically to data acquisition software which plots shear strength vs. deflection. The shear strength plots are then interpreted to determine either peak or ultimate shear strengths. Residual strengths were obtained through multiple shear box reversals. A strain rate compatible with the grain size distribution of the soils was utilized. The interpreted results of these tests are presented in this Appendix B.

EXPANSION TESTS

To provide a standard definition of one-dimensional expansion, expansion index tests were performed on representative samples in general accordance with ASTM Test Method D 4829. The results from this test procedure are reported as an "expansion index." The results of these tests are contained in this Appendix B.

R-VALUE TESTS

Bulk samples representative of the underlying on-site materials were tested to measure the response of a compacted sample to a vertically applied pressure under specific conditions. The R-value of a material is determined when the material is in a state of saturation such that water will be exuded from the compacted test specimen when a 16.8 kN load (2.07 MPa) is applied. The results from these test procedures are reported in this Appendix B.

CHEMICAL TESTS

The corrosion potential of typical on-site soil materials under long-term contact with both metal and concrete was determined by chemical and electrical resistance tests. The soluble sulfate testing for potential concrete corrosion was performed in general accordance with California Test Method 417. The minimum resistivity testing for potential metal corrosion was performed in general accordance with California Test Method 643 and the concentration of soluble chlorides was performed in general accordance with California Test Method 422. The results are presented on Table B-1 in this Appendix B.

SAND EQUIVALENT

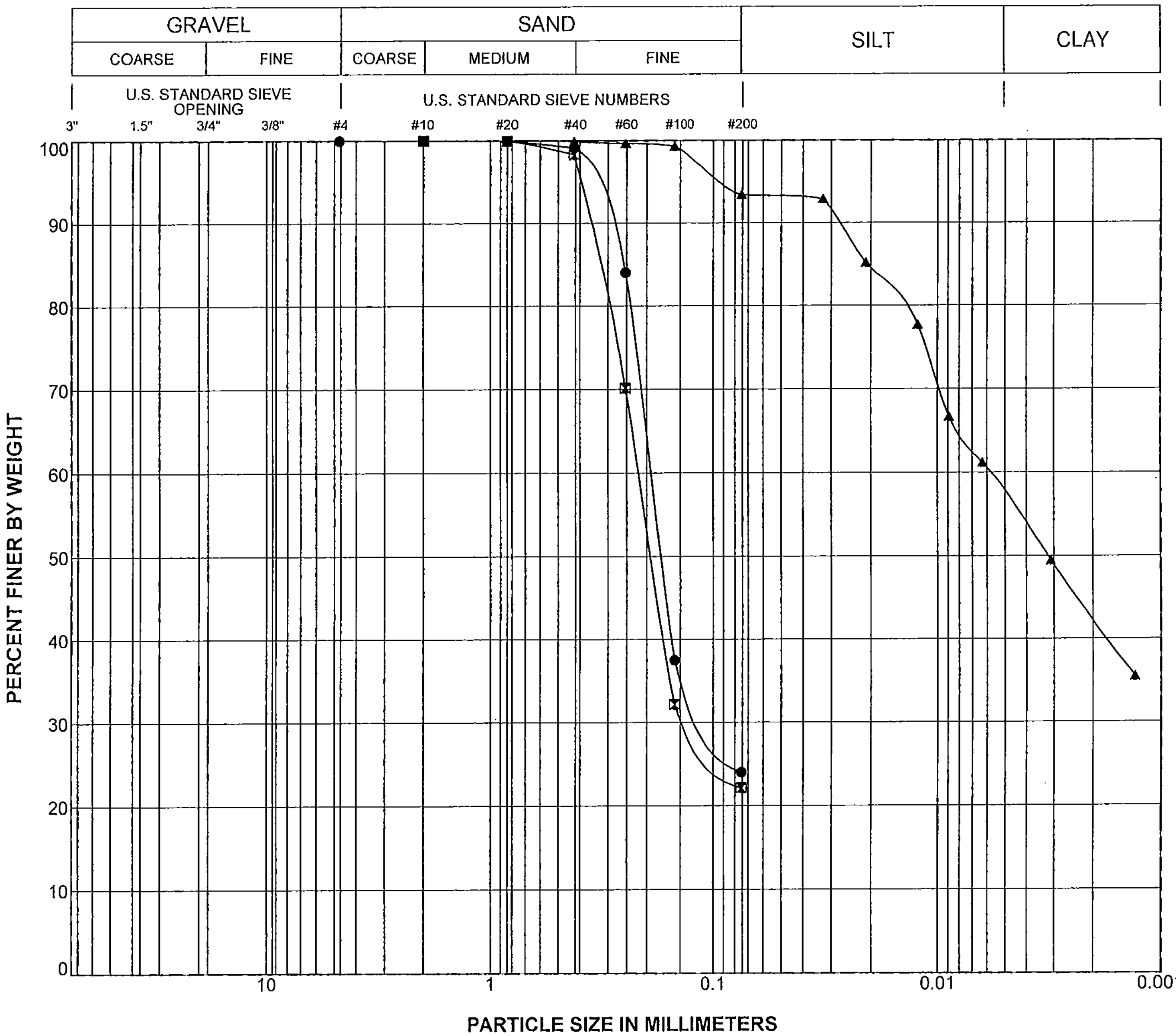
To determine the suitability of select onsite soils for use as pipe bedding, samples were tested to determine, under saturated conditions, the relative proportions of clay-like or plastic fines and dust in granular soils and fine aggregates that pass the 4.75-mm (No. 4) sieve. These tests were determined in accordance with ASTM Test Method D 2419. The results of the tests are contained in this Appendix B.

TABLE B-1
SUMMARY OF SOIL LABORATORY DATA

Sample Information			Geologic Unit	USCS Group Symbol	In Situ Water Content, %	In Situ Dry Unit Weight, pcf	In Situ Satur-ation, %	Sieve/Hydrometer				Atterberg Limits			Compaction		Expansion Index	R-Value	Chemical Test Results			
Boring Number	Depth, feet	Elevation, feet						Gravel, %	Sand, %	<#200, %	<2µ, %	LL	PL	PI	Maximum Dry Unit Weight, pcf	Optimum Water Content, %			pH	Sulfate (ppm)	Chloride (ppm)	Min. Resistivity (ohm/cm)
DH-1	1	7.0		SP														69				
DH-1	2	6.0		SP	20.1	95	71															
DH-1	4	4.0	Qal	SM	51.1	69	96															
DH-1	8	0.0	Qal	SM	26.0	104	116															
DH-2	2	6.0		SM	6.7	108	34															
DH-2	4	4.0	Qal	SM-ML	57.3	71	113															
DH-2	10	-2.0	Qal	SM	24.3	104	109															
DH-3	1	7.5		SM													0		7.3	0	90	13500
DH-3	5	3.5	Qal	CL	50.6	64	85															
DH-3	10	-1.5	Qal	SM	28.1	98	109															
DH-3	15	-6.5	Qal	SM	28.9			0	76	24												
DH-3	20	-11.5	Qal	SP	23.5	101	98															
DH-3	25	-16.5	Qal	SM	26.4			0	78	22												
DH-3	40	-31.5	Qal	SP	23.9																	
DH-3	60	-51.5	Qal	MH	45.3	74	98															
DH-3	65	-56.5	Qal	MH	58.1			0	7	93	42	83	38	45								
DH-3	70	-61.5	Qal	MH	53.6	68	98															
DH-4	1	8.5		SP											112.5	11.5			7.3	65	186	12200
DH-4	2	7.5		SP	3.0	105	14															
DH-5	2	6.5		SP	3.3	104	15															
DH-5	4	4.5	Qal	CL-ML	34.6	83	92															
DH-5	10	-1.5	Qal	SM	28.1	96	103															

Project: Lido House Hotel
Project No. 13-160-00

GMU GEOTECHNICAL, INC.



Boring Number	Depth (feet)	Geologic Unit	Symbol	LL	PI	Classification
DH-3	15.0		●			Silty Sand (SM)
DH-3	25.0		⊠			Silty Sand (SM)
DH-3	65.0		▲	83	45	ELASTIC SILT(MH)

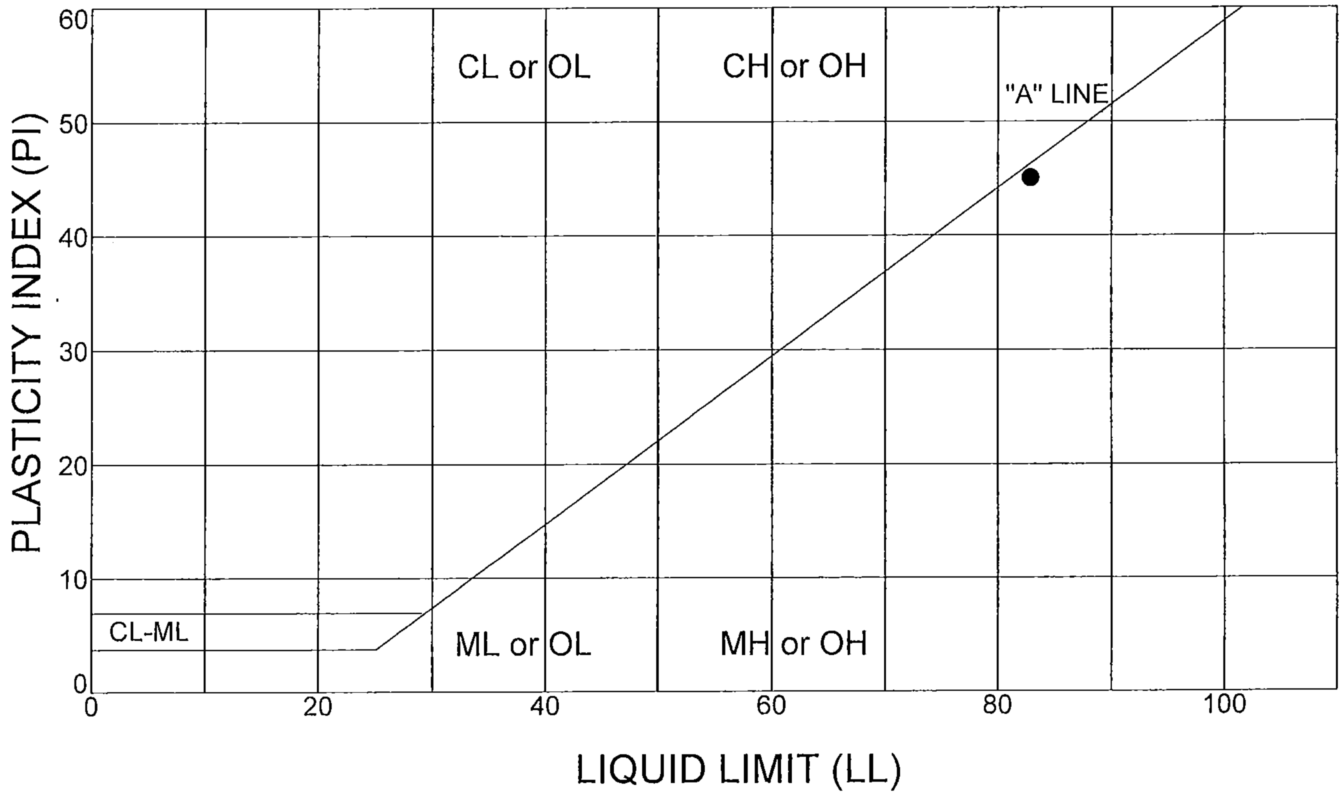
GMU_GRAIN_SIZE 13-160-00.GPJ 11/13/13

PARTICLE SIZE DISTRIBUTION

Project: Lido House Hotel

Project No. 13-160-00

GMU GEOTECHNICAL, INC.



Boring Number	Depth (feet)	Geologic Unit	Test Symbol	Insitu Water Content (%)	LL	PL	PI	Classification
DH-3	65.0		●	58	83	38	45	Elastic Silt (MH)

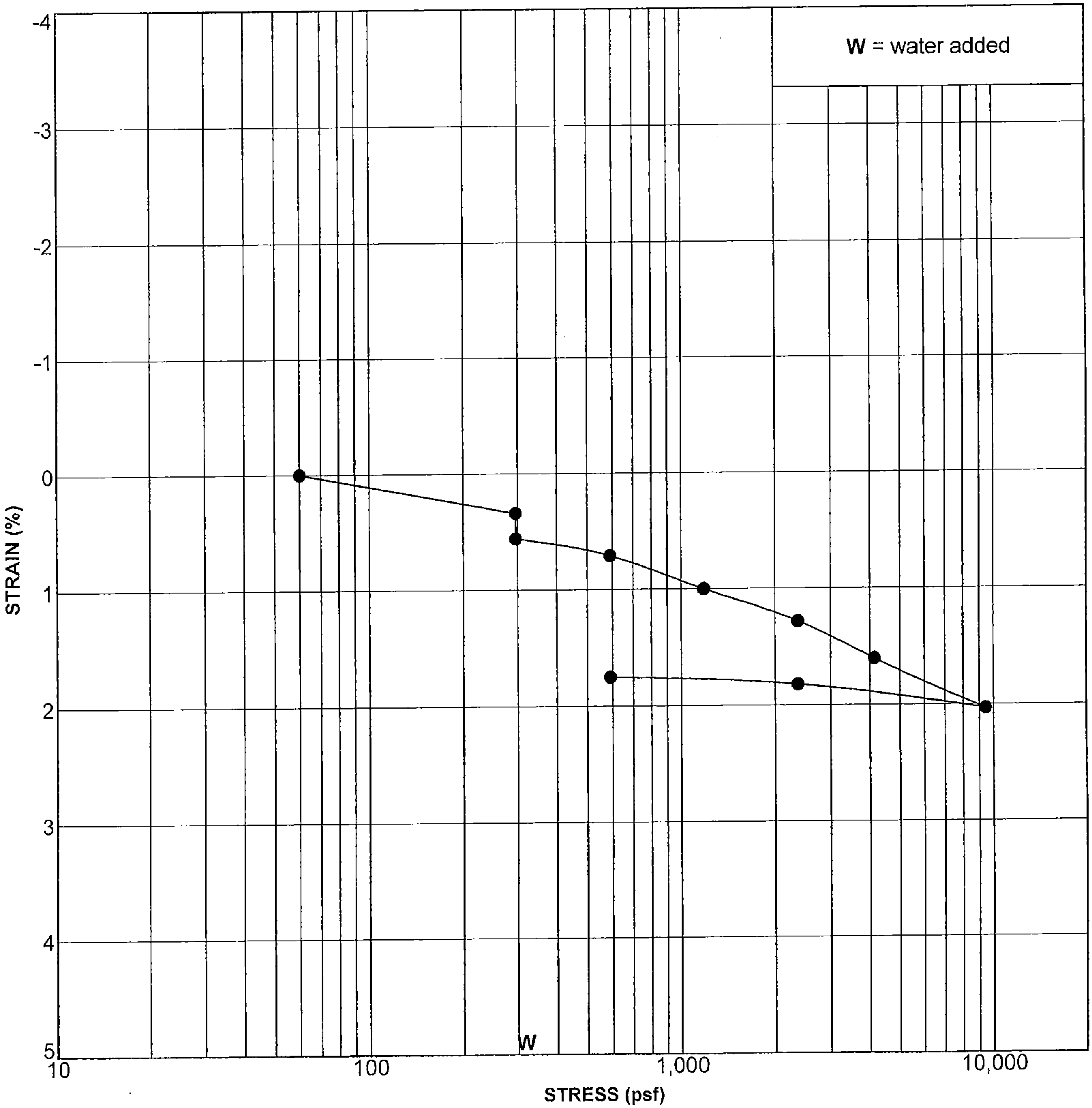
LIMITS 13-160-00.GPJ 11/13/13

ATTERBERG LIMITS

Project: Lido House Hotel

Project No. 13-160-00

GMU GEOTECHNICAL, INC.



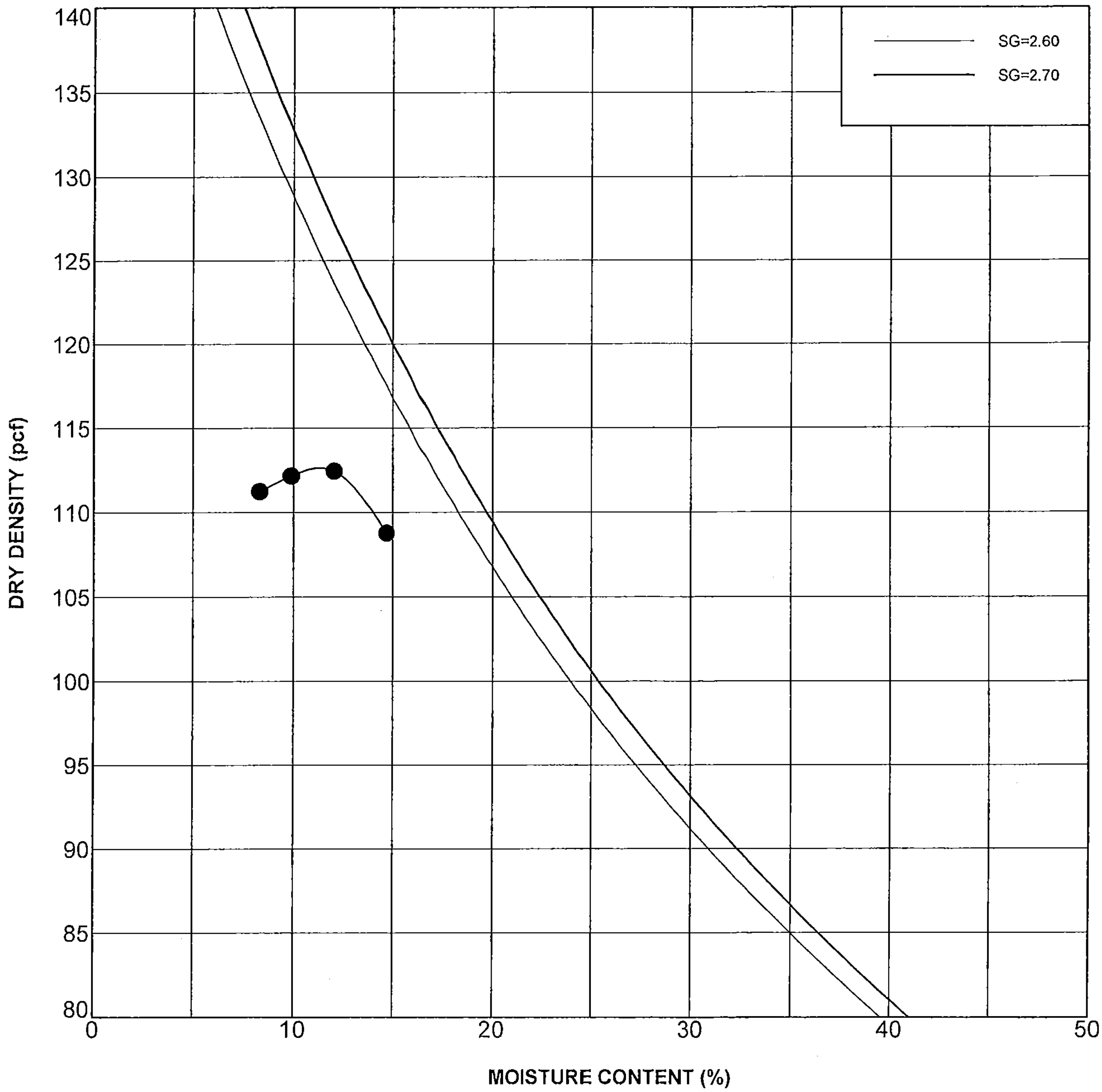
Boring Number	Depth (feet)	Geologic Unit	Symbol	In Situ or Remolded Sample	% Hydro-Collapse	Classification
DH-3	10.0		●	In Situ	0.22	Silty Sand (SM)
			⊠	In Situ		
			▲	In Situ		
			★	In Situ		

GMU_CONSOL 13-160-00.GPJ GM&U.GDT 11/13/13

CONSOLIDATION TEST DATA

Project: Lido House Hotel
Project No. 13-160-00

GMU GEOTECHNICAL, INC.



Boring Number	Depth (feet)	Geologic Unit	Symbol	Maximum Dry Density, pcf	Optimum Moisture Content, %	Classification
DH-4	1.0		●	112.5	11.5	Poorly Graded Sand (SP)

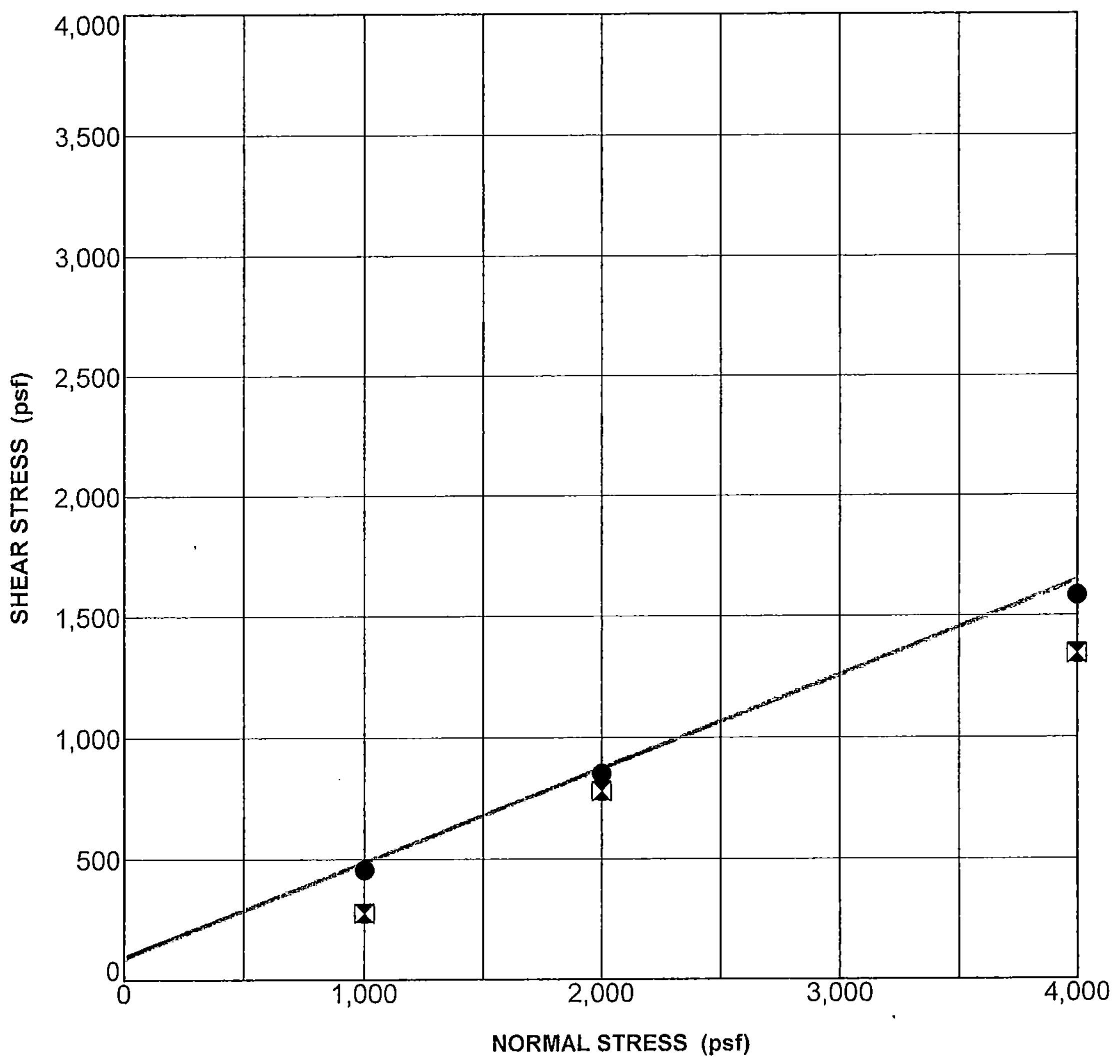
DVTCOMP 13-160-00.GPJ 11/13/13

COMPACTION TEST DATA

Project: Lido House Hotel

Project No. 13-160-00

GMU GEOTECHNICAL, INC.



SAMPLE AND TEST DESCRIPTION
Sample Location: DH-3 @ 5.0 ft **Geologic Unit:** **Classification:** Silty Clay (CL)
Strain Rate (in/min): 0.005 **Sample Preparation:** Undisturbed
Notes: Sample saturated prior and during shearing

STRENGTH PARAMETERS		
STRENGTH TYPE	**COHESION (psf)**	**FRICTION ANGLE (degrees)**
● Peak Strength	90	21.0
⊠ Ultimate Strength	0	19.0

SHEAR TEST DATA

Project: Lido House Hotel
Project No. 13-160-00

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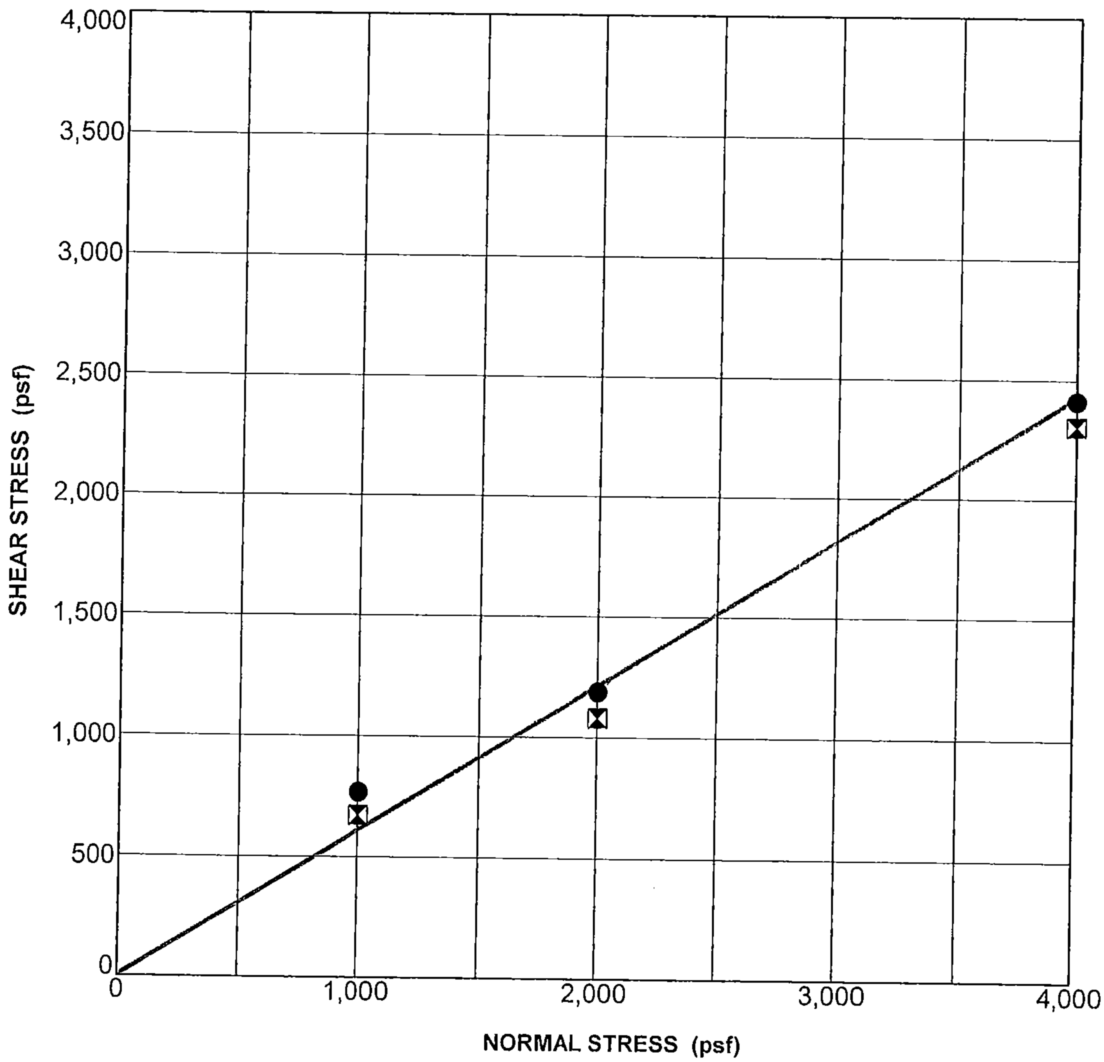
GMU_DIRECT_SHEAR 13-160-00.GPJ GM&U.GDT 11/13/13



SAMPLE AND TEST DESCRIPTION		
Sample Location: DH-4 @ 1.0 ft	**Geologic Unit:**	**Classification:** Poorly Graded Sand (SP)
Strain Rate (in/min): 0.01	**Sample Preparation:** Remolded	
Notes: 90% compaction at optimum		

STRENGTH PARAMETERS		
STRENGTH TYPE	**COHESION (psf)**	**FRICTION ANGLE (degrees)**
● Peak Strength	0	31.0
⊠ Ultimate Strength	0	29.0

SHEAR TEST DATA

Project: Lido House Hotel
Project No. 13-160-00

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EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	Lido House Newport Beach	Tested By:	JV	Date:	11/12/2013
Project No. :	13-160-00	Checked By:	JV	Date:	11/13/2013
Drill Hole No.:	DH-3	TRACT #			
Depth, ft.:	1-5				
Visual Sample Description:	SM				

Dry Wt. of Soil + Cont. (gm.)	1000.00
Wt. of Container No. (gm.)	0.00
Dry Wt. of Soil (gm.)	1000.00
Weight Soil Retained on #4 Sieve	0.00
Percent Passing # 4	100.00

	MOLDED SPECIMEN	Before Test	After Test
	Specimen Diameter (in.)	4.00	
	Specimen Height (in.)	1.0000	
G	Wt. Comp. Soil + Mold (gm.)	575.10	
H	Wt. of Mold (gm.)	192.10	
	Specific Gravity (Assumed)	2.70	
	Container No.	C	
A	Wet Wt. of Soil + Cont. (gm.)	146.50	0.00
B	Dry Wt. of Soil + Cont. (gm.)	138.80	0.00
D	Wt. of Container (gm.)	70.10	0.00
F	Moisture Content (%)	11.21	#DIV/0!
J	Wet Density (pcf)	116.1	
K	Dry Density (pcf)	104.4	
	Void Ratio	0.615	
	Total Porosity	0.381	
	Pore Volume (cc)	78.4	
L	Degree of Saturation (%) [S meas]	**49.2**	

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h.

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
11/12/13	10:45	1.0	0	0.0979
11/12/13	10:55	1.0	10	0.0969
Add Distilled Water to the Specimen				
11/12/13	11:19	1.0	24	0.0964
11/12/13	16:50	1.0	355	0.0959
11/13/13	6:45	1.0	1190	0.0968
11/13/13	6:45	1.0	1190	0.0968

Expansion Index (EI_{meas})	= ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	-0.1
Expansion Index (EI) $_{50}$	= EI_{meas} - (50 -S_{meas})x((65+EI_{meas}) / (220-S_{meas}))	**0**
		VERY LOW

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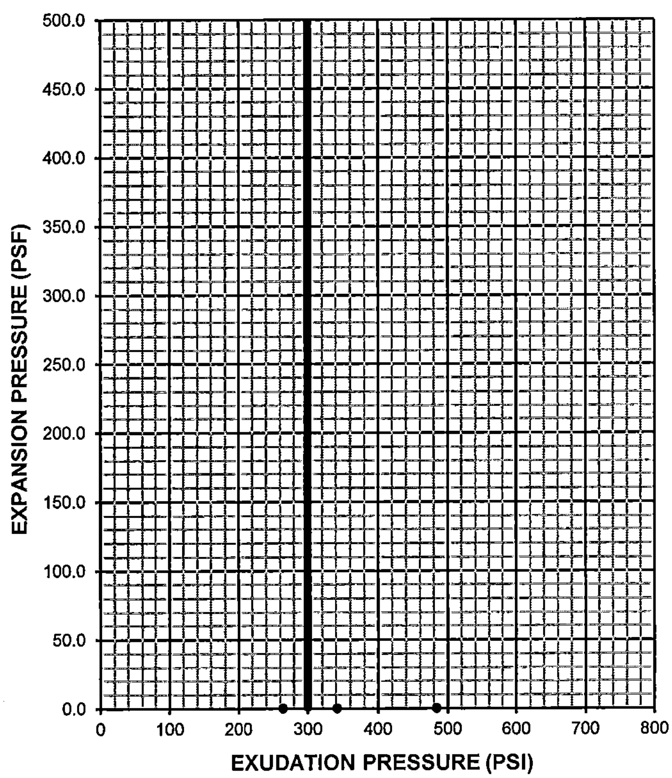
R-VALUE TEST RESULTS

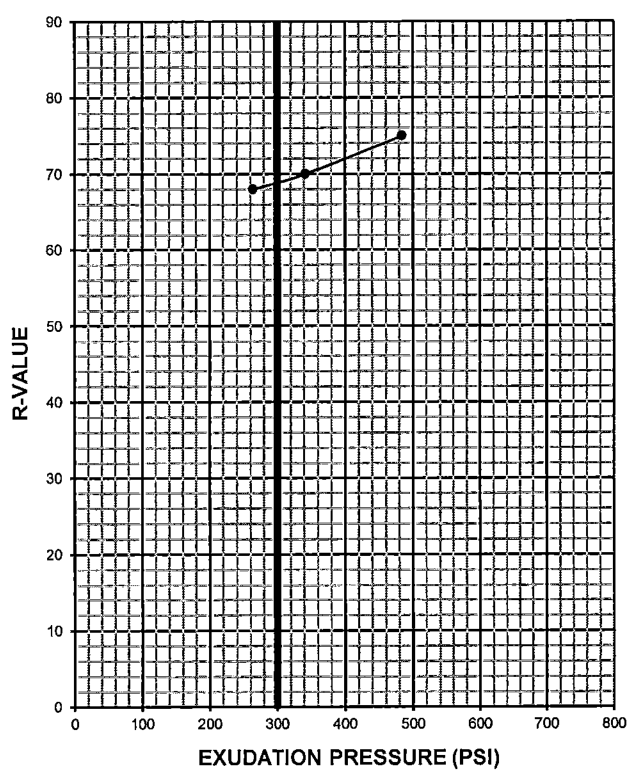
PROJECT NAME:	Lido House Nweport Beach	PROJECT NUMBER:	13-160-00
SAMPLE LOCATION:	Newport Beach	SAMPLE NUMBER:	DH-1 @ 1'-3'
SAMPLE DESCRIPTION:	Poorly Graded Sand (SP)	TECHNICIAN:	JV
		DATE TESTED	11/12/2013

TEST SPECIMEN	a	b	c
MOISTURE AT COMPACTION %	11.5	10.7	10.2
WEIGHT OF SAMPLE, grams	1025	994	1013
HEIGHT OF SAMPLE, Inches	2.62	2.51	2.56
DRY DENSITY, pcf	106.3	108.4	108.8
COMPACTOR AIR PRESSURE, psi	250	250	250
EXUDATION PRESSURE, psi	264	342	484
EXPANSION, Inches x 10exp-4	0	0	0
STABILITY Ph 2,000 lbs (160 psi)	30	28	24
TURNS DISPLACEMENT	5.10	5.00	4.66
R-VALUE UNCORRECTED	68	70	75
R-VALUE CORRECTED	68	70	75
EXPANSION PRESSURE (psf)	0.0	0.0	0.0

EXPANSION PRESSURE VS. EXUDATION PRESSURE



R-VALUE VS. EXUDATION PRESSURE



R-VALUE AT 300 PSI EXUDATION PRESSURE :	69
EXP. PRESSURE AT 300 PSI EXUDATION PRESSURE (PSF) :	0

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Geotechnical Consultants

SOIL CORROSIVITY TESTS
DOT CA TEST 417/422/ 643

Project Name:	Lido House Hotel	Tested By :	EE/MF Date 11/07/13
Project No. :	13-160-00	Data Input By:	MF Date 11/13/13
Pad #'S:	0 - 1'	Depth (ft.) :	1' - 5'
Sample No. :	DH-3	Flask #	S1
Sample Description:	Silty Sand (SM)		

Chloride Content, DOT California Test 422 / **Sulfate Content, DOT California Test 417**

Sample used from flask (ml)	25.0		Sample used from flask (ml)	20.0	
Initial Burette Reading (ml)	15.9		Total Diluted amount (ml)	100.0	
Final Burette Reading (ml)	17.40		Spectrophotometer reading	0.000	
Silver Nitrate usen in titration (ml)	1.50		% Transmittance	100.00	
Chloride (ppm)	90.0		**Sulfate (ppm)**	0.0	

Soil Resistivity, DOT California Test 643

Remolded Specimen	Moisture Adjustments			
Water Added (ml)	45	50	50	50
Adj. Moisture Content (%)	7.5%	15.8%	24.2%	32.5%
Soil Temperature (C)	22.3	20.6	20.5	19.7
Resistance Reading (ohm)	38000	27000	12000	13000
Soil Resistivity (ohm-cm)	44460.0	30442.5	13500.0	14365.0
Remolded Specimen	**Moisture Adjustments**			
Water Added (ml)				
Adj. Moisture Content (%)				
Soil Temperature (C)				
Resistance Reading (ohm)				
Soil Resistivity (ohm-cm)				

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH
DOT CA Test 532 / 643		DOT CA Test 417 1999	DOT CA Test 422	DOT CA Test 532 / 643
13500	**24.2**	**0**	**90**	**7.3**

Goffman, McCormick & Urban, Inc.
Geotechnical Consultants

SOIL CORROSIVITY TESTS
DOT CA TEST 417/422/ 643

Project Name:	Lido House Hotel	Tested By :	EE/MF Date 11/07/13
Project No. :	13-160-00	Data Input By:	MF Date 11/13/13
Pad #'S:	0 - 1'	Depth (ft.) :	1.0' - 4.0'
Sample No. :	DH-4	Flask #	S2
Sample Description:	Poorly Graded Sand (SP)		

Chloride Content, DOT California Test 422 / **Sulfate Content, DOT California Test 417**

Sample used from flask (ml)	25.0		Sample used from flask (ml)	20.0	
Initial Burette Reading (ml)	0.1		Total Diluted amount (ml)	100.0	
Final Burette Reading (ml)	3.20		Spectrophotometer reading	0.045	
Silver Nitrate usen in titration (ml)	3.10		% Transmittance	98.00	
Chloride (ppm)	186.0		**Sulfate (ppm)**	64.9	

Soil Resistivity, DOT California Test 643

Remolded Specimen	Moisture Adjustments			
Water Added (ml)	45	50	50	
Adj. Moisture Content (%)	7.5%	15.8%	24.2%	
Soil Temperature (C)	21.9	20.6	20.0	
Resistance Reading (ohm)	19000	11000	11000	
Soil Resistivity (ohm-cm)	22040.0	12402.5	12237.5	
Remolded Specimen	Moisture Adjustments			
Water Added (ml)				
Adj. Moisture Content (%)				
Soil Temperature (C)				
Resistance Reading (ohm)				
Soil Resistivity (ohm-cm)	0.0	0.0	0.0	0.0

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH
DOT CA Test 532 / 643		DOT CA Test 417 1999	DOT CA Test 422	DOT CA Test 532 / 643
12200	**25.0**	**65**	**186**	**7.3**

SAND EQUIVALENT TEST RESULTS

BORING NUMBER	DEPTH	GEOLOGIC UNIT	USCS	SAND EQUIVALENT
DH-2	1'-3'	Qaf	SP	72

PERFORMED IN GENERAL ACCORDANCE WITH ASTM D 4329

GMU GEOTECHNICAL, INC.

Lido House Hotel,
Newport Beach

13-160-00

APPENDIX C

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APPENDIX C

Liquefaction Analysis

(Including Liquefaction-Induced Settlement and Lateral Spread)

GMU
GEOTECHNICAL, INC.

GeoLogismiki
Geotechnical Engineers
Merarhias 56
http://www.geologismiki.gr

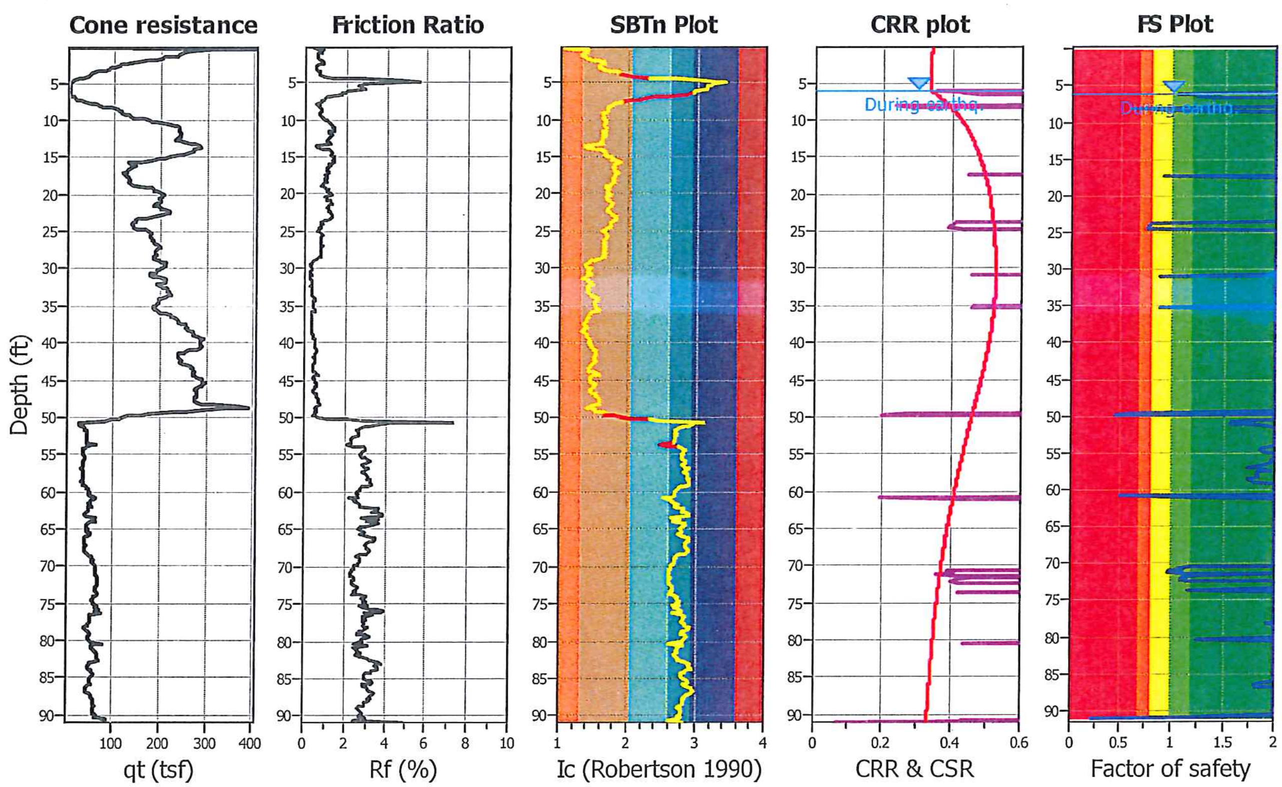
LIQUEFACTION ANALYSIS REPORT

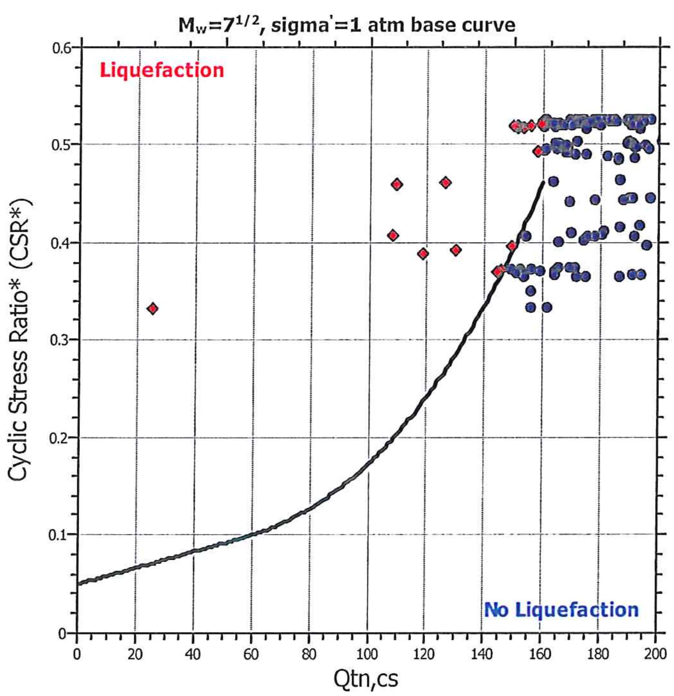
Project title : Lido House Hotel **Location : Balboa Penesula**

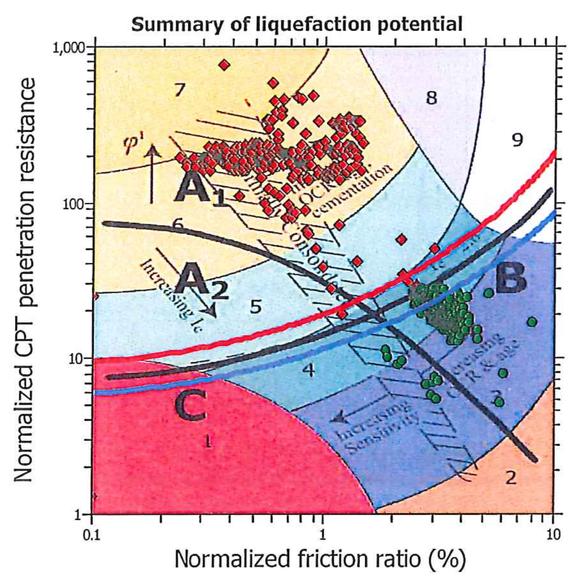
CPT file : CPT-1

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	6.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	6.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.97	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.63	Unit weight calculation:	Based on SBT	K_σ applied:	No		

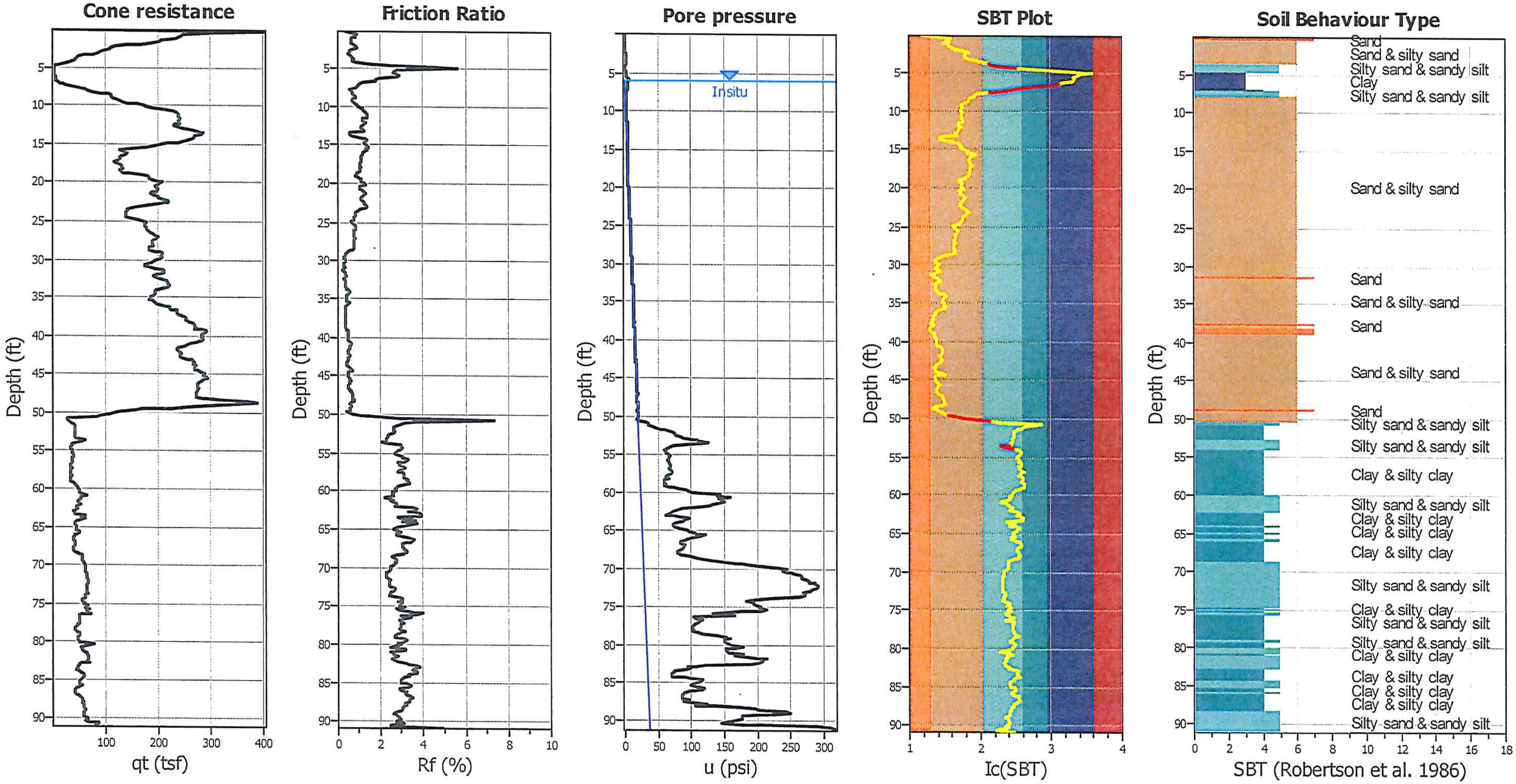






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



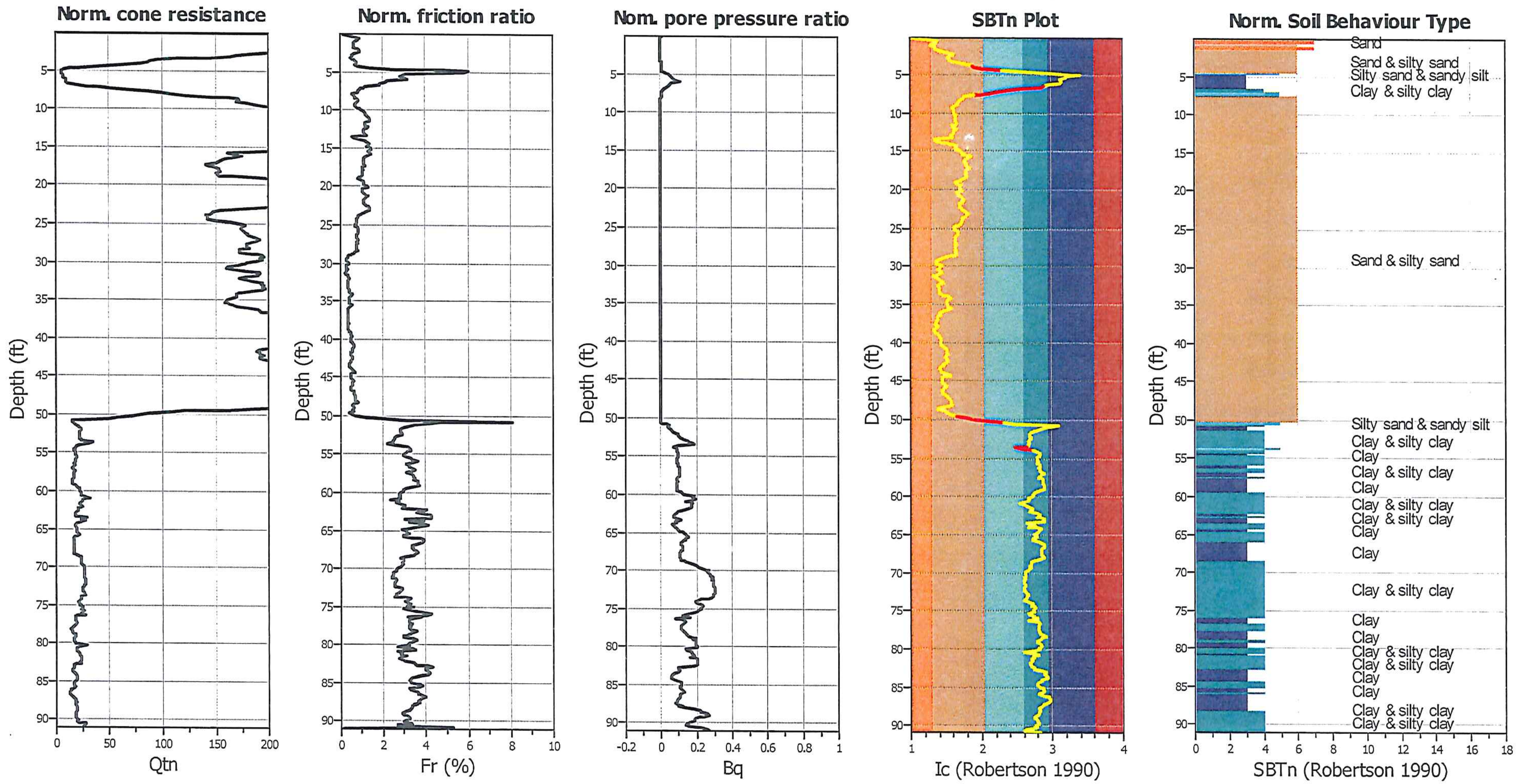
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



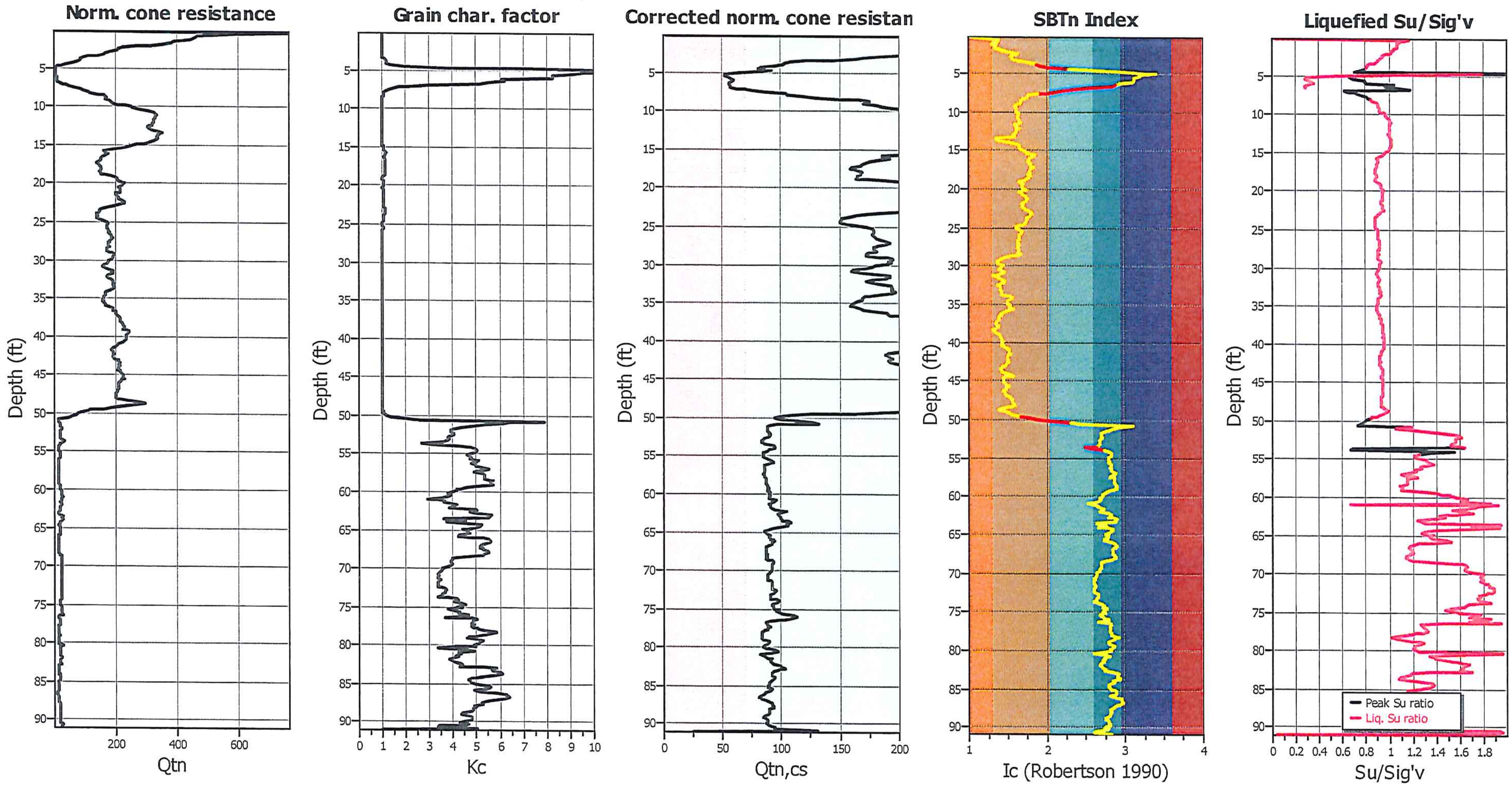
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 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

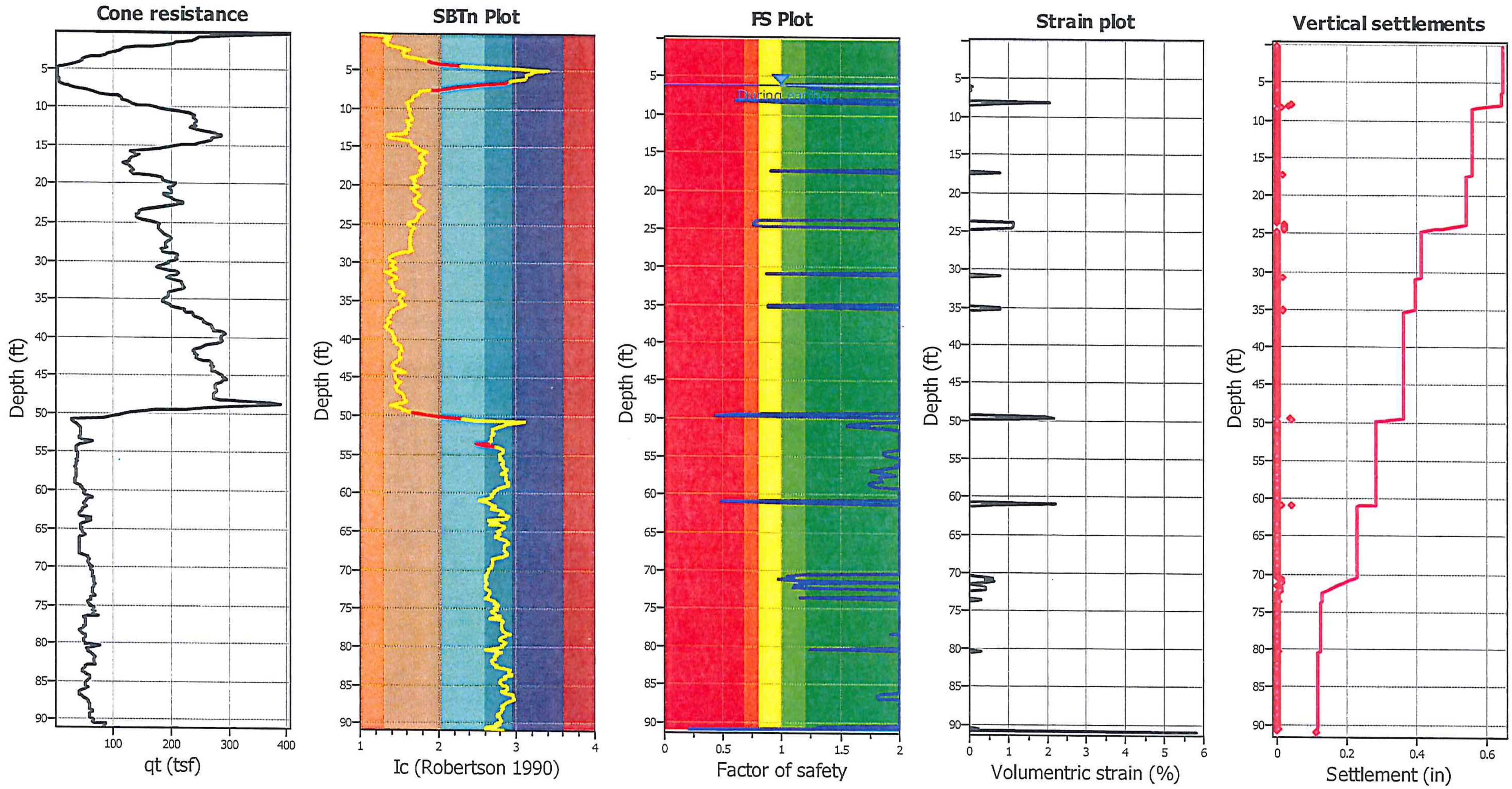
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 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

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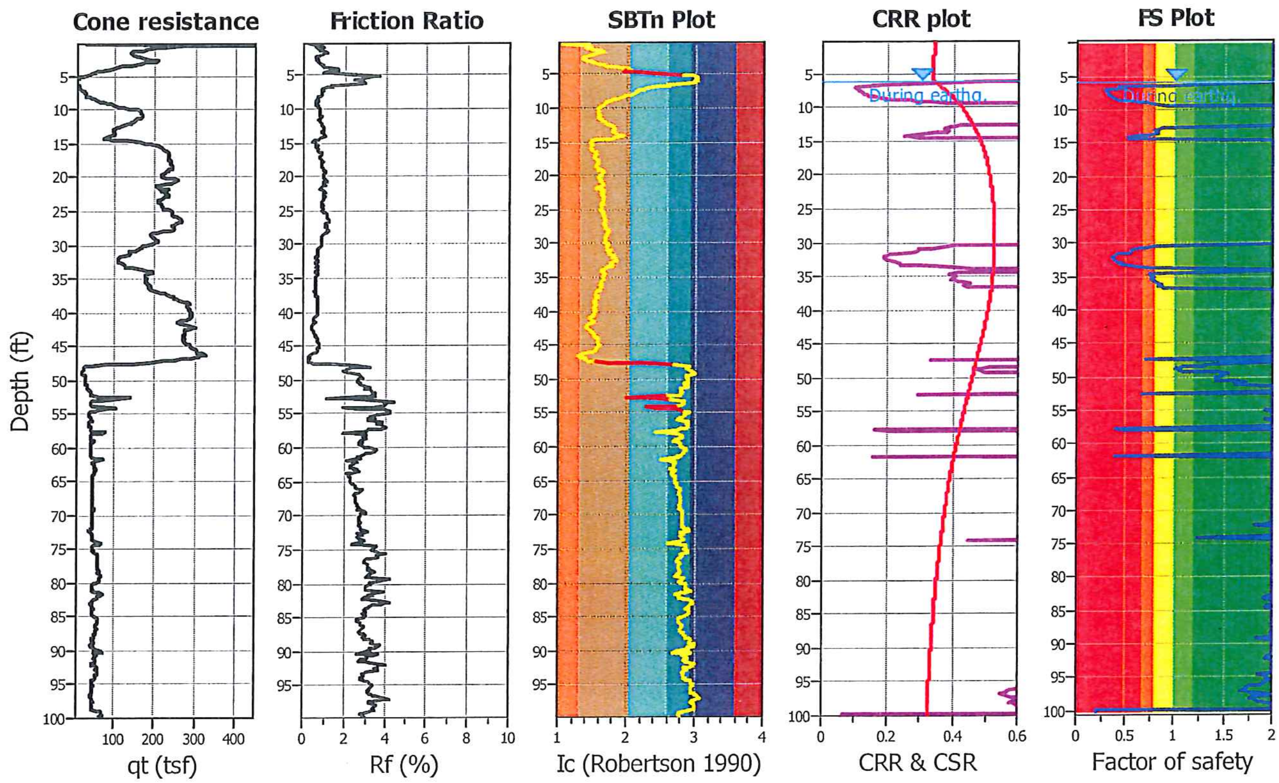
LIQUEFACTION ANALYSIS REPORT

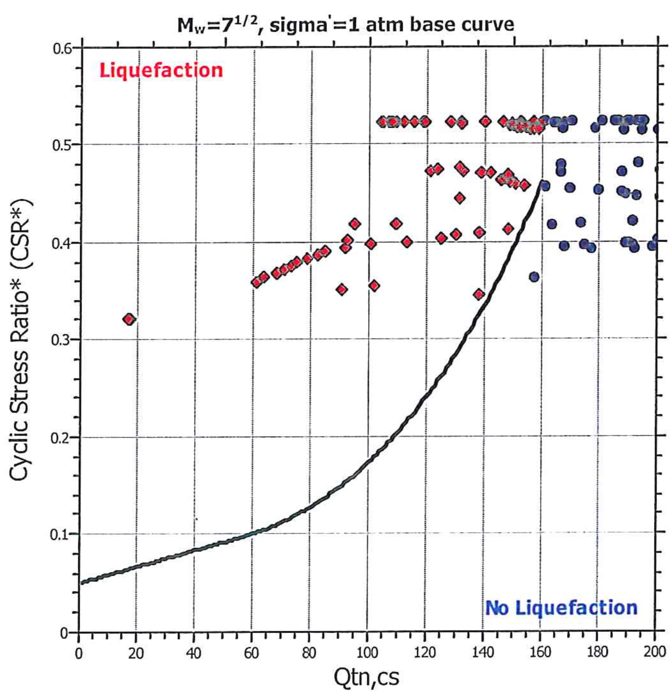
Project title : Lido House Hotel **Location : Balboa Penesula**

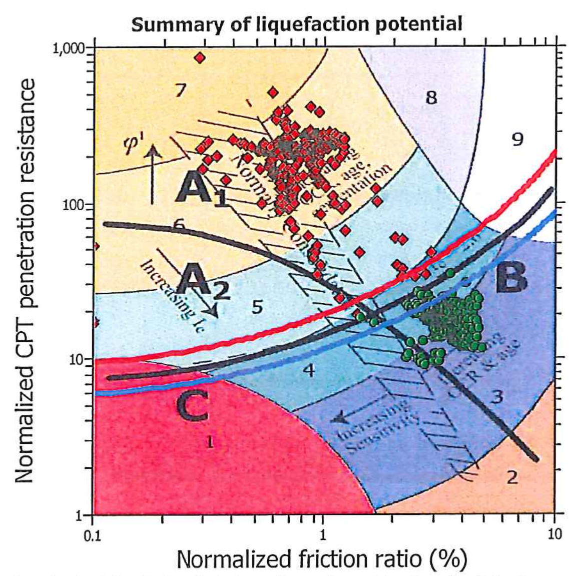
CPT file : CPT-2

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	6.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	6.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.97	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.63	Unit weight calculation:	Based on SBT	K_σ applied:	No		

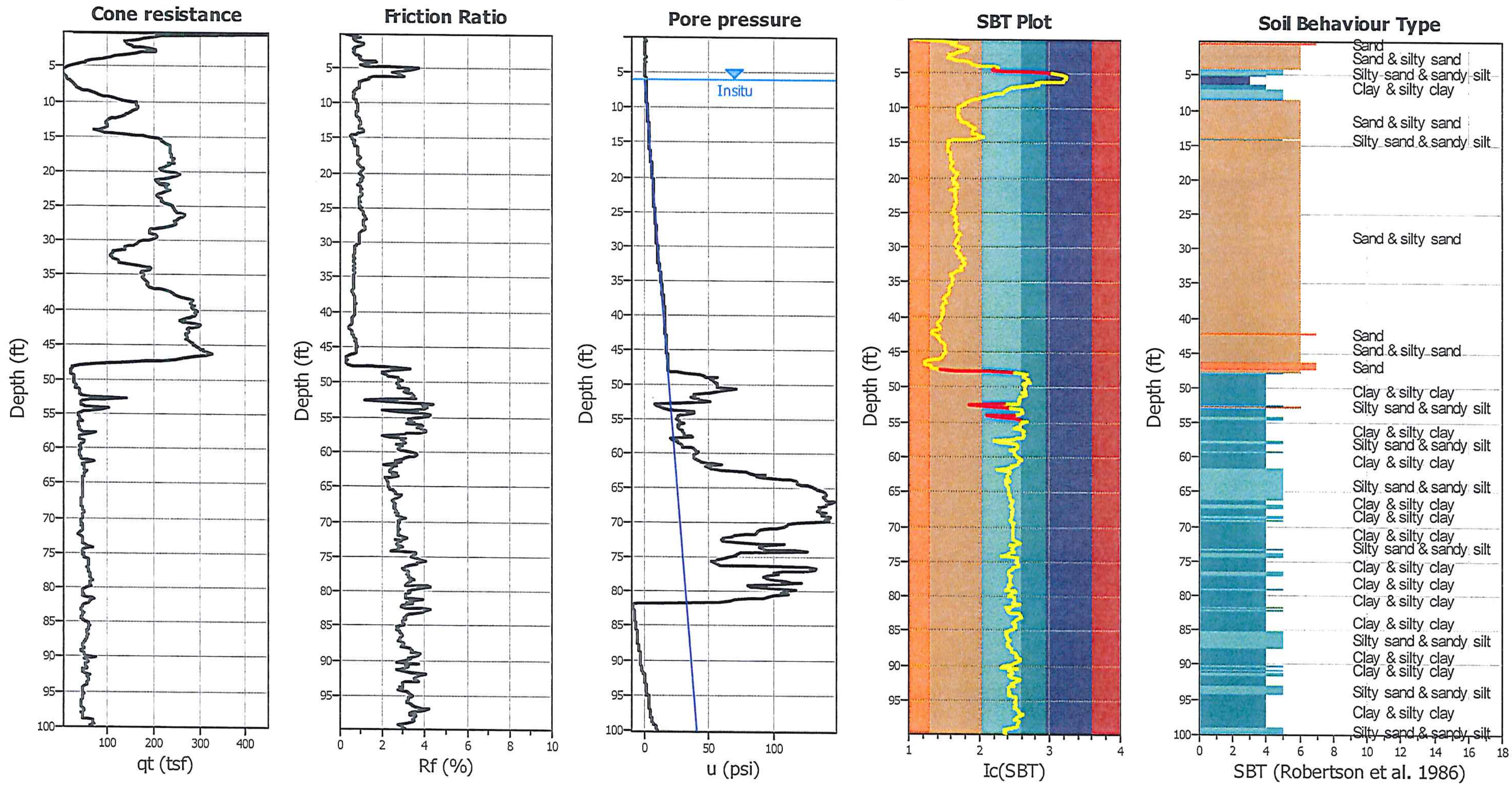






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



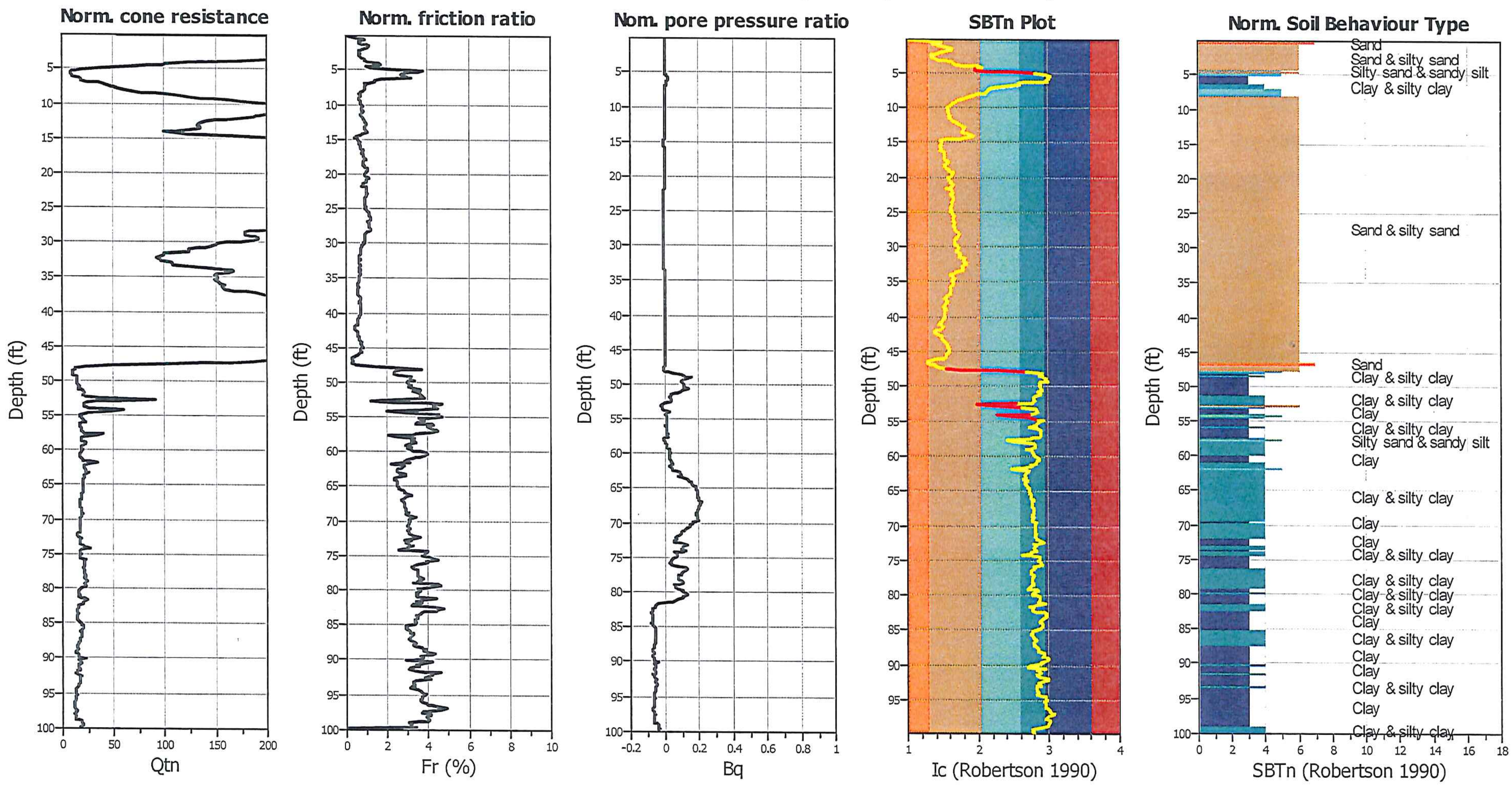
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 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)



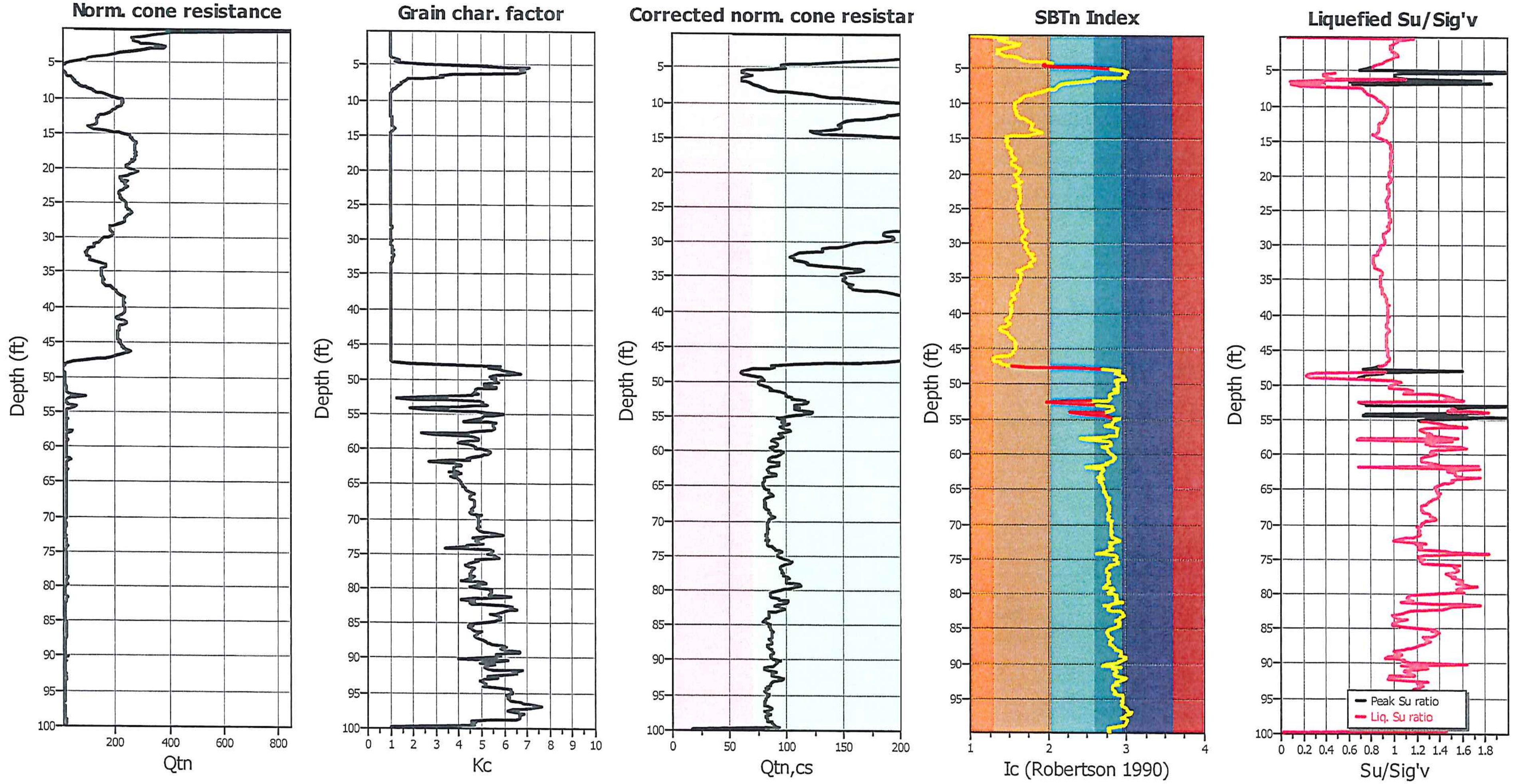
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 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

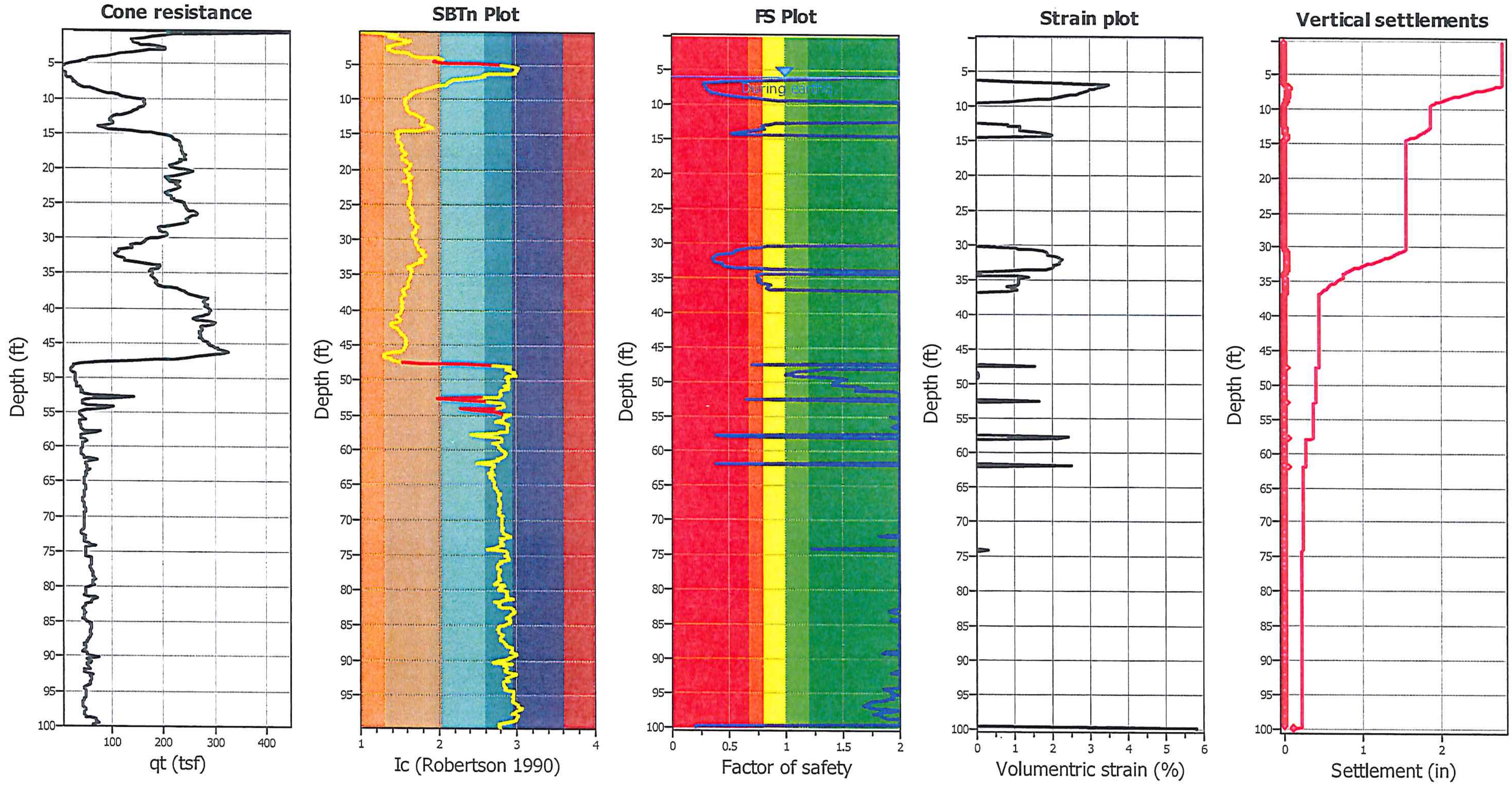
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 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

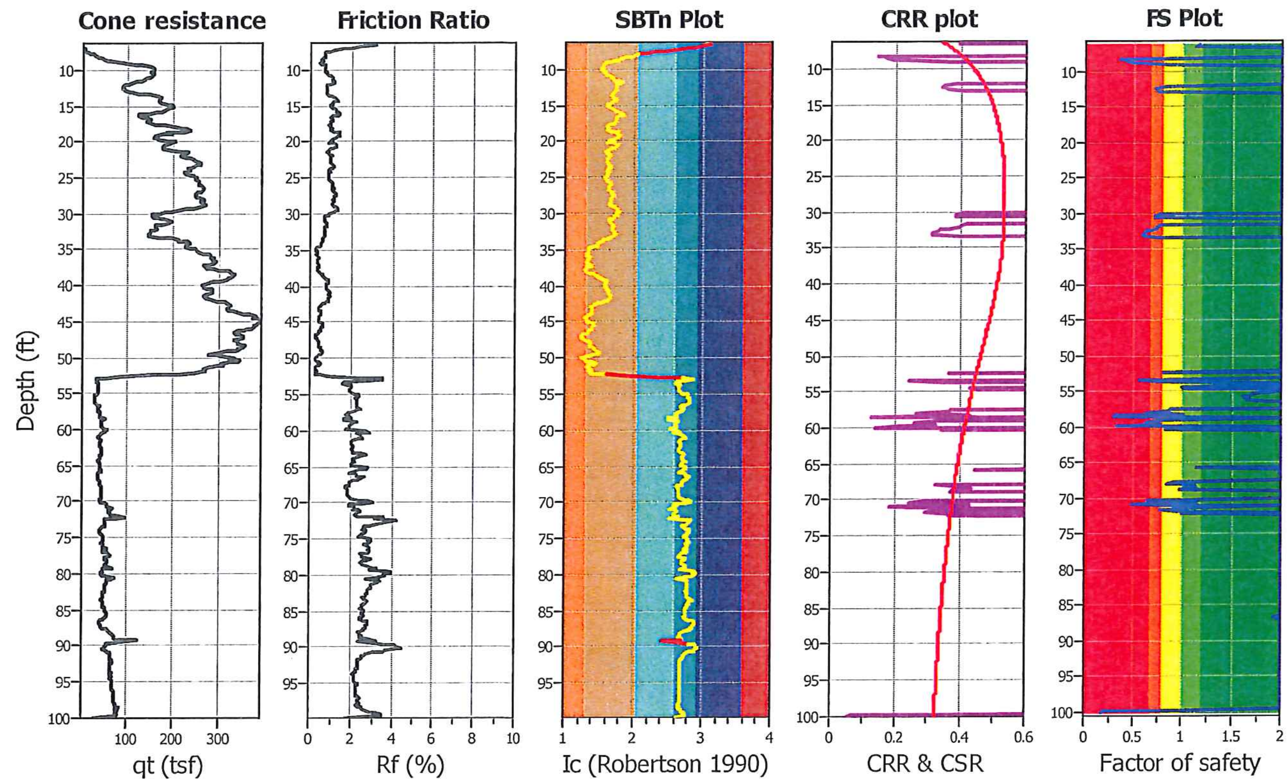
LIQUEFACTION ANALYSIS REPORT

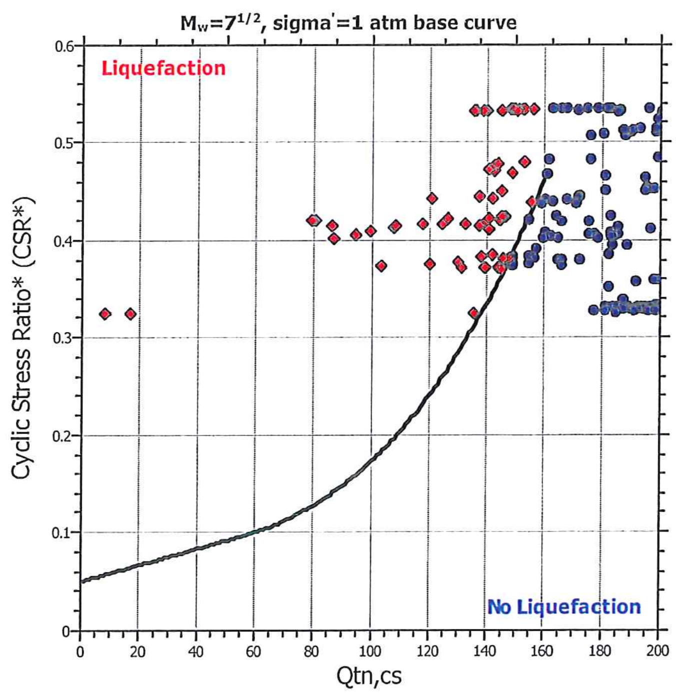
Project title : Lido House Hotel **Location : Balboa Penesula**

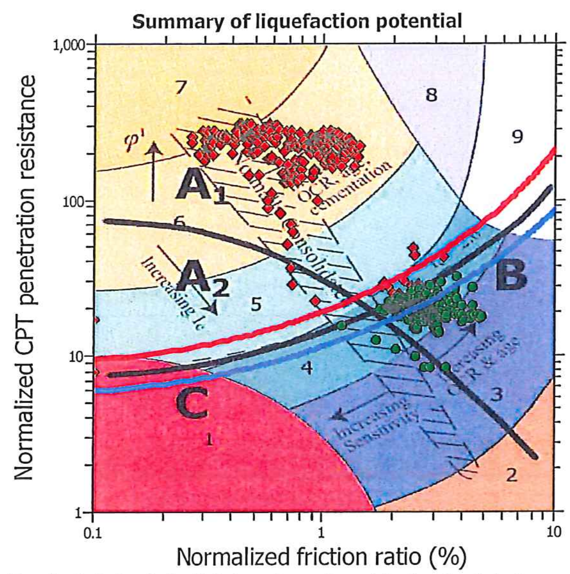
CPT file : CPT-3

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	6.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	6.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.97	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.63	Unit weight calculation:	Based on SBT	K_σ applied:	No		

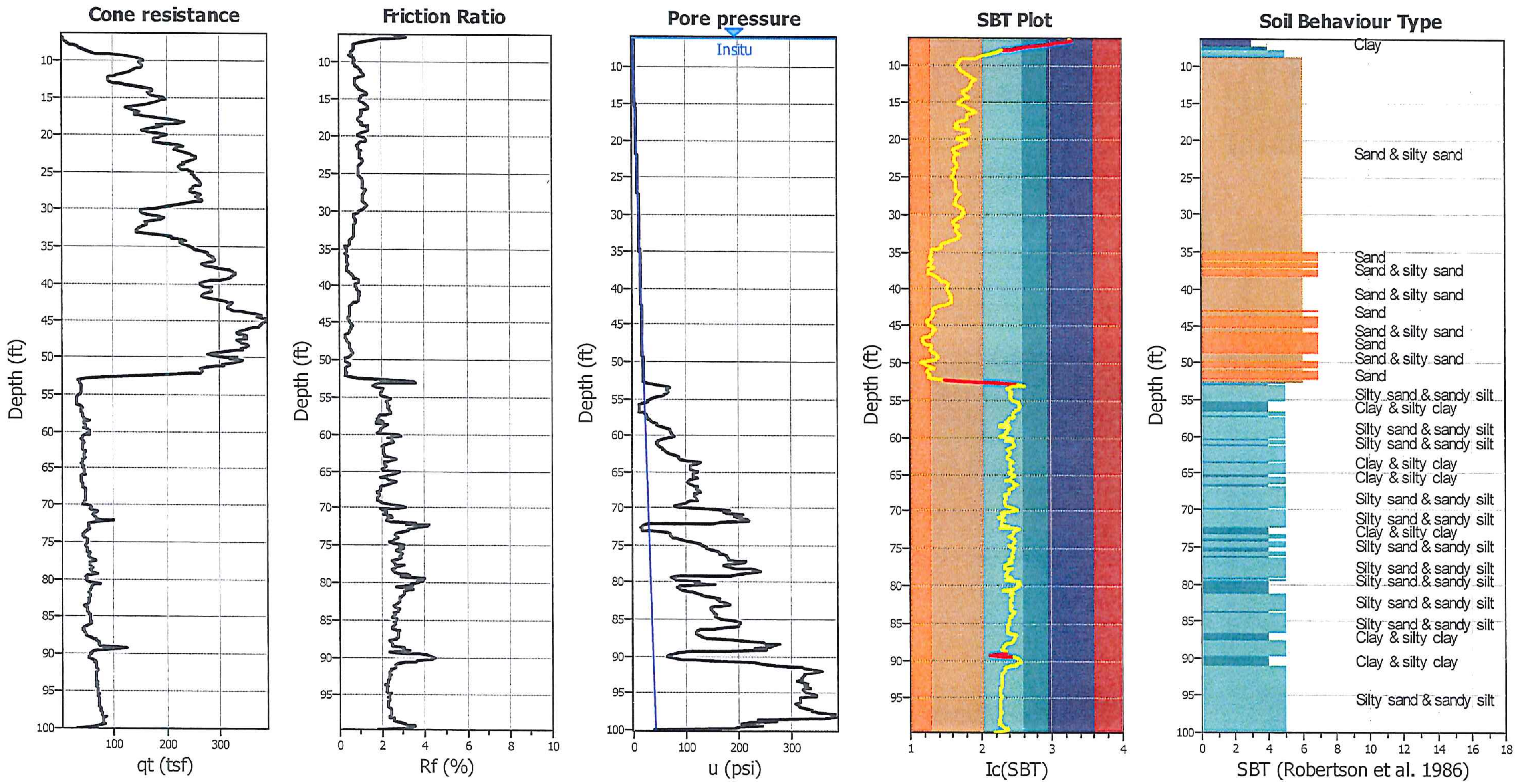






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



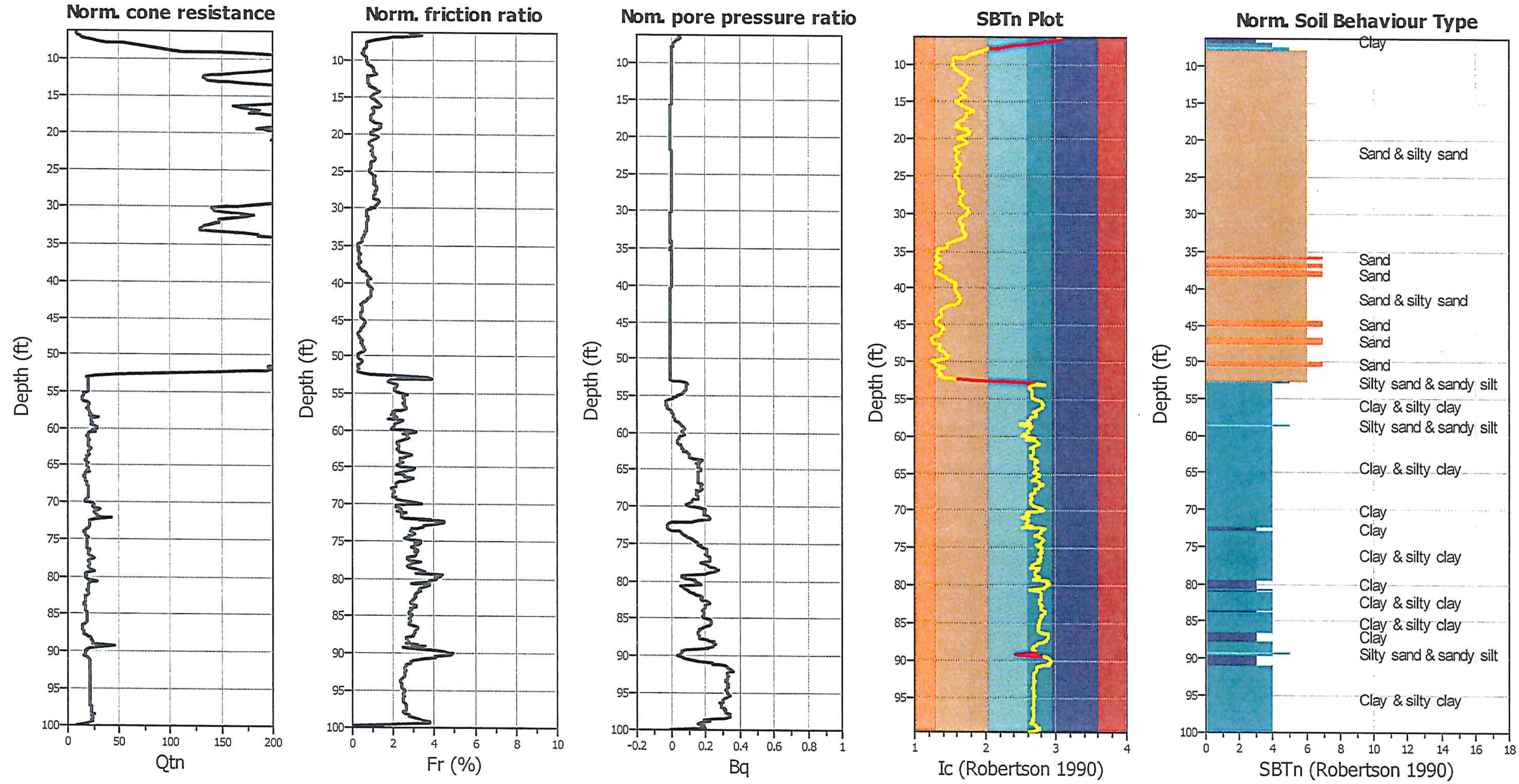
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



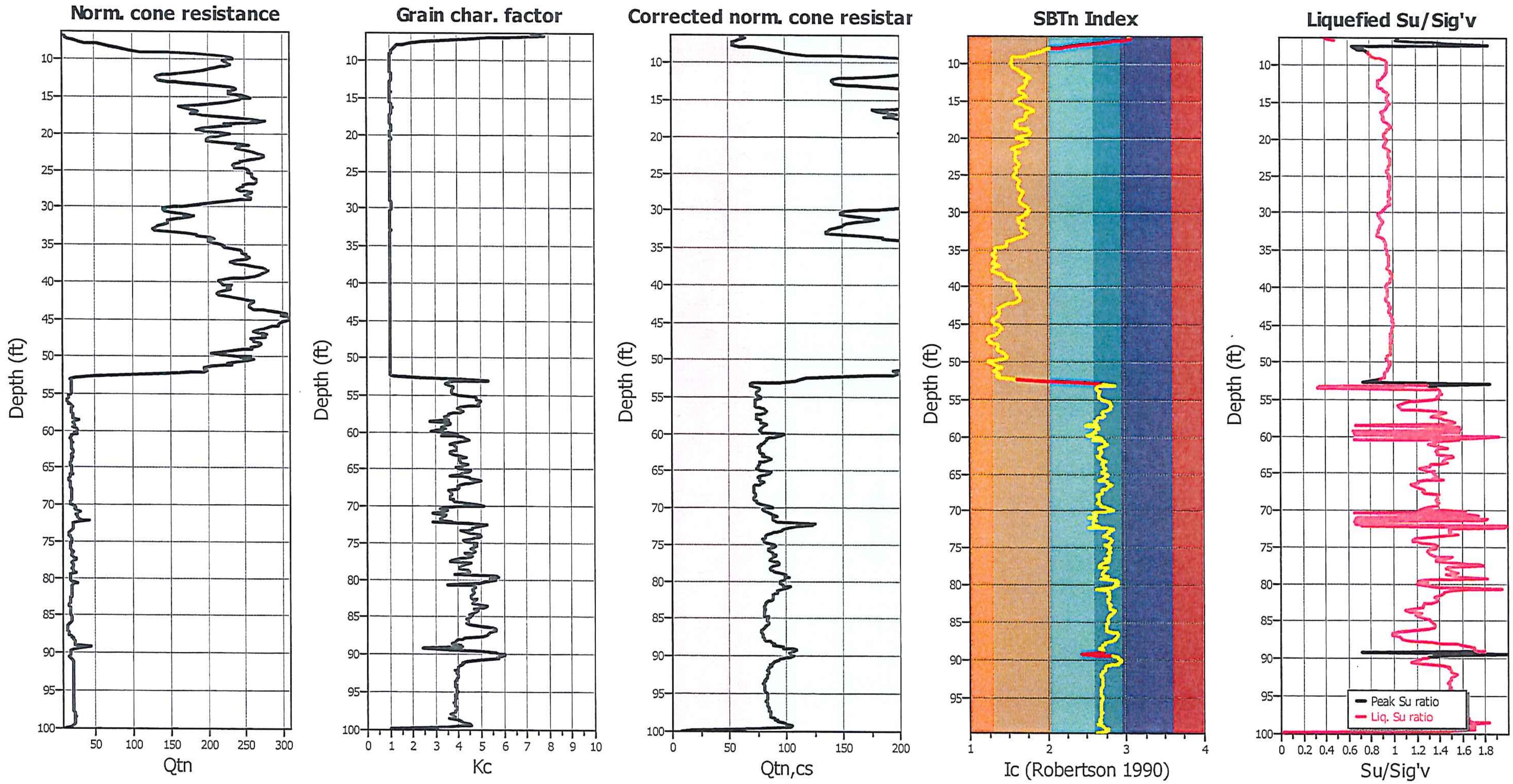
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 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

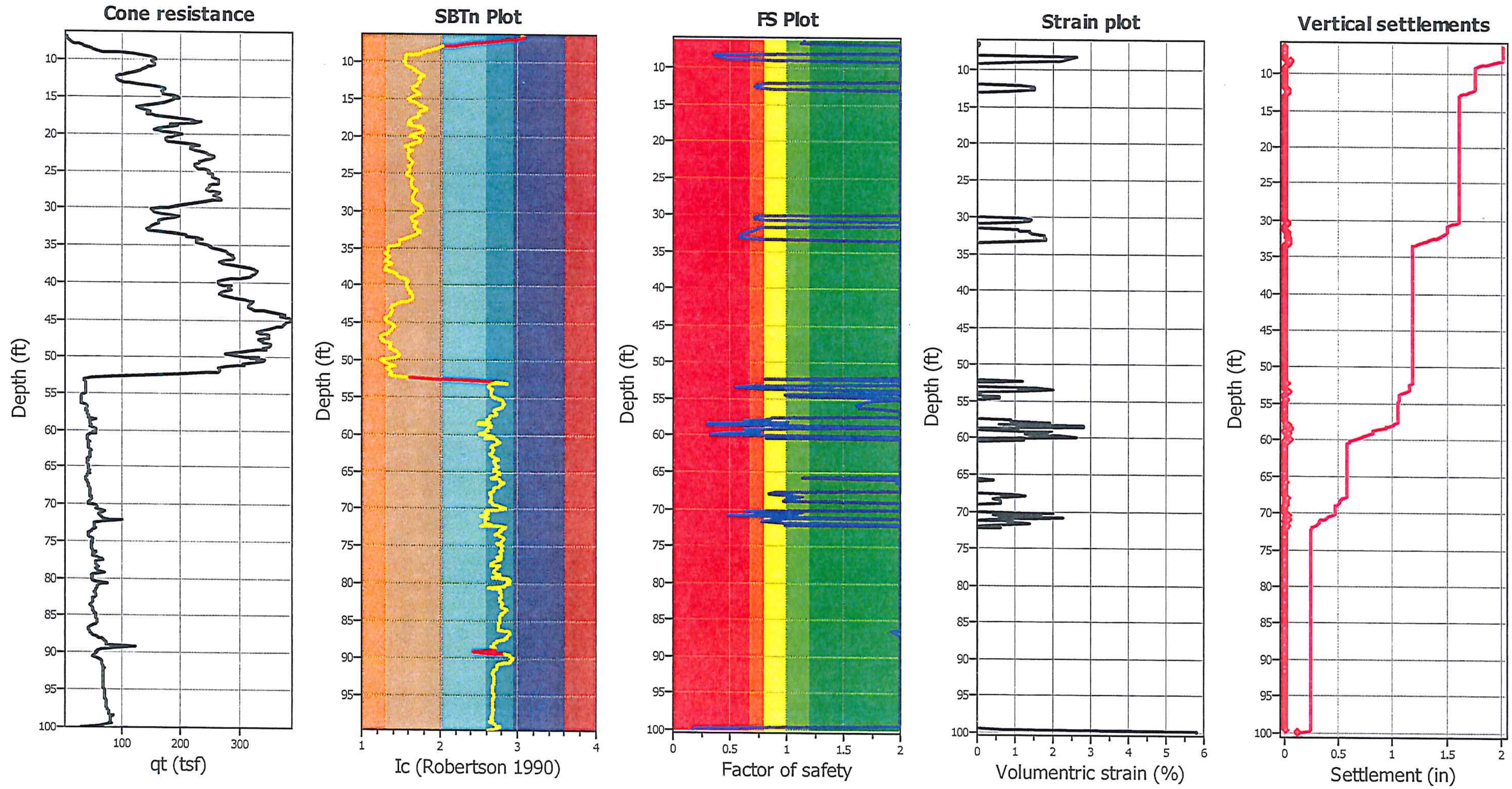
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 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

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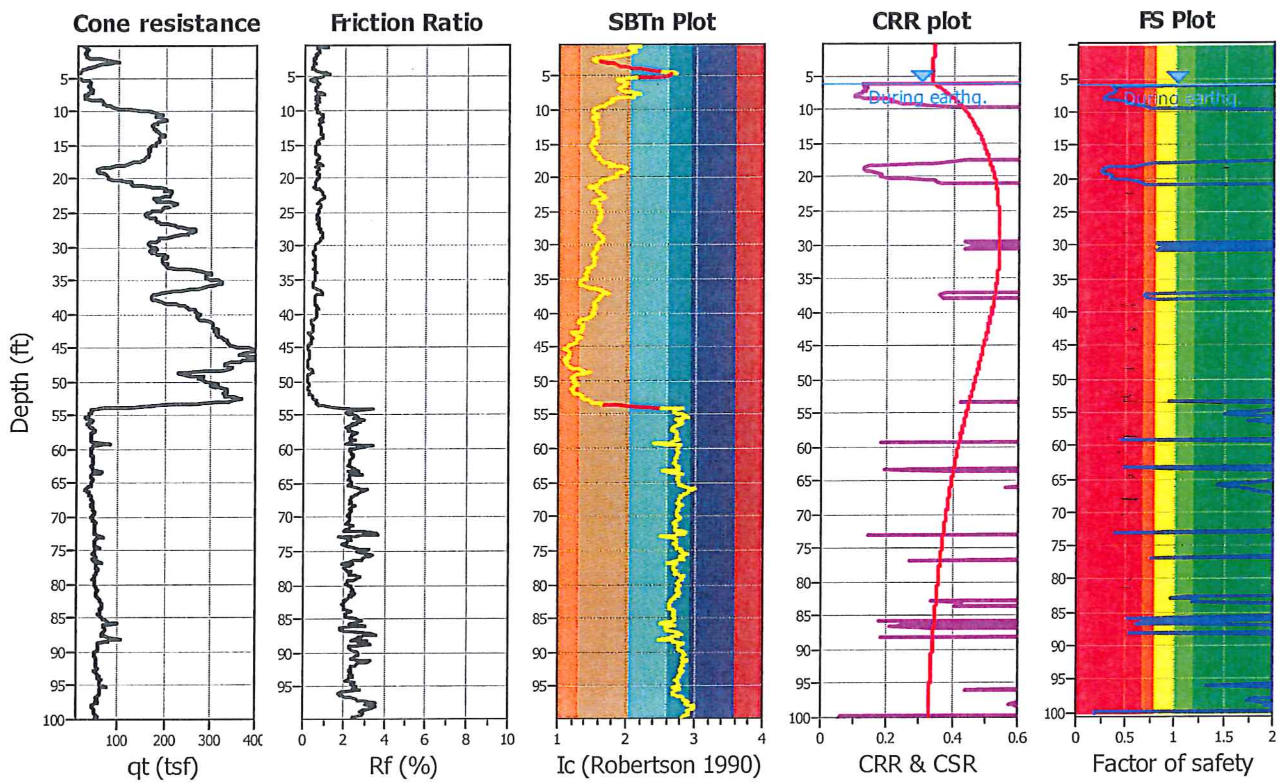
LIQUEFACTION ANALYSIS REPORT

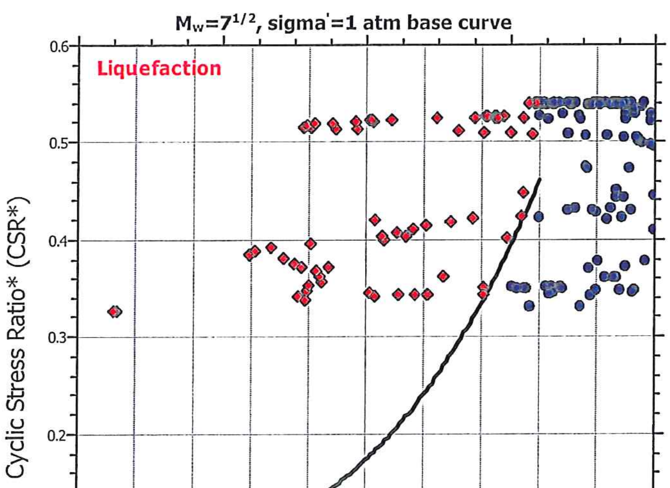
Project title : Lido House Hotel **Location : Balboa Penesula**

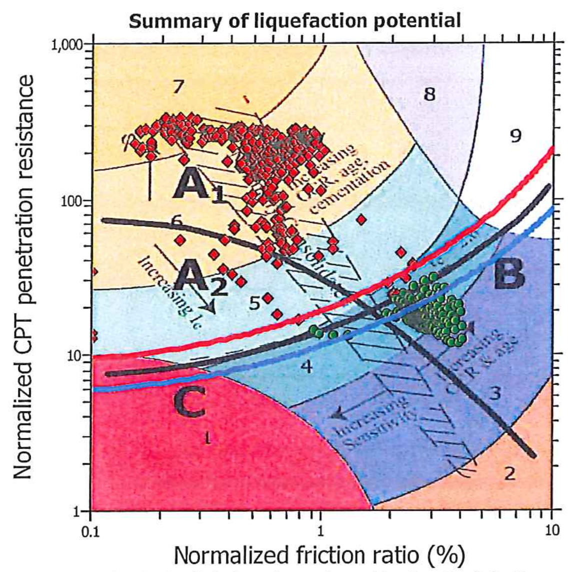
CPT file : CPT-4

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	6.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	6.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.97	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.63	Unit weight calculation:	Based on SBT	K_σ applied:	No		

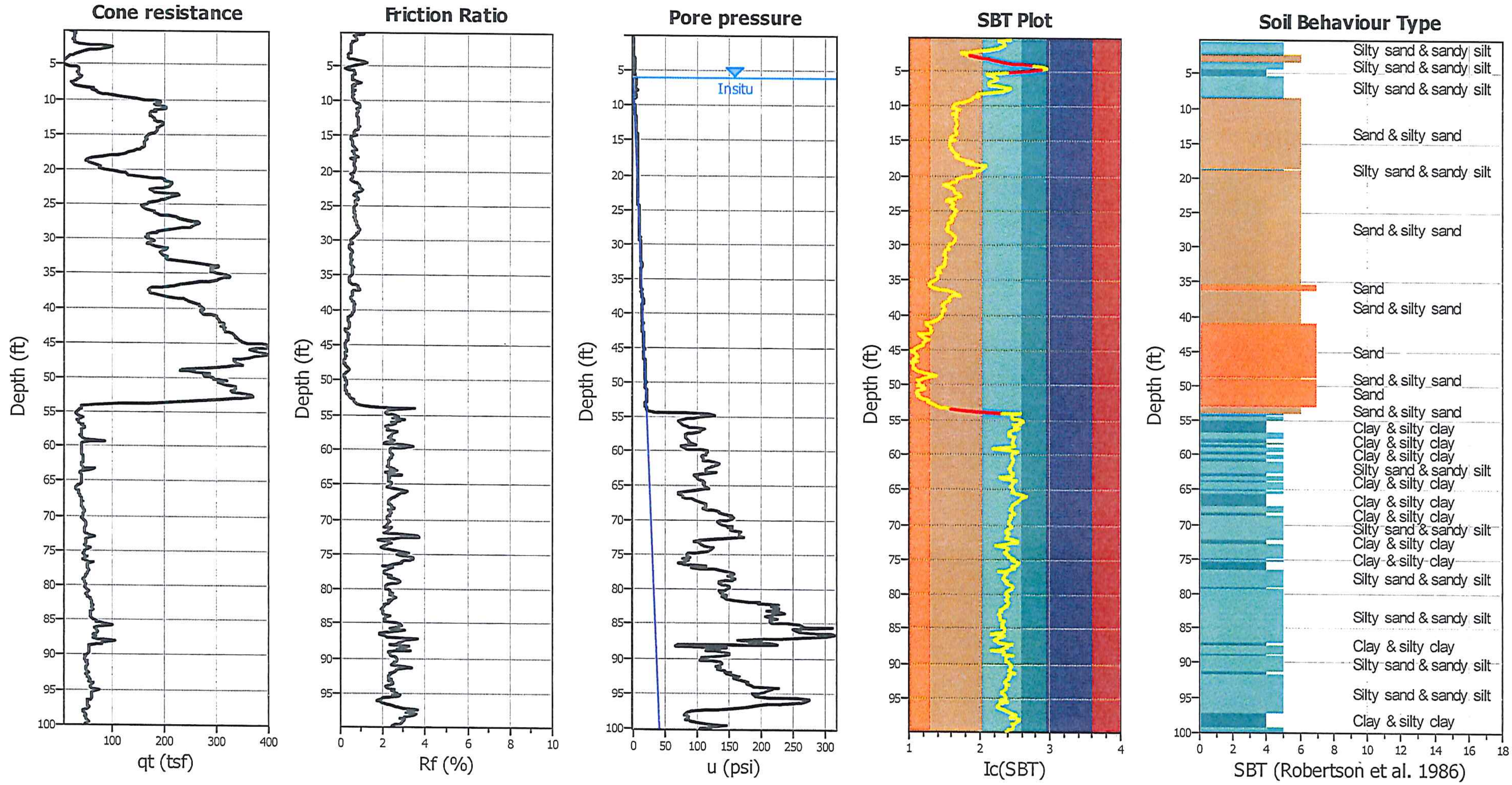






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



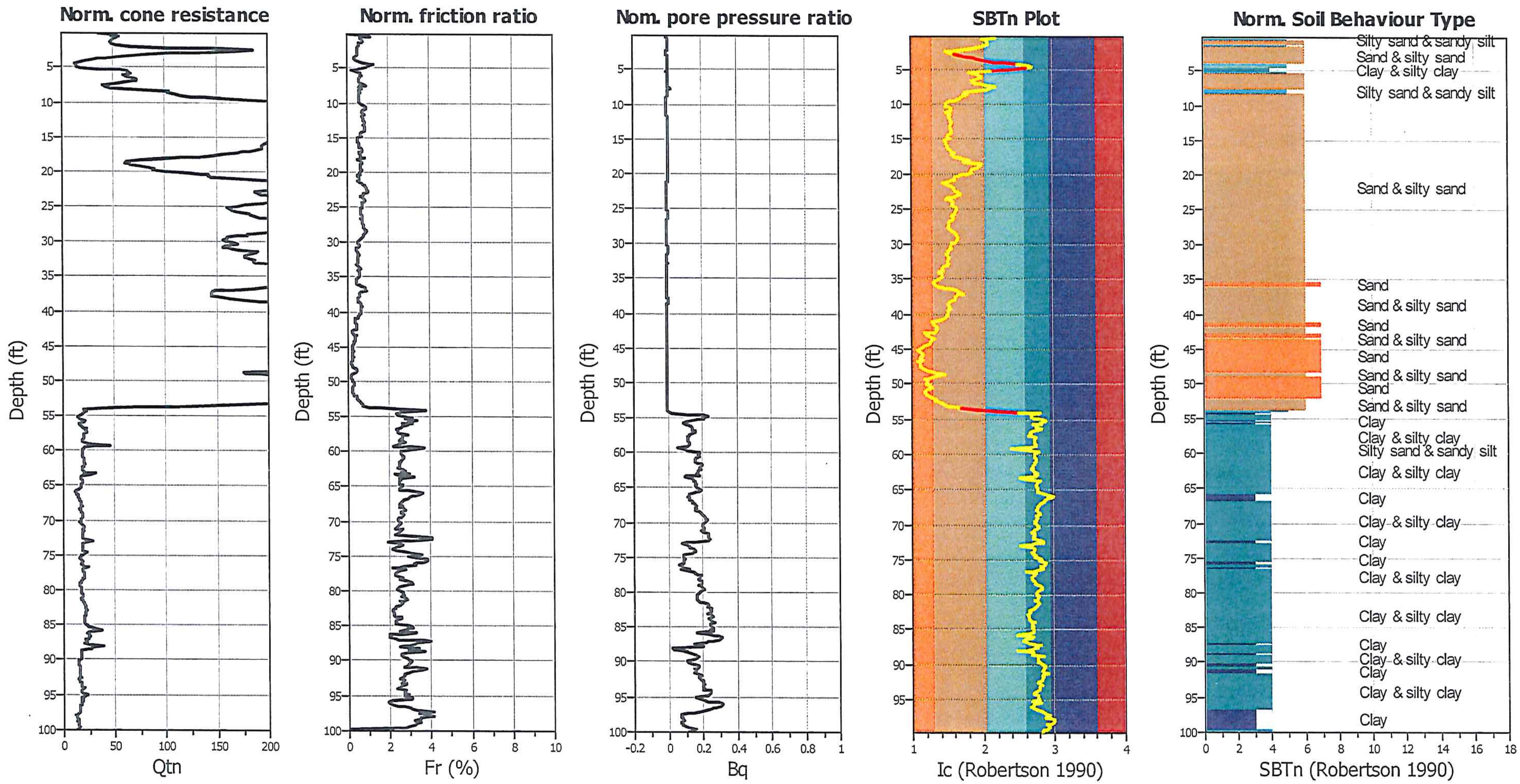
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



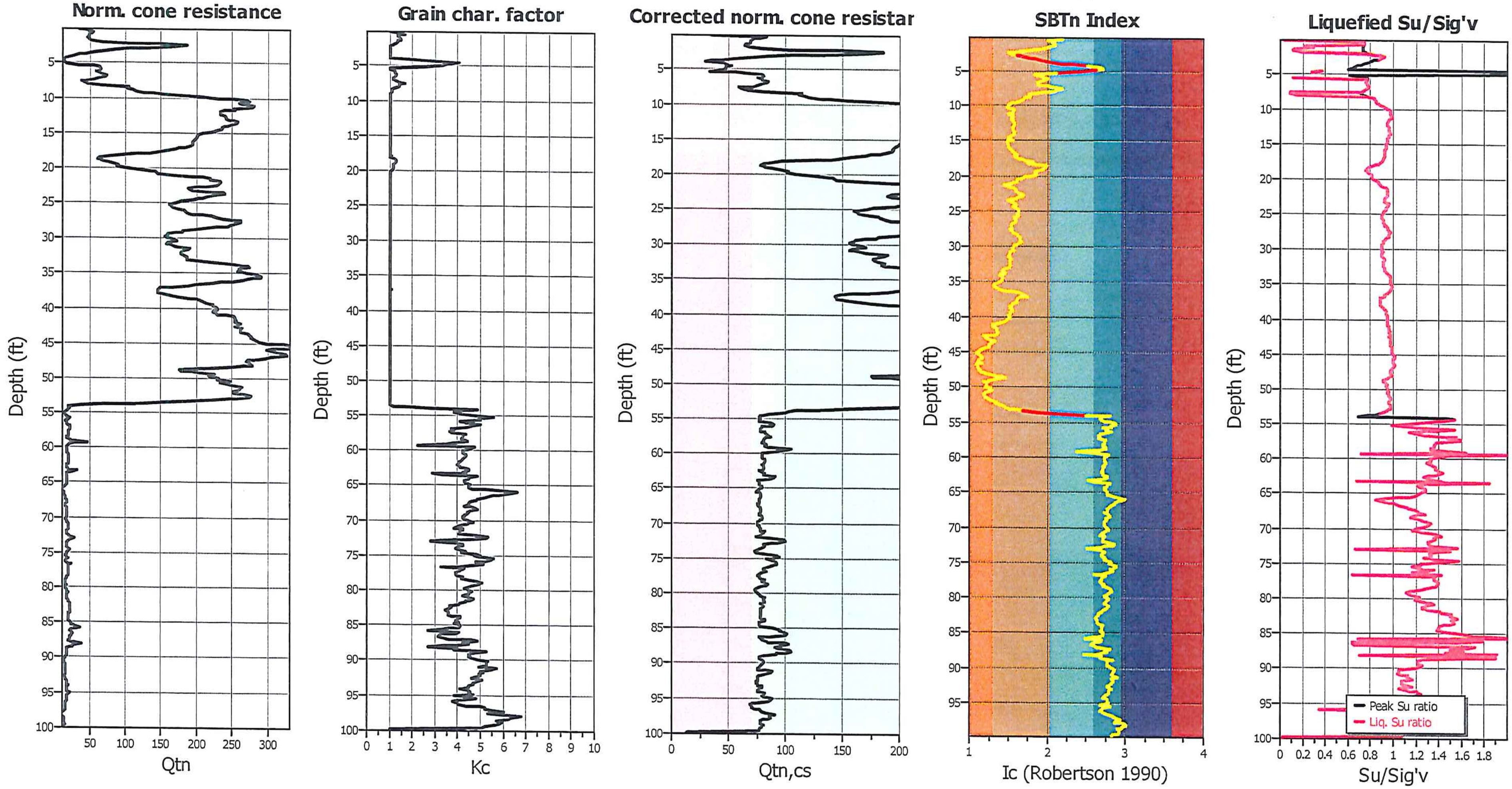
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 ft	Fill height:	N/A	Limit depth:	N/A

SBTn legend

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

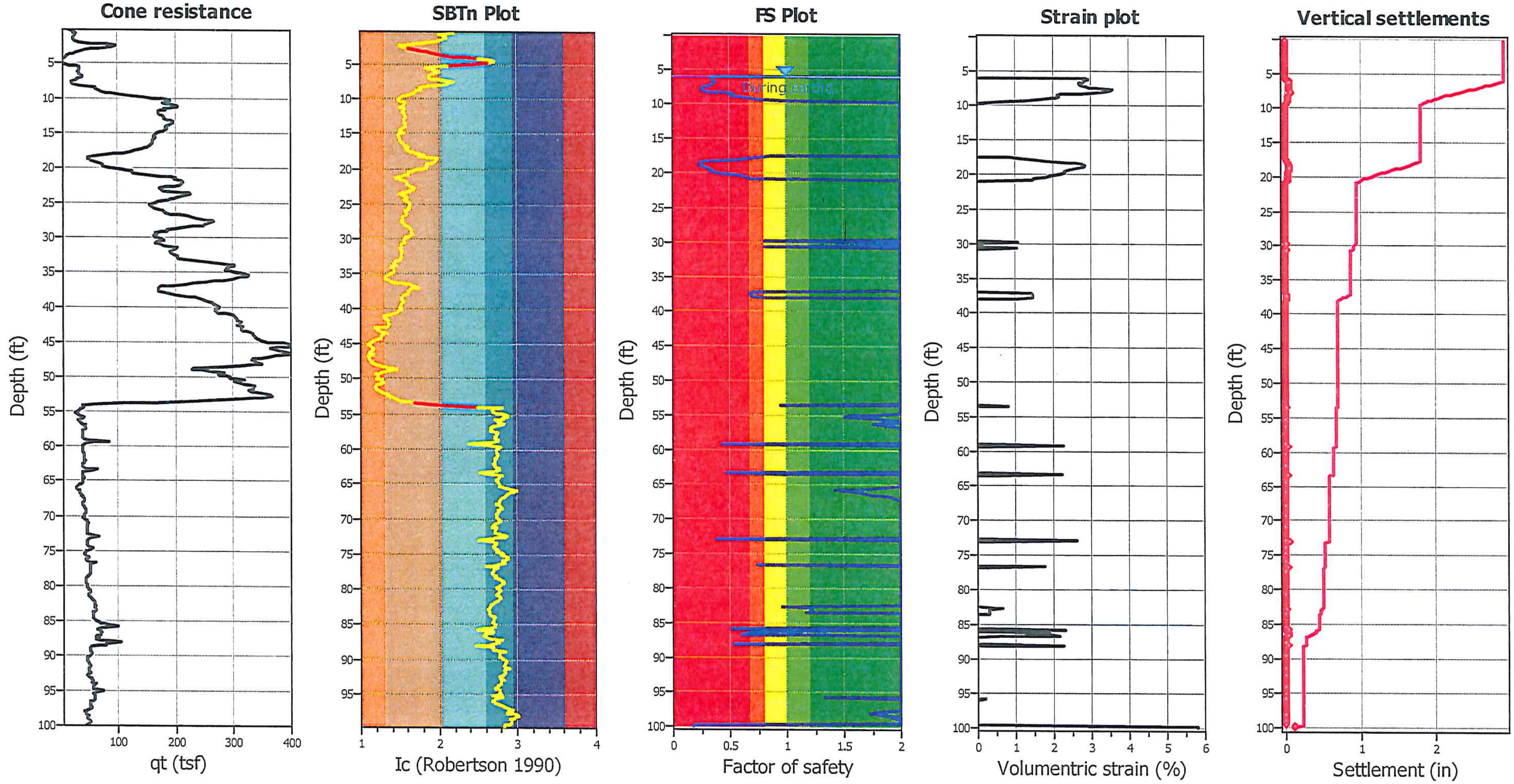
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 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

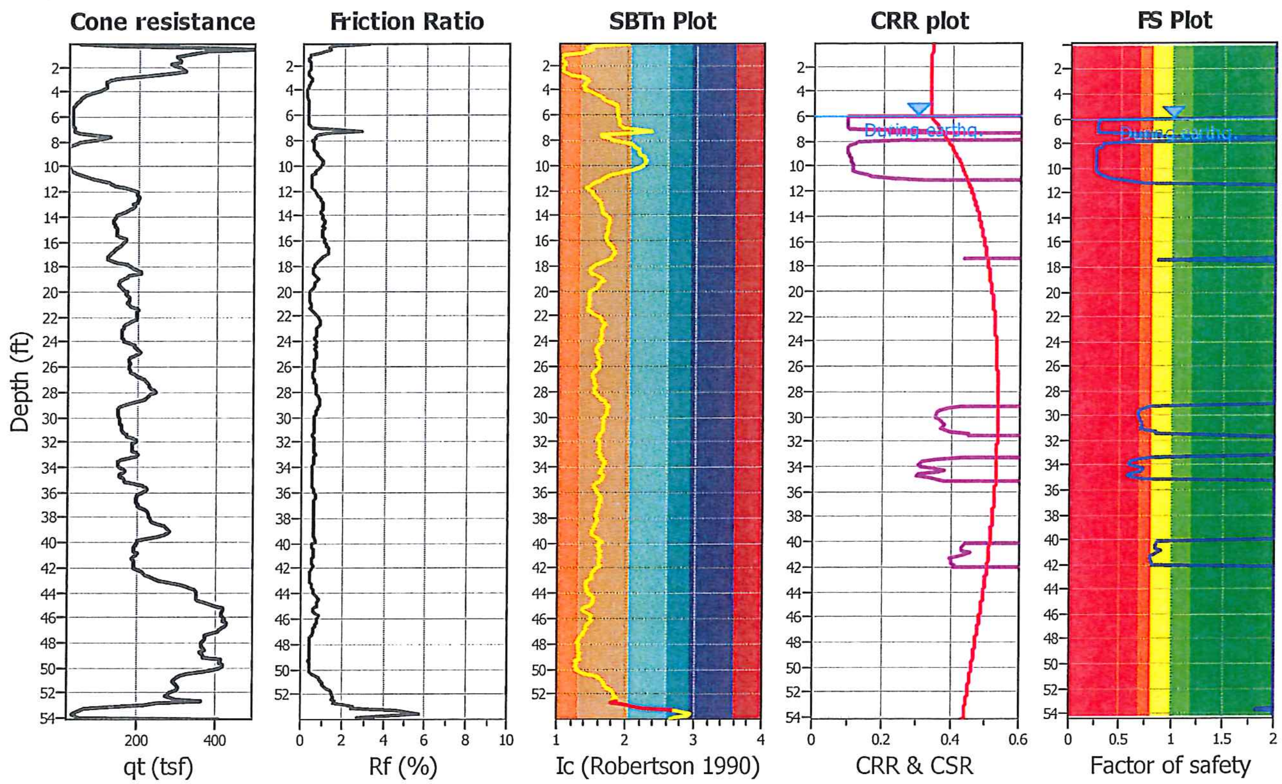
LIQUEFACTION ANALYSIS REPORT

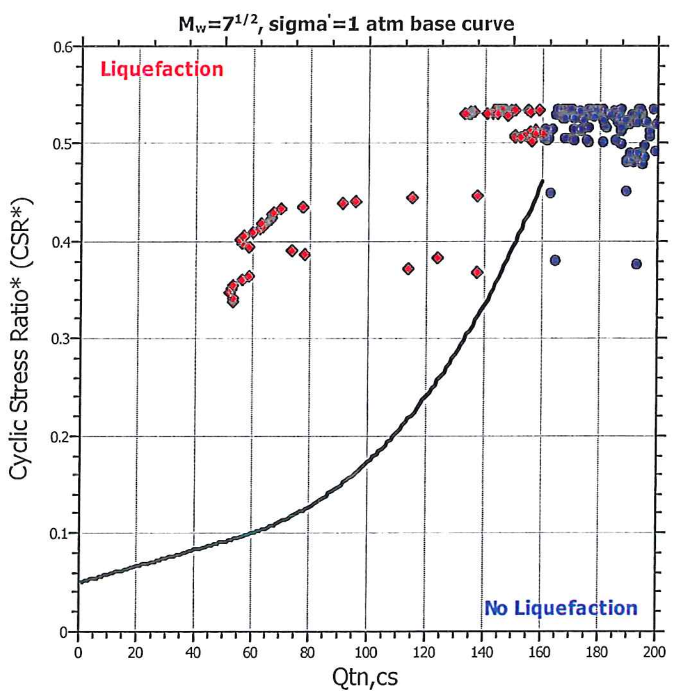
Project title : Lido House Hotel **Location : Balboa Penesula**

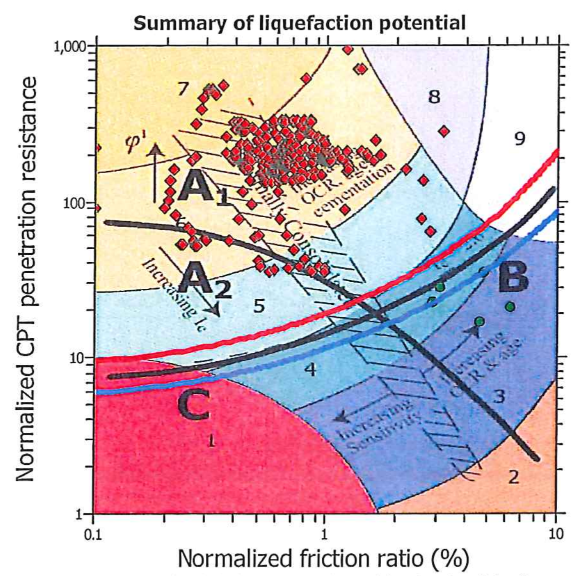
CPT file : CPT-5

Input parameters and analysis data

Analysis method:	Robertson (2009)	G.W.T. (in-situ):	6.00 ft	Use fill:	No	Clay like behavior applied:	All soils
Fines correction method:	Robertson (2009)	G.W.T. (earthq.):	6.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	1	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	6.97	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.63	Unit weight calculation:	Based on SBT	K_σ applied:	No		

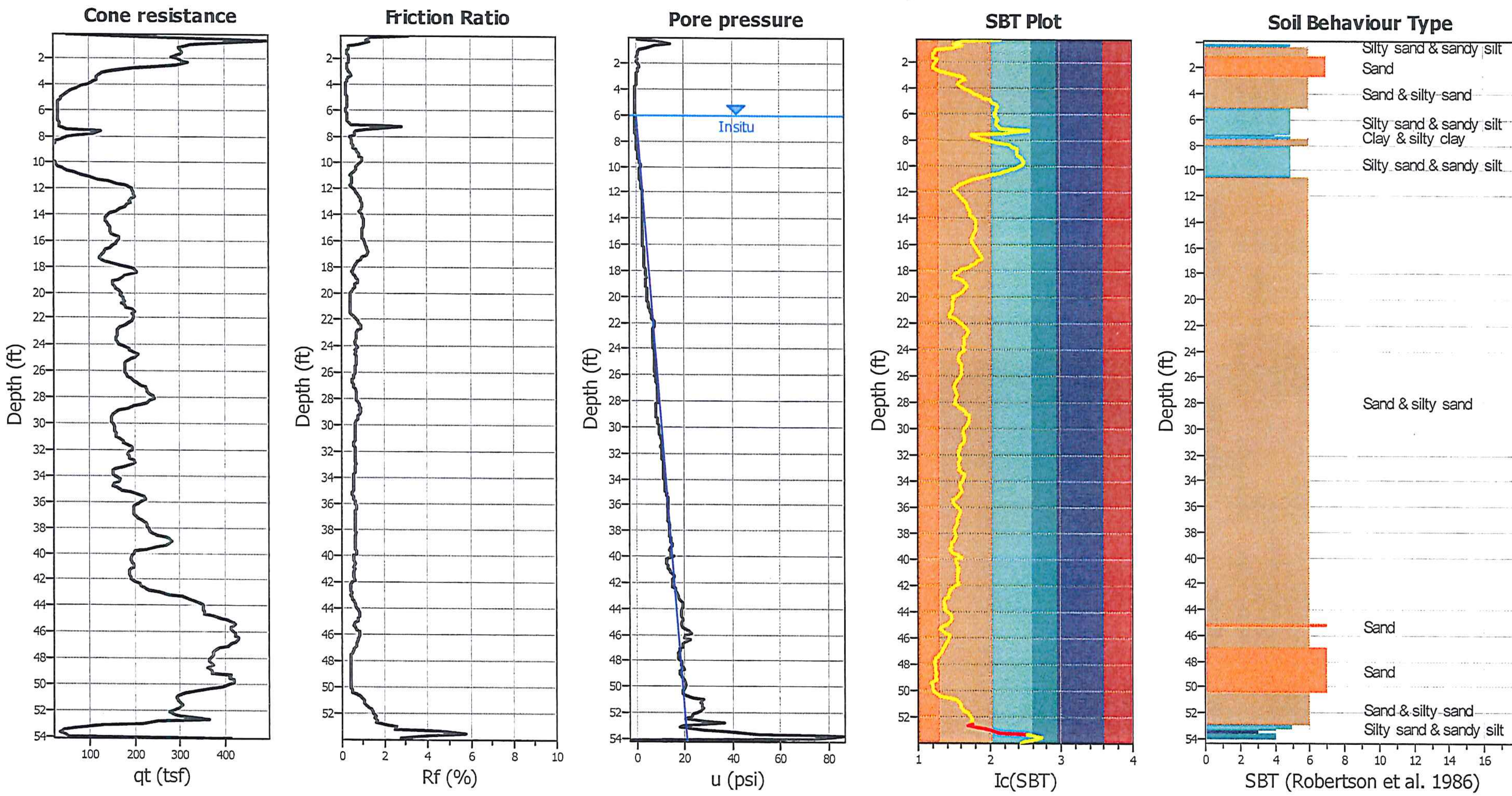






Zone A_1: Cyclic liquefaction likely depending on size and duration of cyclic loading
Zone A_2: Cyclic liquefaction and strength loss likely depending on loading and ground geometry
Zone B: Liquefaction and post-earthquake strength loss unlikely, check cyclic softening
Zone C: Cyclic liquefaction and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

CPT basic interpretation plots



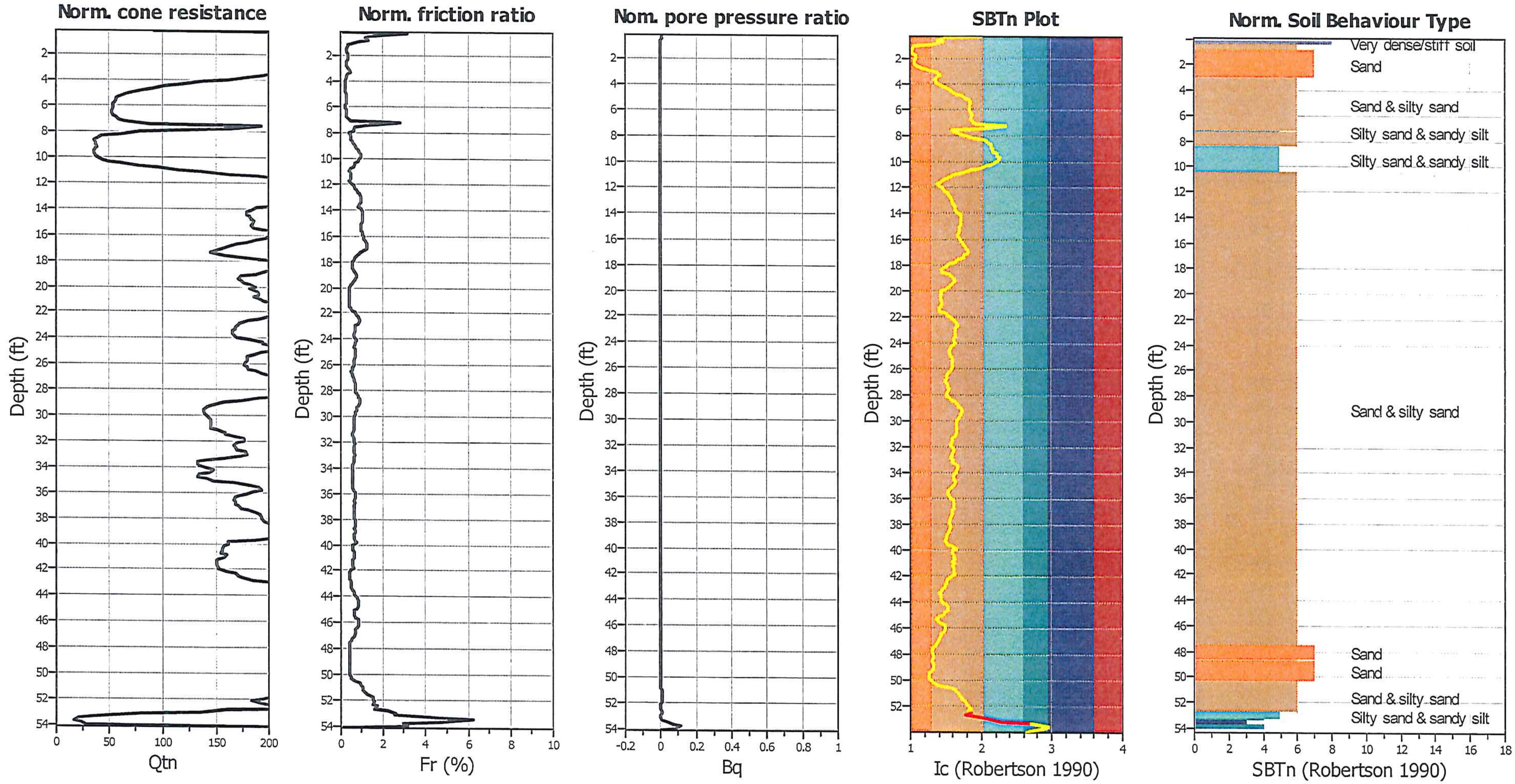
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 ft	Fill height:	N/A	Limit depth:	N/A

SBT legend

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

CPT basic interpretation plots (normalized)



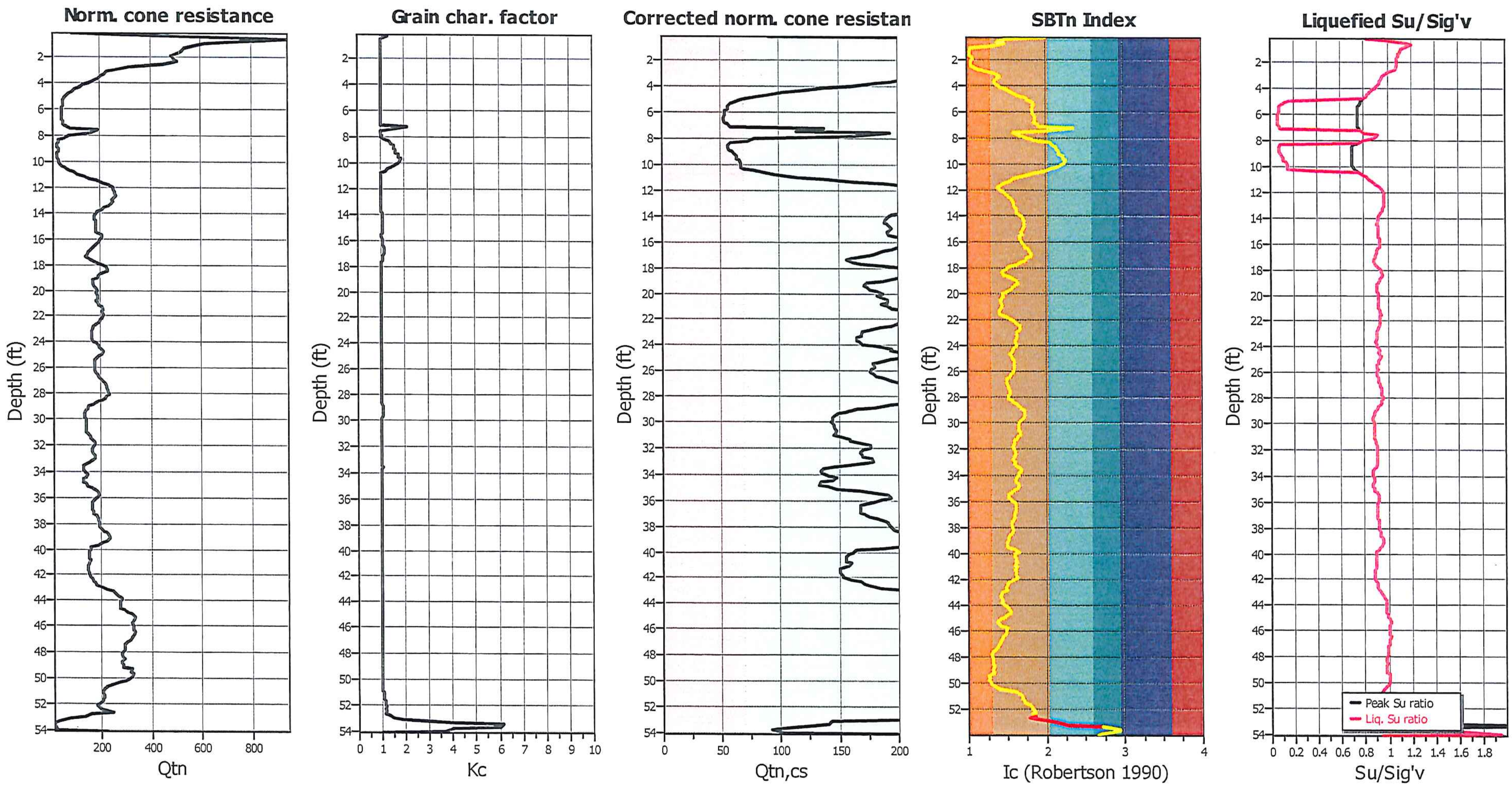
Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 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

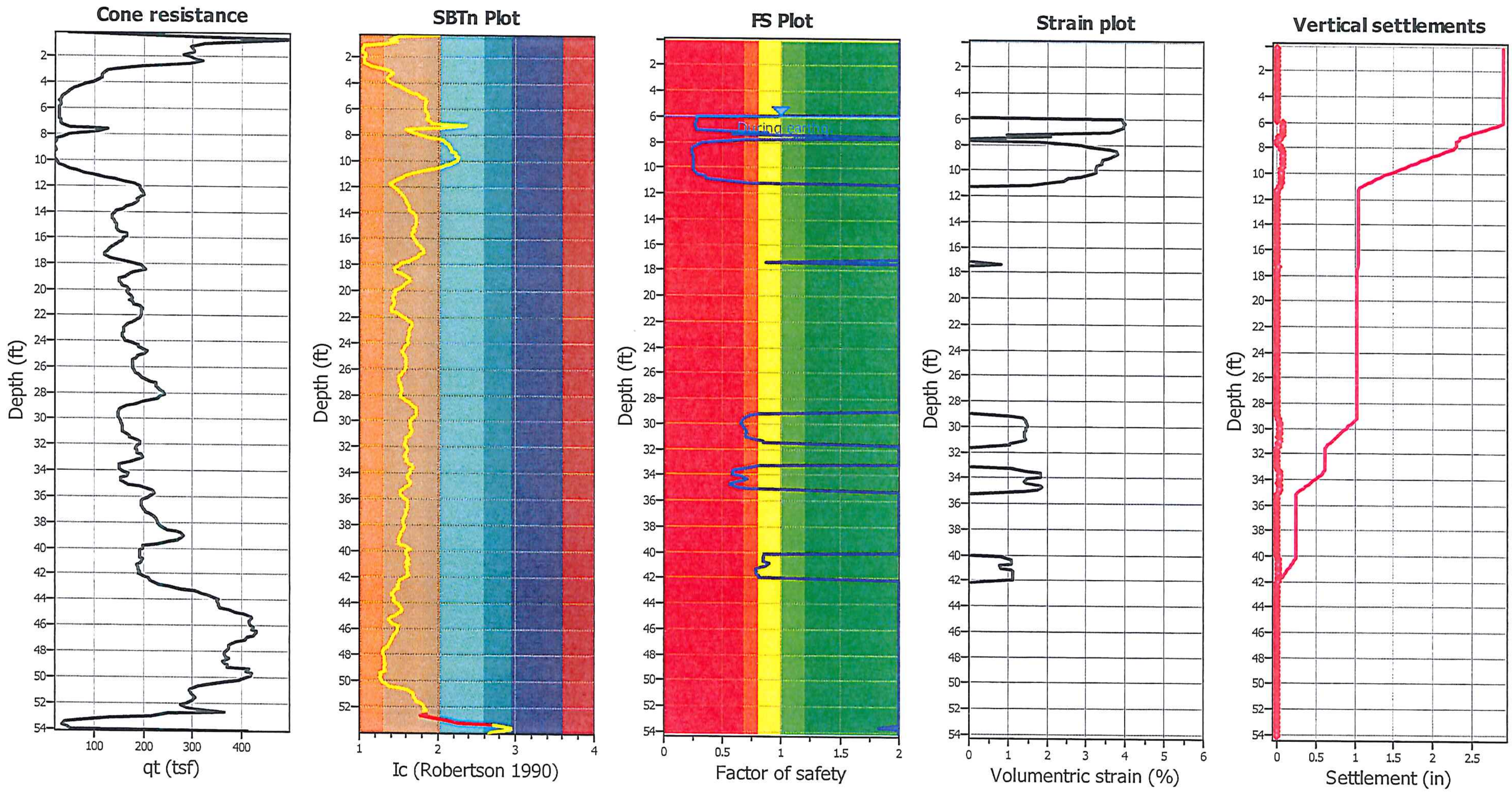
Check for strength loss plots (Robertson (2010))



Input parameters and analysis data

Analysis method:	Robertson (2009)	Depth to water table (erthq.):	6.00 ft	Fill weight:	N/A
Fines correction method:	Robertson (2009)	Average results interval:	1	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:	6.97	Unit weight calculation:	Based on SBT	Clay like behavior applied:	All soils
Peak ground acceleration:	0.63	Use fill:	No	Limit depth applied:	No
Depth to water table (insitu):	6.00 ft	Fill height:	N/A	Limit depth:	N/A

Estimation of post-earthquake settlements



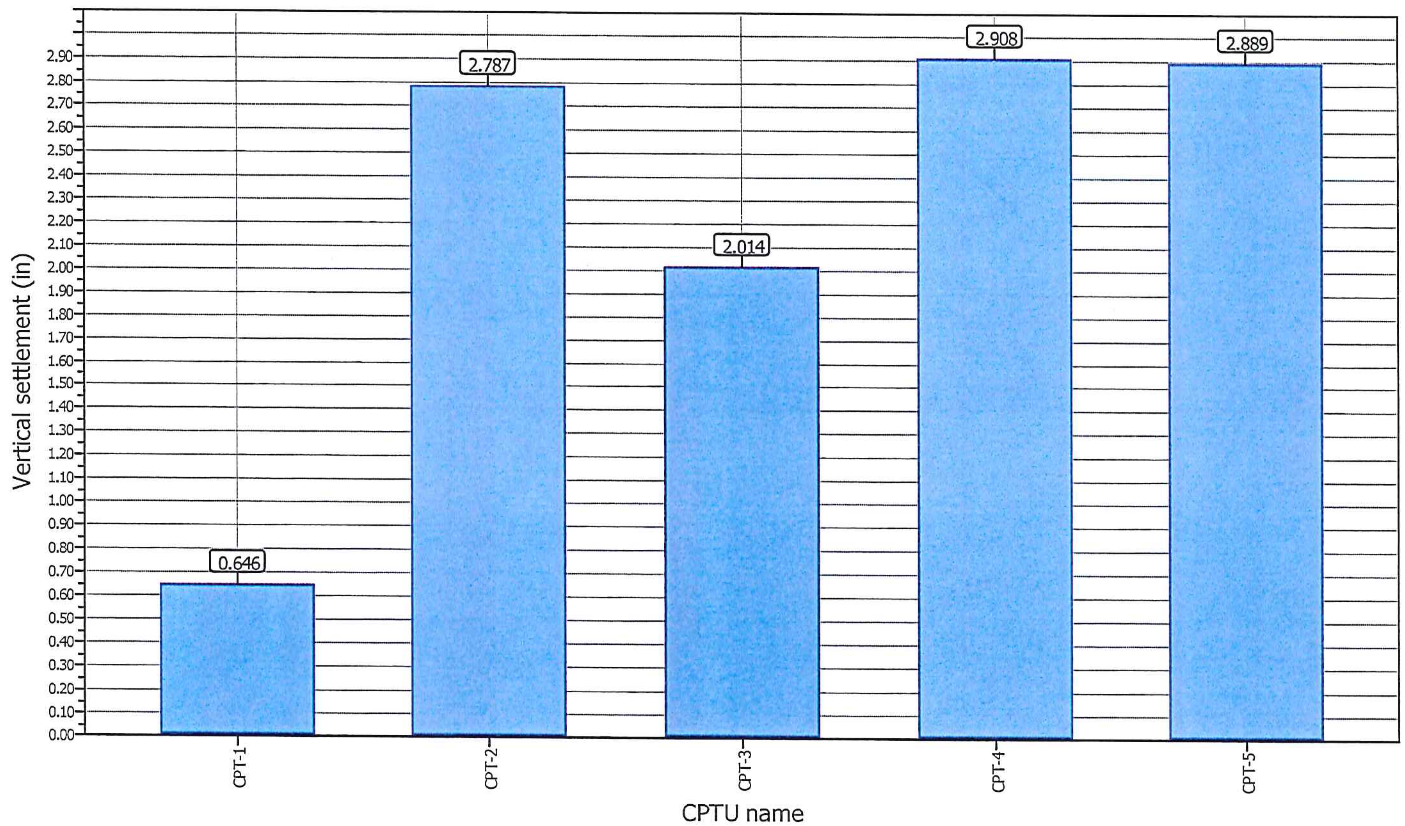
Abbreviations

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

Project title : Lido House Hotel

Location : Balboa Penesula

Overall vertical settlements report



APPENDIX D

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APPENDIX D

Retaining Wall Design Parameters

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BEARING CAPACITY FOR SHALLOW FOOTINGS

(DM 7.2)

Length	Base	Depth	c	φ	γ	q
ft	ft	ft	psf	degrees	pcf	psf
100	2	1.5	50	30	125	187.5

N_q	N_c	N_γ
19.3	32	17

q_{all} (ksf) (FS=3)

Square Footing	
q_{ult}	q_{all}
(ksf)	(ksf)
6.93	2.31

	Base/Length (ft)				Increase from	Increase from
	2	3	4	5	2x2 to 3x3	3x3 to 4x4
Depth (ft)	(2'x2')	(3'x3')	(4'x4')	(5'x5')		
2	2.87	3.15	3.44	3.72	0.283	0.283
3	3.67	3.96	4.24	4.52	0.283	0.283
4	4.48	4.76	5.04	5.33	0.283	0.283
Inc. from 1.5 to 2.5	0.804	0.804	0.804	0.804		
Inc. from 2.5 to 3.5	0.804	0.804	0.804	0.804		

200 psf and 500 psf for every foot increase in footing width and depth, respectively

Continuous Footing	
q_{ult}	q_{all}
(ksf)	(ksf)
7.34	2.45

	Base (ft)					
Depth (ft)	1.5	2	2.5	3	Inc. from 1.5 to 2.5	Inc. from 2 to 3
1.5	2.27	2.45	2.63	2.80	0.354	0.354
2.5	3.08	3.25	3.43	3.61	0.354	0.354
3.5	3.88	4.06	4.23	4.41	0.354	0.354
Inc. from 1.5 to 2.5	0.804	0.804	0.804	0.804		
Inc. from 2.5 to 3.5	0.804	0.804	0.804	0.804		

300 psf and 500 psf for every foot increase in footing width and depth, respectively

Circular Footing

	Diameter (ft)					
Depth (ft)	2	3	4	5	Inc. from 2 to 3	Inc. from 3 to 4
1.5	2.32	2.54	2.75	2.96	**0.213**	**0.213**
2.5	3.13	3.34	3.55	3.77	**0.213**	**0.213**
3.5	3.93	4.15	4.36	4.57	**0.213**	**0.213**
Inc. from 1.5 to 2.5	0.804	0.804	0.804	0.804		
Inc. from 2.5 to 3.5	0.804	0.804	0.804	0.804		

Retaing Wall Lateral Earth Pressures
Summary of Variou Conditions

REQUIRED INPUT PARAMETERS
OUTPUT DATA
Information Required to Be Read for Design

PGA (g):	0.42
K_h/PGA⁺:	0.5

⁺NOTE:

AASHTO seismic design for highway bridges (1983) recommends:	Kh: 0.5 PGA

Whitman and Liao (1985) recommend for M=7

Kh as a Function of PGA & Expected Displacements		
For Displacement to less than (in)	PGA = 0.2g	PGA = 0.4g
1	0.13	0.3
4	0.1	0.25

Use kv of 0.1 & 0.05 for gravity and anchored sheet pile walls, respectively.
Assume the vertical acceleration upward, downward, & zero. Use the conservative results.
$a_h=k_h*g$, $a_v=k_v*g$

γ_t (pcf):	125
Mc (%):	15
γ_b (pcf):	62.6
Gs:	2.65
K_h (g):	0.21
K_v (g):	0

	Degrees	
Friction Angle (ϕ'):	30	
Increase the Strength for Dynamic Event?	no	
Dynamic Firction Angle (ATAN[1.33*TAN(ϕ')]:	30.00	
Ratio* of δ/ϕ' :	0.5	* ϕ/2 < δ < 2ϕ/3
$r_u = \Delta u/\sigma_v'$ (%):	0	

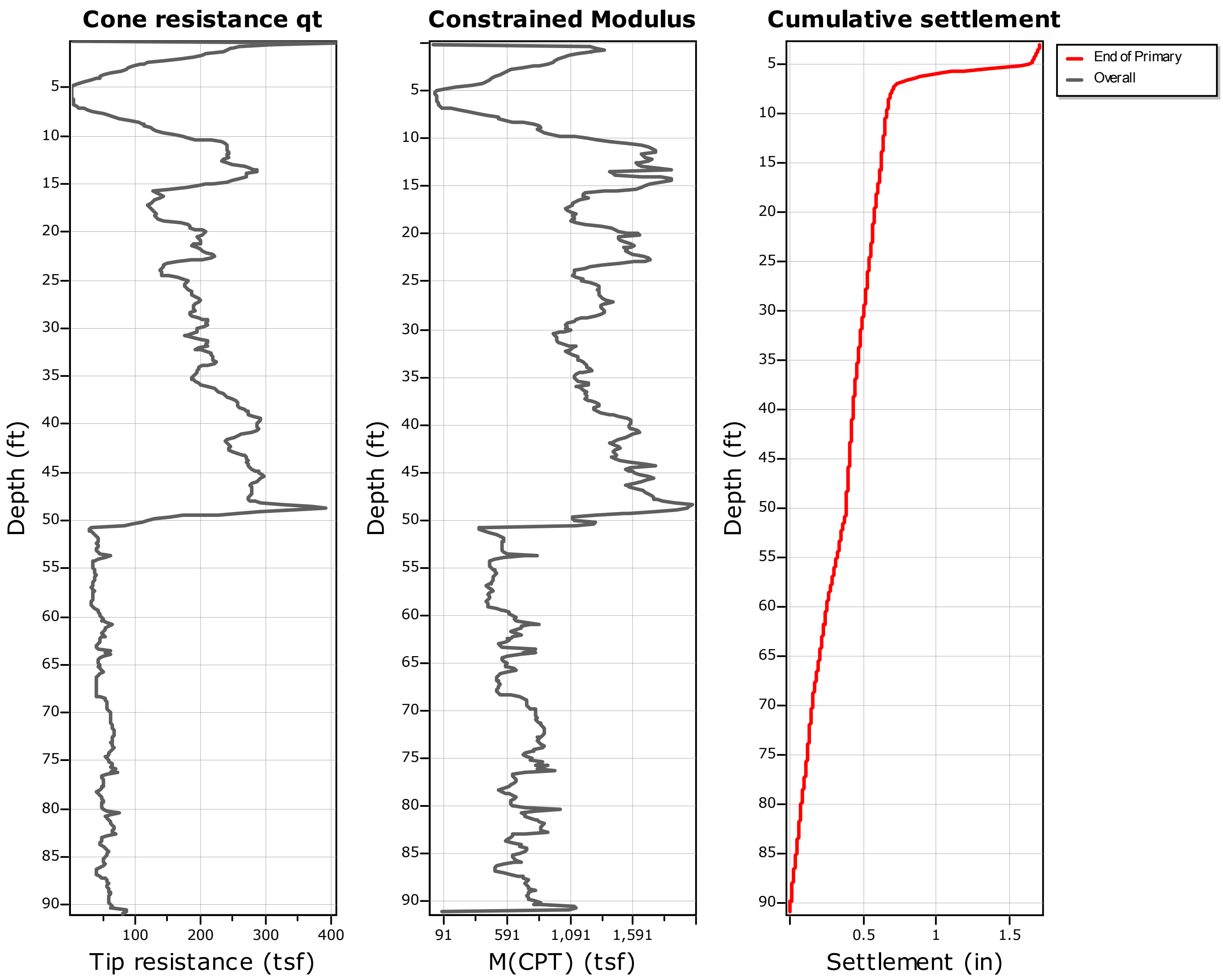
$P_{AE} = 0.5*K_{AE}*[\gamma_t*(1-k_v)]*H^2$

Vertical Wall with flat Backfill

KA:	**0.30**			
	Dry/Moist	**Submerged Ru=0, Restrained Water**	**Submerged Ru=0, Free Water**	**Submerged, Ru, Restrained Water**
Mononobe-Okabe, Whitman & Christian 1970, K_{AE}:	**0.46**	**0.76**	**0.61**	**0.76**
		K_{WD} (@ 0.4H form Base):	**0.25**	
KAE-KA:	**0.16**	**0.45**	**0.56**	**0.45**

RECOMMENDED DESIGN VALUES FOR DRAINED CONDITION		
EFP Active Pressure (pcf):	**38**	**Round Up to 40**
EFP At Rest Pressure (pcf):	**63**	
EFP Seismic (pcf):	**20**	

Settlements calculation according to theory of elasticity*



Caclulation properties

Footing type: Rectangular
Footing width: 125.00 (ft)
L/B: 2.0
Footing pressure: 1.00 (tsf)
Embedment depth: 3.00 (ft)
Footing is rigid: Yes
Remove excavation load: No
Apply 20% rule: No
Calculate secondary settlements: No
Time period for primary consolidation: N/A
Time period for second. settlements: N/A

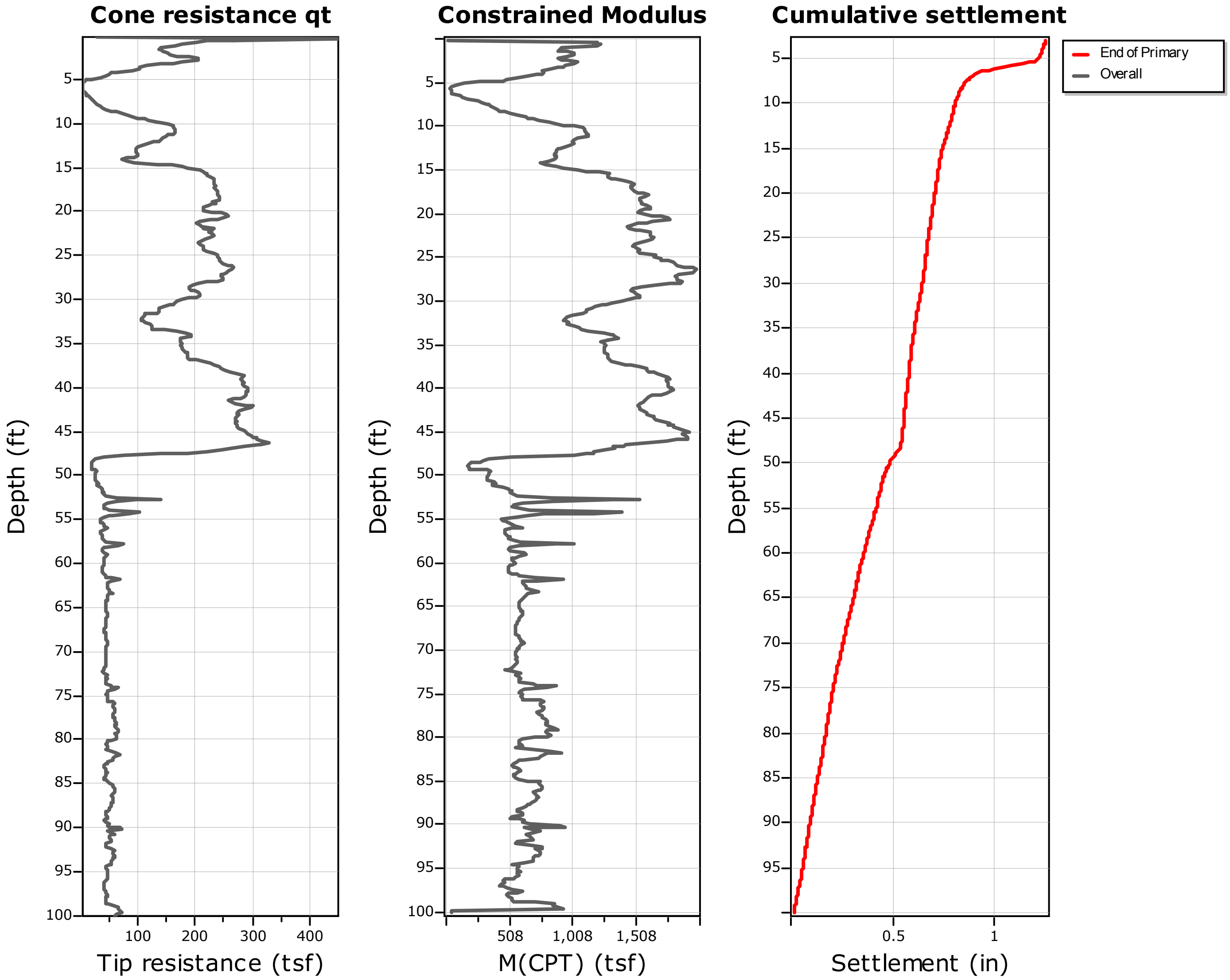
* Primary settlements calculation is performed according to the following formula:

$$S = \sum \frac{\Delta\sigma_v}{M_{CPT}} \Delta z$$

* Secondary (creep) settlements calculation is performed according to the following formula:

$$S = C_a \cdot \Delta z \cdot \log(t)$$

Settlements calculation according to theory of elasticity*



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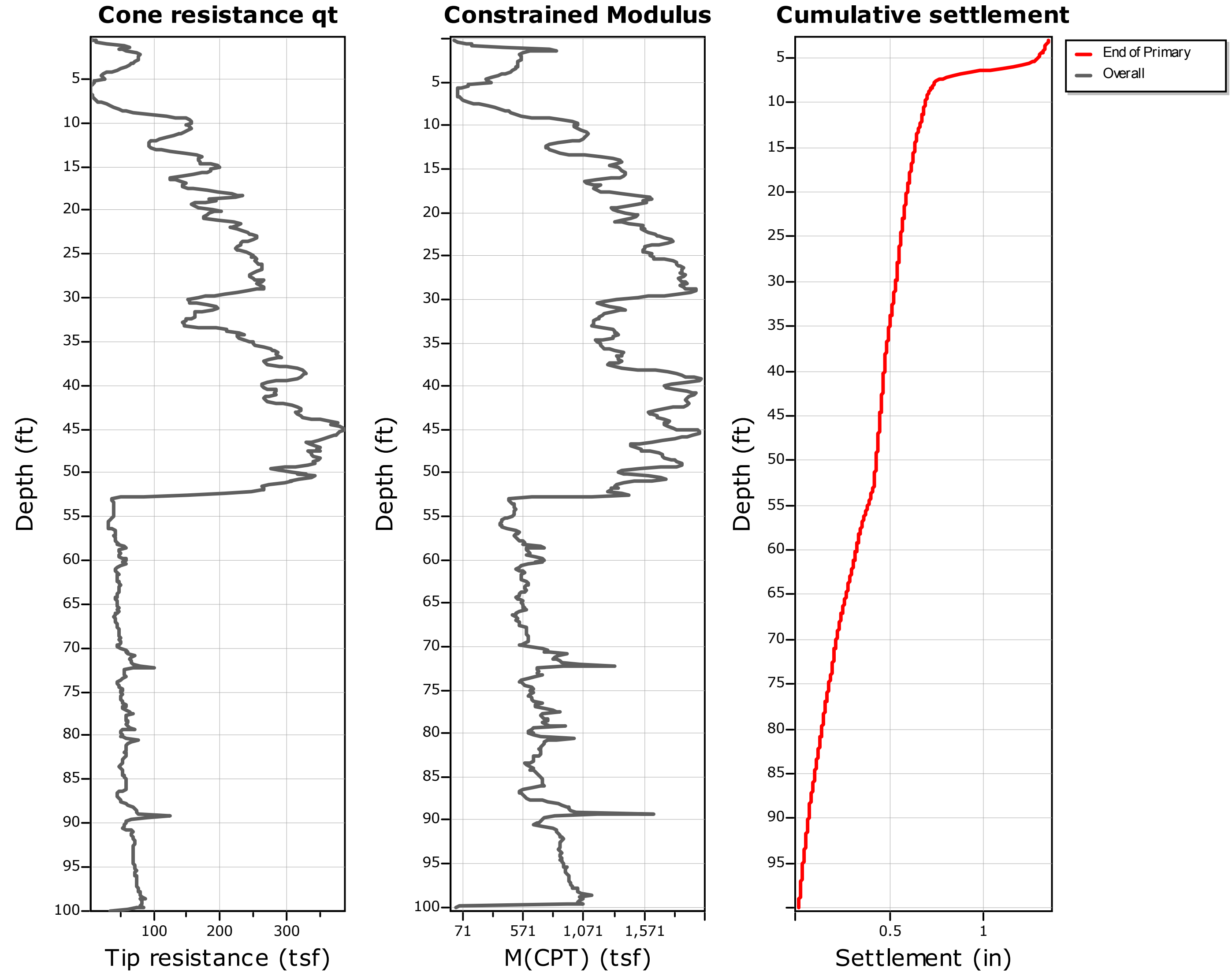

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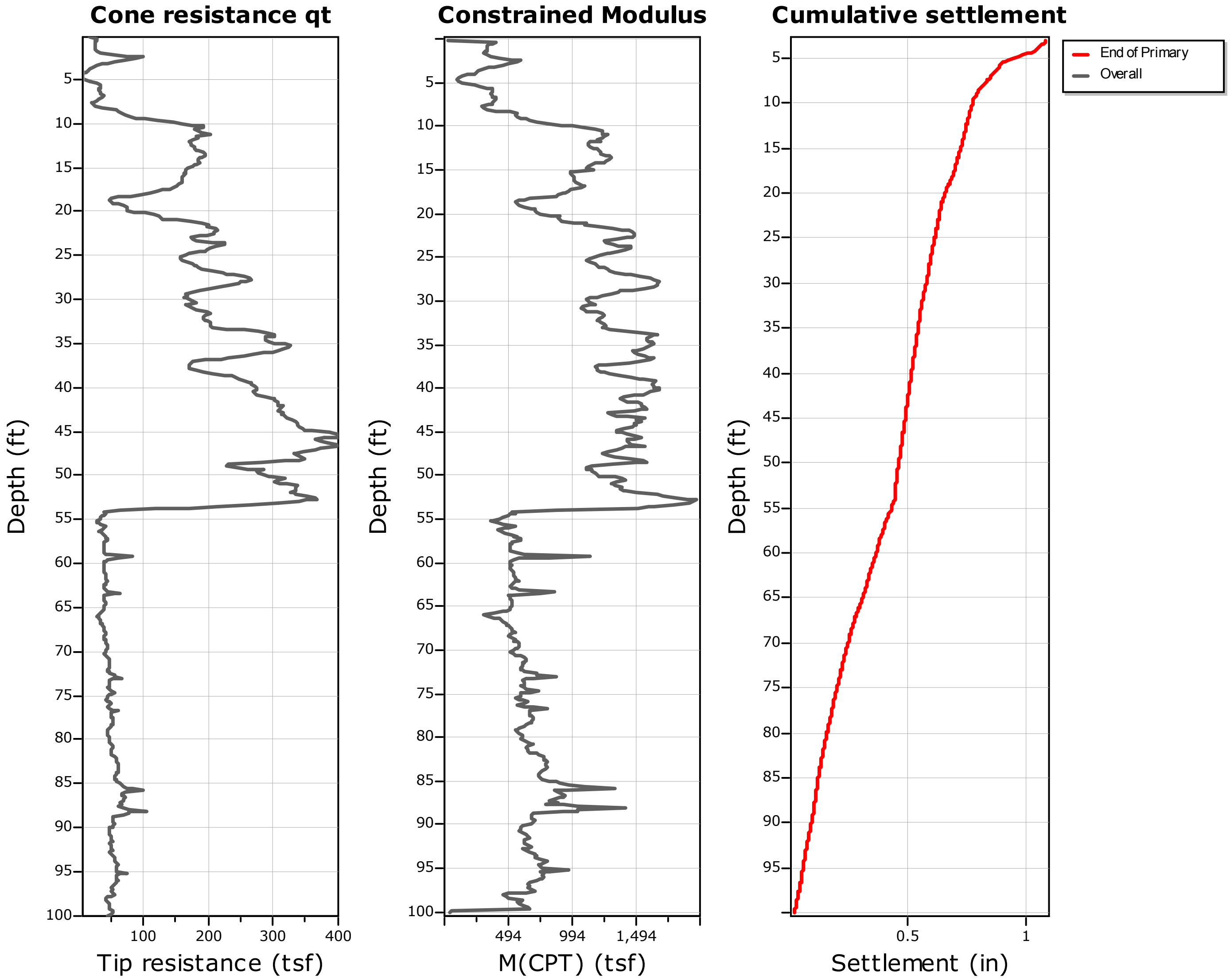

Caclulation properties

Footing type: Rectangular
Footing width: 125.00 (ft)
L/B: 2.0
Footing pressure: 1.00 (tsf)
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