Preliminary

Water Quality Management Plan

For:

14835 San Bernardino Ave.

APN: 0234-121-14, 15, 16, 18 & 19

Prepared for:

The OFT Family Corporation

893 W 16th ST.

Newport Beach, CA 92663

323-477-2151

Prepared by:

234 North Arrowhead Avenue

San Bernardino, CA 92408

(909) 885-3806

Approval Date: _____

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for The OFT Family Corporation by Bonadiman & Associates, Inc. The WQMP is intended to comply with the requirements of the County of San Bernardino and the NPDES Area wide Stormwater Program requiring the preparation of a WQMP. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

Project Data			
Permit/Application Number(s):	P201800662	Grading Permit Number(s):	TBD
Tract/Parcel Map Number(s):		Building Permit Number(s):	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 0234-121-14, 15, 16, 18 & 19

Owner's Signature	
Owner: The OFT Family Corporation	
Title	Owner
Representative	Dan Otting
Address	893 W 16th ST., Newport Beach, CA 92661
Email	Dan@FleetYardsInc.com
Telephone #	949-246-6000
Signature	Date 10/19/2020

Preparer's Certification

Project Data			
Permit/Application Number(s):	P201800662	Grading Permit Number(s):	TBD
Tract/Parcel Map Number(s):		Building Permit Number(s):	TBD
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 0234-121-14, 15, 16, 18 & 19

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: James T. Stanton	
Title	Vice President of Engineering
Company	Joseph E. Bonadiman & Associates, Inc.
Address	234 North Arrowhead Avenue San Bernardino, CA 92408
Email	jts@bonadiman.com
Telephone #	(909) 885-3806
Signature	
Date	3/16/21

PE Stamp Below

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Section 1 Discretionary Permit(s)

Form 1-1 Project Information

Project Name	14835 San Bernardino Ave.				
Project Owner Contact Name:	Dan Otting				
Mailing Address:	893 W 16th ST., Newport Beach, CA 92661	E-mail Address:	accounting@fleetyardsinc.com	Telephone:	949-246-6000
Permit/Application Number(s):	P201800662		Tract/Parcel Map Number(s):		
Additional Information/ Comments:					
Description of Project:	The proposed project site plan shows paving the site, installing landscaping, constructing a main entrance on Live Oak Ave. with rolling gates, and the removal and/or protection of several existing buildings. A proposed basin will be on the southeast corner of the site to allow for Water Quality Management Plan (WQMP) compliance. The site will have an office building with employee parking. Lot breakdown: structures (3,229 SF), asphalt (12,895 SF), gravel (279,604 SF), landscape (50,202 SF), concrete (7,027 SF). Total impervious area of 79,071 SF. Total pervious area of 273,885 SF. Total square footage of 352,956 SF.				
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.					

Section 2 Project Description

2.1 Project Information

This section of the WQMP should provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

Form 2.1-1 Description of Proposed Project

1 Development Category (Select all that apply):

☒ Significant re-development involving the addition or replacement of 5,000 ft² or more of impervious surface on an already developed site	☐ New development involving the creation of 10,000 ft² or more of impervious surface collectively over entire site	☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539	☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft² or more
☐ Hillside developments of 5,000 ft² or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	☐ Developments of 2,500 ft² of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.	☒ Parking lots of 5,000 ft² or more exposed to storm water	☐ Retail gasoline outlets that are either 5,000 ft² or more, or have a projected average daily traffic of 100 or more vehicles per day

☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements*.

2 Project Area (ft2):	352,956	**3** Number of Dwelling Units:	0	**4** SIC Code:	4225

5 Is Project going to be phased? Yes ☐ No ☒ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*

6 Does Project include roads? Yes ☐ No ☒ *If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)*

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:

The OFT Family Corporation will be responsible for long-term maintenance of WQMP stormwater facilities.

Contact name: Dan Otting

Address: 893 W 16th ST., Newport Beach, CA 92661

Phone number: 949-246-6000

Email: accounting@fleetyardsinc.com

2.3 Potential Stormwater Pollutants

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Per Table 3-3 in the TGD for WQMP. Potential source include animal waste.
Phosphorous	E ☒	N ☐	Per Table 3-3 in the TGD for WQMP. Potential source include fertilizers and eroded soils.
Nitrogen	E ☒	N ☐	Per Table 3-3 in the TGD for WQMP. Potential source include fertilizers and eroded soils.
Sediment	E ☒	N ☐	Per Table 3-3 in the TGD for WQMP. Potential source include eroded soils.
Metals	E ☒	N ☐	Per Table 3-3 in the TGD for WQMP. Potential source include brake pad and tire tread wear associated with driving.
Oil and Grease	E ☒	N ☐	Per Table 3-3 in the TGD for WQMP. Potential source include petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids.
Trash/Debris	E ☒	N ☐	Per Table 3-3 in the TGD for WQMP. Potential source include paper, plastic, polystyrene packing foam, and aluminum materials.
Pesticides / Herbicides	E ☒	N ☐	Per Table 3-3 in the TGD for WQMP. Potential source include fertilizers and pest sprays.
Organic Compounds	E ☒	N ☐	Per Table 3-3 in the TGD for WQMP. Potential source include solvents and cleaning compounds.
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

2.4 Water Quality Credits

A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing other treatment BMP or participating in other alternative compliance programs. Refer to Section 6.2 in the TGD for WQMP to determine if water quality credits are applicable for the project.

Form 2.4-1 Water Quality Credits

1 Project Types that Qualify for Water Quality Credits: *Select all that apply*

☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects ☐ Vertical density [20%] ☐ 7 units/ acre [5%]	☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	☐ Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	☐ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]

2 Total Credit % 0 *(Total all credit percentages up to a maximum allowable credit of 50 percent)*

Description of Water Quality Credit Eligibility (if applicable)	N/A

Section 3 Site and Watershed Description

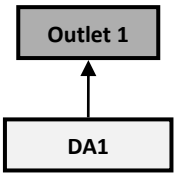
Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed DMAs) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. ***If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet.***

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34.076445°	Longitude -117.481050°	Thomas Bros Map page 604

1 San Bernardino County climatic region: ☒ Valley ☐ Mountain

2 Does the site have more than one drainage area (DA): Yes☐ No☒ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*



Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA-1 to BMP-1	DA-1 drains to proposed basin

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1				
For Drainage Area 1's sub-watershed DA, provide the following characteristics	DA 1			
1 DA drainage area (ft^2)	352,956			
2 Existing site impervious area (ft^2)	19,458			
3 Antecedent moisture condition *For desert areas, use* *http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	II			
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	A			
5 Longest flowpath length (ft)	843			
6 Longest flowpath slope (ft/ft)	0.014			
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Barren			
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*	Fair			

Form 3-3 Watershed Description for Drainage Area 1

Receiving waters *Refer to Watershed Mapping Tool - http://sbcounty.permitrack.com/WAP See 'Drainage Facilities" link at this website*	Mulberry Channel San Sevaine Channel Santa Ana River, Reach 3 Prado Reservoir Santa Ana River, Reach 2 Santa Ana River, Reach 1 Pacific Ocean
Applicable TMDLs *Refer to Local Implementation Plan*	Mulberry Channel - None San Sevaine Channel - None Santa Ana River, Reach 3 - Pathogens, Copper & Lead Prado Reservoir - Pathogens Santa Ana River, Reach 2 - None Santa Ana River, Reach 1 - None Pacific Ocean - None
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	Mulberry Channel - None San Sevaine Channel - None Santa Ana River, Reach 3 - Copper, Lead & Pathogens Prado Reservoir - Pathogens Santa Ana River, Reach 2 - Indicator Bacteria Santa Ana River, Reach 1 - None Pacific Ocean - None
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	Areas within 200': NONE
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool – http://sbcounty.permitrack.com/WAP*	Santa Ana River
Hydrologic Conditions of Concern	☐ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☒ No
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* • *More Effective than On-site LID* • *Remaining Capacity for Project DCV* • *Upstream of any Water of the US* • *Operational at Project Completion* • *Long-Term Maintenance Plan* ☒ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	The Property Owner will provide practical information materials to the first occupants/tenants on general housekeeping practices that contribute to the protection of stormwater quality. These materials will be initially included in the approved WQMP. Thereafter such materials will be available through the local jurisdiction's stormwater education program.The current website is www.sbcountystormwater.org .
N2	Activity Restrictions	☒	☐	Activity restrictions will be imposed by the owner to limit exposure of stormwater to potential pollutants. Pesticide application must be done by a licensed applicator.
N3	Landscape Management BMPs	☒	☐	Owner will ensure landscaping and irrigation is properly maintained through the following: fertilizing garden areas with amulch of leaves, bark or composted manure and or garden waste, applying chemical fertilizer and pesticide only as needed with licensed personell, and keep the lawn trimmed as needed.
N4	BMP Maintenance	☒	☐	The property owner will ensure maintence through regular inspection and repair of the BMP. Owner will inspect to determine if any reseeding and irrigation is needed, accumulation of sediment, grass in poor condition, trash and debris, and standing water.
N5	Title 22 CCR Compliance (How development will comply)	☐	☒	No hazardous waste will be stored on the proposed project site.
N6	Local Water Quality Ordinances	☒	☐	This project will comply with NPDES Permit No. CAS618036by implementation of the approved WQMP.
N7	Spill Contingency Plan	☒	☐	The Spill Contingency Plan developed by the facility oporator shal include the following items. Chemical spill kit, similar to a ULine S-18303, with Absorption Capacity equal to or greater than the volume of chemicals stored on site. In the event of a spill call the San Bernardino County Fire Department Hazardous Materials Division 909-386-8401 for proper disposal of contaminated materials. Document the spill noting the time of occuarance, material, volume of spill and completed clean up. Restock spill material as needed.
N8	Underground Storage Tank Compliance	☐	☒	No underground storage tanks are proposed.

Form 4.1-1 Non-Structural Source Control BMPs				
N9	Hazardous Materials Disclosure Compliance	☐	☒	No hazardous material storage is proposed for this site.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N10	Uniform Fire Code Implementation	☐	☒	No hazardous waste anticipated for this site.
N11	Litter/Debris Control Program	☒	☐	Owner will conduct litter and debris inspection and clean up will be made weekly and as needed.
N12	Employee Training	☒	☐	Owner will train employees on the BMPs at initial hiring and as needed.
N13	Housekeeping of Loading Docks	☐	☒	No proposed loading docks.
N14	Catch Basin Inspection Program	☒	☐	Owner will ensure catch basins are regularly inspected, repair, and maintained.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	At a minimum all paved areas of a business will be vacuum swept, in late summer or early fall, prior to the start of the rainy season.
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	Not a public project.
N17	Comply with all other applicable NPDES permits	☒	☐	The proposed site will comply with current NPDES permit requirements by the implementation of the approved WQMP and the site specific Storm Water Pollution Prevension Plan (SWPPP). SWPPP is under deferred submittal.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	All storm drain inlets and catch basins will be labeled. Stenciled labels shall state "No Dumping – Drains to River" or similar message discouraging any litter dumping.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	No general outdoor material storage proposed for this site. No toxic or hazardous material storage is proposed.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Trash storage area will be paved with an impervious surface, not to allow run-on from adjoining roofs and pavements, walled to prevent off-sitre transport of trash. Trash enclosure will have a permanent solid roof .
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	Owner will ensure landscaping and irrigation is properly maintained.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Landscape areas will be a minimum of 1 inch below adjacent impervious areas.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☒	☐	Slopes will be protected by vegetation/energy dissipation as needed.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☐	☒	No docks are proposed.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	No maintenance bays are proposed.
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No vehicle wash proposed.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	No outdoor processing proposed.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No equipment wash proposed.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	No fueling proposed.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	No hillside.
S14	Wash water control for food preparation areas	☐	☒	No food preparation proposed.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	No car wash proposed.

4.1.2 Preventative LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Preventative LID Site Design Practices Checklist

Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: Impervious area has been minimized as much as possible for the proposed use of this site by the addition of landscaping areas.
Maximize natural infiltration capacity: Yes ☒ No ☐ Explanation: Landscape areas will be marked durning construction to minimize compaction and maximize natural infiltration capacity.
Preserve existing drainage patterns and time of concentration: Yes ☐ No ☒ Explanation: Existing time of concentration will change due to the proposed development. The LID BMP selected to meet WQMP targets is an infiltration basin.
Disconnect impervious areas: Yes ☒ No ☐ Explanation: Impervious areas have been disconnected as much as possible for this site.
Protect existing vegetation and sensitive areas: Yes ☒ No ☐ Explanation: No sensitive areas exist on site.
Re-vegetate disturbed areas: Yes ☒ No ☐ Explanation: Disturbed areas will be re-vegetated where possible.Existing vegetation will be removed and re-vegetated in proposed landscaping.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Stormwater BMP areas will be marked to minimize unnecessary compaction.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ☒ Explanation: Vegetated swales will not be used on this project due to lot size constraints. LID BMP selected to meet target is a infiltration basin.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: Landscape areas will be staked off during construction to minimize compaction.

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection of any downstream waterbody segments with a HCOC. ***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P_6 method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi^2), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)

1 Project area DA 1 (ft^2): 352,956	**2** Imperviousness after applying preventative site design practices (Imp%): 22.40	**3** Runoff Coefficient (Rc): 0.184 *$R_c = 0.858(Imp\%)^{\wedge 3} - 0.78(Imp\%)^{\wedge 2} + 0.774(Imp\%) + 0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.522 *http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html*		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.772 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 8,206 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-2 Summary of HCOC Assessment (DA 1)

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☐ No ☒

Go to: http://sbcounty.permitrack.com/WAP

If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below

(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** *Form 4.2-3 Item 12*	**2** *Form 4.2-4 Item 13*	**3** *Form 4.2-5 Item 10*
Post-developed	**4** *Form 4.2-3 Item 13*	**5** *Form 4.2-4 Item 14*	**6** *Form 4.2-5 Item 14*
Difference	**7** 0 *Item 4 – Item 1*	**8** 0.00 *Item 2– Item 5*	**9** 0.00 *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** % *Item 7 / Item 1*	**11** % *Item 8 / Item 2*	**12** % *Item 9 / Item 3*

Form 4.2-3 HCOC Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type								
2a Hydrologic Soil Group (HSG)								
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type								
2b Hydrologic Soil Group (HSG)								
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*								
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*								

5 Pre-Developed area-weighted CN:	**7** Pre-developed soil storage capacity, S (in): *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN:	**8** Post-developed soil storage capacity, S (in): *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): *I_a = 0.2 * Item 8*

11 Precipitation for 2 yr, 24 hr storm (in):
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3):
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet HCOC Requirement, (ft^3):
*V_{HCOC} = (Item 13 * 0.95) – Item 12*

Form 4.2-4 HCOC Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*								
2 Change in elevation (ft)								
3 Slope (ft/ft), S_o *= Item 2 / Item 1*								
4 Land cover								
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*								
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*								
7 Cross-sectional area of channel (ft^2)								
8 Wetted perimeter of channel (ft)								
9 Manning's roughness of channel (n)								
10 Channel flow velocity (ft/sec) V_{fps} *= (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*								
11 Travel time to outlet (min) T_t *= Item 6 / (Item 10 * 60)*								
12 Total time of concentration (min) T_c *= Item 5 + Item 11*								
13 Pre-developed time of concentration (min): *Minimum of Item 12 pre-developed DMA*								
14 Post-developed time of concentration (min): *Minimum of Item 12 post-developed DMA*								
15 Additional time of concentration needed to meet HCOC requirement (min): $T_{C\text{-}HCOC}$ *= (Item 14 * 0.95) – Item 13*								

Form 4.2-5 HCOC Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.6 LOG Form 4.2-4 Item 5 /60)*							
2 Drainage Area of each DMA (ft^2) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*							
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*							
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*							
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	**9** Pre-developed Q_p at T_c for DMA B: *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	**10** Pre-developed Q_p at T_c for DMA C: *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*
10 Peak runoff from pre-developed condition confluence analysis (cfs):		*Maximum of Item 8, 9, and 10 (including additional forms as needed)*
11 Post-developed Q_p at T_c for DMA A: *Same as Item 8 for post-developed values*	**12** Post-developed Q_p at T_c for DMA B: *Same as Item 9 for post-developed values*	**13** Post-developed Q_p at T_c for DMA C: *Same as Item 10 for post-developed values*
14 Peak runoff from post-developed condition confluence analysis (cfs):		*Maximum of Item 11, 12, and 13 (including additional forms as needed)*
15 Peak runoff reduction needed to meet HCOC Requirement (cfs):		*$Q_{p\text{-}HCOC}$ = (Item 14 * 0.95) – Item 10*

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2.1 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable HSC BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). **Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment**.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)

Feasibility Criterion – Complete evaluation for each DA on the Project Site

1 Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒

Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: (attach)

2 Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒

(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than eight feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: (attach)

3 Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒

If Yes, Provide basis: (attach)

4 Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒

If Yes, Provide basis: (attach)

5 Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒

If Yes, Provide basis: (attach)

6 Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒

See Section 3.5 of the TGD for WQMP and WAP

If Yes, Provide basis: (attach)

7 Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒

If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 9 below.

8 Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒

If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP.
If no, then proceed to Item 9, below.

9 All answers to Item 1 through Item 6 are "No":

Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
Proceed to Form 4.3-2, Hydrologic Source Control BMP.

4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☒ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)			
3 Ratio of pervious area receiving runoff to impervious area			
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*	0	0	0
5 Sum of retention volume achieved from impervious area dispersion (ft^3): 0 $V_{retention}$ *=Sum of Item 4 for all BMPs*			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☒ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)			
8 Ponding depth (ft)			
9 Surface area of amended soil/gravel (ft^2)			
10 Average depth of amended soil/gravel (ft)			
11 Average porosity of amended soil/gravel			
12 Retention volume achieved from on-lot infiltration (ft^3) $V_{retention}$ *= (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*	0	0	0
13 Runoff volume retention from on-lot infiltration (ft^3): 0 $V_{retention}$ *=Sum of Item 12 for all BMPs*			

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1)

14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes ☐ No ☒ *If yes, complete Items 15-20. If no, proceed to Item 21*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Rooftop area planned for ET BMP (ft^2)			
16 Average wet season ET demand (in/day) *Use local values, typical ~ 0.1*			
17 Daily ET demand (ft^3/day) *Item 15 * (Item 16 / 12)*			
18 Drawdown time (hrs) *Copy Item 6 in Form 4.2-1*			
19 Retention Volume (ft^3) $V_{retention}$ *= Item 17 * (Item 18 / 24)*	0	0	0
20 Runoff volume retention from evapotranspiration BMPs (ft^3): 0 $V_{retention}$ *=Sum of Item 19 for all BMPs*			
21 Implementation of Street Trees: Yes ☐ No ☒ *If yes, complete Items 20-2. If no, proceed to Item 24*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
22 Number of Street Trees	0	0	0
23 Average canopy cover over impervious area (ft^2)			
24 Runoff volume retention from street trees (ft^3) $V_{retention}$ *= Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*	0	0	0
25 Runoff volume retention from street tree BMPs (ft^3): 0 $V_{retention}$ *= Sum of Item 24 for all BMPs*			
26 Implementation of residential rain barrels/cisterns: Yes ☐ No ☒ *If yes, complete Items 27-28; If no, proceed to Item 29*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
27 Number of rain barrels/cisterns	0	0	0
28 Runoff volume retention from rain barrels/cisterns (ft^3) $V_{retention}$ *= Item 27 * 3*	0	0	0
29 Runoff volume retention from residential rain barrels/Cisterns (ft3): 0 $V_{retention}$ *=Sum of Item 28 for all BMPs*			
30 Total Retention Volume from Site Design Hydrologic Source Control BMPs: 0 *Sum of Items 5, 13, 20, 25 and 29*			

4.3.2 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix D of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5.1 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

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Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC BMP (ft^3): 8,206 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA BMP Type Basin	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	13.25		
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2.63		
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	5.03		
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48		
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	20.12		
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	20.12		
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	3,700		
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	0.00		
10 Amended soil porosity	0.00		
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	0.00		
12 Gravel porosity	0.00		
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	3		
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	79,096		
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	0		

16 Total Retention Volume from LID Infiltration BMPs: 79,096 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP: 963% *Retention% = Item 16 / Form 4.2-1 Item 7*

18 Is full LID DCV retained on-site with combination of hydrologic source control and LID retention and infiltration BMPs? Yes ☒ No ☐

If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

4.3.3 Harvest and Use BMP

Harvest and use BMP may be considered if the full LID DCV cannot be met by maximizing infiltration BMPs. Use Form 4.3-4 to compute on-site retention of runoff from proposed harvest and use BMPs.

Volume retention estimates for harvest and use BMPs are sensitive to the on-site demand for captured stormwater. Since irrigation water demand is low in the wet season, when most rainfall events occur in San Bernardino County, the volume of water that can be used within a specified drawdown period is relatively low. The bottom portion of Form 4.3-4 facilitates the necessary computations to show infeasibility if a minimum incremental benefit of 40 percent of the LID DCV would not be achievable with MEP implementation of on-site harvest and use of stormwater (Section 5.5.4 of the TGD for WQMP).

Form 4.3-4 Harvest and Use BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC or infiltration BMP (ft^3): 0
V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16

BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Describe cistern or runoff detention facility			
3 Storage volume for proposed detention type (ft^3) *Volume of cistern*			
4 Landscaped area planned for use of harvested stormwater (ft^2)			
5 Average wet season daily irrigation demand (in/day) Use local values, typical ~ 0.1 in/day			
6 Daily water demand (ft^3/day) *Item 4 * (Item 5 / 12)*			
7 Drawdown time (hrs) *Copy Item 6 from Form 4.2-1*			
8 Retention Volume (ft^3) *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))*	0	0	0

9 Total Retention Volume (ft^3) from Harvest and Use BMP: 0 *Sum of Item 8 for all harvest and use BMP included in plan*

10 Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest and use BMPs? Yes ☐ No ☐

If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-5 Selection and Evaluation of Biotreatment BMP (DA 1)

1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft^3): 0 *Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9*	List pollutants of concern *Copy from Form 2.3-1.*	
2 Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	Volume-based biotreatment *Use Forms 4.3-6 and 4.3-7 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-8 to compute treated volume*
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention	☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment
3 Volume biotreated in volume based biotreatment BMP (ft^3): 0 *Form 4.3-6 Item 15 + Form 4.3-7 Item 13*	**4** Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): 0 *Item 1 – Item 3*	**5** Remaining fraction of LID DCV for sizing flow based biotreatment BMP: % *Item 4 / Item 1*
6 Flow-based biotreatment BMP capacity provided (cfs): *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*		
7 Metrics for MEP determination: • Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: ☐ *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*		

Form 4.3-6 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type *(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*			
2 Amended soil infiltration rate *Typical ~ 5.0*			
3 Amended soil infiltration safety factor *Typical ~ 2.0*			
4 Amended soil design percolation rate (in/hr) P_{design} *= Item 2 / Item 3*			
5 Ponded water drawdown time (hr) *Copy Item 6 from Form 4.2-1*			
6 Maximum ponding depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Ponding Depth (ft) d_{BMP} *= Minimum of (1/12 * Item 4 * Item 5) or Item 6*			
8 Amended soil surface area (ft^2)			
9 Amended soil depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Amended soil porosity, *n*			
11 Gravel depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
12 Gravel porosity, *n*			
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*			
14 Biotreated Volume (ft^3) $V_{biotreated}$ *= Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	0	0	0
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: 0 *Sum of Item 14 for all volume-based BMPs included in this form*			

Form 4.3-7 Volume Based Biotreatment (DA 1) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (e.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	DA DMA BMP Type		DA DMA BMP Type *(Use additional forms for more BMPs)*	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*				
2 Bottom width (ft)				
3 Bottom length (ft)				
4 Bottom area (ft^2) A_{bottom} = *Item 2 * Item 3*				
5 Side slope (ft/ft)				
6 Depth of storage (ft)				
7 Water surface area (ft^2) $A_{surface}$ =*(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*				
8 Storage volume (ft^3) *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details* V =*Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]*				
9 Drawdown Time (hrs) *Copy Item 6 from Form 2.1*				
10 Outflow rate (cfs) Q_{BMP} = *(Item* $8_{forebay}$ *+ Item* 8_{basin}*) / (Item 9 * 3600)*				
11 Duration of design storm event (hrs)				
12 Biotreated Volume (ft^3) $V_{biotreated}$ = *(Item* $8_{forebay}$ *+ Item* 8_{basin}*) +(Item 10 * Item 11 * 3600)*	0		0	
13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : 0 *(Sum of Item 12 for all BMP included in plan)*				

Form 4.3-8 Flow Based Biotreatment (DA 1)

Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*			
2 Flow depth for water quality treatment (ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
3 Bed slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
4 Manning's roughness coefficient			
5 Bottom width (ft) *b_w = (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item 2^1.67 * Item 3^0.5)*			
6 Side Slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
7 Cross sectional area (ft^2) *A = (Item 5 * Item 2) + (Item 6 * Item 2^2)*			
8 Water quality flow velocity (ft/sec) *V = Form 4.3-5 Item 6 / Item 7*			
9 Hydraulic residence time (min) *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*			
10 Length of flow based BMP (ft) *L = Item 8 * Item 9 * 60*			
11 Water surface area at water quality flow depth (ft^2) *SA_{top} = (Item 5 + (2 * Item 2 * Item 6)) * Item 10*			

4.3.5 Conformance Summary

Complete Form 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)

1 Total LID DCV for the Project DA-1 (ft^3): 8,206 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): 0 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 79,096 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): 0 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): 0 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☒
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☒
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

4.3.6 Hydromodification Control BMP

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control BMPs (DA 1)

1 Volume reduction needed for HCOC performance criteria (ft^3): 0 *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3): *Sum of Form 4.3-9 Items 2, 3, and 4 Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving HCOC volume reduction*
3 Remaining volume for HCOC volume capture (ft^3): *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)*

5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification ☐ *Attach in-stream control BMP selection and evaluation to this WQMP*

6 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP ☐
  BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

7 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs ☐
  BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance. Alternative compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP - All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP - Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMP included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance (use additional forms as necessary)

BMP	Reponsible Party(s)	Inspection/Maintenance Activities Required	Minimum Frequency of Activities
Building & Grounds Maintenance	Property Owner	Inspect and clean site for trash and debris	Weekly
Infiltration Basin	Property Owner	Inspect for trash. debris and sediment. Clean and repair as needed.	Monthly
Education of Property Owners, Tenants & Occupants on Stormwater BMPs	Property Owner	The Property Owner will provide BMP educational information materials to all employees or occupants of site.	As needed
Activity Restrictions	Property Owner	Activity restrictions such as posting "No Littering" signs to prevent pollution to stormwater BMP.	As needed
BMP Maintenance	Property Owner	Inspect, clean, repair and maintain BMP.	Monthly
Local Water Quality Ordinances	Property Owner	Local water quality ordinances shall be followed per local agency.	As needed
Uniform Fire Code Implementation	N/A	No hazardous material proposed on site.	N/A
Litter/Debris Control Program	Property Owner	Inspect and clean site for trash and debris	Weekly

Employee Training	Property Owner	Educational materials on general housekeeping practices for the protection of storm water quality shall be provided to employees.	As needed
Catch Basin Inserts	Property Owner	Inspect for trash, debris and damage	Monthly
Sweeping	Property Owner	Parking lots shall be swept and vacuumed regularly	Monthly
NPDES Permits	Property Owner	Approval and implementation of this WQMP and SWPPP.	On going
Provide storm drain system stenciling and signage	Property Owner	Inspected storm drain system stenciling and signage	As needed
Trash enclosure	Property Owner	Inspect trash enclosure for maintenance and repairs	Monthly
Use Efficient Irrigation System and Landscape Design	Property Owner	Install irrigation systems with timing devices to avoid overwatering. Repair as needed	As needed

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their local Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

6.3 Post Construction

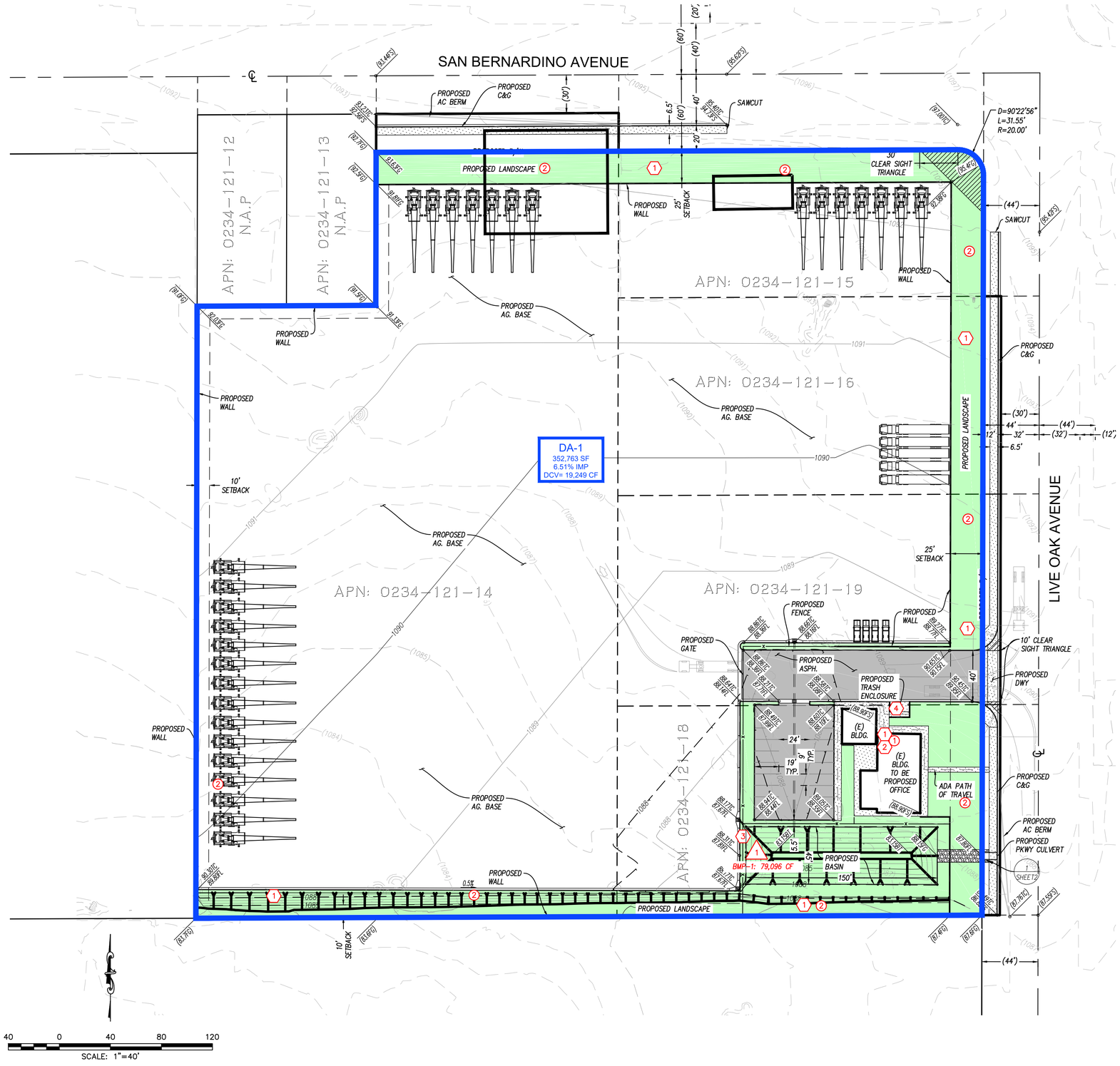
Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP.

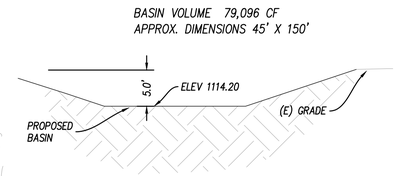
- O&M Plan
  - BMP Educational Materials
- Maintenance Agreement(s)
- Activity Restriction – C, C&R's & Lease Agreements

6.4 Other Supporting Documentation

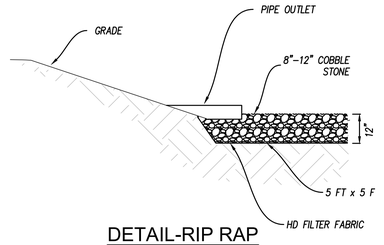
- San Bernardino County Watershed Mapping Tool Data
- NOAA Rainfall Data
- Soils information

Appendix 6.1 – Site Plan and Drainage Plan

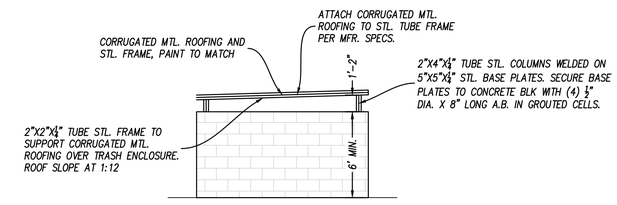




DETAIL-BASIN



DETAIL-RIP RAP

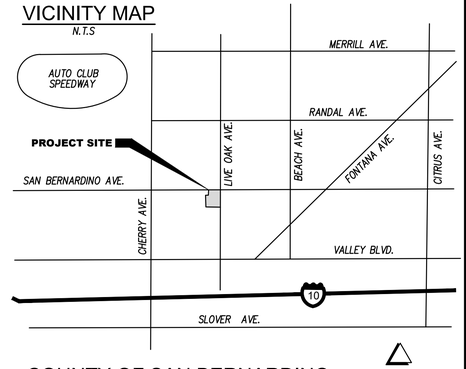


4 TRASH ENCLOSURE ROOF DETAIL

NTS

VICINITY MAP

N.T.S



COUNTY OF SAN BERNARDINO

OWNER INFORMATION:

THE OFT FAMILY CORPORATION
893 W 16TH ST.
NEWPORT BEACH, CA 92663
TEL. (323)477-2151

PROPOSED SITE DESIGN BMP'S:

- SITE DESIGN & LANDSCAPE PLANNING (SD-10) [S13]
- 1 ROOF RUNOFF CONTROLS (SD-11)
- 2 EFFICIENT IRRIGATION (SD-12) [S4]
- 3 TRASH STORAGE AREAS (SD-32) [S3]

PROPOSED SOURCE CONTROL BMP'S:

- SPILL PREVENTION, CONTROL & CLEANUP (SC-11) [N7]
- 1 BUILDING & GROUNDS MAINTENANCE (SC-41)
- 2 BUILDING REPAIR AND CONSTRUCTION (SC-42)
- 3 PARKING & STORAGE AREA MAINTENANCE (SC-43) [N15]
- 4 DESIGN AND CONSTRUCT TRASH AND WASTE STORAGE AREAS REDUCE POLLUTION INTRODUCTION [S3] (CASQA SD-32)

PROPOSED TREATMENT CONTROL BMP'S:

- 1 INFILTRATION BASIN (TC-11)

LEGEND:

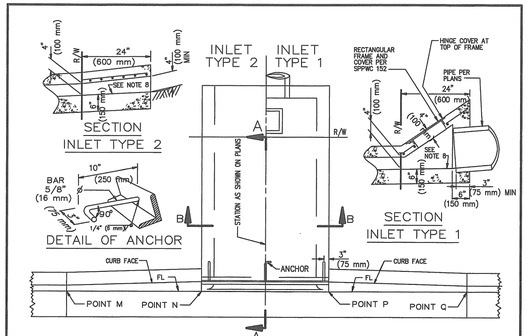
- W.Q.M.P DRAINAGE AREA/PL
- FLOW LINE
- PROPOSED LANDSCAPING AREAS
- PROPOSED CONCRETE PAVING AREAS
- PROPOSED STRUCTURES
- PROPOSED PERVIOUS GRAVEL COVER

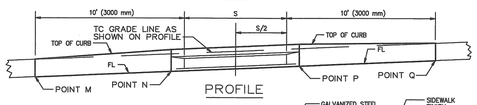
PRELIMINARY W.Q.M.P.

APN: 0234-121-14, 15, 16, 18 & 19
FONTANA, CA 92335

BONADIMAN
JOSEPH E. BONADIMAN & ASSOCIATES, INC.
ENGINEERS - G.I.S. - SURVEYING - PLANNING
TEL. (909) 885-3806
234 NORTH ARROWHEAD AVE.
SAN BERNARDINO, CA 92408
FAX (909) 381-1221
www.bonadiman.com

PREPARED FOR: THE OFT FAMILY CORPORATION					
DRAWN BY:	SG	SCALE:	1" = 40'	SHEET:	1 OF 2
CHECKED BY:	C.R.	JOB NO:	184546		
DISREGARD PRINTS BEARING EARLIER REVISION DATES		03-17-21			





S, INCHES (mm)	J BAR SPACING
12" (300)	7" (240)
18" (450)	7" (240)
24" (600)	7" (240)
30" (750)	7" (240)
36" (900)	7" (240)
42" (1050)	6" (210)
48" (1200)	5" (180)
54" (1350)	6-1/2" (225)
60" (1500)	5" (180)
66" (1650)	4" (180)
72" (1800)	3-1/2" (120)

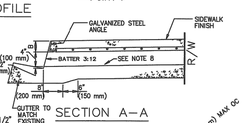
FOR S = 30" (750 mm) AND LESS, USE 2 ANCHORS. OTHERWISE, USE 3 ANCHORS.

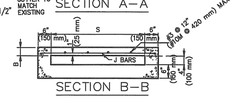
FOR S = 48" (1200 mm) AND LESS, B = 3" (75 mm)

USE 2-1/2"x2"x3/8" (64x51x9.5) GALVANIZED STEEL ANGLE.

OTHERWISE, B = 4" (100 mm).USE 3-1/2"x3"x1/2" (89x76x12.7) GALVANIZED STEEL ANGLE.

J BARS ARE #3 (#10M).





STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PROMULGATED BY THE PUBLIC WORKS STANDARDS INC. GREENBOOK COMMITTEE 1993 REV. 1996, 2009

PARKWAY DRAIN

USE WITH STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION

STANDARD PLAN 151–2

SHEET 1 OF 2

NOTES

1. FLOOR OF BOX SHALL BE TROWELED SMOOTH.
2. IF THE TOE OF SLOPE IS ALLOWED WITHIN THE R/W, INLET TYPE 1 BEGINS AT THE TOE RATHER THAN AT THE R/W LINE.
3. FOR OPEN DITCH (TYPE 2), THE 24" (600 mm) EXTENSION BEYOND THE R/W LINE IS NOT REQUIRED WHEN BACK OF WALK IS 24" (600 mm) OR MORE FROM THE R/W LINE; HOWEVER, THE PIPE SHALL EXTEND TO THE R/W LINE IN ANY EVENT.
4. TOP OF INLET STRUCTURE (TYPE 1 & 2) SHALL BE FLUSH WITH ADJACENT SURFACE WHERE PRACTICAL.
5. A HEADED STEEL STUD 5/8" x 6-3/8" WITH A 1" HEAD (16 x 160 mm, 25 mm HEAD) ATTACHED BY A FULL PENETRATION BUTT WELD MAY BE USED AS AN ALTERNATE ANCHOR.
6. NORMAL CURB FACE AT POINT M AND Q. CURB FACE IS B + 5" (125 mm) AT POINT N AND P.
7. THE 3" (75 mm) LEG OF THE 5/8" (16 mm) DIA ANCHORS SHALL BE PARALLEL TO THE TOP OF SIDEWALK.
8. SLOPE = 2.0%.

STANDARD PLANS FOR PUBLIC WORKS CONSTRUCTION

PARKWAY DRAIN

STANDARD PLAN 151–2

SHEET 2 OF 2

1
SHEET2

PRELIMINARY W.Q.M.P.
APN: 0234-121-14, 15, 16, 18 & 19
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PREPARED FOR: THE OFT FAMILY CORPORATION

DRAWN BY: SG	SCALE: 1" = 40'	SHEET: 2 OF 2			
CHECKED BY: C.R.	JOB NO: 184546				
DISREGARD PRINTS BEARING EARLIER REVISION DATES →	03-17-21				

Appendix 6.2 – Electronic Data Submittal

Note: A cd containing PDF versions of the WQMP documents will be included in this section during final engineering, when requested by the reviewing agency.

Appendix 6.3 – Post Construction

Note: As indicated in section 8.2.3 of the "Technical Guidance Document for Water Quality Management Plans", dated June 7, 2013, a maintenance agreement may be required by local jurisdiction for proposed BMPs. A maintenance agreement will be provided in this section if requested by the local jurisdiction.

Appendix 6.4 – Other Supporting Documentation

WQMP Project Report

County of San Bernardino Stormwater Program

Santa Ana River Watershed Geodatabase

Thursday, November 08, 2018

Note: The information provided in this report and on the Stormwater Geodatabase for the County of San Bernardino Stormwater Program is intended to provide basic guidance in the preparation of the applicant's Water Quality Management Plan (WQMP) and should not be relied upon without independent verification.

Project Site Parcel Number(s):	023412114, 023412116, 023412119, 023412115, 023412118
Project Site Acreage:	8.392
HCOC Exempt Area:	Yes. Verify that the project is completely with the HCOC exemption area.
Closest Receiving Waters: (Applicant to verify based on local drainage facilities and topography.)	**System Number** - 809 **Facility Name** - West Fontana Channel **Owner** - SBCFCD
Closest channel segment's susceptibility to Hydromodification:	EHM
Highest downstream hydromodification susceptibility:	EHM
Is this drainage segment subject to TMDLs?	No
Are there downstream drainage segments subject to TMDLs?	No
Is this drainage segment a 303d listed stream?	No
Are there 303d listed streams downstream?	No
Are there unlined downstream waterbodies?	No
Project Site Onsite Soil Group(s):	A
Environmentally Sensitive Areas within 200':	None
Groundwater Depth (FT):	-380
Parcels with potential septic tanks within 1000':	Yes
Known Groundwater Contamination Plumes within 1000':	Yes
Studies and Reports Related to Project Site:	Chino Basin Recharge Master Plan Chino Basin Water Master 32nd Annual Report Summary Report Master Storm Drainage Plan Study Summary Report Master Storm Drainage Plan Map FONTANA MPD FEE STUDY Master SD Hydrology Calcs for Fontana Vol III Master SD Hydrology Calcs For Fontana Vol II Master SD Hydrology Calcs for Fontana Vol V Master SD Hydrology Calcs for Fontana Vol IV San Sevaine - Boyle Map 0001 San Sevaine - Boyle Map 0002 San Sevaine - Boyle Map 0003 SBCounty CSDP Project No.2 Volume 1 SBCounty CSDP Project No.2 Volume 2 Volume 2 Map SBCounty CSDP Project No.3 Volume I SBCounty CSDP Project No.3 Volume II West Fontana Channel Preliminary Basin Study

NOAA Atlas 14, Volume 6, Version 2
Location name: Fontana, California, USA*
Latitude: 34.0764°, Longitude: -117.481°
Elevation: 1088.24 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.105** (0.087-0.127)	**0.138** (0.115-0.167)	**0.183** (0.152-0.223)	**0.222** (0.182-0.272)	**0.277** (0.220-0.351)	**0.321** (0.250-0.417)	**0.368** (0.279-0.491)	**0.419** (0.309-0.575)	**0.492** (0.347-0.704)	**0.552** (0.376-0.818)
10-min	**0.150** (0.125-0.182)	**0.197** (0.164-0.240)	**0.262** (0.218-0.319)	**0.318** (0.261-0.390)	**0.396** (0.315-0.504)	**0.460** (0.358-0.598)	**0.528** (0.400-0.703)	**0.601** (0.443-0.824)	**0.705** (0.498-1.01)	**0.791** (0.539-1.17)
15-min	**0.182** (0.152-0.220)	**0.239** (0.199-0.290)	**0.317** (0.263-0.386)	**0.384** (0.316-0.471)	**0.479** (0.381-0.609)	**0.557** (0.433-0.723)	**0.639** (0.484-0.850)	**0.727** (0.536-0.997)	**0.853** (0.602-1.22)	**0.957** (0.651-1.42)
30-min	**0.271** (0.226-0.329)	**0.356** (0.297-0.433)	**0.473** (0.393-0.576)	**0.573** (0.472-0.703)	**0.716** (0.569-0.909)	**0.831** (0.646-1.08)	**0.953** (0.723-1.27)	**1.09** (0.799-1.49)	**1.27** (0.899-1.82)	**1.43** (0.972-2.12)
60-min	**0.397** (0.331-0.482)	**0.522** (0.434-0.633)	**0.693** (0.575-0.844)	**0.839** (0.691-1.03)	**1.05** (0.833-1.33)	**1.22** (0.946-1.58)	**1.40** (1.06-1.86)	**1.59** (1.17-2.18)	**1.86** (1.32-2.67)	**2.09** (1.42-3.10)
2-hr	**0.600** (0.500-0.727)	**0.775** (0.645-0.941)	**1.01** (0.840-1.23)	**1.21** (0.995-1.48)	**1.48** (1.18-1.89)	**1.70** (1.32-2.21)	**1.93** (1.46-2.57)	**2.17** (1.60-2.97)	**2.50** (1.77-3.58)	**2.77** (1.89-4.11)
3-hr	**0.767** (0.639-0.930)	**0.987** (0.822-1.20)	**1.28** (1.06-1.56)	**1.52** (1.25-1.87)	**1.85** (1.47-2.35)	**2.11** (1.64-2.74)	**2.38** (1.80-3.17)	**2.66** (1.96-3.64)	**3.04** (2.15-4.35)	**3.34** (2.28-4.96)
6-hr	**1.10** (0.914-1.33)	**1.41** (1.17-1.71)	**1.82** (1.51-2.21)	**2.14** (1.77-2.63)	**2.59** (2.06-3.29)	**2.93** (2.28-3.80)	**3.27** (2.48-4.36)	**3.62** (2.67-4.97)	**4.10** (2.89-5.86)	**4.46** (3.04-6.62)
12-hr	**1.45** (1.21-1.76)	**1.88** (1.57-2.28)	**2.43** (2.02-2.96)	**2.87** (2.36-3.52)	**3.44** (2.73-4.37)	**3.87** (3.01-5.02)	**4.29** (3.26-5.72)	**4.72** (3.48-6.47)	**5.28** (3.73-7.56)	**5.71** (3.89-8.46)
24-hr	**1.95** (1.73-2.25)	**2.58** (2.28-2.98)	**3.37** (2.97-3.90)	**3.98** (3.48-4.64)	**4.78** (4.05-5.77)	**5.37** (4.46-6.61)	**5.95** (4.82-7.50)	**6.53** (5.14-8.45)	**7.27** (5.50-9.81)	**7.83** (5.73-10.9)
2-day	**2.36** (2.09-2.72)	**3.19** (2.82-3.69)	**4.25** (3.75-4.92)	**5.09** (4.45-5.93)	**6.19** (5.24-7.45)	**7.00** (5.81-8.62)	**7.81** (6.33-9.84)	**8.62** (6.80-11.2)	**9.69** (7.33-13.1)	**10.5** (7.67-14.6)
3-day	**2.57** (2.28-2.97)	**3.54** (3.13-4.08)	**4.78** (4.21-5.53)	**5.77** (5.05-6.73)	**7.09** (6.01-8.55)	**8.09** (6.71-9.96)	**9.09** (7.36-11.5)	**10.1** (7.96-13.1)	**11.5** (8.66-15.4)	**12.5** (9.13-17.4)
4-day	**2.78** (2.46-3.20)	**3.86** (3.41-4.46)	**5.27** (4.64-6.10)	**6.40** (5.60-7.47)	**7.93** (6.71-9.55)	**9.09** (7.54-11.2)	**10.3** (8.30-12.9)	**11.4** (9.02-14.8)	**13.0** (9.87-17.6)	**14.3** (10.4-19.9)
7-day	**3.17** (2.80-3.65)	**4.49** (3.97-5.18)	**6.22** (5.49-7.20)	**7.63** (6.68-8.90)	**9.55** (8.09-11.5)	**11.0** (9.15-13.6)	**12.5** (10.2-15.8)	**14.1** (11.1-18.2)	**16.2** (12.2-21.8)	**17.8** (13.0-24.8)
10-day	**3.43** (3.03-3.95)	**4.91** (4.34-5.66)	**6.87** (6.05-7.94)	**8.47** (7.41-9.88)	**10.7** (9.04-12.9)	**12.4** (10.3-15.2)	**14.1** (11.5-17.8)	**16.0** (12.6-20.7)	**18.4** (14.0-24.9)	**20.4** (14.9-28.4)
20-day	**4.05** (3.59-4.67)	**5.89** (5.21-6.80)	**8.37** (7.38-9.68)	**10.4** (9.13-12.2)	**13.3** (11.3-16.1)	**15.6** (13.0-19.2)	**18.0** (14.6-22.7)	**20.6** (16.2-26.6)	**24.1** (18.2-32.5)	**26.9** (19.7-37.5)
30-day	**4.78** (4.23-5.51)	**6.94** (6.14-8.01)	**9.90** (8.73-11.5)	**12.4** (10.8-14.5)	**16.0** (13.5-19.2)	**18.8** (15.6-23.1)	**21.8** (17.7-27.5)	**25.0** (19.7-32.4)	**29.6** (22.4-39.9)	**33.2** (24.3-46.4)
45-day	**5.65** (5.00-6.51)	**8.10** (7.16-9.34)	**11.5** (10.1-13.3)	**14.4** (12.6-16.8)	**18.7** (15.8-22.5)	**22.1** (18.3-27.2)	**25.8** (20.9-32.5)	**29.7** (23.4-38.5)	**35.4** (26.8-47.8)	**40.1** (29.3-56.0)
60-day	**6.68** (5.92-7.70)	**9.41** (8.32-10.9)	**13.3** (11.7-15.3)	**16.6** (14.5-19.4)	**21.5** (18.2-25.9)	**25.5** (21.1-31.3)	**29.8** (24.2-37.6)	**34.6** (27.2-44.7)	**41.4** (31.3-55.9)	**47.2** (34.5-65.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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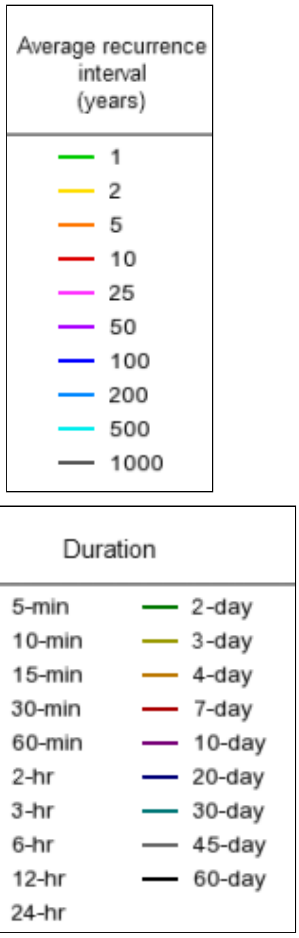
PF graphical

curve plots



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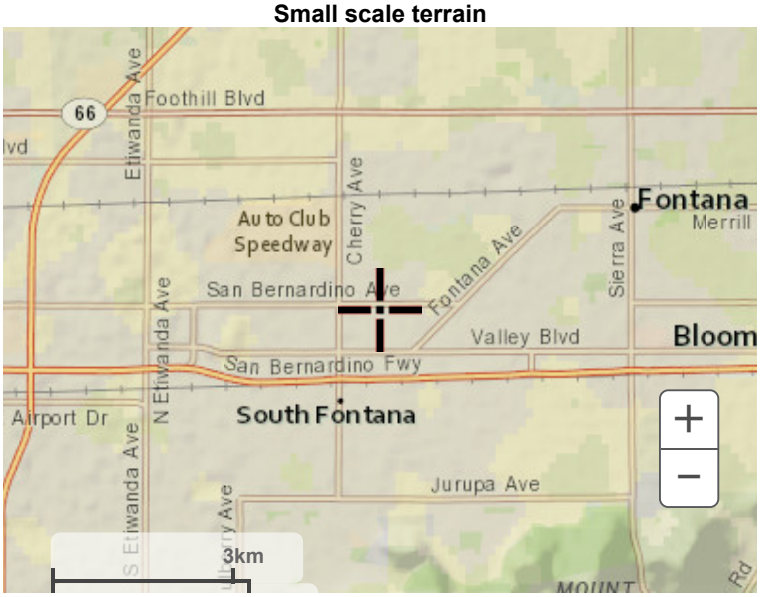
Maps & aerials

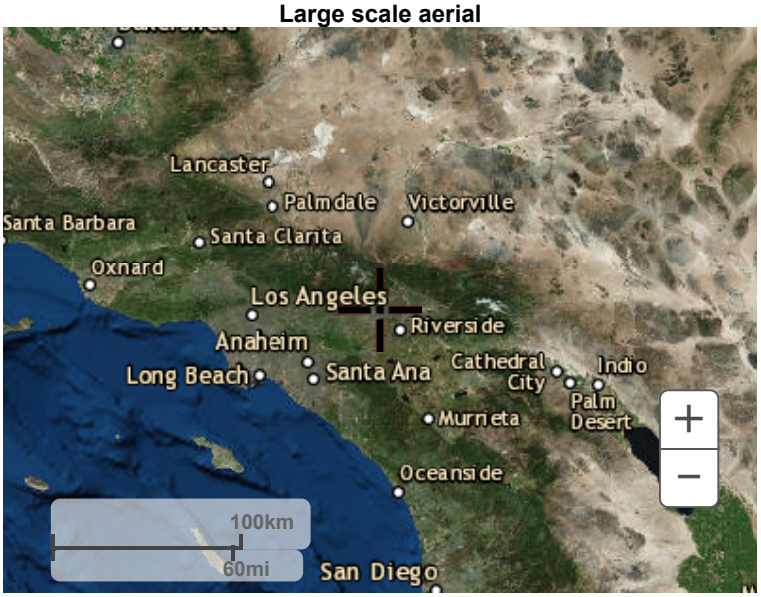
Small scale terrain



Large scale terrain

Large scale map

Large scale aerial



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SOILS SOUTHWEST, INC.
SOILS, MATERIALS AND ENVIRONMENTAL ENGINEERING CONSULTANTS

897 VIA LATA, SUITE N • COLTON, CA 92324 • (909) 370-0474 • (909) 370-0481 • FAX (909) 370-3156

Report of On-Site Paving Thickness & Evaluations for Soils infiltration Rate for WQMP-BMP Wastewater Disposal Design

Proposed OFT Construction Equipment Yard Improvement
14835 San Bernardino Avenue
Fontana area of San Bernardino County, California
A.P.N. 0234-121-14,15,16,17,18, & 19

Project No. 20050-F/BMP

March 3, 2021

Prepared for:

Mr. Dan Otting
c/o The OFT Family Corporation
893 W. 16th Street
Newport Beach, CA 92663

Bonadiman Civil Design
234 N. Arrowhead Avenue
San Bernardino, California 92408

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Established 1984

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March 3, 2021 Project No. 20050-F/BMP

Mr. Dan Otting
c/o The OFT Family Corporation
893 W. 16th Street, Newport Beach, CA 92663

Bonadiman Civil Design
234 N. Arrowhead Avenue
San Bernardino, California 92408

Subject: Report of On-Site Paving Thickness Design &
Testing for Soils Infiltration Rate for WQMP-BMP Wastewater Disposal Design
Proposed OFT Construction Equipment Yard Improvement
14835 San Bernardino Avenue, Fontana area of San Bernardino County, California
A.P.N. 0234-121-14,15,16,17,18, & 19

Reference: Preliminary Grading Plan provided by Bonadiman & Associates

Dear Mr. Otting:

Presented herewith are the reports of (i) on-site paving thickness design and (ii) testing for WQMP-BMP soils infiltration rate for wastewater disposal design as proposed for the site of the existing equipment yard located at 14835 San Bernardino Avenue, County of San Bernardino, California.

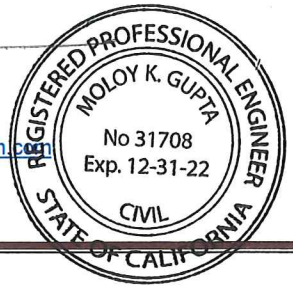
Based on the geotechnical evaluations completed at this time it our opinion that the near grade soils up to about 2-3 feet, as encountered, primarily consist of loose, disturbed, dry and compressible silty fine to medium coarse gravelly sands with rock fragments and rocks, overlying dense fine to coarse gravely sands with cobbles and rocks to the refusal depth of 23 feet as explored. No free groundwater was encountered. Descriptions of the soils encountered are provided in the Log of Borings, B-1 to B-6, attached.

Based on review of the available publications published by the State of California, Department of Conservation-San Bernardino South Quadrangle Special Studies Zone map, the site is not considered to be situated within an A-P Special Study Zone; and with historical groundwater table at a depth of 50 feet, based on the CDMG Special Publication 117, the site is considered non susceptible to potential for seismically induced soils liquefaction.

Geotechnical evaluations completed indicate that when adequately designed and constructed, the site should be considered suitable for upgrading, to include the new paving and installation of WQMP-BMP deep chamber wastewater disposal, as currently proposed.

Respectfully submitted,
Soils Southwest, Inc.

Moloy Gupta, RCE 31708



John Flippin, Project Coordinator

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Established 1984

1.0 Introduction

1.1 Scope of Services

Scope of services include the report of (i) on-site paving thickness design for use by the construction equipment traffic loading, and (ii) testing for soils infiltration Rate for WQMP-BMP Wastewater Disposal Design for the site of the existing equipment yard, located at 14835 San Bernardino Avenue, County of San Bernardino, California. The recommendations contained are based on the soils condition as encountered as described in the later sections of this report. It is not to be considered as a warranty of the soils existing beyond the exploratory depths conducted and the test exploration locations described.

The recommendations supplied should be considered valid and applicable when the following conditions, in minimum, are observed:

i. Pre-grade meeting with contractor, public agency and soils engineer,
ii. Observations and testing during paving surface preparations and grading,
iii. Utility trenches backfill testing,
iv. Consultations as required during construction upon your request, and
v. Verification of soil subgrades prior to WQMP-BMP chamber installation.

1.2 Site Description

The relatively flat irregularly shaped parcel is currently used as an equipment yard. In general, the site is bounded by San Bernardino Avenue on the north, a single-family residential development on the south, by Live Oak Avenue on the east, and by commercial industrial equipment yard on the west. Overall vertical relief is currently unknown, but sheet-flow from incidental rainfall appears to flow towards the south. With the exception of scattered structures, stored equipment and vehicles, and matured trees and vegetation, no other significant features are noted.

1.3 Proposed Development

Based on the preliminary project information supplied, it is understood that the subject development will primarily include (i) new asphalt paving for use by heavy truck/vehicle traffic associated with the existing equipment yard along with a new trash enclosure, and (ii) installation of WQMP-BMP wastewater infiltration chamber at depth. With the exception of a trash enclosure, no other major structures are currently planned.

2.0 Scope of Services

Scope of work includes test explorations, soil sampling, necessary laboratory testing, engineering analyses and recommendations paving for the storage yard equipment traffic. Supplemental evaluations include in-situ testing for soils infiltration rate for WQMP-BMP wastewater deep chamber design.

In general, our Scope of Services include the following:

- **Field Explorations**

  Geotechnical and WQMP-BMP evaluations, six (6) exploratory test borings (B-1 to B-6) using a hollow-stem auger drilling rig advanced to the depth of refusal at about 23 feet below existing grade. Prior to test excavations, an underground utility clearance was established with Underground Service Alert (USA) of Southern California to avoid possible subsurface life-line obstruction and rupture. Following necessary soil sampling and in-situ testing, the test excavations were backfilled with local soils using minimum compaction effort.

  During excavations, the soils encountered were continuously logged and bulk and undisturbed samples were procured. Collected samples were subsequently transferred to our laboratory for necessary geotechnical testing. Description of the soils encountered is shown on the Test Exploration Logs in Appendix A. Approximate test excavation locations are shown on the attached Plate 1.

- **Laboratory Testing**

  Representative bulk and undisturbed site soils were tested in laboratory to aid in the soils classification and to evaluate relevant engineering properties pertaining to the project requirements. The laboratory tests completed include the following:

  - In-situ moisture contents and dry density (ASTM Standard D2216),
  - Maximum Dry Density and Optimum Moisture Content (ASTM Standard D1557),
  - Direct Shear (ASTM Standard D3080),
  - Soil Consolidation (ASTM Standard D2435),
  - Soils Gradation evaluations (ASTM D422),
  - Soils Sand Equivalent, SE (ASTM D 2419), and
  - Laboratory soils' R-value determinations.

  Description of the test results and test procedures used are provided in Appendix B.

- Based on the field investigations, soil sampling and laboratory testing necessary engineering analyses are made, on which to base our recommendations for paving design for use by heavy-loaded vehicular traffic associated with the existing storage yard.

3.0 Geotechnical Descriptions

3.1 Soils Conditions

Based on the test explorations completed, it is our opinion that the soils encountered primarily consist of upper 2 to 3 feet of loose, dry and compressible, slightly silty, fine to medium coarse sands with minor rocks fragments, overlying moderately dense fine to coarse gravely sands with rocks to the maximum depth of refusal at about 23 feet below the ground surface. No free groundwater was encountered. Descriptions of the soils encountered are in the attached Log of Borings, B-1 to B-6.

Laboratory shear tests conducted on the upper bulk samples remolded to higher density indicate moderate shear strengths under increased soil moisture conditions. Results of the laboratory tests are provided in Appendix B of this report.

Sandy silty and gravely in nature, the site soils are considered "very low" in expansion characteristics with Expansion Index, EI, less than 20, thereby requiring no special construction requirements other than those as described herein.

3.2 Subsurface Variations

During site preparations and grading, presence of buried irrigation, debris, organic and others non-structural materials may be anticipated. In addition, variations in soil strata and their continuity and orientations may be expected. Due to the nature and depositional characteristics of the natural soils existing as described, care should be exercised in interpolating or extrapolating the subsurface soils conditions existing in between and beyond the test explorations conducted.

3.3 Groundwater

The following table lists the historical groundwater table based on the information as supplied by the local reporting agency.

GROUNDWATER TABLE	
Reporting Agency	Water Master Support Services-San Bernardino Valley Conservation District/Western Municipal Water District Cooperative Well Measuring Program, Fall 2018
Well Number	01S/06W-23 F17C
Well Monitoring Agency	San Gabriel Water Company (FWC)
Well Location: Township/Range/Section	T1S-R6W-Section 23
Well Elevation:	1,074.85
Current Depth to Water (Measured in feet)	356
Current Date Water was Measured	November 2018
Depth to Water (Measured in feet) (Shallowest)	356
Date Water was Measured (Shallowest)	November 2018

4.0 Evaluations and Recommendations

4.1 Site Preparations for Paving/Parking for Equipment Traffic

For adequate load bearing equipment yard traffic support, it is our opinion that site preparations and grading should include, in minimum, minor sub-excavations of the near surface soils up to about 18-inch, followed by the excavated soils placement as engineered fills compacted to minimum 95%.

The sub-excavation depths described should be considered as "preliminary". Localized additional sub-excavations may be required within the areas underlain by undocumented fills and buried debris, including buried broken asphalt, old fills, buried utilities and others.

4.1.1 Recommendations for Asphalt Paving

Based on the laboratory Soils Sand Equivalent, SE of 44 and soil R-value of 75 (test results attached), the following asphalt paving sections are suggested using the estimated Traffic Index, TI, as described:

Traffic Type	Traffic Indices (TIs)	Asphalt Thickness (inch)	Class II Base or Miscellaneous Base Thickness (Inch)
Equipment/Truck Parking & Circulation	6.5 to 7.0	4.0	4.0
Auto parking/driveways	6.0-6.5	3.5	4.0

The subgrades to receive base materials shall be scarified/subexcavated to minimum 18", followed by the excavated soils replacement to minimum 95% relative compaction at near Optimum Moisture content as described earlier. The suggested base and asphalt placed should similarly be compacted to 95% relative compaction.

The paving materials used, including the asphalt and aggregate base should meet the minimum gradation and quality requirements of the Green Book along with the requirements of the Caltrans Standard Specifications.

It should be noted that with repeated use of the paving by heavy truck loading, regular maintenance may be expected. Use of thickened edges are suggested to protect paving from accidental edge-loading and/or lateral sliding.

4.2 Alternative Rigid Concrete Paving

Rigid Concrete Paving, if selected, may be constructed with the estimated Traffic Index TI, as described below:

Materials	Autos/Light Trucks (TI=6.0-6.5)	Truck Traffic (TI=6.5 to 7.0)
Portland Cement Concrete, PCC, over	4" (net)	5" (net)
Class II Base, or Miscellaneous Base compacted to min. 95%, over	-0-	-0-
Engineered fills of local soils compacted to min. 95%	18"	18"

Use of concrete paving reinforcing should be considered as suggested by the project structural engineer, with recommended construction/expansion joint spacings limited to 24 to 30-times the paving thickness.

Alternatively, concrete paving thickness, construction/expansion joints and reinforcing requirements etc. may be supplied by the project structural engineer using an Annual Daily Traffic (ADT) and on Soil Subgrade Reaction, ks, of 400 kcf.

4.3 Concrete Driveways

For equipment yard traffic driveways, if any, it is recommended that prior to concrete placement, the areas to receive concrete paving should be scarified/sub excavated to minimum 18-inch, followed by their replacement compacted to at least 95% relative compaction. Use of low slump concrete is suggested.

Actual concrete thickness, reinforcing requirements and expansion/construction joint spacings etc. should be determined by the project structural engineer using a soil Modular of Subgrade Reaction, k_s, of 400 kcf.

In addition, it is recommended that utility trenches underlying concrete slabs and driveways should be thoroughly backfilled with gravelly sandy soils, mechanically compacted to the recommended minimum 95% relative compaction.

The site being situated within an area of known "extreme" weather conditions, it is our opinion that to minimize potential for concrete "warping", use of excess water in concrete or on the surface graded, should be limited. Use of low-slump concrete is suggested.

To reduce and/or control concrete shrinkage or curling or cracking, concrete slabs shall be "cured" by using water prior to structural load placement. In general, it is recommended that construction and expansion joints associated with concrete driveways should be at intervals not exceeding 24 to 30 times the slab thickness. Actual intervals should be as required by the project structural engineer. Shorter distance between joint spacings would provide greater crack control. Joints at curves and angle points are suggested as recommended by structural engineer.

5.0 Geotechnical Recommendations for Trash Enclosure

For adequate load bearing, it is recommended that the areas to receive trash enclosure, site preparations should include a minimum 3 feet subexcavations, followed by their replacement as engineered fills compacted to minimum 90%. The site preparations described should encompass, in minimum, the proposed trash enclosure pad areas and minimum 3 feet beyond.

For foundation design, an allowable soil bearing capacity of 1800 psf may be considered.

6.0 Soil Infiltration Rate for WQMP-BMP Stormwater Disposal Design

For water infiltration rate for WQMP-BMP stormwater disposal design, two (2) infiltration tests were performed using the standardized "falling-head" test method with the results converted to "infiltration Rate" using Porchet Method in general accordance with the Table 1, Infiltration Basin Option 2 of Appendix A of the Riverside County-Low Impact Development (LID) BMP design Handbook, as well as per the Appendices Section VII.3.8.2, Appendix VII: Infiltration Rate Evaluation Protocol and Factor of Safety Recommendations of the San Bernardino County Technical Guidance Document for Water Quality Management Plans Handbook. Approximate test locations are shown on the attached Plate 1.

The soils encountered consist, in general, of upper fine to medium coarse gravelly sands with traces of silt, overlying gravely medium to coarse sands with cobbles and rocks as described in the Log of Borings, P-1 and P-2, attached.

Based on the field infiltration testing completed, it is our opinion that the average observed soils infiltration rate is 13.54 in/hr.

For design, it is suggested that use of an appropriate factor of safety as selected by the design engineer should considered to the described infiltration rate to account for long-term saturation, inconsistencies in subsoil conditions, potential for silting and lack of maintenance.

The observed soils percolation and infiltration rates are provided in Table 6.3.1 in Section 6.3 of this report.

6.1 Excavated Test Borings

For BMP soil infiltration testing, two (2) test borings (P-1 and P-2) are made using an 8-inch diameter hollow-stem auger drilling rig, advanced to 12 feet below the current grade as suggested the project engineer. Water used during infiltration percolation testing was supplied by portable water tank. Test locations are shown on the attached Plate 1.

6.2 Methodology and Test Procedure

Following test boring completion, each of the test holes were fitted with perforated pvc pipes and backfilled with 2-inch crushed rock at the bottom to minimize potentials for scouring and caving. For testing, each test hole was initially filled using water supplied by portable water containers.

To determine test intervals, as per the Section 2.3 for deep infiltration testing of the referenced handbook guideline, two consecutive readings were performed to determine if six (6) or more inches of water seeped in 25 minutes. Since 6 inches or more of water seeped away in less than 25 minutes, subsequent percolation testing was performed at 10-minute time intervals for minimum one hour, or until the observed rates were consistent.

Testing included water placement to about 24 inches above the planned infiltration disposal system bottoms as selected by the project civil engineer.

The final 10-minute recorded soil percolation rates are converted into an Infiltration Rate (I_t) in inches per hour using the "Porchet Method" equation as described in the Reference 2, Riverside County Low Impact Development BMP Design Handbook or the Appendices Section VII.3.8 of the San Bernardino County Technical Guidance Document for Water Quality Management Plans handbook.

6.3 Infiltration Test Results

Based on the soils infiltration testing completed at the test locations (P-1 and P-2) and to the test depths as described the observed average soil infiltration rate is estimated to 13.54 inch per hour.

Calculations to convert the percolation test rate to infiltration rate in accordance with Section 2.3 of the County Handbook are presented in Table I and II below. It is suggested that in design, a factor of safety of 2.0 to 3.0, or a factor of safety as selected by the design engineer, should be considered to the observed rate described.

6.3.1. Conversion Calculations & Summary:

TABLE I
Conversion Table (Porchet Method)

Test Location	Depth of Test Hole (inches)	Time Interval	Initial Water Depth (inch)	Final Water Depth (inch)	Initial Water Height (inch)	Final Water Height (inch)	Change in Height/Time (inch)	Average Head Height/Time
	D_t	Δt (Min)	D_o (in)	D_f (in)	$H_o=D_t-D_o$	$H_f=D_t-D_f$	$\Delta H= H_f-H_o$	$H_{avg} = (H_o+H_f)/2$
P-1	144	10	120.0	139.0	24.0	5.0	19.0	14.50
P-2	144	10	120.0	138.5	24.0	5.5	18.5	14.75

Test Location	Infiltration Rate (It)=ΔH60r/Δt(r+2Havg)		
	A	B	C
	ΔH60r	Δt(r+2Havg)	A/B=in/hr
P-1	4560	330	13.82
P-2	4440	335	13.25

TABLE II

The following provides the observed soils infiltration rate for the test locations and the test depths as described. Actual field test data are attached.

Observed Infiltration Rate

Test Date & Test No. (1-12-2021)	Relative Site Location	Test Depth (ft.) Below Grade	Observed Rate (inch/hour.) Field	Observed Design Infiltration Rate (inch/hour) using Porchet Method
P-1	Southeast-east	12.0	19.0	13.82 (GP-SP sand)
P-2	Southeast-west	12.0	18.5	13.25 (GP-SP sand)

Average observed soils Infiltration Rate: 13.54 in/hr.

For design, use of an appropriate factor of safety to the described Observed Infiltration Rate is suggested to account for long-term saturation, inconsistencies in subsoil conditions, along with the potential for silting of percolating soils.

The infiltration rate described is based on the in-situ testing completed at the locations as suggested by the project civil engineer. In event the final chamber location and depth vary considerably from those as described herein, supplemental soils infiltration testing may be warranted.

It should be noted that over prolong use and lack of maintenance of the detention/infiltration basins, or deep chambers constructed based on the suggested design rate may experience much lower infiltration rate due to the accumulation of silts, fines, oils and others. Regular maintenance of the chambers in form of removal of debris, oil and fines are strongly recommended. A maintenance record of such is suggested for future use, if any.

6.3.2 Suggested Site Requirements for Stormwater BMP installation

The invert of stormwater infiltration shall be at least 10 feet above the groundwater elevation. Stormwater infiltration BMPs should not be placed on steep slopes and shall not create the condition or potential for slopes instability.

When adequately installed, it is our opinion that stormwater infiltration should not increase the potential for static or seismic settlement of structures on or its adjacent.

Stormwater infiltration should not increase surcharge on structures or foundations on or its adjacent. The pore-water pressure is not expected to increase on soil retaining structures, if any.

The invert of stormwater infiltration shall be set back at least 15 feet, and outside a 1:1 plan drawn up from the bottom of adjacent foundations.

Stormwater infiltration shall not be located near utility lines where the introduction of stormwater could cause damage to utilities or settlement of trench backfill.

Stormwater infiltration is not allowed within 100 feet of any potable groundwater production well.

Once installed, regular maintenance of the stormwater detention system is recommended.

7.0 Closure

The conclusions and recommendations presented are based on the findings, observations and necessary laboratory testing as considered necessary at this time.

The opinions and recommendations included should be considered "preliminary" and thus may require supplemental investigations including additional borings, laboratory testing and engineering evaluations. If during construction, the subsoil conditions appear to be different from those as described, this office should be notified to consider modification of the geotechnical recommendations included in this report.

Final grading and foundation plans should be reviewed by this office when they become available. As the project Geotechnical Consultant, Soils Southwest, Inc. should be provided with the opportunity to verify footing excavations and slab subgrades prior to steel and concrete placement. Soils Southwest, Inc. will assume no responsibility in event concrete is poured without the required verifications described.

A pre-grading meeting between grading contractor and soils engineer is recommended prior to construction preferably at the site, to discuss the grading procedures to be implemented and other requirements described in this report to be fulfilled.

This report has been prepared exclusively for the use of the addressee for the project referenced in the context. It shall not be transferred or be used by other parties without a written consent by Soils Southwest, Inc. We cannot be responsible for use of this report by others without the necessary inspection and testing by our personnel.

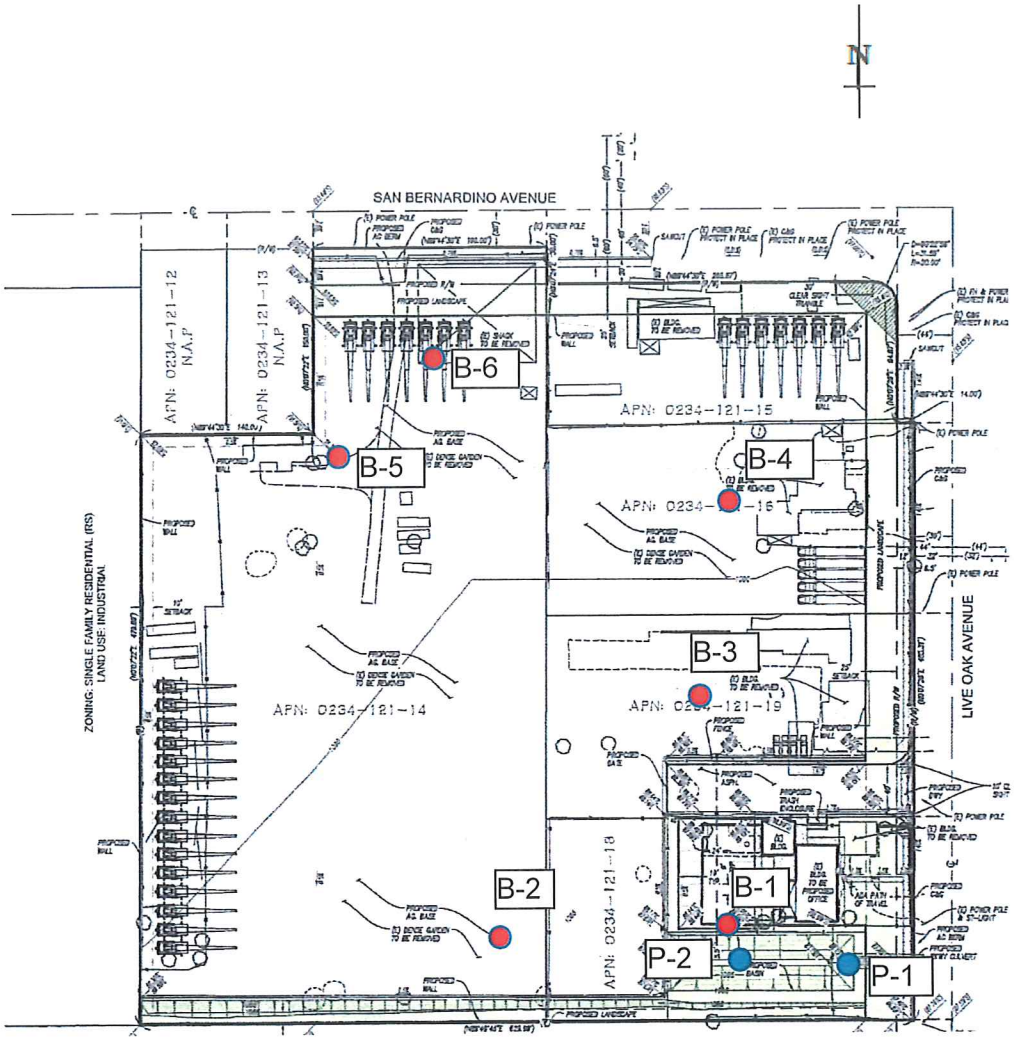
Should the project be delayed beyond one year after the date of this report; the recommendations presented shall be reviewed to consider any possible change in site conditions.

The recommendations presented assume that the geotechnical observations and testing required for the project shall be performed by a representative of Soils Southwest, Inc.

The field observations are considered as a continuation of the geotechnical investigation performed. If another firm is retained for geotechnical observations and testing, our professional liability and responsibility shall be limited to the extent that Soils Southwest, Inc. would not be the geotechnical engineer of record. A letter of Transfer of Responsibility shall be supplied by the new geotechnical engineer clearly describing Soils Southwest, Inc. as 'harmless and non-responsible" for any distress that may occur to the structure during life-time use.

PLOT PLAN AND TEST LOCATIONS
Proposed Cedar Avenue Office and Truck Storage Facility
Cedar Avenue, Bloomington, California
A.P.N. 0257-031-12

(Not to Scale)



Legend:
- B-1 Approximate Location of Exploratory Test Borings
- P-1 Approximate Location of WQMP-BMP Infiltration Test Borings

Plate 1

8.0 APPENDIX A

Field Explorations

For geotechnical and WQMP-BMP design rate field evaluations included six (6) exploratory test borings (B-1 to B-3), along with two (2) infiltration test borings (P-1 & P-2) using a hollow-stem auger drilling rig advanced to the refusal depth of about 23 feet below existing the grade surface. Considering the subject site is an existing operational equipment yard for more than one tenant, test boring locations were limited to open spaces accessible by drill rig. Approximate test exploration locations are shown on attached Plate 1.

Soils encountered during explorations were logged and such were classified by visual observations in accordance with the generally accepted classification system. The field descriptions were modified, where appropriate, to reflect laboratory test results.

Logs of test explorations are presented in the following summary sheets that include the description of the soils encountered.

LOG OF TEST BORING

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-1

Project: OFT Construction Equipment		**Job No.:** 20050-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** December 17,2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					GM-SM			gravels and crushed asphalt
								SAND - light brown, traces of silt, fine to medium coarse, pebbles, rock fragment occasional rock, dry, loose
					GP		5	- (Max Dry Density = 123 pcf @ 9.5 %)
								GRAVEL - with little to no sand, rocks, cobbles, dry, dense
					GP-SP			NO SAMPLE REVOVERY
		3.2	121.6	98.8				SAND - gravely, coarse, rock fragments, rocks, occasional cobbles, dry
							10	
41								- gravely, medium coarse to coarse, damp, dense
							15	GRAVELS with some coarse sands, rocks and cobbles
					GP		20	- little to no sand, very dense
50								- no sand
							25	- Abandoned test boring @ 23 ft. due to resistance (rocks and cobbles) - no bedrock - no groundwater
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Proposed Site Improvements 14835 San Bernardino Ave. San Bernardino County	**Plate #**

Bulk/Grab sample California sampler Standard penetration test

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-2

Project: OFT Construction Equipment		**Job No.:** 20050-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** December 17,2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SP-SM			gravels and crushed asphalt
								SAND - light brown, slightly silty, fine to medium, pebbles, rock fragments, rock occasional cobbles, dry to damp
		2.1	111.2	90.45	SP			- fine to medium coarse, pebbles, rock fragments, rock 3/4"
							5	
26								SAND - color change to grayish yellowish brown, fine to medium coarse, rock fragments and rocks, medium dense to dense
							10	
33					VS			SILT/fine sand mixture- color change to tannish light brown, scattered pebbles, damp
								- End of test boring @ 11.0 ft. - no bedrock - no groundwater
							15	
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location

Proposed Site Improvements
14835 San Bernardino Ave.
San Bernardino County

Plate #

Bulk/Grab sample California sampler Standard penetration test

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-3

Project: OFT Construction Equipment	**Job No.:** 20050-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA
	Date: December 17,2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
								crushed asphalt and scattered debris
					SP			SAND - light brown, traces of silt, fine to medium, pebbles, rock fragments, dry
17								- gravely, medium to coarse, pebbles, rock fragments, rock, damp
							5	- End of test boring @ 4.0 ft.
								- no bedrock
								- no groundwater
							10	
							15	
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location

Proposed Site Improvements
14835 San Bernardino Ave.
San Bernardino County

Plate #

Bulk/Grab sample California sampler Standard penetration test

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-4

Project: OFT Construction Equipment		**Job No.:** 20050-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** December 17,2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SP-SM			disturbed soils and gravels
								SAND - light brown, slightly silty, fine to medium, damp, pebbles, scattered rock
							5	
16					SP			- color change to tannish brown, gravely, medium to coarse, rocks 2", damp
								- End of test boring @ 6.0 ft. - no bedrock - no groundwater
							10	
							15	
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Proposed Site Improvements 14835 San Bernardino Ave. San Bernardino County	**Plate #**

Bulk/Grab sample California sampler Standard penetration test

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-5

Project: OFT Construction Equipment		**Job No.:** 20050-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** December 17,2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SP			gravels, crushed asphalt, and scattered debris
		3.2	109.9	89.4				SAND - brown to light brown, traces of silt fine to medium, scattered pebbles, scattered rocks
							5	- pebbles, rock fragments, and rock 3/4"
6								- fine to medium coarse, scattered 1"-2" rock, loose
							10	- color change to yellow, fine to medium rippible rocks
57								- very dense
								- End of test boring @ 11.0 ft. - no bedrock - no groundwater
							15	
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Proposed Site Improvements 14835 San Bernardino Ave. San Bernardino County	**Plate #**

Bulk/Grab sample California sampler Standard penetration test

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING B-6

Project: OFT Construction Equipment		**Job No.:** 20050-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** December 17,2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SP			gravels, crushed asphalt, scattered debris
								SAND - light brown, fine to medium coarse, pebbles, rock fragments, occasional rock 1/2" -1", dry, loose
15							5	- medium dense
								- End of test boring @ 5.0 ft. - no bedrock - no groundwater
							10	
							15	
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location

Proposed Site Improvements
14835 San Bernardino Ave.
San Bernardino County

Plate #

Bulk/Grab sample California sampler Standard penetration test

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING P-1

Project: OFT Construction Equipment		**Job No.:** 20050-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** December 17,2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SP			scattered weeds, disturbed soils, scattered debris
								SAND - tannish light brown, fine to medium coarse, pebbles, rock fragments, occasional rock, dry, loose
							5	
					GP-SP			GRAVELS with some medium to coarse sand, rock fragments, rocks, cobbles, dry
							10	
								- End of infiltration test boring @ 12.0 ft. - no bedrock - no groundwater - 3" perforated pvc pipe installed
							15	
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location

Proposed Site Improvements
14835 San Bernardino Ave.
San Bernardino County

Plate #

Bulk/Grab sample California sampler Standard penetration test

Soils Southwest, Inc.
897 Via Lata, Suite N
Colton, CA 92324
(909) 370-0474 Fax (909) 370-3156

LOG OF BORING P-2

Project: OFT Construction Equipment		**Job No.:** 20050-F/BMP
Logged By: John F.	**Boring Diam.:** 8" HSA	**Date:** December 17,2020

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					SP			crushed asphalt
								SAND - light brown, traces of silt, fine to medium, pebbles, rock fragments, rock, dry, loose
					GP-SP			- color change to yellow, gravely, medium to coarse, rock fragments, rocks, cobbles, dry, loose
							5	
							10	
								- End of infiltration test boring @ 12.0 ft. - no bedrock - no groundwater - 3" perforated pvc pipe installed
							15	
							20	
							25	
							30	

Groundwater: n/a
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location

Proposed Site Improvements
14835 San Bernardino Ave.
San Bernardino County

Plate #

Bulk/Grab sample California sampler Standard penetration test

KEY TO SYMBOLS

Symbol Description

Strata symbols

Silty sand and gravel

Poorly graded gravel

Poorly graded gravel and sand

Poorly graded sand with silt

Poorly graded sand

Variable sand and silt mix

Soil Samplers

Bulk/Grab sample

California sampler

Standard penetration test

Notes:

1. Exploratory borings were drilled on December 17,2020 using a 4-inch diameter continuous flight power auger.
2. No free water was encountered at the time of drilling or when re-checked the following day.
3. Boring locations were taped from existing features and elevations extrapolated from the final design schematic plan.
4. These logs are subject to the limitations, conclusions, and recommendations in this report.
5. Results of tests conducted on samples recovered are reported on the logs.

East End

Percolation Test Data Sheet

Project:	Off Construction	Project No:	20050-BMP	Date:	1-12-21
Test Hole No:	P-1	Tested By:	A.D.		
Depth of Test Hole, D_T:	144"	USCS Soil Classification:	GP-SP		
Test Hole Dimensions (inches)			Length	Width	
Diameter (if round)=		Sides (if rectangular)=			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1	8:27	8:52	25	120	144	24	Y
2	8:53	9:18	25	120	144	24	Y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	Percolation Rate (min./in.)
1	9:31	9:41	10	120	144	24	
2	9:46	9:56	10	120	144	24	
3	9:57	10:07	10	120	144	24	
4	10:08	10:18	10	120	144	24	
5	10:19	10:29	10	120	144	24	
6	10:31	10:36	5	120	140	20	
7	10:38	10:43	5	120	139	19	
8	10:44	10:49	5	120	139	19	
9	10:51	10:56	5	120	139	19	
10	10:57	11:02	5	120	139	19	
11							
12							
13							
14							
15							

COMMENTS:

Percolation Test Data Sheet

Project:	Off Construction	Project No:	20050-BMP	Date:	1-12-21
Test Hole No:	P-2	Tested By:	A. D.		
Depth of Test Hole, D_T:	144	USCS Soil Classification:			
Test Hole Dimensions (inches)			Length	Width	
Diameter (if round)=		Sides (if rectangular)=			

Sandy Soil Criteria Test*

Trial No.	Start Time	Stop Time	Time Interval, (min.)	Initial Depth to Water (in.)	Final Depth to Water (in.)	Change in Water Level (in.)	Greater than or Equal to 6"? (y/n)
1	8:31	8:56	25	120	144	24	Y
2	8:58	9:23	25	120	144	24	Y

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Other wise, pre-soak (fill) overnight. Obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25".

Trial No.	Start Time	Stop Time	Δt Time Interval (min.)	D_o Initial Depth to Water (in.)	D_f Final Depth to Water (in.)	ΔD Change in Water Level (in.)	Percolation Rate (min./in.)
1	9:26	9:36	10	120	144	24	
2	9:51	10:01	10	120	144	24	
3	10:02	10:12	10	120	144	24	
4	10:13	10:23	10	120	144	24	
5	10:24	10:34	10	120	144	24	
6	10:37	10:42	5	120	138 1/2	18 1/2	
7	10:43	10:48	5	120	138 1/2	18 1/2	
8	10:49	10:54	5	120	138 1/2	18 1/2	
9	10:55	11:00	5	120	138 1/2	18 1/2	
10	11:01	11:06	5	120	138 1/2	18 1/2	
11							
12							
13							
14							
15							

COMMENTS:

9.0 APPENDIX B

Laboratory Test Programs

Laboratory tests were conducted on representative soils for the purpose of classification and for the determination of the physical properties and engineering characteristics. The number and selection of the types of testing for a given study are based on the geotechnical conditions of the site. A summary of the various laboratory tests performed for the project is presented below.

Moisture Content and Dry Density (D2937):

Data obtained from these tests, performed on undisturbed samples are used to aid in the classification and correlation of the soils and to provide qualitative information regarding soil strength and compressibility.

Direct Shear (D3080):

Data obtained from this test performed at increased and field moisture conditions on relatively remolded soil sample is used to evaluate soil shear strengths. Samples contained in brass sampler rings, placed directly on test apparatus are sheared at a constant strain rate of 0.002 inch per minute under saturated conditions and under varying loads appropriate to represent anticipated structural loadings. Shearing deformations are recorded to failure. Peak and/or residual shear strengths are obtained from the measured shearing load versus deflection curve. Test results, plotted on graphical form, are presented on Plate B-1 of this section.

Consolidation (D2835):

Drive-tube samples are tested at their field moisture contents and at increased moisture conditions since the soils may become saturated during lifetime use of the planned structure.

Data obtained from this test performed on relatively undisturbed and/or remolded samples, were used to evaluate the consolidation characteristics of foundation soils under anticipated foundation loadings. Preparation for this test involved trimming the sample, placing it in one-inch high brass ring, and loading it into the test apparatus which contained porous stones to accommodate drainage during testing. Normal axial loads are applied at a load increment ratio, successive loads being generally twice the preceding.

Soil samples are usually under light normal load conditions to accommodate seating of the apparatus. Samples were tested at the field moisture conditions at a predetermined normal load. Potentially moisture sensitive soil typically demonstrated significant volume change with the introduction of free water. The results of the consolidation tests are presented in graphical forms on Appendix B of this report.

Potential Expansion (ASTM Standard D4829-88)

Gravely sands in nature, the site soils are considered 'very low' in expansion characteristic. Supplemental testing for soil expansion should be performed following mass grading completion.

Laboratory Test Results

A Table I: In-Situ Moisture-Density (ASTM D2216-80)

Test Boring No.	Sample Depth, ft.	Dry Density, pcf.	Moisture Content, %
1	5	121.62	3.2
2	3	111.20	2.1
5	2	109.90	3.2

B Table II: Max. Density/Optimum Moisture Content (ASTM D1557)

Sample Location @ depth, ft.	Max. Dry Density, pcf	Optimum Moisture (%)
B-1 @ 0-6 ft. SAND-Light brown, gravely fine to medium coarse with some silt, pebbles and rock fragments (GM-SM)	123.0	9.5

C. Table III: Direct Shear (ASTM D3080)

Test Boring & Sample Depth (ft)	Test Condition	Cohesion (psf)	Friction (degree)
B-1 @ 0-6	Remolded to 95%	100	45

D. Table IV: Consolidation (D2435)

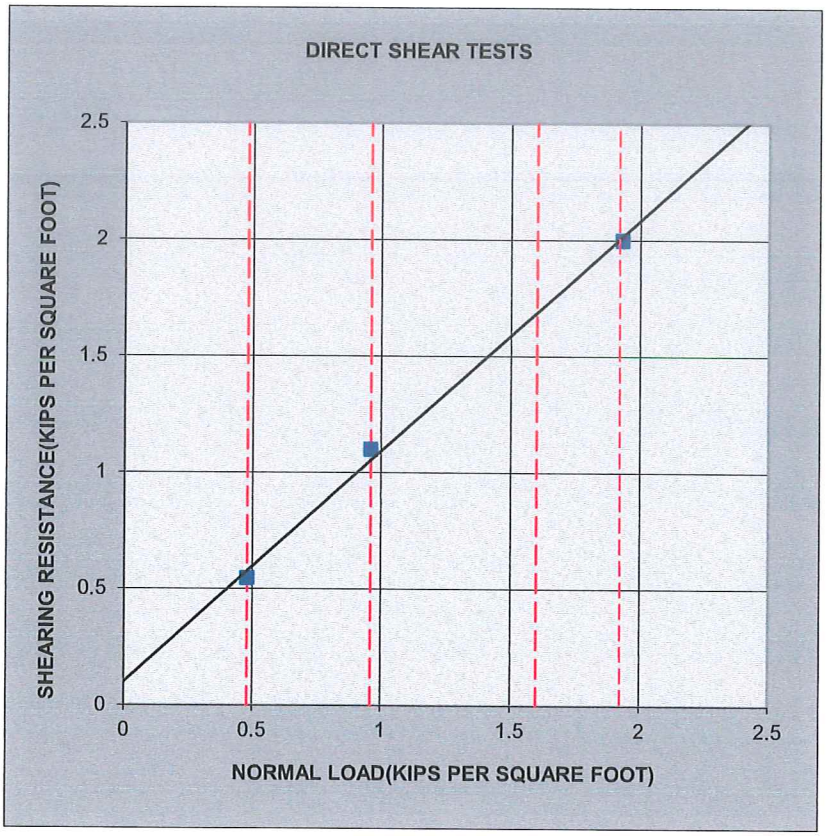
Boring B #	Depth (ft.)	Consolidation prior to saturation (%) @ 2 kips	Hydro collapse (%) @ 2 kips	Total Consolidation (%@ 8 kips) (saturated)
1 (remolded) 95%	0-6	0.6	0.1	1.7

E. Table V: Sand Equivalent

Sample Location @ depth, ft.	Sand Equivalent Average
B-1 @ 0-6	31.5

F. Table VI: Soils Expansion Index, EI. (ASTM D4829)

Sample Location & Soils Type	Soil Expansion Index, EI	Expansion Potential
B-1 @ 0-6' SAND-Light brown GM-SM gravely fine to medium coarse with some silt, pebbles, rock fragments, rocks 1.5"	10	"very low"



SYMBOL	LOCATION	DEPTH (FT)	TEST CONDITION	COHESION (psf)	FRICTION (degree)
■	B-1	0 to 6	Remolded to 95%	100.12	44.78

OFT Family Trust Construction Equipment Yard 14835 San Bernardino Avenue Fontana area of San Bernardino County, California	PROJECT NO.	20050-F
	PLATE	B-1

SOILS SOUTHWEST, INC.
Consulting Foundation Engineers

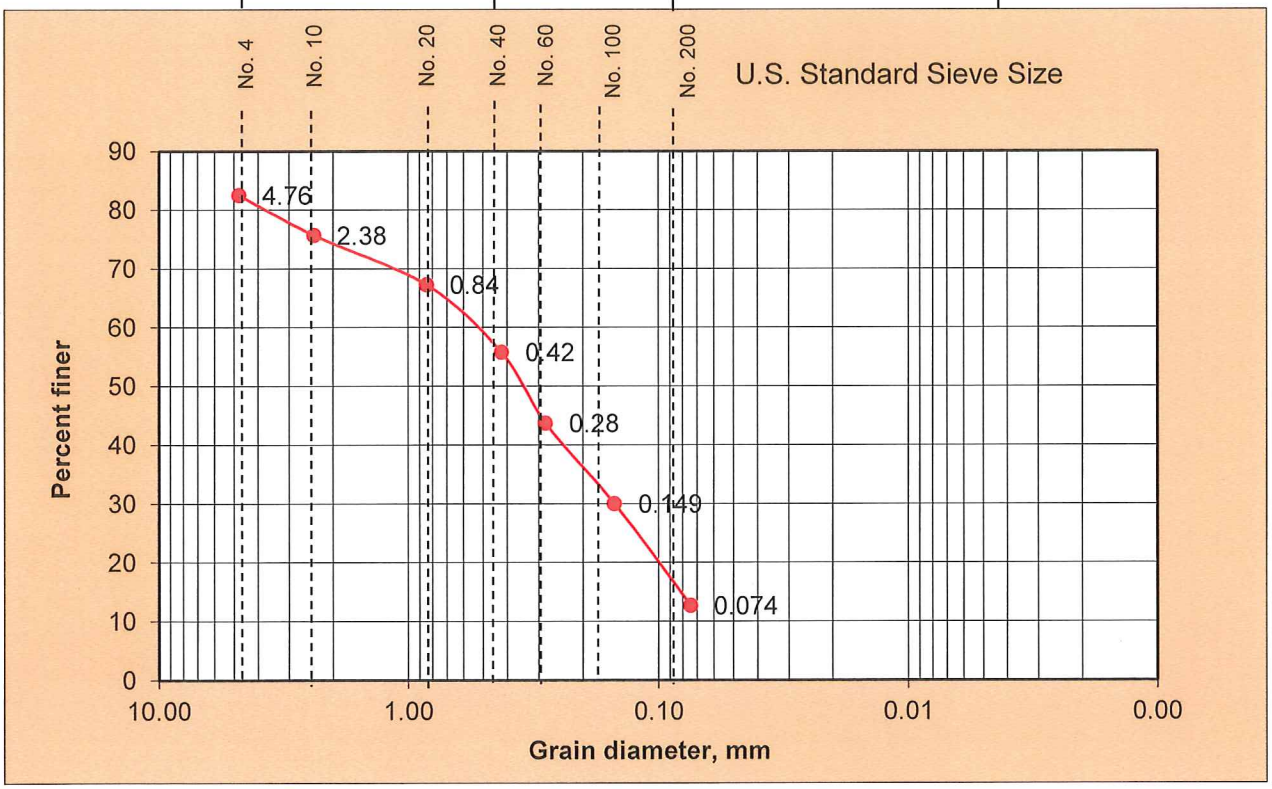
GRAIN SIZE DISTRIBUTION

Project: Oft Construction **Job #** 20050-F/BMP
Location: 14835 San Bernardino Ave, Fontana **Boring No:** B-1 @ 0-6' **Sample No:** 1
Description of Soil: Greyish brown, silty, damp, fine, some clay
Date of Sample: 1/12/2021
Tested By: John **Date of Testing:** 1/19/2021

Sieve No.	Sieve Openings in mm	Percent Finer
4	4.76	82.58
10	2.38	75.74
20	0.84	67.32
40	0.42	55.86
60	0.28	43.76
100	0.149	30.06
200	0.074	12.74

Grain Size	% Retained
Gravel	18
Med. to Crs	24
Fines	41
Silts	17
Clays	0

Gravel	Sand			
	Coarse to Medium	Fine	Silt	Clay



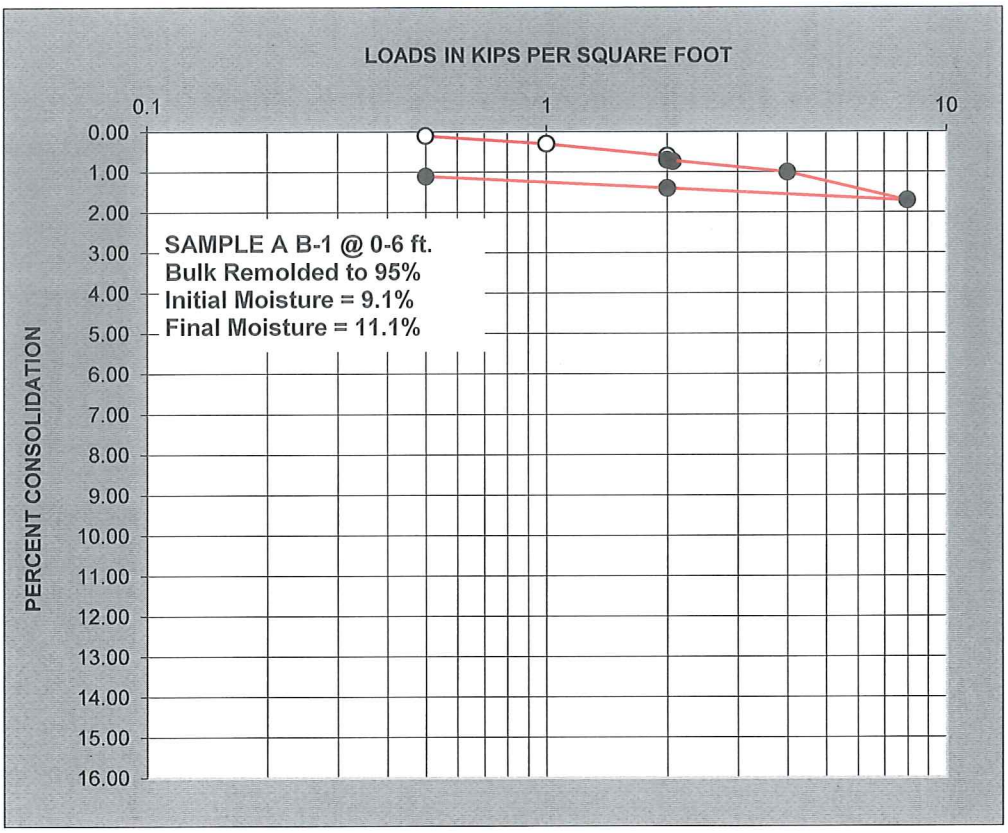
Visual Soil Description : Sand - Gravelly fine to medium coarse, moist to damp, and silty

Soil Classification: GM-SM

System: USC

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

CONSOLIDATION TESTS



- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Oft Construction 14835 San Bernardino Ave, Fontana, CA 92335		
	PROJECT NO.	20050-F/BMP	PLATE	B-2

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

SAND EQUIVALENT TEST

Test Date: January 19, 2021

Project No.: 20050-F

Job Name: OFT Family Trust Construction Equipment Yard
14835 San Bernardino Ave. Fontana area of SBD CO.

Sample Location: B-1 @ 0-6

Sample by: J.F Tested by: A.D.

LABORATORY DATA

SAMPLE NO.	1	2	3	4
TIME START	10:52	10:57	11:02	
TIME SOAK (10 min.)	11:02	11:07	11:12	
TIME AT LEVEL 15ML	11:05	11:10	11:15	
TIME of READING (20-min)	11:25	11:30	11:35	
FINE, ML	5.3	5.4	5.2	
COARSE, ML	1.7	1.7	1.6	
SE = 100x (coarse/fine)	32.1	31.5	30.8	
SE Average	31.5			

Soil Description: GM-SM – light brown, slightly silty sand with scattered pebbles, rock fragments, and organic rock, dry to damp

OFT
20050PV

ANAHEIM TEST LAB, INC

196 Technology Drive, Unit D
Irvine, CA 92618
Phone (949) 336-6544

TO:

SOILS SOUTHWEST, INC.
897 VIA LATA # N
COLTON, CA. 92324

DATE: 3/8/2021

P.O. NO: VERBAL

LAB NO: C-4588

SPECIFICATION: CA 301

MATERIAL: Brown, Silty Sand

Project No.: 20050-F
Project: OFT Construction
Sample ID: B-3 @ 0-3'

ANALYTICAL REPORT
"R" VALUE

BY EXUDATION	BY EXPANSION
75	N/A

RESPECTFULLY SUBMITTED

WES BRIDGER LAB MANAGER

"R" VALUE CA 301

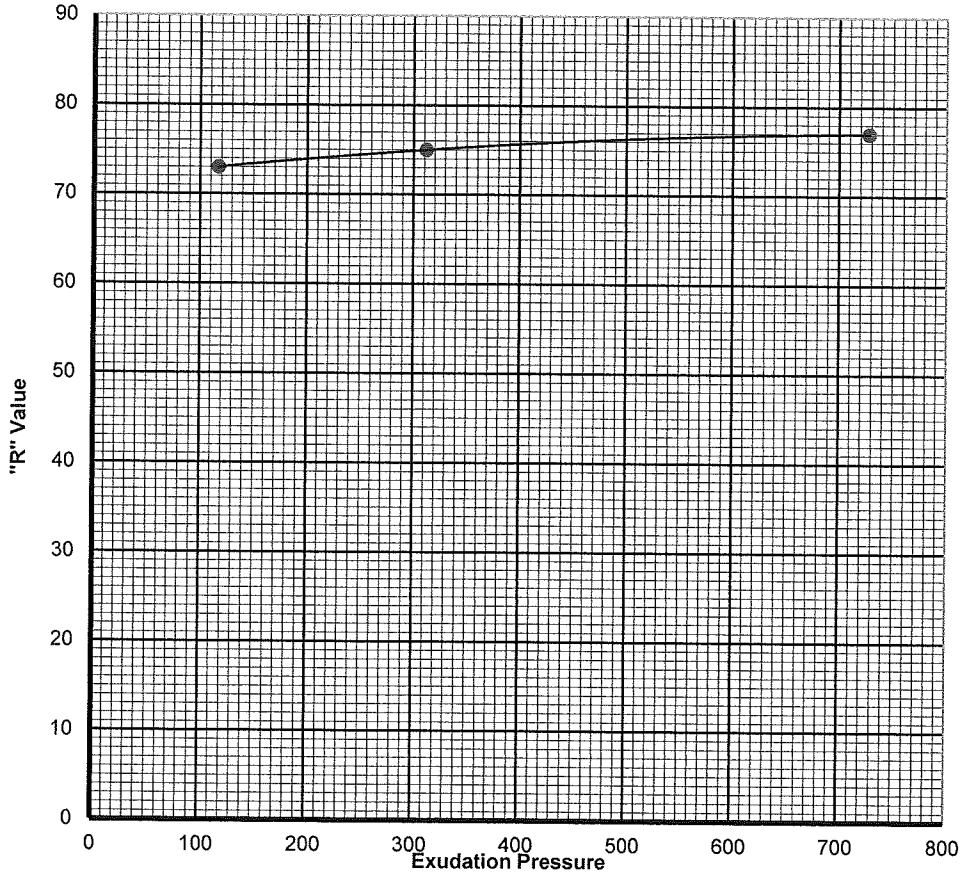
Client: Soils Southwest, Inc. **ATL No.:** C 4588 **Date:** 3/8/2021

Client Reference No.: 20050-F

Sample: B-3 @ 0 - 3' **Soil Type:** Brown, Silty Sand

TEST SPECIMEN		A	B	C	D
Compactor Air Pressure	psi	350	350	350	
Initial Moisture Content	%	2.9	2.9	2.9	
Moisture at Compaction	%	9.3	8.6	9.0	
Briquette Height	in.	2.54	2.46	2.51	
Dry Density	pcf	120.5	124.4	122.2	
EXUDATION PRESSURE	psi	117	728	312	
EXPANSION dial	(x .0001)	0	0	0	
Ph at 1000 pounds	psi	19	15	17	
Ph at 2000 pounds	psi	32	25	28	
Displacement	turns	3.76	4.01	3.88	
"R" Value		73	77	75	
CORRECTED "R" VALUE		73	77	75	

Final "R" Value	
BY EXUDATION: @ 300 psi	**75**
BY EXPANSION: TI = 5.0	**N/A**



APPENDIX C

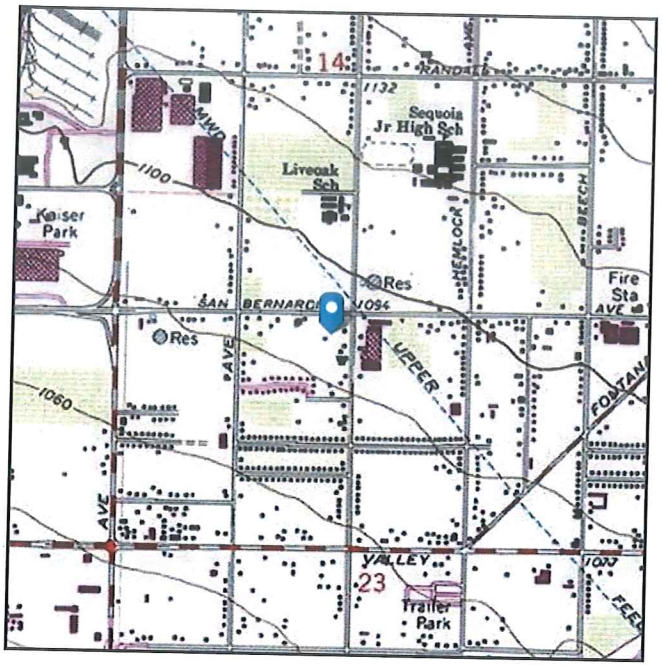
Supplemental Seismic Design Parameters

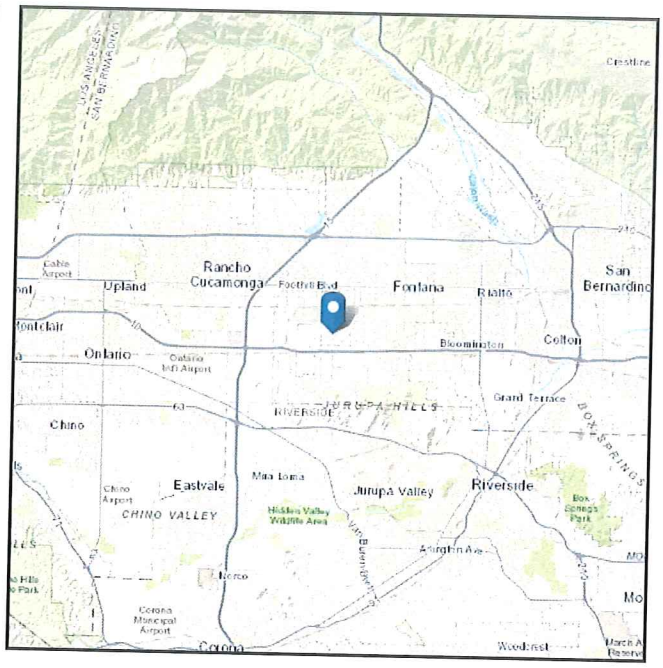
ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-16
Risk Category: III
Soil Class: D - Stiff Soil

Elevation: 1090.15 ft (NAVD 88)
Latitude: 34.076741
Longitude: -117.480768





ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Seismic

Site Soil Class: D - Stiff Soil

Results:

S_S :	1.822	S_{D1} :	N/A
S_1 :	0.683	T_L :	12
F_a :	1	PGA :	0.778
F_v :	N/A	PGA_M :	0.856
S_{MS} :	1.822	F_{PGA} :	1.1
S_{M1} :	N/A	I_e :	1.25
S_{DS} :	1.215	C_v :	1.464

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Fri Jan 15 2021

Date Source: USGS Seismic Design Maps

CA.GOV

Select Language

California Department of Conservation

Ground Motion Interpolator

Ground Motion Interpolator (2008)

Longitude: -117.480768

Latitude: 34.076741

Site Condition (VS30): 270 (180-1050 m/sec)

Return Period:

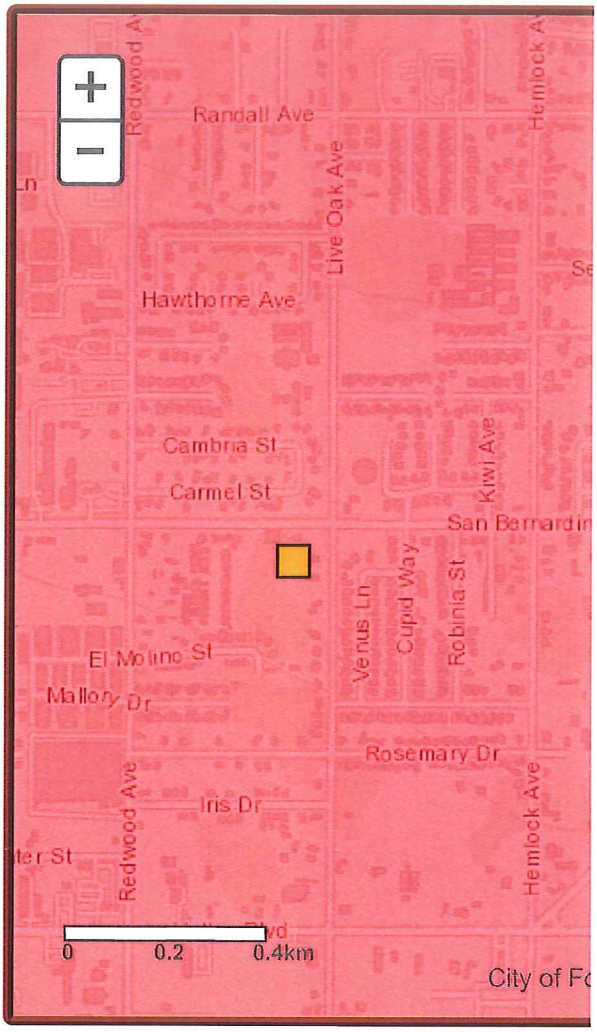
2% in 50 years 10% in 50 years

Spectral Acceleration:

PGA 0.2 second SA 1.0 second SA

Submit

Inputs:	Result:
-117.480768, 34.076741 vs30: 270 m/sec 10% in 50 years PGA	**0.524 g**



Information and Disclaimer

CGS MENU

U.S. Geological Survey - Earthquake Hazards Program

2008 National Seismic Hazard Maps - Source Parameters

New Search

Distance in Miles	Name	State	Pref Slip Rate (mm/yr)	Dip (degrees)	Dip Dir	Slip Sense	Rupture Top (km)	Rupture Bottom (km)	Length (km)
6.23	Cucamonga	CA	5	45	N	thrust	0	8	28
8.50	San Jacinto;SBV+SJV+A	CA	n/a	90	V	strike slip	0	16	134
8.50	San Jacinto;SBV+SJV+A+C	CA	n/a	90	V	strike slip	0	17	181
8.50	San Jacinto;SBV+SJV+A+CC+B+SM	CA	n/a	90	V	strike slip	0.1	15	241
8.50	San Jacinto;SBV+SJV+A+CC+B	CA	n/a	90	V	strike slip	0.1	15	215
8.50	San Jacinto;SBV+SJV+A+CC	CA	n/a	90	V	strike slip	0	16	181
8.50	San Jacinto;SBV+SJV	CA	n/a	90	V	strike slip	0	16	88
8.50	San Jacinto;SBV	CA	6	90	V	strike slip	0	16	45
11.90	S. San Andreas;BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	85		strike slip	0.1	13	390
11.90	S. San Andreas;CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13	512
11.90	S. San Andreas;NSB+SSB+BG+CO	CA	n/a	79		strike slip	0.2	12	206
11.90	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB+BG	CA	n/a	86		strike slip	0.1	13	479
11.90	S. San Andreas;PK+CH+CC+BB+NM+SM+NSB+SSB+BG+CO	CA	n/a	86		strike slip	0.1	13	548
11.90	S. San Andreas;BB+NM+SM+NSB	CA	n/a	90	V	strike slip	0	14	220
11.90	S. San Andreas;SM+NSB	CA	n/a	90	V	strike slip	0	13	133
11.90	S. San Andreas;SM+NSB+SSB	CA	n/a	90	V	strike slip	0	13	176
11.90	S. San Andreas;SM+NSB+SSB+BG	CA	n/a	81		strike slip	0	13	234
11.90	S. San Andreas;SM+NSB+SSB+BG+CO	CA	n/a	83		strike	0.1	13	303

U.S. Geological Survey - Earthquake Hazards Program

2008 National Seismic Hazard Maps – Source Parameters

New Search

Fault Name	State
Cucamonga	**California**

GEOMETRY	
Dip (degrees)	45
Dip direction	N
Sense of slip	thrust
Rupture top (km)	0
Rupture bottom (km)	8
Rake (degrees)	90
Length (km)	28

MODEL VALUES		
Slip Rate	5	
Probability of activity	1	
	ELLSWORTH	HANKS
Minimum magnitude	6.5	6.5
Maximum magnitude	6.70	6.50
b-value	0.8	0.8

Fault Model	Deformation	Char Rate[1]	GR-a-value[1]	Weight

Model				
Stitched	2.1	3.31e-03 / 6.61e-03	2.648 / NA	0.50
UnStitched	2.1	3.31e-03 / 6.61e-03	2.648 / NA	0.50
Stitched	2.4	3.31e-03 / 6.61e-03	2.648 / NA	0.50
UnStitched	2.4	3.31e-03 / 6.61e-03	2.648 / NA	0.50

[1] 1st Value is based on Ellsworth relation and 2nd value is based on Hanks and Bakun relation

Comments

Slip rate based on cumulative vertical displacement across three strands reported by Morton and Matti (1987, 1991).

PROFESSIONAL LIMITATIONS

Our investigation was performed using the degree of care and skill ordinarily exercised, under similar circumstances by other reputable Soils Engineers practicing in these general or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

The investigations are based on soil samples only, consequently the recommendations provided shall be considered as "preliminary". The samples taken and used for testing and the observations made are believed representative of site conditions; however, soil and geologic conditions can vary significantly between test excavations. If this occurs, the changed conditions must be evaluated by the Project Soils Engineer and designs adjusted as required or alternate design recommended.

The report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the project architect and engineers. Appropriate recommendations should be incorporated into structural plans. The necessary steps should be taken to see that out such recommendations in field.

The findings of this report are valid as of this present date. However, changes in the conditions of a property can occur with the passage of time, whether they due to natural process or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur from legislation or broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by change outside of our control. Therefore, this report is subject to review and should be updated after a period of one year.

RECOMMENDED SERVICES

The review of grading plans and specifications, field observations and testing by a geotechnical representative of this office is integral part of the conclusions and recommendations made in this report. If Soils Southwest, Inc. (SSW) is not retained for these services, the Client agrees to assume SSW's responsibility for any potential claims that may arise during and after construction, or during the life-time use of the structure and its appurtenant.

The recommendations supplied should be considered valid and applicable, provided the following conditions, in minimum, are met:

i. Pre-grade meeting with contractor, public agency, and soils engineer,
ii. Excavated bottom inspections and verification s by soils engineer prior to backfill placement,
iii. Continuous observations and testing during site preparation and structural fill soils placement,
iv. Observation and inspection of footing trenching prior to steel and concrete placement,
v. Subgrade verifications including plumbing trench backfills prior to concrete slab-on-grade placement,
vi. On and off-site utility trench backfill testing and verifications,
vii. Precise-grading plan review, and
viii. Consultations as required during construction, or upon your request.

VII.4.1. Site Suitability Considerations

Suitability assessment related considerations include (**Table VII.3**):

- Soil assessment methods – the site assessment extent (e.g., number of borings, test pits, etc.) and the measurement method used to estimate the short-term infiltration rate.
- Predominant soil texture/percent fines – soil texture and the percent of fines can greatly influence the potential for clogging.
- Site soil variability – site with spatially heterogeneous soils (vertically or horizontally) as determined from site investigations are more difficult to estimate average properties for resulting in a higher level of uncertainty associated with initial estimates.
- Depth to seasonal high groundwater/impervious layer – groundwater mounding may become an issue during excessively wet conditions where shallow aquifers or shallow clay lenses are present.

Table VII.3: Suitability Assessment Related Considerations for Infiltration Facility Safety Factors

Consideration	High Concern	Medium Concern	Low Concern
Assessment methods (see explanation below)	Use of soil survey maps or simple texture analysis to estimate short-term infiltration rates	Direct measurement of ≥ 20 percent of infiltration area with localized infiltration measurement methods (e.g., infiltrometer)	Direct measurement of ≥ 50 percent of infiltration area with localized infiltration measurement methods or Use of extensive test pit infiltration measurement methods
Texture Class	Silty and clayey soils with significant fines	Loamy soils	Granular to slightly loamy soils
Site soil variability	Highly variable soils indicated from site assessment or limited soil borings collected during site assessment	Soil borings/test pits indicate moderately homogeneous soils	Multiple soil borings/test pits indicate relatively homogeneous soils
Depth to groundwater/ impervious layer	<5 ft below facility bottom	5-10 ft below facility bottom	>10 below facility bottom

Localized infiltration testing refers to methods such as the double ring infiltrometer test (ASTM D3385-88) which measure infiltration rates over an area less than 10 sq-ft, may include lateral

flow, and do not attempt to account for heterogeneity of soil. The amount of area each test represents should be estimated depending on the observed heterogeneity of the soil.

Extensive infiltration testing refers to methods that include excavating a significant portion of the proposed infiltration area, filling the excavation with water, and monitoring drawdown. The excavation should be to the depth of the proposed infiltration surface and ideally be at least 50 to 100 square feet.

In all cases, testing should be conducted in the area of the proposed BMP where, based on review of available geotechnical data, soils appear least likely to support infiltration.

VII.4.2. Design Related Considerations

Design related considerations include (**Table VII.4**):

- Size of area tributary to facility – all things being equal, risk factors related to infiltration facilities increase with an increase in the tributary area served. Therefore facilities serving larger tributary areas should use more restrictive adjustment factors.
- Level of pretreatment/expected influent sediment loads – credit should be given for good pretreatment by allowing less restrictive factors to account for the reduced probability of clogging from high sediment loading. Also, facilities designed to capture runoff from relatively clean surfaces such as rooftops are likely to see low sediment loads and therefore should be allowed to apply less restrictive safety factors.
- Redundancy – facilities that consist of multiple subsystems operating in parallel such that parts of the system remains functional when other parts fail and/or bypass should be rewarded for the built-in redundancy with less restrictive correction and safety factors. For example, if bypass flows would be at least partially treated in another BMP, the risk of discharging untreated runoff in the event of clogging the primary facility is reduced. A bioretention facility that overflows to a landscaped area is another example.
- Compaction during construction – proper construction oversight is needed during construction to ensure that the bottoms of infiltration facility are not overly compacted. Facilities that do not commit to proper construction practices and oversight should have to use more restrictive correction and safety factors.

Worksheet H: Factor of Safety and Design Infiltration Rate and Worksheet

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	2	0.50
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	2	0.50
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.50
B	Design	Tributary area size	0.25	2	0.50
		Level of pretreatment/ expected sediment loads	0.25	2	0.50
		Redundancy	0.25	2	0.50
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			1.75
Combined Safety Factor, $S_{Total} = S_A \times S_B$					2.63
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)					13.25
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_{Observed} / S_{Total}$					5.05

Supporting Data

Briefly describe infiltration test and provide reference to test forms:
See soils report in Appendix 6.4.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.