CLIMATE ACTION PLAN
CONSISTENCY CHECKLIST INTRODUCTION

In December 2015, the City adopted a Climate Action Plan (CAP) that outlines the actions that City will undertake to achieve its proportional share of State greenhouse gas (GHG) emission reductions. The purpose of the Climate Action Plan Consistency Checklist (Checklist) is to, in conjunction with the CAP, provide a streamlined review process for proposed new development projects that are subject to discretionary review and trigger environmental review pursuant to the California Environmental Quality Act (CEQA).[1]

Analysis of GHG emissions and potential climate change impacts from new development is required under CEQA. The CAP is a plan for the reduction of GHG emissions in accordance with CEQA Guidelines Section 15183.5. Pursuant to CEQA Guidelines Sections 15064(h)(3), 15130(d), and 15183(b), a project's incremental contribution to a cumulative GHG emissions effect may be determined not to be cumulatively considerable if it complies with the requirements of the CAP.

This Checklist is part of the CAP and contains measures that are required to be implemented on a project-by-project basis to ensure that the specified emissions targets identified in the CAP are achieved. Implementation of these measures would ensure that new development is consistent with the CAP's assumptions for relevant CAP strategies toward achieving the identified GHG reduction targets. Projects that are consistent with the CAP as determined through the use of this Checklist may rely on the CAP for the cumulative impacts analysis of GHG emissions. Projects that are not consistent with the CAP must prepare a comprehensive project-specific analysis of GHG emissions, including quantification of existing and projected GHG emissions and incorporation of the measures in this Checklist to the extent feasible. Cumulative GHG impacts would be significant for any project that is not consistent with the CAP.

The Checklist may be updated to incorporate new GHG reduction techniques or to comply with later amendments to the CAP or local, State, or federal law.

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[1] Certain projects seeking ministerial approval may be required to complete the Checklist. For example, projects in a Community Plan Implementation Overlay Zone may be required to use the Checklist to qualify for ministerial level review. See Supplemental Development Regulations in the project's community plan to determine applicability.

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CAP CONSISTENCY CHECKLIST SUBMITTAL APPLICATION

- The Checklist is required only for projects subject to CEQA review.[2]
- If required, the Checklist must be included in the project submittal package. Application submittal procedures can be found in Chapter 11: Land Development Procedures of the City's Municipal Code.
- The requirements in the Checklist will be included in the project's conditions of approval.
- The applicant must provide an explanation of how the proposed project will implement the requirements described herein to the satisfaction of the Planning Department.

Application Information

Contact Information

Project No./Name: 521798 / Baja Freight SDP

Property Address: 6852 Calle De Linea, San Diego, CA 92154

Applicant Name/Co.: Miguel Perez/Noble House Real Estate, LLC

Contact Phone: (619) 671-3100 Contact Email: miguelo@bajafreight.com

Was a consultant retained to complete this checklist? ☒ Yes ☐ No If Yes, complete the following

Consultant Name: Toby Hallal Contact Phone: (619) 230-1088 x:1#

Company Name: TRH, Inc. Contact Email: toby@trhinc.com

Project Information

1. What is the size of the project (acres)? 4.09 acres
2. Identify all applicable proposed land uses:
   - ☐ Residential (indicate # of single-family units):
   - ☐ Residential (indicate # of multi-family units):
   - ☐ Commercial (total square footage):
   - ☒ Industrial (total square footage): 37,330 square feet total building area
   - ☐ Other (describe):
3. Is the project or a portion of the project located in a Transit Priority Area? ☐ Yes ☒ No
4. Provide a brief description of the project proposed:

PROPOSED 36,610 S.F. CONCRETE TILT-UP BUILDING FOR WAREHOUSE AND OFFICES. EXISTING 720 S.F. STATE APPROVED OFFICE TRAILER TO REMAIN. EXISTING TRUCK PARK AND STORAGE FACILITY TO REMAIN PERMANENT AND COMPLY WITH THE CURRENT DEVELOPMENT REGULATIONS.

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[2] Certain projects seeking ministerial approval may be required to complete the Checklist. For example, projects in a Community Plan Implementation Overlay Zone may be required to use the Checklist to qualify for ministerial level review. See Supplemental Development Regulations in the project's community plan to determine applicability.

CAP CONSISTENCY CHECKLIST QUESTIONS

Step 1: Land Use Consistency

The first step in determining CAP consistency for discretionary development projects is to assess the project's consistency with the growth projections used in the development of the CAP. This section allows the City to determine a project's consistency with the land use assumptions used in the CAP.

Step 1: Land Use Consistency		
Checklist Item (Check the appropriate box and provide explanation and supporting documentation for your answer)	Yes	No
A. Is the proposed project consistent with the existing General Plan and Community Plan land use and zoning designations?;[3] <u>OR</u>, B. If the proposed project is not consistent with the existing land use plan and zoning designations, and includes a land use plan and/or zoning designation amendment, would the proposed amendment result in an increased density within a Transit Priority Area (TPA)[4] and implement CAP Strategy 3 actions, as determined in Step 3 to the satisfaction of the Development Services Department?; <u>OR</u>, C. If the proposed project is not consistent with the existing land use plan and zoning designations, does the project include a land use plan and/or zoning designation amendment that would result in an equivalent or less GHG-intensive project when compared to the existing designations?	☑	☐
If "***Yes***," proceed to Step 2 of the Checklist. For question B above, complete Step 3. For question C above, provide estimated project emissions under both existing and proposed designation(s) for comparison. Compare the maximum buildout of the existing designation and the maximum buildout of the proposed designation. If "***No***," in accordance with the City's Significance Determination Thresholds, the project's GHG impact is significant. The project must nonetheless incorporate each of the measures identified in Step 2 to mitigate cumulative GHG emissions impacts unless the decision maker finds that a measure is infeasible in accordance with CEQA Guidelines Section 15091. Proceed and complete Step 2 of the Checklist.		

Existing land use designation per the General Plan is Heavy Industrial.

Existing zone designation is IH-1-1 and OC-1-1.

This project is consistent with the existing General Plan land use, the Otay Mesa Community Plan and zoning designation.

The proposed use for truck/trailer storage and distribution storage is consistent with the permitted uses under the current zoning.

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[3] This question may also be answered in the affirmative if the project is consistent with SANDAG Series 12 growth projections, which were used to determine the CAP projections, as determined by the Planning Department.

[4] This category applies to all projects that answered in the affirmative to question 3 on the previous page: Is the project or a portion of the project located in a transit priority area.

Step 2: CAP Strategies Consistency

The second step of the CAP consistency review is to review and evaluate a project’s consistency with the applicable strategies and actions of the CAP. Step 2 only applies to development projects that involve permits that would require a certificate of occupancy from the Building Official or projects comprised of one and two family dwellings or townhouses as defined in the California Residential Code and their accessory structures.[5] All other development projects that would not require a certificate of occupancy from the Building Official shall implement Best Management Practices for construction activities as set forth in the Greenbook (for public projects).

Step 2: CAP Strategies Consistency			
Checklist Item (Check the appropriate box and provide explanation for your answer)	Yes	No	N/A
Strategy 1: Energy & Water Efficient Buildings			
1. *Cool/Green Roofs*. • Would the project include roofing materials with a minimum 3-year aged solar reflection and thermal emittance or solar reflection index equal to or greater than the values specified in the voluntary measures under California Green Building Standards Code (Attachment A)?; OR • Would the project roof construction have a thermal mass over the roof membrane, including areas of vegetated (green) roofs, weighing at least 25 pounds per square foot as specified in the voluntary measures under California Green Building Standards Code?; OR • Would the project include a combination of the above two options? Check “N/A” only if the project does not include a roof component. This project proposes to comply with the first Bullet - This project will include new roofing materials with a minimum 3-aged solar reflection and thermal emittance or solar reflection index equal to or greater than the values specified in the voluntary measures under California Green Building Standards Code (Attachment A).	☑	☐	☐

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[5] Actions that are not subject to Step 2 would include, for example: 1) discretionary map actions that do not propose specific development, 2) permits allowing wireless communication facilities, 3) special events permits, 4) use permits or other permits that do not result in the expansion or enlargement of a building (e.g., decks, garages, etc.), and 5) non-building infrastructure projects such as roads and pipelines. Because such actions would not result in new occupancy buildings from which GHG emissions reductions could be achieved, the items contained in Step 2 would not be applicable.

2. *Plumbing fixtures and fittings* With respect to plumbing fixtures or fittings provided as part of the project, would those low-flow fixtures/appliances be consistent with each of the following: Residential buildings: • Kitchen faucets: maximum flow rate not to exceed 1.5 gallons per minute at 60 psi; • Standard dishwashers: 4.25 gallons per cycle; • Compact dishwashers: 3.5 gallons per cycle; and • Clothes washers: water factor of 6 gallons per cubic feet of drum capacity? Nonresidential buildings: [✓ • Plumbing fixtures and fittings that do not exceed the maximum flow rate specified in Table A5.303.2.3.1 (voluntary measures) of the California Green Building Standards Code (See Attachment A); and] • Appliances and fixtures for commercial applications that meet the provisions of Section A5.303.3 (voluntary measures) of the California Green Building Standards Code (See Attachment A)? Check "N/A" only if the project does not include any plumbing fixtures or fittings. This project proposes to comply with the first bullet under Nonresidential buildings. The proposed low-flow fixtures/appliances be consistent with plumbing fixtures and fittings that do not exceed the maximum flow rate specified in Table A5.303.2.3.1 (voluntary measures) of the California Green Building Standards Code (Attachment A); and appliances and fixtures for commercial applications that meet the provisions of Section A5.303.3 (voluntary measures) of the California Green Building Standards Code (Attachment A).	☑	☐	☐

Strategy 3: Bicycling, Walking, Transit & Land Use

3. *Electric Vehicle Charging*

- Multiple-family projects of 17 dwelling units or less: Would 3% of the total parking spaces required, or a minimum of one space, whichever is greater, be provided with a listed cabinet, box or enclosure connected to a conduit linking the parking spaces with the electrical service, in a manner approved by the building and safety official, to allow for the future installation of electric vehicle supply equipment to provide electric vehicle charging stations at such time as it is needed for use by residents?

- Multiple-family projects of more than 17 dwelling units: Of the total required listed cabinets, boxes or enclosures, would 50% have the necessary electric vehicle supply equipment installed to provide active electric vehicle charging stations ready for use by residents?

- Non-residential projects: Of the total required listed cabinets, boxes or enclosures, would 50% have the necessary electric vehicle supply equipment installed to provide active electric vehicle charging stations ready for use?

Check "N/A" only if the project is a single-family project or would not require the provision of listed cabinets, boxes, or enclosures connected to a conduit linking the parking spaces with electrical service, e.g., projects requiring fewer than 10 parking spaces.

Proposed Non-residential project:

This project is required to have (2) two Electric Vehicle Charging stations. This project is proposing to provide (2) two required cabinets, boxes or enclosures (more than 50%) with the necessary vehicle supply equipment installed to provide active Electric Vehicle Charging stations ready for use as required to be located within the on-site parking area as shown on the proposed site plan.

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Strategy 3: Bicycling, Walking, Transit & Land Use

(Complete this section if project includes non-residential or mixed uses)

4. *Bicycle Parking Spaces*

Would the project provide more short- and long-term bicycle parking spaces than required in the City's Municipal Code (Chapter 14, Article 2, Division 5)?[6]

Check "N/A" only if the project is a residential project.

Per SDMC Section 142.0530, Table 142-05G, this project is required to have (4) four short-term bicycle parking spaces and (4) four long-term bicycle parking spaces. This project is proposed to provide (4) four short-term bicycle parking spaces, and (4) four long-term bicycle parking spaces as required.

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[6] Non-portable bicycle corrals within 600 feet of project frontage can be counted towards the project's bicycle parking requirements.

5. *Shower facilities*

If the project includes nonresidential development that would accommodate over 10 tenant occupants (employees), would the project include changing/shower facilities in accordance with the voluntary measures under the California Green Building Standards Code as shown in the table below?

Number of Tenant Occupants (Employees)	Shower/Changing Facilities Required	Two-Tier (12" X 15" X 72") Personal Effects Lockers Required
0-10	0	0
11-50	1 shower stall	2
51-100	1 shower stall	3
101-200	1 shower stall	4
Over 200	1 shower stall plus 1 additional shower stall for each 200 additional tenant-occupants	1 two-tier locker plus 1 two-tier locker for each 50 additional tenant-occupants

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Check "N/A" only if the project is a residential project, or if it does not include nonresidential development that would accommodate over 10 tenant occupants (employees).

This project will accommodate 48 tenants occupants (employees). The project is required to have (1) one changing/shower facility. This project is proposing (1) one changing/shower facility in accordance with the voluntary measures under the CGBSC as shown in table above. This project will also provide two personal effects lockers as noted in the table.

6. *Designated Parking Spaces*

If the project includes a nonresidential use in a TPA, would the project provide designated parking for a combination of low-emitting, fuel-efficient, and carpool/vanpool vehicles in accordance with the following table?

Number of Required Parking Spaces	Number of Designated Parking Spaces
0-9	0
10-25	2
26-50	4
51-75	6
76-100	9
101-150	11
151-200	18
201 and over	At least 10% of total

This measure does not cover electric vehicles. See Question 4 for electric vehicle parking requirements.

Note: Vehicles bearing Clean Air Vehicle stickers from expired HOV lane programs may be considered eligible for designated parking spaces. The required designated parking spaces are to be provided within the overall minimum parking requirement, not in addition to it.

Check "N/A" only if the project is a residential project, or if it does not include nonresidential use in a TPA.

N/A. This project is not in a TPA

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7. *Transportation Demand Management Program*

If the project would accommodate over 50 tenant-occupants (employees), would it include a transportation demand management program that would be applicable to existing tenants and future tenants that includes:

At least one of the following components:

- Parking cash out program
- Parking management plan that includes charging employees market-rate for single-occupancy vehicle parking and providing reserved, discounted, or free spaces for registered carpools or vanpools
- Unbundled parking whereby parking spaces would be leased or sold separately from the rental or purchase fees for the development for the life of the development

And at least three of the following components:

- Commitment to maintaining an employer network in the SANDAG iCommute program and promoting its RideMatcher service to tenants/employees
- On-site carsharing vehicle(s) or bikesharing
- Flexible or alternative work hours
- Telework program
- Transit, carpool, and vanpool subsidies
- Pre-tax deduction for transit or vanpool fares and bicycle commute costs
- Access to services that reduce the need to drive, such as cafes, commercial stores, banks, post offices, restaurants, gyms, or childcare, either onsite or within 1,320 feet (1/4 mile) of the structure/use?

Check "N/A" only if the project is a residential project or if it would not accommodate over 50 tenant-occupants (employees).

N/A. This project does not include over 50 tenants/occupants.

☐	☐	☑

Step 3: Project CAP Conformance Evaluation (if applicable)

The third step of the CAP consistency review only applies if Step 1 is answered in the affirmative under option B. The purpose of this step is to determine whether a project that is located in a TPA but that includes a land use plan and/or zoning designation amendment is nevertheless consistent with the assumptions in the CAP because it would implement CAP Strategy 3 actions. In general, a project that would result in a reduction in density inside a TPA would not be consistent with Strategy 3.The following questions must each be answered in the affirmative and fully explained.

1. **Would the proposed project implement the General Plan's City of Villages strategy in an identified Transit Priority Area (TPA) that will result in an increase in the capacity for transit-supportive residential and/or employment densities?**

   Considerations for this question:
   - Does the proposed land use and zoning designation associated with the project provide capacity for transit-supportive residential densities within the TPA?
   - Is the project site suitable to accommodate mixed-use village development, as defined in the General Plan, within the TPA?
   - Does the land use and zoning associated with the project increase the capacity for transit-supportive employment intensities within the TPA?

2. **Would the proposed project implement the General Plan's Mobility Element in Transit Priority Areas to increase the use of transit?**

   Considerations for this question:
   - Does the proposed project support/incorporate identified transit routes and stops/stations?
   - Does the project include transit priority measures?

3. **Would the proposed project implement pedestrian improvements in Transit Priority Areas to increase walking opportunities?**

   Considerations for this question:
   - Does the proposed project circulation system provide multiple and direct pedestrian connections and accessibility to local activity centers (such as transit stations, schools, shopping centers, and libraries)?
   - Does the proposed project urban design include features for walkability to promote a transit supportive environment?

4. **Would the proposed project implement the City of San Diego's Bicycle Master Plan to increase bicycling opportunities?**

   Considerations for this question:
   - Does the proposed project circulation system include bicycle improvements consistent with the Bicycle Master Plan?
   - Does the overall project circulation system provide a balanced, multimodal, "complete streets" approach to accommodate mobility needs of all users?

5. **Would the proposed project incorporate implementation mechanisms that support Transit Oriented Development?**

   Considerations for this question:
   - Does the proposed project include new or expanded urban public spaces such as plazas, pocket parks, or urban greens in the TPA?
   - Does the land use and zoning associated with the proposed project increase the potential for jobs within the TPA?
   - Do the zoning/implementing regulations associated with the proposed project support the efficient use of parking through mechanisms such as: shared parking, parking districts, unbundled parking, reduced parking, paid or time-limited parking, etc.?

6. **Would the proposed project implement the Urban Forest Management Plan to increase urban tree canopy coverage?**

   Considerations for this question:
   - Does the proposed project provide at least three different species for the primary, secondary and accent trees in order to accommodate varying parkway widths?
   - Does the proposed project include policies or strategies for preserving existing trees?
   - Does the proposed project incorporate tree planting that will contribute to the City's 20% urban canopy tree coverage goal?

CLIMATE ACTION PLAN CONSISTENCY CHECKLIST
ATTACHMENT A

This attachment provides performance standards for applicable Climate Action Pan (CAP) Consistency Checklist measures.

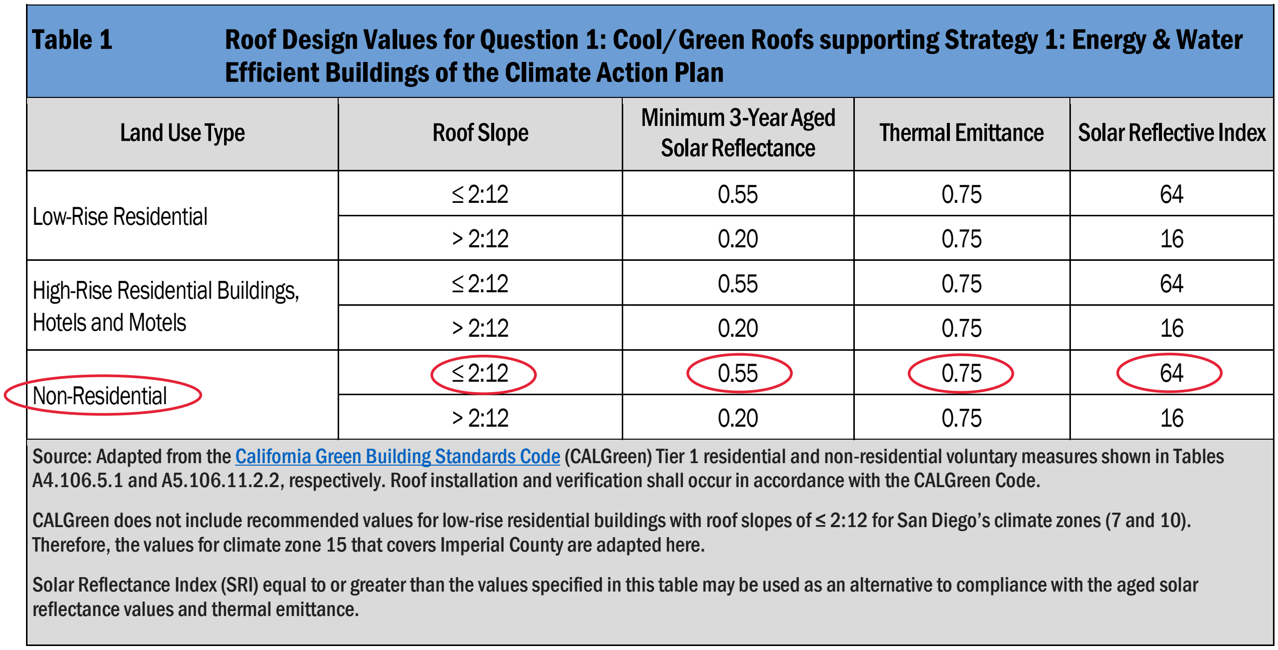

Table 1 Roof Design Values for Question 1: Cool/Green Roofs supporting Strategy 1: Energy & Water Efficient Buildings of the Climate Action Plan

Land Use Type	Roof Slope	Minimum 3-Year Aged Solar Reflectance	Thermal Emittance	Solar Reflective Index
Low-Rise Residential	≤ 2:12	0.55	0.75	64
	> 2:12	0.20	0.75	16
High-Rise Residential Buildings, Hotels and Motels	≤ 2:12	0.55	0.75	64
	> 2:12	0.20	0.75	16
[✓ Non-Residential]	[✓ ≤ 2:12]	[✓ 0.55]	[✓ 0.75]	[✓ 64]
	> 2:12	0.20	0.75	16

Source: Adapted from the California Green Building Standards Code (CALGreen) Tier 1 residential and non-residential voluntary measures shown in Tables A4.106.5.1 and A5.106.11.2.2, respectively. Roof installation and verification shall occur in accordance with the CALGreen Code.

CALGreen does not include recommended values for low-rise residential buildings with roof slopes of ≤ 2:12 for San Diego's climate zones (7 and 10). Therefore, the values for climate zone 15 that covers Imperial County are adapted here.

Solar Reflectance Index (SRI) equal to or greater than the values specified in this table may be used as an alternative to compliance with the aged solar reflectance values and thermal emittance.

Table 2 **Fixture Flow Rates for Non-Residential Buildings related to Question 2: Plumbing Fixtures and Fittings supporting Strategy 1: Energy & Water Efficient Buildings of the Climate Action Plan**

Fixture Type	Maximum Flow Rate
Showerheads	1.8 gpm @ 80 psi
Lavatory Faucets	0.35 gpm @60 psi
Kitchen Faucets	1.6 gpm @ 60 psi
Wash Fountains	1.6 [rim space(in.)/20 gpm @ 60 psi]
Metering Faucets	0.18 gallons/cycle
Metering Faucets for Wash Fountains	0.18 [rim space(in.)/20 gpm @ 60 psi]
Gravity Tank-type Water Closets	1.12 gallons/flush
Flushometer Tank Water Closets	1.12 gallons/flush
Flushometer Valve Water Closets	1.12 gallons/flush
Electromechanical Hydraulic Water Closets	1.12 gallons/flush
Urinals	0.5 gallons/flush

Source: Adapted from the California Green Building Standards Code (CALGreen) Tier 1 non-residential voluntary measures shown in Tables A5.303.2.3.1 and A5.106.11.2.2, respectively. See the California Plumbing Code for definitions of each fixture type.

Where complying faucets are unavailable, aerators rated at 0.35 gpm or other means may be used to achieve reduction.

Acronyms:
gpm = gallons per minute
psi = pounds per square inch (unit of pressure)
in. = inch

Table 3 **Standards for Appliances and Fixtures for Commercial Application related to Question 2: Plumbing Fixtures and Fittings supporting Strategy 1: Energy & Water Efficient Buildings of the Climate Action Plan**

Appliance/Fixture Type	Standard	
Clothes Washers	Maximum Water Factor (WF) that will reduce the use of water by 10 percent below the California Energy Commissions' WF standards for commercial clothes washers located in Title 20 of the *California Code of Regulations.*	
Conveyor-type Dishwashers	0.70 maximum gallons per rack (2.6 L) (High-Temperature)	0.62 maximum gallons per rack (4.4 L) (Chemical)
Door-type Dishwashers	0.95 maximum gallons per rack (3.6 L) (High-Temperature)	1.16 maximum gallons per rack (2.6 L) (Chemical)
Undercounter-type Dishwashers	0.90 maximum gallons per rack (3.4 L) (High-Temperature)	0.98 maximum gallons per rack (3.7 L) (Chemical)
Combination Ovens	Consume no more than 10 gallons per hour (38 L/h) in the full operational mode.	
Commercial Pre-rinse Spray Valves (manufactured on or after January 1, 2006)	Function at equal to or less than 1.6 gallons per minute (0.10 L/s) at 60 psi (414 kPa) and • Be capable of cleaning 60 plates in an average time of not more than 30 seconds per plate. • Be equipped with an integral automatic shutoff. • Operate at static pressure of at least 30 psi (207 kPa) when designed for a flow rate of 1.3 gallons per minute (0.08 L/s) or less.	

Source: Adapted from the California Green Building Standards Code (CALGreen) Tier 1 non-residential voluntary measures shown in Section A5.303.3. See the California Plumbing Code for definitions of each appliance/fixture type.

Acronyms:
L = liter
L/h = liters per hour
L/s = liters per second
psi = pounds per square inch (unit of pressure)
kPa = kilopascal (unit of pressure)

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October 15, 2018

SCST No. 170385N
Report No. 6

Mr. Miguel O. Perez
Noble House Real Estate, LLC
8662 A Siempre Viva Road
San Diego, California 92154

Subject: SITE SUITABILITY
BAJA FREIGHT
6852 CALLE DE LINEA
SAN DIEGO, CALIFORNIA

References:

1. TRH, Inc., (2018), *Baja Freight SDP, APN: 667-050-68, 6852 Calle De Linea, San Diego, CA 92154, Site Plan, Keynotes & Legends,* dated July 30, Plan Check 3, dated August 11.
2. K & S Engineering, (undated), *Conceptual Grading Plan for Baja Freight SDP,* signed by Kamal S. Sweis, P.E. 48592
3. SCST, Inc. (2018), *Supplemental Geotechnical Investigation, Baja Freight, 6852 Calle De Linea, San Diego, California,* SCST No. 170385N-03, March 19
4. SCST, Inc. (2017), *Infiltration Feasibility Study, Baja Freight, 6852 Calle De Linea, San Diego, California,* SCST No. 170385N-01, October 12
5. SCST, Inc. (2016), *Update Geotechnical Report, Proposed Loading Dock, 6852 Calle de Linea, San Diego, CA,* SCST No. 160101N-1, January 15

Dear Mr. Perez:

At your request, SCST, Inc. (SCST) is pleased to present this letter addressing the subject project. In our opinion, the site is suitable for the intended use.

If you have questions, please call us at (619) 280-4321.

Respectfully submitted,
SCST, INC.

Issac Chun, GE 2649
Principal Engineer

ISAAC B. CHUN
No. 2649
EXP. 12/31/19

Douglas A. Skinner, CEG 2472
Project Geologist

DOUGLAS A. SKINNER
No. 2472
CERTIFIED ENGINEERING GEOLOGIST

DAS:IC:hu

(1) Addressee via e-mail: gusm@ks-engr.com
(1) Mr. Toby Hallal via e-mail: toby@trhinc.com

The City of San Diego

PRIORITY DEVELOPMENT PROJECT (PDP) STORM WATER QUALITY MANAGEMENT PLAN (SWQMP) FOR

Baja Freight Park and Storage

PTS#521798

DWG# AND I.O.#

ENGINEER OF WORK:

6-29-2018

Kamal S. Sweis RCE 48592, EXP. 06/30/2020

Provide Wet Signature and Stamp Above Line

PREPARED FOR:

Noble House Real Estate, LLC CONTACT: Miguel Perez
8662 Siempre Viva Road, Suite A
San Diego, CA 92154
(619) 671-3100

PREPARED BY:

K&S ENGINEERING, INC.
Planning Engineering Surveying

K & S Engineering, Inc.

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San Diego, CA 92108
(619) 296-5565

DATE: 06/25/2018

Approved by: City of San Diego Date

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ACRONYMS

APN	Assessor's Parcel Number
ASBS	Area of Special Biological Significance
BMP	Best Management Practice
CEQA	California Environmental Quality Act
CGP	Construction General Permit
DCV	Design Capture Volume
DMA	Drainage Management Areas
ESA	Environmentally Sensitive Area
GLU	Geomorphic Landscape Unit
GW	Ground Water
HMP	Hydromodification Management Plan
HSG	Hydrologic Soil Group
HU	Harvest and Use
INF	Infiltration
LID	Low Impact Development
LUP	Linear Underground/Overhead Projects
MS4	Municipal Separate Storm Sewer System
N/A	Not Applicable
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
PDP	Priority Development Project
PE	Professional Engineer
POC	Pollutant of Concern
SC	Source Control
SD	Site Design
SDRWQCB	San Diego Regional Water Quality Control Board
SIC	Standard Industrial Classification
SWPPP	Stormwater Pollutant Protection Plan
SWQMP	Storm Water Quality Management Plan
TMDL	Total Maximum Daily Load
WMAA	Watershed Management Area Analysis
WPCP	Water Pollution Control Program
WQIP	Water Quality Improvement Plan

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CERTIFICATION PAGE

Project Name: Baja Freight Park and Storage
Permit Application Number: PTS#521798

I hereby declare that I am the Engineer in Responsible Charge of design of storm water BMPs for this project, and that I have exercised responsible charge over the design of the project as defined in Section 6703 of the Business and Professions Code, and that the design is consistent with the requirements of the Storm Water Standards, which is based on the requirements of SDRWQCB Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 (MS4 Permit).

I have read and understand that the City Engineer has adopted minimum requirements for managing urban runoff, including storm water, from land development activities, as described in the Storm Water Standards. I certify that this PDP SWQMP has been completed to the best of my ability and accurately reflects the project being proposed and the applicable source control and site design BMPs proposed to minimize the potentially negative impacts of this project's land development activities on water quality. I understand and acknowledge that the plan check review of this PDP SWQMP by the City Engineer is confined to a review and does not relieve me, as the Engineer in Responsible Charge of design of storm water BMPs for this project, of my responsibilities for project design.

RCE 48592, EXP. 06/30/2020
Engineer of Work's Signature, PE Number & Expiration Date

Kamal S. Sweis
Print Name

K & S Engineering, Inc.
Company

6-29-2018
Date

Engineer's Stamp

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SUBMITTAL RECORD

Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In last column indicate changes that have been made or indicate if response to plan check comments is included. When applicable, insert response to plan check comments.

Submittal Number	Date	Project Status	Changes
1	03/30/2017	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Initial Submittal
2	06/25/2018	☑ Preliminary Design/Planning/CEQA ☐ Final Design	Second Submittal
3		☐ Preliminary Design/Planning/CEQA ☐ Final Design	
4		☐ Preliminary Design/Planning/CEQA ☐ Final Design	

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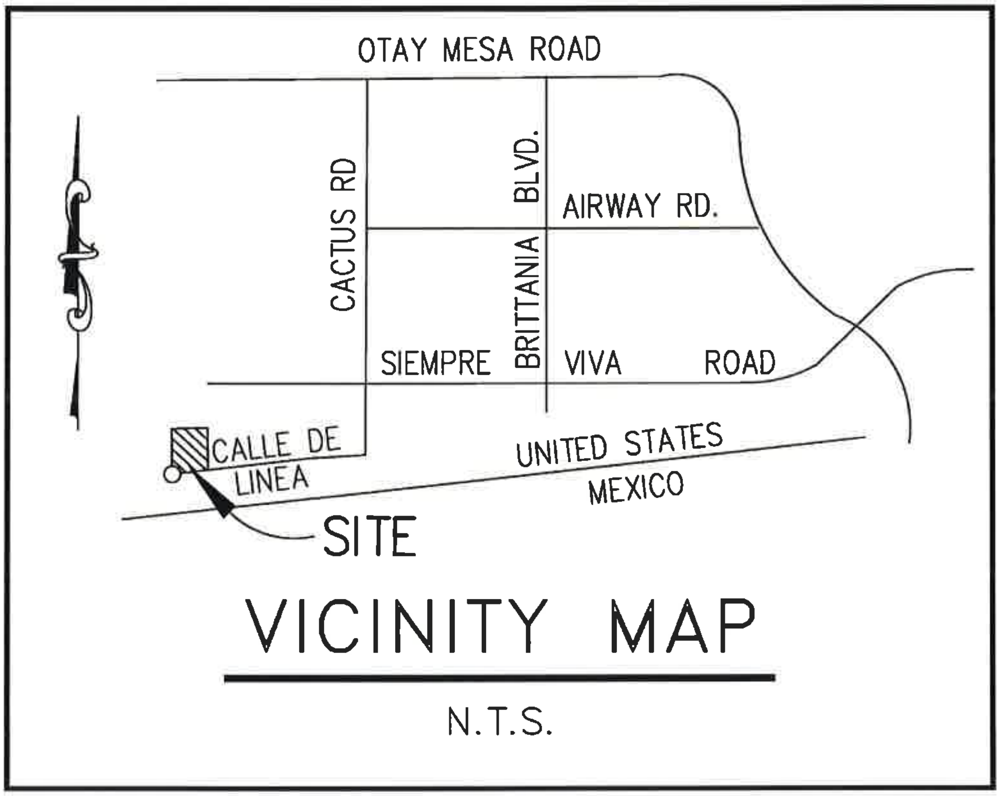
PROJECT VICINITY MAP

Project Name: Baja Freight Park and Storage
Permit Application Number: PTS#521798



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STORM WATER REQUIREMENTS APPLICABILITY CHECKLIST

Complete and attach DS-560 Form included in Appendix A.1

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Applicability of Permanent, Post-Construction Storm Water BMP Requirements		**Form I-1**
Project Identification		
Project Name Baja Freight Park and Storage		
Permit Application Number: PTS#521798		Date: 06/25/2018
Determination of Requirements		
The purpose of this form is to identify permanent, post-construction requirements that apply to the project. This form serves as a short summary of applicable requirements, in some cases referencing separate forms that will serve as the backup for the determination of requirements. Answer each step below, starting with Step 1 and progressing through each step until reaching "Stop". Refer to Part 1 of Storm Water Standards sections and/or separate forms referenced in each step below.		
Step	**Answer**	**Progression**
Step 1: Is the project a "development project"? See Section 1.3 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	Go to Step 2.
	☐ No	Stop. Permanent BMP requirements do not apply. No SWQMP will be required. Provide discussion below.
Discussion / justification if the project is not a "development project" (e.g., the project includes only interior remodels within an existing building):		
Step 2: Is the project a Standard Project, Priority Development Project (PDP), or exception to PDP definitions? To answer this item, see Section 1.4 of the BMP Design Manual (Part 1 of Storm Water Standards) in its entirety for guidance, AND complete Storm Water Requirements Applicability Checklist.	☐ Standard Project	Stop. Standard Project requirements apply.
	☑ PDP	PDP requirements apply, including PDP SWQMP. Go to Step 3.
	☐ PDP Exempt	Stop. Standard Project requirements apply. Provide discussion and list any additional requirements below.
Discussion / justification, and additional requirements for exceptions to PDP definitions, if applicable:		

Form I-1 Page 2

Step	Answer	Progression
Step 3. Is the project subject to earlier PDP requirements due to a prior lawful approval? See Section 1.10 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Consult the City Engineer to determine requirements. Provide discussion and identify requirements below. Go to Step 4.
	☑ No	BMP Design Manual PDP requirements apply. Go to Step 4.
Discussion / justification of prior lawful approval, and identify requirements (<u>not required if prior lawful approval does not apply</u>):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☑ Yes	PDP structural BMPs required for pollutant control (Chapter 5) and hydromodification control (Chapter 6). Go to Step 5.
	☐ No	Stop. PDP structural BMPs required for pollutant control (Chapter 5) only. Provide brief discussion of exemption to hydromodification control below.
Discussion / justification if hydromodification control requirements do <u>not</u> apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the BMP Design Manual (Part 1 of Storm Water Standards) for guidance.	☐ Yes	Management measures required for protection of critical coarse sediment yield areas (Chapter 6.2). Stop.
	☑ No	Management measures not required for protection of critical coarse sediment yield areas. Provide brief discussion below. Stop.
Discussion / justification if protection of critical coarse sediment yield areas does <u>not</u> apply: There is CCYSA within the property limits but proposed project is not draining into CCYSA. CCYSA does not drain into project. See Attachment 2b for project location on CCYSA map.		

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Baja Freight and Storage
Project Address	6852 Calle de Linea San Diego, CA 92154
Assessor's Parcel Number(s) (APN(s))	667-050-56
Permit Application Number	PTS#521798
Project Watershed	Select One: ☐ San Dieguito River ☐ Penasquitos ☐ Mission Bay ☐ San Diego River ☐ San Diego Bay ☑ Tijuana River
Hydrologic subarea name with Numeric Identifier up to two decimal places (9XX.XX)	Water Tanks 911.12
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	11.49 Acres (500,787 Square Feet)
Area to be disturbed by the project (Project Footprint)	3.94 Acres (171,859 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	3.13 Acres (136,356 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	0.81 Acres (35,503 Square Feet)
Note: Proposed Impervious Area + Proposed Pervious Area = Area to be Disturbed by the Project. This may be less than the Project Area.	
The proposed increase or decrease in impervious area in the proposed condition as compared to the pre-project condition.	1400 %

Form I-3B Page 2 of 11

Description of Existing Site Condition and Drainage Patterns

Current Status of the Site (select all that apply):
☑ Existing development
☐ Previously graded but not built out
☐ Agricultural or other non-impervious use
☐ Vacant, undeveloped/natural
Description / Additional Information:

The Site is currently developed with one office trailer, a paved parking lot area to the East, sidewalks and a decomposed granite parking area to the West.

Existing Land Cover Includes (select all that apply):
☐ Vegetative Cover
☑ Non-Vegetated Pervious Areas
☑ Impervious Areas
Description / Additional Information:

The existing site developed with approximately 10% of impervious areas.

Underlying Soil belongs to Hydrologic Soil Group (select all that apply):
☐ NRCS Type A ☐ Undetermined Urban Site
☐ NRCS Type B
☐ NRCS Type C
☑ NRCS Type D

Approximate Depth to Groundwater (GW):
☐ GW Depth < 5 feet
☐ 5 feet < GW Depth < 10 feet
10 feet < GW Depth < 20 feet
✓ GW Depth > 20 feet
☐

Existing Natural Hydrologic Features (select all that apply):
☐ Watercourses
☐ Seeps
☐ Springs
☐ Wetlands
☑ None
Description / Additional Information:

There are no existing natural hydrologic features within project limits

Form I-3B Page 3 of 11

Description of Existing Site Topography and Drainage:

How is storm water runoff conveyed from the site? At a minimum, this description should answer:

1. Whether existing drainage conveyance is natural or urban;
2. If runoff from offsite is conveyed through the site? If yes, quantification of all offsite drainage areas, design flows, and locations where offsite flows enter the project site and summarize how such flows are conveyed through the site;
3. Provide details regarding existing project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, and natural and constructed channels;
4. Identify all discharge locations from the existing project along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide summary of the pre-project drainage areas and design flows to each of the existing runoff discharge locations.

Description / Additional Information:

The existing condition is a developed site with one office trailer, sidewalks, paved parking area and decomposed granite trailer parking area. Currently the runoff sheet-flows in a Northwest-Southeast direction into an existing catch basin, then into the existing public storm drain system located at Calle de Linea. No offsite drainage is conveyed through the site. See attachment 5 for drainage report.

Form I-3B Page 4 of 11

Description of Proposed Site Development and Drainage Patterns

Project Description / Proposed Land Use and/or Activities:

The project consists of construction of one building for office and distribution uses, installation of underground pipe system, AC car parking and PCC truck parking, loading dock area and one bioretention facility for storm water quality, hydromodification and detention purposes.

The Westerly side of project is conveyed to a proposed underground storm drain system which takes the runoff east into a proposed bioretention facility. The Central part of the project comprised by half the building, loading dock area drains south via concrete swale into a proposed concrete brow ditch located along the southerly property line where it comingles with the runoff generated by the westerly side of the project and which conveys the flow into the bioretention facility. The Westerly part of the project sheet-flows into the biotretention facility. The is a small parking area located far west of the project which will be surfaced with pervious pavers and will be draining directly into the existing storm drain clean out located East of the bioretention facility (POC#1)

After treatment, detention and hydromodification requirements are met, the runoff will be conveyed to the existing storm drain cleanout (POC#1) east of the proposed bioretention facility, then into the existing 18" RCP to the MS4.

List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features):

The proposed impervious features consists of roof, asphaltic and concrete paving, concrete sidewalk, concrete curb.

List/describe proposed pervious features of the project (e.g., landscape areas):

The proposed pervious features are landscaped areas, permeable pavers surface and one bioretention facility for treatment and flow control purposes.

Does the project include grading and changes to site topography?

☑ Yes

☐ No

Description / Additional Information:

The project proposes grading to accommodate a proposed parking area, a building and attached Loading dock area and one bioretention facility

Form I-3B Page 5 of 11

Does the project include changes to site drainage (e.g., installation of new storm water conveyance systems)?

☑ Yes

☐ No

If yes, provide details regarding the proposed project site drainage conveyance network, including storm drains, concrete channels, swales, detention facilities, storm water treatment facilities, natural and constructed channels, and the method for conveying offsite flows through or around the proposed project site. Identify all discharge locations from the proposed project site along with a summary of the conveyance system size and capacity for each of the discharge locations. Provide a summary of pre and post-project drainage areas and design flows to each of the runoff discharge locations. Reference the drainage study for detailed calculations.

Description / Additional Information:

The project will maintain the existing drainage patterns and basin areas and includes installation of underground pipe system and one bioretention facility for storm water quality, hydromodification and detention purposes.
Since the site is located is located in the Otay Mesa area that drains to Mexico, the project is required to provide a storm water detention facility designed to mitigate the developed runoff to be equal or less than the pre-developed condition for the 5, 10, 25 and 50 year event.
The project's drainage pattern is as follows:
Runoff from the West portion of the site consisting of Asphaltic concrete parking and half the roof area is conveyed into four catch basins, then into an underground pipe system which will discharge flow into a proposed concrete brow ditch located along the Southerly property line of the site where the runoff generated by the Easterly side of the project confluence. The Easterly side of the project consists of concrete parking, loading dock area, and a bioretention facility. The runoff from the loading dock area will be directed into proposed containment concrete structure (as source control BMP) , then into the proposed PCC brow ditch joining the westerly site's runoff; this flow will be directed towards the proposed bioretention/flow control facility
located on Southwest area and where treatment, hydromodification and detention requirements will be addressed.
After treatment and mitigation is accomplished site's runoff will be conveyed into the existing public storm drain system located at Calle de Linea via storm drain pipe (POC#1).
A small area located at the Southeast corner of the site surfaced with pervious pavers will drain, part into an existing catch basin, then into POC#1 and the rest (driveway area) will surface flow into Calle De Linea.
Baja Freight and Storage project will not have a negative impact on the downstream drainage system, since there will be no increase in flow due to mitigation by means of the proposed detention basin. See attachment 5 for drainage and routing report.
The following table was extracted from the 5, 10, 25, 50-year Routing Analysis prepared by REC Consultants dated June, 2018.

Return Period	Drainage Area (Ac)		Difference	Peak Discharge (cfs)		Difference
	Existing	Developed		Existing	Developed	
5-yr	3.94	3.94	0.00	4.63	0.88	-3.75
10-yr	3.94	3.94	0.00	5.96	1.42	-4.54
25-yr	3.94	3.94	0.00	7.45	5.35	-2.10
50-yr	3.94	3.94	0.00	10.82	7.92	-2.90

Form I-3B Page 6 of 11

Identify whether any of the following features, activities, and/or pollutant source areas will be present (select all that apply):

☑ On-site storm drain inlets
☐ Interior floor drains and elevator shaft sump pumps
☐ Interior parking garages
☑ Need for future indoor & structural pest control
☑ Landscape/Outdoor Pesticide Use
☐ Pools, spas, ponds, decorative fountains, and other water features
☐ Food service
☑ Refuse areas
☐ Industrial processes
☐ Outdoor storage of equipment or materials
☐ Vehicle and Equipment Cleaning
☐ Vehicle/Equipment Repair and Maintenance
☐ Fuel Dispensing Areas
☑ Loading Docks
☑ Fire Sprinkler Test Water
☐ Miscellaneous Drain or Wash Water
☑ Plazas, sidewalks, and parking lots
☐ Large Trash Generating Facilities
☐ Animal Facilities
☐ Plant Nurseries and Garden Centers
☐ Automotive-related Uses

Description / Additional Information:

Form I-3B Page 7 of 11

Identification and Narrative of Receiving Water

Narrative describing flow path from discharge location(s), through urban storm conveyance system, to receiving creeks, rivers, and lagoons and ultimate discharge location to Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable)

The runoff from the proposed site drains into a public storm drain system on Calle de Linea then is conveyed towards the Tijuana River and eventually discharges to the Tijuana Estuary and into the Pacific Ocean.

Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations.

Ground Water:
Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), Industrial service supply (IND).
Coastal Water: Contact water recreation (REC1), Non-contact water recreation (REC2), Commercial and sport fishing (COMM), Preservation of biological habitats of special significance (BIOL), Estuarine habitat (EST), Wildlife habitat (WILD), Rare threatened or endangered species (RARE), Marine habitat (MAR), Migration of aquatic organisms (MIGR), Spawning (SPWN), Shellfish harvesting (SHELL)

Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations.

Site drains to Tijuana River, then into the Pacific Ocean, there are no areas of ASBS downstream project.

Provide distance from project outfall location to impaired or sensitive receiving waters.

The site is 0.2 miles to the closest ESA

Summarize information regarding the proximity of the permanent, post-construction storm water BMPs to the City's Multi-Habitat Planning Area and environmentally sensitive lands

The post-construction storm water BMP is located 0.2 miles upstream of City's Environmentally Sensitive Area.

Form I-3B Page 8 of 11

Identification of Receiving Water Pollutants of Concern

List any 303(d) impaired water bodies within the path of storm water from the project site to the Pacific Ocean (or bay, lagoon, lake or reservoir, as applicable), identify the pollutant(s)/stressor(s) causing impairment, and identify any TMDLs and/or Highest Priority Pollutants from the WQIP for the impaired water bodies:

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs/ WQIP Highest Priority Pollutant
Pacific Ocean, Tijuana HU	Enterococcus, fecal coliform, total coliform	
Tijuana River	Eutrophic, indicator bacteria, low dissolved oxygen, pesticides, phosphorus, sedimentation / siltation, selenium, solids, surfactants, synthetic organics, total nitrogen, toxicity, trace elements, trash	
Tijuana River Estuary	Eutrophic, indicator bacteria, lead, low dissolved oxygen, nickel, pesticides, thalium, trash, turbidity	

Identification of Project Site Pollutants*

*Identification of project site pollutants is only required if flow-thru treatment BMPs are implemented onsite in lieu of retention or biofiltration BMPs (note the project must also participate in an alternative compliance program unless prior lawful approval to meet earlier PDP requirements is demonstrated)

Identify pollutants anticipated from the project site based on all proposed use(s) of the site (see BMP Design Manual (Part 1 of Storm Water Standards) Appendix B.6):

Pollutant	Not Applicable to the Project Site	Anticipated from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment		✓	✓
Nutrients		✓	✓
Heavy Metals		✓	✓
Organic Compounds	✓		
Trash & Debris		✓	✓
Oxygen Demanding Substances		✓	✓
Oil & Grease		✓	
Bacteria & Viruses	✓		
Pesticides		✓	✓

Form I-3B Page 9 of 11

Hydromodification Management Requirements

Do hydromodification management requirements apply (see Section 1.6 of the BMP Design Manual)?

☑ Yes, hydromodification management flow control structural BMPs required.

☐ No, the project will discharge runoff directly to existing underground storm drains discharging directly to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to conveyance channels whose bed and bank are concrete-lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.

☐ No, the project will discharge runoff directly to an area identified as appropriate for an exemption by the WMAA for the watershed in which the project resides.

Description / Additional Information (to be provided if a 'No' answer has been selected above):

Critical Coarse Sediment Yield Areas*

*This Section only required if hydromodification management requirements apply

Based on Section 6.2 and Appendix H does CCSYA exist on the project footprint or in the upstream area draining through the project footprint?

☐ Yes

☑ No

Discussion / Additional Information:

There is CCYSA within the property limits but proposed project is not draining into CCYSA.
CCYSA does not drain into project. See Attachment 2b for project location on CCYSA map.

Form I-3B Page 10 of 11

Flow Control for Post-Project Runoff*

*This Section only required if hydromodification management requirements apply

List and describe point(s) of compliance (POCs) for flow control for hydromodification management (see Section 6.3.1). For each POC, provide a POC identification name or number correlating to the project's HMP Exhibit and a receiving channel identification name or number correlating to the project's HMP Exhibit.

There will be one point of compliance (POC-1), an existing storm drain clean out located Southeasterly of project.

Has a geomorphic assessment been performed for the receiving channel(s)?

☑ No, the low flow threshold is 0.1Q2 (default low flow threshold)
☐ Yes, the result is the low flow threshold is 0.1Q2
☐ Yes, the result is the low flow threshold is 0.3Q2
☐ Yes, the result is the low flow threshold is 0.5Q2

If a geomorphic assessment has been performed, provide title, date, and preparer:

Discussion / Additional Information: (optional)

Form I-3B Page 11 of 11

Other Site Requirements and Constraints

When applicable, list other site requirements or constraints that will influence storm water management design, such as zoning requirements including setbacks and open space, or local codes governing minimum street width, sidewalk construction, allowable pavement types, and drainage requirements.

Optional Additional Information or Continuation of Previous Sections As Needed

This space provided for additional information or continuation of information from previous sections as needed.

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Source Control BMP Checklist for All Development Projects

Form I-4

Source Control BMPs

All development projects must implement source control BMPs SC-1 through SC-6 where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of the Storm Water Standards) for information to implement source control BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the source control BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project has no outdoor materials storage areas). Discussion / justification may be provided.

Source Control Requirement	Applied?		
SC-1 Prevention of Illicit Discharges into the MS4	☑ Yes	☐ No	☐ N/A
Discussion / justification if SC-1 not implemented:			
SC-2 Storm Drain Stenciling or Signage	☑ Yes	☐ No	☐ N/A
Discussion / justification if SC-2 not implemented:			
SC-3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☑ N/A
Discussion / justification if SC-3 not implemented: The project has no outdoor material storage areas.			
SC-4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☑ N/A
Discussion / justification if SC-4 not implemented: The project has no outdoor work areas.			
SC-5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☑ Yes	☐ No	☐ N/A
Discussion / justification if SC-5 not implemented:			

Form I-4 Page 2 of 2

Source Control Requirement	Applied?		
SC-6 Additional BMPs Based on Potential Sources of Runoff Pollutants (must answer for each source listed below)			
On-site storm drain inlets	☑ Yes	☐ No	☐ N/A
Interior floor drains and elevator shaft sump pumps	☐ Yes	☐ No	☑ N/A
Interior parking garages	☐ Yes	☐ No	☑ N/A
Need for future indoor & structural pest control	☑ Yes	☐ No	☐ N/A
Landscape/Outdoor Pesticide Use	☑ Yes	☐ No	☐ N/A
Pools, spas, ponds, decorative fountains, and other water features	☐ Yes	☐ No	☑ N/A
Food service	☐ Yes	☐ No	☑ N/A
Refuse areas	☑ Yes	☐ No	☐ N/A
Industrial processes	☐ Yes	☐ No	☑ N/A
Outdoor storage of equipment or materials	☐ Yes	☐ No	☑ N/A
Vehicle/Equipment Repair and Maintenance	☐ Yes	☐ No	☑ N/A
Fuel Dispensing Areas	☐ Yes	☐ No	☑ N/A
Loading Docks	☑ Yes	☐ No	☐ N/A
Fire Sprinkler Test Water	☑ Yes	☐ No	☐ N/A
Miscellaneous Drain or Wash Water	☐ Yes	☐ No	☑ N/A
Plazas, sidewalks, and parking lots	☑ Yes	☐ No	☐ N/A
SC-6A: Large Trash Generating Facilities	☐ Yes	☐ No	☑ N/A
SC-6B: Animal Facilities	☐ Yes	☐ No	☑ N/A
SC-6C: Plant Nurseries and Garden Centers	☐ Yes	☐ No	☑ N/A
SC-6D: Automotive-related Uses	☐ Yes	☐ No	☑ N/A
Discussion / justification if SC-6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for <u>all</u> "No" answers shown above.			

Site Design BMP Checklist for All Development Projects

Form I-5

Site Design BMPs

All development projects must implement site design BMPs SD-1 through SD-8 where applicable and feasible. See Chapter 4 and Appendix E of the BMP Design Manual (Part 1 of Storm Water Standards) for information to implement site design BMPs shown in this checklist.

Answer each category below pursuant to the following.

- "Yes" means the project will implement the site design BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" means the BMP is not applicable at the project site because the project does not include the feature that is addressed by the BMP (e.g., the project site has no existing natural areas to conserve). Discussion / justification may be provided.

A site map with implemented site design BMPs must be included at the end of this checklist.

Site Design Requirement	Applied?		
SD-1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☐ No	☑ N/A
Discussion / justification if SD-1 not implemented: Site is already developed, there are no natural drainage pathways.			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☐ Yes	☑ No	
1-2 Are trees implemented? If yes, are they shown on the site map?	☐ Yes	☑ No	
1-3 Implemented trees meet the design criteria in SD-1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☑ No	
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☑ No	
SD-2 Have natural areas, soils and vegetation been conserved?	☐ Yes	☐ No	☑ N/A
Discussion / justification if SD-2 not implemented: There are no natural areas onsite.			

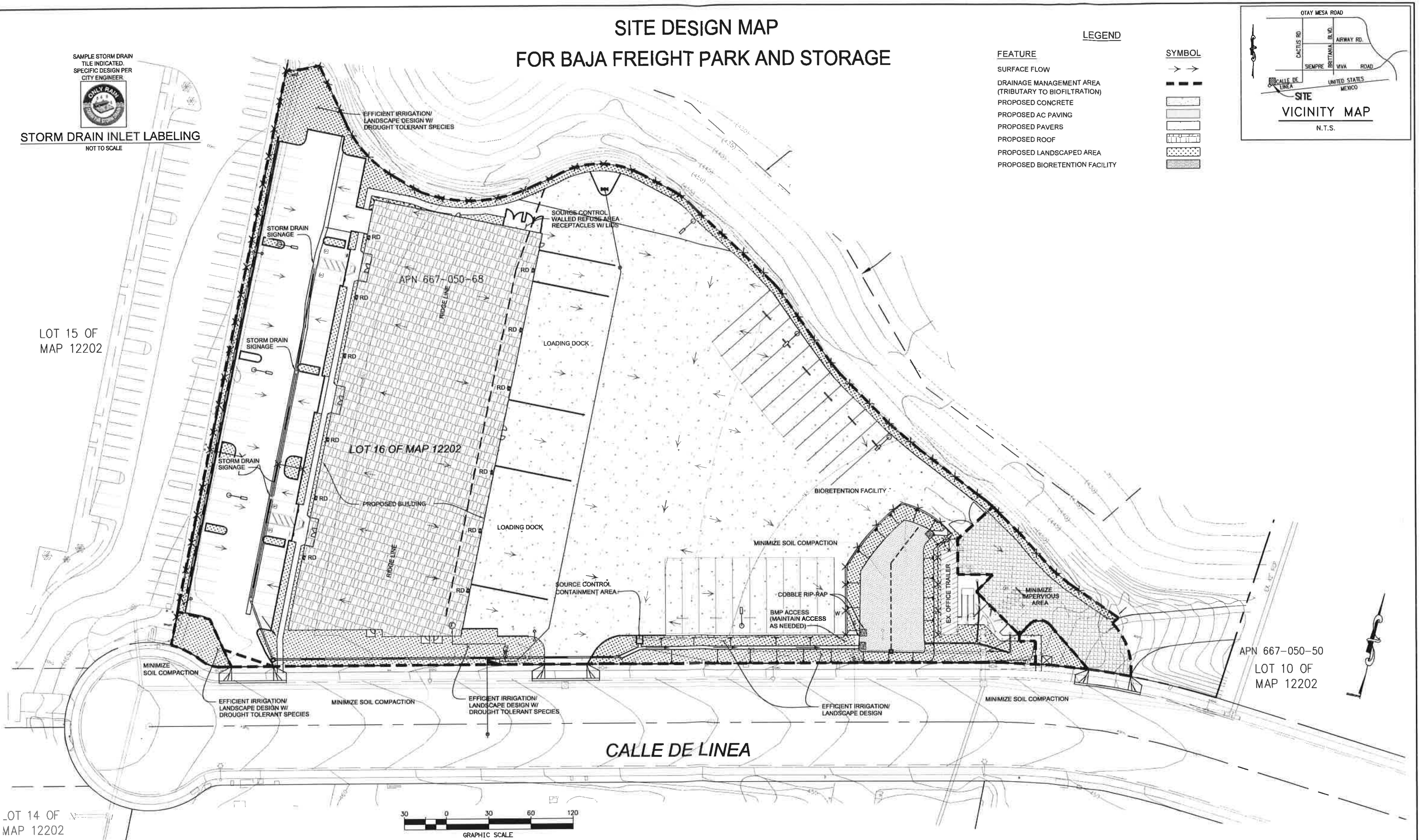
Site Design Requirement	Applied?		
SD-3 Minimize Impervious Area	☑ Yes	☐ No	☐ N/A
Discussion / justification if SD-3 not implemented:			
SD-4 Minimize Soil Compaction	☑ Yes	☐ No	☐ N/A
Discussion / justification if SD-4 not implemented:			
SD-5 Impervious Area Dispersion	☐ Yes	☑ No	☐ N/A
Discussion / justification if SD-5 not implemented: Being the project a truck parking is not feasible to add landscape areas for area dispersion per SD-5 guidelines but the site's runoff will be directed into the proposed bioretention facility where runoff will be treated and mitigated before connecting into the MS4.			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☐ Yes	☑ No	
5-2 Does the pervious area satisfy the design criteria in SD-5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☐ Yes	☑ No	
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and SD-5 Fact Sheet in Appendix E?	☐ Yes	☑ No	

Form I-5 Page 3 of 4

Site Design Requirement	Applied?		
SD-6 Runoff Collection	☐ Yes	☑ No	☐ N/A
Discussion / justification if SD-6 not implemented: Runoff collection is infeasible, green roof requires structural capacity that will make this project very costly and therefore unfeasible.			
6a-1 Are green roofs implemented in accordance with design criteria in SD-6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☑ No	
6a-2 Is green roof credit volume calculated using Appendix B.2.1.2 and SD-6A Fact Sheet in Appendix E?	☐ Yes	☑ No	
6b-1 Are permeable pavements implemented in accordance with design criteria in SD-6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☑ No	
6b-2 Is permeable pavement credit volume calculated using Appendix B.2.1.3 and SD-6B Fact Sheet in Appendix E?	☐ Yes	☑ No	
SD-7 Landscaping with Native or Drought Tolerant Species	☑ Yes	☐ No	☐ N/A
Discussion / justification if SD-7 not implemented: Landscape will include drought tolerant and shrubs			
SD-8 Harvesting and Using Precipitation	☐ Yes	☑ No	☐ N/A
Discussion / justification if SD-8 not implemented: Harvesting and reuse not feasible for project (See attachment 1c)			
8-1 Are rain barrels implemented in accordance with design criteria in SD-8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☑ No	
8-2 Is rain barrel credit volume calculated using Appendix B.2.2.2 and SD-8 Fact Sheet in Appendix E?	☐ Yes	☑ No	

Form I-5 Page 4 of 4
Insert Site Map with all site design BMPs identified:
For Site Map with all site design BMP, site design and source control see BMP exhibit on the following page.

SITE DESIGN MAP
FOR BAJA FREIGHT PARK AND STORAGE



LEGEND

FEATURE	SYMBOL
SURFACE FLOW	→ →
DRAINAGE MANAGEMENT AREA (TRIBUTARY TO BIOFILTRATION)	▬ ▬ ▬
PROPOSED CONCRETE	▭
PROPOSED AC PAVING	▭
PROPOSED PAVERS	▭
PROPOSED ROOF	▦
PROPOSED LANDSCAPED AREA	▒
PROPOSED BIORETENTION FACILITY	▨

SD-3 MINIMIZE IMPERVIOUS AREAS

ACCOMPLISHED BY PROVING MINIMUM AISLE AND PARKING DIMENSIONS WHILE MAINTAINING SUFFICIENT SPACE FOR VEHICLE AND PEDESTRIAN MANEUVERING SAFETY.

SD-4 SOIL COMPACTION

MINIMIZE SOIL COMPACTION WHENEVER POSSIBLE BY: HAVING A MINIMUM 8" TOP SOIL LAYER AND BY SCARIFYING SUB-SOILS BELOW THE TOP SOIL LAYER WITHIN LANDSCAPE AREAS BY AT LEAST 4".

SD-7 LANDSCAPING WITH NATIVE OR DROUGHT TOLERANT SPECIES:

NATIVE PLANTS RESILIENT TO VARIABLE FLOW, TOLERANT TO SUMMER DROUGHT AND SATURATED SOIL CONDITIONS. IE: THINGRASS, YERBA MANZA, MARSH BACCAHRIS, CALIFORNIA FIELD SEDGE, SAN DIEGO SEDGE, RUSTY SEDGE, SALT GRASS, MEXICAN RUSH, CALIFORNIA GREY RUSH, CANYON PRINCE WILD RYE, NEVIN'S BARBERRY, DEERGRASS AND LOW BULLRUSH, FULLY VEGETATE BOTTOM OF BASIN. ALL PLANTING PER LANDSCAPE PLANS.

Summary of PDP Structural BMPs	Form I-6

PDP Structural BMPs

All PDPs must implement structural BMPs for storm water pollutant control (see Chapter 5 of the BMP Design Manual, Part 1 of Storm Water Standards). Selection of PDP structural BMPs for storm water pollutant control must be based on the selection process described in Chapter 5. PDPs subject to hydromodification management requirements must also implement structural BMPs for flow control for hydromodification management (see Chapter 6 of the BMP Design Manual). Both storm water pollutant control and flow control for hydromodification management can be achieved within the same structural BMP(s).

PDP structural BMPs must be verified by the City at the completion of construction. This includes requiring the project owner or project owner's representative to certify construction of the structural BMPs (complete Form DS-563). PDP structural BMPs must be maintained into perpetuity (see Chapter 7 of the BMP Design Manual).

Use this form to provide narrative description of the general strategy for structural BMP implementation at the project site in the box below. Then complete the PDP structural BMP summary information sheet (page 3 of this form) for each structural BMP within the project (copy the BMP summary information page as many times as needed to provide summary information for each individual structural BMP).

Describe the general strategy for structural BMP implementation at the site. This information must describe how the steps for selecting and designing storm water pollutant control BMPs presented in Section 5.1 of the BMP Design Manual were followed, and the results (type of BMPs selected). For projects requiring hydromodification flow control BMPs, indicate whether pollutant control and flow control BMPs are integrated or separate.

According to percolation tests performed by the soils engineer (see report on attachment 6) and per work sheets I-8 and I-9 (see attachment 1) the site's soil is suitable for partial infiltration. As an effort to comply with City of San Diego StormWater Standars January 2016 edition, the project proposes a Bioretention basin with underdrain as a BMP to offer treatment through filtration, sedimentation, sorption, biochemical process and plant uptake to the most extend practicable. The proposed facility is designed to provide enough hydraulic head to move flows through the underdrain connection to the storm drain system.

In general the site's runoff will be conveyed into the bioretention facility for treatment and flow control purposes, then into the public storm drain system (MS4). The proposed biofiltration facility was designed in accordance with the Storm Water Standards BMP Design Manual Section5.5.2.1 and Appendix B.5. option 1 where is required to treat 1.5 times the portion of DCV not reliably retained onsite.

The Easterly side of the site proposes permeable pavers surface as pollutant control BMP which allows percolation through void spaces into surface layers. Pollutant control is provided via infiltration, sorption, sedimentation and biodegradation processes.

The harvest and reuse is not feasible per Attachment 1c: Harvest and reuse Feasibility Screen.

Since the site is a Priority development project PDP), hydromodification will be addressed inside the bioretention basin, which will also serve as a detention basin, since the runoff generated by the project drains into Mexico. See project's Hydromodification study in attachment 2.

This SWQMP has shown LID design, source control and treatment BMP's that should satisfy the requirements identified in the order and standards by treating and mitigating runoff to the most extend practicable, and it is anticipated that the downstream waters will not be affected by the proposed development.

(Continue on page 2 as necessary.)

Form I-6 Page 2 of 4
(Page reserved for continuation of description of general strategy for structural BMP implementation at the site)
(Continued from page 1)

Form I-6 Page 3 of 4 (Copy as many as needed)

Structural BMP Summary Information

Structural BMP ID No. BMP-1

Construction Plan Sheet No. PTS#

Type of structural BMP:

☐ Retention by harvest and use (HU-1)

☐ Retention by infiltration basin (INF-1)

☐ Retention by bioretention (INF-2)

☐ Retention by permeable pavement (INF-3)

☐ Partial retention by biofiltration with partial retention (PR-1)

☐ Biofiltration (BF-1)

☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below)

☑ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)

☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in

☑ Detention pond or vault for hydromodification management

☐ Other (describe in discussion section below)

Purpose:

☐ Pollutant control only

☐ Hydromodification control only

☑ Combined pollutant control and hydromodification control

☐ Pre-treatment/forebay for another structural BMP

☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	K & S Engineering, Inc. Kamal S. Sweis PE 48592 619.296.5565
Who will be the final owner of this BMP?	Noble House Real Estate, LLC Contact: Miguel Perez 8662 Siempre Viva Rd, Suite A, San Diego CA 92154 (619) 671-3100
Who will maintain this BMP into perpetuity?	Noble House Real Estate, LLC Contact: Miguel Perez 8662 Siempre Viva Rd, Suite A, San Diego CA 92154 (619) 671-3100
What is the funding mechanism for maintenance?	Private income

Form I-6 Page 3 of 4 (Copy as many as needed)

Structural BMP Summary Information

Structural BMP ID No. BMP-2 (PAVERS#2)

Construction Plan Sheet No. PTS#

Type of structural BMP:

☐ Retention by harvest and use (HU-1)
☐ Retention by infiltration basin (INF-1)
☐ Retention by bioretention (INF-2)
☑ Retention by permeable pavement (INF-3)
☐ Partial retention by biofiltration with partial retention (PR-1)
☐ Biofiltration (BF-1)
☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below)
☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)
☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in
☐ Detention pond or vault for hydromodification management
☐ Other (describe in discussion section below)

Purpose:

☑ Pollutant control only
☐ Hydromodification control only
☐ Combined pollutant control and hydromodification control
☐ Pre-treatment/forebay for another structural BMP
☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	K & S Engineering, Inc. Kamal S. Sweis PE 48592 619.296.5565
Who will be the final owner of this BMP?	Noble House Real Estate, LLC Contact: Miguel Perez 8662 Siempre Viva Rd, Suite A, San Diego CA 92154 (619) 671-3100
Who will maintain this BMP into perpetuity?	Noble House Real Estate, LLC Contact: Miguel Perez 8662 Siempre Viva Rd, Suite A, San Diego CA 92154 (619) 671-3100
What is the funding mechanism for maintenance?	Private income

Form I-6 Page 3 of 4 (Copy as many as needed)

Structural BMP Summary Information

Structural BMP ID No. BMP-3 (PAVERS#3)

Construction Plan Sheet No. PTS#

Type of structural BMP:

☐ Retention by harvest and use (HU-1)

☐ Retention by infiltration basin (INF-1)

☐ Retention by bioretention (INF-2)

☑ Retention by permeable pavement (INF-3)

☐ Partial retention by biofiltration with partial retention (PR-1)

☐ Biofiltration (BF-1)

☐ Flow-thru treatment control with prior lawful approval to meet earlier PDP requirements (provide (BMP type/description in discussion section below)

☐ Flow-thru treatment control included as pre-treatment/forebay for an onsite retention or biofiltration BMP (provide BMP type/description and indicate which onsite retention or biofiltration BMP it serves in discussion section below)

☐ Flow-thru treatment control with alternative compliance (provide BMP type/description in

☐ Detention pond or vault for hydromodification management

☐ Other (describe in discussion section below)

Purpose:

☑ Pollutant control only

☐ Hydromodification control only

☐ Combined pollutant control and hydromodification control

☐ Pre-treatment/forebay for another structural BMP

☐ Other (describe in discussion section below)

Who will certify construction of this BMP? Provide name and contact information for the party responsible to sign BMP verification form DS-563	K & S Engineering, Inc. Kamal S. Sweis PE 48592 619.296.5565
Who will be the final owner of this BMP?	Noble House Real Estate, LLC Contact: Miguel Perez 8662 Siempre Viva Rd, Suite A, San Diego CA 92154 (619) 671-3100
Who will maintain this BMP into perpetuity?	Noble House Real Estate, LLC Contact: Miguel Perez 8662 Siempre Viva Rd, Suite A, San Diego CA 92154 (619) 671-3100
What is the funding mechanism for maintenance?	Private income

City of San Diego
Development Services
1222 First Ave., MS-501
San Diego, CA 92101

Permanent BMP Construction
Self Certification Form

FORM
DS-563
December 2016

Date Prepared:	Project No./Drawing No.: PTS#
Project Applicant: Noble House Real Estate, LLC	Phone: (619) 671-3100
Project Address: 6852 Calle de Linea, San Diego	
Project Name: Baja Freight and Storage	

The purpose of this form is to verify that the site improvements for the project, identified above, have been constructed in conformance with the approved Storm Water Standards Manual documents and drawings.

This form must be completed by the engineer and submitted prior to final inspection of the construction permit. Completion and submittal of this form is required for Priority Development Projects in order to comply with the City's Storm Water ordinances and applicable San Diego Regional MS4 Permit. Final inspection for occupancy and/or release of grading or public improvement bonds may be delayed if this form is not submitted and approved by the City of San Diego.

Certification:

As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control, hydromodification, and treatment control BMP's required per the Storm Water Standards Manual; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and San Diego Regional MS4 Permit.

I understand that this BMP certification statement does not constitute an operation and maintenance verification.

Signature: ______________________

Date of Signature: ______________________

Printed Name: Kamal S. Sweis

Title: Project Engineer

Phone No. (619) 296-5565

Engineer's Stamp

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ATTACHMENT 1
BACKUP FOR PDP POLLUTANT CONTROL BMPS

This is the cover sheet for Attachment 1.

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Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☑ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☑ Included on DMA Exhibit in Attachment 1a ☐ Included as Attachment 1b, separate from DMA Exhibit
Attachment 1c	Form I-7, Harvest and Use Feasibility Screening Checklist (Required unless the entire project will use infiltration BMPs) Refer to Appendix B.3-1 of the BMP Design Manual to complete Form I-7.	☑ Included ☐ Not included because the entire project will use infiltration BMPs
Attachment 1d	Form I-8, Categorization of Infiltration Feasibility Condition (Required unless the project will use harvest and use BMPs) Refer to Appendices C and D of the BMP Design Manual to complete Form I-8.	☑ Included ☐ Not included because the entire project will use harvest and use BMPs ☐
Attachment 1e	Pollutant Control BMP Design Worksheets / Calculations (Required) Refer to Appendices B and E of the BMP Design Manual for structural pollutant control BMP design guidelines and site design credit calculations	☑ Included

Use this checklist to ensure the required information has been included on the DMA Exhibit:

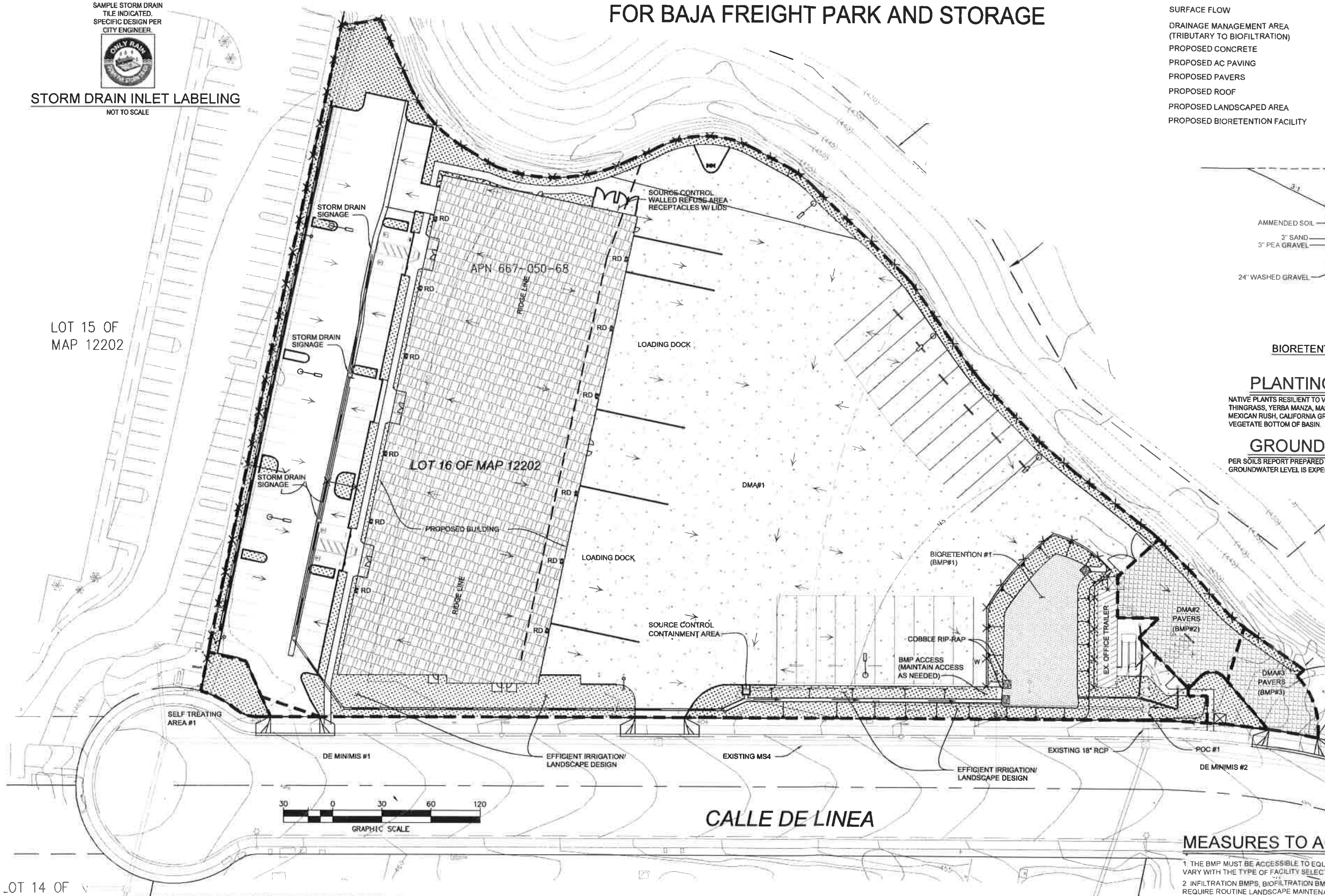
The DMA Exhibit must identify:

- ☑ Underlying hydrologic soil group
- ☑ Approximate depth to groundwater
- ☐ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
- ☐ Critical coarse sediment yield areas to be protected
- ☑ Existing topography and impervious areas
- ☑ Existing and proposed site drainage network and connections to drainage offsite
- ☑ Proposed grading
- ☑ Proposed impervious features
- ☑ Proposed design features and surface treatments used to minimize imperviousness
- ☑ Drainage management area (DMA) boundaries, DMA ID numbers, and DMA areas (square footage or acreage), and DMA type (i.e., drains to BMP, self-retaining, or self-mitigating)
- ☑ Potential pollutant source areas and corresponding required source controls (see Chapter 4, Appendix E.1, and Form I-3B)
- ☑ Structural BMPs (identify location, type of BMP, and size/detail)

BMP EXHIBIT
FOR BAJA FREIGHT PARK AND STORAGE

SAMPLE STORM DRAIN
TILE INDICATED.
SPECIFIC DESIGN PER
CITY ENGINEER.

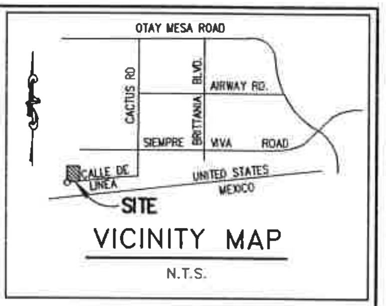
STORM DRAIN INLET LABELING
NOT TO SCALE



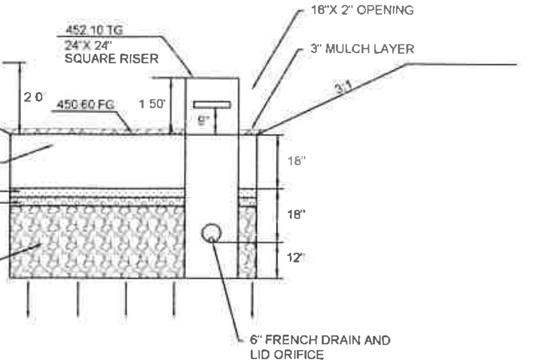
APN 667-050-50
LOT 10 OF
MAP 12202

LEGEND

FEATURE	SYMBOL
SURFACE FLOW	→ →
DRAINAGE MANAGEMENT AREA (TRIBUTARY TO BIOFILTRATION)	▬ ▬ ▬
PROPOSED CONCRETE	▭
PROPOSED AC PAVING	▭
PROPOSED PAVERS	▭
PROPOSED ROOF	▥
PROPOSED LANDSCAPED AREA	▨
PROPOSED BIORETENTION FACILITY	▩



VICINITY MAP
N.T.S.



BIORETENTION WITH PARTIAL RETENTION DETAIL
NOT TO SCALE

PLANTING NOTES:

NATIVE PLANTS RESILIENT TO VARIABLE FLOW, TOLERANT TO SUMMER DROUGHT AND SATURATED SOIL CONDITIONS. IE: THINGRASS, YERBA MANZA, MARSH BACCAHRIS, CALIFORNIA FIELD SEDGE, SAN DIEGO SEDGE, RUSTY SEDGE, SALT GRASS, MEXICAN RUSH, CALIFORNIA GREY RUSH, CANYON PRINCE WILD RYE, NEVIN'S BARBERRY, DEERGRASS AND LOW BULLRUSH, FULLY VEGETATE BOTTOM OF BASIN

GROUNDWATER

PER SOILS REPORT PREPARED BY SCST, INC DATED JANUARY 15, 2016 GROUNDWATER WAS NOT ENCOUNTERED IN EXCAVATION. GROUNDWATER LEVEL IS EXPECTED TO BE BELOW A DEPTH THAT WILL INFLUENCE THE PLANNED CONSTRUCTION.

UNDERLAYING SOIL GROUP

ACCORDING TO THE NATIONAL COOPERATIVE SOIL SURVEY (USDA) THE UNDERLAYING SOIL CONSISTS OF SOIL TYPE D

MEASURES TO ACCESS THE STRUCTURAL BMP

1 THE BMP MUST BE ACCESSIBLE TO EQUIPMENT NEEDED FOR MAINTENANCE ACCESS REQUIREMENTS FOR MAINTENANCE WILL VARY WITH THE TYPE OF FACILITY SELECTED

2 INFILTRATION BMPS, BIOFILTRATION BMPS AND MOST ABOVE-GROUND DETENTION BASINS AND SAND FILTERS WILL TYPICALLY REQUIRE ROUTINE LANDSCAPE MAINTENANCE USING THE SAME EQUIPMENT THAT IS USED FOR GENERAL LANDSCAPE MAINTENANCE AT TIMES THESE BMPS MAY REQUIRE EXCAVATION OF CLOGGED MEDIA (E G BIORETENTION SOIL MEDIA, OR SAND FOR THE SAND FILTER), AND SHOULD BE ACCESSIBLE TO APPROPRIATE EQUIPMENT FOR EXCAVATION AND REMOVAL/REPLACEMENT OF MEDIA

AREAS DRAINING TO BIOFILTRATION BMP#1 (DMA #1)

POST-PROJECT SURFACE TYPE	DMA AREA (SF)	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR	IMP SIZING FACTOR (WM ONLY)	MIN. AREA (S.F.)	PROPOSED AREA (S.F.)
P C C /A C PAVEMENT	98,840	0 9	88,956			
ROOF	37,330	0 9	33,597			
LANDSCAPE	27,727	0 1	2,773			
TOTAL DMA AREA=	163,897 SF		125,326	0 03	3,760	3,790

AREAS DRAINING TO BMP#2 (DMA #2)

POST-PROJECT SURFACE TYPE	DMA AREA (SF)	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR
PERVIOS PAVERS	3,465	0 3	1,039 50
LANDSCAPE	385	0 1	38 50
TOTAL DMA AREA=	3,850SF		1,078

AREAS DRAINING TO BMP#3 (DMA #3)

POST-PROJECT SURFACE TYPE	DMA AREA (SF)	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR
PERVIOS PAVERS	1,933	0 3	579 90
LANDSCAPE	215	0 1	21 50
TOTAL DMA AREA=	2,148SF		601 40

AREAS NOT DRAINING TO BIOFILTRATION

SELF TREATING AREA 1	970 SF
DE MINIMIS 1	186 SF
DE MINIMIS 2	808 SF
DMA #2	3,850 SF
DMA#3	2,148 SF
	7,962 SF

TOTAL DISTURBED AREA

DRAINING TO BIOFILTRATION	163,897 SF
NOT DRAINING TO BIOFILTRATION	7,962 SF
	171,859 SF

Harvest and Use Feasibility Checklist — Form I-7

1. Is there a demand for harvested water (check all that apply) at the project site that is reliably present during the wet season?

☑ Toilet and urinal flushing
☑ Landscape irrigation
☐ Other:________________

Landtype (Table B.3-1)= Office
Total use per resident/employee (Table B.3-1)= 7
Plant water Use (Table B.3-2)= Moderate
36hr Irrigation demand (Table B.3-3)= 1,470 Gal/Ac (per 36hr period)
Total Resident/Employee= 50

2. If there is a demand; estimate the anticipated average wet season demand over a period of 36 hours. Guidance for planning level demand calculations for toilet/urinal flushing and landscape irrigation is provided in Section B.3.2.
[Provide a summary of calculations here]

$$\text{T \& U} = \frac{\text{7Gal}}{\text{Day}} \text{ x } \frac{\text{50 Persons x 1.5 day}}{\text{7.48 Gal/Ft3}} = 70.19$$

$$\text{29,505 sf (0.68AC) Landscape Area } \underline{\text{ LI}}= \frac{\text{1,470 Gal x 0.68 x 1.5 Day}}{\text{7.48 Gal/Ft3}} = 200.45$$

$$\text{Total 36hr demand} = \frac{\text{T \& U + LI}}{\text{DCV}} = \frac{70.19+200.45}{4{,}772} = 0.057$$

3. Calculate the DCV using worksheet B-2.1.
DCV = __4,772__ (cubic feet)

3a. Is the 36 hour demand greater than or equal to the DCV? ☐ Yes ⇩ / ☑ No ⇨	3b. Is the 36 hour demand greater than 0.25DCV but less than the full DCV? ☐ Yes ⇩ / ☑ No ⇨	3c. Is the 36 hour demand less than 0.25DCV? ☑ Yes ⇩
Harvest and use appears to be feasible. Conduct more detailed evaluation and sizing calculations to confirm that DCV can be used at an adequate rate to meet drawdown criteria.	Harvest and use may be feasible. Conduct more detailed evaluation and sizing calculations to determine feasibility. Harvest and use may only be able to be used for a portion of the site, or (optionally) the storage may need to be upsized to meet long term capture targets while draining in longer than 36 hours.	Harvest and use is considered to be infeasible.

Is harvest and use feasible based on further evaluation?
☐ Yes, refer to Appendix E to select and size harvest and use BMPs.
☐ No, select alternate BMPs.

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition

Categorization of Infiltration Feasibility Condition			Worksheet C.4-1
Part 1 - Full Infiltration Feasibility Screening Criteria **Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?**			
Criteria	Screening Question	**Yes**	**No**
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	☐	☑
Provide basis: The soil present on-site is largely made up of fill and formational material consisting of dense sandy silt and silty sand with cobble. The tested material is believed to be generally representative of the material that will be encountered below the proposed BMP locations. The tested infiltration rates were low and ranged from between less than 0.1 and 0.3 inches per hour (inch/hour). In our opinion, the tested infiltration rates do not support a reliable infiltration rate of greater than 0.5 inch/hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	☐	☑
Provide basis: The tested infiltration rates do not support reliable infiltration of greater than 0.5 inch/hour. Allowing infiltration greater than 0.5 inch/hour will increase the risk of geotechnical hazards including increased surface runoff on the project site and onto adjacent properties and slopes, as well as uncontrolled lateral and vertical migration of groundwater through permeable bedding material of on-site utilities as well as utilities within the public right-of-way. SCST does not recommend allowing infiltration greater than 0.5 inch/hour at the site. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

<table>
<tr><th colspan="4">Worksheet C.4-1 Page 2 of 4</th></tr>
<tr><th>Criteria</th><th>Screening Question</th><th>Yes</th><th>No</th></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>☐</td><td>☑</td></tr>
<tr><td colspan="4">Provide basis:
The observed infiltration rates at the site indicate that the on-site soils do not support reliable infiltration of greater than 0.5 inch per hour.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>☐</td><td>☑</td></tr>
<tr><td colspan="4">Provide basis:
The observed infiltration rates at the site indicate that the on-site soils do not support reliable infiltration of greater than 0.5 inch per hour.
Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration
If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2</td><td></td></tr>
</table>

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by [City Engineer] to substantiate findings.

Worksheet C.4-1 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	☑	☐

Provide basis:

The soil present on-site is largely made up of fill and formational material consisting of dense sandy silt and silty sand with cobble. The tested material is believed to be generally representative of the material that will be encountered below the proposed BMP locations. The tested infiltration rates were low and ranged from less than 0.1 and 0.3 inches per hour (inch/hour). In our opinion, the tested infiltration rates do not support partial infiltration rates of between <0.1 and 0.3 inches per hour provided an adequate factor of safety is applied in BMP design.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Criteria	Screening Question	Yes	No
6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	☑	☐

Provide basis:

Partial infiltration in limited quantities as described in Criteria 5 will not increase the risk of geotechnical hazards.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Worksheet C.4-1 Page 4 of 4			
Criteria	Screening Question	Yes	No
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☑	☐
Provide basis: There are no known significant groundwater related risks related to allowing partial infiltration at the site as described in Criteria 5. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
8	**Can infiltration be allowed without violating downstream water rights?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☑	☐
Provide basis: This Criteria should be addressed by the project Civil Engineer. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**		

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by Agency/Jurisdictions to substantiate findings

Factor of Safety and Design Infiltration Rate Worksheet

Worksheet D.5-1

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \times v$
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	3	0.75
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	2	0.5
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.75
B	Design	Level of pretreatment/ expected sediment loads	0.5	1	0.5
		Redundancy/resiliency	0.25	1	0.25
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			1
Combined Safety Factor, $S_{total} = S_A$ x S_B					1.75
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)					0.2
Design Infiltration Rate, in/hr, $K_{design} = K_{observed} / S_{total}$					0.11

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Infiltration rate per SCST Inc. percolation test.

BIORETENTION #1

Worksheet B.2-1 DCV

	Design Capture Volume	Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.46	inches
2	Area tributary to BMP (s)	A=	3.76	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.76	unitless
4	Trees Credit Volume	TCV=	0	cubic-feet
5	Rain barrels Credit Volume	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	4,772	cubic-feet

PER STORM WATER STANDARDS TABLE B.1-1
RUNOFF FACTOR FOR:
- CONCRETE OR ASPHALT= 0.90
-AMMENDED, MULCHED SOILS OR LANDSCAPE= 0.10

WEIGHTED RUNOFF FACTOR EQUATION;

Wc=[(C*)(AREA imp)+(C*)(AREA perv)]/TOTAL AREA

Where:

Aimp=Tributary Area 136,170 sf
Aperv=Tributary Area 27,727 sf

Wc=[(0.90)(136,170 sf)+(0.10)(27,727sf)]/163,897sf
Wc=0.76

BIORETENTION #1

Appendix B: Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

	Simple Sizing Method for Biofiltration BMPs DMA 1	**Worksheet B.5-1 (Page 1 of 2)**	
1	Remaining DCV after implementing retention BMPs	4772	cubic-feet
	Partial Retention		
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.11	in/hr.
3	Allowable drawdown time for aggregate storage below the underdrain	36	hours
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	**3.96**	inches
5	Aggregate pore space	0.40	in/in
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	**9.9**	inches
7	Assumed surface area of the biofiltration BMP	3790	sq-ft
8	Media retained pore storage	0.1	in/in
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	**1819.2**	cubic-feet
10	DCV that requires biofiltration [Line 1 – Line 9]	**2952.8**	cubic-feet
	BMP Parameters		
11	Surface Ponding [6 inch minimum, 12 inch maximum]	9	inches
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations	18	inches
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area	18	inches
14	Freely drained pore storage	0.2	in/in
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	**5.00**	
	Outlet Control Rate (Q) x 3600 S / (Line 7 x 12) ---> Q	0	
	Baseline Calculations		
16	Allowable Routing Time for sizing	6	hours
17	Depth filtered during storm [Line 15 x Line 16]	**30**	inches
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	**19.8**	inches
19	Total Depth Treated [Line 17 + Line 18]	**49.8**	inches

Note: Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

Appendix B: Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs (continued)

Simple Sizing Method for Biofiltration BMPs DMA1		**Worksheet B.5-1 (Page 2 of 2)**	
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	**4429.2**	cubic- feet
21	Required Footprint [Line 20/ Line 19] x 12	**1067**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	**2214.6**	cubic- feet
23	Required Footprint [Line 22/ Line 18] x 12	**1342.181818**	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	163,897	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.76	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	
27	Minimum BMP Footprint [Line 24 x Line 25 x Line 26]	**3737**	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	**3737**	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	**0.38**	unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.375	unitless
31	Is the retained DCV ≥ 0.375? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	☐ Yes ☐ No	

Note:

1 Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

2 The DCV fraction of 0.375 is based on a 40% average annual percent capture and a 36-hour drawdown time.

3 The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.

4 If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

PAVERS #2 DMA

Worksheet B.2-1 DCV

Design Capture Volume		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.46	inches
2	Area tributary to BMP (s)	A=	0.088	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.28	unitless
4	Trees Credit Volume	TCV=	0	cubic-feet
5	Rain barrels Credit Volume	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	41.14	cubic-feet

PER STORM WATER STANDARDS TABLE B.1-1
RUNOFF FACTOR FOR:
- PERVIOUS PAVERS= 0.30
-AMMENDED, MULCHED SOILS OR LANDSCAPE= 0.10

WEIGHTED RUNOFF FACTOR EQUATION;

Wc=[(C*)(AREA imp)+(C*)(AREA perv)]/TOTAL AREA

Where:

Aimp=Tributary Area 3,850 sf
Apavers=Tributary Area 3,465 sf
Aperv=Tributary Area 385 sf

Wc=[(0.30)(3,465 sf)+(0.10)(385 sf)]/3,850sf
Wc=0.28

PAVERS #2

Appendix B: Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods
Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

Simple Sizing Method for Biofiltration BMPs DMA 1		Worksheet B.5-1 (Page 1 of 2)		
1	Remaining DCV after implementing retention BMPs	41.4	cubic-feet	
Partial Retention				
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.11	in/hr.	
3	Allowable drawdown time for aggregate storage below the underdrain	2	hours	
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	0.22	inches	
5	Aggregate pore space	0.40	in/in	
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	0.55	inches	
7	Assumed surface area of the biofiltration BMP	3465	sq-ft	
8	Media retained pore storage	0.1	in/in	
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	63.525	cubic-feet	*
10	DCV that requires biofiltration [Line 1 – Line 9]	-22.125	cubic-feet	*
BMP Parameters				
11	Surface Ponding [6 inch minimum, 12 inch maximum]		inches	
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations		inches	
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area		inches	
14	Freely drained pore storage	0.2	in/in	
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	5.00		
	Outlet Control Rate (Q) x 3600 S / (Line 7 x 12) ---> Q | 0			
Baseline Calculations				
16	Allowable Routing Time for sizing	6	hours	
17	Depth filtered during storm [Line 15 x Line 16]	30	inches	
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	0	inches	
19	Total Depth Treated [Line 17 + Line 18]	30	inches	

Note: Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

* Volume retained exceeds requirement.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs (continued)

Simple Sizing Method for Biofiltration BMPs DMA1		Worksheet B.5-1 (Page 2 of 2)	
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	**-33.1875**	cubic- feet
21	Required Footprint [Line 20/ Line 19] x 12	**-13**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	**-16.59375**	cubic- feet
23	Required Footprint [Line 22/ Line 18] x 12	**#DIV/0!**	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	3,850	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.28	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	
27	Minimum BMP Footprint [Line 24 x Line 25 x Line 26]	**32**	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	**32**	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	**1.53**	unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.375	unitless
31	Is the retained DCV ≥ 0.375? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	☐ Yes ☐ No	

Note:

1 Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

2 The DCV fraction of 0.375 is based on a 40% average annual percent capture and a 36-hour drawdown time.

3 The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.

4 If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

PAVERS #3 DMA

Worksheet B.2-1 DCV

Design Capture Volume		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.46	inches
2	Area tributary to BMP (s)	A=	0.049	acres
3	Area weighted runoff factor (estimate using Appendix B.1.1 and B.2.1)	C=	0.28	unitless
4	Trees Credit Volume	TCV=	0	cubic-feet
5	Rain barrels Credit Volume	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x d x A) – TCV - RCV	DCV=	22.91	cubic-feet

PER STORM WATER STANDARDS TABLE B.1-1
RUNOFF FACTOR FOR:
- PERVIOUS PAVERS= 0.30
-AMMENDED, MULCHED SOILS OR LANDSCAPE= 0.10

WEIGHTED RUNOFF FACTOR EQUATION;

Wc=[(C*)(AREA imp)+(C*)(AREA perv)]/TOTAL AREA

Where:

Aimp=Tributary Area 2,148 sf
Apavers=Tributary Area 1,933 sf
Aperv=Tributary Area 215 sf

Wc=[(0.30)(1,933 sf)+(0.10)(215 sf)]/2,148sf
Wc=0.28

PAVERS #3

Appendix B: Storm Water Pollutant Control Hydrologic Calculations and Sizing Methods

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs

Simple Sizing Method for Biofiltration BMPs DMA 1		Worksheet B.5-1 (Page 1 of 2)		
1	Remaining DCV after implementing retention BMPs	22.91	cubic-feet	
Partial Retention				
2	Infiltration rate from Worksheet D.5-1 if partial infiltration is feasible	0.11	in/hr.	
3	Allowable drawdown time for aggregate storage below the underdrain	2	hours	
4	Depth of runoff that can be infiltrated [Line 2 x Line 3]	**0.22**	inches	
5	Aggregate pore space	0.40	in/in	
6	Required depth of gravel below the underdrain [Line 4/ Line 5]	**0.55**	inches	
7	Assumed surface area of the biofiltration BMP	1933	sq-ft	
8	Media retained pore storage	0.1	in/in	
9	Volume retained by BMP [[Line 4 + (Line 12 x Line 8)]/12] x Line 7	**35.43833333**	cubic-feet	*
10	DCV that requires biofiltration [Line 1 – Line 9]	**-12.52833333**	cubic-feet	*
BMP Parameters				
11	Surface Ponding [6 inch minimum, 12 inch maximum]		inches	
12	Media Thickness [18 inches minimum], also add mulch layer thickness to this line for sizing calculations		inches	
13	Aggregate Storage above underdrain invert (12 inches typical) – use 0 inches for sizing if the aggregate is not over the entire bottom surface area		inches	
14	Freely drained pore storage	0.2	in/in	
15	Media filtration rate to be used for sizing (5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate which will be less than 5 in/hr.)	**5.00**		
	Outlet Control Rate (Q) x 3600 S / (Line 7 x 12) ---> Q	0		
Baseline Calculations				
16	Allowable Routing Time for sizing	6	hours	
17	Depth filtered during storm [Line 15 x Line 16]	**30**	inches	
18	Depth of Detention Storage [Line 11 + (Line 12 x Line 14) + (Line 13 x Line 5)]	**0**	inches	
19	Total Depth Treated [Line 17 + Line 18]	**30**	inches	

Note: Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

* Volume retained exceeds requirement.

Worksheet B.5-1: Simple Sizing Method for Biofiltration BMPs (continued)

Simple Sizing Method for Biofiltration BMPs DMA1		Worksheet B.5-1 (Page 2 of 2)	
Option 1 – Biofilter 1.5 times the DCV			
20	Required biofiltered volume [1.5 x Line 10]	**-18.7925**	cubic- feet
21	Required Footprint [Line 20/ Line 19] x 12	**-8**	sq-ft
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
22	Required Storage (surface + pores) Volume [0.75 x Line 10]	**-9.39625**	cubic- feet
23	Required Footprint [Line 22/ Line 18] x 12	**#DIV/0!**	sq-ft
Footprint of the BMP			
24	Area draining to the BMP	2,148	sq-ft
25	Adjusted Runoff Factor for drainage area (Refer to Appendix B.1 and B.2)	0.28	
26	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Worksheet B.5-2, Line 11)	0.03	
27	Minimum BMP Footprint [Line 24 x Line 25 x Line 26]	**18**	sq-ft
28	Footprint of the BMP = Maximum(Minimum(Line 21, Line 23), Line 27)	**18**	sq-ft
Check for Volume Reduction [Not applicable for No Infiltration Condition]			
29	Calculate the fraction of DCV retained in the BMP [Line 9/Line 1]	**1.55**	unitless
30	Minimum required fraction of DCV retained for partial infiltration condition	0.375	unitless
31	Is the retained DCV ≥ 0.375? If the answer is no increase the footprint sizing factor in Line 26 until the answer is yes for this criterion.	☐ Yes ☐ No	

Note:

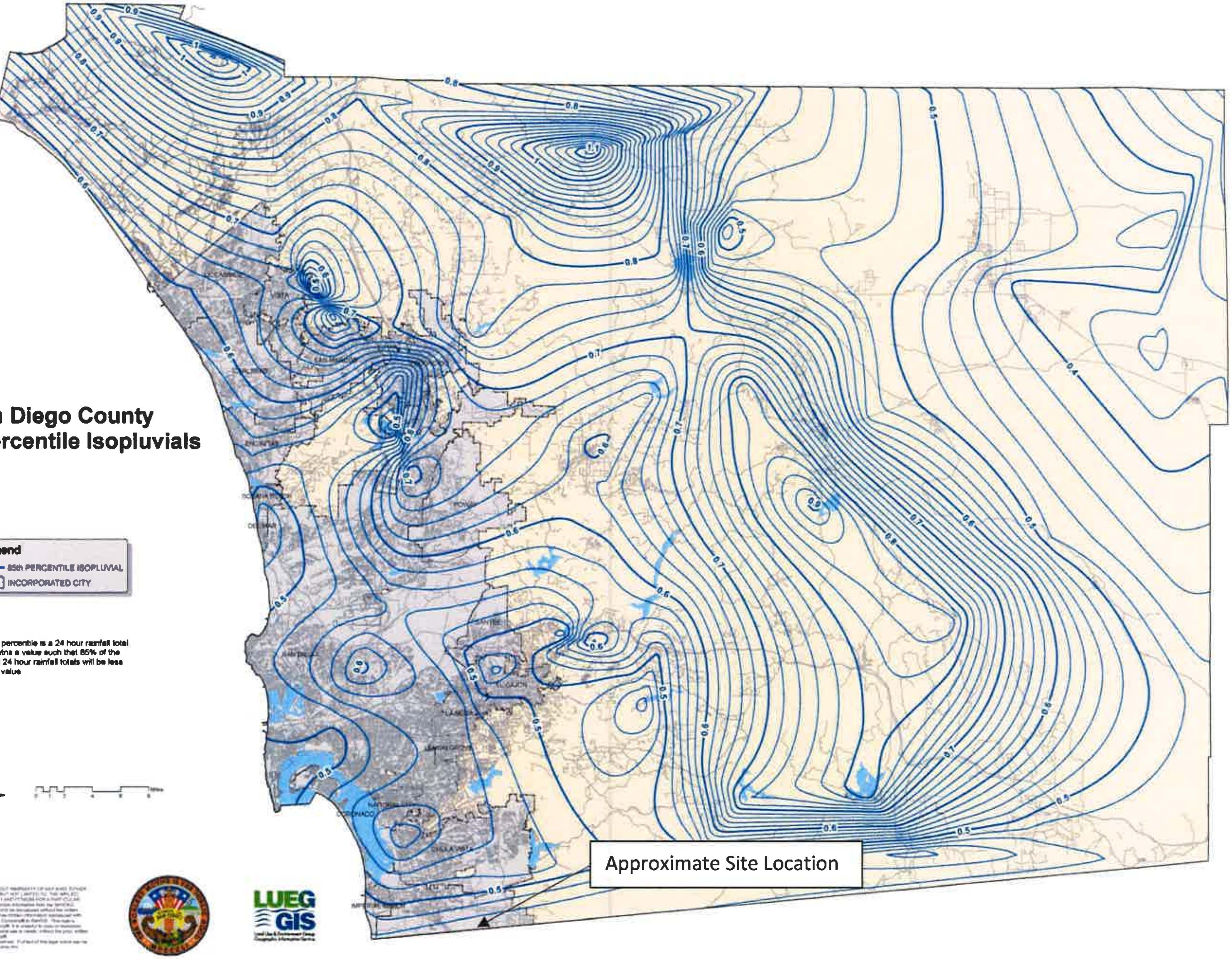
1 Line 7 is used to estimate the amount of volume retained by the BMP. Update assumed surface area in Line 7 until its equivalent to the required biofiltration footprint (either Line 21 or Line 23)

2 The DCV fraction of 0.375 is based on a 40% average annual percent capture and a 36-hour drawdown time.

3 The increase in footprint for volume reduction can be optimized using the approach presented in Appendix B.5.2. The optimized footprint cannot be smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2.

4 If the proposed biofiltration BMP footprint is smaller than the alternative minimum footprint sizing factor from Worksheet B.5-2, but satisfies Option 1 or Option 2 sizing, it is considered a compact biofiltration BMP and may be allowed at the discretion of the City Engineer, if it meets the requirements in Appendix F.

San Diego County
85 th Percentile Isopluvials



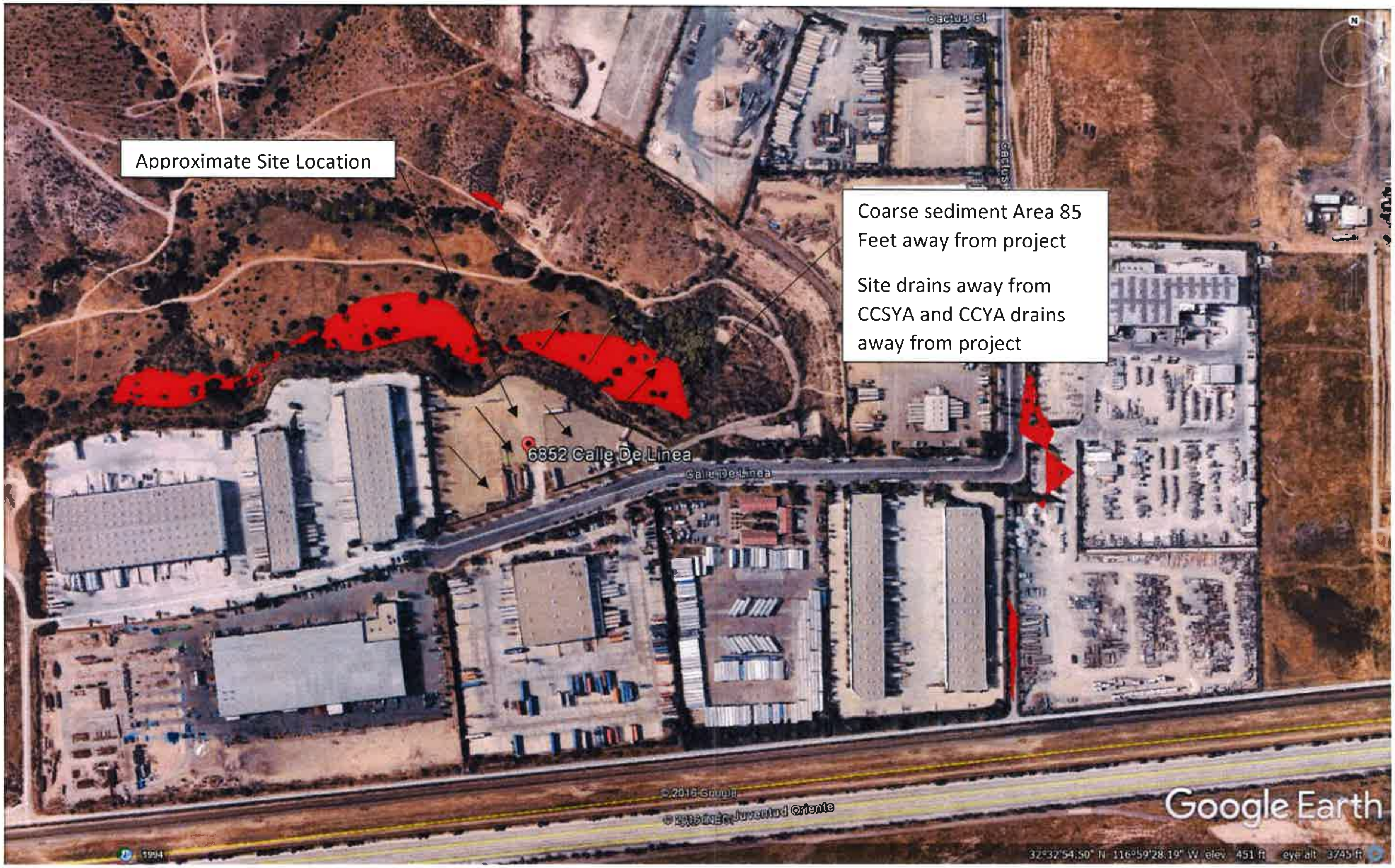
Legend

— 85th PERCENTILE ISOPLUVIAL

▭ INCORPORATED CITY

NOTE
The 85th percentile is a 24 hour rainfall total.
It represents a value such that 85% of the observed 24 hour rainfall totals will be less than that value

COARSE SEDIMENT YIELD MAP



Approximate Site Location

Coarse sediment Area 85 Feet away from project

Site drains away from CCSYA and CCYA drains away from project

E.1. Source Control BMP Requirements

Worksheet E.1-1: Source Control BMP Requirements

How to comply: Projects shall comply with this requirement by implementing all source control BMPs listed in this section that are applicable to their project. Applicability shall be determined through consideration of the development project's features and anticipated pollutant sources. Appendix E.1 provides guidance for identifying source control BMPs applicable to a project. Checklist I.4 in Appendix I shall be used to document compliance with source control BMP requirements.

How to use this worksheet:

1. Review Column 1 and identify which of these potential sources of storm water pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your project site plan.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in a table in your project-specific storm water management report. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternatives.

If These Sources Will Be on the Project Site …	… Then Your SWQMP Shall Consider These Source Control BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Drawings	3 Permanent Controls—List in Table and Narrative	4 Operational BMPs—Include in Table and Narrative
☑ A. Onsite storm drain inlets ☐ Not Applicable	☑ Locations of inlets.	☑ Mark all inlets with the words “No Dumping! Flows to Bay” or similar.	☑ Maintain and periodically repaint or replace inlet markings. ☑ Provide storm water pollution prevention information to new site owners, lessees, or operators. ☑ See applicable operational BMPs in Fact Sheet SC-44, “Drainage System Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com. ☑ Include the following in lease agreements: “Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains.”

If These Sources Will Be on the Project Site …	… Then Your SWQMP shall consider These Source Control BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Drawings	3 Permanent Controls—List in Table and Narrative	4 Operational BMPs—Include in Table and Narrative
☐ B. Interior floor drains and elevator shaft sump pumps ☑ Not Applicable		☐ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.
☐ C. Interior parking garages ☑ Not Applicable		☐ State that parking garage floor drains will be plumbed to the sanitary sewer.	☐ Inspect and maintain drains to prevent blockages and overflow.
☑ D1. Need for future indoor & structural pest control ☐ Not Applicable		☑ Note building design features that discourage entry of pests.	☑ Provide Integrated Pest Management information to owners, lessees, and operators.

If These Sources Will Be on the Project Site …	… Then Your SWQMP shall consider These Source Control BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Drawings	3 Permanent Controls—List in Table and Narrative	4 Operational BMPs—Include in Table and Narrative
☑ D2. Landscape/ Outdoor Pesticide Use ☐ Not Applicable	☑ Show locations of existing trees or areas of shrubs and ground cover to be undisturbed and retained. ☑ Show self-retaining landscape areas, if any. ☑ Show storm water treatment facilities.	☑ State that final landscape plans will accomplish all of the following. ☑ Preserve existing drought tolerant trees, shrubs, and ground cover to the maximum extent possible. ☑ Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to storm water pollution. ☑ Where landscaped areas are used to retain or detain storm water, specify plants that are tolerant of periodic saturated soil conditions. ☑ Consider using pest-resistant plants, especially adjacent to hardscape. ☑ To ensure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	☑ Maintain landscaping using minimum or no pesticides. ☑ See applicable operational BMPs in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com. ☑ Provide IPM information to new owners, lessees and operators.

If These Sources Will Be on the Project Site …	… Then Your SWQMP shall consider These Source Control BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Drawings	3 Permanent Controls—List in Table and Narrative	4 Operational BMPs—Include in Table and Narrative
☐ E. Pools, spas, ponds, decorative fountains, and other water features. ☑ Not Applicable	☐ Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet.	☐ If the local municipality requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.	☐ See applicable operational BMPs in Fact Sheet SC-72, "Fountain and Pool Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.
☐ F. Food service ☑ Not Applicable	☐ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ☐ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	☐ Describe the location and features of the designated cleaning area. ☐ Describe the items to be cleaned in this facility and how it has been sized to ensure that the largest items can be accommodated.	

If These Sources Will Be on the Project Site …	… Then Your SWQMP shall consider These Source Control BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Drawings	3 Permanent Controls—List in Table and Narrative	4 Operational BMPs—Include in Table and Narrative
☑ G. Refuse areas ☐ Not Applicable	☑ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ☑ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. Also show how the designated area will be protected from wind dispersal. ☑ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	☑ State how site refuse will be handled and provide supporting detail to what is shown on plans. ☑ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	☑ State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.

If These Sources Will Be on the Project Site …	… Then Your SWQMP shall consider These Source Control BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Drawings	3 Permanent Controls—List in Table and Narrative	4 Operational BMPs—Include in Table and Narrative
☐ H. Industrial processes. ☑ Not Applicable	☐ Show process area.	☐ If industrial processes are to be located onsite, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	☐ See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.
☐ I. Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.) ☑ Not Applicable	☐ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or runoff from area and protected from wind dispersal. ☐ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ☐ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	☐ Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of local Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release Prevention Program ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank	☐ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.

If These Sources Will Be on the Project Site …	… Then Your SWQMP shall consider These Source Control BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Drawings	3 Permanent Controls—List in Table and Narrative	4 Operational BMPs—Include in Table and Narrative
☐ J. Vehicle and Equipment Cleaning ☑ Not Applicable	☐ Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle /equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited onsite and hoses are provided with an automatic shut-off to discourage such use). (3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	☐ If a car wash area is not provided, describe measures taken to discourage onsite car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): ☐ Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. ☐ Car dealerships and similar may rinse cars with water only. ☐ See Fact Sheet SC-21, "Vehicle and Equipment Cleaning," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

If These Sources Will Be on the Project Site …	… Then Your SWQMP shall consider These Source Control BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Drawings	3 Permanent Controls—List in Table and Narrative	4 Operational BMPs—Include in Table and Narrative
☐ K. Vehicle/Equipment Repair and Maintenance ☑ Not Applicable	☐ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to protect from rainfall, run-on runoff, and wind dispersal. ☐ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. ☐ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	☐ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ☐ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. ☐ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	In the report, note that all of the following restrictions apply to use the site: ☐ No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. ☐ No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. ☐ No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.

If These Sources Will Be on the Project Site …	… Then Your SWQMP shall consider These Source Control BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Drawings	3 Permanent Controls—List in Table and Narrative	4 Operational BMPs—Include in Table and Narrative
☐ L. Fuel Dispensing Areas ☑ Not Applicable	☐ Fueling areas[1] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are (1) graded at the minimum slope necessary to prevent ponding; and (2) separated from the rest of the site by a grade break that prevents run-on of storm water to the MEP. ☐ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area1.] The canopy [or cover] shall not drain onto the fueling area.		☐ The property owner shall dry sweep the fueling area routinely. ☐ See the Business Guide Sheet, "Automotive Service—Service Stations" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.

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

If These Sources Will Be on the Project Site …	… Then Your SWQMP shall consider These Source Control BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Drawings	3 Permanent Controls—List in Table and Narrative	4 Operational BMPs—Include in Table and Narrative
M. Loading Docks ☐ Not Applicable	☑ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct storm water away from the loading area. Water from loading dock areas should be drained to the sanitary sewer where feasible. Direct connections to storm drains from depressed loading docks are prohibited. ☑ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ☑ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		☑ Move loaded and unloaded items indoors as soon as possible. ☑ See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.

If These Sources Will Be on the Project Site …	… Then Your SWQMP shall consider These Source Control BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Drawings	3 Permanent Controls—List in Table and Narrative	4 Operational BMPs—Include in Table and Narrative
☑ N. Fire Sprinkler Test Water ☐ Not Applicable		☑ Provide a means to drain fire sprinkler test water to the sanitary sewer.	☑ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com.

O. Miscellaneous Drain or Wash Water ☐ Boiler drain lines ☐ Condensate drain lines ☐ Rooftop equipment ☐ Drainage sumps ☐ Roofing, gutters, and trim ☑ Not Applicable		☐ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ☐ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. ☐ Rooftop mounted equipment with potential to produce pollutants shall be roofed and/or have secondary containment. ☑ Any drainage sumps onsite shall feature a sediment sump to reduce the quantity of sediment in pumped water. ☑ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.	

If These Sources Will Be on the Project Site …	… Then Your SWQMP shall consider These Source Control BMPs		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on Drawings	3 Permanent Controls—List in Table and Narrative	4 Operational BMPs—Include in Table and Narrative
☑ P. Plazas, sidewalks, and parking lots. ☐ Not Applicable			☑ Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.

E.12. PR-1 Biofiltration with Partial Retention

Location: 805 and Bonita Road, Chula Vista, CA.

MS4 Permit Category

NA

Manual Category

Partial Retention

Applicable Performance Standard

Pollutant Control
Flow Control

Primary Benefits

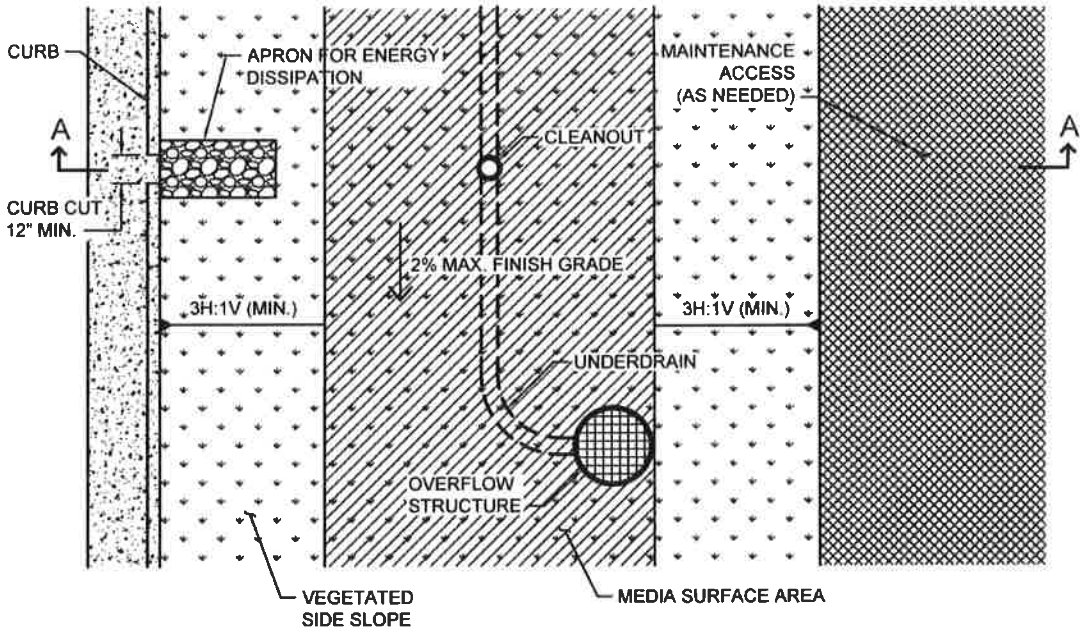
Volume Reduction
Treatment
Peak Flow Attenuation

Description

Biofiltration with partial retention (partial infiltration and biofiltration) facilities are vegetated surface water systems that filter water through vegetation, and soil or engineered media prior to infiltrating into native soils, discharge via underdrain, or overflow to the downstream conveyance system. Where feasible, these BMPs have an elevated underdrain discharge point that creates storage capacity in the aggregate storage layer. Biofiltration with partial retention facilities are commonly incorporated into the site within parking lot landscaping, along roadsides, and in open spaces. They can be constructed in ground or partially aboveground, such as planter boxes with open bottoms to allow infiltration. Treatment is achieved through filtration, sedimentation, sorption, infiltration, biochemical processes and plant uptake.

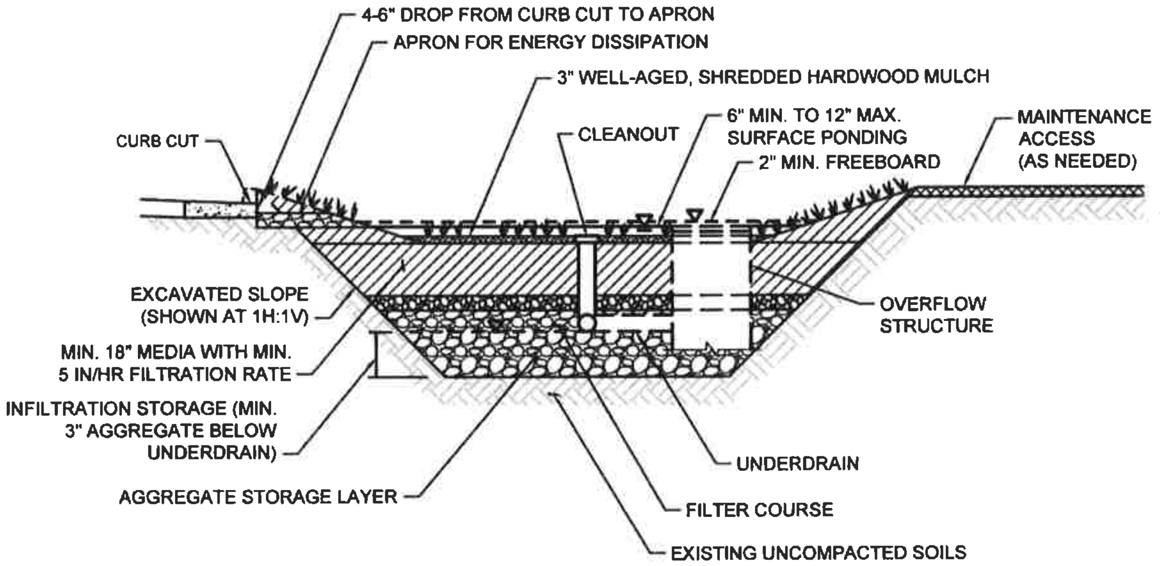
Typical biofiltration with partial retention components include:

- Inflow distribution mechanisms (e.g, perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Shallow surface ponding for captured flows
- Side Slope and basin bottom vegetation selected based on climate and ponding depth
- Non-floating mulch layer
- Media layer (planting mix or engineered media) capable of supporting vegetation growth
- Filter course layer (aka choking layer) consisting of aggregate to prevent the migration of fines into uncompacted native soils or the optional aggregate storage layer
- Aggregate storage layer with underdrain(s)
- Uncompacted native soils at the bottom of the facility
- Overflow structure



PLAN

NOT TO SCALE



SECTION A-A'

NOT TO SCALE

Figure E.12-E.12-1: Typical plan and Section view of a Biofiltration with Partial Retention BMP

Design Adaptations for Project Goals

Partial infiltration BMP with biofiltration treatment for storm water pollutant control. Biofiltration with partial retention can be designed so that a portion of the DCV is infiltrated by providing infiltration storage below the underdrain invert. The infiltration storage depth should be determined by the volume that can be reliably infiltrated within drawdown time limitations. Water discharged through the underdrain is considered biofiltration treatment. Storage provided above the underdrain within surface ponding, media, and aggregate storage is included in the biofiltration treatment volume.

Integrated storm water flow control and pollutant control configuration. The system can be designed to provide flow rate and duration control by primarily providing increased surface ponding and/or having a deeper aggregate storage layer. This will allow for significant detention storage, which can be controlled via inclusion of an orifice in an outlet structure at the downstream end of the underdrain.

Design Criteria and Considerations

Biofiltration with partial retention must meet the following design criteria and considerations. Deviations from the below criteria may be approved at the discretion of the City Engineer if it is determined to be appropriate:

	Siting and Design	Intent/Rationale
☐	Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities).	Must not negatively impact existing site geotechnical concerns.
☐	Selection and design of basin is based on infiltration feasibility criteria and appropriate design infiltration rate (See Appendix C and D).	Must operate as a partial infiltration design and must be supported by drainage area and in-situ infiltration rate feasibility findings.
☐	Contributing tributary area shall be ≤ 5 acres (≤ 1 acre preferred).	Bigger BMPs require additional design features for proper performance. Contributing tributary area greater than 5 acres may be allowed at the discretion of the City Engineer if the following conditions are met: 1) incorporate design features (e.g. flow spreaders) to minimizing short circuiting of flows in the BMP and 2) incorporate additional design features requested by the City Engineer for proper performance of the regional BMP.
☐	Finish grade of the facility is ≤ 2%.	Flatter surfaces reduce erosion and channelization within the facility.
Surface Ponding		
☐	Surface ponding is limited to a 24-hour drawdown time.	Surface ponding limited to 24 hours for plant health. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of the City Engineer if certified by a landscape architect or agronomist.

	Siting and Design	Intent/Rationale
☐	Surface ponding depth is ≥ 6 and ≤ 12 inches.	Surface ponding capacity lowers subsurface storage requirements. Deep surface ponding raises safety concerns. Surface ponding depth greater than 12 inches (for additional pollutant control or surface outlet structures or flow-control orifices) may be allowed at the discretion of the City Engineer if the following conditions are met: 1) surface ponding depth drawdown time is less than 24 hours; and 2) safety issues and fencing requirements are considered (typically ponding greater than 18" will require a fence and/or flatter side slopes) and 3) potential for elevated clogging risk is considered.
☐	A minimum of 2 inches of freeboard is provided.	Freeboard provides room for head over overflow structures and minimizes risk of uncontrolled surface discharge.
☐	Side slopes are stabilized with vegetation and are = 3H:1V or shallower.	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.
Vegetation		
☐	Plantings are suitable for the climate and expected ponding depth. A plant list to aid in selection can be found in Appendix E.20	Plants suited to the climate and ponding depth are more likely to survive.
☐	An irrigation system with a connection to water supply should be provided as needed.	Seasonal irrigation might be needed to keep plants healthy.
Mulch (Mandatory)		
☐	A minimum of 3 inches of well-aged, shredded hardwood mulch that has been stockpiled or stored for at least 12 months is provided. Mulch must be non-floating to avoid clogging of overflow structure.	Mulch will suppress weeds and maintain moisture for plant growth. Aging mulch kills pathogens and weed seeds and allows the beneficial microbes to multiply.
Media Layer		

	Siting and Design	Intent/Rationale
☐	Media maintains a minimum filtration rate of 5 in/hr over lifetime of facility. Additional Criteria for media hydraulic conductivity described in the bioretention soil media model specification (Appendix F.4)	A filtration rate of at least 5 inches per hour allows soil to drain between events, and allows flows to relatively quickly enter the aggregate storage layer, thereby minimizing bypass. The initial rate should be higher than long term target rate to account for clogging over time. However an excessively high initial rate can have a negative impact on treatment performance, therefore an upper limit is needed.
☐	Media is a minimum 18 inches deep, meeting the following media specifications: Model bioretention soil media specification provided in Appendix F.4 <u>or</u> County of San Diego Low Impact Development Handbook: Appendix G - Bioretention Soil Specification (June 2014, unless superseded by more recent edition). Alternatively, for proprietary designs and custom media mixes not meeting the media specifications, the media meets the pollutant treatment performance criteria in Section F.1.	A deep media layer provides additional filtration and supports plants with deeper roots. Standard specifications shall be followed. For non-standard or proprietary designs, compliance with Appendix F.1 ensures that adequate treatment performance will be provided.
☐	Media surface area is 3% of contributing area times adjusted runoff factor or greater. Unless demonstrated that the BMP surface area can be smaller than 3%.	Greater surface area to tributary area ratios: a) maximizes volume retention as required by the MS4 Permit and b) decrease loading rates per square foot and therefore increase longevity. Adjusted runoff factor is to account for site design BMPs implemented upstream of the BMP (such as rain barrels, impervious area dispersion, etc.). Refer to Appendix B.2 guidance. Use Worksheet B.5-1 Line 26 to estimate the minimum surface area required per this criteria.
☐	Where receiving waters are impaired or have a TMDL for nutrients, the system is designed with nutrient sensitive media design (see fact sheet BF-2).	Potential for pollutant export is partly a function of media composition; media design must minimize potential for export of nutrients, particularly where receiving waters are impaired for nutrients.
Filter Course Layer		

	Siting and Design	Intent/Rationale
☐	A filter course is used to prevent migration of fines through layers of the facility. Filter fabric is not used.	Migration of media can cause clogging of the aggregate storage layer void spaces or subgrade and can result in poor water quality performance for turbidity and suspended solids. Filter fabric is more likely to clog.
☐	Filter course is washed and free of fines.	Washing aggregate will help eliminate fines that could clog the facility
☐	To reduce clogging potential, a two-layer filter course (aka choking stone system) is used consisting of one 3" layer of clean and washed ASTM 33 Fine Aggregate Sand overlying a 3" layer of ASTM No 8 Stone (Appendix F.5)	This specification has been developed to maintain permeability while limiting the migration of media material into the stone reservoir and underdrain system.
Aggregate Storage Layer		
☐	ASTM #57 open graded stone is used for the storage layer and a two layer filter course (detailed above) is used above this layer	This layer provides additional storage capacity. ASTM #8 stone provides an acceptable choking/bridging interface with the particles in ASTM #57 stone.
☐	Maximum aggregate storage layer depth below the underdrain invert is determined based on the infiltration storage volume that will infiltrate within a 36-hour drawdown time.	A maximum drawdown time is needed for vector control and to facilitate providing storm water storage for the next storm event.
Inflow, Underdrain, and Outflow Structures		
☐	Inflow, underdrains and outflow structures are accessible for inspection and maintenance.	Maintenance will prevent clogging and ensure proper operation of the flow control structures.
☐	Inflow velocities are limited to 3 ft/s or less or use energy dissipation methods. (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.
☐	Curb cut inlets are at least 12 inches wide, have a 4-6 inch reveal (drop) and an apron and energy dissipation as needed.	Inlets must not restrict flow and apron prevents blockage from vegetation as it grows in. Energy dissipation prevents erosion.
☐	Underdrain outlet elevation should be a minimum of 3 inches above the bottom elevation of the aggregate storage layer.	A minimal separation from subgrade or the liner lessens the risk of fines entering the underdrain and can improve hydraulic performance by allowing perforations to remain unblocked.
☐	Minimum underdrain diameter is 8 inches.	Smaller diameter underdrains are prone to clogging.

	Siting and Design	Intent/Rationale
☐	Underdrains should be affixed with an upturned elbow to an elevation at least 9 to 12 inches above the invert of the underdrain.	An upturned elbow reduces velocity in the underdrain pipe and can help reduce mobilization of sediments from the underdrain and media bed.
☐	Underdrains are made of slotted, PVC pipe conforming to ASTM D 3034 or equivalent or corrugated, HDPE pipe conforming to AASHTO 252M or equivalent.	Slotted underdrains provide greater intake capacity, clog resistant drainage, and reduced entrance velocity into the pipe, thereby reducing the chances of solids migration.
☐	An underdrain cleanout with a minimum 8-inch diameter and lockable cap is placed every 50 feet as required based on underdrain length.	Properly spaced cleanouts will facilitate underdrain maintenance.
☐	Overflow is safely conveyed to a downstream storm drain system or discharge point. Size overflow structure to pass 100-year peak flow for on-line infiltration basins and water quality peak flow for off-line basins.	Planning for overflow lessens the risk of property damage due to flooding.

Conceptual Design and Sizing Approach for Storm Water Pollutant Control Only

To design biofiltration with partial retention and an underdrain for storm water pollutant control only (no flow control required), the following steps should be taken:

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Calculate the DCV per Appendix B based on expected site design runoff for tributary areas.
3. Generalized sizing procedure is presented in Appendix B.5. The surface ponding should be verified to have a maximum 24-hour drawdown time. Surface ponding drawdown time greater than 24-hours but less than 96 hours may be allowed at the discretion of the City Engineer if certified by a landscape architect or agronomist.

Conceptual Design and Sizing Approach when Storm Water Flow Control is Applicable

Control of flow rates and/or durations will typically require significant surface ponding and/or aggregate storage volumes, and therefore the following steps should be taken prior to determination of storm water pollutant control design. Pre-development and allowable post-project flow rates and durations should be determined as discussed in Chapter 6 of the manual.

1. Verify that siting and design criteria have been met, including placement requirements, contributing tributary area, maximum side and finish grade slopes, and the recommended media surface area tributary ratio.
2. Iteratively determine the facility footprint area, surface ponding and/or aggregate storage layer depth required to provide detention and/or infiltration storage to reduce flow rates and durations to allowable limits. Flow rates and durations can be controlled from detention

E.11. INF-3 Permeable Pavement (Pollutant Control)


Location: Kellogg Park, San Diego, California

MS4 Permit Category

Retention
Flow-thru Treatment Control

Manual Category

Infiltration
Flow-thru Treatment Control

Applicable Performance Standard

Pollutant Control
Flow Control

Primary Benefits

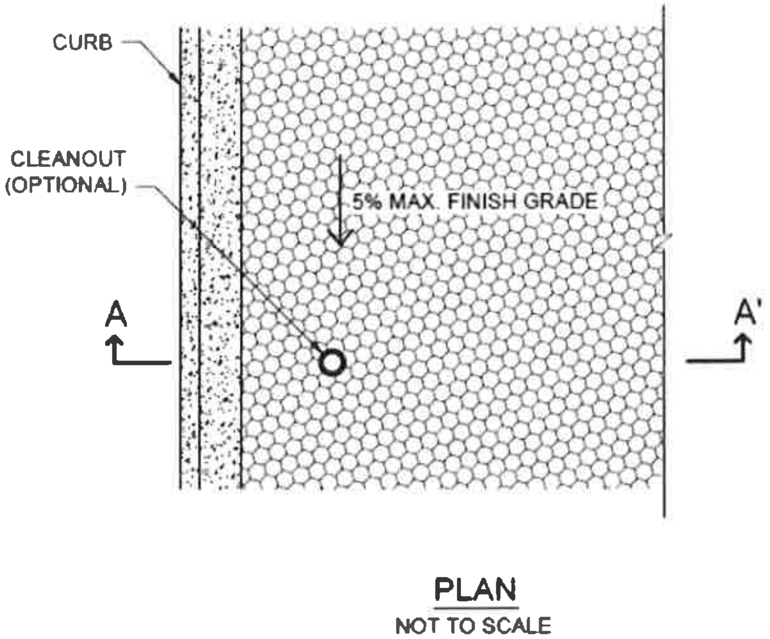
Volume Reduction
Peak Flow Attenuation

Description

Permeable pavement is pavement that allows for percolation through void spaces in the pavement surface into subsurface layers. The subsurface layers are designed to provide storage of storm water runoff so that outflows, primarily via infiltration into subgrade soils or release to the downstream conveyance system, can be at controlled rates. Varying levels of storm water treatment and flow control can be provided depending on the size of the permeable pavement system relative to its drainage area, the underlying infiltration rates, and the configuration of outflow controls. Pollutant control permeable pavement is designed to receive runoff from a larger tributary area than site design permeable pavement (see SD-6B). Pollutant control is provided via infiltration, filtration, sorption, sedimentation, and biodegradation processes. **Permeable pavements proposed as a retention or partial retention BMP should not have an impermeable liner**.

Typical permeable pavement components include, from top to bottom:

- Permeable surface layer
- Bedding layer for permeable surface
- Aggregate storage layer with optional underdrain(s)
- Optional final filter course layer over uncompacted existing subgrade



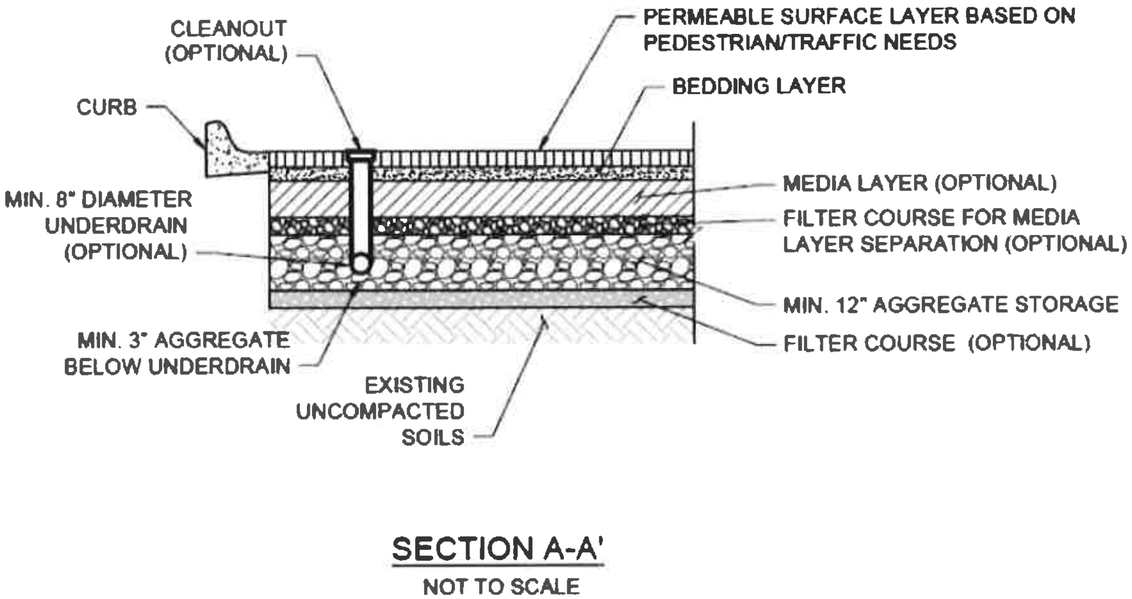


Figure E.11-E.11-1: Typical plan and Section view of a Permeable Pavement BMP

Subcategories of permeable pavement include modular paver units or paver blocks, pervious concrete, porous asphalt, and turf pavers. These subcategory variations differ in the material used for the permeable surface layer but have similar functions and characteristics below this layer.

Design Adaptations for Project Goals

Site design BMP to reduce impervious area and DCV. See site design option SD-6B.

Full infiltration BMP for storm water pollutant control. Permeable pavement without an underdrain and without impermeable liners can be used as a pollutant control BMP, designed to infiltrate runoff from direct rainfall as well as runoff from adjacent areas that are tributary to the pavement. The system must be designed with an infiltration storage volume (a function of the aggregate storage volume) equal to the full DCV and able to meet drawdown time limitations.

Partial infiltration BMP with flow-thru treatment for storm water pollutant control. Permeable pavement can be designed so that a portion of the DCV is infiltrated by providing an underdrain with infiltration storage below the underdrain invert. The infiltration storage depth should be determined by the volume that can be reliably infiltrated within drawdown time limitations. Water discharged through the underdrain is considered flow-thru treatment and is not considered biofiltration treatment. Storage provided above the underdrain invert is included in the flow-thru treatment volume.

Flow-thru treatment BMP for storm water pollutant control. The system may be lined and/or installed over impermeable native soils with an underdrain provided at the bottom to carry away filtered runoff. Water quality treatment is provided via unit treatment processes other than infiltration. This configuration is considered to provide flow-thru treatment, not biofiltration treatment. Significant aggregate storage provided above the underdrain invert can provide detention storage, which can be controlled via inclusion of an orifice in an outlet structure at the downstream end of the underdrain. **PDPs have the option to add saturated storage to the flow-thru configuration in order to reduce the DCV that the BMP is required to treat.** Saturated storage can be added to this design by including an upturned elbow installed at the downstream end of the underdrain or via an internal weir structure designed to maintain a specific water level elevation. The DCV can be reduced by the amount of saturated storage provided.

Integrated storm water flow control and pollutant control configuration. With any of the above configurations, the system can be designed to provide flow rate and duration control. This may include having a deeper aggregate storage layer that allows for significant detention storage above the underdrain, which can be further controlled via inclusion of an outlet structure at the downstream end of the underdrain.

Design Criteria and Considerations

Permeable pavements must meet the following design criteria. Deviations from the below criteria may be approved at the discretion of the City Engineer if it is determined to be appropriate:

	Siting and Design	Intent/Rationale
☐	Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities).	Must not negatively impact existing site geotechnical concerns.
☐	Selection must be based on infiltration feasibility criteria.	Full or partial infiltration designs must be supported by drainage area feasibility findings.

	Siting and Design	Intent/Rationale
☐	An impermeable liner or other hydraulic restriction layer is included if site constraints indicate that infiltration should not be allowed.	Lining prevents storm water from impacting groundwater and/or sensitive environmental or geotechnical features. Incidental infiltration, when allowable, can aid in pollutant removal and groundwater recharge.
☐	Permeable pavement is not placed in an area with significant overhanging trees or other vegetation.	Leaves and organic debris can clog the pavement surface.
☐	For pollutant control permeable pavement, the ratio of the total drainage area (including the permeable pavement) to the permeable pavement should not exceed 4:1.	Higher ratios increase the potential for clogging but may be acceptable for relatively clean tributary areas.
☐	Finish grade of the permeable pavement has a slope ≤ 5%.	Flatter surfaces facilitate increased runoff capture.
☐	Minimum depth to groundwater and bedrock ≥ 10 ft.	A minimum separation facilitates infiltration and lessens the risk of negative groundwater impacts.
☐	Contributing tributary area includes effective sediment source control and/or pretreatment measures such as raised curbed or grass filter strips.	Sediment can clog the pavement surface.
☐	Direct discharges to permeable pavement are only from downspouts carrying "clean" roof runoff that are equipped with filters to remove gross solids.	Roof runoff typically carries less sediment than runoff from other impervious surfaces and is less likely to clog the pavement surface.
Permeable Surface Layer		
☐	Permeable surface layer type is appropriately chosen based on pavement use and expected vehicular loading.	Pavement may wear more quickly if not durable for expected loads or frequencies.
☐	Permeable surface layer type is appropriate for expected pedestrian traffic.	Expected demographic and accessibility needs (e.g., adults, children, seniors, runners, high-heeled shoes, wheelchairs, strollers, bikes) requires selection of appropriate surface layer type that will not impede pedestrian needs.
Bedding Layer for Permeable Surface		

	Siting and Design	Intent/Rationale
☐	Bedding thickness and material is appropriate for the chosen permeable surface layer type.	Porous asphalt requires a 2- to 4-inch layer of asphalt and a 1- to 2-inch layer of choker course (single-sized crushed aggregate, one-half inch) to stabilize the surface. Pervious concrete also requires an aggregate course of clean gravel or crushed stone with a minimum amount of fines. Permeable Interlocking Concrete Paver requires 1 or 2 inches of sand or No. 8 aggregate to allow for leveling of the paver blocks. Similar to Permeable Interlocking Concrete Paver, plastic grid systems also require a 1- to 2-inch bedding course of either gravel or sand. For Permeable Interlocking Concrete Paver and plastic grid systems, if sand is used, a geotextile should be used between the sand course and the reservoir media to prevent the sand from migrating into the stone media.
☐	Aggregate used for bedding layer is washed prior to placement.	Washing aggregate will help eliminate fines that could clog the permeable pavement system aggregate storage layer void spaces or underdrain.
Media Layer (Optional) –used between bedding layer and aggregate storage layer to provide pollutant treatment control		
☐	The pollutant removal performance of the media layer is documented by the applicant.	Media used for BMP design should be shown via research or testing to be appropriate for expected pollutants of concern and flow rates.
☐	A filter course is provided to separate the media layer from the aggregate storage layer.	Migration of media can cause clogging of the aggregate storage layer void spaces or underdrain.
☐	If a filter course is used, calculations assessing suitability for particle migration prevention have been completed.	Gradation relationship between layers can evaluate factors (e.g., bridging, permeability, and uniformity) to determine if particle sizing is appropriate or if an intermediate layer is needed.
☐	Consult permeable pavement manufacturer to verify that media layer provides required structural support.	Media must not compromise the structural integrity or intended uses of the permeable pavement surface.
Aggregate Storage Layer		

	Siting and Design	Intent/Rationale
☐	Aggregate used for the aggregate storage layer is washed and free of fines.	Washing aggregate will help eliminate fines that could clog aggregate storage layer void spaces or underdrain.
☐	Minimum layer depth is 6 inches and for infiltration designs, the maximum depth is determined based on the infiltration storage volume that will infiltrate within a 36-hour drawdown time.	A minimum depth of aggregate provides structural stability for expected pavement loads.
Underdrain and Outflow Structures		
☐	Underdrains and outflow structures, if used, are accessible for inspection and maintenance.	Maintenance will improve the performance and extend the life of the permeable pavement system.
☐	Underdrain outlet elevation should be a minimum of 3 inches above the bottom elevation of the aggregate storage layer.	A minimal separation from subgrade or the liner lessens the risk of fines entering the underdrain and can improve hydraulic performance by allowing perforations to remain unblocked.
☐	Minimum underdrain diameter is 8 inches.	Smaller diameter underdrains are prone to clogging.
☐	Underdrains are made of slotted, PVC pipe conforming to ASTM D 3034 or equivalent or corrugated, HDPE pipe conforming to AASHTO 252M or equivalent.	Slotted underdrains provide greater intake capacity, clog resistant drainage, and reduced entrance velocity into the pipe, thereby reducing the chances of solids migration.
Filter Course (Optional)		
☐	Filter course is washed and free of fines.	Washing aggregate will help eliminate fines that could clog subgrade and impede infiltration.

Conceptual Design and Sizing Approach for Site Design

1. Determine the areas where permeable pavement can be used in the site design to replace traditional pavement to reduce the impervious area and DCV. These permeable pavement areas can be credited toward reducing runoff generated through representation in storm water calculations as pervious, not impervious, areas but are not credited for storm water pollutant control. These permeable pavement areas should be designed as self-retaining with the appropriate tributary area ratio identified in the design criteria.
2. Calculate the DCV per Appendix B, taking into account reduced runoff from self-retaining permeable pavement areas.

Conceptual Design and Sizing Approach for Storm Water Pollutant Control Only

To design permeable pavement for storm water pollutant control only (no flow control required), the following steps should be taken:

ATTACHMENT 2
BACKUP FOR PDP HYDROMODIFICATION CONTROL MEASURES

This is the cover sheet for Attachment 2.

☐ Mark this box if this attachment is empty because the project is exempt from PDP hydromodification management requirements.

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Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 2a	Hydromodification Management Exhibit (Required)	☐ Included See Hydromodification Management Exhibit Checklist.
Attachment 2b	Management of Critical Coarse Sediment Yield Areas (WMAA Exhibit is required, additional analyses are optional) See Section 6.2 of the BMP Design Manual.	☐ Exhibit showing project drainage boundaries marked on WMAA Critical Coarse Sediment Yield Area Map (Required) Optional analyses for Critical Coarse Sediment Yield Area Determination ☐ 6.2.1 Verification of Geomorphic Landscape Units Onsite ☐ 6.2.2 Downstream Systems Sensitivity to Coarse Sediment ☐ 6.2.3 Optional Additional Analysis of Potential Critical Coarse Sediment Yield Areas Onsite
Attachment 2c	Geomorphic Assessment of Receiving Channels (Optional) See Section 6.3.4 of the BMP Design Manual.	☐ Not Performed ☐ Included ☐ Submitted as separate stand-alone document
Attachment 2d	Flow Control Facility Design and Structural BMP Drawdown Calculations (Required) Overflow Design Summary for each structural BMP See Chapter 6 and Appendix G of the BMP Design Manual	☐ Included ☐ Submitted as separate stand-alone document
Attachment 2e	Vector Control Plan (Required when structural BMPs will not drain in 96 hours)	☐ Included ☐ Not required because BMPs will drain in less than 96 hours

Use this checklist to ensure the required information has been included on the Hydromodification Management Exhibit:

The Hydromodification Management Exhibit must identify:

☐ Underlying hydrologic soil group
☐ Approximate depth to groundwater
☐ Existing natural hydrologic features (watercourses, seeps, springs, wetlands)
☐ Critical coarse sediment yield areas to be protected
☐ Existing topography
☐ Existing and proposed site drainage network and connections to drainage offsite
☐ Proposed grading
☐ Proposed impervious features
☐ Proposed design features and surface treatments used to minimize imperviousness
☐ Point(s) of Compliance (POC) for Hydromodification Management
☐ Existing and proposed drainage boundary and drainage area to each POC (when necessary, create separate exhibits for pre-development and post-project conditions)
☐ Structural BMPs for hydromodification management (identify location, type of BMP, and size/detail)

TECHNICAL MEMORANDUM:

SWMM Modeling for Hydromodification Compliance of:

Baja Freight

Prepared For:

K&S Engineering

Prepared by:

Luis Parra, PhD, CPSWQ, ToR, D.WRE.
R.C.E. 66377

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TECHNICAL MEMORANDUM

TO: K&S Engineering

FROM: Luis Parra, PhD, PE, CPSWQ, ToR, D.WRE.

DATE: June 22, 2018

RE: Summary of SWMM Modeling for Hydromodification Compliance for Baja Freight, San Diego, CA.

INTRODUCTION

This memorandum summarizes the approach used to model the proposed commercial site in the City of Chula Vista using the Environmental Protection Agency (EPA) Storm Water Management Model 5.0 (SWMM). SWMM models were prepared for the pre and post-developed conditions at the site in order to determine if the proposed LID HMP bio-filtration facility has sufficient volume to meet Order R9-2013-001 requirements of the California Regional Water Quality Control Board San Diego Region (SDRWQCB), as explained in the Final Hydromodification Management Plan (HMP), dated March 2011, prepared for the County of San Diego by Brown and Caldwell.

SWMM MODEL DEVELOPMENT

The Baja Freight project site consists of a commercial development with associated hardscape and landscape of an existing site that currently serves as a Parking area for semi-trucks. Two (2) SWMM models were prepared for this study: the first for the pre-developed and the second for the post-developed conditions. The project site drains to one (1) Point of Compliance (POC) located in the Wruck Canyon at the north east end of the site.

The SWMM model was used because it is a non-proprietary model approved by the HMP document. For both SWMM models, flow duration curves were prepared to determine if the proposed HMP BMP is sufficient to meet the current HMP requirements.

The inputs required to develop SWMM models include rainfall, watershed characteristics, and BMP configurations. The Lower Otay Gage from the Project Clean Water website was used for this study since it is the most representative of the project site precipitation due to elevation and proximity to the project site.

Per the California Irrigation Management Information System "Reference Evaporation Zones" (CIMIS ETo Zone Map), the project site is located within the Zone 6 Evapotranspiration Area. Thus evapotranspiration vales for the site were modeled using Zone 6 average monthly values from Table G.1-1 from the 2016 BMP Design Manual. Per the NRCS web soil survey, the project site is situated upon Class D soils. Soils have been assumed to be compacted in the existing condition to represent the existing developed condition of the site, while fully compacted in the post developed conditions. Other SWMM inputs for the subareas are discussed in the appendices to this document, where the selection of parameters is explained in detail.

HMP MODELING

PRE DEVELOPED CONDITIONS

In current existing conditions, runoff from the currently mass graded site discharges via overland flow to the existing curb and existing grated inlet in the site and then discharges into the Wruck Canyon. Table 1 below illustrates the pre-developed area to be redeveloped and impervious percentage accordingly.

TABLE 1 – SUMMARY OF PRE-DEVELOPED CONDITIONS

POC	DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip(1)
POC-1	DMA-1-C	3.940	0%
TOTAL	--	**3.940**	--

Notes: (1) – Per the 2013 RWQCB permit, existing condition impervious surfaces are not to be accounted for in existing conditions analysis.

DEVELOPED CONDITIONS

The Baja Freight site proposes a commercial development of the existing site inclusive of hardscape and landscape. Runoff from the majority of the improvements is drained to one (1) bio-filtration basin with partial retention. Once flows are routed via the proposed BMP, flows are then discharged to MS4 system which drains to the POC. A few small areas of the improvement are unable to discharge to the HMP facility and will bypass the BMP, confluencing with flows at the aforementioned discharge location.

TABLE 2 – SUMMARY OF POST-DEVELOPED CONDITIONS

POC	DMA	Tributary Area, A (Ac)	Impervious Percentage, Ip
POC-1	DMA-1	3.763	85.05%
	DMA-2 (Pavers 1)	0.088	0.00%
	DMA-3 (Pavers 2)	0.049	0.00%
	Self Mitigating 1 (SM-1)	0.022	0.00%
	De Minimis 1 (DMA-4)	0.004	100.00%
	De Minimis 2 (DMA-5)	0.019	16.83%
TOTAL	--	**3.945**	N/A

One (1) LID biofiltration basin with partial retention is located within the project site and is responsible for handling hydromodification requirements for the project site. In developed conditions, the basin will have a surface depth of 2.0 feet and a riser spillway structure (see dimensions in Table 3). Flows will then discharge from the basin via a low flow orifice outlet within the gravel layer. The riser structure will act as a spillway such that peak flows can be safely discharged to the receiving storm drain system.

Beneath the basins' invert lies the proposed LID biofiltration portion of the drainage facility. This portion of the basin is comprised of a 3-inch layer of mulch, an 18-inch layer of amended soil (a highly sandy, organic rich composite with an infiltration capacity of at least 5 inches/hr) and a 30-inch layer of gravel for additional detention and to accommodate the French drain system (the French Drain will be set at an elevation 12-inches above the base of the gravel layer). These systems are to be located beneath the biofiltration layers to intercept treated storm water and convey these flows to a small diameter lower outlet orifice. Once flows have been routed by the outlet structure, flows are then drained to the receiving storm drain system.

Per the site specific geotechnical investigation and per Worksheet D.5-1 from the SWQMP (attached in Attachment 8 of this report) the design infiltration for the bio-filtration facility is 0.11 in/hr, as such the basin will be unlined.

The biofiltration basin was modeled using the biofiltration LID module within SWMM. The biofiltration module can model the underground gravel storage layer, underdrain with an orifice plate, amended soil layer, and a surface storage pond up to the elevation of the invert of the spillway. It should be noted that detailed outlet structure location and elevations will be shown on the construction plans based on the recommendations of this study.

Water Quality BMP Sizing

It is assumed all storm water quality requirements for the project will be met by the bio-filtration LID BMPs detailed in the SWQMP and other BMPs included within the site design. However, detailed water quality requirements are not discussed within this technical memo. For further information in regards to storm water quality requirements for the project (including sizing and drawdown) please refer to the site specific Storm Water Quality Management Plan (SWQMP).

BMP MODELING FOR HMP PURPOSES

Modeling of dual purpose Water Quality/HMP BMPs

One (1) HMP BMP bio-filtration basin is proposed for water quality treatment and hydromodification conformance for the project site. Tables 3 & 4 illustrate the dimensions required for HMP compliance according to the SWMM model that was undertaken for the project.

TABLE 3 – SUMMARY OF DEVELOPED DUAL PURPOSE BMP

BMP	Tributary Area (Ac)	DIMENSIONS					
		BMP Area(1) (ft^2)	Gravel Depth(2) (in)	Lower Orif. D (in)(3)	Depth Riser Invert (ft)(4)	Weir Perimeter Length(5) (ft)	Total Surface Depth(6) (ft)
BR-1	3.763	3790	30	1.625	1.50	8	2.0

Notes: (1): Area of amended soil equal to area of gravel

(2): Includes filter gravel layer, French Drain is set at an elevation of 12-inches above the base of the facility.

(3): Diameter of orifice in gravel layer with invert at bottom of layer; tied with hydromod min threshold ($0.1\cdot Q_2$).

(4): Depth of ponding beneath riser structure's surface spillway.

(5): Overflow length, the internal perimeter of the riser is 8 ft (2 ft x 2 ft internal dimensions).

(6): Total surface depth of BMP from top crest elevation to surface invert.

TABLE 4 – SUMMARY OF RISER STRUCTURE

BASIN	Lower Slot			Emergency Weir	
	Width (in)	Height (in)	Elev (ft)	Width (ft)	Elev (ft)
1	18	2	0.75	8	1.50

FLOW DURATION CURVE COMPARISON

The Flow Duration Curve (FDC) for the site was compared at the POC by exporting the hourly runoff time series results from SWMM to a spreadsheet.

Q_2 and Q_{10} were determined with a partial duration statistical analysis of the runoff time series in an Excel spreadsheet using the Cunnane plotting position method (which is the preferred plotting methodology in the HMP Permit). As the SWMM Model includes a statistical analysis based on the Weibull Plotting Position Method, the Weibull Method was also used within the spreadsheet to ensure that the results were similar to those obtained by the SWMM Model.

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals; the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period "i" were obtained (Q_i with i=3 to 9). For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate. FDC comparison at the POC is illustrated in Figure 1 in both normal and logarithmic scale. Attachment 5 provides a detailed drainage exhibit for the post-developed condition.

As can be seen in Figure 1, the FDC for the proposed condition with the HMP BMPs is within 110% of the curve for the existing condition in both peak flows and durations. The additional runoff volume generated from developing the site will be released to the existing point of discharge at a flow rate below the 10% Q_2 lower threshold for POC-1. Additionally, the project will also not increase peak flow rates between the Q_2 and the Q_{10}, as shown in the peak flow tables in Attachment 1.

Discussion of the Manning's coefficient (Pervious Areas) for Pre and Post-Development Conditions

Typically the Manning's coefficient is selected as n = 0.10 for pervious areas and n = 0.012 for impervious areas. Due to the complexity of the model carried out in pre and post-development conditions, a more accurate value of the Manning's coefficient for pervious areas has been chosen. Taking into consideration the "Handouts on Supplemental Guidance – Handout #2: Manning's "n" Values for Overland Flow Using EPA SWMM V.5" by the County of San Diego (Reference [6]) a more accurate value of n = 0.05 has been selected (see Table 1 of Reference [6] included in Attachment 7). An average n value between pasture and shrubs and bushes (which is also the value of dense grass) has been selected per the reference cited, for light rain (<0.8 in/hr) as more than 99% of the rainfall has been measured with this intensity.

Drawdown Calculations

According to SWQMP requirements the surface of the biofiltration basin must be emptied in less than 24 hours. Per the calculations done and shown on attachment 4, the surface of the biofiltration basin empties in 9.6 hours thus complying with SWQMP requirements.

SUMMARY

This study has demonstrated that the proposed HMP BMP provided for the Baja Freight site is sufficient to meet the current HMP criteria for the Point of Compliance (POC), if the cross-section area and volume recommended within this technical memorandum, and the respective orifice and outlet structure are incorporated as specified within the proposed project site.

KEY ASSUMPTIONS

1. Type D Soils is representative of the existing condition site.

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. FDC Plots (log and natural "x" scale) and Flow Duration Table.
3. List of the "n" largest Peaks: Pre-Development and Post-Development Conditions
4. Elevations vs. Discharge Curves to be used in SWMM & Drawdown Calculations
5. Pre & Post Development Maps, Project plan and section sketches
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. SWMM Screens and Explanation of Significant Variables
8. Geotechnical Documentation
9. Summary files from the SWMM Model

REFERENCES

[1] – *"Review and Analysis of San Diego County Hydromodification Management Plan (HMP): Assumptions, Criteria, Methods, & Modeling Tools – Prepared for the Cities of San Marcos, Oceanside & Vista"*, May 2012, TRW Engineering.

[2] – *"Final Hydromodification Management Plan (HMP) prepared for the County of San Diego"*, March 2011, Brown and Caldwell.

[3] - Order R9-20013-001, California Regional Water Quality Control Board San Diego Region (SDRWQCB).

[4] – *"Handbook of Hydrology"*, David R. Maidment, Editor in Chief. 1992, McGraw Hill.

[5] – *"City of San Diego BMP Design Manual"*, February 2016.

[6] – *"Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region"*, 2016, TRW Engineering.

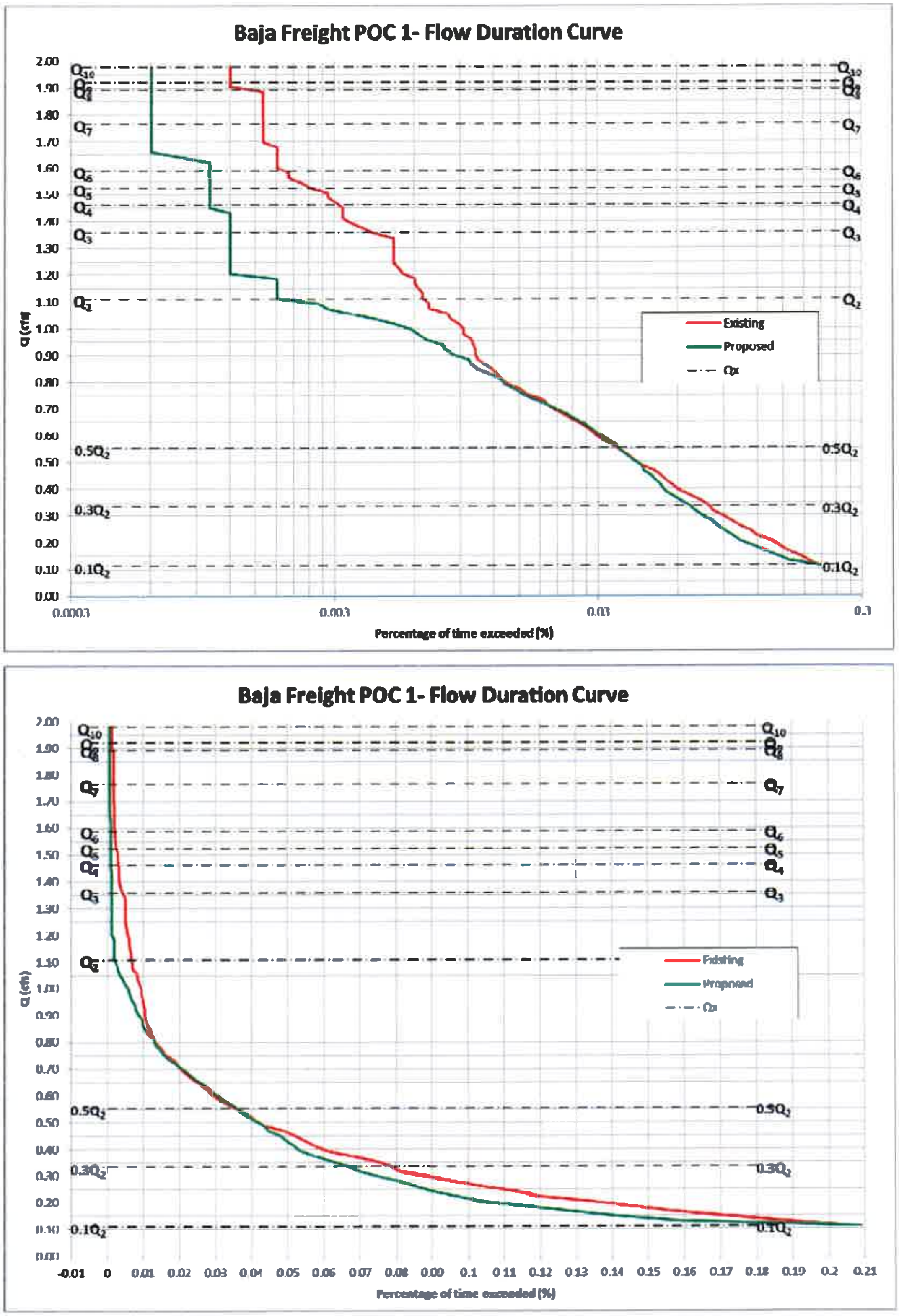


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal "x" scale)

ATTACHMENT 1.

Q_2 to Q_{10} Comparison Table – POC 1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
2-year	1.109	0.834	0.275
3-year	1.361	0.957	0.404
4-year	1.463	1.059	0.405
5-year	1.524	1.099	0.424
6-year	1.590	1.115	0.475
7-year	1.765	1.188	0.577
8-year	1.893	1.190	0.703
9-year	1.921	1.245	0.676
10-year	1.979	1.409	0.570

ATTACHMENT 2

FLOW DURATION CURVE ANALYSIS

1) Flow duration curve shall not exceed the existing conditions by more than 10%, neither in peak flow nor duration.

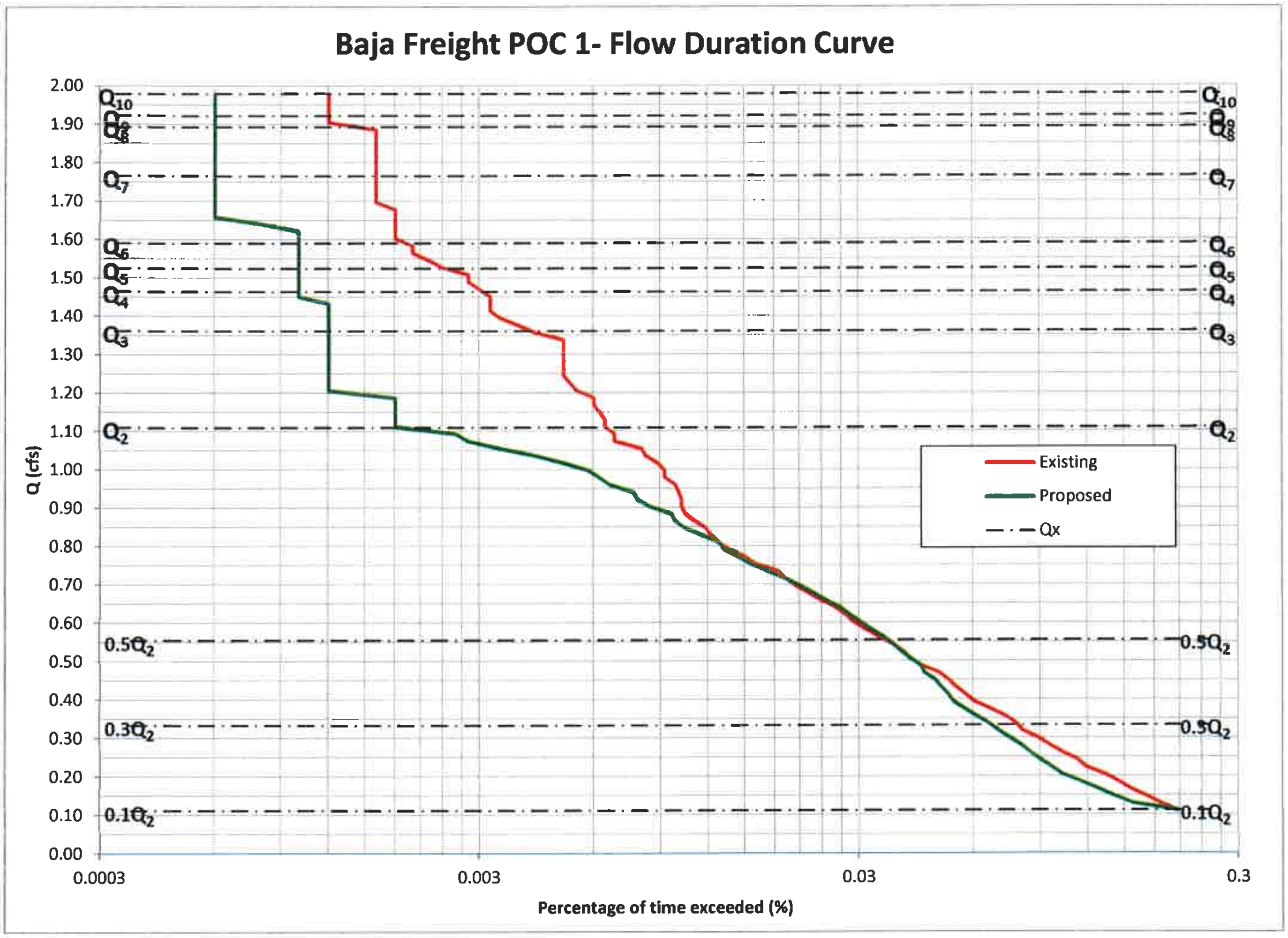
The figures on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration curve table following the curve shows that if the interval $0.10Q_2 - Q_{10}$ is divided in 100 sub-intervals, then a) the post development divided by pre-development durations are never larger than 110% (the permit allows up to 110%); and b) there are no more than 10 intervals in the range 101%-110% which would imply an excess over 10% of the length of the curve (the permit allows less than 10% of excesses measured as 101-110%).

Consequently, the design passes the hydromodification test.

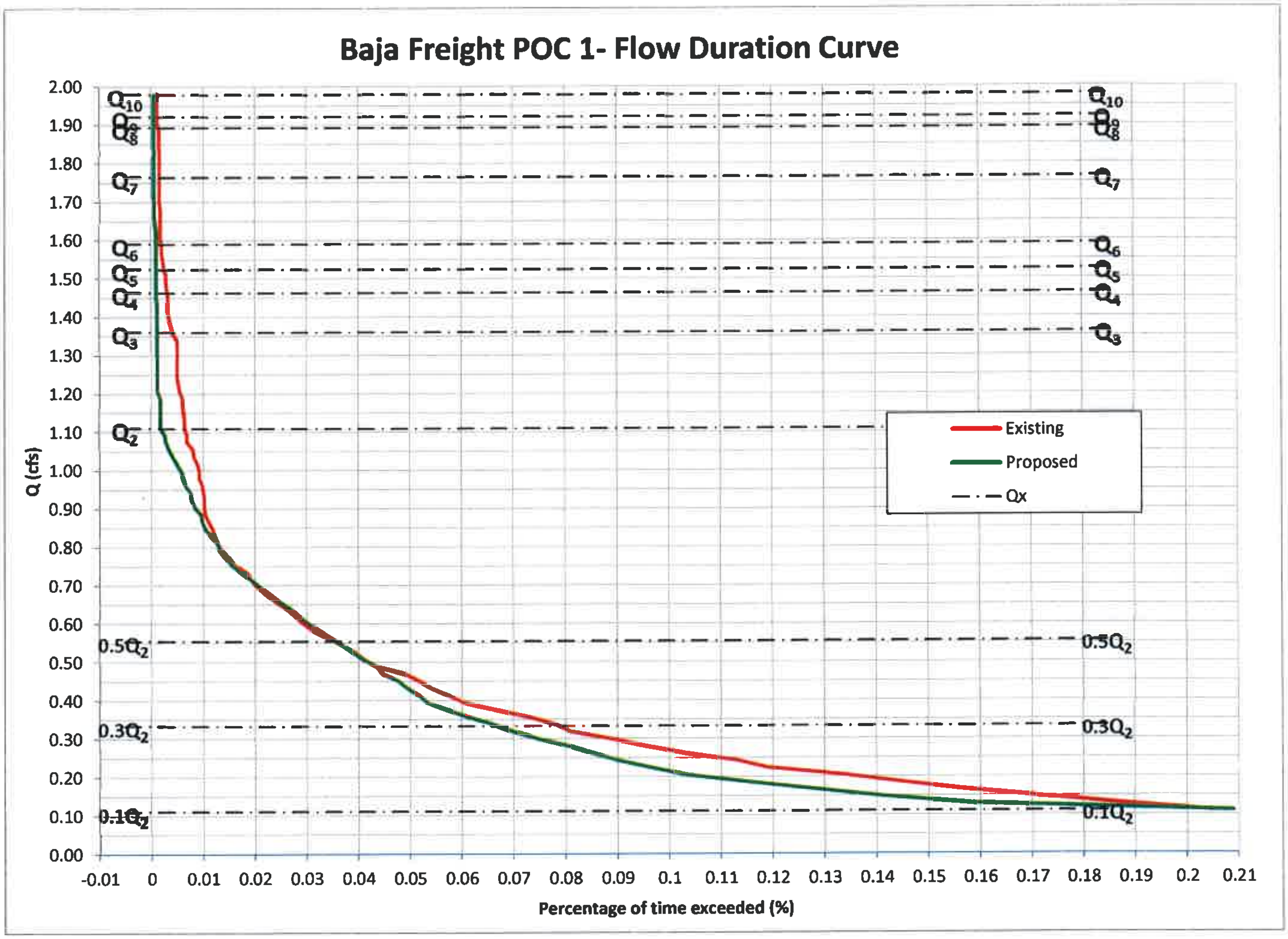
It is important to note that the flow duration curve can be expressed in the "x" axis as percentage of time, hours per year, total number of hours, or any other similar time variable. As those variables only differ by a multiplying constant, their plot in logarithmic scale is going to look exactly the same, and compliance can be observed regardless of the variable selected. However, in order to satisfy the City of Otay HMP example, % of time exceeded is the variable of choice in the flow duration curve. The selection of a logarithmic scale in lieu of the normal scale is preferred, as differences between the pre-development and post-development curves can be seen more clearly in the entire range of analysis. Both graphics are presented just to prove the difference.

In terms of the "y" axis, the peak flow value is the variable of choice. As an additional analysis performed by REC, not only the range of analysis is clearly depicted (10% of Q_2 to Q_{10}) but also all intermediate flows are shown (Q_2, Q_3, Q_4, Q_5, Q_6, Q_7, Q_8 and Q_9) in order to demonstrate compliance at any range $Q_x - Q_{x+1}$. It must be pointed out that one of the limitations of both the SWMM and SDHM models is that the intermediate analysis is not performed (to obtain Q_i from i = 2 to 10). REC performed the analysis using the Cunnane Plotting position Method (the preferred method in the HMP permit) from the "n" largest independent peak flows obtained from the continuous time series.

The largest "n" peak flows are attached in this appendix, as well as the values of Q_i with a return period "i", from i=2 to 10. The Q_i values are also added into the flow-duration plot.



Baja Freight POC 1- Flow Duration Curve


Baja Freight POC 1- Flow Duration Curve
Q (cfs)
2.00
1.90
1.80
1.70
1.60
1.50
1.40
1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
-0.01
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
0.11
0.12
0.13
0.14
0.15
0.16
0.17
0.18
0.19
0.2
0.21
Percentage of time exceeded (%)
Q10
Q9
Q8
Q7
Q6
Q5
Q4
Q3
Q2
0.5Q2
0.3Q2
0.1Q2
Existing
Proposed
Qx

Flow Duration Curve Data for Baja Freight, City of San Diego CA

Q2 = 1.11 cfs Fraction 10 %
Q10 = 1.98 cfs
Step = 0.0189 cfs
Count = 496008 hours
56.58 years

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
1	0.111	1018	2.05E-01	1037	2.09E-01	102%	Pass
2	0.130	928	1.87E-01	788	1.59E-01	85%	Pass
3	0.149	849	1.71E-01	702	1.42E-01	83%	Pass
4	0.167	774	1.56E-01	637	1.28E-01	82%	Pass
5	0.186	716	1.44E-01	573	1.16E-01	80%	Pass
6	0.205	661	1.33E-01	513	1.03E-01	78%	Pass
7	0.224	590	1.19E-01	480	9.68E-02	81%	Pass
8	0.243	561	1.13E-01	448	9.03E-02	80%	Pass
9	0.262	512	1.03E-01	423	8.53E-02	83%	Pass
10	0.281	473	9.54E-02	400	8.06E-02	85%	Pass
11	0.300	441	8.89E-02	372	7.50E-02	84%	Pass
12	0.318	402	8.10E-02	348	7.02E-02	87%	Pass
13	0.337	387	7.80E-02	328	6.61E-02	85%	Pass
14	0.356	363	7.32E-02	305	6.15E-02	84%	Pass
15	0.375	331	6.67E-02	284	5.73E-02	86%	Pass
16	0.394	300	6.05E-02	265	5.34E-02	88%	Pass
17	0.413	285	5.75E-02	257	5.18E-02	90%	Pass
18	0.432	269	5.42E-02	246	4.96E-02	91%	Pass
19	0.450	257	5.18E-02	237	4.78E-02	92%	Pass
20	0.469	243	4.90E-02	222	4.48E-02	91%	Pass
21	0.488	217	4.37E-02	217	4.37E-02	100%	Pass
22	0.507	204	4.11E-02	203	4.09E-02	100%	Pass
23	0.526	195	3.93E-02	193	3.89E-02	99%	Pass
24	0.545	182	3.67E-02	183	3.69E-02	101%	Pass
25	0.564	168	3.39E-02	173	3.49E-02	103%	Pass
26	0.583	155	3.12E-02	161	3.25E-02	104%	Pass
27	0.601	145	2.92E-02	151	3.04E-02	104%	Pass
28	0.620	138	2.78E-02	142	2.86E-02	103%	Pass
29	0.639	130	2.62E-02	134	2.70E-02	103%	Pass
30	0.658	119	2.40E-02	123	2.48E-02	103%	Pass
31	0.677	110	2.22E-02	114	2.30E-02	104%	Pass
32	0.696	102	2.06E-02	105	2.12E-02	103%	Pass
33	0.715	96	1.94E-02	96	1.94E-02	100%	Pass
34	0.733	92	1.85E-02	86	1.73E-02	93%	Pass
35	0.752	80	1.61E-02	78	1.57E-02	98%	Pass
36	0.771	75	1.51E-02	72	1.45E-02	96%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
37	0.790	68	1.37E-02	66	1.33E-02	97%	Pass
38	0.809	64	1.29E-02	64	1.29E-02	100%	Pass
39	0.828	61	1.23E-02	58	1.17E-02	95%	Pass
40	0.847	59	1.19E-02	52	1.05E-02	88%	Pass
41	0.866	55	1.11E-02	49	9.88E-03	89%	Pass
42	0.884	52	1.05E-02	48	9.68E-03	92%	Pass
43	0.903	51	1.03E-02	42	8.47E-03	82%	Pass
44	0.922	51	1.03E-02	39	7.86E-03	76%	Pass
45	0.941	50	1.01E-02	38	7.66E-03	76%	Pass
46	0.960	49	9.88E-03	33	6.65E-03	67%	Pass
47	0.979	46	9.27E-03	31	6.25E-03	67%	Pass
48	0.998	46	9.27E-03	29	5.85E-03	63%	Pass
49	1.016	44	8.87E-03	25	5.04E-03	57%	Pass
50	1.035	41	8.27E-03	21	4.23E-03	51%	Pass
51	1.054	40	8.06E-03	17	3.43E-03	43%	Pass
52	1.073	34	6.85E-03	14	2.82E-03	41%	Pass
53	1.092	34	6.85E-03	13	2.62E-03	38%	Pass
54	1.111	32	6.45E-03	9	1.81E-03	28%	Pass
55	1.130	32	6.45E-03	9	1.81E-03	28%	Pass
56	1.149	31	6.25E-03	9	1.81E-03	29%	Pass
57	1.167	30	6.05E-03	9	1.81E-03	30%	Pass
58	1.186	30	6.05E-03	9	1.81E-03	30%	Pass
59	1.205	27	5.44E-03	6	1.21E-03	22%	Pass
60	1.224	26	5.24E-03	6	1.21E-03	23%	Pass
61	1.243	25	5.04E-03	6	1.21E-03	24%	Pass
62	1.262	25	5.04E-03	6	1.21E-03	24%	Pass
63	1.281	25	5.04E-03	6	1.21E-03	24%	Pass
64	1.299	25	5.04E-03	6	1.21E-03	24%	Pass
65	1.318	25	5.04E-03	6	1.21E-03	24%	Pass
66	1.337	25	5.04E-03	6	1.21E-03	24%	Pass
67	1.356	21	4.23E-03	6	1.21E-03	29%	Pass
68	1.375	19	3.83E-03	6	1.21E-03	32%	Pass
69	1.394	17	3.43E-03	6	1.21E-03	35%	Pass
70	1.413	16	3.23E-03	6	1.21E-03	38%	Pass
71	1.432	16	3.23E-03	6	1.21E-03	38%	Pass
72	1.450	16	3.23E-03	5	1.01E-03	31%	Pass
73	1.469	15	3.02E-03	5	1.01E-03	33%	Pass
74	1.488	14	2.82E-03	5	1.01E-03	36%	Pass
75	1.507	14	2.82E-03	5	1.01E-03	36%	Pass
76	1.526	12	2.42E-03	5	1.01E-03	42%	Pass
77	1.545	11	2.22E-03	5	1.01E-03	45%	Pass
78	1.564	10	2.02E-03	5	1.01E-03	50%	Pass
79	1.582	10	2.02E-03	5	1.01E-03	50%	Pass
80	1.601	9	1.81E-03	5	1.01E-03	56%	Pass
81	1.620	9	1.81E-03	5	1.01E-03	56%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
82	1.639	9	1.81E-03	4	8.06E-04	44%	Pass
83	1.658	9	1.81E-03	3	6.05E-04	33%	Pass
84	1.677	9	1.81E-03	3	6.05E-04	33%	Pass
85	1.696	8	1.61E-03	3	6.05E-04	38%	Pass
86	1.715	8	1.61E-03	3	6.05E-04	38%	Pass
87	1.733	8	1.61E-03	3	6.05E-04	38%	Pass
88	1.752	8	1.61E-03	3	6.05E-04	38%	Pass
89	1.771	8	1.61E-03	3	6.05E-04	38%	Pass
90	1.790	8	1.61E-03	3	6.05E-04	38%	Pass
91	1.809	8	1.61E-03	3	6.05E-04	38%	Pass
92	1.828	8	1.61E-03	3	6.05E-04	38%	Pass
93	1.847	8	1.61E-03	3	6.05E-04	38%	Pass
94	1.865	8	1.61E-03	3	6.05E-04	38%	Pass
95	1.884	8	1.61E-03	3	6.05E-04	38%	Pass
96	1.903	6	1.21E-03	3	6.05E-04	50%	Pass
97	1.922	6	1.21E-03	3	6.05E-04	50%	Pass
98	1.941	6	1.21E-03	3	6.05E-04	50%	Pass
99	1.960	6	1.21E-03	3	6.05E-04	50%	Pass
100	1.979	6	1.21E-03	3	6.05E-04	50%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period (years)	Pre-dev. Q (cfs)	Post-Dev. Q (cfs)	Reduction (cfs)
10	1.979	1.409	0.570
9	1.921	1.245	0.676
8	1.893	1.190	0.703
7	1.765	1.188	0.577
6	1.590	1.115	0.475
5	1.524	1.099	0.424
4	1.463	1.059	0.405
3	1.361	0.957	0.404
2	1.109	0.834	0.275

ATTACHMENT 3

List of the “n” Largest Peaks: Pre & Post-Developed Conditions

Basic Probabilistic Equation:

R = 1/P R: Return period (years).

P: Probability of a flow to be equaled or exceeded any given year (dimensionless).

Cunnane Equation:

$$P = \frac{i-0.4}{n+0.2}$$

Weibull Equation:

$$P = \frac{i}{n+1}$$

i: Position of the peak whose probability is desired (sorted from large to small)

n: number of years analyzed.

Explanation of Variables for the Tables in this Attachment

Peak: Refers to the peak flow at the date given, taken from the continuous simulation hourly results of the n year analyzed.

Posit: If all peaks are sorted from large to small, the position of the peak in a sorting analysis is included under the variable Posit.

Date: Date of the occurrence of the peak at the outlet from the continuous simulation

Note: all peaks are not annual maxima; instead they are defined as event maxima, with a threshold to separate peaks of at least 12 hours. In other words, any peak P in a time series is defined as a value where dP/dt = 0, and the peak is the largest value in 25 hours (12 hours before, the hour of occurrence and 12 hours after the occurrence, so it is in essence a daily peak).

List of Peak events and Determination of Q2 and Q10 (Pre-Development)

Baja Freight - POC 1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**1.98**	**2.01**
9	**1.92**	**1.95**
8	**1.89**	**1.90**
7	**1.76**	**1.82**
6	**1.59**	**1.62**
5	**1.52**	**1.53**
4	**1.46**	**1.47**
3	**1.36**	**1.36**
2	**1.11**	**1.11**

Note:
Cunnane is the preferred
method by the HMP permit.

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
0.748	2/15/1992	57	1.02	1.01
0.749	1/11/2001	56	1.04	1.03
0.761	3/20/1991	55	1.05	1.05
0.762	11/28/1970	54	1.07	1.07
0.783	3/8/1968	53	1.09	1.09
0.788	1/31/1979	52	1.12	1.11
0.796	1/3/1977	51	1.14	1.13
0.801	12/28/1977	50	1.16	1.15
0.836	1/13/1997	49	1.18	1.18
0.854	12/20/1997	48	1.21	1.20
0.86	11/15/1965	47	1.23	1.23
0.868	11/23/1965	46	1.26	1.25
0.878	3/5/1970	45	1.29	1.28
0.884	10/20/2004	44	1.32	1.31
0.886	12/28/1984	43	1.35	1.34
0.939	1/29/1980	42	1.38	1.38
0.945	11/21/1967	41	1.41	1.41
0.968	1/17/1978	40	1.45	1.44
0.977	2/8/1976	39	1.49	1.48
1.002	3/1/1991	38	1.53	1.52
1.018	2/6/1976	37	1.57	1.56
1.019	12/7/1992	36	1.61	1.61
1.025	10/27/2004	35	1.66	1.65
1.058	1/18/1952	34	1.71	1.70
1.063	3/1/1970	33	1.76	1.75
1.066	1/18/1955	32	1.81	1.81
1.071	3/22/1954	31	1.87	1.87
1.072	1/14/1969	30	1.93	1.93
1.109	3/24/1983	29	2.00	2.00
1.142	1/7/1993	28	2.07	2.07
1.192	3/1/1983	27	2.15	2.15
1.199	2/16/1959	26	2.23	2.23
1.216	2/16/1998	25	2.32	2.33
1.24	3/27/1971	24	2.42	2.42
1.339	12/30/1951	23	2.52	2.53
1.341	1/4/1995	22	2.64	2.65
1.351	2/23/2005	21	2.76	2.78
1.359	3/2/1983	20	2.90	2.92
1.362	2/15/1986	19	3.05	3.08
1.387	11/25/1985	18	3.22	3.25
1.39	2/6/1992	17	3.41	3.45
1.404	3/4/1978	16	3.63	3.67
1.455	1/29/1983	15	3.87	3.92
1.484	2/23/1998	14	4.14	4.21
1.512	11/22/1996	13	4.46	4.54
1.518	12/21/1970	12	4.83	4.93
1.557	11/12/1976	11	5.27	5.40
1.584	3/1/1978	10	5.80	5.96
1.684	1/3/2005	9	6.44	6.65
1.886	10/19/1972	8	7.25	7.53
1.902	2/22/2004	7	8.29	8.67
1.991	2/2/1988	6	9.67	10.21
2.092	10/14/2006	5	11.60	12.43
2.154	10/30/1998	4	14.50	15.89
2.295	2/2/1998	3	19.33	22.00
2.435	2/7/1998	2	29.00	35.75
2.577	2/13/1998	1	58.00	95.33

List of Peak events and Determination of Q2 and Q10 (Post-Development)

Baja Freight - POC 1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**1.41**	**1.48**
9	**1.25**	**1.32**
8	**1.19**	**1.19**
7	**1.19**	**1.19**
6	**1.11**	**1.13**
5	**1.10**	**1.10**
4	**1.06**	**1.06**
3	**0.96**	**0.96**
2	**0.83**	**0.83**

Note:
Cunnane is the preferred
method by the HMP permit.

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
0.624	3/17/1982	57	1.02	1.01
0.643	1/8/1993	56	1.04	1.03
0.643	2/19/2007	55	1.05	1.05
0.644	3/5/1995	54	1.07	1.07
0.646	3/24/1964	53	1.09	1.09
0.657	12/6/1966	52	1.12	1.11
0.668	10/19/2004	51	1.14	1.13
0.673	2/16/1998	50	1.16	1.15
0.693	1/23/1967	49	1.18	1.18
0.693	12/21/1970	48	1.21	1.20
0.697	3/8/1968	47	1.23	1.23
0.697	1/15/1978	46	1.26	1.25
0.703	1/7/1957	45	1.29	1.28
0.703	10/19/1972	44	1.32	1.31
0.713	10/20/2004	43	1.35	1.34
0.721	3/27/1971	42	1.38	1.38
0.724	2/28/1970	41	1.41	1.41
0.731	12/7/1992	40	1.45	1.44
0.737	2/8/1976	39	1.49	1.48
0.762	1/18/1952	38	1.53	1.52
0.765	3/1/1983	37	1.57	1.56
0.773	3/4/1978	36	1.61	1.61
0.776	2/16/1959	35	1.66	1.65
0.778	1/29/1983	34	1.71	1.70
0.781	3/1/1970	33	1.76	1.75
0.784	2/6/1976	32	1.81	1.81
0.789	10/27/2004	31	1.87	1.87
0.824	1/13/1997	30	1.93	1.93
0.834	2/14/1995	29	2.00	2.00
0.836	12/28/1984	28	2.07	2.07
0.838	1/3/2005	27	2.15	2.15
0.84	11/23/1965	26	2.23	2.23
0.846	1/18/1955	25	2.32	2.33
0.862	1/29/1980	24	2.42	2.42
0.887	1/7/1993	23	2.52	2.53
0.902	2/23/1998	22	2.64	2.65
0.946	11/15/1965	21	2.76	2.78
0.946	2/23/2005	20	2.90	2.92
0.967	2/15/1986	19	3.05	3.08
0.993	3/1/1991	18	3.22	3.25
0.998	1/14/1969	17	3.41	3.45
1.028	3/22/1954	16	3.63	3.67
1.054	3/1/1978	15	3.87	3.92
1.07	11/25/1985	14	4.14	4.21
1.09	2/22/2004	13	4.46	4.54
1.098	2/6/1992	12	4.83	4.93
1.107	2/2/1988	11	5.27	5.40
1.11	3/2/1983	10	5.80	5.96
1.187	1/4/1995	9	6.44	6.65
1.189	10/30/1998	8	7.25	7.53
1.191	11/22/1996	7	8.29	8.67
1.444	12/30/1951	6	9.67	10.21
1.627	11/12/1976	5	11.60	12.43
1.64	2/2/1998	4	14.50	15.89
2.08	2/7/1998	3	19.33	22.00
2.316	10/14/2006	2	29.00	35.75
2.437	2/13/1998	1	58.00	95.33

ATTACHMENT 4

AREA VS ELEVATION

The storage provided by the LID BMP is entered into the LID Module within SWMM – please refer to Attachment 7 for further information. For verification, a stage storage relationship for the facilities is provided on the following pages.

DISCHARGE VS ELEVATION

The orifices have been selected to maximize their size while still restricting flows to conform with the required 10% of the Q2 event flow as mandated in the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011. While REC acknowledges that these orifices are small, to increase the size of these outlets would impact the basin's ability to restrict flows beneath the HMP thresholds, thus preventing the BMP from conformance with HMP requirements.

In order to further reduce the risk of blockage of the orifices, regular maintenance of the riser and orifices must be performed to ensure potential blockages are minimized. A detail of the orifice and riser structure is provided in Attachment 5 of this memorandum.

The LID low flow orifice discharge relationship is addressed within the LID Module within SWMM – please refer to Attachment 7 for further information.

DRAWDOWN CALCULATIONS

Surface drawdown calculations are provided on the following pages for reference and proof of draining within 24 hours. It is assumed the basin is full to the crest and discharges occur thru all available outlets as well as by infiltration.

DISCHARGE EQUATIONS

1) Weir:

$$Q_W = C_W \cdot L \cdot H^{3/2} \tag{1}$$

2) Slot:

As an orifice: $$Q_s = B_s \cdot h_s \cdot c_g \cdot \sqrt{2g\left(H - \frac{h_s}{2}\right)} \tag{2.a}$$

As a weir: $$Q_s = C_W \cdot B_s \cdot H^{3/2} \tag{2.b}$$

For H > h_s slot works as weir until orifice equation provides a smaller discharge. The elevation such that equation (2.a) = equation (2.b) is the elevation at which the behavior changes from weir to orifice.

3) Vertical Orifices

As an orifice: $$Q_o = 0.25 \cdot \pi D^2 \cdot c_g \cdot \sqrt{2g\left(H - \frac{D}{2}\right)} \tag{3.a}$$

As a weir: Critical depth and geometric family of circular sector must be solved to determined Q as a function of H:

$$\frac{Q_O^2}{g} = \frac{A_{cr}^3}{T_{cr}}; \quad H = y_{cr} + \frac{A_{cr}}{2 \cdot T_{cr}}; \quad T_{cr} = 2\sqrt{y_{cr}(D - y_{cr})}; \quad A_{cr} = \frac{D^2}{8}[\alpha_{cr} - sin(\alpha_{cr})];$$

$$y_{cr} = \frac{D}{2}[1 - sin(0.5 \cdot \alpha_{cr})]$$ (3.b.1, 3.b.2, 3.b.3, 3.b.4 and 3.b.5)

There is a value of H (approximately H = 110% D) from which orifices no longer work as weirs as critical depth is not possible at the entrance of the orifice. This value of H is obtained equaling the discharge using critical equations and equations (3.b).

A mathematical model is prepared with the previous equations depending on the type o discharge.

The following are the variables used above:

Q_W, Q_s, Q_O = Discharge of weir, slot or orifice (cfs)

C_W, c_g : Coefficients of discharge of weir (typically 3.1) and orifice (0.61 to 0.62)

L, B_s, D, h_s : Length of weir, width of slot, diameter of orifice and height of slot, respectively; (ft)

H: Level of water in the pond over the invert of slot, weir or orifice (ft)

A_{cr}, T_{cr}, y_{cr}, α_{cr}: Critical variables for circular sector: area (sq-ft), top width (ft), critical depth (ft), and angle to the center, respectively.

Stage-Area for Biofiltration 1 (Basin1)

Elevation (ft)	Area (ft^2)	Volume (ft^3)		
0.00	3790	0	Bottom of 3" layer of mulch (1)	**BIOFILTRATION (2)**
0.08	3856	127		
0.17	3922	257		
0.25	3988	389		
0.33	4055	724		
0.42	4123	1065		
0.50	4190	1411		
0.58	4258	1763		
0.67	4327	2121		
0.75	4396	2484	**Surface Outlet (3)**	
0.83	4465	2854		
0.92	4535	3229		
1.00	4605	3609		
1.08	4675	3996		
1.17	4746	4389		
1.25	4818	4787		
1.33	4889	5192		
1.42	4961	5602		
1.50	5034	6019	**Emergency Weir (4)**	
1.58	5107	6441		
1.67	5180	6870		
1.75	5254	7304		
1.83	5328	7745		
1.92	5402	8192		
2.00	5477	8646		

SUB SURFACE STORAGE BASIN 1

Elevation (ft)	Area (ft^2)	Volume (ft^3)	
-1.50	3790	1706	**Amended Soil Base (0.3 voids)**
-4.00	3790	3790	**Gravel Base (0.4 voids) (5)**

Gravel & Amended Soil	**TOTAL =**	5496	(ft^3)
Surface Total	**TOTAL =**	2484	(ft^3)
IMP	**TOTAL =**	**7980**	**(ft^3)**

Effective Depth(6):	7.87 in

(1): The three inches of mulch begin here, they have a porosity of 0.4 voids.

(2): The area at this surface elevation corresponds to the area of gravel and amended soil (Bio-retention layer)

(3): Volume at this elevation coresponds with surface volume for WQ purposes (invert of lowest surface outlet)

(4): This elevation corresponds to the top of the riser elevation.

(5): The gravel depth includes 6 inches of infiltration storage below the LID orifice.

(6): Depth to be used in the SWMM LID Controls. See Attachment 7 for more details.

Outlet structure for Discharge of Basin 1

Discharge vs Elevation Table

Low orifice	0.750 "	Lower slot		Lower Weir	
Number of orif:	0	Number of slots:	1	Number of weirs:	0
Cg-low:	0.62	Invert:	0.00 ft	Invert:	0.00
		B	1.500 ft	B:	0.00
Middle orifice	1 "	h_{slot}	0.167 ft		
Number of orif:	0				
Cg-middle:	0.62	Upper slot		Emergency weir	
invert elev:	0.000 ft	Number of slots:	0	Invert:	0.750 ft
		Invert:	0.00 ft	W:	8.00 ft
		B:	0.00 ft		
		h_{slot}	0.000 ft		

*Note: h = head above the invert of the lowest surface discharge opening. In this case h = 0 ft refers to 0.5' from the top of the mulch layer.

h* (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qweir (cfs)	Qemerg (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.042	0.667	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.040
0.083	1.333	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.112	0.000	0.000	0.000	0.112
0.125	2.000	1.500	0.000	0.000	0.000	0.000	0.000	0.000	0.206	0.000	0.000	0.000	0.206
0.167	2.667	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.316	0.000	0.000	0.000	0.316
0.208	3.333	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.433	0.000	0.000	0.000	0.433
0.250	4.000	3.000	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.500
0.292	4.667	3.500	0.000	0.000	0.000	0.000	0.000	0.000	0.559	0.000	0.000	0.000	0.559
0.333	5.333	4.000	0.000	0.000	0.000	0.000	0.000	0.000	0.612	0.000	0.000	0.000	0.612
0.375	6.000	4.500	0.000	0.000	0.000	0.000	0.000	0.000	0.661	0.000	0.000	0.000	0.661
0.417	6.667	5.000	0.000	0.000	0.000	0.000	0.000	0.000	0.707	0.000	0.000	0.000	0.707
0.458	7.333	5.500	0.000	0.000	0.000	0.000	0.000	0.000	0.749	0.000	0.000	0.000	0.749
0.500	8.000	6.000	0.000	0.000	0.000	0.000	0.000	0.000	0.790	0.000	0.000	0.000	0.790
0.542	8.667	6.500	0.000	0.000	0.000	0.000	0.000	0.000	0.829	0.000	0.000	0.000	0.829
0.583	9.333	7.000	0.000	0.000	0.000	0.000	0.000	0.000	0.865	0.000	0.000	0.000	0.865
0.625	10.000	7.500	0.000	0.000	0.000	0.000	0.000	0.000	0.901	0.000	0.000	0.000	0.901
0.667	10.667	8.000	0.000	0.000	0.000	0.000	0.000	0.000	0.935	0.000	0.000	0.000	0.935
0.708	11.333	8.500	0.000	0.000	0.000	0.000	0.000	0.000	0.968	0.000	0.000	0.000	0.968
0.750	12.000	9.000	0.000	0.000	0.000	0.000	0.000	0.000	0.999	0.000	0.000	0.000	0.999
0.792	12.667	9.500	0.000	0.000	0.000	0.000	0.000	0.000	1.030	0.000	0.000	0.211	1.241
0.833	13.333	10.000	0.000	0.000	0.000	0.000	0.000	0.000	1.060	0.000	0.000	0.597	1.656
0.875	14.000	10.500	0.000	0.000	0.000	0.000	0.000	0.000	1.089	0.000	0.000	1.096	2.185
0.917	14.667	11.000	0.000	0.000	0.000	0.000	0.000	0.000	1.117	0.000	0.000	1.687	2.805
0.958	15.333	11.500	0.000	0.000	0.000	0.000	0.000	0.000	1.145	0.000	0.000	2.358	3.503
1.000	16.000	12.000	0.000	0.000	0.000	0.000	0.000	0.000	1.172	0.000	0.000	3.100	4.272
1.042	16.667	12.500	0.000	0.000	0.000	0.000	0.000	0.000	1.198	0.000	0.000	3.906	5.104
1.083	17.333	13.000	0.000	0.000	0.000	0.000	0.000	0.000	1.224	0.000	0.000	4.773	5.997
1.125	18.000	13.500	0.000	0.000	0.000	0.000	0.000	0.000	1.249	0.000	0.000	5.695	6.944
1.167	18.667	14.000	0.000	0.000	0.000	0.000	0.000	0.000	1.274	0.000	0.000	6.670	7.944
1.208	19.333	14.500	0.000	0.000	0.000	0.000	0.000	0.000	1.298	0.000	0.000	7.695	8.993
1.250	20.000	15.000	0.000	0.000	0.000	0.000	0.000	0.000	1.322	0.000	0.000	8.768	10.090

Drawdown of Basin 1 Surface Volume

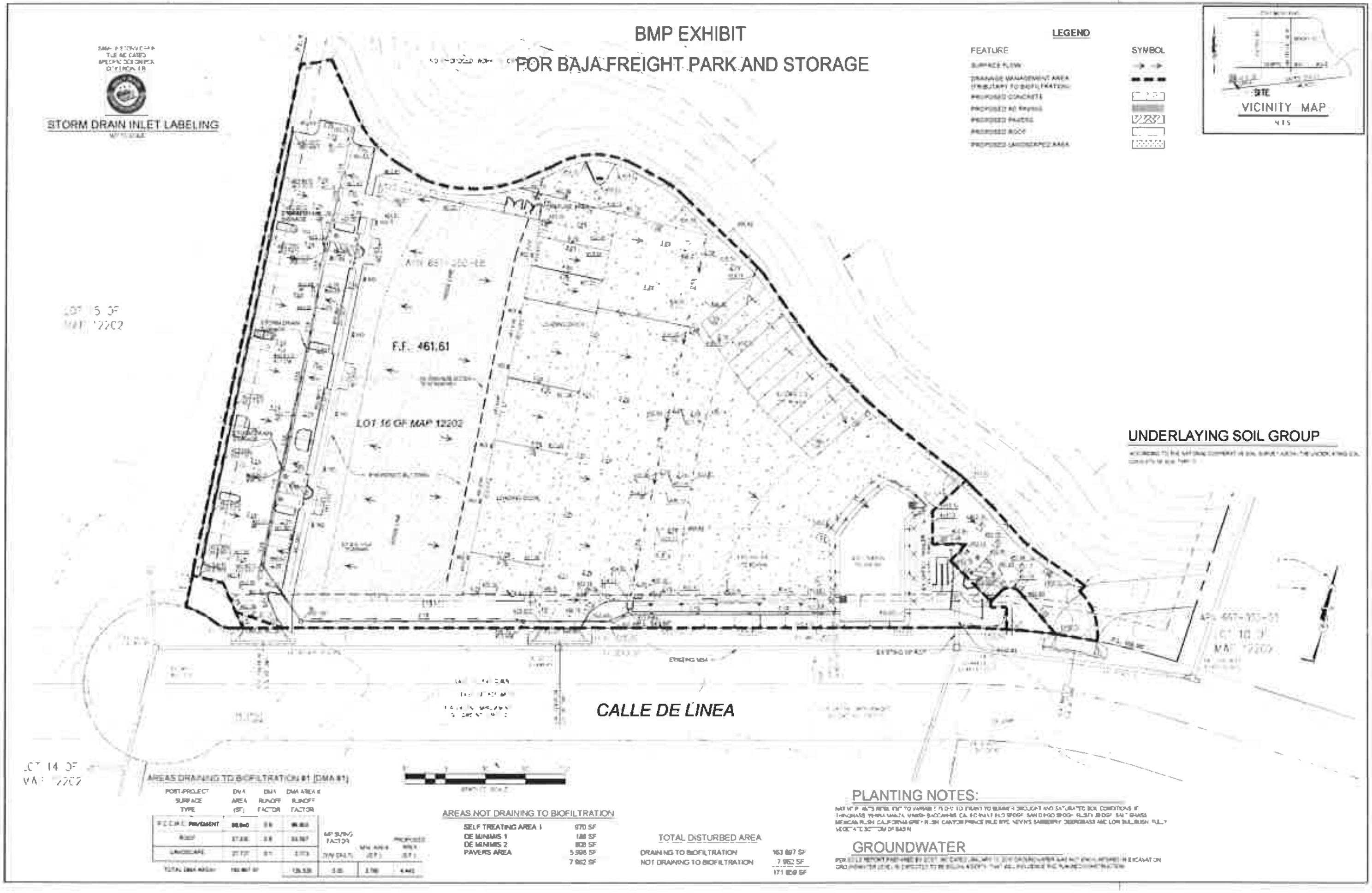
Elevation (ft)	Area (sq-ft)	Volume (cu-ft)	Volume (ac-ft)	Q (cfs)	Δ Time (hr)	Cumm. (hr)
2.000	5477	8646	0.1985	10.1849	0.00	0.00
1.958	5440	8418	0.1933	9.0882	0.01	0.01
1.917	5402	8192	0.1881	8.0388	0.01	0.01
1.875	5365	7968	0.1829	7.0390	0.01	0.02
1.833	5328	7745	0.1778	6.0914	0.01	0.03
1.792	5291	7524	0.1727	5.1994	0.01	0.04
1.750	5254	7304	0.1677	4.3666	0.01	0.06
1.708	5217	7086	0.1627	3.5979	0.02	0.07
1.667	5180	6870	0.1577	2.8995	0.02	0.09
1.625	5143	6655	0.1528	2.2798	0.02	0.11
1.583	5107	6441	0.1479	1.7513	0.03	0.14
1.542	5070	6229	0.1430	1.3358	0.04	0.18
1.500	5034	6019	0.1382	1.0941	0.05	0.23
1.458	4998	5810	0.1334	1.0624	0.05	0.28
1.417	4961	5602	0.1286	1.0296	0.06	0.34
1.375	4925	5396	0.1239	0.9956	0.06	0.39
1.333	4889	5192	0.1192	0.9602	0.06	0.45
1.292	4853	4989	0.1145	0.9234	0.06	0.51
1.250	4818	4787	0.1099	0.8848	0.06	0.57
1.208	4782	4587	0.1053	0.8443	0.06	0.64
1.167	4746	4389	0.1008	0.8014	0.07	0.70
1.125	4711	4192	0.0962	0.7558	0.07	0.77
1.083	4675	3996	0.0917	0.7068	0.07	0.85
1.042	4640	3802	0.0873	0.6535	0.08	0.93
1.000	4605	3609	0.0829	0.5945	0.09	1.01
0.958	4570	3418	0.0785	0.5276	0.09	1.11
0.917	4535	3229	0.0741	0.4113	0.11	1.22
0.875	4500	3040	0.0698	0.3004	0.15	1.37
0.833	4465	2854	0.0655	0.2067	0.20	1.57
0.792	4431	2668	0.0613	0.1344	0.30	1.87
0.750	4396	2484	0.0570	0.0949	0.45	2.32
0.708	4361	2302	0.0528	0.0949	0.53	2.85
0.667	4327	2121	0.0487	0.0949	0.53	3.38
0.625	4293	1941	0.0446	0.0949	0.53	3.91
0.583	4258	1763	0.0405	0.0949	0.52	4.43
0.542	4224	1586	0.0364	0.0949	0.52	4.95
0.500	4190	1411	0.0324	0.0949	0.51	5.46
0.458	4156	1237	0.0284	0.0949	0.51	5.97
0.417	4123	1065	0.0244	0.0949	0.51	6.48
0.375	4089	894	0.0205	0.0949	0.50	6.98
0.333	4055	724	0.0166	0.0949	0.50	7.47
0.292	4022	556	0.0128	0.0949	0.49	7.97
0.250	3988	389	0.0089	0.0949	0.49	8.46
0.208	3955	323	0.0074	0.0949	0.19	8.65
0.167	3922	257	0.0059	0.0949	0.19	8.84
0.125	3889	192	0.0044	0.0949	0.19	9.03
0.083	3856	127	0.0029	0.0949	0.19	9.22
0.042	3823	63	0.0015	0.0949	0.19	9.41
0.000	3790	0	0.0000	0.0949	0.19	9.59

Total Drawdown : 9.59 hrs

ATTACHMENT 5

Pre & Post-Developed Maps, Project Plan and Detention Section Sketches


Kearny Mesa
Santee
Los Coches Cr
Harbison Canyon
8
163
Lake Murray
8
Granite Hills
Fashion Valley
La Mesa
Lindbergh Field
Roads Div I
Bonita Road
5
Bonita
Plaza Bonita
Barrett Dam
Morena Lake
Thousand Trails
805
Lower Otay Res
Dulzura Summit
Potrero Park
Car
Marron Valley
San Ysidro
Rio Alamar
Toll Bridge
Puente San Jose II
Project Site
Rancho Tecate
Rodriguez Reservoir
MEXICO



AREAS DRAINING TO BIOFILTRATION #1 (DMA #1)

POST-PROJECT SURFACE TYPE	DMA AREA (SF)	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR	BMP SIZING FACTOR	MIN. AREA (SF)	PROPOSED AREA (SF)
P.C.C./A.C. PAVEMENT	[illegible]	[illegible]	[illegible]			
ROOF	[illegible]	[illegible]	[illegible]			
LANDSCAPE	[illegible]	[illegible]	[illegible]			
TOTAL DMA AREA	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]

AREAS NOT DRAINING TO BIOFILTRATION

SELF TREATING AREA 1	970 SF
DE MINIMIS 1	188 SF
DE MINIMIS 2	808 SF
PAVERS AREA	5,996 SF
	7,962 SF

TOTAL DISTURBED AREA

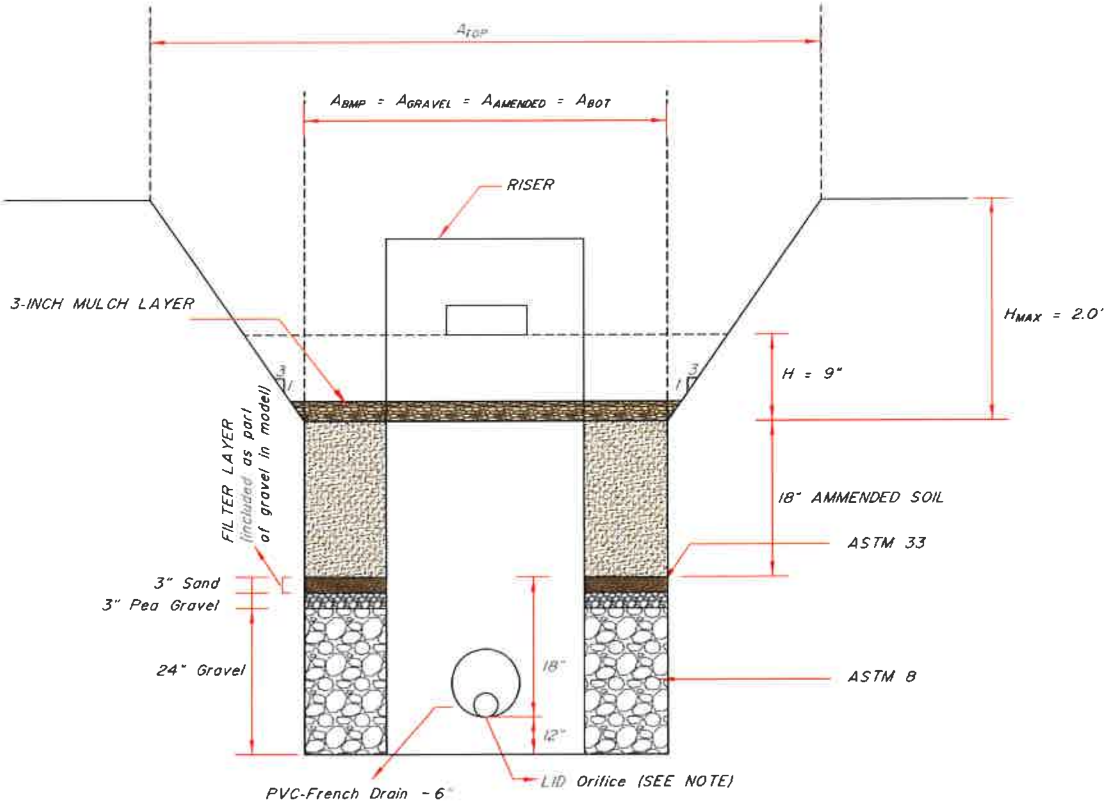
DRAINING TO BIOFILTRATION	163,897 SF
NOT DRAINING TO BIOFILTRATION	7,962 SF
	171,859 SF

PLANTING NOTES:

GROUNDWATER

BASIN 1 DETAIL

(NOT TO SCALE)

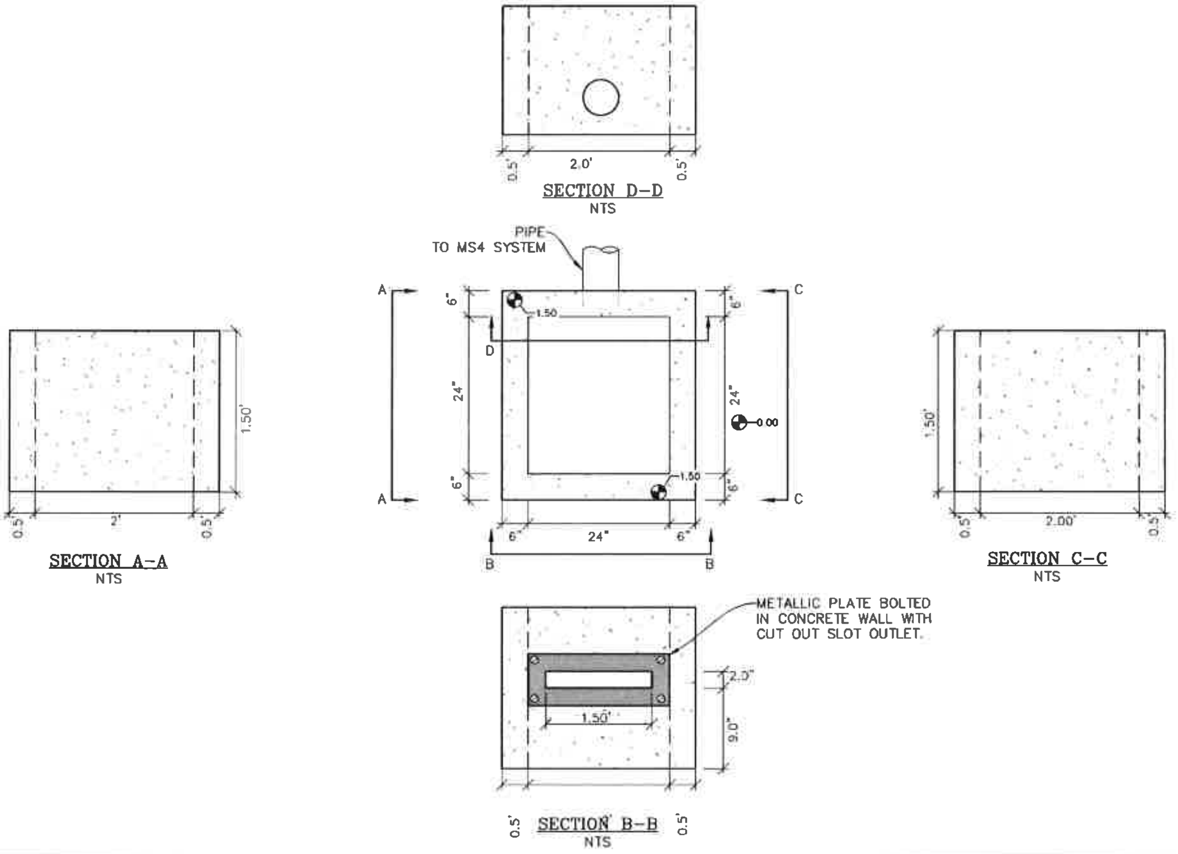


Note: A_{BOT} = 3,790 ft^2

A_{TOP} = 5,477 ft^2

LID Diameter: 1-1.625 inch orifice to be used.

Square Riser: 2' by 2' internal perimeter.



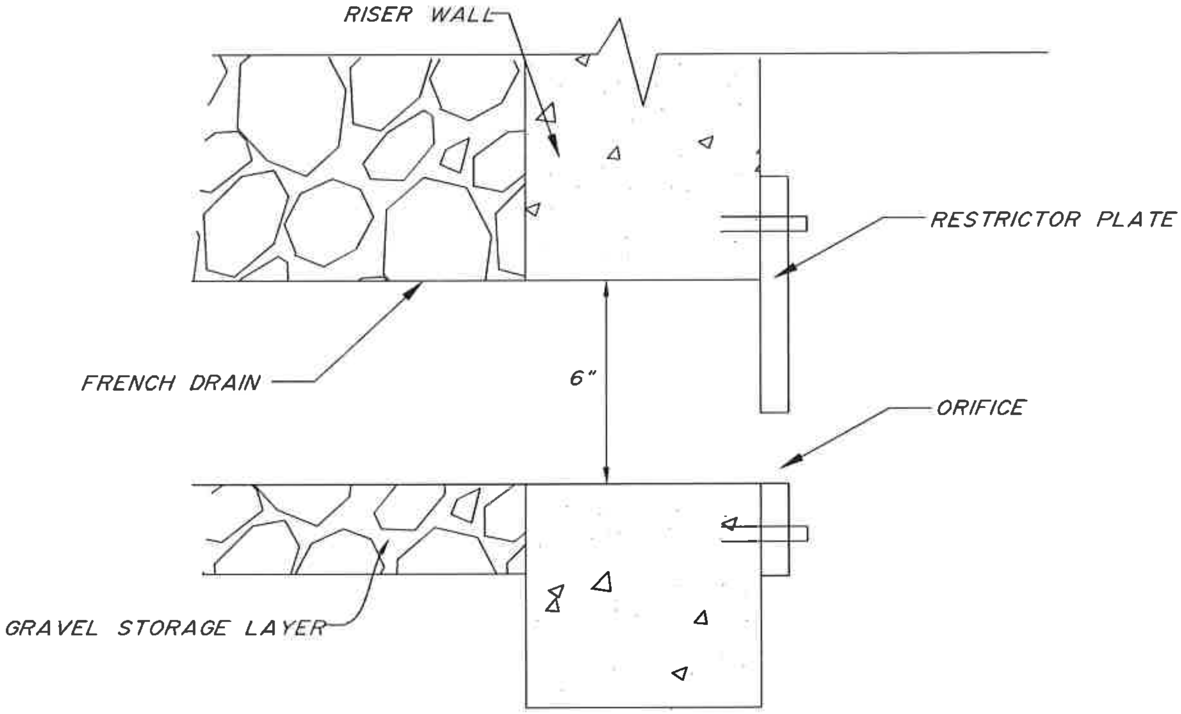
R·E·C
Consultants, Inc.
Civil Engineering · Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

BAJA FREIGHT, SAN DIEGO, CA
BASIN 1 OUTLET STRUCTURAL DETAIL

DESIGN BY__________
DRAWN BY__________
APPRV'D BY__________

NO.	DATE	BY	

SCALE: AS SHOWN
JOB NO.: 2006-01
DATE: 06/[illegible]/2018
SHEET: 1 OF 1



LID ORIFICE DETAIL

NOT TO SCALE

ATTACHMENT 6

SWMM Input Data in Input Format (Existing & Proposed Models)

PRE_DEV

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           08/29/1951
START_TIME           00:00:00
REPORT_START_DATE    08/29/1951
REPORT_START_TIME    00:00:00
END_DATE             03/29/2008
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.06   0.08   0.11   0.16   0.18   0.21   0.21   0.20   0.16   0.12   0.08   0.06
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
Lower-Otay       INTENSITY 1:00   1.0    TIMESERIES Lower-Otay

[SUBCATCHMENTS]
;;                                                Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
DMA-1-C          Lower-Otay       POC-1            3.94     0        205      1        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1-C          0.012      0.05       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
DMA-1-C          9          0.01875    0.33

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
POC-1            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
Lower-Otay       FILE "Lower Otay.txt"

[REPORT]
INPUT      NO
```

PRE_DEV

```
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 0.000 0.000 10000.000 10000.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            2500.000           2700.000

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1-C          2478.814           6927.966
DMA-1-C          2478.814           6927.966

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
Lower-Otay       1525.424           6864.407
```

POST_DEV

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           08/29/1951
START_TIME           00:00:00
REPORT_START_DATE    08/29/1951
REPORT_START_TIME    00:00:00
END_DATE             03/29/2008
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.06   0.08   0.11   0.16   0.18   0.21   0.21   0.20   0.16   0.12   0.08   0.06
DRY_ONLY     NO

[RAINGAGES]
;;               Rain      Time   Snow   Data
;;Name           Type      Intrvl Catch  Source
;;-------------- --------- ------ ------ ----------
LowerOtay        INTENSITY 1:00   1.0    TIMESERIES LowerOtay

[SUBCATCHMENTS]
;;                                                Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
DMA-1            LowerOtay        LID-1            3.676    85.05    468      1        0
;Pavers
DMA-2            LowerOtay        POC-1            0.088    0        64       1        0
LID-1            LowerOtay        DIV-1            0.08700643 0        10       0        0
SM-1             LowerOtay        POC-1            0.022    0        28       1        0
;DeMinimis 1
DMA-4            LowerOtay        POC-1            0.004    100      9        1        0
;DeMinimis 2
DMA-5            LowerOtay        POC-1            0.019    16.83    27       1        0
DMA-3            LowerOtay        POC-1            0.049    0        36       1        0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1            0.012      0.05       0.05       0.1        25         OUTLET
DMA-2            0.012      0.05       0.05       0.1        25         OUTLET
LID-1            0.012      0.05       0.05       0.1        25         OUTLET
SM-1             0.012      0.05       0.05       0.1        25         OUTLET
DMA-4            0.012      0.05       0.05       0.1        25         OUTLET
DMA-5            0.012      0.05       0.05       0.1        25         OUTLET
DMA-3            0.012      0.05       0.05       0.1        25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
```

POST_DEV

```
DMA-1            9          0.01875    0.33
DMA-2            9          0.01875    0.33
LID-1            9          0.01875    0.33
SM-1             9          0.01875    0.33
DMA-4            9          0.01875    0.33
DMA-5            9          0.01875    0.33
DMA-3            9          0.01875    0.33

[LID_CONTROLS]
;;               Type/Layer Parameters
;;-------------- ---------- ----------
LID-1            BC
LID-1            SURFACE    7.87       0.05       0.0        0.0        5
LID-1            SOIL       18         0.4        0.2        0.1        5          5          1.5
LID-1            STORAGE    30         0.67       0.11       0
LID-1            DRAIN      0.2320     0.5        12         6

[LID_USAGE]
;;Subcatchment   LID Process      Number  Area       Width      InitSatur  FromImprv  ToPerv     Report File
;;-------------- ---------------- ------- ---------- ---------- ---------- ---------- ---------- -----------
LID-1            LID-1            1       3790       0          0          100        0

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
POC-1            0          FREE                        NO

[DIVIDERS]
;;               Invert     Diverted         Divider
;;Name           Elev.      Link             Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
DIV-1            0          bypass           CUTOFF     0.08522    0          0          0          0

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                      Ponded   Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                     Area     Frac.    Infiltration
Parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- -------- -----------------
------
BASIN            0        1.25     0        TABULAR    BASIN                      5477     1

[CONDUITS]
;;               Inlet            Outlet                      Manning    Inlet      Outlet     Init.      Max.
;;Name           Node             Node             Length     N          Offset     Offset     Flow       Flow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- ----------
BYPASS           DIV-1            BASIN            400        0.01       0          0          0          0
UDRAIN           DIV-1            POC-1            10         0.01       0          0          0          0

[OUTLETS]
;;               Inlet            Outlet           Outflow    Outlet          Qcoeff/                     Flap
;;Name           Node             Node             Height     Type            QTable           Qexpon     Gate
;;-------------- ---------------- ---------------- ---------- --------------- ---------------- ---------- ----
OUTLET           BASIN            POC-1            0          TABULAR/HEAD    OUTLET                      NO

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4      Barrels
;;-------------- ------------ ---------------- ---------- ---------- ---------- ----------
BYPASS           DUMMY        0                0          0          0          1
UDRAIN           DUMMY        0                0          0          0          1

[LOSSES]
;;Link           Inlet      Outlet     Average    Flap Gate
;;-------------- ---------- ---------- ---------- ----------

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
OUTLET           Rating     0.000      0.000
OUTLET                      0.042      0.040
OUTLET                      0.083      0.112
```

```
OUTLET                          0.125      0.206
OUTLET                          0.167      0.316
OUTLET                          0.208      0.433
OUTLET                          0.250      0.500
OUTLET                          0.292      0.559
OUTLET                          0.333      0.612
OUTLET                          0.375      0.661
OUTLET                          0.417      0.707
OUTLET                          0.458      0.749
OUTLET                          0.500      0.790
OUTLET                          0.542      0.829
OUTLET                          0.583      0.865
OUTLET                          0.625      0.901
OUTLET                          0.667      0.935
OUTLET                          0.708      0.968
OUTLET                          0.750      0.999
OUTLET                          0.792      1.241
OUTLET                          0.833      1.656
OUTLET                          0.875      2.185
OUTLET                          0.917      2.805
OUTLET                          0.958      3.503
OUTLET                          1.000      4.272
OUTLET                          1.042      5.104
OUTLET                          1.083      5.997
OUTLET                          1.125      6.944
OUTLET                          1.167      7.944
OUTLET                          1.208      8.993
OUTLET                          1.250      10.090

BASIN            Storage        0.00       4396
BASIN                           0.08       4465
BASIN                           0.17       4535
BASIN                           0.25       4605
BASIN                           0.33       4675
BASIN                           0.42       4746
BASIN                           0.50       4818
BASIN                           0.58       4889
BASIN                           0.67       4961
BASIN                           0.75       5034
BASIN                           0.83       5107
BASIN                           0.92       5180
BASIN                           1.00       5254
BASIN                           1.08       5328
BASIN                           1.17       5402
BASIN                           1.25       5477

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
LowerOtay        FILE "Lower Otay.txt"

[REPORT]
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS -3303.827 4777.087 3660.035 9503.453
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            -290.792           4991.922
DIV-1            -282.486           7175.141
BASIN            -3021.205          7175.317
```

POST_DEV

```
[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1            -263.653           9133.710
DMA-2            3107.049           7170.310
LID-1            -282.486           8003.766
SM-1             -2966.131          6098.867
DMA-4            -2941.097          5027.424
DMA-5            3152.110           5007.397
DMA-3            3117.063           5978.705

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
LowerOtay        -2865.854          9258.130
```

ATTACHMENT 7

EPA SWMM FIGURES AND EXPLANATIONS

Per the attached, the reader can see the screens associated with the EPA-SWMM Model in both pre-development and post-development conditions. Each portion, i.e., sub-catchments, outfalls, storage units, weir as a discharge, and outfalls (point of compliance), are also shown.

Variables for modeling are associated with typical recommended values by the EPA-SWMM model, typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been attained from the interim Orange County criteria established for their SWMM calibration. Currently, no recommended values have been established by the San Diego County HMP Permit for the SWMM Model.

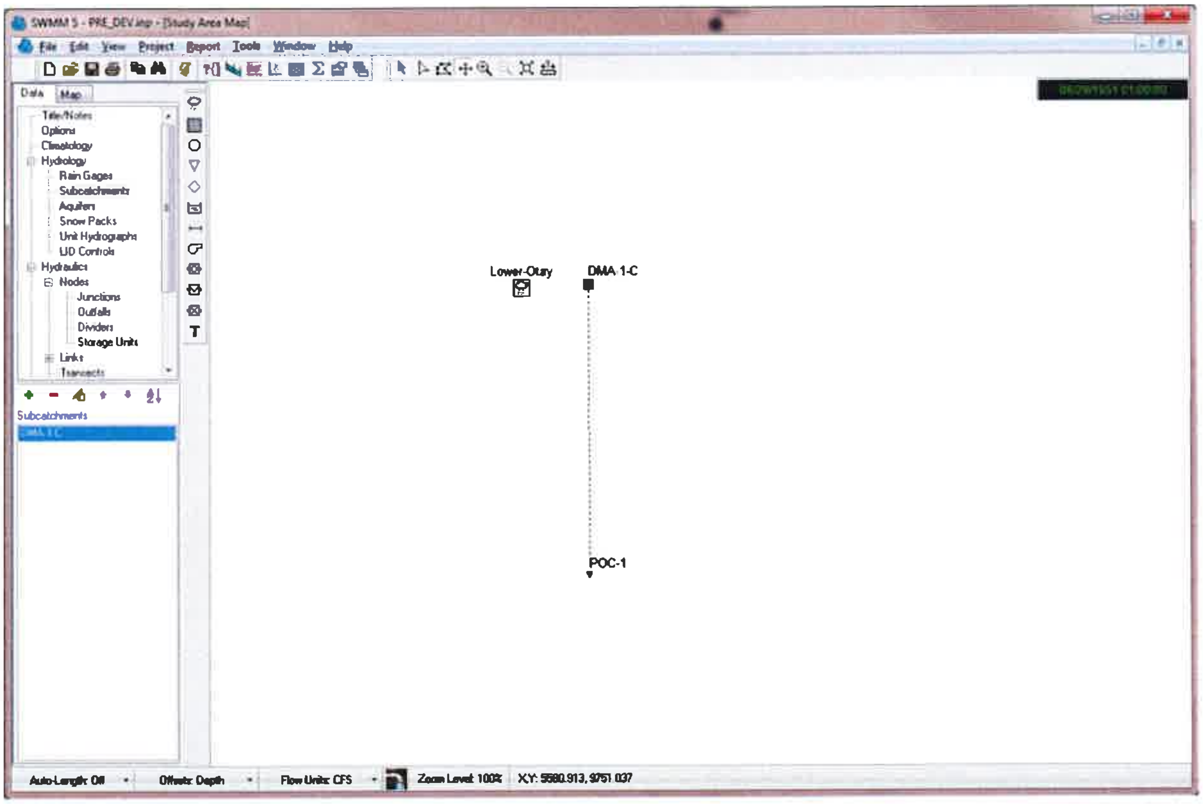
Soil characteristics of the existing soils were determined from the NRCS Web Soil Survey (located in Attachment 8 of this report).

Some values incorporated within the SWMM model have been determined from the professional experience of REC using conservative assumptions that have a tendency to increase the size of the needed BMP and also generate a long-term runoff as a percentage of rainfall similar to those measured in gage stations in Southern California by the USGS.

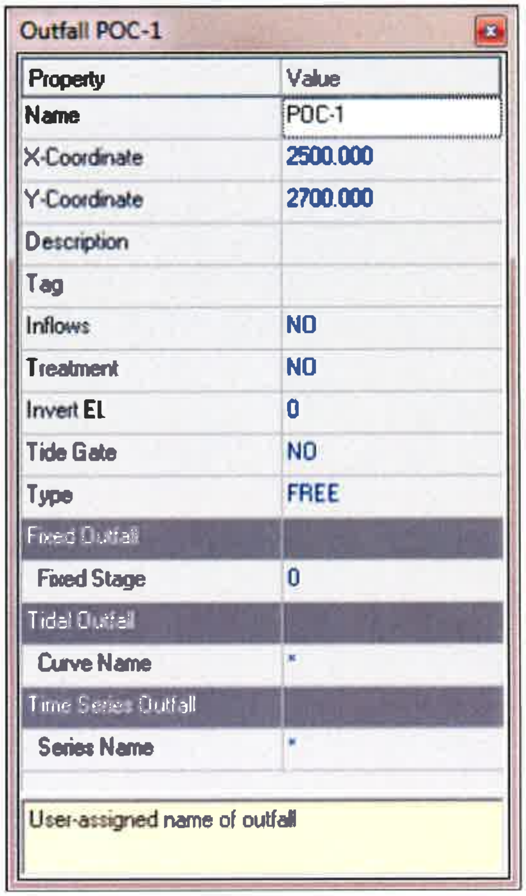
A Technical document prepared by Tory R Walker Engineering for the Cities of San Marcos, Oceanside and Vista (Reference [1]) can also be consulted for additional information regarding typical values for SWMM parameters.

Manning's roughness coefficients have been based upon the findings of the "*Improving Accuracy in Continuous Hydrologic Modeling: Guidance for Selecting Pervious Overland Flow Manning's n Values in the San Diego Region*" date 2016 by TRW Engineering (Reference [6]).

PRE-DEVELOPED CONDITIONS



Auto-Length: Off · Offsets: Depth · Flow Units: CFS · Zoom Level: 100% · X,Y: 5580.913, 9751.037



Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	2500.000
Y-Coordinate	2700.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert EL	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

User-assigned name of outfall

Rain Gage Lower-Otay

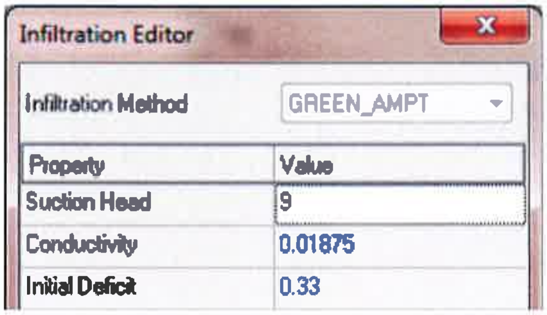
Property	Value
Name	Lower-Otay
X-Coordinate	1525.424
Y-Coordinate	6864.407
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	Lower-Otay
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

User-assigned name of rain gage

Subcatchment DMA-1-C

Property	Value
Name	DMA-1-C
X-Coordinate	2478.814
Y-Coordinate	6927.966
Description	
Tag	
Rain Gage	Lower-Otay
Outlet	POC-1
Area	3.94
Width	205
% Slope	1
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

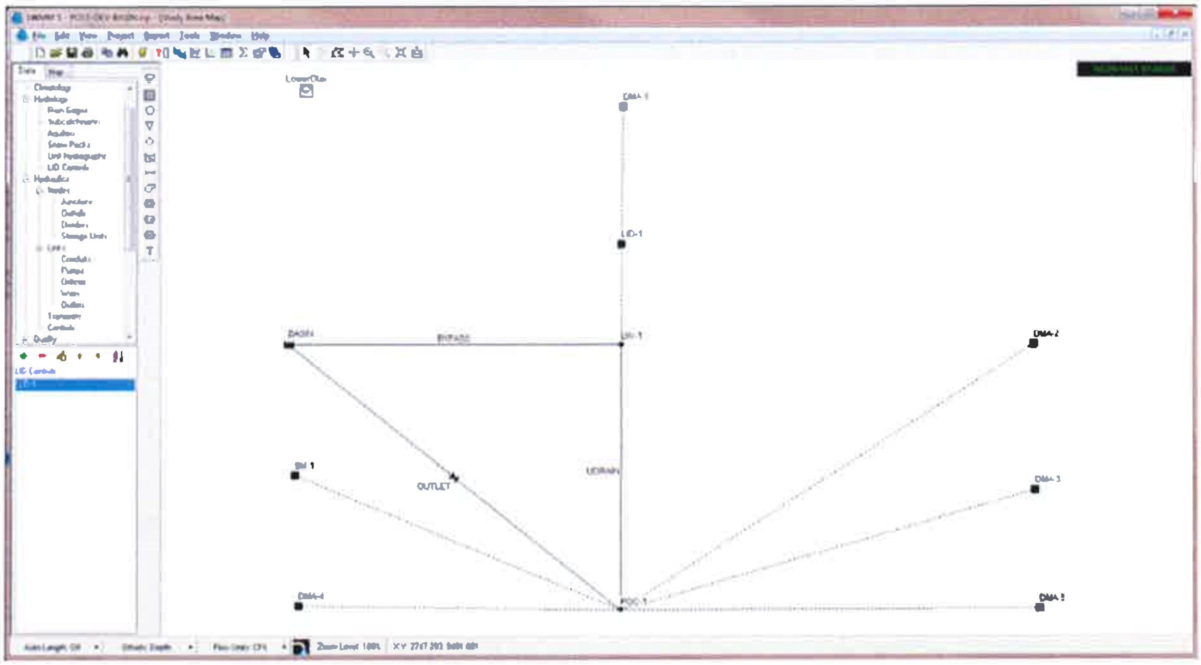


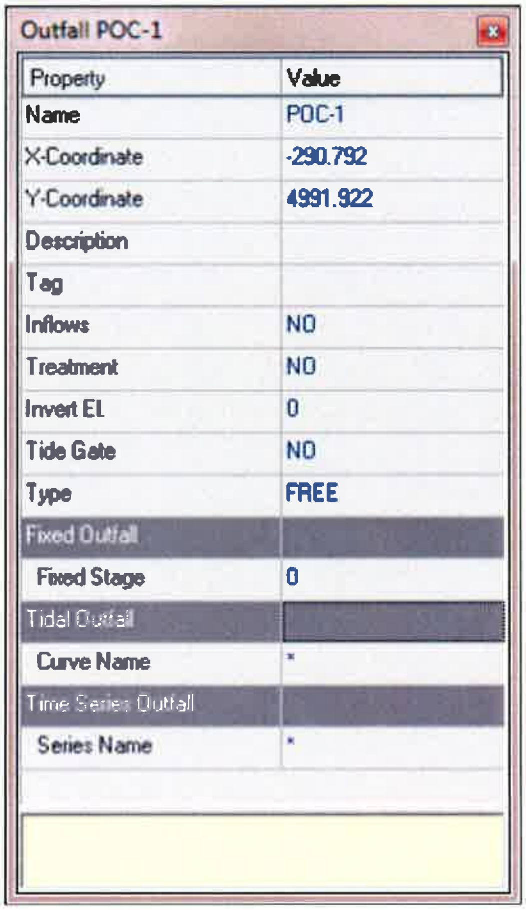
Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

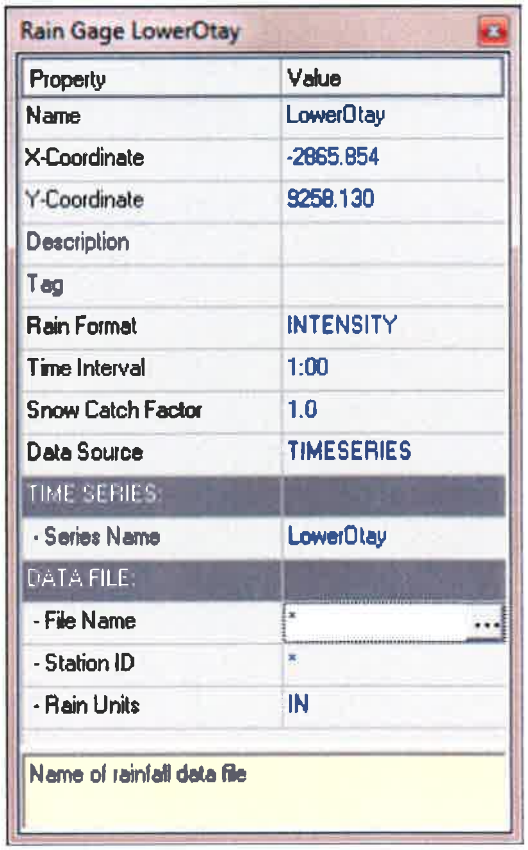
POST-DEVELOPED CONDITIONS





Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	-290.792
Y-Coordinate	4991.922
Description	
Tag	
Inflows	NO
Treatment	NO
Invert EL	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*



Rain Gage LowerOtay

Property	Value
Name	LowerOtay
X-Coordinate	-2865.854
Y-Coordinate	9258.130
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	LowerOtay
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

Name of rainfall data file

Subcatchment DMA-1

Property	Value
Name	DMA-1
X-Coordinate	-263.653
Y-Coordinate	9133.710
Description	
Tag	
Rain Gage	LowerOtay
Outlet	LID-1
Area	3.676
Width	468
% Slope	1
% Imperv	85.05
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Mannings N for pervious area

Infiltration Editor

Infiltration Method GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Subcatchment LID-1

Property	Value
Name	LID-1
X-Coordinate	-282.486
Y-Coordinate	8003.766
Description	
Tag	
Rain Gage	LowerOtay
Outlet	DIV-1
Area	0.08700643
Width	10
% Slope	0
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	1
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

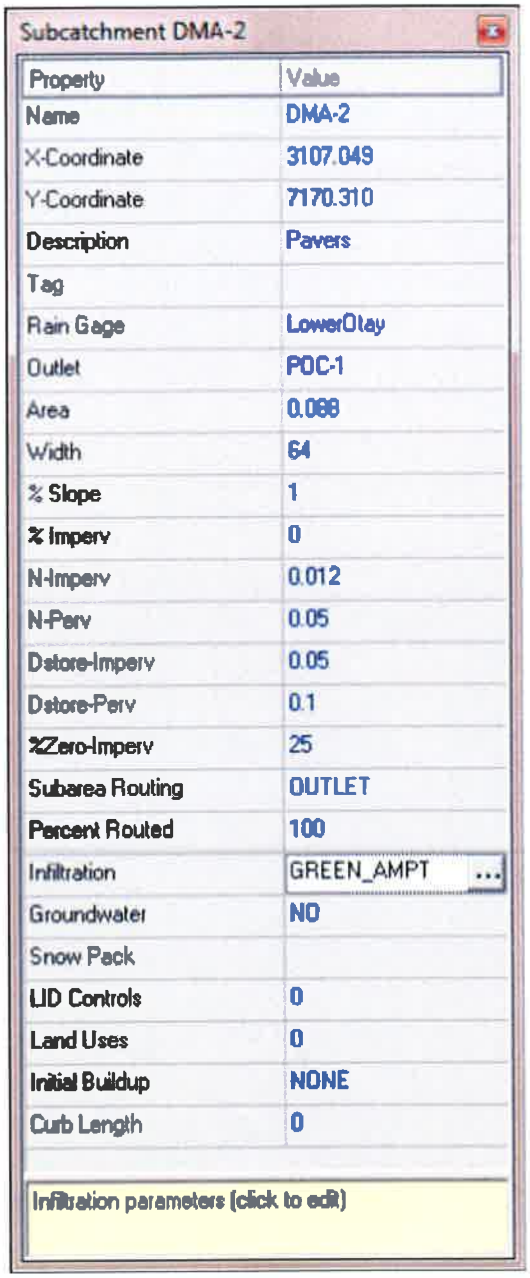
Infiltration Method GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Subcatchment SM-1

Property	Value
Name	SM-1
X-Coordinate	-2966.131
Y-Coordinate	6098.867
Description	
Tag	
Rain Gage	LowerOtay
Outlet	POC-1
Area	0.022
Width	28
% Slope	1
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)



Subcatchment DMA-2

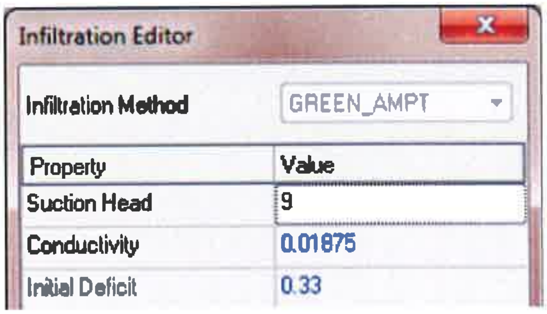
Property	Value
Name	DMA-2
X-Coordinate	3107.049
Y-Coordinate	7170.310
Description	Pavers
Tag	
Rain Gage	LowerOtay
Outlet	POC-1
Area	0.088
Width	64
% Slope	1
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Subcatchment DMA-3

Property	Value
Name	DMA-3
X-Coordinate	3117.063
Y-Coordinate	5978.705
Description	
Tag	
Rain Gage	LowerOtay
Outlet	POC-1
Area	0.049
Width	36
% Slope	1
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Subcatchment DMA-4

Property	Value
Name	DMA-4
X-Coordinate	-2941.097
Y-Coordinate	5027.424
Description	DeMinimis 1
Tag	
Rain Gage	LowerOtay
Outlet	POC-1
Area	0.004
Width	9
% Slope	1
% Imperv	100
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Infiltration Editor

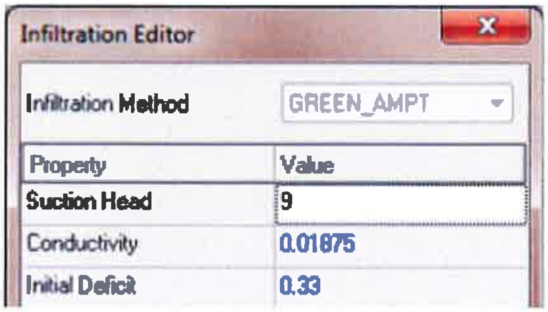
Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Subcatchment DMA-5

Property	Value
Name	DMA-5
X-Coordinate	3152.110
Y-Coordinate	5007.397
Description	DeMinimis 2
Tag	
Rain Gage	LowerOtay
Outlet	POC-1
Area	0.019
Width	27
% Slope	1
% Imperv	16.83
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.1
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

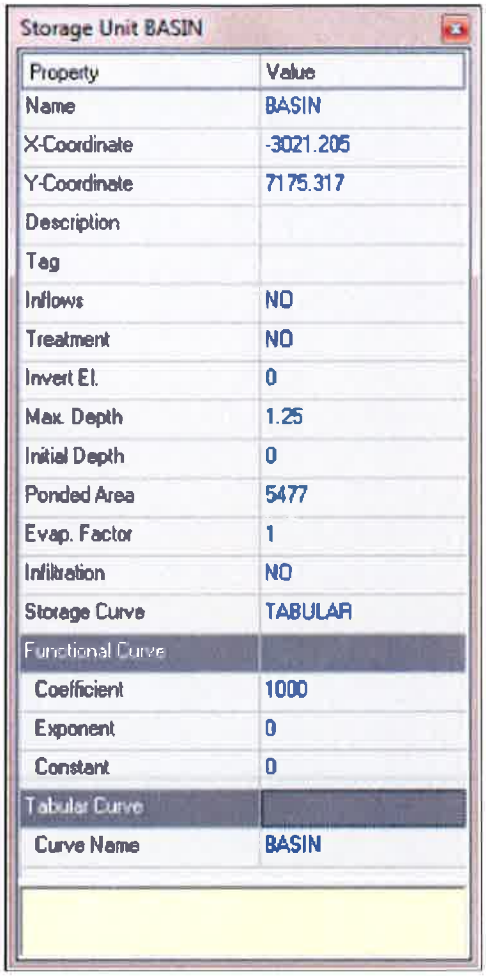


Infiltration Editor

Infiltration Method: GREEN_AMPT

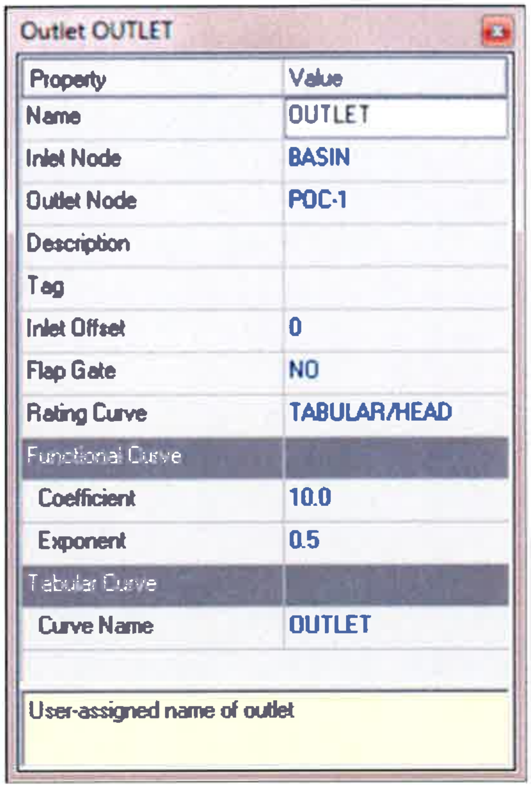
Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Detention Basin



Storage Unit BASIN

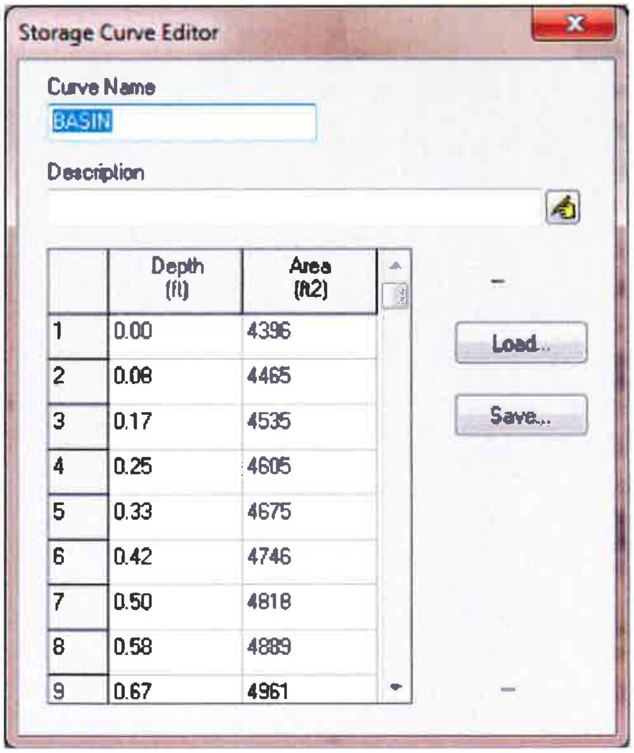
Property	Value
Name	BASIN
X-Coordinate	-3021.205
Y-Coordinate	7175.317
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	1.25
Initial Depth	0
Ponded Area	5477
Evap. Factor	1
Infiltration	NO
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	BASIN



Outlet OUTLET

Property	Value
Name	OUTLET
Inlet Node	BASIN
Outlet Node	POC-1
Description	
Tag	
Inlet Offset	0
Flap Gate	NO
Rating Curve	TABULAR/HEAD
Functional Curve	
Coefficient	10.0
Exponent	0.5
Tabular Curve	
Curve Name	OUTLET

User-assigned name of outlet

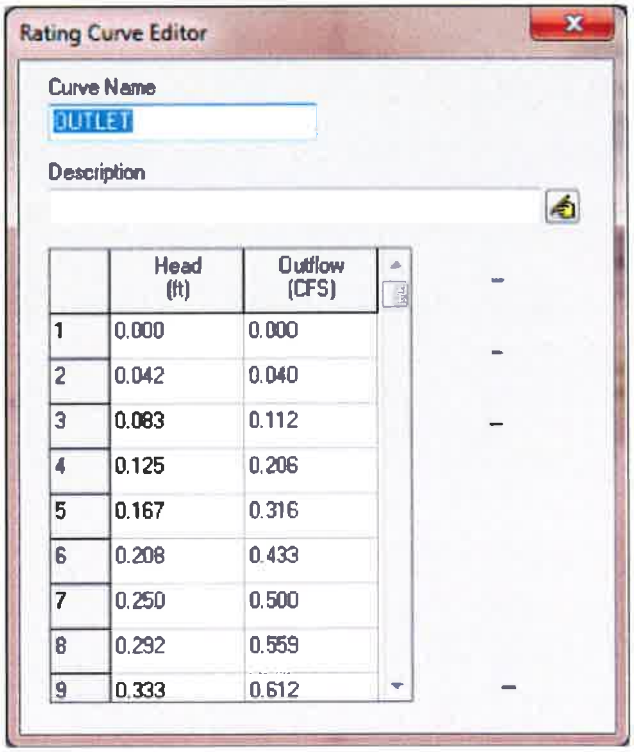


Storage Curve Editor

Curve Name: BASIN

Description:

	Depth (ft)	Area (ft2)
1	0.00	4396
2	0.08	4465
3	0.17	4535
4	0.25	4605
5	0.33	4675
6	0.42	4746
7	0.50	4818
8	0.58	4889
9	0.67	4961



Rating Curve Editor

Curve Name: OUTLET

Description:

	Head (ft)	Outflow (CFS)
1	0.000	0.000
2	0.042	0.040
3	0.083	0.112
4	0.125	0.206
5	0.167	0.316
6	0.208	0.433
7	0.250	0.500
8	0.292	0.559
9	0.333	0.612

EXPLANATION OF SELECTED VARIABLES

Sub Catchment Areas:

Please refer to the attached diagrams that indicate the DMA and detention BMPs (BMP) sub areas modeled within the project site at both the pre and post developed conditions draining to the POC.

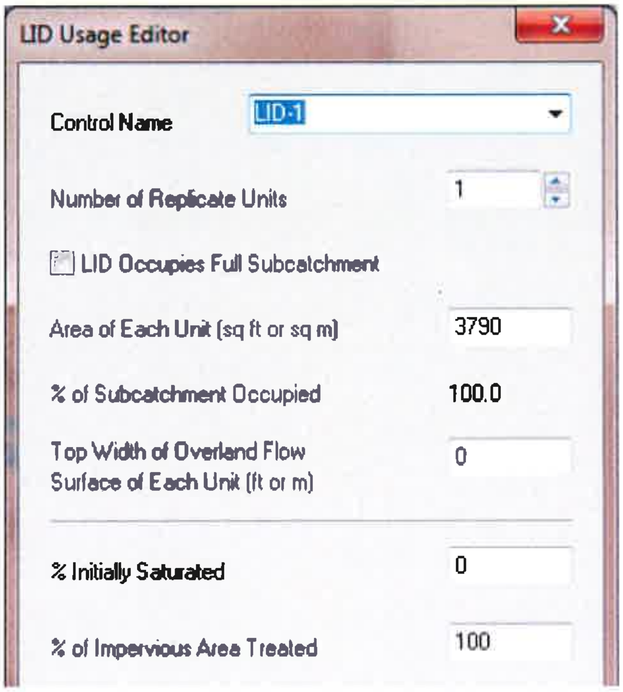
Parameters for the pre- and post-developed models include soil type C as determined from the NRCS websoil survey review (attached at the end of this appendix). Suction head, conductivity and initial deficit corresponds to average values expected for these soils types, according to sources consulted, professional experience, and approximate values obtained by the interim Orange County modeling approach.

REC selected infiltration values, such that the percentage of total precipitation that becomes runoff, is realistic for the soil types and slightly smaller than measured values for Southern California watersheds.

Selection of a Kinematic Approach: As the continuous model is based on hourly rainfall, and the time of concentration for the pre-development and post-development conditions is significantly smaller than 60 minutes, precise routing of the flows through the impervious surfaces, the underdrain pipe system, and the discharge pipe was considered unnecessary. The truncation error of the precipitation into hourly steps is much more significant than the precise routing in a system where the time of concentration is much smaller than 1 hour.

Sub-catchment BMP:

The area of biofiltration must be equal to the area of the development tributary to the biofiltration facility (area that drains into the biofiltration, equal external area plus bio-retention itself). Five (5) decimal places were given regarding the areas of the biofiltration to insure that the area used by the program for the LID subroutine corresponds exactly with this tributary.



Control Name: LID-1

Number of Replicate Units: 1

☐ LID Occupies Full Subcatchment

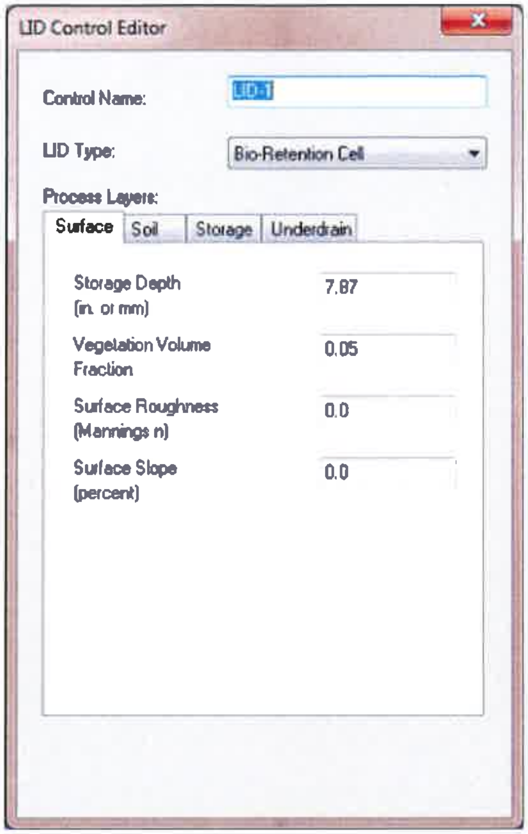
Area of Each Unit (sq ft or sq m): 3790

% of Subcatchment Occupied: 100.0

Top Width of Overland Flow Surface of Each Unit (ft or m): 0

% Initially Saturated: 0

% of Impervious Area Treated: 100

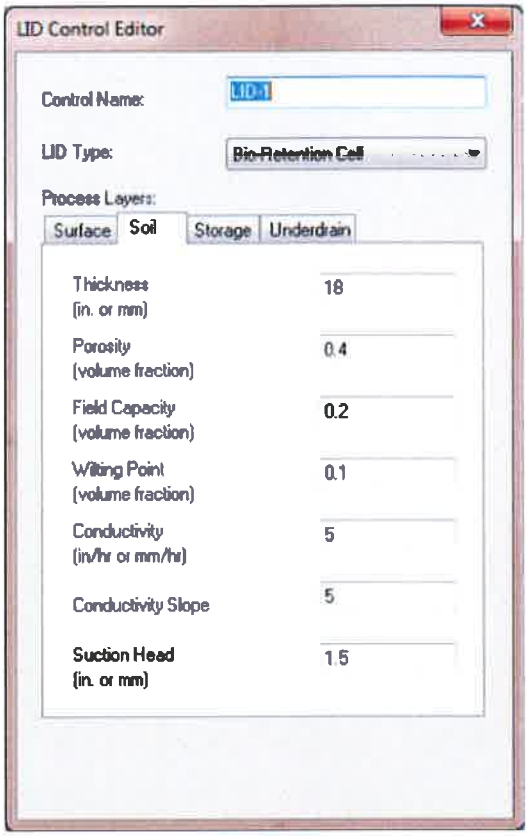


Control Name: LID-1

LID Type: Bio-Retention Cell

Process Layers: Surface

Storage Depth (in. or mm)	7.87
Vegetation Volume Fraction	0.05
Surface Roughness (Mannings n)	0.0
Surface Slope (percent)	0.0

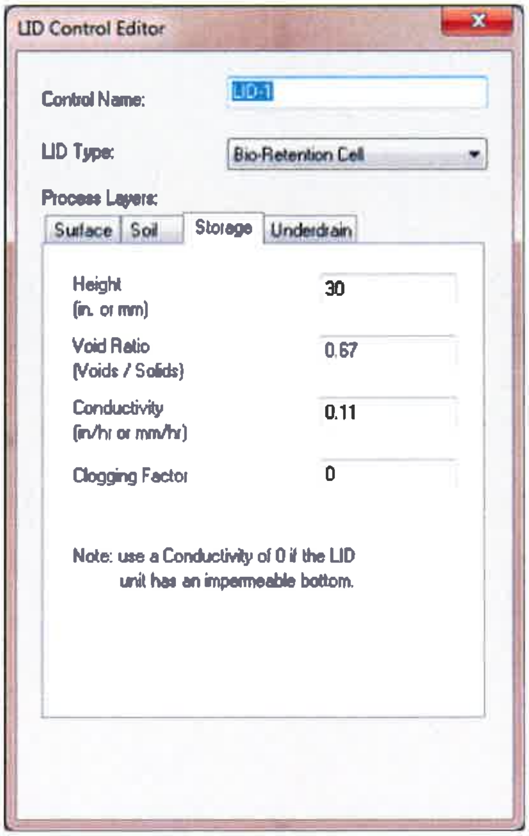


Control Name: LID-1

LID Type: Bio-Retention Cell

Process Layers: Soil

Thickness (in. or mm)	18
Porosity (volume fraction)	0.4
Field Capacity (volume fraction)	0.2
Wilting Point (volume fraction)	0.1
Conductivity (in/hr or mm/hr)	5
Conductivity Slope	5
Suction Head (in. or mm)	1.5



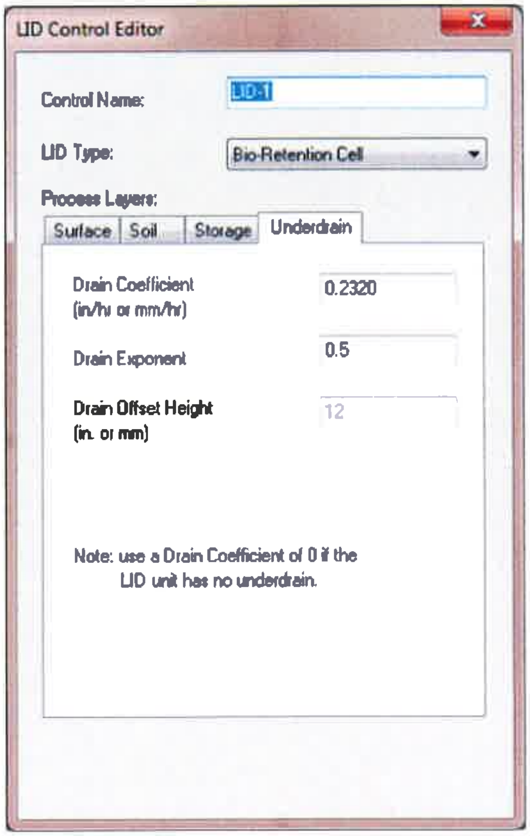
Control Name: LID-1

LID Type: Bio-Retention Cell

Process Layers: Storage

Height (in. or mm)	30
Void Ratio (Voids / Solids)	0.67
Conductivity (in/hr or mm/hr)	0.11
Clogging Factor	0

Note: use a Conductivity of 0 if the LID unit has an impermeable bottom.



Control Name: LID-1

LID Type: Bio-Retention Cell

Process Layers: Underdrain

Drain Coefficient (in/hr or mm/hr)	0.2320
Drain Exponent	0.5
Drain Offset Height (in. or mm)	12

Note: use a Drain Coefficient of 0 if the LID unit has no underdrain.

LID Control Editor: Explanation of Significant Variables

Storage Depth:

The storage depth variable within the SWMM model is representative of the storage volume provided beneath the surface riser outlet and the surface of the bio filtration facility.

In those cases where the surface storage has a variable area that is also different to the area of the gravel and amended soil, the SWMM model needs to be calibrated as the LID module will use the storage depth multiplied by the BMP area as the amount of volume stored at the surface.

Let A_{BMP} be the area of the BMP (area of amended soil and area of gravel). The proper value of the storage depth S_D to be included in the LID module can be calculated by using geometric properties of the surface volume. Let A_0 be the surface area at the bottom of the surface pond, and let A_i be the surface area at the elevation of the invert of the first row of orifices (or at the invert of the riser if not surface orifices are included). Finally, let h_i be the difference in elevation between A_0 and A_i. By volumetric definition:

$$A_{BMP} \cdot S_D = \frac{(A_0+A_i)}{2} h_i \qquad (1)$$

Equation (1) allows the determination of S_D to be included as Storage Depth in the LID module. The 3-inches of gravel volume (3-inches x volume of voids (0.4) = 1.2-inches) is then subtracted to this volume.

Porosity: A porosity value of 0.4 has been selected for the model. The amended soil is to be highly sandy in content in order to have a saturated hydraulic conductivity of approximately 5 in/hr.

REC considers such a value to be slightly high; however, in order to comply with the HMP Permit, the value recommended by the Copermittees for the porosity of amended soil is 0.4, per Appendix A of the Final Hydromodification Management Plan by Brown & Caldwell, dated March 2011. Such porosity is equal to the porosity of the gravel per the same document.

Void Ratio: The ratio of the void volume divided by the soil volume is directly related to porosity as n/(1-n). As the underdrain layer is composed of gravel, a porosity value of 0.4 has been selected (also per Appendix A of the Final HMP document), which results in a void ratio of 0.4/(1-0.4) = 0.67 for the gravel detention layer.

Conductivity: Per the site specific geotechnical investigation for the project site, the design infiltration rate determined by SWQMP Form D-5.1 is 0.110 in/hr.

Clogging factor: A clogging factor was not used (0 indicates that there is no clogging assumed within the model). The reason for this is related to the fairness of a comparison with the SDHM model and the HMP sizing tables: a clogging factor was not considered, and instead, a conservative value of infiltration was recommended.

Drain (Flow) coefficient: The flow coefficient C in the SWMM Model is the coefficient needed to transform the orifice equation into a general power law equation of the form:

$$q = C(H - H_D)^n \tag{2}$$

where q is the peak flow in in/hr, n is the exponent (typically 0.5 for orifice equation), H_D is the elevation of the centroid of the orifice in inches (assumed equal to the invert of the orifice for small orifices and in our design equal to 0) and H is the depth of the water in inches.

The general orifice equation can be expressed as:

$$Q = \frac{\pi}{4} c_g \frac{D^2}{144} \sqrt{2g \frac{(H - H_D)}{12}} \tag{3}$$

where Q is the peak flow in cfs, D is the diameter in inches, c_g is the typical discharge coefficient for orifices (0.61-0.63 for thin walls and around 0.75-0.8 for thick walls), g is the acceleration of gravity in ft/s^2, and H and H_D are defined above and are also used in inches in Equation (3).

It is clear that:

$$q\left(\frac{in}{hr}\right) X \frac{A_{BMP}}{12\ X\ 3600} = Q\ (cfs) \tag{4}$$

Cut-Off Flow: Q (cfs) and q (in/hr) are also the cutoff flow. For numerical reasons to insure the LID is full, the model uses cut-off = 1.01 Q.

Overland Flow Manning's Coefficient per TRWE (Reference [6])

appeal of a de facto value, we anticipate that jurisdictions will not be inclined to approve land surfaces other than short prairie grass. Therefore, in order to provide SWMM users with a wider range of land surfaces suitable for local application and to provide Copermittees with confidence in the design parameters, we recommend using the values published by Yen and Chow in Table 3-5 of the EPA SWMM Reference Manual Volume I – Hydrology.

SWMM-Endorsed Values Will Improve Model Quality

In January 2016, the EPA released the SWMM Reference Manual Volume I – Hydrology (SWMM Hydrology Reference Manual). The SWMM Hydrology Reference Manual complements the SWMM 5 User's Manual and SWMM 5 Applications Manual by providing an in-depth description of the program's hydrologic components (EPA 2016). Table 3-5 of the SWMM Hydrology Reference Manual expounds upon SWMM 5 User's Manual Table A.6 by providing Manning's *n* values for additional overland flow surfaces[3]. The values are provided in Table 1:

Table 1: Manning's *n* Values for Overland Flow (EPA, 2016; Yen 2001; Yen and Chow, 1983).

Overland Surface	**Light Rain (< 0.8 in/hr)**	**Moderate Rain (0.8-1.2 in/hr)**	**Heavy Rain (> 1.2 in/hr)**
Smooth asphalt pavement	0.010	0.012	0.015
Smooth impervious surface	0.011	0.013	0.015
Tar and sand pavement	0.012	0.014	0.016
Concrete pavement	0.014	0.017	0.020
Rough impervious surface	0.015	0.019	0.023
Smooth bare packed soil	0.017	0.021	0.025
Moderate bare packed soil	0.025	0.030	0.035
Rough bare packed soil	0.032	0.038	0.045
Gravel soil	0.025	0.032	0.045
Mowed poor grass	0.030	0.038	0.045
Average grass, closely clipped sod	0.040	0.050	0.060
Pasture	0.040	0.055	0.070
Timberland	0.060	0.090	0.120
Dense grass	0.060	0.090	0.120
Shrubs and bushes	0.080	0.120	0.180
Land Use			
Business	0.014	0.022	0.035
Semibusiness	0.022	0.035	0.050
Industrial	0.020	0.035	0.050
Dense residential	0.025	0.040	0.060
Suburban residential	0.030	0.055	0.080
Parks and lawns	0.040	0.075	0.120

For purposes of local hydromodification management BMP design, these Manning's *n* values are an improvement upon the values presented by Engman (1986) in SWMM 5 User's Manual Table A.6. Values from SWMM 5 User's Manual Table A.6, while completely suitable for the intended application to certain agricultural land covers, comes with the disclaimer that the provided Manning's *n* values are valid for shallow-depth overland flow that match the conditions in the experimental plots (Engman,

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[3] Further discussion is provided on page 6 under "Discussion of Differences Between Manning's *n* Values"

ATTACHMENT 8

USGS Soil Report & Geotechnical Documentation

Factor of Safety and Design Infiltration Rate Worksheet

Worksheet D.5-1

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	3	0.75
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	2	0.5
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.75
B	Design	Level of pretreatment/ expected sediment loads	0.5	1	0.5
		Redundancy/resiliency	0.25	1	0.25
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			1

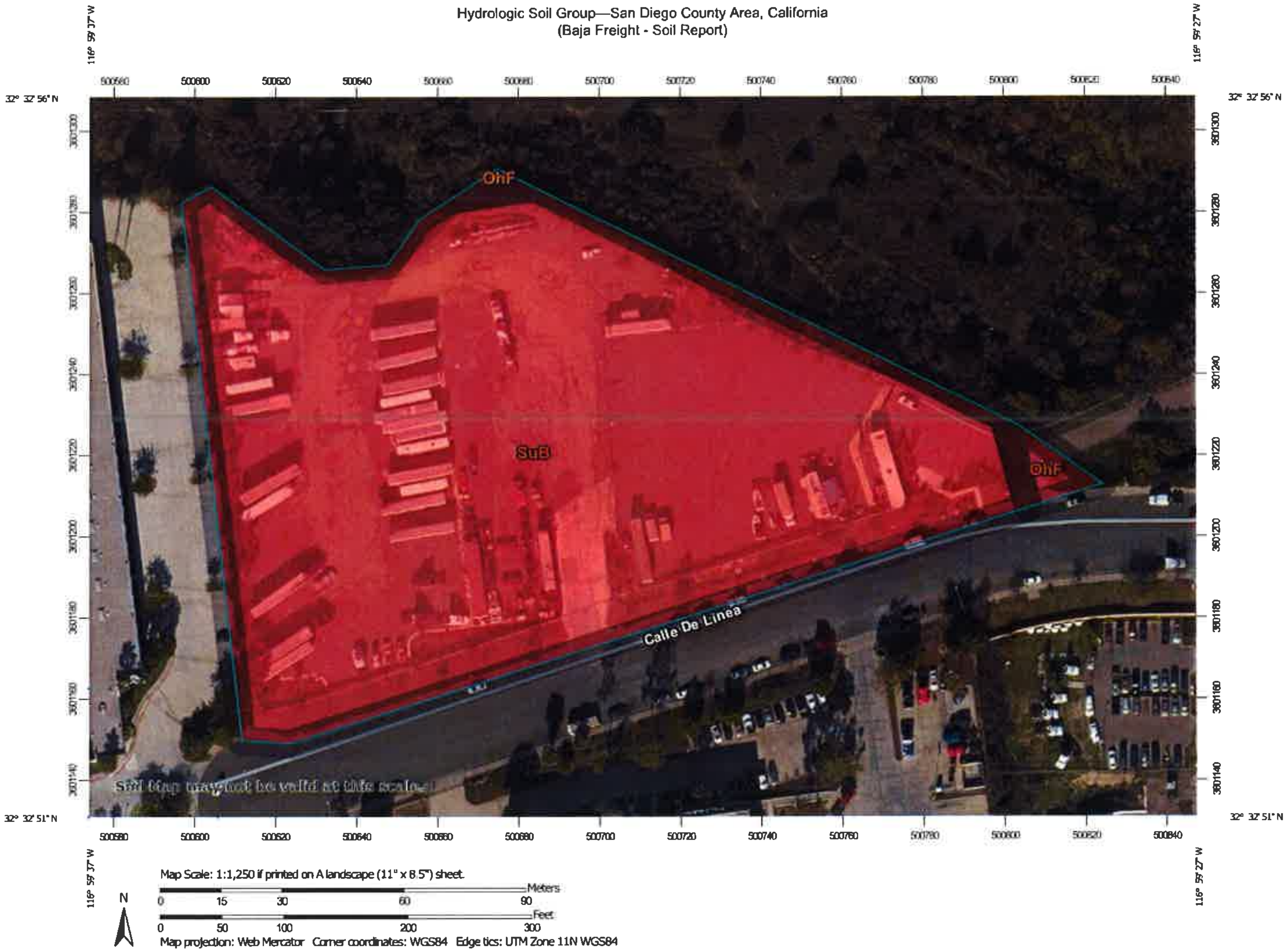
Combined Safety Factor, $S_{total} = S_A \times S_B$	1.75
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)	0.2
Design Infiltration Rate, in/hr, $K_{design} = K_{observed} / S_{total}$	0.11

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Infiltration rate per SCST Inc. percolation test.

Hydrologic Soil Group—San Diego County Area, California
(Baja Freight - Soil Report)



MAP LEGEND

Area of Interest (AOI)

- ☐ Area of Interest (AOI)

Soils

Soil Rating Polygons

- ▨ A
- ▨ A/D
- ▨ B
- ▨ B/D
- ▨ C
- ▨ C/D
- ▨ D
- ☐ Not rated or not available

Soil Rating Lines

- ~ A
- ~ A/D
- ~ B
- ~ B/D
- ~ C
- ~ C/D
- ~ D
- ~ Not rated or not available

Soil Rating Points

- ■ A
- ■ A/D
- ■ B
- ■ B/D
- ■ C
- ■ C/D
- ■ D
- ☐ Not rated or not available

Water Features

- ~ Streams and Canals

Transportation

- +++ Rails
- ~ Interstate Highways
- ~ US Routes
- ~ Major Roads
- ~ Local Roads

Background

- ■ Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 12, Sep 13, 2017

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

Date(s) aerial images were photographed: Dec 7, 2014—Jan 4, 2015

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
OhF	Olivenhain cobbly loam, 30 to 50 percent slopes	D	0.1	1.6%
SuB	Stockpen gravelly clay loam, 2 to 5 percent slopes	D	4.4	98.4%
Totals for Area of Interest			**4.5**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

ATTACHMENT 9

Summary Files from the SWMM Model

PRE_DEV

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Starting Date ............ AUG-29-1951 00:00:00
Ending Date .............. MAR-29-2008 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00

**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       194.258       591.650
Evaporation Loss .........         9.963        30.345
Infiltration Loss ........       157.154       478.642
Surface Runoff ...........        31.627        96.327
Final Surface Storage ....         0.000         0.000
Continuity Error (%) .....        -2.310

**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        31.627        10.306
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        31.627        10.306
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000


***************************
Subcatchment Runoff Summary
***************************

-----------------------------------------------------------------------------------------------------------
                             Total      Total      Total      Total      Total       Total     Peak  Runoff
                            Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                    in         in         in         in         in    10^6 gal      CFS
-----------------------------------------------------------------------------------------------------------
DMA-1-C                     591.65       0.00      30.35     478.64      96.33       10.31     2.58   0.163

Analysis begun on:  Wed Jun 20 11:33:31 2018
Analysis ended on:  Wed Jun 20 11:33:45 2018
Total elapsed time: 00:00:14
```

POST_DEV

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.0 (Build 5.0.022)
--------------------------------------------------------------


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ AUG-29-1951 00:00:00
Ending Date .............. MAR-29-2008 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


WARNING 04: minimum elevation drop used for Conduit BYPASS

WARNING 04: minimum elevation drop used for Conduit UDRAIN

**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       194.505       591.650
Evaporation Loss .........        36.852       112.098
Infiltration Loss ........        67.075       204.030
Surface Runoff ...........        92.497       281.358
Final Surface Storage ....         0.000         0.000
Continuity Error (%) .....        -0.986


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        92.485        30.138
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        92.402        30.110
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.067         0.022
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.018


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     60.00 sec
Average Time Step           :     60.00 sec
Maximum Time Step           :     60.00 sec
Percent in Steady State     :      0.00
```

POST_DEV

```
  Average Iterations per Step :      1.00


  ***************************
  Subcatchment Runoff Summary
  ***************************

  ---------------------------------------------------------------------------------------------------------
                              Total      Total      Total      Total      Total       Total     Peak  Runoff
                             Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
  Subcatchment                   in         in         in         in         in    10^6 gal      CFS
  ---------------------------------------------------------------------------------------------------------
  DMA-1                      591.65       0.00      96.78      68.45     432.91       43.21     3.02   0.732
  DMA-2                      591.65       0.00      20.99     458.28     117.24        0.28     0.06   0.198
  LID-1                      591.65   18290.23     943.52    5439.31   12478.41       29.48     2.84   0.661
  SM-1                       591.65       0.00      20.80     456.78     120.12        0.07     0.02   0.203
  DMA-4                      591.65       0.00     101.43       0.00     503.15        0.05     0.00   0.850
  DMA-5                      591.65       0.00      34.03     379.38     186.29        0.10     0.01   0.315
  DMA-3                      591.65       0.00      20.99     458.25     117.28        0.16     0.04   0.198


  ***********************
  LID Performance Summary
  ***********************

  ---------------------------------------------------------------------------------------------------------------
----
                                            Total       Evap      Infil    Surface      Drain      Init.      Final
Pcnt.
                                           Inflow       Loss       Loss    Outflow    Outflow    Storage    Storage
Error
  Subcatchment      LID Control                in         in         in         in         in         in         in
  ---------------------------------------------------------------------------------------------------------------
----
  LID-1             LID-1                18881.88     943.56    5439.51    2842.89    9635.98       0.00       0.00
0.11

  *****************
  Node Depth Summary
  *****************

  ------------------------------------------------------------------
                                 Average  Maximum  Maximum  Time of Max
                                   Depth    Depth      HGL   Occurrence
  Node                 Type         Feet     Feet     Feet  days hr:min
  ------------------------------------------------------------------
  POC-1                OUTFALL      0.00     0.00     0.00     0  00:00
  DIV-1                DIVIDER      0.00     0.00     0.00     0  00:00
  BASIN                STORAGE      0.00     0.91     0.91  16970  17:15


  ******************
  Node Inflow Summary
  ******************

  ---------------------------------------------------------------------------------
                                  Maximum  Maximum                 Lateral       Total
                                  Lateral    Total  Time of Max     Inflow      Inflow
                                   Inflow   Inflow   Occurrence     Volume      Volume
  Node                 Type           CFS      CFS  days hr:min   10^6 gal    10^6 gal
  ---------------------------------------------------------------------------------
  POC-1                OUTFALL       0.13     2.84  16970  17:12      0.659      30.108
  DIV-1                DIVIDER       2.84     2.84  16970  17:00     29.477      29.477
  BASIN                STORAGE       0.00     2.75  16970  17:00      0.000       6.607


  *********************
  Node Surcharge Summary
  *********************

  Surcharging occurs when water rises above the top of the highest conduit.
  ------------------------------------------------------------------
                                              Max. Height   Min. Depth
                                  Hours       Above Crown    Below Rim
  Node                 Type    Surcharged           Feet         Feet
  ------------------------------------------------------------------
  DIV-1                DIVIDER   496008.02          0.000        0.000
```

```
BASIN                STORAGE    496008.02          0.911        0.339


*********************
Node Flooding Summary
*********************

No nodes were flooded.


**********************
Storage Volume Summary
**********************

--------------------------------------------------------------------------------------------
                       Average     Avg   E&I       Maximum     Max    Time of Max    Maximum
                        Volume    Pcnt  Pcnt        Volume    Pcnt     Occurrence    Outflow
Storage Unit          1000 ft3    Full  Loss      1000 ft3    Full    days hr:min        CFS
--------------------------------------------------------------------------------------------
BASIN                    0.002       0     0         4.358      71    16970  17:15      2.72


***********************
Outfall Loading Summary
***********************

-----------------------------------------------------------
                      Flow       Avg.      Max.       Total
                      Freq.      Flow      Flow      Volume
Outfall Node          Pcnt.       CFS       CFS    10^6 gal
-----------------------------------------------------------
POC-1                  3.04      0.07      2.84      30.108
-----------------------------------------------------------
System                 3.04      0.07      2.84      30.108


********************
Link Flow Summary
********************

-----------------------------------------------------------------------------
                               Maximum  Time of Max   Maximum    Max/    Max/
                               |Flow|    Occurrence   |Veloc|    Full    Full
Link                 Type         CFS  days hr:min    ft/sec    Flow   Depth
-----------------------------------------------------------------------------
BYPASS               DUMMY       2.75  16970  17:00
UDRAIN               DUMMY       0.09    123  10:06
OUTLET               DUMMY       2.72  16970  17:15


*************************
Conduit Surcharge Summary
*************************

----------------------------------------------------------------------------
                                                         Hours        Hours
                       --------- Hours Full --------   Above Full   Capacity
Conduit                Both Ends  Upstream   Dnstream  Normal Flow   Limited
----------------------------------------------------------------------------
BYPASS                      0.01       0.01       0.01 496008.02        0.01
UDRAIN                      0.01       0.01       0.01 496008.02        0.01


Analysis begun on:  Wed Jun 20 11:34:01 2018
Analysis ended on:  Wed Jun 20 11:34:29 2018
Total elapsed time: 00:00:28
```

ATTACHMENT 3
STRUCTURAL BMP MAINTENANCE INFORMATION

This is the cover sheet for Attachment 3.

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Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3a	Structural BMP Maintenance Thresholds and Actions (Required)	☑ Included See Structural BMP Maintenance Information Checklist.
Attachment 3b	Maintenance Agreement (Form DS-3247) (when applicable)	☑ Included ☐ Not Applicable

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Use this checklist to ensure the required information has been included in the Structural BMP Maintenance Information Attachment:

Preliminary Design / Planning / CEQA level submittal:

- Attachment 3a must identify:
  - ☑ Typical maintenance indicators and actions for proposed structural BMP(s) based on Section 7.7 of the BMP Design Manual
- Attachment 3b is not required for preliminary design / planning / CEQA level submittal.

Final Design level submittal:

Attachment 3a must identify:

- ☐ Specific maintenance indicators and actions for proposed structural BMP(s). This shall be based on Section 7.7 of the BMP Design Manual and enhanced to reflect actual proposed components of the structural BMP(s)
- ☐ How to access the structural BMP(s) to inspect and perform maintenance
- ☐ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- ☐ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- ☐ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- ☐ When applicable, frequency of bioretention soil media replacement.
- ☐ Recommended equipment to perform maintenance
- ☐ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management

Attachment 3b: For private entity operation and maintenance, Attachment 3b must include a Storm Water Management and Discharge Control Maintenance Agreement (Form DS-3247). The following information must be included in the exhibits attached to the maintenance agreement:

- ☐ Vicinity map
- ☐ Site design BMPs for which DCV reduction is claimed for meeting the pollutant control obligations.
- ☐ BMP and HMP location and dimensions
- ☐ BMP and HMP specifications/cross section/model
- ☐ Maintenance recommendations and frequency
- ☐ LID features such as (permeable paver and LS location, dim, SF).

Table 7-2. Maintenance Indicators and Actions for Vegetated BMPs

Typical Maintenance Indicator(s) for Vegetated BMPs	Maintenance Actions
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials, without damage to the vegetation.
Poor vegetation establishment	Re-seed, re-plant, or re-establish vegetation per original plans.
Overgrown vegetation	Mow or trim as appropriate, but not less than the design height of the vegetation per original plans when applicable (e.g. a vegetated swale may require a minimum vegetation height).
Erosion due to concentrated irrigation flow	Repair/re-seed/re-plant eroded areas and adjust the irrigation system.
Erosion due to concentrated storm water runoff flow	Repair/re-seed/re-plant eroded areas, and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or minor re-grading to restore proper drainage according to the original plan. If the issue is not corrected by restoring the BMP to the original plan and grade, the City Engineer shall be contacted prior to any additional repairs or reconstruction.
Standing water in vegetated swales	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, loosening or replacing top soil to allow for better infiltration, or minor re-grading for proper drainage. If the issue is not corrected by restoring the BMP to the original plan and grade, the City Engineer shall be contacted prior to any additional repairs or reconstruction.
Standing water in bioretention, biofiltration with partial retention, or biofiltration areas, or flow-through planter boxes for longer than 96 hours following a storm event*	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, clearing underdrains (where applicable), or repairing/replacing clogged or compacted soils.
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.
*These BMPs typically include a surface ponding layer as part of their function which may take 96 hours to drain following a storm event.	

Table 7-4. Maintenance Indicators and Actions for Filtration BMPs

Typical Maintenance Indicator(s) for Filtration BMPs	Maintenance Actions
Accumulation of sediment, litter, or debris	Remove and properly dispose accumulated materials.
Obstructed inlet or outlet structure	Clear obstructions.
Clogged filter media	Remove and properly dispose filter media, and replace with fresh media.
Damage to components of the filtration system	Repair or replace as applicable.
Note: For proprietary media filters, refer to the manufacturer's maintenance guide.	

7.7.4 Maintenance of Detention BMPs

"Detention BMPs" includes basins, cisterns, vaults, and underground galleries that are primarily designed to store runoff for controlled release to downstream systems. For the purpose of the maintenance discussion, this category does not include an infiltration component (refer to "vegetated infiltration or filtration BMPs" or "non-vegetated infiltration BMPs" above). Applicable Fact Sheets may include HU-1 (cistern) or FT-4 (extended detention basin). There are many possible configurations of above ground and underground detention BMPs, including both proprietary and non-proprietary systems. The project civil engineer is responsible for determining which maintenance indicators and actions shown below are applicable based on the components of the structural BMP.

The City of
SAN DIEGO

RECORDING REQUESTED BY:
THE CITY OF SAN DIEGO AND
WHEN RECORDED MAIL TO:
Noble House Real Estate

8662 Siempre Viva Rd, Ste A
San Diego, Ca 92154

(THIS SPACE IS FOR RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:	ASSESSORS PARCEL NUMBER:	PROJECT NUMBER:
	667-050-56	

This agreement is made by and between the City of San Diego, a municipal corporation [City] and Noble House Real Estate, LLC, the owner or duly authorized representative of the owner [Property Owner] of property located at

6852 Calle de Linea, San Diego CA 92154
(PROPERTY ADDRESS)

and more particularly described as: Lot 16 of Map 12202

(LEGAL DESCRIPTION OF PROPERTY)

in the City of San Diego, County of San Diego, State of California.

Property Owner is required pursuant to the City of San Diego Municipal Code, Chapter 4, Article 3, Division 3, Chapter 14, Article 2, Division 2, and the Land Development Manual, Storm Water Standards to enter into a Storm Water Management and Discharge Control Maintenance Agreement [Maintenance Agreement] for the installation and maintenance of Permanent Storm Water Best Management Practices [Permanent Storm Water BMP's] prior to the issuance of construction permits. The Maintenance Agreement is intended to ensure the establishment and maintenance of Permanent Storm Water BMP's onsite, as described in the attached exhibit(s), the project's Storm Water Quality Management Plan [SWQMP] and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): ____________________.

Property Owner wishes to obtain a building or engineering permit according to the Grading and/or Improvement Plan Drawing No(s) or Building Plan Project No(s): ____________________.

Continued on Page 2

NOW, THEREFORE, the parties agree as follows:

1. Property Owner shall have prepared, or if qualified, shall prepare an Operation and Maintenance Procedure [OMP] for Permanent Storm Water BMP's, satisfactory to the City, according to the attached exhibit(s), consistent with the Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s): __________.

2. Property Owner shall install, maintain and repair or replace all Permanent Storm Water BMP's within their property, according to the OMP guidelines as described in the attached exhibit(s), the project's SWQMP and Grading and/or Improvement Plan Drawing No(s), or Building Plan Project No(s) __________.

3. Property Owner shall maintain operation and maintenance records for at least five (5) years. These records shall be made available to the City for inspection upon request at any time.

This Maintenance Agreement shall commence upon execution of this document by all parties named hereon, and shall run with the land.

Executed by the City of San Diego and by Property Owner in San Diego, California.

See Attached Exhibit(s): ____________________

____
(Owner Signature)

____
(Print Name and Title)

Noble House Real Estate, LLC
(Company/Organization Name)

____
(Date)

THE CITY OF SAN DIEGO

APPROVED:

____
(City Control Engineer Signature)

____
(Print Name)

____
(Date)

NOTE: ALL SIGNATURES MUST INCLUDE NOTARY ACKNOWLEDGMENTS PER CIVIL CODE SEC. 1180 ET.SEQ.

ATTACHMENT 4
COPY OF PLAN SHEETS SHOWING PERMANENT STORM WATER BMPS

This is the cover sheet for Attachment 4.

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Use this checklist to ensure the required information has been included on the plans:

The plans must identify:

- ☑ Structural BMP(s) with ID numbers matching Form I-6 Summary of PDP Structural BMPs
- ☑ The grading and drainage design shown on the plans must be consistent with the delineation of DMAs shown on the DMA exhibit
- ☑ Details and specifications for construction of structural BMP(s)
- ☑ Signage indicating the location and boundary of structural BMP(s) as required by the City Engineer
- ☑ How to access the structural BMP(s) to inspect and perform maintenance
- ☑ Features that are provided to facilitate inspection (e.g., observation ports, cleanouts, silt posts, or other features that allow the inspector to view necessary components of the structural BMP and compare to maintenance thresholds)
- ☑ Manufacturer and part number for proprietary parts of structural BMP(s) when applicable
- ☑ Maintenance thresholds specific to the structural BMP(s), with a location-specific frame of reference (e.g., level of accumulated materials that triggers removal of the materials, to be identified based on viewing marks on silt posts or measured with a survey rod with respect to a fixed benchmark within the BMP)
- ☑ Recommended equipment to perform maintenance
- ☑ When applicable, necessary special training or certification requirements for inspection and maintenance personnel such as confined space entry or hazardous waste management
- ☑ Include landscaping plan sheets showing vegetation requirements for vegetated structural BMP(s)
- ☑ All BMPs must be fully dimensioned on the plans
- ☑ When proprietary BMPs are used, site specific cross section with outflow, inflow and model number shall be provided. Broucher photocopies are not allowed.

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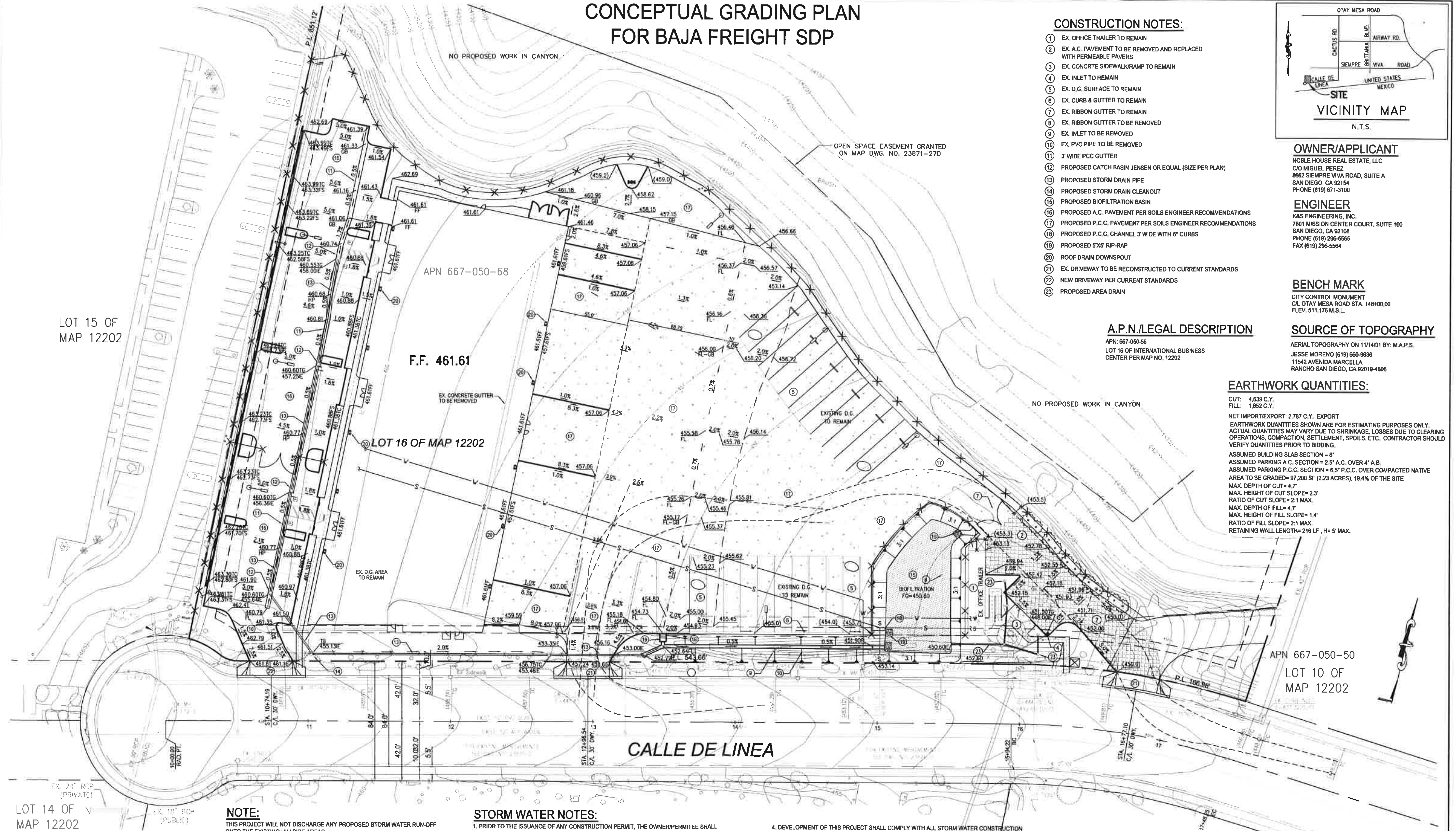
CONCEPTUAL GRADING PLAN
FOR BAJA FREIGHT SDP



CONSTRUCTION NOTES:

- ① EX. OFFICE TRAILER TO REMAIN
- ② EX. A.C. PAVEMENT TO BE REMOVED AND REPLACED WITH PERMEABLE PAVERS
- ③ EX. CONCRTE SIDEWALK/RAMP TO REMAIN
- ④ EX. INLET TO REMAIN
- ⑤ EX. D.G. SURFACE TO REMAIN
- ⑥ EX. CURB & GUTTER TO REMAIN
- ⑦ EX. RIBBON GUTTER TO REMAIN
- ⑧ EX. RIBBON GUTTER TO BE REMOVED
- ⑨ EX. INLET TO BE REMOVED
- ⑩ EX. PVC PIPE TO BE REMOVED
- ⑪ 3' WIDE PCC GUTTER
- ⑫ PROPOSED CATCH BASIN JENSEN OR EQUAL (SIZE PER PLAN)
- ⑬ PROPOSED STORM DRAIN PIPE
- ⑭ PROPOSED STORM DRAIN CLEANOUT
- ⑮ PROPOSED BIOFILTRATION BASIN
- ⑯ PROPOSED A.C. PAVEMENT PER SOILS ENGINEER RECOMMENDATIONS
- ⑰ PROPOSED P.C.C. PAVEMENT PER SOILS ENGINEER RECOMMENDATIONS
- ⑱ PROPOSED P.C.C. CHANNEL 3' WIDE WITH 6" CURBS
- ⑲ PROPOSED 5'X5' RIP-RAP
- ⑳ ROOF DRAIN DOWNSPOUT
- ㉑ EX. DRIVEWAY TO BE RECONSTRUCTED TO CURRENT STANDARDS
- ㉒ NEW DRIVEWAY PER CURRENT STANDARDS
- ㉓ PROPOSED AREA DRAIN

OWNER/APPLICANT

NOBLE HOUSE REAL ESTATE, LLC
C/O MIGUEL PEREZ
8662 SIEMPRE VIVA ROAD, SUITE A
SAN DIEGO, CA 92154
PHONE (619) 671-3100

ENGINEER

K&S ENGINEERING, INC.
7801 MISSION CENTER COURT, SUITE 100
SAN DIEGO, CA 92108
PHONE (619) 296-5565
FAX (619) 296-5564

BENCH MARK

CITY CONTROL MONUMENT
C/L OTAY MESA ROAD STA. 148+00.00
ELEV. 511.176 M.S.L.

A.P.N./LEGAL DESCRIPTION

APN: 667-050-56

LOT 16 OF INTERNATIONAL BUSINESS
CENTER PER MAP NO. 12202

SOURCE OF TOPOGRAPHY

AERIAL TOPOGRAPHY ON 11/14/01 BY: M.A.P.S.

JESSE MORENO (619) 660-9636
11542 AVENIDA MARCELLA
RANCHO SAN DIEGO, CA 92019-4806

EARTHWORK QUANTITIES:

CUT: 4,639 C.Y.
FILL: 1,852 C.Y.

NET IMPORT/EXPORT: 2,787 C.Y. EXPORT

EARTHWORK QUANTITIES SHOWN ARE FOR ESTIMATING PURPOSES ONLY. ACTUAL QUANTITIES MAY VARY DUE TO SHRINKAGE, LOSSES DUE TO CLEARING OPERATIONS, COMPACTION, SETTLEMENT, SPOILS, ETC. CONTRACTOR SHOULD VERIFY QUANTITIES PRIOR TO BIDDING.

ASSUMED BUILDING SLAB SECTION = 8"
ASSUMED PARKING A.C. SECTION = 2.5" A.C. OVER 4" A.B.
ASSUMED PARKING P.C.C. SECTION = 6.5" P.C.C. OVER COMPACTED NATIVE
AREA TO BE GRADED= 97,200 SF (2.23 ACRES), 19.4% OF THE SITE
MAX. DEPTH OF CUT= 4.7'
MAX. HEIGHT OF CUT SLOPE= 2.3'
RATIO OF CUT SLOPE= 2:1 MAX.
MAX. DEPTH OF FILL= 4.7'
MAX. HEIGHT OF FILL SLOPE= 1.4'
RATIO OF FILL SLOPE= 2:1 MAX.
RETAINING WALL LENGTH= 216 LF , H= 5' MAX.

NOTE:

THIS PROJECT WILL NOT DISCHARGE ANY PROPOSED STORM WATER RUN-OFF ONTO THE EXISTING HILLSIDE AREAS.

KAMAL S. SWEIS
No. 48592
CIVIL

30 0 30 60 120
GRAPHIC SCALE

STORM WATER NOTES:

1. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITEE SHALL ENTER INTO A MAINTENENCE AGREEMENT FOR THE ONGOING PERMANENT BMP MAINTENANCE, SATISFACTORY TO THE CITY ENGINEER.

2. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER/PERMITEE SHALL INCORPORATE ANY CONSTRUCTION BEST MANAGEMENT PRACTICES NECESSARY TO COMPLY WITH CHAPTER 14, ARTICLE 2, DIVISION 1 (GRADING REGULATIONS) OF THE SAN DIEGO MUNICIPAL CODE, INTO THE CONSTRUCTION PLANS OR SPECIFICATIONS.

3. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE APPLICANT SHALL SUBMIT A TECHNICAL REPORT THAT WILL BE SUBJECT TO FINAL REVIEW AND APPROVAL BY THE CITY ENGINEER, BASED ON THE STORM WATER STANDARDS IN EFFECT AT THE TIME OF THE CONSTRUCTION PERMIT ISSUANCE.

4. DEVELOPMENT OF THIS PROJECT SHALL COMPLY WITH ALL STORM WATER CONSTRUCTION REQUIREMENTS OF THE STATE CONSTRUCTION GENERAL PERMIT ORDER No 2009-009DWQ, OR SUBSEQUENT ORDER, AND THE MUNICIPAL STORM WATER PERMIT, ORDER No R9-2013-001, OR SUBSEQUENT ORDER. IN ACCORDANCE WITH ORDER No 2009-009-DWQ, OR SUBSEQUENT ORDER, A RISK LEVEL DETERMINATION SHALL BE CALCULATED FOR THE SITE AND A STORM WATER POLLUTION PREVENTION PLAN (SWPPP) SHALL BE IMPLEMENTED CONCURRENTLY WITH THE COMMENCEMENT OF GRADING ACTIVITIES.

5. PRIOR TO THE ISSUANCE OF A GRADING OR CONSTRUCTION PERMIT, A COPY OF THE NOTICE OF INTENT (NOI) WITH A VALID WASTE DISCHARGE ID NUMBER (WDID#) SHALL BE SUBMITTED TO THE CITY OF SAN DIEGO AS A PROOF OF ENROLLMENT UNDER THE CONSTRUCTION GENERAL PERMIT. WHEN OWNERSHIP OF THE ENTIRE SITE OR PORTIONS OF THE SITE CHANGES PRIOR TO FILLING OF THE NOTICE OF TERMINATION (NOT), A REVISED NOI SHALL BE SUBMITTED ELECTRONICALLY TO THE STATE WATER RESOURCE CONTROL BOARD IN ACCORDANCE WITH THE PROVISIONS AS SET FORTH IN SECTION II.C OF ORDER No 2009-0009-DWQ AND A COPY SHALL BE SUBMITTED TO THE CITY.

ATTACHMENT 5
DRAINAGE REPORT

Attach project's drainage report. Refer to Drainage Design Manual to determine the reporting requirements.

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K &S ENGINEERING, INC.
Planning Engineering Surveying

HYDROLOGY STUDY
FOR

BAJA FREIGHT AND STORAGE
6852 CALLE DE LINEA
P.T.S.#: 521798

IN

CITY OF SAN DIEGO

JN 17-001

JUNE 29, 2018

KAMAL S. SWEIS R.C.E. 48592

6-29-2018
DATE

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5. HYDROLOGY MAPS

*A. **EXISTING CONDITION***

The site consists of a 3.94 acre project located on Calle de Linea in the City of San Diego. It comprises APN: 667-050-56.

The existing condition is already developed with one office trailer, sidewalks, AC parking, a decomposed granite truck parking area and underground storm drain system which connects to the existing MS4 located at Calle de Linea. The surrounding area is Industrial land use.

Currently the runoff sheet-flows in a Southeast direction into an existing vegetated swale located along the Southerly property line, then the runoff is conveyed towards the East via underground storm drain pipe into an existing cleanout where the runoff from the existing parking lot area at the East confluence; then the private storm drain connects into the public MS4 by means of an existing 18" RCP, the runoff at this point (POC#1) is Q50= 10.54 CFS.

A small portion of the Easterly driveway (0.07AC) sheet-flows towards Calle de Linea generating Q50= 0.28 CFS

Since under the current City of San Diego manual there is no differential in runoff coefficient between an industrial site and an already developed site with fully compacted decomposed granite surface; the runoff coefficients utilized to calculate peak flows for existing condition are based on the City of San Diego Modified Rational Method.

Return Period	Drainage Area (AC)	Runoff Coefficient (C)	Peak Flow (CFS)
5 Yr	3.94	0.64	4.63
10 Yr	3.94	0.68	5.96
25 Yr	3.94	0.73	7.45
50 Yr	3.94	0.83	10.82
100 Yr	3.94	0.85	11.98

*B. **PROPOSED CONDITION***

The project consists of construction of one building for office and distribution uses, installation of underground pipe system, AC car parking and PCC truck parking, loading dock area and one bioretention facility for storm water quality, hydromodification and detention purposes.

Since the site is located is located in the Otay Mesa area that drains to Mexico, the project is required to provide a storm water detention facility designed to mitigate the developed runoff to be equal or less than the pre-developed condition for the 5, 10, 25 and 50 year event (see calculations herein)

The Westerly side of project is conveyed to a proposed underground storm drain system which takes the runoff east into a proposed bioretention facility. The Central part of the project comprised by half the building and loading dock area drains south via concrete swale into a proposed concrete brow ditch located along the southerly property line where it comingles with the runoff generated by the westerly side of the project and which conveys the flow into the bioretention facility. The Westerly part of the project sheet-flows into the biotretention facility.

After treatment, detention and hydromodification requirements are met, the runoff will be conveyed to the existing storm drain cleanout (POC#1) east of the proposed bioretention facility, then into the existing 18" RCP to the MS4, where it confluence with the runoff generated by the easterly parking area. The runoff generated at this POC#1 is Q50= 13.39 CFS

The driveway at the far Southeast area of the project (0.7 AC) and a small landscape area at the westerly driveway (0.03 AC) will sheet flow into Calle de Linea, the runoff generated by these areas is Q50= 0.38 CFS.

Since under the current City of San Diego manual there is no differential in runoff coefficient between an industrial site and an already developed site with fully compacted decomposed granite surface; the runoff coefficients utilized to calculate peak flows for existing condition are based on the City of San Diego Modified Rational Method.

Return Period	Drainage Area (AC)	Runoff Coefficient (C)	Peak Flow (CFS)
5 Yr	3.94	0.901	9.93
10 Yr	3.94	0.901	11.41
25 Yr	3.94	0.901	12.31
50 Yr	3.94	0.901	13.77
100 Yr	3.94	0.901	14.31

C. SUMMARY

Although the proposed project does not increase the total basin area, there was an increase in runoff (see table below) caused by the increment in imperviousness of the site; this increment will be mitigated at the proposed detention facility. The project's developed condition runoff will be equal or less than the pre-developed condition, therefore, Baja Freight's project will not have negative impact on the downstream drainage system. See 5, 10, 25, 50 Year Routing Analysis prepared by REC Consultants, Dated June, 2018. Project is not required to obtain approval from the regional Water Quality Control Board under Federal Clean Water Act section 401 nor 404, since project does discharge into the navigable waters, nor dredged or fill material will be discharged into waters of the United States.

Return Period	Existing Condition Peak Flow (CFS)	Developed Condition Peak Flow (CFS)	Increase (CFS)
5 Yr	4.63	9.93	5.30
10 Yr	5.96	11.41	5.45
25 Yr	7.45	12.31	4.86
50 Yr	10.82	13.77	2.95
100 Yr	11.98	14.31	2.33

2. HYDROLOGY DESIGN MODELS

A. *DESIGN METHODS*

THE RATIONAL METHOD IS USED IN THIS HYDROLOGY STUDY; THE RATIONAL FORMULA IS AS FOLLOWS:

Q = CIA, WHERE : Q= PEAK DISCHARGE IN CUBIC FEET/SECOND *

C = RUNOFF COEFFICIENT (DIMENSIONLESS)

I = RAINFALL INTENSITY IN INCHES/HOUR

A = TRIBUTARY DRAINAGE AREA IN ACRES

*1 ACRE INCHES/HOUR = 1.008 CUBIC FEET/SEC

THE OVERLAND METHOD IS ALSO USED IN THIS HYDROLOGY STUDY;
THE URBAN AREAS OVERLAND FORMULA IS AS FOLLOWS:

$T=[1.8(1.1-C)(L)^{(.5)})]/[S(100)]^{.333}$

L = LENGTH OF WATERSHED

C = COEFFICIENT OF RUNOFF

T = TIME IN MINUTES

S = DIFFERENCE IN ELEVATION DIVIDED BY DE LENGTH OF WATERSHED

B. *DESIGN CRITERIA*

- FREQUENCY 50 YEAR STORM.

- LAND USE PER SPECIFIC PLAN AND TENTATIVE MAP.
- RAIN FALL INTENSITY PER CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL, JANUARY, 2017.

C. *REFERENCES*

- CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL, JANUARY 2017

- HAND BOOK OF HYDRAULICS BY BRATER & KING, SIXTH EDITION.

3. RATIONAL METHOD HYDROLOGY CALCULATION

EXISTING CONDITION STUDY

BAJA FREIGHT **J.N. 17-001**
EXISTING CONDITION HYDROLOGY
5 YEAR STORM

```
San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
          Rational Hydrology Study        Date: 06/11/18
------------------------------------------------------------------------
 *********  Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4035

------------------------------------------------------------------------
Rational hydrology study storm event year is     5.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       2.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
User specified 'C' value of 0.640 given for subarea
Initial subarea flow distance  =  440.000(Ft.)
Highest elevation =  463.000(Ft.)
Lowest elevation =  456.540(Ft.)
Elevation difference =     6.460(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     15.28 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6400)*( 440.000^.5)/( 1.468^(1/3)]=  15.28
Rainfall intensity (I) =       1.799(In/Hr) for a     5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.640
Subarea runoff =       1.865(CFS)
Total initial stream area =        1.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       3.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   456.540(Ft.)
Downstream point elevation =   456.060(Ft.)
Channel length thru subarea  =    52.000(Ft.)
Channel base width  =     0.000(Ft.)
Slope or 'Z' of left channel bank =  66.660
Slope or 'Z' of right channel bank =  66.660
Manning's 'N'    = 0.015
Maximum depth of channel   =    0.300(Ft.)
Flow(q) thru subarea =      1.865(CFS)
```

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Depth of flow =   0.134(Ft.), Average velocity =   1.567(Ft/s)
Channel flow top width =   17.814(Ft.)
Flow Velocity =    1.57(Ft/s)
Travel time  =    0.55 min.
Time of concentration =   15.83 min.
Critical depth =      0.137(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       3.000 to Point/Station       4.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   456.060(Ft.)
Downstream point elevation =   450.000(Ft.)
Channel length thru subarea  =   106.000(Ft.)
Channel base width =     0.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.023
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      1.865(CFS)
Depth of flow =   0.361(Ft.), Average velocity =   4.765(Ft/s)
Channel flow top width =    2.167(Ft.)
Flow Velocity =    4.77(Ft/s)
Travel time  =    0.37 min.
Time of concentration =   16.21 min.
Critical depth =      0.473(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       3.000 to Point/Station       4.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.640 given for subarea
Time of concentration =    16.21 min.
Rainfall intensity =      1.747(In/Hr) for a     5.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.640
Subarea runoff =      2.426(CFS) for    2.170(Ac.)
Total runoff =      4.290(CFS)  Total area =        3.79(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       4.000 to Point/Station       5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   448.080(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length  =   160.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.290(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     4.290(CFS)
Normal flow depth in pipe =    6.42(In.)
Flow top width inside pipe =   17.24(In.)
Critical Depth =    9.52(In.)
Pipe flow velocity =      7.59(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =    16.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       4.000 to Point/Station       5.000
**** CONFLUENCE OF MINOR STREAMS ****
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________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.790(Ac.)
Runoff from this stream =      4.290(CFS)
Time of concentration =   16.56 min.
Rainfall intensity =     1.728(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       6.000 to Point/Station       7.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________
User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance  =   90.000(Ft.)
Highest elevation =  453.600(Ft.)
Lowest elevation =  451.500(Ft.)
Elevation difference =    2.100(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.93 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  90.000^.5)/(   2.333^(1/3)]=   1.93
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      3.149(In/Hr) for a     5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =       0.239(CFS)
Total initial stream area =         0.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       7.000 to Point/Station       5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________
Upstream point/station elevation =   448.000(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length  =    27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.239(CFS)
Given pipe size =       6.00(In.)
Calculated individual pipe flow  =      0.239(CFS)
Normal flow depth in pipe =     1.39(In.)
Flow top width inside pipe =     5.07(In.)
Critical Depth =     2.95(In.)
Pipe flow velocity =       6.93(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     5.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       7.000 to Point/Station       5.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.080(Ac.)
Runoff from this stream =      0.239(CFS)
Time of concentration =     5.06 min.
Rainfall intensity =     3.128(In/Hr)
Summary of stream data:

Stream   Flow rate     TC          Rainfall Intensity
 No.      (CFS)      (min)             (In/Hr)


1       4.290    16.56              1.728
```

```
2       0.239     5.06                 3.128
Qmax(1) =
                1.000 *    1.000 *     4.290) +
                0.552 *    1.000 *     0.239) + =        4.423
Qmax(2) =
                1.000 *    0.306 *     4.290) +
                1.000 *    1.000 *     0.239) + =        1.552

Total of 2 streams to confluence:
Flow rates before confluence point:
      4.290       0.239
Maximum flow rates at confluence using above data:
       4.423        1.552
Area of streams before confluence:
       3.790        0.080
Results of confluence:
Total flow rate =       4.423(CFS)
Time of concentration =    16.557 min.
Effective stream area after confluence =       3.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station       8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =   444.480(Ft.)
Downstream point/station elevation =   444.100(Ft.)
Pipe length   =    18.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     4.423(CFS)
Given pipe size =      18.00(In.)
Calculated individual pipe flow   =     4.423(CFS)
Normal flow depth in pipe =    7.17(In.)
Flow top width inside pipe =   17.62(In.)
Critical Depth =    9.69(In.)
Pipe flow velocity =       6.74(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    16.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  453.000(Ft.)
Lowest elevation =  450.000(Ft.)
Elevation difference =    3.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.22 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  60.000^.5)/(   5.000^(1/3)]=   1.22
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       3.149(In/Hr) for a     5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =       0.209(CFS)
Total initial stream area =          0.070(Ac.)
End of computations, total study area =           3.940 (Ac.)
```

BAJA FREIGHT
EXISTING CONDITION HYDROLOGY
10 YEAR STORM

J.N. 17-001

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San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
            Rational Hydrology Study          Date: 06/12/18
------------------------------------------------------------------------
*********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4035

------------------------------------------------------------------------
Rational hydrology study storm event year is     10.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       2.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.680 given for subarea
Initial subarea flow distance  =  440.000(Ft.)
Highest elevation =  463.000(Ft.)
Lowest elevation =  456.540(Ft.)
Elevation difference =     6.460(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     13.95 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6800)*( 440.000^.5)/( 1.468^(1/3)]=  13.95
Rainfall intensity (I) =       2.194(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.680
Subarea runoff =       2.417(CFS)
Total initial stream area =          1.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       3.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   456.540(Ft.)
Downstream point elevation =   456.060(Ft.)
Channel length thru subarea  =    52.000(Ft.)
Channel base width =     0.000(Ft.)
Slope or 'Z' of left channel bank =  66.660
Slope or 'Z' of right channel bank =  66.660
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.300(Ft.)
Flow(q) thru subarea =       2.417(CFS)
```

```
Depth of flow =   0.147(Ft.), Average velocity =   1.672(Ft/s)
Channel flow top width =   19.634(Ft.)
Flow Velocity =    1.67(Ft/s)
Travel time  =    0.52 min.
Time of concentration =   14.47 min.
Critical depth =      0.152(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       3.000 to Point/Station       4.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   456.060(Ft.)
Downstream point elevation =   450.000(Ft.)
Channel length thru subarea  =   106.000(Ft.)
Channel base width =    0.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.023
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      2.417(CFS)
Depth of flow =   0.398(Ft.), Average velocity =   5.084(Ft/s)
Channel flow top width =    2.388(Ft.)
Flow Velocity =    5.08(Ft/s)
Travel time  =    0.35 min.
Time of concentration =   14.82 min.
Critical depth =      0.527(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       3.000 to Point/Station       4.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.680 given for subarea
Time of concentration =    14.82 min.
Rainfall intensity =      2.132(In/Hr) for a    10.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.680
Subarea runoff =      3.147(CFS) for    2.170(Ac.)
Total runoff =      5.564(CFS) Total area =        3.79(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       4.000 to Point/Station       5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   448.080(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length  =   160.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.564(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     5.564(CFS)
Normal flow depth in pipe =    7.39(In.)
Flow top width inside pipe =   17.71(In.)
Critical Depth =   10.91(In.)
Pipe flow velocity =      8.15(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =    15.15 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       4.000 to Point/Station       5.000
**** CONFLUENCE OF MINOR STREAMS ****
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________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.790(Ac.)
Runoff from this stream =      5.564(CFS)
Time of concentration =   15.15 min.
Rainfall intensity =     2.110(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       6.000 to Point/Station       7.000
**** INITIAL AREA EVALUATION ****

________________________________________________________________________
User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance  =   90.000(Ft.)
Highest elevation =  453.600(Ft.)
Lowest elevation =  451.500(Ft.)
Elevation difference =    2.100(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.93 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  90.000^.5)/(   2.333^(1/3)]=   1.93
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      3.592(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.273(CFS)
Total initial stream area =        0.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       7.000 to Point/Station       5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

________________________________________________________________________
Upstream point/station elevation =   448.000(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length   =     27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.273(CFS)
Given pipe size =       6.00(In.)
Calculated individual pipe flow  =     0.273(CFS)
Normal flow depth in pipe =    1.49(In.)
Flow top width inside pipe =    5.18(In.)
Critical Depth =     3.16(In.)
Pipe flow velocity =      7.19(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     5.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       7.000 to Point/Station       5.000
**** CONFLUENCE OF MINOR STREAMS ****

________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.080(Ac.)
Runoff from this stream =      0.273(CFS)
Time of concentration =    5.06 min.
Rainfall intensity =     3.570(In/Hr)
Summary of stream data:

Stream   Flow rate     TC           Rainfall Intensity
 No.      (CFS)      (min)               (In/Hr)


1        5.564     15.15                 2.110
```

```
2       0.273      5.06                   3.570
Qmax(1) =
              1.000 *    1.000 *    5.564) +
              0.591 *    1.000 *    0.273) + =        5.725
Qmax(2) =
              1.000 *    0.334 *    5.564) +
              1.000 *    1.000 *    0.273) + =        2.133

Total of 2 streams to confluence:
Flow rates before confluence point:
      5.564       0.273
Maximum flow rates at confluence using above data:
       5.725        2.133
Area of streams before confluence:
       3.790        0.080
Results of confluence:
Total flow rate =       5.725(CFS)
Time of concentration =    15.146 min.
Effective stream area after confluence =       3.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =   444.480(Ft.)
Downstream point/station elevation =   444.100(Ft.)
Pipe length  =    18.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =      5.725(CFS)
Given pipe size =      18.00(In.)
Calculated individual pipe flow  =      5.725(CFS)
Normal flow depth in pipe =    8.28(In.)
Flow top width inside pipe =   17.94(In.)
Critical Depth =   11.08(In.)
Pipe flow velocity =       7.22(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    15.19 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  453.000(Ft.)
Lowest elevation =  450.000(Ft.)
Elevation difference =    3.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.22 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  60.000^.5)/(   5.000^(1/3)]=   1.22
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      3.592(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.239(CFS)
Total initial stream area =          0.070(Ac.)
End of computations, total study area =            3.940 (Ac.)
```

BAJA FREIGHT **J.N.17-001**
EXISTING CONDITION HYDROLOGY
25 YEAR STORM

```
San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
          Rational Hydrology Study        Date: 06/11/18
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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Program License Serial Number 4035

------------------------------------------------------------------------
Rational hydrology study storm event year is    25.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.730 given for subarea
Initial subarea flow distance  =  440.000(Ft.)
Highest elevation =  463.000(Ft.)
Lowest elevation =  456.540(Ft.)
Elevation difference =     6.460(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     12.29 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.7300)*( 440.000^.5)/( 1.468^(1/3)]=  12.29
Rainfall intensity (I) =       2.572(In/Hr) for a     25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.730
Subarea runoff =       3.042(CFS)
Total initial stream area =        1.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   456.540(Ft.)
Downstream point elevation =   456.060(Ft.)
Channel length thru subarea  =    52.000(Ft.)
Channel base width =     0.000(Ft.)
Slope or 'Z' of left channel bank =   66.660
Slope or 'Z' of right channel bank =   66.660
Manning's 'N'    = 0.015
Maximum depth of channel   =    0.300(Ft.)
Flow(q) thru subarea =       3.042(CFS)
```

```
Depth of flow =   0.161(Ft.), Average velocity =   1.771(Ft/s)
Channel flow top width =   21.400(Ft.)
Flow Velocity =    1.77(Ft/s)
Travel time  =    0.49 min.
Time of concentration =   12.78 min.
Critical depth =      0.167(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       3.000 to Point/Station       4.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   456.060(Ft.)
Downstream point elevation =   450.000(Ft.)
Channel length thru subarea  =   106.000(Ft.)
Channel base width =     0.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.023
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =       3.042(CFS)
Depth of flow =   0.434(Ft.), Average velocity =   5.385(Ft/s)
Channel flow top width =    2.603(Ft.)
Flow Velocity =    5.39(Ft/s)
Travel time  =    0.33 min.
Time of concentration =   13.11 min.
Critical depth =      0.578(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       3.000 to Point/Station       4.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.730 given for subarea
Time of concentration =    13.11 min.
Rainfall intensity =      2.501(In/Hr) for a    25.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.730
Subarea runoff =      3.962(CFS) for    2.170(Ac.)
Total runoff =      7.003(CFS)  Total area =       3.79(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       4.000 to Point/Station       5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =   448.080(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length  =   160.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.003(CFS)
Given pipe size =      18.00(In.)
Calculated individual pipe flow  =     7.003(CFS)
Normal flow depth in pipe =    8.40(In.)
Flow top width inside pipe =   17.96(In.)
Critical Depth =   12.29(In.)
Pipe flow velocity =       8.65(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    13.42 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       4.000 to Point/Station       5.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.790(Ac.)
Runoff from this stream =      7.003(CFS)
Time of concentration =   13.42 min.
Rainfall intensity =     2.476(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       6.000 to Point/Station       7.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________
User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance  =   90.000(Ft.)
Highest elevation =  453.600(Ft.)
Lowest elevation =  451.500(Ft.)
Elevation difference =    2.100(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.93 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  90.000^.5)/(   2.333^(1/3)]=   1.93
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      3.845(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.292(CFS)
Total initial stream area =        0.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       7.000 to Point/Station       5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________
Upstream point/station elevation =   448.000(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length  =    27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.292(CFS)
Given pipe size =       6.00(In.)
Calculated individual pipe flow  =     0.292(CFS)
Normal flow depth in pipe =     1.54(In.)
Flow top width inside pipe =     5.24(In.)
Critical Depth =     3.28(In.)
Pipe flow velocity =       7.34(Ft/s)
Travel time through pipe =     0.06 min.
Time of concentration (TC) =      5.06 min.


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Process from Point/Station       7.000 to Point/Station       5.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.080(Ac.)
Runoff from this stream =      0.292(CFS)
Time of concentration =     5.06 min.
Rainfall intensity =     3.823(In/Hr)
Summary of stream data:

Stream   Flow rate     TC            Rainfall Intensity
 No.       (CFS)      (min)               (In/Hr)


1        7.003     13.42                  2.476
```

```
2      0.292     5.06                 3.823
Qmax(1) =
               1.000 *    1.000 *    7.003) +
               0.648 *    1.000 *    0.292) + =      7.192
Qmax(2) =
               1.000 *    0.377 *    7.003) +
               1.000 *    1.000 *    0.292) + =      2.934

Total of 2 streams to confluence:
Flow rates before confluence point:
      7.003      0.292
Maximum flow rates at confluence using above data:
       7.192       2.934
Area of streams before confluence:
       3.790       0.080
Results of confluence:
Total flow rate =      7.192(CFS)
Time of concentration =    13.417 min.
Effective stream area after confluence =      3.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station       8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

______________________________________________________
Upstream point/station elevation =   444.480(Ft.)
Downstream point/station elevation =   444.100(Ft.)
Pipe length   =    18.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow   =     7.192(CFS)
Given pipe size =      18.00(In.)
Calculated individual pipe flow   =      7.192(CFS)
Normal flow depth in pipe =    9.46(In.)
Flow top width inside pipe =   17.98(In.)
Critical Depth =   12.46(In.)
Pipe flow velocity =       7.64(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    13.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station      10.000
**** INITIAL AREA EVALUATION ****

______________________________________________________
User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance   =   60.000(Ft.)
Highest elevation =  453.000(Ft.)
Lowest elevation =  450.000(Ft.)
Elevation difference =    3.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.22 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  60.000^.5)/(  5.000^(1/3)]=   1.22
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      3.845(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.256(CFS)
Total initial stream area =       0.070(Ac.)
End of computations, total study area =          3.940 (Ac.)
```

BAJA FREIGHT **J.N. 17-001**
EXISTING CONDITION HYDROLOGY
50 YEAR STORM

```
San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
          Rational Hydrology Study        Date: 06/11/18
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4035

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       2.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
User specified 'C' value of 0.830 given for subarea
Initial subarea flow distance  =  440.000(Ft.)
Highest elevation =  463.000(Ft.)
Lowest elevation =  456.540(Ft.)
Elevation difference =    6.460(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     8.97 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8300)*( 440.000^.5)/( 1.468^(1/3)]=  8.97
Rainfall intensity (I) =      3.333(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.830
Subarea runoff =       4.481(CFS)
Total initial stream area =        1.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       3.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =   456.540(Ft.)
Downstream point elevation =   456.060(Ft.)
Channel length thru subarea  =    52.000(Ft.)
Channel base width  =     0.000(Ft.)
Slope or 'Z' of left channel bank =  66.660
Slope or 'Z' of right channel bank =  66.660
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.300(Ft.)
Flow(q) thru subarea =      4.481(CFS)
```

```
Depth of flow =   0.186(Ft.), Average velocity =   1.951(Ft/s)
Channel flow top width =   24.748(Ft.)
Flow Velocity =    1.95(Ft/s)
Travel time  =    0.44 min.
Time of concentration =     9.41 min.
Critical depth =      0.195(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________
Upstream point elevation =   456.060(Ft.)
Downstream point elevation =   450.000(Ft.)
Channel length thru subarea  =   106.000(Ft.)
Channel base width =    0.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.023
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      4.481(CFS)
Depth of flow =   0.502(Ft.), Average velocity =   5.933(Ft/s)
Channel flow top width =    3.011(Ft.)
Flow Velocity =    5.93(Ft/s)
Travel time  =    0.30 min.
Time of concentration =     9.71 min.
Critical depth =      0.672(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        4.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________
User specified 'C' value of 0.830 given for subarea
Time of concentration =     9.71 min.
Rainfall intensity =      3.228(In/Hr) for a     50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.830
Subarea runoff =      5.814(CFS) for    2.170(Ac.)
Total runoff =      10.295(CFS) Total area =        3.79(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________
Upstream point/station elevation =   448.080(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length  =    160.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.295(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =    10.295(CFS)
Normal flow depth in pipe =   10.61(In.)
Flow top width inside pipe =   17.71(In.)
Critical Depth =   14.81(In.)
Pipe flow velocity =       9.50(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     9.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****
```

```
________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.790(Ac.)
Runoff from this stream =      10.295(CFS)
Time of concentration =      9.99 min.
Rainfall intensity =      3.191(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       6.000 to Point/Station       7.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________
User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance  =   90.000(Ft.)
Highest elevation =  453.600(Ft.)
Lowest elevation =  451.500(Ft.)
Elevation difference =    2.100(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.93 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  90.000^.5)/(   2.333^(1/3)]=   1.93
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a     50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.324(CFS)
Total initial stream area =        0.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       7.000 to Point/Station       5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________
Upstream point/station elevation =   448.000(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length  =     27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      0.324(CFS)
Given pipe size =       6.00(In.)
Calculated individual pipe flow  =      0.324(CFS)
Normal flow depth in pipe =     1.62(In.)
Flow top width inside pipe =     5.33(In.)
Critical Depth =     3.46(In.)
Pipe flow velocity =       7.56(Ft/s)
Travel time through pipe =     0.06 min.
Time of concentration (TC) =      5.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       7.000 to Point/Station       5.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.080(Ac.)
Runoff from this stream =      0.324(CFS)
Time of concentration =      5.06 min.
Rainfall intensity =      4.243(In/Hr)
Summary of stream data:

Stream   Flow rate     TC            Rainfall Intensity
 No.      (CFS)       (min)              (In/Hr)


1       10.295      9.99                  3.191
```

```
2       0.324     5.06                  4.243
Qmax(1) =
                1.000 *    1.000 *    10.295) +
                0.752 *    1.000 *     0.324) + =      10.539
Qmax(2) =
                1.000 *    0.506 *    10.295) +
                1.000 *    1.000 *     0.324) + =       5.537

Total of 2 streams to confluence:
Flow rates before confluence point:
      10.295       0.324
Maximum flow rates at confluence using above data:
       10.539        5.537
Area of streams before confluence:
        3.790        0.080
Results of confluence:
Total flow rate =      10.539(CFS)
Time of concentration =       9.992 min.
Effective stream area after confluence =       3.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =   444.480(Ft.)
Downstream point/station elevation =   444.100(Ft.)
Pipe length  =    18.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    10.539(CFS)
Given pipe size =      18.00(In.)
Calculated individual pipe flow  =     10.539(CFS)
Normal flow depth in pipe =   12.14(In.)
Flow top width inside pipe =   16.87(In.)
Critical Depth =   14.98(In.)
Pipe flow velocity =       8.31(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    10.03 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station       10.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  453.000(Ft.)
Lowest elevation =  450.000(Ft.)
Elevation difference =    3.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.22 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  60.000^.5)/(   5.000^(1/3)]=   1.22
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       4.265(In/Hr) for a     50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =       0.284(CFS)
Total initial stream area =          0.070(Ac.)
End of computations, total study area =           3.940 (Ac.)
```

BAJA FREIGHT **J.N. 17-001**
EXISTING CONDITION HYDROLOGY
100 YEAR STORM

```
San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
          Rational Hydrology Study        Date: 06/29/18
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4035

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.850 given for subarea
Initial subarea flow distance  =  440.000(Ft.)
Highest elevation =  463.000(Ft.)
Lowest elevation =  456.540(Ft.)
Elevation difference =    6.460(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     8.31 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8500)*( 440.000^.5)/( 1.468^(1/3)]=   8.31
Rainfall intensity (I) =      3.610(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.850
Subarea runoff =       4.971(CFS)
Total initial stream area =          1.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________
Upstream point elevation =   456.540(Ft.)
Downstream point elevation =   456.060(Ft.)
Channel length thru subarea  =    52.000(Ft.)
Channel base width =     0.000(Ft.)
Slope or 'Z' of left channel bank =  66.660
Slope or 'Z' of right channel bank =  66.660
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.300(Ft.)
Flow(q) thru subarea =       4.971(CFS)
```

```
Depth of flow =   0.193(Ft.), Average velocity =   2.002(Ft/s)
Channel flow top width =   25.728(Ft.)
Flow Velocity =    2.00(Ft/s)
Travel time  =    0.43 min.
Time of concentration =    8.74 min.
Critical depth =      0.203(Ft.)


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Process from Point/Station       3.000 to Point/Station       4.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation =   456.060(Ft.)
Downstream point elevation =   450.000(Ft.)
Channel length thru subarea  =   106.000(Ft.)
Channel base width =      0.000(Ft.)
Slope or 'Z' of left channel bank =   3.000
Slope or 'Z' of right channel bank =   3.000
Manning's 'N'    = 0.023
Maximum depth of channel  =    1.000(Ft.)
Flow(q) thru subarea =      4.971(CFS)
Depth of flow =   0.522(Ft.), Average velocity =   6.089(Ft/s)
Channel flow top width =    3.130(Ft.)
Flow Velocity =    6.09(Ft/s)
Travel time  =    0.29 min.
Time of concentration =    9.03 min.
Critical depth =      0.703(Ft.)


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Process from Point/Station       3.000 to Point/Station       4.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.850 given for subarea
Time of concentration =      9.03 min.
Rainfall intensity =       3.501(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.850
Subarea runoff =       6.458(CFS) for    2.170(Ac.)
Total runoff =      11.429(CFS) Total area =         3.79(Ac.)


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       4.000 to Point/Station       5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =   448.080(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length  =    160.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     11.429(CFS)
Given pipe size =     18.00(In.)
Calculated individual pipe flow  =     11.429(CFS)
Normal flow depth in pipe =   11.37(In.)
Flow top width inside pipe =   17.37(In.)
Critical Depth =   15.48(In.)
Pipe flow velocity =       9.72(Ft/s)
Travel time through pipe =    0.27 min.
Time of concentration (TC) =     9.30 min.


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Process from Point/Station       4.000 to Point/Station       5.000
**** CONFLUENCE OF MINOR STREAMS ****
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```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      3.790(Ac.)
Runoff from this stream =     11.429(CFS)
Time of concentration =    9.30 min.
Rainfall intensity =     3.464(In/Hr)


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Process from Point/Station        6.000 to Point/Station        7.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance  =   90.000(Ft.)
Highest elevation =  453.600(Ft.)
Lowest elevation =  451.500(Ft.)
Elevation difference =    2.100(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.93 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  90.000^.5)/(   2.333^(1/3)]=   1.93
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.334(CFS)
Total initial stream area =        0.080(Ac.)


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Process from Point/Station        7.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =   448.000(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length  =     27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      0.334(CFS)
Given pipe size =      6.00(In.)
Calculated individual pipe flow  =      0.334(CFS)
Normal flow depth in pipe =     1.65(In.)
Flow top width inside pipe =     5.35(In.)
Critical Depth =    3.51(In.)
Pipe flow velocity =       7.62(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     5.06 min.


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Process from Point/Station        7.000 to Point/Station        5.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.080(Ac.)
Runoff from this stream =      0.334(CFS)
Time of concentration =    5.06 min.
Rainfall intensity =     4.368(In/Hr)
Summary of stream data:

Stream   Flow rate     TC          Rainfall Intensity
 No.      (CFS)      (min)              (In/Hr)


1       11.429     9.30                 3.464
```

```
2      0.334     5.06                4.368
Qmax(1) =
            1.000 *    1.000 *    11.429) +
            0.793 *    1.000 *     0.334) + =      11.693
Qmax(2) =
            1.000 *    0.544 *    11.429) +
            1.000 *    1.000 *     0.334) + =       6.549

Total of 2 streams to confluence:
Flow rates before confluence point:
    11.429      0.334
Maximum flow rates at confluence using above data:
     11.693       6.549
Area of streams before confluence:
      3.790       0.080
Results of confluence:
Total flow rate =     11.693(CFS)
Time of concentration =     9.302 min.
Effective stream area after confluence =      3.870(Ac.)


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Process from Point/Station        5.000 to Point/Station        8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =  444.480(Ft.)
Downstream point/station elevation =  444.100(Ft.)
Pipe length  =    18.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     11.693(CFS)
Given pipe size =      18.00(In.)
Calculated individual pipe flow  =     11.693(CFS)
Normal flow depth in pipe =   13.15(In.)
Flow top width inside pipe =   15.97(In.)
Critical Depth =   15.62(In.)
Pipe flow velocity =      8.45(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =      9.34 min.


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Process from Point/Station        9.000 to Point/Station       10.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.950 given for subarea
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  453.000(Ft.)
Lowest elevation =  450.000(Ft.)
Elevation difference =    3.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.22 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9500)*(  60.000^.5)/(   5.000^(1/3)]=   1.22
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.950
Subarea runoff =      0.292(CFS)
Total initial stream area =         0.070(Ac.)
End of computations, total study area =           3.940 (Ac.)
```

PROPOSED CONDITION STUDY

BAJA FREIGHT **J.N. 17-001**
PROPOSED CONDITION HYDROLOGY
5 YEAR STORM

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San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
          Rational Hydrology Study        Date: 06/12/18
------------------------------------------------------------------------
 *********  Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4035

------------------------------------------------------------------------
Rational hydrology study storm event year is     5.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


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Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   90.000(Ft.)
Highest elevation =  463.490(Ft.)
Lowest elevation =  460.550(Ft.)
Elevation difference =     2.940(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.29 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  90.000^.5)/(  3.267^(1/3)]=  2.29
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      3.149(In/Hr) for a     5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =       1.107(CFS)
Total initial stream area =        0.390(Ac.)


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Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   458.000(Ft.)
Downstream point/station elevation =   457.250(Ft.)
Pipe length  =     75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.107(CFS)
Given pipe size =     10.00(In.)
Calculated individual pipe flow  =      1.107(CFS)
Normal flow depth in pipe =    5.03(In.)
Flow top width inside pipe =   10.00(In.)
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Critical Depth =    5.62(In.)
Pipe flow velocity =      4.03(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =     5.31 min.


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Process from Point/Station       2.000 to Point/Station       3.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.901 given for subarea
Time of concentration =     5.31 min.
Rainfall intensity =      3.051(In/Hr) for a     5.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.935(CFS) for    0.340(Ac.)
Total runoff =      2.041(CFS) Total area =         0.73(Ac.)


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Process from Point/Station       3.000 to Point/Station       4.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =   457.250(Ft.)
Downstream point/station elevation =   456.360(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.041(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.041(CFS)
Normal flow depth in pipe =    6.51(In.)
Flow top width inside pipe =   11.96(In.)
Critical Depth =    7.32(In.)
Pipe flow velocity =      4.69(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =     5.63 min.


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Process from Point/Station       3.000 to Point/Station       4.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.901 given for subarea
Time of concentration =     5.63 min.
Rainfall intensity =      2.960(In/Hr) for a     5.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.854(CFS) for    0.320(Ac.)
Total runoff =      2.895(CFS) Total area =         1.05(Ac.)


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Process from Point/Station       4.000 to Point/Station       5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =   456.360(Ft.)
Downstream point/station elevation =   455.640(Ft.)
Pipe length  =    72.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.895(CFS)
Given pipe size =     15.00(In.)
Calculated individual pipe flow  =     2.895(CFS)
Normal flow depth in pipe =    7.04(In.)
Flow top width inside pipe =   14.97(In.)
Critical Depth =    8.20(In.)
Pipe flow velocity =      5.12(Ft/s)
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Travel time through pipe =    0.23 min.
Time of concentration (TC) =     5.86 min.


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Process from Point/Station       4.000 to Point/Station       5.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.901 given for subarea
Time of concentration =      5.86 min.
Rainfall intensity =      2.898(In/Hr) for a      5.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.287(CFS) for    0.110(Ac.)
Total runoff =      3.182(CFS) Total area =        1.16(Ac.)


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Process from Point/Station       5.000 to Point/Station       6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =   455.640(Ft.)
Downstream point/station elevation =   455.130(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.182(CFS)
Given pipe size =      15.00(In.)
Calculated individual pipe flow  =     3.182(CFS)
Normal flow depth in pipe =    7.39(In.)
Flow top width inside pipe =   15.00(In.)
Critical Depth =    8.61(In.)
Pipe flow velocity =      5.28(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     6.02 min.


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Process from Point/Station       6.000 to Point/Station       7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =   455.130(Ft.)
Downstream point/station elevation =   453.460(Ft.)
Pipe length  =    166.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.182(CFS)
Given pipe size =      15.00(In.)
Calculated individual pipe flow  =     3.182(CFS)
Normal flow depth in pipe =    7.42(In.)
Flow top width inside pipe =   15.00(In.)
Critical Depth =    8.61(In.)
Pipe flow velocity =      5.26(Ft/s)
Travel time through pipe =    0.53 min.
Time of concentration (TC) =     6.55 min.


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Process from Point/Station       6.000 to Point/Station       7.000
**** SUBAREA FLOW ADDITION ****

User specified 'C' value of 0.901 given for subarea
Time of concentration =      6.55 min.
Rainfall intensity =      2.739(In/Hr) for a      5.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.247(CFS) for    0.100(Ac.)
Total runoff =      3.429(CFS) Total area =        1.26(Ac.)
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Process from Point/Station       7.000 to Point/Station       8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_______________________________________________________
Upstream point/station elevation =   453.460(Ft.)
Downstream point/station elevation =   452.790(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.429(CFS)
Given pipe size =     15.00(In.)
Calculated individual pipe flow  =     3.429(CFS)
Normal flow depth in pipe =    7.70(In.)
Flow top width inside pipe =   14.99(In.)
Critical Depth =    8.96(In.)
Pipe flow velocity =      5.40(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     6.75 min.


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Process from Point/Station       7.000 to Point/Station       8.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =     6.75 min.
Rainfall intensity =      2.697(In/Hr) for a      5.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      3.888(CFS) for    1.600(Ac.)
Total runoff =      7.317(CFS)  Total area =       2.86(Ac.)


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Process from Point/Station       8.000 to Point/Station       9.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_______________________________________________________
Upstream point/station elevation =   452.790(Ft.)
Downstream point/station elevation =   451.870(Ft.)
Pipe length  =   168.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     7.317(CFS)
Given pipe size =     36.00(In.)
Calculated individual pipe flow  =     7.317(CFS)
Normal flow depth in pipe =   10.08(In.)
Flow top width inside pipe =   32.33(In.)
Critical Depth =   10.21(In.)
Pipe flow velocity =      4.52(Ft/s)
Travel time through pipe =    0.62 min.
Time of concentration (TC) =     7.37 min.


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Process from Point/Station       8.000 to Point/Station       9.000
**** SUBAREA FLOW ADDITION ****
_______________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =     7.37 min.
Rainfall intensity =      2.580(In/Hr) for a      5.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      2.092(CFS) for    0.900(Ac.)
Total runoff =      9.408(CFS)  Total area =       3.76(Ac.)
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Process from Point/Station      10.000 to Point/Station      11.000
**** INITIAL AREA EVALUATION ****

______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   91.000(Ft.)
Highest elevation =  453.500(Ft.)
Lowest elevation =  451.500(Ft.)
Elevation difference =     2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.63 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  91.000^.5)/(   2.198^(1/3)]=   2.63
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       3.149(In/Hr) for a      5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =        0.227(CFS)
Total initial stream area =          0.080(Ac.)


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Process from Point/Station      11.000 to Point/Station      12.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

______________________________________________________________________
Upstream point/station elevation =   448.000(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length   =     27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow   =      0.227(CFS)
Given pipe size =        6.00(In.)
Calculated individual pipe flow   =      0.227(CFS)
Normal flow depth in pipe =     1.36(In.)
Flow top width inside pipe =     5.02(In.)
Critical Depth =     2.87(In.)
Pipe flow velocity =        6.83(Ft/s)
Travel time through pipe =     0.07 min.
Time of concentration (TC) =      5.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      13.000 to Point/Station      14.000
**** INITIAL AREA EVALUATION ****

______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  451.960(Ft.)
Lowest elevation =  450.000(Ft.)
Elevation difference =     1.960(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.87 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  60.000^.5)/(   3.267^(1/3)]=   1.87
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       3.149(In/Hr) for a      5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =        0.199(CFS)
Total initial stream area =          0.070(Ac.)


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Process from Point/Station      15.000 to Point/Station      16.000
**** INITIAL AREA EVALUATION ****

______________________________________________________________________
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User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =  463.610(Ft.)
Lowest elevation =  461.160(Ft.)
Elevation difference =    2.450(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.09 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  75.000^.5)/(   3.267^(1/3)]=   2.09
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      3.149(In/Hr) for a     5.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =      0.085(CFS)
Total initial stream area =        0.030(Ac.)
End of computations, total study area =          3.940 (Ac.)
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BAJA FREIGHT **J.N.17-001**
PROPOSED CONDITION HYDROLOGY
10 YEAR STORM

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San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
          Rational Hydrology Study        Date: 06/12/18
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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Program License Serial Number 4035

------------------------------------------------------------------------
Rational hydrology study storm event year is    10.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


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Process from Point/Station       1.000 to Point/Station       2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   90.000(Ft.)
Highest elevation =  463.490(Ft.)
Lowest elevation =  460.550(Ft.)
Elevation difference =    2.940(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.29 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  90.000^.5)/(  3.267^(1/3)]=   2.29
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       3.592(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =       1.262(CFS)
Total initial stream area =        0.390(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   458.000(Ft.)
Downstream point/station elevation =   457.250(Ft.)
Pipe length  =    75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.262(CFS)
Given pipe size =     10.00(In.)
Calculated individual pipe flow  =     1.262(CFS)
Normal flow depth in pipe =    5.44(In.)
Flow top width inside pipe =    9.96(In.)
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Critical Depth =    6.02(In.)
Pipe flow velocity =      4.16(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     5.30 min.


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Process from Point/Station       2.000 to Point/Station       3.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =     5.30 min.
Rainfall intensity =      3.488(In/Hr) for a     10.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      1.068(CFS) for    0.340(Ac.)
Total runoff =      2.331(CFS) Total area =        0.73(Ac.)


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Process from Point/Station       3.000 to Point/Station       4.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

______________________________________________________________________
Upstream point/station elevation =   457.250(Ft.)
Downstream point/station elevation =   456.360(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.331(CFS)
Given pipe size =      12.00(In.)
Calculated individual pipe flow  =     2.331(CFS)
Normal flow depth in pipe =    7.08(In.)
Flow top width inside pipe =   11.80(In.)
Critical Depth =    7.84(In.)
Pipe flow velocity =      4.84(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =     5.61 min.


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Process from Point/Station       3.000 to Point/Station       4.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =     5.61 min.
Rainfall intensity =      3.391(In/Hr) for a     10.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.978(CFS) for    0.320(Ac.)
Total runoff =      3.308(CFS) Total area =        1.05(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       4.000 to Point/Station       5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

______________________________________________________________________
Upstream point/station elevation =   456.360(Ft.)
Downstream point/station elevation =   455.640(Ft.)
Pipe length  =    72.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.308(CFS)
Given pipe size =      15.00(In.)
Calculated individual pipe flow  =     3.308(CFS)
Normal flow depth in pipe =    7.61(In.)
Flow top width inside pipe =   15.00(In.)
Critical Depth =    8.80(In.)
Pipe flow velocity =      5.30(Ft/s)
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Travel time through pipe =    0.23 min.
Time of concentration (TC) =     5.83 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       4.000 to Point/Station       5.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =     5.83 min.
Rainfall intensity =      3.324(In/Hr) for a    10.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.329(CFS) for    0.110(Ac.)
Total runoff =      3.638(CFS) Total area =        1.16(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       5.000 to Point/Station       6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

______________________________________________________________
Upstream point/station elevation =   455.640(Ft.)
Downstream point/station elevation =   455.130(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.638(CFS)
Given pipe size =     15.00(In.)
Calculated individual pipe flow   =     3.638(CFS)
Normal flow depth in pipe =     8.00(In.)
Flow top width inside pipe =   14.97(In.)
Critical Depth =     9.25(In.)
Pipe flow velocity =       5.46(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     5.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       6.000 to Point/Station       7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

______________________________________________________________
Upstream point/station elevation =   455.130(Ft.)
Downstream point/station elevation =   453.460(Ft.)
Pipe length  =   166.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.638(CFS)
Given pipe size =     15.00(In.)
Calculated individual pipe flow   =     3.638(CFS)
Normal flow depth in pipe =     8.04(In.)
Flow top width inside pipe =   14.96(In.)
Critical Depth =     9.25(In.)
Pipe flow velocity =       5.43(Ft/s)
Travel time through pipe =    0.51 min.
Time of concentration (TC) =     6.50 min.


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Process from Point/Station       6.000 to Point/Station       7.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =     6.50 min.
Rainfall intensity =      3.152(In/Hr) for a    10.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.284(CFS) for    0.100(Ac.)
Total runoff =      3.922(CFS) Total area =        1.26(Ac.)
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Process from Point/Station      7.000 to Point/Station      8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   453.460(Ft.)
Downstream point/station elevation =   452.790(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.922(CFS)
Given pipe size =      15.00(In.)
Calculated individual pipe flow  =     3.922(CFS)
Normal flow depth in pipe =    8.36(In.)
Flow top width inside pipe =   14.90(In.)
Critical Depth =    9.61(In.)
Pipe flow velocity =       5.58(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =     6.69 min.


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Process from Point/Station      7.000 to Point/Station      8.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =      6.69 min.
Rainfall intensity =      3.107(In/Hr) for a    10.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      4.480(CFS) for    1.600(Ac.)
Total runoff =      8.401(CFS) Total area =        2.86(Ac.)


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Process from Point/Station      8.000 to Point/Station      9.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   452.790(Ft.)
Downstream point/station elevation =   451.870(Ft.)
Pipe length  =   168.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     8.401(CFS)
Given pipe size =      36.00(In.)
Calculated individual pipe flow  =     8.401(CFS)
Normal flow depth in pipe =   10.82(In.)
Flow top width inside pipe =   33.01(In.)
Critical Depth =   10.97(In.)
Pipe flow velocity =       4.70(Ft/s)
Travel time through pipe =    0.60 min.
Time of concentration (TC) =     7.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      8.000 to Point/Station      9.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =      7.29 min.
Rainfall intensity =      2.981(In/Hr) for a    10.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      2.418(CFS) for    0.900(Ac.)
Total runoff =     10.819(CFS) Total area =        3.76(Ac.)
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Process from Point/Station      10.000 to Point/Station      11.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   91.000(Ft.)
Highest elevation =  453.500(Ft.)
Lowest elevation =  451.500(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      2.63 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  91.000^.5)/(   2.198^(1/3)]=   2.63
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      3.592(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =       0.259(CFS)
Total initial stream area =        0.080(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      11.000 to Point/Station      12.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation =   448.000(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length  =    27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.259(CFS)
Given pipe size =       6.00(In.)
Calculated individual pipe flow  =     0.259(CFS)
Normal flow depth in pipe =    1.45(In.)
Flow top width inside pipe =    5.13(In.)
Critical Depth =    3.08(In.)
Pipe flow velocity =       7.08(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     5.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      13.000 to Point/Station      14.000
**** INITIAL AREA EVALUATION ****

User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  451.960(Ft.)
Lowest elevation =  450.000(Ft.)
Elevation difference =    1.960(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      1.87 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  60.000^.5)/(   3.267^(1/3)]=   1.87
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      3.592(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =       0.227(CFS)
Total initial stream area =        0.070(Ac.)


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Process from Point/Station      15.000 to Point/Station      16.000
**** INITIAL AREA EVALUATION ****
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User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =  463.610(Ft.)
Lowest elevation =  461.160(Ft.)
Elevation difference =    2.450(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      2.09 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  75.000^.5)/(   3.267^(1/3)]=   2.09
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       3.592(In/Hr) for a    10.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =        0.097(CFS)
Total initial stream area =         0.030(Ac.)
End of computations, total study area =           3.940 (Ac.)
```

BAJA FREIGHT **J.N.17-001**
PROPOSED CONDITION HYDROLOGY
25 YEAR STORM

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San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
          Rational Hydrology Study        Date: 06/12/18
--------------------------------------------------------------------
*********  Hydrology Study Control Information **********

--------------------------------------------------------------------


Program License Serial Number 4035

--------------------------------------------------------------------
Rational hydrology study storm event year is    25.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


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Process from Point/Station      1.000 to Point/Station       2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   90.000(Ft.)
Highest elevation =  463.490(Ft.)
Lowest elevation =  460.550(Ft.)
Elevation difference =    2.940(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.29 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  90.000^.5)/(   3.267^(1/3)]=   2.29
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       3.845(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =       1.351(CFS)
Total initial stream area =          0.390(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      2.000 to Point/Station       3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   458.000(Ft.)
Downstream point/station elevation =   457.250(Ft.)
Pipe length  =     75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.351(CFS)
Given pipe size =     10.00(In.)
Calculated individual pipe flow  =     1.351(CFS)
Normal flow depth in pipe =    5.68(In.)
Flow top width inside pipe =    9.91(In.)
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Critical Depth =    6.24(In.)
Pipe flow velocity =       4.23(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =      5.30 min.


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Process from Point/Station        2.000 to Point/Station       3.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =      5.30 min.
Rainfall intensity =      3.742(In/Hr) for a     25.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =       1.146(CFS) for    0.340(Ac.)
Total runoff =       2.497(CFS) Total area =         0.73(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station       4.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

______________________________________________________
Upstream point/station elevation =   457.250(Ft.)
Downstream point/station elevation =   456.360(Ft.)
Pipe length   =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow   =      2.497(CFS)
Given pipe size =      12.00(In.)
Calculated individual pipe flow   =      2.497(CFS)
Normal flow depth in pipe =    7.41(In.)
Flow top width inside pipe =   11.67(In.)
Critical Depth =    8.13(In.)
Pipe flow velocity =       4.91(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =      5.60 min.


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Process from Point/Station        3.000 to Point/Station       4.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =      5.60 min.
Rainfall intensity =      3.645(In/Hr) for a     25.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =       1.051(CFS) for    0.320(Ac.)
Total runoff =       3.548(CFS) Total area =         1.05(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station       5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

______________________________________________________
Upstream point/station elevation =   456.360(Ft.)
Downstream point/station elevation =   455.640(Ft.)
Pipe length   =    72.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow   =      3.548(CFS)
Given pipe size =      15.00(In.)
Calculated individual pipe flow   =      3.548(CFS)
Normal flow depth in pipe =    7.93(In.)
Flow top width inside pipe =   14.97(In.)
Critical Depth =    9.13(In.)
Pipe flow velocity =       5.39(Ft/s)
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Travel time through pipe =    0.22 min.
Time of concentration (TC) =     5.82 min.


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Process from Point/Station       4.000 to Point/Station      5.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =     5.82 min.
Rainfall intensity =      3.580(In/Hr) for a    25.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.355(CFS) for    0.110(Ac.)
Total runoff =      3.903(CFS) Total area =        1.16(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       5.000 to Point/Station      6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

______________________________________________________________________
Upstream point/station elevation =   455.640(Ft.)
Downstream point/station elevation =   455.130(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.903(CFS)
Given pipe size =     15.00(In.)
Calculated individual pipe flow  =     3.903(CFS)
Normal flow depth in pipe =    8.36(In.)
Flow top width inside pipe =   14.90(In.)
Critical Depth =    9.59(In.)
Pipe flow velocity =      5.55(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     5.97 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       6.000 to Point/Station      7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

______________________________________________________________________
Upstream point/station elevation =   455.130(Ft.)
Downstream point/station elevation =   453.460(Ft.)
Pipe length  =   166.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.903(CFS)
Given pipe size =     15.00(In.)
Calculated individual pipe flow  =     3.903(CFS)
Normal flow depth in pipe =    8.39(In.)
Flow top width inside pipe =   14.89(In.)
Critical Depth =    9.59(In.)
Pipe flow velocity =      5.52(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =     6.47 min.


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Process from Point/Station       6.000 to Point/Station      7.000
**** SUBAREA FLOW ADDITION ****

______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =     6.47 min.
Rainfall intensity =      3.409(In/Hr) for a    25.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.307(CFS) for    0.100(Ac.)
Total runoff =      4.210(CFS) Total area =        1.26(Ac.)
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Process from Point/Station       7.000 to Point/Station       8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

________________________________________________________
Upstream point/station elevation =    453.460(Ft.)
Downstream point/station elevation =    452.790(Ft.)
Pipe length  =     65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      4.210(CFS)
Given pipe size =      15.00(In.)
Calculated individual pipe flow  =      4.210(CFS)
Normal flow depth in pipe =     8.74(In.)
Flow top width inside pipe =    14.79(In.)
Critical Depth =     9.97(In.)
Pipe flow velocity =       5.67(Ft/s)
Travel time through pipe =     0.19 min.
Time of concentration (TC) =      6.66 min.


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Process from Point/Station       7.000 to Point/Station       8.000
**** SUBAREA FLOW ADDITION ****

________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =      6.66 min.
Rainfall intensity =      3.364(In/Hr) for a     25.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      4.850(CFS) for     1.600(Ac.)
Total runoff =      9.061(CFS)  Total area =         2.86(Ac.)


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Process from Point/Station       8.000 to Point/Station       9.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

________________________________________________________
Upstream point/station elevation =    452.790(Ft.)
Downstream point/station elevation =    451.870(Ft.)
Pipe length  =    168.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =      9.061(CFS)
Given pipe size =      36.00(In.)
Calculated individual pipe flow  =      9.061(CFS)
Normal flow depth in pipe =    11.25(In.)
Flow top width inside pipe =    33.37(In.)
Critical Depth =    11.39(In.)
Pipe flow velocity =       4.80(Ft/s)
Travel time through pipe =     0.58 min.
Time of concentration (TC) =      7.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       8.000 to Point/Station       9.000
**** SUBAREA FLOW ADDITION ****

________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =      7.25 min.
Rainfall intensity =      3.240(In/Hr) for a     25.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      2.627(CFS) for     0.900(Ac.)
Total runoff =     11.688(CFS) Total area =         3.76(Ac.)
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Process from Point/Station      10.000 to Point/Station      11.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________

User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   91.000(Ft.)
Highest elevation =  453.500(Ft.)
Lowest elevation =  451.500(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.63 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  91.000^.5)/(  2.198^(1/3)]=  2.63
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      3.845(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =      0.277(CFS)
Total initial stream area =        0.080(Ac.)


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Process from Point/Station      11.000 to Point/Station      12.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________

Upstream point/station elevation =  448.000(Ft.)
Downstream point/station elevation =  444.480(Ft.)
Pipe length  =    27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.277(CFS)
Given pipe size =      6.00(In.)
Calculated individual pipe flow  =     0.277(CFS)
Normal flow depth in pipe =     1.50(In.)
Flow top width inside pipe =     5.19(In.)
Critical Depth =     3.19(In.)
Pipe flow velocity =      7.23(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     5.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      13.000 to Point/Station      14.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________

User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  451.960(Ft.)
Lowest elevation =  450.000(Ft.)
Elevation difference =    1.960(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.87 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  60.000^.5)/(  3.267^(1/3)]=  1.87
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      3.845(In/Hr) for a    25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =      0.243(CFS)
Total initial stream area =        0.070(Ac.)


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Process from Point/Station      15.000 to Point/Station      16.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
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User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =  463.610(Ft.)
Lowest elevation =  461.160(Ft.)
Elevation difference =    2.450(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      2.09 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  75.000^.5)/(   3.267^(1/3)]=   2.09
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       3.845(In/Hr) for a     25.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =       0.104(CFS)
Total initial stream area =        0.030(Ac.)
End of computations, total study area =           3.940 (Ac.)
```

BAJA FREIGHT **J.N.17-001**
PROPOSED CONDITION HYDROLOGY
50 YEAR STORM

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San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
          Rational Hydrology Study        Date: 06/12/18
------------------------------------------------------------------------
 *********  Hydrology Study Control Information **********

------------------------------------------------------------------------


Program License Serial Number 4035

------------------------------------------------------------------------
Rational hydrology study storm event year is    50.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   90.000(Ft.)
Highest elevation =  463.490(Ft.)
Lowest elevation =  460.550(Ft.)
Elevation difference =    2.940(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      2.29 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  90.000^.5)/(   3.267^(1/3)]=   2.29
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =        1.499(CFS)
Total initial stream area =         0.390(Ac.)


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Process from Point/Station       2.000 to Point/Station       3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   458.000(Ft.)
Downstream point/station elevation =   457.250(Ft.)
Pipe length  =     75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      1.499(CFS)
Given pipe size =      10.00(In.)
Calculated individual pipe flow  =      1.499(CFS)
Normal flow depth in pipe =     6.07(In.)
Flow top width inside pipe =     9.77(In.)
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Critical Depth =    6.59(In.)
Pipe flow velocity =       4.32(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =     5.29 min.


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Process from Point/Station        2.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________

User specified 'C' value of 0.901 given for subarea
Time of concentration =      5.29 min.
Rainfall intensity =       4.160(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      1.274(CFS) for    0.340(Ac.)
Total runoff =      2.773(CFS) Total area =        0.73(Ac.)


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Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________

Upstream point/station elevation =   457.250(Ft.)
Downstream point/station elevation =   456.360(Ft.)
Pipe length  =     89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      2.773(CFS)
Given pipe size =      12.00(In.)
Calculated individual pipe flow  =      2.773(CFS)
Normal flow depth in pipe =      7.96(In.)
Flow top width inside pipe =   11.34(In.)
Critical Depth =    8.57(In.)
Pipe flow velocity =       5.01(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     5.58 min.


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Process from Point/Station        3.000 to Point/Station        4.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________

User specified 'C' value of 0.901 given for subarea
Time of concentration =      5.58 min.
Rainfall intensity =       4.062(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      1.171(CFS) for    0.320(Ac.)
Total runoff =      3.944(CFS) Total area =        1.05(Ac.)


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Process from Point/Station        4.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________

Upstream point/station elevation =   456.360(Ft.)
Downstream point/station elevation =   455.640(Ft.)
Pipe length  =     72.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      3.944(CFS)
Given pipe size =      15.00(In.)
Calculated individual pipe flow  =      3.944(CFS)
Normal flow depth in pipe =      8.46(In.)
Flow top width inside pipe =   14.88(In.)
Critical Depth =    9.64(In.)
Pipe flow velocity =       5.52(Ft/s)
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Travel time through pipe =    0.22 min.
Time of concentration (TC) =     5.80 min.


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Process from Point/Station       4.000 to Point/Station       5.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =      5.80 min.
Rainfall intensity =       3.995(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.396(CFS) for     0.110(Ac.)
Total runoff =      4.340(CFS) Total area =        1.16(Ac.)


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Process from Point/Station       5.000 to Point/Station       6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =    455.640(Ft.)
Downstream point/station elevation =    455.130(Ft.)
Pipe length  =     50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      4.340(CFS)
Given pipe size =      15.00(In.)
Calculated individual pipe flow  =      4.340(CFS)
Normal flow depth in pipe =      8.94(In.)
Flow top width inside pipe =    14.72(In.)
Critical Depth =    10.13(In.)
Pipe flow velocity =       5.69(Ft/s)
Travel time through pipe =     0.15 min.
Time of concentration (TC) =      5.95 min.


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Process from Point/Station       6.000 to Point/Station       7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =    455.130(Ft.)
Downstream point/station elevation =    453.460(Ft.)
Pipe length  =    166.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      4.340(CFS)
Given pipe size =      15.00(In.)
Calculated individual pipe flow  =      4.340(CFS)
Normal flow depth in pipe =      8.99(In.)
Flow top width inside pipe =    14.70(In.)
Critical Depth =    10.13(In.)
Pipe flow velocity =       5.66(Ft/s)
Travel time through pipe =     0.49 min.
Time of concentration (TC) =      6.44 min.


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Process from Point/Station       6.000 to Point/Station       7.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =      6.44 min.
Rainfall intensity =       3.821(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.344(CFS) for     0.100(Ac.)
Total runoff =      4.684(CFS) Total area =        1.26(Ac.)
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Process from Point/Station       7.000 to Point/Station       8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________
Upstream point/station elevation =   453.460(Ft.)
Downstream point/station elevation =   452.790(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.684(CFS)
Given pipe size =      15.00(In.)
Calculated individual pipe flow  =      4.684(CFS)
Normal flow depth in pipe =    9.38(In.)
Flow top width inside pipe =   14.52(In.)
Critical Depth =   10.54(In.)
Pipe flow velocity =       5.81(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =      6.62 min.


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Process from Point/Station       7.000 to Point/Station       8.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =      6.62 min.
Rainfall intensity =      3.775(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      5.442(CFS) for     1.600(Ac.)
Total runoff =     10.127(CFS) Total area =        2.86(Ac.)


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Process from Point/Station       8.000 to Point/Station       9.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
____________________________________________________________________
Upstream point/station elevation =   452.790(Ft.)
Downstream point/station elevation =   451.870(Ft.)
Pipe length  =   168.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    10.127(CFS)
Given pipe size =      36.00(In.)
Calculated individual pipe flow  =     10.127(CFS)
Normal flow depth in pipe =   11.92(In.)
Flow top width inside pipe =   33.88(In.)
Critical Depth =   12.07(In.)
Pipe flow velocity =       4.95(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =      7.19 min.


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Process from Point/Station       8.000 to Point/Station       9.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =      7.19 min.
Rainfall intensity =      3.648(In/Hr) for a    50.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      2.958(CFS) for     0.900(Ac.)
Total runoff =     13.085(CFS) Total area =        3.76(Ac.)
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Process from Point/Station      10.000 to Point/Station      11.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________

User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   91.000(Ft.)
Highest elevation =  453.500(Ft.)
Lowest elevation =  451.500(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.63 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  91.000^.5)/(   2.198^(1/3)]=   2.63
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =      0.307(CFS)
Total initial stream area =        0.080(Ac.)


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Process from Point/Station      11.000 to Point/Station      12.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
__________________________________________________________________________

Upstream point/station elevation =   448.000(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length  =    27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.307(CFS)
Given pipe size =      6.00(In.)
Calculated individual pipe flow  =     0.307(CFS)
Normal flow depth in pipe =    1.58(In.)
Flow top width inside pipe =    5.29(In.)
Critical Depth =    3.37(In.)
Pipe flow velocity =      7.45(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     5.06 min.


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Process from Point/Station      13.000 to Point/Station      14.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________

User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  451.960(Ft.)
Lowest elevation =  450.000(Ft.)
Elevation difference =    1.960(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.87 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  60.000^.5)/(   3.267^(1/3)]=   1.87
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.265(In/Hr) for a    50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =      0.269(CFS)
Total initial stream area =        0.070(Ac.)


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Process from Point/Station      15.000 to Point/Station      16.000
**** INITIAL AREA EVALUATION ****
__________________________________________________________________________
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User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance = 75.000(Ft.)
Highest elevation = 463.610(Ft.)
Lowest elevation = 461.160(Ft.)
Elevation difference = 2.450(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) = 2.09 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(75.000^.5)/(3.267^(1/3)]= 2.09
Setting time of concentration to 5 minutes
Rainfall intensity (I) = 4.265(In/Hr) for a 50.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff = 0.115(CFS)
Total initial stream area = 0.030(Ac.)
End of computations, total study area = 3.940 (Ac.)

BAJA FREIGHT **J.N.17-001**
PROPOSED CONDITION HYDROLOGY
100 YEAR STORM

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San Diego County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2005 Version 6.4
Rational method hydrology  program based on
San Diego County Flood Control Division 1985 hydrology manual
          Rational Hydrology Study        Date: 06/29/18
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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Program License Serial Number 4035

------------------------------------------------------------------------
Rational hydrology study storm event year is   100.0
English (in-lb) input data Units used
English (in) rainfall data used

Standard intensity of Appendix I-B used for year and
Elevation 0 - 1500 feet
Factor (to multiply * intensity)  =  1.000
Only used if inside City of San Diego
San Diego hydrology manual 'C' values used
Runoff coefficients by rational method


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   90.000(Ft.)
Highest elevation =  463.490(Ft.)
Lowest elevation =  460.550(Ft.)
Elevation difference =    2.940(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =      2.29 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  90.000^.5)/(   3.267^(1/3)]=   2.29
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =       1.542(CFS)
Total initial stream area =          0.390(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   458.000(Ft.)
Downstream point/station elevation =   457.250(Ft.)
Pipe length  =     75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      1.542(CFS)
Given pipe size =      10.00(In.)
Calculated individual pipe flow  =      1.542(CFS)
Normal flow depth in pipe =     6.19(In.)
Flow top width inside pipe =     9.71(In.)
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Critical Depth =    6.68(In.)
Pipe flow velocity =       4.35(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =     5.29 min.


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Process from Point/Station        2.000 to Point/Station        3.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =      5.29 min.
Rainfall intensity =       4.291(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =       1.314(CFS) for    0.340(Ac.)
Total runoff =       2.857(CFS)  Total area =        0.73(Ac.)


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Process from Point/Station        3.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   457.250(Ft.)
Downstream point/station elevation =   456.360(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.857(CFS)
Given pipe size =     12.00(In.)
Calculated individual pipe flow  =     2.857(CFS)
Normal flow depth in pipe =    8.13(In.)
Flow top width inside pipe =   11.22(In.)
Critical Depth =    8.69(In.)
Pipe flow velocity =       5.04(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =     5.58 min.


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Process from Point/Station        3.000 to Point/Station        4.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =      5.58 min.
Rainfall intensity =       4.199(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =       1.211(CFS) for    0.320(Ac.)
Total runoff =       4.067(CFS)  Total area =        1.05(Ac.)


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Process from Point/Station        4.000 to Point/Station        5.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   456.360(Ft.)
Downstream point/station elevation =   455.640(Ft.)
Pipe length  =    72.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.067(CFS)
Given pipe size =     15.00(In.)
Calculated individual pipe flow  =     4.067(CFS)
Normal flow depth in pipe =    8.64(In.)
Flow top width inside pipe =   14.83(In.)
Critical Depth =    9.79(In.)
Pipe flow velocity =       5.56(Ft/s)
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Travel time through pipe =    0.22 min.
Time of concentration (TC) =    5.80 min.


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Process from Point/Station       4.000 to Point/Station       5.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =     5.80 min.
Rainfall intensity =      4.136(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.410(CFS) for    0.110(Ac.)
Total runoff =      4.477(CFS) Total area =       1.16(Ac.)


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Process from Point/Station       5.000 to Point/Station       6.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   455.640(Ft.)
Downstream point/station elevation =   455.130(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.477(CFS)
Given pipe size =     15.00(In.)
Calculated individual pipe flow  =     4.477(CFS)
Normal flow depth in pipe =    9.13(In.)
Flow top width inside pipe =   14.64(In.)
Critical Depth =   10.29(In.)
Pipe flow velocity =      5.73(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    5.94 min.


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Process from Point/Station       6.000 to Point/Station       7.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   455.130(Ft.)
Downstream point/station elevation =   453.460(Ft.)
Pipe length  =   166.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.477(CFS)
Given pipe size =     15.00(In.)
Calculated individual pipe flow  =     4.477(CFS)
Normal flow depth in pipe =    9.16(In.)
Flow top width inside pipe =   14.63(In.)
Critical Depth =   10.29(In.)
Pipe flow velocity =      5.70(Ft/s)
Travel time through pipe =    0.49 min.
Time of concentration (TC) =    6.43 min.


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Process from Point/Station       6.000 to Point/Station       7.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =     6.43 min.
Rainfall intensity =      3.973(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      0.358(CFS) for    0.100(Ac.)
Total runoff =      4.835(CFS) Total area =       1.26(Ac.)
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Process from Point/Station       7.000 to Point/Station       8.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   453.460(Ft.)
Downstream point/station elevation =   452.790(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      4.835(CFS)
Given pipe size =      15.00(In.)
Calculated individual pipe flow  =      4.835(CFS)
Normal flow depth in pipe =    9.57(In.)
Flow top width inside pipe =   14.41(In.)
Critical Depth =   10.70(In.)
Pipe flow velocity =       5.84(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =     6.61 min.


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Process from Point/Station       7.000 to Point/Station       8.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =     6.61 min.
Rainfall intensity =      3.930(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      5.666(CFS) for    1.600(Ac.)
Total runoff =     10.501(CFS) Total area =        2.86(Ac.)


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Process from Point/Station       8.000 to Point/Station       9.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________
Upstream point/station elevation =   452.790(Ft.)
Downstream point/station elevation =   451.870(Ft.)
Pipe length  =   168.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =     10.501(CFS)
Given pipe size =      36.00(In.)
Calculated individual pipe flow  =     10.501(CFS)
Normal flow depth in pipe =   12.15(In.)
Flow top width inside pipe =   34.05(In.)
Critical Depth =   12.29(In.)
Pipe flow velocity =       5.01(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =     7.17 min.


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Process from Point/Station       8.000 to Point/Station       9.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________
User specified 'C' value of 0.901 given for subarea
Time of concentration =     7.17 min.
Rainfall intensity =      3.811(In/Hr) for a   100.0 year storm
Runoff coefficient used for sub-area, Rational method,Q=KCIA, C = 0.901
Subarea runoff =      3.090(CFS) for    0.900(Ac.)
Total runoff =     13.591(CFS) Total area =        3.76(Ac.)
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Process from Point/Station       10.000 to Point/Station       11.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________
User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   91.000(Ft.)
Highest elevation =  453.500(Ft.)
Lowest elevation =  451.500(Ft.)
Elevation difference =    2.000(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.63 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  91.000^.5)/(   2.198^(1/3)]=   2.63
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =       0.316(CFS)
Total initial stream area =        0.080(Ac.)


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Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________
Upstream point/station elevation =   448.000(Ft.)
Downstream point/station elevation =   444.480(Ft.)
Pipe length  =     27.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =      0.316(CFS)
Given pipe size =       6.00(In.)
Calculated individual pipe flow  =      0.316(CFS)
Normal flow depth in pipe =     1.60(In.)
Flow top width inside pipe =     5.31(In.)
Critical Depth =     3.42(In.)
Pipe flow velocity =        7.51(Ft/s)
Travel time through pipe =     0.06 min.
Time of concentration (TC) =       5.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________
User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   60.000(Ft.)
Highest elevation =  451.960(Ft.)
Lowest elevation =  450.000(Ft.)
Elevation difference =    1.960(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     1.87 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  60.000^.5)/(   3.267^(1/3)]=   1.87
Setting time of concentration to 5 minutes
Rainfall intensity (I) =       4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =       0.277(CFS)
Total initial stream area =        0.070(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________
```

```
User specified 'C' value of 0.901 given for subarea
Initial subarea flow distance  =   75.000(Ft.)
Highest elevation =  463.610(Ft.)
Lowest elevation =  461.160(Ft.)
Elevation difference =    2.450(Ft.)
Time of concentration calculated by the urban
areas overland flow method (App X-C) =     2.09 min.
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.9010)*(  75.000^.5)/(   3.267^(1/3)]=   2.09
Setting time of concentration to 5 minutes
Rainfall intensity (I) =      4.389(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.901
Subarea runoff =      0.119(CFS)
Total initial stream area =        0.030(Ac.)
End of computations, total study area =           3.940 (Ac.)
```

```
        Manning Pipe Calculator

Given Input Data:
   Shape ........................... Circular
   Solving for ..................... Depth of Flow
   Diameter ........................ 18.0000 in      — EX. RCP
   Flowrate ........................ 13.9100 cfs
   Slope ........................... 0.0210 ft/ft
   Manning's n ..................... 0.0150

Computed Results:
   Depth ........................... 15.8449 in
   Area ............................ 1.7671 ft2
   Wetted Area ..................... 1.6474 ft2
   Wetted Perimeter ................ 43.8291 in
   Perimeter ....................... 56.5487 in
   Velocity ........................ 8.4435 fps      — Velocity 100YR
   Hydraulic Radius ................ 5.4126 in          POC#1
   Percent Full .................... 88.0274 %
   Full flow Flowrate .............. 13.1926 cfs
   Full flow velocity .............. 7.4655 fps
```

```
            Channel Calculator

Given Input Data:
    Shape ........................... Trapezoidal
    Solving for ..................... Depth of Flow
    Flowrate ........................ 0.2800 cfs
    Slope ........................... 0.0500 ft/ft
    Manning's n ..................... 0.0150
    Height .......................... 6.0000 in
    Bottom width .................... 0.0000 in
    Left slope ...................... 0.0050 ft/ft (V/H)
    Right slope ..................... 0.0050 ft/ft (V/H)

Computed Results:
    Depth ........................... 0.3799 in
    Velocity ........................ 1.3966 fps
    Full Flowrate ................... 439.5473 cfs
    Flow area ....................... 0.2005 ft2
    Flow perimeter .................. 151.9756 in
    Hydraulic radius ................ 0.1900 in
    Top width ....................... 151.9737 in
    Area ............................ 50.0000 ft2
    Perimeter ....................... 2400.0300 in
    Percent full .................... 6.3322 %

            Critical Information
    Critical depth .................. 0.4970 in
    Critical slope .................. 0.0119 ft/ft
    Critical velocity ............... 0.8162 fps
    Critical area ................... 0.3430 ft2
    Critical perimeter .............. 198.7938 in
    Critical hydraulic radius ....... 0.2485 in
    Critical top width .............. 198.7913 in
    Specific energy ................. 0.0620 ft
    Minimum energy .................. 0.0621 ft
```

Velocity 100YR
Node ⑭

```
Froude number ................... 1.9569
Flow condition .................. Supercritical
```

```
            Channel Calculator

Given Input Data:
   Shape ........................... Trapezoidal
   Solving for ..................... Depth of Flow
   Flowrate ........................ 0.1200 cfs
   Slope ........................... 0.0750 ft/ft
   Manning's n ..................... 0.0180
   Height .......................... 6.0000 in
   Bottom width .................... 0.0000 in
   Left slope ...................... 0.0050 ft/ft (V/H)
   Right slope ..................... 0.0050 ft/ft (V/H)

Computed Results:
   Depth ........................... 0.2744 in
   Velocity ........................ 1.1474 fps
   Full Flowrate ................... 448.6111 cfs
   Flow area ....................... 0.1046 ft2
   Flow perimeter .................. 109.7636 in
   Hydraulic radius ................ 0.1372 in
   Top width ....................... 109.7622 in
   Area ............................ 50.0000 ft2
   Perimeter ....................... 2400.0300 in
   Percent full .................... 4.5734 %

            Critical Information
   Critical depth .................. 0.3541 in
   Critical slope .................. 0.0192 ft/ft
   Critical velocity ............... 0.6890 fps
   Critical area ................... 0.1742 ft2
   Critical perimeter .............. 141.6486 in
   Critical hydraulic radius ....... 0.1771 in
   Critical top width .............. 141.6468 in
   Specific energy ................. 0.0433 ft
   Minimum energy .................. 0.0443 ft
```

Velocity 100 YR
Node (16)

```
Froude number ..................  1.8918
Flow condition .................  Supercritical
```

4. TABLES AND CHARTS

Pre-Development C

Return Period	PZN	AMC	CN*	S	P24 (in)	Q24 (in)	C**
5	1.5	II	92.5	0.81	2.02	1.29	**0.64**
10	1.5	II	92.5	0.81	2.38	1.62	**0.68**
25	1.5	II	92.5	0.81	2.89	2.10	**0.73**
50	1.5	II.5	95	0.53	3.28	2.72	**0.83**
100	1.5	II.5	95	0.53	3.69	3.13	**0.85**

Use C coefficients shown to the left for each given storm.

*: Average Barren soil and Commercial/Industrial, AMC-II per Table B.1 of City of San Diego DDM, Jan 2017.

Note that for AMC II.5, CN increases as the soil is more saturated, per Table B.2. (CNII.5 = (92.5+97.5)/2)

**: runoff coefficient is defined as the total 24 hr runoff divided by the total 24 hr precipitation (avergae value during the storm)

Post-Development C
Use Table A-1.

Industrial 90% impervious:	0.95
Industrial, 85.4% impervious:	0.901

Use C = 0.901 for all storms.

Appendix A

Rational Method and Modified Rational Method

A.1. Rational Method (RM)

The Rational Method (RM) is a mathematical formula used to determine the maximum runoff rate from a given rainfall. It has particular application in urban storm drainage where it is used to estimate peak runoff rates from small urban and rural watersheds for the design of storm drains and drainage structures. The RM is recommended for analyzing the runoff response from drainage areas for watersheds less than 0.5 square miles. It should not be used in instances where there is a junction of independent drainage systems or for drainage areas greater than approximately 0.5 square mile in size. In these instances, the Modified Rational Method (MRM) should be used for junctions of independent drainage systems in watersheds up to approximately 1 square mile in size (see Section A.2); or the NRCS Hydrologic Method should be used for watersheds greater than approximately 1 square mile in size (see Appendix B).

A.1.1. Rational Method Formula

The RM formula estimates the peak rate of runoff at any location in a watershed as a function of the drainage area (A), runoff coefficient (C), and rainfall intensity (I) for a duration equal to the time of concentration (T_c), which is the time required for water to flow from the most remote point of the basin to the location being analyzed. The RM formula is expressed in Equation A-1.

Equation A-1. RM Formula Expression

$$Q = C\,I\,A$$

where:

Q = peak discharge, in cubic feet per second (cfs)

C = runoff coefficient expressed as that percentage of rainfall which becomes surface runoff (no units); Refer to Appendix A.1.2

I = average rainfall intensity for a storm duration equal to the time of concetrnatation (T_c) of the contributing draiange area, in inches per hour; Refer to Appendix A.1.3 and Appendix A.1.4

A = drainage area contributing to the design location, in acres

Combining the units for the expression CIA yields:

$$\boxed{\left(\frac{1\text{ acre}\times\text{inch}}{\text{hour}}\right)\left(\frac{43{,}560\text{ ft}^2}{\text{acre}}\right)\left(\frac{1\text{ foot}}{12\text{ inches}}\right)\left(\frac{1\text{ hour}}{3{,}600\text{ seconds}}\right)\Rightarrow 1.008\text{ cfs}}$$

For practical purposes, the unit conversion coefficient difference of 0.8% can be ignored.

The RM formula is based on the assumption that for constant rainfall intensity, the peak discharge rate at a point will occur when the raindrop that falls at the most upstream point in the tributary drainage basin arrives at the point of interest.

Unlike the MRM (discussed in Appendix A.2) or the NRCS hydrologic method (discussed in Appendix B), the RM does not create hydrographs and therefore does not add separate subarea hydrographs at collection points. Instead, the RM develops peak discharges in the main line by increasing the T_c as flow travels downstream.

Characteristics of, or assumptions inherent to, the RM are listed below:

1. The discharge resulting from any I is maximum when the I lasts as long as or longer than the T_c.
2. The storm frequency of peak discharges is the same as that of I for the given T_c.
3. The fraction of rainfall that becomes runoff (or the runoff coefficient, C) is independent of I or precipitation zone number (PZN) condition (PZN Condition is discussed in the NRCS method).
4. The peak rate of runoff is the only information produced by using the RM.

A.1.2. Runoff Coefficient

The runoff coefficients are based on land use (see Table A–1). Soil type "D" is used throughout the City of San Diego for storm drain conveyance design. An appropriate runoff coefficient (C) for each type of land use in the subarea should be selected from this table and multiplied by the percentage of the total area (A) included in that class. The sum of the products for all land uses is the weighted runoff coefficient (Σ[CA]). Good engineering judgment should be used when applying the values presented in Table A–1, as adjustments to these values may be appropriate based on site-specific characteristics.

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	Soil Type [(1)]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [(2)]	
80% Impervious	0.85
Industrial [(2)]	
90% Impervious	0.95

Note:

(1) Type D soil to be used for all areas.

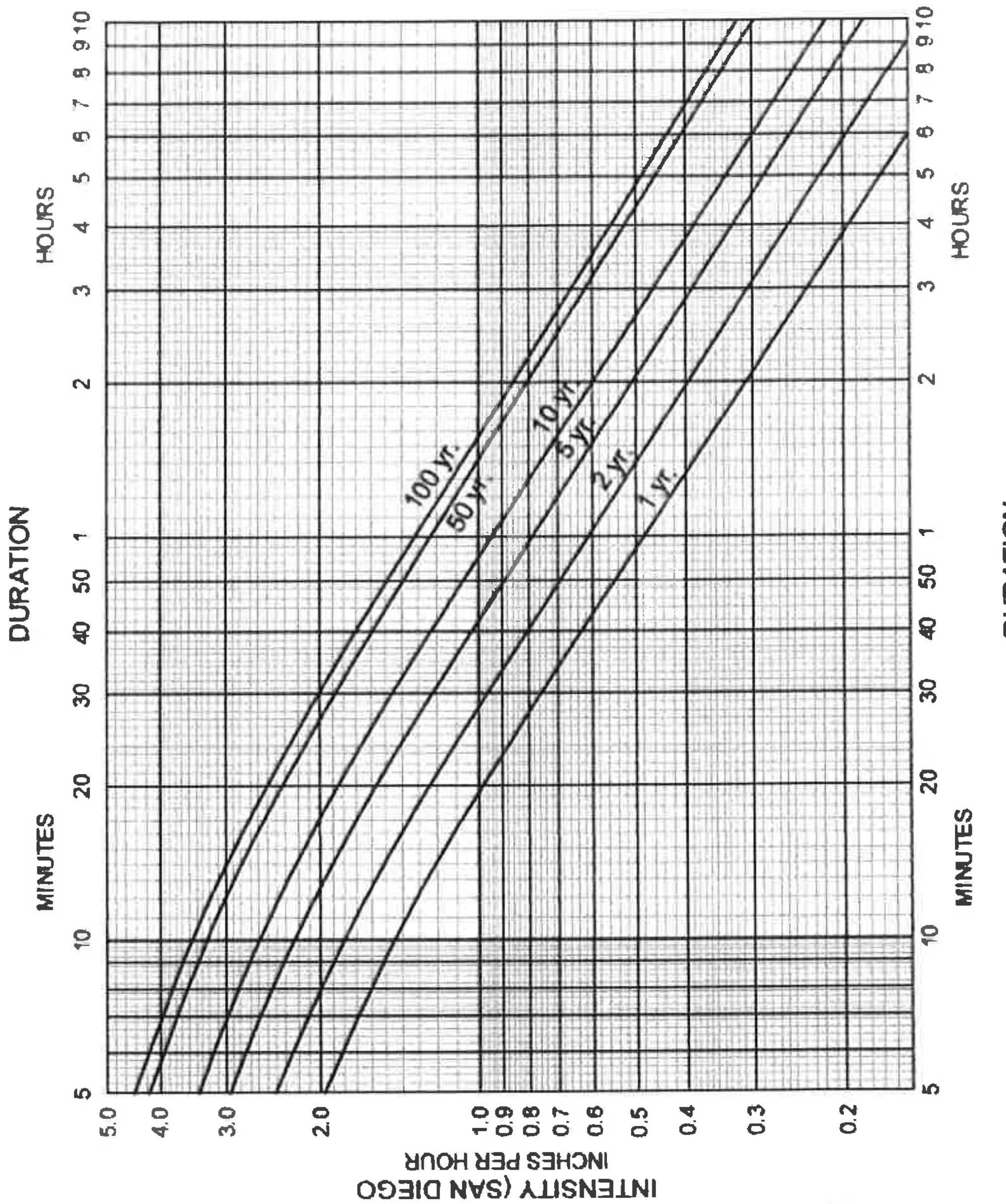
(2) Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%
Tabulated imperviousness = 80%
Revised C = (50/80) x 0.85 = 0.53

The values in Table A-1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_C for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_C calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).



RAINFALL

INTENSITY - DURATION - FREQUENCY
CURVES

FOR

COUNTY OF SAN DIEGO

ELEV.	FACTOR
0-1500	1.00
1500-3000	1.25
3000-4000	1.42
4000-5000	1.60
5000-6000	1.7
DESERT	1.25

TO OBTAIN CORRECT INTENSITY, MULTIPLY INTENSITY ON CHART BY FACTOR FOR DESIGN ELEVATION.

Figure A-1. Intensity-Duration-Frequency Design Chart

A.1.4. Time of Concentration

The Time of Concentration (T_c) is the time required for runoff to flow from the most remote part of the watershed to the outlet point under consideration.

Methods of calculation differ for natural watersheds (non-urbanized) and for urban drainage systems. Also, when designing storm drain systems, the designer must consider the possibility that an existing natural watershed may become urbanized during the useful life of the storm drain system. Future land uses must be used for Tc and runoff calculations, and can be determined from the Community Plans.

a. Natural watersheds: Obtain Tc from Figures A.2 and A.3

b. Urban drainage systems: In the case of urban drainage systems, the time of concentration at any point within the drainage area is given by:

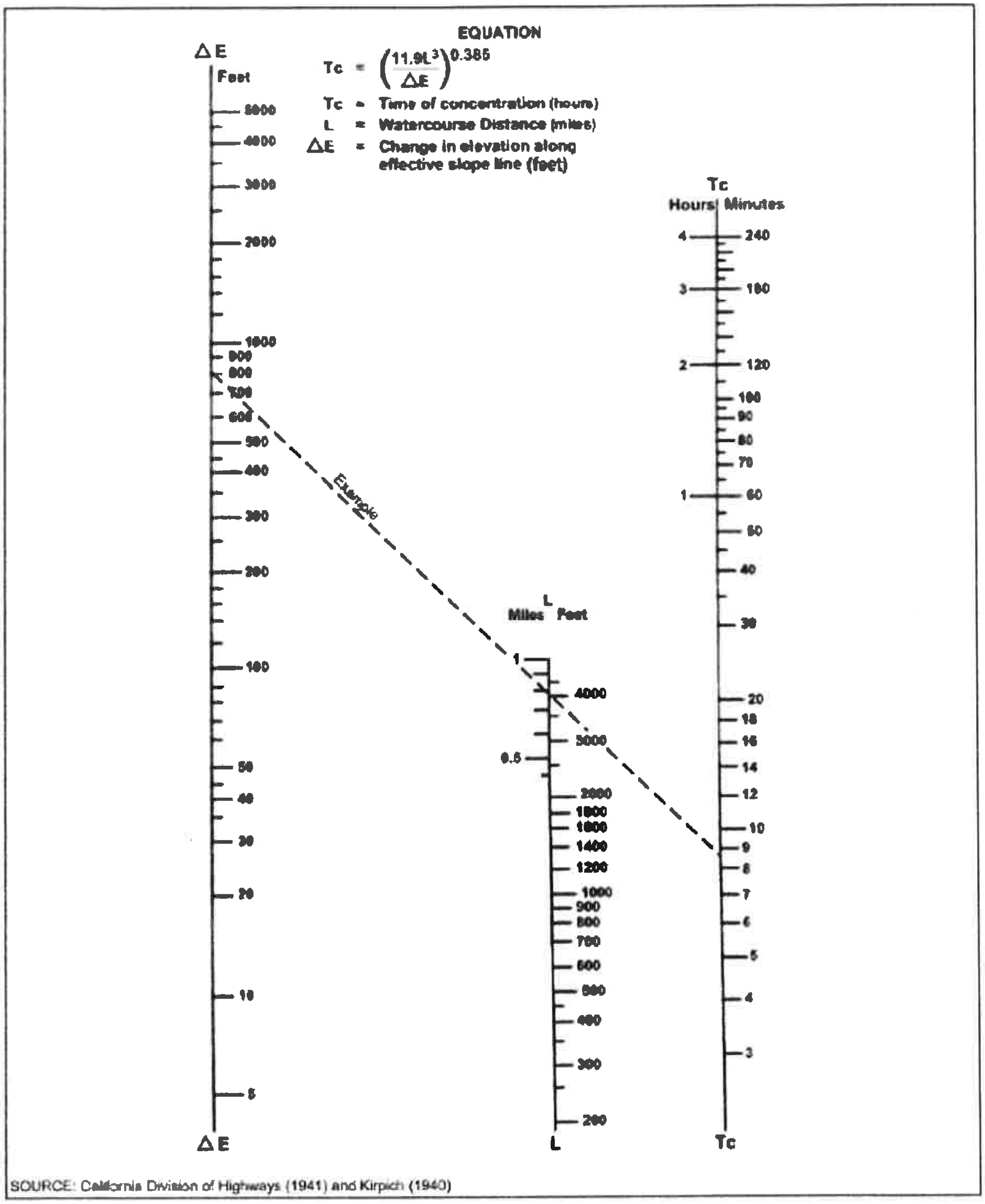
   $T_c = T_i + T_t$ where

   T_i is the inlet time or the time required for the storm water to flow to the first inlet in the system. It is the sum of time in overland flow across lots and in the street gutter.

   T_t is the travel time or the time required for the storm water to flow in the storm drain from the most upstream inlet to the point in question.

   Travel Time, T_t is computed by dividing the length of storm drain by the computed flow velocity. Since the velocity normally changes at each inlet because of changes in flow rate or slope, total travel time must be computed as the sum of the travel times for each section of the storm drain.

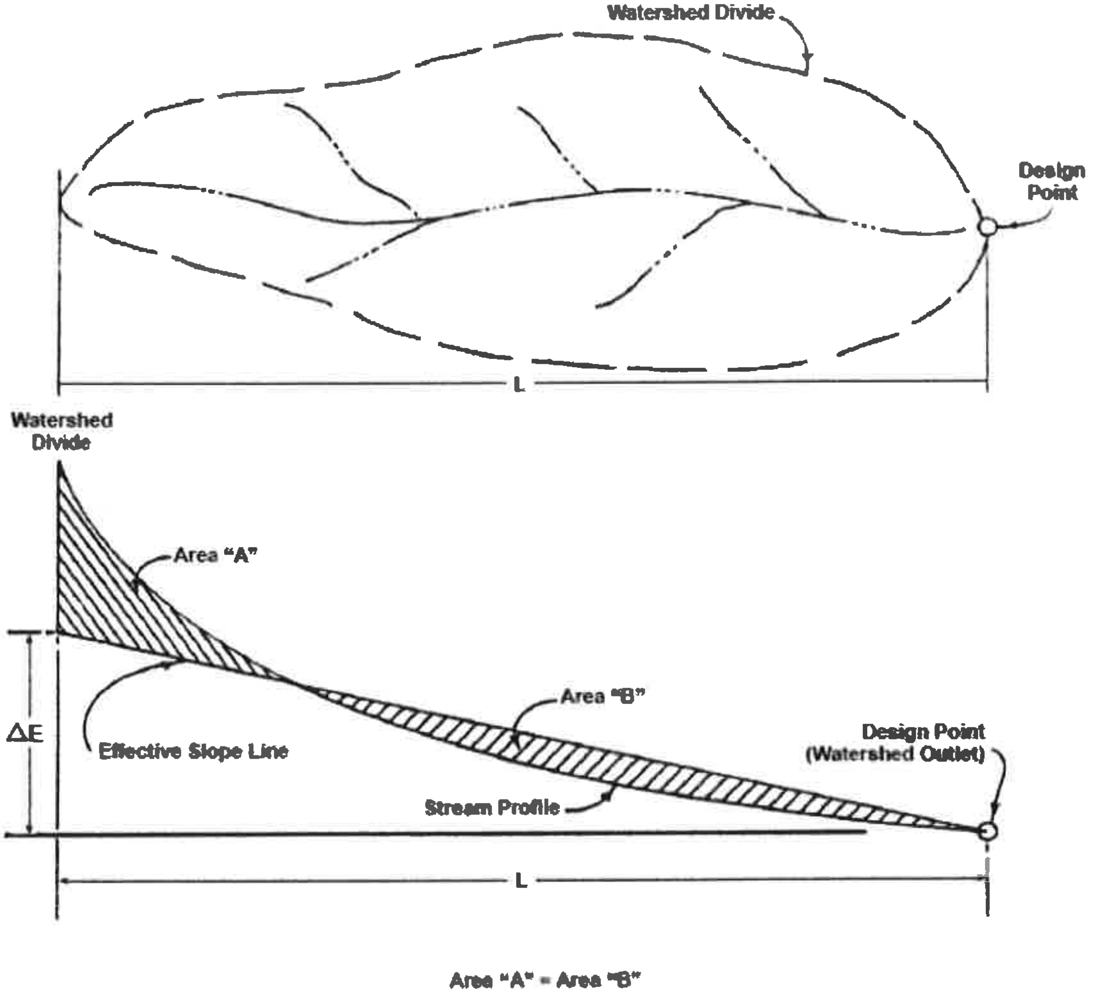
   The overland flow component of inlet time, T_i, may be estimated by the use of the chart shown in Figure A-4. Use Figure A-5 to estimate time of travel for street gutter flow.



SOURCE: California Division of Highways (1941) and Kirpich (1940)

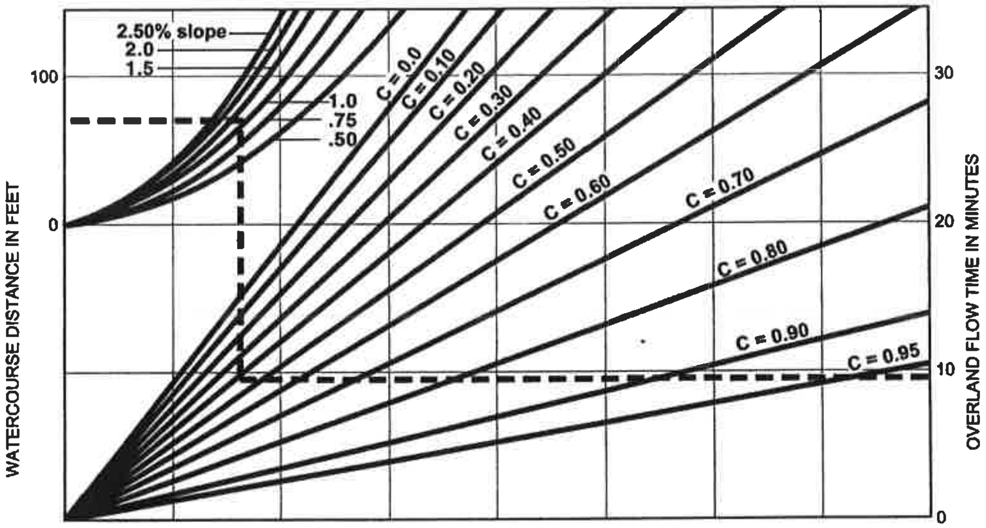
Figure A-2. Nomograph for Determination of T_c for Natural Watersheds

Note: Add ten minutes to the computed time of concentration from Figure A-2.



SOURCE: California Division of Highways (1941) and Kirpich (1940)

Figure A-3. Computation of Effective Slope for Natural Watersheds



EXAMPLE:

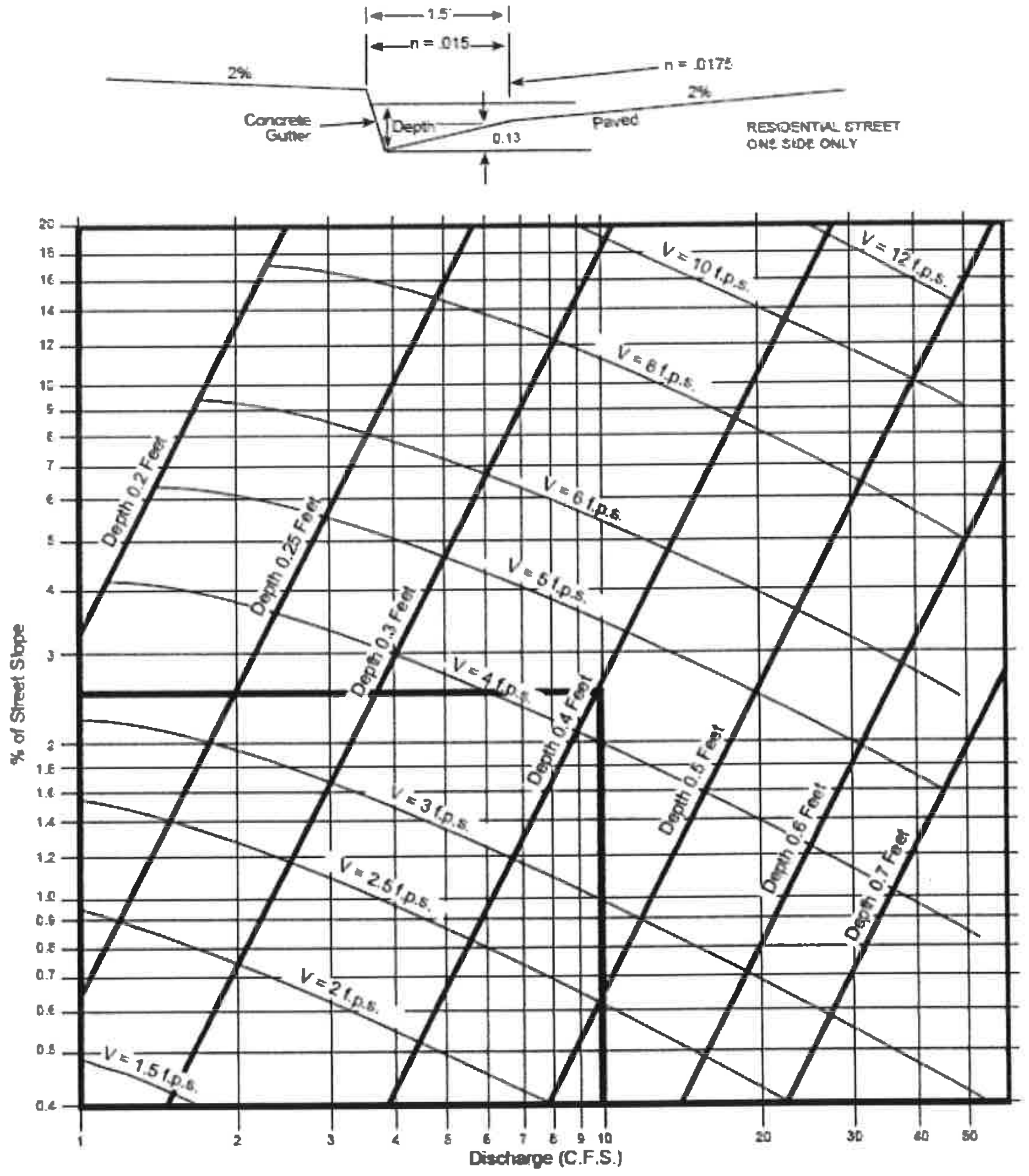
Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

$$T = \frac{1.8\,(1.1-C)\,\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

Figure A-4. Rational Formula – Overland Time of Flow Nomograph

<u>**Note**</u>: Use formula for watercourse distances in excess of 100 feet.



EXAMPLE:
Given: Q = 10 S = 2.5%
Chart gives: Depth = 0.4, Velocity = 4.4 f.p.s.

SOURCE: San Diego County Department of Special District Services Design Manual

Figure A-5. Gutter and Roadway Discharge – Velocity Chart

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Appendix B

Soil Conservation Service: NRCS Hydrologic Method

The Soil Conservation Service (SCS) (now called the Natural Resources Conservation Service [NRCS]) hydrologic method (NRCS hydrologic method) requires basic data similar to the RM: drainage area, a "runoff curve number" (CN) describing the proportion of rainfall that runs off, time to peak (Tp), the elapsed time from the beginning of unit effective rainfall to the peak flow for the point of concentration, and total rainfall (P). The NRCS approach, however, is more sophisticated in that it also considers the time distribution of the rainfall, the initial rainfall losses to interception and depression storage, and an infiltration rate that decreases during the course of a storm. Results of the NRCS approach are more detailed, in the form of a runoff hydrograph. Details of the methodology can be found in the NRCS National Engineering Handbook (NEH), Section 4 (NEH-4) (USDA, 1985). The NRCS hydrologic method should be used for study areas approximately 1 square mile and greater in size.

B.1. Procedure for Calculation of Runoff Curve Number (CN)

1. Locate basin on 1:2000 scale USGS topographic map(s).
2. Using a ½-inch or 1-inch grid (1/2-inch for areas less than 5 square miles) on a translucent overlay sheet, trace the basin boundary and other significant information from the topographic maps.
3. Locate basin on 1:2000 scale SCS hydrologic ground cover and soil group maps at the offices of the Department of Sanitation and Flood Control.
4. Overlay the grid sheet onto the ground cover and soil group maps; for each map record appropriate group cover (OB, NC, DL, etc.) and soil group (A, B, B, or D) at each grid intersection within the basin.
5. For each combination of ground cover/soil group (OB/A, NC/B, NC/D, etc.) count and record the number of grid intersections where that combination occurs.
6. Compute the total number of grid intersections within the basin. For a 1-inch grid, each intersection represents 1 square inch on the maps, and the total area of the basin is found by scale conversion; for ½-inch grid, each intersection is ¼ square inch. Compute the total area of the basin.
7. By field inspection, determine the hydrologic conditions which exist in the basin for each type of ground cover.

8. For each ground cover/soil group combination compute the fraction of the total area represented by that combination by the ratio of the number grid intersections counted in Step 5 to the total number of grid intersections counted in Step 6.
9. For each ground cover/soil group/hydrologic condition combination, select the appropriate runoff curve number for antecedent moisture condition 2 (CN_2). Refer to **Table B-1**.
10. Compute the partial CN_2 for each ground cover/soil group combination by the product of area fraction of each combination from Step 8 and the selected CN_2's from Step 9.
11. Sum the partial CN_2's from Step 10 to obtain the CN_2 for the entire basin.
12. For future land uses modify existing ground cover designations and use same procedures.
13. If stream bed is alluvial fill with deep group "A" soils (sand and gravels), the CN adjustment procedure should be considered.

Table B-1. Runoff Curve Numbers for Hydrologic Soil-Cover Complexes (CN); AMC 2; $I_a = 0.2S$

Cover			Hydrologic Soil Groups			
Land Use	**Treatment or Practice**	**Hydrologic Condition**	**A**	**B**	**C**	**D**
Water Surfaces (During Floods)			97	98	99	99
Urban						
Commercial-industrial			89	90	91	92
High density residential			75	82	88	90
Medium density residential			73	80	86	88
Low density residential			70	78	84	87
Barren			78	86	91	93
Fallow	Straight row		76	85	90	90
Vineyards	Disked		76	85	90	92
	Annual grass or legume cover	Poor	65	78	85	89
		Fair	50	69	79	84
		Good	38	61	74	80
Roads	Hard surface		74	84	90	92
	Dirt		72	82	87	89
Row Crops	Straight row	Poor	72	81	88	91
		Good	67	78	85	89
	Contoured	Poor	70	79	84	88
		Good	65	75	82	86

Cover			Hydrologic Soil Groups			
Land Use	**Treatment or Practice**	**Hydrologic Condition**	**A**	**B**	**C**	**D**
Narrowleaf chaparral		Poor	71	82	88	91
		Fair	55	72	81	86
Perennial grass		Poor	67	79	86	89
		Fair	50	69	79	84
		Good	38	61	74	80
Annual grass		Poor	67	78	86	89
		Fair	50	69	79	84
		Good	38	61	74	80
Close-seeded legumes or rotated pasture	Straight row	Poor	66	77	85	89
		Good	58	72	81	85
	Contoured	Poor	64	75	83	85
		Good	55	69	78	83
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
Meadow		Poor	63	77	85	88
		Fair	51	70	80	84
		Good	30	58	72	78
Open brush		Poor	62	76	84	88
		Fair	46	66	77	83
		Good	41	63	75	81
Farmsteads			59	74	82	86
Irrigated pasture		Poor	58	74	83	87
		Fair	44	65	77	82
		Good	33	58	72	79
Turf		Poor	58	74	83	87
		Fair	44	65	77	82
		Good	33	58	72	79

Cover			Hydrologic Soil Groups			
Land Use	Treatment or Practice	Hydrologic Condition	A	B	C	D
Woodland-grass		Poor	57	73	82	86
		Fair	44	65	77	82
		Good	33	58	72	79
Orchards (evergreen)		Poor	57	73	82	86
		Fair	44	65	77	82
		Good	33	58	72	79
Broadleaf chaparral		Poor	53	70	80	85
		Fair	40	63	75	81
		Good	31	57	71	78
Woods (woodland)		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	28	55	70	77

B.2. Procedure for Calculation of Lag Time and Time to Peak

1. Locate basin on 1:2000 scale USGS topographic map(s).
2. Compute:
    a. Drainage area, A, square miles.
    b. Length of longest watercourse, L in miles.
    c. L_c, length along longest watercourse in miles, measured upstream to point opposite center of area.
3. Compute overall slope, S:
    a. E_h = elevation of most remote point on watercourse, in feet.
    b. E_1 = elevation at outlet, in feet.
    c. $S = [E_h - E_1]/L$, in feet/mile.
4. By field inspection select basin n factor, the average of the Manning's n values of the watercourse and tributaries
5. Compute Lag time using **Equation B-1**.

Average Values of Roughness Coefficient (Manning's n)

Type of Waterway	Roughness Coefficient (n)
1. Closed Conduits (1)	
Steel (not lined)	0.015
Cast Iron	0.015
Aluminum	.021
Corrugated Metal (not lined)	0.024
Corrugated Metal (2) (smooth asphalt quarterlining)	0.021
Corrugated Metal (2) (smooth asphalt half lining)	0.018
Corrugated Metal (smooth asphalt full lining)	0.012
Concrete RCP	0.012
Clay (sewer)	0.013
Asbestos Cement & PVC	0.011
Drain Tile (terra cotta)	0.015
Cast-in-place Pipe	0.015
Reinforced Concrete Box	0.014
2. Open Channels (1)	
a. Unlined	
Clay Loam	0.023
Sand	0.020
b. Revetted	
Gravel	0.030
Rock	0.040
Pipe and Wire	0.025
Sacked Concrete	0.025
c. Lined	
Concrete (poured)	0.014
Air Blown Mortar (3)	0.016
Asphaltic Concrete or Bituminous Plant Mix	0.018
d. Vegetated (5)	
Grass lined, maintained	.035
Grass and Weeds	.045
Grass lined with concrete low flow channel	.032
3. Pavement and Gutters (1)	
Concrete	0.015
Bituminous (plant-mixed)	0.016

Ernest F. Brater and Horace Williams King

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Table 7-14. Values of K' for Circular Channels in the Formula

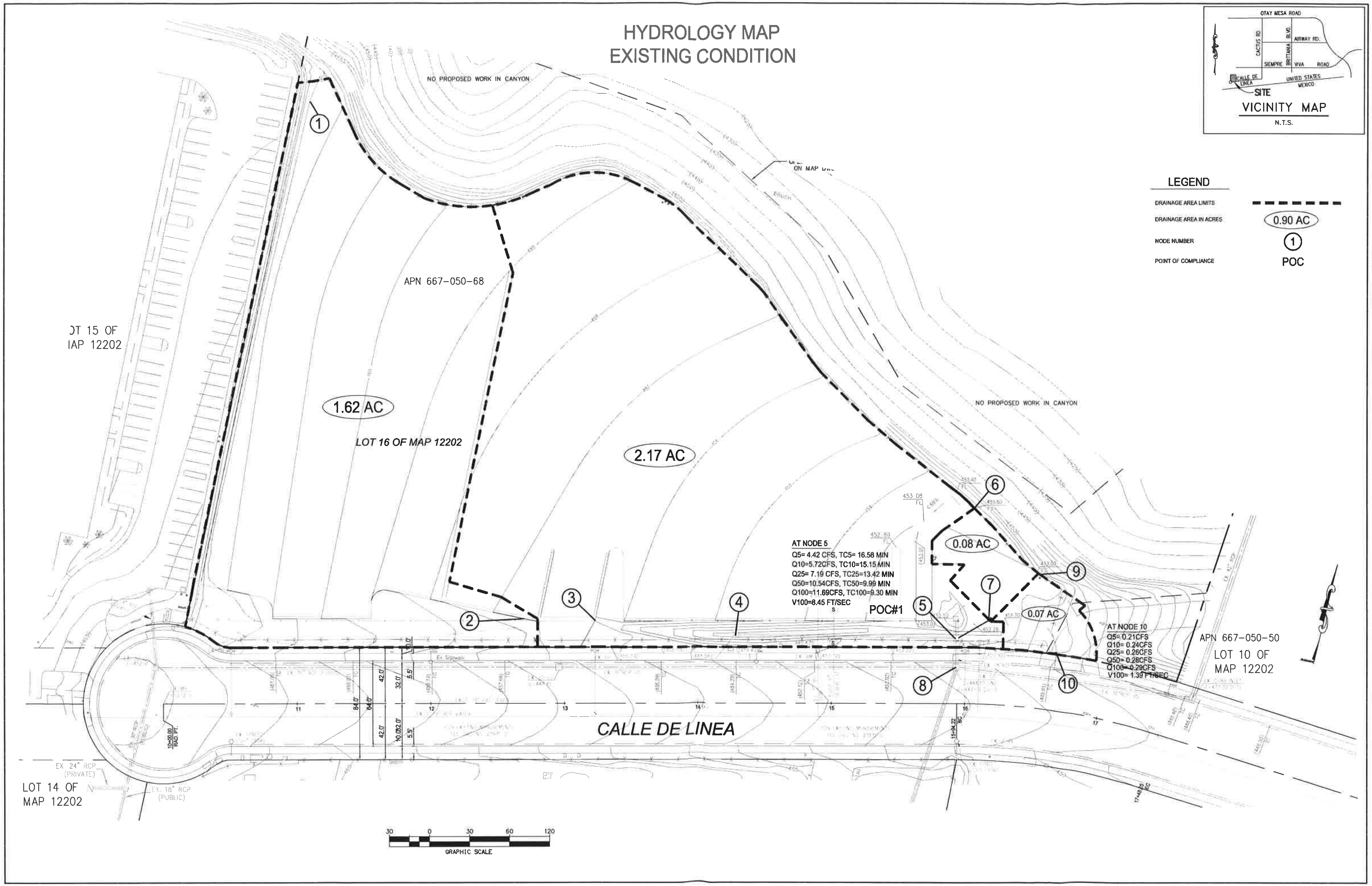
$$Q = \frac{K'}{n} d^{8/3} s^{1/2}$$

D = depth of water d = diameter of channel

$\frac{D}{d}$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
.0		.00007	.00031	.00074	.00138	.00222	.00328	.00455	.00604	.00775
.1	.00967	.0118	.0142	.0167	.0195	.0225	.0257	.0291	.0327	.0366
.2	.0406	.0448	.0492	.0537	.0585	.0634	.0686	.0738	.0793	.0849
.3	.0907	.0966	.1027	.1089	.1153	.1218	.1284	.1352	.1420	.1490
.4	.1561	.1633	.1705	.1779	.1854	.1929	.2005	.2082	.2160	.2238
.5	.232	.239	.247	.255	.263	.271	.279	.287	.295	.303
.6	.311	.319	.327	.335	.343	.350	.358	.366	.373	.380
.7	.388	.395	.402	.409	.416	.422	.429	.435	.441	.447
.8	.458	.458	.463	.468	.473	.477	.481	.485	.488	.491
.9	.494	.496	.497	.498	.498	.498	.496	.494	.489	.483
1.0	.463									

5. HYDROLOGY MAPS

HYDROLOGY MAP
EXISTING CONDITION

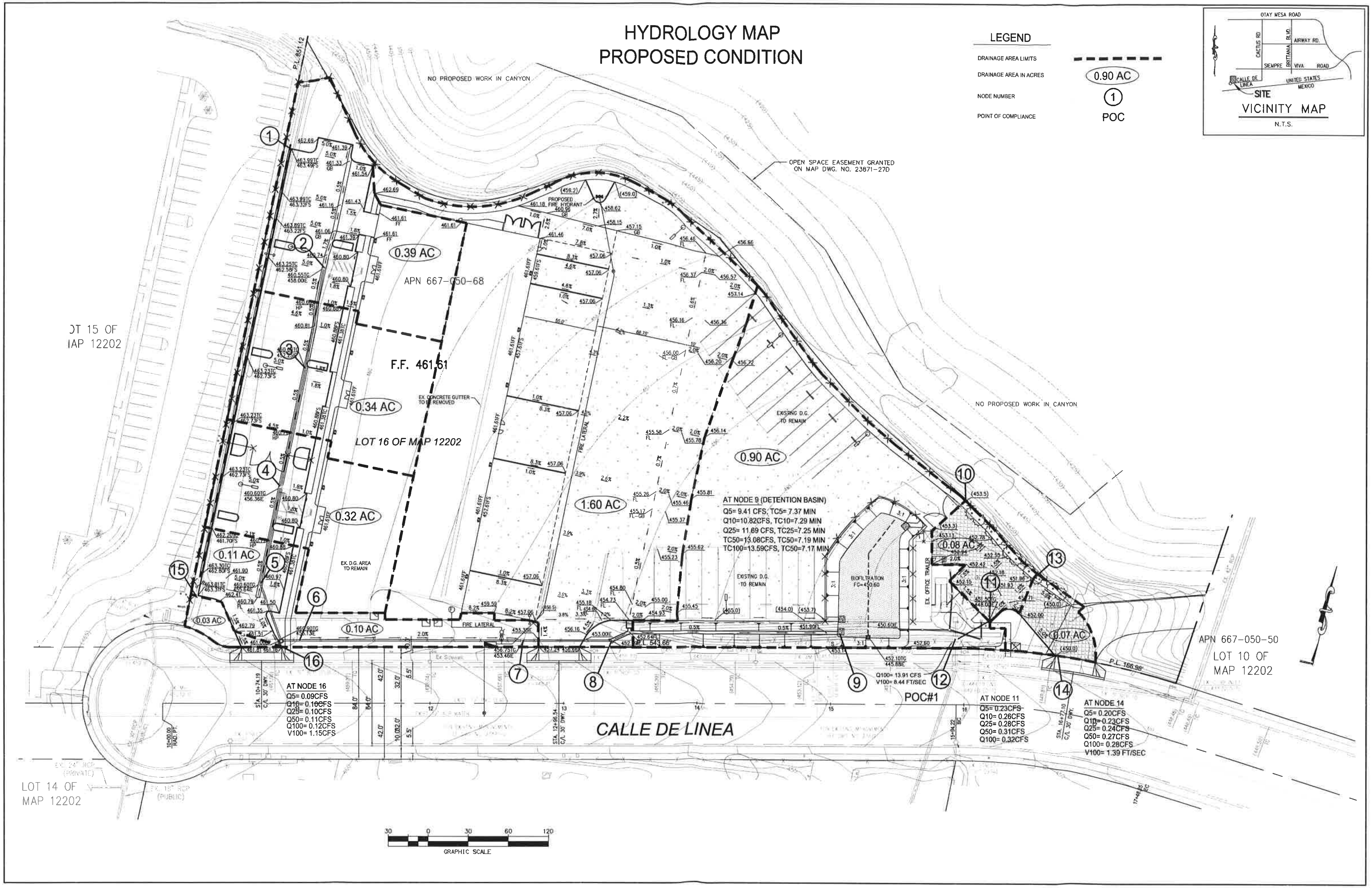


AT NODE 5
Q5= 4.42 CFS, TC5= 16.58 MIN
Q10=5.72CFS, TC10=15.15 MIN
Q25= 7.19 CFS, TC25=13.42 MIN
Q50=10.54CFS, TC50=9.99 MIN
Q100=11.69CFS, TC100=9.30 MIN
V100=8.45 FT/SEC

AT NODE 10
Q5= 0.21CFS
Q10= 0.24CFS
Q25= 0.26CFS
Q50= 0.28CFS
Q100= 0.29CFS
V100= 1.39 FT/SEC

V:\data-V\PROJECTS-V\05-035\dwg\05-035BASE.dwg 8/7/2007 1:22:23 PM PST

HYDROLOGY MAP
PROPOSED CONDITION



AT NODE 9 (DETENTION BASIN)
Q5= 9.41 CFS, TC5= 7.37 MIN
Q10=10.82CFS, TC10=7.29 MIN
Q25= 11.69 CFS, TC25=7.25 MIN
TC50=13.08CFS, TC50=7.19 MIN
TC100=13.59CFS, TC50=7.17 MIN

AT NODE 16
Q5= 0.09CFS
Q10= 0.10CFS
Q25= 0.10CFS
Q50= 0.11CFS
Q100= 0.12CFS
V100= 1.15CFS

Q100= 13.91 CFS
V100= 8.44 FT/SEC

AT NODE 11
Q5= 0.23CFS
Q10= 0.26CFS
Q25= 0.28CFS
Q50= 0.31CFS
Q100= 0.32CFS

AT NODE 14
Q5= 0.20CFS
Q10= 0.23CFS
Q25= 0.24CFS
Q50= 0.27CFS
Q100= 0.28CFS
V100= 1.39 FT/SEC

ATTACHMENT 6
GEOTECHNICAL AND GROUNDWATER INVESTIGATION REPORT

Attach project's geotechnical and groundwater investigation report. Refer to Appendix C.4 to determine the reporting requirements.

SDVOSB . DVBE

SCST, Inc.
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June 7, 2018

SCST No. 170385N
Report No. 4

Mr. Miguel O. Perez
Noble House Real Estate, LLC
8662-A Siempre Viva Road
San Diego, California 92154

Subject: UPDATED INFILTRATION FEASIBILITY RECOMMENDATIONS
BAJA FREIGHT
6852 CALLE DE LINEA
SAN DIEGO, CALIFORNIA

References:

1. K & S Engineering, (undated), *Conceptual Grading Plan for Baja Freight SDP,* signed by Kamal S. Sweis, P.E. 48592
2. SCST, Inc. (2018), *Supplemental Geotechnical Investigation, Baja Freight, 6852 Calle De Linea, San Diego, California,* SCST No. 170385N-03, March 19
3. SCST, Inc. (2017), *Infiltration Feasibility Study, Baja Freight, 6852 Calle De Linea, San Diego, California,* SCST No. 170385N-01, October 12
4. SCST, Inc. (2016), *Update Geotechnical Report, Proposed Loading Dock, 6852 Calle de Linea, San Diego, CA,* SCST No. 160101N-1, January 15

Dear Mr. Perez:

SCST, Inc. (SCST) is pleased to provide updated infiltration feasibility recommendations for the subject project. We understand the project will include the design and construction of two warehouse/loading dock buildings, the design and construction of onsite stormwater management devices, and associated hardscape areas. In preparing these updated recommendations, SCST discussed the project with your representatives, reviewed current grading plans (Reference 1), and reviewed previously prepared geotechnical reports (References 2, 3, and 4).

Updated Recommendations

SCST conducted an infiltration feasibility study at the site on October 15, 2017. SCST produced a report summarizing our infiltration feasibility study (Reference 3). The tested infiltration rates range from approximately <0.1 to 0.3 inches per hour. In our opinion, the onsite materials will reliably support partial infiltration with infiltration rates of between <0.1 and 0.3 inches per hour. The stormwater management device design should apply an adequate factor of safety to these observed rates.

We appreciate the opportunity to be of service to you on this project. If you have any questions, comments, or require additional information, please call our office at (619) 280-4321.

Respectfully submitted,
SCST, INC.

Douglas A. Skinner
No. 2472

Douglas A. Skinner, CEG 2472
Senior Geologist

DAS:hu

Attachments:
Appendix I - Worksheet C.4-1: Categorization of Infiltration Feasibility Condition

(1) Mr. Gustavo Miranda via e-mail: gusmks-engr.com

APPENDIX I
WORKSHEET C.4-1: CATEGORIZATION OF INFILTRATION FEASIBILITY CONDITION

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition

Categorization of Infiltration Feasibility Condition	Worksheet C.4-1

Part 1 - Full Infiltration Feasibility Screening Criteria

Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
1	**Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	☐	☑

Provide basis:

The soil present on-site is largely made up of fill and formational material consisting of dense sandy silt and silty sand with cobble. The tested material is believed to be generally representative of the material that will be encountered below the proposed BMP locations. The tested infiltration rates were low and ranged from between less than 0.1 and 0.3 inches per hour (inch/hour). In our opinion, the tested infiltration rates do not support a reliable infiltration rate of greater than 0.5 inch/hour.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Criteria	Screening Question	Yes	No
2	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	☐	☑

Provide basis:

The tested infiltration rates do not support reliable infiltration of greater than 0.5 inch/hour. Allowing infiltration greater than 0.5 inch/hour will increase the risk of geotechnical hazards including increased surface runoff on the project site and onto adjacent properties and slopes, as well as uncontrolled lateral and vertical migration of groundwater through permeable bedding material of on-site utilities as well as utilities within the public right-of-way. SCST does not recommend allowing infiltration greater than 0.5 inch/hour at the site.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.

Worksheet C.4-1 Page 2 of 4			
Criteria	Screening Question	Yes	No
3	**Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☐	☑
Provide basis: The observed infiltration rates at the site indicate that the on-site soils do not support reliable infiltration of greater than 0.5 inch per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	**Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☐	☑
Provide basis: The observed infiltration rates at the site indicate that the on-site soils do not support reliable infiltration of greater than 0.5 inch per hour. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1 - 4 are "**Yes**" a full infiltration design is potentially feasible. The feasibility screening category is **Full Infiltration** If any answer from row 1-4 is "**No**", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by [City Engineer] to substantiate findings.

Worksheet C.4-1 Page 3 of 4

Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria

Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?

Criteria	Screening Question	Yes	No
5	**Do soil and geologic conditions allow for infiltration in any appreciable rate or volume?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	☑	☐

Provide basis:

The soil present on-site is largely made up of fill and formational material consisting of dense sandy silt and silty sand with cobble. The tested material is believed to be generally representative of the material that will be encountered below the proposed BMP locations. The tested infiltration rates were low and ranged from less than 0.1 and 0.3 inches per hour (inch/hour). In our opinion, the tested infiltration rates do not support partial infiltration rates of between <0.1 and 0.3 inches per hour provided an adequate factor of safety is applied in BMP design.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

6	**Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	☑	☐

Provide basis:

Partial infiltration in limited quantities as described in Criteria 5 will not increase the risk of geotechnical hazards.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Worksheet C.4-1 Page 4 of 4

Criteria	Screening Question	Yes	No
7	**Can Infiltration in any appreciable quantity be allowed without posing significant risk for groundwater related concerns (shallow water table, storm water pollutants or other factors)?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☑	☐

Provide basis:

There are no known significant groundwater related risks related to allowing partial infiltration at the site as described in Criteria 5.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

8	**Can infiltration be allowed without violating downstream water rights?** The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	☑	☐

Provide basis:

This Criteria should be addressed by the project Civil Engineer.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.

Part 2 Result*	If all answers from row 1-4 are yes then partial infiltration design is potentially feasible. The feasibility screening category is **Partial Infiltration.** If any answer from row 5-8 is no, then infiltration of any volume is considered to be **infeasible** within the drainage area. The feasibility screening category is **No Infiltration.**	

*To be completed using gathered site information and best professional judgment considering the definition of MEP in the MS4 Permit. Additional testing and/or studies may be required by Agency/Jurisdictions to substantiate findings

Factor of Safety and Design Infiltration Rate Worksheet

Worksheet D.5-1

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) $p = w \times v$
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	3	0.75
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	2	0.5
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.75
B	Design	Level of pretreatment/ expected sediment loads	0.5	1	0.5
		Redundancy/resiliency	0.25	1	0.25
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			1
Combined Safety Factor, $S_{total} = S_A \times S_B$					1.75
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)					0.2
Design Infiltration Rate, in/hr, $K_{design} = K_{observed} / S_{total}$					0.11

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

Infiltration rate per SCST Inc. percolation test.

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March 13, 2018

SCST No. 170385N
Report No. 1

Mr. Miguel O. Perez
Noble House Real Estate, LLC
8662-A Siempre Viva Road
San Diego, California 92154

Subject: INFILTRATION FEASIBILITY STUDY
BAJA FREIGHT
6852 CALLE DE LINEA
SAN DIEGO, CALIFORNIA

References:

1. SCST, Inc. (2016), *Update Geotechnical Report, Proposed Loading Dock, 6852 Calle de Linea, San Diego, CA,* SCST No. 160101N-1, January 15
2. SCST, Inc. (2006), *Update Report, Baja Freight Park Lot and Storage, Calle de Linea, San Diego, CA, SCST No. 0611226-1,* dated November 8
3. SCST, Inc. (2002), *Report of Geotechnical Investigation, Lot 16, International Business Center,* SCST No. 0611226-1, dated November 8
4. SCS&T (1989), *Report of As-Built Geology, Field Observations and Relative Compaction, Proposed International Business Center, Calle de Linea, San Diego, CA, SCS&T No. 8711096-16,* dated June 12
5. SCS&T (1987), *Preliminary Geotechnical Investigation, International Business Center, Calle de Linea, San Diego, CA, SCS&T No. 8711096-16,* dated June 8

Dear Mr. Perez:

SCST, Inc. (SCST) is pleased to submit this infiltration feasibility study performed for the subject project. We understand the project will include the design and construction of two warehouse/loading dock buildings, the design and construction of on-site stormwater management devices, and associated hardscape areas. Our services were provided in accordance with our proposal dated August 31, 2017.

SITE DESCRIPTION

The site is identified as 6852 Calle de Linea, in the community Otay Mesa of the city of San Diego, California (Figure 1). The site is bounded by commercial development on the south, east, and west, and by undeveloped land on the north. Existing improvements at the site consist of a graded pad used for equipment and tractor-trailer storage and associated temporary buildings. The graded pad is flat with an elevation of about 470 feet above mean sea level (MSL). A slope descends north from the northern edge of the graded at an inclination ranging from 2:1 (horizontal to vertical) 3:1.

INFILTRATION FEASIBILITY

SCST conducted an infiltration feasibility study at the site on October 15, 2017. Our field work consisted of advancing eight exploratory test borings to observe the existing subsurface materials and to perform infiltration testing at the bottom of the test borings. The test borings were excavated using a truck-mounted hollow stem auger. The test borings were excavated to depths ranging from approximately 3 to 10 feet below the existing ground surface. An SCST engineer logged the test borings and collected representative soil samples of the materials encountered.

Logs of the test borings are presented in Appendix I. Soils are classified according to the Unified Soil Classification System (USCS) present on Figure I-1. Figure 2 presents a Subsurface Exploration Map showing the approximate locations of our test borings.

A borehole percolation test was performed in the bottom of each boring in accordance with ASTM D 5126 and the San Diego Storm Water Standards BMP Design Manual at depths of approximately 3 feet below the existing ground surface. The testing was performed by an SCST engineer in accordance with ASTM D 3385 and guidelines set forth by the County of San Diego. Table 1 presents the calculated infiltration rates. The data and results of the percolation testing are presented in Appendix III.

Table 1: Infiltration Rate Test Results

Test Location	Test Depth (feet)	Material Type at Test Depth (USCS Classification)	Infiltration Rate (inches/hour)
I-1	10	Sandy Clay with cobble (CL)	<0.1
I-2	5	Sandy Clay with cobble (CL)	<0.1
I-3	6	Sandy Clay with cobble (CL)	<0.1
I-4	10	Sandy Clay with cobble (CL)	0.3
I-5	5	Sandy Clay with cobble (CL)	<0.1*
I-6	7	Sandy Clay with cobble (CL)	<0.1*
I-7	5	Sandy Clay with cobble (CL)	<0.1*
I-8	5	Sandy Clay with cobble (CL)	<0.1*

*** indicates no infiltration in any appreciable quantity observed**

SUBSURFACE CONDITIONS

The materials encountered in the test boring consist of fill. The fill extended beyond the maximum depth of the test pits and consists of medium dense to dense, fine to medium grained clayey sand with cobble. Groundwater was not encountered in our borings. However, groundwater levels may fluctuate in the future due to rainfall, irrigation, broken pipes, or changes in site drainage.

CONCLUSIONS AND RECOMMENDATIONS

Infiltration Feasibility

Evaluation of stormwater infiltration feasibility was performed in general accordance with the San Diego Regional BMP Design Manual. Worksheet C.4-1 from the manual is provided in Appendix IV. In our opinion, the materials tested during our study are generally representative of the materials that may be encountered below proposed BMP devices.

The tested infiltration rates range from approximately 0.2 to 0.4 inches per hour. In our opinion, the on-site materials will not reliably support infiltration in any appreciable quantity.

We appreciate the opportunity to be of service to you on this project. If you have any questions, comments, or require additional information, please call our office at (619) 280-4321.

Respectfully submitted,
SCST, INC.

DRAFT ONLY – DO NOT RELY ON THIS REPORT

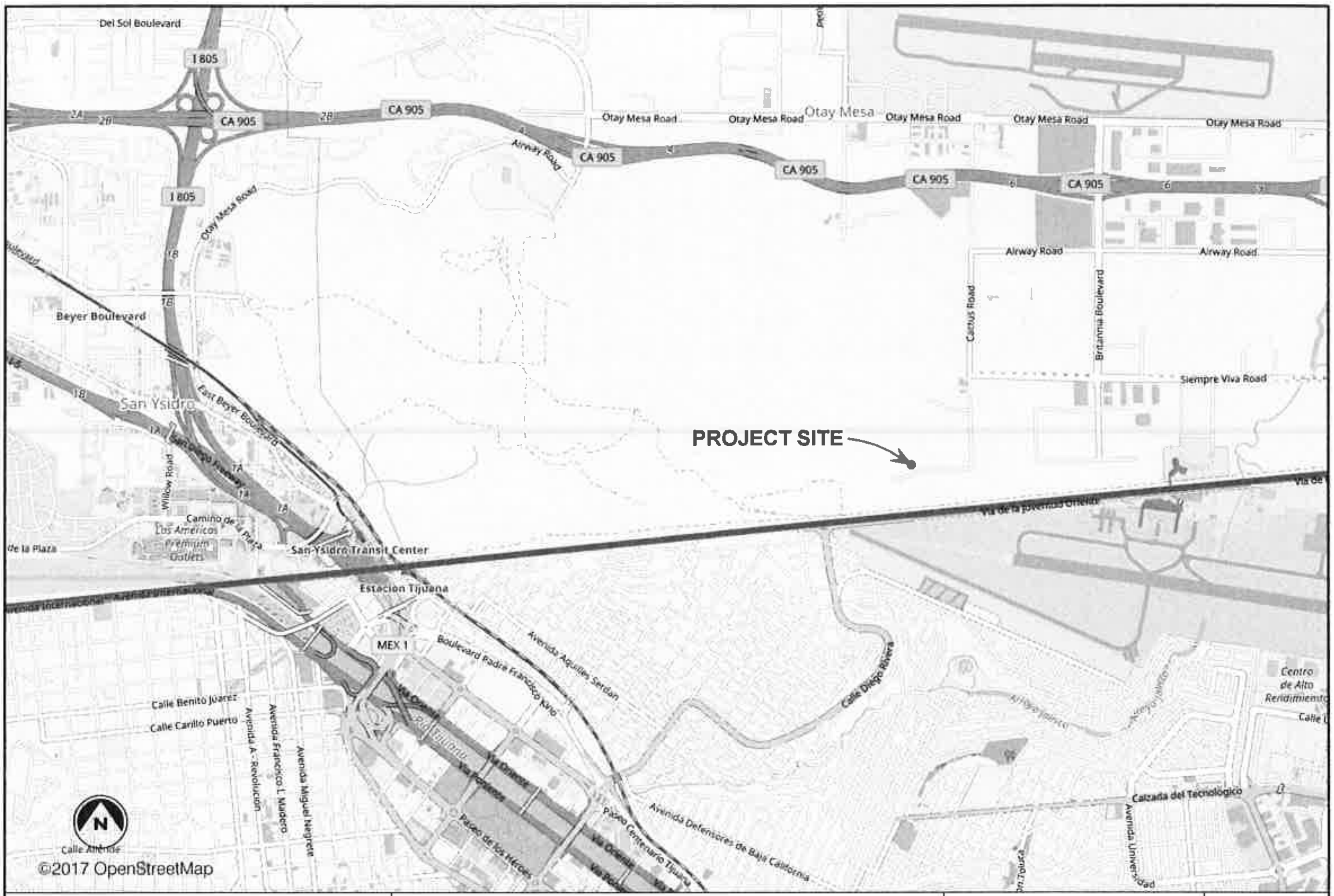
Douglas A. Skinner, CEG 2472
Senior Geologist

DAS:hu

Attachments:
Figures
Figure 1 - Site Vicinity Map
Figure 2 - Geotechnical Map
Figure 3 - Geologic Cross Section

Appendices
Appendix I - Field Investigation
Appendix II - Laboratory Results
Appendix III - Infiltration Testing Results
Appendix IV - Worksheet C.4-1: Categorization of Infiltration Feasibility Condition

(1) Mr. Gustavo Miranda via e-mail: gusmks-engr.com

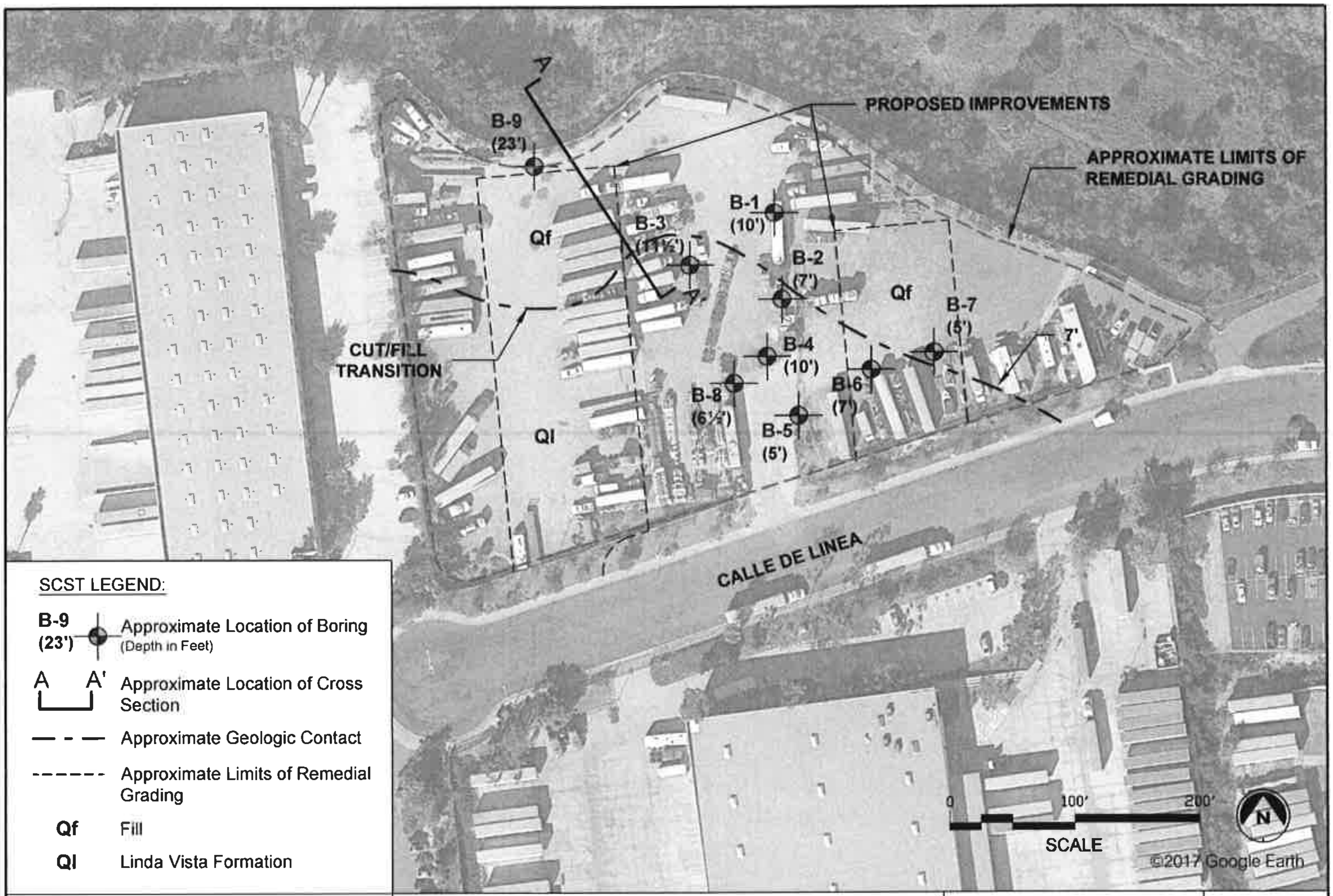


SCST, Inc.

SITE VICINITY MAP
Baja Freight
6852 Calle De Linea
San Ysidro, California

Date: October, 2017
By: MAW
Job No.: 170385N-1

Figure:
1



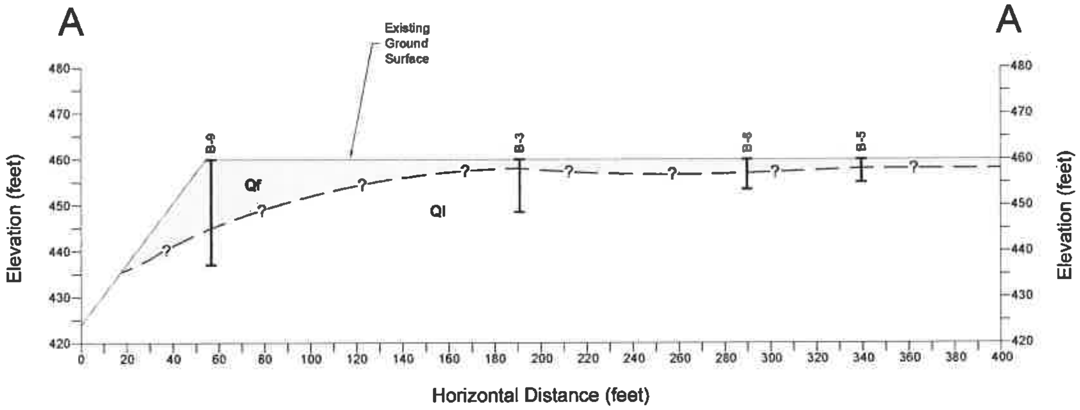
SCST, Inc.

GEOTECHNICAL MAP

Baja Freight
6852 Calle De Linea
San Ysidro, California

Date: November, 2017
By: MAW/DTC
Job No.: 170385N-1

Figure:
2



SCST LEGEND:

B-9 Approximate Location of Boring

—?— Approximate Location of Geologic Contact, Queried Where Uncertain

Qf	Fill
Ql	Linda Vista Formation

Date: November, 2017
By: AG
Job No.: 170270N4-1

GEOLOGIC CROSS SECTION
Baja Freight
6852 Calle De Linea
San Ysidro, California

SCST, Inc.

Figure
3

APPENDIX I
FIELD INVESTIGATION

Our infiltration feasibility study was conducted on October 15th, 2017 and consisted of excavating eight test borings to depths ranging from approximately 5 to 10 feet below the existing surface using a truck-mounted hollow stem auger drill rig. An SCST engineer logged and sampled the materials encountered. Figure 2 presents the approximate locations and depth of the test borings.

Disturbed bulk samples were obtained from the excavation cuttings.

The soils are classified in accordance with the Unified Soil Classification System as illustrated in Appendix I Figure I-1. Logs of the exploration percolation test holes are presented on Figures I-2 and I-9.

SUBSURFACE EXPLORATION LEGEND

UNIFIED SOIL CLASSIFICATION CHART

SOIL DESCRIPTION		GROUP SYMBOL	TYPICAL NAMES
I. COARSE GRAINED, more than 50% of material is larger than No. 200 sieve size.			
GRAVELS More than half of coarse fraction is larger than No. 4 sieve size but smaller than 3".	CLEAN GRAVELS	GW	Well graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels, gravel sand mixtures, little or no fines.
	GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
		GC	Clayey gravels, poorly graded gravel-sand, clay mixtures.
SANDS More than half of coarse fraction is smaller than No. 4 sieve size.	CLEAN SANDS	SW	Well graded sand, gravelly sands, little or no fines.
		SP	Poorly graded sands, gravelly sands, little or no fines.
		SM	Silty sands, poorly graded sand and silty mixtures.
		SC	Clayey sands, poorly graded sand and clay mixtures.
II. FINE GRAINED, more than 50% of material is smaller than No. 200 sieve size.			
	SILTS AND CLAYS (Liquid Limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, sandy silt or clayey-silt-sand mixtures with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL	Organic silts and organic silty clays or low plasticity.
	SILTS AND CLAYS (Liquid Limit greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity.
III. HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils.

SAMPLE SYMBOLS

☒	- Bulk Sample
CAL	- Modified California sampler
CK	- Undisturbed Chunk sample
MS	- Maximum Size of Particle
ST	- Shelby Tube
SPT	- Standard Penetration Test sampler

GROUNDWATER SYMBOLS

▽ - Water level at time of excavation or as indicated

- Water seepage at time of excavation or as indicated

LABORATORY TEST SYMBOLS

AL
CON
COR
DS
EI
MAX
RV
SA
UC

SCST, Inc.

Baja Freight Calle de Linea San Ysidro, California			
By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-1

LOG OF BORING B-1

Date Drilled: 9/17/2017
Equipment: CME-75 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
1 2		**FILL (Qf)**: SILTY SAND, light yellowish-brown, fine to coarse grained, dry, dense.							
3 4 5 6 7 8		**LINDAVISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.							
9			SPT		31	42			SA
10 11 12 13 14 15 16 17 18 19 20		**BORING TERMINATED AT 10 FEET**							

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-2

LOG OF BORING B-2

Date Drilled: 9/17/2017
Equipment: CME-75 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
1	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense. Becomes moist.							
2	SM	**LINDAVISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.							
3									
4									
5			SPT		52/9"	71/9"			
6		**BORING TERMINATED AT 6 FEET**							
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-3

LOG OF BORING B-3

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
1	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense. Becomes moist.							
2		**LINDAVISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.							
3									
4									
5									
6									
7									
8									
9									
10	SC	CLAYEY SAND, light brown with orange and white, fine to coarse grained, moist, dense.							
11			SPT		36	49			
12		**BORING TERMINATED AT 11½**							
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-4

LOG OF BORING B-4

Date Drilled: 9/17/2017
Equipment: CME-75 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense.							
1		Becomes moist.							
2									
3		**LINDAVISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.							
4									
5		Becomes very dense.							
6									
7									
8									
9			SPT		97/8"	133/8"			
10		**BORING TERMINATED AT 10 FEET**							
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-5

LOG OF BORING B-5

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
1	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense. Becomes moist.							
2		**LINDAVISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.							
3									
4				☒					
5		**REFUSAL AT 5 FEET ON COBBLE**							
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-6

LOG OF BORING B-6

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
	SC	**FILL (Qf)**: CLAYEY SAND, light brown, fine to coarse grained, dry, medium dense.							
1									
2		**LINDAVISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, very dense.							
3									
4									
5		Becomes more fine.							
6				☒					SA
7		**REFUSAL AT 7 FEET ON COBBLE**							
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-7

LOG OF BORING B-7

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
1	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense.							
2									
3									
4									
5		**LINDAVISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.	SPT		65/11"	89/11			
6		**BORING TERMINATED AT 5 FEET**							
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-8

LOG OF BORING B-8

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense. Becomes moist.							
1									
2									
3		**LINDAVISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.							
4									
5									
6			SPT		44	60			
7		**BORING TERMINATED AT 6½ FEET**							
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-9

LOG OF BORING B-9

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense.							
1		Becomes moist.							
2									
3									
4									
5		Becomes yellowish-brown and white, and very dense.	SPT		65/9"	89/9"			
6									
7									
8									
9									
10									
11			SPT		40	55			
12									
13									
14									
15		**LINDAVISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.	SPT		50/4"	68/4"			
16									
17									
18		Boring hit refusal at18 feet on cobble; move 5 feet south and continue.							
19									
20									

BORING CONTINUED ON I-11.

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-10

LOG OF BORING B-9 (Continued)

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

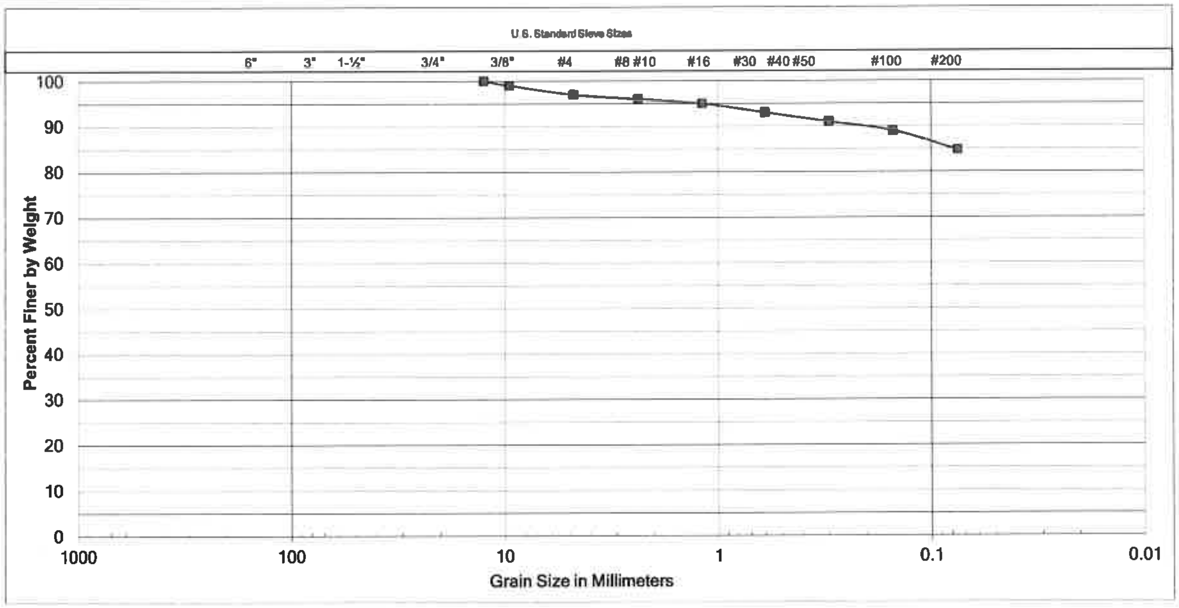
DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
21		**LINDAVISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.	SPT		29	40			
22									
23		**REFUSAL AT 23 FEET ON COBBLE**							
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-11

APPENDIX II
LABORATORY RESULTS



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

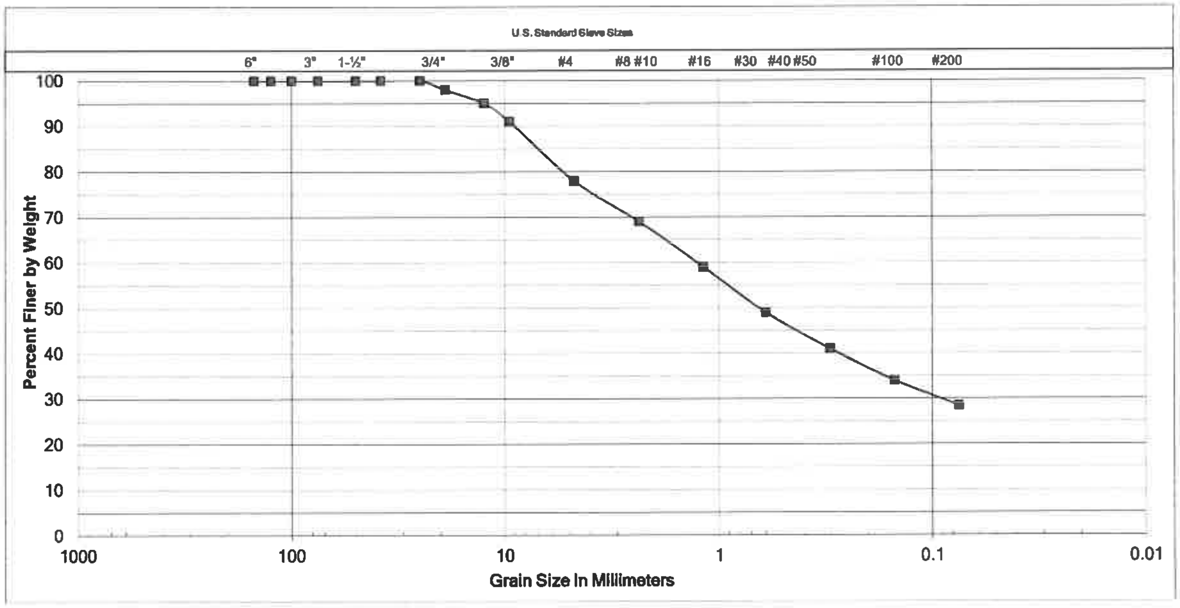
SAMPLE LOCATION
B1 @ 8½-10

UNIFIED SOIL CLASSIFICATION:	SM
DESCRIPTION	SILTY SAND

ATTERBERG LIMITS	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTICITY INDEX	

SCST, Inc.

Baja Freight Calle De Linea San Ysidro, California			
By:	CN	Date:	March, 2018
Job Number:	170385N	Figure:	II-1



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
B6 @ 6-7

UNIFIED SOIL CLASSIFICATION:	SM
DESCRIPTION	SILTY SAND with GRAVEL

ATTERBERG LIMITS	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTICITY INDEX	

SCST, Inc.

Baja Freight Calle De Linea San Ysidro, California			
By:	CN	Date:	March, 2018
Job Number:	170385N-1	Figure:	II-2

APPENDIX III
INFILTRATION RATE TEST RESULTS

Report of Borehole Percolation Testing

Storm Water Infiltration

Project Name: Baja Freight Calle de Linea
Job Number: 170385N-1
Date Drilled: 9/14/2017
Drilling Method: 6" Hollow Stem Auger
Drilled Depth (feet): 10
Test Hole Diameter (inches): 6
Gravel Pack: Yes
Pipe Diameter (inches): 3

Test Number: **I-1**
Tested By: JRD
Date Tested: 9/15/2017
Presoak Time: 20 hours

Trial No.	Time	Time Interval, ΔT (min)	Initial Water Height, H_o (ft)	Final Water Height, H_f (ft)	Change in Water Height, ΔH (in)	Percolation Rate (min/in)
1	7:25 7:55	0:30	2.50	2.29	2.5	12
2	7:55 8:25	0:30	2.50	2.44	0.7	42
3	8:25 9:15	0:50	2.44	2.35	1.1	46
4	9:15 9:50	0:35	2.5	2.5	0.6	58
5	9:50 10:30	0:40	2.45	2.39	0.7	56
6	10:30 11:09	0:39	2.39	2.37	0.2	163
7	11:09 11:45	0:36	2.37	2.31	0.7	50
8	11:45 12:27	0:42	2.41	2.37	0.5	87
				Observed Percolation Rate:	100 min/in 0.6 in/hr	
				Gravel Correction Factor:	1.95	
				Corrected Percolation Rate:	195 min/in 0.3 in/hr	
				***Tested Infiltation Rate, I_t:**	**<0.1 in/hr**	

*Tested infiltration rate using the Porchet Method:

$$I_t = \frac{\Delta H(60r)}{\Delta T(r + 2H_{avg})}$$

ΔH = Change in water head height over the time interval [in] = 0.2

r = Test hole radius [in] = 3

ΔT = Time interval [min] = 39

H_{avg} = Average water height over time interval = $12(H_o + H_f)/2$ [in] = 29.1

$_t =$

SCST, Inc.	Baja Freight Calle de Linea San Diego, California		
	By: JRD	Date: March, 2018	
	Job No: 170385N-1	Figure: III-1	

Report of Borehole Percolation Testing

Storm Water Infiltration

Project Name: Baja Freight Calle de Linea
Job Number: 170385N-1
Date Drilled: 9/14/2017
Drilling Method: 6" Hollow Stem Auger
Drilled Depth (feet): 5
Test Hole Diameter (inches): 6
Gravel Pack: Yes
Pipe Diameter (inches): 4

Test Number: **I-2**
Tested By: JRD
Date Tested: 9/15/2017
Presoak Time: 20 hours

Trial No.	Time	Time Interval, ΔT (min)	Initial Water Height, H_o (ft)	Final Water Height, H_f (ft)	Change in Water Height, ΔH (in)	Percolation Rate (min/in)
1	7:20 7:50	0:30	1.00	0.97	0.4	83
2	7:50 8:20	0:30	0.97	0.97	0.0	0
3	8:20 9:15	0:55	0.97	0.95	0.2	229
4	9:15 9:50	0:35	1.0	0.9	0.2	146
5	9:50 10:30	0:40	0.93	0.93	0.0	0
6	10:30 11:07	0:37	0.93	0.92	0.1	308
7	11:07 11:43	0:36	0.92	0.90	0.2	150
8	11:43 12:26	0:43	0.90	0.90	0.0	0
					Observed Percolation Rate:	153 min/in 0.4 in/hr
					Gravel Correction Factor:	1.57
					Corrected Percolation Rate:	239 min/in 0.3 in/hr
					***Tested Infiltation Rate, I_t:**	**<0.1 in/hr**

*Tested infiltration rate using the Porchet Method:

$$I_t = \frac{\Delta H(60r)}{\Delta T(r + 2H_{avg})}$$

ΔH = Change in water head height over the time interval [in] = 0.1

r = Test hole radius [in] = 3

ΔT = Time interval [min] = 37

H_{avg} = Average water height over time interval = $12(H_o + H_f)/2$ [in] = 11.2

$_t =$

SCST, Inc.

Baja Freight Calle de Linea San Diego, California			
By:	JRD	Date:	March, 2018
Job No:	170385N-1	Figure:	III-2

Report of Borehole Percolation Testing

Storm Water Infiltration

Project Name: Baja Freight Calle de Linea
Job Number: 170385N-1
Date Drilled: 9/26/2017
Drilling Method: 6" Hollow Stem Auger
Drilled Depth (feet): 10
Test Hole Diameter (inches): 6
Gravel Pack: Yes
Pipe Diameter (inches): 3

Test Number: **I-3**
Tested By: JRD
Date Tested: 9/27/2017
Presoak Time: 20 hours

Trial No.	Time	Time Interval, ΔT (min)	Initial Water Height, H_o (ft)	Final Water Height, H_f (ft)	Change in Water Height, ΔH (in)	Percolation Rate (min/in)
1	7:39 8:09	0:30	2.35	2.25	1.2	25
2	8:09 8:39	0:30	2.25	2.20	0.6	50
3	8:39 9:20	0:41	2.20	2.12	1.0	43
4	9:20 9:50	0:30	2.1	2.1	0.5	63
5	9:53 10:23	0:30	2.40	2.35	0.6	50
6	10:23 10:53	0:30	2.35	2.29	0.7	42
Observed Percolation Rate:					51 min/in 1.2 in/hr	
Gravel Correction Factor:					1.82	
Corrected Percolation Rate:					93 min/in 0.6 in/hr	
***Tested Infiltation Rate, I_t:**					**<0.1 in/hr**	

*Tested infiltration rate using the Porchet Method:

$$I_t = \frac{\Delta H(60r)}{\Delta T(r + 2H_{avg})}$$

ΔH = Change in water head height over the time interval [in] = 0.7

r = Test hole radius [in] = 3

ΔT = Time interval [min] = 30

H_{avg} = Average water height over time interval = $12(H_o + H_f)/2$ [in] = 27.2

$_t =$

SCST ENGINEERING

SCST, Inc.

Baja Freight Calle de Linea San Diego, California			
By:	JRD	Date:	March, 2018
Job No:	170385N-1	Figure:	III-3

Report of Borehole Percolation Testing

Storm Water Infiltration

Project Name:	Baja Freight Calle de Linea	Test Number:	**I-4**
Job Number:	170385N-1	Tested By:	JRD
Date Drilled:	9/14/2017	Date Tested:	9/15/2017
Drilling Method:	6" Hollow Stem Auger	Presoak Time:	20 hours
Drilled Depth (feet):	10		
Test Hole Diameter (inches):	6		
Gravel Pack:	Yes		
Pipe Diameter (inches):	4		

Trial No.	Time	Time Interval, ΔT (min)	Initial Water Height, H_o (ft)	Final Water Height, H_f (ft)	Change in Water Height, ΔH (in)	Percolation Rate (min/in)
1	7:15 7:45	0:30	0.72	0.70	0.2	125
2	7:45 8:15	0:30	0.70	0.67	0.4	83
3	8:15 9:12	0:57	0.84	0.72	1.4	40
4	9:12 9:50	0:38	0.7	0.7	0.2	158
5	9:50 10:26	0:36	0.70	0.65	0.6	60
6	10:26 11:05	0:39	1.03	0.93	1.2	33
7	11:05 11:40	0:35	0.93	0.82	1.3	27
8	11:40 12:14	0:34	0.82	0.79	0.4	94
Observed Percolation Rate:						51 min/in 1.2 in/hr
Gravel Correction Factor:						1.57
Corrected Percolation Rate:						80 min/in 0.7 in/hr
***Tested Infiltation Rate, I_t:**						**0.3 in/hr**

*Tested infiltration rate using the Porchet Method:

$$I_t = \frac{\Delta H(60r)}{\Delta T(r + 2H_{avg})}$$

ΔH = Change in water head height over the time interval [in] = 1.2

r = Test hole radius [in] = 3

ΔT = Time interval [min] 36

H_{avg} = Average water height over time interval = $12(H_o + H_f)/2$ [in] = 9.4

$_t =$

SCST, Inc.

Baja Freight Calle de Linea
San Diego, California

By:	JRD	Date:	March, 2018
Job No:	170385N-1	Figure:	III-4

Report of Borehole Percolation Testing

Storm Water Infiltration

Project Name: Baja Freight Calle de Linea
Job Number: 170385N-1
Date Drilled: 9/26/2017
Drilling Method: 6" Hollow Stem Auger
Drilled Depth (feet): 5
Test Hole Diameter (inches): 6
Gravel Pack: Yes
Pipe Diameter (inches): 3

Test Number: **I-5**
Tested By: JRD
Date Tested: 9/27/2017
Presoak Time: 20 hours

Trial No.	Time	Time Interval, ΔT (min)	Initial Water Height, H_o (ft)	Final Water Height, H_f (ft)	Change in Water Height, ΔH (in)	Percolation Rate (min/in)
1	7:43 8:12	0:29	0.93	0.93	0.0	0
2	8:12 8:44	0:32	0.93	0.93	0.0	0
3	8:44 9:22	0:38	0.93	0.93	0.0	0
4	9:22 9:59	0:37	0.9	0.9	0.0	0

Observed Percolation Rate:	0 min/in 0.0 in/hr
Gravel Correction Factor:	1.82
Corrected Percolation Rate:	0 min/in 0.0 in/hr
***Tested Infiltation Rate, I_t:**	**0.0 in/hr**

*Tested infiltration rate using the Porchet Method:

$$I_t = \frac{\Delta H(60r)}{\Delta T(r + 2H_{avg})}$$

ΔH = Change in water head height over the time interval [in] = 0.0

r = Test hole radius [in] = 3

ΔT = Time interval [min] = 37

H_{avg} = Average water height over time interval = $12(H_o + H_f)/2$ [in] = 11.1

$_t =$

SCST, Inc.

Baja Freight Calle de Linea San Diego, California			
By:	JRD	Date:	March, 2018
Job No:	170385N-1	Figure:	III-5

Report of Borehole Percolation Testing

Storm Water Infiltration

Project Name: Baja Freight Calle de Linea
Job Number: 170385N-1
Date Drilled: 9/26/2017
Drilling Method: 6" Hollow Stem Auger
Drilled Depth (feet): 7
Test Hole Diameter (inches): 6
Gravel Pack: Yes
Pipe Diameter (inches): 3

Test Number: **I-6**
Tested By: JRD
Date Tested: 9/27/2017
Presoak Time: 20 hours

Trial No.	Time	Time Interval, ΔT (min)	Initial Water Height, H_o (ft)	Final Water Height, H_f (ft)	Change in Water Height, ΔH (in)	Percolation Rate (min/in)
1	7:46 8:13	0:27	1.60	1.60	0.0	0
2	8:13 8:43	0:30	1.60	1.60	0.0	0
3	8:43 9:24	0:41	1.60	1.59	0.1	342
4	9:24 10:03	0:39	1.6	1.6	0.1	325
Observed Percolation Rate:					333 min/in 0.2 in/hr	
Gravel Correction Factor:					1.82	
Corrected Percolation Rate:					606 min/in 0.1 in/hr	
***Tested Infiltation Rate, I_t:**					**0 in/hr**	

*Tested infiltration rate using the Porchet Method:

$$I_t = \frac{\Delta H(60r)}{\Delta T(r + 2H_{avg})}$$

ΔH = Change in water head height over the time interval [in] = 0.0

r = Test hole radius [in] = 3

ΔT = Time interval [min] = 40

H_{avg} = Average water height over time interval = $12(H_o + H_f)/2$ [in] = 19.0

$_t =$

SCST, Inc.

Baja Freight Calle de Linea San Diego, California			
By:	JRD	Date:	March, 2018
Job No:	170385N-1	Figure:	III-6

Report of Borehole Percolation Testing

Storm Water Infiltration

Project Name: Baja Freight Calle de Linea
Job Number: 170385N-1
Date Drilled: 9/26/2017
Drilling Method: 6" Hollow Stem Auger
Drilled Depth (feet): 5
Test Hole Diameter (inches): 6
Gravel Pack: Yes
Pipe Diameter (inches): 3

Test Number: **I-6**
Tested By: JRD
Date Tested: 9/27/2017
Presoak Time: 20 hours

Trial No.	Time	Time Interval, ΔT (min)	Initial Water Height, H_o (ft)	Final Water Height, H_f (ft)	Change in Water Height, ΔH (in)	Percolation Rate (min/in)
1	7:48 8:14	0:26	0.67	0.63	0.5	54
2	8:14 8:44	0:30	0.63	0.63	0.0	0
3	8:44 9:24	0:40	0.63	0.63	0.0	0
4	9:24 10:06	0:42	0.6	0.6	0.2	175

Observed Percolation Rate:	58 min/in 1.0 in/hr
Gravel Correction Factor:	1.82
Corrected Percolation Rate:	106 min/in 0.6 in/hr
***Tested Infiltation Rate, I_t:**	**0 in/hr**

*Tested infiltration rate using the Porchet Method:

$$I_t = \frac{\Delta H(60r)}{\Delta T(r + 2H_{avg})}$$

ΔH = Change in water head height over the time interval [in] = 0.0

r = Test hole radius [in] = 3

ΔT = Time interval [min] = 37

H_{avg} = Average water height over time interval = $12(H_o + H_f)/2$ [in] = 7.4

$_t =$

SCST, Inc.

Baja Freight Calle de Linea
San Diego, California

By:	JRD	Date:	March, 2018
Job No:	170385N-1	Figure:	III-6

Report of Borehole Percolation Testing

Storm Water Infiltration

Project Name: Baja Freight Calle de Linea
Job Number: 170385N-1
Date Drilled: 9/26/2017
Drilling Method: 6" Hollow Stem Auger
Drilled Depth (feet): 5
Test Hole Diameter (inches): 6
Gravel Pack: Yes
Pipe Diameter (inches): 3

Test Number: **I-8**
Tested By: JRD
Date Tested: 9/27/2017
Presoak Time: 20 hours

Trial No.	Time	Time Interval, ΔT (min)	Initial Water Height, H_o (ft)	Final Water Height, H_f (ft)	Change in Water Height, ΔH (in)	Percolation Rate (min/in)
1	7:40 8:11	0:31	1.53	1.53	0.0	0
2	8:11 8:41	0:30	1.53	1.53	0.0	0
3	8:41 9:21	0:40	1.53	1.53	0.0	0
4	9:21 9:55	0:34	1.5	1.5	0.0	0

Observed Percolation Rate: 0 min/in
0.0 in/hr

Gravel Correction Factor: 1.82

Corrected Percolation Rate: 0 min/in
0.0 in/hr

***Tested Infiltation Rate, I_t: 0 in/hr**

*Tested infiltration rate using the Porchet Method:

$$I_t = \frac{\Delta H(60r)}{\Delta T(r + 2H_{avg})}$$

ΔH = Change in water head height over the time interval [in] = 0.0

r = Test hole radius [in] = 3

ΔT = Time interval [min] = 35

H_{avg} = Average water height over time interval = $12(H_o + H_f)/2$ [in] = 18.3

$_t$ =

SCST, Inc.

Baja Freight Calle de Linea San Diego, California			
By:	JRD	Date:	March, 2018
Job No:	170385N-1	Figure:	III-8

SDVOSB . DVBE

SCST, Inc.
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SUPPLEMENTAL GEOTECHNICAL INVESTIGATION
BAJA FREIGHT
6852 CALLE DE LINEA
SAN DIEGO, CALIFORNIA

PREPARED FOR:

MR. MIGUEL O. PEREZ
NOBEL HOUSE REAL ESTATE, LLC
8662-A SIEMPRE VIVA ROAD
SAN DIEGO, CALIFORNIA 921548

PREPARED BY:

SCST, INC.
6280 RIVERDALE STREET
SAN DIEGO, CALIFORNIA 92120

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March 19, 2018

SCST No. 170385N
Report No. 3

Mr. Miguel O. Perez
Noble House Real Estate, LLC
8662-A Siempre Viva Road
San Diego, California 92154

Subject: SUPPLEMENTAL GEOTECHNICAL INVESTIGATION
BAJA FREIGHT
6852 CALLE DE LINEA
SAN DIEGO, CALIFORNIA

Dear Mr. Perez:

SCST, Inc. (SCST) is pleased to present our report describing the supplemental geotechnical investigation performed for the subject project. SCST conducted the investigation in general conformance with the scope of work presented in our proposal dated August 31, 2017. If you have any questions, please call us at (619) 280-4321.

Respectfully Submitted,
SCST, INC.

DOUGLAS A. SKINNER
No. 2472

ISAAC B. CHUN
No. 2649
EXP. 12/31/19

Douglas A. Skinner, CEG 2472
Senior Geologist

Isaac Chun, GE 2649
Principal Geotechnical Engineer

DAS:IC:hu

(1) Addressee via e-mail: gusm@ks-engr.com

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Figure 1 .... Site Vicinity Map
Figure 2 .... Geotechnical Map
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Appendix I .... Field Investigation
Appendix II .... Laboratory Testing

1 INTRODUCTION

This report presents the results of the supplemental geotechnical investigation SCST, Inc. (SCST) performed for the subject project. We understand the project will include the design and construction of two warehouse/loading dock buildings, on-site stormwater management devices, and associated hardscape areas. One of the buildings will be located near the top of an existing slope.

The project is located at 6852 Calle de Linea in the city of San Diego, California. SCST has provided geotechnical services for the project since 1987. These services have included conducting a predevelopment geotechnical investigation, providing field observations and relative compaction testing during mass grading at the site, and performing supplemental geotechnical and infiltration feasibility investigations at the site, post grading. Reports summarizing these geotechnical services are referenced in Section 8 of this report.

The purpose of this supplemental geotechnical investigation is to address comments regarding the geotechnical aspects of the project generated by the City of San Diego Development Services Department (Reference 1) and the updated project development plans (Reference 11). Figure 1 presents a site vicinity map.

2 SCOPE OF WORK

2.1 FIELD INVESTIGATION

We recently explored the subsurface conditions by drilling nine borings between September 17 and 26, 2017 to depths ranging from about 5 to 23 feet below the existing ground surface using a truck-mounted drill rig equipped with a hollow stem auger. An SCST geologist logged the borings and collected samples of the materials encountered for laboratory testing. Figure 2 shows the approximate locations of the borings, distribution of fill and geologic units, proposed construction, and limits of anticipated remedial grading. The logs of the borings are presented in Appendix I. Soils are classified according to the Unified Soil Classification System illustrated on Figure I-1.

2.2 LABORATORY TESTING

Selected samples obtained from the borings were tested to evaluate pertinent soil classification and engineering properties and enable development of geotechnical conclusions and recommendations. The laboratory tests consisted of:

- Grain-Size Distribution

The results of the laboratory tests and brief explanations of test procedures are presented in Appendix II.

2.3 ANALYSIS AND REPORT

The results of the field and laboratory tests were evaluated to develop conclusions and recommendations regarding:

- Subsurface conditions beneath the site
- Stability of the on-site and adjacent slope

3 SITE AND SUBSURFACE CONDITIONS

3.1 SITE DESCRIPTION

The site is located at 6852 Calle de Linea, in the community Otay Mesa of the city of San Diego, California (Figure 1). The site is bounded by commercial development to the south, east, and west, and by undeveloped land to the north. Existing improvements at the site consist of a graded pad used for equipment and tractor-trailer storage and associated temporary buildings.

The site was graded as a cut/fill transition lot in approximately 1988. Earthwork observation and testing services were provided by SCST personnel during mass grading. The graded pad is relatively flat with an elevation of about 470 feet above mean sea level (MSL). A slope descends north from the northern edge of the graded pad at an inclination ranging from 2:1 (Horizontal:Vertical) to 3:1 (Horizontal:Vertical). The slope consists of both fill and native materials. Fill material was placed near the top of the slope on the northern edge of the pad during mass grading to create a level building surface. The maximum fill thickness is located along the northern edge of the pad. In general, the fill at this location ranges up to approximately 15 feet in thickness. However, up to about 60 feet of fill exists at the northeastern portion of the pad. A cross section is presented as Figure 3.

3.2 SUBSURFACE CONDITIONS

The materials encountered in our borings consist of fill and the Quaternary-age Linda Vista Formation. Descriptions of the materials are presented below.

Fill - The fill is comprised of brown to reddish-brown, moist, loose to dense, mixtures of silty sand and clayey sand with gravel and cobble, and sandy clay. The fill ranges in thickness from less than 1 foot to 15 feet in depth.

Lindavista Formation – The Linda Vista Formation underlies the fill and is exposed at the ground surface in some area of the cut portion of the pad. These deposits are comprised of light brown to reddish brown, moist, dense to very dense, sandy silt to silty sand and sandy cobble conglomerate. Previous explorations at the site indicate the conglomerate contains cobbles and boulders of up to 24 inches in maximum dimension.

Groundwater - Groundwater was not encountered in the borings to a depth of 23 feet. However, groundwater levels may fluctuate in the future due to rainfall, irrigation, broken pipes, or changes in site drainage. Because groundwater rise or seepage is difficult to predict, such conditions are typically mitigated if and when they occur.

4 GEOLOGIC HAZARDS

4.1 CITY OF SAN DIEGO SEISMIC SAFETY STUDY

A review of the City of San Diego Seismic Safety Study Geologic Hazards and Fault Maps (Grid Tile 21) indicates the site is a Geologic Hazards Category 53. Geologic Hazard Category 53 designates sites that are characterized by sloping terrain, unfavorable geologic structure, and variable slope stability. There are no mapped landslides or slopes on or adjacent to the site, and we did not observe any evidence of deep-seated slope instability. In our opinion, the geologic structure at the site is favorable with respect to slope stability

4.2 SLOPE STABILITY

SCST provided earthwork observation and testing services during mass grading activities at the site. The upper portion of the existing slope consists of fill materials placed at an inclination of 2:1 (Horizontal:Vertical) in accordance with applicable guidelines and standards. These fill materials consist of dense, granular material. The underlying native slope is also comprised of dense, granular material and has an inclination no greater than 2:1. In our opinion, the site will have a factor-of-safety of 1.5 or greater for both gross and surficial stability following project completion.

5 CONCLUSIONS AND RECOMMENDATIONS

In general, no geotechnical conditions exist that would prevent the development of the site as presently proposed. The geotechnical recommendations presented in the previous geotechnical reports remain the same.

6 GEOTECHNICAL ENGINEERING DURING CONSTRUCTION

The geotechnical engineer should review project plans and specifications prior to bidding and construction to check that the intent of the recommendations in this and previously prepared reports have been incorporated. Observations and tests should be performed during construction. If the conditions encountered during construction differ from those anticipated based on the subsurface exploration program, the presence of the geotechnical engineer during construction will enable an evaluation of the exposed conditions and modifications of the recommendations in this report or development of additional recommendations in a timely manner.

7 CLOSURE

SCST should be advised of any changes in the project scope so that the recommendations contained in this report can be evaluated with respect to the revised plans. Changes in recommendations will be verified in writing. The findings in this report are valid as of the date of this report. Changes in the condition of the site can, however, occur with the passage of time, whether they are due to natural processes or work on this or adjacent areas. In addition, changes in the standards of practice and government regulations can occur. Thus, the findings in this report may be invalidated wholly or in part by changes beyond our control. This report should not be relied upon after a period of two years without a review by us verifying the suitability of the conclusions and recommendations to site conditions at that time.

In the performance of our professional services, we comply with that level of care and skill ordinarily exercised by members of our profession currently practicing under similar conditions and in the same locality. The client recognizes that subsurface conditions may vary from those encountered at the boring locations and that our data, interpretations, and recommendations are based solely on the information obtained by us. We will be responsible for those data, interpretations, and recommendations, but shall not be responsible for interpretations by others of the information developed. Our services consist of professional consultation and observation only, and no warranty of any kind whatsoever, express or implied, is made or intended in connection with the work performed or to be performed by us, or by our proposal for consulting or other services, or by our furnishing of oral or written reports or findings.

8 REFERENCES

1) City of San Diego (2017), Cycle Issues, Cycle 6, LDR-Geology, dated February 7, 2018.

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5) SCST, Inc. (2018), Infiltration Feasibility Study, Baja Freight, 6852 Calle de Linea, San Diego, CA, SCST No. 170365N-1, March 13.

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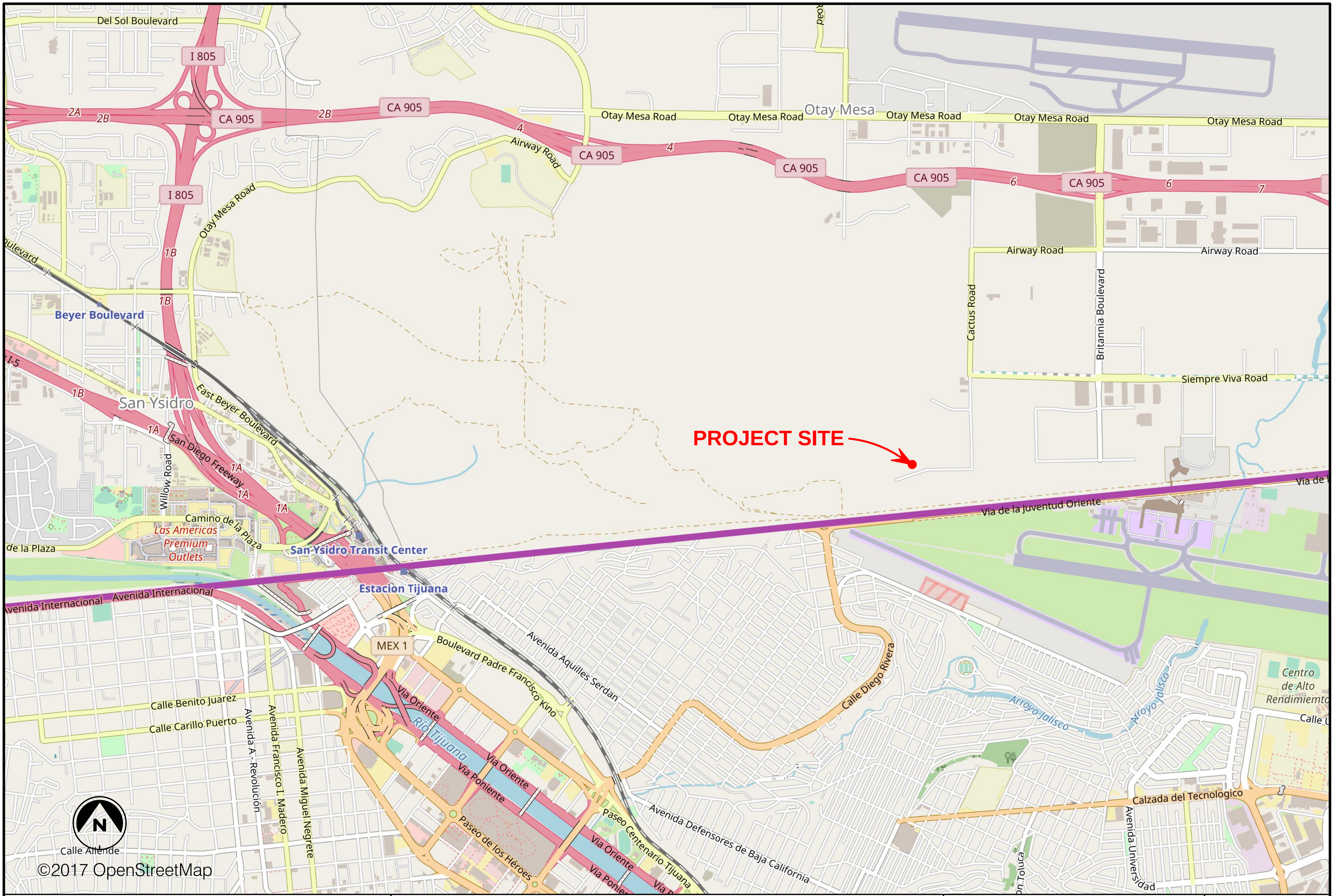
11) TRH, Inc. (2017), *Development Plans for Baja Freight SDP, APN: 667-050-68, 6852 Calle De Linea, San Diego, California 92154*, dated April 3; Grading prepared by H&S Engineering, Inc.



©2017 OpenStreetMap

SCST, Inc.

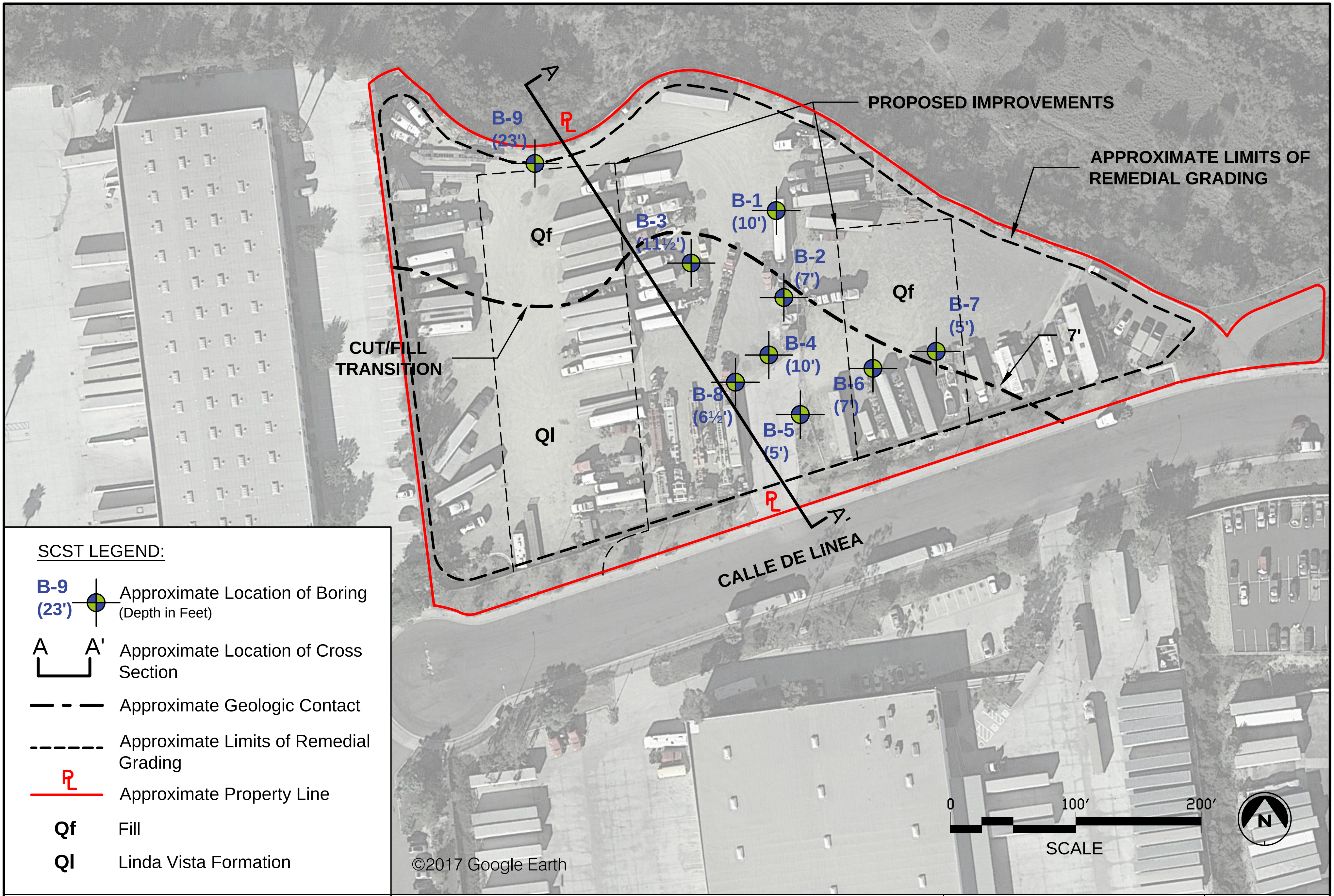
SITE VICINITY MAP

Baja Freight
6852 Calle De Linea
San Ysidro, California

Date:	March, 2018
By:	MAW
Job No.:	170385N-2

Figure:

1



SCST LEGEND:

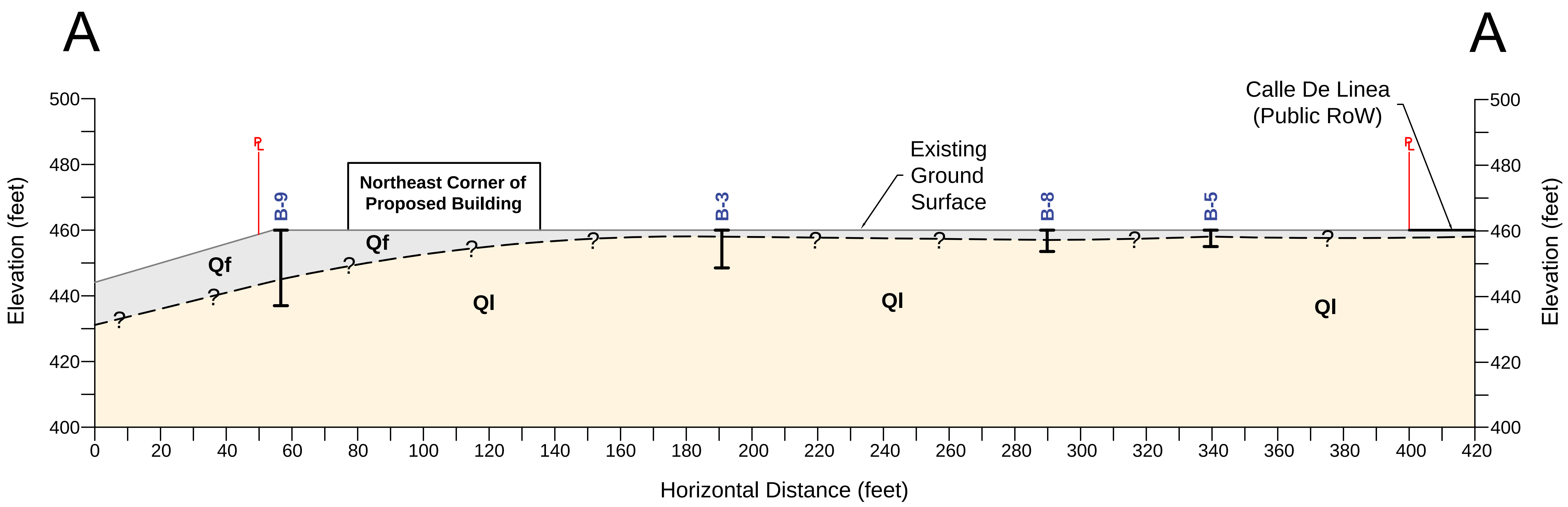
B-9 (23') ⊕	Approximate Location of Boring (Depth in Feet)
A A'	Approximate Location of Cross Section
— - —	Approximate Geologic Contact
- - - - -	Approximate Limits of Remedial Grading
PL	Approximate Property Line
Qf	Fill
Ql	Linda Vista Formation

SCST, Inc.

GEOTECHNICAL MAP
Baja Freight
6852 Calle De Linea
San Ysidro, California

Date: March, 2018
By: MAW
Job No.: 170385N-2

Figure:
2



SCST LEGEND:

B-9 I	Approximate Location of Boring
PL	Approximate Location of Property Line
?	Approximate Location of Geologic Contact, Queried Where Uncertain
Qf	Fill
Ql	Linda Vista Formation

Date: March, 2018
By: EMW/MAW
Job No.: 170385N-2

GEOLOGIC CROSS SECTION
Baja Freight
6852 Calle De Linea
San Ysidro, California

SCST, Inc.

Figure:
3

APPENDIX I
FIELD INVESTIGATION

Our field investigation consisted of drilling nine borings between September 17 and 26, 2017 to depths ranging from about 5 and 23 feet below the existing ground surface using a truck-mounted drill rig equipped with a hollow stem auger. Figure 2 shows the approximate locations of the borings. The field investigation was performed under the observation of an SCST geologist who also logged the borings and obtained samples of the materials encountered. Relatively undisturbed samples were obtained using a modified California (CAL) sampler, which is ring-lined split tube sampler with a 3-inch outer diameter and 2½-inch inner diameter. Standard Penetration Tests (SPT) were performed using a 2-inch outer diameter and 1⅜-inch inner diameter split tube sampler. The CAL and SPT samplers were driven with a 140-pound weight dropping 30 inches. The number of blows needed to drive the samplers the final 12 inches of an 18-inch drive is noted on the borings logs as “Driving Resistance (blows/ft of drive).” SPT and CAL sampler refusal was encountered when 50 blows were applied during any one of the three 6-inch intervals, a total of 100 blows was applied, or there was no discernible sampler advancement during the application of 10 successive blows. Because the SPT sampler was driven with a cathead and rope, the driving resistance is representative of a 60% energy transfer ratio (N60). Disturbed bulk samples were obtained from the SPT sampler and the drill cuttings.

The soils are classified in accordance with the Unified Soil Classification System as illustrated on Figure I-1. Logs of the borings are presented on Figures I-2 through I-11.

SUBSURFACE EXPLORATION LEGEND

UNIFIED SOIL CLASSIFICATION CHART

SOIL DESCRIPTION		GROUP SYMBOL	TYPICAL NAMES
I. COARSE GRAINED, more than 50% of material is larger than No. 200 sieve size.			
GRAVELS More than half of coarse fraction is larger than No. 4 sieve size but smaller than 3".	CLEAN GRAVELS	GW	Well graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly graded gravels, gravel sand mixtures, little or no fines.
	GRAVELS WITH FINES (Appreciable amount of fines)	GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
		GC	Clayey gravels, poorly graded gravel-sand, clay mixtures.
SANDS More than half of coarse fraction is smaller than No. 4 sieve size.	CLEAN SANDS	SW	Well graded sand, gravelly sands, little or no fines.
		SP	Poorly graded sands, gravelly sands, little or no fines.
		SM	Silty sands, poorly graded sand and silty mixtures.
		SC	Clayey sands, poorly graded sand and clay mixtures.
II. FINE GRAINED, more than 50% of material is smaller than No. 200 sieve size.			
	SILTS AND CLAYS (Liquid Limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, sandy silt or clayey-silt-sand mixtures with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
		OL	Organic silts and organic silty clays or low plasticity.
	SILTS AND CLAYS (Liquid Limit greater than 50)	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity.
III. HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils.

SAMPLE SYMBOLS

☒	- Bulk Sample
CAL	- Modified California sampler
CK	- Undisturbed Chunk sample
MS	- Maximum Size of Particle
ST	- Shelby Tube
SPT	- Standard Penetration Test sampler

GROUNDWATER SYMBOLS

▽	- Water level at time of excavation or as indicated
≀≀	- Water seepage at time of excavation or as indicated

LABORATORY TEST SYMBOLS

AL
CON
COR

DS
EI
MAX
RV
SA
UC

SCST, Inc.	Baja Freight Calle de Linea San Ysidro, California			
	By:	JRD	Date:	March, 2018
	Job Number:	170385N-1	Figure:	I-1

LOG OF BORING B-1

Date Drilled: 9/17/2017
Equipment: CME-75 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
	SM	**FILL (Qf)**: SILTY SAND, light yellowish-brown, fine to coarse grained, dry, dense.							
1									
2	ML	**LINDA VISTA FORMATION (Ql)**: SANDY SILT, fine grained, moist, dense.							
3									
4									
5		Increase in sand content							
6									
7		Cobbles and boulders encountered.							
8									
9			SPT		31	42			SA
10		**BORING TERMINATED AT 10 FEET**							
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-2

LOG OF BORING B-2

Date Drilled: 9/17/2017
Equipment: CME-75 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense.							
1		Becomes moist.							
2	SM	**LINDA VISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.							
3									
4		Gravel and cobble encountered.							
5									
6			SPT		52/9"	71/9"			
7		**BORING TERMINATED AT 7 FEET**							
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-3

LOG OF BORING B-3

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense. Becomes moist.							
1									
2		**LINDA VISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.							
3									
4									
5									
6									
7									
8									
9									
10	SC	CLAYEY SAND, light brown with orange and white, fine to coarse grained, moist, dense.							
11			SPT		36	49			
12		**BORING TERMINATED AT 11½**							
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-4

LOG OF BORING B-4

Date Drilled: 9/17/2017
Equipment: CME-75 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense.							
1		Becomes moist.							
2									
		LINDA VISTA FORMATION (Ql): SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.							
3									
4									
		Becomes very dense.							
5									
6									
7									
8									
9									
			SPT		97/8"	133/8"			
10		**BORING TERMINATED AT 10 FEET**							
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-5

LOG OF BORING B-5

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL
Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense.							
1		Becomes moist.							
2		**LINDA VISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.							
3									
4				☒					
5		**REFUSAL AT 5 FEET ON COBBLE**							
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-6

LOG OF BORING B-6

Date Drilled: 9/26/2017

Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger

Elevation (ft): 460 MSL

Logged by: JRD

Project Manager: DS

Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
	SC	**FILL (Qf)**: CLAYEY SAND, light brown, fine to coarse grained, dry, medium dense.							
1									
2		**LINDA VISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, very dense.							
3									
4									
5		Becomes more fine.							
6				☒					SA
7		**REFUSAL AT 7 FEET ON COBBLE**							
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-7

LOG OF BORING B-7

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense.							
1									
2									
3									
4		**LINDA VISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.	SPT		65/11"	89/11			
5		**BORING TERMINATED AT 5 FEET**							
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-8

LOG OF BORING B-8

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL
Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES		DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
			DRIVEN	BULK					
	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense. Becomes moist.							
1									
2									
3		**LINDA VISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.							
4									
5									
6			SPT		44	60			
7		**BORING TERMINATED AT 6½ FEET**							
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-9

LOG OF BORING B-9

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL

Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
	SC	**FILL (Qf)**: CLAYEY SAND, light yellowish-brown, fine to coarse grained, dry, dense.							
1		Becomes moist.							
2									
3									
4									
5		Becomes yellowish-brown and white, and very dense.	SPT		65/9"	89/9"			
6									
7									
8									
9									
10									
11			SPT		40	55			
12									
13									
14									
15		**LINDA VISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.	SPT		50/4"	68/4"			
16									
17									
18		Boring hit refusal at18 feet on cobble; move 5 feet south and continue.							
19									
20									

BORING CONTINUED ON I-11.

LOG OF BORING B-9 (Continued)

Date Drilled: 9/26/2017
Equipment: CME-95 with 6-inch Diameter Hollow-Stem Auger
Elevation (ft): 460 MSL
Logged by: JRD
Project Manager: DS
Depth to Groundwater (ft): Not Encountered

DEPTH (ft)	USCS	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES DRIVEN	SAMPLES BULK	DRIVING RESISTANCE (blows/ft of drive)	N_{60}	MOISTURE CONTENT (%)	DRY UNIT WEIGHT (pcf)	LABORATORY TESTS
21		**LINDA VISTA FORMATION (Ql)**: SILTY SAND with GRAVEL, fine to coarse grained, moist, dense.	SPT		29	40			
22									
23		**REFUSAL AT 23 FEET ON COBBLE**							
24									
25									
26									
27									
28									
29									
30									
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									

SCST, Inc.

Baja Freight Calle de Linea
San Ysidro, California

By:	JRD	Date:	March, 2018
Job Number:	170385N-1	Figure:	I-11

APPENDIX II

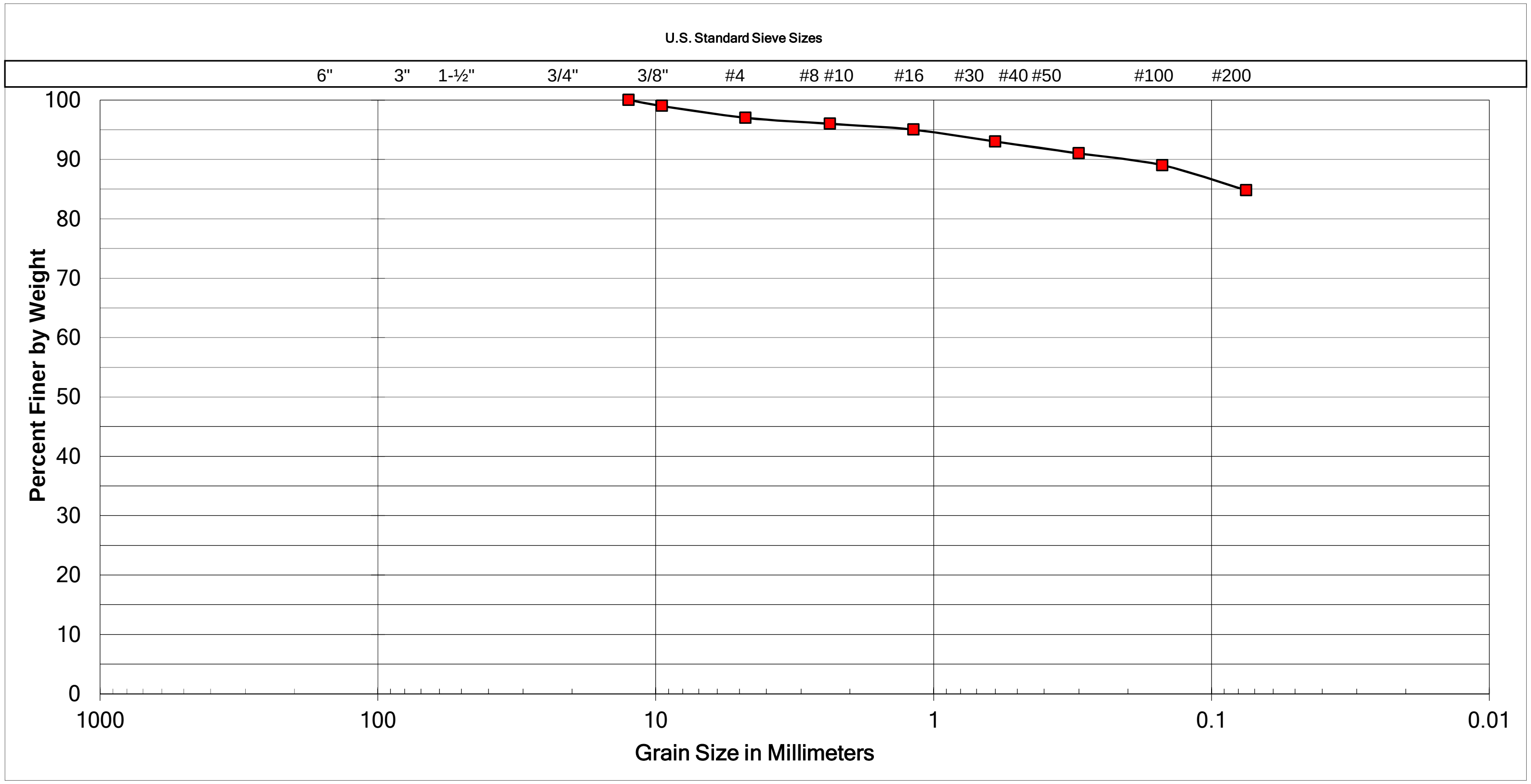
APPENDIX II
LABORATORY TESTING

Laboratory tests were performed to provide geotechnical parameters for engineering analyses. The following tests were performed:

CLASSIFICATION: Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System

GRAIN-SIZE DISTRIBUTION: The grain-size distribution was determined on two soil samples in accordance with ASTM D422. Figures II-5 and II-6 present the test results.

Soil samples not tested are now stored in our laboratory for future reference and analysis, if needed. Unless notified to the contrary, all samples will be disposed of 30 days from the date of this report.



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
B-1 at 8½ to 10 feet

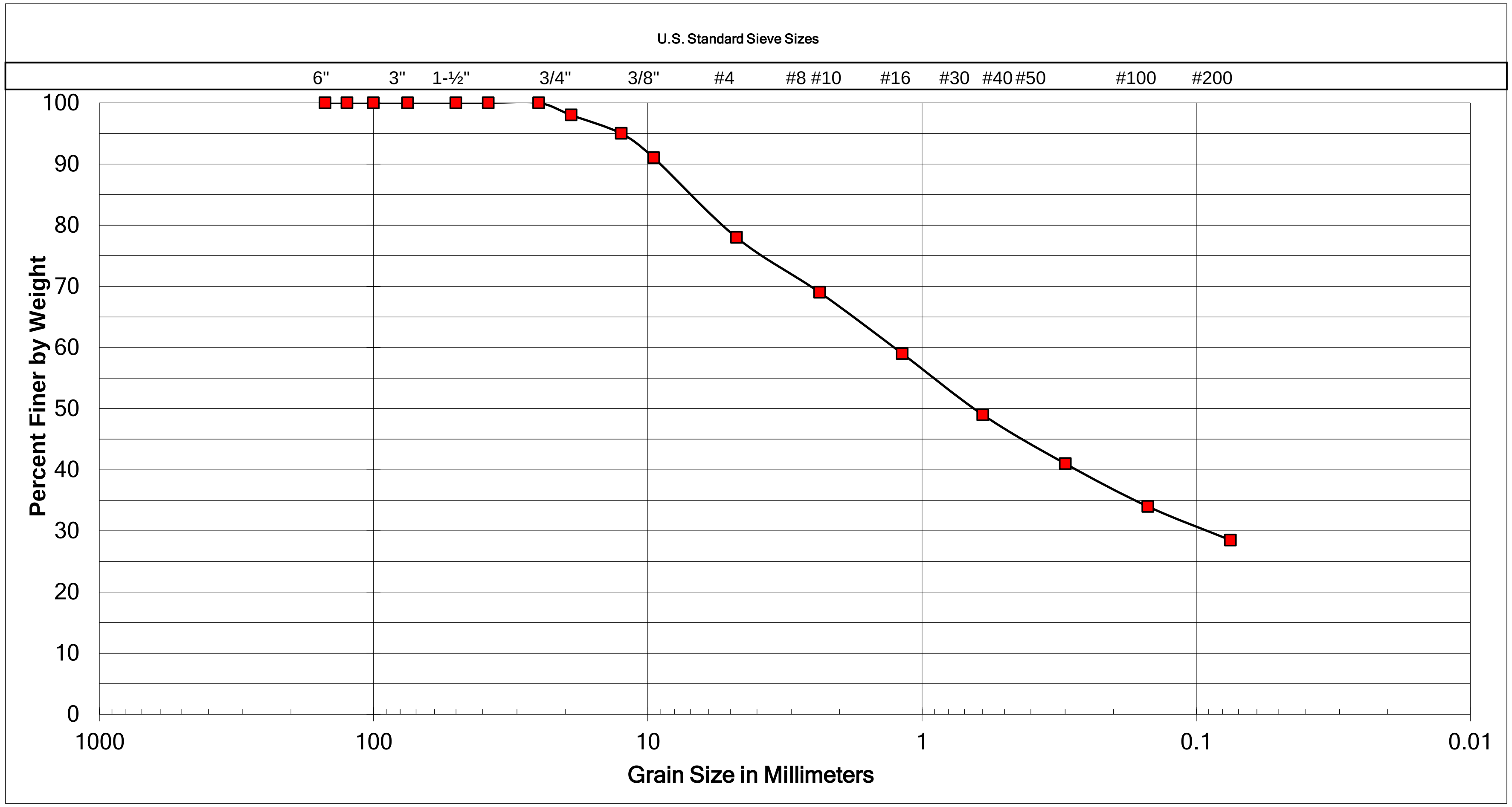
UNIFIED SOIL CLASSIFICATION:	ML
DESCRIPTION	SANDY SILT

ATTERBERG LIMITS	
LIQUID LIMIT	--
PLASTIC LIMIT	--
PLASTICITY INDEX	--

SCST, Inc.

Baja Freight Calle De Linea
San Ysidro, California

By:	DAS	Date:	November, 2017
Job Number:	170385N-2	Figure:	II-1



Cobbles	Gravel		Sand			Silt or Clay
	Coarse	Fine	Coarse	Medium	Fine	

SAMPLE LOCATION
B6 @ 6-7

UNIFIED SOIL CLASSIFICATION:	SM
DESCRIPTION	SILTY SAND with GRAVEL

ATTERBERG LIMITS	
LIQUID LIMIT	
PLASTIC LIMIT	
PLASTICITY INDEX	

SCST, Inc.

Baja Freight Calle De Linea
San Ysidro, California

By:	CN	Date:	October, 2017
Job Number:	170385N-1	Figure:	II-2