APPENDIX E
Water Quality Management Plan

Joseph C. Truxaw and Associates, Inc.
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June 17, 2019

Kristen Bogue
Michael Baker International
14725 Alton Parkway
Irvine, CA 92618
Via email: kbogue@mbakerintl.com

Subject: Chick-fil-A and In-N-Out Restaurants, Hydrology and WQMP Reports
Santa Ana area of Orange County

Dear Ms. Bogue,

Chick-fil-A, Inc. contracted with Truxaw and Associates in October of 2015 to complete a Conceptual Submittal package for the proposed project at the northeast corner of 17th Street and Tustin Avenue in the County of Orange. The submittal package included the preparation of a Hydrology Study and Conceptual Water Quality Management Plan (WQMP).

The Hydrology Study and WQMP have been revised based on changes to the site plan and the WQMP has been updated to use the current County of Orange WQMP template. The current Hydrology Study and WQMP are adequate for the current submittal package and are not affected by the extended time frame of the project.

Sincerely,

Randy Decker, PE
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
RANDY J. DECKER
No. 81077
CIVIL
STATE OF CALIFORNIA

C-WQMP

County of Orange/Santa Ana Region Priority Project Water Quality Management Plan (WQMP)

Project Name:

Chick-fil-A Restaurant No. 3756
And
In-N-Out Burger Restaurant
NEC of 17th St. and Tustin Avenue
County of Orange, CA

PA160055

Prepared for:

Chick-fil-A Inc.,
15635 Alton Parkway, Suite 350
Irvine, CA 92618
(404) 305-4834
And
In-N-Out Burger
13502 Hamburger Lane
Baldwin Park, CA
(626) 813-8275

Prepared by:

Joseph C. Truxaw & Associates, Inc.

265 S. Anita Drive, Suite 111

Orange, CA 92868

(714) 935-0265

RandyDecker@truxaw.com

May 10, 2017
2nd submittal: September 13, 2017

This Water Quality Management Plan (WQMP) has been prepared for Chick-fil-A, Inc. and In-N-Out Burger by Joseph C. Truxaw & Associates, Inc. The WQMP is intended to comply with the requirements of the County of Orange NPDES Stormwater Program requiring the preparation of the plan.

Project Owner's Certification			
Planning Application No. (If applicable)	PA160055	Grading Permit No.	
Tract/Parcel Map and Lot(s) No.	Portion of Lot 13 in block "B" of the A,B, Chapman Tract rec. Book 102, Page 15 misc.	Building Permit No.	
Address of Project Site and APN (If no address, specify Tract/Parcel Map and Lot Numbers)			APN 396-312-01, -02, -03, -04, -05, -06, -07, -08, -11

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:			
Title			
Company			
Address			
Email			
Telephone #			
I understand my responsibility to implement the provisions of this WQMP including the ongoing operation and maintenance of the best management practices (BMPs) described herein.			
Owner Signature		Date	

Preparer (Engineer):			
Title	Project Engineer	PE Registration #	C 81077
Company	Joseph C. Truxaw & Associates, Inc.		
Address	265 S. Anita Drive, Suite 111, Orange, CA 92868		
Email	randydecker@truxaw.com		
Telephone #	(714) 935-0265		

I hereby certify that this Water Quality Management Plan is in compliance with, and meets the requirements set forth in, Order No. R8-2009-0030/NPDES No. CAS618030, of the Santa Ana Regional Water Quality Control Board.

Preparer Signature		Date	
Place Stamp Here			

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Attachments

Section I Permit(s) and Water Quality Conditions of Approval or Issuance

Provide discretionary or grading/building permit information and water quality conditions of approval, or permit issuance, applied to the project. If conditions are unknown, please request applicable conditions from staff. *Refer to Section 2.1 in the Technical Guidance Document (TGD) available on the OC Planning website (ocplanning.net).*

Project Infomation			
Permit/Application No. (If applicable)	PA160055	Grading or Building Permit No. (If applicable)	Pending
Address of Project Site (or Tract Map and Lot Number if no address) and APN	APN 396-312-01, -02, -03, -04, -05, -06, -07, -08, -11		
Water Quality Conditions of Approval or Issuance			
Water Quality Conditions of Approval or Issuance applied to this project. (Please list verbatim.)	**Final Water Quality Management Plan.** Prior to issuance of a grading permit, the Applicant submit a Final Water Quality Management Plan (WQMP) to the City Public Works Department for review and approval. Both Source Control Best Management Practices (BMPs) and Site Design BMPs designed to reduce impacts to water quality from operation of the Proposed Project shall be identified in the Final WQMP.		
Conceptual WQMP			
Was a Conceptual Water Quality Management Plan previously approved for this project?	This is the Conceptual WQMP		

Watershed-Based Plan Conditions	
Provide applicable conditions from watershed - based plans including WIHMPs and TMDLS.	The project is located within the Newport Bay Watershed. Established TDMLs for the project's receiving waters are as follows: Upper Newport Bay – Sediment, Nutrients, Toxics, and Fecal Coliform.

Section II Project Description

II.1 Project Description

Provide a detailed project description including:

- Project areas;
- Land uses;
- Land cover;
- Design elements;
- A general description not broken down by drainage management areas (DMAs).

Include attributes relevant to determining applicable source controls. *Refer to Section 2.2 in the Technical Guidance Document (TGD) for information that must be included in the project description.*

Description of Proposed Project				
Development Category (From Model WQMP, Table 7.11-2; or -3):	Priority Project			
Project Area (ft²): 96,369	Number of Dwelling Units: 0		SIC Code: 5812	
Project Area	Pervious		Impervious	
	Area (acres or sq ft)	Percentage	Area (acres or sq ft)	Percentage
Pre-Project Conditions	96,369	100%	0	0%
Post-Project Conditions	20,762	21.54%	75,607	78.46%
Drainage Patterns/Connections	The existing storm runoff from the site drains from the north to the south, to 17th Street. At 17th Street, the runoff drains to an existing municipal curb opening catch basin which conveys storm water to a municipal 36" RCP running along 17th Street. A small portion of the northerly area flows westerly to the municipal curb and gutter on Tustin Avenue. The curb and gutter conveys storm water to the same curb opening catch basin on 17th Street. Currently the F11, F10, F06, F05 Reinforced Concrete Trapezoidal Channel owned by the O.C.F.C.D., a public storm drain system is accepting the runoff from the site and			

	delivering to the Upper Newport Bay and finally to the Pacific Ocean.
Narrative Project Description: (Use as much space as necessary.)	This project is located at the NEC of 17th St. and Tustin Avenue in the County of Orange, California. The project is bound to the north by vacant private land, to the east by Ponderosa Street, to the south by 17th Street, and to the west by Tustin Avenue. The soil type is "B" as determined from the soils maps in the Orange County Hydrology Manual. See Appendix. The proposed site consists of multiple lots that will be adjusted to accommodate the Chick-fil-A and In-n-Out Burger developments, approximately 96,369 SF. The parcel is currently undeveloped vacant land. The proposed improvements to the site include the construction of a new Chick-fil-A Restaurant (4,777 SF) with drive-thru and a new In-N-Out Burger Restaurant (3,867 SF) with drive-thru, storage area with trash enclosures, paving of traffic and parking areas, and landscape planters. Site runoff will be collected by a private storm drain system and conveyed to underground infiltration systems for treatment. The overflow will be conveyed to municipal curb and gutter in Tustin Avenue via parkway drains and then to the municipal curb opening catch basin in 17th Street. The proposed landscape areas will be irrigated with efficient irrigation systems and will be planted with drought-tolerant plant materials as selected by the project landscape architect.

II.2 Potential Stormwater Pollutants

Determine and list expected stormwater pollutants based on land uses and site activities. *Refer to Section 2.2.2 and Table 2.1 in the Technical Guidance Document (TGD) for guidance.*

Pollutants of Concern			
Pollutant	Check One for each: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E ☒	N ☐	Expected
Nutrients	E ☒	N ☐	Expected due to landscape areas
Heavy Metals	E ☒	N ☐	Expected
Pathogens (Bacteria/Virus)	E ☒	N ☐	Expected
Pesticides	E ☒	N ☐	Expected due to landscape areas
Oil and Grease	E ☒	N ☐	Expected
Toxic Organic Compounds	E ☒	N ☐	Expected
Trash and Debris	E ☒	N ☐	Expected

II.3 Hydrologic Conditions of Concern

Determine if streams located downstream from the project area are potentially susceptible to hydromodification impacts. *Refer to Section 2.2.3.1 in the Technical Guidance Document (TGD) for North Orange County or Section 2.2.3.2 for South Orange County.*

☐ No – Show map

☒ Yes – Describe applicable hydrologic conditions of concern below. *Refer to Section 2.2.3 in the Technical Guidance Document (TGD).*

The proposed project is within the blue zone of the Susceptibility Map. (See Appendix) To determine if hydrologic condition of concern (HCOC) is applicable, the 2-year, 24-hour runoff event for the pre- and post-development are compared. Using Equation III.1 from the Orange County TGD, the runoff volume associated is calculated.

V = C x d x A x 43,560 sf/ac x 1ft/12in

C = (0.75 x imp) + 0.15

d = storm depth (inches) = 2.10 inches (Per Figure B-1 from OC Hydrology Manual)

A = tributary area (acres) = 2.21 acres

Pre-development

C = (0.75 x 0) + 0.15 = 0.15

V = 0.15 x 2.10 in x 2.21 x 43560 x (1/12)

V_{PRE} = 2,527 CF

Post-development

RUNOFF COEFFICIENT CALCULATIONS
DMA-1:
C_{DMA-1} for 88.37% impervious = 0.8837 x 0.75 + 0.15 = 0.813
DMA-2:
C_{DMA-2} for 93.48% impervious = 0.9348 x 0.75 + 0.15 = 0.851
DMA-1:
V_{DMA-1} = 0.813 x 2.10 in x 0.887 ac x 43560 sf/ac x 1/12 in/ft. = 5,497 **cf**
DMA-2:
V_{DMA-2} = 0.851 x 2.10 in x 0.971 ac x 43560 sf/ac x 1/12 in/ft. = 6,299 **cf**
V_{POST} = 11,796 CF

Δ2-yr Vol = V_{POST} - V_{PRE} = 11,796 – 2,527 = 9,269 CF

Hydromodification is required.

II.4 Post Development Drainage Characteristics

Describe post development drainage characteristics. *Refer to Section 2.2.4 in the Technical Guidance Document (TGD).*

Drainage of the proposed improvement will be directed to the existing F11, F10, F06, F05 public storm drain system owned by O.C.F.C.D. The site discharges to the Upper Newport Bay, to the Lower Newport Bay and finally conveyed to the Pacific Ocean via the Main Channel.

II.5 Property Ownership/Management

Describe property ownership/management.

Property will continue to be owned by the Hall Family Trust. Chick-fil-A, Inc. and In N Out Burger will have lease agreements for their respective parcels.

No infrastructure will transfer to a public agency.

No homeowners or property owners associations will be formed.

Section III Site Description

III.1 Physical Setting

Fill out table with relevant information. *Refer to Section 2.3.1 in the Technical Guidance Document (TGD).*

Name of Planned Community/Planning Area (if applicable)	N/A
Location/Address	NEC of 17th Street and Tustin Avenue
	Santa Ana area of Orange County
General Plan Land Use Designation	Vacant land
Zoning	Local Business Commercial
Acreage of Project Site	2.21
Predominant Soil Type	As per the Orange County Infiltration Study, native soils are classified as "B". See Figures VXI-2a and 2b, in Attachment C.

III.2 Site Characteristics

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.2 in the Technical Guidance Document (TGD).*

Site Characteristics	
Precipitation Zone	Site is located in the rainfall zone of 0.80 inches design capture storm depth per figure XVI- 1 in Attachment C.
Topography	The site is vacant land with no pavement and relatively flat, sloping north to south.

Drainage Patterns/Connections	The existing storm runoff from the site drains from the north to the west and south, to Tustin Avenue and 17th Street respectively. At 17th Street, there is an existing curb opening catch basin and an existing 36" RCP running along 17th Street. Currently the F11, F10, F06, F05 Reinforced Concrete Trapezoidal Channel owned by the O.C.F.C.D., a public storm drain system is accepting the runoff from the site and delivering to the Upper Newport Bay and finally to the Pacific Ocean
Soil Type, Geology, and Infiltration Properties	Infiltration is feasible per measured rate of 0.60 in/hr from infiltration testing. See Geotechnical Engineering Investigation report by Krazen & Associates Inc., dated May 13, 2013 in Attachment D.
Hydrogeologic (Groundwater) Conditions	Groundwater was not encountered during boring tests to a depth of 50 feet. Per Figure XVI-2d, depth approximately 35 feet.
Geotechnical Conditions (relevant to infiltration)	See above.
Off-Site Drainage	Run-on drainage is not encountered.
Utility and Infrastructure Information	There is no existing underground or infrastructure within project site. Proposed infiltration systems to be away from buildings and proposed underground utilities.

III.3 Watershed Description

Fill out table with relevant information and include information regarding BMP sizing, suitability, and feasibility, as applicable. *Refer to Section 2.3.3 in the Technical Guidance Document (TGD).*

Receiving Waters	Drainage of the proposed improvement will be directed to the existing facilities F11, F10, F06, F05 and will be accepted by the existing public storm drain system owned by O.C.F.C.D. The site discharges to the Upper Newport Bay, to the Lower Newport Bay and finally conveyed to the Pacific Ocean via the Main Channel.
303(d) Listed Impairments	Pathogens. Category 5A. See attached sheets.
Applicable TMDLs	Category 5A - 303(d) list requiring the development of a TMDL

Pollutants of Concern for the Project

Pollutants of Concern

Pollutant	Circle One: E=Expected to be of concern N=Not Expected to be of concern		Additional Information and Comments
Suspended-Solid/ Sediment	E ☒	N ☐	Expected
Nutrients	E ☒	N ☐	Expected due to the landscape areas
Heavy Metals	E ☒	N ☐	Expected
Pathogens (Bacteria/Virus)	E ☒	N ☐	Expected
Pesticides	E ☒	N ☐	Expected due to the landscape areas
Oil and Grease	E ☒	N ☐	Expected
Toxic Organic Compounds	E ☒	N ☐	Expected
Trash and Debris	E ☒	N ☐	Expected

Environmentally Sensitive and Special Biological Significant Areas	The project is not located adjacent to or within 200 feet of an Environmentally Sensitive Area (ESA). The project does not discharge directly to an ESA. There are no Areas of Special Biological Significance (ASBS) within the vicinity of the project.

Section IV Best Management Practices (BMPs)

IV. 1 Project Performance Criteria

Describe project performance criteria. Several steps must be followed in order to determine what performance criteria will apply to a project. These steps include:

- If the project has an approved WIHMP or equivalent, then any watershed specific criteria must be used and the project can evaluate participation in the approved regional or sub-regional opportunities. (Please ask your assigned planner or plan checker regarding whether your project is part of an approved WIHMP or equivalent.)
- Determine applicable hydromodification control performance criteria. *Refer to Section 7.II-2.4.2.2 of the Model WQMP.*
- Determine applicable LID performance criteria. *Refer to Section 7.II-2.4.3 of the Model WQMP.*
- Determine applicable treatment control BMP performance criteria. *Refer to Section 7.II-3.2.2 of the Model WQMP.*
- Calculate the LID design storm capture volume for the project. *Refer to Section 7.II-2.4.3 of the Model WQMP.*

(NOC Permit Area only) 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 ☒
If yes, describe WIHMP feasibility criteria or regional/sub-regional LID opportunities.		

Project Performance Criteria	
If HCOC exists, list applicable hydromodification control performance criteria (Section 7.II-2.4.2.2 in MWQMP)	Due to the increase in 2-Yr, 24-hour volume from pre-development to post-development, hydromodification is required. The underground infiltration system will be sized to accommodate the Delta 2 year volume (9,269 CF) and not the 85-percentile 24-hour event volume. (4,494 CF)
List applicable LID performance criteria (Section 7.II-2.4.3 from MWQMP)	The LID treatment will be achieved by infiltration. Per Appendix I of the TGD, the Design Capture Volume (DCV) will be the Delta 2-yr volume.
List applicable treatment control BMP performance criteria (Section 7.II-3.2.2 from MWQMP)	N1. Education for Property Owners, tenants and occupants – No Property Owners Association. Copies of this manual shall be used by the owner of this site and shall be responsible for the training of their employees on proper BMP procedures that apply to their portion of the site. N2. Activity Restrictions - Documents shall be prepared by the owner for the purpose of surface water quality protection. N3. Common Area Landscape Management – Ongoing maintenance consistent with County Water Conservation Resolution, with the City of Santa Ana model water efficient landscape ordinance, and fertilizer and pesticide usage consistent with County N4. BMP Maintenance – The owner will be responsible for implementing each non-structural BMP and schedule cleaning and maintenance of all BMP structural facilities as shown on Section V. N5. Title 22 CCR Complaince – N/A. No hazardous waste at the site. N6. Local Industrial Permit Compliance – N/A City of Santa Ana does not issue water quality permits. N7. Spill Contingency Plan – N/A. No spill contingency plan is required.

N8. Underground Storage Tank Compliance – N/A. No underground storage tanks are proposed at the site.

N9. Hazardous Materials Disclosure Compliance – N/A. No hazardous materials at the site.

N10. Uniform Fire Code Implementation – N/A. Property owner is not required to comply with Article 80 of the Uniform Fire Code.

N11. Common Area Litter Control – The owner will be required to implement trash management and litter control procedures in the areas aimed at reducing pollution of drainage water.

N12. Employee Training – Education program as it would apply to future employees of the restaurantes.

N13. Housekeeping of Loading Docks – N/A. No proposed loading dock at the site..

N14. Common Area Catch Basin Inspection - The owner shall have all onsite proposed catch basins inspected and, if necessary, cleaned prior to the wet season, no later than October 1st each year.

N15. Street Sweeping Private Streets and Parking Lots – Sweeping of the private parking lots will be the responsibility of the owner.

N16. Retail Gasoline Outlets – N/A. No retail gasoline outlets are proposed at the site.

STRUCTURAL MEASURES

S1.- Storm Drain System Stenciling and Signage. Storm drain stencils are highly visible source control messages, typically placed directly adjacent to storm drain inlets. The stencils contain a brief statement that prohibits the dumping of improper materials into the municipal storm drain system.

S2 -Design Outdoor Hazardous Material Storage Areas to Reduce Pollutant Introduction. N/A. No hazardous materials at the site.

S3 -Design Trash Enclosures to Reduce Pollutant Introduction. Trash enclosure areas will be paved and have perimeter walls and gates.

S4 - Use Efficient Irrigation Systems and Landscape Design
Projects shall design the timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the municipal storm drain system.

	S5 - Protect Slopes and Channels. N/A. No slope areas to be protect. No channels to protect at the site. S6- Loading Dock Areas. N/A. No loading area is proposed. S7 - Maintenance Bays. N/A. No maintenance Bays at the site S8 - Vehicle Wash Areas. N/A. No vehicle Wash areas at the site. S9 - Outdoor Processing Areas. N/A. No outdoor processing areas at the site. S10 - Equipment Wash Areas. N/A. No equipment wash areas at the site. S11 - Fueling Areas. N/A. No proposed fueling area at the site. S12 - Site Design and Landscape Planning (Hillside Landscaping). N/A - Project not located within a hillside area S13 - Wash Water Controls for Food Preparation Areas. N/A. Wash Water for food preparation will be located inside the restaurant buildings. S14-- Community Car Wash Racks. N/A. TREATMENT CONTROL MEASURES Design LID BMPs using the assumed Principal Unit Operations and Processes Provided of Filtration, Sorption/Ion Exchange and Volume loss, will be reached by Underground Infiltration gallery as shown on Plan. See WQMP.
Calculate LID design storm capture volume for Project.	LID DESIGN STORM CAPTURE VOLUME Priority projects must retain on-site stormwater runoff as feasible up to the Design Capture Volume. (Delta 2-year event or 85th percentile, 24-hour storm event) As per TGD the volume will be: $V = d \times C \times A \times 43{,}560/12$ Where: d = Design Capture storm depth in inches, d = 0.80 in per Figure XVI-1 C = Runoff coefficient $C = (0.75 \times Imp + 0.15)$ Imp = Impervious in decimal A = area of DMA in acres <u>RUNOFF COEFFICIENT CALCULATIONS</u> <u>DMA-1</u>: C_{DMA-1} for 88.37% impervious = $0.8837 \times 0.75 + 0.15 = 0.813$ <u>DMA-2</u>: C_{DMA-2} for 93.48% impervious = $0.9348 \times 0.75 + 0.15 = 0.851$

	DESIGN CAPTURE VOLUME CALCULATIONS (85th-percentile) DMA-1: V_{DMA-1} = 0.813 x 0.80 in x 0.887 ac x 43560 sf/ac x 1/12 in/ft. = **2,094 cf** DMA-2: V_{DMA-2} = 0.851 x 0.80 in x 0.971 ac x 43560 sf/ac x 1/12 in/ft. = **2,400 cf** DESIGN CAPTURE VOLUME CALCULATIONS (2-Year, 24-hour) DMA-1: V_{DMA-1} = 0.813 x 2.10 in x 0.887 ac x 43560 sf/ac x 1/12 in/ft. = 5,497 **cf** DMA-2: V_{DMA-2} = 0.851 x 2.10 in x 0.971 ac x 43560 sf/ac x 1/12 in/ft. = 6,299 **cf** V_{POST} = 11,796 CF Δ2-yr Vol = V_{POST} - V_{PRE} = 11,796 – 2,527 = **9,269 CF**

IV.2. Site Design and Drainage

Describe site design and drainage including

- A narrative of site design practices utilized or rationale for not using practices;
- A narrative of how site is designed to allow BMPs to be incorporated to the MEP
- A table of DMA characteristics and list of LID BMPs proposed in each DMA.
- Reference to the WQMP "BMP Exhibit."
- Calculation of Design Capture Volume (DCV) for each drainage area.
- A listing of GIS coordinates for LID and Treatment Control BMPs.

Refer to Section 2.4.2 in the Technical Guidance Document (TGD).

Site Design BMPs

Technique	Included?		Description of Method
	Yes	No	
Minimize Impervious Area/Maximize Permeability (C-Factor Reduction)	X		Minimum parking and drive-aisle widths used to minimize impervious area
Minimize Directly Connected Impervious Areas (DCIAs) (C-Factor Reduction)		X	
Create Reduced or "Zero Discharge" Areas (Runoff Volume Reduction)		X	
Conserve Natural Areas (C-Factor Reduction)		X	

Infiltration BMP will be installed to treat runoff from the DMAs. The next Table shows the characteristics of the DMAs and the proposed LID BMPs. The project's DMA's are described below:

Table 1.-DRAINAGE MANAGEMENT AREAS

DMA	SURFACE TYPE	AREA acres	PERVIOUS		IMPERVIOUS		PROPOSED LID BMP
DMA -1	ROOF -PAV. LANDSCAPE	0.887	0.103 ac.	11.63 %	0.784 ac.	88.37 %	**Infiltration.**
DMA-2	ROOF – PAV. LANDSCAPE	0.971	0.063 ac.	6.52 %	0.908 ac.	93.48 %	**Infiltration.**

IV.3 LID BMP Selection and Project Conformance Analysis

Each sub-section below documents that the proposed design features conform to the applicable project performance criteria via check boxes, tables, calculations, narratives, and/or references to worksheets. *Refer to Section 2.4.2.3 in the Technical Guidance Document (TGD) for selecting LID BMPs and Section 2.4.3 in the Technical Guidance Document (TGD) for conducting conformance analysis with project performance criteria.*

IV.3.1 Hydrologic Source Controls (HSCs)

If required HSCs are included, fill out applicable check box forms. If the retention criteria are otherwise met with other LID BMPs, include a statement indicating HSCs not required.

Name	Included?
Localized on-lot infiltration	☐
Impervious area dispersion (e.g. roof top disconnection)	☐
Street trees (canopy interception)	☐
Residential rain barrels (not actively managed)	☐
Green roofs/Brown roofs	☐
Blue roofs	☐
Impervious area reduction (e.g. permeable pavers, site design)	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐
Other:	☐

IV.3.2 Infiltration BMPs

Identify infiltration BMPs to be used in project. If design volume cannot be met, state why.

Name	Included?
Bioretention without underdrains	☐
Rain gardens	☐
Porous landscaping	☐
Infiltration planters	☐
Retention swales	☐
Infiltration trenches	☐
Infiltration basins	☐
Drywells	☐
Subsurface infiltration galleries	☒
French drains	☐
Permeable asphalt	☐
Permeable concrete	☐
Permeable concrete pavers	☐
Other:	☐
Other:	☐

Show calculations below to demonstrate if the LID Design Strom Capture Volume can be met with infiltration BMPs. If not, document how much can be met with infiltration and document why it is not feasible to meet the full volume with infiltration BMPs.

ON-SITE SUBSURFACE INFILTRATION GALLERIES

Note: The underground infiltration systems are being sized based on the drainage subareas. See Attachment G for drainage map.

LID DESIGN STORM CAPTURE VOLUME
Priority projects must retain on-site stormwater runoff as feasible up to the Design Capture Volume (Delta 2-Year, 24-hour storm event).

The volume to detain from the Delta 2-Year, 24-hour storm event $V_{POST} - V_{PRE} = 11{,}796 - 2{,}527 = \mathbf{9{,}269}$ **CF**.

	DCV	PROPOSED BMP	PROVIDED VOLUME	FOOTPRINT
DMA-1	9,269 CF / 2 = 4,634.5 CF	Cultec Infiltration System	4,781 ft^3	2,102 ft^2
DMA-2	9,269 CF / 2 = 4,634.5 CF	Cultec Infiltration System	4,685 ft^3	2,073 ft^2

Observation Well

Provide a vertical riser pipe as recommended by the manufacturer.

IV.3.3 Evapotranspiration, Rainwater Harvesting BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, describe any evapotranspiration and/or rainwater harvesting BMPs included.

Name	Included?
All HSCs; *See Section IV.3.1*	☐
Surface-based infiltration BMPs	☐
Biotreatment BMPs	☐
Above-ground cisterns and basins	☐
Underground detention	☐
Other:	☐
Other:	☐
Other:	☐

CULTEC

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Prepared For:	Project Information:	Engineer:	Calculations Performed By:
Name	In N Out Burger	Randy Decker	Name
Company Name	NEC 17th St & Tustin Ave	Truxaw & Associates	Company Name
Street Address	Orange County	265 S. Anita Drive, Suite 111	Street Address
City	CA	Orange	City
State Zip		CA 92868	State Zip
Phone	Date: September 19, 2017	714-935-0265	Phone
Fax		714-935-0106	Fax
Email		randydecker@truxaw.com	Email

Input Given Parameters

Unit of Measure	English	
Select Model	Recharger 330XLHD	
Stone Porosity	40.0%	
Number of Header Systems	1 Header	
Stone Depth **Above** Chamber	6	inches
Stone Depth **Below** Chamber	6	inches
Workable Bed Depth	5.00	feet
Max. Bed Width	36.00	feet
Storage Volume Required	4635.00	cu. feet

Image for visual reference only.May not reflect selected model.

Chamber Specifications		
Height	30.5	inches
Width	52.00	inches
Length	8.50	feet
Installed Length	7.00	feet
Bare Chamber Volume	52.21	cu. feet
Installed Chamber Volume	79.26	cu. feet
Bed Depth	4.63	feet
Bed Width	35.33	feet
Storage Volume Provided	4781.29	cu. feet

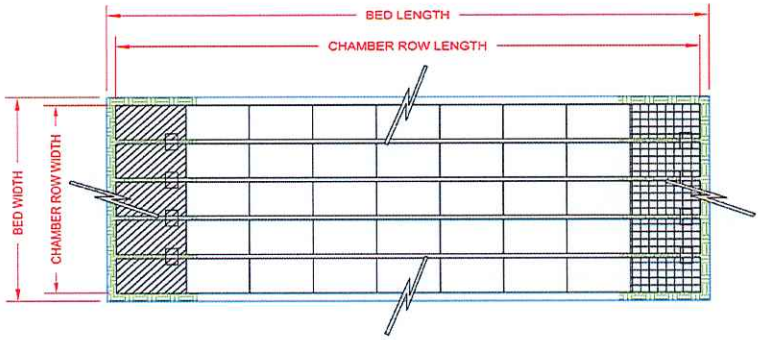
Materials List

Recharger 330XLHD Stormwater System by CULTEC, Inc.

Approx. Unit Count - not for construction	58	pieces
Actual Number of Chambers Required	56	pieces
Starter Chambers	7	pieces
Intermediate Chambers	42	pieces
End Chambers	7	pieces

HVLV FC-24 Feed Connector	6	pieces
CULTEC No. 410™ Filter Fabric	596.00	sq. yards
CULTEC No. 20L Polyethylene Liner	35.33	feet
Stone	164.47	cu. yards

Bed Detail



Number of Rows Wide	7	pieces
Number of Chambers Long	8	pieces
Chamber Row Width	33.33	feet
Chamber Row Length	57.50	feet
Bed Width	35.33	feet
Bed Length	59.50	feet
Bed Area Required	2102.33	sq. feet

Bed detail for reference only. Not project specific. Not to scale. Use CULTEC StormGenie to output project specific detail.

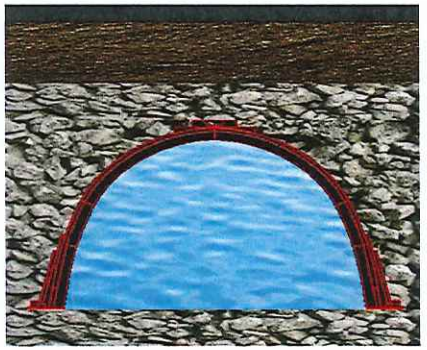
CULTEC, Inc.
P.O. Box 280, Brookfield, CT 06804 USA
Phone: 203-775-4416 - Fax: 203-775-1462 - **www.cultec.com**

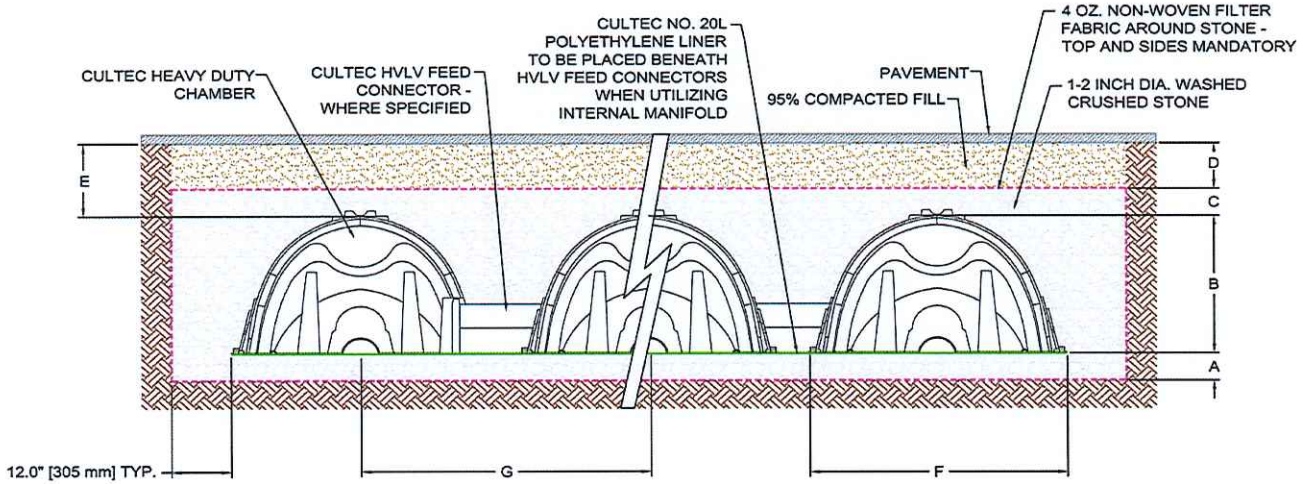
Project Name: In N Out Burger **Date:** September 19, 2017

Cross Section Detail

Conceptual graphic only. Not job specific.

Recharger 330XLHD		
Pavement	3	inches
95% Compacted Fill	10	inches
Stone Above	6	inches
Chamber Height	30.5	inches
Stone Below	6	inches
Effective Depth	42.5	inches
Bed Depth	55.5	inches





A	Depth of Stone Base	6.0	inches
B	Chamber Height	30.5	inches
C	Depth of Stone Above Units	6.0	inches
D	Depth of 95% Compacted Fill	10.0	inches
E	Max. Depth of Cover Allowed Above Crown of Chamber	12.0	feet
F	Chamber Width	52.0	inches
G	Center to Center Spacing	4.83	feet

Breakdown of Storage Provided by Recharger 330XLHD	Stormwater System	
Chambers	3002.25	cu. feet
Feed Connectors	2.73	cu. feet
Stone	1776.31	cu. feet
Total Storage Provided	4781.29	cu. feet

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CULTEC

Founder of Plastic Chamber Technology
Stormwater and Septic Solutions
Since 1986

1-800-4-CULTEC
custservice@cultec.com

Prepared For:	Project Information:	Engineer:	Calculations Performed By:
Name	In N Out Burger	Randy Decker	Name
Company Name	NEC 17th St & Tustin Ave	Truxaw & Associates	Company Name
Street Address	Orange County	265 S. Anita Drive, Suite 111	Street Address
City	CA	Orange	City
State Zip	Date: September 19, 2017	CA 92868	State Zip
Phone		714-935-0265	Phone
Fax		714-935-0106	Fax
Email		randydecker@truxaw.com	Email

Input Given Parameters

Unit of Measure	English	
Select Model	Recharger 330XLHD	
Stone Porosity	40.0%	
Number of Header Systems	1 Header	
Stone Depth **Above** Chamber	6	inches
Stone Depth **Below** Chamber	6	inches
Workable Bed Depth	5.00	feet
Max. Bed Width	30.00	feet
Storage Volume Required	4625.00	cu. feet

Image for visual reference only.May not reflect selected model.

Chamber Specifications		
Height	30.5	inches
Width	52.00	inches
Length	8.50	feet
Installed Length	7.00	feet
Bare Chamber Volume	52.21	cu. feet
Installed Chamber Volume	79.26	cu. feet
Bed Depth	4.63	feet
Bed Width	25.67	feet
Storage Volume Provided	4684.76	cu. feet

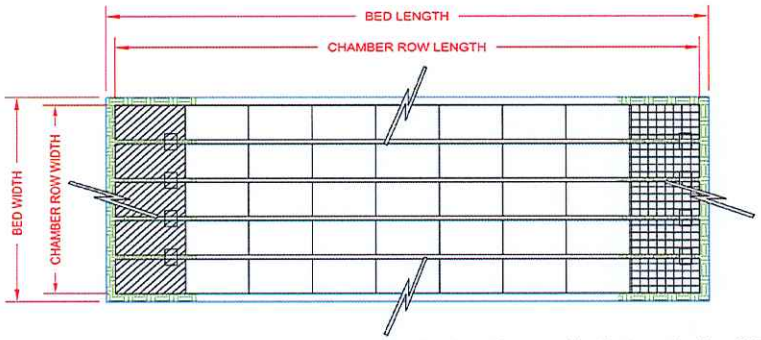
Materials List

Recharger 330XLHD Stormwater System by CULTEC, Inc.

Approx. Unit Count - not for construction	58	pieces
Actual Number of Chambers Required	55	pieces
Starter Chambers	5	pieces
Intermediate Chambers	45	pieces
End Chambers	5	pieces

HVLV FC-24 Feed Connector	4	pieces
CULTEC No. 410™ Filter Fabric	596.98	sq. yards
CULTEC No. 20L Polyethylene Liner	25.67	feet
Stone	162.53	cu. yards

Bed Detail



Number of Rows Wide	5	pieces
Number of Chambers Long	11	pieces
Chamber Row Width	23.67	feet
Chamber Row Length	78.50	feet
Bed Width	25.67	feet
Bed Length	80.50	feet
Bed Area Required	2066.17	sq. feet

Bed detail for reference only. Not project specific. Not to scale. Use CULTEC StormGenie to output project specific detail.

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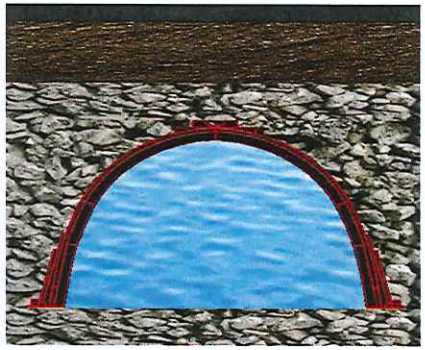
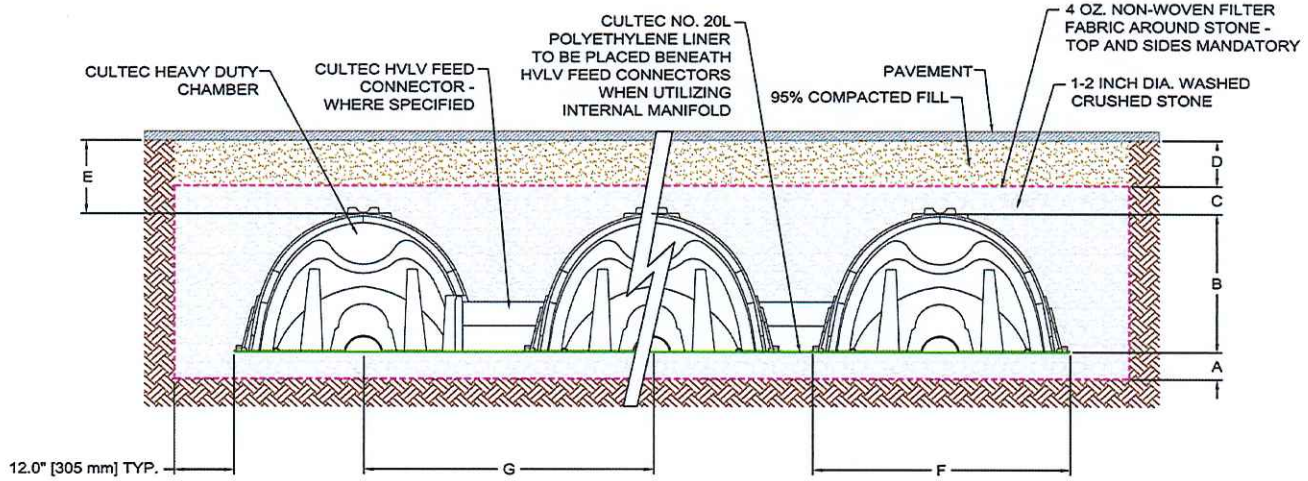
Project Name: In N Out Burger **Date:** September 19, 2017

Cross Section Detail

Conceptual graphic only. Not job specific.

Recharger 330XLHD		
Pavement	3	inches
95% Compacted Fill	10	inches
Stone Above	6	inches
Chamber Height	30.5	inches
Stone Below	6	inches
Effective Depth	42.5	inches
Bed Depth	55.5	inches





A	Depth of Stone Base	6.0	inches
B	Chamber Height	30.5	inches
C	Depth of Stone Above Units	6.0	inches
D	Depth of 95% Compacted Fill	10.0	inches
E	Max. Depth of Cover Allowed Above Crown of Chamber	12.0	feet
F	Chamber Width	52.0	inches
G	Center to Center Spacing	4.83	feet

Breakdown of Storage Provided by Recharger 330XLHD	Stormwater System	
Chambers	2927.66	cu. feet
Feed Connectors	1.82	cu. feet
Stone	1755.28	cu. feet
Total Storage Provided	4684.76	cu. feet

CULTEC, Inc.
P.O. Box 280, Brookfield, CT 06804 USA
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Show calculations below to demonstrate if the LID Design Storm Capture Volume can be met with evapotranspiration and/or rainwater harvesting BMPs in combination with infiltration BMPs. If not, document below how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with these BMP categories.

IV.3.4 Biotreatment BMPs

If the full Design Storm Capture Volume cannot be met with infiltration BMPs, and/or evapotranspiration and rainwater harvesting BMPs, describe biotreatment BMPs included. Include sections for selection, suitability, sizing, and infeasibility, as applicable.

Name	Included?
Bioretention with underdrains	☐
Stormwater planter boxes with underdrains	☐
Rain gardens with underdrains	☐
Constructed wetlands	☐
Vegetated swales	☐
Vegetated filter strips	☐
Proprietary vegetated biotreatment systems	☐
Wet extended detention basin	☐
Dry extended detention basins	☐
Other:	☐
Other:	☐

Show calculations below to demonstrate if the LID Design Storm Capture Volume can be met with infiltration, evapotranspiration, rainwater harvesting and/or biotreatment BMPs. If not, document how much can be met with either infiltration BMPs, evapotranspiration, rainwater harvesting BMPs, or a combination, and document why it is not feasible to meet the full volume with these BMP categories.

IV.3.5 Hydromodification Control BMPs

Describe hydromodification control BMPs. *See Section 5 of the Technical Guidance Document (TGD).* Include sections for selection, suitability, sizing, and infeasibility, as applicable. Detail compliance with Prior Conditions of Approval (if applicable).

Hydromodification Control BMPs	
BMP Name	**BMP Description**
Infiltration System	Cultec Infiltration System to provide Hydromodification per TGD. See calculations in Section IV above.

IV.3.6 Regional/Sub-Regional LID BMPs

Describe regional/sub-regional LID BMPs in which the project will participate. *Refer to Section 7.II-2.4.3.2 of the Model WQMP.*

Regional/Sub-Regional LID BMPs

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. Describe treatment control BMPs including sections for selection, sizing, and infeasibility, as applicable.

Treatment Control BMPs	
BMP Name	**BMP Description**

IV.3.8 Non-structural Source Control BMPs

Fill out non-structural source control check box forms or provide a brief narrative explaining if non-structural source controls were not used.

Non-Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**If not applicable, state brief reason**
		Included	**Not Applicable**	
N1	Education for Property Owners, Tenants and Occupants	☒	☐	
N2	Activity Restrictions	☒	☐	
N3	Common Area Landscape Management	☒	☐	
N4	BMP Maintenance	☒	☐	
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	No hazardous waste
N6	Local Industrial Permit Compliance	☐	☒	This BMP is not applicable. The City of Santa Ana does not issue water quality permits
N7	Spill Contingency Plan	☒	☐	
N8	Underground Storage Tank Compliance	☐	☒	No underground storage tanks
N9	Hazardous Materials Disclosure Compliance	☒	☐	
N10	Uniform Fire Code Implementation	☐	☒	No hazardous materials
N11	Common Area Litter Control	☒	☐	
N12	Employee Training	☒	☐	
N13	Housekeeping of Loading Docks	☐	☒	No loading docks proposed
N14	Common Area Catch Basin Inspection	☒	☐	
N15	Street Sweeping Private Streets and Parking Lots	☒	☐	
N16	Retail Gasoline Outlets	☐	☒	Not a fuel retailer

N1– Education for Property Owners, Tenants and Occupants

The Property Owner shall provide information contained within this report to educate the owners and tenants of general good housekeeping practices that contribute to the protection of storm water quality. Refer to Section VII for a checklist of educational materials included as part of this WQMP. This education program applies to all current and future employees of the facility as well as maintenance contractors. The owner shall prepare manual(s) that include copies of educational materials as included in Appendix A for distribution to employees, tenants and future property owners. Appropriate employee training shall be provided by the owner to provide employees, tenants and future property owners with an awareness and understanding of potential stormwater pollutants and potential pollutant-generating activities, the importance of maintaining potential pollutants in a manner that prevents them from physical contact with the outside environment and the storm drain system, and an awareness that stormwater entering the storm drain system in not treated and is conveyed directly to the ocean. A copy of this WQMP is to be present at the site at all times.

This activity shall be conducted on an ongoing / as-needed basis.

N2– Activity Restrictions

The Property Owner will be responsible for refraining from the activity restriction listed herein.

No washing down hard or paved surfaces. Washing down hard or paved surfaces, including, but not limited to, sidewalks, walkways, driveways, parking areas, patios or alleys, is prohibited.

Water conservation and landscape activity restrictions are described in BMP 'N3' below.

N3 – Landscape Management

The Property Owner will be responsible for on-going landscape management requirements consistent with the City's "Water Conservation Information". See specific activity restrictions below.

Limits on Watering Hours. Watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited between the hours of 10:00 a.m. and 4:00 p.m. Pacific Standard Time on any day, except by use of a hand-held bucket or similar container, a hand-held hose equipped with a positive self-closing water shut-off nozzle or device, or for very short periods of time for the express purpose of adjusting or repairing an irrigation system.

Limit on Watering Duration. Watering or irrigating of lawn, landscape or other vegetated area with potable water using a landscape irrigation system or a watering device that is not continuously attended is limited to no more than fifteen minutes watering per day per station. This subsection does not apply to landscape irrigation systems that exclusively use very low-flow drip type irrigation systems when no emitter produces more than two gallons of water per hour and weather based controllers or stream rotor sprinklers that meet a seventy percent efficiency standard.

No Excessive Water Flow or Runoff. Watering or irrigating of any lawn, landscape or other vegetated area in a manner that causes or allows excessive water flow or runoff onto an adjoining sidewalk, driveway, street, alley, gutter or ditch is prohibited.

Obligation to Fix Leaks, Breaks or Malfunctions. Excessive use, loss or escape of water through breaks, leaks or other malfunctions in the water user's plumbing or distribution system for any period of time after such escape of water should have reasonably been discovered and corrected and in no event more than five days of receiving notice form the city, is prohibited.

The Property Owner will also be responsible for on-going landscape maintenance consistent with the County's management guidelines for use of pesticides and fertilizers (DAMP Section 5.5) including, but not limited to, the flowing:

- Thoroughly investigate and consider all least toxic pest management practices
- Use pesticides only according to label instruction.
- Consider weather conditions that could affect applications (i.e. wind or rain)
- Only apply the minimum amount of fertilizer or pesticide needed.
- Plant, or mulch/re-mulch (wood chips or shredded wood products) any bare areas in the landscaping.
- Irrigation application rates and schedules should be adjusted to minimize surface runoff, especially immediately following the application of fertilizer or pesticides.
- Immediately clean up spills using dry methods of cleanup.

N4 - BMP Maintenance

The Property Owner shall be responsible for implementation, maintenance, and cleaning of all BMPs.

N7 – Spill Contingency Plan

N/A

N9 – Hazardous Materials Disclosure Compliance

N/A

N11 - Common Area Litter Control

The Property Owner shall implement trash management and litter control procedures aimed at reducing off-site migration of trash and pollution of drainage water. The Property Owner may contract with landscape maintenance firms to provide this service during regularly scheduled maintenance which should consist of litter patrol, and emptying of trash receptacles.

N12 – Employee Training

The Property Owner shall train employees and maintenance contractors on general housekeeping practices that contribute to the protection of stormwater quality. Refer to Section VII for a checklist of educational materials included as part of this WQMP. This education program applies to all current and future employees as well as maintenance contractors of the facility. The owner shall prepare manual(s) that include copies of educational materials as included in Appendix A for distribution to employees and contractors. Appropriate employee training shall be provided by the owner to provide employees and contractors with an awareness and understanding of potential stormwater pollutants and potential pollutant-generating activities, the importance of maintaining potential pollutants in a manner that prevents them from physical contact with the outside

environment and the storm drain system, and an awareness that stormwater entering the storm drain system in not treated and is conveyed directly to the ocean. A copy of this WQMP is to be present at the site at all times.

N13 – Housekeeping of Loading Docks

N/A

N14 – Catch Basin Inspection

The Property Owner will be responsible for inspection and maintenance of all catch basins and inlet structures once per year prior to the storm season in August/September, and as necessary throughout the year. Maintenance consists of cleaning out accumulated debris and sediment either manually or by mechanical methods. Debris and sediment shall not be washed down the storm drain.

N15 – Street Sweeping

The Property Owner shall be responsible for having the private streets, driveways, and parking areas swept at least once prior to the storm season in August/September, and as necessary throughout the year.

IV.3.9 Structural Source Control BMPs

Fill out structural source control check box forms or provide a brief narrative explaining if structural source controls were not used.

Structural Source Control BMPs				
Identifier	**Name**	**Check One**		**If not applicable, state brief reason**
		Included	**Not Applicable**	
S1	Provide storm drain system stenciling and signage	☒	☐	
S2	Design and construct outdoor material storage areas to reduce pollution introduction	☐	☒	
S3	Design and construct trash and waste storage areas to reduce pollution introduction	☒	☐	
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control	☒	☐	
S5	Protect slopes and channels and provide energy dissipation	☐	☒	
	Incorporate requirements applicable to individual priority project categories (from SDRWQCB NPDES Permit)	☐	☐	
S6	Dock areas	☐	☒	No dock areas
S7	Maintenance bays	☐	☒	No maintenance bays
S8	Vehicle wash areas	☐	☒	No vehicle wash areas
S9	Outdoor processing areas	☐	☒	No outdoor processing areas
S10	Equipment wash areas	☐	☒	No equipment wash areas
S11	Fueling areas	☐	☒	No fueling areas
S12	Hillside landscaping	☐	☒	No hillside areas
S13	Wash water control for food preparation areas	☒	☐	
S14	Community car wash racks	☐	☒	No car wash racks

S1– Storm Drain Stenciling and Signage

Anti-dumping stenciling messages will be provided at storm drain inlets to alert the public to the destination of pollutants discharged into stormwater. Stenciling shall comply with the following requirements:

(1) Provide stenciling or labeling of all storm drain inlets and catch basins within the project area with prohibitive language (such as: "NO DUMPING – DRAINS TO OCEAN") and/or graphical icons to discourage illegal dumping

(2) Maintain legibility of stencils

S3– Trash Enclosure Design

Trash storage areas will be designed to reduce pollutant introduction. All trash container areas shall meet the following requirements:

1. Paved with an impervious surface, designed not to allow run-on from adjoining areas, designed to divert drainage from adjoining roofs and pavements diverted around the area, screened or walled to prevent off-site transport of trash; and
2. Provide lids to the containers to prevent direct precipitation.

Connection of trash area drains to the municipal storm drain system is prohibited.

See CASQA Stormwater Handbook Section 3.2.9 and BMP Fact Sheet SD-32 for additional information.

S4 – Efficient Irrigation

The landscape/irrigation plan shall implement irrigation smart timers. The Property Owner will be responsible for adjusting the system seasonally, and checking for broken/over-spraying sprinkler heads. See additional irrigation requirements in BMP 'N2" and 'N3' above.

S13 – Wash Water Control for Food Preparation Areas

Food preparation will take place inside the restaurant in contained areas with drains connected to the sanitary sewer.

Refer to O& M Plan in Section V and applicable BMP Fact sheets in Attachment 'A' for additional information.

IV.4 Alternative Compliance Plan (If Applicable)

Describe an alternative compliance plan (if applicable). Include alternative compliance obligations (i.e., gallons, pounds) and describe proposed alternative compliance measures. *Refer to Section 7.II 3.0 in the WQMP.*

IV.4.1 Water Quality Credits

Determine if water quality credits are applicable for the project. *Refer to Section 3.1 of the Model WQMP for description of credits and Appendix VI of the Technical Guidance Document (TGD) for calculation methods for applying water quality credits.*

<table>
<tr><th colspan="5">Description of Proposed Project</th></tr>
<tr><td colspan="5">Project Types that Qualify for Water Quality Credits (Select all that apply):</td></tr>
<tr><td colspan="2">☐Redevelopment projects that reduce the overall impervious footprint of the project site.</td><td colspan="2">☐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 WQ if not redeveloped.</td><td>☐ 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).</td></tr>
<tr><td colspan="2">☐ 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).</td><td colspan="2">☐ 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</td><td>☐ 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).</td></tr>
<tr><td>☐Developments with dedication of undeveloped portions to parks, preservation areas and other pervious uses.</td><td>☐ Developments in a city center area.</td><td>☐ Developments in historic districts or historic preservation areas.</td><td>☐ 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.</td><td>☐In-fill projects, the conversion of empty lots and other underused spaces into more beneficially used spaces, such as residential or commercial areas.</td></tr>
</table>

Calculation of Water Quality Credits (if applicable)	Not applicable

IV.4.2 Alternative Compliance Plan Information

Describe an alternative compliance plan (if applicable). Include alternative compliance obligations (i.e., gallons, pounds) and describe proposed alternative compliance measures. *Refer to Section 7.II 3.0 in the Model WQMP.*

Not applicable

Section V Inspection/Maintenance Responsibility for BMPs

Fill out information in table below. Prepare and attach an Operation and Maintenance Plan. Identify the funding mechanism through which BMPs will be maintained. Inspection and maintenance records must be kept for a minimum of five years for inspection by the regulatory agencies. *Refer to Section 7.II 4.0 in the Model WQMP.*

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N1. Education for Property Owners, Tenants and Occupants	Owner or Future Property Owner	The Property Owner shall provide information contained within this report to educate the owners and tenants of general good housekeeping practices that contribute to the protection of storm water quality. Refer to Section VII for a checklist of educational materials included as part of this WQMP. This education program applies to all current and future employees of the facility as well as maintenance contractors. The owner shall prepare manual(s) that include copies of educational materials as included in Appendix A for distribution to employees, tenants and future property owners. Appropriate employee training shall be provided by the owner to provide employees, tenants and future property owners with an awareness and understanding of potential stormwater pollutants and potential pollutant-generating activities, the importance of maintaining potential pollutants in a manner that prevents them from physical contact with the outside environment and the storm drain system, and an awareness that stormwater entering the storm drain system in not treated and is conveyed directly to the ocean. A copy of this WQMP is to be present at the site at all times. This activity shall be conducted on	Education program as it would apply to future employees of the facility. The owner shall prepare manual(s) for employees. Included in Appendix are educational materials intended for reproduction and distribution to employees. Copy of this WQMP to be present at the site Continuous

		an ongoing / as-needed basis.	
N2. Activity Restriction	Owner or Future Property Owner	The Property Owner will be responsible for refraining from the activity restriction listed herein. No washing down hard or paved surfaces. Washing down hard or paved surfaces, including, but not limited to, sidewalks, walkways, driveways, parking areas, patios or alleys. Water conservation and landscape activity restrictions are described in BMP 'N3' below.	Do not use detergents or other chemical additives when washing concrete sidewalks or building exteriors, use potable water only and collect wash water runoff using a vacuum truck, for proper offsite disposal. Continuous
N3. Common Area Landscape Management	Owner or Future Property Owner	The Property Owner will be responsible for on-going landscape management requirements consistent with the City's "Water Conservation Information". See specific activity restrictions below. **Limits on Watering Hours.** Watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited between the hours of 10:00 a.m. and 4:00 p.m. Pacific Standard Time on any day, except by use of a hand-held bucket or similar container, a hand-held hose equipped with a positive self-closing water shut-off nozzle or device, or for very short periods of time for the express purpose of adjusting or repairing an irrigation system. **Limit on Watering Duration.** Watering or irrigating of lawn, landscape or other vegetated area with potable water using a landscape irrigation system or a watering device that is not continuously attended is limited to no more than	Owner may employ the services of a qualified landscape maintenance contractor to maintain all planters in accordance with City of Santa Ana Management Guidelines. See County of Orange, Model Integrated Pest Management, Pesticides, and Fertilizer Guidelines. (DAMP 5.5) Weekly

		fifteen minutes watering per day per station. This subsection does not apply to landscape irrigation systems that exclusively use very low-flow drip type irrigation systems when no emitter produces more than two gallons of water per hour and weather based controllers or stream rotor sprinklers that meet a seventy percent efficiency standard. **No Excessive Water Flow or Runoff.** Watering or irrigating of any lawn, landscape or other vegetated area in a manner that causes or allows excessive water flow or runoff onto an adjoining sidewalk, driveway, street, alley, gutter or ditch is prohibited. **Obligation to Fix Leaks, Breaks or Malfunctions.** Excessive use, loss or escape of water through breaks, leaks or other malfunctions in the water user's plumbing or distribution system for any period of time after such escape of water should have reasonably been discovered and corrected and in no event more than five days of receiving notice form the city, is prohibited. The Property Owner will also be responsible for on-going landscape maintenance consistent with the County's management guidelines for use of pesticides and fertilizers (DAMP Section 5.5)	
N4. BMP Maintenance	Owner or Future Property Owner	The Property Owner shall be responsible for implementation, maintenance, and cleaning of all BMPs.	The manager and employees will be instructed in environmental procedures regarding contamination and cleanup. The matrix itself is N4. Per established maintenance schedule

N11. Common Area Litter Control	Owner or Future Property Owner	The Property Owner shall implement trash management and litter control procedures aimed at reducing off-site migration of trash and pollution of drainage water. The Property Owner may contract with landscape maintenance firms to provide this service during regularly scheduled maintenance which should consist of litter patrol, and emptying of trash receptacles.	Management shall prepare educational manuals based on this Water Quality Management Plan to inform future employees working at this site about the BMPs required at this facility. Weekly/As needed
N12. Employee Training	Owner or Future Property Owner	The Property Owner shall train employees and maintenance contractors on general housekeeping practices that contribute to the protection of stormwater quality. Refer to Section VII for a checklist of educational materials included as part of this WQMP. This education program applies to all current and future employees as well as maintenance contractors of the facility. The owner shall prepare manual(s) that include copies of educational materials as included in Appendix A for distribution to employees and contractors. Appropriate employee training shall be provided by the owner to provide employees and contractors with an awareness and understanding of potential stormwater pollutants and potential pollutant-generating activities, the importance of maintaining potential pollutants in a manner that prevents them from physical contact with the outside environment and the storm drain system, and an awareness that stormwater	Provide educational materials to new employees; Provide updates to existing employees annually Continuous, annually

		entering the storm drain system in not treated and is conveyed directly to the ocean. A copy of this WQMP is to be present at the site at all times.	
N14. Common Area Catch Basin Inspection	Owner or Future Property Owner	The Property Owner will be responsible for inspection and maintenance of all catch basins and inlet structures once per year prior to the storm season in August/September, and as necessary throughout the year. Maintenance consists of cleaning out accumulated debris and sediment either manually or by mechanical methods. Debris and sediment shall not be washed down the storm drain.	Management to inspect and , if necessary, remove silt and debris from catch basins prior to the rainy season Monthly and prior to rainy season (October 1st each year)
N15. Street Sweeping Private Streets and Parking Lots	Owner or Future Property Owner	The Property Owner shall be responsible for having the private streets, driveways, and parking areas swept at least once prior to the storm season in August/September, and as necessary throughout the year.	Management may contract with a contractor to provide sweeping or vacuuming of the entrance driveway and interior drive lanes. The use of water to flush debris and sediment into storm drains shall be prohibited. Sweep parking lot weekly and prior to the rainy season
Structural Source Control BMPs			

S1.-Provide Storm Drain System Stenciling and Signage	Owner or Future Property Owner	Anti-dumping stenciling messages will be provided at storm drain inlets to alert the public to the destination of pollutants discharged into stormwater. Stenciling shall comply with the following requirements: (1) Provide stenciling or labeling of all storm drain inlets and catch basins within the project area with prohibitive language (such as: "NO DUMPING – DRAINS TO OCEAN") and/or graphical icons to discourage illegal dumping (2) Maintain legibility of stencils	Management shall have the phrase "NO DUMPING! DRAINS TO OCEAN" stenciled on each catch basin to alert the public to the destination of pollutants discharged into stormwater. Inspect Annually. Re-stencil as needed if stencilling becomes faded or otherwise illegible.
S3.-Design and Construct Trash and Waste Storage Areas to Reduce Pollutant Introduction	Owner or Future Property Owner	Trash storage areas will be kept clean. Trash and debris will be picked up and placed in dumpsters that are stored within the trash enclosure area. The trash area shall be swept clean.	Continuous
S4.-Use Efficient Irrigation Systems & Landscape Design	Owner or Future Property Owner	The landscape/irrigation plan shall implement irrigation smart timers. The Property Owner will be responsible for adjusting the system seasonally, and checking for broken/over-spraying sprinkler heads. See additional irrigation requirements in BMP 'N2" and 'N3' above	Adjust landscape watering according to weather conditions to avoid excess usage; inspect timers and adjust seasonally; inspect for broken/over-spraying sprinkler heads Monthly
Treatment Control BMPs			

Pre-Treatment Control BMPs for DMA-1, and DMA-2	Owner or Future Property Owner	Select pre-treatment system to protect the underground infiltration gallery from clogging due to sediment. Use CULTEC StormFilter pre-treatment system.	Visually inspect and remove debris. 3 times annually prior to, during and after rainy season.
Treatment Control BMPs for DMA-1, and DMA-2	Owner or Future Property Owner	**Underground Infiltration gallery** Design LID BMPs using the assumed Principal Unit Operations and Processes Provided of Filtration, Sorption/Ion Exchange and Volume loss, will be reached by an Underground Infiltration gallery as shown on Plan. Use CULTEC Chambers	Visually inspect and remove debris. 3 times annually prior to, during and after rainy season.

Section VI BMP Exhibit (Site Plan)

VI.1 BMP Exhibit (Site Plan)

Include a BMP Exhibit (Site Plan), at a size no less than 24" by 36," which includes the following minimum information:

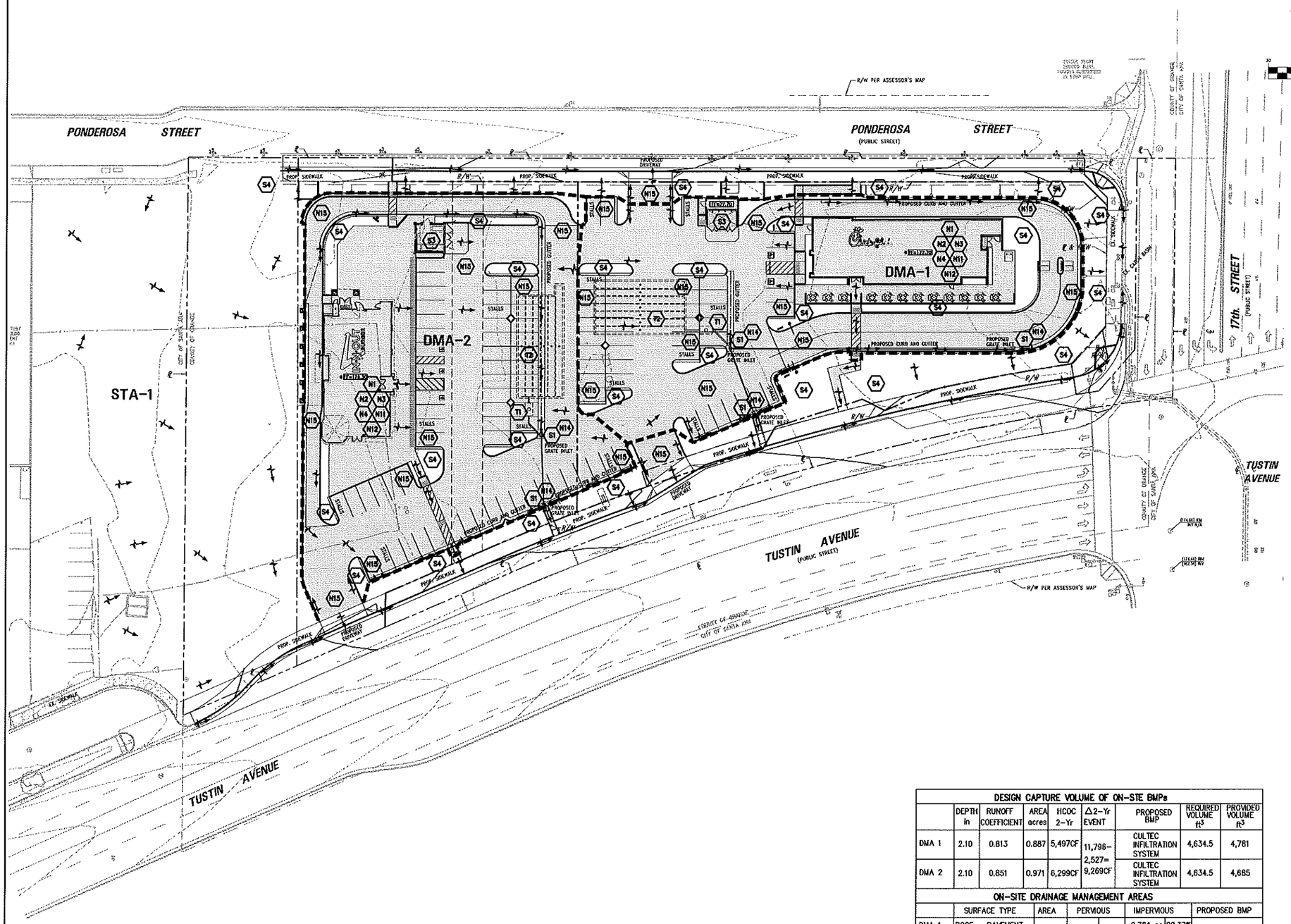
- Insert in the title block (lower right hand corner) of BMP Exhibit: the WQMP Number (assigned by staff) and the grading/building or Planning Application permit numbers
- Project location (address, tract/lot number(s), etc.)
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural BMP locations
- Drainage delineations and flow information
- Delineate the area being treated by each structural BMP
- GIS coordinates for LID and Treatment Control BMPs
- Drainage connections
- BMP details
- Preparer name and stamp

Please do not include any areas outside of the project area or any information not related to drainage or water quality. The approved BMP Exhibit (Site Plan) shall be submitted as a plan sheet on all grading and building plan sets submitted for plan check review and approval. The BMP Exhibit shall be at the same size as the rest of the plan sheets in the submittal and shall have an approval stamp and signature prior to plan check submittal.

VI.2 Submittal and Recordation of Water Quality Management Plan

Following approval of the Final Project-Specific WQMP, three copies of the approved WQMP (including BMP Exhibit, Operations and Maintenance (O&M) Plan, and Appendices) shall be submitted. In addition, these documents shall be submitted in a PDF format.

Each approved WQMP (including BMP Exhibit, Operations and Maintenance (O&M) Plan, and Appendices) shall be recorded in the Orange County Clerk-Recorder's Office, prior to close-out of grading and/or building permit. Educational Materials are not required to be included.



DESIGN CAPTURE VOLUME OF ON-SITE BMPs								
	DEPTH in	RUNOFF COEFFICIENT	AREA acres	HCOC 2-Yr	Δ2-Yr EVENT	PROPOSED BMP	REQUIRED VOLUME ft³	PROVIDED VOLUME ft³
DMA 1	2.10	0.813	0.887	5,497CF	11,796-2,527=9,269CF	CULTEC INFILTRATION SYSTEM	4,634.5	4,781
DMA 2	2.10	0.851	0.971	6,299CF		CULTEC INFILTRATION SYSTEM	4,634.5	4,685

ON-SITE DRAINAGE MANAGEMENT AREAS								
	SURFACE TYPE	AREA	PERVIOUS		IMPERVIOUS		PROPOSED BMP
DMA 1	ROOF – PAVEMENT	0.887 ac			0.784 ac	88.37%	INFILTRATION
	LANDSCAPE		0.103 ac	11.63%			
DMA 2	ROOF – PAVEMENT	0.971 ac			0.908 ac	93.48%	INFILTRATION
	LANDSCAPE		0.063 ac	6.52%			

NO.	REVISIONS	DATE

Prepared by:
Joseph C. Truxaw and Associates, Inc.
Civil Engineers and Land Surveyors
265 S. Anita Dr., Suite 111, Orange, CA. 92868 (714)935-0265 fax:(714)935-0106

WATER QUALITY MANAGEMET PLAN

CHICK-FIL-A RESTAURANT No. 3756
NEC OF 17TH ST. AND TUSTIN AVE.,
IN THE CITY OF SANTA ANA, COUNTY OF ORANGE,
STATE OF CALIFORNIA

DATE 09-13-17
DRAWN BY RD
CHECKED BY SMH
JOB NO. CFA98055
SHEET NO. 1 OF 2 SHEETS

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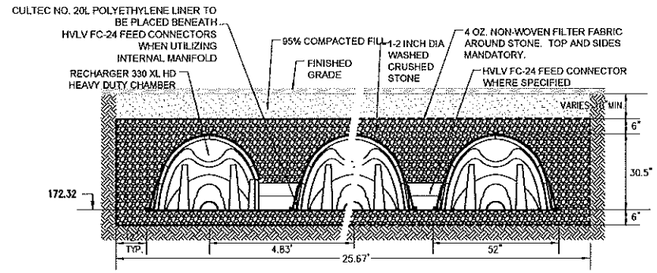
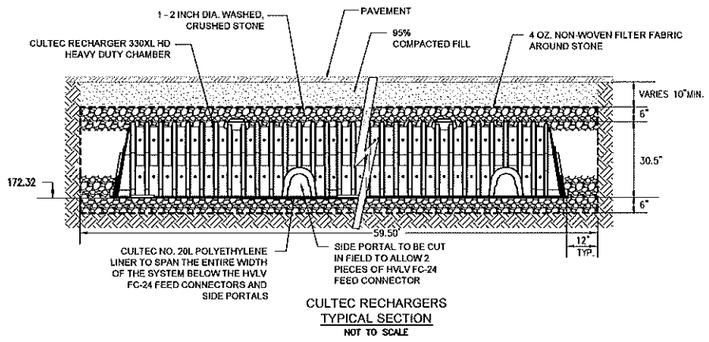
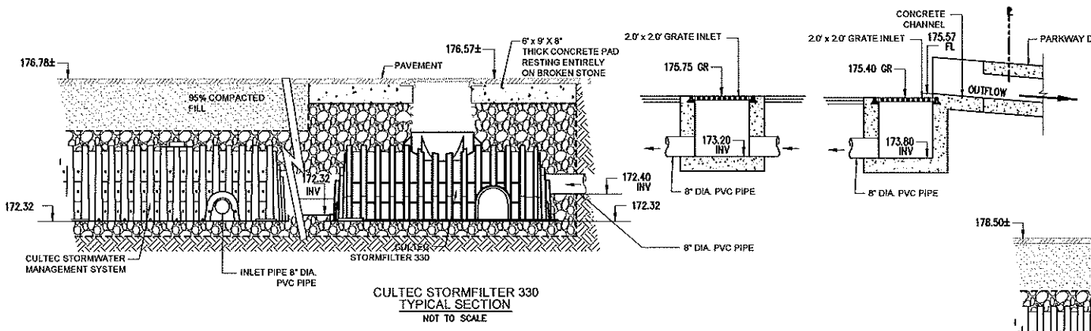
DMA-1 INFILTRATION SYSTEM



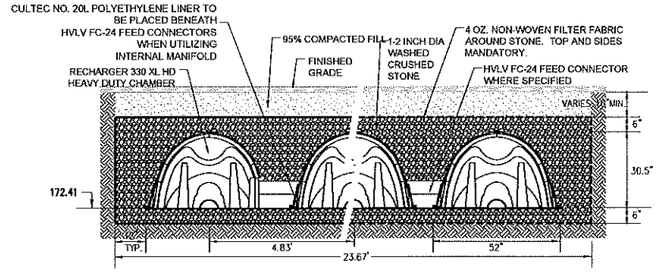


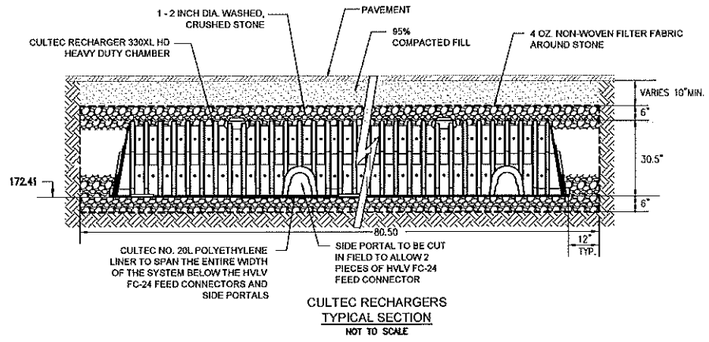
CULTEC RECHARGERS
TYPICAL SECTION
NOT TO SCALE



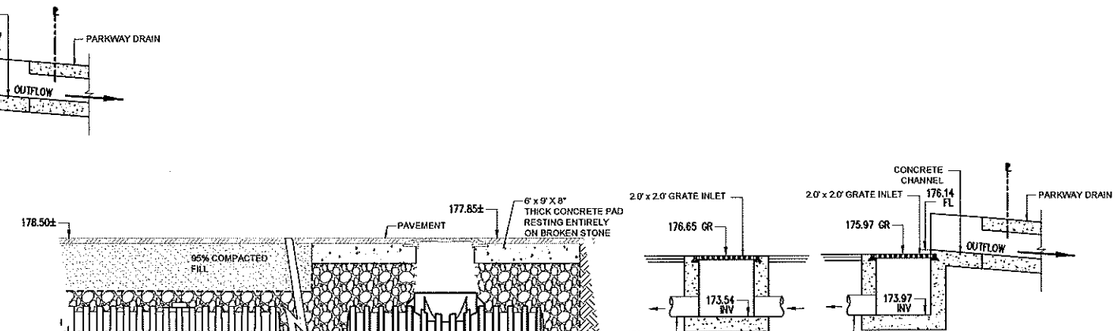
CULTEC STORMFILTER 330
TYPICAL SECTION
NOT TO SCALE

DMA-2 INFILTRATION SYSTEM





CULTEC RECHARGERS
TYPICAL SECTION
NOT TO SCALE



CULTEC STORMFILTER 330
TYPICAL SECTION
NOT TO SCALE

NO.	REVISIONS	DATE

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WATER QUALITY MANAGEMET PLAN

CHICK-FIL-A RESTAURANT No. 3756
NEC OF 17TH ST. AND TUSTIN AVE.
IN THE CITY OF SANTA ANA, COUNTY OF ORANGE,
STATE OF CALIFORNIA

DATE	09-13-17
DRAWN BY	RD
CHECKED BY	SMH
JOB NO.	CFA98055
SHEET NO.	2 OF 2 SHEETS

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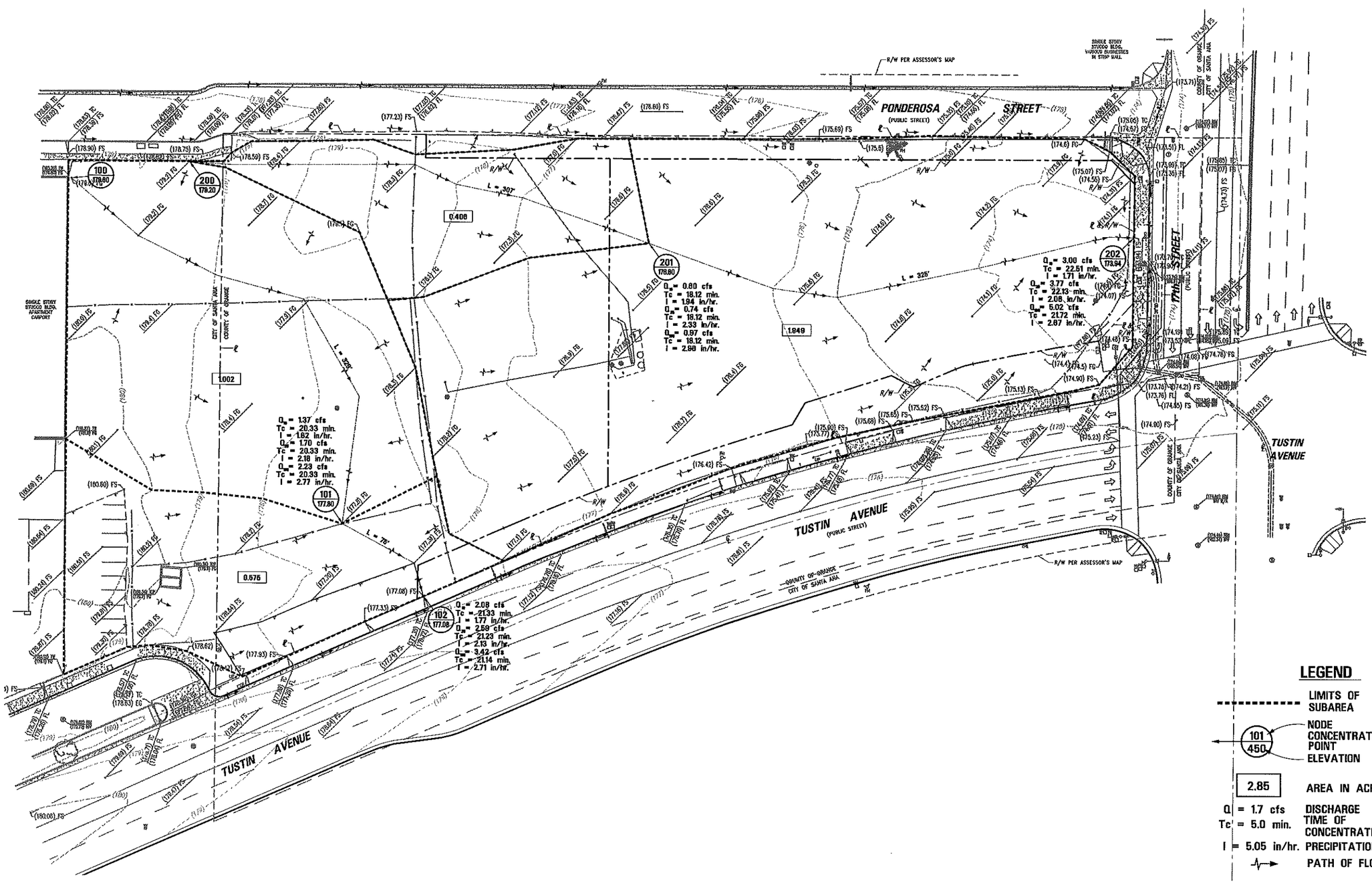
GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.



LEGEND

- LIMITS OF SUBAREA
- 101 / 450 — NODE CONCENTRATION POINT ELEVATION
- 2.85 — AREA IN ACRES
- Q = 1.7 cfs — DISCHARGE
- Tc = 5.0 min. — TIME OF CONCENTRATION
- I = 5.05 in/hr. — PRECIPITATION
- PATH OF FLOW

NO.	REVISIONS	DATE

Prepared by:
Joseph C Truxaw and Associates, Inc
Civil Engineers and Land Surveyors
265 S. Anita Dr., Suite 111, Orange, CA. 92868 (714)935-0265 fax:(714)935-0106

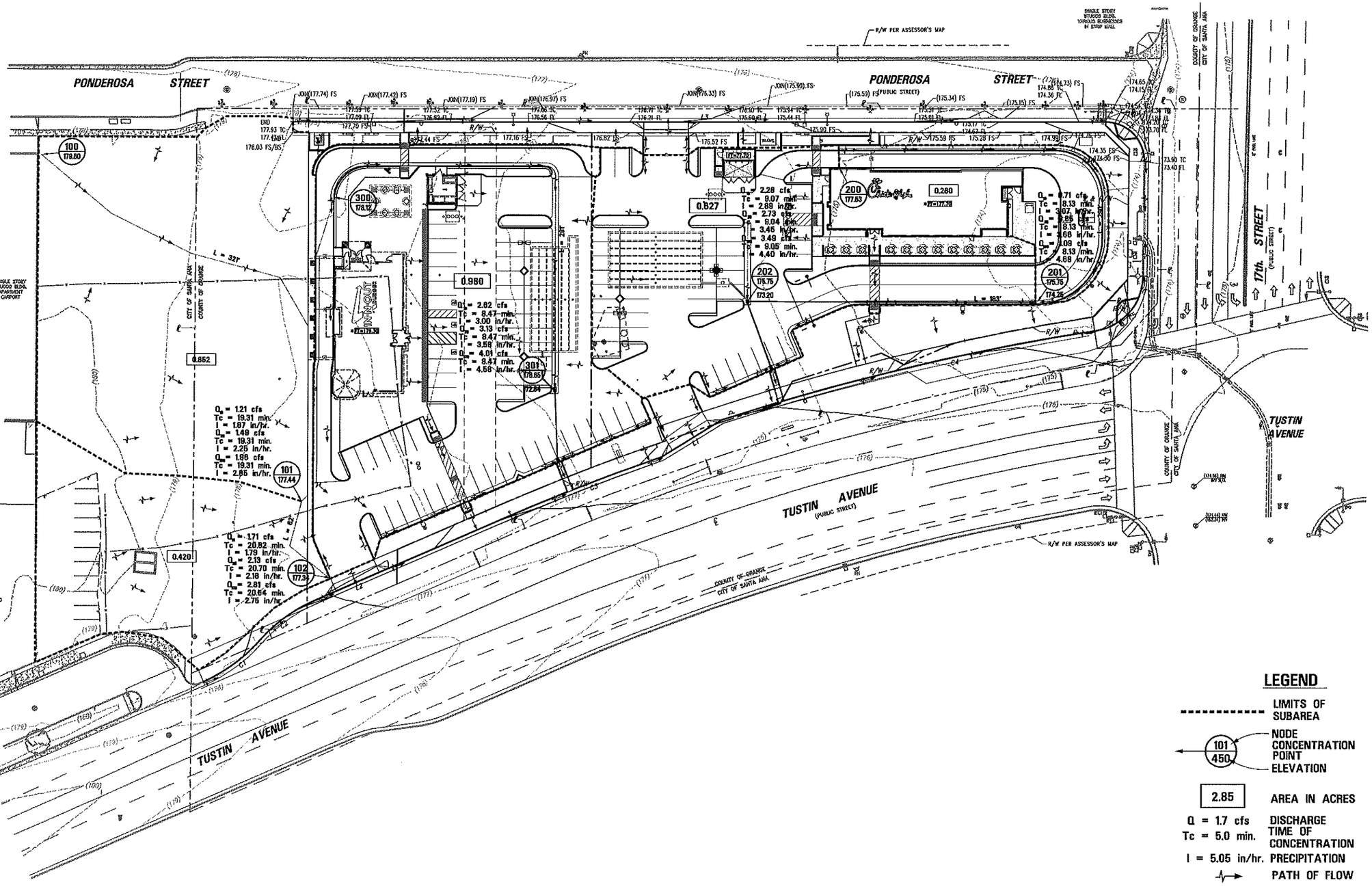
HYDROLOGY MAP
PRE-DEVELOPMENT CONDITION

CHICK-FIL-A RESTAURANT No. 3756
NEC OF 17TH ST. AND TUSTIN AVE.
IN THE CITY OF SANTA ANA, COUNTY OF ORANGE,
STATE OF CALIFORNIA

DATE	05-10-16
DRAWN BY	HV
CHECKED BY	SMH
JOB NO.	CFA98055
SHEET NO.	1 OF 2 SHEETS

GRAPHIC SCALE

(IN FEET)
1 inch = 30 ft



LEGEND

- LIMITS OF SUBAREA
- 101 / 450 — NODE CONCENTRATION POINT / ELEVATION
- 2.85 — AREA IN ACRES
- Q = 1.7 cfs — DISCHARGE
- Tc = 5.0 min. — TIME OF CONCENTRATION
- I = 5.05 in/hr. — PRECIPITATION
- PATH OF FLOW

NO.	REVISIONS	DATE

Prepared by:
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HYDROLOGY MAP
POST-DEVELOPMENT CONDITION

CHICK-FIL-A RESTAURANT No. 3756
NEC OF 17TH ST. AND TUSTIN AVE.
IN THE CITY OF SANTA ANA, COUNTY OF ORANGE,
STATE OF CALIFORNIA

DATE	05-11-16
DRAWN BY	HV
CHECKED BY	SMH
JOB NO.	CFA98055
SHEET NO.	2 OF 2 SHEETS

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Section VII Educational Materials

Refer to the Orange County Stormwater Program (ocwatersheds.com) for a library of materials available. Please only attach the educational materials specifically applicable to this project. Other materials specific to the project may be included as well and must be attached.

Education Materials			
Residential Material (http://www.ocwatersheds.com)	**Check If Applicable**	**Business Material (http://www.ocwatersheds.com)**	**Check If Applicable**
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 Material**	**Check If Attached**
Proper Disposal of Household Hazardous Waste	☒		
Recycle at Your Local Used Oil Collection Center (North County)	☐		☐
Recycle at Your Local Used Oil Collection Center (Central County)	☐		☐
Recycle at Your Local Used Oil Collection Center (South County)	☐		☐
Tips for Maintaining a Septic Tank System	☐		☐
Responsible Pest Control	☒		☐
Sewer Spill	☐		☐
Tips for the Home Improvement Projects	☐		☐
Tips for Horse Care	☐		☐
Tips for Landscaping and Gardening	☒		☐
Tips for Pet Care	☐		☐
Tips for Pool Maintenance	☐		☐
Tips for Residential Pool, Landscape and Hardscape Drains	☐		☐
Tips for Projects Using Paint	☐		☐

Attachment A

Educational Materials

The Ocean Begins at Your Front Door

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
information on household hazardous waste collection centers, recycling centers and solid waste collection
714-834-6752 or visit www.oclandfills.com

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.org

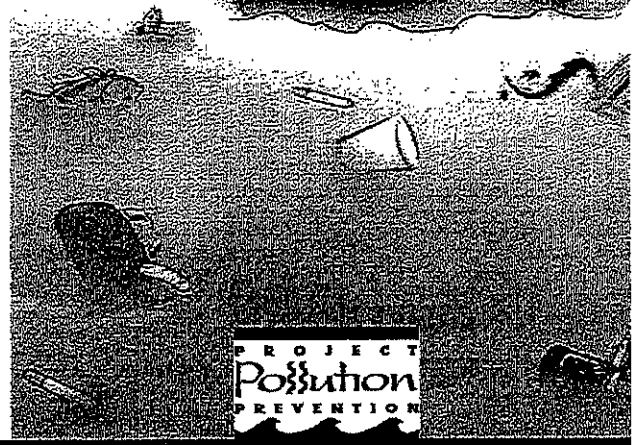
The Orange County Stormwater Program has created and moderates an electronic mailing list to facilitate communications, take questions and exchange ideas among its users about issues and topics related to stormwater and urban runoff and the implementation of program elements. To join the list, please 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 Service	(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	(714) 567-6363

Orange County 24-Hour
Water Pollution Problem Reporting Hotline
(714)-567-6363

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



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

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 refers to runoff resulting from rainfall. It is very noticeable during heavy rainstorms when large volumes of water drain off the urban landscape picking up pollutants along the way.
- Urban runoff can happen anytime 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 the storm drains.
- A little water from a garden hose or rain can also send materials into the storm drains.
- Storm drains are separate from our sanitary sewer systems: unlike water in sanitary sewers (from sinks or toilets) water in the storm drains is not treated before entering our waterways.

Sources of Non-Point Source Pollution

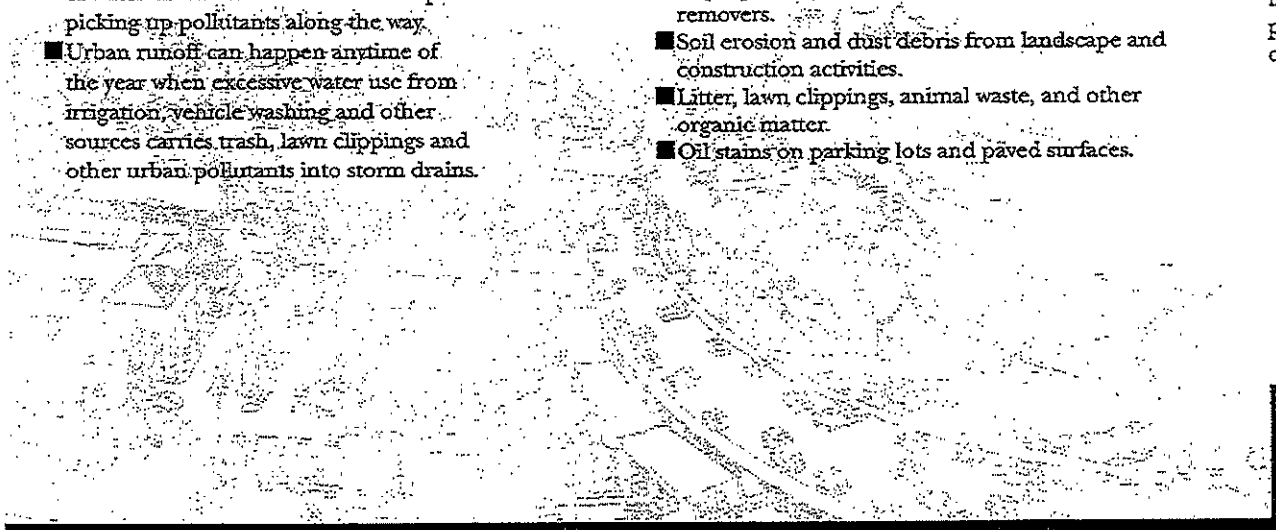
- Automotive leaks and spills.
- Improper disposal of used oil and other engine fluids.
- Metals found in vehicle exhaust, weathered paint, rust, metal plating, and tires.
- Pesticides and fertilizers from lawns, gardens and farms.
- Improper disposal of cleaners, paint and paint removers.
- Soil erosion 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.

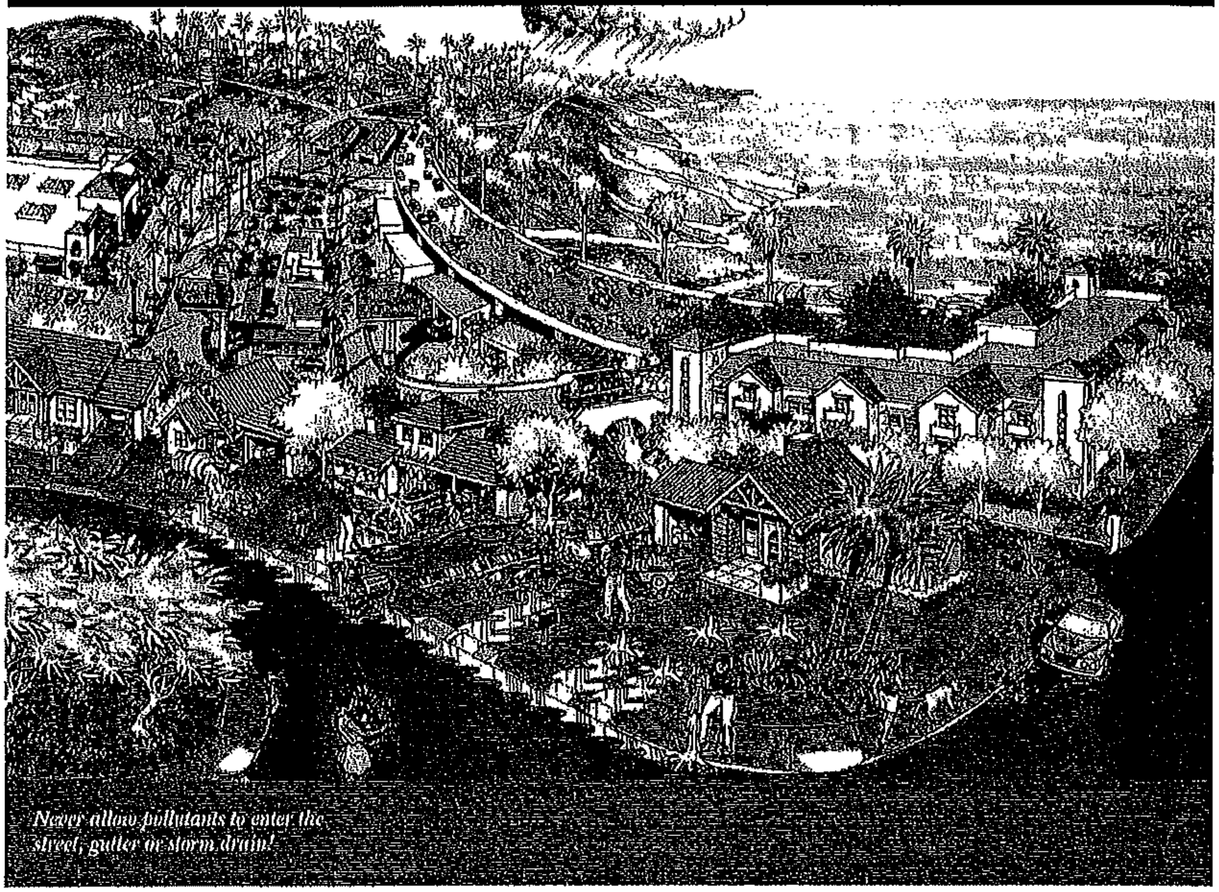
Stormwater quality management programs have been developed by the Orange County Stormwater Program under National Pollutant Discharge Elimination System (NPDES) permits. The program educates and encourages the public to protect water quality, monitor runoff in the storm drain system, manage NPDES permit process for municipalities, investigate illegal disposals, and maintain storm drains.

The support of Orange County residents, businesses and industries is needed to improve water quality and reduce the threat of stormwater and urban runoff pollution. Proper use and disposal of materials we use everyday will help stop this form of pollution before it reaches the storm drain and the ocean.



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

The Ocean Begins at Your Front Door



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 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.
- For a household hazardous waste collection center 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 in 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 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 vehicle 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 be free of excess acid, alkali or color to be allowed in the street, gutter or storm drain.
- Whenever possible, drain dechlorinated pool and spa water directly into the sanitary sewer but only when it is not raining.
- Some cities may have ordinances that do not allow pool water to be disposed into 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 with 48 hours.
- Take unwanted pesticides to a Household Hazardous Waste Collection Center to be recycled. For locations and hours of Household Hazardous Waste Collection Centers 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 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 Household Hazardous Waste Collection Center.

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

Do your part to prevent water pollution in our creeks, rivers, bays and ocean.

Clean beaches and healthy creeks, rivers, bays and ocean are important to Orange County. However, not properly disposing of household hazardous waste can lead to water pollution. Batteries, electronics, paint, oil, gardening chemicals, cleaners and other hazardous materials cannot be thrown in the trash. They also must never be poured or thrown into yards, sidewalks, driveways, gutters or streets. Rain or other water could wash the materials into the storm drain and eventually into our waterways and the ocean. In addition, hazardous waste must not be poured in the sanitary sewers (sinks and toilets).

NEVER DISPOSE OF HOUSEHOLD HAZARDOUS WASTE IN THE TRASH, STREET, GUTTER, STORM DRAIN OR SEWER.

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 Illegal Dumping of Household Hazardous Waste call 1-800-69-TOXIC

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.

RECYCLE USED OIL

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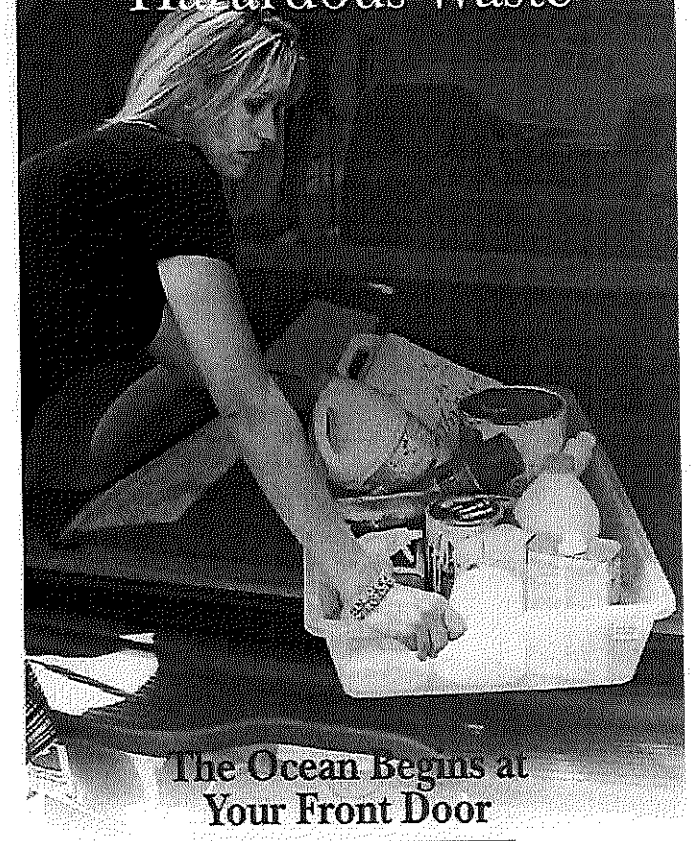
Help Prevent Ocean Pollution:

Proper Disposal of Household Hazardous Waste



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

ORANGE COUNTY

Pollution Prevention

Leftover household products that contain corrosive, toxic, ignitable, or reactive ingredients are considered to be "household hazardous waste" or "HHW." HHW can be found throughout your home, including the bathroom, kitchen, laundry room and garage.

WHEN POSSIBLE, USE NON-HAZARDOUS OR LESS-HAZARDOUS PRODUCTS.

Disposal of HHW down the drain, on the ground, into storm drains, or in the trash is illegal and unsafe.

Proper disposal of HHW is actually easy. Simply drop them off at a Household Hazardous Waste Collection Center (HHWCC) for free disposal and recycling. Many materials including anti-freeze, latex-based paint, motor oil and batteries can be recycled. Some centers have a "Stop & Swap" program that lets you take partially used home, garden, and automobile products free of charge. There are four HHWCCs in Orange County:

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

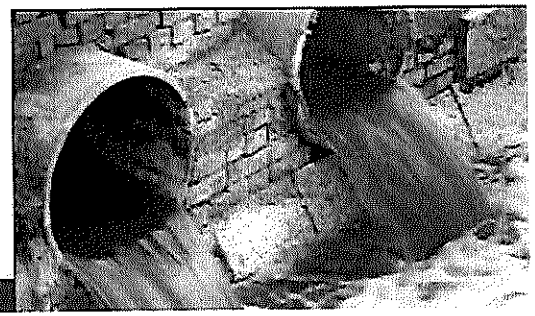
Centers are open Tuesday-Saturday, 9 a.m.-3 p.m. Centers are closed on rainy days and major holidays. For more information, call **(714) 834-6752** or visit **www.oclandfills.com.**

Common household hazardous wastes

- Batteries
- Paint and paint products
- Adhesives
- Drain openers
- Household cleaning products
- Wood and metal cleaners and polishes
- Pesticides
- Fungicides/wood preservatives
- Automotive products (antifreeze, motor oil, fluids)
- Grease and rust solvents
- Fluorescent lamps
- Mercury (thermometers & thermostats)
- All forms of electronic waste including computers and microwaves
- Pool & spa chemicals
- Cleaners
- Medications
- Propane (camping & BBQ)
- Mercury-containing lamps
- Television & monitors (CRTs, flatscreens)

Tips for household hazardous waste

- Never dispose of HHW in the trash, street, gutter, storm drain or sewer.
- Keep these materials in closed, labeled containers and store materials indoors or under a cover.
- When possible, use non-hazardous products.
- Reuse products whenever possible or share with family and friends.
- Purchase only as much of a product as you'll need. Empty containers may be disposed of in the trash.
- HHW can be harmful to humans, pets and the environment. Report emergencies to 911.



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.

Funding for this brochure has been provided in full or in part through an agreement with the State Water Resources Control Board (SWRCB) pursuant to the Costa-Machado Water Act of 2000 (Prop. 13).

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Help Prevent Ocean Pollution:

Responsible Pest Control

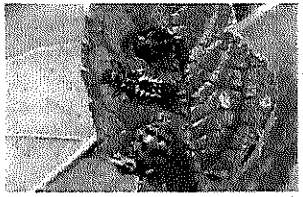
The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

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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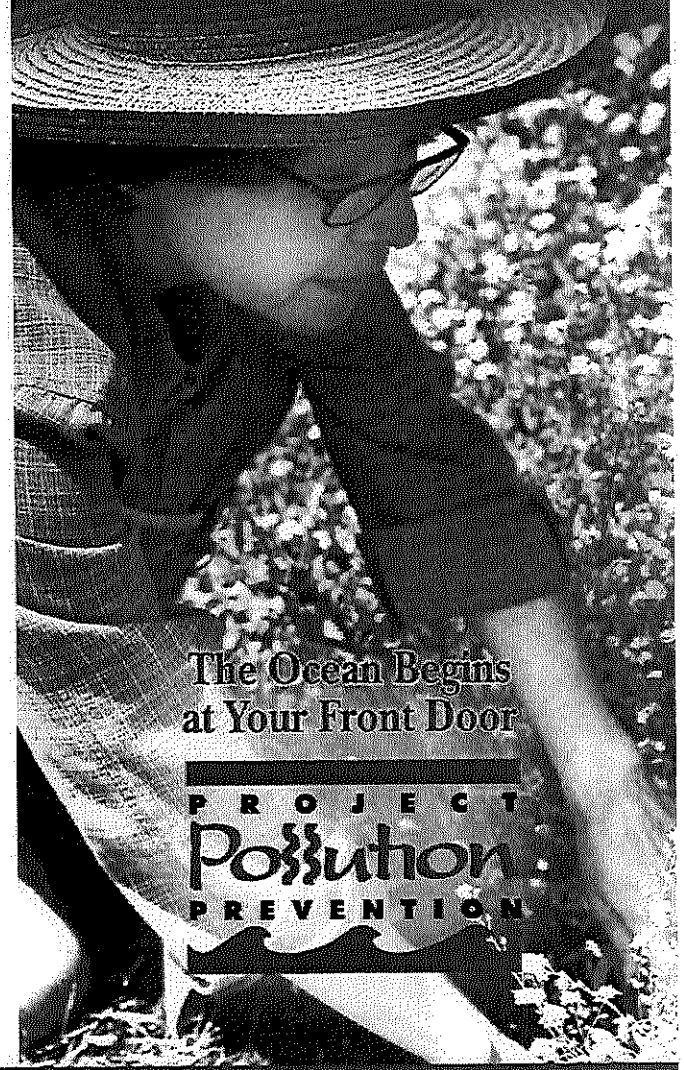
Help Prevent Ocean Pollution:

Tips for Landscape & Gardening



The Ocean Begins at Your Front Door

PROJECT Pollution PREVENTION

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

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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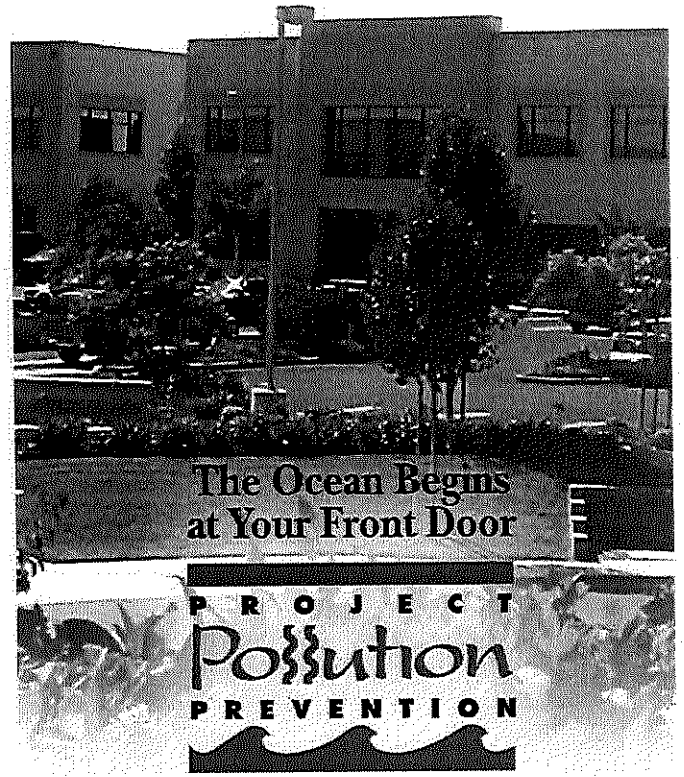
Help Prevent Ocean Pollution:

Proper Maintenance Practices for Your Business



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

Attachment B

O&M Plan

O&M Plan (Operation & Maintenance)

BMP Inspection/Maintenance			
BMP	**Reponsible Party(s)**	**Inspection/ Maintenance Activities Required**	**Minimum Frequency of Activities**
N1. Education for Property Owners, Tenants and Occupants	Owner or Future Property Owner	The Property Owner shall provide information contained within this report to educate the tenants of general good housekeeping practices that contribute to the protection of storm water quality. Refer to Section VII for a checklist of educational materials included as part of this WQMP. This education program applies to all current and future employees of the facility as well as maintenance contractors. The owner shall prepare manual(s) that include copies of educational materials as included in Appendix A for distribution to employees, tenants and future property owners. Appropriate employee training shall be provided by the owner to provide employees, tenants and future property owners with an awareness and understanding of potential stormwater pollutants and potential pollutant-generating activities, the importance of maintaining potential pollutants in a manner that prevents them from physical contact with the outside environment and the storm drain system, and an awareness that stormwater entering the storm drain system in not treated and is conveyed directly to the ocean. A copy of this WQMP is to be present at the site at all times. This activity shall be conducted on	Education program as it would apply to future employees of the facility. The owner shall prepare manual(s) for employees. Included in Appendix are educational materials intended for reproduction and distribution to employees. Copy of this WQMP to be present at the site Continuous

		an ongoing / as-needed basis.	
N2. Activity Restriction	Owner or Future Property Owner	The Property Owner will be responsible for refraining from the activity restriction listed herein. No washing down hard or paved surfaces. Washing down hard or paved surfaces, including, but not limited to, sidewalks, walkways, driveways, parking areas, patios or alleys, is prohibited. Water conservation and landscape activity restrictions are described in BMP 'N3' below.	Do not use detergents or other chemical additives when washing concrete sidewalks or building exteriors, use potable water only and collect wash water runoff using a vacuum truck, for proper offsite disposal. Continuous
N3. Common Area Landscape Management	Owner or Future Property Owner	The Property Owner will be responsible for on-going landscape management requirements consistent with the City's "Water Conservation Information". See specific activity restrictions below. **Limits on Watering Hours.** Watering or irrigating of lawn, landscape or other vegetated area with potable water is prohibited between the hours of 10:00 a.m. and 4:00 p.m. Pacific Standard Time on any day, except by use of a hand-held bucket or similar container, a hand-held hose equipped with a positive self-closing water shut-off nozzle or device, or for very short periods of time for the express purpose of adjusting or repairing an irrigation system. **Limit on Watering Duration.** Watering or irrigating of lawn, landscape or other vegetated area with potable water using a landscape irrigation system or a watering device that is not continuously attended is limited to	Owner may employ the services of a qualified landscape maintenance contractor to maintain all planters in accordance with City of Santa Ana Management Guidelines. See County of Orange, Model Integrated Pest Management, Pesticides, and Fertilizer Guidelines. (DAMP 5.5) Weekly

		no more than fifteen minutes watering per day per station. This subsection does not apply to landscape irrigation systems that exclusively use very low-flow drip type irrigation systems when no emitter produces more than two gallons of water per hour and weather based controllers or stream rotor sprinklers that meet a seventy percent efficiency standard. **No Excessive Water Flow or Runoff.** Watering or irrigating of any lawn, landscape or other vegetated area in a manner that causes or allows excessive water flow or runoff onto an adjoining sidewalk, driveway, street, alley, gutter or ditch is prohibited. **Obligation to Fix Leaks, Breaks or Malfunctions.** Excessive use, loss or escape of water through breaks, leaks or other malfunctions in the water user's plumbing or distribution system for any period of time after such escape of water should have reasonably been discovered and corrected and in no event more than five days of receiving notice form the city, is prohibited. The Property Owner will also be responsible for on-going landscape maintenance consistent with the County's management guidelines for use of pesticides and fertilizers (DAMP Section 5.5)	
N4. BMP Maintenance	Owner or Future Property Owner	The Property Owner shall be responsible for implementation, maintenance, and cleaning of all BMPs.	The manager and employees will be instructed in environmental procedures regarding contamination and cleanup. The matrix itself is N4.

			Per established maintenance schedule
N11. Common Area Litter Control	Owner or Future Property Owner	The Property Owner shall implement trash management and litter control procedures aimed at reducing off-site migration of trash and pollution of drainage water. The Property Owner may contract with landscape maintenance firms to provide this service during regularly scheduled maintenance which should consist of litter patrol, and emptying of trash receptacles.	Management shall prepare educational manuals based on this Water Quality Management Plan to inform future employees working at this site about the BMPs required at this facility. Weekly/As needed
N12. Employee Training	Owner or Future Property Owner	The Property Owner shall train employees and maintenance contractors on general housekeeping practices that contribute to the protection of stormwater quality. Refer to Section VII for a checklist of educational materials included as part of this WQMP. This education program applies to all current and future employees as well as maintenance contractors of the facility. The owner shall prepare manual(s) that include copies of educational materials as included in Appendix A for distribution to employees and contractors. Appropriate employee training shall be provided by the owner to provide employees and contractors with an awareness and understanding of potential stormwater pollutants and potential pollutant-generating activities, the importance of maintaining potential pollutants in a manner that prevents them from physical contact with the outside	Provide educational materials to new employees; Provide updates to existing employees annually Continuous, annually

		environment and the storm drain system, and an awareness that stormwater entering the storm drain system in not treated and is conveyed directly to the ocean. A copy of this WQMP is to be present at the site at all times.	
N14. Common Area Catch Basin Inspection	Owner or Future Property Owner	The Property Owner will be responsible for inspection and maintenance of all catch basins and inlet structures once per year prior to the storm season in August/September, and as necessary throughout the year. Maintenance consists of cleaning out accumulated debris and sediment either manually or by mechanical methods. Debris and sediment shall not be washed down the storm drain.	Management to inspect and , if necessary, remove silt and debris from catch basins prior to the rainy season Monthly and prior to rainy season (October 1st each year)
N15. Street Sweeping Private Streets and Parking Lots	Owner or Future Property Owner	The Property Owner shall be responsible for having the private streets, driveways, and parking areas swept at least once prior to the storm season in August/September, and as necessary throughout the year.	Management may contract with a contractor to provide sweeping or vacuuming of the entrance driveway and interior drive lanes. The use of water to flush debris and sediment into storm drains shall be prohibited. Sweep parking lot weekly and prior to the rainy season
Structural Source Control BMPs			
S1.-Provide Storm Drain System Stenciling and Signage	Owner or Future Property Owner	Anti-dumping stenciling messages will be provided at storm drain inlets to alert the public to the destination of pollutants discharged into stormwater.	Management shall have the phrase "NO DUMPING! DRAINS TO OCEAN" stenciled on each

		Stenciling shall comply with the following requirements: (1) Provide stenciling or labeling of all storm drain inlets and catch basins within the project area with prohibitive language (such as: "NO DUMPING – DRAINS TO OCEAN") and/or graphical icons to discourage illegal dumping (2) Maintain legibility of stencils	catch basin to alert the public to the destination of pollutants discharged into stormwater. Inspect Annually. Re-stencil as needed if stencilling becomes faded or otherwise illegible.
S3.-Design and Construct Trash and Waste Storage Areas to Reduce Pollutant Introduction	Owner or Future Property Owner	Trash storage areas will be kept clean. Trash and debris will be picked up and placed in dumpsters that are stored within the trash enclosure area. The trash area shall be swept clean.	Continuous
S4.-Use Efficient Irrigation Systems & Landscape Design	Owner or Future Property Owner	The landscape/irrigation plan shall implement irrigation smart timers. The Property Owner will be responsible for adjusting the system seasonally, and checking for broken/over-spraying sprinkler heads. See additional irrigation requirements in BMP 'N2" and 'N3' above	Adjust landscape watering according to weather conditions to avoid excess usage; inspect timers and adjust seasonally; inspect for broken/over-spraying sprinkler heads Monthly
Treatment Control BMPs			
Pre-Treatment Control BMPs for DMA-1, and DMA-2	Owner or Future Property Owner	Select pre-treatment system to protect the underground infiltration gallery from clogging due to sediment. Use CULTEC StormFilter pre-treatment system.	Visually inspect and remove debris. 3 times annually prior to, during and after rainy season.
Treatment Control BMPs for DMA-1, and DMA-2	Owner or Future Property Owner	**Underground Infiltration gallery** Design LID BMPs using the assumed Principal Unit Operations and Processes Provided of	Visually inspect and remove debris. 3 times annually prior to, during and after rainy season.

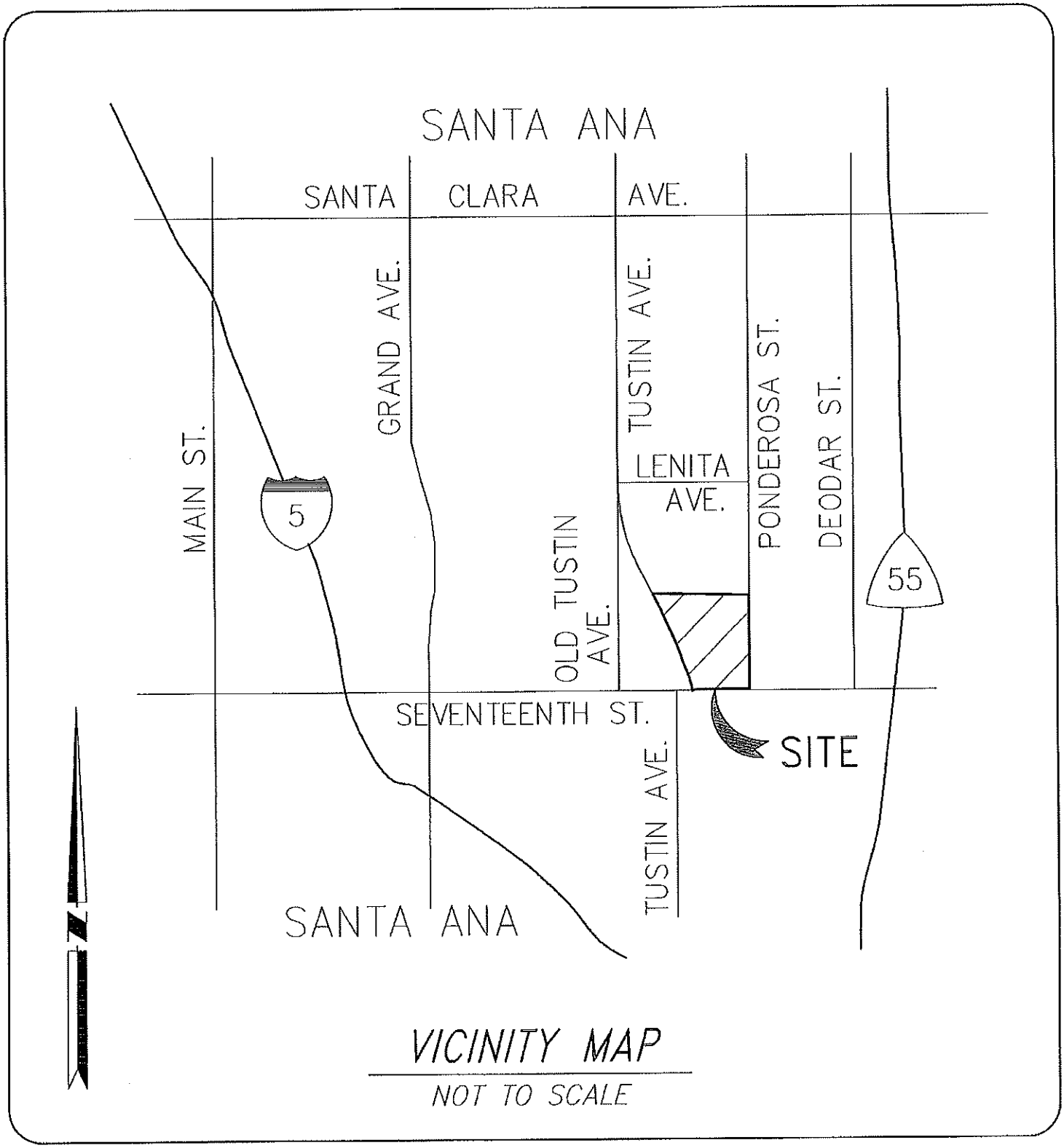
		Filtration, Sorption/Ion Exchange and Volume loss, will be reached by an Underground Infiltration gallery as shown on Plan. Use CULTEC Chambers.	

The funding for the treatment and structural BMPs will be provided by the owner through the current budget for Operation and Maintenance.

Responsible Party Information:
Name:
Company:
Phone Number: ( ) -

Attachment C

Figures



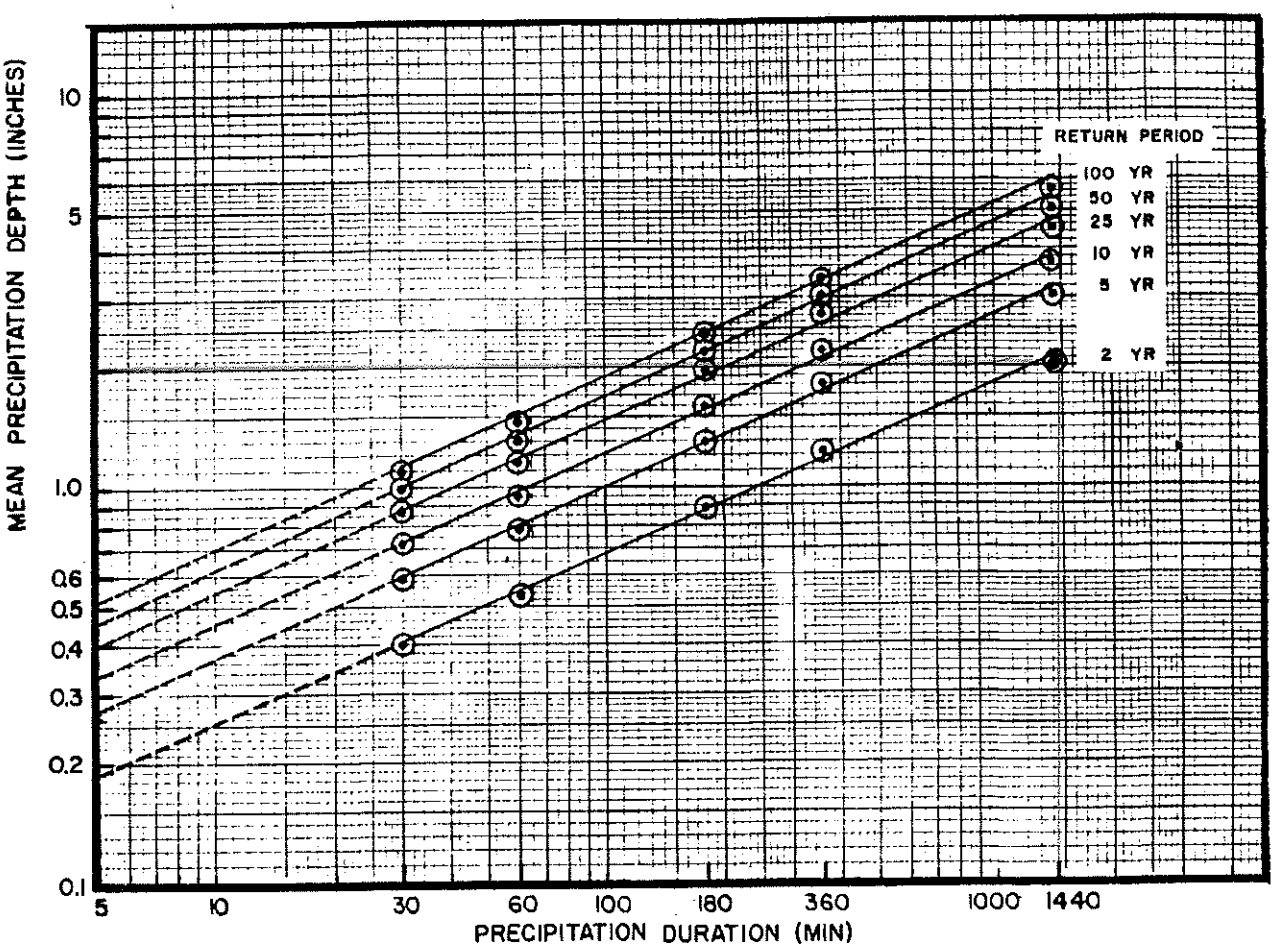
VICINITY MAP

NOT TO SCALE

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

(D= Depth in inches, t= duration in minutes)

Return Frequency (years)	a	b
2	0.095	0.426
5	0.131	0.438
10	0.170	0.427
25	0.200	0.434
50	0.225	0.434
100	0.259	0.427

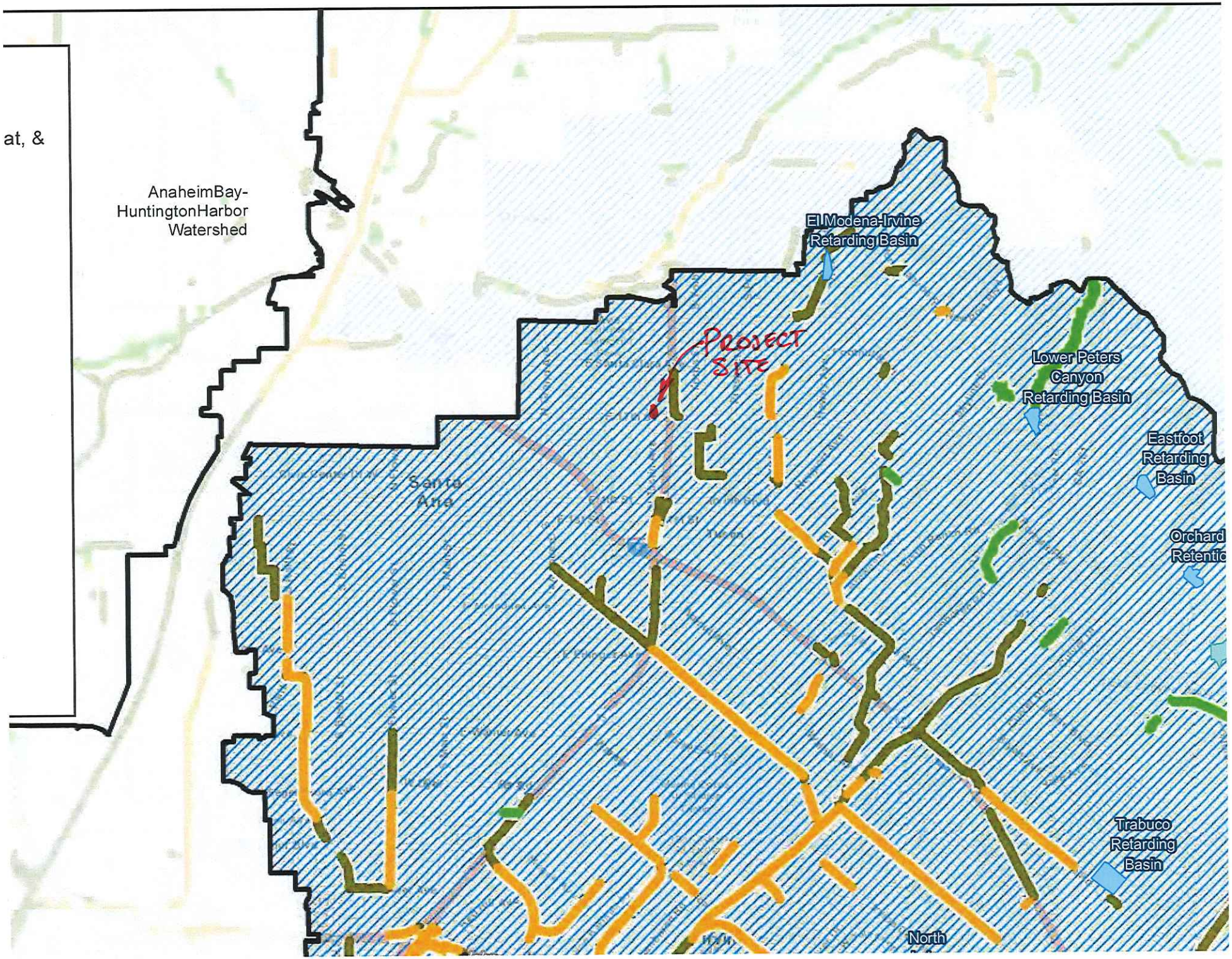


ORANGE COUNTY

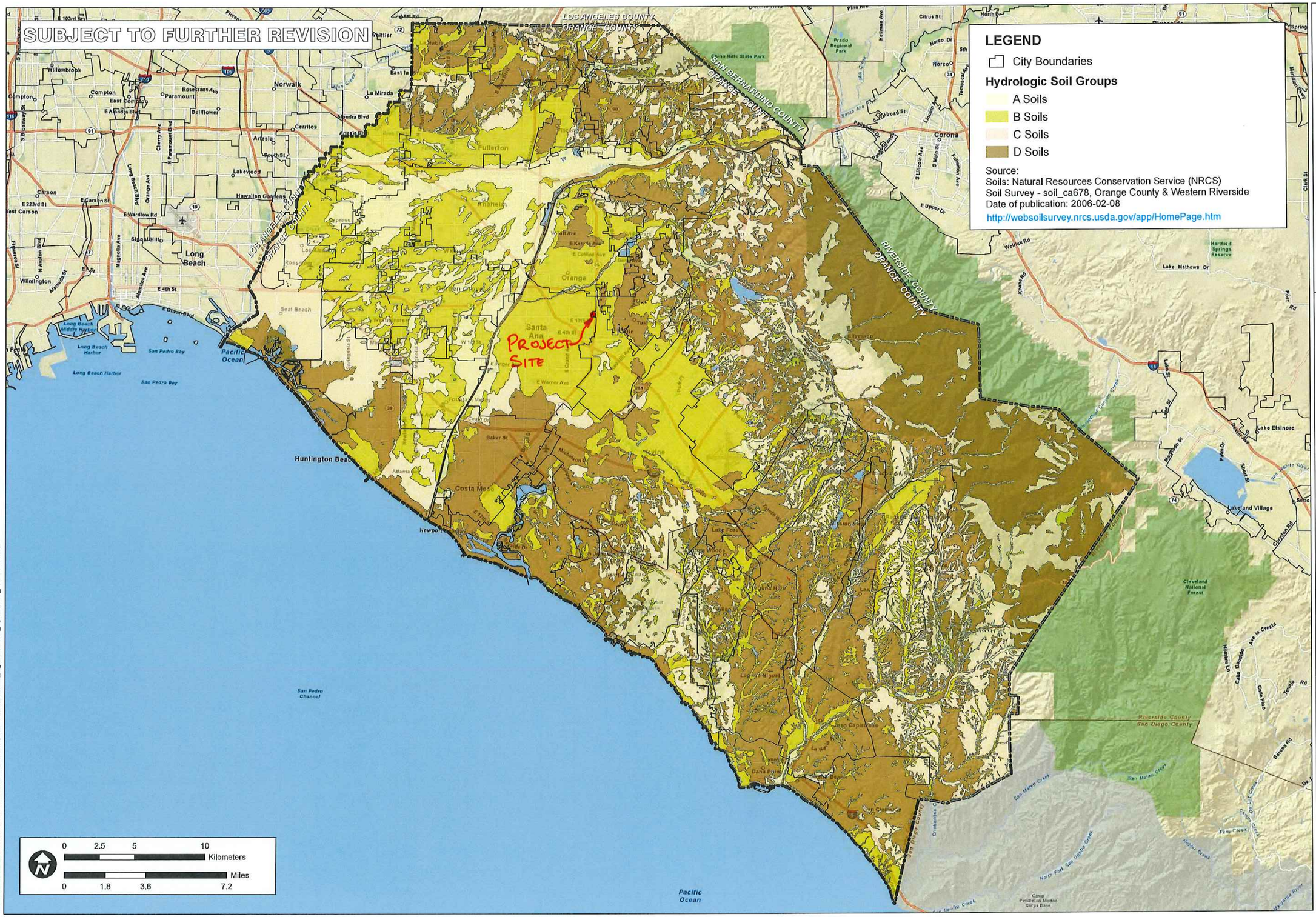
HYDROLOGY MANUAL

MEAN PRECIPITATION DEPTHS FOR NONMOUNTAINOUS AREAS

Figure B-1


at, &
AnaheimBay-
HuntingtonHarbor
Watershed
El Modena-Irvine
Retarding Basin
PROJECT
SITE
Lower Peters
Canyon
Retarding Basin
Eastfoot
Retarding
Basin
Orchard
Retentio
Santa
Ana
Trabuco
Retarding
Basin
North

SUBJECT TO FURTHER REVISION



LEGEND

- City Boundaries

Hydrologic Soil Groups

- A Soils
- B Soils
- C Soils
- D Soils

Source:
Soils: Natural Resources Conservation Service (NRCS)
Soil Survey - soil_ca678, Orange County & Western Riverside
Date of publication: 2006-02-08
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

0 2.5 5 10 Kilometers
0 1.8 3.6 7.2 Miles

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TITLE
NRCS HYDROLOGIC SOILS GROUPS

ORANGE COUNTY INFILTRATION STUDY

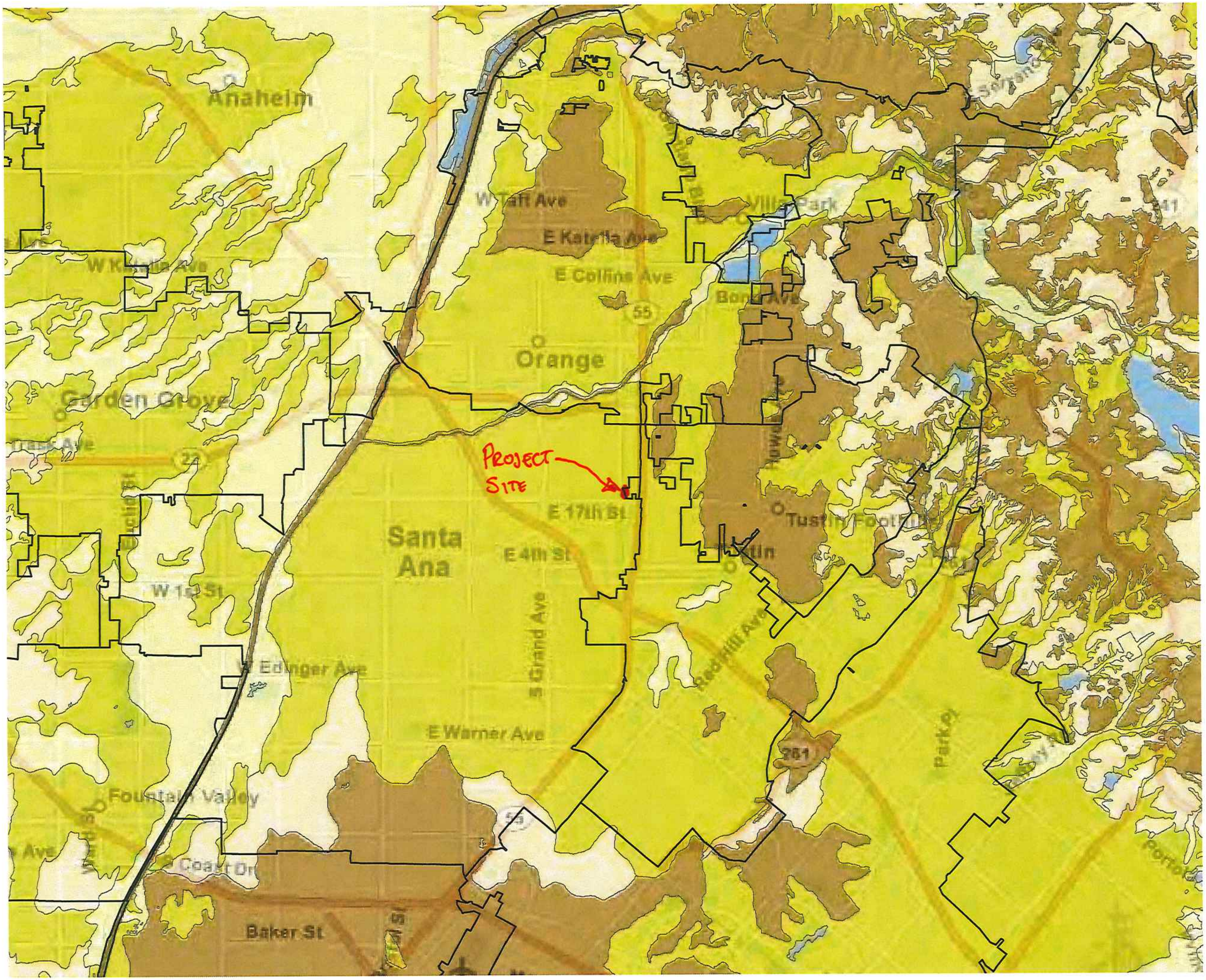
CA

JOB
ORANGE CO.

SCALE	1" = 1.8 miles
DESIGNED	TH
DRAWING	TH
CHECKED	BMP
DATE	02/09/11
JOB NO.	9526-E

PACE
Advanced Water Engineering

FIGURE
XVI-2a


Anaheim
Orange
Garden Grove
Santa Ana
Fountain Valley
Villa Park
W Taft Ave
E Katella Ave
E Collins Ave
Bond Ave
E 17th St
E 4th St
S Grand Ave
E Warner Ave
W Edinger Ave
W 1st St
Baker St
Red Hill Ave
55
22
261
PROJECT SITE

SUBJECT TO FURTHER REVISION

LEGEND

- Orange County Precipitation Stations
- 24 Hour, 85th Percentile Rainfall (Inches)
- 24 Hour, 85th Percentile Rainfall (Inches) - Extrapolated
- City Boundaries

Rainfall Zones

Design Capture Storm Depth (inches)

- 0.65"
- 0.7
- 0.75
- 0.80
- 0.85
- 0.90
- 0.95
- 1.00
- 1.10"

Note: Events defined as 24-hour periods (calendar days) with greater than 0.1 inches of rainfall.
For areas outside of available data coverage, professional judgment shall be applied.

PROJECT SITE

0.65 0.7 0.75 0.8 0.85 0.9 0.95 1 1.05

0 3 6 12 Kilometers
0 1.8 3.6 7.2 Miles

TITLE: RAINFALL ZONES

ORANGE COUNTY
TECHNICAL GUIDANCE
DOCUMENT

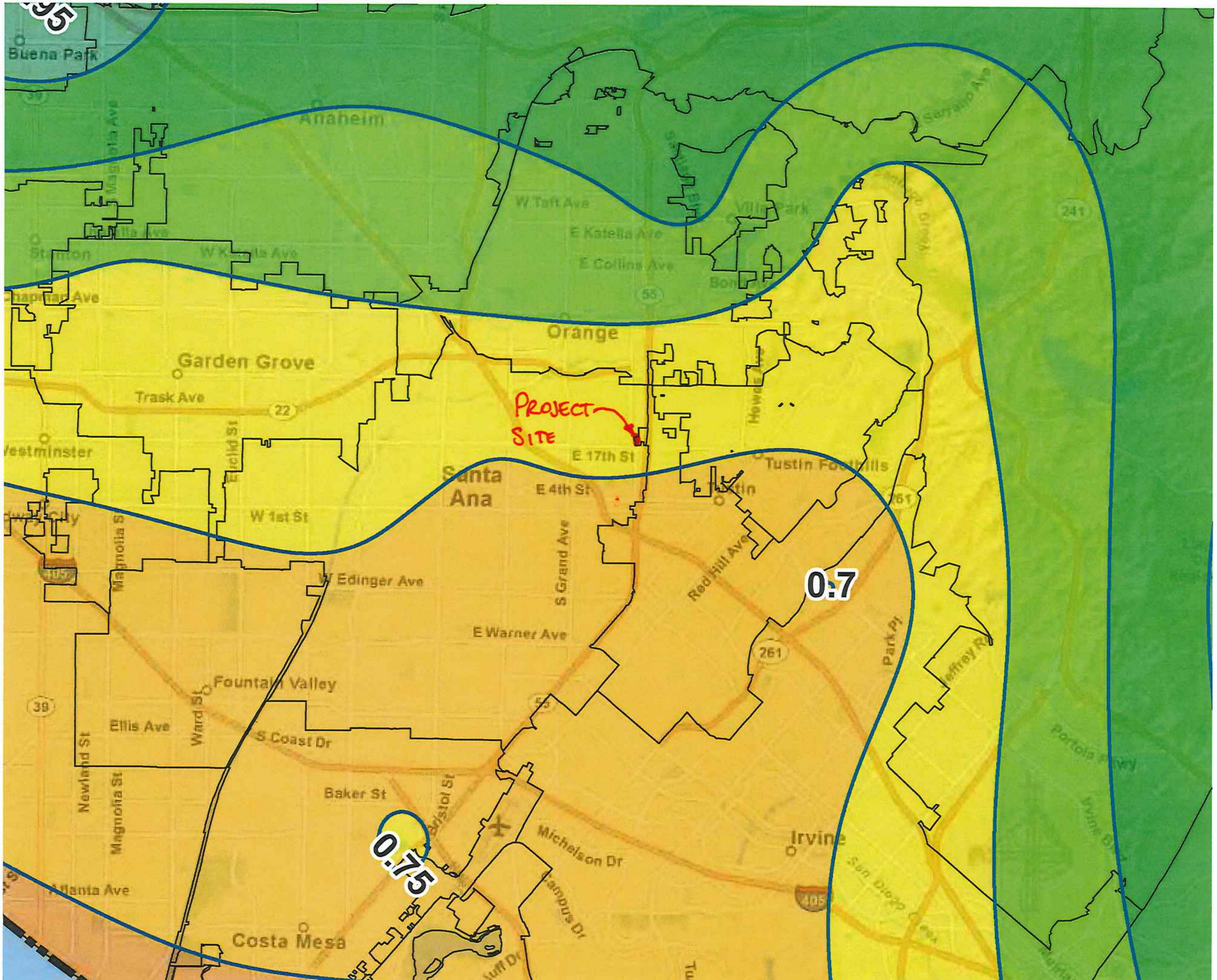
JOB: ORANGE CO. CA

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


Buena Park
Anaheim
Orange
Garden Grove
Trask Ave
Westminster
Santa Ana
PROJECT SITE
E 17th St
E 4th St
W 1st St
Tustin Foothills
W Taft Ave
E Katella Ave
E Collins Ave
Villa Park
W Edinger Ave
S Grand Ave
E Warner Ave
Red Hill Ave
0.7
Park Pl
Fountain Valley
Ellis Ave
S Coast Dr
Baker St
Bristol St
0.75
Michelson Dr
Irvine
Costa Mesa
Newland St
Magnolia St
Atlanta Ave
Portola Pkwy
Campus Dr
Euclid St
Ward St
Howes Ave

SUBJECT TO FURTHER REVISION

LEGEND

- Depth To First Groundwater Contours
- City Boundaries
- OCWD Groundwater Basin Protection Boundary

Note: Data are not available for South Orange County at this time.

Source:
Sprotte, Fuller and Greenwood, 1980.
California Division of Mines and Geology;
California Geological Survey

PROSECT SITE

0 2 4 8 Kilometers

0 1.25 2.5 5 Miles

P:\9526E\e-GIS\Mxds\Reports\InfiltrationFeasability_20110215\9526E_FigureXVI-2d_DepthToGroundwaterOverview_20110215.mxd

TITLE

NORTH ORANGE COUNTY
MAPPED DEPTH TO FIRST
GROUNDWATER

JOB

ORANGE COUNTY
INFILTRATION STUDY

CA

ORANGE CO.

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-2d

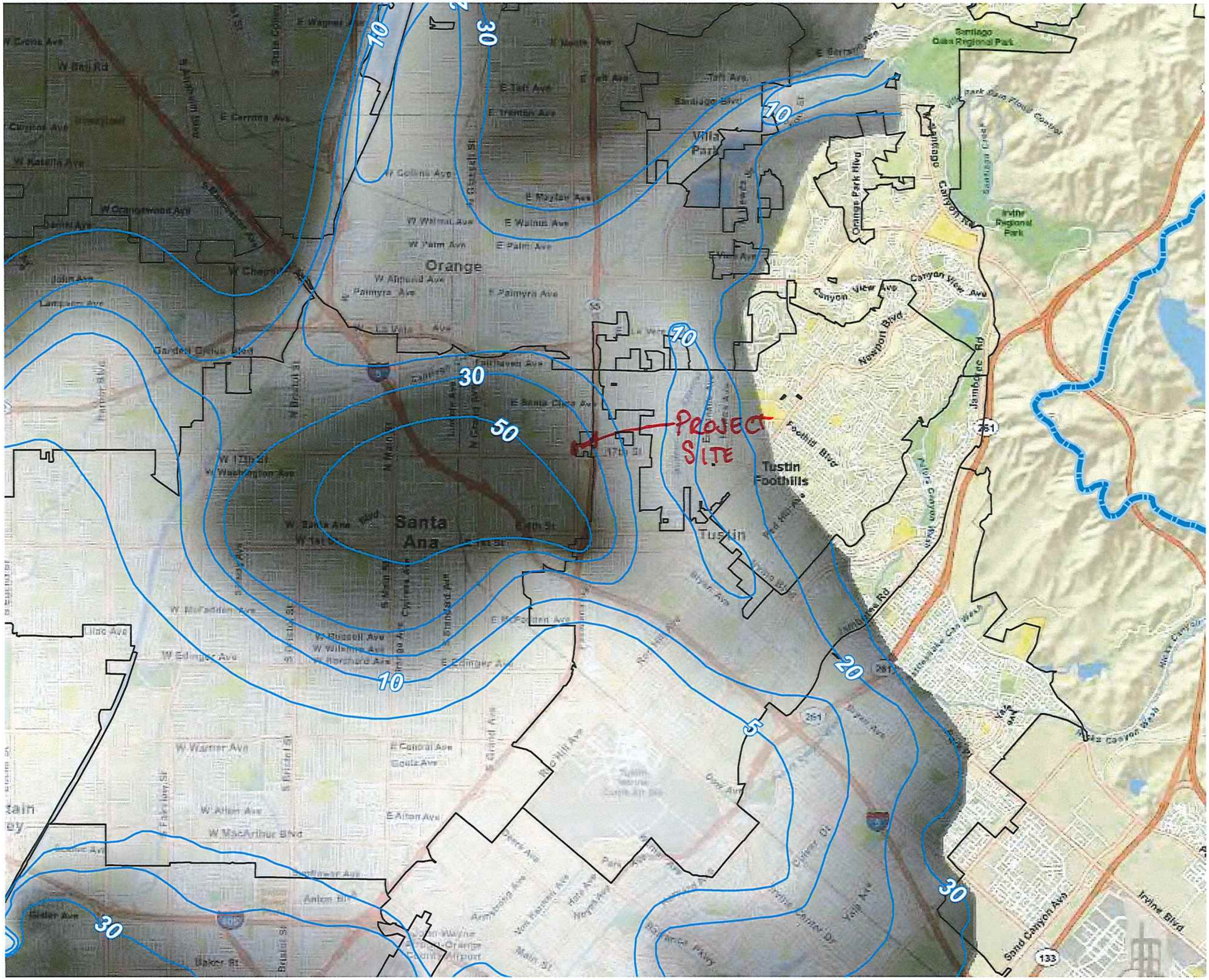

PROJECT SITE
Orange
Santa Ana
Tustin
Tustin Foothills
Villa Park
Irvine Regional Park
Santiago Oaks Regional Park
Foothill Blvd
Newport Blvd
Canyon View Ave
Orange Park Blvd
Jamboree Rd
Santiago Canyon Rd
Irvine Blvd
Sand Canyon Ave
E Santa Clara Ave
W 17th St
E Walnut Ave
W Walnut Ave
E Palm Ave
W Palm Ave
W Almond Ave
E Palmyra Ave
E Chapman Ave
E Taft Ave
E Katella Ave
E McFadden Ave
W McFadden Ave
E Edinger Ave
W Edinger Ave
W Warner Ave
E Warner Ave
W MacArthur Blvd
E Alton Ave
Baker St
Bristol St
Main St
5
10
20
30
50

Table 2.7: Infiltration BMP Feasibility Worksheet

	Infeasibility Criteria	*Yes*	*No*
1	**Would Infiltration BMPs pose significant risk for groundwater related concerns?** Refer to **Appendix VIII** (Worksheet I) for guidance on groundwater-related infiltration feasibility criteria.		X
Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	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.		X
Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
3	Would infiltration of the DCV from drainage area **violate downstream water rights**?		X
Provide basis: Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Table 2.7: Infiltration BMP Feasibility Worksheet (continued)

	Partial Infeasibility Criteria	*Yes*	*No*
4	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?		X
Provide basis: SOIL TYPE B Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
5	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**.		X
Provide basis: PER SOILS REPORT 0.6 IN/HR. WITH FS OF 2 = 0.3 IN/HR. Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
6	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?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: SITE IS UNDEVELOPED LAND. Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
7	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?**		X
Provide citation to applicable study and summarize findings relative to the amount of infiltration that is permissible: SITE IS UNDEVELOPED LAND. INFILTRATION WILL DECREASE. Summarize findings of studies provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

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.	
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	
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	
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.	X

Harvest and Use Infeasibility

Harvest and use infeasibility criteria include:

- If inadequate demand exists for the use of the harvested rainwater. See **Appendix X** for guidance on determining harvested water demand and applicable feasibility thresholds.
- If the use of harvested water for the type of demand on the project violates codes or ordinances most applicable to stormwater harvesting in effect at the time of project application and a waiver of these codes and/or ordinances cannot be obtained. It is noted that codes and ordinances most applicable to stormwater harvesting may change

Attachment D

Soils Report

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED IN-N-OUT CENTER
NEC OF TUSTIN AVENUE AND 17TH STREET
SANTA ANA, CA

PROJECT NO. 112-13025
MAY 13, 2013

PREPARED FOR:

In-N-Out Burger
13502 Hamburger Lane
Baldwin Park, CA. 91706

ATTENTION: MR. JOHN PUENTE

PREPARED BY:

KRAZAN & ASSOCIATES, INC.
1100 OLYMPIC DRIVE SUITE 103
CORONA, CALIFORNIA 92881
(951) 273-1011

Offices Serving the Western United States

- Review of selected published geologic maps, reports and literature pertinent to the site and surrounding area.

- A field investigation consisting of drilling nine (9) borings to depths ranging from approximately 10 to 51 feet below the existing ground surface for evaluation of the subsurface conditions at the project site.

- Performing laboratory tests on representative soil samples obtained from the borings to evaluate the physical and index properties of the subsurface soils.

- Performing double ring infiltration testing at two (2) locations in order to obtain approximate infiltration rates for the near surface soil conditions.

- Evaluation of the data obtained from the investigation and engineering analyses of the data with respect to the geotechnical aspects of structural design, site grading and paving.

- Preparation of this report summarizing the findings, results, conclusions and recommendations of our investigation.

Environmental services, such as a chemical analysis of soil and groundwater for possible environmental contaminates, were not in our scope of services.

PROPOSED CONSTRUCTION

Based on our review of the preliminary site plan and our discussions with the project representative, we understand that the proposed development will include construction of a new In-N-Out restaurant facility and associated site improvements. In addition, a second retail building will be constructed at the subject site. The proposed buildings are understood to range in size from approximately 3,300 square feet to 3,750 square feet in size. The proposed buildings are anticipated to be single-story structures. The proposed buildings are anticipated to be of wood frame/stucco, masonry, or steel construction with slab-on-grade floors. It is assumed that the proposed buildings will be supported on a shallow foundation system. It is anticipated that the foundation loads will be relatively light.

In the event these structural or grading details are inconsistent with the final design criteria, we should be notified so that we can evaluate the potential impacts of the changes on the recommendations presented in this report and provide an updated report as necessary.

SITE LOCATION AND SITE DESCRIPTION

The site is a roughly triangular shaped parcel. The site is located at the northeast corner of Tustin Avenue and 17th Street, in the city of Santa Ana, California. (see Vicinity Map, Figure 1). Presently, the site is vacant of any above ground structures. Ground cover at the site consists of exposed soil. Localized debris and small stockpiles of soil are located throughout the site. The site is bound by multi-family housing to the north, 17th Street to the south, Tustin Avenue to the west, and retail development to the east.

SOIL PROFILE AND SUBSURFACE CONDITIONS

Based on our findings, the subsurface conditions encountered appear typical of those found in the geologic region of the site. The near surface soil conditions encountered at the subject site consisted of up to twelve (12) feet of loose silty sand material. These soils were found to have varying consistencies and moisture contents. The conditions encountered included up to four (4) feet of fill material. The thickness of fill was based on conditions encountered and the boring locations and varying depths of undocumented fill materials may be present at the site between our boring locations. Verification of any fill material should be determined during site grading. The near surface soils were found to have low strength characteristics and are highly compressible when saturated. Field and laboratory tests suggest that the near surface soils are moderately compressible. Penetration resistance, measured by the number of blows required to drive a Modified California sampler or a Standard Penetration Test (SPT) sampler, ranged from 4 to 19 blows per foot.

Below the loose surficial soil, dense to very dense sand, silty sands, and clayey sands were encountered. Field and laboratory tests suggest that these soils are moderately strong and slightly compressible. Penetration resistance, measured by the number of blows required to drive a Modified California sampler or a Standard Penetration Test (SPT) sampler, ranged from 5 to over 50 blows per foot. Representative soil samples had angles of internal friction of 30 to 32 degrees. Representative soil samples were found to consolidate 0.8 to 1.2 percent when saturated.

The above is a general description of soil conditions encountered at the site in the borings drilled for this investigation. For a more detailed description of the soil conditions encountered, please refer to the boring logs in Appendix A.

GROUNDWATER

Test boring locations were checked for the presence of groundwater during and immediately following the drilling operations. Groundwater was not encountered in any of the borings drilled as part of this investigation. Historic groundwater depths for the site indicate a depth to groundwater in excess of fifty (50) feet below ground surface according to the Seismic Hazard Zone Report for the Orange 7.5-Minute Quadrangle, Orange County, California, Revised 1998.

It should be recognized that water table elevation might fluctuate with time. The depth to groundwater can be expected to fluctuate both seasonally and from year to year. Fluctuations in the groundwater level may occur due to variations in precipitation, irrigation practices at the site and in the surrounding areas, climatic conditions, flow in adjacent or nearby canals, pumping from wells and possibly as the result of other factors that were not evident at the time of our investigation. Therefore, water level observations at the time of our field investigation may vary from those encountered during the construction phase of the project. The evaluation of such factors is beyond the scope of this report. Long-term monitoring in observation wells, sealed from the influence of surface water, is often required to more accurately define the potential range of groundwater conditions on a site.

required prior to permitting most urban developments within the mapped zones. The Act also requires sellers of real property within the zones to disclose this fact to potential buyers. The area of the subject site is included on the Seismic Hazard Zones Map entitled "Orange Quadrangle", Revised Official Map, dated 1998. The area of the subject is not located in an area designated as a seismic hazard zone.

OTHER HAZARDS

Rockfall, Landslide, Slope Instability, Debris Flow: The subject site is relatively flat and level. It is our understanding that there are no significant slopes proposed as part of the proposed development. Provided the recommendations presented in this report are implemented into the design and construction of the anticipated development, rockfalls, landslides, slope instability, and debris flows are not anticipated to pose a hazard to the subject site.

Seiches: Seiches are large waves generated within enclosed bodies of water. The site is not located in close proximity to any lakes or reservoirs. As such, seiches are not anticipated to pose a hazard to the subject site.

Tsunamis: Tsunamis are tidal waves generated by fault displacement or major ground movement. The site is several miles from the ocean. As such, tsunamis are not anticipated to pose a hazard to the subject site.

Hydroconsolidation: The near surface soils encountered at the subject site were found to be loose to medium dense. Provided the recommendations in this report are incorporated into the design and construction of the proposed development, hydroconsolidation is not anticipated to be a significant concern for the subject site.

EXPANSIVE SOIL

The near-surface silty sand soils encountered at the site have been identified through laboratory testing as having a low expansion potential. The Expansion Index on the representative silty clay soil was tested to be 16. Expansive soils have the potential to undergo volume change, or shrinkage and swelling, with changes in soil moisture. As expansive soils dry, the soil shrinks; when moisture is reintroduced into the soil, the soil swells.

INFILTRATION TESTING

An estimated infiltration rate was determined using the results of double ring infiltration testing performed at the subject site. The infiltration testing indicated an infiltration rate of approximately 0.6 inch per hour. Detailed results of the infiltration testing are included in Appendix A tabular format. The soil infiltration rates are based on tests conducted with clean water. The infiltration rates may vary with time as a result of soil clogging from water impurities. A factor of safety should be incorporated into the design of the infiltration system to compensate for these factors as determined appropriate by the designer. In addition, routine maintenance consisting of clearing the system of clogged soils and debris should be expected.

GROUNDWATER INFLUENCE ON STRUCTURES/CONSTRUCTION

Based on our findings and historical records, it is not anticipated that groundwater will rise within the zone of structural influence or affect the construction of foundations and pavements for the project. However, if earthwork is performed during or soon after periods of precipitation, the subgrade soils may become saturated, "pump," or not respond to densification techniques. Typical remedial measures include: discing and aerating the soil during dry weather; mixing the soil with dryer materials; removing and replacing the soil with an approved fill material; or mixing the soil with an approved lime or cement product. Our firm should be consulted prior to implementing remedial measures to observe the unstable subgrade conditions and provide appropriate recommendations.

Historic high groundwater levels indicate a depth to water greater than fifty (50) feet below ground surface. In addition, groundwater was not encountered in any of the borings drilled as part of this investigation. Based on our understanding of the anticipated project grading requirements, only minor cuts and fills, one to two feet or less from existing grades will be required to achieve final finished grades. The soil conditions encountered at the site consist of predominately dense granular soil to a depth of at least fifty (50) feet below site grades. Based on this information, there is no indication that on site infiltration will result in adverse transmission along impervious layers located within ten (10) feet of the bottom of proposed infiltration areas. Based on the historic depth to groundwater there is no indication that on site infiltration will impact groundwater located within ten (10) feet of the bottom of proposed infiltration areas.

SEISMIC CONSIDERATIONS

Ground Shaking

Although ground rupture is not considered to be a major concern at the subject site, the site will likely be subject to at least one moderate to severe earthquake and associated seismic shaking during its lifetime, as well as periodic slight to moderate earthquakes. Some degree of structural damage due to stronger seismic shaking should be expected at the site, but the risk can be reduced through adherence to seismic design codes.

Soil Liquefaction

Soil liquefaction is a state of soil particle suspension caused by a complete loss of strength when the effective stress drops to zero. Liquefaction normally occurs under saturated conditions in soils such as sand in which the strength is purely frictional. However, liquefaction has occurred in soils other than clean sand. Liquefaction usually occurs under vibratory conditions such as those induced by seismic events. To evaluate the liquefaction potential of the site, the following items were evaluated:

1) Soil type
2) Groundwater depth
3) Relative density
4) Initial confining pressure
5) Intensity and duration of ground shaking

EARTHWORK

Site Preparation – Clearing and Stripping

General site clearing should include removal of vegetation and existing utilities, structures (footings and slabs); trees and associated root systems; rubble; rubbish; and any loose and/or saturated materials. Site stripping should extend to a minimum depth of 2 to 4 inches, or until all organics in excess of 3 percent by volume are removed. Deeper stripping may be required in localized areas. These materials will not be suitable for reuse as Engineered Fill. However, stripped topsoil may be stockpiled and reused in landscape or non-structural areas.

Any excavations that result from clearing operations should be backfilled with Engineered Fill. Krazan & Associates' field staff should be present during site clearing operations to enable us to locate areas where depressions or disturbed soils are present and to allow our staff to observe and test the backfill as it is placed. If site clearing and backfilling operations occur without appropriate observation and testing by a qualified geotechnical consultant, there may be the need to over-excavate the building area to identify uncontrolled fills prior to mass grading of the building pad.

As with site clearing operations, any buried structures encountered during construction should be properly removed and backfilled. The resulting excavations should be backfilled with Engineered Fill.

Overexcavation and Recompaction

To reduce post-construction soil movement and provide uniform support for the proposed buildings, overexcavation and recompaction of the near surface soil within the proposed building and wall foundation footprint areas should be performed to a minimum depth of eight (8) feet below existing grades or three (3) feet below bottom of the proposed footings, whichever is deeper. The actual depth of the overexcavation and recompaction should be determined by our field representative during construction. The overexcavation and recompaction should also extend laterally at least five (5) feet beyond edges of the proposed footings or building limits. Any undocumented fill encountered during grading should be removed and replaced with Engineered Fill.

Within the proposed exterior flatwork and pavement areas, the overexcavation and recompaction should be performed to a depth of at least twenty-four (24) inches below existing grade or finish subgrade, whichever is deeper. This compaction effort should stabilize the surface soils and locate any unsuitable or pliant areas not found during our field investigation.

Expansive Soil Mitigation

When concrete slabs-on-grade and shallow foundations are placed on expansive soils that have been allowed to lose moisture, the soil is likely to swell as water re-enters the soil structure. Conversely, when slabs and foundations are constructed on moist to wet soils that are allowed to lose moisture, the soil will shrink, as the moisture is lost. This can result in distress to structures founded on these soils, and in particular, lightly loaded concrete slabs. Thus, it is very important that soil within at least the upper two (2) feet of the subgrade in the building pad areas consist of "non-expansive" fill.

TEMPORARY EXCAVATION STABILITY

All excavations should comply with the current requirements of Occupational Safety and Health Administration (OSHA). All cuts greater than 5 feet in depth should be sloped or shored. Temporary excavations should be sloped at 1:1 (horizontal to vertical) or flatter, up to a maximum depth of 10 feet, and at 2:1 (horizontal to vertical) for temporary slopes greater than 20 feet in height. Heavy construction equipment, building materials, excavated soil, and vehicular traffic should not be allowed within five feet of the top (edge) of the excavation. Where sloped excavations are not feasible due to site constraints, the excavations may require shoring. The design of the shoring system is normally the responsibility of the contractor or shoring designer, and therefore, is outside the scope of this report. The design of the temporary shoring should take into account lateral pressures exerted by the adjacent soil, and, where anticipated, surcharge loads due to adjacent buildings and any construction equipment or traffic expected to operate alongside the excavation.

Temporary excavations planned for the construction of the proposed subterranean parking and any other associated underground structures should be excavated according to the accepted engineering practice following Occupational Safety and Health Administration (OSHA) standards by a contractor experienced in such work. Open, unbraced excavations in undisturbed soils should be made according to the table below.

Recommended Excavation Slopes	
Depth of Excavation (feet)	**Temporary Slope (Horizontal:Vertical)**
0-10	1:1
10-15	1½:1
15-20	1¾:1
20+	2:1

If, due to space limitation, excavation near existing structures or roads is performed in a vertical position; braced shoring or shields may be used for supporting vertical excavations. Therefore, in order to comply with the local and state safety regulations, a properly designed and installed shoring system would be required to accomplish planned excavation and installation. A specialty Shoring Contractor should be responsible for the design and installation of such a shoring system during construction. The lateral pressures provided below may be used in the design of a braced-type shoring system.

COMPACTED MATERIAL ACCEPTANCE

Compaction specifications are not the only criteria for acceptance of the site grading or other such activities. However, the compaction test is the most universally recognized test method for assessing the performance of the Grading Contractor. The numerical test results from the compaction test cannot be solely used to predict the engineering performance of the compacted material. Therefore, the acceptance of compacted materials will also be dependent on the moisture content and the stability of that material. The Geotechnical Engineer has the option of rejecting any compacted material regardless of the degree of compaction if that material is considered to be too dry or excessively wet, unstable or if future instability is suspected. A specific example of rejection of fill material passing the required percent compaction is a fill which has been compacted with in-situ moisture content significantly less than optimum moisture. Where expansive soils are present, heaving of the soils may occur with the introduction of water. Where the material is a lean clay or silt, this type of dry fill (brittle fill) is susceptible to future settlement if it becomes saturated or flooded.

SURFACE DRAINAGE AND LANDSCAPING

The ground surface should slope away from building and pavement areas toward appropriate drop inlets or other surface drainage devices. We recommended that adjacent paved exterior grades be sloped a minimum of 2 percent for a minimum distance of 5 feet away from structures. Ideally, asphalt concrete pavement areas should be sloped at a minimum of 2 percent, with Portland cement concrete sloped at a minimum of one percent toward drainage structures. These grades should be maintained for the life of the project. Roof drains should be designed to avoid discharging into landscape areas adjacent to the building. Downspouts should be directed to discharge directly onto paved surfaces to allow for surface drainage into the storm systems or should be connected directly to the on-site storm drain.

FOUNDATIONS

The proposed structures, including buildings, walls, or any other structure designed using the following soil bearing pressures may be supported on a shallow foundation system bearing on a minimum of three (3) foot of newly placed Engineered Fill. Spread and continuous footings can be designed for the following maximum allowable soil bearing pressures:

Load	Allowable Loading
Dead Load Only	2,000 psf
Dead-Plus-Live Load	2,600 psf
Total Load, including wind or seismic loads	3,300 psf

The footings should have a minimum depth of 18 inches below pad subgrade (soil grade) or adjacent exterior grade, whichever is deeper. Minimum footing widths should be 15 inches for continuous footings and 24 inches for isolated footings. The footing excavations should not be allowed to dry out any time prior to pouring concrete.

It is recommended that the slabs be underlain by two to four inches (2-4") of clean sand with a minimum 15 mil polyolefin membrane vapor barrier (i.e. Stego Wrap or equivalent) placed with two inches (2") of clean sand on top of the vapor barrier.

Moisture within the structure may be derived from water vapors, which were transformed from the moisture within the soils. This moisture vapor can travel through the vapor membrane and penetrate the slab-on-grade. This moisture vapor penetration can affect floor coverings and produce mold and mildew in the structure. To minimize moisture vapor intrusion, it is recommended that a vapor retarder be installed in accordance with ASTM guidelines. It is recommended that the utility trenches within the structure be compacted, as specified in our report, to minimize the transmission of moisture through the utility trench backfill. Special attention to the immediate drainage and irrigation around the building is recommended. Positive drainage should be established away from the structure and should be maintained throughout the life of the structure. Ponding of water should not be allowed adjacent to the structure. Over-irrigation within landscaped areas adjacent to the structure should not be performed. In addition, ventilation of the structure (i.e. ventilation fans) is recommended to reduce the accumulation of interior moisture.

RETAINING WALLS

For retaining walls with level ground surface behind the walls, we recommend that retaining walls capable of deflecting a minimum of 0.1 percent of the wall height at the top be designed using an equivalent fluid active pressure of 35 pounds per square foot per foot of depth and 60 pounds per square foot of depth for drained conditions and undrained conditions, respectively. Walls that are incapable of this deflection or walls that are fully constrained against deflection should be designed for an equivalent fluid at-rest pressure of 55 pounds per square foot per foot of depth and 80 pounds per square foot of depth, for drained and undrained conditions, respectively. A passive lateral pressure of 250 pounds per square foot may be used to calculate sliding resistance. If walls are to be constructed above descending slopes, our office should be contacted to discuss further reduction in allowable passive pressures for resistance of lateral forces, and for overall retaining wall foundation design. The stated lateral earth pressures do not include the effects of hydrostatic water pressures generated by infiltrating surface water that may accumulate behind the retaining walls; or loads imposed by construction equipment, foundations, or roadways. All of the above earth pressures are unfactored and are, therefore, not inclusive of factors of safety.

Any surcharge effect from loads adjacent to the walls should be included in the wall design. For surcharge load for walls capable of deflecting (cantilever walls), we recommend applying a uniform surcharge pressure equal to one-third of the applied load over the full height of the wall. Where walls are restrained the surcharge load should be based on one-half of the applied load above the wall, also distributed over the full height of the wall. For other surcharges, such as from adjacent foundations, point loads or line loads, Krazan & Associates should be consulted.

Expansive soils should not be used for backfill against walls. The zone of non-expansive backfill material should extend from the bottom of each retaining wall laterally back a distance equal to the height of the wall, to a maximum of five (5) feet.

ASPHALT CONCRETE (FLEXIBLE) PAVEMENTS Subgrade R-value = 40				
Traffic / Pavement Designation	**Traffic Index**	**Asphalt Concrete (inches)**	**Class 2 Aggregate Base (inches)**	**Depth of Compacted Subgrade (in)**
STANDARD	5.5	4.0	6.0	12.0

We recommend that the subgrade soil be prepared as discussed in this report. The compacted subgrade should be non-yielding when proof-rolled with a loaded ten-wheel truck, such as a water truck or dump truck, prior to pavement construction. Subgrade preparation should extend a minimum of 2 feet laterally behind the edge of pavement or back of curbs.

Pavement areas should be sloped and drainage gradients maintained to carry all surface water off the site. A cross slope of 2 percent is recommended in asphalt concrete pavement areas to provide good surface drainage and to reduce the potential for water to penetrate into the pavement structure.

Unless otherwise required by local jurisdictions, paving materials should comply with the materials specifications presented in the Caltrans Standard Specifications Section. Class 2 aggregate should comply with the materials requirements for Class 2 base found in Section 26.

The mineral aggregate shall be Type B, ½-inch or ¾-inch maximum, medium grading, for the wearing course and ¾-inch maximum, medium grading for the base course, and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The asphalt concrete materials should comply with and be placed in accordance with the specifications presented in Section 39 of the Caltrans Standard Specifications, latest edition. Asphalt concrete should be compacted to a minimum of 96 percent of the maximum laboratory compacted (kneading compactor) unit weight.

ASTM Test procedures and should be used to assess the percent relative compaction of soils, aggregate base and asphalt concrete. Aggregate base and subbase, and the upper 12 inches of subgrade should be compacted to at least 95 percent based on the Modified Proctor maximum compacted unit weight obtained in accordance with ASTM test method D1557. Compacted aggregate base should also be stable and unyielding when proof-rolled with a loaded ten-wheel water truck or dump truck.

Portland Cement Concrete (Rigid) Pavement

A five-inch layer of compacted Class 2 aggregate base should be placed over the prepared subgrade prior to placement of the concrete. With the addition of the aggregate base material, we recommend that in the rigid pavement is to be designed by a Structural Engineer.

RIGID PAVEMENT			
Traffic/Pavement Designation	**Portland Cement Concrete (inches)**	**Class 2 Aggregate Base (inches)**	**Compacted Subgrade (inches)**
Standard Duty	5.0	6.0	12.0

Electrical resistivity testing of the soils (10,000 ohms-cm) indicates that the onsite soils have a mild potential for metal loss from electrochemical corrosion process. A qualified corrosion engineer should be consulted regarding the corrosion effects of the on-site soils on underground metal utilities.

ADDITIONAL SERVICES

Krazan & Associates should be retained to review your final foundation and grading plans, and specifications. It has been our experience that this review provides an opportunity to detect misinterpretation or misunderstandings with respect to the recommendations presented in this report prior to the start of construction.

Variations in soil types and conditions are possible and may be encountered during construction. In order to permit correlation between the soil data obtained during this investigation and the actual soil conditions encountered during construction, a representative of Krazan & Associates, Inc. should be present at the site during the earthwork and foundation construction activities to confirm that actual subsurface conditions are consistent with those contemplated in our development of this report. This will allow us the opportunity to compare actual conditions exposed during construction with those encountered in our investigation and to expedite supplemental recommendations if warranted by the exposed conditions. This activity is an integral part of our service, as acceptance of earthwork construction is dependent upon compaction testing and stability of the material. Krazan & Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

All earthwork should be performed in accordance with the recommendations presented in this report, or as recommended by Krazan & Associates during construction. Krazan & Associates should be notified at least five working days prior to the start of construction and at least two days prior to when observation and testing services are needed. Krazan & Associates, Inc. will not be responsible for grades or staking, since this is the responsibility of the Prime Contractor.

The review of plans and specifications, and the observation and testing of earthwork related construction activities by Krazan & Associates are important elements of our services if we are to remain in the role of Geotechnical Engineer-of-Record. If Krazan & Associates is not retained for these services, the client and the consultants providing these services will be assuming our responsibility for any potential claims that may arise during or after construction.

LIMITATIONS

Geotechnical Engineering is one of the newest divisions of Civil Engineering. This branch of Civil Engineering is constantly improving as new technologies and understanding of earth sciences advance. Although your site was analyzed using appropriate and current techniques and methods, undoubtedly there will be substantial future improvements in this branch of engineering. In addition to advancements in the field of Geotechnical Engineering, physical changes in the site due to site clearing or grading activities, new agency regulations, or possible changes in the proposed structure or development after issuance of this report will result in the need for professional review of this report. Updating or revisions to the recommendations report, and possibly additional study of the site may be required at that time. In light of this, the Owner should be aware that there is a practical limit to the usefulness of this report

If you have any questions, or if we may be of further assistance, please do not hesitate to contact our office at (951) 273-1011.

Respectfully submitted,
KRAZAN & ASSOCIATES, INC.

James M. Kellogg, PE, GE
Managing Engineer
RCE No. 65092, RGE No. 2902

GEOTECHNICAL ENGINEERING INVESTIGATION *PROPOSED IN-N-OUT CENTER* *SANTA ANA, CALIFORNIA*	Scale: *NTS*	Date: *MAY 13, 2013*	Krazan *SITE DEVELOPMENT ENGINEERS* *Offices Serving the Western United States*
	Drawn by: *JMK*	Approved by: *JMK*	
SITE MAP	Project No. *112-13025*	Figure No. *2*	

Appendix A

UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
SILTS 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

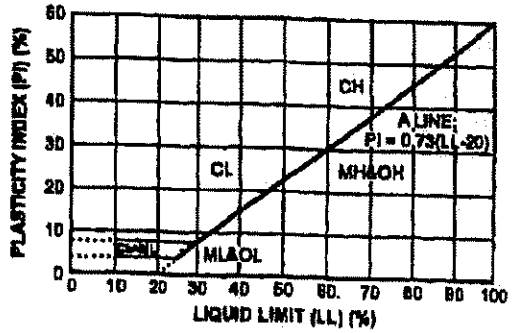
CONSISTENCY CLASSIFICATION

Description	Blows per Foot
Granular Soils	
Very Loose	< 5
Loose	5 – 15
Medium Dense	16 – 40
Dense	41 – 65
Very Dense	> 65
Cohesive Soils	
Very Soft	< 3
Soft	3 – 5
Firm	6 – 10
Stiff	11 – 20
Very Stiff	21 – 40
Hard	> 40

GRAIN SIZE CLASSIFICATION

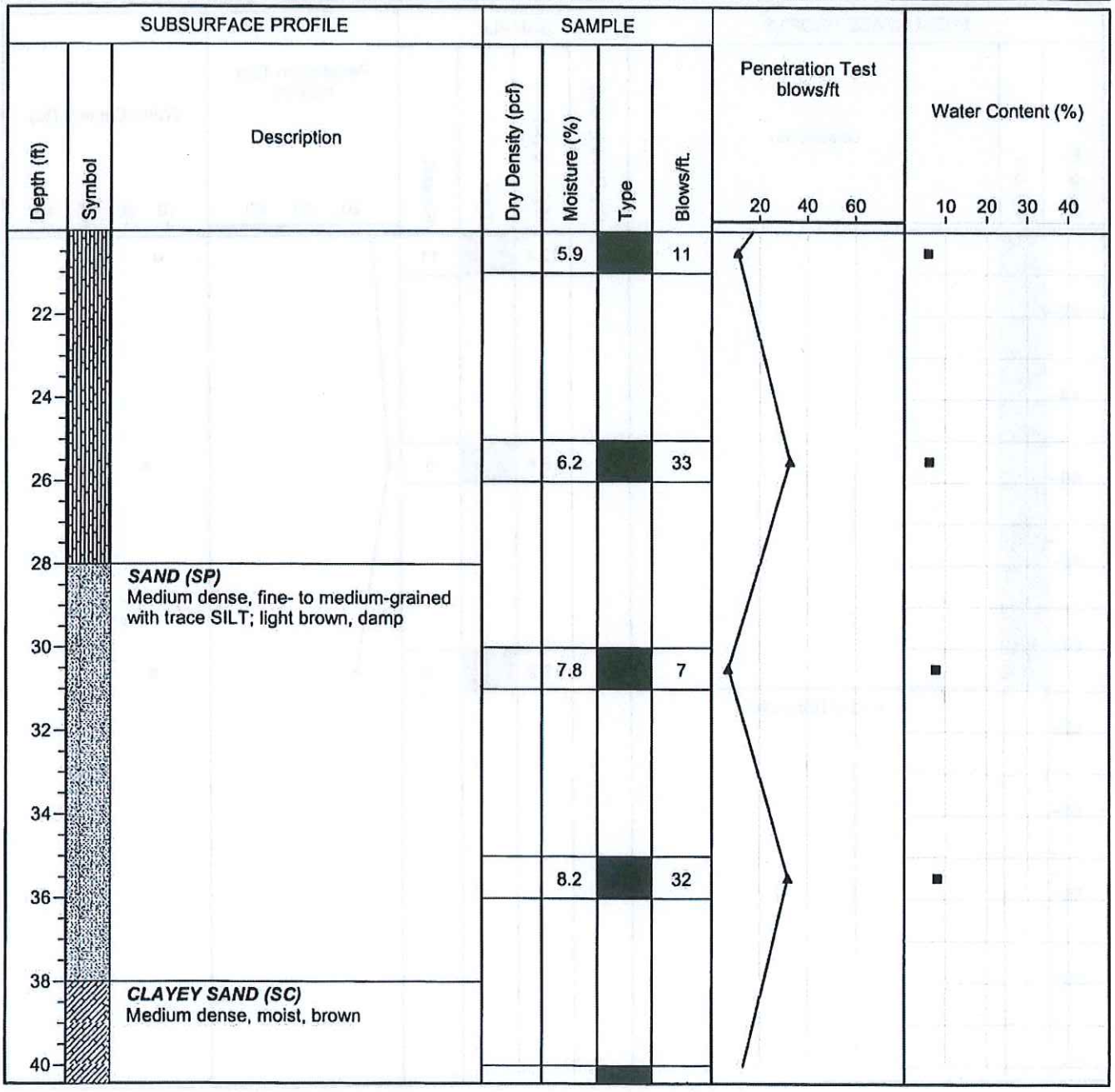
Grain Type	*Standard Sieve Size*	*Grain Size in Millimeters*
Boulders	Above 12 inches	Above 305
Cobbles	3 to 12 inches	305 to 76.2
Gravel	3 inches to No. 4	76.2 to 4.76
Coarse-grained	3 to ¾ inches	76.2 to 19.1
Fine-grained	¾ inches to No. 4	19.1 to 4.76
Sand	No. 4 to No. 200	4.76 to 0.074
Coarse-grained	No. 4 to No. 10	4.76 to 2.00
Medium-grained	No. 10 to No. 40	2.00 to 0.042
Fine-grained	No. 40 to No. 200	0.042 to 0.074
Silt and Clay	Below No. 200	Below 0.074

PLASTICITY CHART



Log of Boring B1

Project: In-N-Out Burger
Project No: 112-13025
Client: In-N-Out Burger
Figure No.: A-1
Location: Santa Ana, California
Logged By: EB
Depth to Water> **Initial:** None **At Completion:** None



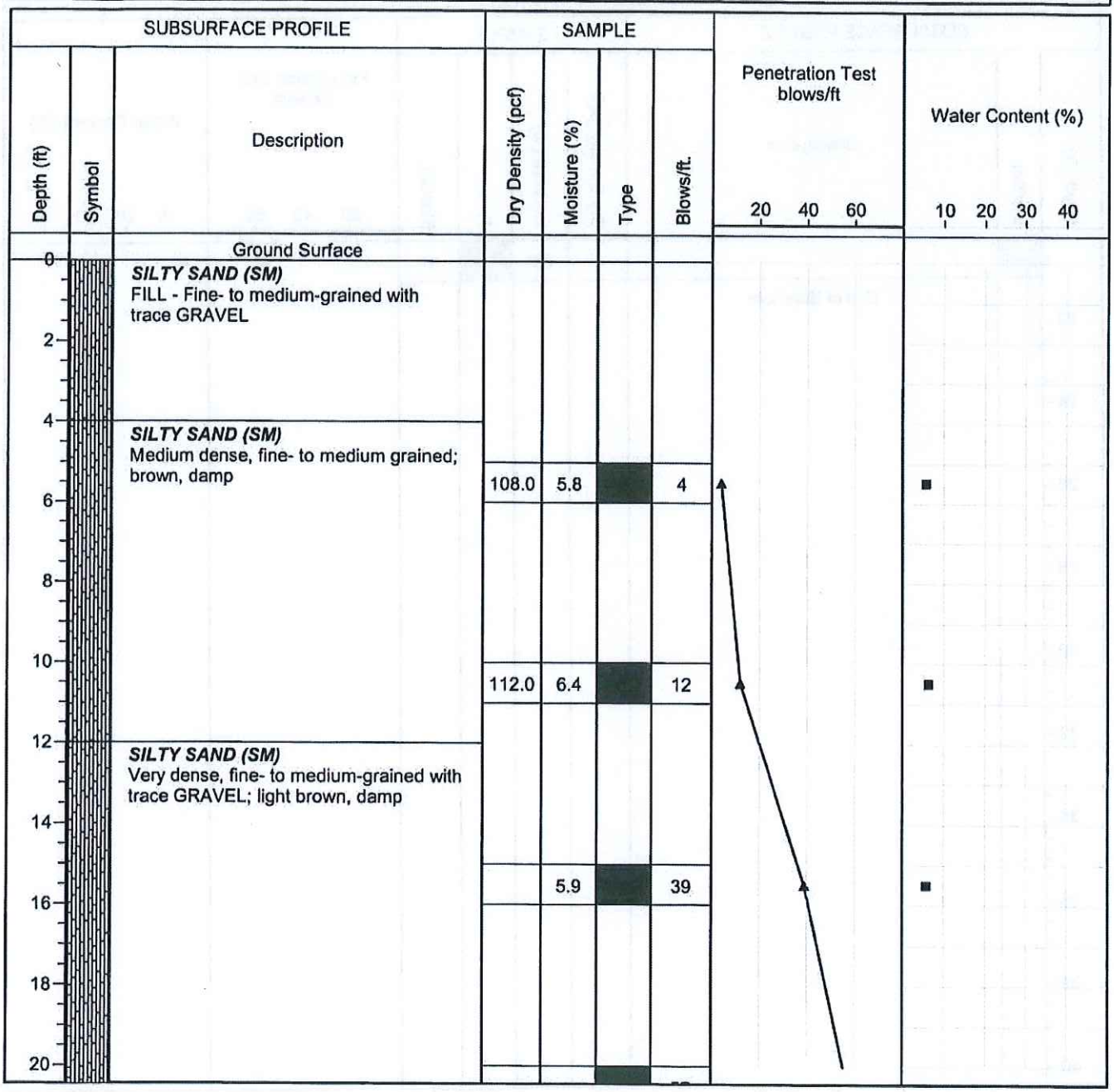
Drill Method: Solid Flight
Drill Rig: CME
Driller: Baja

Krazan and Associates

Drill Date: 4-11-13
Hole Size: 4½ Inches
Elevation: 51 Feet

Log of Boring B2

Project: In-N-Out Burger
Project No: 112-13025
Client: In-N-Out Burger
Figure No.: A-2
Location: Santa Ana, California
Logged By: EB
Depth to Water> **Initial:** None **At Completion:** None



Drill Method: Solid Flight
Drill Rig: CME
Driller: Baja

Krazan and Associates

Drill Date: 4-11-13
Hole Size: 4½ Inches
Elevation: 21 Feet
Sheet: 1 of 2

Log of Boring B3

Project: In-N-Out Burger

Project No: 112-13025

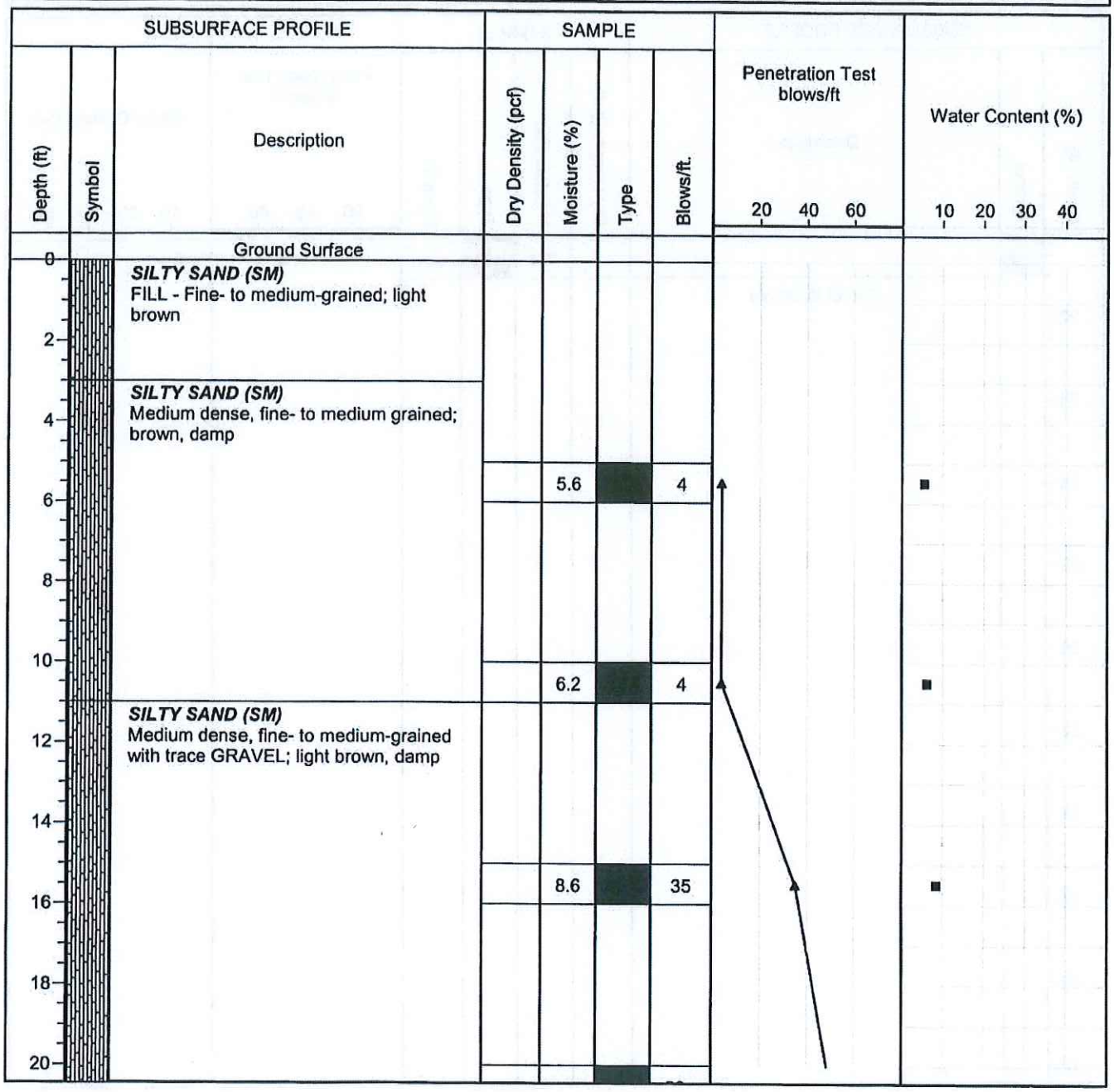
Client: In-N-Out Burger

Figure No.: A-3

Location: Santa Ana, California

Logged By: EB

Depth to Water> Initial: None At Completion: None



Drill Method: Solid Flight

Drill Rig: CME

Driller: Baja

Krazan and Associates

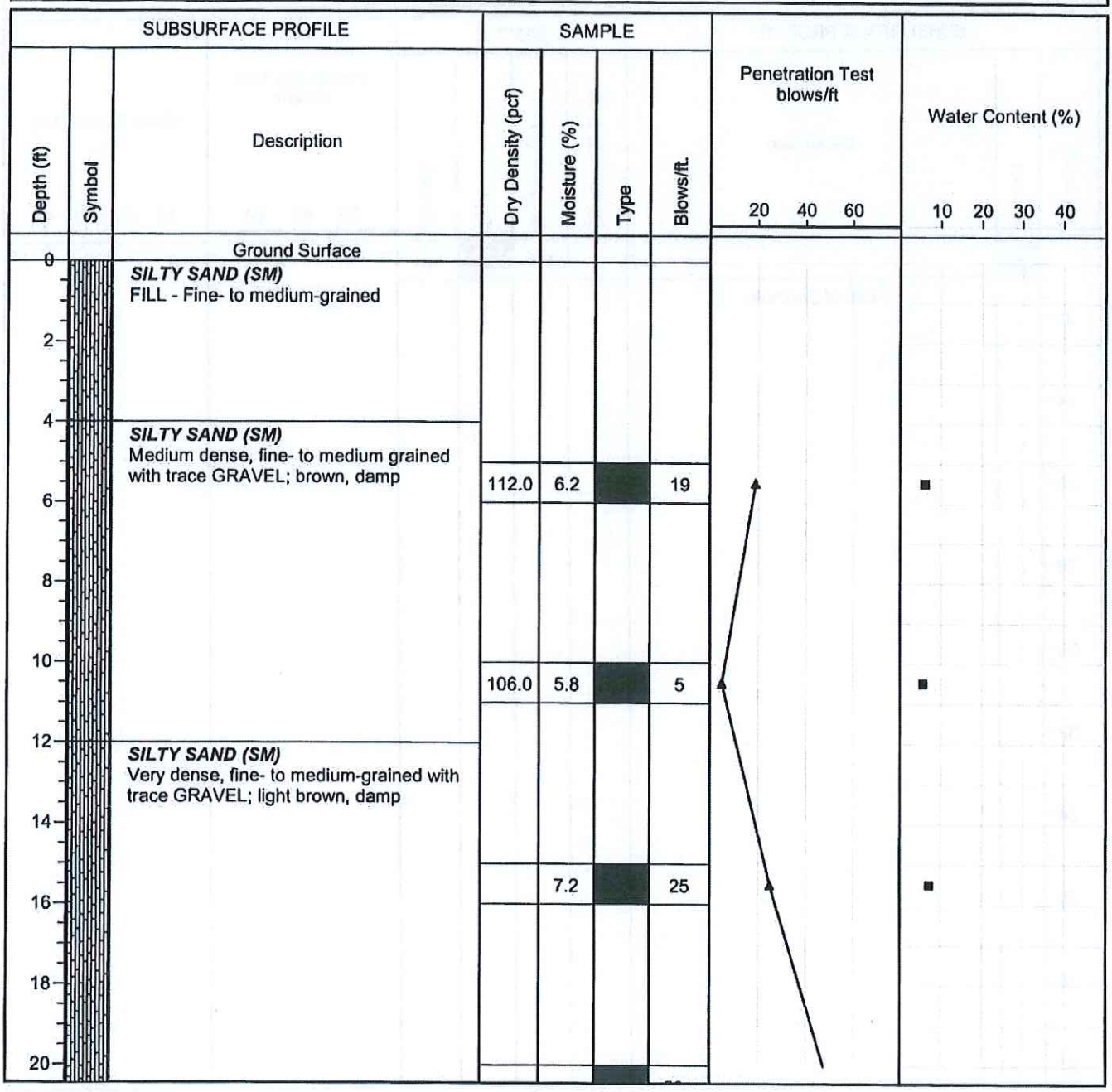
Drill Date: 4-11-13

Hole Size: 4½ Inches

Elevation: 21 Feet

Log of Boring B4

Project: In-N-Out Burger
Project No: 112-13025
Client: In-N-Out Burger
Figure No.: A-4
Location: Santa Ana, California
Logged By: EB
Depth to Water> **Initial:** None **At Completion:** None



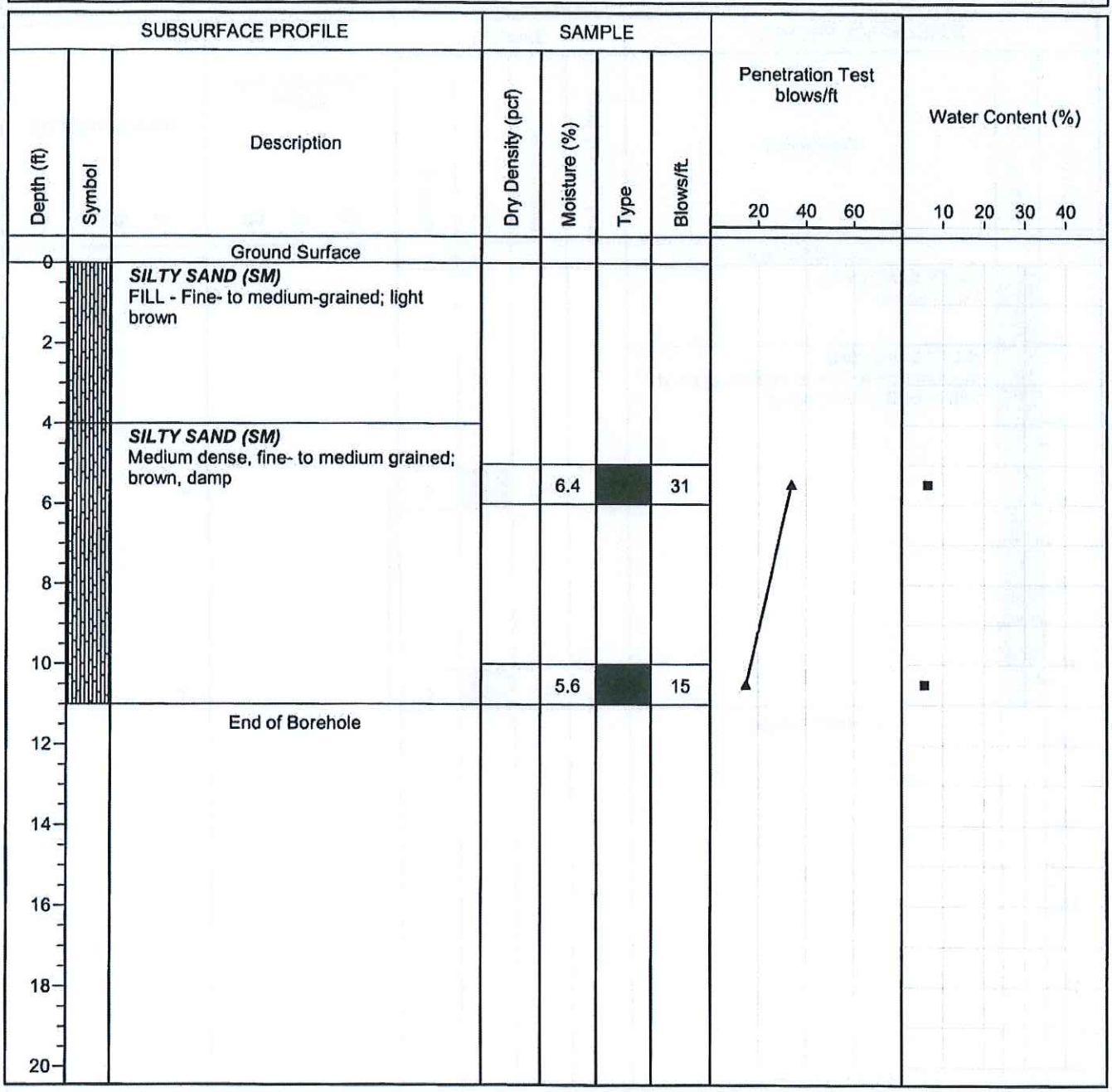
Drill Method: Solid Flight
Drill Rig: CME
Driller: Baja

Krazan and Associates

Drill Date: 4-11-13
Hole Size: 4½ Inches
Elevation: 21 Feet
Sheet: 1 of 2

Log of Boring B5

Project: In-N-Out Burger
Project No: 112-13025
Client: In-N-Out Burger
Figure No.: A-5
Location: Santa Ana, California
Logged By: EB
Depth to Water> **Initial:** None **At Completion:** None



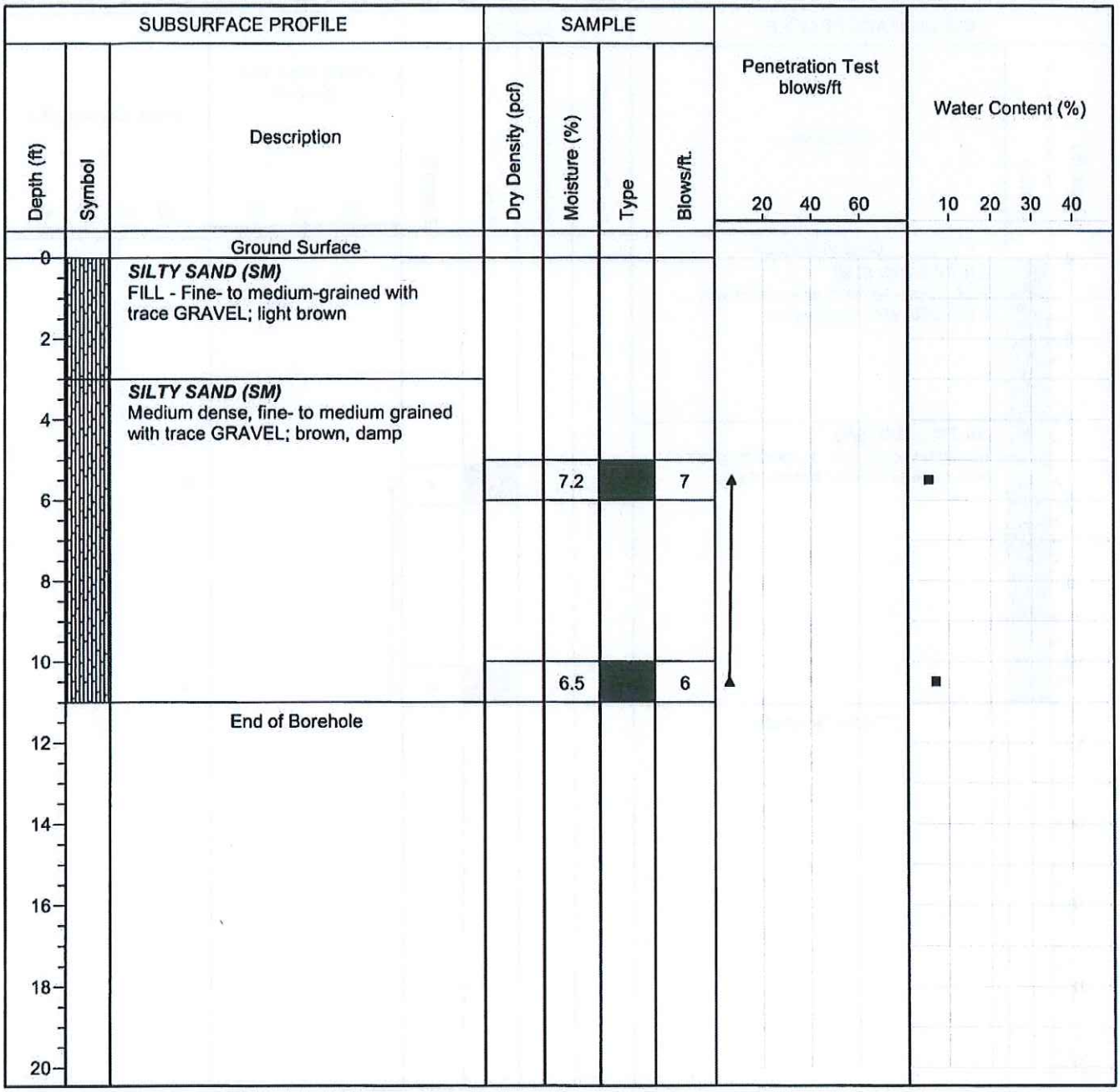
Drill Method: Solid Flight
Drill Rig: CME
Driller: Baja

Krazan and Associates

Drill Date: 4-11-13
Hole Size: 4½ Inches
Elevation: 11 Feet
Sheet: 1 of 1

Log of Boring B7

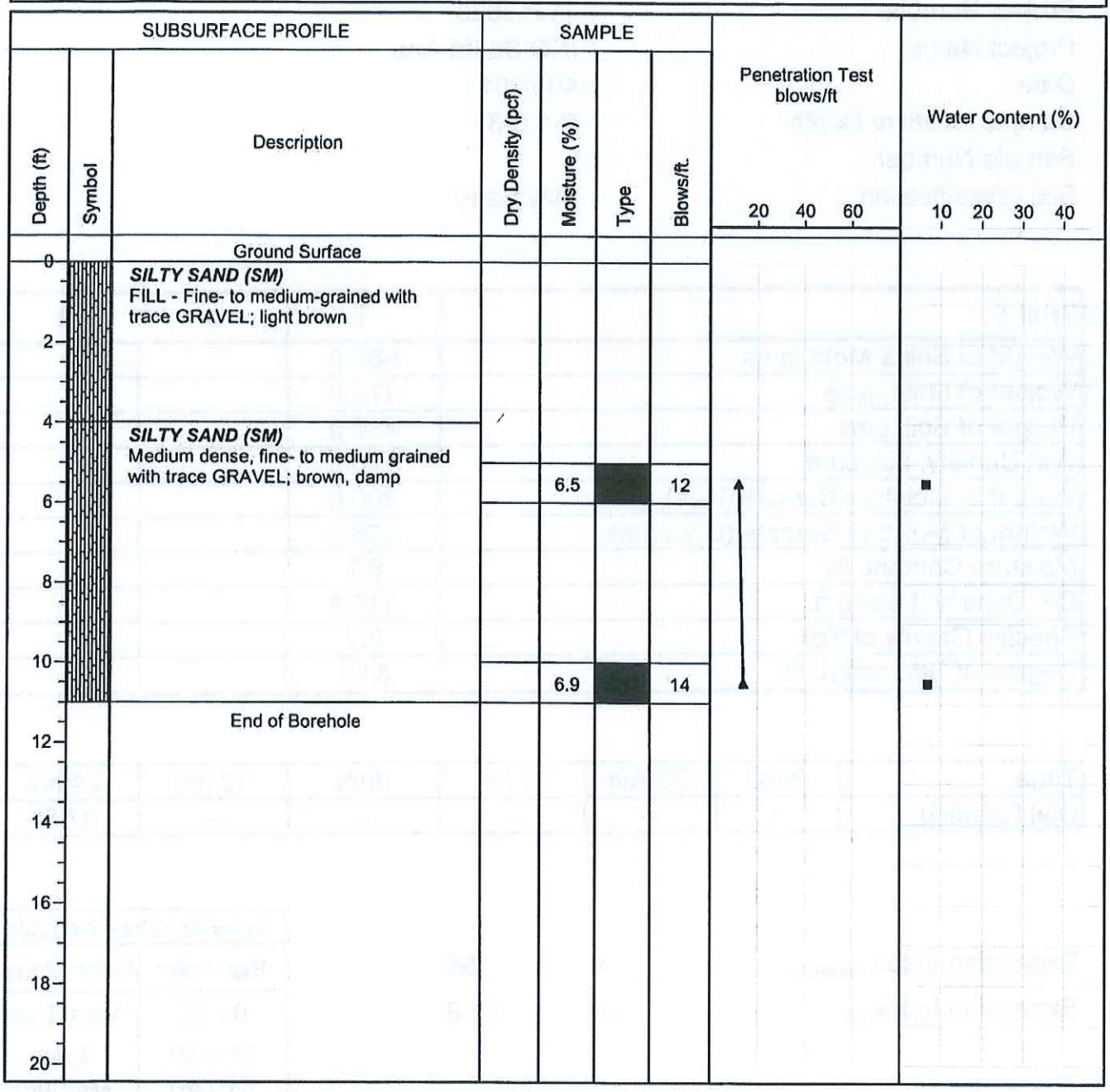
Project: In-N-Out Burger
Project No: 112-13025
Client: In-N-Out Burger
Figure No.: A-7
Location: Santa Ana, California
Logged By: EB
Depth to Water> **Initial:** None **At Completion:** None



Drill Method: Solid Flight
Drill Date: 4-11-13
Drill Rig: CME
Krazan and Associates
Hole Size: 4½ Inches
Driller: Baja
Elevation: 11 Feet
Sheet: 1 of 1

Log of Boring B9

Project: In-N-Out Burger
Project No: 112-13025
Client: In-N-Out Burger
Figure No.: A-9
Location: Santa Ana, California
Logged By: EB
Depth to Water> **Initial:** None **At Completion:** None



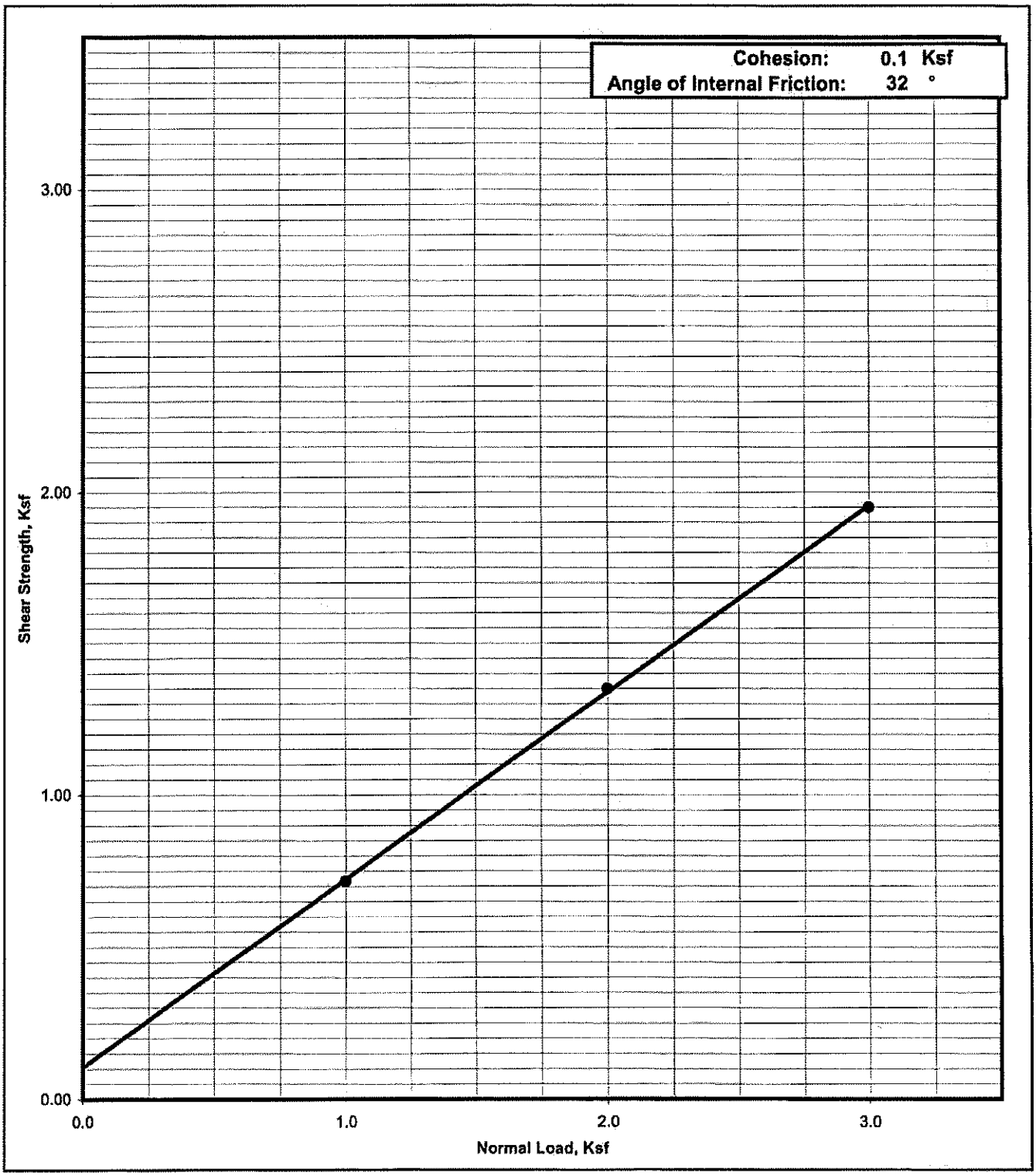
Drill Method: Solid Flight
Drill Rig: CME
Driller: Baja

Krazan and Associates

Drill Date: 4-11-13
Hole Size: 4½ Inches
Elevation: 11 Feet
Sheet: 1 of 1

Shear Strength Diagram (Direct Shear)
ASTM D - 3080 / AASHTO T - 236

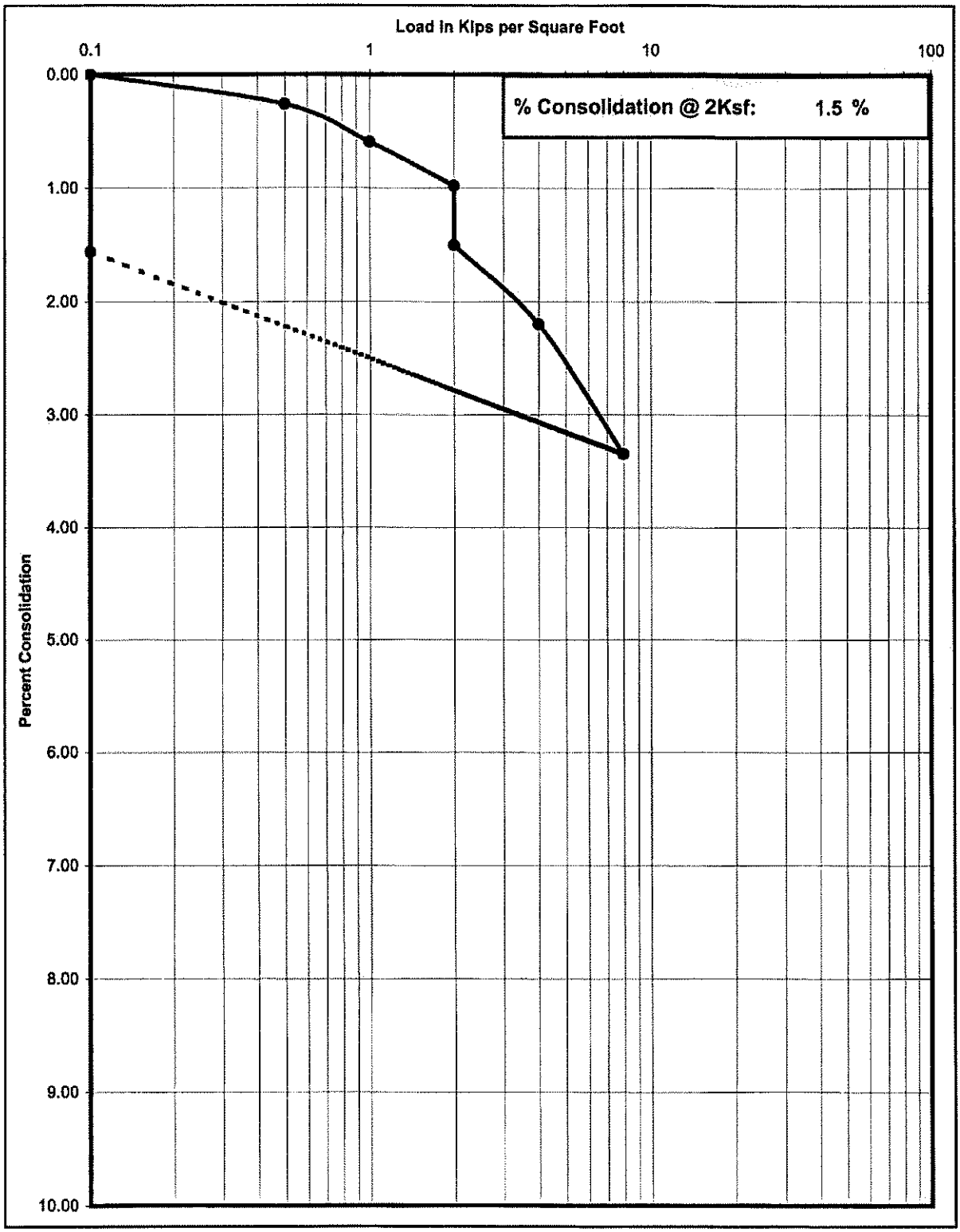
Project Number	Boring No. & Depth	Soil Type	Date
11213025	B-2 5-6'	Silty Sand	4/15/2013



Krazan Testing Laboratory

Consolidation Test

Project No	Boring No. & Depth	Date	Soil Classification
11213025	B-3 @ 10'	4/18/2013	Silty Sand



Krazan Testing Laboratory

Project #	11213025	Constants	Area (cm^2)	Depth of Liquid(cm)	Liqurd Containers No.	Vol/Delta H
Test Location	Santa Ana, CA	Inner Ring	707	NA	1	707
Liqurd Used	Water	Annular Ring	2106	NA	2	2106
Tested By	JMK					
Depth to Water Table	>50	**Infiltration Test No. 1**				
Test Depth	-1	Penetration of Rings into Subgrade (in.)		Inner	6	Annular 6

Reading No.	Date	Time (hr:min.)	Elapsed Time (hr)	Flow Reading				Liqurd Temp	Incr. Infiltration Rate		Ground Temp /Depth	Remarks
				Inner Ring		Annular Space			Inner	Annular		
				Reading (cm)	Flow (CM^3)	Reading (cm)	Flow (CM^3)	°C	Cm/Hr	Cm/Hr	°C / cm	
1	4/12/13	8:00	0.000	37.5	-	37	-		-	-		
2	4/12/13	8:15	0.25	37	353.5	35.9	2316.6		2.00	4.40		
3	4/12/13	8:30	0.50	36.6	282.8	34.8	2316.6		1.60	4.40		
4	4/12/13	8:45	0.75	36.2	282.8	33.9	1895.4		1.60	3.60		
5	4/12/13	9:00	1.00	35.8	282.8	33.2	1474.2		1.60	2.80		
6	4/12/13	9:30	1.50	35.1	494.9	31.9	2737.8		1.40	2.60		
7	4/12/13	10:00	2.00	34.5	424.2	30.6	2737.8		1.20	2.60		
8	4/12/13	10:30	2.50	33.8	494.9	29.4	2527.2		1.40	2.40		
9	4/12/13	11:00	3.00	33	565.6	28.2	2527.2		1.60	2.40		
10	4/12/13	11:30	3.50	32.2	565.6	27	2527.2		1.60	2.40		
11	4/12/13	12:00	4.00	31.5	494.9	25.7	2737.8		1.40	2.60		
12	4/12/13	12:30	4.50	30.8	494.9	24.4	2737.8		1.40	2.60		
13	4/12/13	13:00	5.00	30	565.6	23	2948.4		1.60	2.80		
14	4/12/13	13:30	5.50	29.2	565.6	21.8	2527.2		1.60	2.40		
15	4/12/13	14:00	6.00	28.5	494.9	20.5	2737.8		1.40	2.60		
16	4/12/13	14:30	6.50	27.8	494.9	19.2	2737.8		1.40	2.60		
17	4/12/13	15:00	7.00	27	565.6	17.9	2737.8		1.60	2.60		
18	4/12/13	15:30	7.50	26.2	565.6	16.6	2737.8		1.60	2.60		
19	4/12/13	16:00	8.00	25.4	565.6	15.3	2737.8		1.60	2.60		
20	4/12/13	16:30	8.50	24.7	494.9	14	2737.8		1.40	2.60		
21	4/12/13	17:00	9.00	24	494.9	12.6	2948.4		1.40	2.80		
22	4/12/13	18:00	10.00	22.6	989.8	10	5475.6		1.40	2.60		
Average of Reading in Inches per hour									0.60	1.11		

Appendix B

by the Geotechnical Engineer. The results of these tests and compliance with these specifications shall be the basis upon which the Geotechnical Engineer will judge satisfactory completion of work.

SOILS AND FOUNDATION CONDITIONS: The Contractor is presumed to have visited the site and to have familiarized himself with existing site conditions and the contents of the data presented in the Geotechnical Engineering Investigation report.

The Contractor shall make his own interpretation of the data contained in the Geotechnical Engineering Investigation report and the Contractor shall not be relieved of liability under the Contract for any loss sustained as a result of any variance between conditions indicated by or deduced from said report and the actual conditions encountered during the progress of the work.

DUST CONTROL: The work includes dust control as required for the alleviation or prevention of any dust nuisance on or about the site or the borrow area, or off-site if caused by the Contractor's operation either during the performance of the earthwork or resulting from the conditions in which the Contractor leaves the site. The Contractor shall assume all liability, including court costs of codefendants, for all claims related to dust or wind-blown materials attributable to his work.

SITE PREPARATION

Site preparation shall consist of site clearing and grubbing, over-excavation of the proposed building pad areas, preparation of foundation materials for receiving fill, construction of engineered fill including the placement of non-expansive fill where recommended by the Geotechnical Engineer.

CLEARING AND GRUBBING: The Contractor shall accept the site in this present condition and shall demolish and/or remove from the area of designated project earthwork all structures, both surface and subsurface, trees, brush, roots, debris, organic matter and all other matter determined by the Geotechnical Engineer to be deleterious. Site stripping to remove organic materials and organic-laden soils in landscaped areas shall extend to a minimum depth of 2 inches or until all organic-laden soil with organic matter in excess of 3 percent of the soils by volume are removed. Such materials shall become the property of the Contractor and shall be removed from the site.

Tree root systems in proposed building areas should be removed to a minimum depth of 3 feet and to such an extent that would permit removal of all roots greater than 1 inch in diameter. Tree roots removed in parking areas may be limited to the upper 1½ feet of the ground surface. Backfill of tree root excavation should not be permitted until all exposed surfaces have been inspected and the Geotechnical Engineer is present for the proper control of backfill placement and compaction. Burning in areas that are to receive fill materials shall not be permitted.

Excavations required to achieve design grades, depressions, soft or pliant areas, or areas disturbed by demolition activities extending below planned finished subgrade levels should be excavated down to firm, undisturbed soil and backfilled with engineered fill. The resulting excavations should be backfilled with engineered fill.

EXCAVATION: Following clearing and grubbing operations, the proposed building pad area shall be over-excavated to a depth of at least five feet below existing grades or the planned foundation bottom levels, whichever is deeper, and the remaining areas of the building and adjoining exterior concrete flatwork or pavements at the building perimeter shall be over-excavated to a depth of at least two feet

General Paving Specifications

Appendix C

6. ASPHALT CONCRETE SURFACING - Asphalt concrete surfacing shall consist of a mixture of mineral aggregate and paving grade asphalt, mixed at a central mixing plant and spread and compacted on a prepared base in conformity with the lines, grades, and dimensions shown on the plans. The viscosity grade of the asphalt shall be AR-8000. The mineral aggregate shall be Type B, ½-inch or ¾-inch maximum, medium grading, for the wearing course and ¾-inch maximum, medium grading for the base course, and shall conform to the requirements set forth in Section 39 of the Standard Specifications. The drying, proportioning, and mixing of the materials shall conform to Section 39.

The prime coat, spreading and compacting equipment, and spreading and compacting the mixture shall conform to the applicable chapters of Section 39, with the exception that no surface course shall be placed when the atmospheric temperature is below 50 degrees F. The surfacing shall be rolled with a combination steel-wheel and pneumatic rollers, as described in Section 39-6. The surface course shall be placed with an approved self-propelled mechanical spreading and finishing machine.

7. FOG SEAL COAT - The fog seal (mixing type asphalt emulsion) shall conform to and be applied in accordance with the requirements of Section 37.

GILES
ENGINEERING ASSOCIATES, INC.
GEOTECHNICAL, ENVIRONMENTAL & CONSTRUCTION MATERIALS CONSULTANTS

• Atlanta, GA
• Baltimore, MD
• Dallas, TX
• Los Angeles, CA
• Manassas, VA
• Milwaukee, WI

June 8, 2016

Chick-fil-A, Inc.
15635 Alton Parkway, Suite 350
Irvine, California 92618

Attention: Ms. Jennifer Daw
Design & Construction

Subject: Geotechnical Report Review
Proposed Chick-fil-A & In-N-Out Development
NEC Tustin Avenue & 17th Street
Santa Ana, California
Project No. 2G-1603009

Reference: *Geotechnical Engineering Investigation, Proposed Drive Thru Restaurants, NEC of Tustin Avenue and 17th Street, Santa Ana, California;* prepared by Krazan & Associates, Inc., dated June 6, 2016.

Dear Ms. Daw:

In accordance with your request and authorization, Giles Engineering Associates, Inc. (Giles) has completed a geotechnical review of the above-referenced geotechnical report prepared by Krazan & Associates (Krazan) for the subject site. The purpose of this review was to provide our comments and opinions/recommendations regarding the geotechnical recommendations provided within the Krazan report. Based on a review of the most recent Preliminary Site Plan (PSP-14A), prepared by CRHO, development at the site will include a new In-N-Out Restaurant in the northern portion of the site and a new Chick-fil-A Restaurant in the southern portion of the site.

Document Review

The Krazan geotechnical report included the performance of eight recent geotechnical test borings within the planned development areas. The borings extended to depths ranging from about 15 to 20 feet below grade. Krazan previously drilled several test borings at this site to depths ranging from about 10 to 50 feet below grade in 2013. Although the Request for Proposal (RFP) issued to Krazan by Chick-fil-A (CFA) for the most-recent test borings requested specific sampling depths, some of those sampling depths were not included within the Krazan borings.

As noted on the test boring logs provided within the Krazan report, the soil profile beneath the restaurant pads generally consisted of about 0 to 4 feet of existing fill consisting of a silty sand to gravelly sand. The relative density of the existing fill was not determined by Krazan. The native soils encountered within the test borings generally consisted of gravelly sand to silty sand that extended to the maximum depths explored. The native soils were typically damp/moist and medium dense to dense, although some loose soils were also encountered.

Krazan noted that the site is not considered to be potentially susceptible to soil liquefaction due to the absence of groundwater within the upper 50 feet of grade. The near-surface soils were also determined by Krazan to possess a very low expansion potential (EI=16).

The geotechnical recommendations provided by Krazan included a recommendation to over-excavate the existing soil beneath the planned buildings at the site to a depth of at least 8 feet below existing grade and at least 3 feet below the bottom of the planned footings, whichever is deeper. Beneath pavements and concrete flatwork, the existing soils were recommended to be over-excavated to a depth of at least 24 inches.

The soils exposed at the base of the soil over-excavations were recommended by Krazan to be scarified to a depth of at least 8 inches, moisture conditioned and then compacted to at least 95% of the soil's maximum dry density (per ASTM D-1557). The over-excavated areas were then recommended to be backfilled in thin lifts, moisture conditioned and compacted to at least 95% relative compaction.

Following site and remedial grading, Krazan indicated that conventional shallow foundations were suitable. Footings were recommended by Krazan to be dimensioned based on an allowable soil bearing pressure of 2,000 psf (Deal Load only), 2,600 psf (Dead plus Live Loads) and/or 3,300 psf for Dead Load, Live Load plus wind and/or seismic loads.

Floor slabs were recommended to consist of the standard CFA and In-N-Out floor slab designs. Pavement section thicknesses were based on an R-value of 40 and an assumed Traffic Index of 5.5. A pavement section of 4 inches of asphalt underlain by 6 inches of Class 2 base has been recommended by Krazan.

Giles Conclusions & Recommendations

- Our review of the test boring logs and laboratory consolidation testing by Krazan indicates that the 8 feet of soil over-excavation and replacement as an engineered fill is excessively conservative and the cost associated with this excessive depth of over-excavation is not warranted. It is our opinion that the depth of the soil over-excavation can be reduced to a depth of 4 feet beneath the planned buildings. For pavement and concrete flatwork areas, we do not believe that wide-spread soil over-excavation is necessary. Rather, we recommend that the existing subgrade soils be proof rolled with heavy rubber-tired equipment in the presence of the geotechnical engineer to detect loose/soft or yielding soils. Any unstable or yielding soils should be compacted in-place or over-excavated as recommended by the geotechnical engineer. Prior to placing fill, the subgrade should be scarified, moisture treated and compacted to at least 90% of the soil's maximum dry density (per ASTM D-1557). The upper 12 inches of subgrade beneath pavements should be densified to at least 95% relative compaction.

- Krazan recommended that all fill be compacted to at least 95% of the soil's maximum dry density, per ASTM D-1557. The local grading ordinance and standard of practice is to compact fills to at least 90% of the soil maximum dry density. We see no value in specifying a higher degree of compaction than typically used or required.

- The pavement section provided by Krazan appears to be suitable for the drive-lanes and other high traffic areas of the site. For parking stall areas, it is our opinion that a thinner pavement section could be used since these areas will receive only minimal traffic. For light-duty pavements, we recommend a pavement section consisting of 3 inches of asphalt pavement underlain by 4 inches of Class 2 aggregate base. This reduced pavement section is based on a Traffic Index of 4.0 and the R-value of 40 as used by Krazan.

- The design team associated with the construction of the planned In-N-Out Restaurant may desire to follow the Krazan recommendations for the deep soil over-excavation and/or higher compaction specification. However, it is our opinion that the CFA development will incur excessive and unnecessary costs if the Krazan recommendations are followed.

Should you have any questions after reviewing this letter, please feel free to contact the undersigned at your convenience.

Respectfully submitted,

GILES ENGINEERING ASSOCIATES, INC.

Robert R. Russell, P.E., G.E.
Regional Director

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