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.

[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: Protea VA Facility

Property Address: 8825-8875 Aero Drive, San Diego, CA 92123

Applicant Name/Co.: Paul Gherini, Protea Properties

Contact Phone: (805) 448-8160 Contact Email: pgherini@proteaproperties.com

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

Consultant Name: Steven Bossi Contact Phone: (619) 523-1930

Company Name: Atlantis Group Contact Email: sbossi@atlantissd.com

Project Information

1. What is the size of the project (acres)? 141,000 square feet
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):
   - ■ Other (describe): VA Facility
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:

Expansion of an existing vacant bank vault to construct a Veterans Affairs Hospital Annex facility and a parking structure.

[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] OR, 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?; OR, 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.		

[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. New addition to comply, existing facility roof to remain. See note on sheet A3.1. New roofing materials to comply 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.	☑	☐	☐

[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. See general note 1 on sheet A2.1 and A2.2. Plumbing fixtures and fittings are not to exceed the maximum flow rate specified in Table A5.303.2.3.1 voluntary measures of the California Green Building Standards Code.	☑	☐	☐

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. See breakdown on sheet A1.1. Infrastructure for future EV charging stations will be provided and 50% of the 33 parking stalls proposed will have the necessary electric vehicle supply equipment installed to provide active electric vehicle charging stations ready for use.	☑	☐	☐
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. See keynotes 7 & 8 on sheet A1.1. Short term and long term bicycle parking will be provided. There are 25 short term and 25 long term bicycle parking stalls.	☑	☐	☐

[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

☑ ☐ ☐

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).

See keynote 2 on sheet A2.1 and A2.2.

Proposed shower facility program will exceed requirements by providing one or more shower stalls and three or more personal effects lockers.

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.

☑ ☐ ☐

See sheet A0.1.

Designated stall marking per the above table provided. There are 44 low-emitting, fuel-efficient, and carpool/vanpool designated parking stalls proposed.

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). The project may include over 50 tenant-occupants and would be consistent with the Transportation Demand Management (TDM) program requirements while adhering to the Veterans Affairs Federal requirements. The TDM measures are listed on the following sheet in this report.	☑	☐	☐

CAP Checklist Item No. 7 – Supplemental Explanation

Transportation Demand Management Program – The project includes a Transportation Demand Management Program as detailed in the Transportation Impact Analysis by Linscott, Law and Greenspan that includes the following measures:

1) Carpool/vanpool parking spaces will be provided in preferentially located areas (closest to building entrances) for use by qualified employees. These spaces will be signed and striped "Car/Vanpool Parking Only". Information about the availability of and the means of accessing the car/vanpool parking spaces will be posted on Transportation Information Displays located in back-offices, common areas or on intranets, as appropriate.

2a) The project will maintain an employer network in the SANDAG iCommute program and employees will be offered the opportunity to register for commuter ridematching provided through publicly sponsored services (e.g., SANDAG sponsored "iCommute Ridetracker" or similar program).

2b) The project will reduce the demand for trips by participating in the Veterans Affairs Veterans Transportation Program which dedicates Veterans Affairs resources to subsidize carpool, vanpool, and transit travel options.

2c) The project is within ¼-mile of numerous services that reduce the need to drive such as (see map in Attachment A):

- Cafes, restaurants, and dry cleaners available in the Olympus Corsair project which is on the southwest corner of Aero Drive and Sandrock Drive;
- Cafes, restaurants, and other commercial services such as cleaners and a barber shop in the commercial shopping center on the northwest corner of Aero Drive and Sandrock Drive;
- A café located to the west in the building immediately adjacent to the project site; and
- The Serra Mesa-Kearny Mesa Branch library which includes numerous resources such as computer and internet access to the east of the project site on the south side of Aero Drive.

Additionally, the project is 2,135 feet from the social security office and there are two bus stops that are 1,375 feet from each other which further provide access to the social security office while reducing trips.

Attachment A

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)

GEOTECHNICAL INVESTIGATION
PROPOSED HOSPITAL ANNEX
8875 AERO DRIVE
SAN DIEGO, CALIFORNIA

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CTE JOB NO.: 10-14209G APRIL 30, 2018

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FIGURES

APPENDICES

1.0 INTRODUCTION AND SCOPE OF SERVICES

1.1 Introduction

Construction Testing and Engineering, Inc. (CTE) has completed a geotechnical investigation and report providing conclusions and recommendations for the proposed hospital annex improvements located at 8875 Aero Drive (APN 421-3000-300), and proposed four-level parking structure to be located on the southern portion of the adjacent parcel at 8825 Aero Drive (APN 421-3000-200) (Figure 1).

The proposed scope of work for the hospital annex includes two wing additions to the existing 100,000 square foot structure and modifications to the proposed building entrance. The wing additions will increase the footprint of the existing structure by approximately 134,000 square feet.

A separate four-story above ground parking structure with associated at-grade parking and drive areas is proposed in the adjacent parcel to the west of the existing building (Figures 1 and 2). Associated improvements are to include flatwork, pavement, and bioretention basins.

CTE has performed this work in general accordance with the terms of proposal G-4337 dated March 16, 2018. Preliminary geotechnical recommendations for excavations, fill placement, and foundation design for the proposed improvements are presented herein.

1.2 Scope of Services

The scope of services provided included:

- Review of readily available geologic and soils reports.
- Review of historic topographic maps.
- Coordination of USA and private utility mark-out and location.
- Obtaining appropriate San Diego County Department of Environmental Health (DEH) Boring Permits.
- Excavation of exploratory borings and soil sampling utilizing a truck-mounted drill rig.
- Percolation testing in accordance with County of San Diego Department of Environmental Health (DEH) procedures.
- Establishing infiltration rates in accordance with City of San Diego Storm Water Standards (2018).
- Laboratory testing of selected soil samples.
- Description of the site geology and evaluation of potential geologic hazards.
- Engineering and geologic analysis.
- Preparation of this preliminary geotechnical report.

2.0 SITE DESCRIPTION

The subject site is located at 8875 Aero Drive in San Diego, California (Figure 1). The site is bounded by Aero Drive to the north, commercial structures to the east and west, and residential development to the south. The current site area is illustrated on Figure 1. The proposed improvement area is currently developed with a large commercial structure with associated parking and flatwork, landscaping, utilities and other minor improvements. Based on reconnaissance and review of general site topography, it appears that the improvement area generally descends to the north with elevations ranging from approximately 420 feet above mean sea level in the south (msl) to approximately 413 feet msl to the north. The proposed site modifications and additions are depicted on Figure 2.

3.0 FIELD INVESTIGATION AND LABORATORY TESTING

3.1 Historical Topographic and Aerial Photograph Review

As part of the initial phase of investigation, area United States Geologic Survey historic topographic maps from 1903, 1930, 1943, 1953, 1967, and 1979 were reviewed. Aerial images from Google Earth were reviewed from 1996 to 2017. Based on the review, it appears that a shallow pond or vernal pool was present within the general site area prior to regional development. This feature was indicated to be within the proposed project area on the maps dating from 1943 to 1967 and to the southwest of the project area on the maps prior to 1943. The localized water feature was not shown on topographic maps post 1967.

Review of building plans for the Bank of America Central Cash Vault (existing structure at 8875 Aero Drive), prepared by Boyle Architectural Associates (no date), indicated that the existing foundation system consisted of continuous and spread footings placed on shallow structural fill. Based on the foundation schedule, the deepest footings were indicated to be two-feet nine inches below pad grades. Depth of the previously placed fill was not indicated, however, based on recent boring explorations the fill thickness surrounding the existing structure ranges from approximately five to seven feet below existing grades. In the area of the proposed parking structure the existing fill thickness is indicated to range from approximately one to four feet below existing grades.

3.2 Field Investigation

CTE performed the recent subsurface investigation on March 29, 2018 to evaluate underlying soil conditions. This fieldwork consisted of site reconnaissance, and the excavation of seven exploratory soil borings and seven percolation test holes. The borings were advanced to a maximum explored depth of approximately 18 feet below ground surface (bgs). Bulk samples were collected from the cuttings, and relatively undisturbed samples were collected by driving Standard Penetration Test (SPT) and Modified California (CAL) samplers. The borings and percolation test holes were excavated by a CME-95 truck-mounted drill rig equipped with eight-inch-diameter, hollow-stem augers. The percolation test holes were excavated to the depths ranging from approximately 3.0 to 5.1 feet below the ground surface (bgs). Approximate locations of the soil borings and test holes are shown on the attached Figure 2.

Soils were logged in the field by a CTE Engineering Geologist, and were visually classified in general accordance with the Unified Soil Classification System. The field descriptions have been modified, where appropriate, to reflect laboratory test results. Boring logs, including descriptions of the soils encountered, are included in Appendix B.

3.3 Laboratory Testing

Laboratory tests were conducted on selected soil samples for classification purposes, and to evaluate physical properties and engineering characteristics. Laboratory tests included: Maximum Density/Proctor Testing, Expansion Index, R-Value, Grain Size Analysis, Atterberg Limits, Consolidation, and Chemical Characteristics. Test descriptions and laboratory test results are included in Appendix C.

4.0 GEOLOGY

4.1 General Setting

San Diego is located with the Peninsular Ranges physiographic province that is characterized by its northwest-trending mountain ranges, intervening valleys, and predominantly northwest trending active regional faults. The San Diego Region can be further subdivided into the coastal plain area, a central mountain–valley area, and the eastern mountain valley area. The project site is located within the coastal plain area. The coastal plain subprovince ranges in elevation from approximately sea level to 1200 feet above mean sea level (msl) and is characterized by Cretaceous and Tertiary sedimentary deposits that onlap an eroded basement surface consisting of Jurassic and Cretaceous crystalline rocks that have been repeatedly eroded and infilled and by alluvial processes throughout the Quaternary Period in response to regional uplift. This has resulted in a geomorphic landscape of uplifted alluvial and marine terraces that are dissected by current active alluvial drainages.

4.2 Geologic Conditions

Based on the regional geologic map prepared by Kennedy and Tan (2008), the near surface geologic unit that underlies the site consists of Quaternary Very Old Paralic Deposits Unit 8. Based on recent explorations, Quaternary Previously Placed Fill was observed overlying the Very Old Paralic Deposits. The Tertiary Mission Valley Formation is anticipated at depth beneath the Very Old

Paralic Deposits. Descriptions of the geologic and soil units encountered during the investigation are presented below.

4.2.1 Quaternary Previously Placed Fill

Where observed, the Previously Placed Fill generally consists of stiff or loose to medium dense, brown, fine to medium grained sandy clay and clayey sand. Exploratory excavations encountered Previously Placed Fill to a maximum observed depth of approximately seven feet (bgs). As described above in Section 3.1, the fill thickness surrounding the existing structure was found to range from approximately five to seven feet below existing grades. In the area of the proposed parking structure the fill thickness is indicated to range from approximately one to four feet below existing grades. Isolated areas with deeper fill may be encountered during site excavations and grading.

4.2.2 Quaternary Very Old Paralic Deposits

Quaternary Very Old Paralic Deposits, (map unit Qvop 8 of Kennedy and Tan, 2008) were observed in all the investigation borings. Where observed, these materials generally consist of medium dense to very dense, mottled gray and reddish brown, silty to clayey fine to medium grained sandstone and cobble conglomerate. This unit is anticipated at depth throughout the site.

4.2.3 Groundwater Conditions

Groundwater was not encountered in any of the recent borings at the time of drilling. The borings were advanced to a maximum explored depth of approximately 18 feet bgs or to an approximate elevation of 399 feet msl. Review of California State Water Resources Control Board-Geotracker electronic database found several sites in the general vicinity that provided regional groundwater information. According to various studies completed for the Broadstone site located approximately 800 to 1000 feet west of the subject site, regional groundwater was reported to be approximately 75 feet bgs (an approximate elevation of 337 msl). To the north at Montgomery Field, regional groundwater was reported at approximately 100 feet bgs, or at an approximate elevation of 315 feet msl (Geosoils Inc., 1998). However, Group Delta (2012) encountered localized perched lenses of groundwater at approximately 11 feet bgs, (approximate elevation of 400 feet msl) at the Broadstone site. Approximately 1,700 feet south of the subject site, near the intersection of Sandrock Road and Hammond Drive, Santec Consulting Services (2012) reported groundwater elevations ranging from 385.81 to 393.76 feet msl, with historic groundwater elevations from 1996 through 2008 ranging from approximately 387 to 391 feet msl. Groundwater flow direction was reported to be to the south-southeast. These groundwater elevations are consistent with the relatively shallow perched groundwater elevations reported at the Broadstone site.

Based on the recent site explorations and review of groundwater data from the adjacent area, regional static groundwater is generally anticipated at depths greater than proposed excavations as recommended herein. Although no groundwater was observed during the recent drilling, localized perched groundwater conditions could potentially be present at elevations shallower than approximately 400 feet msl.

While groundwater conditions may vary, especially following periods of sustained precipitation or irrigation, it is generally not anticipated to adversely affect the proposed shallow construction activities or the completed improvements, if irrigation is limited and proper site drainage is designed, installed, and maintained per the recommendations of the project civil engineer. Seepage and perched water conditions may locally be encountered in deeper site excavations.

4.3 Geologic Hazards

The site is located within City of San Diego Seismic Safety Zone Geologic Hazard Categories 51 and 52. Category 51 corresponds to "level mesas – underlain by terrace deposits and bedrock, nominal risk", and Category 52 corresponds to "other level areas, gently sloping to steep terrain, favorable geologic structure, low risk."

Geologic hazards considered to have potential impacts to site development were evaluated based on field observations, literature review, and laboratory test results. The following paragraphs discuss geologic hazards considered and associated potential risk to the site.

4.3.1 Surface Fault Rupture

Based on the site reconnaissance and review of referenced literature, the site is not within a local fault hazard zone or State of California -designated Alquist-Priolo Earthquake Fault Studies Zone, and no known active fault traces underlie or project toward the site. According to the California Division of Mines and Geology, a fault is active if it displays evidence of activity in the last 11,000 years (Hart and Bryant, 1997). As such, the potential for surface rupture from displacement or fault movement beneath the proposed improvements is considered to be low.

4.3.2 Local and Regional Faulting

The California Geological Survey (CGS) and the United States Geological Survey (USGS) broadly group faults as "Class A" or "Class B" (Cao, 2003; Frankel et al., 2002). Class A faults are identified based upon relatively well-defined paleoseismic activity, and a fault-slip rate of more than 5 millimeters per year (mm/yr). In contrast, Class B faults have comparatively less defined paleoseismic activity and are considered to have a fault-slip rate less than 5 mm/yr. The nearest known Class B fault is the Rose Canyon Fault, which is approximately 7.0 kilometers southwest of the site (Blake, T.F., 2000). The nearest known Class A fault is the Julian segment of the Elsinore Fault, which is located approximately 57.6 kilometers northeast of the site.

The site could be subjected to significant shaking in the event of a major earthquake on any of the faults noted above or other faults in the southern California or northern Baja California area.

4.3.3 Liquefaction and Seismic Settlement Evaluation

Liquefaction occurs when saturated fine-grained sands or silts lose their physical strengths during earthquake-induced shaking and behave like a liquid. This is due to loss of point-to-point grain contact and transfer of normal stress to the pore water. Liquefaction potential varies with water level, soil type, material gradation, relative density, and probable intensity and duration of ground shaking. Seismic settlement can occur with or without liquefaction; it results from densification of loose soils.

The site is underlain at shallow depths by medium dense to very dense formational materials (Very Old Paralic Deposits). Based on the noted subsurface conditions, the potential for liquefaction or significant seismic settlement at the site is considered to be low.

4.3.4 Tsunamis and Seiche Evaluation

According to McCulloch (1985), the potential in the San Diego County coastal area for "100-year" and "500-year" tsunami waves is approximately five and eight feet, or less. This suggests that there is a negligible probability of a tsunami reaching the site based on elevation of the area and distance from the Pacific Ocean. The site is not located in a zone of potential tsunami inundation based on emergency planning maps prepared by California Emergency Management Agency and CGS. In addition, oscillatory waves (seiches) are considered unlikely due to the absence of nearby confined bodies of water.

4.3.5 Landsliding

According to mapping by Tan (1995), the site is considered to be only "Marginally Susceptible" to landsliding, and no landslides are mapped in the site area. In addition, evidence of landslides or landslide potential was not observed during the field exploration at the relatively flat-lying site. Based on these findings, landsliding is not considered to be a significant geologic hazard at the subject site.

4.3.6 Compressible and Expansive Soils

Portions of the Previously Placed Fill soils are considered to be compressible in their current condition. Therefore, it is recommended that these soils be overexcavated, where necessary, and properly compacted beneath proposed improvement areas as recommended herein and as determined to be necessary during construction. Based on the field data, site observations, and CTE's experience with similar soils in the vicinity of the site, dense native soils underlying the site are not considered to be subject to significant compressibility under the proposed loads.

Based on laboratory testing and the generally granular nature of the subgrade materials, soils at the site are anticipated to exhibit Low expansion potential (Expansion Index of 50 or less). Therefore, expansive soils are generally not anticipated to present significant adverse impacts to site development if geotechnical recommendations are properly implemented. Additional evaluation of near-surface soils should be performed based on field observations during grading and excavation activities.

4.3.7 Corrosive Soils

Testing of representative site soils was performed to evaluate the potential corrosive effects on concrete foundations and buried metallic utilities. Soil environments detrimental to concrete generally have elevated levels of soluble sulfates and/or pH levels less than 5.5. According to the American Concrete Institute (ACI) Table 318 4.3.1, specific guidelines have been provided for concrete where concentrations of soluble sulfate (SO_4) in soil exceed 0.10 percent by weight. These guidelines include low water:cement ratios, increased compressive strength, and specific cement type requirements. A minimum resistivity value less than approximately 5,000 ohm-cm and/or soluble chloride levels in excess of 200 ppm generally indicate a corrosive environment for buried metallic utilities and untreated conduits.

Chemical test results indicate that near-surface soils at the site generally present a negligible corrosion potential for Portland cement concrete. Based on resistivity and chloride testing, the site soils have been interpreted to have a moderate to severe corrosivity potential to buried metal improvements.

Based on the results of the limited testing performed, it is likely prudent to utilize plastic piping and conduits where buried and feasible. However, CTE does not practice corrosion engineering. Therefore, if corrosion of metallic or other improvements is of more significant concern, a qualified corrosion engineer could be consulted.

5.0 STORMWATER INFILTRATION - PRELIMINARY FESIBILITY SCREENING

5.1 Purpose

As part of the geotechnical site assessment, CTE completed a preliminary feasibility screening of the subject site for storm water infiltration. The preliminary screening was completed in accordance with the City of San Diego Storm Water Standards (January 2018) for the purpose of providing geotechnical-geologic characteristics, groundwater information, and estimates of vertical infiltration rates that can be incorporated by the project Storm Water Quality Management Plan (SWQMP) preparer (e.g. Project Architect, Civil Engineer), in the process of developing a comprehensive storm water management plan. The information can also be used to facilitate the final storm water design in accordance with the water quality and hydro modification criteria of the MS4 permitting process.

5.2 Test Procedures

The shallow borehole percolation methodology was used to establish percolation rates. This is considered an acceptable method of percolation testing, as stated in the City of San Diego BMP Design Manual, Appendix D (February, 2018). The percolation test procedure was completed in general accordance with the County of San Diego Department of Environmental Health (DEH), Version 2010 guidelines. The percolation rates account for both lateral and vertical flow through the tested section. The derived percolation rates were then converted to infiltration rates following the procedures of the Porchet Method, as recommended by the BMP Design Manual, Appendix D (February, 2018). The percolation test methodology, field data, and infiltration conversion calculations are presented in Appendix E. The Model BMP Design Manual, Worksheet C.4.1 “Categorization of Infiltration Feasibility Conditions”, is also presented in Appendix E.

5.3 Site Background and Characterization

Review of the Natural Resources Conservation Service (NRCS) website indicates that agricultural soil types in the site area are classified as Redding gravelly loam, gravelly clay, and gravelly clay loam (Map Unit-Rdc). The Rdc map unit, as defined by the NRCS, is assigned a hydrologic soil group (D), in accordance with the United States Department of Agriculture (USDA). These USDA soil types were generally confirmed with the geotechnical logs of borings from the recent investigation, as described in Section 4.2.1 and 4.2.2 above, which encountered Quaternary Very Old Paralic Deposits (Map Unit Qop- 8 of Kennedy and Tan, 2008), and Quaternary Previously Placed Fill consisting of re-worked formational deposits.

As described in Section 4.2.3, regional static groundwater elevations are estimated to be 76 to 83 feet below existing grades. Groundwater was not encountered at the time of drilling during our recent investigation to depths of approximately 18 feet bgs. However, based on review of adjacent projects, perched groundwater could be expected at depths ranging from approximately 22 to 33 feet bgs.

As the project is in the conceptual phase of design, percolation test borings were conducted in representative areas such that the entire site would be accurately characterized in terms of infiltration potential. In total, seven percolation test borings were advanced to depths ranging from approximately three to five feet below existing grades.

5.3 Percolation Test Results and Calculated Infiltration Rates

The following table presents a summary of the percolation test results conducted within the subject site, the soil type encountered in each test boring, the depth of each test boring, the derived percolation rate, the calculated infiltration rate, and a recommended design rate derived by applying a safety factor of two to the calculated infiltration rate in accordance with the City of San Diego BMP Design Manual, Appendix D (January, 2018). The percolation tests met Case I conditions (Appendix E).

TABLE 5.3
SUMMARY OF PERCOLATION AND INFILTRATION TEST RESULTS

Test Location	Soil Type	San Diego County Percolation Procedure	Depth (inches)	Percolation Rate (inches/hour)	Infiltration Rate (inches/hour)	Recommended Rate for Design* (inches/hour)
P-1	Qvop	Case I	61	0.13	0.025	0.013
P-2	Qvop	Case I	36	0.13	0.027	0.013
P-3	Qvop	Case I	59	0.00	0.00	0.000
P-4	Qppf	Case I	37	0.12	0.027	0.014
P-5	Qppf	Case I	60	0.13	0026	0.013
P-6	Qvop	Case I	60	0.13	0.024	0.012
P-7	Qppf	Case I	61	0.00	0.00	0.000

* A safety factor of two (2) was applied to the calculated infiltration rate
Qvop = Quaternary Very Old Paralic Deposits, (Map Unit Qop- 8 of Kennedy and Tan, 2008)

The calculated infiltration rates within both the Quaternary Very Old Paralic Deposits and the Quaternary Previously Placed Fill were all found to be below the defined lower boundary infiltration of rate of 0.05 inches per hour for partial infiltration as defined by the City of San Diego BMP Design Manual (January 2018), Appendix C. For Planning Phase feasibility screening and design of partial infiltration BMP's, a factor of safety of 2 is required in accordance with Appendix C of the

City of San Diego BMP Design Manual (January 2018). As shown in the above table, this further reduces the infiltration below the cutoff rate for partial infiltration classification. As such, the results of the preliminary site screening indicate that the site classifies as a "No Infiltration Condition".

5.4 Infiltration Recommendations

Although the preliminary screening indicates that the entire site classifies as not suitable for partial infiltration, the SWQMP preparer could consider modification of the existing site soils for a proposed BMP infiltration basin provided the potential modified basin area conforms with all structural setback criteria as defined in Appendix C of the City of San Diego BMP Design Manual (January 2018). The main structural setbacks at the site would be distances from building foundations and utility trenches. The site is considered feasible with respect to other geotechnical-geologic criteria including depths to groundwater, expansive soils, settlement or volume change, and slope stability. Replacement of existing soils with improved infiltration feasibility soils could be an option provided the BMP dimensions are capable of temporarily storing DMA water volumes associated with the underlying lower infiltration rates as documented as part of this feasibility screening.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 General

CTE concludes that the proposed improvements on the site are feasible from a geotechnical standpoint, provided the preliminary recommendations in this report are incorporated into the design and construction of the project. Recommendations for the proposed earthwork and improvements are included in the following sections and Appendix D. However, recommendations in the text of this report supersede those presented in Appendix D should conflicts exist. These preliminary recommendations should either be confirmed as appropriate or updated following required excavations, demolition of existing improvements, and observations during site preparation.

6.2 Site Preparation

Prior to grading, the site should be cleared of existing construction debris and vegetation, not suitable for structural backfill and be properly disposed of offsite. In areas to receive structural improvements, overexcavation beneath slab areas should extend to a minimum depth of two feet below finish subgrade. Foundation elements for both the existing building modifications and the new proposed parking structure are to be extended to the depth of dense native materials.

Excavations adjacent to the existing structure should generally not extend below a 1:1 plane extended down from the bottom of existing footings or as recommended during grading based on the exposed conditions. Depending on the depth and proximity of the existing building footings to remain, alternating slot excavations could be required during earthwork.

Overexcavations for proposed surface improvement areas, such as pavement or flatwork should be conducted to a depth of two feet below proposed subgrade.

If encountered, existing below-ground utilities should be redirected around proposed structures. Existing utilities at an elevation to extend through the proposed footings should generally be sleeved and caulked to minimize the potential for moisture migration below the building slabs. Abandoned pipes exposed by grading should be securely capped or filled with minimum two-sack cement/sand slurry to help prevent moisture from migrating beneath foundation and slab soils.

A CTE representative should observe the exposed ground surface prior to placement of compacted fill to document and verify the competency of the encountered subgrade materials. If unsuitable material is exposed at the base of excavations additional removals may be recommended. After approval by this office, the exposed subgrades to receive fill should be scarified a minimum of eight inches, moisture conditioned, and properly compacted prior to additional compacted fill placement.

6.3 Site Excavation

Based on CTE's observations, shallow excavations at the site should be feasible using well-maintained heavy-duty construction equipment run by experienced operators. However, localized very dense zones consisting of cemented conglomerate formation may be encountered, which could result in very difficult excavation.

6.4 Fill Placement and Compaction

Following the recommended overexcavation of loose or disturbed soils, the areas to receive fills should be scarified approximately eight inches, moisture conditioned, and properly compacted. Fill and backfill should be compacted to a minimum relative compaction of 90 percent at a moisture content of at least two percent above optimum, as evaluated by ASTM D 1557. The optimum lift thickness for fill soil depends on the type of compaction equipment used. Generally, backfill should be placed in uniform, horizontal lifts not exceeding eight inches in loose thickness. Fill placement and compaction should be conducted in conformance with local ordinances, and should be observed and tested by a CTE geotechnical representative.

6.5 Fill Materials

Properly moisture-conditioned very low to low expansion potential soils derived from the on-site excavations are considered suitable for reuse on the site as compacted fill. If used, these materials should be screened of organics and materials generally greater than three inches in maximum dimension. Irreducible materials greater than three inches in maximum dimension should generally not be used in shallow fills (within three feet of proposed grades). In utility trenches, adequate bedding should surround pipes.

Imported fill beneath structures, flatwork, and pavements should have an Expansion Index of 20 or less (ASTM D 4829). Proposed import fill soils for use in structural or slope areas should be evaluated by the geotechnical engineer before being transported to the site.

If retaining walls are proposed, backfill located within a 45-degree wedge extending up from the heel of the wall should consist of soil having an Expansion Index of 20 or less (ASTM D 4829) with less than 30 percent passing the No. 200 sieve. The upper 12 to 18 inches of wall backfill should consist of lower permeability soils, in order to reduce surface water infiltration behind walls. The project structural engineer and/or architect should detail proper wall backdrains, including gravel drain zones, fills, filter fabric, and perforated drain pipes. A conceptual wall backdrain detail, which may be suitable for use at the site, is provided as Figure 4.

6.6 Temporary Construction Slopes

The following recommended slopes should be relatively stable against deep-seated failure, but may experience localized sloughing. On-site soils are considered Type B and Type C soils with recommended slope ratios as set forth in Table 6.6.

TABLE 6.6
RECOMMENDED TEMPORARY SLOPE RATIOS

SOIL TYPE	SLOPE RATIO (Horizontal: vertical)	MAXIMUM HEIGHT
B (Very Old Paralic Deposits)	1:1 (OR FLATTER)	10 Feet
C (Previously Placed Fill)	1.5:1 (OR FLATTER)	10 Feet

Actual field conditions and soil type designations must be verified by a "competent person" while excavations exist, according to Cal-OSHA regulations. In addition, the above sloping recommendations do not allow for surcharge loading at the top of slopes by vehicular traffic, equipment or materials. Appropriate surcharge setbacks must be maintained from the top of all unshored slopes.

6.7 Foundations and Slab Recommendations

The following recommendations are for preliminary design purposes only. These foundation recommendations should be re-evaluated after review of the project grading and foundation plans, and after completion of rough grading of the building pad areas. Upon completion of rough pad grading, Expansion Index of near surface soils should be verified, and these recommendations should be updated, if necessary.

6.7.1 Foundations

Foundation recommendations presented herein are based on the anticipated low expansion potential of site soils (Expansion Index of 50 or less).

Following the recommended preparatory grading, continuous and isolated spread footings are anticipated to be suitable for use at this site. Foundation dimensions and reinforcement should be based on allowable bearing values of 4,000 pounds per square foot (psf) for minimum 18-inch wide footings embedded a minimum of 36-inches below lowest adjacent subgrade elevation and extended to the depth of dense native formational material, as required. Isolated footings should be at least 24 inches in minimum dimension. The allowable bearing value may be increased by 250 psf for each additional six inches of embedment up to a maximum of 6,500 psf. The allowable bearing value may also be increased by one-third for short-duration loading, which includes the effects of wind or seismic forces.

In order to approximate minimum required footing depths, it is anticipated that suitable dense native bearing material will be encountered at, or slightly below, the bottom of existing fills. Approximate fill depths based on the investigation findings are shown on Figure 2. Localized areas of deeper fill or unsuitable soils may be encountered that would require deeper excavation for proposed footings.

Minimum reinforcement for continuous footings should consist of four No. 6 reinforcing bars; two placed near the top and two placed near the bottom, or as per the project structural engineer. The structural engineer should design isolated footing reinforcement. An uncorrected subgrade modulus of 140 pounds per cubic inch is considered suitable for elastic foundation design.

The structural engineer should provide recommendations for reinforcement of any spread footings and footings with pipe penetrations. Footing excavations should generally be maintained above optimum moisture content until concrete placement.

6.7.2 Foundation Settlement

For structures founded on footings extended to dense native material, the maximum total static settlement is expected to be on the order of one inch and the maximum differential settlement is expected to be on the order of 0.5 inch over a distance of 50 feet. Due to the nature of underlying materials, dynamic settlement is not expected to significantly affect the proposed buildings.

6.7.3 Foundation Setback

Footings for structures should be designed such that the horizontal distance from the face of adjacent slopes to the outer edge of the footing is at least 10 feet. In addition, footings should bear beneath a 1:1 plane extended up from the nearest bottom edge of adjacent trenches and/or excavations. Deepening of affected footings may be a suitable means of attaining the prescribed setbacks.

6.7.4 Interior Concrete Slabs

Lightly loaded interior concrete slabs for non-traffic areas should be a minimum of 5.0 inches thick, or slabs should be designed to match existing thickness at building modification boundaries per recommendations of the project structural engineer. Minimum reinforcement for lightly loaded slabs should consist of #4 reinforcing bars placed on maximum 18-inch centers, each way, at or above mid-slab height, but with proper cover or as per the recommendations of the project structural engineer.

In moisture-sensitive non-traffic floor areas, a suitable vapor retarder of at least 15-mil thickness (with all laps or penetrations sealed or taped) overlying a four-inch layer of consolidated aggregate base or gravel (with SE of 30 or more) should be installed. An optional maximum two-inch layer of similar material may be placed above the vapor retarder to help protect the membrane during steel and concrete placement. This recommended protection is generally considered typical in the industry. If proposed floor areas or coverings are considered especially sensitive to moisture emissions, additional recommendations from a specialty consultant could be obtained. CTE is not an expert at preventing moisture penetration through slabs. A qualified architect or other experienced professional should be contacted if moisture penetration is a more significant concern.

Parking garage slabs subjected to heavier loads and traffic will require thicker slab sections and/or increased reinforcement. Minimum underlayment for the parking garage slab is to consist of 6 inches of non-recycled class 2 base. Aggregate base and the upper foot of underlying subgrade are to be compacted to 95% relative compaction.

A 110-pci subgrade modulus is considered suitable for elastic design of minimally embedded improvements such as slabs-on-grade.

Subgrade materials should be maintained at a minimum of two percent above optimum moisture content until slab underlayment and concrete are placed.

6.8 Seismic Design Criteria

The seismic ground motion values listed in the table below were derived in accordance with the ASCE 7-10 Standard. This was accomplished by establishing the Site Class based on the soil properties at the site, and calculating the site coefficients and parameters using the United States Geological Survey Seismic Design Maps application. These values are intended for the design of structures to resist the effects of earthquake ground motions for the site coordinates 32.8088° latitude and –117.1374° longitude, as underlain by soils corresponding to site Class C.

TABLE 6.8
SEISMIC GROUND MOTION VALUES (CODE-BASED)
2016 CBC AND ASCE 7-10

PARAMETER	VALUE	2016 CBC/ASCE 7-10 REFERENCE
Site Class	C	ASCE 7, Chapter 20
Mapped Spectral Response Acceleration Parameter, S_S	1.018	Figure 1613.3.1 (1)
Mapped Spectral Response Acceleration Parameter, S_1	0.389	Figure 1613.3.1 (2)
Seismic Coefficient, F_a	1.000	Table 1613.3.3 (1)
Seismic Coefficient, F_v	1.411	Table 1613.3.3 (2)
MCE Spectral Response Acceleration Parameter, S_{MS}	1.018	Section 1613.3.3
MCE Spectral Response Acceleration Parameter, S_{M1}	0.549	Section 1613.3.3
Design Spectral Response Acceleration, Parameter S_{DS}	0.678	Section 1613.3.4
Design Spectral Response Acceleration, Parameter S_{D1}	0.366	Section 1613.3.4
Peak Ground Acceleration PGA_M	0.423	ASCE 7, Section 11.8.3

6.9 Lateral Resistance and Earth Pressures

Lateral loads acting against structures may be resisted by friction between the footings and the supporting soil or passive pressure acting against structures. If frictional resistance is used, allowable coefficients of friction of 0.30 (total frictional resistance equals the coefficient of friction multiplied by the dead load) for concrete cast directly against compacted fill is recommended. A design passive resistance value of 250 pounds per square foot per foot of depth (with a maximum value of 2,500 pounds per square foot) may be used. The allowable lateral resistance can be taken as the sum of the frictional resistance and the passive resistance, provided the passive resistance does not exceed two-thirds of the total allowable resistance.

Retaining walls backfilled using granular soils may be designed using the equivalent fluid unit weights given in Table 6.9 below.

TABLE 6.9 EQUIVALENT FLUID UNIT WEIGHTS (G_h) (pounds per cubic foot)		
WALL TYPE	LEVEL BACKFILL	SLOPE BACKFILL 2:1 (HORIZONTAL: VERTICAL)
CANTILEVER WALL (YIELDING)	35	55
RESTRAINED WALL	55	65

Lateral pressures on cantilever retaining walls (yielding walls) over six feet high due to earthquake motions may be calculated based on work by Seed and Whitman (1970). The total lateral earth pressure against a properly drained and backfilled cantilever retaining wall above the groundwater level can be expressed as:

$P_{AE} = P_A + \Delta P_{AE}$

For non-yielding (or “restrained”) walls, the total lateral earth pressure may be similarly calculated based on work by Wood (1973):

$P_{KE} = P_K + \Delta P_{KE}$

Where P_A/b = Static Active Earth Pressure = $G_h H^2/2$

P_K/b = Static Restrained Wall Earth Pressure = $G_h H^2/2$

$\Delta P_{AE}/b$ = Dynamic Active Earth Pressure Increment = $(3/8)\ k_h\ \gamma H^2/2$

$\Delta P_{KE}/b$ = Dynamic Restrained Earth Pressure Increment = $k_h\ \gamma H^2/2$

b = unit length of wall

$k_h = 2/3\ PGA_m$ (PGA_m given previously Table 6.8)

G_h = Equivalent Fluid Unit Weight (given previously Table 6.9)

H = Total Height of the retained soil

γ = Total Unit Weight of Soil ≈ 135 pounds per cubic foot

The static and increment of dynamic earth pressure in both cases may be applied with a line of action located at H/3 above the bottom of the wall (SEAOC, 2013).

These values assume non-expansive backfill and free-draining conditions. Measures should be taken to prevent moisture buildup behind all retaining walls. Drainage measures should include free-draining backfill materials and sloped, perforated drains. These drains should discharge to an appropriate off-site location. Figure 4 shows a conceptual wall backdrain detail that may be suitable for walls at the subject site. Waterproofing should be as specified by the project architect.

6.10 Exterior Flatwork

Flatwork should be installed with crack-control joints at appropriate spacing as designed by the project architect to reduce the potential for cracking in exterior flatwork caused by minor movement of subgrade soils and concrete shrinkage. Additionally, it is recommended that flatwork be installed with at least number 4 reinforcing bars at 24-inch centers, each way, at or above mid-height of slab, but with proper concrete cover, or with other reinforcement per the applicable project designer. Flatwork that should be installed with crack control joints, includes driveways, sidewalks, and architectural features. All subgrades should be prepared according to the earthwork recommendations previously given before placing concrete. Positive drainage should be established and maintained next to all flatwork. Subgrade materials should be maintained at a minimum of two percent above optimum moisture content until the time of concrete placement.

6.11 Vehicular Pavement

The proposed improvements include paved vehicle drive and parking areas. Presented in Table 6.11 are preliminary pavement sections utilizing laboratory determined Resistance "R" Value. Actual traffic area slab sections to be provided by the structural designer. Beneath proposed pavement areas, the upper 12 inches of subgrade and all base materials should be compacted to 95% relative compaction in accordance with ASTM D1557, and at a minimum of two percent above optimum moisture content.

TABLE 6.11
RECOMMENDED PAVEMENT THICKNESS

Traffic Area	Assumed Traffic Index	Preliminary Subgrade "R"-Value	Asphalt Pavements		Portland Cement Concrete Pavements, on Subgrade Soils (inches)
			AC Thickness (inches)	Class II Aggregate Base Thickness (inches)	
Drive Areas	6.0	5	4.0	12.0	7.5
Parking Areas	5.0	5	3.0	10.0	6.5

* Caltrans Class 2 aggregate base
** Concrete should have a modulus of rupture of at least 600 psi
Following rough site grading, CTE recommends laboratory testing of representative subgrade soils for as-graded "R"-Value.

Asphalt paved areas should be designed, constructed, and maintained in accordance with the recommendations of the Asphalt Institute, or other widely recognized authority. Concrete paved areas should be designed and constructed in accordance with the recommendations of the American

Concrete Institute or other widely recognized authority, particularly with regard to thickened edges, joints, and drainage. The Standard Specifications for Public Works construction ("Greenbook") or Caltrans Standard Specifications may be referenced for pavement materials specifications.

6.12 Drainage

Surface runoff should be collected and directed away from improvements by means of appropriate erosion-reducing devices and positive drainage should be established around the proposed improvements. Positive drainage should be directed away from improvements at a gradient of at least two percent for a distance of at least five feet. However, the project civil engineers should evaluate the on-site drainage and make necessary provisions to keep surface water from affecting the site.

Generally, CTE recommends against allowing water to infiltrate building pads or adjacent to slopes. CTE understands that some agencies are encouraging the use of storm-water cleansing devices. Use of such devices tends to increase the possibility of adverse effects associated with high groundwater including slope instability and liquefaction. See Appendix E for further discussion of site infiltration.

6.12 Slopes

Based on anticipated soil strength characteristics, fill slopes if proposed, should be constructed at slope ratios of 2:1 (horizontal: vertical) or flatter. These fill slope inclinations should exhibit factors of safety greater than 1.5.

Although properly constructed slopes on this site should be grossly stable, the soils will be somewhat erodible. Therefore, runoff water should not be permitted to drain over the edges of slopes unless that water is confined to properly designed and constructed drainage facilities. Erosion-resistant vegetation should be maintained on the face of all slopes.

Typically, soils along the top portion of a fill slope face will creep laterally. CTE recommends against building distress-sensitive hardscape improvements within five feet of slope crests, and against using thickened edges in this area.

6.13 Controlled Low Strength Materials (CLSM)

Controlled Low Strength Materials (CLSM) may be used in deepened footing excavation areas, building pads, and/or adjacent to retaining walls or other structures, provided the appropriate following recommendations are also incorporated. Minimum overexcavation depths recommended herein beneath slabs, flatwork, and other areas may be applicable beneath CLSM if/where CLSM is to be used, and excavation bottoms should be observed by CTE prior to placement of CLSM. Prior to CLSM placement, the excavation should be free of debris, loose soil materials, and water. Once specific areas to utilize CLSM have been determined, CTE should review the locations to determine if additional recommendations are appropriate.

CLSM should consist of a minimum three-sack cement/sand slurry with a minimum 28-day compressive strength of 100 psi (or equal to or greater than the maximum allowable short term soil bearing pressure provided herein, whichever is higher) as determined by ASTM D4832. If re-excavation is anticipated, the compressive strength of CLSM should generally be limited to a maximum of 150 psi per ACI 229R-99. Where re-excavation is required, two-sack cement/sand slurry may be used to help limit the compressive strength. The allowable soils bearing pressure and coefficient of friction provided herein should still govern foundation design. CLSM may not be used in lieu of structural concrete where required by the structural engineer.

6.14 Plan Review

CTE should be authorized to review the project grading and foundation plans prior to commencement of earthwork in order to provide additional recommendations, if necessary.

6.15 Construction Observation

The recommendations provided in this report are based on preliminary design information for the proposed construction and the subsurface conditions observed in the soil borings. The interpolated subsurface conditions should be checked by CTE during construction with respect to anticipated conditions. Upon completion of precise grading, if necessary, soil samples will be collected to evaluate as-built Expansion Index. Foundation recommendations may be revised upon completion of grading, and as-built laboratory tests results. Additionally, soil samples should be taken in pavement subgrade areas upon rough grading to refine pavement recommendations as necessary.

Recommendations provided in this report are based on the understanding and assumption that CTE will provide the observation and testing services for the project. All earthwork should be observed and tested in accordance with recommendations contained within this report. CTE should evaluate footing excavations before reinforcing steel placement.

7.0 LIMITATIONS OF INVESTIGATION

The field evaluation, laboratory testing and geotechnical analysis presented in this report have been conducted according to current engineering practice and the standard of care exercised by reputable geotechnical consultants performing similar tasks in this area. No other warranty, expressed or implied, is made regarding the conclusions, recommendations and opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered during construction. This report is prepared for the project as described. It is not prepared for any other property or party.

The recommendations provided herein have been developed in order to reduce the post-construction movement of site improvements. However, even with the design and construction recommendations presented herein, some post-construction movement and associated distress may occur.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside CTE's involvement. Therefore, this report is subject to review and should not be relied upon after a period of three years.

CTE's conclusions and recommendations are based on an analysis of the observed conditions. If conditions different from those described in this report are encountered, CTE should be notified and additional recommendations, if required, will be provided subject to CTE remaining as authorized geotechnical consultant of record. This report is for use of the project as described. It should not be utilized for any other project.

The percolation test results were obtained in accordance with City and County standards and were performed with the standard of care practiced by other professionals practicing in the area. However, percolation test results can significantly vary laterally and vertically due to slight changes in soil type, degree of weathering, secondary mineralization, and other physical and chemical variabilities. As such, the test results are only considered as an estimate of percolation and converted infiltration rates for design purposes. No guarantee is made based on the percolation testing to the actual functionality or longevity of associated infiltration basins or other BMP devices designed from the presented infiltration rates.

CTE's conclusions and recommendations are based on an analysis of the observed conditions. If conditions different from those described in this report are encountered during construction, this office should be notified and additional recommendations, if required, will be provided.

CTE appreciate this opportunity to be of service on this project. If you have any questions regarding this report, please do not hesitate to contact the undersigned.

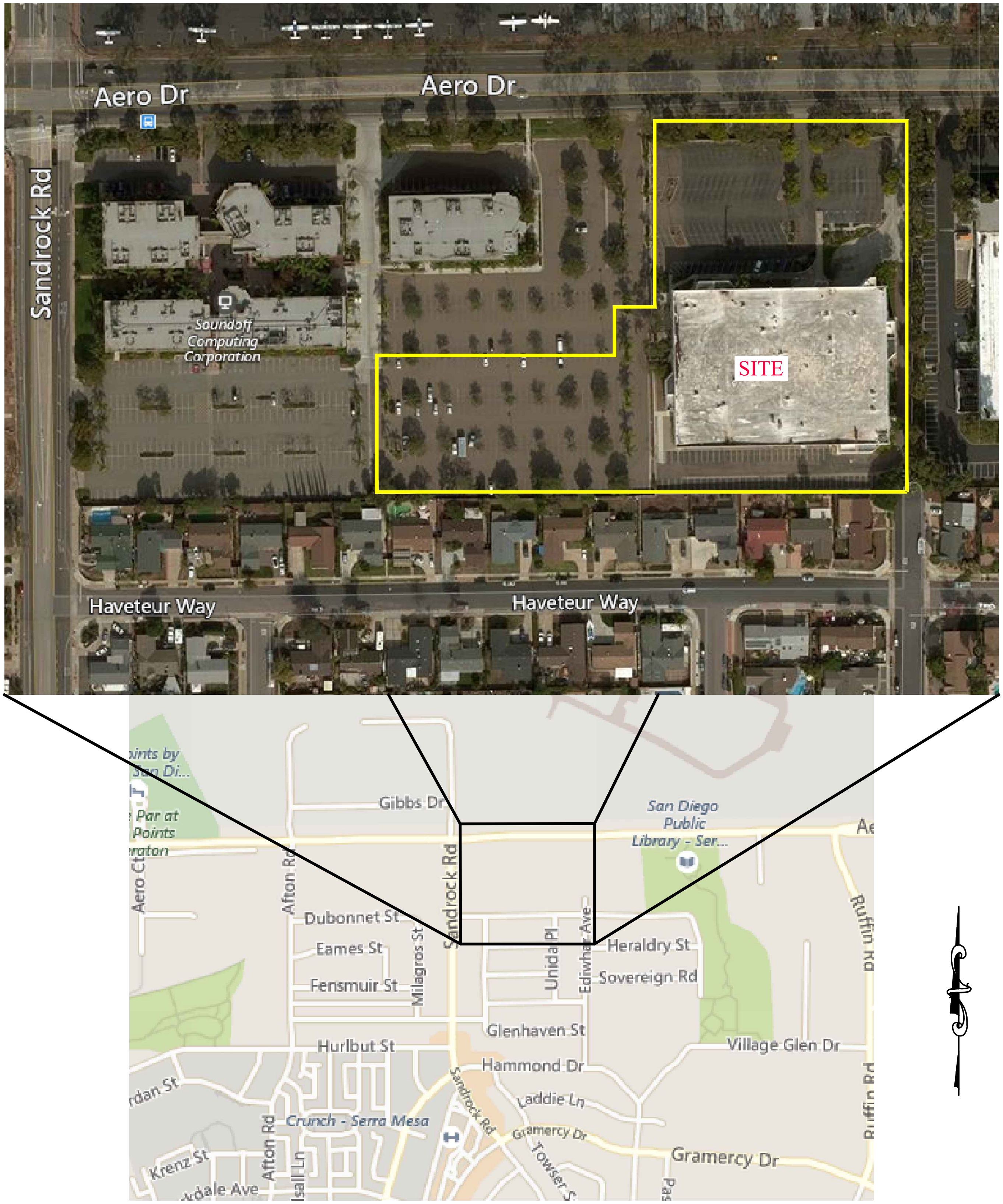
Respectfully submitted,

CONSTRUCTION TESTING & ENGINEERING, INC.

Dan T. Math, GE #2665
Principal Engineer

Jay F. Lynch, CEG #1890
Principal Engineering Geologist

Aaron J. Beeby, CEG #2603
Project Geologist



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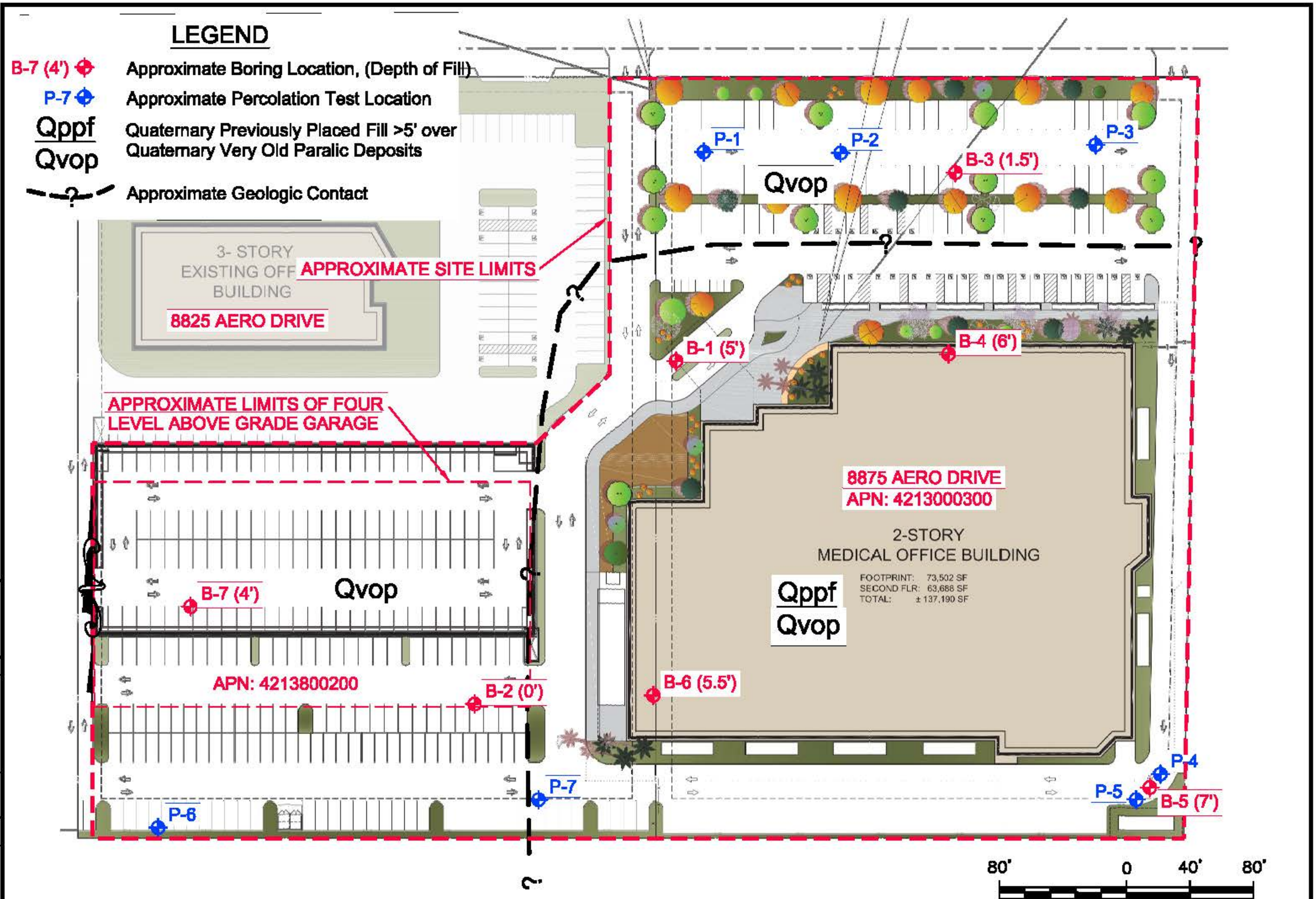
SITE INDEX MAP PROPOSED PROTEA-VA SAN DIEGO 8875 AERO DRIVE SAN DIEGO, CALIFORNIA	SCALE: AS SHOWN	DATE: 3/18
	CTE JOB NO.: 10-14209G	FIGURE: 1



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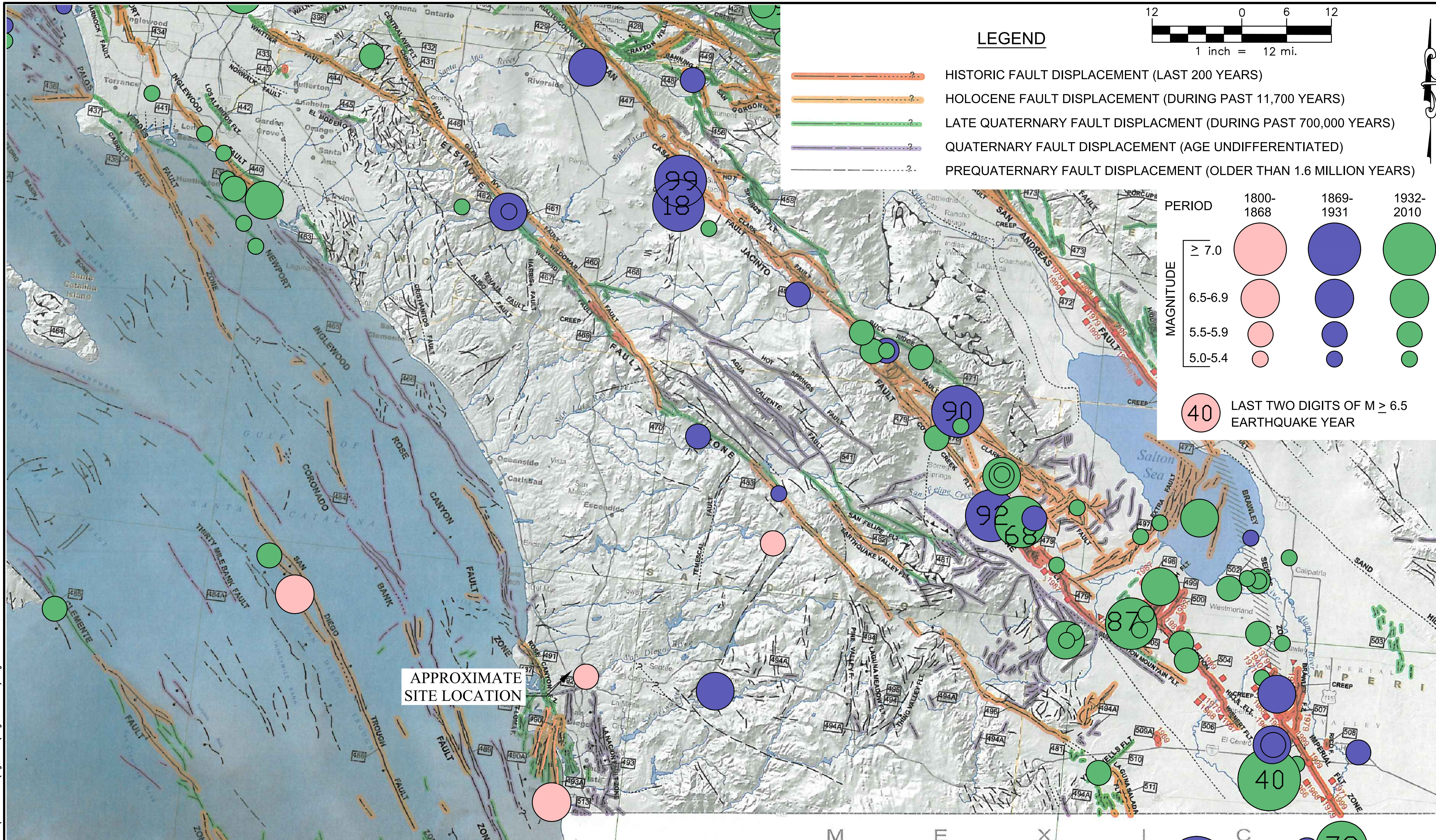
GEOLOGIC/EXPLORATION LOCATION MAP

PROPOSED PROTEA-VA SAN DIEGO
8875 AERO DRIVE
SAN DIEGO, CALIFORNIA

CTE JOB NO: 10-14209G	
SCALE: 1" ~ 80'	
DATE: 4/18	FIGURE: 2



NOTES: FAULT ACTIVITY MAP OF CALIFORNIA, 2010, CALIFORNIA GEOLOGIC DATA MAP SERIES MAP NO. 6;
EPICENTERS OF AND AREAS DAMAGED BY M≥5 CALIFORNIA EARTHQUAKES, 1800-1999 ADAPTED AFTER TOPPOZADA, BRANUM, PETERSEN, HALLSTORM, CRAMER, AND REICHLE, 2000, CDMG MAP SHEET 49
REFERENCE FOR ADDITIONAL EXPLANATION; MODIFIED WITH CISN AND USGS SEISMIC MAPS

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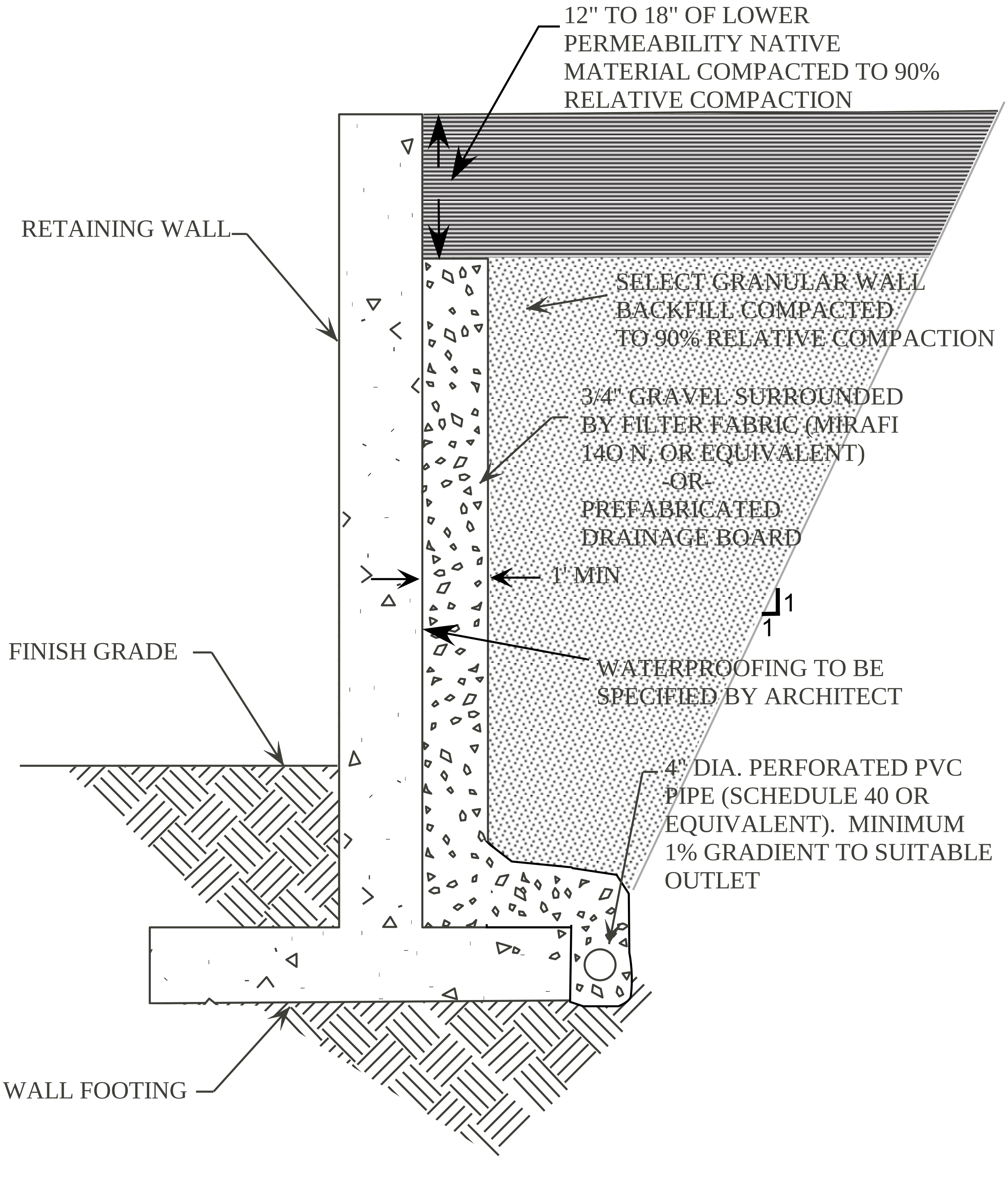
REGIONAL FAULT AND SEISMICITY MAP
PROPOSED PROTEA-VA SAN DIEGO
8875 AERO DRIVE
SAN DIEGO, CALIFORNIA

CTE JOB NO: 10-14209G
SCALE: 1 inch = 12 miles
DATE: 4/18
FIGURE: 3

\\Esc_server\projects\10-14209G\Figure 3 (Regional Fault).dwg



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RETAINING WALL DRAINAGE DETAIL

CTE JOB NO:	10-14209G
SCALE:	NO SCALE
DATE: 04/18	FIGURE: 4

APPENDIX A

REFERENCES

CITED REFERENCES

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APPENDIX B

EXPLORATION LOGS

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DEFINITION OF TERMS

PRIMARY DIVISIONS			SYMBOLS	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS < 5% FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS OR GRAVEL SAND MIXTURES, LITTLE OF NO FINES
		GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, NON-PLASTIC FINES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS < 5% FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50		ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, SLIGHTLY PLASTIC CLAYEY SILTS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, SILTS OR LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT IS 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, ORGANIC SILTY CLAYS
HIGHLY ORGANIC SOILS			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

GRAIN SIZES

BOULDERS	COBBLES	GRAVEL		SAND			SILTS AND CLAYS
		COARSE	FINE	COARSE	MEDIUM	FINE	

12" 3" 3/4" 4 10 40 200

CLEAR SQUARE SIEVE OPENING U.S. STANDARD SIEVE SIZE

ADDITIONAL TESTS

(OTHER THAN TEST PIT AND BORING LOG COLUMN HEADINGS)

MAX- Maximum Dry Density
GS- Grain Size Distribution
SE- Sand Equivalent
EI- Expansion Index
CHM- Sulfate and Chloride Content , pH, Resistivity
COR - Corrosivity
SD- Sample Disturbed

PM- Permeability
SG- Specific Gravity
HA- Hydrometer Analysis
AL- Atterberg Limits
RV- R-Value
CN- Consolidation
CP- Collapse Potential
HC- Hydrocollapse
REM- Remolded

PP- Pocket Penetrometer
WA- Wash Analysis
DS- Direct Shear
UC- Unconfined Compression
MD- Moisture/Density
M- Moisture
SC- Swell Compression
OI- Organic Impurities

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PROJECT:	DRILLER:	SHEET:	of
CTE JOB NO:	DRILL METHOD:	DRILLING DATE:	
LOGGED BY:	SAMPLE METHOD:	ELEVATION:	

Depth (Feet) | Bulk Sample | Driven Type | Blows/Foot | Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log | DESCRIPTION | Laboratory Tests

BORING LEGEND

0

Block or Chunk Sample

Bulk Sample

5

Standard Penetration Test

10

Modified Split-Barrel Drive Sampler (Cal Sampler)

Thin Walled Army Corp. of Engineers Sample

15

Groundwater Table

Soil Type or Classification Change

20

? ——— ? ——— ? ——— ? ——— ? ——— ? ——— ? —

Formation Change [(Approximate boundaries queried (?)]

"SM"

Quotes are placed around classifications where the soils exist in situ as bedrock

25

FIGURE: BL2

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~417 FEET

BORING: B-1

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						CL		Asphalt: 0-3" Base Material: 3-10" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff, moist, dark brown, fine to medium grained sandy CLAY with gravel. Becomes reddish gray	
5		Ring	50/2"			"SC"		**QUATERNARY VERY OLD PARALIC DEPOSITS:** Dense to very dense, olive gray, clayey fine to medium grained SANDSTONE with trace gravel. Increased sand content	
10		SPT	50/5"						
15		SPT	16 42 50/3"					Becomes reddish brown	
20								Total Depth: 18' (refusal on gravel) No Groundwater Encountered Backfilled with Bentonite Chips Capped with Concrete	
25									

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~419 FEET

BORING: B-2

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					"SC"		Asphalt: 0-3.5" Base Material: 3.5-10" **QUATERNARY VERY OLD PARALIC DEPOSITS:** Very dense, slightly moist, reddish brown silty to clayey fine to medium grained SANDSTONE with gravel, oxidized.	MAX
5		Ring	14 50/3"					Abundant gravel	
7								Total Depth: 7' (refusal on gravel) No Groundwater Encountered Backfilled with Bentonite Chips Capped with Concrete	
10									
15									
20									
25									

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~414 FEET

BORING: B-3

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0								Asphalt: 0-4" Base Material: 4-9"	
						SC/CL "SC"		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense or stiff, slightly moist, brown, clayey fine grained SAND/ sandy CLAY.	
								QUATERNARY VERY OLD PARALIC DEPOSITS: Dense, slightly moist, light reddish gray, clayey fine grained SANDSTONE with trace gravel, oxidized.	
						"SM"		Dense, slightly moist, reddish brown, silty fine grained SANDSTONE, oxidized.	
5			14 19 21						RV
						"CL"		Hard, moist, reddish brown, sandy fine to medium grained CLAYSTONE, oxidized.	
10			9 12 16						GS
								Fine gravel	
15			21 50/3"						
								Abundant gravel	
								Total Depth: 18' (refusal on gravel) No Groundwater Encountered Backfilled with Bentonite Chips Capped with Concrete	
20									
25									

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~417 FEET

BORING: B-4

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X (0–5)					CL		Asphalt: 0-2" Base Material: 2-9" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff, moist, reddish brown, fine to medium grained sandy CLAY with gravel. Becomes olive gray at approximately 2 feet	MAX, EI, AL, CHM
5		SPT	14 31 42			"CL"		**QUATERNARY VERY OLD PARALIC DEPOSITS:** Hard, moist, reddish brown, fine grained sandy CLAYSTONE, oxidized.	AL, CN
						"SC"		Medium dense, moist, reddish brown, clayey fine to medium grained SANDSTONE, oxidized, massive.	
10		Ring	7 11 13						
						"CL"		Very stiff to hard, moist, reddish brown, fine to medium grained sandy CLAYSTONE with trace gravel, oxidized.	
15		SPT	50/5"					Abundant gravel	CN
								Total Depth: 17' (refusal on gravel) No Groundwater Encountered	
20									
25									

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~416 FEET

BORING: B-5

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0								Asphalt: 0-3" Base Material: 3-7"	
						SC/CL		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense or stiff, slightly moist, dark brown, clayey fine to medium grained SAND with trace gravel.	
						CL		Very stiff, moist, dark reddish brown, fine to medium grained sandy CLAY.	
5		X	9 14 25						
						"SM"		**QUATERNARY VERY OLD PARALIC DEPOSITS:** Very dense, slightly moist, light reddish brown, silty fine grained SANDSTONE, oxidized.	
10		X	18 22 32						
								Total Depth: 11.5' No Groundwater Encountered	
15									
20									
25									

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~419 FEET

BORING: B-6

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, dark reddish brown, clayey fine to medium grained SAND with trace gravel.	
						CL		Stiff, moist, dark brown, fine grained sandy CLAY with gravel. Becomes dark olive gray	
5		X	50/3"						AL
						"SM"		**QUATERNARY VERY OLD PARALIC DEPOSITS:** Very dense, slightly moist, reddish brown, silty fine grained SANDSTONE with gravel, oxidized.	
								Total Depth: 6.0' (Refusal on gravel) No Groundwater Encountered	
10									
15									
20									
25									

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~417 FEET

BORING: B-7

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					CL		Asphalt: 0-3" Base Material: 3-11" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff, moist, brown, fine to medium grained sandy CLAY with trace gravel.	EI, RV, CHM
5		▯	50/2"			"SC"		**QUATERNARY VERY OLD PARALIC DEPOSITS:** Very dense, slightly moist, reddish olive, clayey fine grained SANDSTONE with gravel, oxidized.	
								Total Depth: 7.0' (Refusal on gravel) No Groundwater Encountered	
10									
15									
20									
25									

APPENDIX C

LABORATORY METHODS AND RESULTS

LABORATORY METHODS AND RESULTS

Laboratory Testing Program

Laboratory tests were performed on representative soil samples to detect their relative engineering properties. Tests were performed following test methods of the American Society for Testing Materials or other accepted standards. The following presents a brief description of the various test methods used.

Classification

Soils were classified visually according to the Unified Soil Classification System. Visual classifications were supplemented by laboratory testing of selected samples according to ASTM D2487. The soil classifications are shown on the Exploration Logs in Appendix B.

Modified Proctor

Laboratory maximum dry density and optimum moisture content were evaluated according to ASTM D 1557, Method A. A mechanically operated rammer was used during the compaction process.

Expansion Index

Expansion testing was performed on selected samples of the matrix of the on-site soils according to ASTM D 4829.

Resistance "R"-Value

The resistance "R"-value was determined by the California Materials Method No. 301 for representative subbase soils. Samples were prepared and exudation pressure and "R"-value determined. The graphically determined "R"- value at exudation pressure of 300 psi is the value used for pavement section calculation.

Particle-Size Analysis

Particle-size analyses were performed on selected representative samples according to ASTM D 422.

Atterberg Limits

The procedure of ASTM D4518-84 was used to measure the liquid limit, plastic limit and plasticity index of representative samples.

Consolidation

To assess their compressibility and volume change behavior when loaded and wetted, relatively undisturbed samples of representative samples from the investigation were subject to consolidation tests in accordance with ASTM D 2435.

Chemical Analysis

Soil materials were collected with sterile sampling equipment and tested for Sulfate and Chloride content, pH, Corrosivity, and Resistivity.

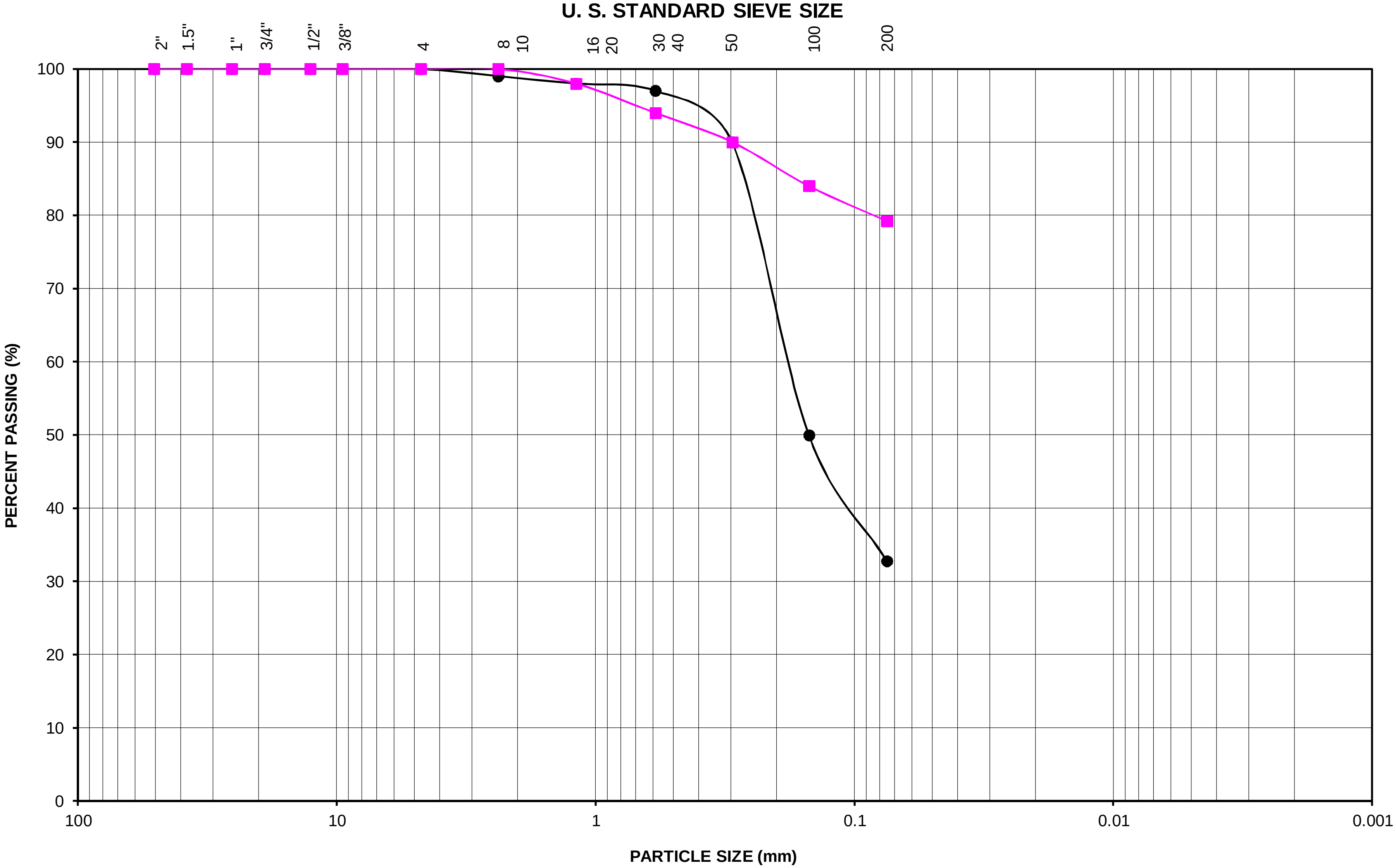
ATTERBERG LIMITS

LOCATION	DEPTH (feet)	LIQUID LIMIT	PLASTICITY INDEX	CLASSIFICATION
B-4	0-5	34	21	CL
B-4	5	39	15	CL
B-6	5	33	22	CL

MODIFIED PROCTOR

ASTM D 1557

LOCATION	DEPTH (feet)	MAXIUM DRY DENSITY (PCF)	OPTIMUM MOISTURE (%)
B-2	0-5	124.4 (RC 130.4)	10.3 (RC 8.5)
B-4	0-5	118.9 (RC 122.8)	10.9 (RC 9.8)



PARTICLE SIZE ANALYSIS

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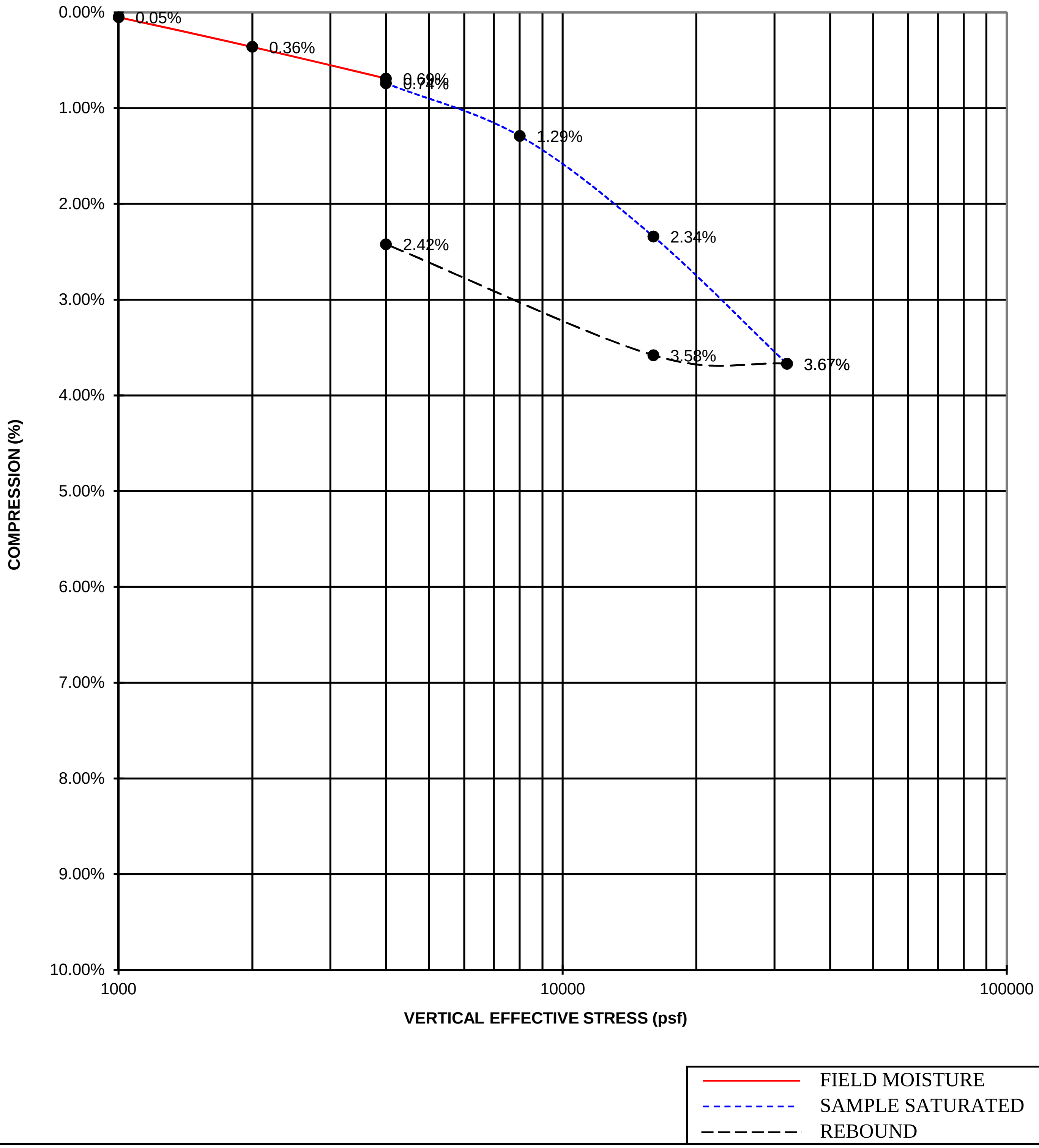
Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-3	5	●	0	0	SM
B-3	10	■	0	0	CL
CTE JOB NUMBER:		10-14209G		FIGURE:	C-1

Construction Testing & Engineering, Inc.

Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying

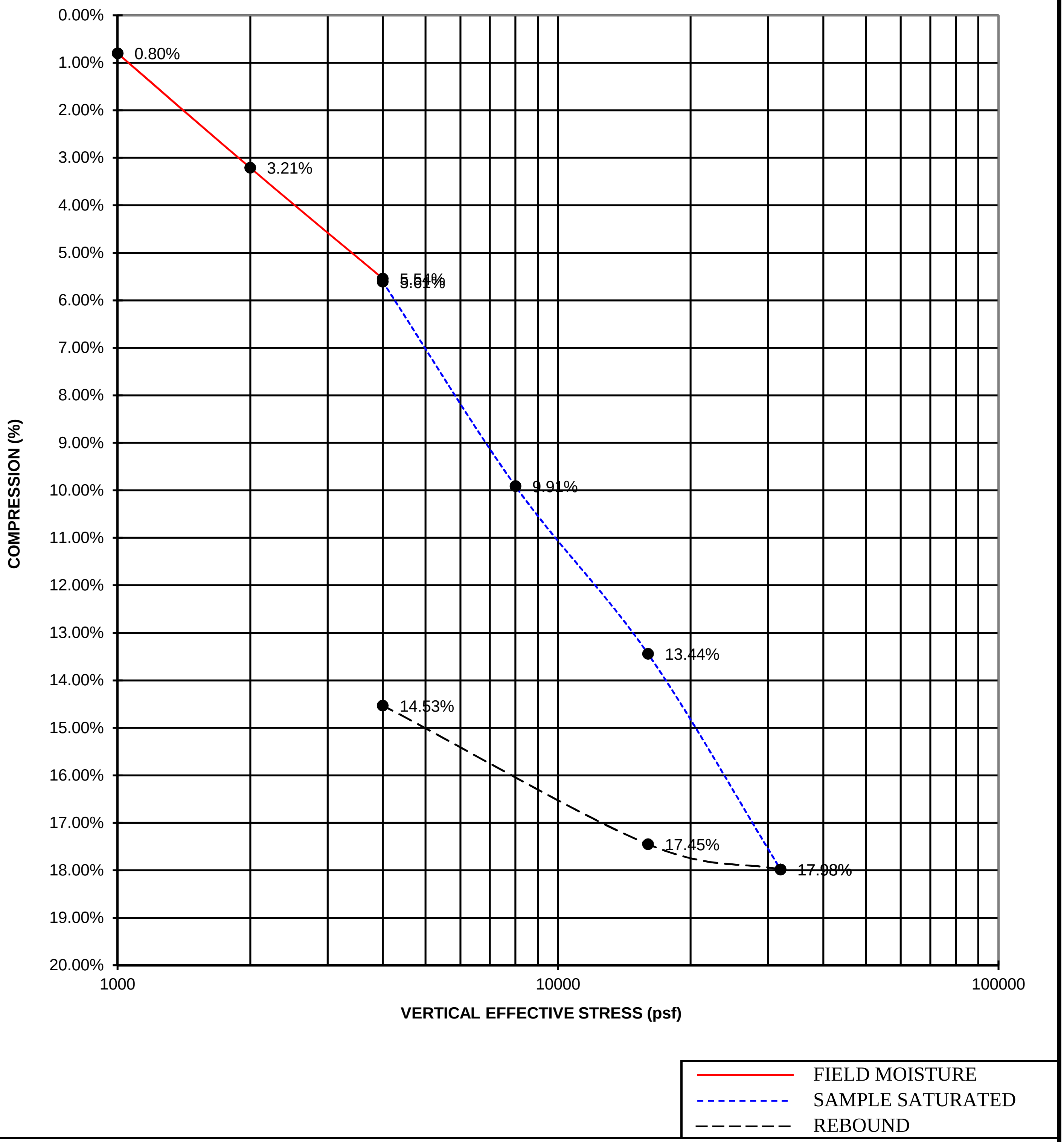


Consolidation Test ASTM D2435

Project Name:	Protea-VA San Diego				
Project Number:	10-14209G	Sample Date:	3/29/2018	Initial Moisture (%):	23.7
Lab Number:	28298	Test Date:	4/12/2018	Final Moisture (%):	24.1
Sample Location:	B-4 @ 5'	Tested By:	JNC	Initial Dry Density (PCF):	98.9
Sample Description:	Moderate yellowish brown CL			Final Dry Density (PCF):	101.3

CTE INC. Construction Testing & Engineering, Inc.

Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying



Consolidation Test ASTM D2435

Project Name: Portea VA- San Diego

Project Number: 10-14209G
Sample Date: 3/29/2018
Initial Moisture (%): 22.1

Lab Number: 28298
Test Date: 4/15/2018
Final Moisture (%): 20.4

Sample Location: B-4 @ 15'
Tested By: RCV
Initial Dry Density (PCF): 91.8

Sample Description: Dark brown CL/CH
Final Dry Density (PCF): 107.5

APPENDIX D

STANDARD SPECIFICATIONS FOR GRADING

Section 1 - General

Construction Testing & Engineering, Inc. presents the following standard recommendations for grading and other associated operations on construction projects. These guidelines should be considered a portion of the project specifications. Recommendations contained in the body of the previously presented soils report shall supersede the recommendations and or requirements as specified herein. The project geotechnical consultant shall interpret disputes arising out of interpretation of the recommendations contained in the soils report or specifications contained herein.

Section 2 - Responsibilities of Project Personnel

The geotechnical consultant should provide observation and testing services sufficient to general conformance with project specifications and standard grading practices. The geotechnical consultant should report any deviations to the client or his authorized representative.

The Client should be chiefly responsible for all aspects of the project. He or his authorized representative has the responsibility of reviewing the findings and recommendations of the geotechnical consultant. He shall authorize or cause to have authorized the Contractor and/or other consultants to perform work and/or provide services. During grading the Client or his authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

The Contractor is responsible for the safety of the project and satisfactory completion of all grading and other associated operations on construction projects, including, but not limited to, earth work in accordance with the project plans, specifications and controlling agency requirements.

Section 3 - Preconstruction Meeting

A preconstruction site meeting should be arranged by the owner and/or client and should include the grading contractor, design engineer, geotechnical consultant, owner's representative and representatives of the appropriate governing authorities.

Section 4 - Site Preparation

The client or contractor should obtain the required approvals from the controlling authorities for the project prior, during and/or after demolition, site preparation and removals, etc. The appropriate approvals should be obtained prior to proceeding with grading operations.

Clearing and grubbing should consist of the removal of vegetation such as brush, grass, woods, stumps, trees, root of trees and otherwise deleterious natural materials from the areas to be graded. Clearing and grubbing should extend to the outside of all proposed excavation and fill areas.

Demolition should include removal of buildings, structures, foundations, reservoirs, utilities (including underground pipelines, septic tanks, leach fields, seepage pits, cisterns, mining shafts, tunnels, etc.) and other man-made surface and subsurface improvements from the areas to be graded. Demolition of utilities should include proper capping and/or rerouting pipelines at the project perimeter and cutoff and capping of wells in accordance with the requirements of the governing authorities and the recommendations of the geotechnical consultant at the time of demolition.

Trees, plants or man-made improvements not planned to be removed or demolished should be protected by the contractor from damage or injury.

Debris generated during clearing, grubbing and/or demolition operations should be wasted from areas to be graded and disposed off-site. Clearing, grubbing and demolition operations should be performed under the observation of the geotechnical consultant.

Section 5 - Site Protection

Protection of the site during the period of grading should be the responsibility of the contractor. Unless other provisions are made in writing and agreed upon among the concerned parties, completion of a portion of the project should not be considered to preclude that portion or adjacent areas from the requirements for site protection until such time as the entire project is complete as identified by the geotechnical consultant, the client and the regulating agencies.

Precautions should be taken during the performance of site clearing, excavations and grading to protect the work site from flooding, ponding or inundation by poor or improper surface drainage. Temporary provisions should be made during the rainy season to adequately direct surface drainage away from and off the work site. Where low areas cannot be avoided, pumps should be kept on hand to continually remove water during periods of rainfall.

Rain related damage should be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress and other adverse conditions as determined by the geotechnical consultant. Soil adversely affected should be classified as unsuitable materials and should be subject to overexcavation and replacement with compacted fill or other remedial grading as recommended by the geotechnical consultant.

The contractor should be responsible for the stability of all temporary excavations. Recommendations by the geotechnical consultant pertaining to temporary excavations (e.g., backcuts) are made in consideration of stability of the completed project and, therefore, should not be considered to preclude the responsibilities of the contractor. Recommendations by the geotechnical consultant should not be considered to preclude requirements that are more restrictive by the regulating agencies. The contractor should provide during periods of extensive rainfall plastic sheeting to prevent unprotected slopes from becoming saturated and unstable. When deemed appropriate by the geotechnical consultant or governing agencies the contractor shall install checkdams, desilting basins, sand bags or other drainage control measures.

In relatively level areas and/or slope areas, where saturated soil and/or erosion gullies exist to depths of greater than 1.0 foot; they should be overexcavated and replaced as compacted fill in accordance with the applicable specifications. Where affected materials exist to depths of 1.0 foot or less below proposed finished grade, remedial grading by moisture conditioning in-place, followed by thorough recompaction in accordance with the applicable grading guidelines herein may be attempted. If the desired results are not achieved, all affected materials should be overexcavated and replaced as compacted fill in accordance with the slope repair recommendations herein. If field conditions dictate, the geotechnical consultant may recommend other slope repair procedures.

Section 6 - Excavations

6.1 Unsuitable Materials

Materials that are unsuitable should be excavated under observation and recommendations of the geotechnical consultant. Unsuitable materials include, but may not be limited to, dry, loose, soft, wet, organic compressible natural soils and fractured, weathered, soft bedrock and nonengineered or otherwise deleterious fill materials.

Material identified by the geotechnical consultant as unsatisfactory due to its moisture conditions should be overexcavated; moisture conditioned as needed, to a uniform at or above optimum moisture condition before placement as compacted fill.

If during the course of grading adverse geotechnical conditions are exposed which were not anticipated in the preliminary soil report as determined by the geotechnical consultant additional exploration, analysis, and treatment of these problems may be recommended.

6.2 Cut Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent cut slopes should not be steeper than 2:1 (horizontal: vertical).

The geotechnical consultant should observe cut slope excavation and if these excavations expose loose cohesionless, significantly fractured or otherwise unsuitable material, the materials should be overexcavated and replaced with a compacted stabilization fill. If encountered specific cross section details should be obtained from the Geotechnical Consultant.

When extensive cut slopes are excavated or these cut slopes are made in the direction of the prevailing drainage, a non-erodible diversion swale (brow ditch) should be provided at the top of the slope.

6.3 Pad Areas

All lot pad areas, including side yard terrace containing both cut and fill materials, transitions, located less than 3 feet deep should be overexcavated to a depth of 3 feet and replaced with a uniform compacted fill blanket of 3 feet. Actual depth of overexcavation may vary and should be delineated by the geotechnical consultant during grading, especially where deep or drastic transitions are present.

For pad areas created above cut or natural slopes, positive drainage should be established away from the top-of-slope. This may be accomplished utilizing a berm drainage swale and/or an appropriate pad gradient. A gradient in soil areas away from the top-of-slopes of 2 percent or greater is recommended.

Section 7 - Compacted Fill

All fill materials should have fill quality, placement, conditioning and compaction as specified below or as approved by the geotechnical consultant.

7.1 Fill Material Quality

Excavated on-site or import materials which are acceptable to the geotechnical consultant may be utilized as compacted fill, provided trash, vegetation and other deleterious materials are removed prior to placement. All import materials anticipated for use on-site should be sampled tested and approved prior to and placement is in conformance with the requirements outlined.

Rocks 12 inches in maximum and smaller may be utilized within compacted fill provided sufficient fill material is placed and thoroughly compacted over and around all rock to effectively fill rock voids. The amount of rock should not exceed 40 percent by dry weight passing the 3/4-inch sieve. The geotechnical consultant may vary those requirements as field conditions dictate.

Where rocks greater than 12 inches but less than four feet of maximum dimension are generated during grading, or otherwise desired to be placed within an engineered fill, special handling in accordance with the recommendations below. Rocks greater than four feet should be broken down or disposed off-site.

7.2 Placement of Fill

Prior to placement of fill material, the geotechnical consultant should observe and approve the area to receive fill. After observation and approval, the exposed ground surface should be scarified to a depth of 6 to 8 inches. The scarified material should be conditioned (i.e. moisture added or air dried by continued discing) to achieve a moisture content at or slightly above optimum moisture conditions and compacted to a minimum of 90 percent of the maximum density or as otherwise recommended in the soils report or by appropriate government agencies.

Compacted fill should then be placed in thin horizontal lifts not exceeding eight inches in loose thickness prior to compaction. Each lift should be moisture conditioned as needed, thoroughly blended to achieve a consistent moisture content at or slightly above optimum and thoroughly compacted by mechanical methods to a minimum of 90 percent of laboratory maximum dry density. Each lift should be treated in a like manner until the desired finished grades are achieved.

The contractor should have suitable and sufficient mechanical compaction equipment and watering apparatus on the job site to handle the amount of fill being placed in consideration of moisture retention properties of the materials and weather conditions.

When placing fill in horizontal lifts adjacent to areas sloping steeper than 5:1 (horizontal: vertical), horizontal keys and vertical benches should be excavated into the adjacent slope area. Keying and benching should be sufficient to provide at least six-foot wide benches and a minimum of four feet of vertical bench height within the firm natural ground, firm bedrock or engineered compacted fill. No compacted fill should be placed in an area after keying and benching until the geotechnical consultant has reviewed the area. Material generated by the benching operation should be moved sufficiently away from the bench area to allow for the recommended review of the horizontal bench prior to placement of fill.

Within a single fill area where grading procedures dictate two or more separate fills, temporary slopes (false slopes) may be created. When placing fill adjacent to a false slope, benching should be conducted in the same manner as above described. At least a 3-foot vertical bench should be established within the firm core of adjacent approved compacted fill prior to placement of additional fill. Benching should proceed in at least 3-foot vertical increments until the desired finished grades are achieved.

Prior to placement of additional compacted fill following an overnight or other grading delay, the exposed surface or previously compacted fill should be processed by scarification, moisture conditioning as needed to at or slightly above optimum moisture content, thoroughly blended and recompacted to a minimum of 90 percent of laboratory maximum dry density. Where unsuitable materials exist to depths of greater than one foot, the unsuitable materials should be over-excavated.

Following a period of flooding, rainfall or overwatering by other means, no additional fill should be placed until damage assessments have been made and remedial grading performed as described herein.

Rocks 12 inch in maximum dimension and smaller may be utilized in the compacted fill provided the fill is placed and thoroughly compacted over and around all rock. No oversize material should be used within 3 feet of finished pad grade and within 1 foot of other compacted fill areas. Rocks 12 inches up to four feet maximum dimension should be placed below the upper 10 feet of any fill and should not be closer than 15 feet to any slope face. These recommendations could vary as locations of improvements dictate. Where practical, oversized material should not be placed below areas where structures or deep utilities are proposed. Oversized material should be placed in windrows on a clean, overexcavated or unyielding compacted fill or firm natural ground surface. Select native or imported granular soil (S.E. 30 or higher) should be placed and thoroughly flooded over and around all windrowed rock, such that voids are filled. Windrows of oversized material should be staggered so those successive strata of oversized material are not in the same vertical plane.

It may be possible to dispose of individual larger rock as field conditions dictate and as recommended by the geotechnical consultant at the time of placement.

The contractor should assist the geotechnical consultant and/or his representative by digging test pits for removal determinations and/or for testing compacted fill. The contractor should provide this work at no additional cost to the owner or contractor's client.

Fill should be tested by the geotechnical consultant for compliance with the recommended relative compaction and moisture conditions. Field density testing should conform to ASTM Method of Test D 1556-00, D 2922-04. Tests should be conducted at a minimum of approximately two vertical feet or approximately 1,000 to 2,000 cubic yards of fill placed. Actual test intervals may vary as field conditions dictate. Fill found not to be in conformance with the grading recommendations should be removed or otherwise handled as recommended by the geotechnical consultant.

7.3 Fill Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent fill slopes should not be steeper than 2:1 (horizontal: vertical).

Except as specifically recommended in these grading guidelines compacted fill slopes should be over-built two to five feet and cut back to grade, exposing the firm, compacted fill inner core. The actual amount of overbuilding may vary as field conditions dictate. If the desired results are not achieved, the existing slopes should be overexcavated and reconstructed under the guidelines of the geotechnical consultant. The degree of overbuilding shall be increased until the desired compacted slope surface condition is achieved. Care should be taken by the contractor to provide thorough mechanical compaction to the outer edge of the overbuilt slope surface.

At the discretion of the geotechnical consultant, slope face compaction may be attempted by conventional construction procedures including backrolling. The procedure must create a firmly compacted material throughout the entire depth of the slope face to the surface of the previously compacted firm fill intercore.

During grading operations, care should be taken to extend compactive effort to the outer edge of the slope. Each lift should extend horizontally to the desired finished slope surface or more as needed to ultimately established desired grades. Grade during construction should not be allowed to roll off at the edge of the slope. It may be helpful to elevate slightly the outer edge of the slope. Slough resulting from the placement of individual lifts should not be allowed to drift down over previous lifts. At intervals not exceeding four feet in vertical slope height or the capability of available equipment, whichever is less, fill slopes should be thoroughly dozer trackrolled.

For pad areas above fill slopes, positive drainage should be established away from the top-of-slope. This may be accomplished using a berm and pad gradient of at least two percent.

Section 8 - Trench Backfill

Utility and/or other excavation of trench backfill should, unless otherwise recommended, be compacted by mechanical means. Unless otherwise recommended, the degree of compaction should be a minimum of 90 percent of the laboratory maximum density.

Within slab areas, but outside the influence of foundations, trenches up to one foot wide and two feet deep may be backfilled with sand and consolidated by jetting, flooding or by mechanical means. If on-site materials are utilized, they should be wheel-rolled, tamped or otherwise compacted to a firm condition. For minor interior trenches, density testing may be deleted or spot testing may be elected if deemed necessary, based on review of backfill operations during construction.

If utility contractors indicate that it is undesirable to use compaction equipment in close proximity to a buried conduit, the contractor may elect the utilization of light weight mechanical compaction equipment and/or shading of the conduit with clean, granular material, which should be thoroughly jetted in-place above the conduit, prior to initiating mechanical compaction procedures. Other methods of utility trench compaction may also be appropriate, upon review of the geotechnical consultant at the time of construction.

In cases where clean granular materials are proposed for use in lieu of native materials or where flooding or jetting is proposed, the procedures should be considered subject to review by the geotechnical consultant. Clean granular backfill and/or bedding are not recommended in slope areas.

Section 9 - Drainage

Where deemed appropriate by the geotechnical consultant, canyon subdrain systems should be installed in accordance with CTE’s recommendations during grading.

Typical subdrains for compacted fill buttresses, slope stabilization or sidehill masses, should be installed in accordance with the specifications.

Roof, pad and slope drainage should be directed away from slopes and areas of structures to suitable disposal areas via non-erodible devices (i.e., gutters, downspouts, and concrete swales).

For drainage in extensively landscaped areas near structures, (i.e., within four feet) a minimum of 5 percent gradient away from the structure should be maintained. Pad drainage of at least 2 percent should be maintained over the remainder of the site.

Drainage patterns established at the time of fine grading should be maintained throughout the life of the project. Property owners should be made aware that altering drainage patterns could be detrimental to slope stability and foundation performance.

Section 10 - Slope Maintenance

10.1 - Landscape Plants

To enhance surficial slope stability, slope planting should be accomplished at the completion of grading. Slope planting should consist of deep-rooting vegetation requiring little watering. Plants native to the southern California area and plants relative to native plants are generally desirable. Plants native to other semi-arid and arid areas may also be appropriate. A Landscape Architect should be the best party to consult regarding actual types of plants and planting configuration.

10.2 - Irrigation

Irrigation pipes should be anchored to slope faces, not placed in trenches excavated into slope faces.

Slope irrigation should be minimized. If automatic timing devices are utilized on irrigation systems, provisions should be made for interrupting normal irrigation during periods of rainfall.

10.3 - Repair

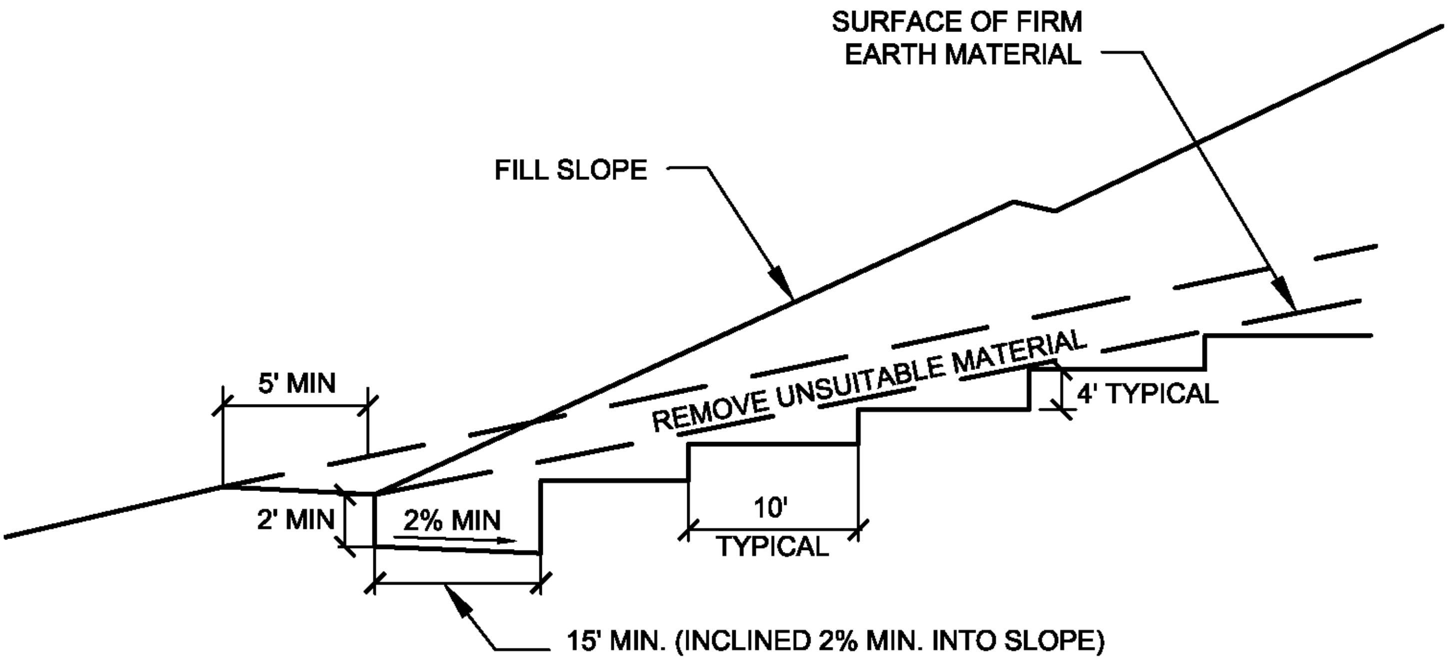
As a precautionary measure, plastic sheeting should be readily available, or kept on hand, to protect all slope areas from saturation by periods of heavy or prolonged rainfall. This measure is strongly recommended, beginning with the period prior to landscape planting.

If slope failures occur, the geotechnical consultant should be contacted for a field review of site conditions and development of recommendations for evaluation and repair.

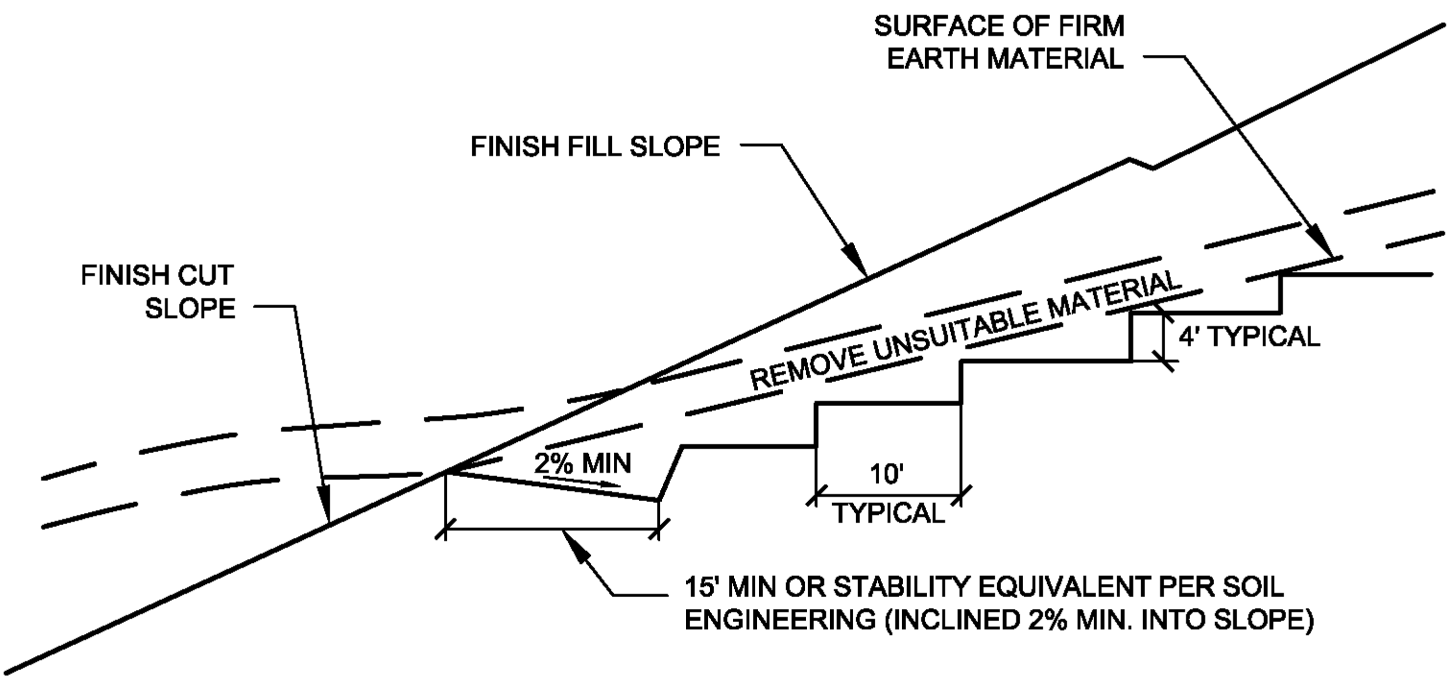
If slope failures occur as a result of exposure to period of heavy rainfall, the failure areas and currently unaffected areas should be covered with plastic sheeting to protect against additional saturation.

In the accompanying Standard Details, appropriate repair procedures are illustrated for superficial slope failures (i.e., occurring typically within the outer one foot to three feet of a slope face).

BENCHING FILL OVER NATURAL

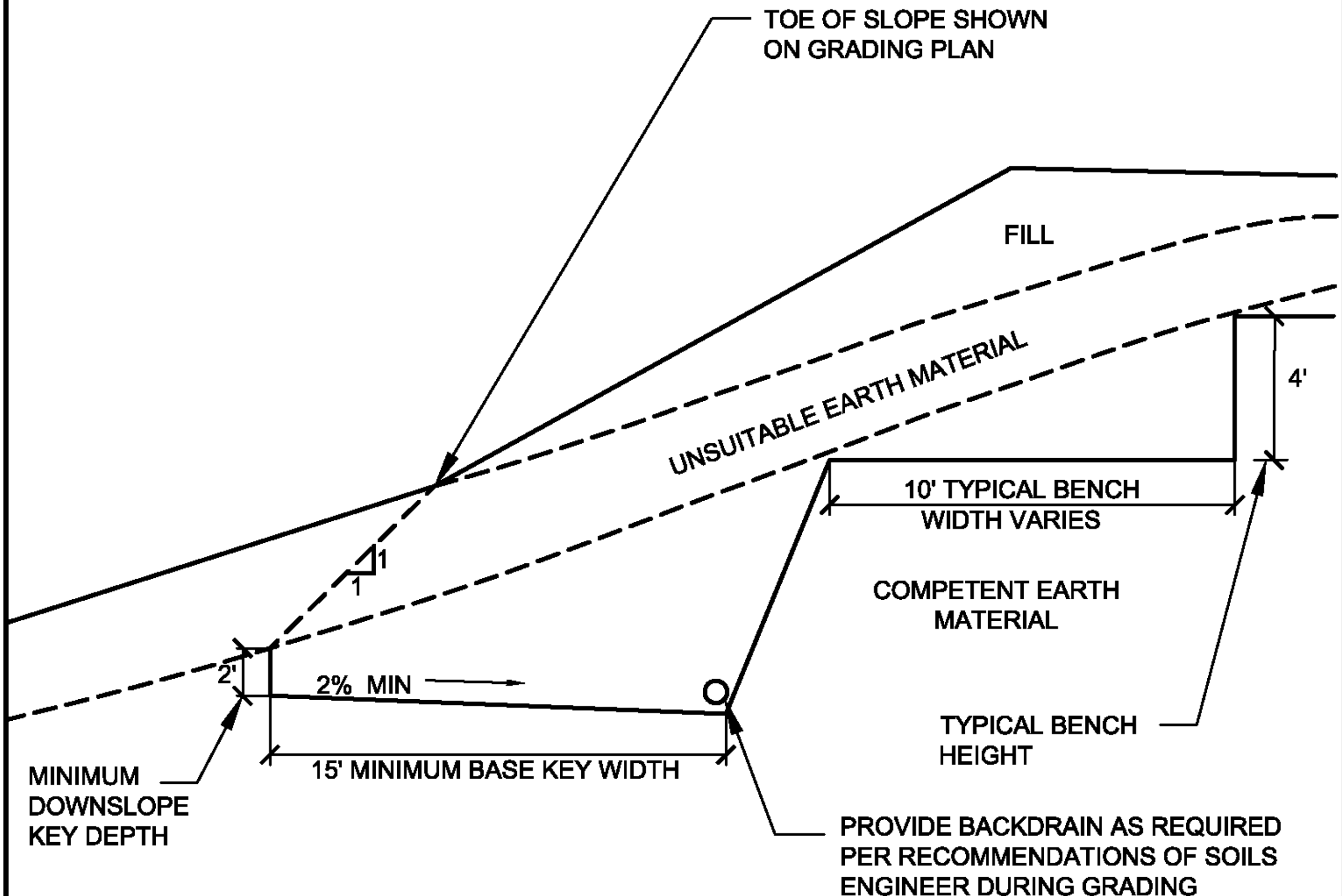


BENCHING FILL OVER CUT



NOT TO SCALE

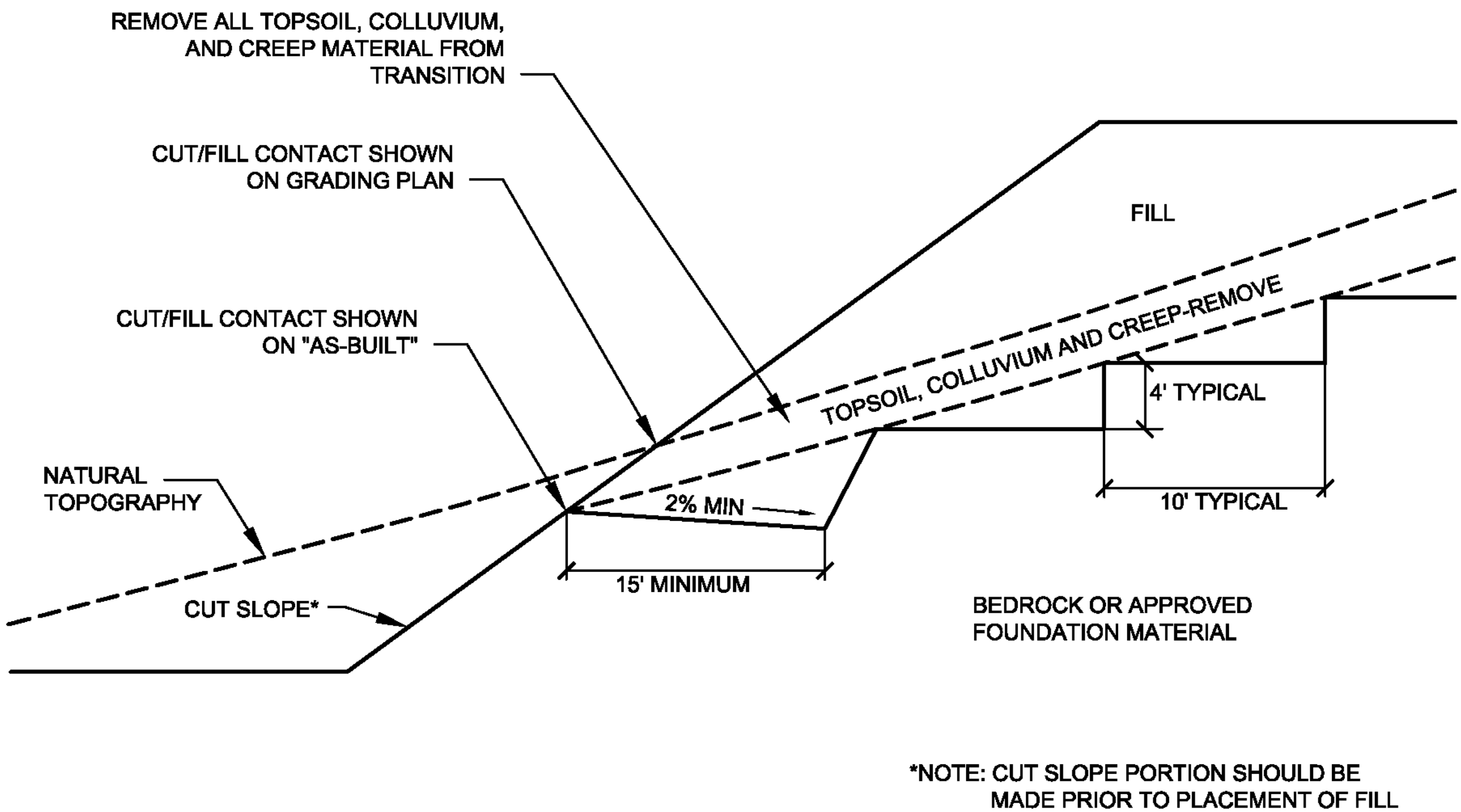
BENCHING FOR COMPACTED FILL DETAIL



WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, BENCHING IS NOT NECESSARY. FILL IS NOT TO BE PLACED ON COMPRESSIBLE OR UNSUITABLE MATERIAL.

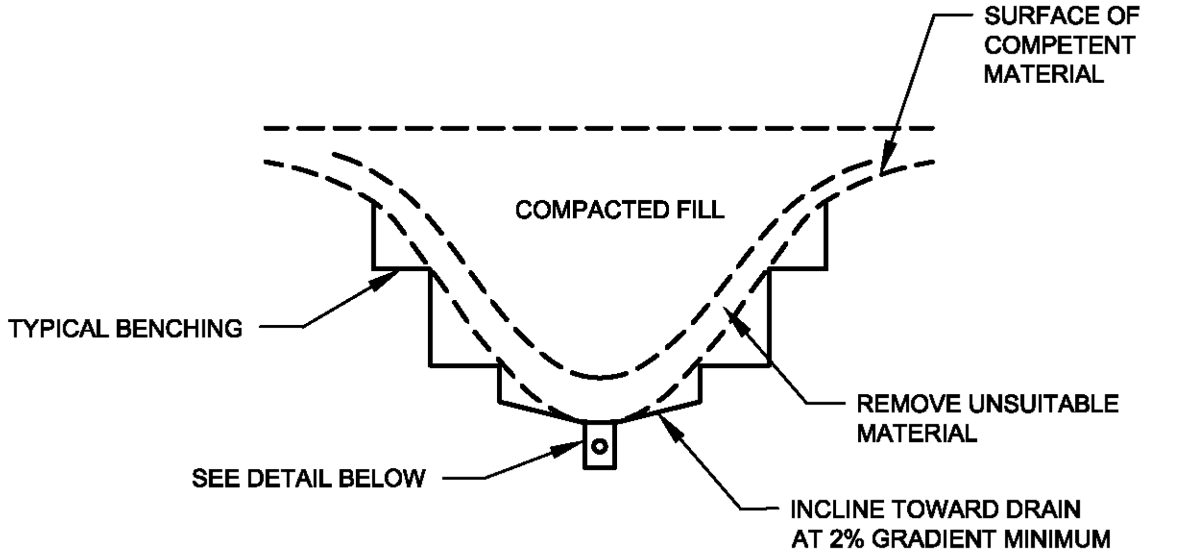
NOT TO SCALE

FILL SLOPE ABOVE NATURAL GROUND DETAIL

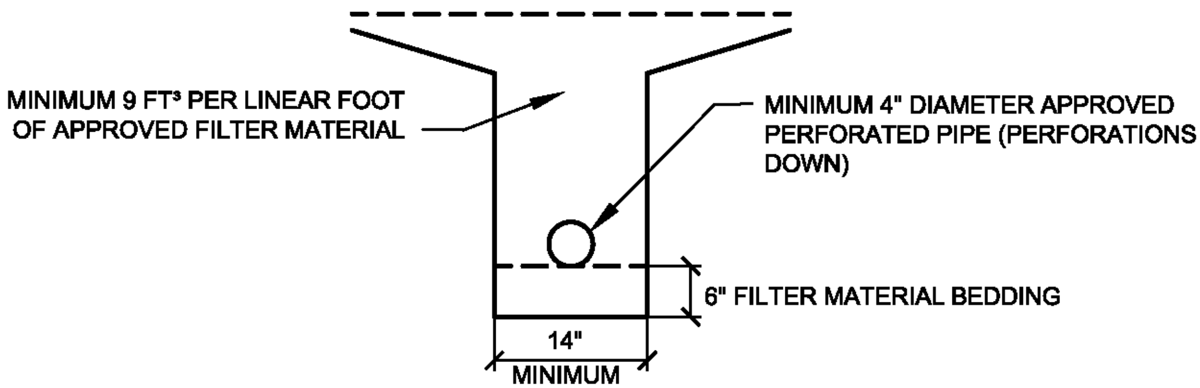


NOT TO SCALE

FILL SLOPE ABOVE CUT SLOPE DETAIL



DETAIL



CALTRANS CLASS 2 PERMEABLE MATERIAL FILTER MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYL-CHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 psi

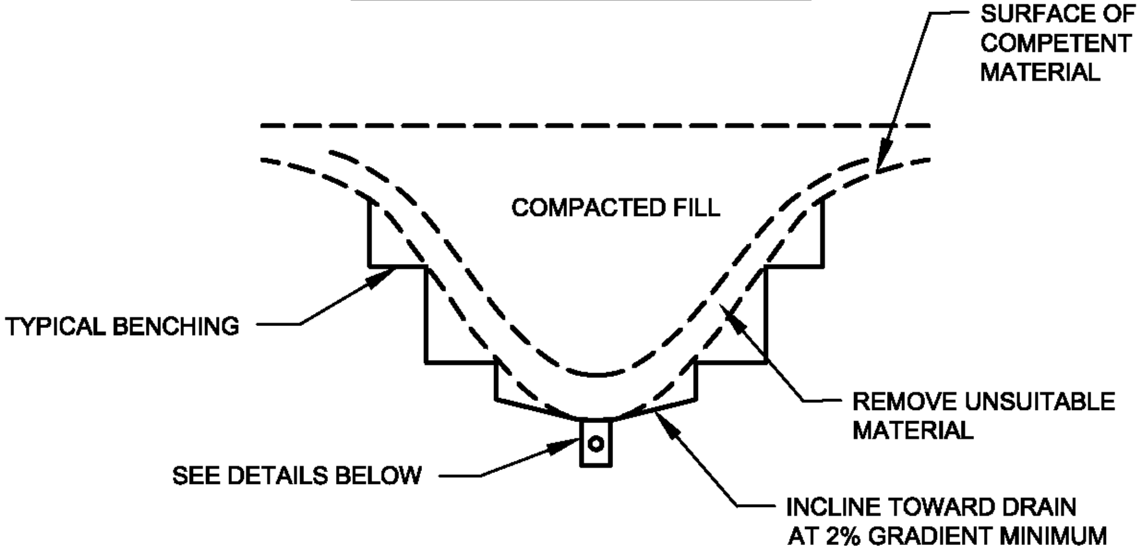
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
INITIAL 500'	4"
500' TO 1500'	6"
> 1500'	8"

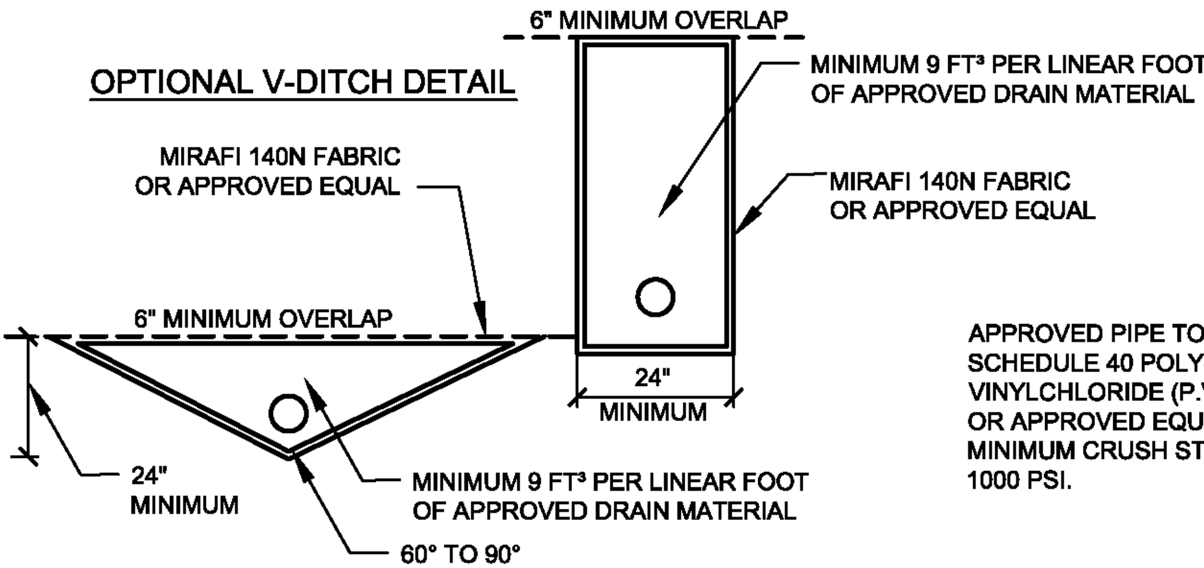
NOT TO SCALE

TYPICAL CANYON SUBDRAIN DETAIL

CANYON SUBDRAIN DETAILS



TRENCH DETAILS



APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYLCHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 PSI.

DRAIN MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 ½"	88-100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

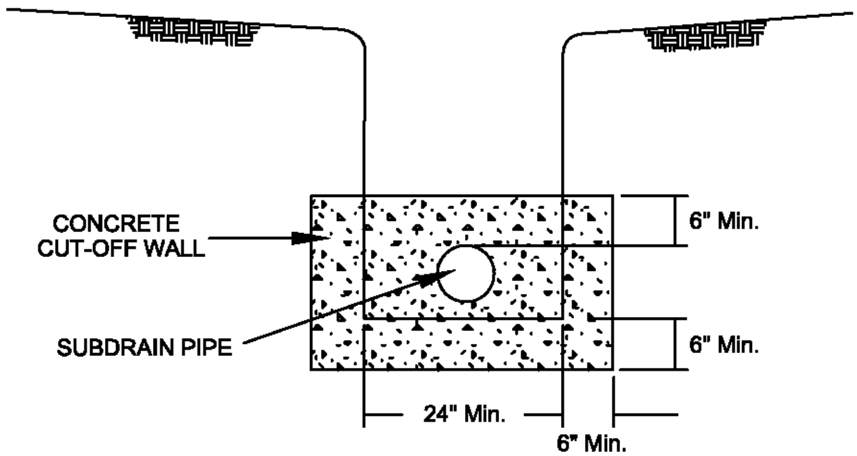
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
INITIAL 500'	4"
500' TO 1500'	6"
> 1500'	8"

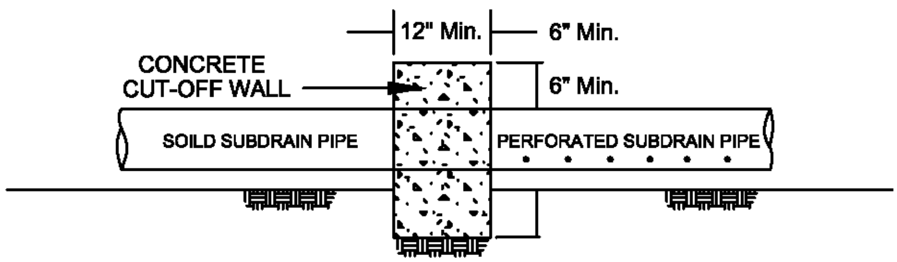
NOT TO SCALE

GEOFABRIC SUBDRAIN

FRONT VIEW



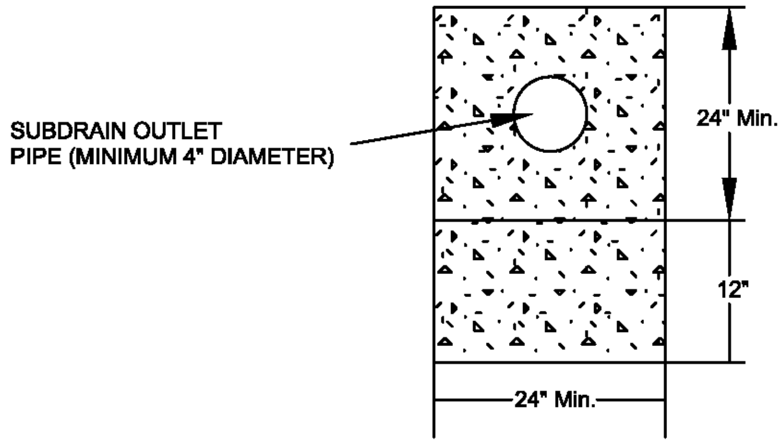
SIDE VIEW



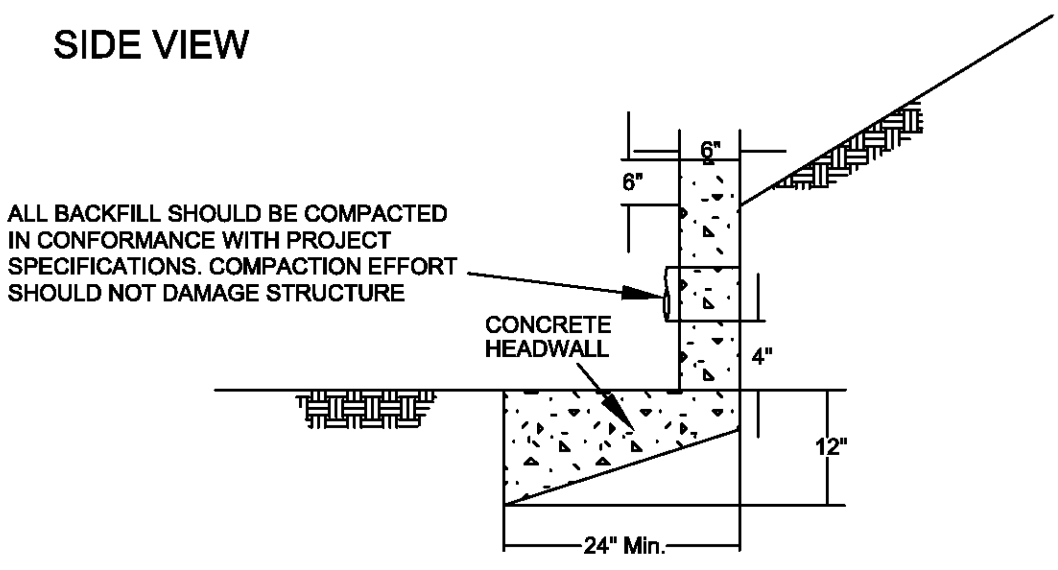
NOT TO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL

FRONT VIEW



SIDE VIEW



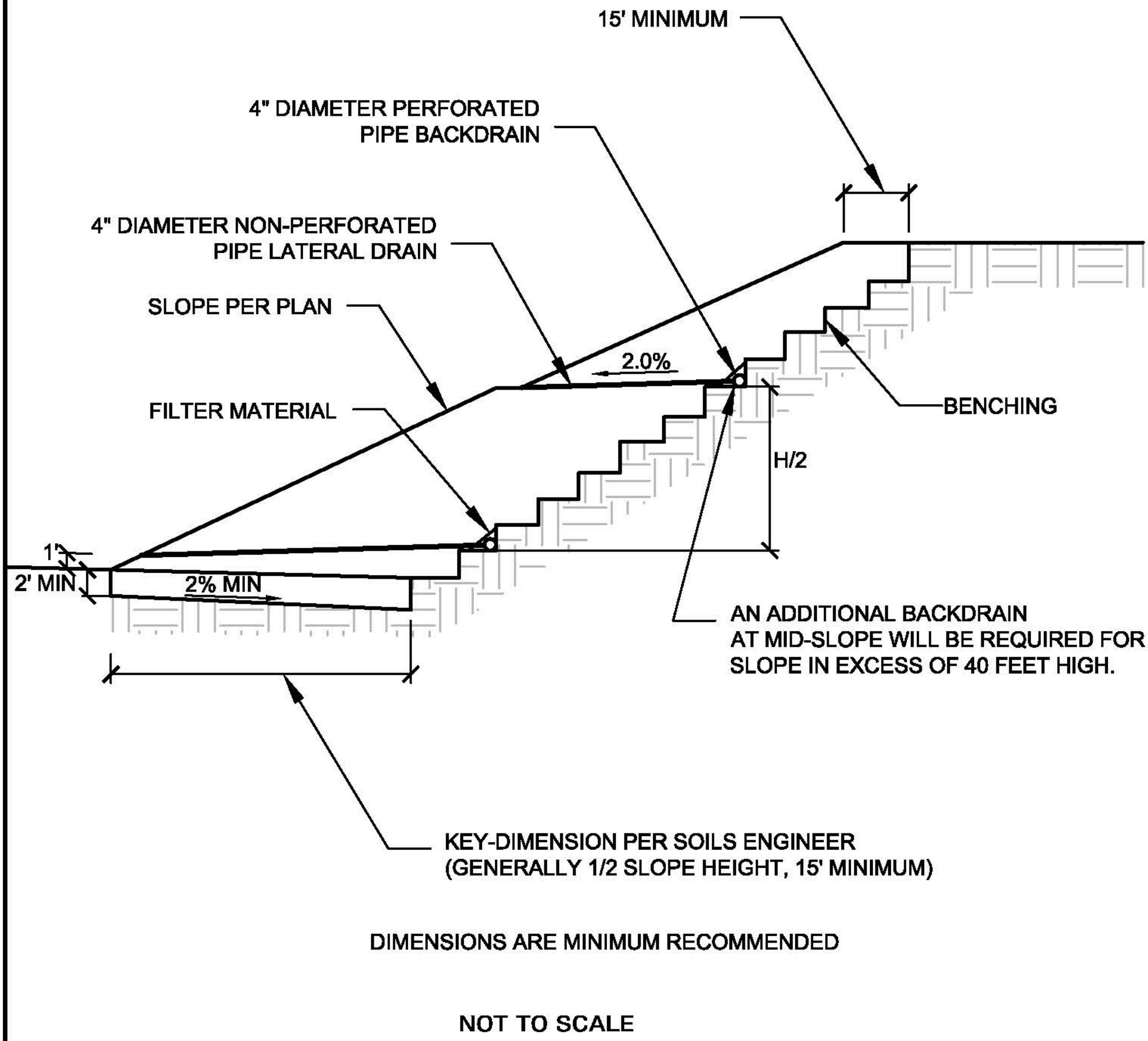
NOTE: HEADWALL SHOULD OUTLET AT TOE OF SLOPE OR INTO CONTROLLED SURFACE DRAINAGE DEVICE

ALL DISCHARGE SHOULD BE CONTROLLED

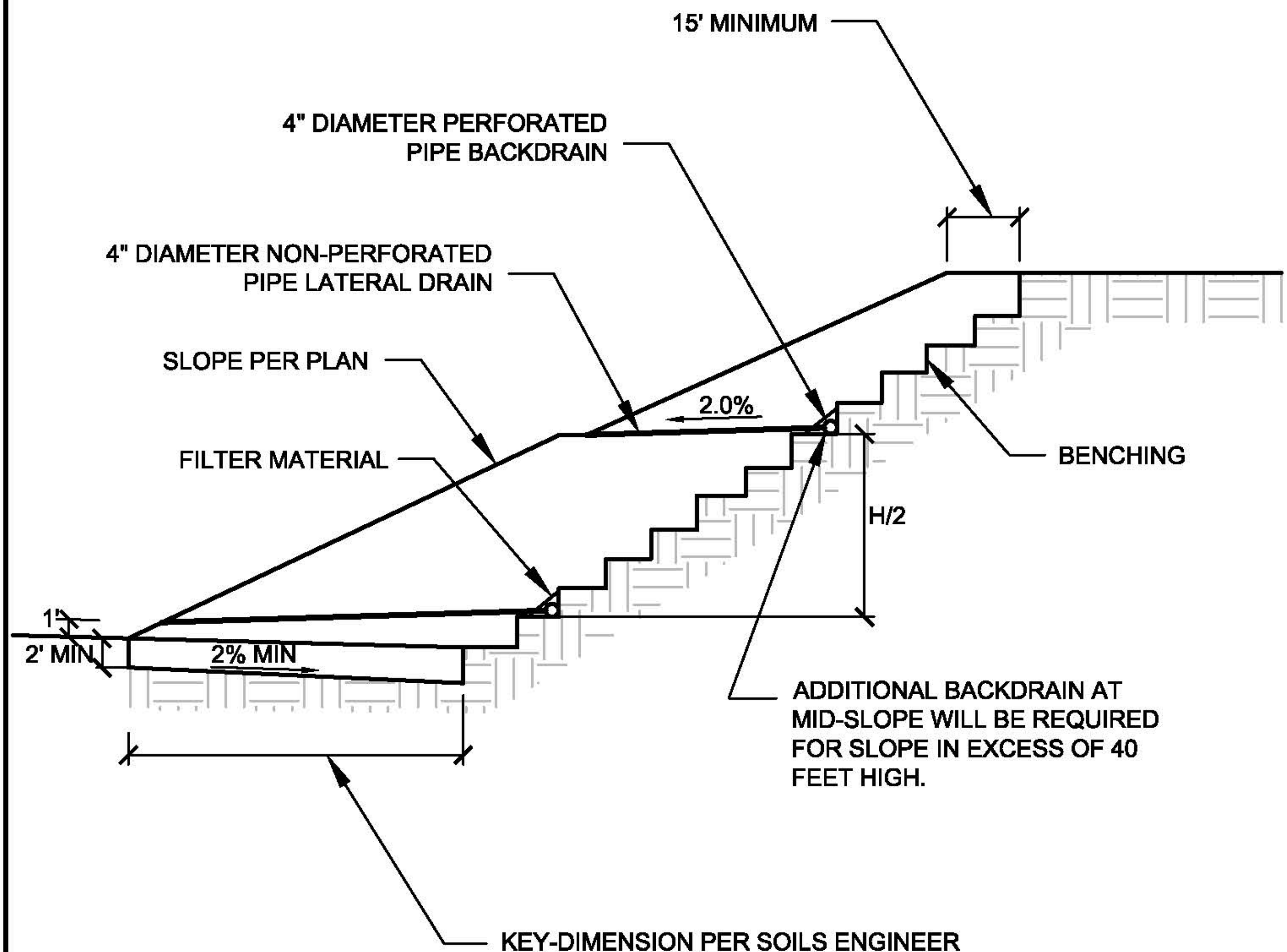
THIS DETAIL IS A MINIMUM DESIGN AND MAY BE MODIFIED DEPENDING UPON ENCOUNTERED CONDITIONS AND LOCAL REQUIREMENTS

NOT TO SCALE

TYPICAL SUBDRAIN OUTLET HEADWALL DETAIL



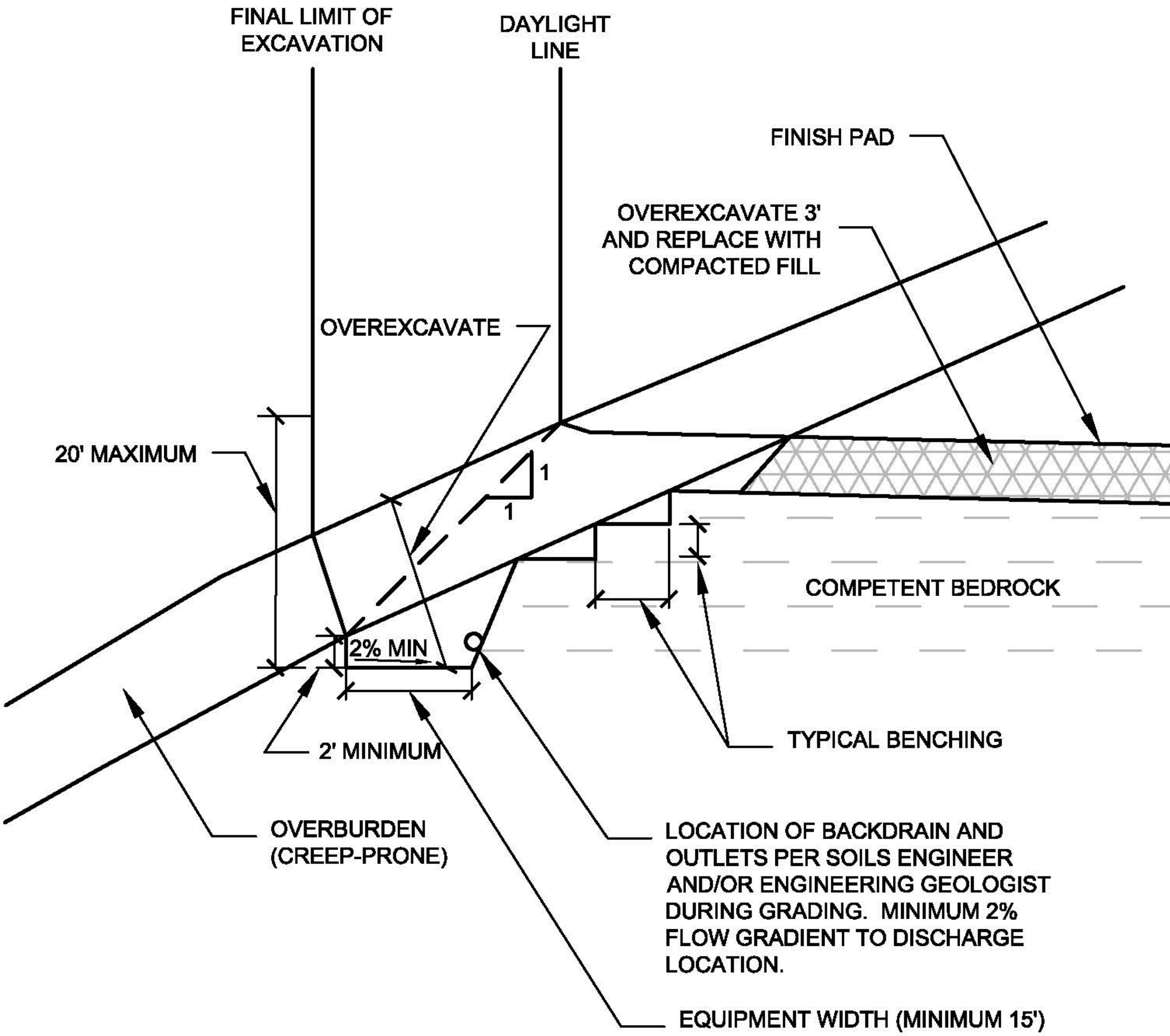
TYPICAL SLOPE STABILIZATION FILL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

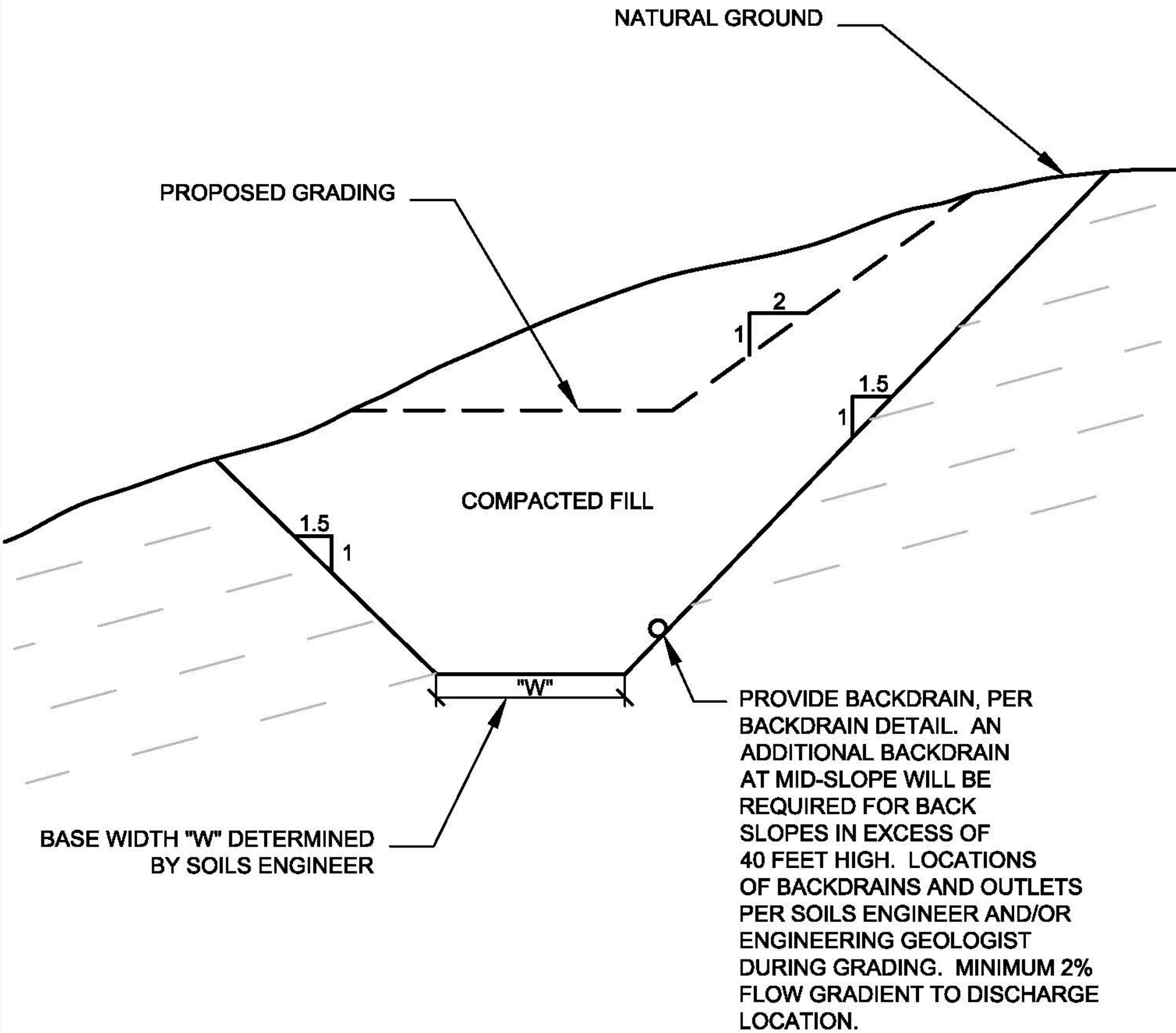
NOT TO SCALE

TYPICAL BUTTRESS FILL DETAIL



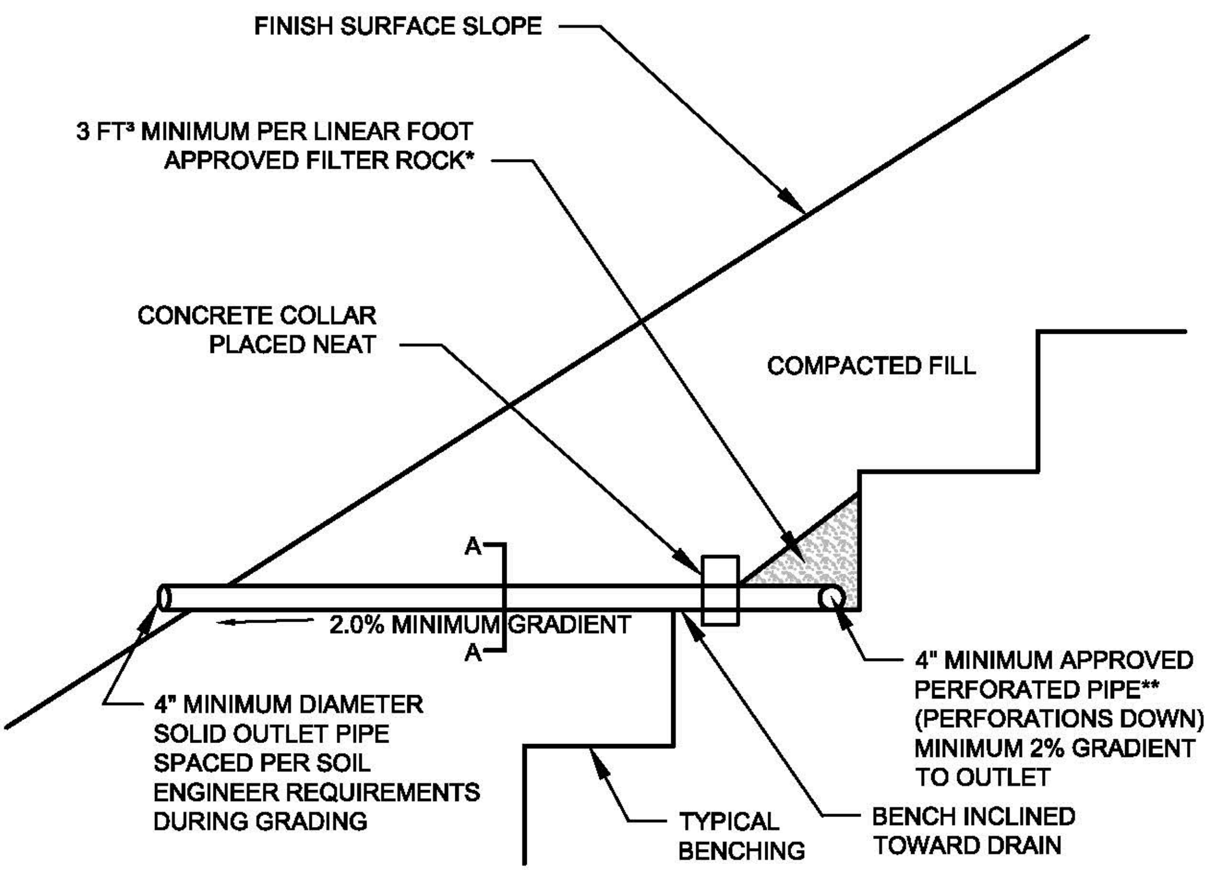
NOT TO SCALE

DAYLIGHT SHEAR KEY DETAIL

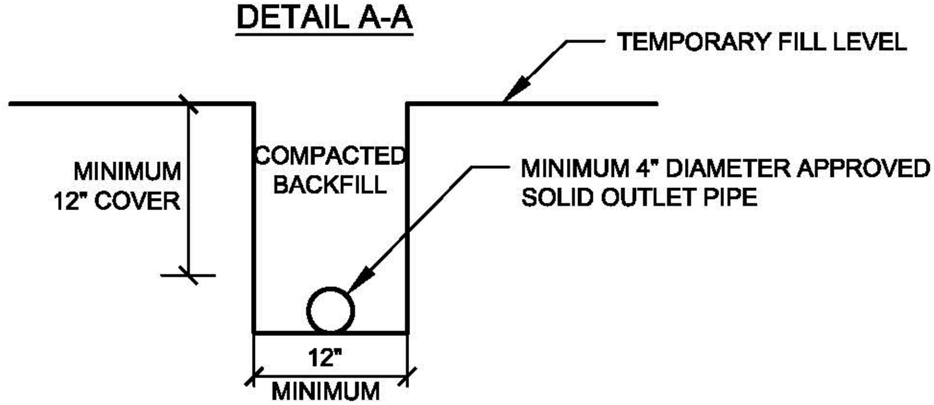


NOT TO SCALE

TYPICAL SHEAR KEY DETAIL



DETAIL A-A



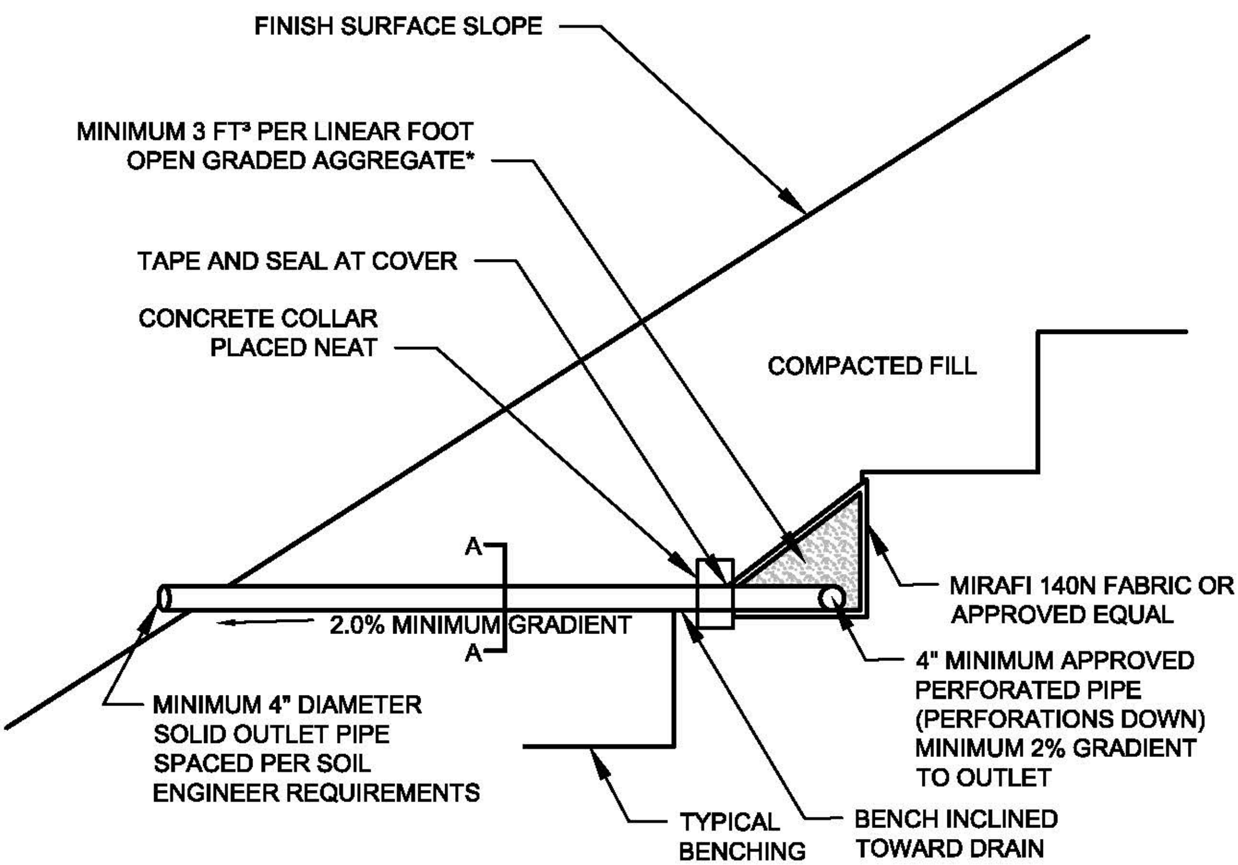
**APPROVED PIPE TYPE:
SCHEDULE 40 POLYVINYL CHLORIDE
(P.V.C.) OR APPROVED EQUAL.
MINIMUM CRUSH STRENGTH 1000 PSI

*FILTER ROCK TO MEET FOLLOWING
SPECIFICATIONS OR APPROVED EQUAL:

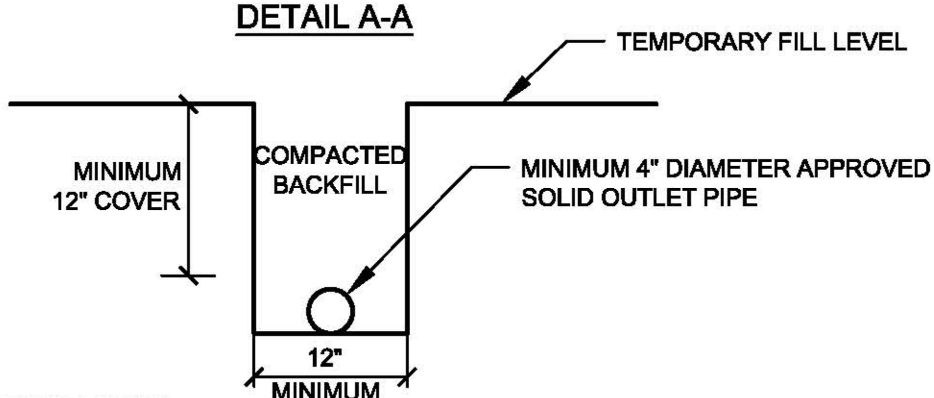
SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

NOT TO SCALE

TYPICAL BACKDRAIN DETAIL



DETAIL A-A

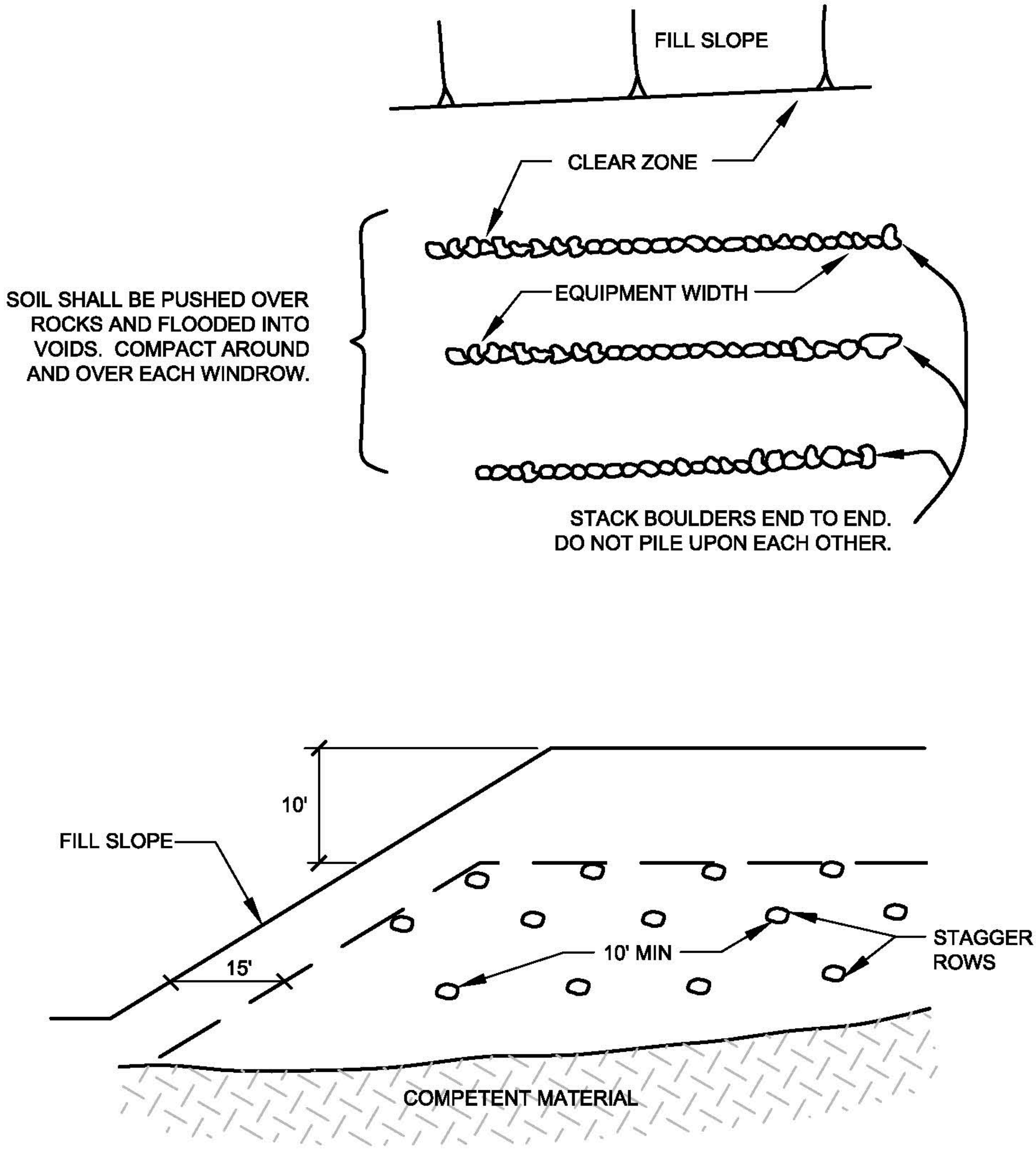


*NOTE: AGGREGATE TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 ½"	100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

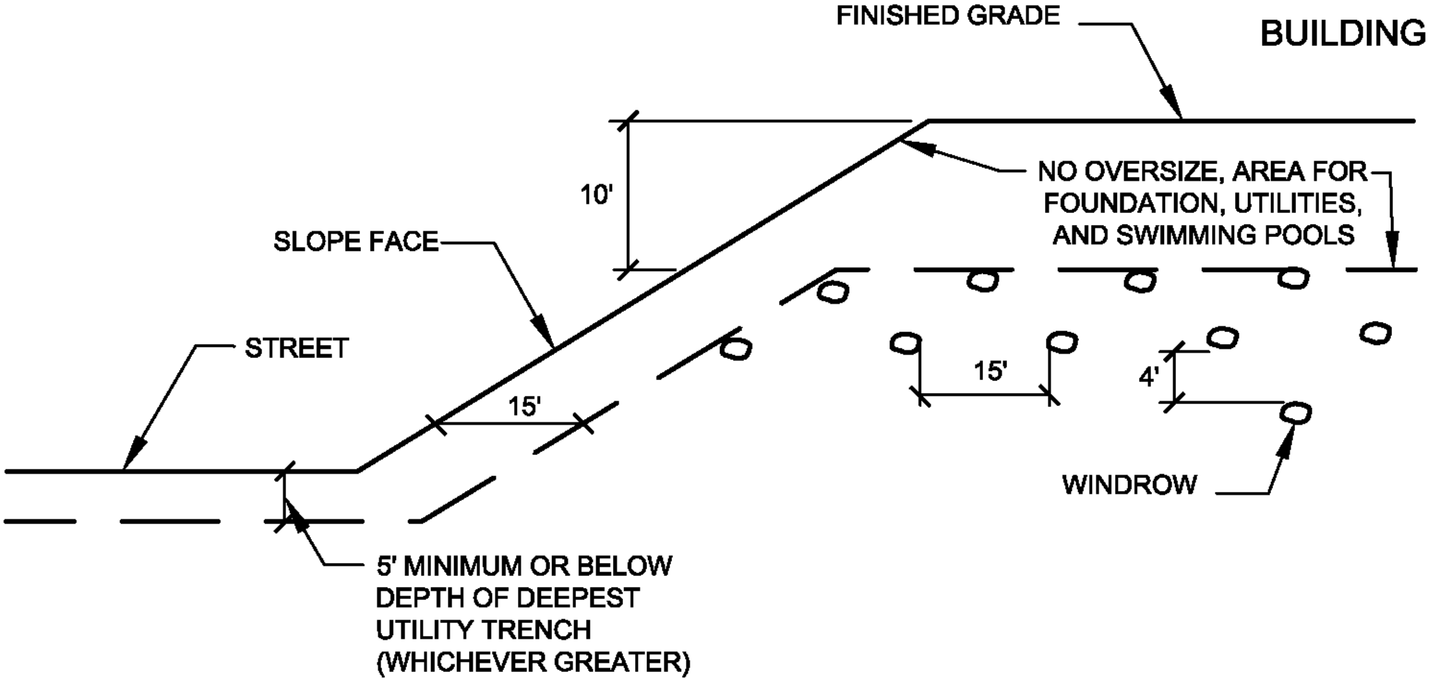
NOT TO SCALE

BACKDRAIN DETAIL (GEOFRABIC)

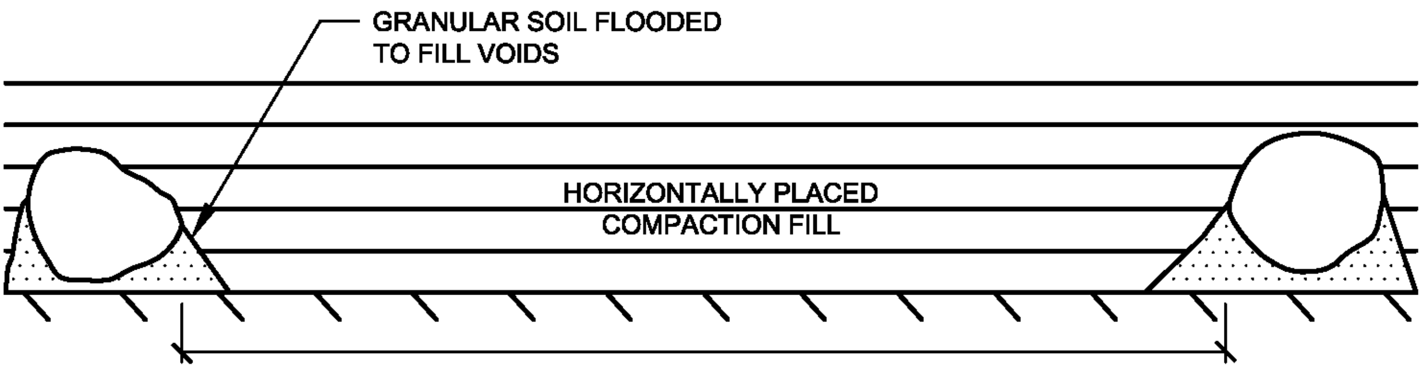


NOT TO SCALE

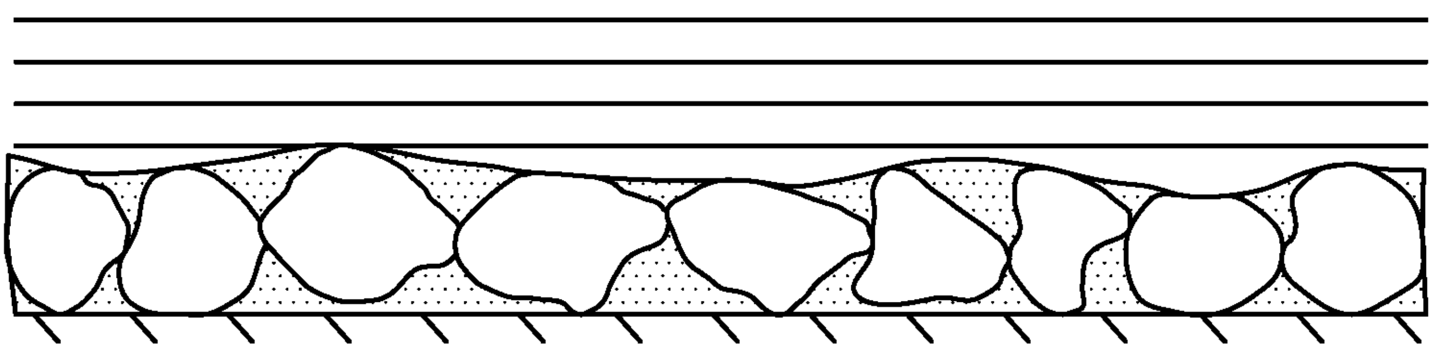
ROCK DISPOSAL DETAIL



TYPICAL WINDROW DETAIL (EDGE VIEW)



PROFILE VIEW

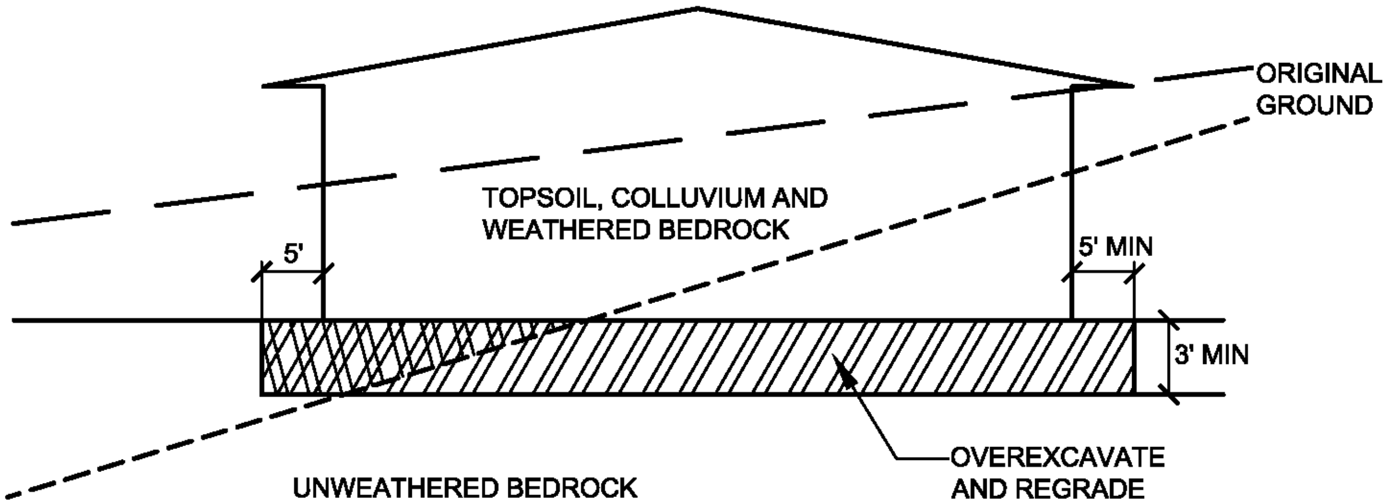


NOT TO SCALE

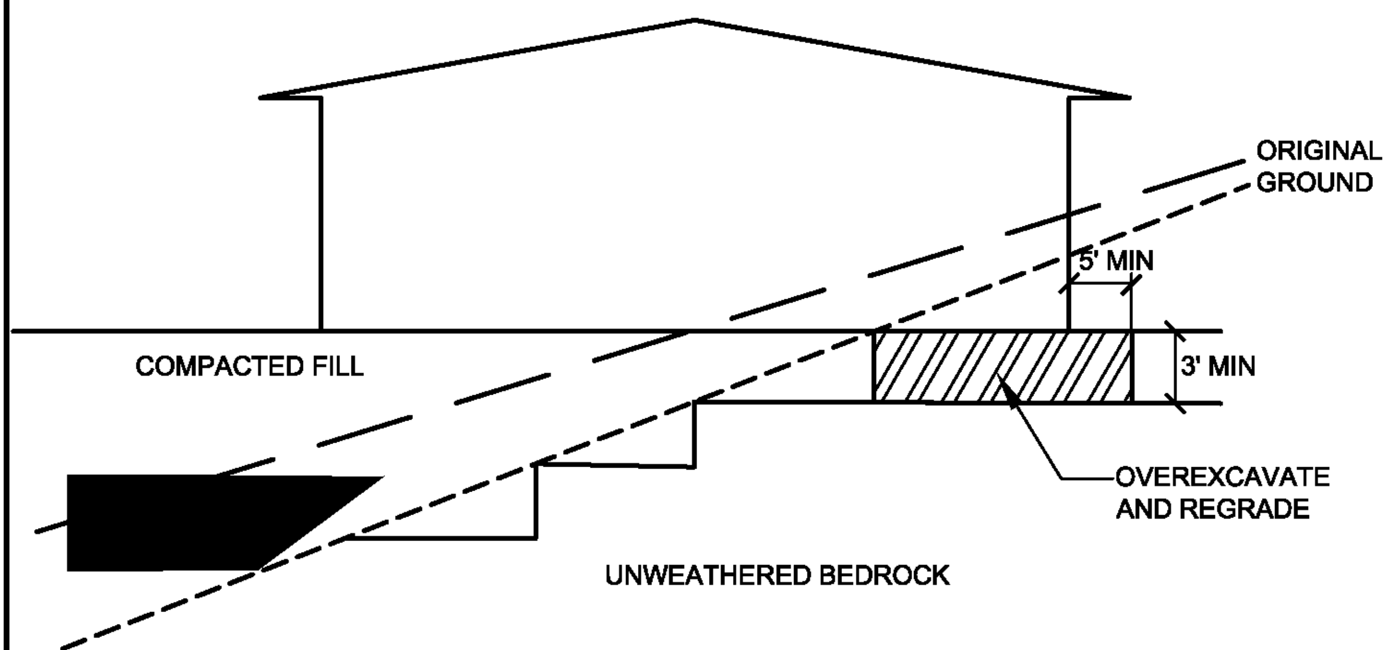
ROCK DISPOSAL DETAIL

GENERAL GRADING RECOMMENDATIONS

CUT LOT



CUT/FILL LOT (TRANSITION)



NOT TO SCALE

TRANSITION LOT DETAIL

APPENDIX E

C.4-1 WORKSHEET

APPENDIX E

Percolation Methodology

Water used to conduct the tests was supplied from an onsite water source. Weather conditions during the test were hot and sunny during both the presoaking and testing days. The percolation testing methodology was determined following the presoak period per the San Diego County guidelines. In summary, Case I conditions are determined by water remaining overnight following an initial four-hour presoak. Case II is considered a fast draining soil in which two columns of 12-14 inches of water percolate in less than 30 minutes during the second presoak period that is conducted after a minimum of 15 hours of the initial presoak period. Case III conditions result when no water remains in the test hole 15-30 hours after the initial four-hour presoak, but does not meet Case II conditions during the second presoak period. The presoak duration for all of the recent tests ranged from approximately 23 to 24 hours, which is within the SD DEH 15 to 30 hour presoak range. The approximate percolation test and boring locations are presented on Figure 2. The associated boring logs are included in Appendix B. Results of the recent percolation testing are presented in Tables E-1 through E-7 below.

Calculated Infiltration Rates

As per the City of San Diego BMP Design Manuel (January, 2018) infiltration rates are to be evaluated through the Porchet Method. The intent of the infiltration rate is to take into account bias inherent in percolation test bore hole sidewall infiltration as would not occur at a basin bottom where such sidewalls are not present.

The infiltration rate (It) is derived by the equation:

$$I_t = \frac{\Delta H \, \pi r2 \, 60}{\Delta t(\pi r2 + 2\pi r H_{avg})} = \frac{\Delta H \, 60 \, r}{\Delta t(r + 2H_{avg})}$$

Where:

It = tested infiltration rate, inches/hour
ΔH = change in head over the time interval, inches
Δt = time interval, minutes
* r = effective radius of test hole
Havg = average head over the time interval, inches

PROTEA-VA SAN DIEGO 10-14209G							
Percolation Field Data and Calculated Rates							
P-1						**Total Depth**	**61 inches**
Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minute	inches/hour
8:20:00	Initial	None	52.75	initial	initial		
8:50:00	0:30	"	52.75	52.88	0.13	0.0040	0.25
9:20:00	0:30	"	52.88	52.94	0.06	0.0020	0.13
P-2						**Total Depth**	**36 inches**
Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minute	inches/hour
8:23:00	Initial	None	28.63	initial	initial		
8:53:00	0:30	"	28.63	28.81	0.19	0.060	0.38
9:23:00	0:30	"	28.81	28.88	0.06	0.0020	0.13
P-3						**Total Depth**	**59 inches**
Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minutes	inches/hour
8:26:00	Initial	None	51.19	initial	initial		
8:56:00	0:30	"	51.19	51.25	0.06	0.0020	0.13
9:26:00	0:30	"	51.25	51.25	0.00	0.0000	0.00
P-4						Total Depth	37 inches
Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minutes	inches/hour
8:30:00	Initial	None	29.56	initial	initial		
9:00:00	0:30	"	29.56	29.69	0.13	0.0043	0.26
9:30:00	0:30	"	29.69	29.75	0.06	0.0020	0.12
P-5						Total Depth	60 inches
Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minutes	inches/hour
8:32:00	Initial	None	52.19	initial	initial		
9:02:00	0:30		52.19	52.25	0.06	0.021	0.13
9:32:00	0:30		52.25	52.31	0.06	0.021	0.13
P-6						Total Depth	60 inches
Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minutes	inches/hour
8:35:00	Initial	None	51.50	initial	initial		
9:05:00	0:30	"	51.50	51.63	0.13	0.0042	0.25
9:35:00	0:30	"	51.63	51.69	0.06	0.0021	0.13
P-7						Total Depth	61 inches
Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minutes	inches/hour
8:40:00	Initial	None	53.19	initial	initial		
9:10:00	0:30	"	53.19	53.25	0.06	0.0021	0.13
9:40:00	0:30	"	53.25	53.25	0.00	0.00	0.00

8875 Aero Development 10-14209G

Prochet Infiltration Conversions Parameters

P-1				**P-2**			
Time Interval,	Δt =	30	in	Time Interval,	Δt =	30	in
Final Depth of Water,	Df =	52.9375	in	Final Depth of Water,	Df =	28.875	in
Test Hole Radius,	r =	4	in	Test Hole Radius,	r =	4	in
Initial Depth to Water,	D0 =	52.875	in	Initial Depth to Water,	D0 =	28.8125	in
Total Depth of Test Hole,	DT =	61	in	Total Depth of Test Hole,	DT =	36	in
	Ho =	8.125	in		Ho =	7.1875	in
	Hf =	8.0625	in		Hf =	7.125	in
	ΔH = ΔD =	0.0625	in		ΔH = ΔD =	0.0625	in
	Havg =	8.09375	in		Havg =	7.15625	in
	It =	0.024768	in/hr		It =	0.027304	in/hr
P-3				**P-4**			
Time Interval,	Δt =	30	in	Time Interval,	Δt =	30	in
Final Depth of Water,	Df =	51.25	in	Final Depth of Water,	Df =	29.75	in
Test Hole Radius,	r =	4	in	Test Hole Radius,	r =	4	in
Initial Depth to Water,	D0 =	51.25	in	Initial Depth to Water,	D0 =	29.6875	in
Total Depth of Test Hole,	DT =	59	in	Total Depth of Test Hole,	DT =	37	in
	Ho =	7.75	in		Ho =	7.3125	in
	Hf =	7.75	in		Hf =	7.25	in
	ΔH = ΔD =	0	in		ΔH = ΔD =	0.0625	in
	Havg =	7.75	in		Havg =	7.28125	in
	It =	0	in/hr		It =	0.026936	in/hr
P-5				**P-6**			
Time Interval,	Δt =	30	in	Time Interval,	Δt =	30	in
Final Depth of Water,	Df =	52.3125	in	Final Depth of Water,	Df =	51.6875	in
Test Hole Radius,	r =	4	in	Test Hole Radius,	r =	4	in
Initial Depth to Water,	D0 =	52.25	in	Initial Depth to Water,	D0 =	51.625	in
Total Depth of Test Hole,	DT =	60	in	Total Depth of Test Hole,	DT =	60	in
	Ho =	7.75	in		Ho =	8.375	in
	Hf =	7.6875	in		Hf =	8.3125	in
	ΔH = ΔD =	0.0625	in		ΔH = ΔD =	0.0625	in
	Havg =	7.71875	in		Havg =	8.34375	in
	It =	0.025723	in/hr		It =	0.024169	in/hr
P-7							
Time Interval,	Δt =	30	in				
Final Depth of Water,	Df =	53.25	in				
Test Hole Radius,	r =	4	in				
Initial Depth to Water,	D0 =	53.25	in				
Total Depth of Test Hole,	DT =	61	in				
	Ho =	7.75	in				
	Hf =	7.75	in				
	ΔH = ΔD =	0	in				
	Havg =	7.75	in				
	It =	0	in/hr				

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition Based on Geotechnical Conditions[9]

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		**Project Phase:**
8875 Aero Drive		Preliminary Screening-Initial Design
Criteria 1: Infiltration Rate Screening		
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☑ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☐ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).	
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☑ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.	
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☑ No; full infiltration is not required. Answer "No" to Criteria 1 Result.	
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☑ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.	

[9] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[11] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☑ No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☑ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☑ No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☑ No; full infiltration is not required. Skip to Part 1 Result.

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

As the project development is in initial design phase, specific potential BMP locations have not been finalized. As such, we conducted percolation test borings such that the entire site would be accurately characterized in terms of infiltration potential. Borehole percolation tests were completed in accordance with Couty of San Diego Department of Environmental Health (DEH), Version 2010 guidelines. The derived percolation rates were then converted to infiltration rates following the procedures of the Prochet Method, as recommended by the BMP Design Manual, Appendix D (February, 2018). In total, seven percolation test borings were advanced over the subject site. All percolation tests met Case 1 criteria, and were converted to infiltration rates. All infiltation rates were below the lower boundary rate for partial infiltration prior to appling a Safety factor of two to the results. As such, the site is classified as a "No Infiltration Condition" based on Class D type NCRS soil types that were confiremd by logs of borings and infiltration rates below 0.05 inches per hour.

However, there were no other geologic-geotechnical conditions with managable mitigation levels that would prohibited infiltration provided conformance with all structural setback criteria as defined in Appendix C of the City of San Diego BMP Design Manuel (January 2018) is ahered to. With the possible exception of expansive soils with Expansion Index values greater than 20.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A-1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	☑Yes	☐No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☑Yes	☐No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☑Yes	☐No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☑Yes	☐No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐Yes	☑No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☑Yes	☐No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☑Yes	☐No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☑Yes	☐No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☑Yes	☐No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☐Yes	☑No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐Yes	☑No

Summarize findings and basis; provide references to related reports or exhibits.

As discussed in the Geotechnical Preliminary Report , dated April 23, 2018 (attached), the site is classified as "No Infiltration condition base on NCRS soil type D and low infiltration rates below 0.05 inches per hour. However, there are no other geologic - geotechnical conditions that are considered non feasible for infiltration provided reasonable mitigation measures are employed and structural setback criteria are adhered to. With the possible exception of expansive soils with Expansion Index values greater than 20.

As the project development is in initial design phase, specific potential BMP locations have not been finalized. As such, we conducted percolation test borings such that the entire site would be accurately characterized in terms of infiltration potential. Borehole percolation tests were completed in accordance with County of San Diego Department of Environmental Health (DEH), Version 2010 guidelines. The derived percolation rates were then converted to infiltration rates following the procedures of the Prochet Method, as recommended by the BMP Design Manual, Appendix D (February, 2018). In total, seven percolation test borings were advanced over the subject site. All percolation tests met Case 1 criteria, and were converted to infiltration rates. All infiltation rates were below the lower boundary rate for partial infiltration prior to appling a Safety factor of two to the results. As such, the site is classified as a "No Infiltration Condition" based on Class D type NCRS soil types that were confiremd by logs of borings and infiltration rates below 0.05 inches per hour.

Part 1 Result – Full Infiltration Geotechnical Screening [12]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	☐Full infiltration Condition ☑Complete Part 2

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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
Criteria 3 : Infiltration Rate Screening		
3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☑ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.	
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ☐ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ☑ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.	
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ☐ Yes; Continue to Criteria 4. ☑ No: Skip to Part 2 Result.	
Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate). Review of the Natural Resources Conservation Service (NCRS) website, accessed on April 22, 2018, indicates that agricultural soil types in the site area are classified as Redding gravelly loam, gravelly clay, and gravelly clay loam (Map Unit-Rdc). The Rdc map unit, as defined by the NCRS, is assigned a hydrologic soil group (D), in accordance with the United States Department of Agriculture (U.S.D.A). These U.S.D.A soil types were confirmed with our geotechnical logs of borings, as described in Section 4.2.1 and 4.2.2 (within the above referenced report) that encountered Quaternary Very Old Paralic Deposits (Map Unit Qop- 8 of Kennedy and Tan, 2008), and Quaternary Previously Placed Fill consisting of re-worked formational deposits.		

<table>
<tr><th colspan="2">Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions</th><th colspan="2">Worksheet C.4-1: Form I-8A[10]</th></tr>
<tr><td colspan="4">Criteria 4: Geologic/Geotechnical Screening</td></tr>
<tr><td>4A</td><td colspan="3">If all questions in Step 4A are answered "Yes," continue to Step 2B.

For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.</td></tr>
<tr><td>4A-1</td><td>Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?</td><td>☐Yes</td><td>☐No</td></tr>
<tr><td>4A-2</td><td>Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?</td><td>☐Yes</td><td>☐No</td></tr>
<tr><td>4A-3</td><td>Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?</td><td>☐Yes</td><td>☐No</td></tr>
<tr><td>4B</td><td colspan="3">When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1

If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result.
If there are any "No" answers continue to Step 4C.</td></tr>
<tr><td>4B-1</td><td>Hydroconsolidation. Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP.
Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?</td><td>☐Yes</td><td>☐No</td></tr>
<tr><td>4B-2</td><td>Expansive Soils. Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs.
Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?</td><td>☐Yes</td><td>☐No</td></tr>
</table>

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐Yes	☐No
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐Yes	☐No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐Yes	☐No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐Yes	☐No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐Yes	☐No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits.			

Part 2 – Partial Infiltration Geotechnical Screening Result[13]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐ Partial Infiltration Condition ☑ No Infiltration Condition

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

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PRELIMINARY DRAINAGE STUDY

FOR:
Protea Hospital Annex Renovation
8875 Aero Drive
San Diego, California

Prepared for:
Protea Properties
3262 Holiday Ct #100
La Jolla, CA 92037

Project No: xxxxxxx

Prepared by: ______________________ 09/20/18
Signature Date

Engineer: Lucas Corsbie, RCE No. 72588

Ware Malcomb
10 Edelman
Irvine CA 92618
Phone: (949) 660-9128

Prepare Date: September 21, 2018
Revised:

Contents

I. Project Description

i. Background

The subject site is bound on the north by Aero Drive, on the south by existing residential, on the west and east by shared driveway and existing office complexes. Refer to the vicinity map in Appendix "A". The proposed project includes interior modifications and additions to the existing building and conversion of a portion of existing surface parking to parking structure, as well as private storm drain improvements for water quality and hydromodification management purposes.

The purpose of this drainage study is to quantify the existing and post-project drainage conditions to support grading and storm drain design for the Project, and to confirm that the project will not adversely affect existing offsite drainage infrastructure. Adverse effects to offsite drainage infrastructure can be avoided by limiting project condition peak flows to equal, or less than, existing condition peak flows. Storm water quality and hydromodification management plan (HMP) compliance is detailed in a separate document, the Storm Water Quality Management Plan (SWQMP).

The project does not include work within any wetland, stream, lake, pond, or any other waters regulated by the state, and is not anticipated to require Clean Water Act Section 404 or 401 permit or certification.

ii. Existing Condition

The existing site consists of a relatively level, rectangular-shaped property that presently supports the existing buildings and surface parking. The site drains via surface sheet flow to three discharge points.

Watershed A (Discharge Node 100): Runoff from the west portion of the site surface flows into the west driveway, as well as north into Aero Drive through curb cuts on the west side of a high point in Aero Drive. Surface flow is conveyed west, approx. 2,000 feet to catch basins just west of Afton Road. A 60" storm drain conveys water to a concrete-lined open channel that parallels the east edge of Interstate 805 before passing under to a natural channel. The natural channel flows south to a storm drain facility that conveys water into the San Diego River at approximately Mission Center Road.

Watershed B (Discharge Node 200): Runoff from the central and northeast portion of the site surface flows into Aero Drive through curb cuts and out of a driveway on the east side of a high point in Aero Drive. Surface flow is conveyed 1,200 feet east to a catch basin that discharges into an unnamed natural channel. Flow in the natural channel is conveyed under developments via storm drain and into the San Diego River at Interstate 805.

Watershed C (Discharge Node 300): Runoff from the southeast portion of the site drains through the existing wall located in the south east corner of the property and into the gutter of Ediwhar Avenue. Surface flow is conveyed into catch basins located about 2,000 feet south and east in Hammond Drive. Storm drains convey flow into the same unnamed natural channel. Flow in the natural channel is conveyed under developments via storm drain and into the San Diego River at approx. Interstate 805.

The San Diego River discharges to the Pacific Ocean just south of Mission Bay. There is no run-on to the site from adjacent properties. The existing condition hydrology map can be found in Appendix "G".

iii. Proposed Condition

The proposed site will be designed to maintain existing condition drainage patterns to the maximum extent practical. Runoff from the parking structure top level will sheet flow into the existing parking lots as in the existing condition. The parking structure straddles the site high point that divides watersheds A and B. Approximately half of the proposed parking structure will drain to Node 100 and the rest will drain to Node 200. The portion of the structure draining to Node 100 will not be captured in a water quality Best Management Practice (BMP). To compensate, an equivalent area of existing parking lot and building roof is included in water quality sizing and hydromodification flow controls at Discharge Node 200 (Point of Connection 1). These calculations are shown and explained in detail in the SWQMP.

Watershed B includes the additions to the existing building, as well as landscape and surface parking improvements. Drainage from these improvements will be conveyed via sheet flow into Biofiltration with Underdrain BMPs and into the hydromodification flow control detention BMP. The detention BMP will include an outlet structure with pump so that water can be discharged to street level as in the existing condition in compliance with HMP requirements, detailed in the SWQMP document. HMP requirements address storms up to the 10-year storm event. Flow in excess of the HMP compliance storm will overflow and/or bypass project BMPs and surface drain into Aero Drive, as in the existing condition.

Limited changes to Watershed C are anticipated as a result of the project. Landscaping will replace some surface parking area along the south edge of the existing building.

iv. Design Criteria and Methods

The rational method hydrologic model was used to determine the 100-year, 6-hour and 24-hr storm event peak flows in both the existing and project conditions for comparison. Computation criteria found in the City of San Diego Drainage Design Manual January 2017 Edition was used in Advanced Engineering Software (AES) 2016 calculations.

II. Hydrology Analysis

i. Rational Method Peak Flows

The existing and proposed condition hydrology maps provided in this report show the sub-areas used to generate flows for the site. The variables taken into consideration in the computation include rainfall, impervious percent, and land use conditions characteristics of flow conveyance, and time of concentration.

The soils map included in Appendix B indicates type D soils. Figure B-2 from the Manual shows that the 100-year 6-hour rainfall is 2.5 inches, included in Appendix C. Figure B-3 from the Manual shows that the 100-year 6-hour rainfall is 4 inches, included in Appendix D. The Antecedent Moisture Condition for the 100-year storm used is two. Runoff coefficients given in Table A-1 of the Manual were revised based on actual impervious percentages in the existing and project condition as shown in the tables below:

EXISTING CONDITION					
Subarea	Imp sf	Pervious sf	Area sf	Area ac	% Imp
A1	1,858	293	2,150	0.05	86%
A2	58,145	3,495	61,640	1.42	94%
A3	54,012	15,259	69,271	1.59	78%
Subtotal	**114,015**	**19,046**	**133,062**	**3.06**	**86%**
B1	1,042	384	1,426	0.03	73%
B2	38,281	2,326	40,607	0.93	94%
B3	91,174	15,667	106,841	2.45	85%
Subtotal	**130,498**	**18,376**	**148,874**	**3.41**	**88%**
C1	1,896	185	2,081	0.05	91%
C2	47,930	3,896	51,826	1.19	92%
Subtotal	**49,826**	**4,081**	**53,907**	**1.24**	**92%**
Total	**294,339**	**41,503**	**335,842**	**7.71**	**88%**

PROPOSED CONDITION					
Subarea	Imp sf	Pervious sf	Area sf	Area ac	% Imp
A1	1,802	345	2,147	0.05	84%
A2	50,806	2,610	53,416	1.23	95%
A3	55,060	15,204	70,264	1.61	78%
Subtotal	**107,668**	**18,159**	**125,827**	**2.89**	**86%**
B1	1,031	395	1,426	0.03	72%
B2	40,030	5,884	45,913	1.05	87%
B3	90,652	16,190	106,841	2.45	85%
Subtotal	**131,712**	**22,468**	**154,180**	**3.53**	**85%**
C1	2,210	481	2,691	0.06	82%
C2	48,319	4,826	53,144	1.22	91%
Subtotal	**50,529**	**5,306**	**55,835**	**1.28**	**90%**
Total	**289,909**	**45,933**	**335,842**	**7.71**	**86%**

EXISTING CONDITION					
SUBAREA	LANDUSE	IMPERVIOUS PERCENT	TABLE A.1 IMPERVIOUS PERCENT	TABLE A.1 RUNOFF COEFFICIENT C	REVISED C
A1	COMMERCIAL	86%	80%	0.85	0.92
A2	COMMERCIAL	94%	80%	0.85	1.00
A3	COMMERCIAL	78%	80%	0.85	0.83
Subtotal	COMMERCIAL	86%	80%	0.85	0.91
B1	COMMERCIAL	73%	80%	0.85	0.78
B2	COMMERCIAL	94%	80%	0.85	1.00
B3	COMMERCIAL	85%	80%	0.85	0.91
Subtotal	COMMERCIAL	88%	80%	0.85	0.93
C1	COMMERCIAL	91%	80%	0.85	0.97
C2	COMMERCIAL	92%	80%	0.85	0.98
Subtotal	COMMERCIAL	92%	80%	0.85	0.98
Total	COMMERCIAL	88%	80%	0.85	0.94

PROJECT CONDITION					
SUBAREA	LANDUSE	ACTUAL IMPERVIOUS PERCENT	TABLE A. IMPERVIOUS PERCENT	TABLE A.1 RUNOFF COEFFICIENT C	REVISED C
A1	COMMERCIAL	84%	80%	0.85	0.89
A2	COMMERCIAL	95%	80%	0.85	1.00
A3	COMMERCIAL	78%	80%	0.85	0.83
Subtotal	COMMERCIAL	86%	80%	0.85	0.91
B1	COMMERCIAL	72%	80%	0.85	0.77
B2	COMMERCIAL	87%	80%	0.85	0.93
B3	COMMERCIAL	85%	80%	0.85	0.90
Subtotal	COMMERCIAL	85%	80%	0.85	0.91
C1	COMMERCIAL	82%	80%	0.85	0.87
C2	COMMERCIAL	91%	80%	0.85	0.97
Subtotal	COMMERCIAL	90%	80%	0.85	0.96
Total	COMMERCIAL	86%	80%	0.85	0.92

The Rational Method via AES Hydrologic software derived the following flow rates for the existing and post-developed condition (see Appendix "E" and "F" for a detailed tabulation):

Node	Existing Condition			Proposed Condition			Q100 Comparison
	Area (ac)	C	Q100 (cfs)	Area (ac)	C	Q100 (cfs)	
100	3.1	0.91	17.12	2.9	0.91	13.98	-22%
200	3.4	0.93	16.94	3.5	0.91	16.72	-1%
300	1.2	0.98	8.00	1.3	0.96	7.83	-2%
Total	7.7	0.94	42.06	7.7	0.92	38.53	-9%

III. Conclusion

Project condition calculations are conservative because they do not account for the storage and flood routing provided by project BMPs. Project improvements include an increase in pervious areas onsite, adding landscaping and biofiltration BMPs where surface parking exists today. As a result, project impacts decrease the amount of discharge expected at each discharge point, as well as in total, when compared to the existing condition. Therefore, no adverse impacts to offsite drainage infrastructure is anticipated.

Water quality and hydromodification flow control BMPs will be implemented to satisfy the requirements of the Natioanl Pollutant Discharge Elimination System (NPDES) permit locally regulated by San Diego Regional MS4 Permit (order R9-2013-0001), reissued by California Regional Water Quality Control Board (SDRWQCB) in May 2013 and amended by Order R9-2015-0001 and R9-2015-0100 and as demonstrated in the SWQMP.

Appendix A – Vicinity Map

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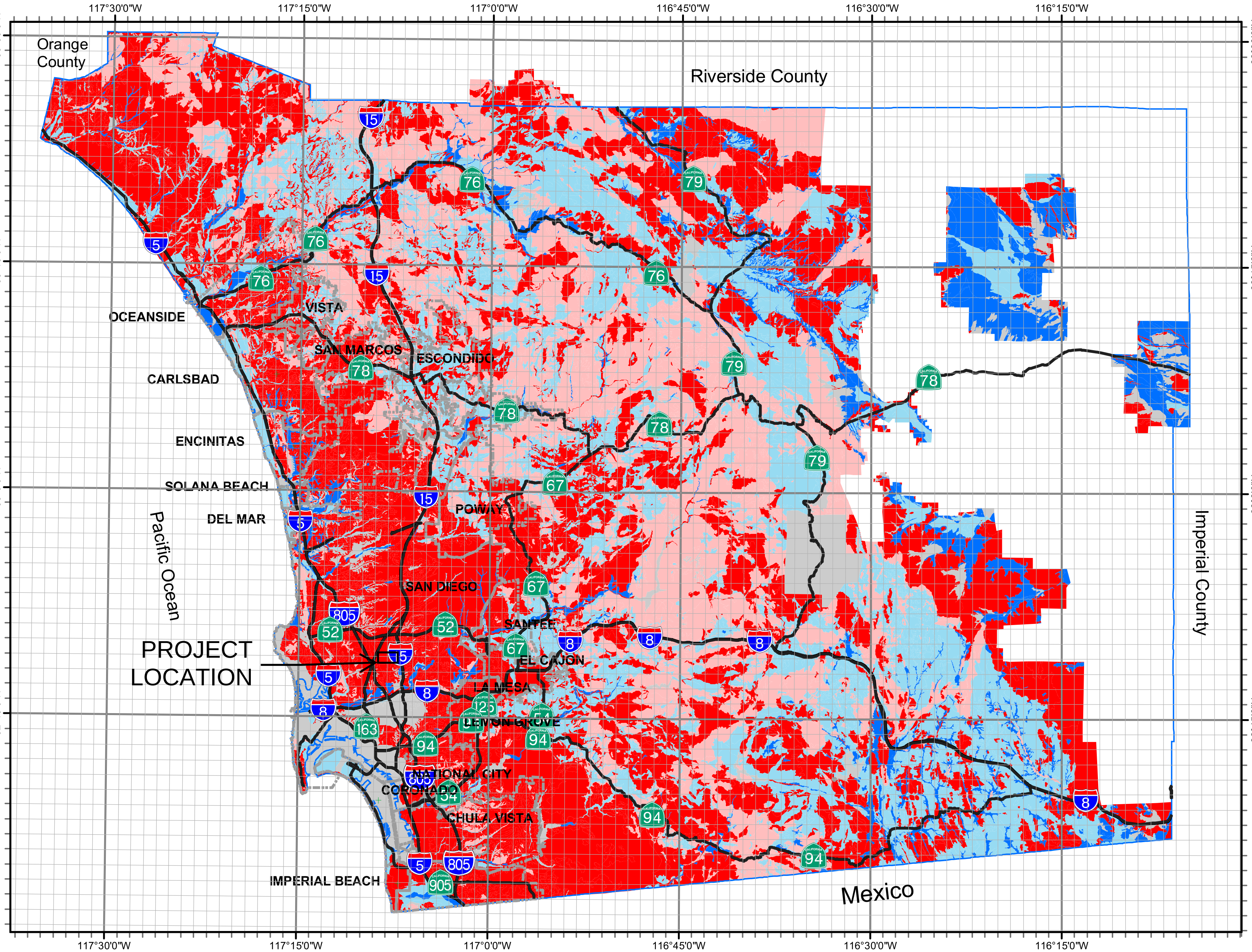
PROTEA HOSPITAL ANNEX RENOVATION

8875 AERO DRIVE

LOCATION MAP

Appendix B – Soil Map

County of San Diego
Hydrology Manual
Soil Hydrologic Group



Legend

- Major Roads
- Incorporated City Bdy

HYDROLOGIC SOIL GROUP

- Hydrologic Group Undefined
- Hydrologic Group A
- Hydrologic Group B
- Hydrologic Group C
- Hydrologic Group D
- No Soil Data

Note: Soil Data Source
USDA/NRCS
SSURGO Soils 2007

N

3 1.5 0 3 Miles

DPW GIS

SanGIS

Appendix C – 100 Year, 6 Hour Precipitation

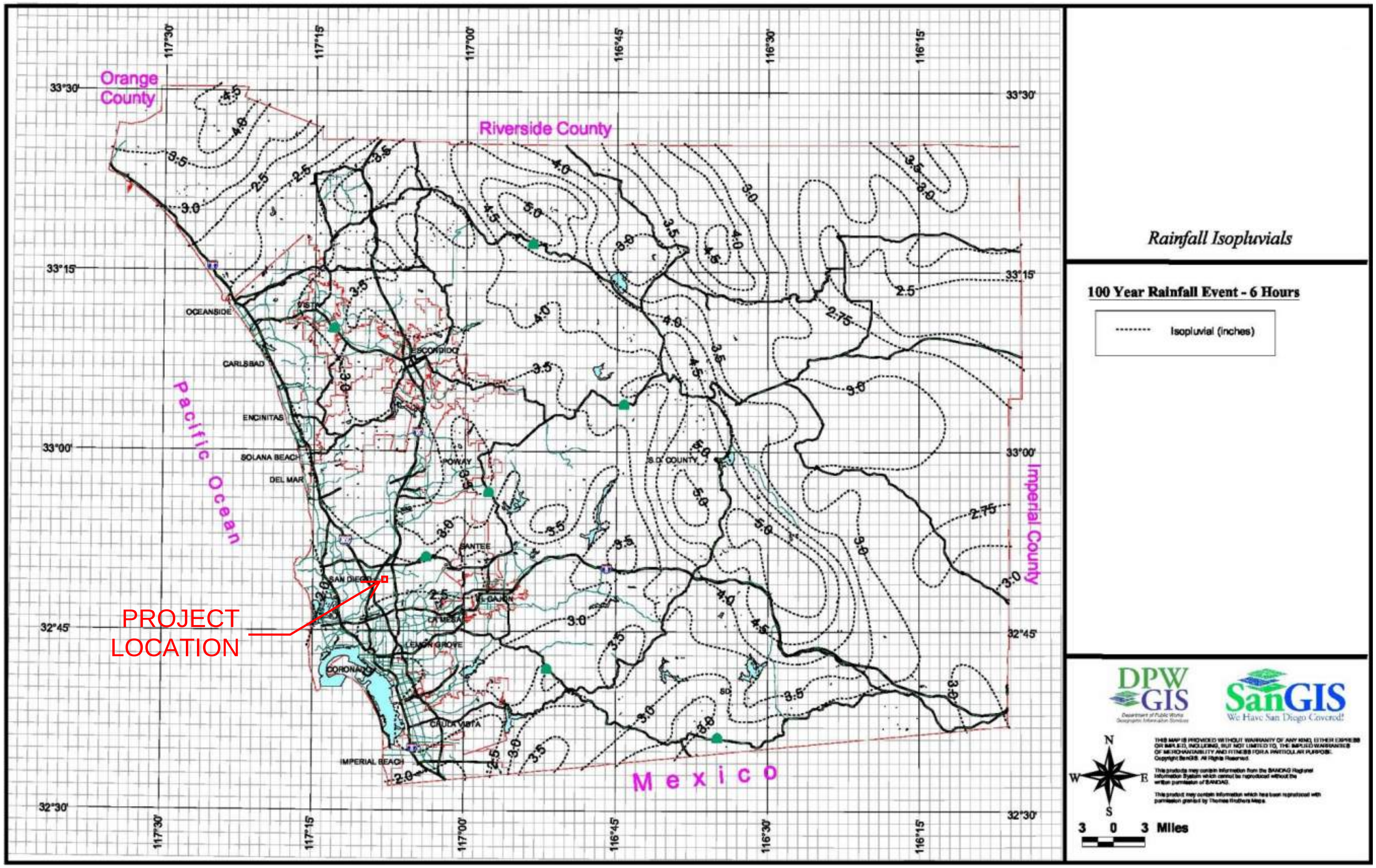


Figure B-2. 100-Year 6-Hour Isopluvials.

Appendix D – 100 Years – 24 Hour Precipitation

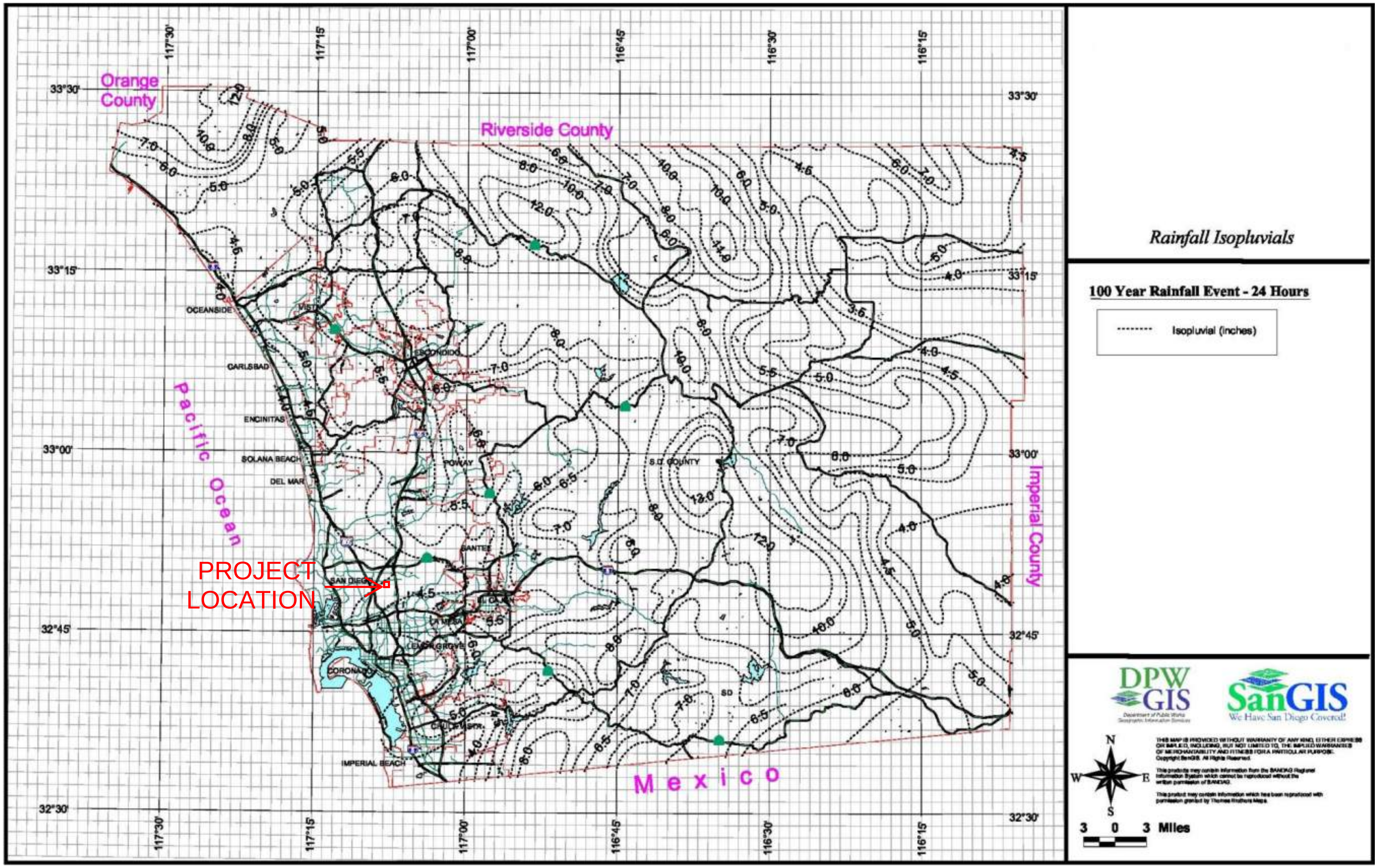


Figure B-3. 100-Year 24-Hour Isopluvials

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Appendix E – Rational Method Calculations Existing Condition

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____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
             Ver. 23.0 Release Date: 07/01/2016  License ID 1679

                           Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
* PROTEA VA SAN DIEGO                                                      *
* EXISTING CONDITIONS                                                      *
* 100-YEAR RATIONAL METHOD                                                 *
 **************************************************************************

  FILE NAME: EX_100.DAT
  TIME/DATE OF STUDY: 16:44 09/19/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   12.0      5.0    0.018/0.018/ ---    0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9200
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    52.00
  UPSTREAM ELEVATION(FEET) =    420.50
  DOWNSTREAM ELEVATION(FEET) =    419.50
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.879
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  62
```

```
 ----------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
   REPRESENTATIVE SLOPE =  0.0102
   STREET LENGTH(FEET) =   345.00   CURB HEIGHT(INCHES) =  6.0
   STREET HALFWIDTH(FEET) = 12.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
   INSIDE STREET CROSSFALL(DECIMAL) =  0.018
   OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

   SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
   Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.93
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.32
     HALFSTREET FLOOD WIDTH(FEET) =   10.63
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.18
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.70
   STREET FLOW TRAVEL TIME(MIN.) =   2.63   Tc(MIN.) =    4.51
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
   NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
   *USER SPECIFIED(SUBAREA):
   OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9900
   S.C.S. CURVE NUMBER (AMC II) =   0
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.988
   SUBAREA AREA(ACRES) =    1.42      SUBAREA RUNOFF(CFS) =    9.26
   TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       9.56

   END OF SUBAREA STREET FLOW HYDRAULICS:
   DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.00
   FLOW VELOCITY(FEET/SEC.) =  2.71   DEPTH*VELOCITY(FT*FT/SEC.) =   1.01
   LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     397.00 FEET.

 ****************************************************************************
   FLOW PROCESS FROM NODE    103.00 TO NODE    100.00 IS CODE =  62
 ----------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
   REPRESENTATIVE SLOPE =  0.0105
   STREET LENGTH(FEET) =   191.00   CURB HEIGHT(INCHES) =  6.0
   STREET HALFWIDTH(FEET) = 12.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
   INSIDE STREET CROSSFALL(DECIMAL) =  0.018
   OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

   SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
   Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.65
     ***STREET FLOWING FULL***
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.41
     HALFSTREET FLOOD WIDTH(FEET) =   12.00
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.16
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.28
   STREET FLOW TRAVEL TIME(MIN.) =   1.01   Tc(MIN.) =    5.52
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.179
   *USER SPECIFIED(SUBAREA):
   OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .8300
   S.C.S. CURVE NUMBER (AMC II) =   0
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.906
   SUBAREA AREA(ACRES) =    1.59      SUBAREA RUNOFF(CFS) =    8.15
   TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =      17.12
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.45   DEPTH*VELOCITY(FT*FT/SEC.) =   1.49
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    100.00 =     588.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .7800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    41.00
  UPSTREAM ELEVATION(FEET) =    420.50
  DOWNSTREAM ELEVATION(FEET) =    420.00
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.452
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0114
  STREET LENGTH(FEET) =   298.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.86
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    8.05
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.04
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.56
  STREET FLOW TRAVEL TIME(MIN.) =   2.43   Tc(MIN.) =    5.88
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.930
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.983
  SUBAREA AREA(ACRES) =    0.93      SUBAREA RUNOFF(CFS) =    5.46
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       5.60

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =  10.95
  FLOW VELOCITY(FEET/SEC.) =  2.35   DEPTH*VELOCITY(FT*FT/SEC.) =   0.76
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =     339.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    200.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0090
  STREET LENGTH(FEET) =   177.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00
```

```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.57
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.40
    HALFSTREET FLOOD WIDTH(FEET) =   12.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.83
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.12
  STREET FLOW TRAVEL TIME(MIN.) =   1.04   Tc(MIN.) =    6.93
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.338
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.931
  SUBAREA AREA(ACRES) =    2.45      SUBAREA RUNOFF(CFS) =   11.90
  TOTAL AREA(ACRES) =        3.4        PEAK FLOW RATE(CFS) =      16.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.44   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.28   DEPTH*VELOCITY(FT*FT/SEC.) =   1.45
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    200.00 =     516.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    44.00
  UPSTREAM ELEVATION(FEET) =    419.00
  DOWNSTREAM ELEVATION(FEET) =    417.90
  ELEVATION DIFFERENCE(FEET) =      1.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.144
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    300.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0069
  STREET LENGTH(FEET) =   274.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.16
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =   10.71
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
```

```
      PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.58
    STREET FLOW TRAVEL TIME(MIN.) =   2.51   Tc(MIN.) =    3.66
     100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
    NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
    *USER SPECIFIED(SUBAREA):
    OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9800
    S.C.S. CURVE NUMBER (AMC II) =   0
    AREA-AVERAGE RUNOFF COEFFICIENT =  0.980
    SUBAREA AREA(ACRES) =    1.19      SUBAREA RUNOFF(CFS) =    7.68
    TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       8.00

    END OF SUBAREA STREET FLOW HYDRAULICS:
    DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.00
    FLOW VELOCITY(FEET/SEC.) =  2.25   DEPTH*VELOCITY(FT*FT/SEC.) =   0.84
    LONGEST FLOWPATH FROM NODE    301.00 TO NODE    300.00 =     318.00 FEET.
  ============================================================================
    END OF STUDY SUMMARY:
    TOTAL AREA(ACRES)     =        1.2  TC(MIN.) =      3.66
    PEAK FLOW RATE(CFS)   =       8.00
  ============================================================================
  ============================================================================
    END OF RATIONAL METHOD ANALYSIS

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Appendix F – Rational Method Calculations Project Condition

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
             Ver. 23.0 Release Date: 07/01/2016  License ID 1679

                            Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
* PROTEA VA SAN DIEGO                                                      *
* PROJECT CONDITIONS                                                       *
* 100-YEAR RATIONAL METHOD                                                 *
 **************************************************************************

  FILE NAME: PR_100.DAT
  TIME/DATE OF STUDY: 16:47 09/19/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   12.0      5.0    0.018/0.018/ ---    0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .8900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    52.00
  UPSTREAM ELEVATION(FEET) =    420.50
  DOWNSTREAM ELEVATION(FEET) =    419.50
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.192
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.29

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  62
```

```
 ----------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
   REPRESENTATIVE SLOPE =  0.0084
   STREET LENGTH(FEET) =   415.00   CURB HEIGHT(INCHES) =  6.0
   STREET HALFWIDTH(FEET) = 12.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
   INSIDE STREET CROSSFALL(DECIMAL) =  0.018
   OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

   SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
   Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.94
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.31
     HALFSTREET FLOOD WIDTH(FEET) =   10.01
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.94
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.60
   STREET FLOW TRAVEL TIME(MIN.) =   3.56   Tc(MIN.) =    5.76
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.015
   *USER SPECIFIED(SUBAREA):
   OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9900
   S.C.S. CURVE NUMBER (AMC II) =   0
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.986
   SUBAREA AREA(ACRES) =    1.23      SUBAREA RUNOFF(CFS) =    7.32
   TOTAL AREA(ACRES) =        1.3        PEAK FLOW RATE(CFS) =       7.59

   END OF SUBAREA STREET FLOW HYDRAULICS:
   DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  12.00
   FLOW VELOCITY(FEET/SEC.) =  2.35   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
   LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     467.00 FEET.

 ****************************************************************************
   FLOW PROCESS FROM NODE    103.00 TO NODE    100.00 IS CODE =  62
 ----------------------------------------------------------------------------
   >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
   >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
 ============================================================================
   REPRESENTATIVE SLOPE =  0.0105
   STREET LENGTH(FEET) =   191.00   CURB HEIGHT(INCHES) =  6.0
   STREET HALFWIDTH(FEET) = 12.00

   DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
   INSIDE STREET CROSSFALL(DECIMAL) =  0.018
   OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

   SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
   Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

     **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.20
     ***STREET FLOWING FULL***
     STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
     STREET FLOW DEPTH(FEET) =  0.39
     HALFSTREET FLOOD WIDTH(FEET) =   12.00
     AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.93
     PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.13
   STREET FLOW TRAVEL TIME(MIN.) =   1.09   Tc(MIN.) =    6.84
    100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.380
   *USER SPECIFIED(SUBAREA):
   OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .8300
   S.C.S. CURVE NUMBER (AMC II) =   0
   AREA-AVERAGE RUNOFF COEFFICIENT =  0.899
   SUBAREA AREA(ACRES) =    1.61      SUBAREA RUNOFF(CFS) =    7.19
   TOTAL AREA(ACRES) =        2.9        PEAK FLOW RATE(CFS) =      13.98

   END OF SUBAREA STREET FLOW HYDRAULICS:
```

```
  DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.19   DEPTH*VELOCITY(FT*FT/SEC.) =   1.31
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    100.00 =     658.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .7700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    38.00
  UPSTREAM ELEVATION(FEET) =    420.50
  DOWNSTREAM ELEVATION(FEET) =    420.00
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.342
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0131
  STREET LENGTH(FEET) =   355.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.98
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    7.98
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.16
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.59
  STREET FLOW TRAVEL TIME(MIN.) =   2.73   Tc(MIN.) =    6.08
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.809
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.926
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    5.67
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       5.81

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =  10.79
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   0.81
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =     393.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    200.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0075
  STREET LENGTH(FEET) =   177.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00
```

```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.58
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.41
    HALFSTREET FLOOD WIDTH(FEET) =   12.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.68
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.09
  STREET FLOW TRAVEL TIME(MIN.) =   1.10   Tc(MIN.) =    7.18
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.217
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.908
  SUBAREA AREA(ACRES) =    2.45      SUBAREA RUNOFF(CFS) =   11.50
  TOTAL AREA(ACRES) =        3.5        PEAK FLOW RATE(CFS) =      16.72

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.45   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.09   DEPTH*VELOCITY(FT*FT/SEC.) =   1.40
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    200.00 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    54.00
  UPSTREAM ELEVATION(FEET) =    418.88
  DOWNSTREAM ELEVATION(FEET) =    418.20
  ELEVATION DIFFERENCE(FEET) =      0.68
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.817
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.34
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.34

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    300.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0078
  STREET LENGTH(FEET) =   284.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.07
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =   10.32
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.90
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.60
```

```
  STREET FLOW TRAVEL TIME(MIN.) =   2.49   Tc(MIN.) =    5.31
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.338
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9700
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.965
  SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    7.50
  TOTAL AREA(ACRES) =        1.3        PEAK FLOW RATE(CFS) =       7.83

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  2.31   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
  LONGEST FLOWPATH FROM NODE    301.00 TO NODE    300.00 =     338.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.3  TC(MIN.) =      5.31
  PEAK FLOW RATE(CFS)   =       7.83
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS

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```

Appendix G – Hydrology Map – Existing Condition

LEGEND

- IMPERVIOUS AREAS
- PERVIOUS AREAS
- EXISTING FLOWPATH
- XXX NODE
- EXISTING HYDROLOGY BOUNDARY
- A1 / 1.10 SUBAREA ID / SUBAREA AC

NODE	AREA AC	100 C S
100	3.1	17.12
200	3.4	16.94
300	1.2	8.00
A	7.7	42.06

EXISTING CONDITION					
Subarea	Imp sf	Pervious sf	Area sf	Area ac	% Imp
A1	1,858	293	2,150	0.05	86%
A2	58,145	3,495	61,640	1.42	94%
A3	54,012	15,259	69,271	1.59	78%
Subtotal	**114,015**	**19,046**	**133,062**	**3.06**	**86%**
B1	1,042	384	1,426	0.03	73%
B2	38,281	2,326	40,607	0.93	94%
B3	91,174	15,667	106,841	2.45	85%
Subtotal	**130,498**	**18,376**	**148,874**	**3.41**	**88%**
C1	1,896	185	2,081	0.05	91%
C2	47,930	3,896	51,826	1.19	92%
Subtotal	**49,826**	**4,081**	**53,907**	**1.24**	**92%**
Total	**294,339**	**41,503**	**335,842**	**7.71**	**88%**

60 30 0 Feet

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8875 AERO DRIVE
EXISTING CONDITIONS HYDROLOGY MAP

Appendix H – Hydrology Map – Project Condition

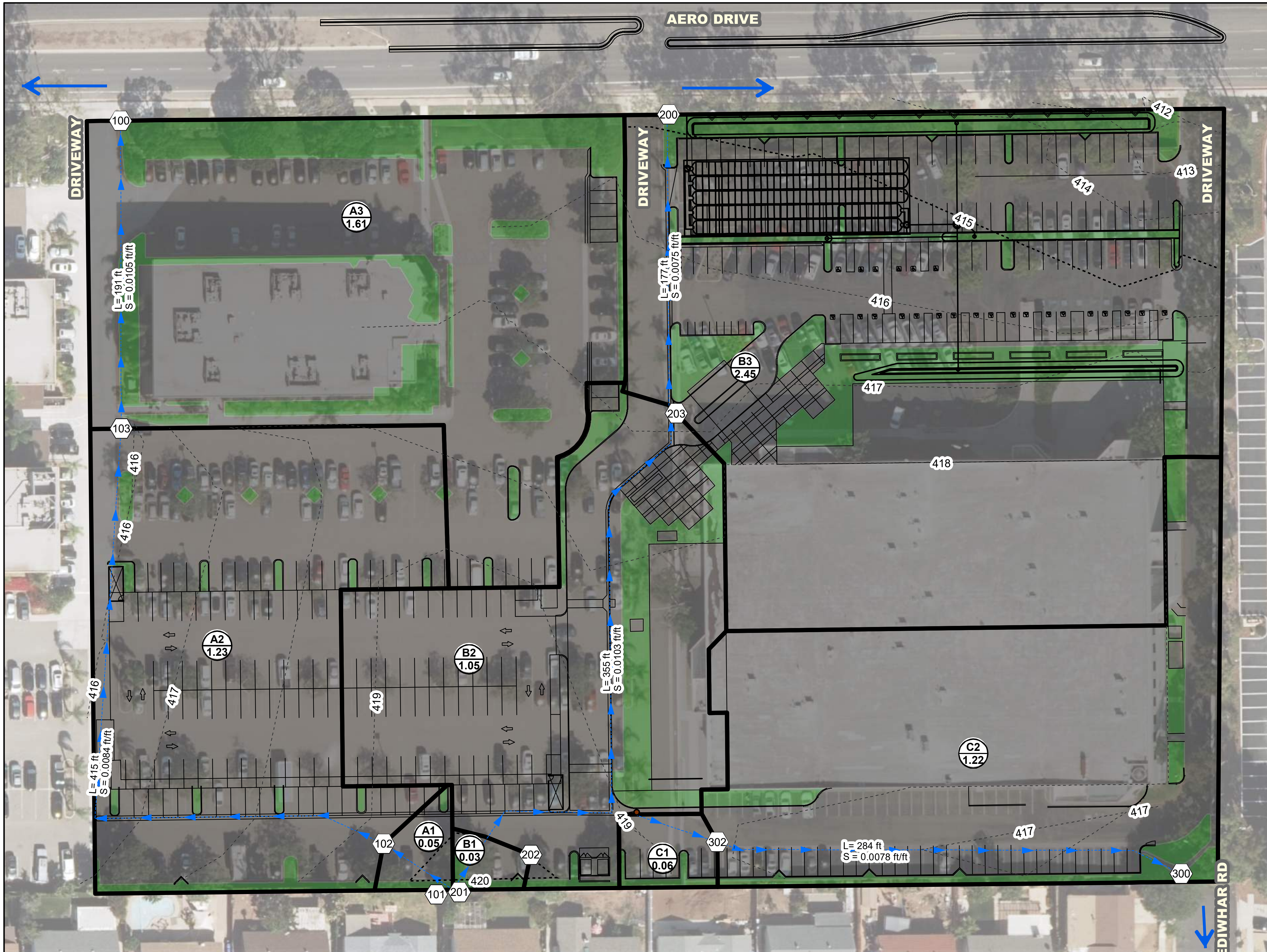
LEGEND

- PERVIOUS
- IMPERVIOUS
- PROJECT FLOWPATH
- XXX NODE
- PROJECT_HYDROLOGY
- A1 / 1.10 SUBAREA ID / SUBAREA AC

NODE	AREA AC	100 C S
100	2.9	13.98
200	3.5	16.72
300	1.3	7.83
A	7.7	38.53

PROPOSED CONDITION					
Subarea	Imp sf	Pervious sf	Area sf	Area ac	% Imp
A1	1,802	345	2,147	0.05	84%
A2	50,806	2,610	53,416	1.23	95%
A3	55,060	15,204	70,264	1.61	78%
Subtotal	**107,668**	**18,159**	**125,827**	**2.89**	**86%**
B1	1,031	395	1,426	0.03	72%
B2	40,030	5,884	45,913	1.05	87%
B3	90,652	16,190	106,841	2.45	85%
Subtotal	**131,712**	**22,468**	**154,180**	**3.53**	**85%**
C1	2,210	481	2,691	0.06	82%
C2	48,319	4,826	53,144	1.22	91%
Subtotal	**50,529**	**5,306**	**55,835**	**1.28**	**90%**
Total	**289,909**	**45,933**	**335,842**	**7.71**	**86%**

60 30 0 Feet



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PROTEA VA SAN DIEGO
8875 AERO DRIVE
PROJECT CONDITIONS HYDROLOGY MAP

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.

Project Name:

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

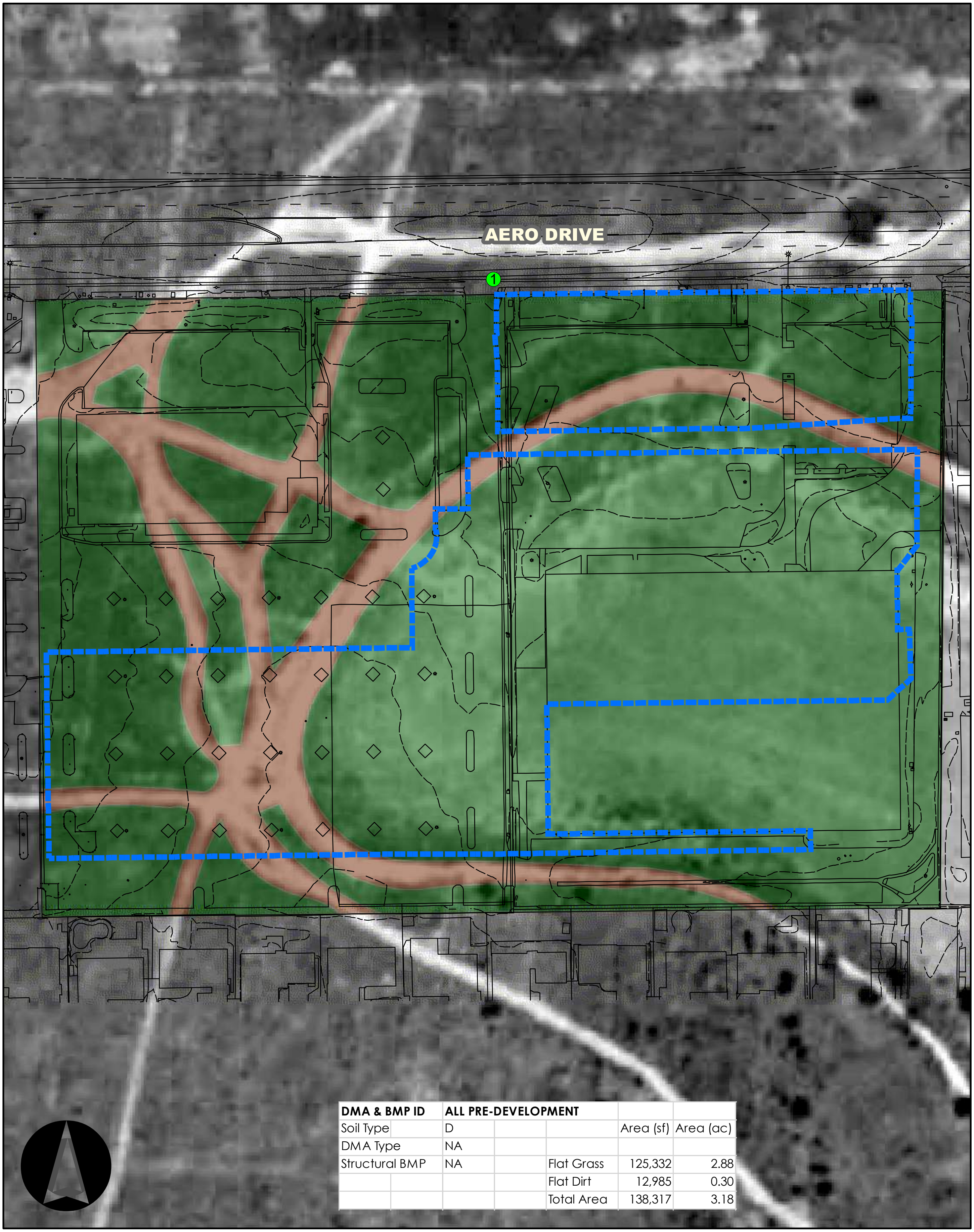
Project Name:

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 OR provide a separate map showing that the project site is outside of any critical coarse sediment yield areas
- ☑ 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).

SEE DMA EXHIBIT



DMA & BMP ID		ALL PRE-DEVELOPMENT				
Soil Type		D			Area (sf)	Area (ac)
DMA Type		NA				
Structural BMP		NA		Flat Grass	125,332	2.88
				Flat Dirt	12,985	0.30
				Total Area	138,317	3.18

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Legend
- Point of Compliance
- DMA Boundary
- DIRT
- GRASS

PROTEA VA SAN DIEGO
8875 AERO DRIVE
1953 SITE MAP

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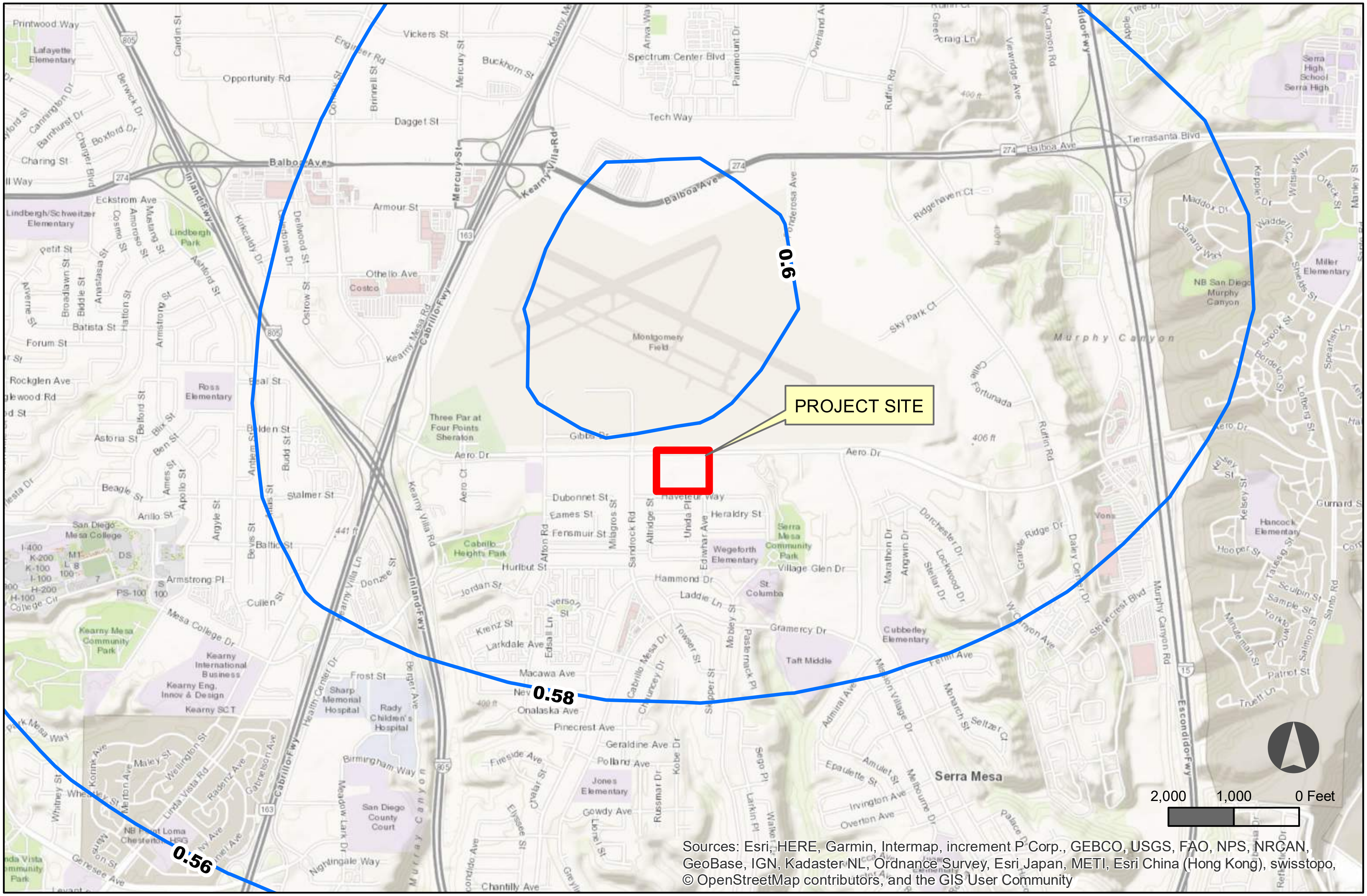
PROTEA VA SAN DIEGO
8875 AERO DRIVE
CRITICAL COARSE SEDIMENT YIELD AREA MAP



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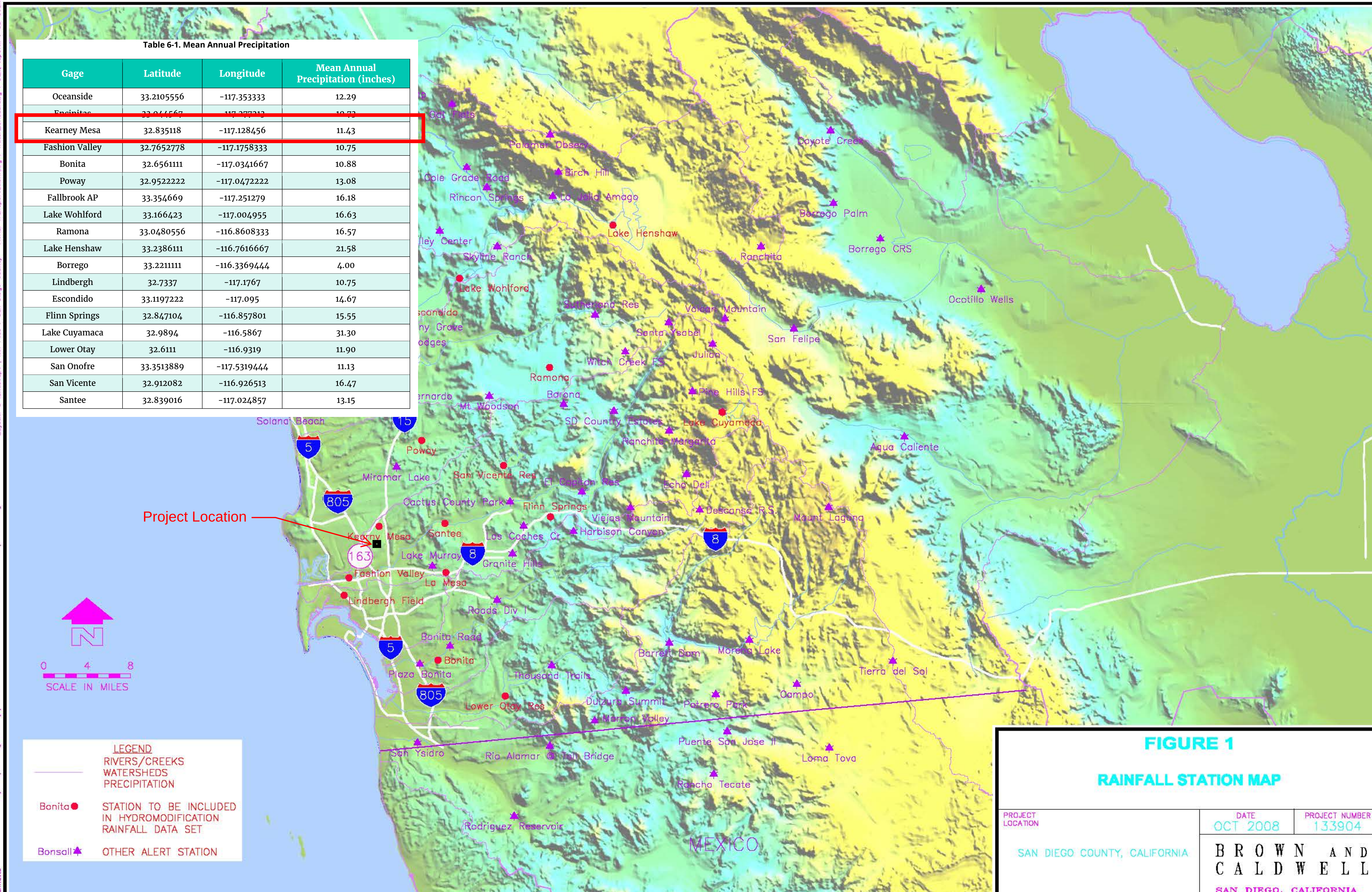
Legend

85TH PERCENT ISOPLUVIAL, INCHES

PROTEA HOSPITAL ANNEX RENOVATION
8875 AERO DRIVE, SAN DIEGO
85th PERCENTILE 24-HOUR ISOPLUVIAL MAP

Table 6-1. Mean Annual Precipitation

Gage	Latitude	Longitude	Mean Annual Precipitation (inches)
Oceanside	33.2105556	-117.353333	12.29
Encinitas	33.044567	-117.277213	10.73
Kearney Mesa	32.835118	-117.128456	11.43
Fashion Valley	32.7652778	-117.1758333	10.75
Bonita	32.6561111	-117.0341667	10.88
Poway	32.9522222	-117.0472222	13.08
Fallbrook AP	33.354669	-117.251279	16.18
Lake Wohlford	33.166423	-117.004955	16.63
Ramona	33.0480556	-116.8608333	16.57
Lake Henshaw	33.2386111	-116.7616667	21.58
Borrego	33.2211111	-116.3369444	4.00
Lindbergh	32.7337	-117.1767	10.75
Escondido	33.1197222	-117.095	14.67
Flinn Springs	32.847104	-116.857801	15.55
Lake Cuyamaca	32.9894	-116.5867	31.30
Lower Otay	32.6111	-116.9319	11.90
San Onofre	33.3513889	-117.5319444	11.13
San Vicente	32.912082	-116.926513	16.47
Santee	32.839016	-117.024857	13.15



SDHM 3.1

PROJECT REPORT

Notes:

1. Pumped discharge was modeled using the Stage Storage Discharge element:
   - The ADS StormTech Chamber system was sized in a separate model and the SSD table was exported and modified to add a constant pump rate of 0.06 cfs, which is less than the 0.1Q2.

2. Both USGS regression equations and SDHM3.1 methodology was used to check Q2 and Q10. USGS Regression equations resulted in larger flows, therefore SDHM3.1 is set to check 0.1Q2 using Regression Equation flow ranges:

USGS REGRESSION EQUATION CHECK		
$Q_2 = 3.60 \times A^{0.672} \times p^{0.753}$		
$Q_{10} = 6.56 \times A^{0.783} \times p^{1.07}$		
A=	168,345	sf
A = Drainage area in square miles	0.004961	sq miles
P = Mean annual precipitation in inches (Table 6-1)	11.43	inches
Q_2 =	0.64	cfs
$0.1Q_2$ =	0.06	cfs
Q_{10} =	1.40	cfs

SDHM3.1 RESULTS

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.18
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.5
Total Impervious Area: 2.68

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.569401
5 year	0.865501
10 year	1.061956
25 year	1.560772

3. Drawdown time for the ADS StormTech Chambers is checked:

Drawdown Calculations		
Total Volume	28159.00	cf
Pump Capacity	0.06	cfs
Time to drawdown	5.43	hrs
Time to drawdown	0.23	days

4. Pre-Development conditions based on 1953 Historic Aerials, next page

General Model Information

Project Name:	V_A2-OPTIMIZED_ADS_SSD
Site Name:	PROTEA VA
Site Address:	8875 AERO DRIVE
City:	SAN DIEGO
Report Date:	9/20/2018
Gage:	KEARNY M
Data Start:	10/01/1964
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.000
Version Date:	2018/04/03

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,NatVeg,Flat	2.88
D,Dirt,Flat	0.3
Pervious Total	3.18
Impervious Land Use	acre
Impervious Total	0
Basin Total	3.18

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.32
Pervious Total	0.32
Impervious Land Use	acre
IMPERVIOUS-FLAT	1.44
Impervious Total	1.44
Basin Total	1.76

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 1	Surface Biofilter 1	

Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.052
Pervious Total	0.052
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.533
Impervious Total	0.533
Basin Total	0.585

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 2	Surface Biofilter 2	

Basin 3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
D,Urban,Flat	0.11
Pervious Total	0.11
Impervious Land Use	acre
IMPERVIOUS-FLAT	0.58
Impervious Total	0.58
Basin Total	0.69

Element Flows To:

Surface	Interflow	Groundwater
Surface Biofilter 3	Surface Biofilter 3	

Routing Elements
Predeveloped Routing

Mitigated Routing

Biofilter 1

Bottom Length:	44.53 ft.
Bottom Width:	44.53 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	2
Material type for second layer:	ESM
Material thickness of third layer:	1
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	2
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	32.141
Total Outflow (ac-ft.):	42.262
Percent Through Underdrain:	76.05

Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 12 in.
Element Flows To:
Outlet 1 Outlet 2
SSD Table 1

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**Infilt(cfs)**
0.0000	0.0655	0.0000	0.0000	0.0000
0.0440	0.0652	0.0006	0.0000	0.0000
0.0879	0.0649	0.0012	0.0000	0.0000
0.1319	0.0647	0.0018	0.0000	0.0000
0.1758	0.0644	0.0024	0.0000	0.0000
0.2198	0.0641	0.0030	0.0000	0.0000
0.2637	0.0639	0.0037	0.0000	0.0000
0.3077	0.0636	0.0043	0.0000	0.0000
0.3516	0.0633	0.0049	0.0000	0.0000
0.3956	0.0630	0.0055	0.0000	0.0000
0.4396	0.0628	0.0062	0.0000	0.0000
0.4835	0.0625	0.0068	0.0000	0.0000
0.5275	0.0622	0.0075	0.0000	0.0000
0.5714	0.0620	0.0081	0.0000	0.0000
0.6154	0.0617	0.0088	0.0000	0.0000
0.6593	0.0614	0.0094	0.0000	0.0000
0.7033	0.0612	0.0101	0.0000	0.0000
0.7473	0.0609	0.0107	0.0000	0.0000
0.7912	0.0606	0.0114	0.0000	0.0000
0.8352	0.0604	0.0120	0.0000	0.0000
0.8791	0.0601	0.0127	0.0000	0.0000
0.9231	0.0598	0.0134	0.0000	0.0000
0.9670	0.0595	0.0141	0.0000	0.0000
1.0110	0.0593	0.0147	0.0000	0.0000
1.0549	0.0590	0.0154	0.0000	0.0000
1.0989	0.0587	0.0161	0.0060	0.0000
1.1429	0.0585	0.0168	0.0091	0.0000
1.1868	0.0582	0.0175	0.0198	0.0000
1.2308	0.0579	0.0182	0.0201	0.0000

1.2747	0.0577	0.0189	0.0202	0.0000
1.3187	0.0574	0.0196	0.0231	0.0000
1.3626	0.0571	0.0203	0.0245	0.0000
1.4066	0.0568	0.0210	0.0276	0.0000
1.4505	0.0566	0.0217	0.0291	0.0000
1.4945	0.0563	0.0225	0.0319	0.0000
1.5385	0.0560	0.0232	0.0333	0.0000
1.5824	0.0558	0.0239	0.0358	0.0000
1.6264	0.0555	0.0246	0.0370	0.0000
1.6703	0.0552	0.0254	0.0393	0.0000
1.7143	0.0550	0.0261	0.0405	0.0000
1.7582	0.0547	0.0269	0.0426	0.0000
1.8022	0.0544	0.0276	0.0436	0.0000
1.8462	0.0541	0.0283	0.0456	0.0000
1.8901	0.0539	0.0291	0.0465	0.0000
1.9341	0.0536	0.0299	0.0484	0.0000
1.9780	0.0533	0.0306	0.0493	0.0000
2.0220	0.0531	0.0314	0.0510	0.0000
2.0659	0.0528	0.0321	0.0519	0.0000
2.1099	0.0525	0.0329	0.0536	0.0000
2.1538	0.0523	0.0337	0.0544	0.0000
2.1978	0.0520	0.0345	0.0560	0.0000
2.2418	0.0517	0.0352	0.0568	0.0000
2.2857	0.0515	0.0363	0.0583	0.0000
2.3297	0.0512	0.0374	0.0590	0.0000
2.3736	0.0509	0.0385	0.0605	0.0000
2.4176	0.0506	0.0396	0.0612	0.0000
2.4615	0.0504	0.0407	0.0626	0.0000
2.5055	0.0501	0.0418	0.0633	0.0000
2.5495	0.0498	0.0429	0.0647	0.0000
2.5934	0.0496	0.0440	0.0654	0.0000
2.6374	0.0493	0.0452	0.0667	0.0000
2.6813	0.0490	0.0463	0.0674	0.0000
2.7253	0.0488	0.0474	0.0687	0.0000
2.7692	0.0485	0.0486	0.0693	0.0000
2.8132	0.0482	0.0497	0.0706	0.0000
2.8571	0.0479	0.0509	0.0712	0.0000
2.9011	0.0477	0.0520	0.0724	0.0000
2.9451	0.0474	0.0532	0.0730	0.0000
2.9890	0.0471	0.0543	0.0739	0.0000
3.0330	0.0469	0.0555	0.0752	0.0000
3.0769	0.0466	0.0567	0.0775	0.0000
3.1209	0.0463	0.0578	0.0803	0.0000
3.1648	0.0461	0.0590	0.0833	0.0000
3.2088	0.0458	0.0602	0.0864	0.0000
3.2500	0.0455	0.0613	0.1880	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
3.2500	0.0655	0.0613	0.0000	0.0864	0.0000
3.2940	0.0657	0.0642	0.0000	0.0864	0.0000
3.3379	0.0660	0.0671	0.0000	0.0864	0.0000
3.3819	0.0663	0.0700	0.0000	0.0864	0.0000
3.4258	0.0665	0.0729	0.0000	0.0864	0.0000
3.4698	0.0668	0.0759	0.0000	0.0864	0.0000
3.5137	0.0671	0.0788	0.0000	0.0864	0.0000
3.5577	0.0673	0.0818	0.0000	0.0864	0.0000
3.6016	0.0676	0.0847	0.0000	0.0864	0.0000

3.6456	0.0679	0.0877	0.0000	0.0864	0.0000
3.6896	0.0682	0.0907	0.0000	0.0864	0.0000
3.7335	0.0684	0.0937	0.0000	0.0864	0.0000
3.7775	0.0687	0.0967	0.0483	0.0864	0.0000
3.8214	0.0690	0.0997	0.2020	0.0864	0.0000
3.8654	0.0692	0.1028	0.4122	0.0864	0.0000
3.9093	0.0695	0.1058	0.6597	0.0864	0.0000
3.9533	0.0698	0.1089	0.9282	0.0864	0.0000
3.9973	0.0700	0.1120	1.2008	0.0864	0.0000
4.0000	0.0701	0.1121	1.4606	0.0864	0.0000

Surface Biofilter 1

Element Flows To:

Outlet 1	Outlet 2
SSD Table 1	Biofilter 1

Biofilter 2

Bottom Length: 25.24 ft.
Bottom Width: 25.24 ft.
Material thickness of first layer: 0.25
Material type for first layer: Mulch
Material thickness of second layer: 2
Material type for second layer: ESM
Material thickness of third layer: 1
Material type for third layer: GRAVEL
Underdrain used
Underdrain Diameter (feet): 0.5
Orifice Diameter (in.): 2
Offset (in.): 3
Flow Through Underdrain (ac-ft.): 13.719
Total Outflow (ac-ft.): 15.144
Percent Through Underdrain: 90.59
Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 12 in.
Element Flows To:
Outlet 1 Outlet 2
SSD Table 1

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0259	0.0000	0.0000	0.0000
0.0440	0.0258	0.0002	0.0000	0.0000
0.0879	0.0256	0.0004	0.0000	0.0000
0.1319	0.0255	0.0006	0.0000	0.0000
0.1758	0.0253	0.0008	0.0000	0.0000
0.2198	0.0252	0.0010	0.0000	0.0000
0.2637	0.0250	0.0012	0.0000	0.0000
0.3077	0.0249	0.0014	0.0000	0.0000
0.3516	0.0247	0.0016	0.0000	0.0000
0.3956	0.0246	0.0018	0.0000	0.0000
0.4396	0.0244	0.0020	0.0000	0.0000
0.4835	0.0243	0.0022	0.0000	0.0000
0.5275	0.0241	0.0025	0.0000	0.0000
0.5714	0.0239	0.0027	0.0000	0.0000
0.6154	0.0238	0.0029	0.0000	0.0000
0.6593	0.0236	0.0031	0.0000	0.0000
0.7033	0.0235	0.0033	0.0000	0.0000
0.7473	0.0233	0.0036	0.0000	0.0000
0.7912	0.0232	0.0038	0.0000	0.0000
0.8352	0.0230	0.0040	0.0000	0.0000
0.8791	0.0229	0.0043	0.0000	0.0000
0.9231	0.0227	0.0045	0.0000	0.0000
0.9670	0.0226	0.0047	0.0000	0.0000
1.0110	0.0224	0.0050	0.0000	0.0000
1.0549	0.0223	0.0052	0.0000	0.0000
1.0989	0.0221	0.0055	0.0055	0.0000
1.1429	0.0220	0.0057	0.0061	0.0000
1.1868	0.0218	0.0059	0.0064	0.0000
1.2308	0.0217	0.0062	0.0073	0.0000
1.2747	0.0215	0.0064	0.0084	0.0000
1.3187	0.0213	0.0067	0.0095	0.0000

1.3626	0.0212	0.0069	0.0108	0.0000
1.4066	0.0210	0.0072	0.0121	0.0000
1.4505	0.0209	0.0075	0.0121	0.0000
1.4945	0.0207	0.0077	0.0121	0.0000
1.5385	0.0206	0.0080	0.0157	0.0000
1.5824	0.0204	0.0082	0.0158	0.0000
1.6264	0.0203	0.0085	0.0174	0.0000
1.6703	0.0201	0.0088	0.0192	0.0000
1.7143	0.0200	0.0091	0.0197	0.0000
1.7582	0.0198	0.0093	0.0200	0.0000
1.8022	0.0197	0.0096	0.0240	0.0000
1.8462	0.0195	0.0099	0.0250	0.0000
1.8901	0.0194	0.0102	0.0255	0.0000
1.9341	0.0192	0.0104	0.0295	0.0000
1.9780	0.0191	0.0107	0.0301	0.0000
2.0220	0.0189	0.0110	0.0304	0.0000
2.0659	0.0188	0.0113	0.0331	0.0000
2.1099	0.0186	0.0116	0.0339	0.0000
2.1538	0.0184	0.0119	0.0343	0.0000
2.1978	0.0183	0.0122	0.0363	0.0000
2.2418	0.0181	0.0125	0.0373	0.0000
2.2857	0.0180	0.0129	0.0394	0.0000
2.3297	0.0178	0.0133	0.0405	0.0000
2.3736	0.0177	0.0137	0.0426	0.0000
2.4176	0.0175	0.0141	0.0436	0.0000
2.4615	0.0174	0.0145	0.0456	0.0000
2.5055	0.0172	0.0150	0.0465	0.0000
2.5495	0.0171	0.0154	0.0484	0.0000
2.5934	0.0169	0.0158	0.0493	0.0000
2.6374	0.0168	0.0162	0.0510	0.0000
2.6813	0.0166	0.0167	0.0519	0.0000
2.7253	0.0165	0.0171	0.0536	0.0000
2.7692	0.0163	0.0176	0.0544	0.0000
2.8132	0.0162	0.0180	0.0555	0.0000
2.8571	0.0160	0.0185	0.0583	0.0000
2.9011	0.0158	0.0189	0.0618	0.0000
2.9451	0.0157	0.0194	0.0655	0.0000
2.9890	0.0155	0.0198	0.0692	0.0000
3.0330	0.0154	0.0203	0.0737	0.0000
3.0769	0.0152	0.0207	0.0737	0.0000
3.1209	0.0151	0.0212	0.0737	0.0000
3.1648	0.0149	0.0217	0.0737	0.0000
3.2088	0.0148	0.0221	0.0737	0.0000
3.2500	0.0146	0.0226	0.0737	0.0000

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
3.2500	0.0259	0.0226	0.0000	0.0737	0.0000
3.2940	0.0261	0.0237	0.0000	0.0737	0.0000
3.3379	0.0262	0.0249	0.0000	0.0737	0.0000
3.3819	0.0264	0.0260	0.0000	0.0737	0.0000
3.4258	0.0265	0.0272	0.0000	0.0737	0.0000
3.4698	0.0267	0.0284	0.0000	0.0737	0.0000
3.5137	0.0268	0.0295	0.0000	0.0737	0.0000
3.5577	0.0270	0.0307	0.0000	0.0737	0.0000
3.6016	0.0271	0.0319	0.0000	0.0737	0.0000
3.6456	0.0273	0.0331	0.0000	0.0737	0.0000
3.6896	0.0275	0.0343	0.0000	0.0737	0.0000

3.7335	0.0276	0.0355	0.0000	0.0737	0.0000
3.7775	0.0278	0.0367	0.0483	0.0737	0.0000
3.8214	0.0279	0.0380	0.2020	0.0737	0.0000
3.8654	0.0281	0.0392	0.4122	0.0737	0.0000
3.9093	0.0282	0.0404	0.6597	0.0737	0.0000
3.9533	0.0284	0.0417	0.9282	0.0737	0.0000
3.9973	0.0285	0.0429	1.2008	0.0737	0.0000
4.0000	0.0285	0.0430	1.4606	0.0737	0.0000

Surface Biofilter 2

Element Flows To:

Outlet 1	Outlet 2
SSD Table 1	Biofilter 2

Biofilter 3

Bottom Length:	31.70 ft.
Bottom Width:	31.70 ft.
Material thickness of first layer:	0.25
Material type for first layer:	Mulch
Material thickness of second layer:	2
Material type for second layer:	ESM
Material thickness of third layer:	1
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	2
Offset (in.):	3
Flow Through Underdrain (ac-ft.):	14.81
Total Outflow (ac-ft.):	16.771
Percent Through Underdrain:	88.31

Discharge Structure

Riser Height: 0.5 ft.

Riser Diameter: 12 in.

Element Flows To:

Outlet 1 Outlet 2

SSD Table 1

Biofilter Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0231	0.0000	0.0000	0.0000
0.0440	0.0231	0.0003	0.0000	0.0000
0.0879	0.0231	0.0006	0.0000	0.0000
0.1319	0.0231	0.0009	0.0000	0.0000
0.1758	0.0231	0.0012	0.0000	0.0000
0.2198	0.0231	0.0015	0.0000	0.0000
0.2637	0.0231	0.0018	0.0000	0.0000
0.3077	0.0231	0.0021	0.0000	0.0000
0.3516	0.0231	0.0024	0.0000	0.0000
0.3956	0.0231	0.0027	0.0000	0.0000
0.4396	0.0231	0.0030	0.0000	0.0000
0.4835	0.0231	0.0033	0.0000	0.0000
0.5275	0.0231	0.0037	0.0000	0.0000
0.5714	0.0231	0.0040	0.0000	0.0000
0.6154	0.0231	0.0043	0.0000	0.0000
0.6593	0.0231	0.0046	0.0000	0.0000
0.7033	0.0231	0.0049	0.0000	0.0000
0.7473	0.0231	0.0052	0.0000	0.0000
0.7912	0.0231	0.0055	0.0000	0.0000
0.8352	0.0231	0.0058	0.0000	0.0000
0.8791	0.0231	0.0061	0.0000	0.0000
0.9231	0.0231	0.0064	0.0000	0.0000
0.9670	0.0231	0.0067	0.0000	0.0000
1.0110	0.0231	0.0070	0.0000	0.0000
1.0549	0.0231	0.0073	0.0000	0.0000
1.0989	0.0231	0.0076	0.0087	0.0000
1.1429	0.0231	0.0079	0.0096	0.0000
1.1868	0.0231	0.0082	0.0101	0.0000
1.2308	0.0231	0.0085	0.0116	0.0000
1.2747	0.0231	0.0088	0.0118	0.0000
1.3187	0.0231	0.0091	0.0120	0.0000

1.3626	0.0231	0.0094	0.0160	0.0000
1.4066	0.0231	0.0097	0.0180	0.0000
1.4505	0.0231	0.0100	0.0201	0.0000
1.4945	0.0231	0.0103	0.0202	0.0000
1.5385	0.0231	0.0106	0.0202	0.0000
1.5824	0.0231	0.0110	0.0249	0.0000
1.6264	0.0231	0.0113	0.0254	0.0000
1.6703	0.0231	0.0116	0.0257	0.0000
1.7143	0.0231	0.0119	0.0282	0.0000
1.7582	0.0231	0.0122	0.0294	0.0000
1.8022	0.0231	0.0125	0.0320	0.0000
1.8462	0.0231	0.0128	0.0334	0.0000
1.8901	0.0231	0.0131	0.0379	0.0000
1.9341	0.0231	0.0134	0.0381	0.0000
1.9780	0.0231	0.0137	0.0382	0.0000
2.0220	0.0231	0.0140	0.0399	0.0000
2.0659	0.0231	0.0143	0.0407	0.0000
2.1099	0.0231	0.0146	0.0427	0.0000
2.1538	0.0231	0.0149	0.0437	0.0000
2.1978	0.0231	0.0152	0.0456	0.0000
2.2418	0.0231	0.0155	0.0466	0.0000
2.2857	0.0231	0.0159	0.0484	0.0000
2.3297	0.0231	0.0164	0.0493	0.0000
2.3736	0.0231	0.0168	0.0510	0.0000
2.4176	0.0231	0.0172	0.0519	0.0000
2.4615	0.0231	0.0176	0.0536	0.0000
2.5055	0.0231	0.0180	0.0544	0.0000
2.5495	0.0231	0.0185	0.0560	0.0000
2.5934	0.0231	0.0189	0.0568	0.0000
2.6374	0.0231	0.0193	0.0583	0.0000
2.6813	0.0231	0.0197	0.0590	0.0000
2.7253	0.0231	0.0201	0.0605	0.0000
2.7692	0.0231	0.0206	0.0612	0.0000
2.8132	0.0231	0.0210	0.0626	0.0000
2.8571	0.0231	0.0214	0.0633	0.0000
2.9011	0.0231	0.0218	0.0643	0.0000
2.9451	0.0231	0.0222	0.0668	0.0000
2.9890	0.0231	0.0227	0.0699	0.0000
3.0330	0.0231	0.0231	0.0732	0.0000
3.0769	0.0231	0.0235	0.0765	0.0000
3.1209	0.0231	0.0239	0.0798	0.0000
3.1648	0.0231	0.0244	0.0831	0.0000
3.2088	0.0231	0.0248	0.0862	0.0000
3.2500	0.0231	0.0252	0.1163	0.0000

Biofilter Hydraulic Table

Stage(feet)	**Area(ac.)**	**Volume(ac-ft.)**	**Discharge(cfs)**	**To Amended(cfs)**	**Infilt(cfs)**
3.2500	0.0231	0.0252	0.0000	0.0862	0.0000
3.2940	0.0231	0.0262	0.0000	0.0862	0.0000
3.3379	0.0231	0.0272	0.0000	0.0862	0.0000
3.3819	0.0231	0.0282	0.0000	0.0862	0.0000
3.4258	0.0231	0.0292	0.0000	0.0862	0.0000
3.4698	0.0231	0.0302	0.0000	0.0862	0.0000
3.5137	0.0231	0.0313	0.0000	0.0862	0.0000
3.5577	0.0231	0.0323	0.0000	0.0862	0.0000
3.6016	0.0231	0.0333	0.0000	0.0862	0.0000
3.6456	0.0231	0.0343	0.0000	0.0862	0.0000
3.6896	0.0231	0.0353	0.0000	0.0862	0.0000

3.7335	0.0231	0.0363	0.0000	0.0862	0.0000
3.7775	0.0231	0.0373	0.0483	0.0862	0.0000
3.8214	0.0231	0.0383	0.2020	0.0862	0.0000
3.8654	0.0231	0.0394	0.4122	0.0862	0.0000
3.9093	0.0231	0.0404	0.6597	0.0862	0.0000
3.9533	0.0231	0.0414	0.9282	0.0862	0.0000
3.9973	0.0231	0.0424	1.2008	0.0862	0.0000
4.0000	0.0231	0.0425	1.4606	0.0862	0.0000

Surface Biofilter 3

Element Flows To:

Outlet 1	Outlet 2
SSD Table 1	Biofilter 3

SSD Table 1

Depth: 6.75 ft.
Element Flows To:
Outlet 1 Outlet 2

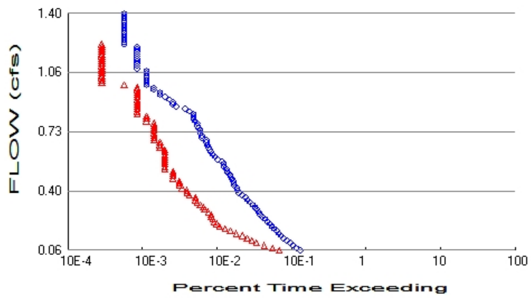
SSD Table Hydraulic Table

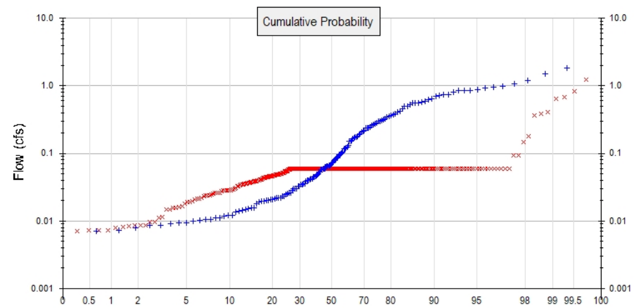
Stage (feet)	Area (ac.)	Volume (ac-ft.)	Manual	NotUsed	NotUsed	NotUsed	NotUsed
0.000	0.140	0.000	0.000	0.000	0.000	0.000	0.000
0.083	0.140	0.005	0.060	0.000	0.000	0.000	0.000
0.167	0.140	0.009	0.060	0.000	0.000	0.000	0.000
0.250	0.140	0.014	0.060	0.000	0.000	0.000	0.000
0.333	0.140	0.019	0.060	0.000	0.000	0.000	0.000
0.417	0.140	0.023	0.060	0.000	0.000	0.000	0.000
0.500	0.140	0.028	0.060	0.000	0.000	0.000	0.000
0.583	0.140	0.033	0.060	0.000	0.000	0.000	0.000
0.667	0.140	0.037	0.060	0.000	0.000	0.000	0.000
0.750	0.140	0.042	0.060	0.000	0.000	0.000	0.000
0.833	0.140	0.052	0.060	0.000	0.000	0.000	0.000
0.917	0.140	0.063	0.060	0.000	0.000	0.000	0.000
1.000	0.140	0.073	0.060	0.000	0.000	0.000	0.000
1.083	0.140	0.083	0.060	0.000	0.000	0.000	0.000
1.167	0.140	0.093	0.060	0.000	0.000	0.000	0.000
1.250	0.140	0.104	0.060	0.000	0.000	0.000	0.000
1.333	0.140	0.114	0.060	0.000	0.000	0.000	0.000
1.417	0.140	0.124	0.060	0.000	0.000	0.000	0.000
1.500	0.140	0.134	0.060	0.000	0.000	0.000	0.000
1.583	0.140	0.144	0.060	0.000	0.000	0.000	0.000
1.667	0.140	0.154	0.060	0.000	0.000	0.000	0.000
1.750	0.140	0.164	0.060	0.000	0.000	0.000	0.000
1.833	0.140	0.174	0.060	0.000	0.000	0.000	0.000
1.917	0.140	0.184	0.060	0.000	0.000	0.000	0.000
2.000	0.140	0.194	0.060	0.000	0.000	0.000	0.000
2.083	0.140	0.204	0.060	0.000	0.000	0.000	0.000
2.167	0.140	0.214	0.060	0.000	0.000	0.000	0.000
2.250	0.140	0.224	0.060	0.000	0.000	0.000	0.000
2.333	0.140	0.233	0.060	0.000	0.000	0.000	0.000
2.417	0.140	0.243	0.060	0.000	0.000	0.000	0.000
2.500	0.140	0.253	0.060	0.000	0.000	0.000	0.000
2.583	0.140	0.262	0.060	0.000	0.000	0.000	0.000
2.667	0.140	0.272	0.060	0.000	0.000	0.000	0.000
2.750	0.140	0.281	0.060	0.000	0.000	0.000	0.000
2.833	0.140	0.291	0.060	0.000	0.000	0.000	0.000
2.917	0.140	0.300	0.060	0.000	0.000	0.000	0.000
3.000	0.140	0.310	0.060	0.000	0.000	0.000	0.000
3.083	0.140	0.319	0.060	0.000	0.000	0.000	0.000
3.167	0.140	0.328	0.060	0.000	0.000	0.000	0.000
3.250	0.140	0.337	0.060	0.000	0.000	0.000	0.000
3.333	0.140	0.346	0.060	0.000	0.000	0.000	0.000
3.417	0.140	0.355	0.060	0.000	0.000	0.000	0.000
3.500	0.140	0.364	0.060	0.000	0.000	0.000	0.000
3.583	0.140	0.373	0.060	0.000	0.000	0.000	0.000
3.667	0.140	0.382	0.060	0.000	0.000	0.000	0.000
3.750	0.140	0.391	0.060	0.000	0.000	0.000	0.000
3.833	0.140	0.399	0.060	0.000	0.000	0.000	0.000

3.917	0.140	0.408	0.060	0.000	0.000	0.000	0.000
4.000	0.140	0.416	0.060	0.000	0.000	0.000	0.000
4.083	0.140	0.425	0.060	0.000	0.000	0.000	0.000
4.167	0.140	0.433	0.060	0.000	0.000	0.000	0.000
4.250	0.140	0.441	0.060	0.000	0.000	0.000	0.000
4.333	0.140	0.449	0.100	0.000	0.000	0.000	0.000
4.417	0.140	0.457	0.173	0.000	0.000	0.000	0.000
4.500	0.140	0.465	0.268	0.000	0.000	0.000	0.000
4.583	0.140	0.473	0.522	0.000	0.000	0.000	0.000
4.667	0.140	0.480	0.972	0.000	0.000	0.000	0.000
4.750	0.140	0.488	1.486	0.000	0.000	0.000	0.000
4.833	0.140	0.495	1.952	0.000	0.000	0.000	0.000
4.917	0.140	0.502	2.281	0.000	0.000	0.000	0.000
5.000	0.140	0.509	2.471	0.000	0.000	0.000	0.000
5.083	0.140	0.515	2.674	0.000	0.000	0.000	0.000
5.167	0.140	0.522	2.840	0.000	0.000	0.000	0.000
5.250	0.140	0.528	2.996	0.000	0.000	0.000	0.000
5.333	0.140	0.534	3.143	0.000	0.000	0.000	0.000
5.417	0.140	0.539	3.284	0.000	0.000	0.000	0.000
5.500	0.140	0.544	3.418	0.000	0.000	0.000	0.000
5.583	0.140	0.549	3.546	0.000	0.000	0.000	0.000
5.667	0.140	0.554	3.670	0.000	0.000	0.000	0.000
5.750	0.140	0.559	3.790	0.000	0.000	0.000	0.000
5.833	0.140	0.564	3.905	0.000	0.000	0.000	0.000
5.917	0.140	0.568	4.017	0.000	0.000	0.000	0.000
6.000	0.140	0.573	4.126	0.000	0.000	0.000	0.000
6.083	0.140	0.578	4.231	0.000	0.000	0.000	0.000
6.167	0.140	0.582	4.334	0.000	0.000	0.000	0.000
6.250	0.140	0.587	4.435	0.000	0.000	0.000	0.000
6.333	0.140	0.592	4.533	0.000	0.000	0.000	0.000
6.417	0.140	0.596	4.629	0.000	0.000	0.000	0.000
6.500	0.140	0.601	4.722	0.000	0.000	0.000	0.000
6.583	0.140	0.606	4.814	0.000	0.000	0.000	0.000
6.667	0.140	0.610	4.904	0.000	0.000	0.000	0.000
6.750	0.140	0.615	4.993	0.000	0.000	0.000	0.000

Analysis Results

POC 1





+ Predeveloped   x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area:	3.18
Total Impervious Area:	0

Mitigated Landuse Totals for POC #1

Total Pervious Area:	0.482
Total Impervious Area:	2.553

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.569401
5 year	0.865501
10 year	1.061956
25 year	1.560772

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.06
5 year	0.171565
10 year	0.609883
25 year	0.91116

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0637	455	240	52	Pass
0.0772	405	196	48	Pass
0.0906	368	152	41	Pass
0.1041	339	119	35	Pass
0.1175	303	104	34	Pass
0.1310	273	89	32	Pass
0.1444	254	78	30	Pass
0.1579	238	64	26	Pass
0.1713	220	53	24	Pass
0.1848	205	45	21	Pass
0.1982	190	38	20	Pass
0.2117	179	35	19	Pass
0.2251	166	32	19	Pass
0.2386	155	31	20	Pass
0.2520	143	29	20	Pass
0.2655	133	29	21	Pass
0.2789	128	27	21	Pass
0.2924	120	24	20	Pass
0.3058	114	23	20	Pass
0.3193	106	21	19	Pass
0.3327	98	19	19	Pass
0.3462	91	18	19	Pass
0.3596	84	18	21	Pass
0.3731	77	15	19	Pass
0.3865	68	14	20	Pass
0.4000	66	14	21	Pass
0.4134	65	12	18	Pass
0.4269	60	11	18	Pass
0.4403	59	11	18	Pass
0.4538	58	11	18	Pass
0.4672	56	9	16	Pass
0.4807	53	9	16	Pass
0.4941	50	9	18	Pass
0.5076	48	9	18	Pass
0.5210	47	7	14	Pass
0.5345	43	7	16	Pass
0.5479	43	7	16	Pass
0.5614	41	7	17	Pass
0.5748	36	7	19	Pass
0.5883	33	7	21	Pass
0.6017	31	7	22	Pass
0.6152	29	7	24	Pass
0.6286	28	7	25	Pass
0.6421	27	6	22	Pass
0.6555	26	6	23	Pass
0.6690	25	6	24	Pass
0.6824	25	5	20	Pass
0.6959	22	5	22	Pass
0.7093	22	5	22	Pass
0.7228	21	5	23	Pass
0.7362	21	5	23	Pass
0.7497	20	5	25	Pass
0.7631	19	5	26	Pass

0.7766	19	5	26	Pass
0.7900	18	4	22	Pass
0.8035	17	4	23	Pass
0.8169	17	4	23	Pass
0.8304	17	3	17	Pass
0.8438	15	3	20	Pass
0.8573	13	3	23	Pass
0.8707	10	3	30	Pass
0.8842	9	3	33	Pass
0.8976	9	3	33	Pass
0.9111	8	3	37	Pass
0.9245	7	3	42	Pass
0.9380	6	3	50	Pass
0.9514	6	3	50	Pass
0.9649	5	3	60	Pass
0.9783	5	3	60	Pass
0.9918	4	2	50	Pass
1.0052	4	1	25	Pass
1.0187	4	1	25	Pass
1.0321	4	1	25	Pass
1.0456	4	1	25	Pass
1.0590	4	1	25	Pass
1.0725	4	1	25	Pass
1.0859	3	1	33	Pass
1.0994	3	1	33	Pass
1.1128	3	1	33	Pass
1.1263	3	1	33	Pass
1.1397	3	1	33	Pass
1.1532	3	1	33	Pass
1.1666	3	1	33	Pass
1.1801	3	1	33	Pass
1.1935	3	1	33	Pass
1.2070	3	1	33	Pass
1.2204	2	1	50	Pass
1.2339	2	0	0	Pass
1.2473	2	0	0	Pass
1.2608	2	0	0	Pass
1.2742	2	0	0	Pass
1.2877	2	0	0	Pass
1.3011	2	0	0	Pass
1.3146	2	0	0	Pass
1.3280	2	0	0	Pass
1.3415	2	0	0	Pass
1.3549	2	0	0	Pass
1.3684	2	0	0	Pass
1.3818	2	0	0	Pass
1.3953	2	0	0	Pass

Water Quality

Model Default Modifications

Total of 0 changes have been made.

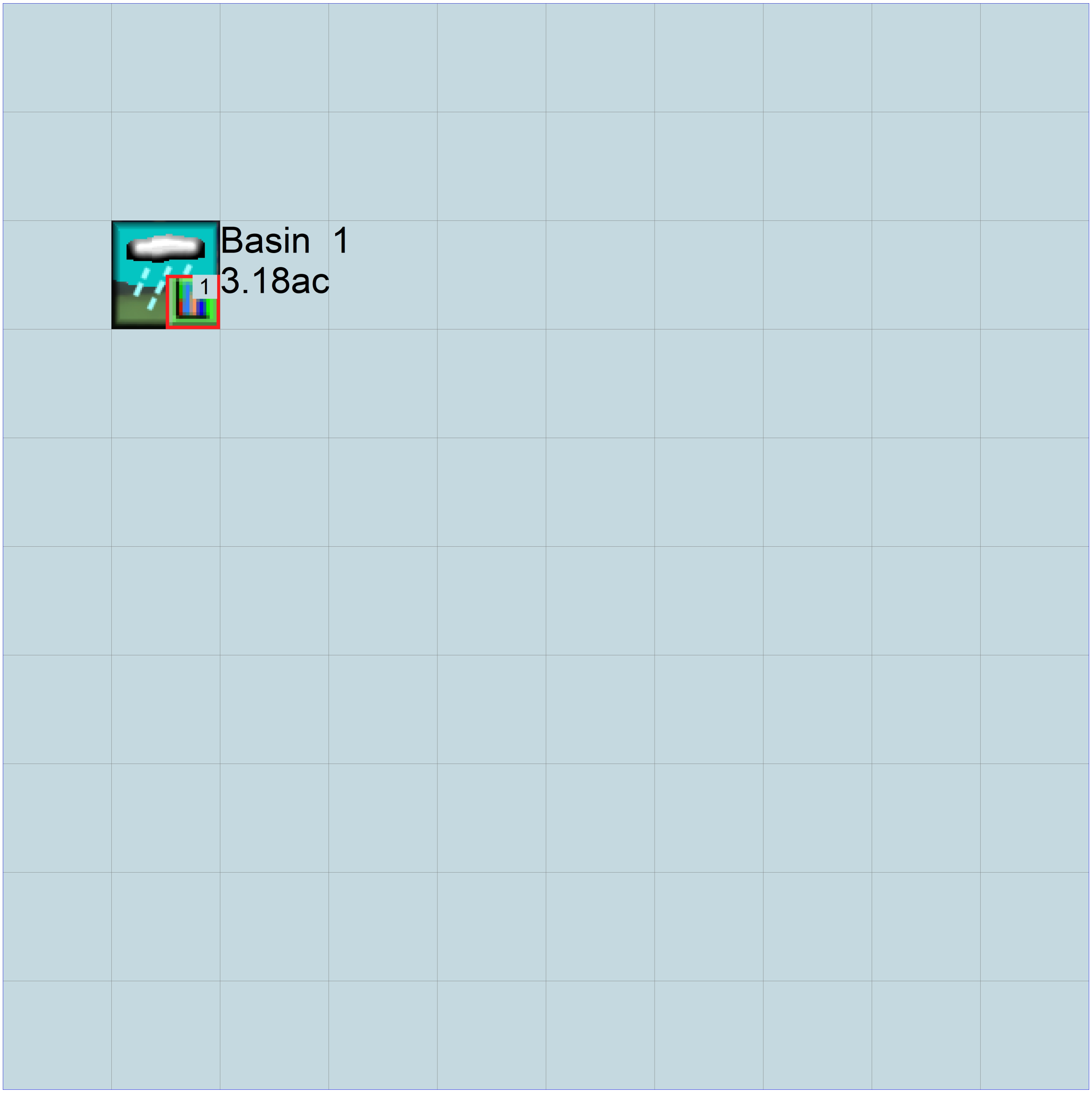
PERLND Changes

No PERLND changes have been made.

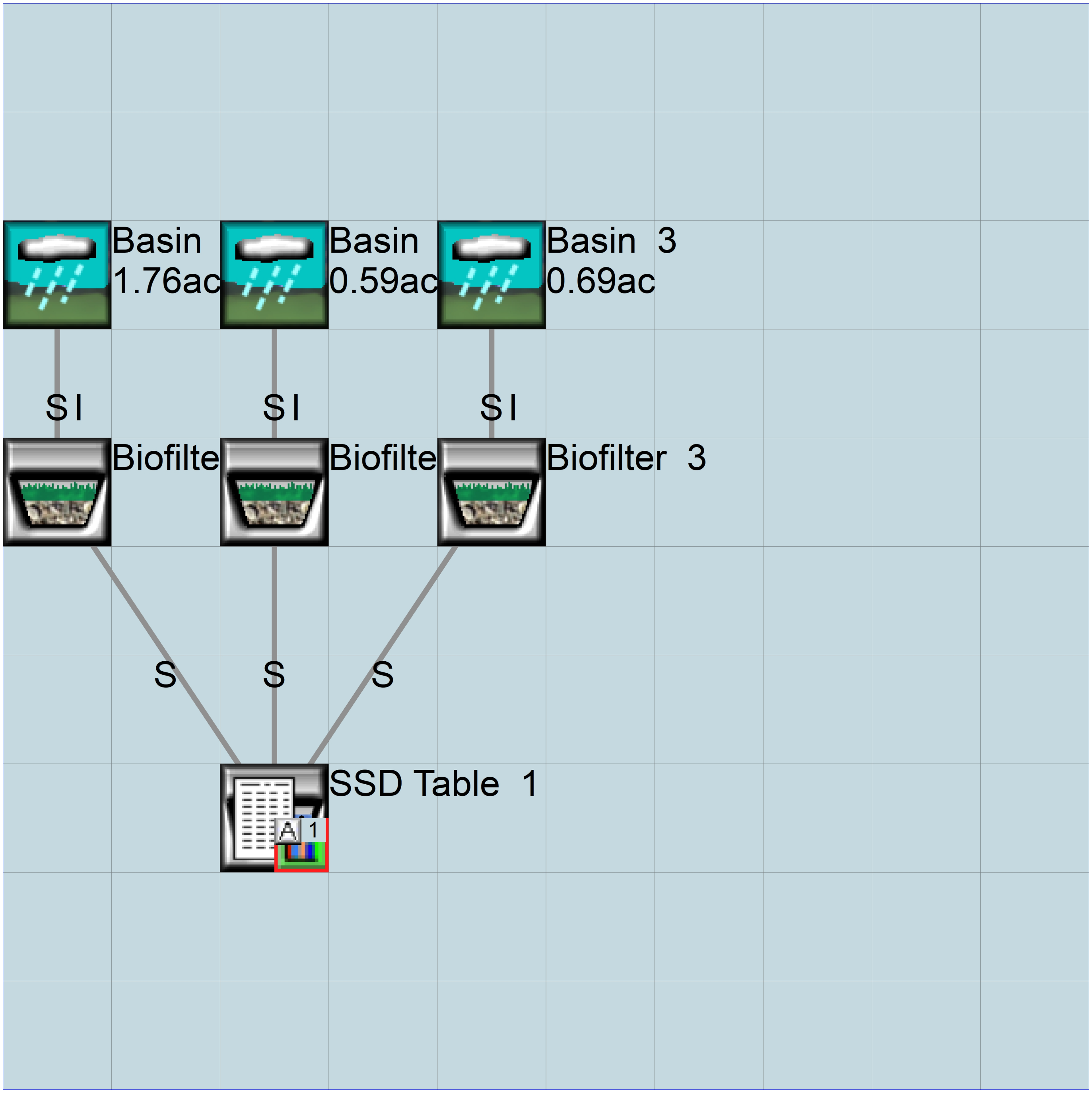
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   V_A2-OPTIMIZED_ADS_SSD.wdm
MESSU      25   PreV_A2-OPTIMIZED_ADS_SSD.MES
           27   PreV_A2-OPTIMIZED_ADS_SSD.L61
           28   PreV_A2-OPTIMIZED_ADS_SSD.L62
           30   POCV_A2-OPTIMIZED_ADS_SSD1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      28
      PERLND      31
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                    MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   28      D,NatVeg,Flat          1    1    1    1   27    0
   31      D,Dirt,Flat            1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   28         0    0    1    0    0    0    0    0    0    0    0    0
   31         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
```

```
   28         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   31         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   28         0    1    1    1    0    0    0    0    1    1    0
   31         0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2          ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   28             0       3.3      0.03       100      0.05       2.5     0.915
   31             0       2.8     0.025       100      0.05       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3          ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   28             0         0         2         2         0      0.05      0.05
   31             0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   28             0       0.6      0.04         1       0.3         0
   31             0       0.6     0.017         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3          ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   28       0.4  0.4  0.4  0.4  0.6  0.6  0.6  0.6  0.6  0.4  0.4  0.4
   31       0.4  0.4  0.4  0.4  0.4  0.4  0.4  0.4  0.4  0.4  0.4  0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3          ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
   28       0.1  0.1  0.1  0.1 0.06 0.06 0.06 0.06 0.06  0.1  0.1  0.1
   31       0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   28             0         0      0.01         0       0.4      0.01         0
   31             0         0      0.01         0       0.4      0.01         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name-------->   Unit-systems   Printer ***
    # -  #                      User  t-series Engl Metr ***
                                       in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO
```

```
  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  28                        2.88     COPY   501     12
PERLND  28                        2.88     COPY   501     13
PERLND  31                         0.3     COPY   501     12
PERLND  31                         0.3     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                           in  out                            ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1
```

```
  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1      12.1      WDM     501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1964 10 01        END    2004 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   V_A2-OPTIMIZED_ADS_SSD.wdm
MESSU      25   MitV_A2-OPTIMIZED_ADS_SSD.MES
           27   MitV_A2-OPTIMIZED_ADS_SSD.L61
           28   MitV_A2-OPTIMIZED_ADS_SSD.L62
           30   POCV_A2-OPTIMIZED_ADS_SSD1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:60
      PERLND      46
      IMPLND       1
      RCHRES       1
      RCHRES       2
      RCHRES       3
      RCHRES       4
      RCHRES       5
      RCHRES       6
      RCHRES       7
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        SSD Table  1                MAX                      1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   46      D,Urban,Flat           1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
```

```
    46          0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    46          0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    46          0    1    1    1    0    0    0    0    1    1    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    46              0       3.8      0.03        50      0.05       2.5     0.915
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    46              0         0         2         2         0      0.05      0.05
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                               ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    46              0       0.6      0.03         1       0.3         0
  END PWAT-PARM4
  MON-LZETPARM
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
    46      0.6  0.6  0.6  0.6  0.7  0.7  0.7  0.7  0.7  0.6  0.6  0.6
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >      PWATER input info: Part 3         ***
    # -  #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
    46      0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1  0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
              ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    46              0         0      0.15         0         1      0.05         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name-------> Unit-systems   Printer ***
    # -  #                    User  t-series Engl Metr ***
                                      in  out          ***
     1      IMPERVIOUS-FLAT       1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
     1          0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   *********
     1          0    0    4    0    0    0    1    9
```

```
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            100      0.05     0.011       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  46                        0.32     RCHRES   1      2
PERLND  46                        0.32     RCHRES   1      3
IMPLND   1                        1.44     RCHRES   1      5
Basin  2***
PERLND  46                       0.052     RCHRES   3      2
PERLND  46                       0.052     RCHRES   3      3
IMPLND   1                       0.533     RCHRES   3      5
Basin  3***
PERLND  46                        0.11     RCHRES   5      2
PERLND  46                        0.11     RCHRES   5      3
IMPLND   1                        0.58     RCHRES   5      5

******Routing******
RCHRES   2                           1     RCHRES   7      6
RCHRES   2                                 COPY     1     16
RCHRES   1                           1     RCHRES   7      7
RCHRES   1                                 COPY     1     17
RCHRES   1                           1     RCHRES   2      8
RCHRES   4                           1     RCHRES   7      6
RCHRES   4                                 COPY     1     16
RCHRES   3                           1     RCHRES   7      7
RCHRES   3                                 COPY     1     17
RCHRES   3                           1     RCHRES   4      8
RCHRES   6                           1     RCHRES   7      6
RCHRES   6                                 COPY     1     16
RCHRES   5                           1     RCHRES   7      7
RCHRES   5                                 COPY     1     17
RCHRES   5                           1     RCHRES   6      8
RCHRES   7                           1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1
```

```
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                            ***
    1     Surface Biofilte-007    3    1    1    1   28    0    1
    2     Biofilter  1            1    1    1    1   28    0    1
    3     Surface Biofilte-009    3    1    1    1   28    0    1
    4     Biofilter  2            1    1    1    1   28    0    1
    5     Surface Biofilte-011    3    1    1    1   28    0    1
    6     Biofilter  3            1    1    1    1   28    0    1
    7     SSD Table  1            1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
    3         1    0    0    0    0    0    0    0    0    0
    4         1    0    0    0    0    0    0    0    0    0
    5         1    0    0    0    0    0    0    0    0    0
    6         1    0    0    0    0    0    0    0    0    0
    7         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR   *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
    3         4    0    0    0    0    0    0    0    0    0    1    9
    4         4    0    0    0    0    0    0    0    0    0    1    9
    5         4    0    0    0    0    0    0    0    0    0    1    9
    6         4    0    0    0    0    0    0    0    0    0    1    9
    7         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible   exit *** possible   exit     possible   exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1        0  1  0  0    4  5  6  0  0       0  0  0  0  0       2  2  2  2  2
    2        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    3        0  1  0  0    4  5  6  0  0       0  0  0  0  0       2  2  2  2  2
    4        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    5        0  1  0  0    4  5  6  0  0       0  0  0  0  0       2  2  2  2  2
    6        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
    7        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1             1      0.01       0.0       0.0       0.5       0.0
    2             2      0.01       0.0       0.0       0.5       0.0
    3             3      0.01       0.0       0.0       0.5       0.0
    4             4      0.01       0.0       0.0       0.5       0.0
    5             5      0.01       0.0       0.0       0.5       0.0
    6             6      0.01       0.0       0.0       0.5       0.0
    7             7      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
```

```
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1          0          4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2          0          4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3          0          4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    4          0          4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    5          0          4.0  5.0  6.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    6          0          4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    7          0          4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      2
   75    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.065456  0.000000  0.000000
  0.043956  0.065203  0.000602  0.000000
  0.087912  0.064933  0.001208  0.000000
  0.131868  0.064664  0.001817  0.000000
  0.175824  0.064394  0.002430  0.000000
  0.219780  0.064125  0.003046  0.000000
  0.263736  0.063855  0.003666  0.000000
  0.307692  0.063585  0.004289  0.000000
  0.351648  0.063316  0.004916  0.000000
  0.395604  0.063046  0.005547  0.000000
  0.439560  0.062777  0.006181  0.000000
  0.483516  0.062507  0.006818  0.000000
  0.527473  0.062237  0.007459  0.000000
  0.571429  0.061968  0.008104  0.000000
  0.615385  0.061698  0.008752  0.000000
  0.659341  0.061429  0.009404  0.000000
  0.703297  0.061159  0.010060  0.000000
  0.747253  0.060889  0.010719  0.000000
  0.791209  0.060620  0.011381  0.000000
  0.835165  0.060350  0.012047  0.000000
  0.879121  0.060080  0.012717  0.000000
  0.923077  0.059811  0.013390  0.000000
  0.967033  0.059541  0.014067  0.000000
  1.010989  0.059272  0.014747  0.000000
  1.054945  0.059002  0.015431  0.000000
  1.098901  0.058732  0.016118  0.006042
  1.142857  0.058463  0.016809  0.009062
  1.186813  0.058193  0.017504  0.019844
  1.230769  0.057924  0.018202  0.020054
  1.274725  0.057654  0.018903  0.020159
  1.318681  0.057384  0.019608  0.023069
  1.362637  0.057115  0.020317  0.024525
  1.406593  0.056845  0.021029  0.027585
  1.450549  0.056576  0.021745  0.029115
  1.494505  0.056306  0.022465  0.031900
  1.538462  0.056036  0.023188  0.033293
  1.582418  0.055767  0.023914  0.035796
  1.626374  0.055497  0.024644  0.037048
  1.670330  0.055228  0.025378  0.039324
  1.714286  0.054958  0.026115  0.040462
  1.758242  0.054688  0.026856  0.042559
  1.802198  0.054419  0.027600  0.043607
  1.846154  0.054149  0.028348  0.045561
  1.890110  0.053879  0.029099  0.046538
  1.934066  0.053610  0.029854  0.048374
  1.978022  0.053340  0.030613  0.049292
  2.021978  0.053071  0.031375  0.051030
  2.065934  0.052801  0.032140  0.051899
  2.109890  0.052531  0.032909  0.053553
  2.153846  0.052262  0.033682  0.054380
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  2.197802  0.051992  0.034458  0.055961
  2.241758  0.051723  0.035238  0.056752
  2.285714  0.051453  0.036322  0.058269
  2.329670  0.051183  0.037410  0.059028
  2.373626  0.050914  0.038504  0.060489
  2.417582  0.050644  0.039602  0.061220
  2.461538  0.050375  0.040706  0.062631
  2.505495  0.050105  0.041814  0.063336
  2.549451  0.049835  0.042927  0.064701
  2.593407  0.049566  0.044045  0.065384
  2.637363  0.049296  0.045168  0.066708
  2.681319  0.049027  0.046296  0.067370
  2.725275  0.048757  0.047429  0.068657
  2.769231  0.048487  0.048567  0.069300
  2.813187  0.048218  0.049710  0.070553
  2.857143  0.047948  0.050857  0.071179
  2.901099  0.047678  0.052010  0.072400
  2.945055  0.047409  0.053167  0.073010
  2.989011  0.047139  0.054330  0.073872
  3.032967  0.046870  0.055497  0.075177
  3.076923  0.046600  0.056669  0.077524
  3.120879  0.046330  0.057846  0.080331
  3.164835  0.046061  0.059028  0.083317
  3.208791  0.045791  0.060215  0.086365
  3.250000  0.045522  0.128798  0.188009
  END FTABLE  2
  FTABLE      1
   19    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)    (cfs)      (cfs)      (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.045522  0.000000  0.000000  0.000000  0.000000
  0.043956  0.065725  0.002883  0.000000  0.086365  0.000000
  0.087912  0.065995  0.005778  0.000000  0.086365  0.000000
  0.131868  0.066265  0.008685  0.000000  0.086365  0.000000
  0.175824  0.066534  0.011604  0.000000  0.086365  0.000000
  0.219780  0.066804  0.014534  0.000000  0.086365  0.000000
  0.263736  0.067073  0.017476  0.000000  0.086365  0.000000
  0.307692  0.067343  0.020431  0.000000  0.086365  0.000000
  0.351648  0.067613  0.023397  0.000000  0.086365  0.000000
  0.395604  0.067882  0.026375  0.000000  0.086365  0.000000
  0.439560  0.068152  0.029364  0.000000  0.086365  0.000000
  0.483516  0.068422  0.032366  0.000000  0.086365  0.000000
  0.527473  0.068691  0.035379  0.048301  0.086365  0.000000
  0.571429  0.068961  0.038405  0.202028  0.086365  0.000000
  0.615385  0.069230  0.041442  0.412175  0.086365  0.000000
  0.659341  0.069500  0.044491  0.659695  0.086365  0.000000
  0.703297  0.069770  0.047552  0.928167  0.086365  0.000000
  0.747253  0.070039  0.050625  1.200769  0.086365  0.000000
  0.750000  0.070056  0.050817  1.460630  0.086365  0.000000
  END FTABLE  1
  FTABLE      4
   75    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)    (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.025924  0.000000  0.000000
  0.043956  0.025780  0.000194  0.000000
  0.087912  0.025628  0.000390  0.000000
  0.131868  0.025475  0.000588  0.000000
  0.175824  0.025322  0.000788  0.000000
  0.219780  0.025169  0.000989  0.000000
  0.263736  0.025016  0.001193  0.000000
  0.307692  0.024864  0.001399  0.000000
  0.351648  0.024711  0.001607  0.000000
  0.395604  0.024558  0.001817  0.000000
  0.439560  0.024405  0.002029  0.000000
  0.483516  0.024252  0.002243  0.000000
  0.527473  0.024099  0.002459  0.000000
  0.571429  0.023947  0.002677  0.000000
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  0.615385  0.023794  0.002897  0.000000
  0.659341  0.023641  0.003120  0.000000
  0.703297  0.023488  0.003344  0.000000
  0.747253  0.023335  0.003570  0.000000
  0.791209  0.023183  0.003798  0.000000
  0.835165  0.023030  0.004028  0.000000
  0.879121  0.022877  0.004260  0.000000
  0.923077  0.022724  0.004494  0.000000
  0.967033  0.022571  0.004730  0.000000
  1.010989  0.022418  0.004969  0.000000
  1.054945  0.022266  0.005209  0.000000
  1.098901  0.022113  0.005451  0.005488
  1.142857  0.021960  0.005695  0.006057
  1.186813  0.021807  0.005942  0.006375
  1.230769  0.021654  0.006190  0.007344
  1.274725  0.021502  0.006440  0.008397
  1.318681  0.021349  0.006692  0.009536
  1.362637  0.021196  0.006947  0.010763
  1.406593  0.021043  0.007203  0.012080
  1.450549  0.020890  0.007461  0.012082
  1.494505  0.020738  0.007722  0.012082
  1.538462  0.020585  0.007984  0.015673
  1.582418  0.020432  0.008249  0.015785
  1.626374  0.020279  0.008515  0.017436
  1.670330  0.020126  0.008783  0.019187
  1.714286  0.019973  0.009054  0.019725
  1.758242  0.019821  0.009326  0.019994
  1.802198  0.019668  0.009601  0.024013
  1.846154  0.019515  0.009877  0.024996
  1.890110  0.019362  0.010156  0.025488
  1.934066  0.019209  0.010436  0.029504
  1.978022  0.019057  0.010719  0.030074
  2.021978  0.018904  0.011003  0.030360
  2.065934  0.018751  0.011290  0.033129
  2.109890  0.018598  0.011579  0.033907
  2.153846  0.018445  0.011869  0.034296
  2.197802  0.018292  0.012162  0.036298
  2.241758  0.018140  0.012456  0.037299
  2.285714  0.017987  0.012867  0.039449
  2.329670  0.017834  0.013280  0.040525
  2.373626  0.017681  0.013696  0.042590
  2.417582  0.017528  0.014114  0.043623
  2.461538  0.017376  0.014536  0.045569
  2.505495  0.017223  0.014960  0.046541
  2.549451  0.017070  0.015387  0.048376
  2.593407  0.016917  0.015817  0.049293
  2.637363  0.016764  0.016250  0.051030
  2.681319  0.016611  0.016685  0.051899
  2.725275  0.016459  0.017123  0.053553
  2.769231  0.016306  0.017564  0.054380
  2.813187  0.016153  0.018008  0.055529
  2.857143  0.016000  0.018455  0.058339
  2.901099  0.015847  0.018904  0.061826
  2.945055  0.015695  0.019356  0.065530
  2.989011  0.015542  0.019811  0.069237
  3.032967  0.015389  0.020269  0.073734
  3.076923  0.015236  0.020730  0.073734
  3.120879  0.015083  0.021193  0.073734
  3.164835  0.014930  0.021659  0.073734
  3.208791  0.014778  0.022128  0.073734
  3.250000  0.014625  0.067710  0.073734
  END FTABLE  4
  FTABLE      3
   19    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)    (cfs)      (cfs)     (cfs)   (ft/sec)
(Minutes)***
  0.000000  0.014625  0.000000  0.000000  0.000000  0.000000
  0.043956  0.026077  0.001143  0.000000  0.073734  0.000000
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0.087912  0.026229  0.002292  0.000000  0.073734  0.000000
0.131868  0.026382  0.003449  0.000000  0.073734  0.000000
0.175824  0.026535  0.004612  0.000000  0.073734  0.000000
0.219780  0.026688  0.005781  0.000000  0.073734  0.000000
0.263736  0.026841  0.006958  0.000000  0.073734  0.000000
0.307692  0.026993  0.008141  0.000000  0.073734  0.000000
0.351648  0.027146  0.009331  0.000000  0.073734  0.000000
0.395604  0.027299  0.010528  0.000000  0.073734  0.000000
0.439560  0.027452  0.011731  0.000000  0.073734  0.000000
0.483516  0.027605  0.012941  0.000000  0.073734  0.000000
0.527473  0.027758  0.014158  0.048301  0.073734  0.000000
0.571429  0.027910  0.015381  0.202028  0.073734  0.000000
0.615385  0.028063  0.016611  0.412175  0.073734  0.000000
0.659341  0.028216  0.017848  0.659695  0.073734  0.000000
0.703297  0.028369  0.019092  0.928167  0.073734  0.000000
0.747253  0.028522  0.020342  1.200769  0.073734  0.000000
0.750000  0.028531  0.020421  1.460630  0.073734  0.000000
END FTABLE  3
FTABLE      6
 75    4
   Depth      Area    Volume  Outflow1 Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
0.000000  0.023069  0.000000  0.000000
0.043956  0.023069  0.000304  0.000000
0.087912  0.023069  0.000608  0.000000
0.131868  0.023069  0.000913  0.000000
0.175824  0.023069  0.001217  0.000000
0.219780  0.023069  0.001521  0.000000
0.263736  0.023069  0.001825  0.000000
0.307692  0.023069  0.002129  0.000000
0.351648  0.023069  0.002434  0.000000
0.395604  0.023069  0.002738  0.000000
0.439560  0.023069  0.003042  0.000000
0.483516  0.023069  0.003346  0.000000
0.527473  0.023069  0.003650  0.000000
0.571429  0.023069  0.003955  0.000000
0.615385  0.023069  0.004259  0.000000
0.659341  0.023069  0.004563  0.000000
0.703297  0.023069  0.004867  0.000000
0.747253  0.023069  0.005172  0.000000
0.791209  0.023069  0.005476  0.000000
0.835165  0.023069  0.005780  0.000000
0.879121  0.023069  0.006084  0.000000
0.923077  0.023069  0.006388  0.000000
0.967033  0.023069  0.006693  0.000000
1.010989  0.023069  0.006997  0.000000
1.054945  0.023069  0.007301  0.000000
1.098901  0.023069  0.007605  0.008657
1.142857  0.023069  0.007909  0.009554
1.186813  0.023069  0.008214  0.010056
1.230769  0.023069  0.008518  0.011585
1.274725  0.023069  0.008822  0.011834
1.318681  0.023069  0.009126  0.011958
1.362637  0.023069  0.009430  0.015992
1.406593  0.023069  0.009735  0.017998
1.450549  0.023069  0.010039  0.020150
1.494505  0.023069  0.010343  0.020207
1.538462  0.023069  0.010647  0.020235
1.582418  0.023069  0.010951  0.024899
1.626374  0.023069  0.011256  0.025439
1.670330  0.023069  0.011560  0.025710
1.714286  0.023069  0.011864  0.028177
1.758242  0.023069  0.012168  0.029411
1.802198  0.023069  0.012473  0.032048
1.846154  0.023069  0.012777  0.033367
1.890110  0.023069  0.013081  0.037878
1.934066  0.023069  0.013385  0.038089
1.978022  0.023069  0.013689  0.038194
2.021978  0.023069  0.013994  0.039897
2.065934  0.023069  0.014298  0.040748
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  2.109890  0.023069  0.014602  0.042702
  2.153846  0.023069  0.014906  0.043679
  2.197802  0.023069  0.015210  0.045597
  2.241758  0.023069  0.015515  0.046555
  2.285714  0.023069  0.015935  0.048383
  2.329670  0.023069  0.016356  0.049296
  2.373626  0.023069  0.016777  0.051032
  2.417582  0.023069  0.017198  0.051900
  2.461538  0.023069  0.017619  0.053553
  2.505495  0.023069  0.018040  0.054380
  2.549451  0.023069  0.018460  0.055961
  2.593407  0.023069  0.018881  0.056752
  2.637363  0.023069  0.019302  0.058269
  2.681319  0.023069  0.019723  0.059028
  2.725275  0.023069  0.020144  0.060489
  2.769231  0.023069  0.020564  0.061220
  2.813187  0.023069  0.020985  0.062631
  2.857143  0.023069  0.021406  0.063336
  2.901099  0.023069  0.021827  0.064325
  2.945055  0.023069  0.022248  0.066779
  2.989011  0.023069  0.022669  0.069862
  3.032967  0.023069  0.023089  0.073172
  3.076923  0.023069  0.023510  0.076522
  3.120879  0.023069  0.023931  0.079829
  3.164835  0.023069  0.024352  0.083066
  3.208791  0.023069  0.024773  0.086240
  3.250000  0.023069  0.052851  0.116307
  END FTABLE  6
  FTABLE      5
   19    6
     Depth      Area    Volume  Outflow1  Outflow2  outflow 3 Velocity  Travel
Time***
      (ft)   (acres) (acre-ft)    (cfs)      (cfs)      (cfs)    (ft/sec)
(Minutes)***
  0.000000  0.023069  0.000000  0.000000  0.000000  0.000000
  0.043956  0.023069  0.001014  0.000000  0.086240  0.000000
  0.087912  0.023069  0.002028  0.000000  0.086240  0.000000
  0.131868  0.023069  0.003042  0.000000  0.086240  0.000000
  0.175824  0.023069  0.004056  0.000000  0.086240  0.000000
  0.219780  0.023069  0.005070  0.000000  0.086240  0.000000
  0.263736  0.023069  0.006084  0.000000  0.086240  0.000000
  0.307692  0.023069  0.007098  0.000000  0.086240  0.000000
  0.351648  0.023069  0.008112  0.000000  0.086240  0.000000
  0.395604  0.023069  0.009126  0.000000  0.086240  0.000000
  0.439560  0.023069  0.010140  0.000000  0.086240  0.000000
  0.483516  0.023069  0.011154  0.000000  0.086240  0.000000
  0.527473  0.023069  0.012168  0.048301  0.086240  0.000000
  0.571429  0.023069  0.013182  0.202028  0.086240  0.000000
  0.615385  0.023069  0.014196  0.412175  0.086240  0.000000
  0.659341  0.023069  0.015210  0.659695  0.086240  0.000000
  0.703297  0.023069  0.016224  0.928167  0.086240  0.000000
  0.747253  0.023069  0.017238  1.200769  0.086240  0.000000
  0.750000  0.023069  0.017302  1.460630  0.086240  0.000000
  END FTABLE  5
  FTABLE      7
   82    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)    (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.140031  0.000000  0.000000
  0.083333  0.140031  0.004672  0.060000
  0.166667  0.140031  0.009343  0.060000
  0.250000  0.140031  0.013998  0.060000
  0.333333  0.140031  0.018671  0.060000
  0.416667  0.140031  0.023339  0.060000
  0.500000  0.140031  0.028007  0.060000
  0.583333  0.140031  0.032675  0.060000
  0.666667  0.140031  0.037342  0.060000
  0.750000  0.140031  0.042010  0.060000
  0.833333  0.140031  0.052322  0.060000
  0.916667  0.140031  0.062601  0.060000
```

1.000000	0.140031	0.072864	0.060000
1.083333	0.140031	0.083103	0.060000
1.166667	0.140031	0.093326	0.060000
1.250000	0.140031	0.103523	0.060000
1.333333	0.140031	0.113696	0.060000
1.416667	0.140031	0.123844	0.060000
1.500000	0.140031	0.133964	0.060000
1.583333	0.140031	0.144055	0.060000
1.666667	0.140031	0.154117	0.060000
1.750000	0.140031	0.164147	0.060000
1.833333	0.140031	0.174143	0.060000
1.916667	0.140031	0.184105	0.060000
2.000000	0.140031	0.194031	0.060000
2.083333	0.140031	0.203918	0.060000
2.166667	0.140031	0.213766	0.060000
2.250000	0.140031	0.223573	0.060000
2.333333	0.140031	0.233338	0.060000
2.416667	0.140031	0.243058	0.060000
2.500000	0.140031	0.252730	0.060000
2.583333	0.140031	0.262354	0.060000
2.666667	0.140031	0.271928	0.060000
2.750000	0.140031	0.281450	0.060000
2.833333	0.140031	0.290917	0.060000
2.916667	0.140031	0.300329	0.060000
3.000000	0.140031	0.309682	0.060000
3.083333	0.140031	0.318975	0.060000
3.166667	0.140031	0.328205	0.060000
3.250000	0.140031	0.337370	0.060000
3.333333	0.140031	0.346467	0.060000
3.416667	0.140031	0.355495	0.060000
3.500000	0.140031	0.364450	0.060000
3.583333	0.140031	0.373329	0.060000
3.666667	0.140031	0.382130	0.060000
3.750000	0.140031	0.390849	0.060000
3.833333	0.140031	0.399483	0.060000
3.916667	0.140031	0.408029	0.060000
4.000000	0.140031	0.416483	0.060000
4.083333	0.140031	0.424841	0.060000
4.166667	0.140031	0.433098	0.060000
4.250000	0.140031	0.441250	0.060000
4.333333	0.140031	0.449291	0.100054
4.416667	0.140031	0.457216	0.173289
4.500000	0.140031	0.465019	0.268125
4.583333	0.140031	0.472694	0.522417
4.666667	0.140031	0.480231	0.971557
4.750000	0.140031	0.487621	1.485680
4.833333	0.140031	0.494854	1.951593
4.916667	0.140031	0.501918	2.281209
5.000000	0.140031	0.508795	2.471460
5.083333	0.140031	0.515462	2.673695
5.166667	0.140031	0.521888	2.839787
5.250000	0.140031	0.528019	2.995785
5.333333	0.140031	0.533684	3.143331
5.416667	0.140031	0.538945	3.283666
5.500000	0.140031	0.544074	3.417755
5.583333	0.140031	0.549104	3.546364
5.666667	0.140031	0.554025	3.670114
5.750000	0.140031	0.558782	3.789518
5.833333	0.140031	0.563701	3.905004
5.916667	0.140031	0.568372	4.016935
6.000000	0.140031	0.573028	4.125618
6.083333	0.140031	0.577701	4.231323
6.166667	0.140031	0.582369	4.334280
6.250000	0.140031	0.587037	4.434694
6.333333	0.140031	0.591704	4.532744
6.416667	0.140031	0.596372	4.628590
6.500000	0.140031	0.601040	4.722374
6.583333	0.140031	0.605708	4.814224
6.666667	0.140031	0.610375	4.904255
6.750000	0.140031	0.615043	4.992570

```
  END FTABLE  7
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1               PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1               IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1               PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1               IMPLND   1 999 EXTNL  PETINP
WDM     22 IRRG     ENGL    0.7        SAME PERLND  46     EXTNL  SURLI
WDM      2 PREC     ENGL    1               RCHRES   1     EXTNL  PREC
WDM      2 PREC     ENGL    1               RCHRES   3     EXTNL  PREC
WDM      2 PREC     ENGL    1               RCHRES   5     EXTNL  PREC
WDM      1 EVAP     ENGL    0.5             RCHRES   1     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7             RCHRES   2     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5             RCHRES   3     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7             RCHRES   4     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.5             RCHRES   5     EXTNL  POTEV
WDM      1 EVAP     ENGL    0.7             RCHRES   6     EXTNL  POTEV

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   7 HYDR   RO     1 1        1      WDM   1010 FLOW     ENGL      REPL
RCHRES   7 HYDR   STAGE  1 1        1      WDM   1011 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     12.1      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK        6
RCHRES     ROFLOW                          RCHRES         INFLOW
  END MASS-LINK    6

  MASS-LINK        7
RCHRES     OFLOW  OVOL   1                 RCHRES         INFLOW IVOL
  END MASS-LINK    7

  MASS-LINK        8
RCHRES     OFLOW  OVOL   2                 RCHRES         INFLOW IVOL
  END MASS-LINK    8

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK
```

```
END RUN
```

Predeveloped HSPF Message File

ERROR/WARNING ID: 341 6

DATE/TIME: 1969/ 1/14 11: 0

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value in the "volume" column of the last row of RCHTAB(). To continue the simulation the table has been extrapolated, based on information contained in the last two rows. This will usually result in some loss of accuracy. If depth is being calculated it will also cause an error condition. Relevant data are:

NROWS	V1	V2	VOL
19 2205.2	2213.6	2215.5	

ERROR/WARNING ID: 341 5

DATE/TIME: 1969/ 1/14 11: 0

RCHRES: 1

Calculation of relative depth, using Newton's method of successive approximations, converged to an invalid value (not in range 0.0 to 1.0). Probably ftable was extrapolated. If extrapolation was small, no problem. Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.4072E-01	6101.8	-7.528E+03	1.2336	1.2335E+00	2

ERROR/WARNING ID: 341 6

DATE/TIME: 1970/ 2/28 18: 0

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value in the "volume" column of the last row of RCHTAB(). To continue the simulation the table has been extrapolated, based on information contained in the last two rows. This will usually result in some loss of accuracy. If depth is being calculated it will also cause an error condition. Relevant data are:

NROWS	V1	V2	VOL
19 2.2052E+03	2213.6	2230.1	

ERROR/WARNING ID: 341 5

DATE/TIME: 1970/ 2/28 18: 0

RCHRES: 1

Calculation of relative depth, using Newton's method of successive approximations, converged to an invalid value (not in range 0.0 to 1.0). Probably ftable was extrapolated. If extrapolation was small, no problem. Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.4072E-01	6101.8	-1.815E+04	2.9741	2.9733E+00	2

ERROR/WARNING ID: 341 6

DATE/TIME: 1972/11/13 22: 0

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value in the "volume" column of the last row of RCHTAB(). To continue the simulation the table has been extrapolated, based on information contained in the last two rows. This will usually result in some loss of accuracy. If depth is being calculated it will also cause an error condition. Relevant data are:

NROWS	V1	V2	VOL
19	2.2052E+03	2213.6	2219.2

ERROR/WARNING ID: 341 5

DATE/TIME: 1972/11/13 22: 0

RCHRES: 1

Calculation of relative depth, using Newton's method of successive approximations, converged to an invalid value (not in range 0.0 to 1.0). Probably ftable was extrapolated. If extrapolation was small, no problem. Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.4072E-01	6101.8	-1.021E+04	1.6739	1.6737E+00	2

ERROR/WARNING ID: 341 6

DATE/TIME: 1974/12/ 4 9: 0

RCHRES: 1

The volume of water in this reach/mixed reservoir is greater than the value in the "volume" column of the last row of RCHTAB(). To continue the simulation the table has been extrapolated, based on information contained in the last two rows. This will usually result in some loss of accuracy. If depth is being calculated it will also cause an error condition. Relevant data are:

NROWS	V1	V2	VOL
19	2.2052E+03	2213.6	2265.7

ERROR/WARNING ID: 341 5

DATE/TIME: 1974/12/ 4 9: 0

RCHRES: 1

Calculation of relative depth, using Newton's method of successive approximations, converged to an invalid value (not in range 0.0 to 1.0). Probably ftable was extrapolated. If extrapolation was small, no problem. Remedy; extend ftable. Relevant data are:

A	B	C	RDEP1	RDEP2	COUNT
7.4072E-01	6101.8	-4.411E+04	7.2233	7.2233E+00	3

ERROR/WARNING ID: 238 1

The continuity error reported below is greater than 1 part in 1000 and is therefore considered high.

Did you specify any "special actions"? If so, they could account for it.

Relevant data are:
DATE/TIME: 1998/ 4/30 24: 0

RCHRES : 3

RELERR	STORS	STOR	MATIN	MATDIF
-5.121E-03	0.00000	0.0000E+00	0.00000	6.2256E-12

```
Where:

RELERR is the relative error (ERROR/REFVAL).
ERROR  is (STOR-STORS) - MATDIF.
REFVAL is the reference value (STORS+MATIN).
STOR   is the storage of material in the processing unit (land-segment or
reach/reservior) at the end of the present interval.
STORS  is the storage of material in the pu at the start of the present
printout reporting period.
MATIN  is the total inflow of material to the pu during the present printout
reporting period.
MATDIF is the net inflow (inflow-outflow) of material to the pu during the
present printout reporting period.
```

Disclaimer

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Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Project Name:

Indicate which Items are Included:

Attachment Sequence	Contents	Checklist
Attachment 3	Maintenance Agreement (Form DS-3247) (when applicable)	☑ Included ☐ Not applicable

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

Attachment 3: For private entity operation and maintenance, Attachment 3 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:

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

The City of
SAN DIEGO

RECORDING REQUESTED BY:
THE CITY OF SAN DIEGO AND
WHEN RECORDED MAIL TO:

____

____

______________________________ ________

(THIS SPACE IS FOR RECORDER'S USE ONLY)

STORM WATER MANAGEMENT AND DISCHARGE CONTROL MAINTENANCE AGREEMENT

APPROVAL NUMBER:	ASSESSORS PARCEL NUMBER:	PROJECT NUMBER:
______________	______________	______________

This agreement is made by and between the City of San Diego, a municipal corporation [City] and ________________

____,

the owner or duly authorized representative of the owner [Property Owner] of property located at

8825-8875 Aero Drive, San Diego, CA 92123

(PROPERTY ADDRESS)

and more particularly described as: ____

____

(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)

____
(Company/Organization Name)

____
(Date)

THE CITY OF SAN DIEGO

APPROVED:

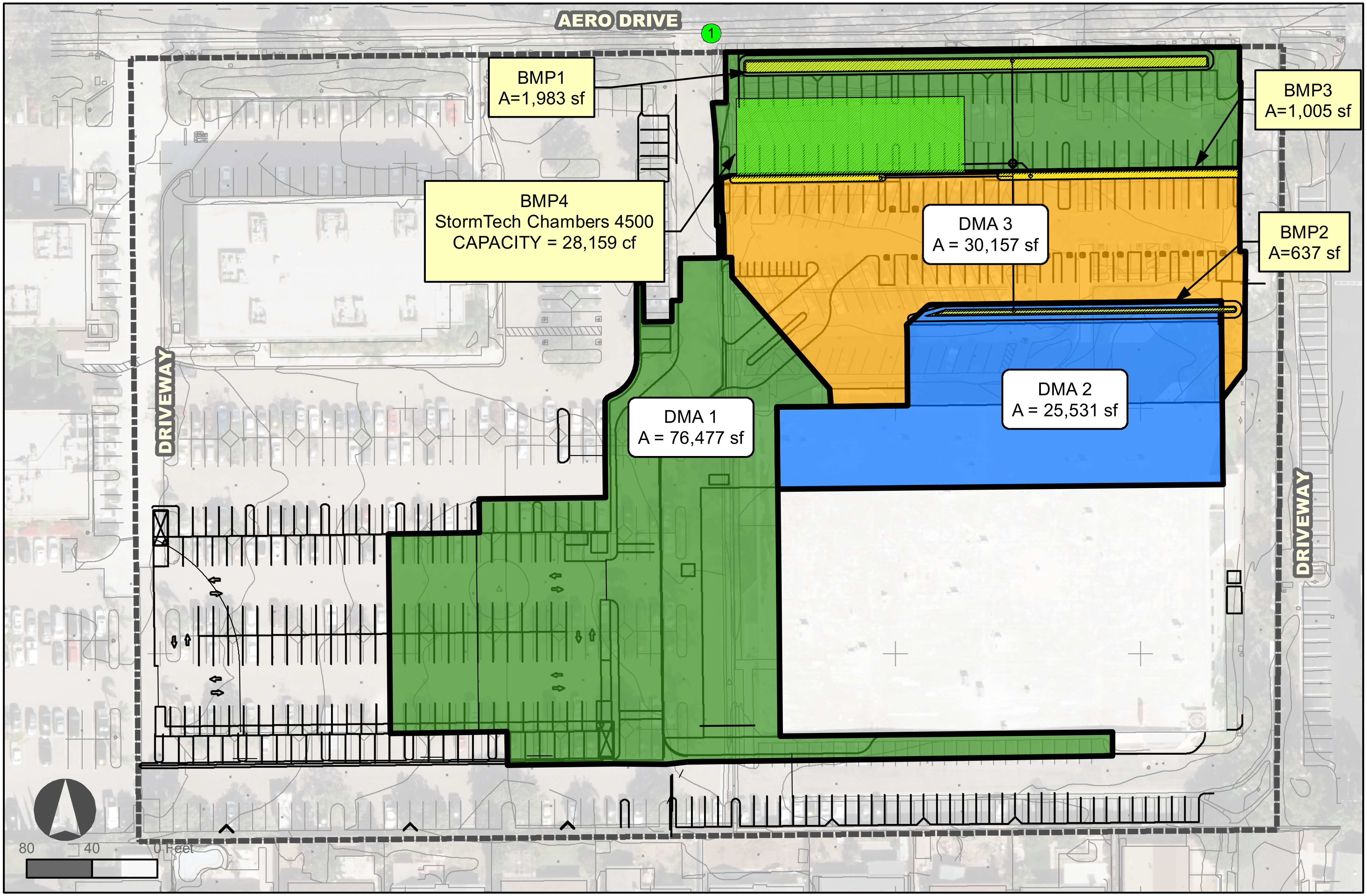
____
(City Control Engineer Signature)

____
(Print Name)

____
(Date)

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

Reset Button Page 2



WARE MALCOMB

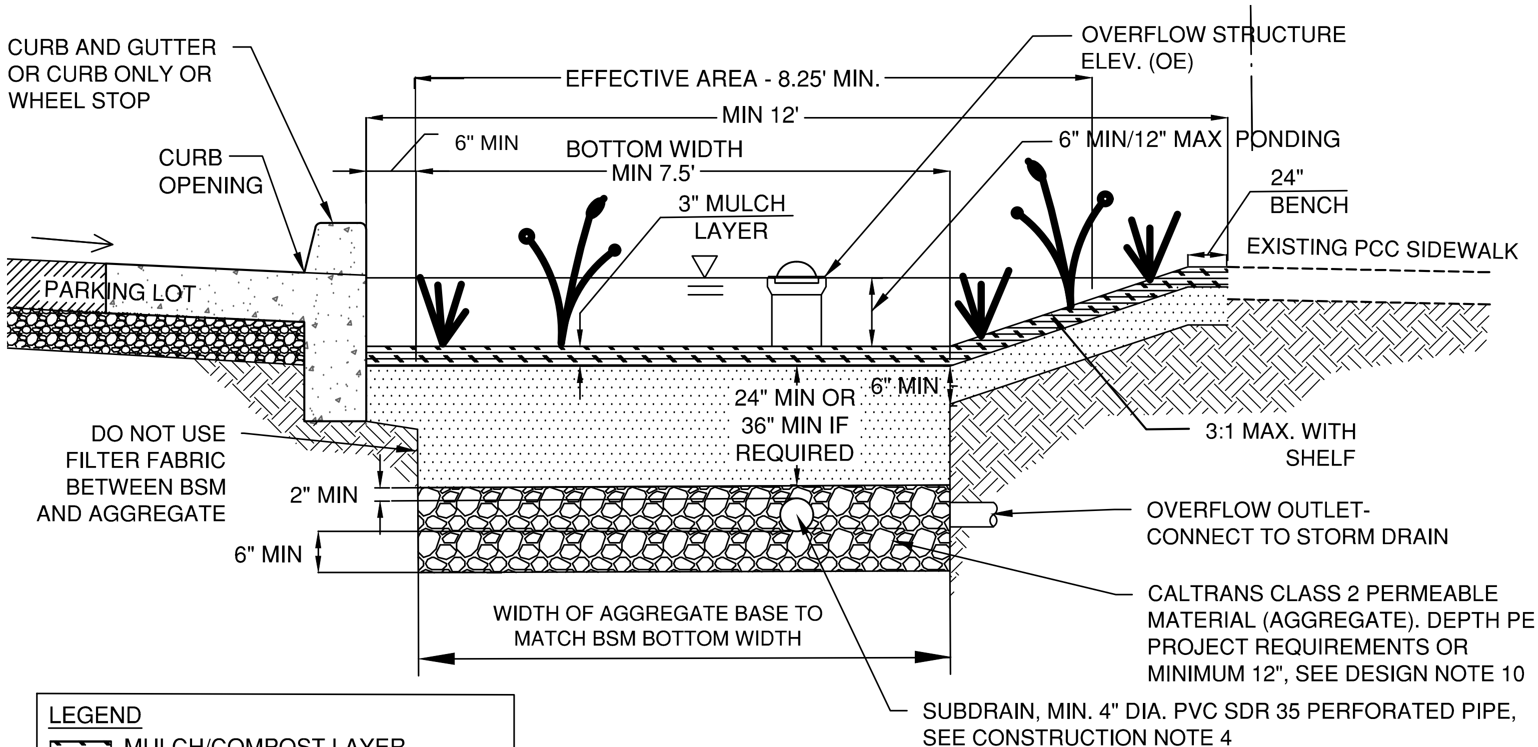
architecture | planning | interiors | branding | civil

Legend

- Point of Compliance
- Biofiltration BMPS
- StormTech Chambers
- DMA 1
- DMA 2
- DMA 3

PROTEA HOSPITAL ANNEX RENOVATION
8875 AERO DRIVE, SAN DIEGO
STRUCTUAL BMP MAP

AERO DRIVE BMP 1
L=281', W_{eff}=8.25'
EFFECTIVE AREA @ 0.25' POND=2394 sf

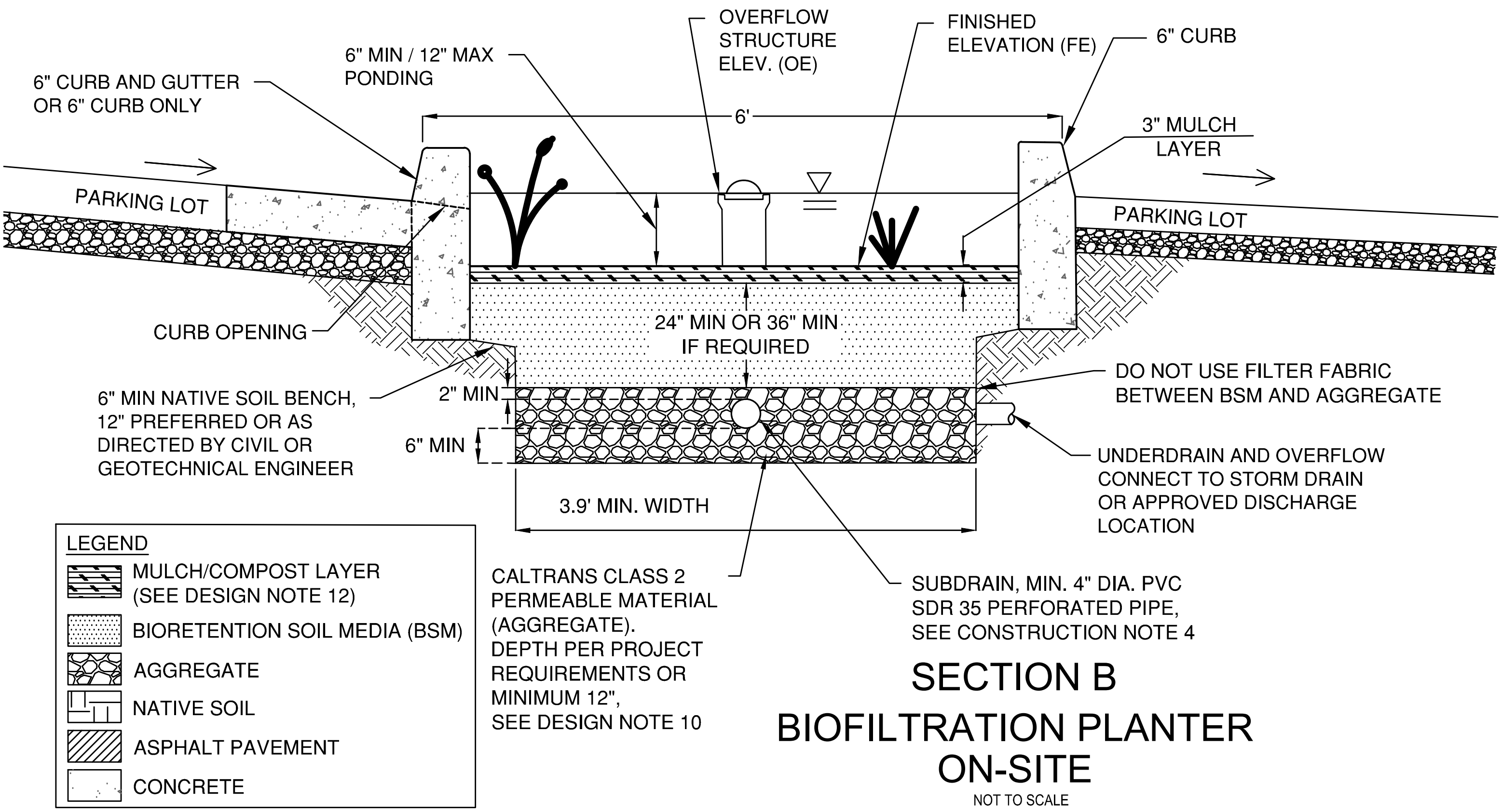


LEGEND
- MULCH/COMPOST LAYER (SEE DESIGN NOTE 12)
- BIORETENTION SOIL MEDIA (BSM)
- AGGREGATE
- NATIVE SOIL
- ASPHALT PAVEMENT
- CONCRETE

SECTION A
BIOFILTRATION PLANTER ALONG AERO DRIVE

NOT TO SCALE

BUILDING FRONT BMP 2
L=188', W_{eff}=3.5'
EFFECTIVE AREA @ 0.25' POND=652 sf

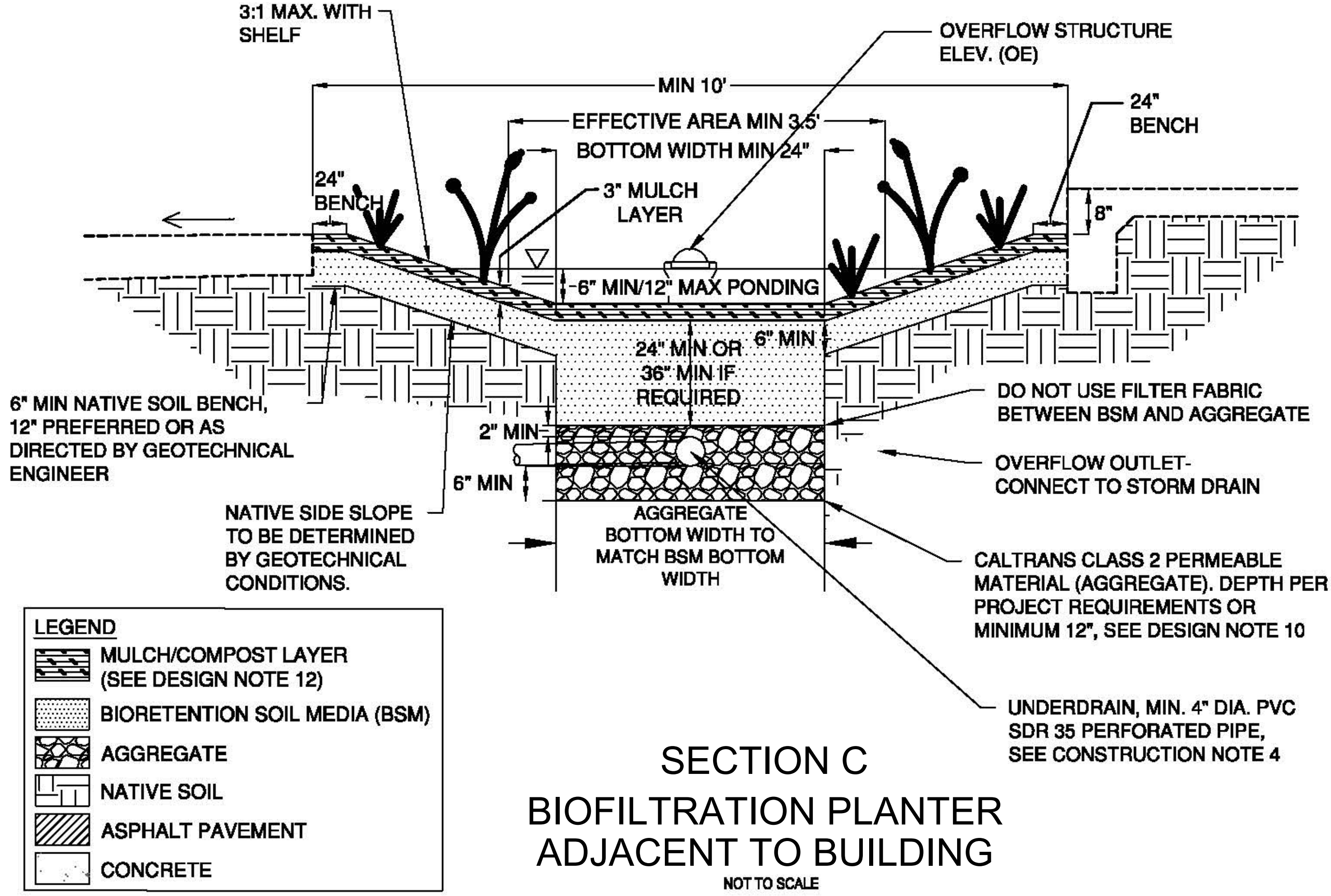


SECTION B

BIOFILTRATION PLANTER ON-SITE

NOT TO SCALE

PARKING MEDIAN BMP 3
L=241', W_{eff}=3.8'
EFFECTIVE AREA @ 0.25' POND=1,005 sf



SECTION C

BIOFILTRATION PLANTER
ADJACENT TO BUILDING

NOT TO SCALE

BMP 4

ADVANCED DRAINAGE SYSTEMS, INC.

PROTEA VA SAN DIEGO
8875 AERO DRIVE

STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-4500 OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-4500 CHAMBER SYSTEM

1. STORMTECH MC-4500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTITIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm) MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-4500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

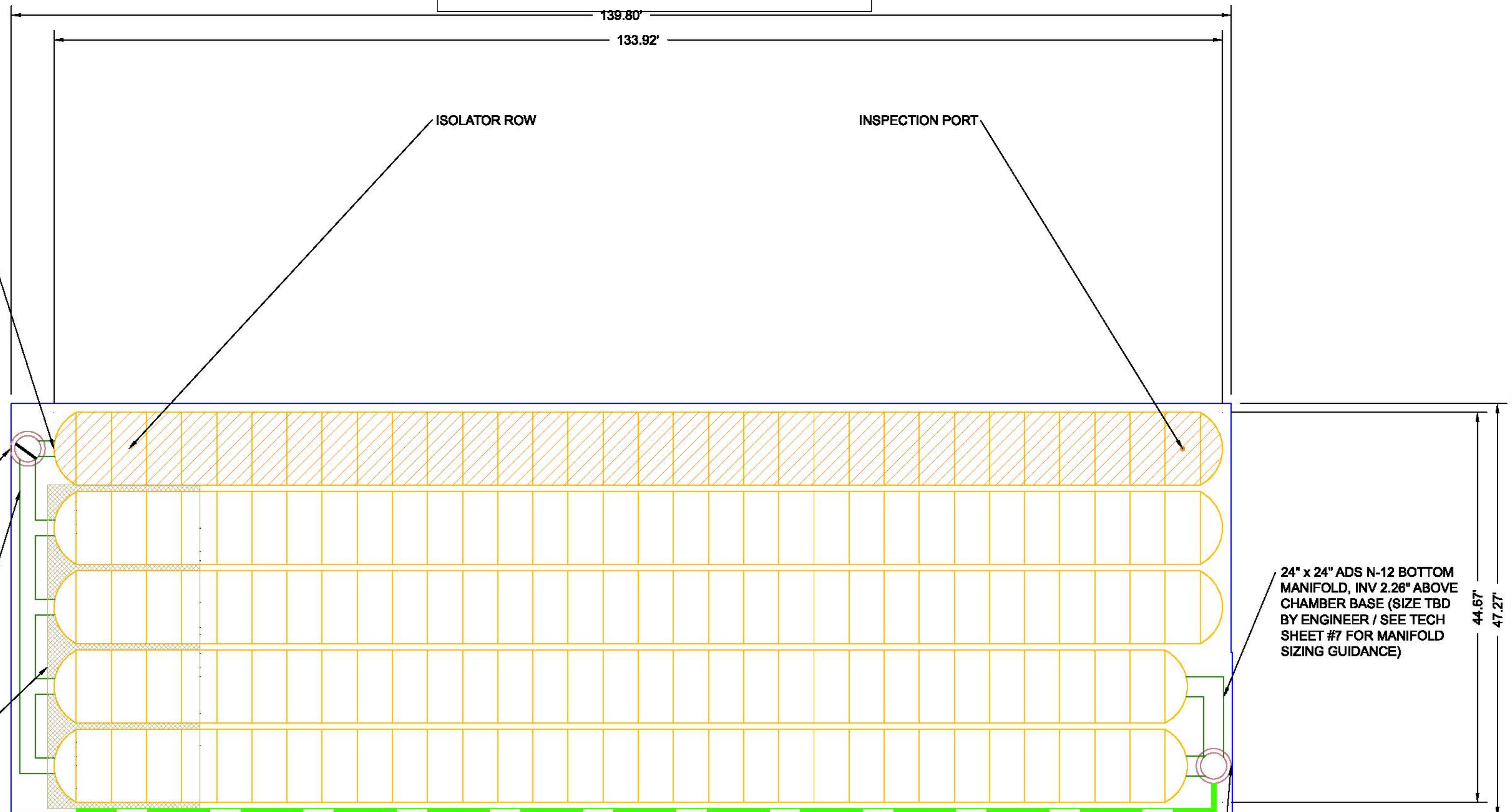
CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

(158) STORMTECH MC-4500 CHAMBERS
(10) STORMTECH MC-4500 END CAPS
INSTALLED WITH 12 " COVER STONE, 9 " BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 28159 CF
AREA OF SYSTEM: 6610 FT²
PERIMETER OF SYSTEM: 374 FT

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION

BMP 4



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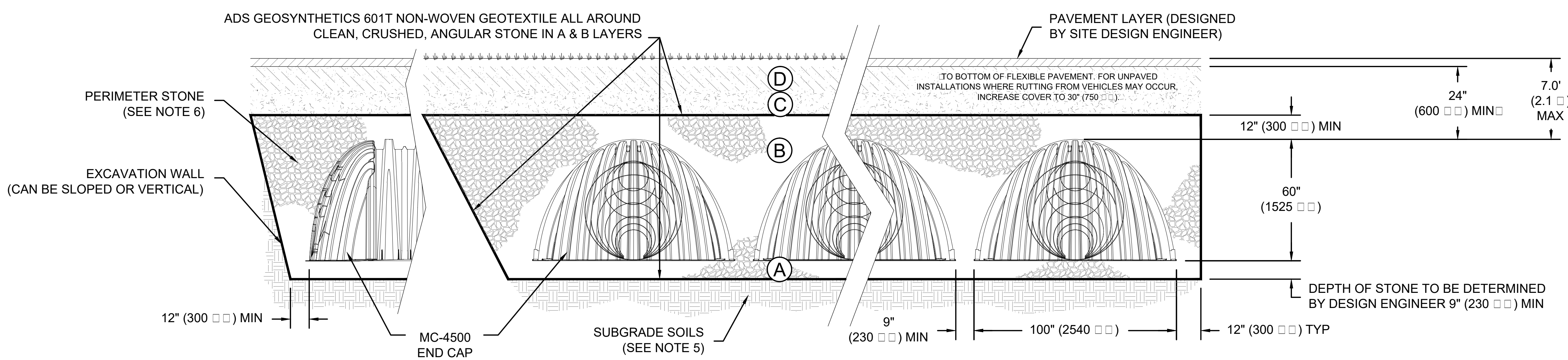
ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 □□) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, □35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 □□) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 □□) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 □□)	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 □□)	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 □□) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. MC-4500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

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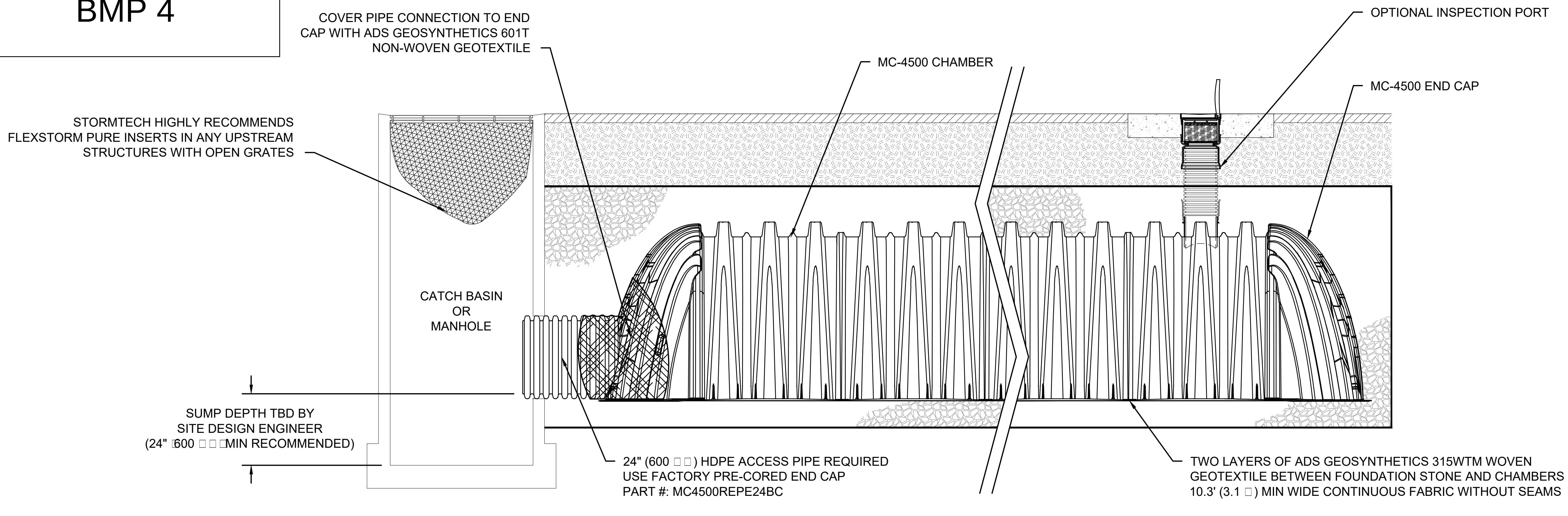


MC-4500 ISOLATOR ROW DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

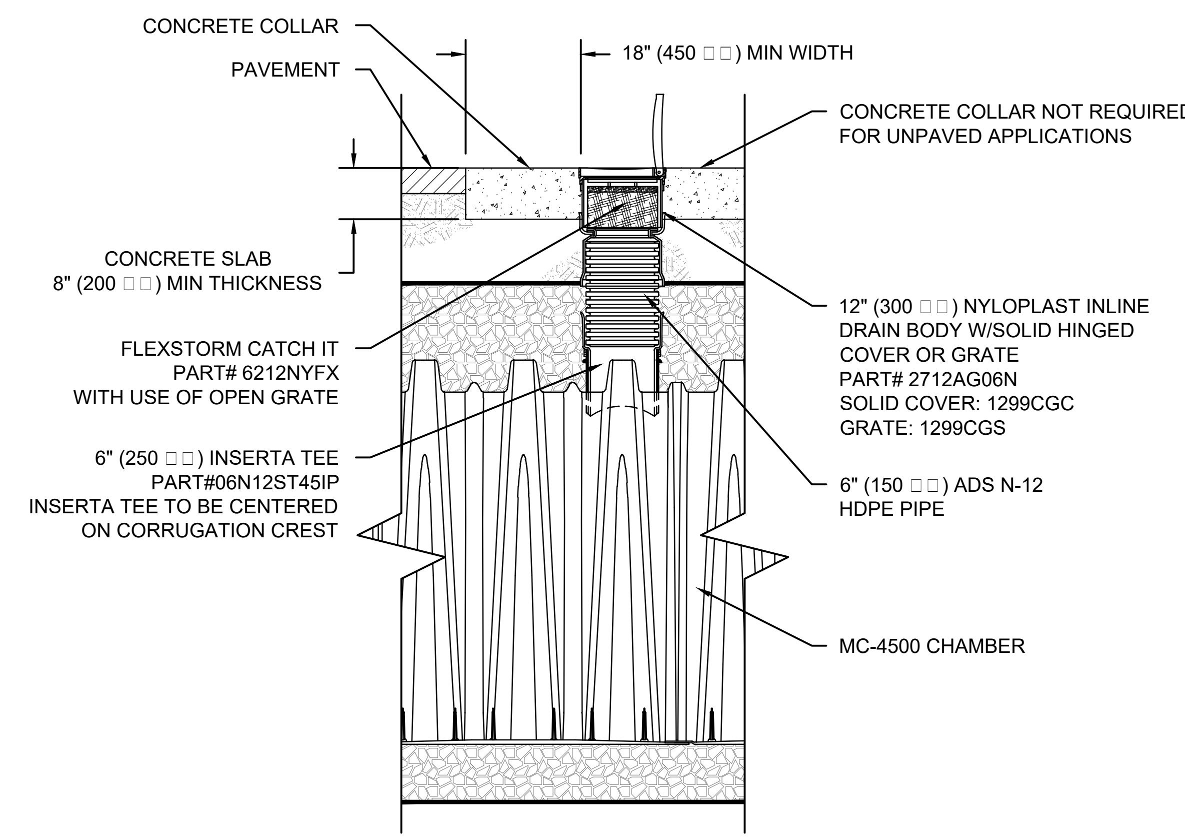
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



MC-4500 6" INSPECTION PORT DETAIL
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SHEET
4 OF 6

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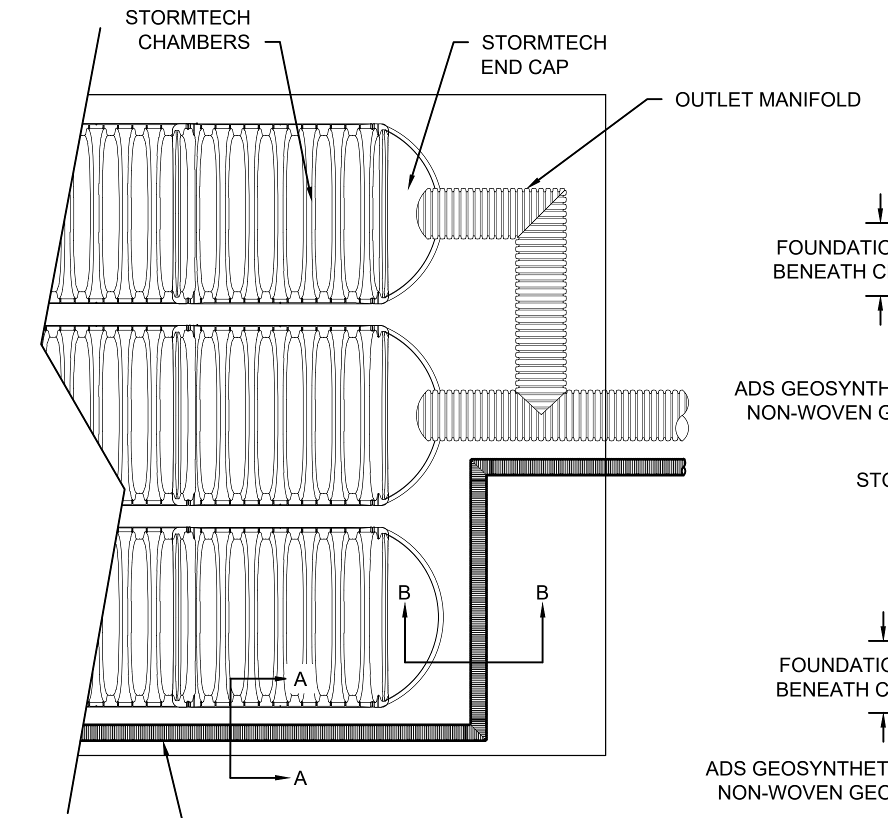
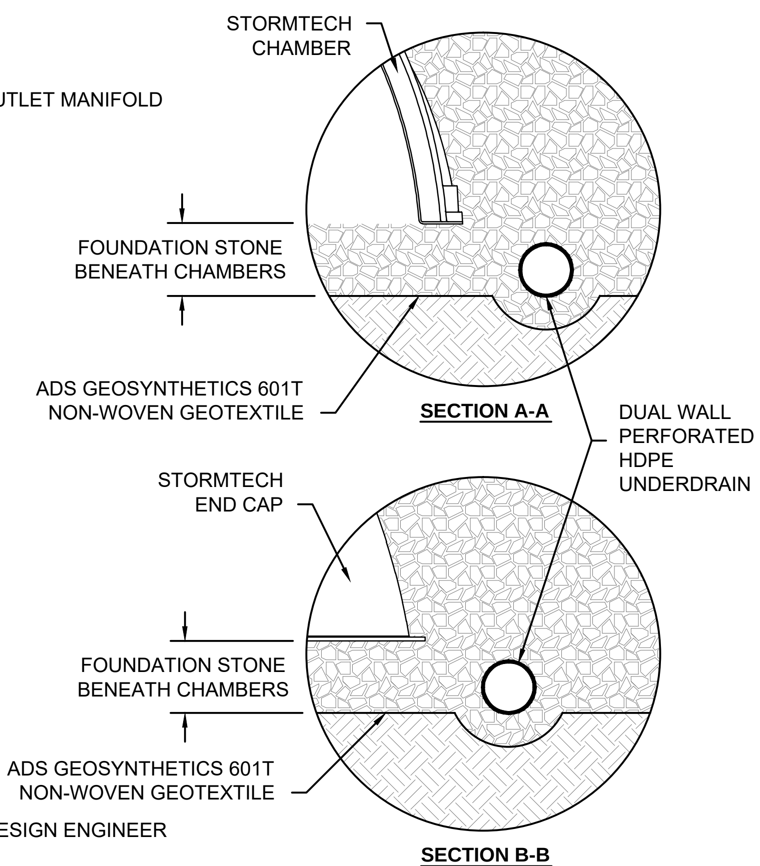
UNDERDRAIN DETAIL

NTS



NUMBER AND SIZE OF UNDERDRAINS PER SITE DESIGN ENGINEER
4" (100 □□) TYP FOR SC-310 SYSTEMS
6" (150 □□) TYP FOR SC-740, DC-780, MC-3500 & MC-4500 SYSTEMS



INSERTA TEE DETAIL

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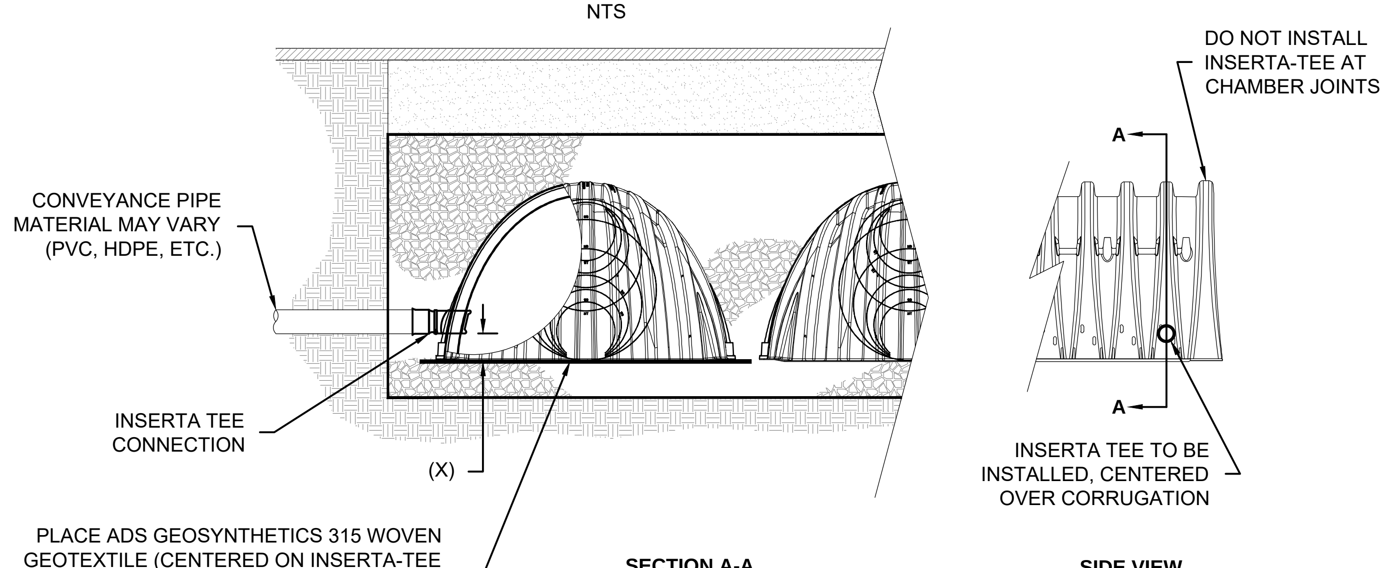

CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 □□)	4" (100 □□)
SC-740	10" (250 □□)	4" (100 □□)
DC-780	10" (250 □□)	4" (100 □□)
MC-3500	12" (300 □□)	6" (150 □□)
MC-4500	12" (300 □□)	8" (200 □□)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS. CONTACT STORMTECH FOR MORE INFORMATION.

MC-4500 TECHNICAL SPECIFICATION

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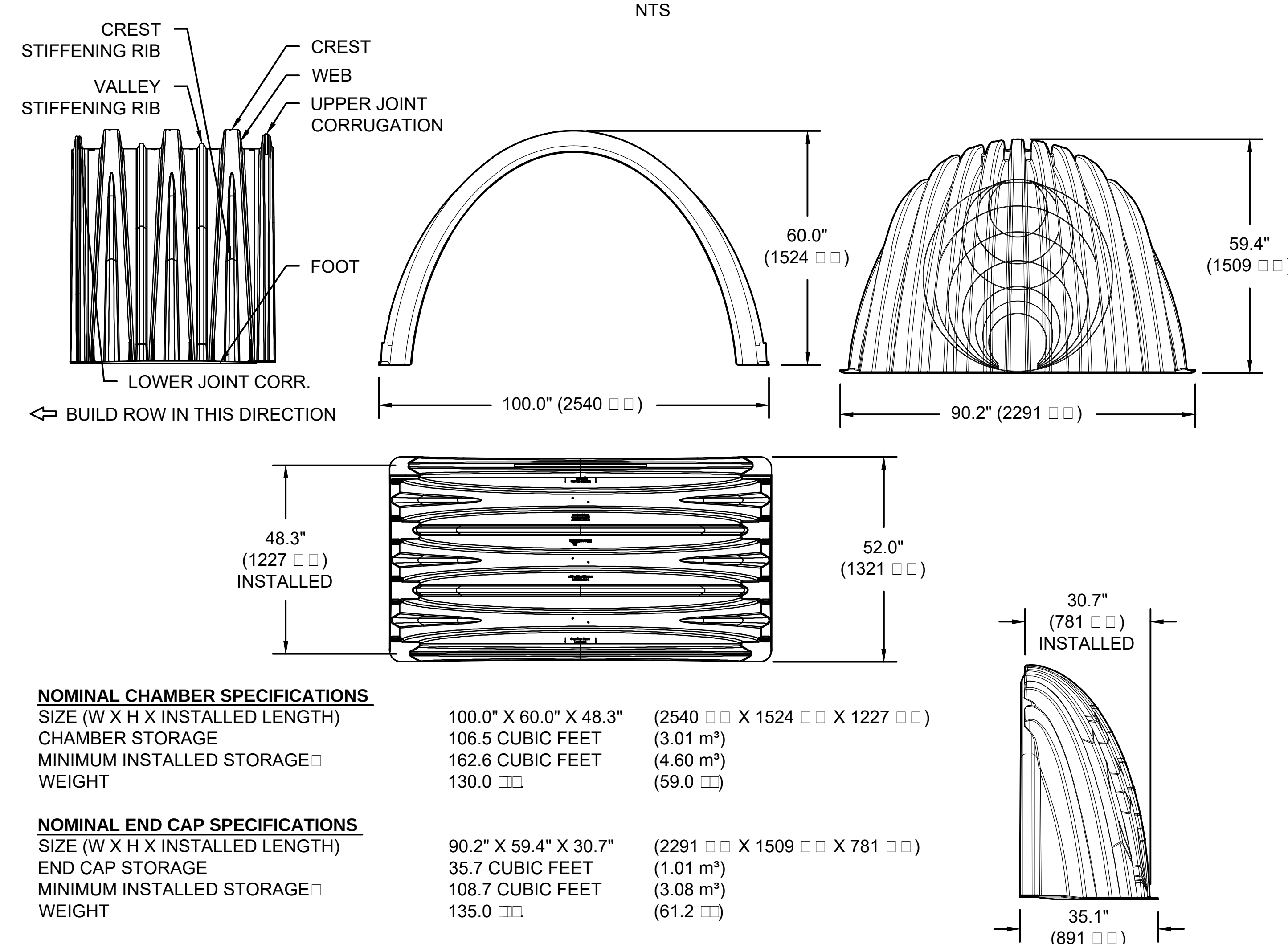


NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 □□ X 1524 □□ X 1227 □□)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE□	162.6 CUBIC FEET	(4.60 m³)
WEIGHT	130.0 □□	(59.0 □□)

NOMINAL END CAP SPECIFICATIONS

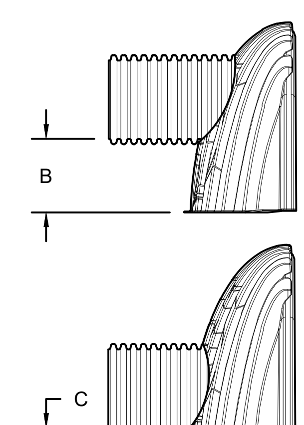
SIZE (W X H X INSTALLED LENGTH)	90.2" X 59.4" X 30.7"	(2291 □□ X 1509 □□ X 781 □□)
END CAP STORAGE	35.7 CUBIC FEET	(1.01 m³)
MINIMUM INSTALLED STORAGE□	108.7 CUBIC FEET	(3.08 m³)
WEIGHT	135.0 □□	(61.2 □□)

□ASSUMES 12" (305 □□) STONE ABOVE, 9" (229 □□) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 □□) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	B	C
MC4500REPE06T	6" (150 □□)	42.54" (1.081 □)	---
MC4500REPE06B		---	0.86" (22 □□)
MC4500REPE08T	8" (200 □□)	40.50" (1.029 □)	---
MC4500REPE08B		---	1.01" (26 □□)
MC4500REPE10T	10" (250 □□)	38.37" (975 □□)	---
MC4500REPE10B		---	1.33" (34 □□)
MC4500REPE12T	12" (300 □□)	35.69" (907 □□)	---
MC4500REPE12B		---	1.55" (39 □□)
MC4500REPE15T	15" (375 □□)	32.72" (831 □□)	---
MC4500REPE15B		---	1.70" (43 □□)
MC4500REPE18TC	18" (450 □□)	29.36" (746 □□)	---
MC4500REPE18BC		---	1.97" (50 □□)
MC4500REPE24TC	24" (600 □□)	23.05" (585 □□)	---
MC4500REPE24BC		---	2.26" (57 □□)
MC4500REPE30BC	30" (750 □□)	---	2.95" (75 □□)
MC4500REPE36BC	36" (900 □□)	---	3.25" (83 □□)
MC4500REPE42BC	42" (1050 □□)	---	3.55" (90 □□)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 □□) SIZE ON SIZE AND 15-48" (375-1200 □□) ECCENTRIC MANIFOLDS.
CUSTOM INVERT LOCATIONS ON THE MC-4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 □□)
THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHTEST POSSIBLE FOR THE PIPE SIZE.

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MC-SERIES END CAP INSERTION DETAIL

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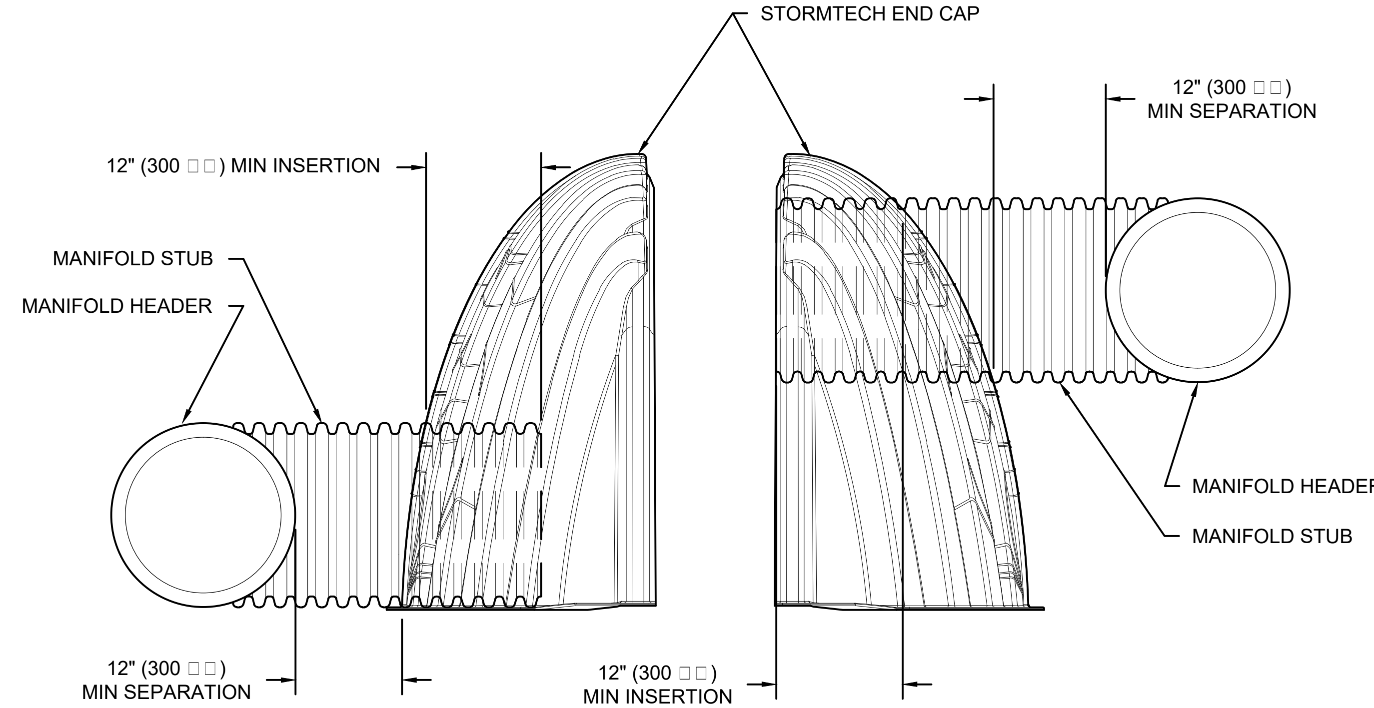

NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL
FOR A PROPER FIT IN END CAP OPENING.

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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 7-5. Maintenance Indicators and Actions for Detention BMPs

Typical Maintenance Indicator(s) for Detention Basins	Maintenance Actions
SEE ADDITIONAL MAINTENANCE FOR ADS STORM TECH CHAMBERS	
Accumulation of sediment, litter, or debris	Remove and properly dispose of accumulated materials.
Standing water	Make appropriate corrective measures such as adjusting irrigation system, removing obstructions of debris or invasive vegetation, or minor re-grading for proper drainage.
Obstructed inlet or outlet structure	Clear obstructions.
Damage to structural components such as weirs, inlet or outlet structures	Repair or replace as applicable.

StormTech®
Detention • Retention • Water Quality
An ADS company

Isolator® Row O&M Manual


SC-740


MC-3500


MC-4500

THE MOST **ADVANCED** NAME IN WATER MANAGEMENT SOLUTIONS™

ADS®

THE ISOLATOR® ROW

INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-160LP, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160LP, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

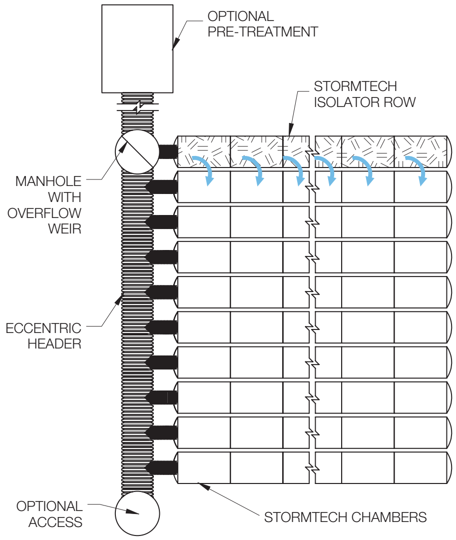
The Isolator Row is typically designed to capture the "first flush" and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

StormTech Isolator Row with Overflow Spillway (not to scale)



ISOLATOR ROW INSPECTION/MAINTENANCE

INSPECTION

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

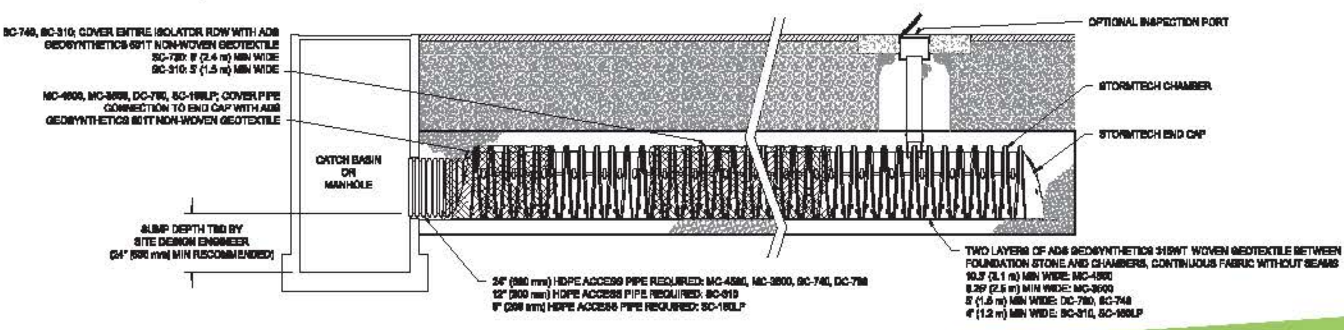
MAINTENANCE

The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row.



ADS

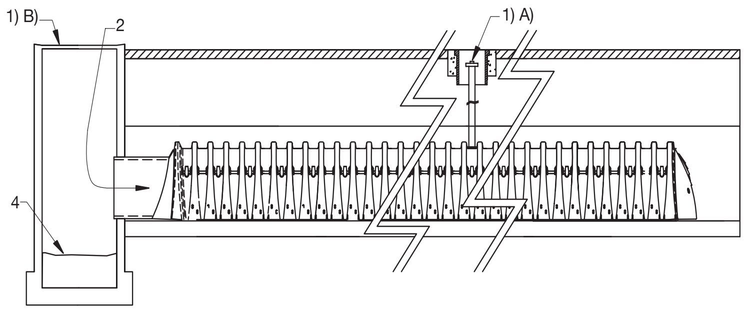
ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

STEP 1
Inspect Isolator Row for sediment.
- A) Inspection ports (if present)
  - i. Remove lid from floor box frame
  - ii. Remove cap from inspection riser
  - iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
  - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
- B) All Isolator Rows
  - i. Remove cover from manhole at upstream end of Isolator Row
  - ii. Using a flashlight, inspect down Isolator Row through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering manhole
  - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

STEP 2
Clean out Isolator Row using the JetVac process.
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

STEP 3
Replace all caps, lids and covers, record observations and actions.

STEP 4
Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings: Fixed point to chamber bottom (1)	Stadia Rod Readings: Fixed point to top of sediment (2)	Sediment Depth (1)–(2)	Observations/Actions	Inspector
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

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Detention • Retention • Water Quality
A division of ADS

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

Attachment 4
Copy of Plan Sheets Showing Permanent Storm Water BMPs

This is the cover sheet for Attachment 4.

Project Name:

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.

CAUTION: IF THIS SHEET IS NOT 30"x42" IT IS A REDUCED PRINT

NOTES TO CONTRACTOR

1. ANY DAMAGED IMPROVEMENTS, ON- OR OFF-SITE SHALL BE RECONSTRUCTED ACCORDING TO THE CURRENT CITY STANDARDS.
2. SEE SHEET C5.0 FOR UTILITY INFORMATION

BENCHMARK:

CITY OF SAN DIEGO MONUMENT NO. 2973 BRASS DISK IN MONUMENT WELL AT THE INTERSECTION OF SANDROCK AND AERO. C/L NOSE OF CENTER ISLAND BP.
ELEV. 409.589 (NAVD88)

BASIS OF BEARINGS:

THE BASIS OF BEARINGS IS THE CENTERLINE OF AERO DRIVE BEING N89°22'04"E AS SHOWN ON MAP NO. 15932.

GRADING TABULATIONS:

TOTAL AREA:	335,842 SF / 7.710 ACRES
AREA TO BE GRADED:	208,170 SF / 4.779 ACRES
PERCENTAGE OF TOTAL SITE:	62.0%
RAW CUT:	19,275 C.Y.
MAXIMUM DEPTH OF CUT:	8'
RAW FILL:	13,215 C.Y.
MAXIMUM DEPTH OF FILL:	8'
IMPORT / EXPORT:	6,060 C.Y.
RETAINING WALLS REQUIRED:	NONE

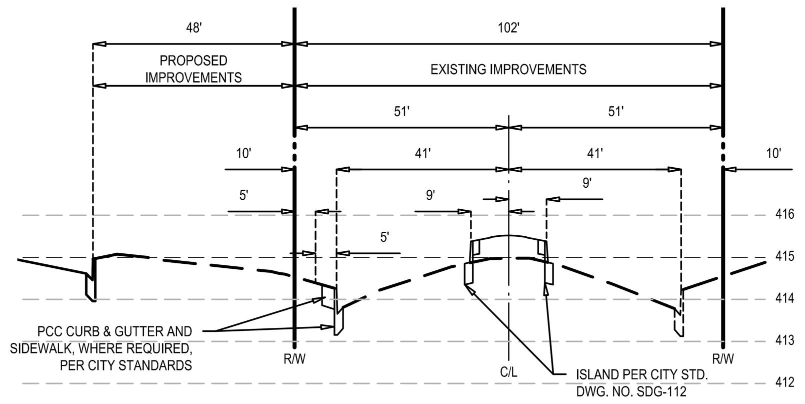
REFERENCE IMPROVEMENT PLANS: 234-1725, 234-1727, 18840-D, 12401-3-D, 13194-1-D, 15964-1-D

EASEMENT LIST:

1. RECIPROCAL EASEMENTS, FOR INGRESS AND EGRESS OVER A COMMON DRIVEWAY, OVER LOT 6 OF MAP NO. 6386 OF OFFICIAL RECORDS, ENTITLED "RESEARCH PARK SUBDIVISION ADDITION", AS DISCLOSED BY A DECLARATION OF RECIPROCAL EASEMENTS, DATED DECEMBER 12, 2003, EXECUTED BY AERO PROPERTIES, LLC., AN ALASKA LIMITED LIABILITY COMPANY, AND RECORDED DECEMBER 23, 2003 AS INSTRUMENT NO. 2001-1503274 OF OFFICIAL RECORDS. BLANKET IN NATURE.
2. A NON-EXCLUSIVE ACCESS EASEMENT TO PROVIDE VEHICULAR ACCESS TO SANDROCK ROAD AND AERO DRIVE AS SET FORTH IN THAT CERTAIN DOCUMENT ENTITLED "EASEMENT AND PARKING AGREEMENT" RECORDED APRIL 08, 2004 AS INSTRUMENT NO. 2004-0298020 OF OFFICIAL RECORDS. BLANKET IN NATURE.
3. RECIPROCAL EASEMENTS FOR USE OF PARKING AREA LAND FOR VEHICULAR AND PEDESTRIAN INGRESS AND EGRESS OVER LOT 8 OF RESEARCH PARK SUBDIVISION ADDITION ACCORDING TO MAP NO. 6386 AS SET OUT IN DECLARATION OF RECIPROCAL EASEMENTS RECORDED JULY 22, 2004 AS INSTRUMENT NO. 2004-0684322 OF OFFICIAL RECORDS. BLANKET IN NATURE.
4. RECIPROCAL EASEMENTS FOR USE OF PARKING AREA LAND FOR VEHICULAR AND PEDESTRIAN INGRESS AND EGRESS OVER LOT 7 OF RESEARCH PARK SUBDIVISION ADDITION ACCORDING TO MAP NO. 6386 AS SET OUT IN DECLARATION OF RECIPROCAL EASEMENTS RECORDED JULY 22, 2004 AS INSTRUMENT NO. 2004-0684322 OF OFFICIAL RECORDS. BLANKET IN NATURE.
5. EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT:
   GRANTED TO: SAN DIEGO GAS AND ELECTRIC COMPANY
   PURPOSE: PUBLIC UTILITIES, INGRESS AND EGRESS
   RECORDING DATE: CTOBER 07, 1980
   RECORDING NO: 80-329807 OF OFFICIAL RECORDS.
   NOT PLOTTABLE
6. EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO, AS GRANTED IN A DOCUMENT:
   GRANTED TO: SAN DIEGO GAS AND ELECTRIC COMPANY
   PURPOSE: PUBLIC UTILITIES, INGRESS AND EGRESS
   RECORDING DATE: APRIL 21, 1982
   RECORDING NO.: 82-112699 OF OFFICIAL RECORDS
   NOT PLOTTABLE
7. THERE ARE NO EASEMENTS FOR PUBLIC OR PRIVATE UTILITIES OTHER THAN LISTED ABOVE.

STORM WATER NOTES:

1. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER / PERMITTEE SHALL ENTER INTO A MAINTENANCE AGREEMENT FOR THE ONGOING PERMANENT BEST MANAGEMENT PRACTICES (BMP) MAINTENANCE, SATISFACTORY TO THE CITY ENGINEER.
2. PRIOR TO THE ISSUANCE OF ANY CONSTRUCTION PERMIT, THE OWNER / PERMITTEE SHALL INCORPORATE ANY CONSTRUCTION BEST MANAGEMENT PRACTICES (BMP) 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 CONSTRUCTION PERMIT ISSUANCE.
4. DEVELOPMENT OF THIS PROJECT SHALL COMPLY WITH ALL STORM WATER CONSTRUCTION REQUIREMENTS OF THE STATE CONSTRUCTION GENERAL PERMIT, ORDER NO. 2009-0009-DWQ, OR SUBSEQUENT ORDER, AND THE MUNICIPAL STORM WATER PERMIT, ORDER NO. R9-2013-0001, OR SUBSEQUENT ORDER. IN ACCORDANCE WITH ORDER NO. 2009-0009-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 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 PROOF OF ENROLLMENT UNDER THE CONSTRUCTION GENERAL PERMIT. WHEN OWNERSHIP OF THE ENTIRE SITE OR PORTIONS OF THE SITE CHANGES PRIOR TO FILING OF THE NOTICE OF TERMINATION (NOT), A REVISED NOI SHALL BE SUBMITTED ELECTRONICALLY TO THE STATE WATER RESOURCES 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.



AERO DRIVE TYPICAL SECTION
SCALE : 1" = 30' HORIZ
1" = 3' VERT

AERIAL TOPOGRAPHY PRODUCED BY:

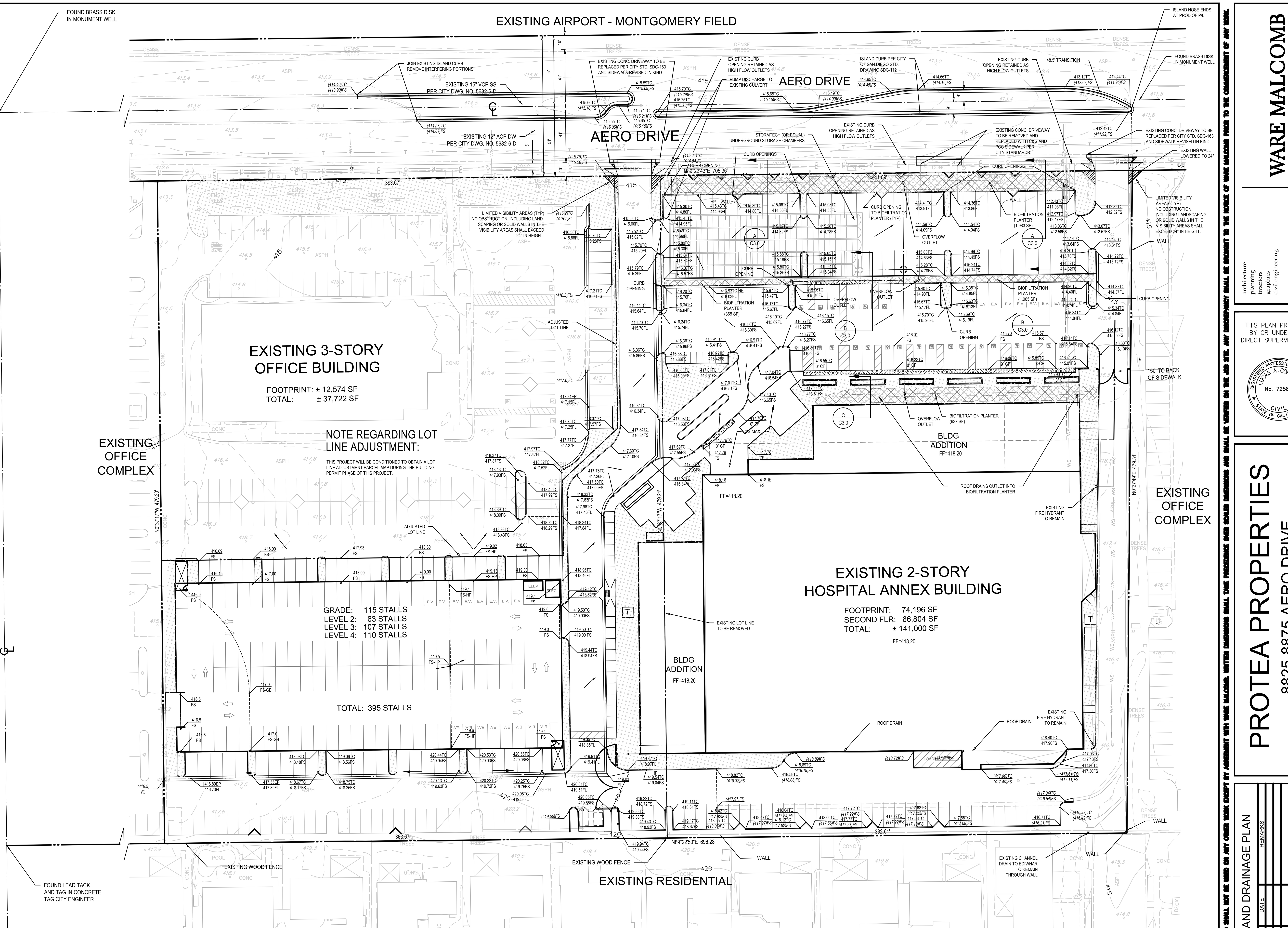
PHOTO GEODETIC CORPORATION
AERIAL MAPPING PROFESSIONALS

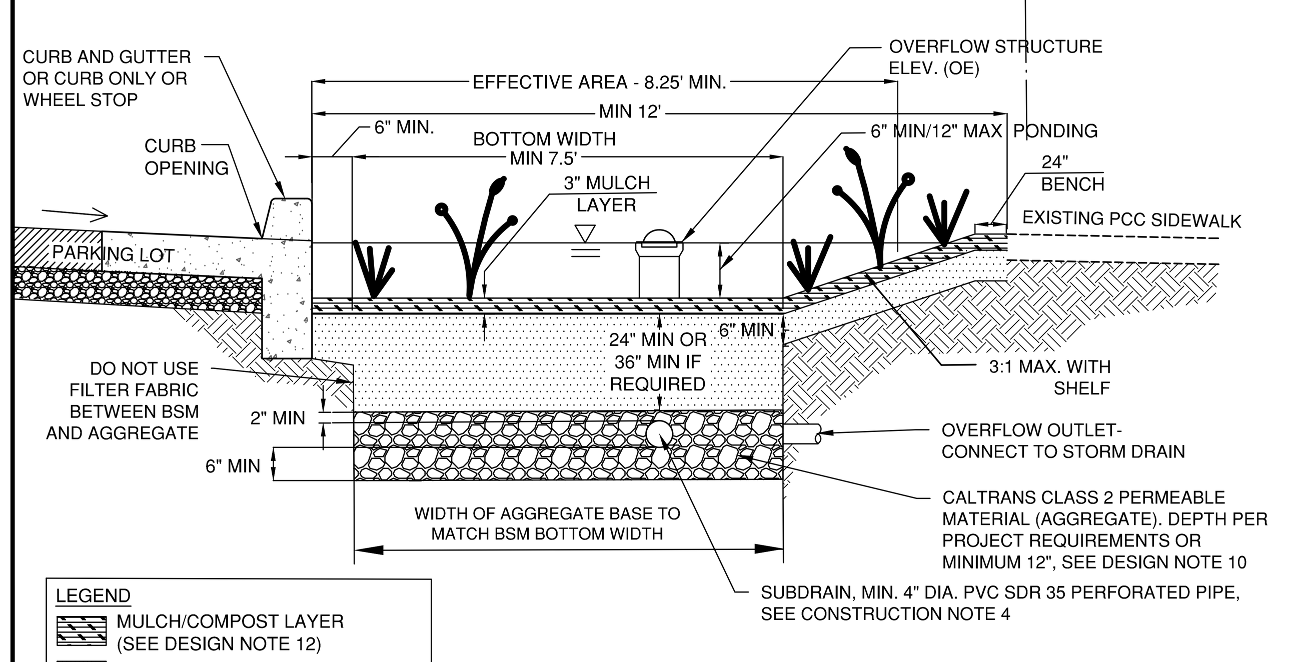
PROJECT NAME:AERO DRIVE
PROJECT NUMBER:489018
DATE OF PHOTOGRAPHY:3-27-18

ON-SITE SURVEY ELEMENTS PRODUCED BY:

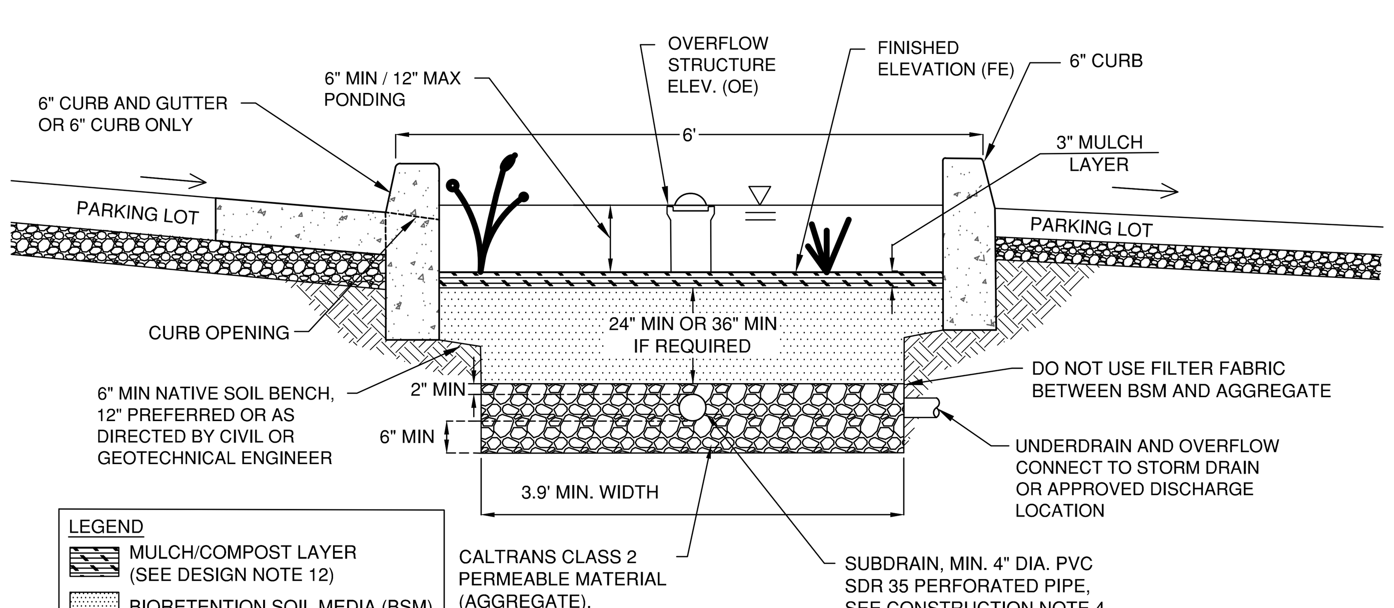
BOCK & CLARK CORP.
8421 AUBURN BLVD., STE 130
CITRUS HEIGHTS, CA 95610
800-787-8393
JAYNE E. LEAVITT LS 8898

PROJECT NAME: 8825 & 8875 AERO BUSINESS CENTER
PROJECT NUMBER: 201604760-001, 201604761-001
DATE OF FIELD SURVEY:12-20-2016

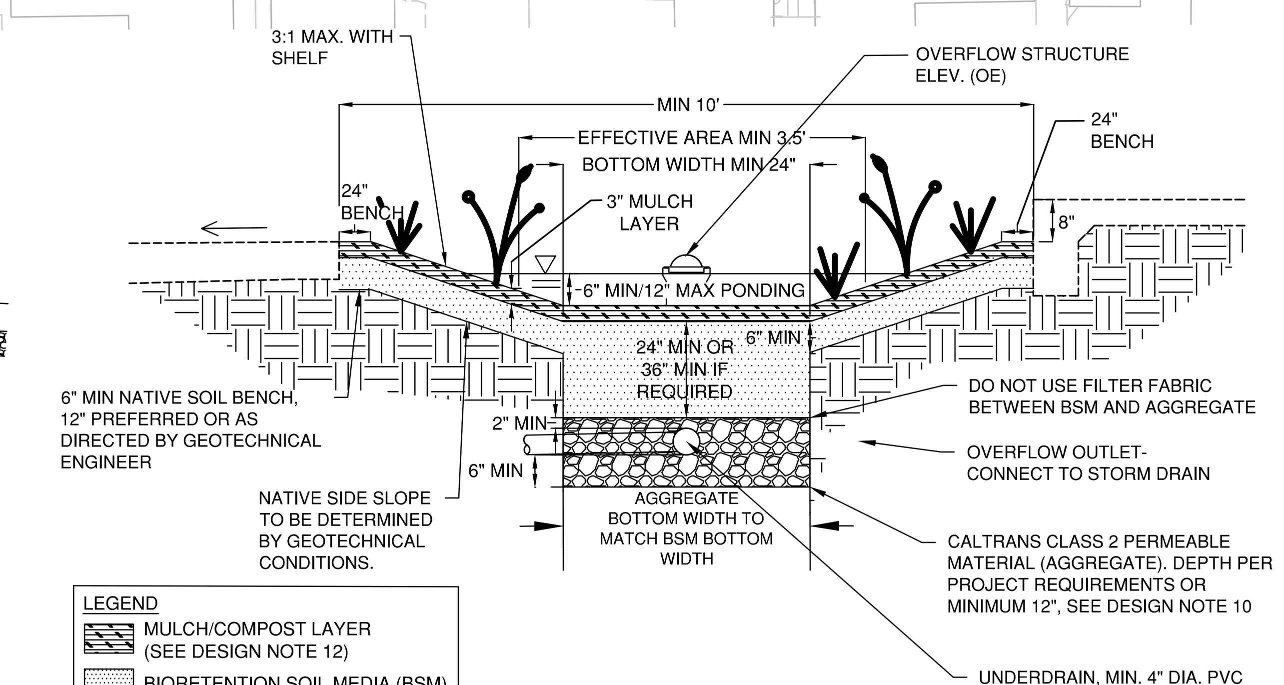




SECTION A
BIOFILTRATION PLANTER ALONG AERO DRIVE
NOT TO SCALE



SECTION B
BIOFILTRATION PLANTER ON-SITE
NOT TO SCALE



SECTION C
BIOFILTRATION PLANTER ADJACENT TO BUILDING
NOT TO SCALE

LEGEND

- PROPERTY LINE
- STORM DRAIN
- BIOFILTRATION PLANTER (PERVIOUS) PER DETAIL HEREON
- PERVIOUS AREAS
- REMOVAL LIMITS

SCALE : 1" = 30'

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10 edelman
irvine, california 92618
p 949.660.9128
f 949.863.1581

THIS PLAN PREPARED BY OR UNDER THE DIRECT SUPERVISION OF:

REGISTERED PROFESSIONAL ENGINEER LUCAS A. CORSBIE No. 72588 CIVIL STATE OF CALIFORNIA

PROTEA PROPERTIES
8825-8875 AERO DRIVE
SAN DIEGO, CALIFORNIA 92123

PRELIMINARY GRADING AND DRAINAGE PLAN

DATE	REMARKS

PA / PM:
DRAWN BY: ASM
JOB NO.:

SHEET
C3.0

Thu, 20 Sep 2018

W:\RV\18\3004\00\Civil\CD\Sheets\C3.0-PreliminaryGradingAndDrainage.dwg

Attachment 5
Drainage Report

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

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PRELIMINARY DRAINAGE STUDY

FOR:
Protea Hospital Annex Renovation
8875 Aero Drive
San Diego, California

Prepared for:
Protea Properties
3262 Holiday Ct #100
La Jolla, CA 92037

Project No: xxxxxxx

Prepared by: ______________________________
Signature Date

Engineer: Lucas Corsbie, RCE No. 72588

Ware Malcomb
10 Edelman
Irvine CA 92618
Phone: (949) 660-9128

Prepare Date: September 21, 2018
Revised:

Contents

I. Project Description

i. Background

The subject site is bound on the north by Aero Drive, on the south by existing residential, on the west and east by shared driveway and existing office complexes. Refer to the vicinity map in Appendix "A". The proposed project includes interior modifications and additions to the existing building and conversion of a portion of existing surface parking to parking structure, as well as private storm drain improvements for water quality and hydromodification management purposes.

The purpose of this drainage study is to quantify the existing and post-project drainage conditions to support grading and storm drain design for the Project, and to confirm that the project will not adversely affect existing offsite drainage infrastructure. Adverse effects to offsite drainage infrastructure can be avoided by limiting project condition peak flows to equal, or less than, existing condition peak flows. Storm water quality and hydromodification management plan (HMP) compliance is detailed in a separate document, the Storm Water Quality Management Plan (SWQMP).

The project does not include work within any wetland, stream, lake, pond, or any other waters regulated by the state, and is not anticipated to require Clean Water Act Section 404 or 401 permit or certification.

ii. Existing Condition

The existing site consists of a relatively level, rectangular-shaped property that presently supports the existing buildings and surface parking. The site drains via surface sheet flow to three discharge points.

Watershed A (Discharge Node 100): Runoff from the west portion of the site surface flows into the west driveway, as well as north into Aero Drive through curb cuts on the west side of a high point in Aero Drive. Surface flow is conveyed west, approx. 2,000 feet to catch basins just west of Afton Road. A 60" storm drain conveys water to a concrete-lined open channel that parallels the east edge of Interstate 805 before passing under to a natural channel. The natural channel flows south to a storm drain facility that conveys water into the San Diego River at approximately Mission Center Road.

Watershed B (Discharge Node 200): Runoff from the central and northeast portion of the site surface flows into Aero Drive through curb cuts and out of a driveway on the east side of a high point in Aero Drive. Surface flow is conveyed 1,200 feet east to a catch basin that discharges into an unnamed natural channel. Flow in the natural channel is conveyed under developments via storm drain and into the San Diego River at Interstate 805.

Watershed C (Discharge Node 300): Runoff from the southeast portion of the site drains through the existing wall located in the south east corner of the property and into the gutter of Ediwhar Avenue. Surface flow is conveyed into catch basins located about 2,000 feet south and east in Hammond Drive. Storm drains convey flow into the same unnamed natural channel. Flow in the natural channel is conveyed under developments via storm drain and into the San Diego River at approx. Interstate 805.

The San Diego River discharges to the Pacific Ocean just south of Mission Bay. There is no run-on to the site from adjacent properties. The existing condition hydrology map can be found in Appendix "G".

iii. Proposed Condition

The proposed site will be designed to maintain existing condition drainage patterns to the maximum extent practical. Runoff from the parking structure top level will sheet flow into the existing parking lots as in the existing condition. The parking structure straddles the site high point that divides watersheds A and B. Approximately half of the proposed parking structure will drain to Node 100 and the rest will drain to Node 200. The portion of the structure draining to Node 100 will not be captured in a water quality Best Management Practice (BMP). To compensate, an equivalent area of existing parking lot and building roof is included in water quality sizing and hydromodification flow controls at Discharge Node 200 (Point of Connection 1). These calculations are shown and explained in detail in the SWQMP.

Watershed B includes the additions to the existing building, as well as landscape and surface parking improvements. Drainage from these improvements will be conveyed via sheet flow into Biofiltration with Underdrain BMPs and into the hydromodification flow control detention BMP. The detention BMP will include an outlet structure with pump so that water can be discharged to street level as in the existing condition in compliance with HMP requirements, detailed in the SWQMP document. HMP requirements address storms up to the 10-year storm event. Flow in excess of the HMP compliance storm will overflow and/or bypass project BMPs and surface drain into Aero Drive, as in the existing condition.

Limited changes to Watershed C are anticipated as a result of the project. Landscaping will replace some surface parking area along the south edge of the existing building.

iv. Design Criteria and Methods

The rational method hydrologic model was used to determine the 100-year, 6-hour and 24-hr storm event peak flows in both the existing and project conditions for comparison. Computation criteria found in the City of San Diego Drainage Design Manual January 2017 Edition was used in Advanced Engineering Software (AES) 2016 calculations.

II. Hydrology Analysis

i. Rational Method Peak Flows

The existing and proposed condition hydrology maps provided in this report show the sub-areas used to generate flows for the site. The variables taken into consideration in the computation include rainfall, impervious percent, and land use conditions characteristics of flow conveyance, and time of concentration.

The soils map included in Appendix B indicates type D soils. Figure B-2 from the Manual shows that the 100-year 6-hour rainfall is 2.5 inches, included in Appendix C. Figure B-3 from the Manual shows that the 100-year 6-hour rainfall is 4 inches, included in Appendix D. The Antecedent Moisture Condition for the 100-year storm used is two. Runoff coefficients given in Table A-1 of the Manual were revised based on actual impervious percentages in the existing and project condition as shown in the tables below:

EXISTING CONDITION					
Subarea	Imp sf	Pervious sf	Area sf	Area ac	% Imp
A1	1,858	293	2,150	0.05	86%
A2	58,145	3,495	61,640	1.42	94%
A3	54,012	15,259	69,271	1.59	78%
Subtotal	**114,015**	**19,046**	**133,062**	**3.06**	**86%**
B1	1,042	384	1,426	0.03	73%
B2	38,281	2,326	40,607	0.93	94%
B3	91,174	15,667	106,841	2.45	85%
Subtotal	**130,498**	**18,376**	**148,874**	**3.41**	**88%**
C1	1,896	185	2,081	0.05	91%
C2	47,930	3,896	51,826	1.19	92%
Subtotal	**49,826**	**4,081**	**53,907**	**1.24**	**92%**
Total	**294,339**	**41,503**	**335,842**	**7.71**	**88%**

PROPOSED CONDITION					
Subarea	Imp sf	Pervious sf	Area sf	Area ac	% Imp
A1	1,802	345	2,147	0.05	84%
A2	50,806	2,610	53,416	1.23	95%
A3	55,060	15,204	70,264	1.61	78%
Subtotal	**107,668**	**18,159**	**125,827**	**2.89**	**86%**
B1	1,031	395	1,426	0.03	72%
B2	40,030	5,884	45,913	1.05	87%
B3	90,652	16,190	106,841	2.45	85%
Subtotal	**131,712**	**22,468**	**154,180**	**3.53**	**85%**
C1	2,210	481	2,691	0.06	82%
C2	48,319	4,826	53,144	1.22	91%
Subtotal	**50,529**	**5,306**	**55,835**	**1.28**	**90%**
Total	**289,909**	**45,933**	**335,842**	**7.71**	**86%**

EXISTING CONDITION					
SUBAREA	LANDUSE	IMPERVIOUS PERCENT	TABLE A.1 IMPERVIOUS PERCENT	TABLE A.1 RUNOFF COEFFICIENT C	REVISED C
A1	COMMERCIAL	86%	80%	0.85	0.92
A2	COMMERCIAL	94%	80%	0.85	1.00
A3	COMMERCIAL	78%	80%	0.85	0.83
Subtotal	COMMERCIAL	86%	80%	0.85	0.91
B1	COMMERCIAL	73%	80%	0.85	0.78
B2	COMMERCIAL	94%	80%	0.85	1.00
B3	COMMERCIAL	85%	80%	0.85	0.91
Subtotal	COMMERCIAL	88%	80%	0.85	0.93
C1	COMMERCIAL	91%	80%	0.85	0.97
C2	COMMERCIAL	92%	80%	0.85	0.98
Subtotal	COMMERCIAL	92%	80%	0.85	0.98
Total	COMMERCIAL	88%	80%	0.85	0.94

PROJECT CONDITION					
SUBAREA	LANDUSE	ACTUAL IMPERVIOUS PERCENT	TABLE A. IMPERVIOUS PERCENT	TABLE A.1 RUNOFF COEFFICIENT C	REVISED C
A1	COMMERCIAL	84%	80%	0.85	0.89
A2	COMMERCIAL	95%	80%	0.85	1.00
A3	COMMERCIAL	78%	80%	0.85	0.83
Subtotal	COMMERCIAL	86%	80%	0.85	0.91
B1	COMMERCIAL	72%	80%	0.85	0.77
B2	COMMERCIAL	87%	80%	0.85	0.93
B3	COMMERCIAL	85%	80%	0.85	0.90
Subtotal	COMMERCIAL	85%	80%	0.85	0.91
C1	COMMERCIAL	82%	80%	0.85	0.87
C2	COMMERCIAL	91%	80%	0.85	0.97
Subtotal	COMMERCIAL	90%	80%	0.85	0.96
Total	COMMERCIAL	86%	80%	0.85	0.92

The Rational Method via AES Hydrologic software derived the following flow rates for the existing and post-developed condition (see Appendix "E" and "F" for a detailed tabulation):

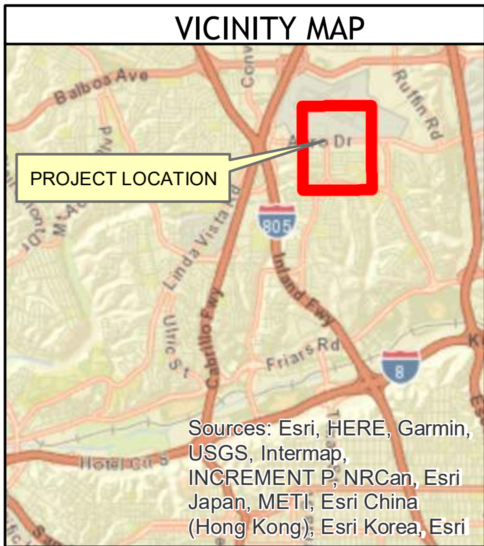
Node	Existing Condition			Proposed Condition			Q100 Comparison
	Area (ac)	C	Q100 (cfs)	Area (ac)	C	Q100 (cfs)	
100	3.1	0.91	17.12	2.9	0.91	13.98	-22%
200	3.4	0.93	16.94	3.5	0.91	16.72	-1%
300	1.2	0.98	8.00	1.3	0.96	7.83	-2%
Total	7.7	0.94	42.06	7.7	0.92	38.53	-9%

III. Conclusion

Project condition calculations are conservative because they do not account for the storage and flood routing provided by project BMPs. Project improvements include an increase in pervious areas onsite, adding landscaping and biofiltration BMPs where surface parking exists today. As a result, project impacts decrease the amount of discharge expected at each discharge point, as well as in total, when compared to the existing condition. Therefore, no adverse impacts to offsite drainage infrastructure is anticipated.

Water quality and hydromodification flow control BMPs will be implemented to satisfy the requirements of the Natioanl Pollutant Discharge Elimination System (NPDES) permit locally regulated by San Diego Regional MS4 Permit (order R9-2013-0001), reissued by California Regional Water Quality Control Board (SDRWQCB) in May 2013 and amended by Order R9-2015-0001 and R9-2015-0100 and as demonstrated in the SWQMP.

Appendix A – Vicinity Map



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0 250 500 1,000 Feet

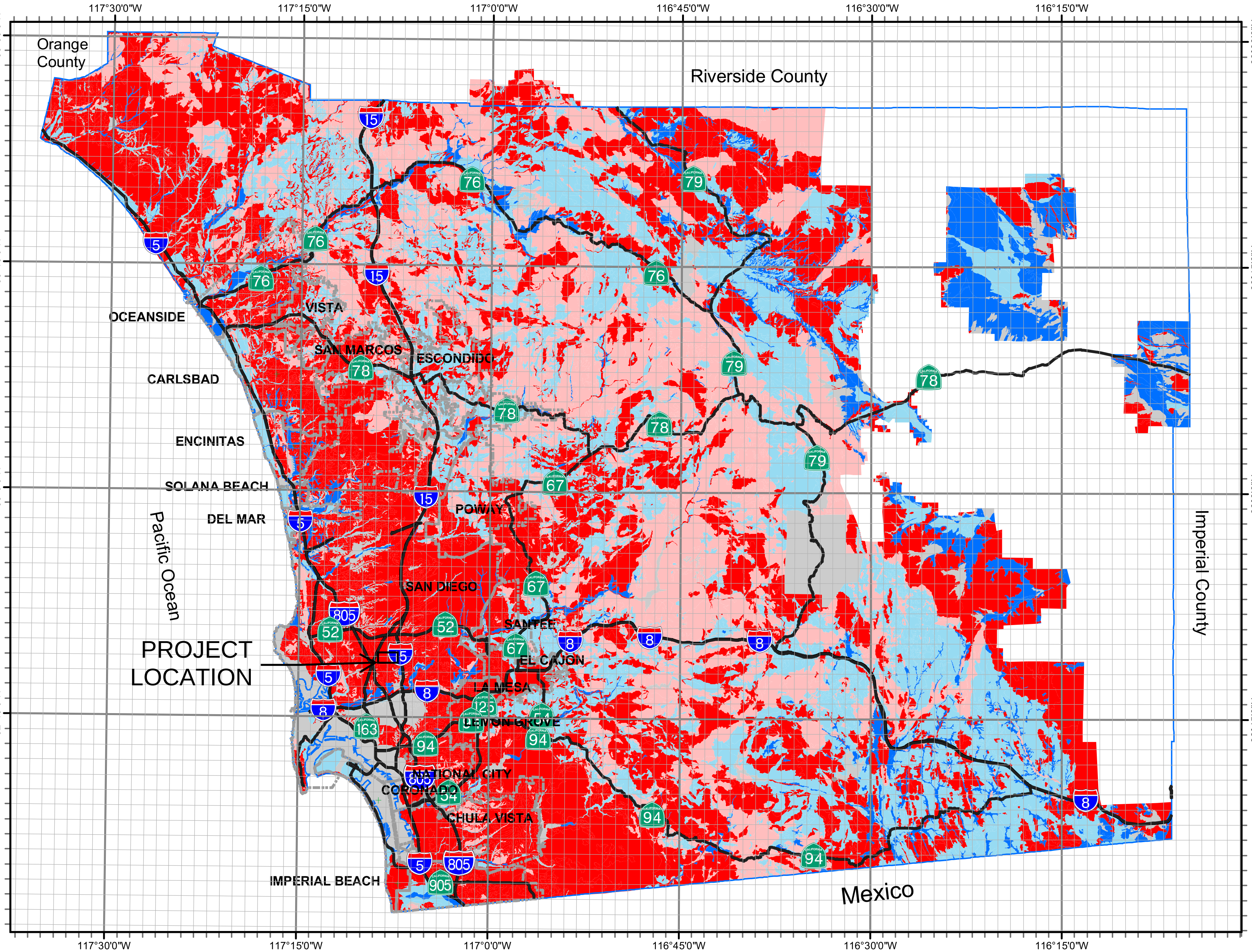
PROTEA HOSPITAL ANNEX RENOVATION

8875 AERO DRIVE

LOCATION MAP

Appendix B – Soil Map

County of San Diego Hydrology Manual Soil Hydrologic Group



Legend

- Major Roads
- Incorporated City Bdy

HYDROLOGIC SOIL GROUP

- Hydrologic Group Undefined
- Hydrologic Group A
- Hydrologic Group B
- Hydrologic Group C
- Hydrologic Group D
- No Soil Data

Note: Soil Data Source USDA/NRCS SSURGO Soils 2007

N

3 1.5 0 3 Miles

Appendix C – 100 Year, 6 Hour Precipitation

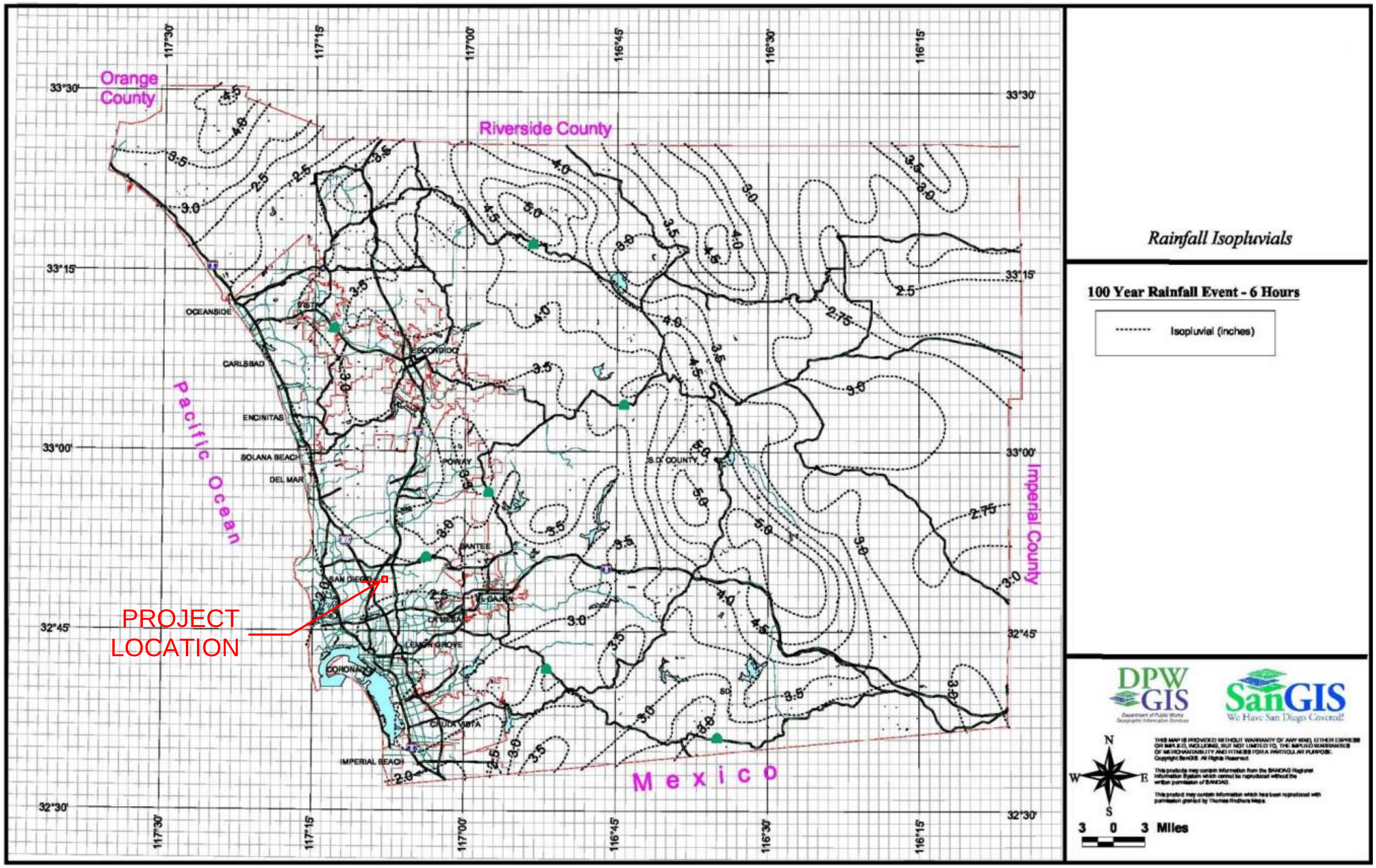


Figure B-2. 100-Year 6-Hour Isopluvials.

Appendix D – 100 Years – 24 Hour Precipitation

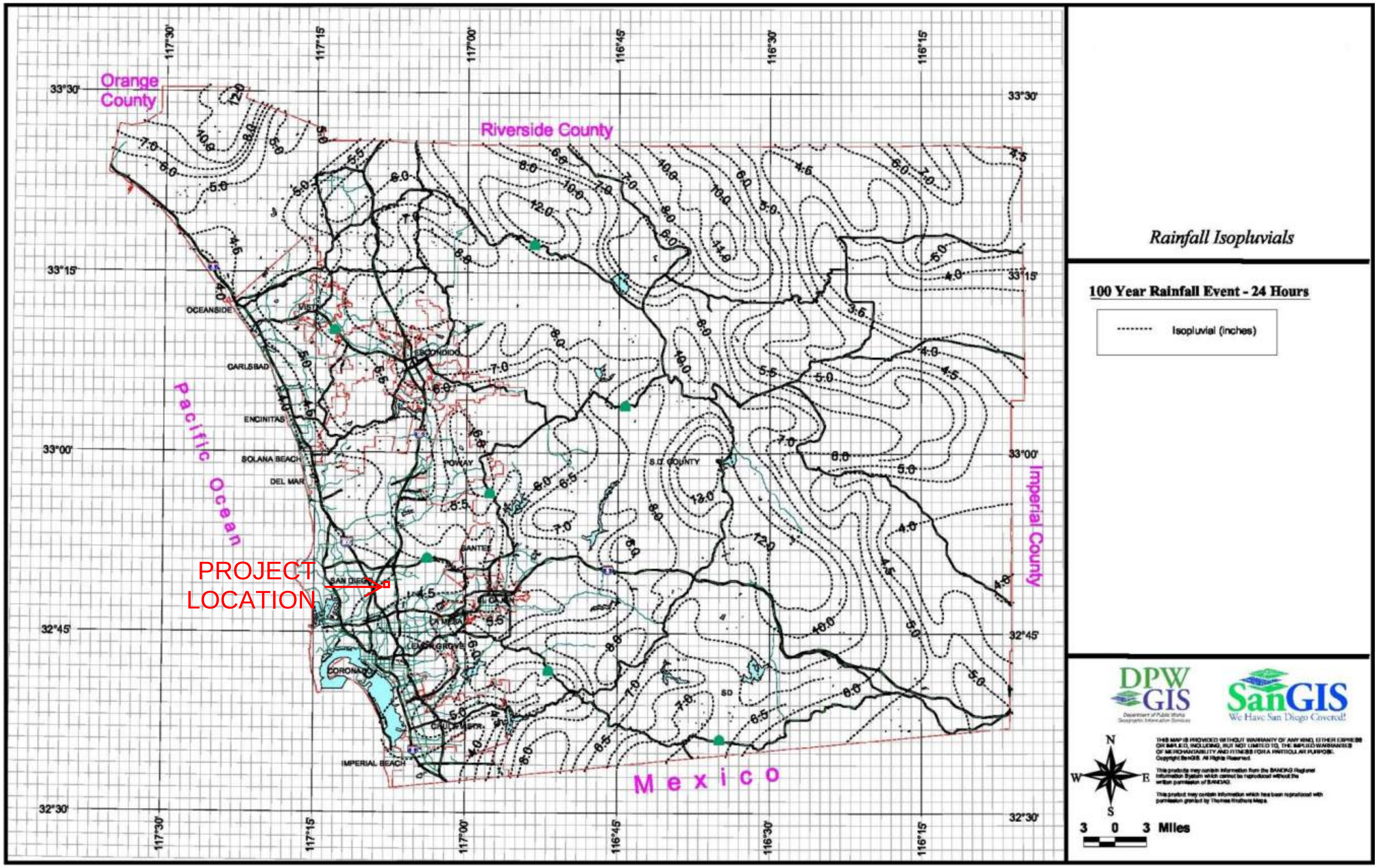


Figure B-3. 100-Year 24-Hour Isopluvials

Appendix E – Rational Method Calculations
Existing Condition

```
____________________________________________________________________________
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2016 Advanced Engineering Software (aes)
             Ver. 23.0 Release Date: 07/01/2016  License ID 1679

                           Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
* PROTEA VA SAN DIEGO                                                      *
* EXISTING CONDITIONS                                                      *
* 100-YEAR RATIONAL METHOD                                                 *
 **************************************************************************

  FILE NAME: EX_100.DAT
  TIME/DATE OF STUDY: 16:44 09/19/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   12.0      5.0    0.018/0.018/ ---    0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9200
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    52.00
  UPSTREAM ELEVATION(FEET) =    420.50
  DOWNSTREAM ELEVATION(FEET) =    419.50
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.879
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.30
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.30

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  62
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0102
  STREET LENGTH(FEET) =   345.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.93
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =   10.63
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.18
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.70
  STREET FLOW TRAVEL TIME(MIN.) =   2.63   Tc(MIN.) =    4.51
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.988
  SUBAREA AREA(ACRES) =    1.42      SUBAREA RUNOFF(CFS) =    9.26
  TOTAL AREA(ACRES) =        1.5        PEAK FLOW RATE(CFS) =       9.56

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  2.71   DEPTH*VELOCITY(FT*FT/SEC.) =   1.01
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     397.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    100.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0105
  STREET LENGTH(FEET) =   191.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      13.65
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.41
    HALFSTREET FLOOD WIDTH(FEET) =   12.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.16
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.28
  STREET FLOW TRAVEL TIME(MIN.) =   1.01   Tc(MIN.) =    5.52
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.179
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .8300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.906
  SUBAREA AREA(ACRES) =    1.59      SUBAREA RUNOFF(CFS) =    8.15
  TOTAL AREA(ACRES) =        3.1        PEAK FLOW RATE(CFS) =      17.12
```

```
  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.43   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.45   DEPTH*VELOCITY(FT*FT/SEC.) =   1.49
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    100.00 =     588.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .7800
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    41.00
  UPSTREAM ELEVATION(FEET) =    420.50
  DOWNSTREAM ELEVATION(FEET) =    420.00
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.452
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0114
  STREET LENGTH(FEET) =   298.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.86
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    8.05
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.04
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.56
  STREET FLOW TRAVEL TIME(MIN.) =   2.43   Tc(MIN.) =    5.88
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.930
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.983
  SUBAREA AREA(ACRES) =    0.93      SUBAREA RUNOFF(CFS) =    5.46
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       5.60

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =  10.95
  FLOW VELOCITY(FEET/SEC.) =  2.35   DEPTH*VELOCITY(FT*FT/SEC.) =   0.76
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =     339.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    200.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0090
  STREET LENGTH(FEET) =   177.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00
```

```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.57
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.40
    HALFSTREET FLOOD WIDTH(FEET) =   12.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.83
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.12
  STREET FLOW TRAVEL TIME(MIN.) =   1.04   Tc(MIN.) =    6.93
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.338
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9100
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.931
  SUBAREA AREA(ACRES) =    2.45      SUBAREA RUNOFF(CFS) =   11.90
  TOTAL AREA(ACRES) =        3.4        PEAK FLOW RATE(CFS) =      16.94

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.44   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.28   DEPTH*VELOCITY(FT*FT/SEC.) =   1.45
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    200.00 =     516.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    44.00
  UPSTREAM ELEVATION(FEET) =    419.00
  DOWNSTREAM ELEVATION(FEET) =    417.90
  ELEVATION DIFFERENCE(FEET) =      1.10
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    1.144
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.32
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.32

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    300.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0069
  STREET LENGTH(FEET) =   274.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.16
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.32
    HALFSTREET FLOOD WIDTH(FEET) =   10.71
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.82
```

```
      PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.58
    STREET FLOW TRAVEL TIME(MIN.) =   2.51   Tc(MIN.) =    3.66
     100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
    NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
    *USER SPECIFIED(SUBAREA):
    OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9800
    S.C.S. CURVE NUMBER (AMC II) =   0
    AREA-AVERAGE RUNOFF COEFFICIENT =  0.980
    SUBAREA AREA(ACRES) =    1.19      SUBAREA RUNOFF(CFS) =    7.68
    TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       8.00

    END OF SUBAREA STREET FLOW HYDRAULICS:
    DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.00
    FLOW VELOCITY(FEET/SEC.) =  2.25   DEPTH*VELOCITY(FT*FT/SEC.) =   0.84
    LONGEST FLOWPATH FROM NODE    301.00 TO NODE    300.00 =     318.00 FEET.
  ============================================================================
    END OF STUDY SUMMARY:
    TOTAL AREA(ACRES)     =        1.2  TC(MIN.) =      3.66
    PEAK FLOW RATE(CFS)   =       8.00
  ============================================================================
  ============================================================================
    END OF RATIONAL METHOD ANALYSIS

  FF
```

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Appendix F – Rational Method Calculations Project Condition

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____________________________________________________________________________
****************************************************************************

             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
              Ver. 23.0 Release Date: 07/01/2016  License ID 1679

                            Analysis prepared by:






 ************************** DESCRIPTION OF STUDY **************************
* PROTEA VA SAN DIEGO                                                      *
* PROJECT CONDITIONS                                                       *
* 100-YEAR RATIONAL METHOD                                                 *
 **************************************************************************

  FILE NAME: PR_100.DAT
  TIME/DATE OF STUDY: 16:47 09/19/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  2003 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.500
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   12.0      5.0    0.018/0.018/ ---    0.50    1.50 0.0313 0.125 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .8900
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    52.00
  UPSTREAM ELEVATION(FEET) =    420.50
  DOWNSTREAM ELEVATION(FEET) =    419.50
  ELEVATION DIFFERENCE(FEET) =      1.00
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.192
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.29
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.29

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  62
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0084
  STREET LENGTH(FEET) =   415.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.94
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =   10.01
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.94
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.60
  STREET FLOW TRAVEL TIME(MIN.) =   3.56   Tc(MIN.) =    5.76
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.015
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9900
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.986
  SUBAREA AREA(ACRES) =    1.23      SUBAREA RUNOFF(CFS) =    7.32
  TOTAL AREA(ACRES) =        1.3        PEAK FLOW RATE(CFS) =       7.59

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  2.35   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    103.00 =     467.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    103.00 TO NODE    100.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0105
  STREET LENGTH(FEET) =   191.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.20
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.39
    HALFSTREET FLOOD WIDTH(FEET) =   12.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.93
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.13
  STREET FLOW TRAVEL TIME(MIN.) =   1.09   Tc(MIN.) =    6.84
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.380
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .8300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.899
  SUBAREA AREA(ACRES) =    1.61      SUBAREA RUNOFF(CFS) =    7.19
  TOTAL AREA(ACRES) =        2.9        PEAK FLOW RATE(CFS) =      13.98

  END OF SUBAREA STREET FLOW HYDRAULICS:
```

```
  DEPTH(FEET) = 0.41   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.19   DEPTH*VELOCITY(FT*FT/SEC.) =   1.31
  LONGEST FLOWPATH FROM NODE    101.00 TO NODE    100.00 =     658.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    202.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .7700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    38.00
  UPSTREAM ELEVATION(FEET) =    420.50
  DOWNSTREAM ELEVATION(FEET) =    420.00
  ELEVATION DIFFERENCE(FEET) =      0.50
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    3.342
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.15
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.15

****************************************************************************
  FLOW PROCESS FROM NODE    202.00 TO NODE    203.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0131
  STREET LENGTH(FEET) =   355.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.98
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.27
    HALFSTREET FLOOD WIDTH(FEET) =    7.98
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.16
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.59
  STREET FLOW TRAVEL TIME(MIN.) =   2.73   Tc(MIN.) =    6.08
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.809
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9300
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.926
  SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    5.67
  TOTAL AREA(ACRES) =        1.1        PEAK FLOW RATE(CFS) =       5.81

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.32   HALFSTREET FLOOD WIDTH(FEET) =  10.79
  FLOW VELOCITY(FEET/SEC.) =  2.50   DEPTH*VELOCITY(FT*FT/SEC.) =   0.81
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    203.00 =     393.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    203.00 TO NODE    200.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0075
  STREET LENGTH(FEET) =   177.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00
```

```
  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.58
    ***STREET FLOWING FULL***
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.41
    HALFSTREET FLOOD WIDTH(FEET) =   12.00
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.68
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.09
  STREET FLOW TRAVEL TIME(MIN.) =   1.10   Tc(MIN.) =    7.18
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  5.217
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9000
  S.C.S. CURVE NUMBER (AMC II) =   0
  AREA-AVERAGE RUNOFF COEFFICIENT =  0.908
  SUBAREA AREA(ACRES) =    2.45      SUBAREA RUNOFF(CFS) =   11.50
  TOTAL AREA(ACRES) =        3.5        PEAK FLOW RATE(CFS) =      16.72

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.45   HALFSTREET FLOOD WIDTH(FEET) =  12.00
  FLOW VELOCITY(FEET/SEC.) =  3.09   DEPTH*VELOCITY(FT*FT/SEC.) =   1.40
  LONGEST FLOWPATH FROM NODE    201.00 TO NODE    200.00 =     570.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  *USER SPECIFIED(SUBAREA):
  OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .8700
  S.C.S. CURVE NUMBER (AMC II) =   0
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    54.00
  UPSTREAM ELEVATION(FEET) =    418.88
  DOWNSTREAM ELEVATION(FEET) =    418.20
  ELEVATION DIFFERENCE(FEET) =      0.68
  SUBAREA OVERLAND TIME OF FLOW(MIN.) =    2.817
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.587
  NOTE: RAINFALL INTENSITY IS BASED ON Tc = 5-MINUTE.
  SUBAREA RUNOFF(CFS) =      0.34
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.34

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    300.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  REPRESENTATIVE SLOPE =  0.0078
  STREET LENGTH(FEET) =   284.00   CURB HEIGHT(INCHES) =  6.0
  STREET HALFWIDTH(FEET) = 12.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =   5.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       4.07
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.31
    HALFSTREET FLOOD WIDTH(FEET) =   10.32
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.90
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.60
```

```
 STREET FLOW TRAVEL TIME(MIN.) =   2.49   Tc(MIN.) =    5.31
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.338
 *USER SPECIFIED(SUBAREA):
 OFFICE PROFESSIONAL/COMMERCIAL RUNOFF COEFFICIENT = .9700
 S.C.S. CURVE NUMBER (AMC II) =   0
 AREA-AVERAGE RUNOFF COEFFICIENT =  0.965
 SUBAREA AREA(ACRES) =    1.22      SUBAREA RUNOFF(CFS) =    7.50
 TOTAL AREA(ACRES) =        1.3        PEAK FLOW RATE(CFS) =       7.83

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.37   HALFSTREET FLOOD WIDTH(FEET) =  12.00
 FLOW VELOCITY(FEET/SEC.) =  2.31   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
 LONGEST FLOWPATH FROM NODE    301.00 TO NODE    300.00 =     338.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        1.3  TC(MIN.) =      5.31
 PEAK FLOW RATE(CFS)   =       7.83
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS

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Appendix G – Hydrology Map – Existing Condition

LEGEND

- IMPERVIOUS AREAS
- PERVIOUS AREAS
- EXISTING FLOWPATH
- NODE (XXX)
- EXISTING HYDROLOGY BOUNDARY
- SUBAREA ID / SUBAREA AC (A1 / 1.10)

NODE	AREA AC	100 C S
100	3.1	17.12
200	3.4	16.94
300	1.2	8.00
A	7.7	42.06

EXISTING CONDITION					
Subarea	Imp sf	Pervious sf	Area sf	Area ac	% Imp
A1	1,858	293	2,150	0.05	86%
A2	58,145	3,495	61,640	1.42	94%
A3	54,012	15,259	69,271	1.59	78%
Subtotal	**114,015**	**19,046**	**133,062**	**3.06**	**86%**
B1	1,042	384	1,426	0.03	73%
B2	38,281	2,326	40,607	0.93	94%
B3	91,174	15,667	106,841	2.45	85%
Subtotal	**130,498**	**18,376**	**148,874**	**3.41**	**88%**
C1	1,896	185	2,081	0.05	91%
C2	47,930	3,896	51,826	1.19	92%
Subtotal	**49,826**	**4,081**	**53,907**	**1.24**	**92%**
Total	**294,339**	**41,503**	**335,842**	**7.71**	**88%**

60 30 0 Feet

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PROTEA VA SAN DIEGO
8875 AERO DRIVE
EXISTING CONDITIONS HYDROLOGY MAP

Appendix H – Hydrology Map – Project Condition

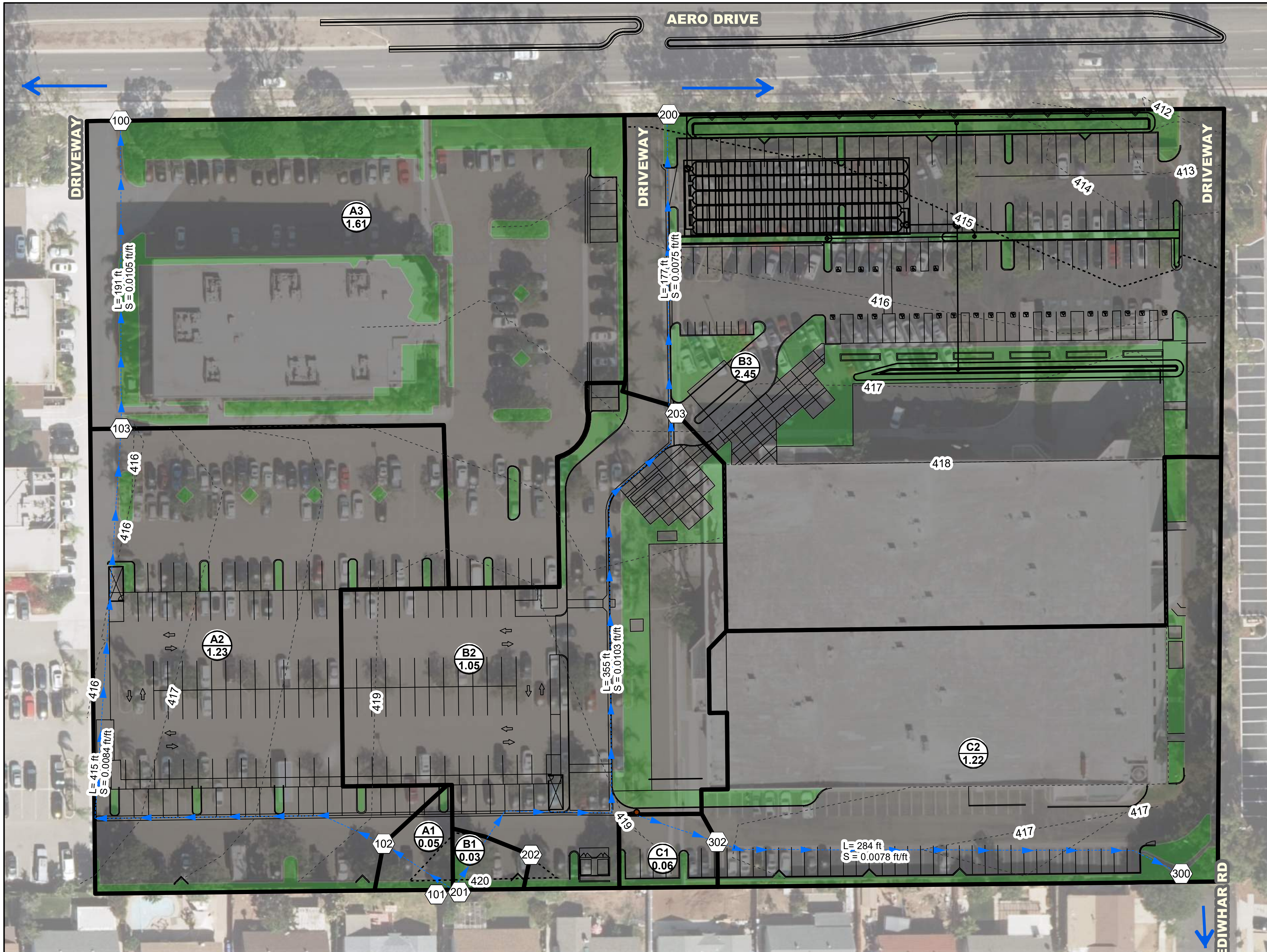
LEGEND

- PERVIOUS
- IMPERVIOUS
- PROJECT FLOWPATH
- XXX NODE
- PROJECT_HYDROLOGY
- A1 / 1.10 SUBAREA ID / SUBAREA AC

NODE	AREA AC	100 C S
100	2.9	13.98
200	3.5	16.72
300	1.3	7.83
A	7.7	38.53

PROPOSED CONDITION					
Subarea	Imp sf	Pervious sf	Area sf	Area ac	% Imp
A1	1,802	345	2,147	0.05	84%
A2	50,806	2,610	53,416	1.23	95%
A3	55,060	15,204	70,264	1.61	78%
Subtotal	**107,668**	**18,159**	**125,827**	**2.89**	**86%**
B1	1,031	395	1,426	0.03	72%
B2	40,030	5,884	45,913	1.05	87%
B3	90,652	16,190	106,841	2.45	85%
Subtotal	**131,712**	**22,468**	**154,180**	**3.53**	**85%**
C1	2,210	481	2,691	0.06	82%
C2	48,319	4,826	53,144	1.22	91%
Subtotal	**50,529**	**5,306**	**55,835**	**1.28**	**90%**
Total	**289,909**	**45,933**	**335,842**	**7.71**	**86%**

60 30 0 Feet



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PROTEA VA SAN DIEGO
8875 AERO DRIVE
PROJECT CONDITIONS HYDROLOGY MAP

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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.

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GEOTECHNICAL INVESTIGATION
PROPOSED HOSPITAL ANNEX
8875 AERO DRIVE
SAN DIEGO, CALIFORNIA

Prepared for:

PROTEA DEVELOPMENT
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CTE JOB NO.: 10-14209G APRIL 30, 2018

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FIGURES

APPENDICES

1.0 INTRODUCTION AND SCOPE OF SERVICES

1.1 Introduction

Construction Testing and Engineering, Inc. (CTE) has completed a geotechnical investigation and report providing conclusions and recommendations for the proposed hospital annex improvements located at 8875 Aero Drive (APN 421-3000-300), and proposed four-level parking structure to be located on the southern portion of the adjacent parcel at 8825 Aero Drive (APN 421-3000-200) (Figure 1).

The proposed scope of work for the hospital annex includes two wing additions to the existing 100,000 square foot structure and modifications to the proposed building entrance. The wing additions will increase the footprint of the existing structure by approximately 134,000 square feet.

A separate four-story above ground parking structure with associated at-grade parking and drive areas is proposed in the adjacent parcel to the west of the existing building (Figures 1 and 2). Associated improvements are to include flatwork, pavement, and bioretention basins.

CTE has performed this work in general accordance with the terms of proposal G-4337 dated March 16, 2018. Preliminary geotechnical recommendations for excavations, fill placement, and foundation design for the proposed improvements are presented herein.

1.2 Scope of Services

The scope of services provided included:

- Review of readily available geologic and soils reports.
- Review of historic topographic maps.
- Coordination of USA and private utility mark-out and location.
- Obtaining appropriate San Diego County Department of Environmental Health (DEH) Boring Permits.
- Excavation of exploratory borings and soil sampling utilizing a truck-mounted drill rig.
- Percolation testing in accordance with County of San Diego Department of Environmental Health (DEH) procedures.
- Establishing infiltration rates in accordance with City of San Diego Storm Water Standards (2018).
- Laboratory testing of selected soil samples.
- Description of the site geology and evaluation of potential geologic hazards.
- Engineering and geologic analysis.
- Preparation of this preliminary geotechnical report.

2.0 SITE DESCRIPTION

The subject site is located at 8875 Aero Drive in San Diego, California (Figure 1). The site is bounded by Aero Drive to the north, commercial structures to the east and west, and residential development to the south. The current site area is illustrated on Figure 1. The proposed improvement area is currently developed with a large commercial structure with associated parking and flatwork, landscaping, utilities and other minor improvements. Based on reconnaissance and review of general site topography, it appears that the improvement area generally descends to the north with elevations ranging from approximately 420 feet above mean sea level in the south (msl) to approximately 413 feet msl to the north. The proposed site modifications and additions are depicted on Figure 2.

3.0 FIELD INVESTIGATION AND LABORATORY TESTING

3.1 Historical Topographic and Aerial Photograph Review

As part of the initial phase of investigation, area United States Geologic Survey historic topographic maps from 1903, 1930, 1943, 1953, 1967, and 1979 were reviewed. Aerial images from Google Earth were reviewed from 1996 to 2017. Based on the review, it appears that a shallow pond or vernal pool was present within the general site area prior to regional development. This feature was indicated to be within the proposed project area on the maps dating from 1943 to 1967 and to the southwest of the project area on the maps prior to 1943. The localized water feature was not shown on topographic maps post 1967.

Review of building plans for the Bank of America Central Cash Vault (existing structure at 8875 Aero Drive), prepared by Boyle Architectural Associates (no date), indicated that the existing foundation system consisted of continuous and spread footings placed on shallow structural fill. Based on the foundation schedule, the deepest footings were indicated to be two-feet nine inches below pad grades. Depth of the previously placed fill was not indicated, however, based on recent boring explorations the fill thickness surrounding the existing structure ranges from approximately five to seven feet below existing grades. In the area of the proposed parking structure the existing fill thickness is indicated to range from approximately one to four feet below existing grades.

3.2 Field Investigation

CTE performed the recent subsurface investigation on March 29, 2018 to evaluate underlying soil conditions. This fieldwork consisted of site reconnaissance, and the excavation of seven exploratory soil borings and seven percolation test holes. The borings were advanced to a maximum explored depth of approximately 18 feet below ground surface (bgs). Bulk samples were collected from the cuttings, and relatively undisturbed samples were collected by driving Standard Penetration Test (SPT) and Modified California (CAL) samplers. The borings and percolation test holes were excavated by a CME-95 truck-mounted drill rig equipped with eight-inch-diameter, hollow-stem augers. The percolation test holes were excavated to the depths ranging from approximately 3.0 to 5.1 feet below the ground surface (bgs). Approximate locations of the soil borings and test holes are shown on the attached Figure 2.

Soils were logged in the field by a CTE Engineering Geologist, and were visually classified in general accordance with the Unified Soil Classification System. The field descriptions have been modified, where appropriate, to reflect laboratory test results. Boring logs, including descriptions of the soils encountered, are included in Appendix B.

3.3 Laboratory Testing

Laboratory tests were conducted on selected soil samples for classification purposes, and to evaluate physical properties and engineering characteristics. Laboratory tests included: Maximum Density/Proctor Testing, Expansion Index, R-Value, Grain Size Analysis, Atterberg Limits, Consolidation, and Chemical Characteristics. Test descriptions and laboratory test results are included in Appendix C.

4.0 GEOLOGY

4.1 General Setting

San Diego is located with the Peninsular Ranges physiographic province that is characterized by its northwest-trending mountain ranges, intervening valleys, and predominantly northwest trending active regional faults. The San Diego Region can be further subdivided into the coastal plain area, a central mountain–valley area, and the eastern mountain valley area. The project site is located within the coastal plain area. The coastal plain subprovince ranges in elevation from approximately sea level to 1200 feet above mean sea level (msl) and is characterized by Cretaceous and Tertiary sedimentary deposits that onlap an eroded basement surface consisting of Jurassic and Cretaceous crystalline rocks that have been repeatedly eroded and infilled and by alluvial processes throughout the Quaternary Period in response to regional uplift. This has resulted in a geomorphic landscape of uplifted alluvial and marine terraces that are dissected by current active alluvial drainages.

4.2 Geologic Conditions

Based on the regional geologic map prepared by Kennedy and Tan (2008), the near surface geologic unit that underlies the site consists of Quaternary Very Old Paralic Deposits Unit 8. Based on recent explorations, Quaternary Previously Placed Fill was observed overlying the Very Old Paralic Deposits. The Tertiary Mission Valley Formation is anticipated at depth beneath the Very Old

Paralic Deposits. Descriptions of the geologic and soil units encountered during the investigation are presented below.

4.2.1 Quaternary Previously Placed Fill

Where observed, the Previously Placed Fill generally consists of stiff or loose to medium dense, brown, fine to medium grained sandy clay and clayey sand. Exploratory excavations encountered Previously Placed Fill to a maximum observed depth of approximately seven feet (bgs). As described above in Section 3.1, the fill thickness surrounding the existing structure was found to range from approximately five to seven feet below existing grades. In the area of the proposed parking structure the fill thickness is indicated to range from approximately one to four feet below existing grades. Isolated areas with deeper fill may be encountered during site excavations and grading.

4.2.2 Quaternary Very Old Paralic Deposits

Quaternary Very Old Paralic Deposits, (map unit Qvop 8 of Kennedy and Tan, 2008) were observed in all the investigation borings. Where observed, these materials generally consist of medium dense to very dense, mottled gray and reddish brown, silty to clayey fine to medium grained sandstone and cobble conglomerate. This unit is anticipated at depth throughout the site.

4.2.3 Groundwater Conditions

Groundwater was not encountered in any of the recent borings at the time of drilling. The borings were advanced to a maximum explored depth of approximately 18 feet bgs or to an approximate elevation of 399 feet msl. Review of California State Water Resources Control Board-Geotracker electronic database found several sites in the general vicinity that provided regional groundwater information. According to various studies completed for the Broadstone site located approximately 800 to 1000 feet west of the subject site, regional groundwater was reported to be approximately 75 feet bgs (an approximate elevation of 337 msl). To the north at Montgomery Field, regional groundwater was reported at approximately 100 feet bgs, or at an approximate elevation of 315 feet msl (Geosoils Inc., 1998). However, Group Delta (2012) encountered localized perched lenses of groundwater at approximately 11 feet bgs, (approximate elevation of 400 feet msl) at the Broadstone site. Approximately 1,700 feet south of the subject site, near the intersection of Sandrock Road and Hammond Drive, Santec Consulting Services (2012) reported groundwater elevations ranging from 385.81 to 393.76 feet msl, with historic groundwater elevations from 1996 through 2008 ranging from approximately 387 to 391 feet msl. Groundwater flow direction was reported to be to the south-southeast. These groundwater elevations are consistent with the relatively shallow perched groundwater elevations reported at the Broadstone site.

Based on the recent site explorations and review of groundwater data from the adjacent area, regional static groundwater is generally anticipated at depths greater than proposed excavations as recommended herein. Although no groundwater was observed during the recent drilling, localized perched groundwater conditions could potentially be present at elevations shallower than approximately 400 feet msl.

While groundwater conditions may vary, especially following periods of sustained precipitation or irrigation, it is generally not anticipated to adversely affect the proposed shallow construction activities or the completed improvements, if irrigation is limited and proper site drainage is designed, installed, and maintained per the recommendations of the project civil engineer. Seepage and perched water conditions may locally be encountered in deeper site excavations.

4.3 Geologic Hazards

The site is located within City of San Diego Seismic Safety Zone Geologic Hazard Categories 51 and 52. Category 51 corresponds to "level mesas – underlain by terrace deposits and bedrock, nominal risk", and Category 52 corresponds to "other level areas, gently sloping to steep terrain, favorable geologic structure, low risk."

Geologic hazards considered to have potential impacts to site development were evaluated based on field observations, literature review, and laboratory test results. The following paragraphs discuss geologic hazards considered and associated potential risk to the site.

4.3.1 Surface Fault Rupture

Based on the site reconnaissance and review of referenced literature, the site is not within a local fault hazard zone or State of California -designated Alquist-Priolo Earthquake Fault Studies Zone, and no known active fault traces underlie or project toward the site. According to the California Division of Mines and Geology, a fault is active if it displays evidence of activity in the last 11,000 years (Hart and Bryant, 1997). As such, the potential for surface rupture from displacement or fault movement beneath the proposed improvements is considered to be low.

4.3.2 Local and Regional Faulting

The California Geological Survey (CGS) and the United States Geological Survey (USGS) broadly group faults as "Class A" or "Class B" (Cao, 2003; Frankel et al., 2002). Class A faults are identified based upon relatively well-defined paleoseismic activity, and a fault-slip rate of more than 5 millimeters per year (mm/yr). In contrast, Class B faults have comparatively less defined paleoseismic activity and are considered to have a fault-slip rate less than 5 mm/yr. The nearest known Class B fault is the Rose Canyon Fault, which is approximately 7.0 kilometers southwest of the site (Blake, T.F., 2000). The nearest known Class A fault is the Julian segment of the Elsinore Fault, which is located approximately 57.6 kilometers northeast of the site.

The site could be subjected to significant shaking in the event of a major earthquake on any of the faults noted above or other faults in the southern California or northern Baja California area.

4.3.3 Liquefaction and Seismic Settlement Evaluation

Liquefaction occurs when saturated fine-grained sands or silts lose their physical strengths during earthquake-induced shaking and behave like a liquid. This is due to loss of point-to-point grain contact and transfer of normal stress to the pore water. Liquefaction potential varies with water level, soil type, material gradation, relative density, and probable intensity and duration of ground shaking. Seismic settlement can occur with or without liquefaction; it results from densification of loose soils.

The site is underlain at shallow depths by medium dense to very dense formational materials (Very Old Paralic Deposits). Based on the noted subsurface conditions, the potential for liquefaction or significant seismic settlement at the site is considered to be low.

4.3.4 Tsunamis and Seiche Evaluation

According to McCulloch (1985), the potential in the San Diego County coastal area for "100-year" and "500-year" tsunami waves is approximately five and eight feet, or less. This suggests that there is a negligible probability of a tsunami reaching the site based on elevation of the area and distance from the Pacific Ocean. The site is not located in a zone of potential tsunami inundation based on emergency planning maps prepared by California Emergency Management Agency and CGS. In addition, oscillatory waves (seiches) are considered unlikely due to the absence of nearby confined bodies of water.

4.3.5 Landsliding

According to mapping by Tan (1995), the site is considered to be only "Marginally Susceptible" to landsliding, and no landslides are mapped in the site area. In addition, evidence of landslides or landslide potential was not observed during the field exploration at the relatively flat-lying site. Based on these findings, landsliding is not considered to be a significant geologic hazard at the subject site.

4.3.6 Compressible and Expansive Soils

Portions of the Previously Placed Fill soils are considered to be compressible in their current condition. Therefore, it is recommended that these soils be overexcavated, where necessary, and properly compacted beneath proposed improvement areas as recommended herein and as determined to be necessary during construction. Based on the field data, site observations, and CTE's experience with similar soils in the vicinity of the site, dense native soils underlying the site are not considered to be subject to significant compressibility under the proposed loads.

Based on laboratory testing and the generally granular nature of the subgrade materials, soils at the site are anticipated to exhibit Low expansion potential (Expansion Index of 50 or less). Therefore, expansive soils are generally not anticipated to present significant adverse impacts to site development if geotechnical recommendations are properly implemented. Additional evaluation of near-surface soils should be performed based on field observations during grading and excavation activities.

4.3.7 Corrosive Soils

Testing of representative site soils was performed to evaluate the potential corrosive effects on concrete foundations and buried metallic utilities. Soil environments detrimental to concrete generally have elevated levels of soluble sulfates and/or pH levels less than 5.5. According to the American Concrete Institute (ACI) Table 318 4.3.1, specific guidelines have been provided for concrete where concentrations of soluble sulfate (SO_4) in soil exceed 0.10 percent by weight. These guidelines include low water:cement ratios, increased compressive strength, and specific cement type requirements. A minimum resistivity value less than approximately 5,000 ohm-cm and/or soluble chloride levels in excess of 200 ppm generally indicate a corrosive environment for buried metallic utilities and untreated conduits.

Chemical test results indicate that near-surface soils at the site generally present a negligible corrosion potential for Portland cement concrete. Based on resistivity and chloride testing, the site soils have been interpreted to have a moderate to severe corrosivity potential to buried metal improvements.

Based on the results of the limited testing performed, it is likely prudent to utilize plastic piping and conduits where buried and feasible. However, CTE does not practice corrosion engineering. Therefore, if corrosion of metallic or other improvements is of more significant concern, a qualified corrosion engineer could be consulted.

5.0 STORMWATER INFILTRATION - PRELIMINARY FESIBILITY SCREENING

5.1 Purpose

As part of the geotechnical site assessment, CTE completed a preliminary feasibility screening of the subject site for storm water infiltration. The preliminary screening was completed in accordance with the City of San Diego Storm Water Standards (January 2018) for the purpose of providing geotechnical-geologic characteristics, groundwater information, and estimates of vertical infiltration rates that can be incorporated by the project Storm Water Quality Management Plan (SWQMP) preparer (e.g. Project Architect, Civil Engineer), in the process of developing a comprehensive storm water management plan. The information can also be used to facilitate the final storm water design in accordance with the water quality and hydro modification criteria of the MS4 permitting process.

5.2 Test Procedures

The shallow borehole percolation methodology was used to establish percolation rates. This is considered an acceptable method of percolation testing, as stated in the City of San Diego BMP Design Manual, Appendix D (February, 2018). The percolation test procedure was completed in general accordance with the County of San Diego Department of Environmental Health (DEH), Version 2010 guidelines. The percolation rates account for both lateral and vertical flow through the tested section. The derived percolation rates were then converted to infiltration rates following the procedures of the Porchet Method, as recommended by the BMP Design Manual, Appendix D (February, 2018). The percolation test methodology, field data, and infiltration conversion calculations are presented in Appendix E. The Model BMP Design Manual, Worksheet C.4.1 "Categorization of Infiltration Feasibility Conditions", is also presented in Appendix E.

5.3 Site Background and Characterization

Review of the Natural Resources Conservation Service (NRCS) website indicates that agricultural soil types in the site area are classified as Redding gravelly loam, gravelly clay, and gravelly clay loam (Map Unit-Rdc). The Rdc map unit, as defined by the NRCS, is assigned a hydrologic soil group (D), in accordance with the United States Department of Agriculture (USDA). These USDA soil types were generally confirmed with the geotechnical logs of borings from the recent investigation, as described in Section 4.2.1 and 4.2.2 above, which encountered Quaternary Very Old Paralic Deposits (Map Unit Qop- 8 of Kennedy and Tan, 2008), and Quaternary Previously Placed Fill consisting of re-worked formational deposits.

As described in Section 4.2.3, regional static groundwater elevations are estimated to be 76 to 83 feet below existing grades. Groundwater was not encountered at the time of drilling during our recent investigation to depths of approximately 18 feet bgs. However, based on review of adjacent projects, perched groundwater could be expected at depths ranging from approximately 22 to 33 feet bgs.

As the project is in the conceptual phase of design, percolation test borings were conducted in representative areas such that the entire site would be accurately characterized in terms of infiltration potential. In total, seven percolation test borings were advanced to depths ranging from approximately three to five feet below existing grades.

5.3 Percolation Test Results and Calculated Infiltration Rates

The following table presents a summary of the percolation test results conducted within the subject site, the soil type encountered in each test boring, the depth of each test boring, the derived percolation rate, the calculated infiltration rate, and a recommended design rate derived by applying a safety factor of two to the calculated infiltration rate in accordance with the City of San Diego BMP Design Manual, Appendix D (January, 2018). The percolation tests met Case I conditions (Appendix E).

TABLE 5.3
SUMMARY OF PERCOLATION AND INFILTRATION TEST RESULTS

Test Location	Soil Type	San Diego County Percolation Procedure	Depth (inches)	Percolation Rate (inches/hour)	Infiltration Rate (inches/hour)	Recommended Rate for Design* (inches/hour)
P-1	Qvop	Case I	61	0.13	0.025	0.013
P-2	Qvop	Case I	36	0.13	0.027	0.013
P-3	Qvop	Case I	59	0.00	0.00	0.000
P-4	Qppf	Case I	37	0.12	0.027	0.014
P-5	Qppf	Case I	60	0.13	0026	0.013
P-6	Qvop	Case I	60	0.13	0.024	0.012
P-7	Qppf	Case I	61	0.00	0.00	0.000

* A safety factor of two (2) was applied to the calculated infiltration rate
Qvop = Quaternary Very Old Paralic Deposits, (Map Unit Qop- 8 of Kennedy and Tan, 2008)

The calculated infiltration rates within both the Quaternary Very Old Paralic Deposits and the Quaternary Previously Placed Fill were all found to be below the defined lower boundary infiltration of rate of 0.05 inches per hour for partial infiltration as defined by the City of San Diego BMP Design Manual (January 2018), Appendix C. For Planning Phase feasibility screening and design of partial infiltration BMP's, a factor of safety of 2 is required in accordance with Appendix C of the

City of San Diego BMP Design Manual (January 2018). As shown in the above table, this further reduces the infiltration below the cutoff rate for partial infiltration classification. As such, the results of the preliminary site screening indicate that the site classifies as a "No Infiltration Condition".

5.4 Infiltration Recommendations

Although the preliminary screening indicates that the entire site classifies as not suitable for partial infiltration, the SWQMP preparer could consider modification of the existing site soils for a proposed BMP infiltration basin provided the potential modified basin area conforms with all structural setback criteria as defined in Appendix C of the City of San Diego BMP Design Manual (January 2018). The main structural setbacks at the site would be distances from building foundations and utility trenches. The site is considered feasible with respect to other geotechnical-geologic criteria including depths to groundwater, expansive soils, settlement or volume change, and slope stability. Replacement of existing soils with improved infiltration feasibility soils could be an option provided the BMP dimensions are capable of temporarily storing DMA water volumes associated with the underlying lower infiltration rates as documented as part of this feasibility screening.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 General

CTE concludes that the proposed improvements on the site are feasible from a geotechnical standpoint, provided the preliminary recommendations in this report are incorporated into the design and construction of the project. Recommendations for the proposed earthwork and improvements are included in the following sections and Appendix D. However, recommendations in the text of this report supersede those presented in Appendix D should conflicts exist. These preliminary recommendations should either be confirmed as appropriate or updated following required excavations, demolition of existing improvements, and observations during site preparation.

6.2 Site Preparation

Prior to grading, the site should be cleared of existing construction debris and vegetation, not suitable for structural backfill and be properly disposed of offsite. In areas to receive structural improvements, overexcavation beneath slab areas should extend to a minimum depth of two feet below finish subgrade. Foundation elements for both the existing building modifications and the new proposed parking structure are to be extended to the depth of dense native materials.

Excavations adjacent to the existing structure should generally not extend below a 1:1 plane extended down from the bottom of existing footings or as recommended during grading based on the exposed conditions. Depending on the depth and proximity of the existing building footings to remain, alternating slot excavations could be required during earthwork.

Overexcavations for proposed surface improvement areas, such as pavement or flatwork should be conducted to a depth of two feet below proposed subgrade.

If encountered, existing below-ground utilities should be redirected around proposed structures. Existing utilities at an elevation to extend through the proposed footings should generally be sleeved and caulked to minimize the potential for moisture migration below the building slabs. Abandoned pipes exposed by grading should be securely capped or filled with minimum two-sack cement/sand slurry to help prevent moisture from migrating beneath foundation and slab soils.

A CTE representative should observe the exposed ground surface prior to placement of compacted fill to document and verify the competency of the encountered subgrade materials. If unsuitable material is exposed at the base of excavations additional removals may be recommended. After approval by this office, the exposed subgrades to receive fill should be scarified a minimum of eight inches, moisture conditioned, and properly compacted prior to additional compacted fill placement.

6.3 Site Excavation

Based on CTE's observations, shallow excavations at the site should be feasible using well-maintained heavy-duty construction equipment run by experienced operators. However, localized very dense zones consisting of cemented conglomerate formation may be encountered, which could result in very difficult excavation.

6.4 Fill Placement and Compaction

Following the recommended overexcavation of loose or disturbed soils, the areas to receive fills should be scarified approximately eight inches, moisture conditioned, and properly compacted. Fill and backfill should be compacted to a minimum relative compaction of 90 percent at a moisture content of at least two percent above optimum, as evaluated by ASTM D 1557. The optimum lift thickness for fill soil depends on the type of compaction equipment used. Generally, backfill should be placed in uniform, horizontal lifts not exceeding eight inches in loose thickness. Fill placement and compaction should be conducted in conformance with local ordinances, and should be observed and tested by a CTE geotechnical representative.

6.5 Fill Materials

Properly moisture-conditioned very low to low expansion potential soils derived from the on-site excavations are considered suitable for reuse on the site as compacted fill. If used, these materials should be screened of organics and materials generally greater than three inches in maximum dimension. Irreducible materials greater than three inches in maximum dimension should generally not be used in shallow fills (within three feet of proposed grades). In utility trenches, adequate bedding should surround pipes.

Imported fill beneath structures, flatwork, and pavements should have an Expansion Index of 20 or less (ASTM D 4829). Proposed import fill soils for use in structural or slope areas should be evaluated by the geotechnical engineer before being transported to the site.

If retaining walls are proposed, backfill located within a 45-degree wedge extending up from the heel of the wall should consist of soil having an Expansion Index of 20 or less (ASTM D 4829) with less than 30 percent passing the No. 200 sieve. The upper 12 to 18 inches of wall backfill should consist of lower permeability soils, in order to reduce surface water infiltration behind walls. The project structural engineer and/or architect should detail proper wall backdrains, including gravel drain zones, fills, filter fabric, and perforated drain pipes. A conceptual wall backdrain detail, which may be suitable for use at the site, is provided as Figure 4.

6.6 Temporary Construction Slopes

The following recommended slopes should be relatively stable against deep-seated failure, but may experience localized sloughing. On-site soils are considered Type B and Type C soils with recommended slope ratios as set forth in Table 6.6.

TABLE 6.6 RECOMMENDED TEMPORARY SLOPE RATIOS		
SOIL TYPE	SLOPE RATIO (Horizontal: vertical)	MAXIMUM HEIGHT
B (Very Old Paralic Deposits)	1:1 (OR FLATTER)	10 Feet
C (Previously Placed Fill)	1.5:1 (OR FLATTER)	10 Feet

Actual field conditions and soil type designations must be verified by a "competent person" while excavations exist, according to Cal-OSHA regulations. In addition, the above sloping recommendations do not allow for surcharge loading at the top of slopes by vehicular traffic, equipment or materials. Appropriate surcharge setbacks must be maintained from the top of all unshored slopes.

6.7 Foundations and Slab Recommendations

The following recommendations are for preliminary design purposes only. These foundation recommendations should be re-evaluated after review of the project grading and foundation plans, and after completion of rough grading of the building pad areas. Upon completion of rough pad grading, Expansion Index of near surface soils should be verified, and these recommendations should be updated, if necessary.

6.7.1 Foundations

Foundation recommendations presented herein are based on the anticipated low expansion potential of site soils (Expansion Index of 50 or less).

Following the recommended preparatory grading, continuous and isolated spread footings are anticipated to be suitable for use at this site. Foundation dimensions and reinforcement should be based on allowable bearing values of 4,000 pounds per square foot (psf) for minimum 18-inch wide footings embedded a minimum of 36-inches below lowest adjacent subgrade elevation and extended to the depth of dense native formational material, as required. Isolated footings should be at least 24 inches in minimum dimension. The allowable bearing value may be increased by 250 psf for each additional six inches of embedment up to a maximum of 6,500 psf. The allowable bearing value may also be increased by one-third for short-duration loading, which includes the effects of wind or seismic forces.

In order to approximate minimum required footing depths, it is anticipated that suitable dense native bearing material will be encountered at, or slightly below, the bottom of existing fills. Approximate fill depths based on the investigation findings are shown on Figure 2. Localized areas of deeper fill or unsuitable soils may be encountered that would require deeper excavation for proposed footings.

Minimum reinforcement for continuous footings should consist of four No. 6 reinforcing bars; two placed near the top and two placed near the bottom, or as per the project structural engineer. The structural engineer should design isolated footing reinforcement. An uncorrected subgrade modulus of 140 pounds per cubic inch is considered suitable for elastic foundation design.

The structural engineer should provide recommendations for reinforcement of any spread footings and footings with pipe penetrations. Footing excavations should generally be maintained above optimum moisture content until concrete placement.

6.7.2 Foundation Settlement

For structures founded on footings extended to dense native material, the maximum total static settlement is expected to be on the order of one inch and the maximum differential settlement is expected to be on the order of 0.5 inch over a distance of 50 feet. Due to the nature of underlying materials, dynamic settlement is not expected to significantly affect the proposed buildings.

6.7.3 Foundation Setback

Footings for structures should be designed such that the horizontal distance from the face of adjacent slopes to the outer edge of the footing is at least 10 feet. In addition, footings should bear beneath a 1:1 plane extended up from the nearest bottom edge of adjacent trenches and/or excavations. Deepening of affected footings may be a suitable means of attaining the prescribed setbacks.

6.7.4 Interior Concrete Slabs

Lightly loaded interior concrete slabs for non-traffic areas should be a minimum of 5.0 inches thick, or slabs should be designed to match existing thickness at building modification boundaries per recommendations of the project structural engineer. Minimum reinforcement for lightly loaded slabs should consist of #4 reinforcing bars placed on maximum 18-inch centers, each way, at or above mid-slab height, but with proper cover or as per the recommendations of the project structural engineer.

In moisture-sensitive non-traffic floor areas, a suitable vapor retarder of at least 15-mil thickness (with all laps or penetrations sealed or taped) overlying a four-inch layer of consolidated aggregate base or gravel (with SE of 30 or more) should be installed. An optional maximum two-inch layer of similar material may be placed above the vapor retarder to help protect the membrane during steel and concrete placement. This recommended protection is generally considered typical in the industry. If proposed floor areas or coverings are considered especially sensitive to moisture emissions, additional recommendations from a specialty consultant could be obtained. CTE is not an expert at preventing moisture penetration through slabs. A qualified architect or other experienced professional should be contacted if moisture penetration is a more significant concern.

Parking garage slabs subjected to heavier loads and traffic will require thicker slab sections and/or increased reinforcement. Minimum underlayment for the parking garage slab is to consist of 6 inches of non-recycled class 2 base. Aggregate base and the upper foot of underlying subgrade are to be compacted to 95% relative compaction.

A 110-pci subgrade modulus is considered suitable for elastic design of minimally embedded improvements such as slabs-on-grade.

Subgrade materials should be maintained at a minimum of two percent above optimum moisture content until slab underlayment and concrete are placed.

6.8 Seismic Design Criteria

The seismic ground motion values listed in the table below were derived in accordance with the ASCE 7-10 Standard. This was accomplished by establishing the Site Class based on the soil properties at the site, and calculating the site coefficients and parameters using the United States Geological Survey Seismic Design Maps application. These values are intended for the design of structures to resist the effects of earthquake ground motions for the site coordinates 32.8088° latitude and –117.1374° longitude, as underlain by soils corresponding to site Class C.

TABLE 6.8
SEISMIC GROUND MOTION VALUES (CODE-BASED)
2016 CBC AND ASCE 7-10

PARAMETER	VALUE	2016 CBC/ASCE 7-10 REFERENCE
Site Class	C	ASCE 7, Chapter 20
Mapped Spectral Response Acceleration Parameter, S_S	1.018	Figure 1613.3.1 (1)
Mapped Spectral Response Acceleration Parameter, S_1	0.389	Figure 1613.3.1 (2)
Seismic Coefficient, F_a	1.000	Table 1613.3.3 (1)
Seismic Coefficient, F_v	1.411	Table 1613.3.3 (2)
MCE Spectral Response Acceleration Parameter, S_{MS}	1.018	Section 1613.3.3
MCE Spectral Response Acceleration Parameter, S_{M1}	0.549	Section 1613.3.3
Design Spectral Response Acceleration, Parameter S_{DS}	0.678	Section 1613.3.4
Design Spectral Response Acceleration, Parameter S_{D1}	0.366	Section 1613.3.4
Peak Ground Acceleration PGA_M	0.423	ASCE 7, Section 11.8.3

6.9 Lateral Resistance and Earth Pressures

Lateral loads acting against structures may be resisted by friction between the footings and the supporting soil or passive pressure acting against structures. If frictional resistance is used, allowable coefficients of friction of 0.30 (total frictional resistance equals the coefficient of friction multiplied by the dead load) for concrete cast directly against compacted fill is recommended. A design passive resistance value of 250 pounds per square foot per foot of depth (with a maximum value of 2,500 pounds per square foot) may be used. The allowable lateral resistance can be taken as the sum of the frictional resistance and the passive resistance, provided the passive resistance does not exceed two-thirds of the total allowable resistance.

Retaining walls backfilled using granular soils may be designed using the equivalent fluid unit weights given in Table 6.9 below.

TABLE 6.9
EQUIVALENT FLUID UNIT WEIGHTS (G_h)
(pounds per cubic foot)

WALL TYPE	LEVEL BACKFILL	SLOPE BACKFILL 2:1 (HORIZONTAL: VERTICAL)
CANTILEVER WALL (YIELDING)	35	55
RESTRAINED WALL	55	65

Lateral pressures on cantilever retaining walls (yielding walls) over six feet high due to earthquake motions may be calculated based on work by Seed and Whitman (1970). The total lateral earth pressure against a properly drained and backfilled cantilever retaining wall above the groundwater level can be expressed as:

$P_{AE} = P_A + \Delta P_{AE}$

For non-yielding (or "restrained") walls, the total lateral earth pressure may be similarly calculated based on work by Wood (1973):

$P_{KE} = P_K + \Delta P_{KE}$

Where P_A/b = Static Active Earth Pressure = $G_h H^2/2$

P_K/b = Static Restrained Wall Earth Pressure = $G_h H^2/2$

$\Delta P_{AE}/b$ = Dynamic Active Earth Pressure Increment = $(3/8)\ k_h\ \gamma H^2/2$

$\Delta P_{KE}/b$ = Dynamic Restrained Earth Pressure Increment = $k_h\ \gamma H^2/2$

b = unit length of wall

$k_h = 2/3\ PGA_m$ (PGA_m given previously Table 6.8)

G_h = Equivalent Fluid Unit Weight (given previously Table 6.9)

H = Total Height of the retained soil

γ = Total Unit Weight of Soil ≈ 135 pounds per cubic foot

The static and increment of dynamic earth pressure in both cases may be applied with a line of action located at H/3 above the bottom of the wall (SEAOC, 2013).

These values assume non-expansive backfill and free-draining conditions. Measures should be taken to prevent moisture buildup behind all retaining walls. Drainage measures should include free-draining backfill materials and sloped, perforated drains. These drains should discharge to an appropriate off-site location. Figure 4 shows a conceptual wall backdrain detail that may be suitable for walls at the subject site. Waterproofing should be as specified by the project architect.

6.10 Exterior Flatwork

Flatwork should be installed with crack-control joints at appropriate spacing as designed by the project architect to reduce the potential for cracking in exterior flatwork caused by minor movement of subgrade soils and concrete shrinkage. Additionally, it is recommended that flatwork be installed with at least number 4 reinforcing bars at 24-inch centers, each way, at or above mid-height of slab, but with proper concrete cover, or with other reinforcement per the applicable project designer. Flatwork that should be installed with crack control joints, includes driveways, sidewalks, and architectural features. All subgrades should be prepared according to the earthwork recommendations previously given before placing concrete. Positive drainage should be established and maintained next to all flatwork. Subgrade materials should be maintained at a minimum of two percent above optimum moisture content until the time of concrete placement.

6.11 Vehicular Pavement

The proposed improvements include paved vehicle drive and parking areas. Presented in Table 6.11 are preliminary pavement sections utilizing laboratory determined Resistance "R" Value. Actual traffic area slab sections to be provided by the structural designer. Beneath proposed pavement areas, the upper 12 inches of subgrade and all base materials should be compacted to 95% relative compaction in accordance with ASTM D1557, and at a minimum of two percent above optimum moisture content.

TABLE 6.11
RECOMMENDED PAVEMENT THICKNESS

Traffic Area	Assumed Traffic Index	Preliminary Subgrade "R"-Value	Asphalt Pavements		Portland Cement Concrete Pavements, on Subgrade Soils (inches)
			AC Thickness (inches)	Class II Aggregate Base Thickness (inches)	
Drive Areas	6.0	5	4.0	12.0	7.5
Parking Areas	5.0	5	3.0	10.0	6.5

* Caltrans Class 2 aggregate base
** Concrete should have a modulus of rupture of at least 600 psi
Following rough site grading, CTE recommends laboratory testing of representative subgrade soils for as-graded "R"-Value.

Asphalt paved areas should be designed, constructed, and maintained in accordance with the recommendations of the Asphalt Institute, or other widely recognized authority. Concrete paved areas should be designed and constructed in accordance with the recommendations of the American

Concrete Institute or other widely recognized authority, particularly with regard to thickened edges, joints, and drainage. The Standard Specifications for Public Works construction ("Greenbook") or Caltrans Standard Specifications may be referenced for pavement materials specifications.

6.12 Drainage

Surface runoff should be collected and directed away from improvements by means of appropriate erosion-reducing devices and positive drainage should be established around the proposed improvements. Positive drainage should be directed away from improvements at a gradient of at least two percent for a distance of at least five feet. However, the project civil engineers should evaluate the on-site drainage and make necessary provisions to keep surface water from affecting the site.

Generally, CTE recommends against allowing water to infiltrate building pads or adjacent to slopes. CTE understands that some agencies are encouraging the use of storm-water cleansing devices. Use of such devices tends to increase the possibility of adverse effects associated with high groundwater including slope instability and liquefaction. See Appendix E for further discussion of site infiltration.

6.12 Slopes

Based on anticipated soil strength characteristics, fill slopes if proposed, should be constructed at slope ratios of 2:1 (horizontal: vertical) or flatter. These fill slope inclinations should exhibit factors of safety greater than 1.5.

Although properly constructed slopes on this site should be grossly stable, the soils will be somewhat erodible. Therefore, runoff water should not be permitted to drain over the edges of slopes unless that water is confined to properly designed and constructed drainage facilities. Erosion-resistant vegetation should be maintained on the face of all slopes.

Typically, soils along the top portion of a fill slope face will creep laterally. CTE recommends against building distress-sensitive hardscape improvements within five feet of slope crests, and against using thickened edges in this area.

6.13 Controlled Low Strength Materials (CLSM)

Controlled Low Strength Materials (CLSM) may be used in deepened footing excavation areas, building pads, and/or adjacent to retaining walls or other structures, provided the appropriate following recommendations are also incorporated. Minimum overexcavation depths recommended herein beneath slabs, flatwork, and other areas may be applicable beneath CLSM if/where CLSM is to be used, and excavation bottoms should be observed by CTE prior to placement of CLSM. Prior to CLSM placement, the excavation should be free of debris, loose soil materials, and water. Once specific areas to utilize CLSM have been determined, CTE should review the locations to determine if additional recommendations are appropriate.

CLSM should consist of a minimum three-sack cement/sand slurry with a minimum 28-day compressive strength of 100 psi (or equal to or greater than the maximum allowable short term soil bearing pressure provided herein, whichever is higher) as determined by ASTM D4832. If re-excavation is anticipated, the compressive strength of CLSM should generally be limited to a maximum of 150 psi per ACI 229R-99. Where re-excavation is required, two-sack cement/sand slurry may be used to help limit the compressive strength. The allowable soils bearing pressure and coefficient of friction provided herein should still govern foundation design. CLSM may not be used in lieu of structural concrete where required by the structural engineer.

6.14 Plan Review

CTE should be authorized to review the project grading and foundation plans prior to commencement of earthwork in order to provide additional recommendations, if necessary.

6.15 Construction Observation

The recommendations provided in this report are based on preliminary design information for the proposed construction and the subsurface conditions observed in the soil borings. The interpolated subsurface conditions should be checked by CTE during construction with respect to anticipated conditions. Upon completion of precise grading, if necessary, soil samples will be collected to evaluate as-built Expansion Index. Foundation recommendations may be revised upon completion of grading, and as-built laboratory tests results. Additionally, soil samples should be taken in pavement subgrade areas upon rough grading to refine pavement recommendations as necessary.

Recommendations provided in this report are based on the understanding and assumption that CTE will provide the observation and testing services for the project. All earthwork should be observed and tested in accordance with recommendations contained within this report. CTE should evaluate footing excavations before reinforcing steel placement.

7.0 LIMITATIONS OF INVESTIGATION

The field evaluation, laboratory testing and geotechnical analysis presented in this report have been conducted according to current engineering practice and the standard of care exercised by reputable geotechnical consultants performing similar tasks in this area. No other warranty, expressed or implied, is made regarding the conclusions, recommendations and opinions expressed in this report. Variations may exist and conditions not observed or described in this report may be encountered during construction. This report is prepared for the project as described. It is not prepared for any other property or party.

The recommendations provided herein have been developed in order to reduce the post-construction movement of site improvements. However, even with the design and construction recommendations presented herein, some post-construction movement and associated distress may occur.

The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside CTE's involvement. Therefore, this report is subject to review and should not be relied upon after a period of three years.

CTE's conclusions and recommendations are based on an analysis of the observed conditions. If conditions different from those described in this report are encountered, CTE should be notified and additional recommendations, if required, will be provided subject to CTE remaining as authorized geotechnical consultant of record. This report is for use of the project as described. It should not be utilized for any other project.

The percolation test results were obtained in accordance with City and County standards and were performed with the standard of care practiced by other professionals practicing in the area. However, percolation test results can significantly vary laterally and vertically due to slight changes in soil type, degree of weathering, secondary mineralization, and other physical and chemical variabilities. As such, the test results are only considered as an estimate of percolation and converted infiltration rates for design purposes. No guarantee is made based on the percolation testing to the actual functionality or longevity of associated infiltration basins or other BMP devices designed from the presented infiltration rates.

CTE's conclusions and recommendations are based on an analysis of the observed conditions. If conditions different from those described in this report are encountered during construction, this office should be notified and additional recommendations, if required, will be provided.

CTE appreciate this opportunity to be of service on this project. If you have any questions regarding this report, please do not hesitate to contact the undersigned.

Respectfully submitted,

CONSTRUCTION TESTING & ENGINEERING, INC.

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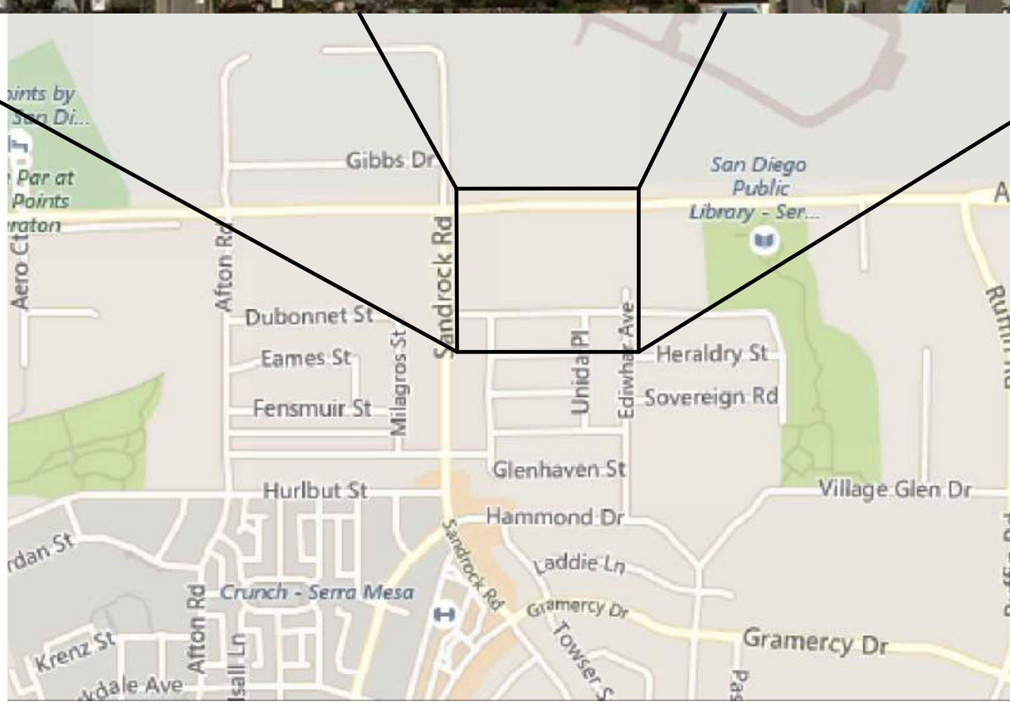

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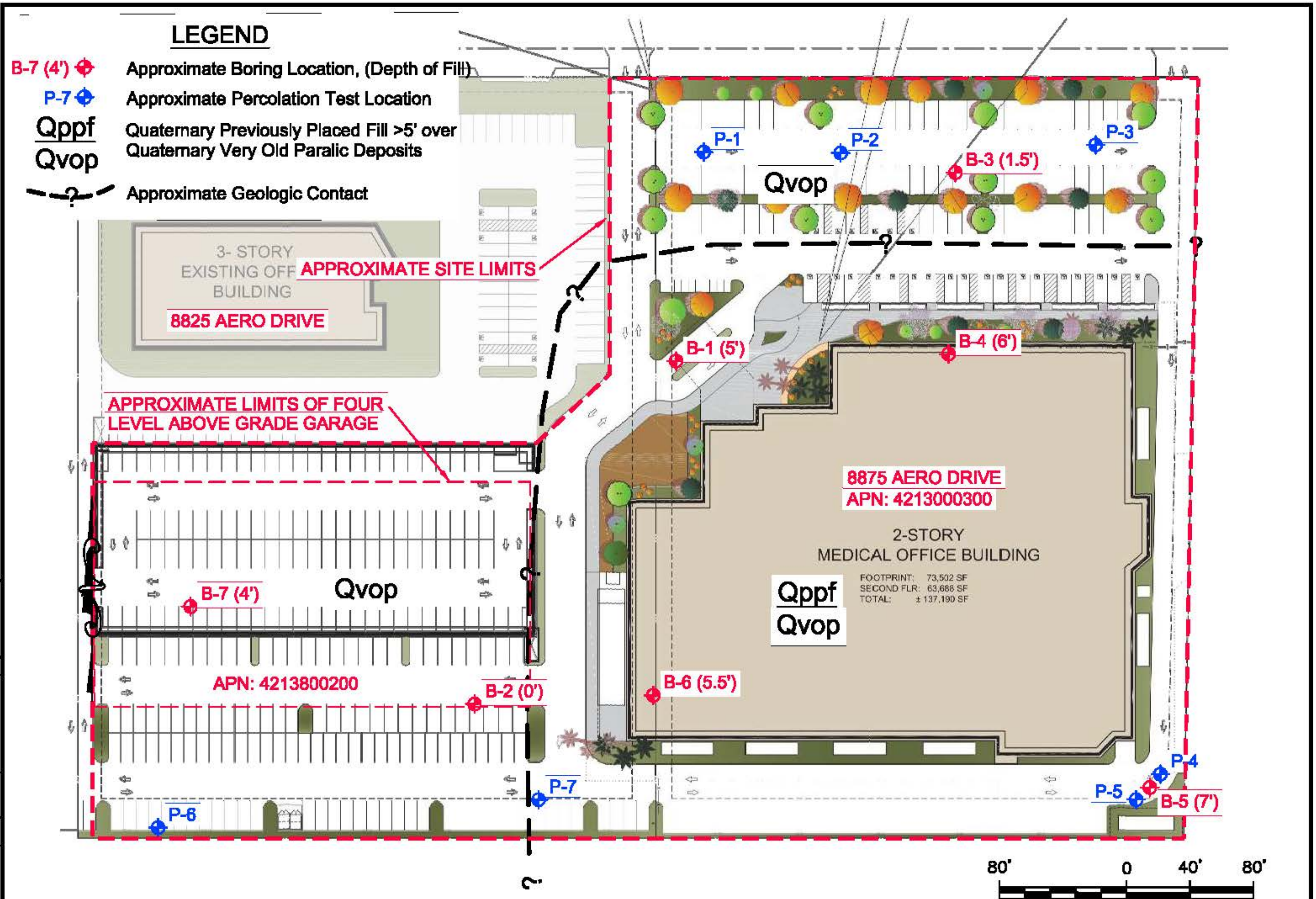
SITE INDEX MAP PROPOSED PROTEA-VA SAN DIEGO 8875 AERO DRIVE SAN DIEGO, CALIFORNIA	SCALE: AS SHOWN	DATE: 3/18
	CTE JOB NO.: 10-14209G	FIGURE: 1



\\ESC_SERVER\Projects\10-14209G\Figure 2.dwg

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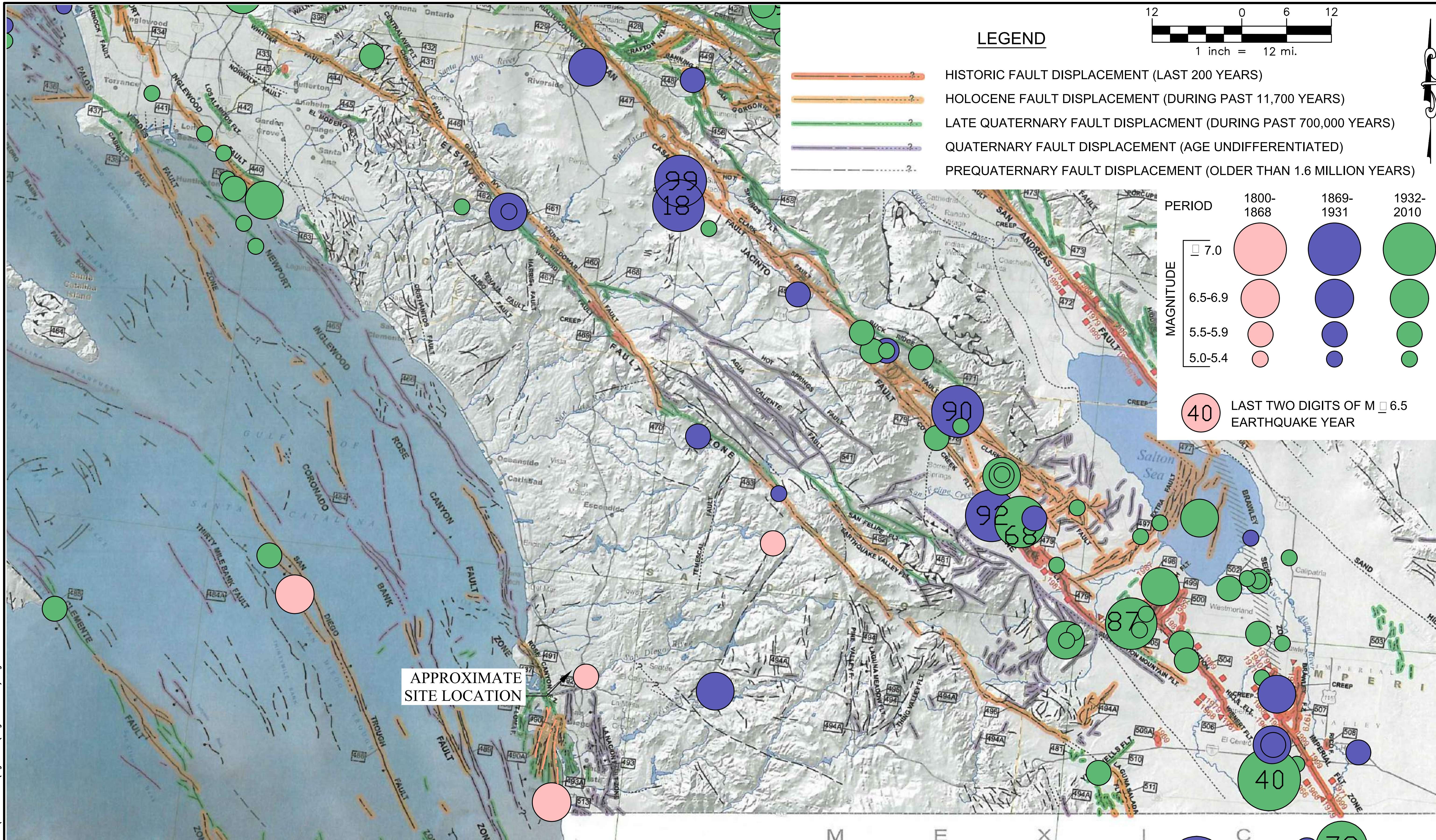
GEOLOGIC/EXPLORATION LOCATION MAP

PROPOSED PROTEA-VA SAN DIEGO
8875 AERO DRIVE
SAN DIEGO, CALIFORNIA

CTE JOB NO: 10-14209G	
SCALE: 1" ~ 80'	
DATE: 4/18	FIGURE: 2



NOTES: FAULT ACTIVITY MAP OF CALIFORNIA, 2010, CALIFORNIA GEOLOGIC DATA MAP SERIES MAP NO. 6;
EPICENTERS OF AND AREAS DAMAGED BY M≥5 CALIFORNIA EARTHQUAKES, 1800–1999 ADAPTED AFTER TOPPOZADA, BRANUM, PETERSEN, HALLSTORM, CRAMER, AND REICHLE, 2000, CDMG MAP SHEET 49
REFERENCE FOR ADDITIONAL EXPLANATION; MODIFIED WITH CISN AND USGS SEISMIC MAPS

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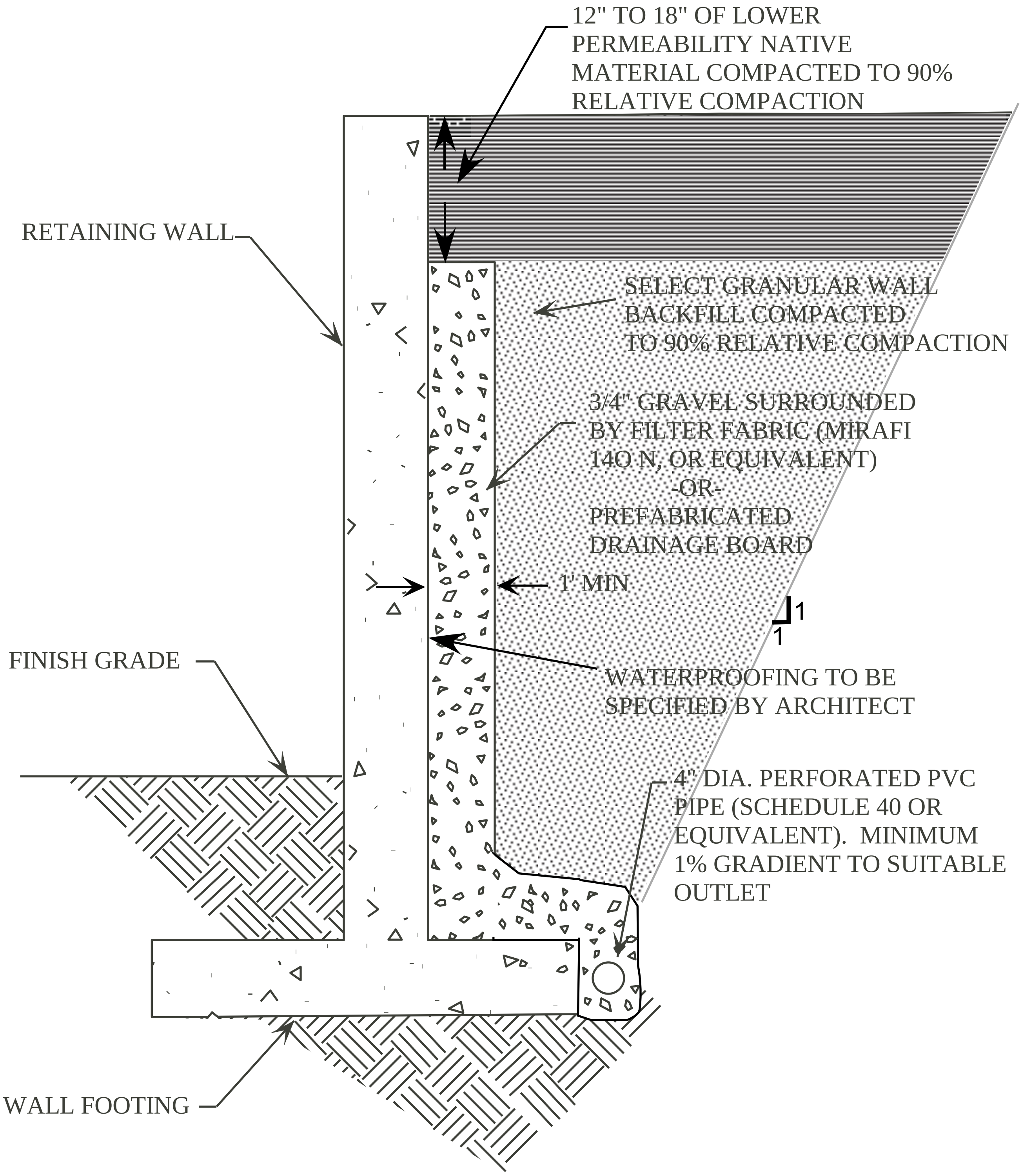
REGIONAL FAULT AND SEISMICITY MAP

PROPOSED PROTEA-VA SAN DIEGO
8875 AERO DRIVE
SAN DIEGO, CALIFORNIA

CTE JOB NO:	10-14209G
SCALE:	1 inch = 12 miles
DATE: 4/18	FIGURE: 3

\\Esc_server\projects\10-14209G\Figure 3 (Regional Fault).dwg



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RETAINING WALL DRAINAGE DETAIL

CTE JOB NO:	10-14209G
SCALE:	NO SCALE
DATE: 04/18	FIGURE: 4

APPENDIX A

REFERENCES

CITED REFERENCES

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APPENDIX B

EXPLORATION LOGS

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DEFINITION OF TERMS

PRIMARY DIVISIONS			SYMBOLS	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	**GRAVELS** MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS < 5% FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS OR GRAVEL SAND MIXTURES, LITTLE OF NO FINES
		GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, NON-PLASTIC FINES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, PLASTIC FINES
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS < 5% FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES, NON-PLASTIC FINES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES, PLASTIC FINES
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	**SILTS AND CLAYS** LIQUID LIMIT IS LESS THAN 50		ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, SLIGHTLY PLASTIC CLAYEY SILTS
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, SILTS OR LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT IS 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, ORGANIC SILTY CLAYS
HIGHLY ORGANIC SOILS			PT	PEAT AND OTHER HIGHLY ORGANIC SOILS

GRAIN SIZES

BOULDERS	COBBLES	GRAVEL		SAND			SILTS AND CLAYS
		COARSE	FINE	COARSE	MEDIUM	FINE	

12" 3" 3/4" 4 10 40 200

CLEAR SQUARE SIEVE OPENING U.S. STANDARD SIEVE SIZE

ADDITIONAL TESTS

(OTHER THAN TEST PIT AND BORING LOG COLUMN HEADINGS)

MAX- Maximum Dry Density
GS- Grain Size Distribution
SE- Sand Equivalent
EI- Expansion Index
CHM- Sulfate and Chloride
Content , pH, Resistivity
COR - Corrosivity
SD- Sample Disturbed

PM- Permeability
SG- Specific Gravity
HA- Hydrometer Analysis
AL- Atterberg Limits
RV- R-Value
CN- Consolidation
CP- Collapse Potential
HC- Hydrocollapse
REM- Remolded

PP- Pocket Penetrometer
WA- Wash Analysis
DS- Direct Shear
UC- Unconfined Compression
MD- Moisture/Density
M- Moisture
SC- Swell Compression
OI- Organic Impurities

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PROJECT:	DRILLER:	SHEET: of
CTE JOB NO:	DRILL METHOD:	DRILLING DATE:
LOGGED BY:	SAMPLE METHOD:	ELEVATION:

Depth (Feet) | Bulk Sample | Driven Type | Blows/Foot | Dry Density (pcf) | Moisture (%) | U.S.C.S. Symbol | Graphic Log

BORING LEGEND

DESCRIPTION

Laboratory Tests

0

Block or Chunk Sample

Bulk Sample

5

Standard Penetration Test

10

Modified Split-Barrel Drive Sampler (Cal Sampler)

Thin Walled Army Corp. of Engineers Sample

15

Groundwater Table

Soil Type or Classification Change

20

? ——— ? ——— ? ——— ? ——— ? ——— ? ——— ? —

Formation Change [(Approximate boundaries queried (?)]

"SM"

Quotes are placed around classifications where the soils exist in situ as bedrock

25

FIGURE: BL2

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~417 FEET

BORING: B-1

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						CL		Asphalt: 0-3" Base Material: 3-10" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff, moist, dark brown, fine to medium grained sandy CLAY with gravel. Becomes reddish gray	
5			50/2"			"SC"		**QUATERNARY VERY OLD PARALIC DEPOSITS:** Dense to very dense, olive gray, clayey fine to medium grained SANDSTONE with trace gravel. Increased sand content	
10			50/5"						
15			16 42 50/3"					Becomes reddish brown	
20								Total Depth: 18' (refusal on gravel) No Groundwater Encountered Backfilled with Bentonite Chips Capped with Concrete	
25									

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~419 FEET

BORING: B-2

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					"SC"		Asphalt: 0-3.5" Base Material: 3.5-10" **QUATERNARY VERY OLD PARALIC DEPOSITS:** Very dense, slightly moist, reddish brown silty to clayey fine to medium grained SANDSTONE with gravel, oxidized.	MAX
5		▯	14 50/3"					Abundant gravel	
								Total Depth: 7' (refusal on gravel) No Groundwater Encountered Backfilled with Bentonite Chips Capped with Concrete	
10									
15									
20									
25									

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~414 FEET

BORING: B-3

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0								Asphalt: 0-4" Base Material: 4-9"	
						SC/CL		**QUATERNARY PREVIOUSLY PLACED FILL:** Medium dense or stiff, slightly moist, brown, clayey fine grained SAND/ sandy CLAY.	
						"SC"		**QUATERNARY VERY OLD PARALIC DEPOSITS:** Dense, slightly moist, light reddish gray, clayey fine grained SANDSTONE with trace gravel, oxidized.	
						"SM"		Dense, slightly moist, reddish brown, silty fine grained SANDSTONE, oxidized.	
5		Ring	14 19 21						RV
						"CL"		Hard, moist, reddish brown, sandy fine to medium grained CLAYSTONE, oxidized.	
10		Ring	9 12 16						GS
								Fine gravel	
15		Ring	21 50/3"						
								Abundant gravel	
								Total Depth: 18' (refusal on gravel) No Groundwater Encountered Backfilled with Bentonite Chips Capped with Concrete	
20									
25									

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~417 FEET

BORING: B-4

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0	X					CL		Asphalt: 0-2" Base Material: 2-9" **<u>QUATERNARY PREVIOUSLY PLACED FILL</u>:** Stiff, moist, reddish brown, fine to medium grained sandy CLAY with gravel. Becomes olive gray at approximately 2 feet	MAX, EI, AL, CHM
5		SPT	14 31 42			"CL"		**<u>QUATERNARY VERY OLD PARALIC DEPOSITS</u>:** Hard, moist, reddish brown, fine grained sandy CLAYSTONE, oxidized.	AL, CN
						"SC"		Medium dense, moist, reddish brown, clayey fine to medium grained SANDSTONE, oxidized, massive.	
10		Ring	7 11 13						
						"CL"		Very stiff to hard, moist, reddish brown, fine to medium grained sandy CLAYSTONE with trace gravel, oxidized.	
15		Ring	50/5"						CN
								Abundant gravel	
								Total Depth: 17' (refusal on gravel) No Groundwater Encountered	
20									
25									

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~416 FEET

BORING: B-5

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC/CL		Asphalt: 0-3" Base Material: 3-7" **QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense or stiff, slightly moist, dark brown, clayey fine to medium grained SAND with trace gravel.	
						CL		Very stiff, moist, dark reddish brown, fine to medium grained sandy CLAY.	
5		X	9 14 25						
						"SM"		**QUATERNARY VERY OLD PARALIC DEPOSITS:** Very dense, slightly moist, light reddish brown, silty fine grained SANDSTONE, oxidized.	
10		X	18 22 32						
								Total Depth: 11.5' No Groundwater Encountered	
15									
20									
25									

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~419 FEET

BORING: B-6

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0						SC		**QUATERNARY PREVIOUSLY PLACED FILL:** Loose to medium dense, moist, dark reddish brown, clayey fine to medium grained SAND with trace gravel.	
						CL		Stiff, moist, dark brown, fine grained sandy CLAY with gravel. Becomes dark olive gray	
5		▯	50/3"			"SM"		**QUATERNARY VERY OLD PARALIC DEPOSITS:** Very dense, slightly moist, reddish brown, silty fine grained SANDSTONE with gravel, oxidized.	AL
								Total Depth: 6.0' (Refusal on gravel) No Groundwater Encountered	
10									
15									
20									
25									

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PROJECT:	PROPOSED PROTEA-VA IMPROVEMENTS	DRILLER:	BAJA EXPLORATION	SHEET:	1 of 1
CTE JOB NO:	10-14209G	DRILL METHOD:	HOLLOW-STEM AUGER	DRILLING DATE:	3/29/2018
LOGGED BY:	AJB	SAMPLE METHOD:	RING, SPT and BULK	ELEVATION:	~417 FEET

BORING: B-7

Depth (Feet)	Bulk Sample	Driven Type	Blows/6"	Dry Density (pcf)	Moisture (%)	U.S.C.S. Symbol	Graphic Log	DESCRIPTION	Laboratory Tests
0–5	X					CL		Asphalt: 0-3" Base Material: 3-11" **QUATERNARY PREVIOUSLY PLACED FILL:** Stiff, moist, brown, fine to medium grained sandy CLAY with trace gravel.	EI, RV, CHM
5		▯	50/2"			"SC"		**QUATERNARY VERY OLD PARALIC DEPOSITS:** Very dense, slightly moist, reddish olive, clayey fine grained SANDSTONE with gravel, oxidized.	
10, 15, 20, 25								Total Depth: 7.0' (Refusal on gravel) No Groundwater Encountered	

APPENDIX C

LABORATORY METHODS AND RESULTS

LABORATORY METHODS AND RESULTS

Laboratory Testing Program

Laboratory tests were performed on representative soil samples to detect their relative engineering properties. Tests were performed following test methods of the American Society for Testing Materials or other accepted standards. The following presents a brief description of the various test methods used.

Classification

Soils were classified visually according to the Unified Soil Classification System. Visual classifications were supplemented by laboratory testing of selected samples according to ASTM D2487. The soil classifications are shown on the Exploration Logs in Appendix B.

Modified Proctor

Laboratory maximum dry density and optimum moisture content were evaluated according to ASTM D 1557, Method A. A mechanically operated rammer was used during the compaction process.

Expansion Index

Expansion testing was performed on selected samples of the matrix of the on-site soils according to ASTM D 4829.

Resistance "R"-Value

The resistance "R"-value was determined by the California Materials Method No. 301 for representative subbase soils. Samples were prepared and exudation pressure and "R"-value determined. The graphically determined "R"- value at exudation pressure of 300 psi is the value used for pavement section calculation.

Particle-Size Analysis

Particle-size analyses were performed on selected representative samples according to ASTM D 422.

Atterberg Limits

The procedure of ASTM D4518-84 was used to measure the liquid limit, plastic limit and plasticity index of representative samples.

Consolidation

To assess their compressibility and volume change behavior when loaded and wetted, relatively undisturbed samples of representative samples from the investigation were subject to consolidation tests in accordance with ASTM D 2435.

Chemical Analysis

Soil materials were collected with sterile sampling equipment and tested for Sulfate and Chloride content, pH, Corrosivity, and Resistivity.

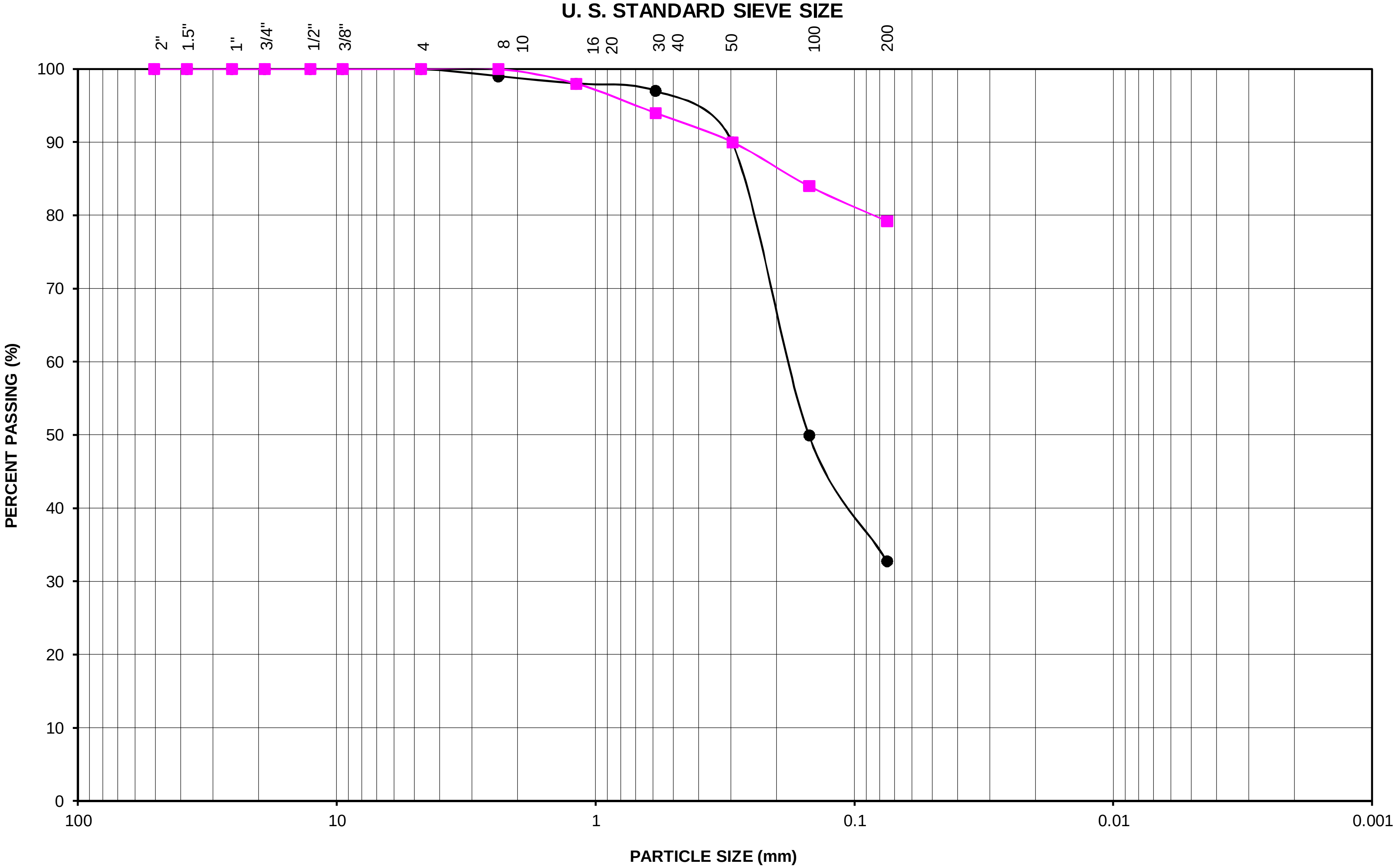
ATTERBERG LIMITS

LOCATION	DEPTH (feet)	LIQUID LIMIT	PLASTICITY INDEX	CLASSIFICATION
B-4	0-5	34	21	CL
B-4	5	39	15	CL
B-6	5	33	22	CL

MODIFIED PROCTOR

ASTM D 1557

LOCATION	DEPTH (feet)	MAXIUM DRY DENSITY (PCF)	OPTIMUM MOISTURE (%)
B-2	0-5	124.4 (RC 130.4)	10.3 (RC 8.5)
B-4	0-5	118.9 (RC 122.8)	10.9 (RC 9.8)



PARTICLE SIZE ANALYSIS

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Sample Designation	Sample Depth (feet)	Symbol	Liquid Limit (%)	Plasticity Index	Classification
B-3	5	●	0	0	SM
B-3	10	■	0	0	CL
CTE JOB NUMBER:		10-14209G		FIGURE:	C-1

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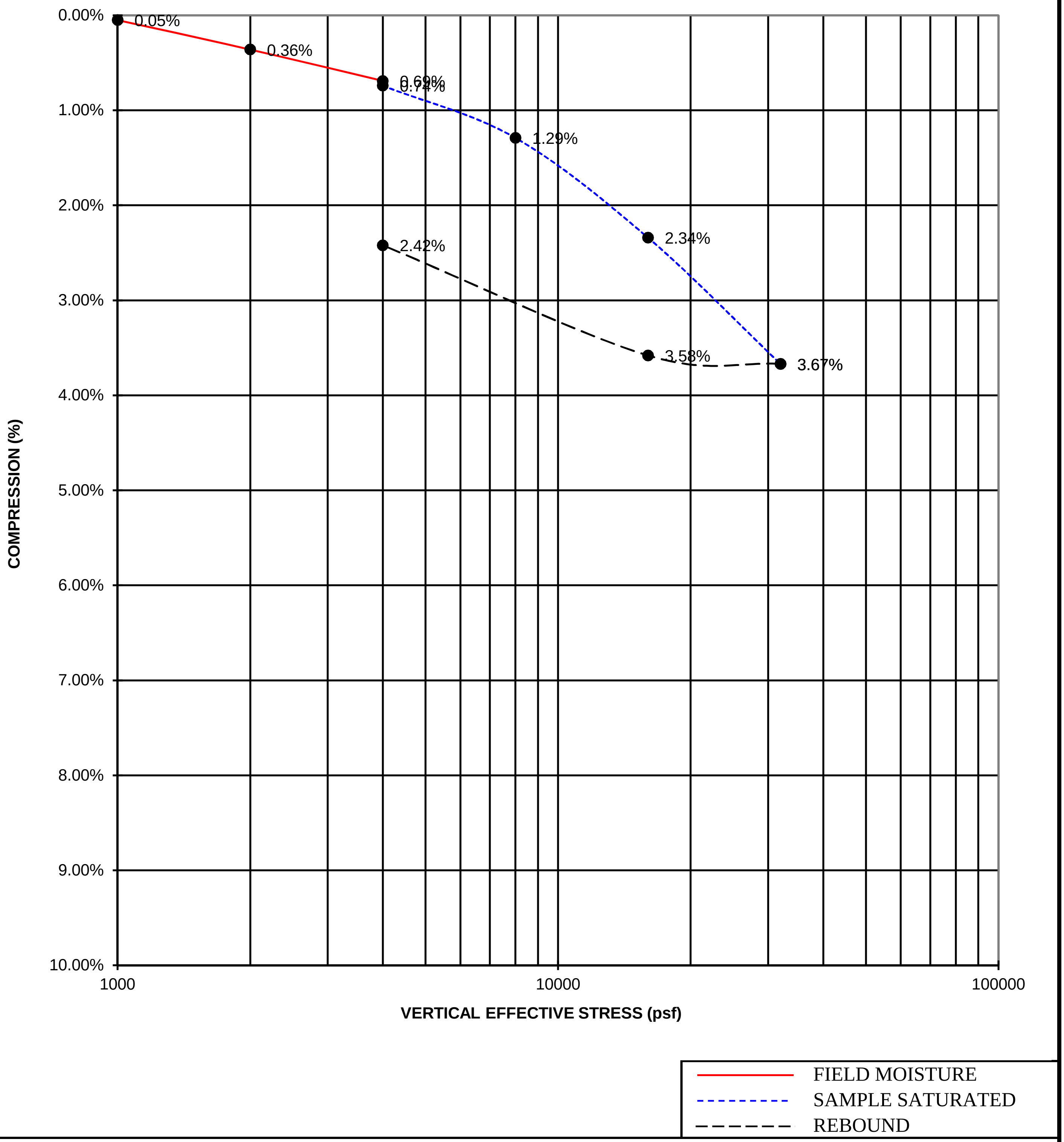
Inspection | Testing | Geotechnical | Environmental & Construction Engineering | Civil Engineering | Surveying



Consolidation Test ASTM D2435

Project Name:	Protea-VA San Diego				
Project Number:	10-14209G	Sample Date:	3/29/2018	Initial Moisture (%):	23.7
Lab Number:	28298	Test Date:	4/12/2018	Final Moisture (%):	24.1
Sample Location:	B-4 @ 5'	Tested By:	JNC	Initial Dry Density (PCF):	98.9
Sample Description:	Moderate yellowish brown CL			Final Dry Density (PCF):	101.3

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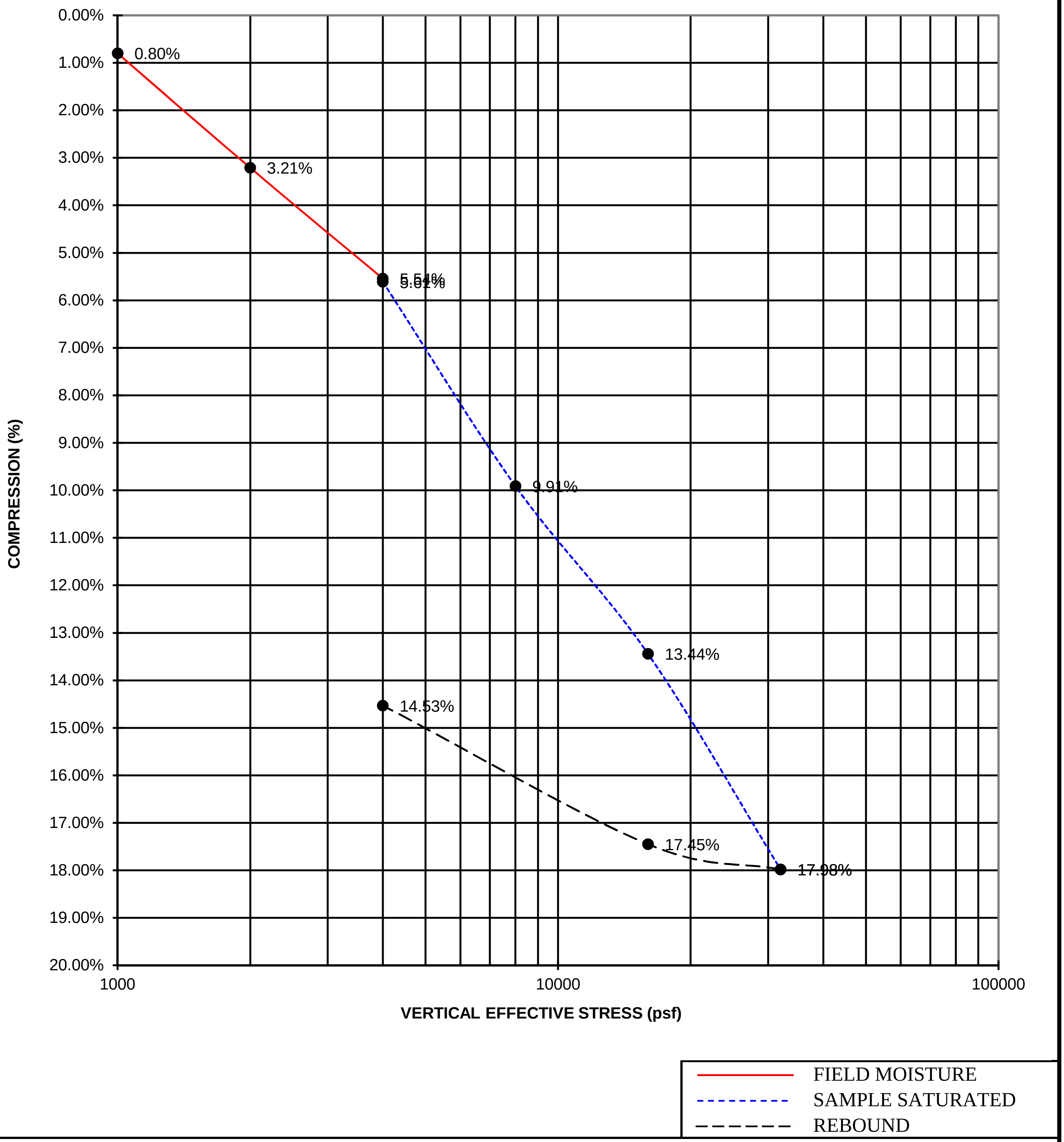


Consolidation Test ASTM D2435

Project Name:	Portea VA- San Diego				
Project Number:	10-14209G	Sample Date:	3/29/2018	Initial Moisture (%):	22.1
Lab Number:	28298	Test Date:	4/15/2018	Final Moisture (%):	20.4
Sample Location:	B-4 @ 15'	Tested By:	RCV	Initial Dry Density (PCF):	91.8
Sample Description:	Dark brown CL/CH			Final Dry Density (PCF):	107.5

APPENDIX D

STANDARD SPECIFICATIONS FOR GRADING

Section 1 - General

Construction Testing & Engineering, Inc. presents the following standard recommendations for grading and other associated operations on construction projects. These guidelines should be considered a portion of the project specifications. Recommendations contained in the body of the previously presented soils report shall supersede the recommendations and or requirements as specified herein. The project geotechnical consultant shall interpret disputes arising out of interpretation of the recommendations contained in the soils report or specifications contained herein.

Section 2 - Responsibilities of Project Personnel

The geotechnical consultant should provide observation and testing services sufficient to general conformance with project specifications and standard grading practices. The geotechnical consultant should report any deviations to the client or his authorized representative.

The Client should be chiefly responsible for all aspects of the project. He or his authorized representative has the responsibility of reviewing the findings and recommendations of the geotechnical consultant. He shall authorize or cause to have authorized the Contractor and/or other consultants to perform work and/or provide services. During grading the Client or his authorized representative should remain on-site or should remain reasonably accessible to all concerned parties in order to make decisions necessary to maintain the flow of the project.

The Contractor is responsible for the safety of the project and satisfactory completion of all grading and other associated operations on construction projects, including, but not limited to, earth work in accordance with the project plans, specifications and controlling agency requirements.

Section 3 - Preconstruction Meeting

A preconstruction site meeting should be arranged by the owner and/or client and should include the grading contractor, design engineer, geotechnical consultant, owner's representative and representatives of the appropriate governing authorities.

Section 4 - Site Preparation

The client or contractor should obtain the required approvals from the controlling authorities for the project prior, during and/or after demolition, site preparation and removals, etc. The appropriate approvals should be obtained prior to proceeding with grading operations.

Clearing and grubbing should consist of the removal of vegetation such as brush, grass, woods, stumps, trees, root of trees and otherwise deleterious natural materials from the areas to be graded. Clearing and grubbing should extend to the outside of all proposed excavation and fill areas.

Demolition should include removal of buildings, structures, foundations, reservoirs, utilities (including underground pipelines, septic tanks, leach fields, seepage pits, cisterns, mining shafts, tunnels, etc.) and other man-made surface and subsurface improvements from the areas to be graded. Demolition of utilities should include proper capping and/or rerouting pipelines at the project perimeter and cutoff and capping of wells in accordance with the requirements of the governing authorities and the recommendations of the geotechnical consultant at the time of demolition.

Trees, plants or man-made improvements not planned to be removed or demolished should be protected by the contractor from damage or injury.

Debris generated during clearing, grubbing and/or demolition operations should be wasted from areas to be graded and disposed off-site. Clearing, grubbing and demolition operations should be performed under the observation of the geotechnical consultant.

Section 5 - Site Protection

Protection of the site during the period of grading should be the responsibility of the contractor. Unless other provisions are made in writing and agreed upon among the concerned parties, completion of a portion of the project should not be considered to preclude that portion or adjacent areas from the requirements for site protection until such time as the entire project is complete as identified by the geotechnical consultant, the client and the regulating agencies.

Precautions should be taken during the performance of site clearing, excavations and grading to protect the work site from flooding, ponding or inundation by poor or improper surface drainage. Temporary provisions should be made during the rainy season to adequately direct surface drainage away from and off the work site. Where low areas cannot be avoided, pumps should be kept on hand to continually remove water during periods of rainfall.

Rain related damage should be considered to include, but may not be limited to, erosion, silting, saturation, swelling, structural distress and other adverse conditions as determined by the geotechnical consultant. Soil adversely affected should be classified as unsuitable materials and should be subject to overexcavation and replacement with compacted fill or other remedial grading as recommended by the geotechnical consultant.

The contractor should be responsible for the stability of all temporary excavations. Recommendations by the geotechnical consultant pertaining to temporary excavations (e.g., backcuts) are made in consideration of stability of the completed project and, therefore, should not be considered to preclude the responsibilities of the contractor. Recommendations by the geotechnical consultant should not be considered to preclude requirements that are more restrictive by the regulating agencies. The contractor should provide during periods of extensive rainfall plastic sheeting to prevent unprotected slopes from becoming saturated and unstable. When deemed appropriate by the geotechnical consultant or governing agencies the contractor shall install checkdams, desilting basins, sand bags or other drainage control measures.

In relatively level areas and/or slope areas, where saturated soil and/or erosion gullies exist to depths of greater than 1.0 foot; they should be overexcavated and replaced as compacted fill in accordance with the applicable specifications. Where affected materials exist to depths of 1.0 foot or less below proposed finished grade, remedial grading by moisture conditioning in-place, followed by thorough recompaction in accordance with the applicable grading guidelines herein may be attempted. If the desired results are not achieved, all affected materials should be overexcavated and replaced as compacted fill in accordance with the slope repair recommendations herein. If field conditions dictate, the geotechnical consultant may recommend other slope repair procedures.

Section 6 - Excavations

6.1 Unsuitable Materials

Materials that are unsuitable should be excavated under observation and recommendations of the geotechnical consultant. Unsuitable materials include, but may not be limited to, dry, loose, soft, wet, organic compressible natural soils and fractured, weathered, soft bedrock and nonengineered or otherwise deleterious fill materials.

Material identified by the geotechnical consultant as unsatisfactory due to its moisture conditions should be overexcavated; moisture conditioned as needed, to a uniform at or above optimum moisture condition before placement as compacted fill.

If during the course of grading adverse geotechnical conditions are exposed which were not anticipated in the preliminary soil report as determined by the geotechnical consultant additional exploration, analysis, and treatment of these problems may be recommended.

6.2 Cut Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent cut slopes should not be steeper than 2:1 (horizontal: vertical).

The geotechnical consultant should observe cut slope excavation and if these excavations expose loose cohesionless, significantly fractured or otherwise unsuitable material, the materials should be overexcavated and replaced with a compacted stabilization fill. If encountered specific cross section details should be obtained from the Geotechnical Consultant.

When extensive cut slopes are excavated or these cut slopes are made in the direction of the prevailing drainage, a non-erodible diversion swale (brow ditch) should be provided at the top of the slope.

6.3 Pad Areas

All lot pad areas, including side yard terrace containing both cut and fill materials, transitions, located less than 3 feet deep should be overexcavated to a depth of 3 feet and replaced with a uniform compacted fill blanket of 3 feet. Actual depth of overexcavation may vary and should be delineated by the geotechnical consultant during grading, especially where deep or drastic transitions are present.

For pad areas created above cut or natural slopes, positive drainage should be established away from the top-of-slope. This may be accomplished utilizing a berm drainage swale and/or an appropriate pad gradient. A gradient in soil areas away from the top-of-slopes of 2 percent or greater is recommended.

Section 7 - Compacted Fill

All fill materials should have fill quality, placement, conditioning and compaction as specified below or as approved by the geotechnical consultant.

7.1 Fill Material Quality

Excavated on-site or import materials which are acceptable to the geotechnical consultant may be utilized as compacted fill, provided trash, vegetation and other deleterious materials are removed prior to placement. All import materials anticipated for use on-site should be sampled tested and approved prior to and placement is in conformance with the requirements outlined.

Rocks 12 inches in maximum and smaller may be utilized within compacted fill provided sufficient fill material is placed and thoroughly compacted over and around all rock to effectively fill rock voids. The amount of rock should not exceed 40 percent by dry weight passing the 3/4-inch sieve. The geotechnical consultant may vary those requirements as field conditions dictate.

Where rocks greater than 12 inches but less than four feet of maximum dimension are generated during grading, or otherwise desired to be placed within an engineered fill, special handling in accordance with the recommendations below. Rocks greater than four feet should be broken down or disposed off-site.

7.2 Placement of Fill

Prior to placement of fill material, the geotechnical consultant should observe and approve the area to receive fill. After observation and approval, the exposed ground surface should be scarified to a depth of 6 to 8 inches. The scarified material should be conditioned (i.e. moisture added or air dried by continued discing) to achieve a moisture content at or slightly above optimum moisture conditions and compacted to a minimum of 90 percent of the maximum density or as otherwise recommended in the soils report or by appropriate government agencies.

Compacted fill should then be placed in thin horizontal lifts not exceeding eight inches in loose thickness prior to compaction. Each lift should be moisture conditioned as needed, thoroughly blended to achieve a consistent moisture content at or slightly above optimum and thoroughly compacted by mechanical methods to a minimum of 90 percent of laboratory maximum dry density. Each lift should be treated in a like manner until the desired finished grades are achieved.

The contractor should have suitable and sufficient mechanical compaction equipment and watering apparatus on the job site to handle the amount of fill being placed in consideration of moisture retention properties of the materials and weather conditions.

When placing fill in horizontal lifts adjacent to areas sloping steeper than 5:1 (horizontal: vertical), horizontal keys and vertical benches should be excavated into the adjacent slope area. Keying and benching should be sufficient to provide at least six-foot wide benches and a minimum of four feet of vertical bench height within the firm natural ground, firm bedrock or engineered compacted fill. No compacted fill should be placed in an area after keying and benching until the geotechnical consultant has reviewed the area. Material generated by the benching operation should be moved sufficiently away from the bench area to allow for the recommended review of the horizontal bench prior to placement of fill.

Within a single fill area where grading procedures dictate two or more separate fills, temporary slopes (false slopes) may be created. When placing fill adjacent to a false slope, benching should be conducted in the same manner as above described. At least a 3-foot vertical bench should be established within the firm core of adjacent approved compacted fill prior to placement of additional fill. Benching should proceed in at least 3-foot vertical increments until the desired finished grades are achieved.

Prior to placement of additional compacted fill following an overnight or other grading delay, the exposed surface or previously compacted fill should be processed by scarification, moisture conditioning as needed to at or slightly above optimum moisture content, thoroughly blended and recompacted to a minimum of 90 percent of laboratory maximum dry density. Where unsuitable materials exist to depths of greater than one foot, the unsuitable materials should be over-excavated.

Following a period of flooding, rainfall or overwatering by other means, no additional fill should be placed until damage assessments have been made and remedial grading performed as described herein.

Rocks 12 inch in maximum dimension and smaller may be utilized in the compacted fill provided the fill is placed and thoroughly compacted over and around all rock. No oversize material should be used within 3 feet of finished pad grade and within 1 foot of other compacted fill areas. Rocks 12 inches up to four feet maximum dimension should be placed below the upper 10 feet of any fill and should not be closer than 15 feet to any slope face. These recommendations could vary as locations of improvements dictate. Where practical, oversized material should not be placed below areas where structures or deep utilities are proposed. Oversized material should be placed in windrows on a clean, overexcavated or unyielding compacted fill or firm natural ground surface. Select native or imported granular soil (S.E. 30 or higher) should be placed and thoroughly flooded over and around all windrowed rock, such that voids are filled. Windrows of oversized material should be staggered so those successive strata of oversized material are not in the same vertical plane.

It may be possible to dispose of individual larger rock as field conditions dictate and as recommended by the geotechnical consultant at the time of placement.

The contractor should assist the geotechnical consultant and/or his representative by digging test pits for removal determinations and/or for testing compacted fill. The contractor should provide this work at no additional cost to the owner or contractor's client.

Fill should be tested by the geotechnical consultant for compliance with the recommended relative compaction and moisture conditions. Field density testing should conform to ASTM Method of Test D 1556-00, D 2922-04. Tests should be conducted at a minimum of approximately two vertical feet or approximately 1,000 to 2,000 cubic yards of fill placed. Actual test intervals may vary as field conditions dictate. Fill found not to be in conformance with the grading recommendations should be removed or otherwise handled as recommended by the geotechnical consultant.

7.3 Fill Slopes

Unless otherwise recommended by the geotechnical consultant and approved by the regulating agencies, permanent fill slopes should not be steeper than 2:1 (horizontal: vertical).

Except as specifically recommended in these grading guidelines compacted fill slopes should be over-built two to five feet and cut back to grade, exposing the firm, compacted fill inner core. The actual amount of overbuilding may vary as field conditions dictate. If the desired results are not achieved, the existing slopes should be overexcavated and reconstructed under the guidelines of the geotechnical consultant. The degree of overbuilding shall be increased until the desired compacted slope surface condition is achieved. Care should be taken by the contractor to provide thorough mechanical compaction to the outer edge of the overbuilt slope surface.

At the discretion of the geotechnical consultant, slope face compaction may be attempted by conventional construction procedures including backrolling. The procedure must create a firmly compacted material throughout the entire depth of the slope face to the surface of the previously compacted firm fill intercore.

During grading operations, care should be taken to extend compactive effort to the outer edge of the slope. Each lift should extend horizontally to the desired finished slope surface or more as needed to ultimately established desired grades. Grade during construction should not be allowed to roll off at the edge of the slope. It may be helpful to elevate slightly the outer edge of the slope. Slough resulting from the placement of individual lifts should not be allowed to drift down over previous lifts. At intervals not exceeding four feet in vertical slope height or the capability of available equipment, whichever is less, fill slopes should be thoroughly dozer trackrolled.

For pad areas above fill slopes, positive drainage should be established away from the top-of-slope. This may be accomplished using a berm and pad gradient of at least two percent.

Section 8 - Trench Backfill

Utility and/or other excavation of trench backfill should, unless otherwise recommended, be compacted by mechanical means. Unless otherwise recommended, the degree of compaction should be a minimum of 90 percent of the laboratory maximum density.

Within slab areas, but outside the influence of foundations, trenches up to one foot wide and two feet deep may be backfilled with sand and consolidated by jetting, flooding or by mechanical means. If on-site materials are utilized, they should be wheel-rolled, tamped or otherwise compacted to a firm condition. For minor interior trenches, density testing may be deleted or spot testing may be elected if deemed necessary, based on review of backfill operations during construction.

If utility contractors indicate that it is undesirable to use compaction equipment in close proximity to a buried conduit, the contractor may elect the utilization of light weight mechanical compaction equipment and/or shading of the conduit with clean, granular material, which should be thoroughly jetted in-place above the conduit, prior to initiating mechanical compaction procedures. Other methods of utility trench compaction may also be appropriate, upon review of the geotechnical consultant at the time of construction.

In cases where clean granular materials are proposed for use in lieu of native materials or where flooding or jetting is proposed, the procedures should be considered subject to review by the geotechnical consultant. Clean granular backfill and/or bedding are not recommended in slope areas.

Section 9 - Drainage

Where deemed appropriate by the geotechnical consultant, canyon subdrain systems should be installed in accordance with CTE's recommendations during grading.

Typical subdrains for compacted fill buttresses, slope stabilization or sidehill masses, should be installed in accordance with the specifications.

Roof, pad and slope drainage should be directed away from slopes and areas of structures to suitable disposal areas via non-erodible devices (i.e., gutters, downspouts, and concrete swales).

For drainage in extensively landscaped areas near structures, (i.e., within four feet) a minimum of 5 percent gradient away from the structure should be maintained. Pad drainage of at least 2 percent should be maintained over the remainder of the site.

Drainage patterns established at the time of fine grading should be maintained throughout the life of the project. Property owners should be made aware that altering drainage patterns could be detrimental to slope stability and foundation performance.

Section 10 - Slope Maintenance

10.1 - Landscape Plants
To enhance surficial slope stability, slope planting should be accomplished at the completion of grading. Slope planting should consist of deep-rooting vegetation requiring little watering. Plants native to the southern California area and plants relative to native plants are generally desirable. Plants native to other semi-arid and arid areas may also be appropriate. A Landscape Architect should be the best party to consult regarding actual types of plants and planting configuration.

10.2 - Irrigation
Irrigation pipes should be anchored to slope faces, not placed in trenches excavated into slope faces.

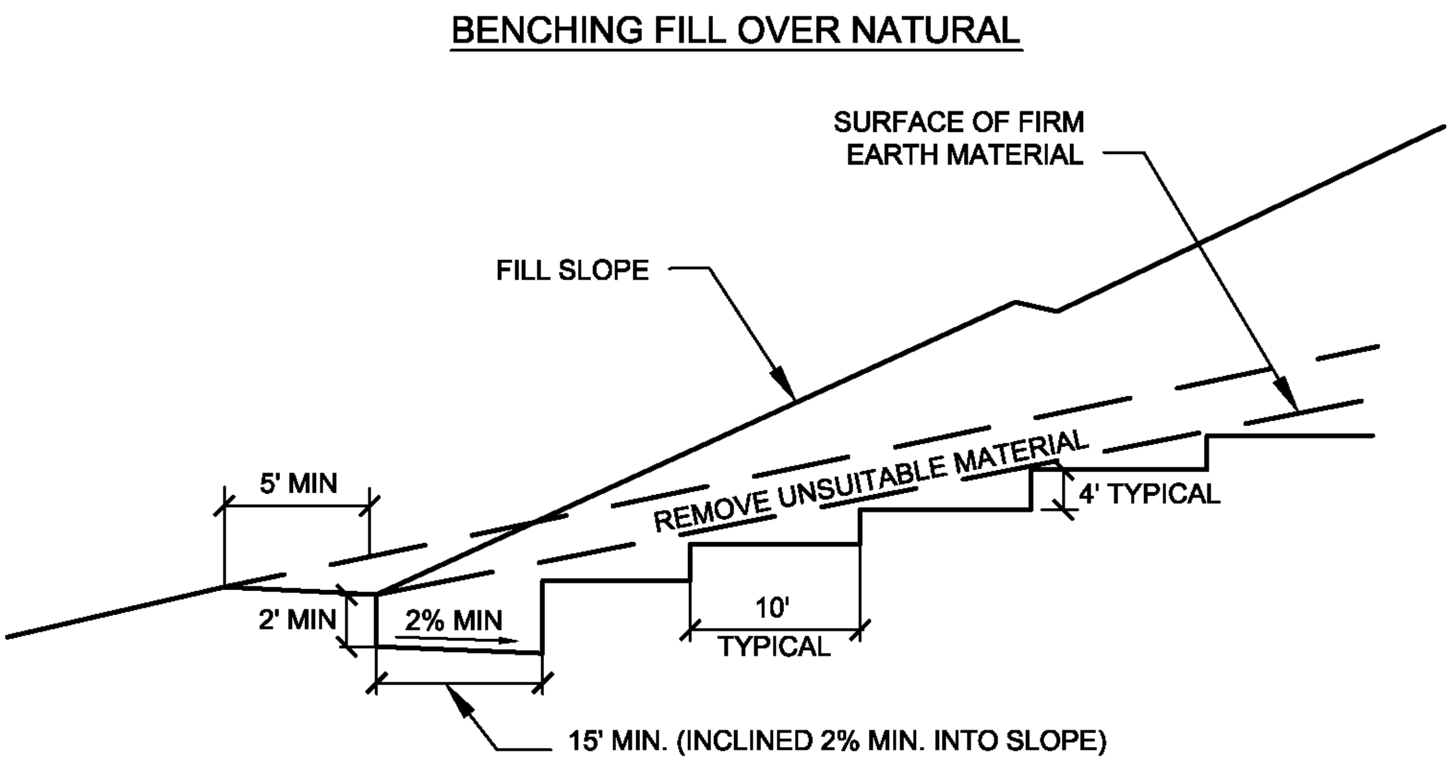
Slope irrigation should be minimized. If automatic timing devices are utilized on irrigation systems, provisions should be made for interrupting normal irrigation during periods of rainfall.

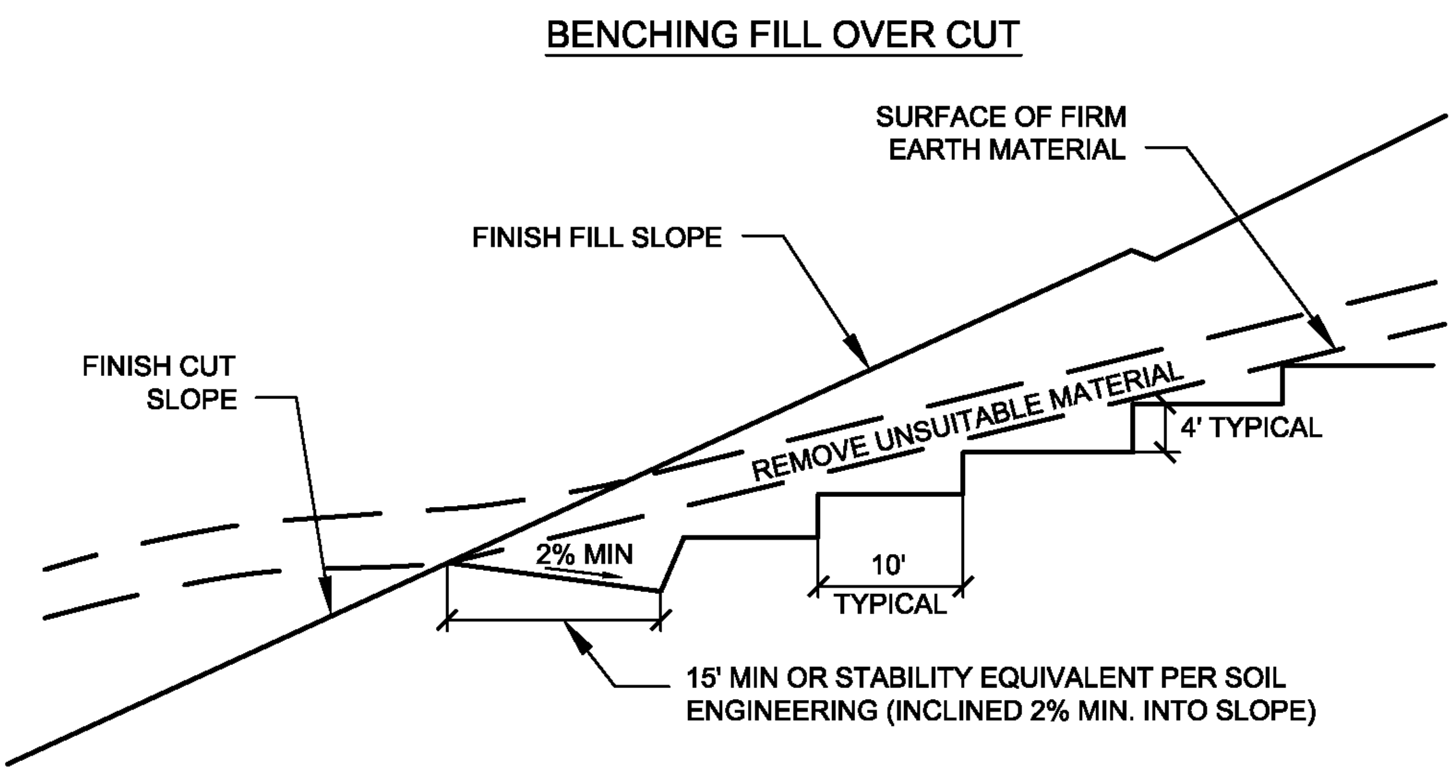
10.3 - Repair
As a precautionary measure, plastic sheeting should be readily available, or kept on hand, to protect all slope areas from saturation by periods of heavy or prolonged rainfall. This measure is strongly recommended, beginning with the period prior to landscape planting.

If slope failures occur, the geotechnical consultant should be contacted for a field review of site conditions and development of recommendations for evaluation and repair.

If slope failures occur as a result of exposure to period of heavy rainfall, the failure areas and currently unaffected areas should be covered with plastic sheeting to protect against additional saturation.

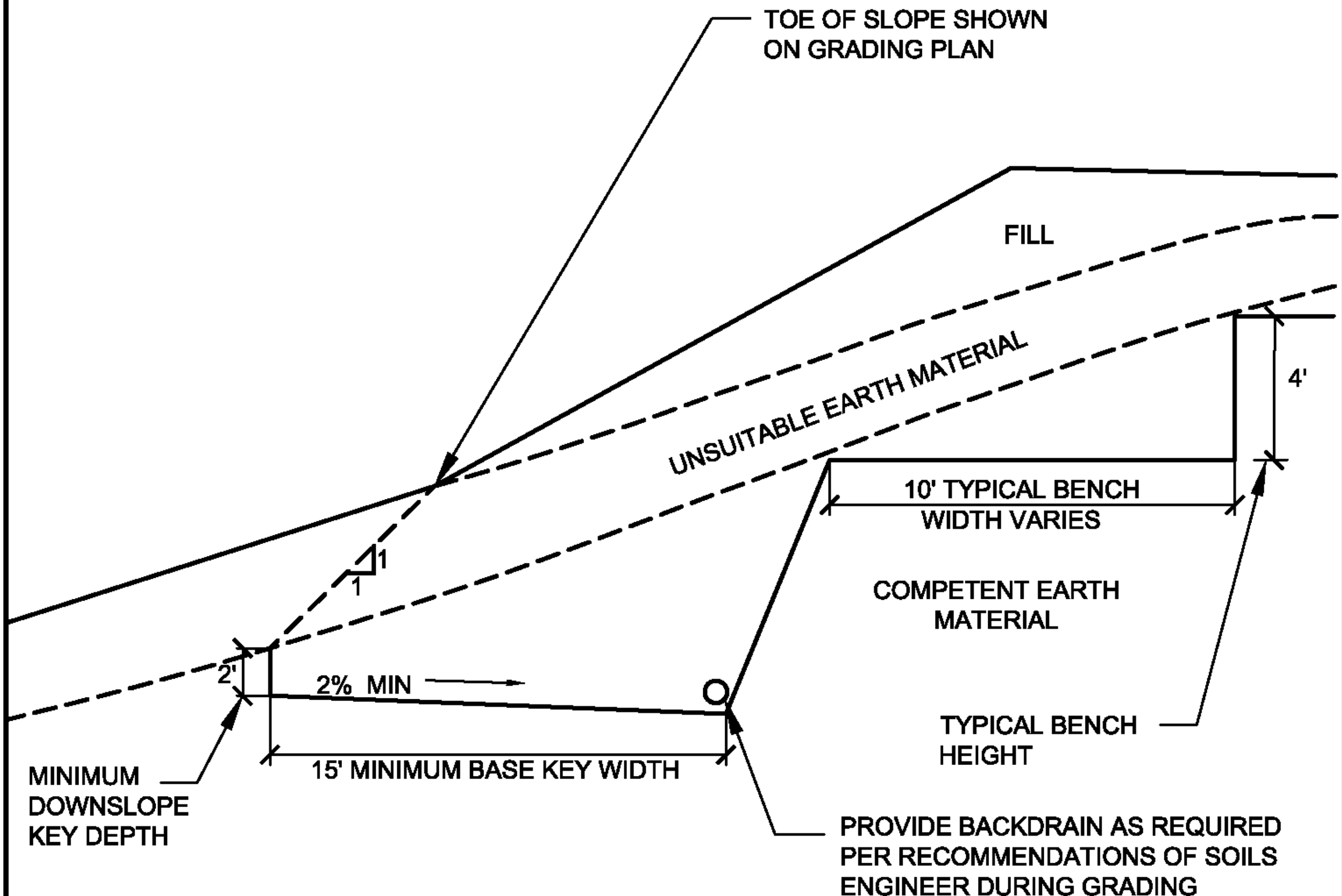
In the accompanying Standard Details, appropriate repair procedures are illustrated for superficial slope failures (i.e., occurring typically within the outer one foot to three feet of a slope face).





NOT TO SCALE

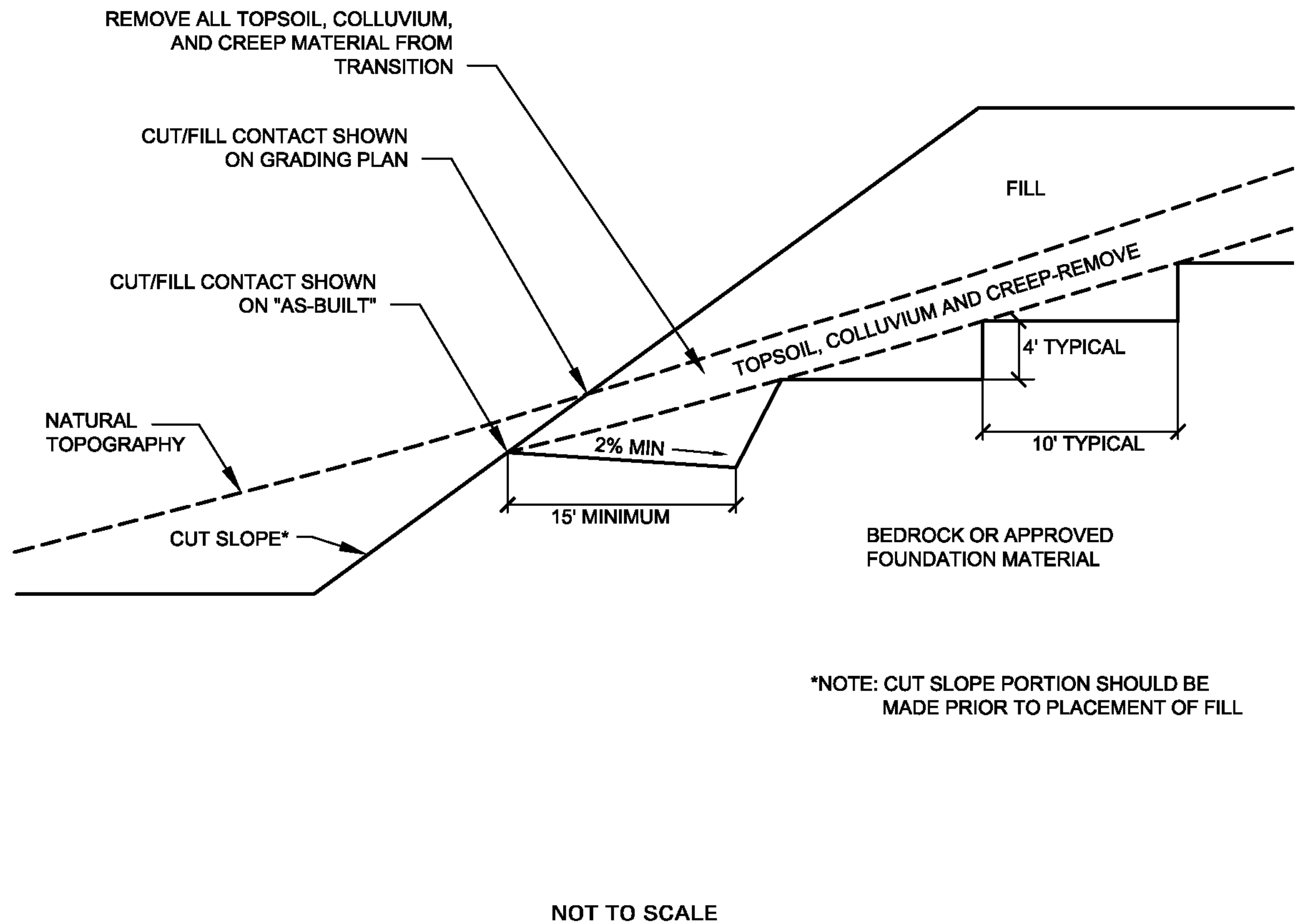
BENCHING FOR COMPACTED FILL DETAIL



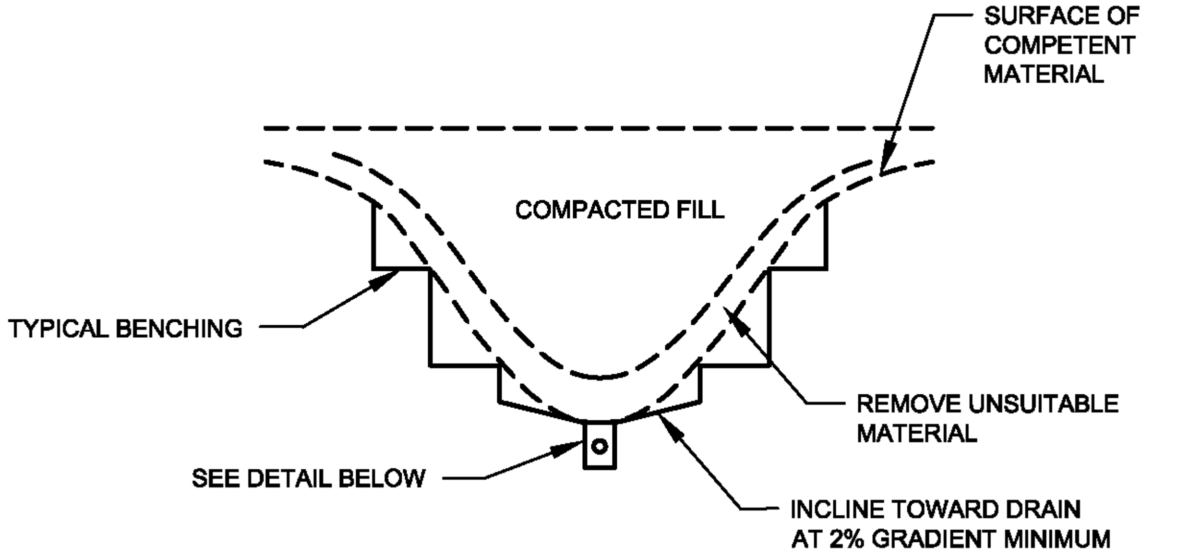
WHERE NATURAL SLOPE GRADIENT IS 5:1 OR LESS, BENCHING IS NOT NECESSARY. FILL IS NOT TO BE PLACED ON COMPRESSIBLE OR UNSUITABLE MATERIAL.

NOT TO SCALE

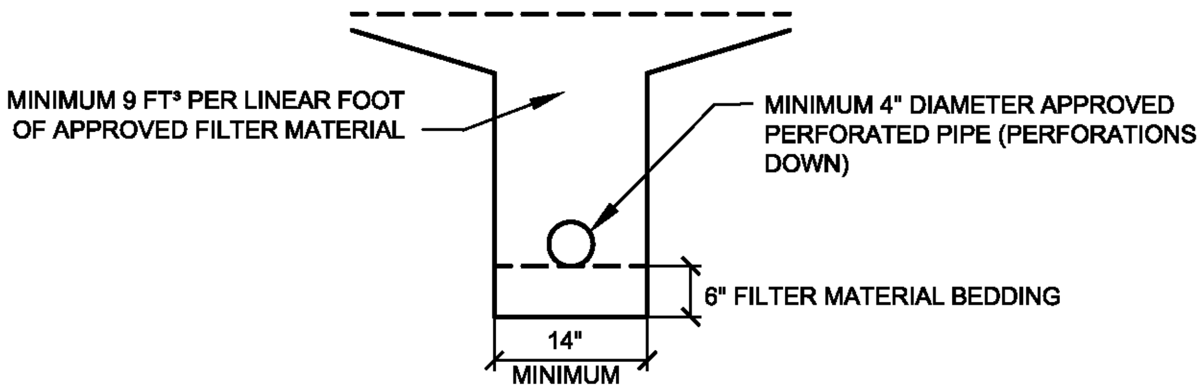
FILL SLOPE ABOVE NATURAL GROUND DETAIL



FILL SLOPE ABOVE CUT SLOPE DETAIL



DETAIL



CALTRANS CLASS 2 PERMEABLE MATERIAL FILTER MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 8	18-33
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYL-CHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 psi

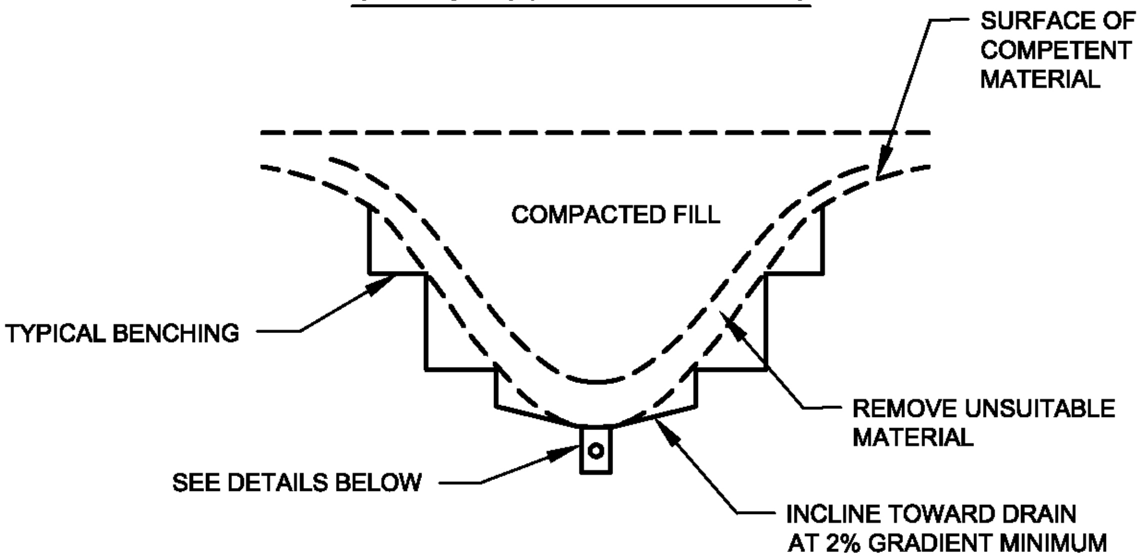
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
INITIAL 500'	4"
500' TO 1500'	6"
> 1500'	8"

NOT TO SCALE

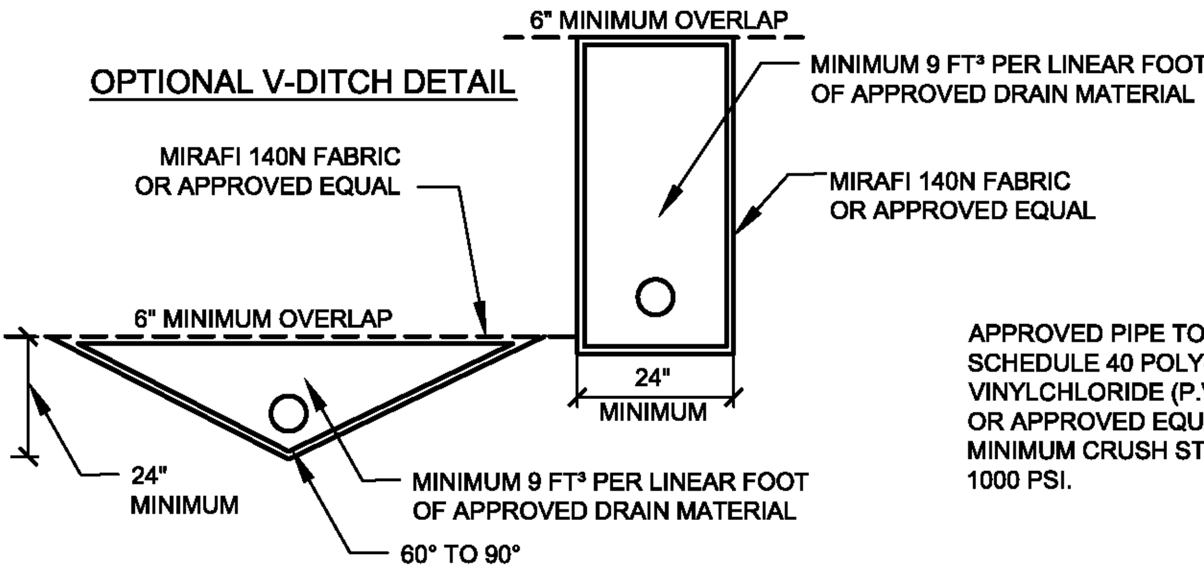
TYPICAL CANYON SUBDRAIN DETAIL

CANYON SUBDRAIN DETAILS



TRENCH DETAILS

OPTIONAL V-DITCH DETAIL



APPROVED PIPE TO BE SCHEDULE 40 POLY-VINYLCHLORIDE (P.V.C.) OR APPROVED EQUAL. MINIMUM CRUSH STRENGTH 1000 PSI.

DRAIN MATERIAL TO MEET FOLLOWING SPECIFICATION OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 ½"	88-100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

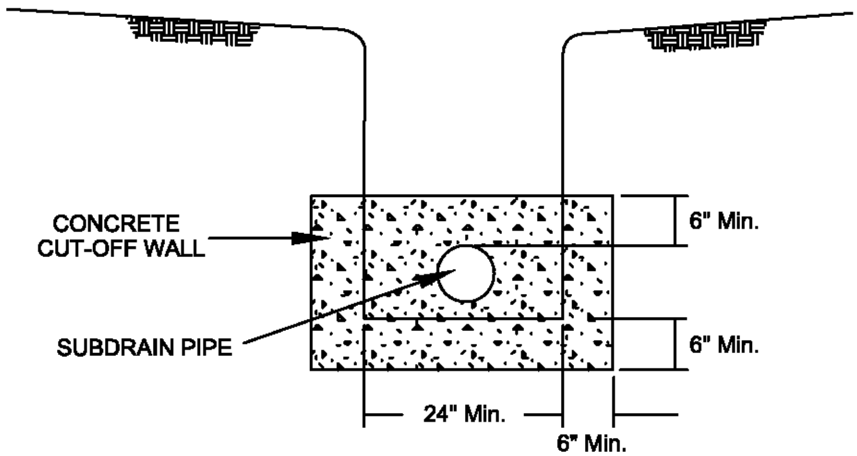
PIPE DIAMETER TO MEET THE FOLLOWING CRITERIA, SUBJECT TO FIELD REVIEW BASED ON ACTUAL GEOTECHNICAL CONDITIONS ENCOUNTERED DURING GRADING

LENGTH OF RUN	PIPE DIAMETER
INITIAL 500'	4"
500' TO 1500'	6"
> 1500'	8"

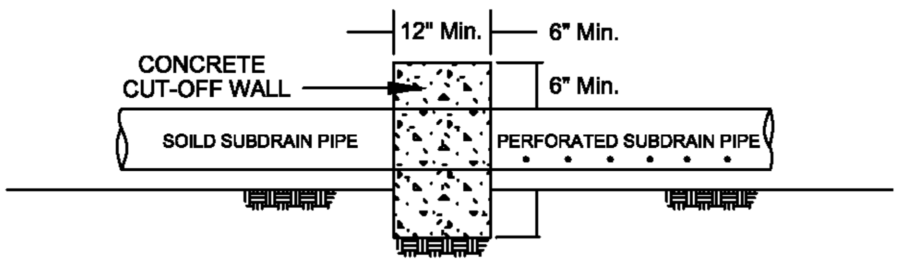
NOT TO SCALE

GEOFABRIC SUBDRAIN

FRONT VIEW



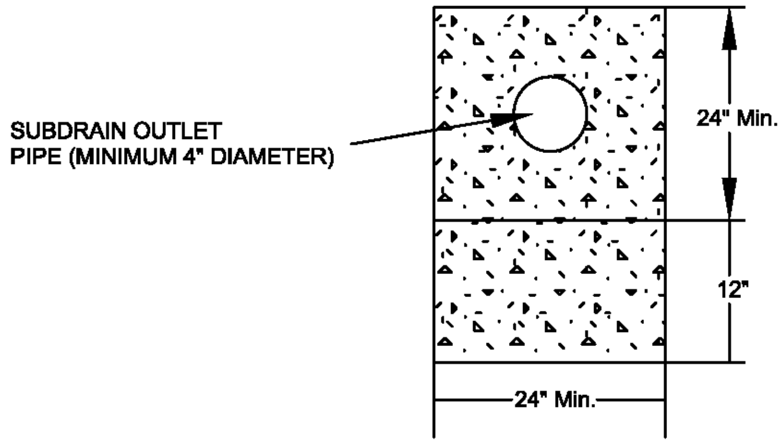
SIDE VIEW



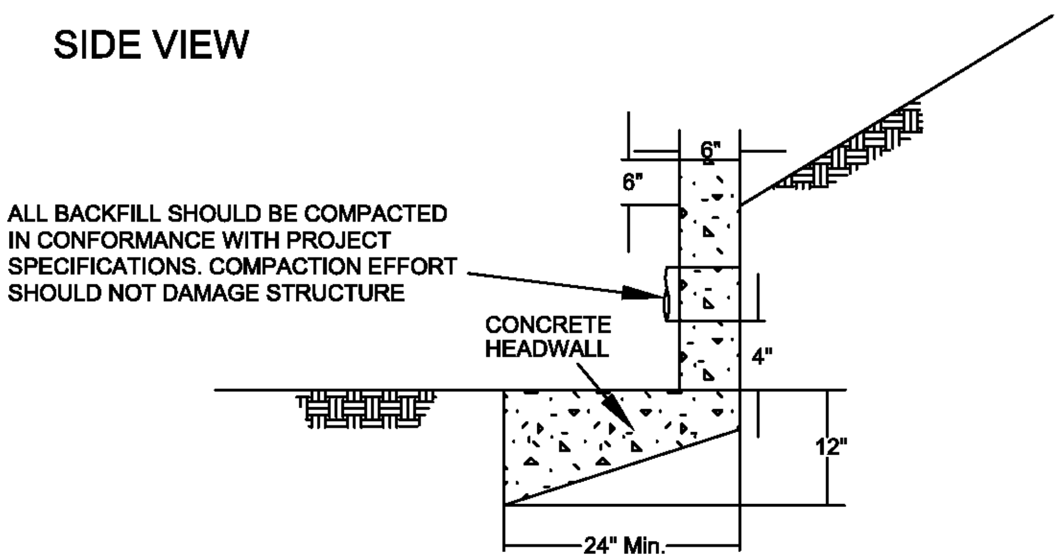
NOT TO SCALE

RECOMMENDED SUBDRAIN CUT-OFF WALL

FRONT VIEW



SIDE VIEW



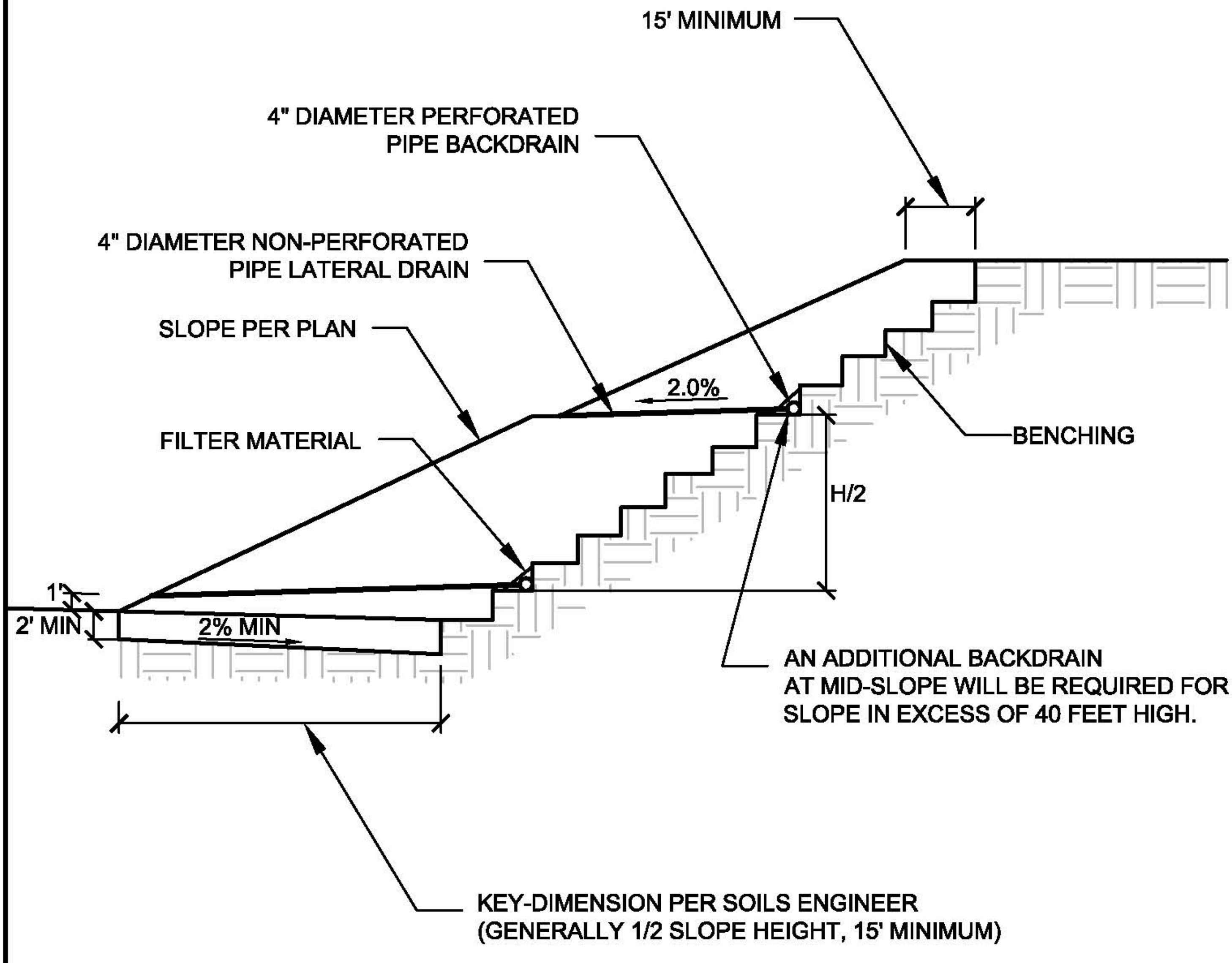
NOTE: HEADWALL SHOULD OUTLET AT TOE OF SLOPE OR INTO CONTROLLED SURFACE DRAINAGE DEVICE

ALL DISCHARGE SHOULD BE CONTROLLED

THIS DETAIL IS A MINIMUM DESIGN AND MAY BE MODIFIED DEPENDING UPON ENCOUNTERED CONDITIONS AND LOCAL REQUIREMENTS

NOT TO SCALE

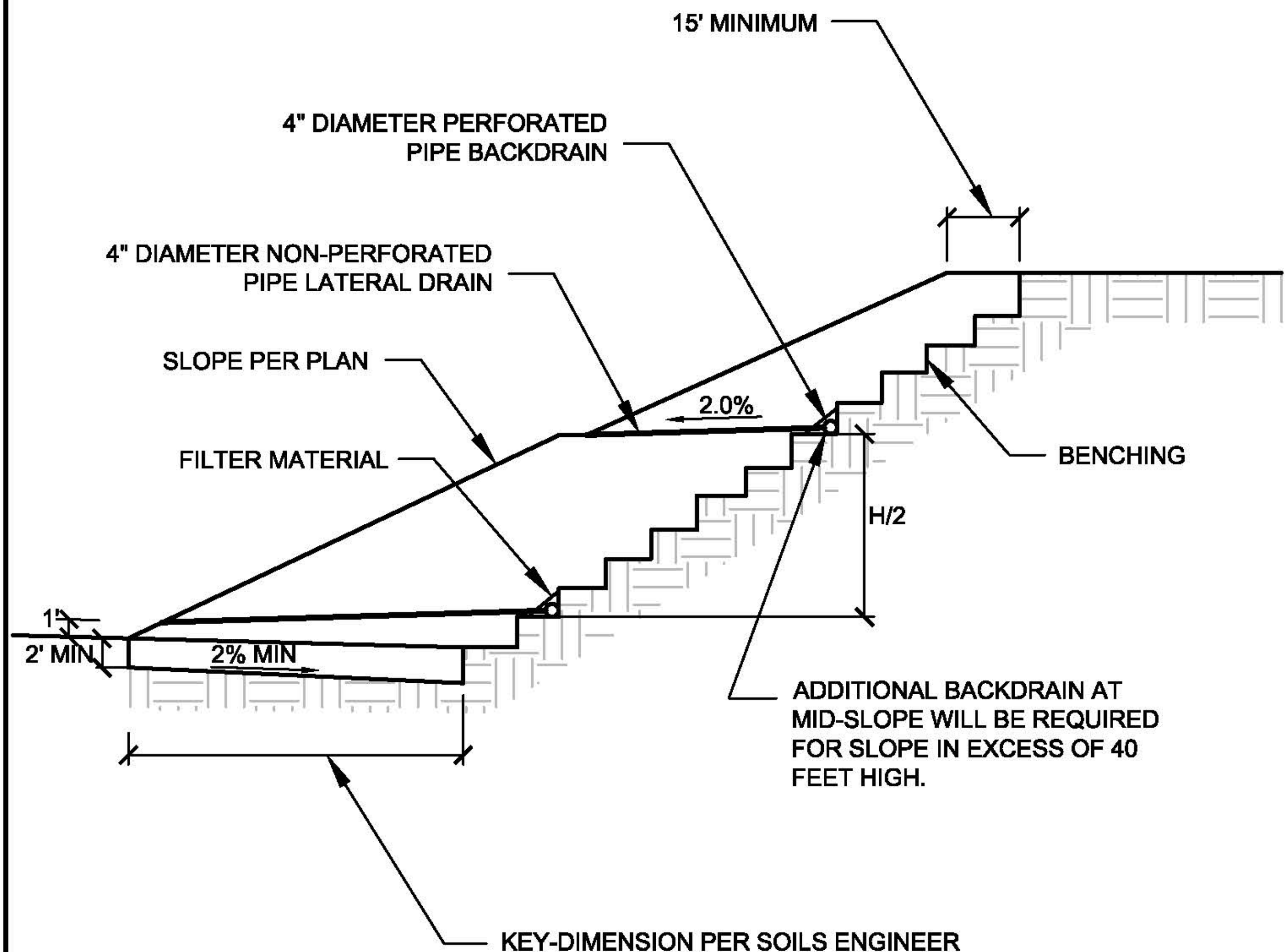
TYPICAL SUBDRAIN OUTLET HEADWALL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

NOT TO SCALE

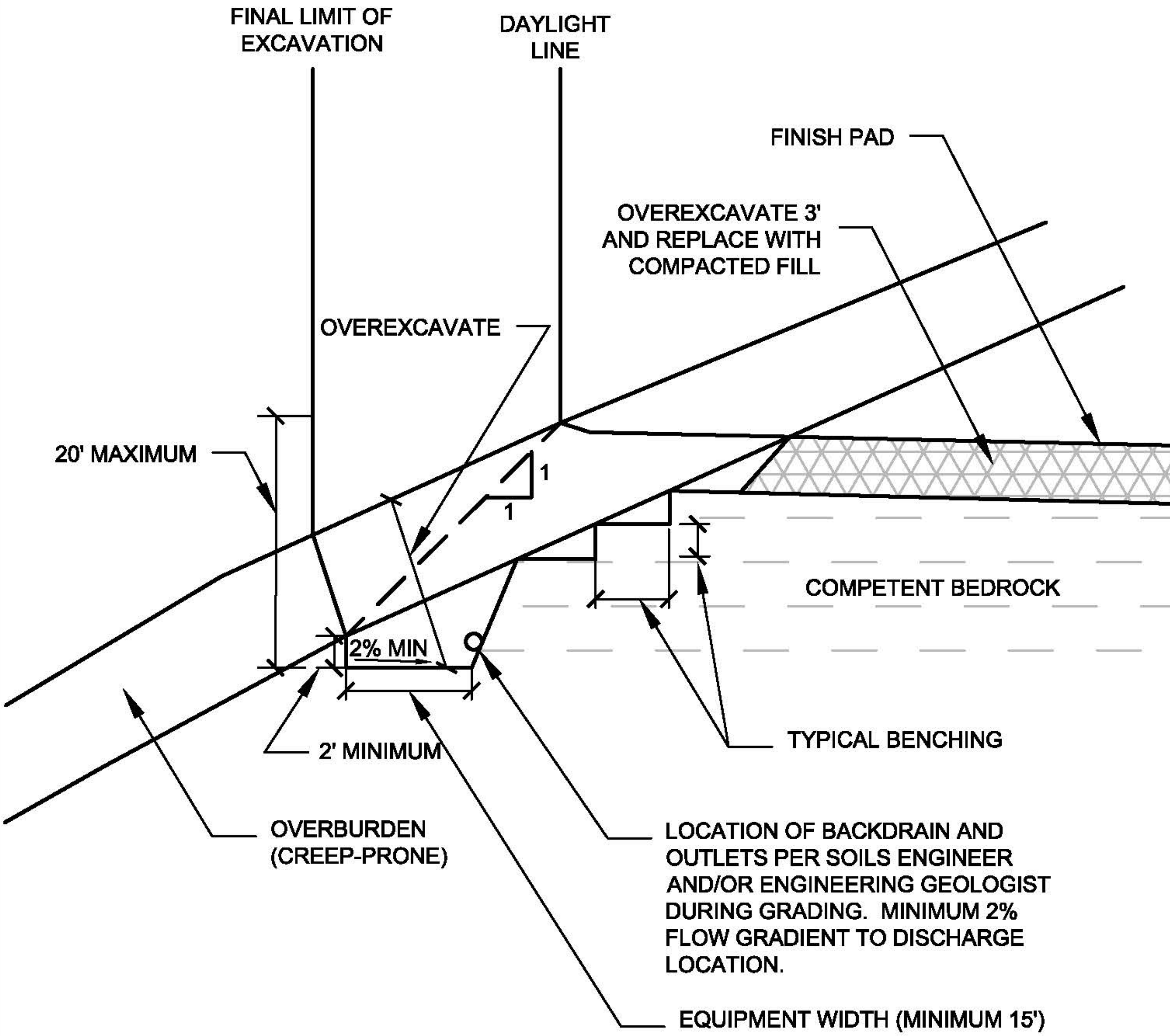
TYPICAL SLOPE STABILIZATION FILL DETAIL



DIMENSIONS ARE MINIMUM RECOMMENDED

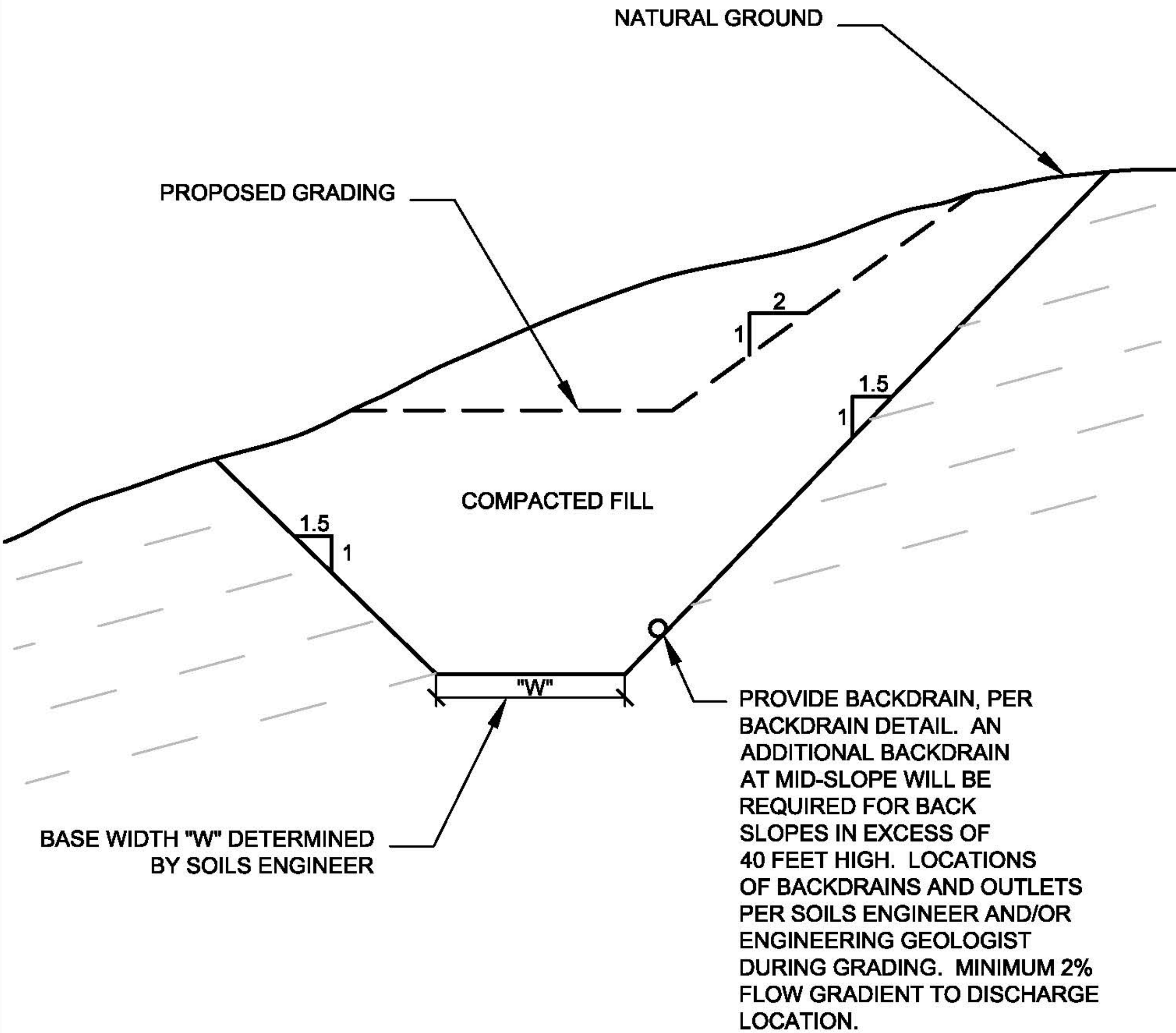
NOT TO SCALE

TYPICAL BUTTRESS FILL DETAIL



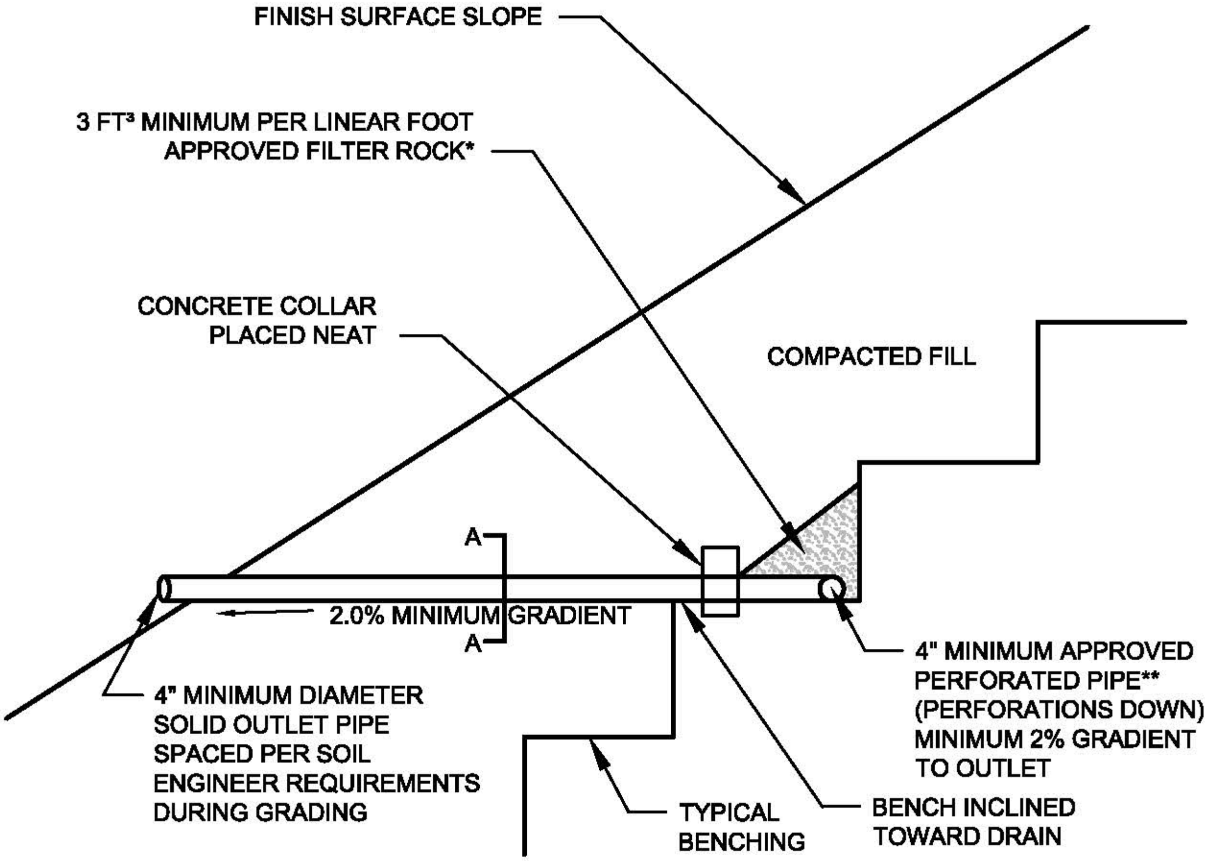
NOT TO SCALE

DAYLIGHT SHEAR KEY DETAIL

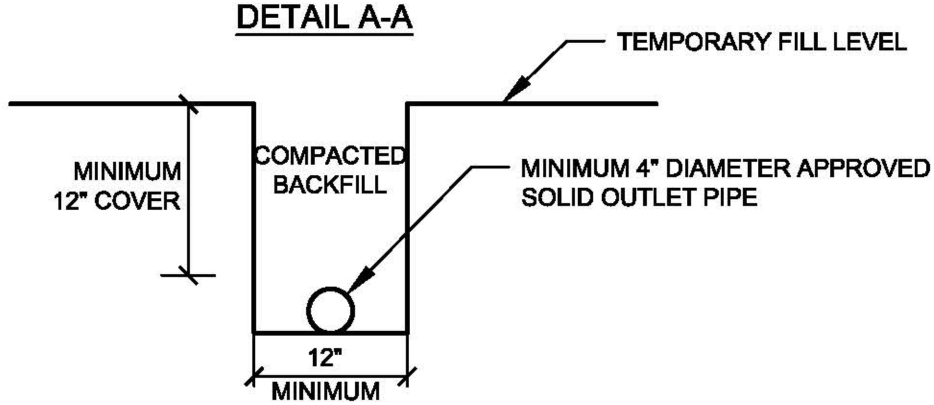


NOT TO SCALE

TYPICAL SHEAR KEY DETAIL



DETAIL A-A



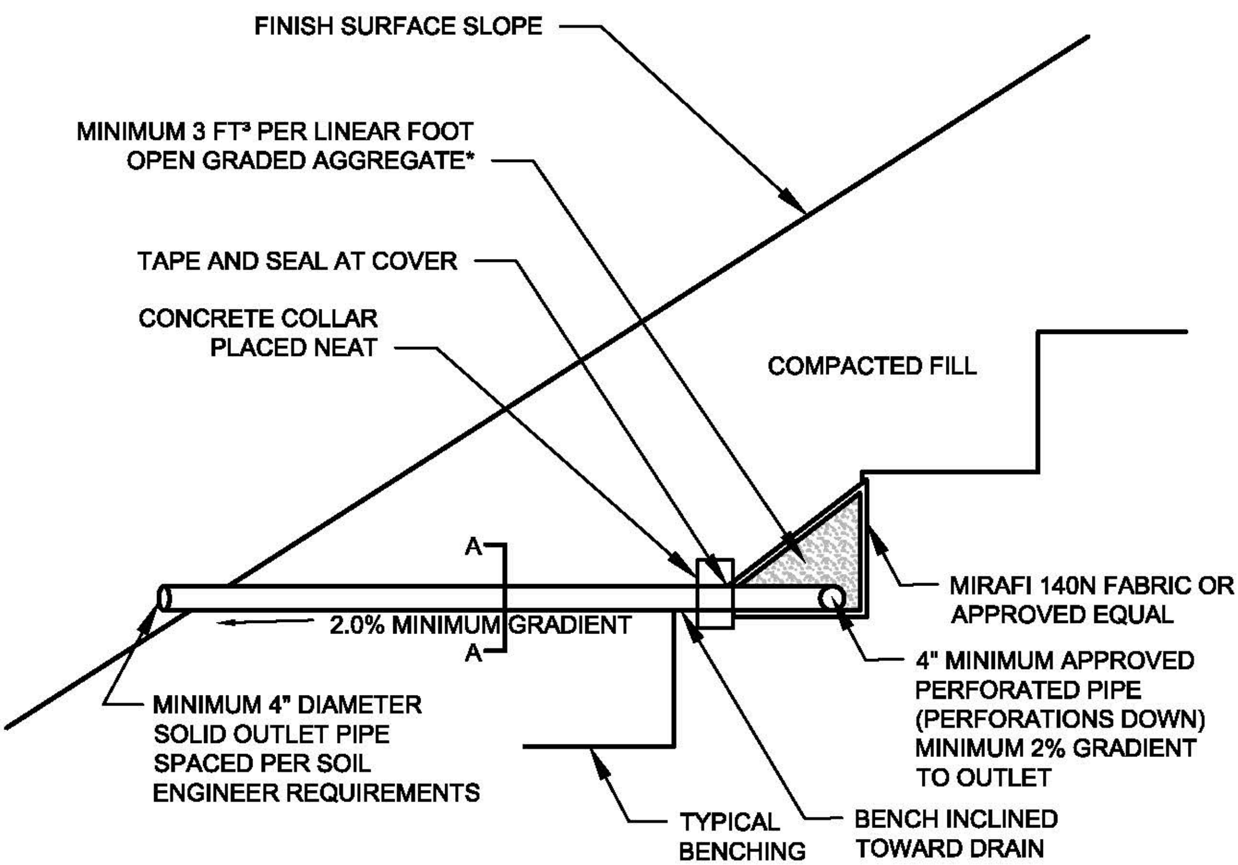
**APPROVED PIPE TYPE:
SCHEDULE 40 POLYVINYL CHLORIDE (P.V.C.) OR APPROVED EQUAL.
MINIMUM CRUSH STRENGTH 1000 PSI

*FILTER ROCK TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

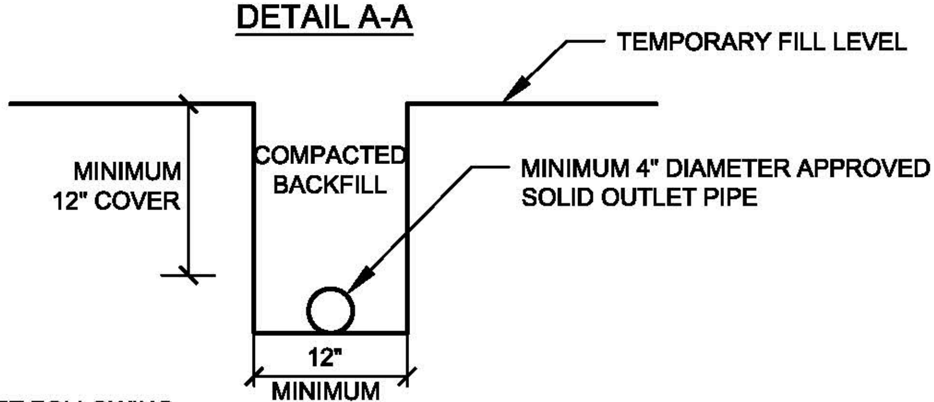
SIEVE SIZE	PERCENTAGE PASSING
1"	100
¾"	90-100
⅜"	40-100
NO. 4	25-40
NO. 30	5-15
NO. 50	0-7
NO. 200	0-3

NOT TO SCALE

TYPICAL BACKDRAIN DETAIL



DETAIL A-A

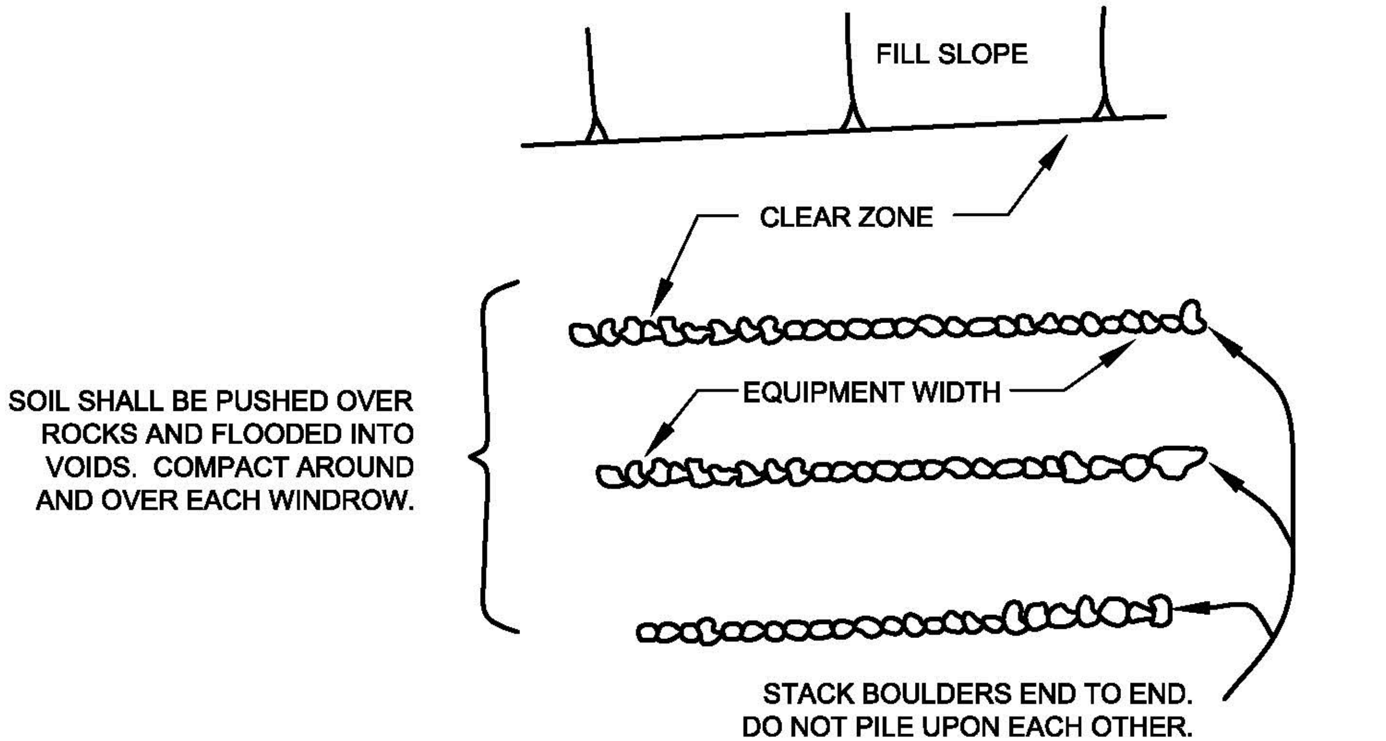


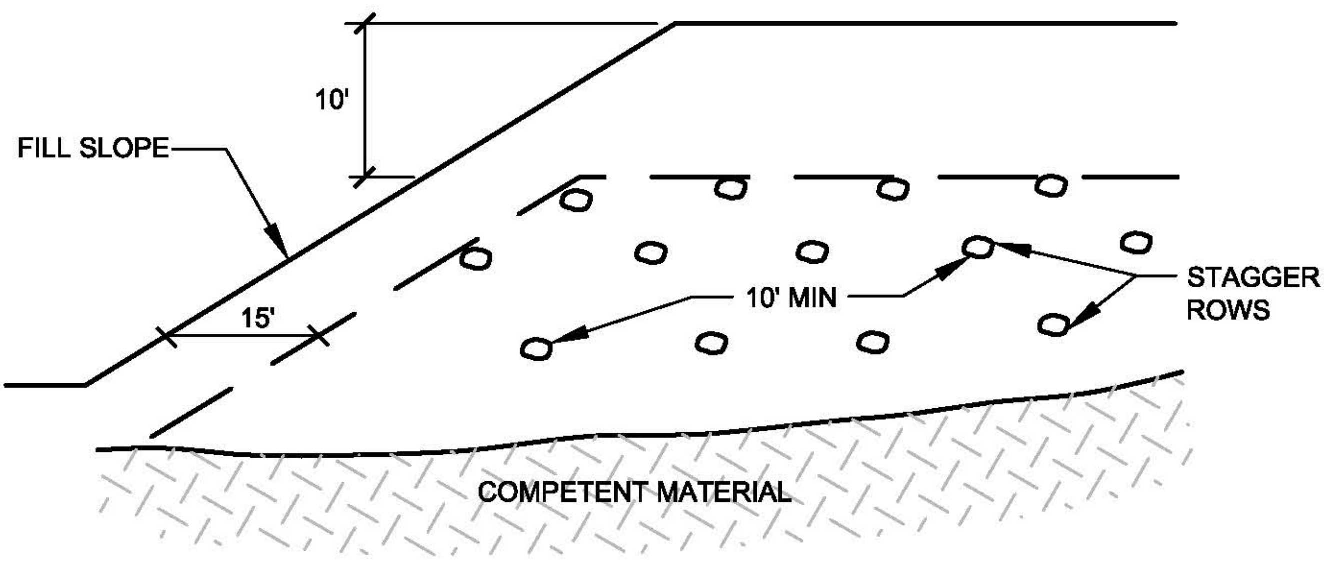
*NOTE: AGGREGATE TO MEET FOLLOWING SPECIFICATIONS OR APPROVED EQUAL:

SIEVE SIZE	PERCENTAGE PASSING
1 ½"	100
1"	5-40
¾"	0-17
⅜"	0-7
NO. 200	0-3

NOT TO SCALE

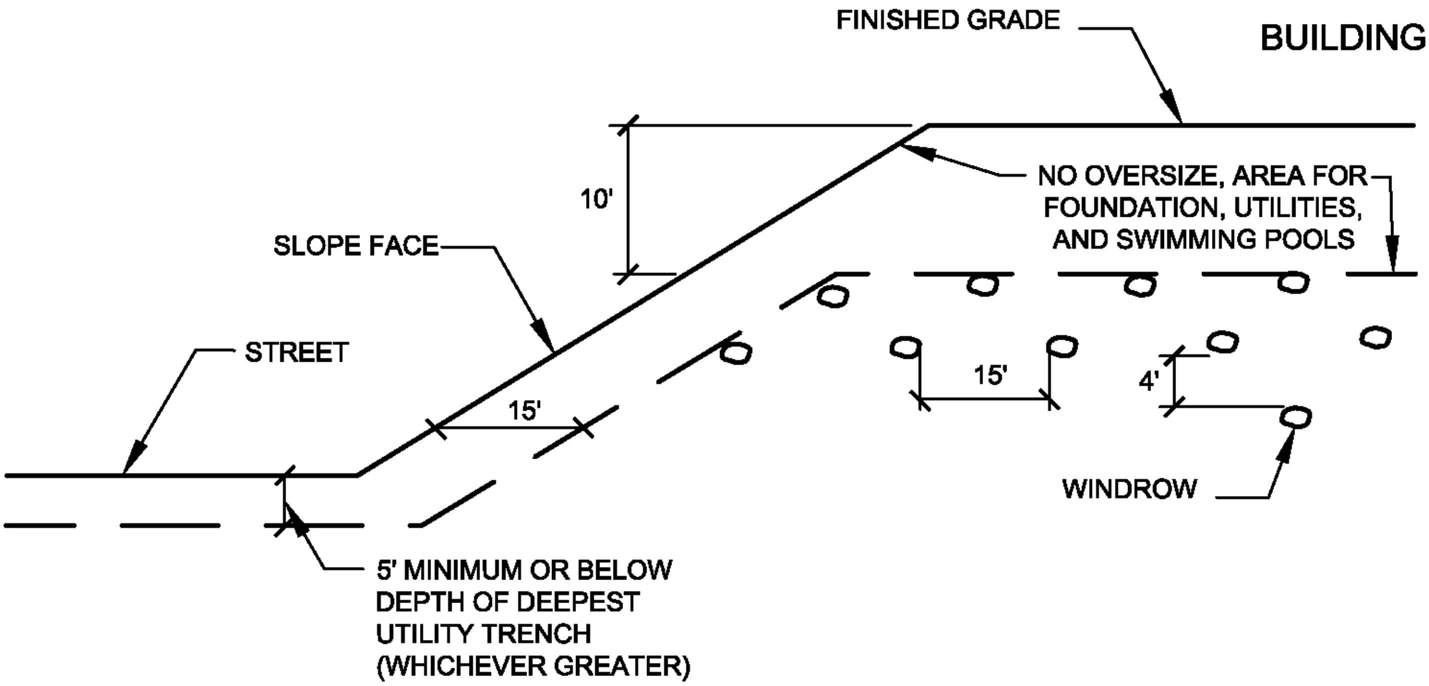
BACKDRAIN DETAIL (GEOFRABIC)



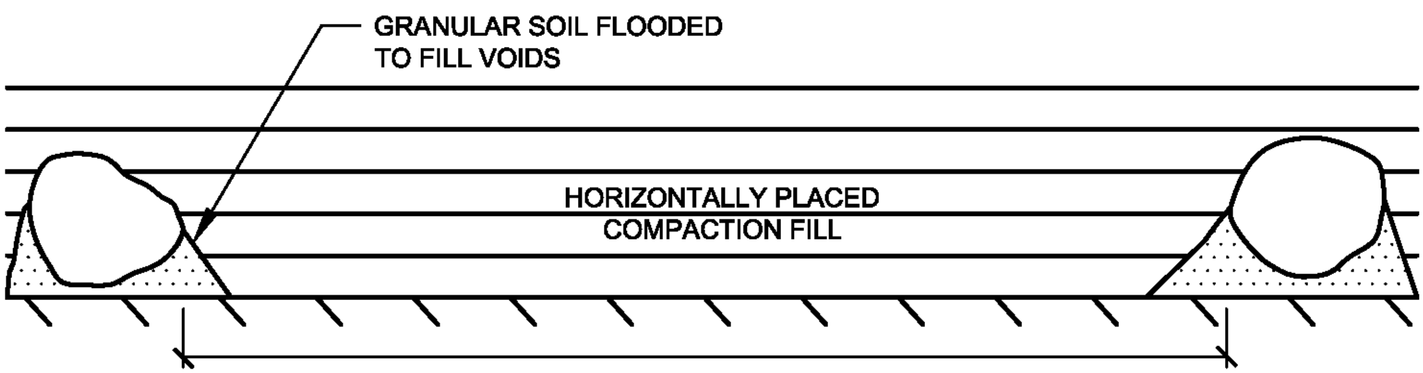


NOT TO SCALE

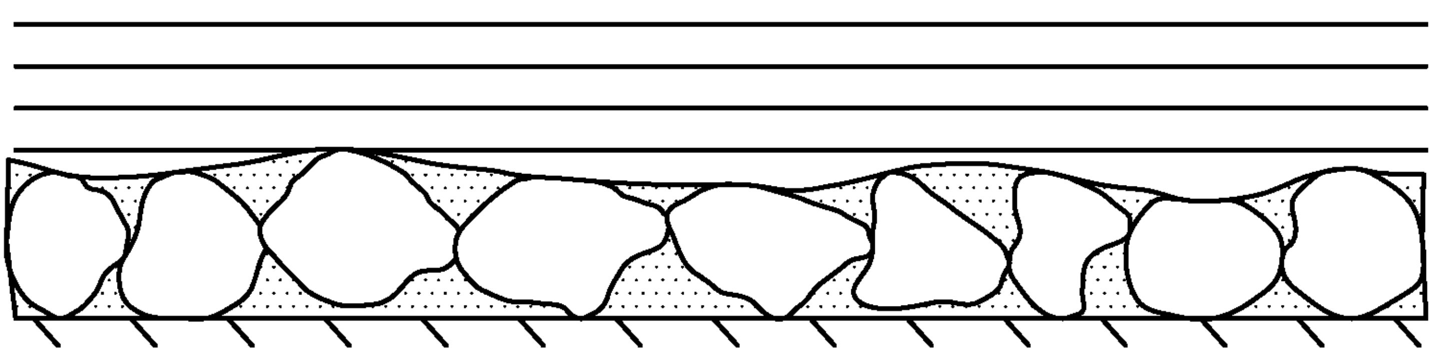
ROCK DISPOSAL DETAIL



TYPICAL WINDROW DETAIL (EDGE VIEW)



PROFILE VIEW

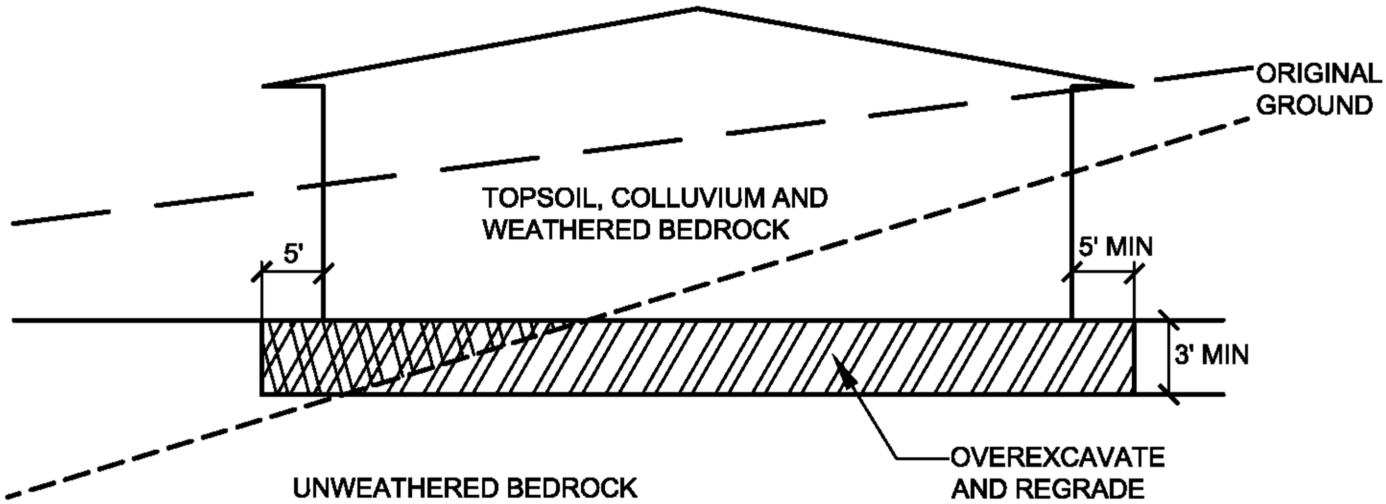


NOT TO SCALE

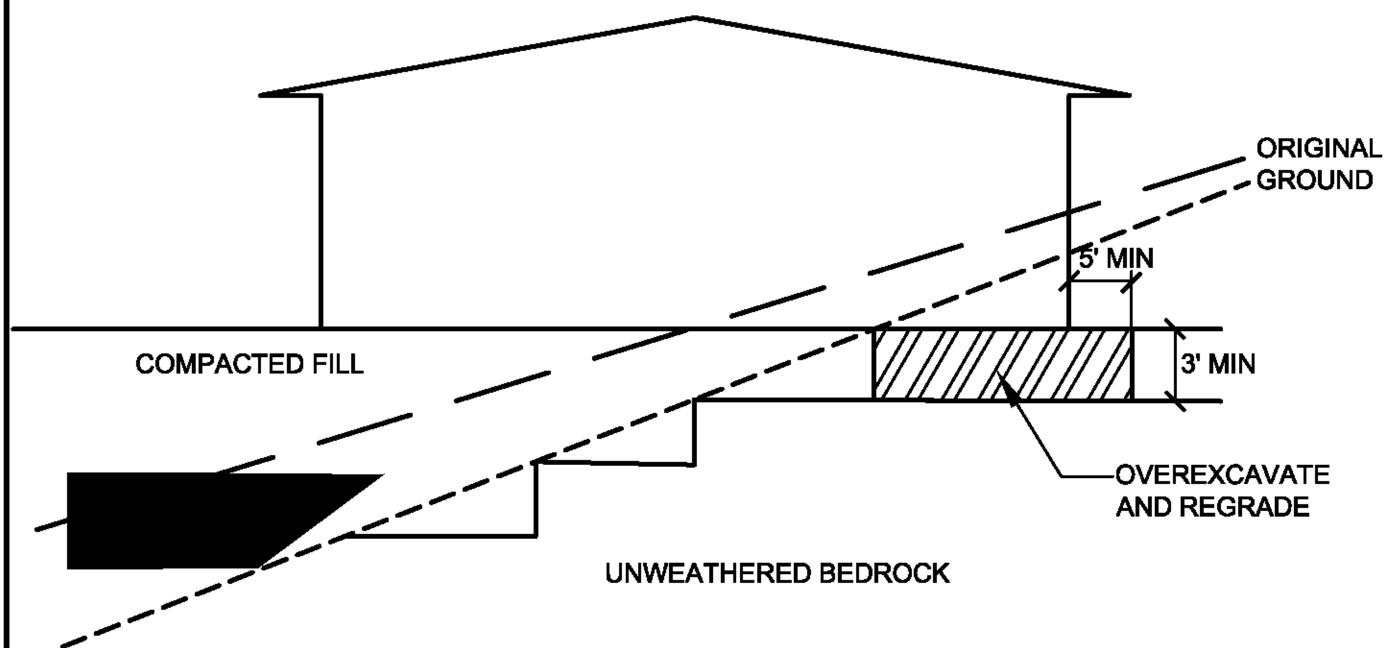
ROCK DISPOSAL DETAIL

GENERAL GRADING RECOMMENDATIONS

CUT LOT



CUT/FILL LOT (TRANSITION)



NOT TO SCALE

TRANSITION LOT DETAIL

APPENDIX E

C.4-1 WORKSHEET

APPENDIX E

Percolation Methodology

Water used to conduct the tests was supplied from an onsite water source. Weather conditions during the test were hot and sunny during both the presoaking and testing days. The percolation testing methodology was determined following the presoak period per the San Diego County guidelines. In summary, Case I conditions are determined by water remaining overnight following an initial four-hour presoak. Case II is considered a fast draining soil in which two columns of 12-14 inches of water percolate in less than 30 minutes during the second presoak period that is conducted after a minimum of 15 hours of the initial presoak period. Case III conditions result when no water remains in the test hole 15-30 hours after the initial four-hour presoak, but does not meet Case II conditions during the second presoak period. The presoak duration for all of the recent tests ranged from approximately 23 to 24 hours, which is within the SD DEH 15 to 30 hour presoak range. The approximate percolation test and boring locations are presented on Figure 2. The associated boring logs are included in Appendix B. Results of the recent percolation testing are presented in Tables E-1 through E-7 below.

Calculated Infiltration Rates

As per the City of San Diego BMP Design Manuel (January, 2018) infiltration rates are to be evaluated through the Porchet Method. The intent of the infiltration rate is to take into account bias inherent in percolation test bore hole sidewall infiltration as would not occur at a basin bottom where such sidewalls are not present.

The infiltration rate (It) is derived by the equation:

$$I_t = \frac{\Delta H \pi r2\ 60}{\Delta t(\pi r2 + 2\pi r H_{avg})} = \frac{\Delta H\ 60\ r}{\Delta t(r+2H_{avg})}$$

Where:

It = tested infiltration rate, inches/hour
ΔH = change in head over the time interval, inches
Δt = time interval, minutes
* r = effective radius of test hole
Havg = average head over the time interval, inches

PROTEA-VA SAN DIEGO 10-14209G

Percolation Field Data and Calculated Rates

P-1 — **Total Depth 61 inches**

Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minute	inches/hour
8:20:00	Initial	None	52.75	initial	initial		
8:50:00	0:30	"	52.75	52.88	0.13	0.0040	0.25
9:20:00	0:30	"	52.88	52.94	0.06	0.0020	0.13

P-2 — **Total Depth 36 inches**

Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minute	inches/hour
8:23:00	Initial	None	28.63	initial	initial		
8:53:00	0:30	"	28.63	28.81	0.19	0.060	0.38
9:23:00	0:30	"	28.81	28.88	0.06	0.0020	0.13

P-3 — **Total Depth 59 inches**

Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minutes	inches/hour
8:26:00	Initial	None	51.19	initial	initial		
8:56:00	0:30	"	51.19	51.25	0.06	0.0020	0.13
9:26:00	0:30	"	51.25	51.25	0.00	0.0000	0.00

P-4 — Total Depth 37 inches

Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minutes	inches/hour
8:30:00	Initial	None	29.56	initial	initial		
9:00:00	0:30	"	29.56	29.69	0.13	0.0043	0.26
9:30:00	0:30	"	29.69	29.75	0.06	0.0020	0.12

P-5 — Total Depth 60 inches

Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minutes	inches/hour
8:32:00	Initial	None	52.19	initial	initial		
9:02:00	0:30		52.19	52.25	0.06	0.021	0.13
9:32:00	0:30		52.25	52.31	0.06	0.021	0.13

P-6 — Total Depth 60 inches

Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minutes	inches/hour
8:35:00	Initial	None	51.50	initial	initial		
9:05:00	0:30	"	51.50	51.63	0.13	0.0042	0.25
9:35:00	0:30	"	51.63	51.69	0.06	0.0021	0.13

P-7 — Total Depth 61 inches

Time	Test Interval Time	Test Refill	Water Level Initial/Start	Water Level End/Final	Incremental Water Level Change	Percolation Rate	Percolation Rate
	(minutes)		Depth /Inches	Depth /Inches	(inches)	inches/minutes	inches/hour
8:40:00	Initial	None	53.19	initial	initial		
9:10:00	0:30	"	53.19	53.25	0.06	0.0021	0.13
9:40:00	0:30	"	53.25	53.25	0.00	0.00	0.00

8875 Aero Development 10-14209G

Prochet Infiltration Conversions Parameters

P-1

Time Interval,	Δt =	30	in
Final Depth of Water,	Df =	52.9375	in
Test Hole Radius,	r =	4	in
Initial Depth to Water,	D0 =	52.875	in
Total Depth of Test Hole,	DT =	61	in
	Ho =	8.125	in
	Hf =	8.0625	in
	ΔH = ΔD =	0.0625	in
	Havg =	8.09375	in
	It =	0.024768	in/hr

P-2

Time Interval,	Δt =	30	in
Final Depth of Water,	Df =	28.875	in
Test Hole Radius,	r =	4	in
Initial Depth to Water,	D0 =	28.8125	in
Total Depth of Test Hole,	DT =	36	in
	Ho =	7.1875	in
	Hf =	7.125	in
	ΔH = ΔD =	0.0625	in
	Havg =	7.15625	in
	It =	0.027304	in/hr

P-3

Time Interval,	Δt =	30	in
Final Depth of Water,	Df =	51.25	in
Test Hole Radius,	r =	4	in
Initial Depth to Water,	D0 =	51.25	in
Total Depth of Test Hole,	DT =	59	in
	Ho =	7.75	in
	Hf =	7.75	in
	ΔH = ΔD =	0	in
	Havg =	7.75	in
	It =	0	in/hr

P-4

Time Interval,	Δt =	30	in
Final Depth of Water,	Df =	29.75	in
Test Hole Radius,	r =	4	in
Initial Depth to Water,	D0 =	29.6875	in
Total Depth of Test Hole,	DT =	37	in
	Ho =	7.3125	in
	Hf =	7.25	in
	ΔH = ΔD =	0.0625	in
	Havg =	7.28125	in
	It =	0.026936	in/hr

P-5

Time Interval,	Δt =	30	in
Final Depth of Water,	Df =	52.3125	in
Test Hole Radius,	r =	4	in
Initial Depth to Water,	D0 =	52.25	in
Total Depth of Test Hole,	DT =	60	in
	Ho =	7.75	in
	Hf =	7.6875	in
	ΔH = ΔD =	0.0625	in
	Havg =	7.71875	in
	It =	0.025723	in/hr

P-6

Time Interval,	Δt =	30	in
Final Depth of Water,	Df =	51.6875	in
Test Hole Radius,	r =	4	in
Initial Depth to Water,	D0 =	51.625	in
Total Depth of Test Hole,	DT =	60	in
	Ho =	8.375	in
	Hf =	8.3125	in
	ΔH = ΔD =	0.0625	in
	Havg =	8.34375	in
	It =	0.024169	in/hr

P-7

Time Interval,	Δt =	30	in
Final Depth of Water,	Df =	53.25	in
Test Hole Radius,	r =	4	in
Initial Depth to Water,	D0 =	53.25	in
Total Depth of Test Hole,	DT =	61	in
	Ho =	7.75	in
	Hf =	7.75	in
	ΔH = ΔD =	0	in
	Havg =	7.75	in
	It =	0	in/hr

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition Based on Geotechnical Conditions[9]

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
8875 Aero Drive	Preliminary Screening-Initial Design
Criteria 1: Infiltration Rate Screening	

1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☑ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☐ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☑ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☑ No; full infiltration is not required. Answer "No" to Criteria 1 Result.
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☑ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.

[9] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[11] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☑ No; conduct appropriate number of tests.	
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☑ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.	
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☑ No; answer "No" to Criteria 1 Result.	
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☑ No; full infiltration is not required. Skip to Part 1 Result.	

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

As the project development is in initial design phase, specific potential BMP locations have not been finalized. As such, we conducted percolation test borings such that the entire site would be accurately characterized in terms of infiltration potential. Borehole percolation tests were completed in accordance with Couty of San Diego Department of Environmental Health (DEH), Version 2010 guidelines. The derived percolation rates were then converted to infiltration rates following the procedures of the Prochet Method, as recommended by the BMP Design Manual, Appendix D (February, 2018). In total, seven percolation test borings were advanced over the subject site. All percolation tests met Case 1 criteria, and were converted to infiltration rates. All infiltation rates were below the lower boundary rate for partial infiltration prior to appling a Safety factor of two to the results. As such, the site is classified as a "No Infiltration Condition" based on Class D type NCRS soil types that were confiremd by logs of borings and infiltration rates below 0.05 inches per hour.

However, there were no other geologic-geotechnical conditions with managable mitigation levels that would prohibited infiltration provided conformance with all structural setback criteria as defined in Appendix C of the City of San Diego BMP Design Manuel (January 2018) is ahered to. With the possible exception of expansive soils with Expansion Index values greater than 20.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions			Worksheet C.4-1: Form I-8A[10]
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A-1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	☑ Yes	☐ No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☑ Yes	☐ No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☑ Yes	☐ No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☑ Yes	☐ No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐ Yes	☑ No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☑Yes	☐No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☑Yes	☐No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☑Yes	☐No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☑Yes	☐No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☐Yes	☑No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐Yes	☑No

Summarize findings and basis; provide references to related reports or exhibits.

As discussed in the Geotechnical Preliminary Report , dated April 23, 2018 (attached), the site is classified as "No Infiltration condition base on NCRS soil type D and low infiltration rates below 0.05 inches per hour. However, there are no other geologic - geotechnical conditions that are considered non feasible for infiltration provided reasonable mitigation measures are employed and structural setback criteria are adhered to. With the possible exception of expansive soils with Expansion Index values greater than 20.

As the project development is in initial design phase, specific potential BMP locations have not been finalized. As such, we conducted percolation test borings such that the entire site would be accurately characterized in terms of infiltration potential. Borehole percolation tests were completed in accordance with County of San Diego Department of Environmental Health (DEH), Version 2010 guidelines. The derived percolation rates were then converted to infiltration rates following the procedures of the Prochet Method, as recommended by the BMP Design Manual, Appendix D (February, 2018). In total, seven percolation test borings were advanced over the subject site. All percolation tests met Case 1 criteria, and were converted to infiltration rates. All infiltation rates were below the lower boundary rate for partial infiltration prior to appling a Safety factor of two to the results. As such, the site is classified as a "No Infiltration Condition" based on Class D type NCRS soil types that were confiremd by logs of borings and infiltration rates below 0.05 inches per hour.

Part 1 Result – Full Infiltration Geotechnical Screening [12]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	☐Full infiltration Condition ☑Complete Part 2

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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
Criteria 3 : Infiltration Rate Screening	

3A	**NRCS Type C, D, or "urban/unclassified":** Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or "urban/unclassified" and corroborated by available site soil data? ☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☐ Yes; the site is mapped as D soils or "urban/unclassified" and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer "Yes" to Criteria 3 Result. ☑ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.
3B	**Infiltration Testing Result:** Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr? ☐ Yes; the site may support partial infiltration. Answer "Yes" to Criteria 3 Result. ☑ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer "No" to Criteria 3 Result.
Criteria 3 Result	Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP? ☐ Yes; Continue to Criteria 4. ☑ No: Skip to Part 2 Result.

Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate).

Review of the Natural Resources Conservation Service (NCRS) website, accessed on April 22, 2018, indicates that agricultural soil types in the site area are classified as Redding gravelly loam, gravelly clay, and gravelly clay loam (Map Unit-Rdc). The Rdc map unit, as defined by the NCRS, is assigned a hydrologic soil group (D), in accordance with the United States Department of Agriculture (U.S.D.A). These U.S.D.A soil types were confirmed with our geotechnical logs of borings, as described in Section 4.2.1 and 4.2.2 (within the above referenced report) that encountered Quaternary Very Old Paralic Deposits (Map Unit Qop- 8 of Kennedy and Tan, 2008), and Quaternary Previously Placed Fill consisting of re-worked formational deposits.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A-1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	☐Yes	☐No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐Yes	☐No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐Yes	☐No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1 If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐Yes	☐No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐Yes	☐No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐Yes	☐No
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐Yes	☐No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐Yes	☐No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐Yes	☐No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐Yes	☐No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐Yes	☐No
Summarize findings and basis; provide references to related reports or exhibits.			

Part 2 – Partial Infiltration Geotechnical Screening Result[13]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐Partial Infiltration Condition ☑No Infiltration Condition

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

Priority Development Project (PDP)
Storm Water Quality Management Plan (SWQMP)

HOSPITAL ANNEX RENOVATION

[Insert Permit Application Number]

[Insert Drawing Number (if applicable) and Internal Order Number (if applicable)]

☐ **Check if electing for offsite alternative compliance**

Engineer of Work:

REGISTERED PROFESSIONAL ENGINEER
LUCAS A. CORSBIE
No. 72588
CIVIL
STATE OF CALIFORNIA

09/20/18

Lucas Corsbie, PE #72588

Provide Wet Signature and Stamp Above Line

Prepared For:

Protea Properties

3262 Holiday Court, Suite 100

La Jolla, CA 92037

760-310-3742

Prepared By:

WARE MALCOMB

architecture | planning | interiors | branding | civil

Ware Malcomb

10 Edelman

Irvine, CA 92618

949-660-9128

Date:

09/20/2018

Approved by: City of San Diego Date

The City of SAN DIEGO

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Project Name:

Table of Contents

Project Name:

- Attachment 3: Structural BMP Maintenance Plan
    - Maintenance Agreement (Form DS-3247) (when applicable)
- Attachment 4: Copy of Plan Sheets Showing Permanent Storm Water BMPs
- Attachment 5: Project's Drainage Report
- Attachment 6: Project's Geotechnical and Groundwater Investigation Report

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

Certification Page

Project Name:
Permit Application

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.

Engineer of Work's Signature

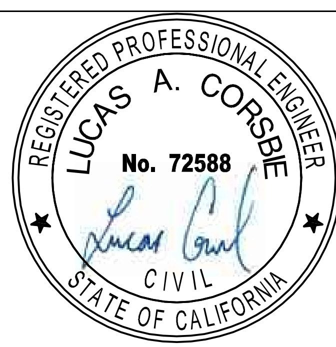
72588 — PE#

06/30/2020 — Expiration Date

Lucas Corsbie — Print Name

Ware Malcomb — Company

09/20/2018 — Date



Engineer's Stamp

Project Name:

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 plancheck comments is included. When applicable, insert response to plancheck comments.

Submittal Number	Date	Project Status	Changes
1	7/16/2018	**Preliminary Design/Planning/CEQA** **Final Design**	**Initial Submittal**
2	09/20/2018	**Preliminary Design/Planning/CEQA** **Final Design**	THIRD SUBMITTAL
3		**Preliminary Design/Planning/CEQA** **Final Design**	
4		**Preliminary Design/Planning/CEQA** **Final Design**	

Project Vicinity Map

Project Name: Hospital Annex Renovation
Permit Application TBD

City of San Diego Form DS-560
Storm Water Requirements Applicability Checklist

Attach DS-560 form.

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City of San Diego
Development Services
1222 First Ave., MS-302
San Diego, CA 92101
(619) 446-5000

Storm Water Requirements Applicability Checklist

FORM DS-560
OCTOBER 2016

Project Address: 8875 Aero Drive, San Diego, CA 92123

Project Number *(for City Use Only)*:

SECTION 1. Construction Storm Water BMP Requirements:

All construction sites are required to implement construction BMPs in accordance with the performance standards in the Storm Water Standards Manual. Some sites are additionally required to obtain coverage under the State Construction General Permit (CGP)[1] , which is administered by the State Water Resources Control Board.

For all projects complete PART A: If project is required to submit a SWPPP or WPCP, continue to PART B.

PART A: Determine Construction Phase Storm Water Requirements.

1. Is the project subject to California's statewide General NPDES permit for Storm Water Discharges Associated with Construction Activities, also known as the State Construction General Permit (CGP)? (Typically projects with land disturbance greater than or equal to 1 acre.)

   ❑ Yes; SWPPP required, skip questions 2-4 ❑ No; next question

2. Does the project propose construction or demolition activity, including but not limited to, clearing, grading, grubbing, excavation, or any other activity resulting in ground disturbance and contact with storm water runoff?

   ❑ Yes; WPCP required, skip 3-4 ❑ No; next question

3. Does the project propose routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility? (Projects such as pipeline/utility replacement)

   ❑ Yes; WPCP required, skip 4 ❑ No; next question

4. Does the project only include the following Permit types listed below?

   - Electrical Permit, Fire Alarm Permit, Fire Sprinkler Permit, Plumbing Permit, Sign Permit, Mechanical Permit, Spa Permit.
   - Individual Right of Way Permits that exclusively include only ONE of the following activities: water service, sewer lateral, or utility service.
   - Right of Way Permits with a project footprint less than 150 linear feet that exclusively include only ONE of the following activities: curb ramp, sidewalk and driveway apron replacement, pot holing, curb and gutter replacement, and retaining wall encroachments.

   ❑ Yes; no document required

Check one of the boxes below, and continue to PART B:

❑ If you checked "Yes" for question 1,
a SWPPP is REQUIRED. Continue to PART B

❑ If you checked "No" for question 1, and checked "Yes" for question 2 or 3,
a WPCP is REQUIRED. If the project proposes less than 5,000 square feet of ground disturbance AND has less than a 5-foot elevation change over the entire project area, a Minor WPCP may be required instead. **Continue to PART B.**

❑ If you checked "No" for all questions 1-3, and checked "Yes" for question 4
PART B **does not apply and no document is required. Continue to Section 2.**

1. More information on the City's construction BMP requirements as well as CGP requirements can be found at: www.sandiego.gov/stormwater/regulations/index.shtml

PART B: Determine Construction Site Priority

This prioritization must be completed within this form, noted on the plans, and included in the SWPPP or WPCP. The city reserves the right to adjust the priority of projects both before and after construction. Construction projects are assigned an inspection frequency based on if the project has a "high threat to water quality." The City has aligned the local definition of "high threat to water quality" to the risk determination approach of the State Construction General Permit (CGP). The CGP determines risk level based on project specific sediment risk and receiving water risk. Additional inspection is required for projects within the Areas of Special Biological Significance (ASBS) watershed. **NOTE:** The construction priority does **NOT** change construction BMP requirements that apply to projects; rather, it determines the frequency of inspections that will be conducted by city staff.

Complete PART B and continued to Section 2

1. ❑ **ASBS**

a. Projects located in the ASBS watershed.

2. ❑ **High Priority**

a. Projects 1 acre or more determined to be Risk Level 2 or Risk Level 3 per the Construction General Permit and not located in the ASBS watershed.

b. Projects 1 acre or more determined to be LUP Type 2 or LUP Type 3 per the Construction General Permit and not located in the ASBS watershed.

3. ❑ **Medium Priority**

a. Projects 1 acre or more but not subject to an ASBS or high priority designation.

b. Projects determined to be Risk Level 1 or LUP Type 1 per the Construction General Permit and not located in the ASBS watershed.

4. ❑ **Low Priority**

a. Projects requiring a Water Pollution Control Plan but not subject to ASBS, high, or medium priority designation.

SECTION 2. Permanent Storm Water BMP Requirements.

Additional information for determining the requirements is found in the Storm Water Standards Manual.

PART C: Determine if Not Subject to Permanent Storm Water Requirements.

Projects that are considered maintenance, or otherwise not categorized as "new development projects" or "redevelopment projects" according to the Storm Water Standards Manual are not subject to Permanent Storm Water BMPs.

If "yes" is checked for any number in Part C, proceed to Part F and check "Not Subject to Permanent Storm Water BMP Requirements".

If "no" is checked for all of the numbers in Part C continue to Part D.

1.	Does the project only include interior remodels and/or is the project entirely within an existing enclosed structure and does not have the potential to contact storm water?	❑ Yes ❑ No
2.	Does the project only include the construction of overhead or underground utilities without creating new impervious surfaces?	❑ Yes ❑ No
3.	Does the project fall under routine maintenance? Examples include, but are not limited to: roof or exterior structure surface replacement, resurfacing or reconfiguring surface parking lots or existing roadways without expanding the impervious footprint, and routine replacement of damaged pavement (grinding, overlay, and pothole repair).	❑ Yes ❑ No

Clear Page 2

PART D: PDP Exempt Requirements.

PDP Exempt projects are required to implement site design and source control BMPs.

If "yes" was checked for any questions in Part D, continue to Part F and check the box labeled "PDP Exempt."

If "no" was checked for all questions in Part D, continue to Part E.

1. **Does the project ONLY include new or retrofit sidewalks, bicycle lanes, or trails that:**
   - **Are designed and constructed to direct storm water runoff to adjacent vegetated areas, or other non-erodible permeable areas? Or;**
   - **Are designed and constructed to be hydraulically disconnected from paved streets and roads? Or;**
   - **Are designed and constructed with permeable pavements or surfaces in accordance with the Green Streets guidance in the City's Storm Water Standards manual?**

   ❑ Yes; PDP exempt requirements apply ❑ No; next question

2. Does the project ONLY include retrofitting or redeveloping existing paved alleys, streets or roads designed and constructed in accordance with the Green Streets guidance in the City's Storm Water Standards Manual?

   ❑ Yes; PDP exempt requirements apply ❑ No; project not exempt.

PART E: Determine if Project is a Priority Development Project (PDP).

Projects that match one of the definitions below are subject to additional requirements including preparation of a Storm Water Quality Management Plan (SWQMP).

If "yes" is checked for any number in PART E, continue to PART F and check the box labeled "Priority Development Project".

If "no" is checked for every number in PART E, continue to PART F and check the box labeled "Standard Development Project".

1. **New Development that creates 10,000 square feet or more of impervious surfaces collectively over the project site.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ❑ Yes ❑ No
2. **Redevelopment project that creates and/or replaces 5,000 square feet or more of impervious surfaces on an existing site of 10,000 square feet or more of impervious surfaces.** This includes commercial, industrial, residential, mixed-use, and public development projects on public or private land. ❑ Yes ❑ No
3. **New development or redevelopment of a restaurant.** Facilities that sell prepared foods and drinks for consumption, including stationary lunch counters and refreshment stands selling prepared foods and drinks for immediate consumption (SIC 5812), and where the land development creates and/or replace 5,000 square feet or more of impervious surface. ❑ Yes ❑ No
4. **New development or redevelopment on a hillside.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site) and where the development will grade on any natural slope that is twenty-five percent or greater. ❑ Yes ❑ No
5. **New development or redevelopment of a parking lot that creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site).** ❑ Yes ❑ No
6. **New development or redevelopment of streets, roads, highways, freeways, and driveways.** The project creates and/or replaces 5,000 square feet or more of impervious surface (collectively over the project site). ❑ Yes ❑ No

Clear Page 3

7. **New development or redevelopment discharging directly to an Environmentally Sensitive Area.** The project creates and/or replaces 2,500 square feet of impervious surface (collectively over project site), and discharges directly to an Environmentally Sensitive Area (ESA). "Discharging directly to" includes flow that is conveyed overland a distance of 200 feet or less from the project to the ESA, or conveyed in a pipe or open channel any distance as an isolated flow from the project to the ESA (i.e. not commingled with flows from adjacent lands). ❑ Yes ❑ No

8. **New development or redevelopment projects of a retail gasoline outlet (RGO) that create and/or replaces 5,000 square feet of impervious surface.** The development project meets the following criteria: (a) 5,000 square feet or more or (b) has a projected Average Daily Traffic (ADT) of 100 or more vehicles per day. ❑ Yes ❑ No

9. **New development or redevelopment projects of an automotive repair shops that creates and/or replaces 5,000 square feet or more of impervious surfaces.** Development projects categorized in any one of Standard Industrial Classification (SIC) codes 5013, 5014, 5541, 7532-7534, or 7536-7539. ❑ Yes ❑ No

10. **Other Pollutant Generating Project.** The project is not covered in the categories above, results in the disturbance of one or more acres of land and is expected to generate pollutants post construction, such as fertilizers and pesticides. This does not include projects creating less than 5,000 sf of impervious surface and where added landscaping does not require regular use of pesticides and fertilizers, such as slope stabilization using native plants. Calculation of the square footage of impervious surface need not include linear pathways that are for infrequent vehicle use, such as emergency maintenance access or bicycle pedestrian use, if they are built with pervious surfaces of if they sheet flow to surrounding pervious surfaces. ❑ Yes ❑ No

PART F: Select the appropriate category based on the outcomes of PART C through PART E.

1. The project is **NOT SUBJECT TO PERMANENT STORM WATER REQUIREMENTS**. ❑
2. The project is a **STANDARD DEVELOPMENT PROJECT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ❑
3. The project is **PDP EXEMPT**. Site design and source control BMP requirements apply. See the Storm Water Standards Manual for guidance. ❑
4. The project is a **PRIORITY DEVELOPMENT PROJECT**. Site design, source control, and structural pollutant control BMP requirements apply. See the Storm Water Standards Manual for guidance on determining if project requires a hydromodification plan management ❑

Name of Owner or Agent *(Please Print)*	Title
Signature	Date

Clear Page 4

Clear Form

Project Name:

Applicability of Permanent, Post-Construction Storm Water BMP Requirements		Form I-1
Project Identification		
Project Name: 8875 Aero Drive		
Permit Application Number:		Date: 4/23/2018
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 the manual 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 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, PDP, or PDP Exempt? To answer this item, see Section 1.4 of the manual in its entirety for guidance AND complete Form DS-560, 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:		

Project Name:

Form I-1 Page 2 of 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 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 (not required if prior lawful approval does not apply):		
Step 4. Do hydromodification control requirements apply? See Section 1.6 of the 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 not apply:		
Step 5. Does protection of critical coarse sediment yield areas apply? See Section 6.2 of the 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 not apply: No CCSYAs onsite or upstream.		

HMP Exemption Exhibit

Attach a HMP Exemption Exhibit that shows direct storm water runoff discharge from the project site to HMP exempt area. Include project area, applicable underground storm drain line and/or concrete lined channels, outfall information and exempt waterbody.
Reference applicable drawing number(s).

Exhibit must be provided on 11"x17" or larger paper.

NOT APPLICABLE

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Project Name:

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Protea Hospital Annex Renovation
Project Address	8875 Aero Drive San Diego, CA 92123
Assessor's Parcel Number(s) (APN(s))	4213000200 & 4213000300
Permit Application Number	TBD
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)	907.11
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	7.7 Acres (335,842 Square Feet)
Area to be disturbed by the project (Project Footprint)	3.18 Acres (132,125 Square Feet) **132,165 sf addressed by project BMPs due to area swap, see Attachment 1 Equivalent Area Swap Exhibit
Project Proposed Impervious Area (subset of Project Footprint)	2.58 Acres (112,290 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	0.46 Acres (19,875 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	-2 %

Project Name:

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 project proposes some additions to one existing commercial building as well as a parking structure where a surface parking lot exists today.
Existing Land Cover Includes (select all that apply): ☑Vegetative Cover ☐Non-Vegetated Pervious Areas ☑Impervious Areas Description / Additional Information: The site is fully developed including existing commercial buildings and surface parking lot.
Underlying Soil belongs to Hydrologic Soil Group (select all that apply): ☐NRCS Type A ☐NRCS Type B ☐NRCS Type C ☑NRCS Type D
Approximate Depth to Groundwater: ☐ Groundwater Depth < 5 feet ☐ 5 feet < Groundwater Depth < 10 feet ☐ 10 feet < Groundwater Depth < 20 feet ☐ Groundwater Depth > 20 feet
Existing Natural Hydrologic Features (select all that apply): ☐Watercourses ☐Seeps ☐Springs ☐Wetlands ☑None Description / Additional Information:

Project Name:

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.
Descriptions/Additional Information
The project is located in the San Diego River Watershed. There is no run-on to the site from adjacent properties. The site does not include any existing storm drain infrastructure, and surface flow exits the project site in three locations: 1. Runoff from the west portion of the site surface flows into a driveway to the west, as well as north into Aero Drive through curb cuts on the west side of a high point in Aero Drive. 2. Runoff from the northeast portion of the site surface flows into Aero Drive through curb cuts and out of a driveway on the east side of a high point in Aero Drive. 3. Runoff from the south east portion of the site drains through the existing wall located in the south east corner of the property and into the gutter of Ediwhar Avenue. Please refer to the Hydrology Report included in Attachment 5.

Project Name:

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 includes interior construction with minor external additions to an existing building and conversion of a portion of the surface parking lot into a parking structure. The majority of the site will remain in the existing condition, and existing drainage patterns will be maintained. In order to maintain existing drainage patterns, as well as minimize construction, and ongoing operations & maintenance costs and efforts, approximately half of the existing building roof will be included in BMP and hydromodification calculations in place of a an equivalent area of the proposed parking structure building. See Equivalent Areas Exhibit in Attachment 1.
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): Additional roof areas for the planned VA building additions will replace existing hardscape. Surface parking lot areas will be replaced with a parking structure.
List/describe proposed pervious features of the project (e.g., landscape areas): Biofiltration BMPs will be located in existing landscape areas. A vegetated landscape area will be added to the perimeter of the building.
Does the project include grading and changes to site topography? ☐ Yes ☐ No Description / Additional Information: Minor grading for accessibility and building drainage will be incorporated.

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 is a priority development project subject to hydromodification flow control requirements. Proposed site drainage will incorporate "no-infiltration" biofiltration BMPs and storage to meet pollution removal and flow control requirements. As less than 50% of the existing impervious areas will be replaced, the project will address only those areas being replaced and not the entire site. Generally, the project will not change existing drainage patterns.

See DMA Map in Attachment 1 and Drainage Study included in Attachment 5 for reference. DMA1 includes approximately half of proposed parking structure as well as the main driveway and north parking lot replacement, which will surface flow into BMP1 Biofiltration with Underdrain.

DMA2 includes half of the existing roof (equivalent area swap with DMA0) as well as the north proposed building addition. Roof drains from the existing and proposed building will be piped into the BMP2 Biofiltration with Underdrain.

DMA3 includes proposed hardscape and landscape which will surface flow into BMP3 Biofiltration with Underdrain located within the center median. BMP 3 is separated into two areas due to accessible truncated domes but will be hydraulically connected via pipe.

Each Biofiltration with Underdrain BMP will include a riser overflow and 2" outlet orifice. The overflow and orifice drains will be connected to an ADS StormTech detention BMP for hydromodification flow control. Since there is no storm drain in Aero Drive, an outlet structure with pump will discharge water to Aero Drive gutter at a rate less than 10% of the Q2 at POC1. Any flows greater than the Q10 in the BMPs will overflow to surface according to existing drainage patterns.

Project Name:

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): ☐Onsite 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 Description/Additional Information:

Project Name:

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) Three discharge locations: (1). Aero Drive at Sandrock Road: Surface flow is conveyed west, approx. 2,000 feet to catch basins just west of Afton Road. A 60" storm drain conveys water to a concrete-lined open channel that parallels the east edge of Interstate 805 before passing under to a natural channel. The natural channel flows south to a storm drain facility that conveys water into the San Diego River at approx. Mission Center Road. (2). Aero Drive at Driveway: Surface flow is conveyed 1,200 feet east to a catch basin that discharges into an unnamed natural channel. Flow in the natural channel is conveyed under developments via storm drain and into the San Diego River at Interstate 805. (3). Ediwhar Avenue: Surface flow is conveyed into catch basins located about 2,000 feet south and east in Hammond Drive. Storm drains convey flow into the same unnamed natural channel. Flow in the natural channel is conveyed under developments via storm drain and into the San Diego River at approx. Interstate 805. The San Diego River discharges to the Pacific Ocean just south of Mission Bay.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations San Diego River: MUN, AGR, IND, PROC, REC1, REC2, WARM, COLD, WILD
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations There are no ASBS receiving waters downstream of the project.
Provide distance from project outfall location to impaired or sensitive receiving waters The project and discharge locations are approximately six miles north of the San Diego River. The San Diego River is impaired for Enterococcus, Dissolved Oxygen, Manganese, Nitrogen, Phosphorus, Total Dissolved Solids, & Toxicity.
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 project and BMPs are approximately 600 feet to the west and approximately 6,000 feet to the northeast of an Environmentally Sensitive Area. The project and BMPs are approximately 400 feet to the west and 6,000 feet to the northeast of a Multi-Habitat Planning Area.

Project Name:

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 (Refer to Appendix K)	Pollutant(s)/Stressor(s) (Refer to Appendix K)	TMDLs/WQIP Highest Priority Pollutant (Refer to Table 1-4 in Chapter 1)
San Diego River (Lower)	Enterococcus	
	Fecal Coliform	
	Low Dissolved Oxygen	
	Manganese	
	Nitrogen	
	Phosphorus	
	Total Dissolved Solids	
	Toxicity	

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 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	☐	☑	☐

Project Name:

Form I-3B Page 9 of 11
Hydromodification Management Requirements
Do hydromodification management requirements apply (see Section 1.6)? ☐ 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): Note: If "No" answer has been selected the SWQMP must include an exhibit that shows the storm water conveyance system from the project site to an exempt water body. The exhibit should include details about the conveyance system and the outfall to the exempt water body.
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: The project is not located in a CCSYA and the project does not receive runon from a CCSYA. CCSYA Map is included in Attachment 2.

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.   POC1 is located at the curb cut to Aero Drive along the north edge of the property just east of the middle driveway.   See DMA Exhibit in Attachment 1 for reference.
Has a geomorphic assessment been performed for the receiving channel(s)?   ☐ No, the low flow threshold is $0.1Q_2$ (default low flow threshold)   ☐ Yes, the result is the low flow threshold is $0.1Q_2$ ☐ Yes, the result is the low flow threshold is $0.3Q_2$ ☐ Yes, the result is the low flow threshold is $0.5Q_2$ If a geomorphic assessment has been performed, provide title, date, and preparer:
Discussion / Additional Information: (optional)   Comparison between USGS Regression equations and SDHM3.1 using Kearny Mesa rain gauge. USGS regression equation results used for 0.1Q2 - Q10 flow duration limits in SDHM3.1 calculations. See notes included in the SDHM3.1 results in Attachment 2.

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. N/A
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. Geotechnical Report included in Attachment 6 indicates that the "no-infiltration" condition be used for Biofiltration BMP sizing.

Project Name:

Source Control BMP Checklist for PDPs			Form I-4B
Source Control BMPs			
All development projects must implement source control BMPs 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?**		
4.2.1 Prevention of Illicit Discharges into the MS4	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.1 not implemented:			
4.2.2 Storm Drain Stenciling or Signage	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.2 not implemented:			
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.3 not implemented: There are no outdoor materials storage areas.			
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.4 not implemented: There are no outdoor work areas.			
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.5 not implemented: Trash storage areas are indoor.			

Project Name:

Form I-4B Page 2 of 2			
Source Control Requirement	**Applied?**		
4.2.6 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 Facilities	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.2.6 not implemented. Clearly identify which sources of runoff pollutants are discussed. Justification must be provided for all "No" answers shown above.			

Project Name:

Site Design BMP Checklist for PDPs	Form I-5B		
Site Design BMPs			
All development projects must implement site design BMPs 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?**		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.1 not implemented: Project has no existing natural drainage pathways or areas.			
1-1 Are existing natural drainage pathways and hydrologic features mapped on the site map?	☐ Yes	☐ No	☐ N/A
1-2 Are trees implemented? If yes, are they shown on the site map?	☐ Yes	☐ No	☐ N/A
1-3 Implemented trees meet the design criteria in 4.3.1 Fact Sheet (e.g. soil volume, maximum credit, etc.)?	☐ Yes	☐ No	☐ N/A
1-4 Is tree credit volume calculated using Appendix B.2.2.1 and SD-1 Fact Sheet in Appendix E?	☐ Yes	☐ No	☐ N/A
4.3.2 Have natural areas, soils and vegetation been conserved?	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.2 not implemented:			

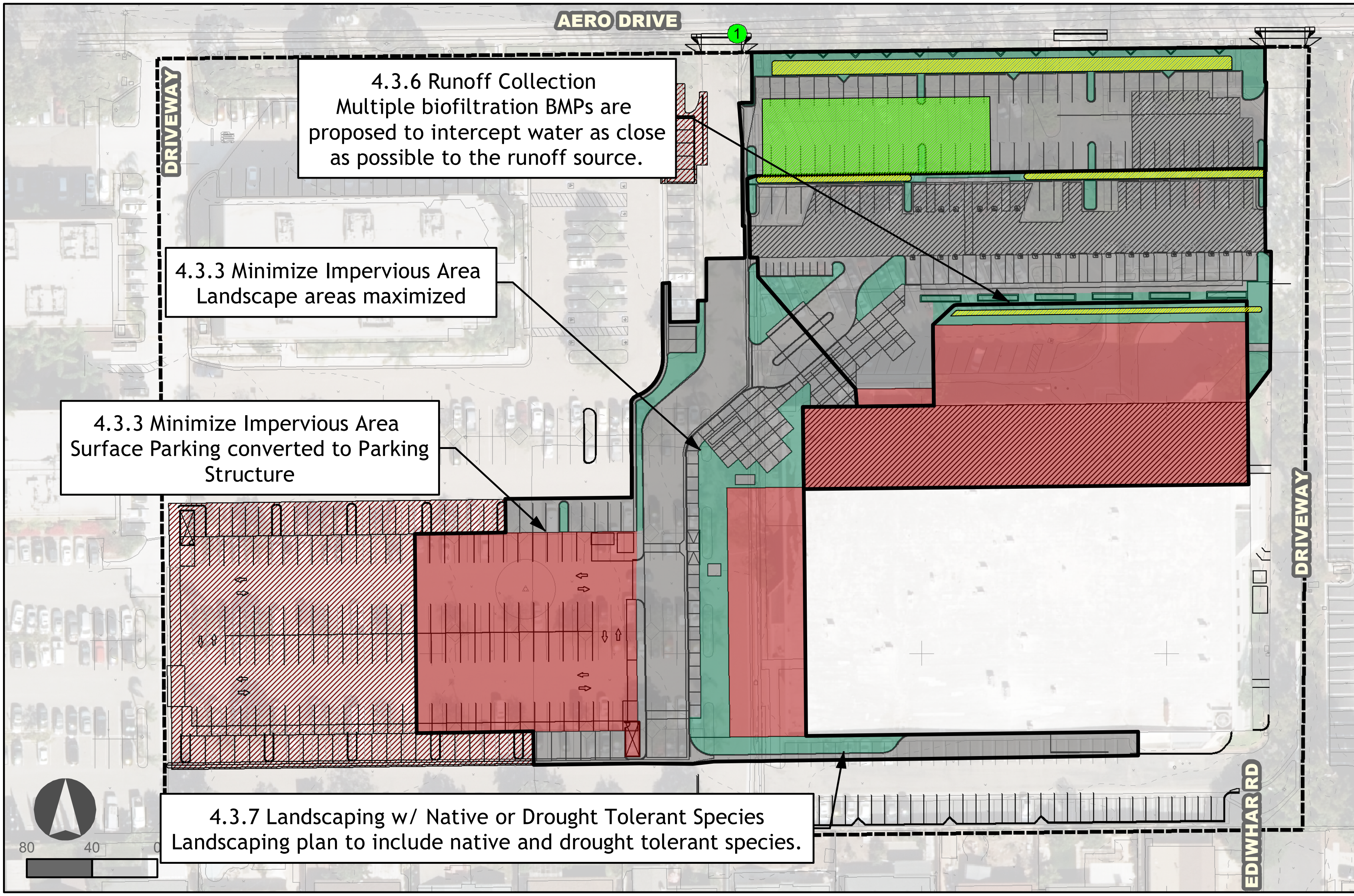
Project Name:

Form I-5B Page 2 of 4			
Site Design Requirement	**Applied?**		
4.3.3 Minimize Impervious Area	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.3 not implemented: Landscape areas maximized, surface parking converted into parking structure.			
4.3.4 Minimize Soil Compaction	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.4 not implemented: Previously impervious areas used for surface parking will be converted into landscape areas in locations around the perimeter of the building, reducing the amount of compacted soil.			
4.3.5 Impervious Area Dispersion	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.5 not implemented: The project is a re-purposed existing building including additions to the building facility as well as conversion of surface parking to parking structure.			
5-1 Is the pervious area receiving runon from impervious area identified on the site map?	☐ Yes	☐ No	☐ N/A
5-2 Does the pervious area satisfy the design criteria in 4.3.5 Fact Sheet in Appendix E (e.g. maximum slope, minimum length, etc.)	☐ Yes	☐ No	☐ N/A
5-3 Is impervious area dispersion credit volume calculated using Appendix B.2.1.1 and 4.3.5 Fact Sheet in Appendix E?	☐ Yes	☐ No	☐ N/A

Form I-5B Page 3 of 4			
Site Design Requirement	**Applied?**		
4.3.6 Runoff Collection	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.6 not implemented: Roof drains will be conveyed directly to biofiltration areas located as close as possible to the parking structure and building. Multiple biofiltration BMPs are proposed to intercept water as close as possible to the runoff source.			
6a-1 Are green roofs implemented in accordance with design criteria in 4.3.6A Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☐ N/A
6a-2 Is the green roof credit volume calculated using Appendix B.2.1.2 and 4.3.6A Fact Sheet in Appendix E?	☐ Yes	☐ No	☐ N/A
6b-1 Are permeable pavements implemented in accordance with design criteria in 4.3.6B Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☐ N/A
6b-2 Is the permeable pavement credit volume calculated using Appendix B.2.1.3 and 4.3.6B Fact Sheet in Appendix E?	☐ Yes	☐ No	☐ N/A
4.3.7 Landscaping with Native or Drought Tolerant Species	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.7 not implemented: Landscaping plan will include native plantings and drought tolerant species.			
4.3.8 Harvest and Use Precipitation	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.8 not implemented: See Worksheet B3.1: Harvest and Use Feasibility Screening			
8-1 Are rain barrels implemented in accordance with design criteria in 4.3.8 Fact Sheet? If yes, are they shown on the site map?	☐ Yes	☐ No	☐ N/A
8-2 Is the rain barrel credit volume calculated using Appendix B.2.2.2 and 4.3.8 Fact Sheet in Appendix E?	☐ Yes	☐ No	☐ N/A

Project Name:

Insert Site Map with all site design BMPs identified:



WARE MALCOMB

architecture | planning | interiors | branding | civil

Legend

- Biofiltration BMPS
- StormTech Chambers
- Concrete or Asphalt
- Landscape
- Roof
- Point of Compliance
- Areas to Remain - Equivalent Area
- Areas to be Replaced - Equivalent Area

PROTEA HOSPITAL ANNEX RENOVATION
8875 AERO DRIVE, SAN DIEGO
SITE DESIGN BMP MAP

Project Name:

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. Biofiltration BMPs with underdrain were selected because harvest and use is not feasible (see Form B.3-1 in Attachment 1) and because measured infiltration rates on site were between 0 and 0.023 in/hr and "No Infiltration" conditions is recommended by Geotechnical Engineer. BMPs were sized based on the No Infiltration Condition using worksheet B.5-1 for minimum surface area footprint. Each of the proposed Biofiltration BMPs 1 through 3 meet pollutant control sizing requirements. In addition, hydromodification flow controls are required. ADS StormTech Chamber underground storage will collect outflows from all Biofiltration BMPs. A pump will discharge detained water at a rate not to exceed 0.1Q2. (Continue on page 2 as necessary.)	

Project Name:

Form I-6 Page 1 of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No.	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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) X 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 discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only X 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	Clint Fowler Protea Properties 3262 Holiday Court, Suite 100 La Jolla, CA 92037 760-310-3742
Who will be the final owner of this BMP?	
Who will maintain this BMP into perpetuity?	
What is the funding mechanism for maintenance?	

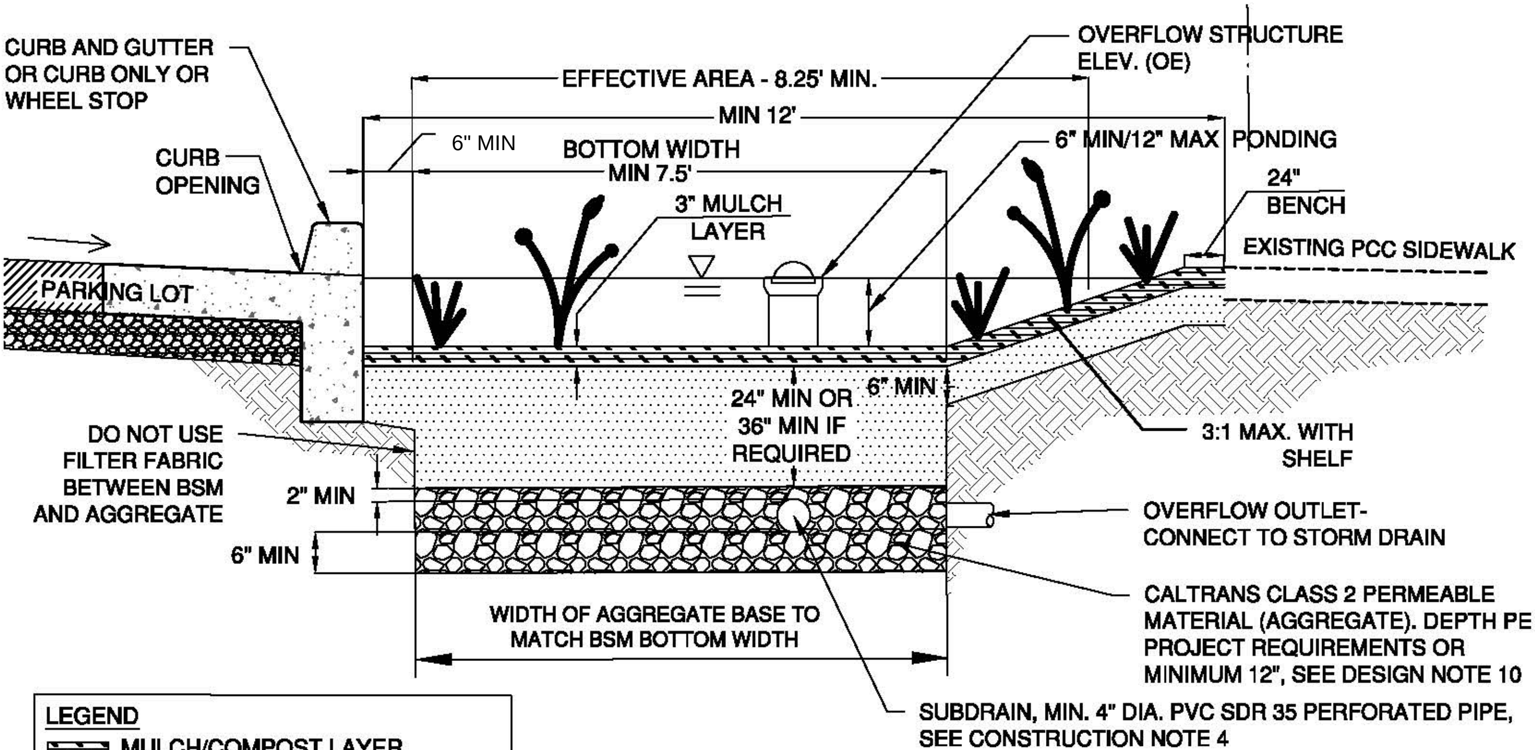
Project Name:

Form I-6 Page 2 of (Copy as many as needed)
Structural BMP ID No.
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

The City of SAN DIEGO	Project Name	PROTEA VA SAN DIEGO	
	BMP ID	1	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	

1	Area draining to the BMP	76,477	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.77	
3	85th percentile 24-hour rainfall depth	0.6	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	2948	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	27	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	3	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	18	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	17.4	inches
15	Total Depth Treated [Line 13 + Line 14]	35.4	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	4422	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	1499	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	2211	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	1525	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	1769	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	1769	sq. ft.
23	Provided BMP Footprint	1983	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

AERO DRIVE BMP 1
$L=281'$, $W_{eff}=8.25'$
EFFECTIVE AREA @ 0.25' POND=2394 sf



LEGEND
- MULCH/COMPOST LAYER (SEE DESIGN NOTE 12)
- BIORETENTION SOIL MEDIA (BSM)
- AGGREGATE
- NATIVE SOIL
- ASPHALT PAVEMENT
- CONCRETE

SECTION A
□IOFILTRATION PLANTER ALONG AERO DRI□E

NOT TO SCALE

Project Name:

Form I-6 Page 3 of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No.	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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 discussion section below) ☐ 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	Clint Fowler Protea Properties 3262 Holiday Court, Suite 100 La Jolla, CA 92037 760-310-3742
Who will be the final owner of this BMP?	
Who will maintain this BMP into perpetuity?	
What is the funding mechanism for maintenance?	

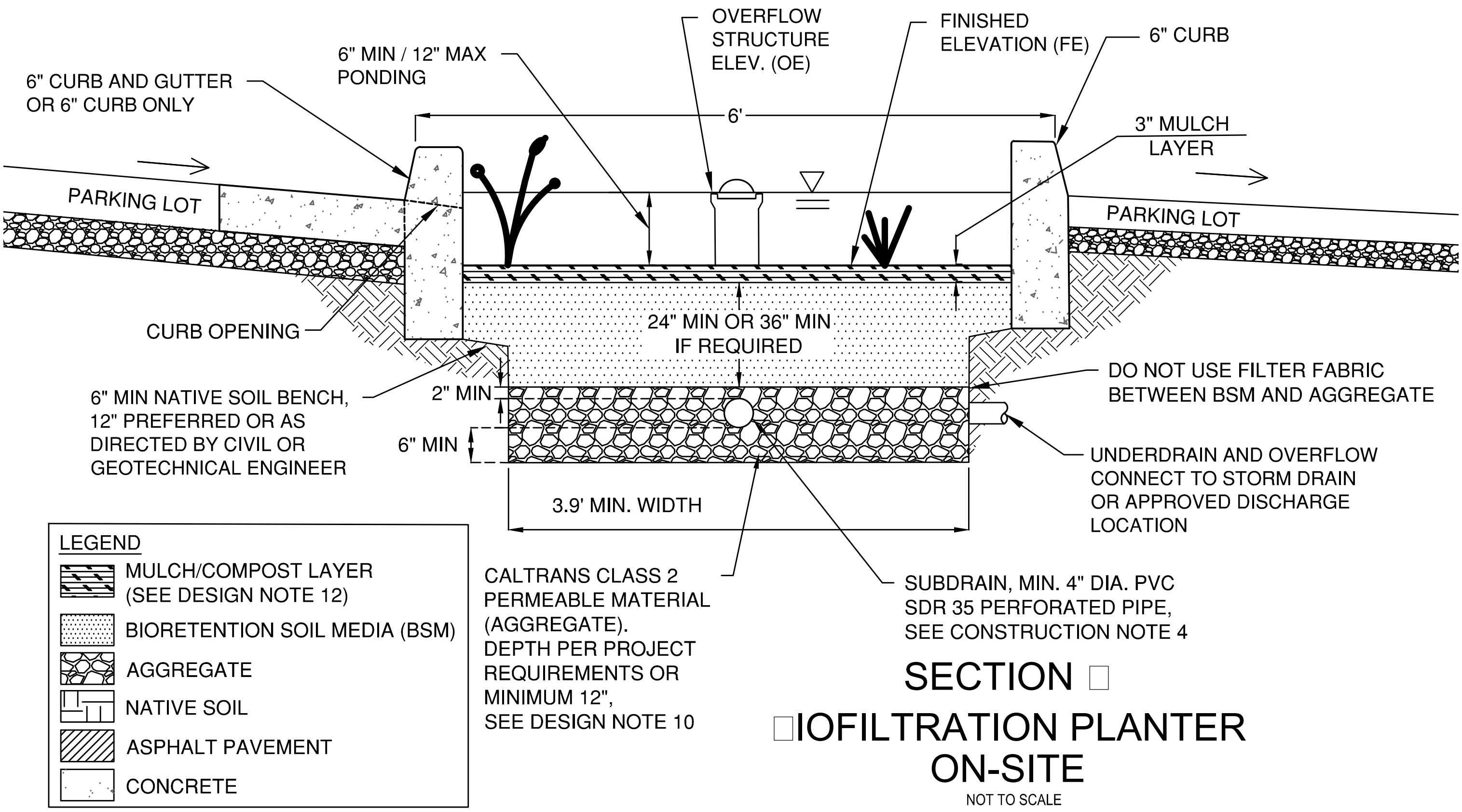
Project Name:

Form I-6 Page 4 of (Copy as many as needed)
Structural BMP ID No.
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

The City of SAN DIEGO

Project Name		PROTEA VA SAN DIEGO	
BMP ID		2	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	25,531	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.83	
3	85th percentile 24-hour rainfall depth	0.6	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	1058	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	27	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	3	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	18	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	17.4	inches
15	Total Depth Treated [Line 13 + Line 14]	35.4	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	1587	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	538	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	793	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	547	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	635	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	635	sq. ft.
23	Provided BMP Footprint	637	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

BUILDING FRONT BMP 2
L=188', W_{eff}=3.5'
EFFECTIVE AREA @ 0.25' POND=652 sf



SECTION □
□IOFILTRATION PLANTER
ON-SITE
NOT TO SCALE

Project Name:

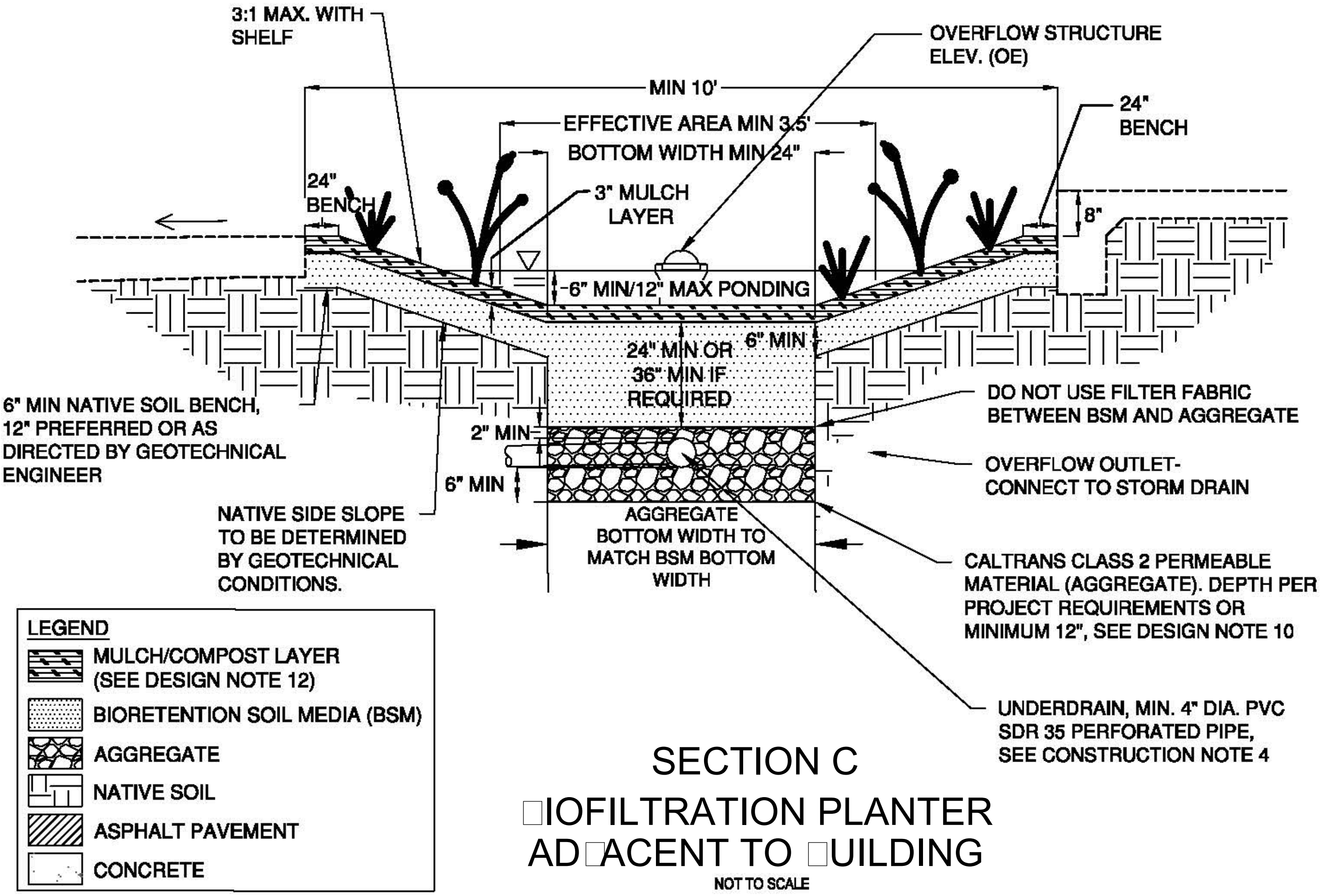
Form I-6 Page 5 of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No.	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ Retention by infiltration basin (INF-1) ☐ Retention by bioretention (INF-2) ☐ Retention by permeable pavement (INF-3) ☐ Partial retention by biofiltration with partial retention (PR-1) X 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 discussion section below) ☐ Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only ☐ Hydromodification control only X 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	Clint Fowler Protea Properties 3262 Holiday Court, Suite 100 La Jolla, CA 92037 760-310-3742
Who will be the final owner of this BMP?	
Who will maintain this BMP into perpetuity?	
What is the funding mechanism for maintenance?	

Project Name:

Form I-6 Page 6 of (Copy as many as needed)
Structural BMP ID No.
Construction Plan Sheet No.
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

The City of SAN DIEGO	Project Name	PROTEA VA SAN DIEGO	
	BMP ID	3	
Sizing Method for Pollutant Removal Criteria		**Worksheet B.5-1**	
1	Area draining to the BMP	30,157	sq. ft.
2	Adjusted runoff factor for drainage area (Refer to Appendix B.1 and B.2)	0.76	
3	85th percentile 24-hour rainfall depth	0.6	inches
4	Design capture volume [Line 1 x Line 2 x (Line 3/12)]	1146	cu. ft.
BMP Parameters			
5	Surface ponding [6 inch minimum, 12 inch maximum]	6	inches
6	Media thickness [18 inches minimum], also add mulch layer and washed ASTM 33 fine aggregate sand thickness to this line for sizing calculations	27	inches
7	Aggregate storage (also add ASTM No 8 stone) above underdrain invert (12 inches typical) – use 0 inches if the aggregate is not over the entire bottom surface area	12	inches
8	Aggregate storage below underdrain invert (3 inches minimum) – use 0 inches if the aggregate is not over the entire bottom surface area	3	inches
9	Freely drained pore storage of the media	0.2	in/in
10	Porosity of aggregate storage	0.4	in/in
11	Media filtration rate to be used for sizing (maximum filtration rate of 5 in/hr. with no outlet control; if the filtration rate is controlled by the outlet use the outlet controlled rate (includes infiltration into the soil and flow rate through the outlet structure) which will be less than 5 in/hr.)	3	in/hr.
Baseline Calculations			
12	Allowable routing time for sizing	6	hours
13	Depth filtered during storm [Line 11 x Line 12]	18	inches
14	Depth of Detention Storage [Line 5 + (Line 6 x Line 9) + (Line 7 x Line 10) + (Line 8 x Line 10)]	17.4	inches
15	Total Depth Treated [Line 13 + Line 14]	35.4	inches
Option 1 – Biofilter 1.5 times the DCV			
16	Required biofiltered volume [1.5 x Line 4]	1720	cu. ft.
17	Required Footprint [Line 16/ Line 15] x 12	583	sq. ft.
Option 2 - Store 0.75 of remaining DCV in pores and ponding			
18	Required Storage (surface + pores) Volume [0.75 x Line 4]	860	cu. ft.
19	Required Footprint [Line 18/ Line 14] x 12	593	sq. ft.
Footprint of the BMP			
20	BMP Footprint Sizing Factor (Default 0.03 or an alternative minimum footprint sizing factor from Line 11 in Worksheet B.5-4)	0.03	
21	Minimum BMP Footprint [Line 1 x Line 2 x Line 20]	688	sq. ft.
22	Footprint of the BMP = Maximum(Minimum(Line 17, Line 19), Line 21)	688	sq. ft.
23	Provided BMP Footprint	1005	sq. ft.
24	Is Line 23 ≥ Line 22?	**Yes, Performance Standard is Met**	

PARKING MEDIAN BMP 3
L=241', W_{eff}=3.8'
EFFECTIVE AREA @ 0.25' POND=1,005 sf



SECTION C
BIOFILTRATION PLANTER ADJACENT TO BUILDING
NOT TO SCALE

Project Name:

Form I-6 Page 7 of (Copy as many as needed)	
Structural BMP Summary Information	
Structural BMP ID No.	
Construction Plan Sheet No.	
Type of Structural BMP: ☐ Retention by harvest and use (e.g. HU-1, cistern) ☐ 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 discussion section below) X Detention pond or vault for hydromodification management ☐ Other (describe in discussion section below)	
Purpose: ☐ Pollutant control only X 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	Clint Fowler Protea Properties 3262 Holiday Court, Suite 100 La Jolla, CA 92037 760-310-3742
Who will be the final owner of this BMP?	
Who will maintain this BMP into perpetuity?	
What is the funding mechanism for maintenance?	

Project Name:

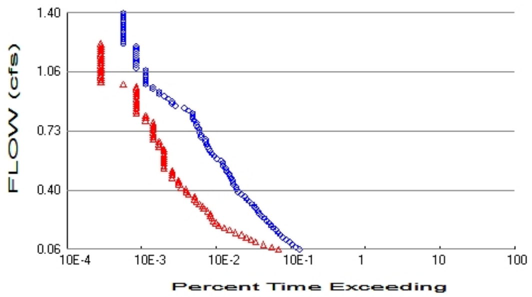
Form I-6 Page 8 of (Copy as many as needed)
Structural BMP ID No.
Construction Plan Sheet No.

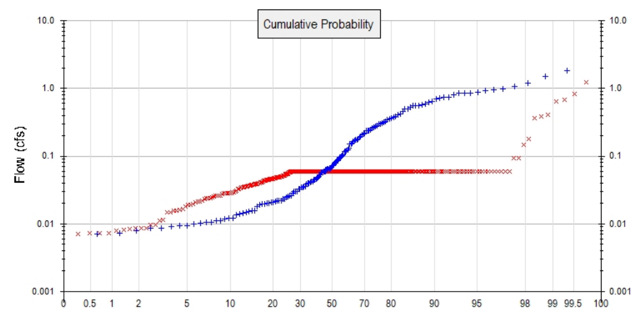
Discussion (as needed; must include worksheets showing BMP sizing calculations in the SWQMPs):

Hydromodification flow control calculations completed using SDHM3.1 to verify StormTech sizing. Please see appendix for detailed calculations.

Analysis Results

POC 1





+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.18
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.482
Total Impervious Area: 2.553

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.569401
5 year	0.865501
10 year	1.061956
25 year	1.560772

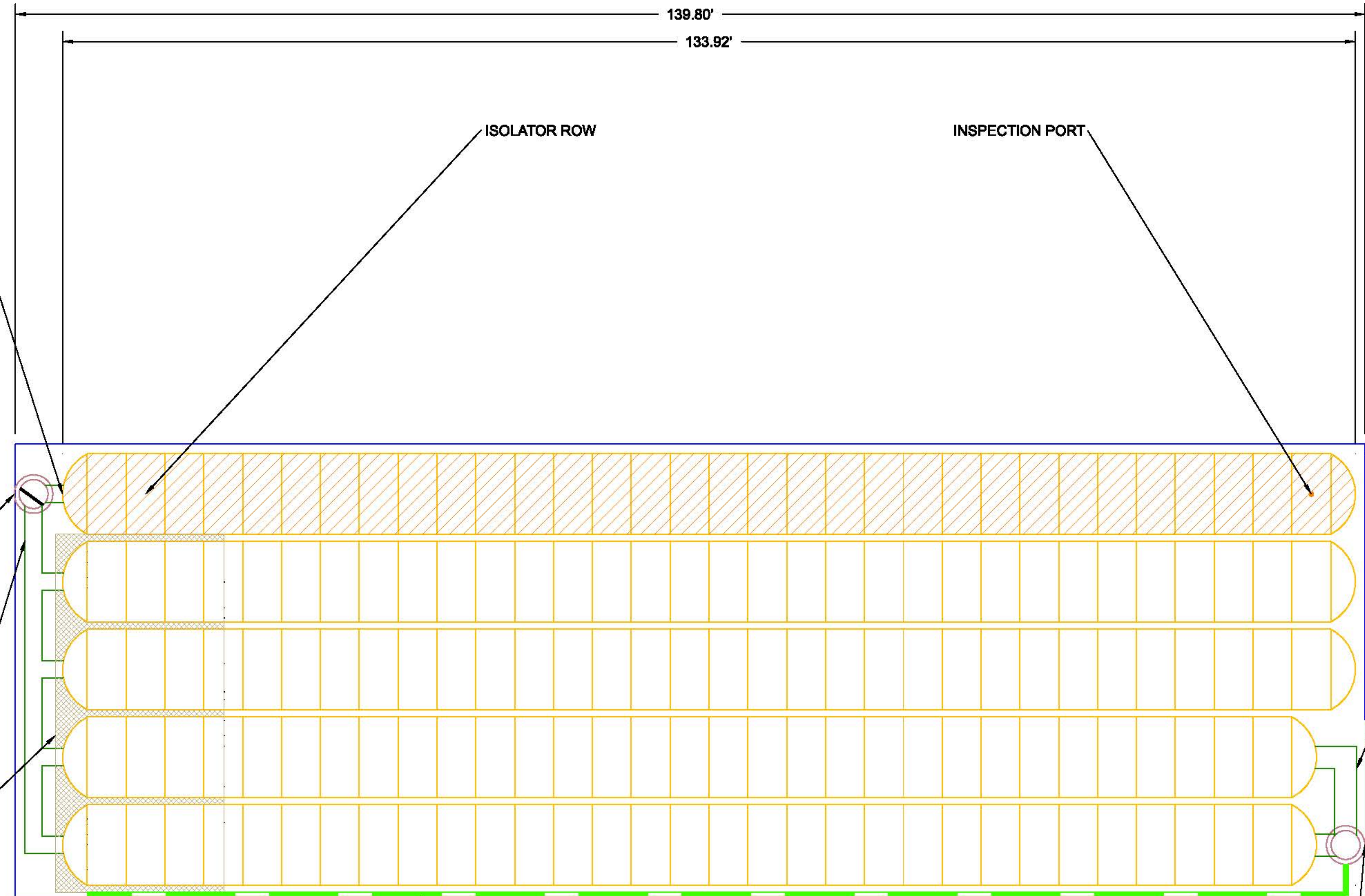
Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.06
5 year	0.171565
10 year	0.609883
25 year	0.91116

CONCEPTUAL LAYOUT

(158) STORMTECH MC-4500 CHAMBERS
(10) STORMTECH MC-4500 END CAPS
INSTALLED WITH 12 " COVER STONE, 9 " BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 28159 CF
AREA OF SYSTEM: 6610 FT²
PERIMETER OF SYSTEM: 374 FT

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION



REV	DRW	CHK	DESCRIPTION

SD
SD
DATE: 04/24/2018
DRAWN: JC
PROJECT #: Tool
CHECKED: —

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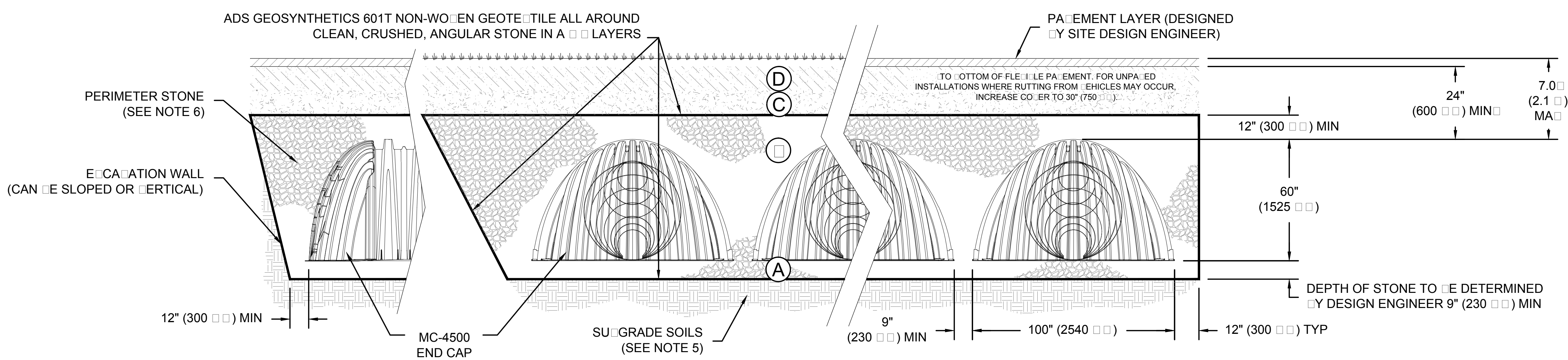
1-800-733-7473

NOT TO SCALE

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION □DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE □OTTOM OF FLE□I□LE PA□EMENT OR UNPA□ED FINISHED GRADE A□O□E. NOTE THAT PA□EMENT SU□□ASE MAY □E PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATI□E SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PA□EMENT SU□GRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PA□ED INSTALLATIONS MAY HA□E STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EM□EDMENT STONE ('□' LAYER) TO 24" (600 □□) A□O□E THE TOP OF THE CHAM□ER. NOTE THAT PA□EMENT SU□□ASE MAY □E A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MI□TURES, <35% FINES OR PROCESSED AGGREGATE. MOST PA□EMENT SU□□ASE MATERIALS CAN □E USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	□EGIN COMPACTIONS AFTER 24" (600 □□) OF MATERIAL O□ER THE CHAM□ERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 □□) MA□ LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATI□E DENSITY FOR PROCESSED AGGREGATE MATERIALS.
□	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAM□ERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER A□O□E.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SI□E DISTRI□UTION □ETWEEN 3/4-2 INCH (20-50 □□)	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL □ELOW CHAM□ERS FROM THE SU□GRADE UP TO THE FOOT (□OTTOM) OF THE CHAM□ER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SI□E DISTRI□UTION □ETWEEN 3/4-2 INCH (20-50 □□)	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIE□E A FLAT SURFACE. [2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO □E CLEAN, CRUSHED, ANGULAR. FOR E□AMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 □□) (MA□) LIFTS USING TWO FULL CO□ERAGES WITH A □I□RATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY □E COMPROMISED □Y COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY □E ACHIE□ED □Y RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. MC-4500 CHAM□ERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAM□ERS".
2. MC-4500 CHAM□ERS SHALL □E DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAM□ERS".
3. "ACCEPTA□LE FILL MATERIALS" TA□LE A□O□E PRO□IDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EM□EDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSI□LE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAM□ERS FOR THIS PRO□ECT.
5. THE SITE DESIGN ENGINEER IS RESPONSI□LE FOR ASSESSING THE □EARING RESISTANCE (ALLOWA□LE □EARING CAPACITY) OF THE SU□GRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF E□PECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST □E E□TENDED HORI□ONTALLY TO THE E□CA□ATION WALL FOR □OTH □ERTICAL AND SLOPED E□CA□ATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN □E PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PA□EMENT SU□□ASE SOILS CAN □E USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

DATE: 04/24/2018 DRAWN: JC
PRO□ECT #: CHECKED: ---
SD SD
RE□ DRW CHK DESCRIPTION

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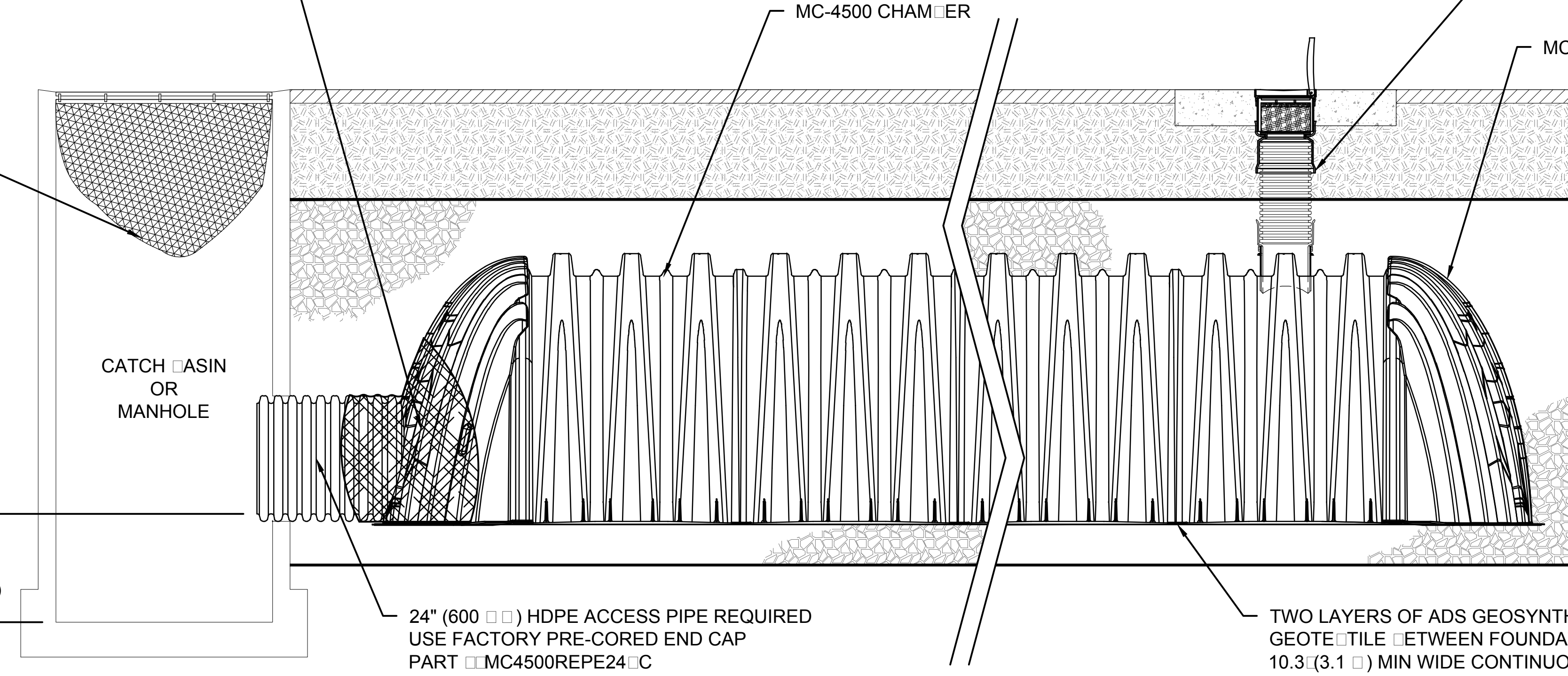


MC-4500 ISOLATOR ROW DETAIL

NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT

A. INSPECTION PORTS (IF PRESENT)
- A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
- A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
- A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
- A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
- A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

B. ALL ISOLATOR ROWS
- B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
- B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
  - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
  - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
- B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS

A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED

B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN

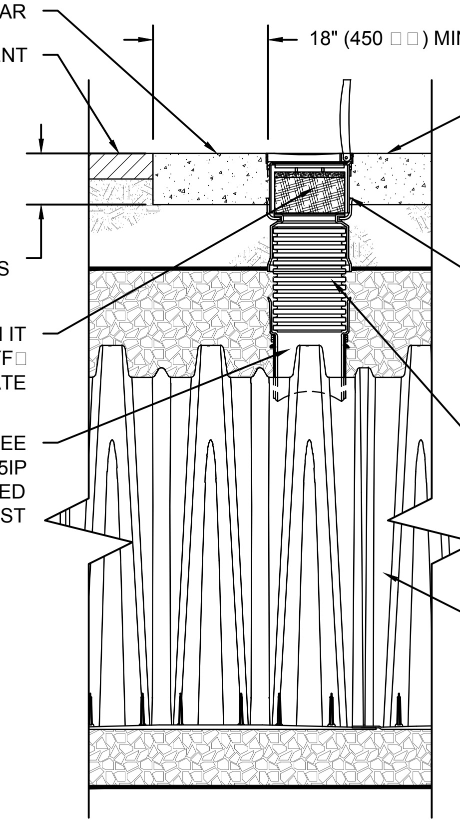
C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



MC-4500 6" INSPECTION PORT DETAIL

NTS

REV	DRW	CHK	DESCRIPTION

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SD
SD

DATE: 04/24/2018 DRAWN: JC

PROJECT #: CHECKED: ---

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Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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Project Name:

Indicate which Items are Included:

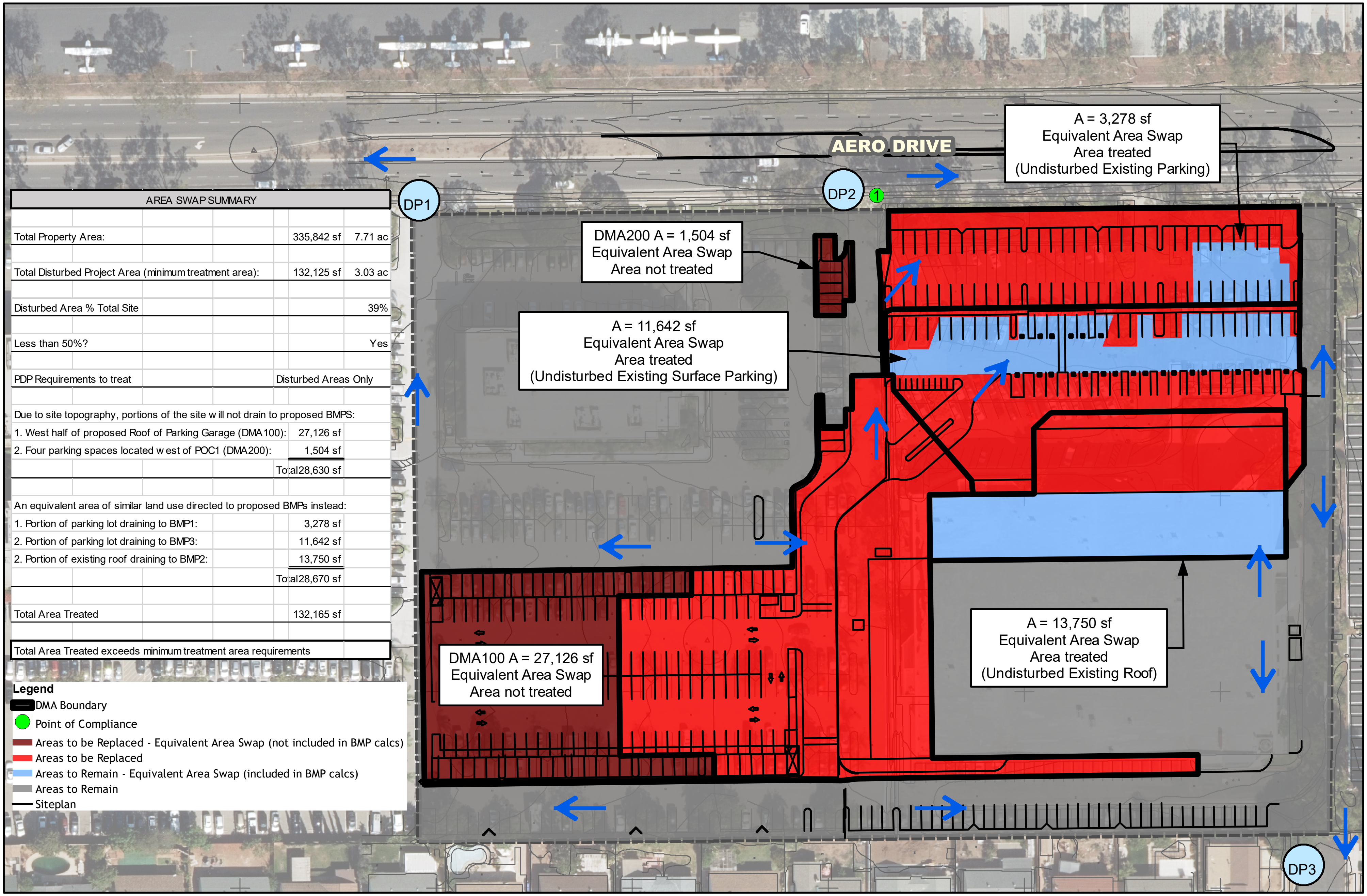
Attachment Sequence	Contents	Checklist
Attachment 1a	DMA Exhibit (Required) See DMA Exhibit Checklist.	☒ Included
Attachment 1b	Tabular Summary of DMAs Showing DMA ID matching DMA Exhibit, DMA Area, and DMA Type (Required)* *Provide table in this Attachment OR on DMA Exhibit in Attachment 1a	☑ Included 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	Infiltration Feasibility Information. Contents of Attachment 1d depend on the infiltration condition: • No Infiltration Condition: ○ Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*) ○ Form I-8A (optional) ○ Form I-8B (optional) • Partial Infiltration Condition: ○ Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*) ○ Form I-8A ○ Form I-8B • Full Infiltration Condition: ○ Form I-8A ○ Form I-8B ○ Worksheet C.4-3 ○ Form I-9 Refer to Appendices C and D of the BMP Design Manual for guidance.	SEE SECTION 5 OF INCLUDED GEOTECHNICAL REPORT ☑ 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) (NA)
- ☑ Critical coarse sediment yield areas to be protected (NA)
- ☑ 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, size/detail, and include cross-section)

AREA SWAP SUMMARY		
Total Property Area:	335,842 sf	7.71 ac
Total Disturbed Project Area (minimum treatment area):	132,125 sf	3.03 ac
Disturbed Area % Total Site		39%
Less than 50%?		Yes
PDP Requirements to treat	Disturbed Areas Only	
Due to site topography, portions of the site will not drain to proposed BMPS:		
1. West half of proposed Roof of Parking Garage (DMA100):	27,126 sf	
2. Four parking spaces located west of POC1 (DMA200):	1,504 sf	
	Total 28,630 sf	
An equivalent area of similar land use directed to proposed BMPs instead:		
1. Portion of parking lot draining to BMP1:	3,278 sf	
2. Portion of parking lot draining to BMP3:	11,642 sf	
2. Portion of existing roof draining to BMP2:	13,750 sf	
	Total 28,670 sf	
Total Area Treated	132,165 sf	
Total Area Treated exceeds minimum treatment area requirements		



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PROTEA HOSPITAL ANNEX RENOVATION
8875 AERO DRIVE, SAN DIEGO
EQUIVALENT AREAS EXHIBIT

DMA & BMP ID	ALL PROJECT			
Soil Type	D		Area (sf)	Area (ac)
DMA Type	Drains to BMP	Concrete or Asphalt	64,589	1.48
Structural BMP	Biofiltration Basin	Landscape	19,875	0.46
Impervious Area	112,290 sf	Roof	47,701	1.10
Impervious %	85%			
Weighted Runoff C	0.78	**Total Area**	**132,165**	**3.03**

DMA & BMP ID	1			
Soil Type	D		Area (sf)	Area (ac)
DMA Type	Drains to BMP			
Structural BMP	BioFil Basin	Concrete or Asphalt	40,233	0.92
Impervious Area	64,141 sf	Landscape	12,336	0.28
Impervious %	84%	Roof	23,908	0.55
Weighted Runoff C	0.77	**Total Area**	**76,477**	**1.76**

DMA & BMP ID	2			
Soil Type	D		Area (sf)	Area (ac)
DMA Type	Drains to BMP			
Structural BMP	BioFil Basin	Concrete or Asphalt	0	0.00
Impervious Area	23,258 sf	Landscape	2,274	0.05
Impervious %	91%	Roof	23,258	0.53
Weighted Runoff C	0.83	**Total Area**	**25,531**	**0.59**

DMA & BMP ID	3			
Soil Type	D			
DMA Type	Drains to BMP		Area (sf)	Area (ac)
Structural BMP	BioFil Basin	Concrete or Asphalt	24,356	0.56
Impervious Area	24,892 sf	Landscape	5,265	0.12
Impervious %	83%	Roof	536	0.01
Weighted Runoff C	0.76	**Total Area**	**30,157**	**0.69**

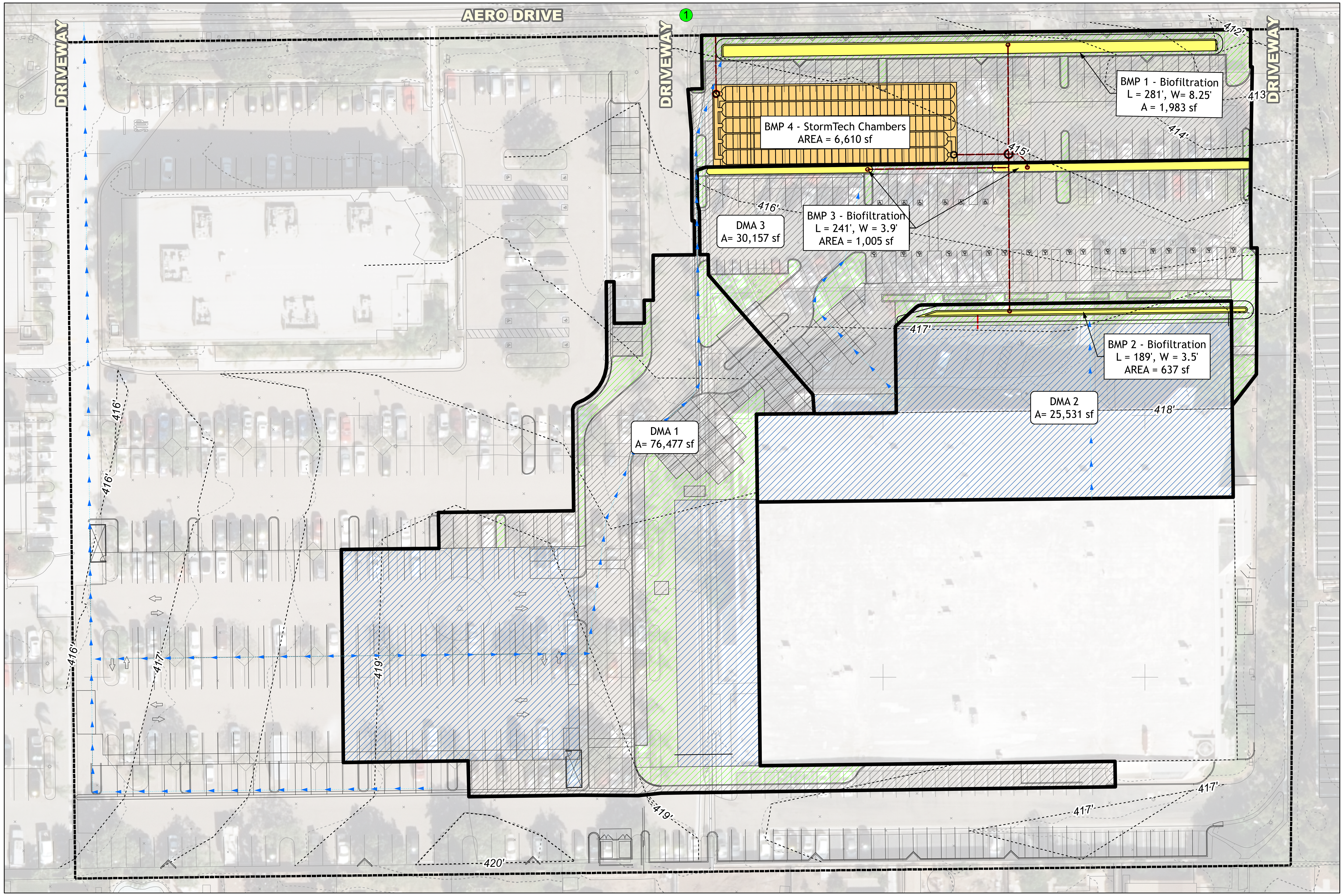
LEGEND

- Flowpath
- DMA Boundary
- Storm Drain
- Biofiltration BMPS
- StormTech Chambers

LANDUSE DESCRIPTION

- Concrete or Asphalt
- Landscape
- Roof
- Point of Compliance

NOTES:
1. GROUNDWATER WAS NOT ENCOUNTERED AT 18 FEET BELOW GROUND SURFACE.



BMP	BMP TYPE	MIN AREA	DESIGNED AREA	RISER	ORIFICE
1	BF-1 w/ Underdrain	1,769	1,983	12", Flat	2", 3" offset
2	BF-1 w/ Underdrain	635	637	12", Flat	2", 3" offset
3	BF-1 w/ Underdrain	688	1,005	12", Flat	2", 3" offset
4	ADS StormTech 4500	NA	6,610	12", Rect Notched (H=0.25', W=0.5')	NA - pumped

Tabular Summary of DMAs							Worksheet B-1		
DMA Unique Identifier	Area (SF	Impervious Area (SF	% Imp	HSG	Area Weighted Runoff Coefficient	DCV (cubic feet)	Treated By (BMP ID)	Pollutant Control Type	Drains to (POC ID)
1	76,477	64,141	84	D	0.77	2,948	BMP1	BIOFILTRATION	1
2	25,531	23,258	91	D	0.83	1,058	BMP2	BIOFILTRATION	1
3	30,157	24,892	83	D	0.76	1,146	BMP3	BIOFILTRATION	1
4	132,165	112,291	85	D	0.78	5,152	BMP4	HYDROMOD	1

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PROTEA HOSPITAL ANNEX RENOVATION SAN DIEGO
8875 AERO DRIVE, SAN DIEGO
DMA MAP

Project Name:

Tabular Summary of DMAs								Worksheet B-1	
DMA Unique Identifier	Area (SF	Impervious Area (SF	% Imp	HSG	Area Weighted Runoff Coefficient	DCV (cubic feet)	Treated By (BMP ID)	Pollutant Control Type	Drains to (POC ID)
1	76,477	64,141	84	D	0.77	2,948	BMP1	BIOFILTRATION	1
2	25,531	23,258	91	D	0.83	1,058	BMP2	BIOFILTRATION	1
3	30,157	24,892	83	D	0.76	1,146	BMP3	BIOFILTRATION	1
4	132,165	112,291	85	D	0.78	5,152	BMP4	HYDROMOD	1
Summary of DMA Information (Must match project description and SWQMP Narrative)									
No. of DMAs	Total DMA Area (acres)	Total Impervious Area (acres)	% Imp		Area Weighted Runoff Coefficient	Total DCV (cubic feet)	Total Area Treated (acres)		No. of POCs
3	132,165	112,291	85		0.78	5,152	132,165		1

Where: DMA = Drainage Management Area; Imp = Imperviousness; HSG = Hydrologic Soil Group; DCV= Design Capture Volume; BMP = Best Management Practice; POC = Point of Compliance; ID = identifier; No. = Number

Worksheet B.3-1: Harvest and Use Feasibility Screening

Harvest and Use Feasibility Screening	Worsksheet B.3-1

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:____________________

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]

Harvest and Use Urinal Flushing Demand Calculations			
Office Use Factor =		7	gallons per person per 24 hrs
Office Visitor Factor =		1.4	
Office Capacity =		500	people
36-hr demand = 1.5 * (7 gal/PP per 24 hrs) * 500 EMPL * 1.4 VF * 0.1337 gal/cf			
=	982.70	cf per 36 hrs	
Irrigation Demand			
Modified ETWU = Etowet x [[Sum(PF x HA) / IE] + SLA] x .015			
Etowet =		1470.00	gal/irrigated acre per 36 hrs
PF =		0.50	
HA =		0.50	ac
IE =		0.90	
SLA =		NA	
ETWU =	6.13	gallons per 36 hrs	
	0.82	cf per 36 hours	
Total Use =		983.51	cf per 36 hrs

3. Calculate the DCV using worksheet B-2.1.
[Provide a results here]

DCV=		6293	cf

3a. Is the 36-hour demand greater than or equal to the DCV?	3b. Is the 36-hour demand greater than 0.25DCV but less than the full DCV?	3c. Is the 36-hour demand less than 0.25DCV?
Yes / (No) ⇨	Yes / (No) ⇨	(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.

Note: 36-hour demand calculations are for feasibility analysis only, once the feasibility analysis is complete the applicant may be allowed to use a different drawdown time provided they meet the 80 percent of average annual (long term) runoff volume performance standard.

Worksheet C.4-1: Categorization of Infiltration Feasibility Condition Based on Geotechnical Conditions[9]

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		**Project Phase:**
8875 Aero Drive		Preliminary Screening-Initial Design
Criteria 1: Infiltration Rate Screening		
1A	Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper Type A or B and corroborated by available site soil data[11]? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result or continue to Step 1B if the applicant elects to perform infiltration testing. ☐ No; the mapped soil types are A or B but is not corroborated by available site soil data (continue to Step 1B). ☑ No; the mapped soil types are C, D, or "urban/unclassified" and is corroborated by available site soil data. Answer "No" to Criteria 1 Result. ☐ No; the mapped soil types are C, D, or "urban/unclassified" but is not corroborated by available site soil data (continue to Step 1B).	
1B	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1? ☑ Yes; Continue to Step 1C. ☐ No; Skip to Step 1D.	
1C	Is the reliable infiltration rate calculated using planning phase methods from Table D.3-1 greater than 0.5 inches per hour? ☐ Yes; the DMA may feasibly support full infiltration. Answer "Yes" to Criteria 1 Result. ☑ No; full infiltration is not required. Answer "No" to Criteria 1 Result.	
1D	**Infiltration Testing Method.** Is the selected infiltration testing method suitable during the design phase (see Appendix D.3)? Note: Alternative testing standards may be allowed with appropriate rationales and documentation. ☑ Yes; continue to Step 1E. ☐ No; select an appropriate infiltration testing method.	

[9] Note that it is not required to investigate each and every criterion in the worksheet, a single "no" answer in Part 1, Part 2, Part 3, or Part 4 determines a full, partial, or no infiltration condition.

[10] This form must be completed each time there is a change to the site layout that would affect the infiltration feasibility condition. Previously completed forms shall be retained to document the evolution of the site storm water design.

[11] Available data includes site-specific sampling or observation of soil types or texture classes, such as obtained from borings or test pits necessary to support other design elements.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[10]
1E	**Number of Percolation/Infiltration Tests.** Does the infiltration testing method performed satisfy the minimum number of tests specified in Table D.3-2? ☐ Yes; continue to Step 1F. ☑ No; conduct appropriate number of tests.
IF	**Factor of Safety.** Is the suitable Factor of Safety selected for full infiltration design? See guidance in D.5; Tables D.5-1 and D.5-2; and Worksheet D.5-1 (Form I-9). ☑ Yes; continue to Step 1G. ☐ No; select appropriate factor of safety.
1G	**Full Infiltration Feasibility.** Is the average measured infiltration rate divided by the Factor of Safety greater than 0.5 inches per hour? ☐ Yes; answer "Yes" to Criteria 1 Result. ☑ No; answer "No" to Criteria 1 Result.
Criteria 1 Result	Is the estimated reliable infiltration rate greater than 0.5 inches per hour within the DMA where runoff can reasonably be routed to a BMP? ☐ Yes; the DMA may feasibly support full infiltration. Continue to Criteria 2. ☑ No; full infiltration is not required. Skip to Part 1 Result.

Summarize infiltration testing methods, testing locations, replicates, and results and summarize estimates of reliable infiltration rates according to procedures outlined in D.5. Documentation should be included in project geotechnical report.

As the project development is in initial design phase, specific potential BMP locations have not been finalized. As such, we conducted percolation test borings such that the entire site would be accurately characterized in terms of infiltration potential. Borehole percolation tests were completed in accordance with Couty of San Diego Department of Environmental Health (DEH), Version 2010 guidelines. The derived percolation rates were then converted to infiltration rates following the procedures of the Prochet Method, as recommended by the BMP Design Manual, Appendix D (February, 2018). In total, seven percolation test borings were advanced over the subject site. All percolation tests met Case 1 criteria, and were converted to infiltration rates. All infiltation rates were below the lower boundary rate for partial infiltration prior to appling a Safety factor of two to the results. As such, the site is classified as a "No Infiltration Condition" based on Class D type NCRS soil types that were confiremd by logs of borings and infiltration rates below 0.05 inches per hour.

However, there were no other geologic-geotechnical conditions with managable mitigation levels that would prohibited infiltration provided conformance with all structural setback criteria as defined in Appendix C of the City of San Diego BMP Design Manuel (January 2018) is ahered to. With the possible exception of expansive soils with Expansion Index values greater than 20.

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 2: Geologic/Geotechnical Screening			
2A	If all questions in Step 2A are answered "Yes," continue to Step 2B. For any "No" answer in Step 2A answer "No" to Criteria 2, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
2A-1	Can the proposed full infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick below the infiltrating surface?	☑Yes	☐No
2A-2	Can the proposed full infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☑Yes	☐No
2A-3	Can the proposed full infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☑Yes	☐No
2B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1. If all questions in Step 2B are answered "Yes," then answer "Yes" to Criteria 2 Result. If there are "No" answers continue to Step 2C.		
2B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can full infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☑Yes	☐No
2B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can full infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐Yes	☑No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011 or most recent edition). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can full infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☑Yes	☐No
2B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can full infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☑Yes	☐No
2B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can full infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☑Yes	☐No
2B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can full infiltration BMPs be proposed within the DMA using established setbacks from underground utilities, structures, and/or retaining walls?	☑Yes	☐No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
2C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 2B. Provide a discussion of geologic/geotechnical hazards that would prevent full infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for full infiltration BMPs? If the question in Step 2 is answered "Yes," then answer "Yes" to Criteria 2 Result. If the question in Step 2C is answered "No," then answer "No" to Criteria 2 Result.	☐Yes	☑No
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐Yes	☑No

Summarize findings and basis; provide references to related reports or exhibits.

As discussed in the Geotechnical Preliminary Report , dated April 23, 2018 (attached), the site is classified as "No Infiltration condition base on NCRS soil type D and low infiltration rates below 0.05 inches per hour. However, there are no other geologic - geotechnical conditions that are considered non feasible for infiltration provided reasonable mitigation measures are employed and structural setback criteria are adhered to. With the possible exception of expansive soils with Expansion Index values greater than 20.

As the project development is in initial design phase, specific potential BMP locations have not been finalized. As such, we conducted percolation test borings such that the entire site would be accurately characterized in terms of infiltration potential. Borehole percolation tests were completed in accordance with County of San Diego Department of Environmental Health (DEH), Version 2010 guidelines. The derived percolation rates were then converted to infiltration rates following the procedures of the Prochet Method, as recommended by the BMP Design Manual, Appendix D (February, 2018). In total, seven percolation test borings were advanced over the subject site. All percolation tests met Case 1 criteria, and were converted to infiltration rates. All infiltation rates were below the lower boundary rate for partial infiltration prior to appling a Safety factor of two to the results. As such, the site is classified as a "No Infiltration Condition" based on Class D type NCRS soil types that were confiremd by logs of borings and infiltration rates below 0.05 inches per hour.

Part 1 Result – Full Infiltration Geotechnical Screening [12]	Result
If answers to both Criteria 1 and Criteria 2 are "Yes", a full infiltration design is potentially feasible based on Geotechnical conditions only. If either answer to Criteria 1 or Criteria 2 is "No", a full infiltration design is not required.	☐Full infiltration Condition ☑Complete Part 2

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

<table>
<tr><th colspan="2">Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions</th><th>Worksheet C.4-1: Form I-8A[10]</th></tr>
<tr><td colspan="3">Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria</td></tr>
<tr><td colspan="2">DMA(s) Being Analyzed:</td><td>Project Phase:</td></tr>
<tr><td colspan="2"></td><td></td></tr>
<tr><td colspan="3">Criteria 3 : Infiltration Rate Screening</td></tr>
<tr><td>3A</td><td colspan="2">NRCS Type C, D, or “urban/unclassified”: Is the mapped hydrologic soil group according to the NRCS Web Soil Survey or UC Davis Soil Web Mapper is Type C, D, or “urban/unclassified” and corroborated by available site soil data?
☐ Yes; the site is mapped as C soils and a reliable infiltration rate of 0.15 in/hr. is used to size partial infiltration BMPS. Answer “Yes” to Criteria 3 Result.
☐ Yes; the site is mapped as D soils or “urban/unclassified” and a reliable infiltration rate of 0.05 in/hr. is used to size partial infiltration BMPS. Answer “Yes” to Criteria 3 Result.
☑ No; infiltration testing is conducted (refer to Table D.3-1), continue to Step 3B.</td></tr>
<tr><td>3B</td><td colspan="2">Infiltration Testing Result: Is the reliable infiltration rate (i.e. average measured infiltration rate/2) greater than 0.05 in/hr. and less than or equal to 0.5 in/hr?
☐ Yes; the site may support partial infiltration. Answer “Yes” to Criteria 3 Result.
☑ No; the reliable infiltration rate (i.e. average measured rate/2) is less than 0.05 in/hr., partial infiltration is not required. Answer “No” to Criteria 3 Result.</td></tr>
<tr><td>Criteria 3 Result</td><td colspan="2">Is the estimated reliable infiltration rate (i.e., average measured infiltration rate/2) greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour at any location within each DMA where runoff can reasonably be routed to a BMP?
☐ Yes; Continue to Criteria 4.
☑ No: Skip to Part 2 Result.</td></tr>
<tr><td colspan="3">Summarize infiltration testing and/or mapping results (i.e. soil maps and series description used for infiltration rate).
Review of the Natural Resources Conservation Service (NCRS) website, accessed on April 22, 2018, indicates that agricultural soil types in the site area are classified as Redding gravelly loam, gravelly clay, and gravelly clay loam (Map Unit-Rdc). The Rdc map unit, as defined by the NCRS, is assigned a hydrologic soil group (D), in accordance with the United States Department of Agriculture (U.S.D.A). These U.S.D.A soil types were confirmed with our geotechnical logs of borings, as described in Section 4.2.1 and 4.2.2 (within the above referenced report) that encountered Quaternary Very Old Paralic Deposits (Map Unit Qop- 8 of Kennedy and Tan, 2008), and Quaternary Previously Placed Fill consisting of re-worked formational deposits.</td></tr>
</table>

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions			Worksheet C.4-1: Form I-8A[10]
Criteria 4: Geologic/Geotechnical Screening			
4A	If all questions in Step 4A are answered "Yes," continue to Step 2B. For any "No" answer in Step 4A answer "No" to Criteria 4 Result, and submit an "Infiltration Feasibility Condition Letter" that meets the requirements in Appendix C.1.1. The geologic/geotechnical analyses listed in Appendix C.2.1 do not apply to the DMA because one of the following setbacks cannot be avoided and therefore result in the DMA being in a no infiltration condition. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP.		
4A-1	Can the proposed partial infiltration BMP(s) avoid areas with existing fill materials greater than 5 feet thick?	☐Yes	☐No
4A-2	Can the proposed partial infiltration BMP(s) avoid placement within 10 feet of existing underground utilities, structures, or retaining walls?	☐Yes	☐No
4A-3	Can the proposed partial infiltration BMP(s) avoid placement within 50 feet of a natural slope (>25%) or within a distance of 1.5H from fill slopes where H is the height of the fill slope?	☐Yes	☐No
4B	When full infiltration is determined to be feasible, a geotechnical investigation report must be prepared that considers the relevant factors identified in Appendix C.2.1 If all questions in Step 4B are answered "Yes," then answer "Yes" to Criteria 4 Result. If there are any "No" answers continue to Step 4C.		
4B-1	**Hydroconsolidation.** Analyze hydroconsolidation potential per approved ASTM standard due to a proposed full infiltration BMP. Can partial infiltration BMPs be proposed within the DMA without increasing hydroconsolidation risks?	☐Yes	☐No
4B-2	**Expansive Soils.** Identify expansive soils (soils with an expansion index greater than 20) and the extent of such soils due to proposed full infiltration BMPs. Can partial infiltration BMPs be proposed within the DMA without increasing expansive soil risks?	☐Yes	☐No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
4B-3	**Liquefaction**. If applicable, identify mapped liquefaction areas. Evaluate liquefaction hazards in accordance with Section 6.4.2 of the City of San Diego's Guidelines for Geotechnical Reports (2011). Liquefaction hazard assessment shall take into account any increase in groundwater elevation or groundwater mounding that could occur as a result of proposed infiltration or percolation facilities. Can partial infiltration BMPs be proposed within the DMA without increasing liquefaction risks?	☐Yes	☐No
4B-4	**Slope Stability**. If applicable, perform a slope stability analysis in accordance with the ASCE and Southern California Earthquake Center (2002) Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Landslide Hazards in California to determine minimum slope setbacks for full infiltration BMPs. See the City of San Diego's Guidelines for Geotechnical Reports (2011) to determine which type of slope stability analysis is required. Can partial infiltration BMPs be proposed within the DMA without increasing slope stability risks?	☐Yes	☐No
4B-5	**Other Geotechnical Hazards.** Identify site-specific geotechnical hazards not already mentioned (refer to Appendix C.2.1). Can partial infiltration BMPs be proposed within the DMA without increasing risk of geologic or geotechnical hazards not already mentioned?	☐Yes	☐No
4B-6	**Setbacks.** Establish setbacks from underground utilities, structures, and/or retaining walls. Reference applicable ASTM or other recognized standard in the geotechnical report. Can partial infiltration BMPs be proposed within the DMA using recommended setbacks from underground utilities, structures, and/or retaining walls?	☐Yes	☐No
4C	**Mitigation Measures.** Propose mitigation measures for each geologic/geotechnical hazard identified in Step 4B. Provide a discussion on geologic/geotechnical hazards that would prevent partial infiltration BMPs that cannot be reasonably mitigated in the geotechnical report. See Appendix C.2.1.8 for a list of typically reasonable and typically unreasonable mitigation measures. Can mitigation measures be proposed to allow for partial infiltration BMPs? If the question in Step 4C is answered "Yes," then answer "Yes" to Criteria 4 Result. If the question in Step 4C is answered "No," then answer "No" to Criteria 4 Result.	☐Yes	☐No

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[10]	
Criteria 4 Result	Can infiltration of greater than or equal to 0.05 inches/hour and less than or equal to 0.5 inches/hour be allowed without increasing the risk of geologic or geotechnical hazards that cannot be reasonably mitigated to an acceptable level?	☐ Yes	☐ No
Summarize findings and basis; provide references to related reports or exhibits.			

Part 2 – Partial Infiltration Geotechnical Screening Result[13]	Result
If answers to both Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible based on geotechnical conditions only. If answers to either Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site.	☐ Partial Infiltration Condition ☑ No Infiltration Condition

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

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LINSCOTT
LAW &
GREENSPAN
engineers

TRANSPORTATION IMPACT ANALYSIS

AERO DRIVE VETERANS AFFAIRS FACILITY

San Diego, California
November 29, 2018

LLG Ref. 3-18-2955

REGISTERED PROFESSIONAL ENGINEER
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EXECUTIVE SUMMARY

Linscott, Law & Greenspan, Engineers (LLG) has prepared the following transportation impact study to determine and evaluate the transportation impacts on the local circulation system due to the repurposing of an existing office building with the proposed Aero Drive Veterans Affairs Facility project (proposed "Project") in the Kearny Mesa Community of the City of San Diego. The project site currently contains a 113,981 SF office building. The Project proposes to repurpose and expand the existing building to provide a 138,915 SF Veterans Affairs Hospital Annex.

The project is calculated to generate 5,082 driveway ADT with 175 additional AM peak hour trips (115 inbound/60 outbound) and 434 additional PM peak hour trips (156 inbound trips/278 outbound). The total cumulative trip generation for the project is 359 cumulative ADT with 109 fewer AM peak hour trips (111 fewer inbound trips/2 additional outbound) and 39 fewer PM peak hour trips (15 additional inbound trips/54 fewer outbound trips).

The project would result in a significant traffic impact at the intersection of Aero Drive/Sandrock Road under the Existing + Project and Long-Term (Year 2035) Project conditions. It is recommended that the Project reconfigure the northbound and southbound approaches, currently controlled with split signal phasing, to provide protected signal phasing. The northbound approach would be restriped to provide two dedicated left-turn lanes and a shared thru / right-turn lane. Modifications to the southbound approach include replacing the existing 9' center raised median with a 4' raised median and restriping to provide a shared thru / right-turn lane, a 10' painted median with chevron markings and a dedicated left-turn lane.

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AERO DRIVE VETERANS AFFAIRS FACILITY

San Diego, California
November 29, 2018

1.0 INTRODUCTION

The following transportation impact study has been prepared to determine and evaluate the transportation impacts on the local circulation system due to the repurposing of an existing office building with the proposed Aero Drive Veterans Affairs Facility project (proposed "Project") in the Kearny Mesa Community of the City of San Diego. The purpose of this study is to assess the potential impacts to the local circulation system as a result of the Project.

Included in this traffic study are the following:

- Project Description
- Existing Conditions Discussion
- Study Area, Analysis Approach & Methodology
- Significance Criteria
- Analysis of Existing Conditions
- Trip Generation, Distribution & Assignment
- Analysis of Existing + Project Scenario
- Near-Term (Opening Year 2020) Analysis
- Near-Term (Opening Year 2020) + Project Analysis
- Horizon Year (Year 2035) Analysis
- Horizon Year (Year 2035) + Project Analysis
- Access and On-Site Circulation Assessment
- Parking Discussion
- Transportation Demand Management Discussion
- Significance of Impacts and Mitigation Measures

2.0 PROJECT DESCRIPTION

2.1 Project Location

The Project is located at 8875 Aero Drive between Interstate 805 and Interstate 15 within the Kearny Mesa Community of the City of San Diego.

Figure 2–1 shows the vicinity map. ***Figure 2–2*** shows a more detailed Project area map.

2.2 Project Description

The Project proposes the repurposing of an existing office building. The project site currently contains a 113,981 SF office building. The Project proposes to repurpose and expand the existing building to provide a 138,915 SF Veterans Affairs Hospital Annex. The project requires a City of San Diego Process Four, Conditional Use Permit for a Hospital Annex facility.

Access to the site will continue to be primarily from Aero Drive, with one existing driveway being closed. The Project will construct a raised median along its frontage, connecting to the existing median to the west of the Project site, in order to satisfy the City's Major Roadway requirements A median break will be provided to allow for left-turns into the site. Left-turns out of the site will be prohibited. The Project site has a legal easement to access Sandrock Road thru the contiguous properties to the west. Therefore, a portion of the Project trips were assumed to exit via Sandrock Road.

Figure 2-3 shows the existing site plan and ***Figure 2–4*** shows the proposed conceptual site plan.

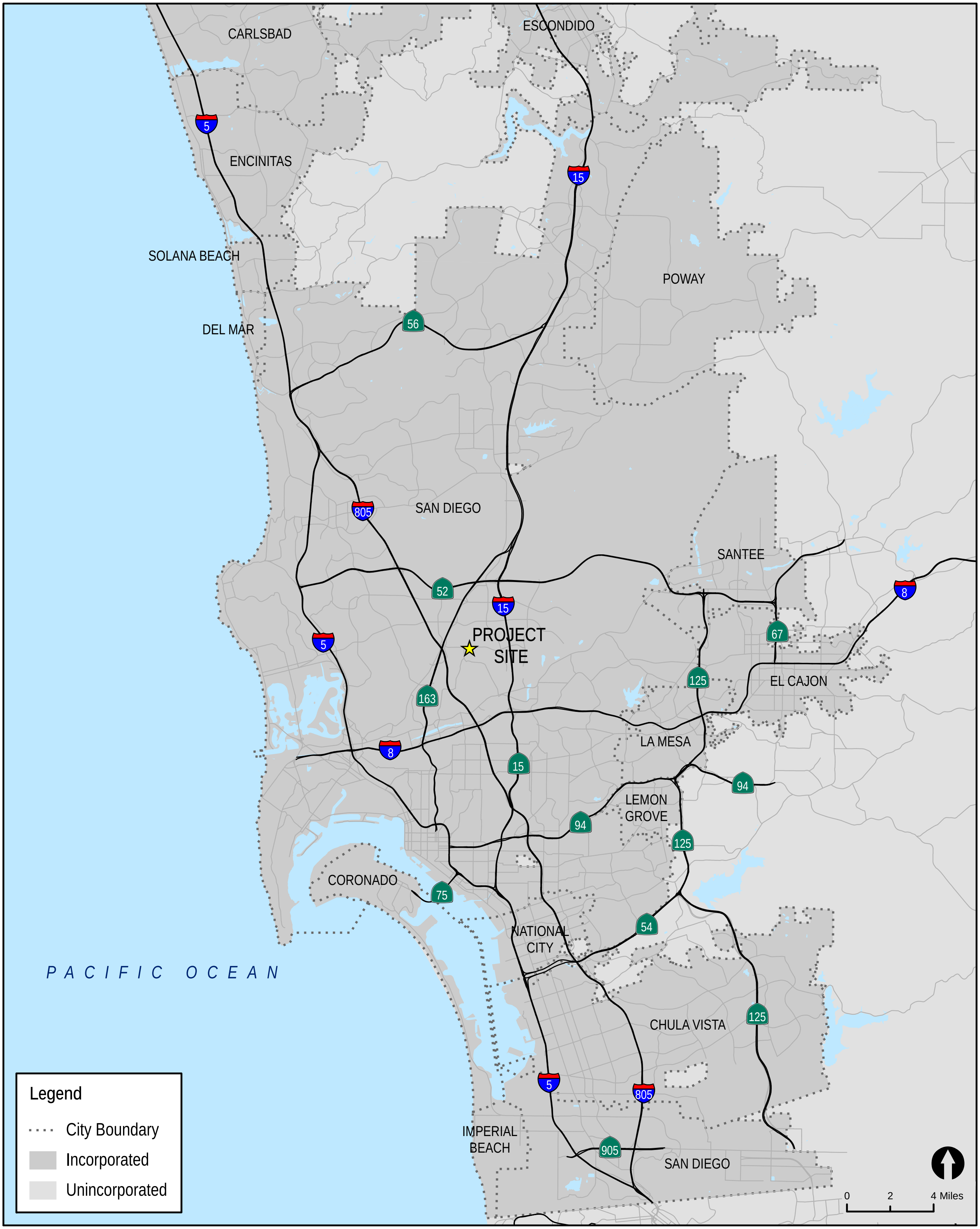

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Figure 2-1

Vicinity Map

AERO DRIVE VA FACILITY

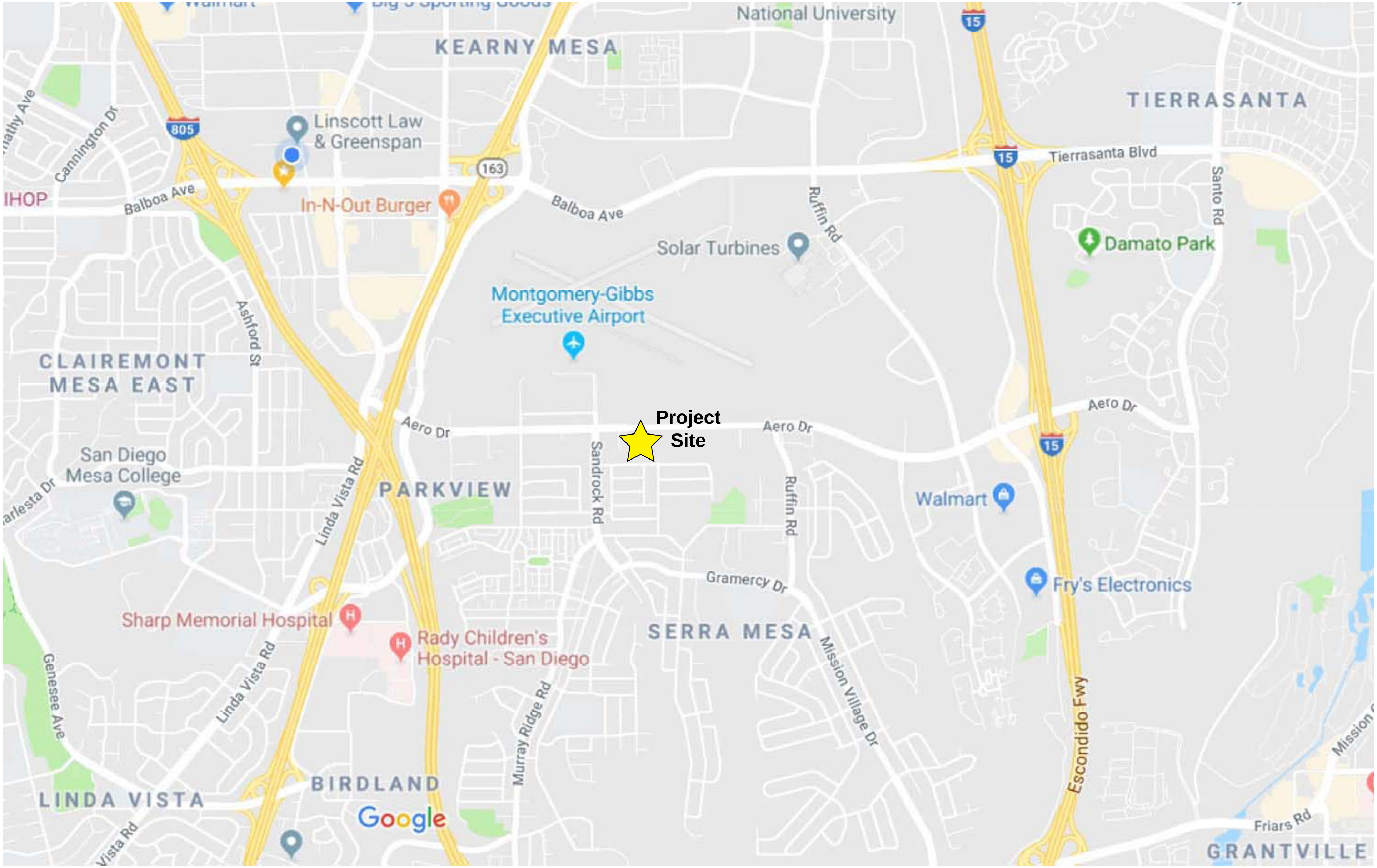

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Figure 2-2

Project Area Map

AERO DRIVE VA FACILITY

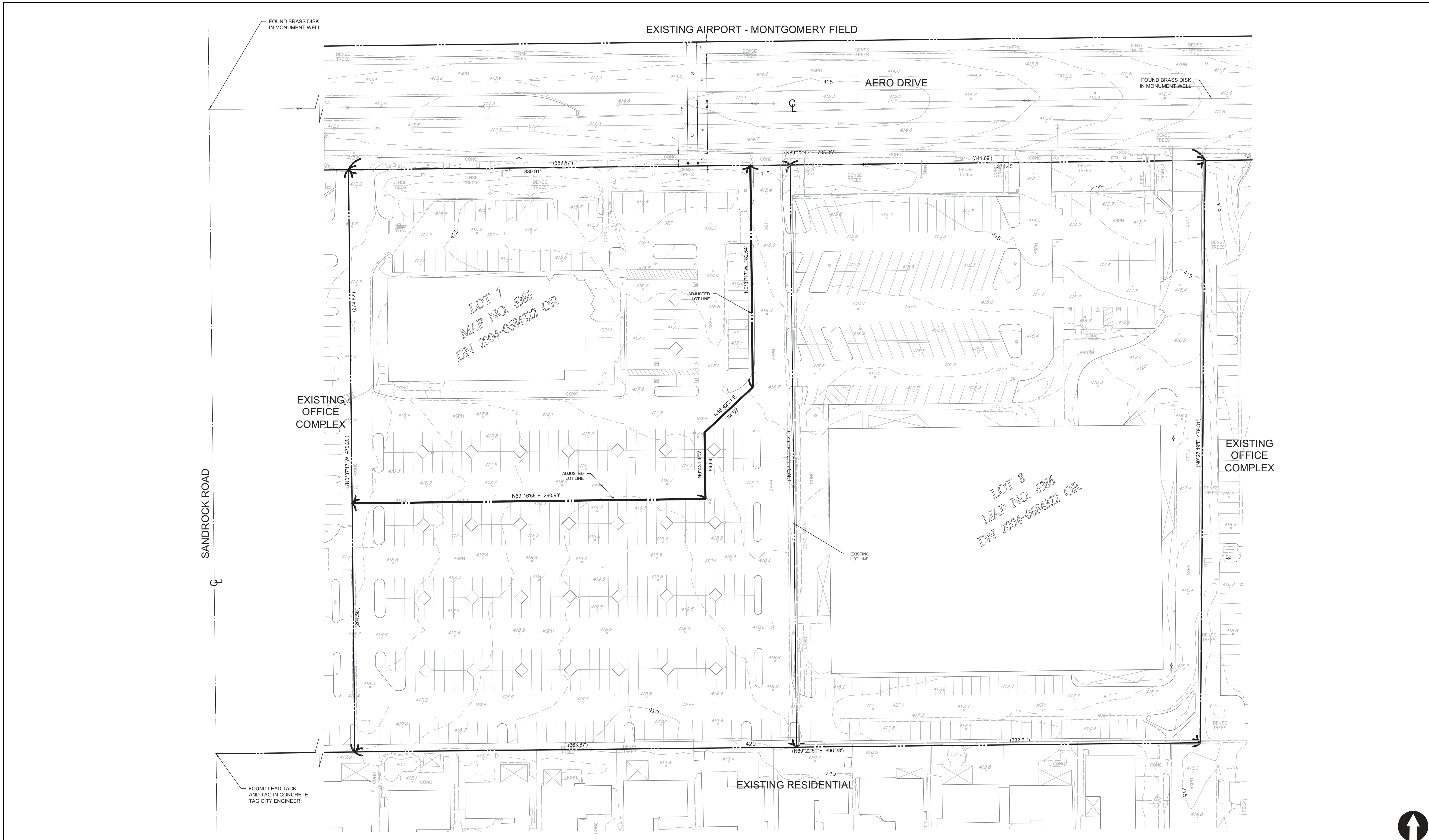

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Figure 2-3

Existing Site Plan

Aero Drive VA Facility

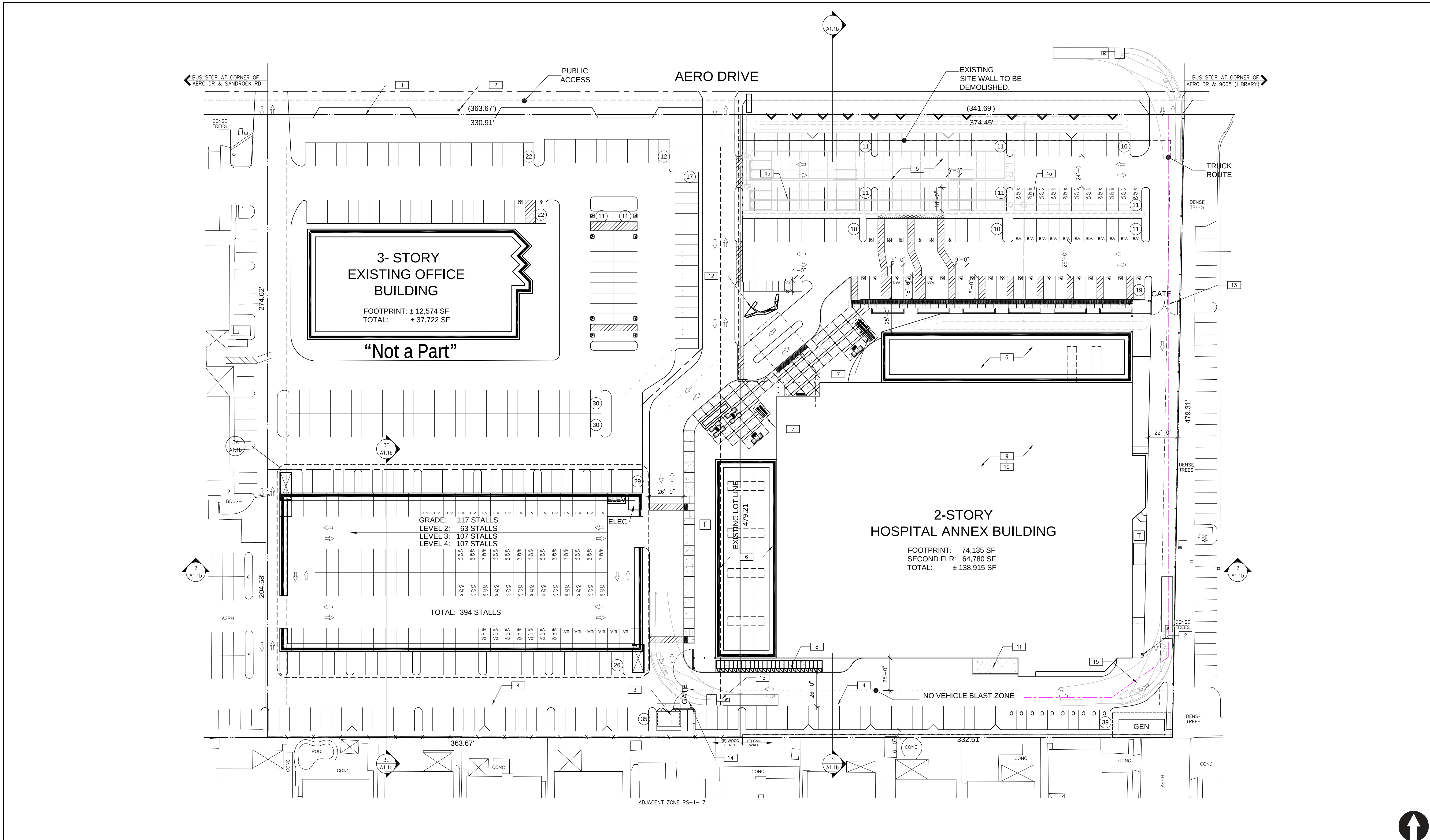

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Figure 2-4

Proposed Site Plan

Aero Drive VA Facility

3.0 EXISTING CONDITIONS

3.1 Existing Street System

The following provides a brief description of the street system in the Project area. ***Figure 3–1*** illustrates existing conditions in terms of traffic lanes and intersection controls.

Aero Drive is classified in the *Kearny Mesa Community Plan* as a 6-Lane Prime from Convoy Street to Sandrock Road and as a 4-Lane Major from Sandrock Road to I-15. It is currently constructed as a 4-Lane Major with a raised median from Convoy Street to Sandrock Road, as a 4-Lane Collector with a continuous two-way turn-lane from Sandrock Road to Ruffin Road, again as a 4-Lane Major with a raised median from Ruffin Road to Murphy Canyon Road, and a 5-Lane Major with a raised median between Murphy Canyon Road and I-15. The Project will construct a raised median on Aero Drive along the project frontage, connecting to the existing median to the west of the Project site, in order to satisfy the City's Major Roadway requirements. The posted speed limit is 40 mph from Convoy Street to Sandrock Road and 45 mph from Sandrock Road to I-15. Class II bike lanes and sidewalks are provided on both sides of the roadway. Curbside parking is prohibited. Public transportation is available along Aero Drive. There are currently 16 stops on both sides of the road between Convoy Street and I-15.

Sandrock Road is classified in the *Kearny Mesa Community Plan* as a 2-Lane Collector. It is currently constructed as a 2-lane roadway with a raised median between Aero Drive and Haveteur Way and a center two-way left-turn lane between Haveteur Way and Hulburt Street. The posted speed limit is 35mph. Class II bike lanes and sidewalks are provided on both sides of the roadway. Curbside parking is allowed on both sides of the road. Public transportation is available on Aero Drive and Sandrock Road (Route 25) providing services to and from Fashion Valley Road and Kearny Mesa via Tierrasanta and Stonecrest. An additional bus stop is available on Sandrock Road and Murray Ridge Road (Route 928) providing services to and from Fashion Valley Road and Kearny Mesa via Serra Mesa and Stonecrest.

3.2 Existing Bicycle Network

Based on a review of the City of San Diego *Bicycle Master Plan*, the *Kearny Mesa Community Plan* and field observations, there are existing Class II bike lanes provided along Aero Drive, between Convoy Street and Murphy Canyon Road within the study area. Class II bike lanes with buffers are provided along Sandrock Road.

3.3 Existing Transit Conditions

Public transit is available throughout the study area. Based on the most recent information on the San Diego Metropolitan Transit System (MTS) website, there are a total of 16 stops on both sides of Aero Drive serviced by route 25 and route 928. The stops along Aero Drive include Kearny Villa Road, Aero Court, Afton Road, Sandrock Road, Kearny Mesa Library, Corporate Court, Ruffin Road, West Canyon Avenue, Daley Center Drive, and Murphy Canyon Road. There are two transit stops along Sandrock Road serviced by route 928 at Aero Drive and Murray Ridge Road.

- ***Route 25*** provides services to and from Fashion Valley and Kearny Mesa via Tierrasanta and Stonecrest. Route 25 currently operates Monday through Friday from 7:10 AM through 6:10 PM departing from Fashion Valley Transit Center and arriving at Kearny Mesa Transit Center. All schedules include one-hour headways.
- ***Route 928*** provides services to and from Fashion Valley and Kearny Mesa via Serra Mesa and Stonecrest. Route 928 currently operates Monday through Friday from 5:25 AM through 9:37 PM with 30-minute headways departing from Fashion Valley Transit Center and arriving at Kearny Mesa Transit Center. Saturday service begins at 7:05 AM and ends at 9:05 PM departing from Fashion Valley Transit Center and arriving at Stonecrest Plaza. Sunday service begins at 9:05 AM and ends at 6:05 departing from Fashion Valley Transit Center and arriving at Stonecrest Plaza. Saturday and Sunday schedules include one-hour headways

3.4 Existing Pedestrian Conditions

Based on field observations within the study area, the following pedestrian conditions are noted:

Aero Drive: Contiguous five-foot sidewalks are provided along the eastbound side of Aero Drive from Convoy Street to I-15 with the exception of the bridge section just east of Convoy Street where sidewalks are not provided. Non-contiguous sidewalks are provided on the westbound side of Aero Drive from Convoy Street to I-15 except between Aero Court and Afton Road and between Sandrock Road and West Canyon Avenue where sidewalks are not provided. Striped crosswalks are provided at all signalized intersections within the study area. There are currently no high-visibility crosswalks in the area.

Sandrock Road: Non-contiguous five-foot sidewalks are provided on both sides of Sandrock Road. Striped crosswalks are provided at all signalized intersections along Sandrock Road.

3.5 Existing Traffic Volumes

Existing weekday AM (7-9 AM) and PM (4-6 PM) peak hour traffic volumes and daily traffic counts were collected at the study area intersections and street segments to capture peak commuter activity. The counts were conducted on Thursday August 30, 2018 while area schools were in session. ***Figure 3–2*** shows the existing AM and PM peak hour turning movement counts and ADTs. ***Appendix A*** contains copies of the intersection manual count sheets and road tube count summaries.

Figure 3-1

Existing Conditions Diagram

Aero Drive VA Facility

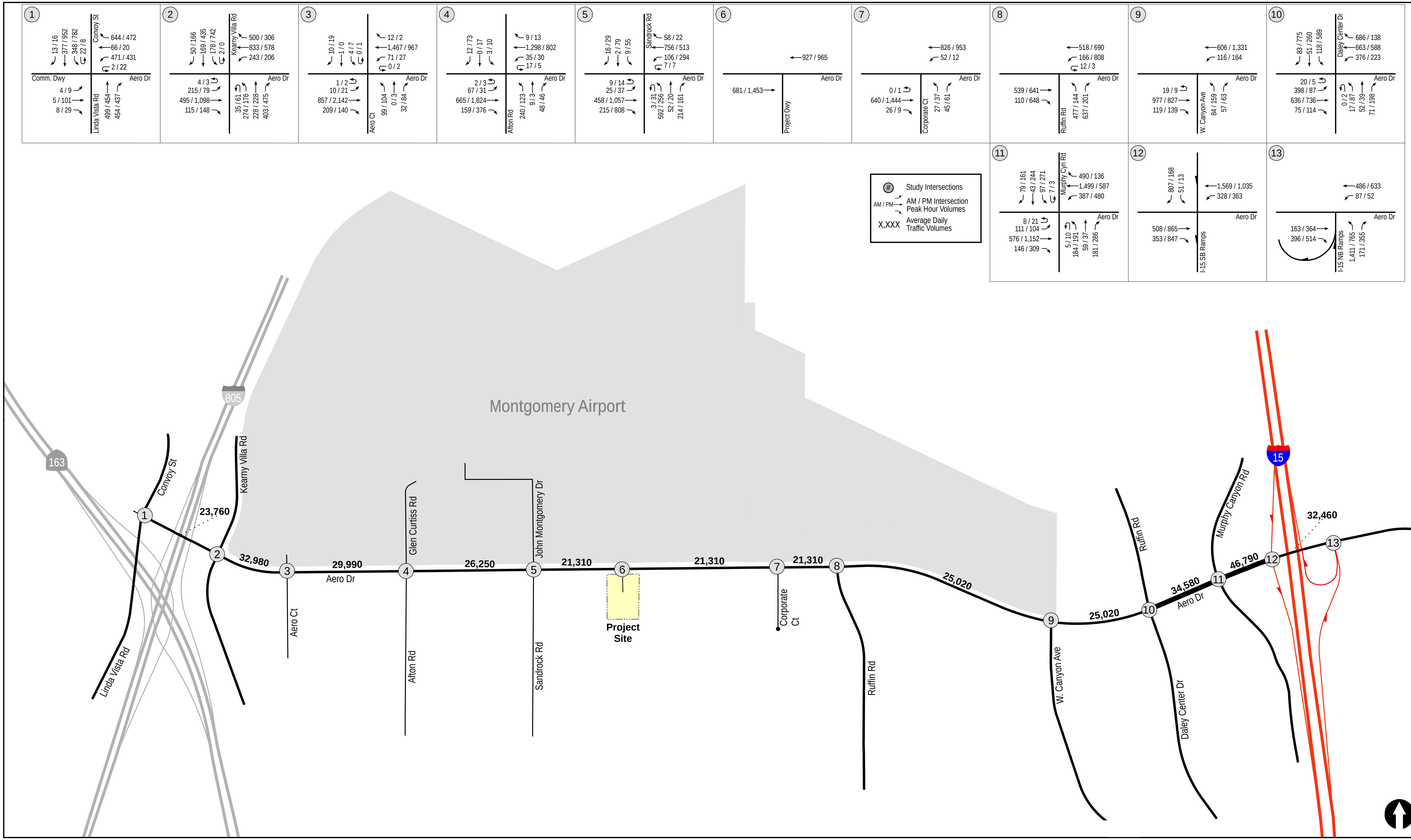

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Figure 3-2

Existing Traffic Volumes

AERO DRIVE VA FACILITY

4.0 ANALYSIS APPROACH AND METHODOLOGY

4.1 Study Area

The study area for this project encompasses areas of anticipated impact related to the project. The scope of the study area was developed in coordination with City of San Diego staff based on the project's trip generation and City of San Diego Traffic Impact Study Manual guidelines. The study area includes the following thirteen (13) intersections and twelve (12) street segments

Intersections

1. Aero Drive / Convoy Street (signalized)
2. Aero Drive / Kearny Villa Road (signalized)
3. Aero Drive / Aero Court (signalized)
4. Aero Drive / Afton Road (signalized)
5. Aero Drive / Sandrock Road (signalized)
6. Aero Drive / Project Driveway (unsignalized)
7. Aero Drive / Corporate Court (unsignalized)
8. Aero Drive / Ruffin Road (signalized)
9. Aero Drive / West Canyon Avenue (signalized)
10. Aero Drive / Daley Center Drive (signalized)
11. Aero Drive / Murphy Canyon Road (signalized)
12. Aero Drive / I-15 Southbound Ramps (signalized)
13. Aero Drive / I-15 Northbound Ramps (signalized)

Segments

Aero Drive

1. Convoy Street to Kearny Villa Road
2. Kearny Villa Road to Aero Court
3. Aero Court to Afton Road
4. Afton Road to Sandrock Road
5. Sandrock Road to Project Driveway
6. Project Driveway to Corporate Court
7. Corporate Court to Ruffin Road
8. Ruffin Road to West Canyon Avenue
9. West Canyon Avenue to Daley Center Drive
10. Daley Center Drive to Murphy Canyon Road
11. Murphy Canyon Road to I-15 Southbound Ramps
12. I-15 Southbound Ramps to I-15 Northbound Ramps

No analyses of freeway mainlines or ramps meters were included since less than 50 and 20 peak hour Project trips would be added to these facilities, respectively.

4.2 Analysis Approach

Level of service (LOS) is the term used to denote the different operating conditions which occur on a given roadway segment under various traffic volume loads. It is a qualitative measure used to describe a quantitative analysis considering factors such as roadway geometries, signal phasing, speed, travel delay, freedom to maneuver, and safety. Level of service provides an index to the operational qualities of a roadway segment or an intersection. Level of service designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions. Level of service designation is reported differently for signalized intersections and for roadway segments.

4.3 Intersections

Signalized intersections were analyzed under weekday 7:00-9:00 AM and 4:00-6:00 PM peak hour conditions. Average vehicle delay was determined utilizing the methodology found in Chapter 18 of the *Highway Capacity Manual (HCM) 6,* with the assistance of the *Synchro* (version 10) computer software. The delay values (represented in seconds) were qualified with a corresponding intersection Level of Service (LOS).

City of San Diego and Caltrans location-specific signal timing information such as minimum greens, cycle lengths, phasing, and splits for the freeway interchanges, where available, and real-time peak hour field observations were included in the analysis. *Appendix A* contains copies of the signal timing sheets.

Unsignalized intersections were analyzed under weekday 7:00-9:00 AM and 4:00-6:00 PM peak hour conditions. Average vehicle delay and Levels of Service (LOS) was determined based upon the procedures found in Chapter 20 and 21 of the *Highway Capacity Manual (HCM) 6,* with the assistance of the *Synchro* (version 10) computer software. Real-time peak hour field observations were included in the analysis

4.4 Street Segments

Street segment analysis is based upon the comparison of daily traffic volumes (ADTs) to the City of San Diego's *Roadway Classification, Level of Service, and ADT Table*. This table provides segment capacities for different street classifications, based on traffic volumes and roadway characteristics.

5.0 SIGNIFICANCE CRITERIA

For the purposes of this traffic study, City of San Diego's *Significance Determination Thresholds* were used as a guide. According to the City of San Diego's *Significance Determination Thresholds* report dated July 2016, a project is considered to have a significant impact if the new project traffic has decreased the operations of surrounding roadways by a City-defined threshold. The City-defined threshold by roadway type or intersection is shown in ***Table 5–1***.

The impact is designated either a "direct" or "cumulative" impact. According to the City's *Significance Determination Thresholds* report,

> "*Direct* traffic impacts are those projected to occur at the time a proposed development becomes operational, including other developments not presently operational but which are anticipated to be operational at that time (near term)."
>
> "*Cumulative* traffic impacts are those projected to occur at some point after a proposed development becomes operational, such as during subsequent phases of a project and when additional proposed developments in the area become operational (short-term cumulative) or when affected community plan area reaches full planned buildout (long-term cumulative)."

For intersections and roadway segments affected by a project, level of service (LOS) D or better is considered acceptable under both direct and cumulative conditions."

If the project exceeds the thresholds in *Table 5–1*, then the project may be considered to have a significant "direct" or "cumulative" project impact. A significant impact can also occur if a project causes the Level of Service to degrade from D to E, even if the allowable increases in *Table 5–1* are not exceeded. A feasible mitigation measure will need to be identified to return the impact within the City thresholds, or the impact will be considered significant and unmitigated.

TABLE 5–1
CITY OF SAN DIEGO
TRAFFIC IMPACT SIGNIFICANT THRESHOLDS

Level of Service with Project[b]	Allowable Increase Due to Project Impacts[a]	
	Roadway Segments	Intersections
	V/C	Delay (sec.)
E	0.02	2.0
F	0.01	1.0

Footnotes:

a. If a proposed project's traffic causes the values shown in the table to be exceeded, the impacts are determined to be significant. The project applicant shall then identify feasible improvements (within the Traffic Impact Study) that will restore/and maintain the traffic facility at an acceptable LOS. If the LOS with the proposed project becomes unacceptable (see note b), the project applicant shall be responsible for mitigating the project's direct significant and/or cumulatively considerable traffic impacts.

b. All LOS measurements are based upon Highway Capacity Manual procedures for peak-hour conditions. However, V/C ratios for roadway segments are estimated on an ADT/24-hour traffic volume basis (using Table 2 of the City's Traffic Impact Study Manual). The acceptable LOS for roadways and intersections is generally "D" ("C" for undeveloped locations).

General Notes:

1. Delay = Average control delay per vehicle measured in seconds for intersections or minutes for ramp meters
2. LOS = Level of Service
3. V/C = Volume to Capacity ratio

6.0 ANALYSIS OF EXISTING CONDITIONS

The analysis of existing conditions includes the assessment of the study area intersections and street segments using the methodologies described in *Section 4.0*.

6.1 Intersection Analysis

Intersection capacity analyses were conducted for the study intersections under existing conditions. ***Table 6–1*** reports the intersection operations during the peak hour conditions. As shown in *Table 6–1,* the following study area intersections are currently calculated to operate at LOS E or F:

1. Aero Drive / Convoy Street (LOS E during the AM peak hour)
2. Aero Drive / Kearny Villa Road (LOS E during the AM peak / LOS F during PM peak)
5. Aero Drive / Sandrock Road (LOS E during the PM peak hour)
7. Aero Drive / Corporate Court (LOS E during the PM peak hour)
8. Aero Drive / Ruffin Road (LOS E during the AM peak hour)
10. Aero Drive / Daley Center Drive (LOS E during AM peak hour)
12. Aero Drive / I-15 Southbound Ramps (LOS F during the AM peak hour)
13. Aero Drive / I-15 Northbound Ramps (LOS F during the AM peak hour)

Appendix B contains the intersection analysis sheets for the Existing scenario.

6.2 Street Segment Analysis

Existing daily street segment analysis was conducted for the study street segments. ***Table 6–2*** reports the street segment operations. As shown in *Table 6–2*, the study street segments are currently calculated to operate at LOS D or better with the exception of Aero Drive between Murphy Canyon Road and I-15 Southbound Ramps which is calculated to operate at LOS F.

TABLE 6–1
EXISTING INTERSECTION OPERATIONS

Intersection	Control Type	Peak Hour	Existing Delay [a]	Existing LOS [b]
1. Aero Drive / Convoy Street	Signal	AM PM	**55.2** 45.6	**E** D
2. Aero Drive / Kearny Villa Road	Signal	AM PM	**64.2** **85.3**	**E** **F**
3. Aero Drive / Aero Court	Signal	AM PM	11.1 23.8	B C
4. Aero Drive / Afton Road	Signal	AM PM	19.6 27.4	B C
5. Aero Drive / Sandrock Road	Signal	AM PM	22.4 **62.4**	C **E**
6. Aero Drive / Project Driveway [d]	MSSC [c]	AM PM	- -	- -
7. Aero Drive / Corporate Court	MSSC [c]	AM PM	15.3 **40.8**	C **E**
8. Aero Drive / Ruffin Road	Signal	AM PM	**62.1** 28.1	**E** C
9. Aero Drive / West Canyon Avenue	Signal	AM PM	17.8 26.8	B C
10. Aero Drive / Daley Center Drive	Signal	AM PM	**58.4** 50.7	**E** D
11. Aero Drive / Murphy Canyon Road	Signal	AM PM	28.4 51.4	C D
12. Aero Drive / I-15 Southbound Ramps	Signal	AM PM	**121.6** 23.5	**F** C
13. Aero Drive / I-15 Northbound Ramps	Signal	AM PM	**154.6** 22.6	**F** C

Footnotes:

a. Average delay expressed in seconds per vehicle.
b. Level of Service.
c. Minor-Street Stop-Controlled intersection. Worst-Case movement delay is reported.
d. The Project site is currently vacant, and therefore there is no traffic using the driveway.

SIGNALIZED Delay	SIGNALIZED LOS	UNSIGNALIZED Delay	UNSIGNALIZED LOS
DELAY/LOS THRESHOLDS		DELAY/LOS THRESHOLDS	
0.0 ≤ 10.0	A	0.0 ≤ 10.0	A
10.1 to 20.0	B	10.1 to 15.0	B
20.1 to 35.0	C	15.1 to 25.0	C
35.1 to 55.0	D	25.1 to 35.0	D
55.1 to 80.0	E	35.1 to 50.0	E
≥ 80.1	F	≥ 50.1	F

TABLE 6–2
EXISTING DAILY STREET SEGMENT OPERATIONS

Street Segment	Functional Classification	Capacity (LOS E)[a]	ADT[b]	LOS[c]	V/C[d]
Aero Drive					
Convoy Street to Kearny Villa Road	4-Ln Major	40,000	23,760	C	0.594
Kearny Villa Road to Aero Court	4-Ln Major	40,000	32,980	D	0.825
Aero Court to Afton Road	4-Ln Major	40,000	29,990	C	0.750
Afton Road to Sandrock Road	4-Ln Major	40,000	26,250	C	0.656
Sandrock Road to Project Driveway	4-Ln Collector	30,000	21,310	D	0.710
Project Driveway to Corporate Court	4-Ln Collector	30,000	21,310	D	0.710
Corporate Court to Ruffin Road	4-Ln Collector	30,000	21,310	D	0.710
Ruffin Road to West Canyon Avenue	4-Ln Major	40,000	25,020	C	0.626
West Canyon Avenue to Daley Center Drive	4-Ln Major	40,000	25,020	C	0.626
Daley Center Drive to Murphy Canyon Road	4-Ln Major	40,000	34,580	D	0.865
Murphy Canyon Road to I-15 Southbound Ramps	5-Ln Major	45,000	46,790	F	1.040
I-15 Southbound Ramps to I-15 Northbound Ramps	5-Ln Major	45,000	32,460	C	0.721

Footnotes:

a. Capacities based on functional classifications per City of San Diego Roadway Classification & LOS table (See *Appendix C*).
b. Average Daily Traffic Volumes.
c. Level of Service.
d. Volume to Capacity.

7.0 TRIP GENERATION/DISTRIBUTION/ASSIGNMENT

7.1 Trip Generation

The Project proposes the repurposing of an existing office building. The project site currently includes a 113,981 SF office building. The existing office building is not occupied, but was occupied for over 30-years until the fourth quarter of 2016. Based on the historical tenancy of the existing building on the site, a modified baseline was used for assessing the potential transportation impacts. Therefore, a trip generation credit was assumed for the office that is not currently occupied.

The Project proposes to repurpose and expand the existing building to provide a 138,915 SF Veterans Affairs Hospital Annex. The Project trip generation was calculated for the AM/PM peak hours and for the daily (ADT) periods using published City of San Diego *driveway* and *cumulative* trip rates.

For the purpose of this study, the *Commercial Office* trip rates were used to calculate the project site's trip credit and the *Medical Office* trip rates were used to calculate the proposed project's trips since outpatient services will be provided. The City of San Diego's *driveway* rate for the Medical Office land use is 50 weekday trips per 1,000 SF, while the cumulative rate is 16 trips weekday per 1,000 SF for an office over 100,000 SF. There is no difference between the driveway and cumulative trip rates for the Commercial Office land use. Per the City of San Diego's Trip Generation Manual, May 2003, the following definitions of driveway trips, cumulative trips and pass-by trips are provided:

- ***Driveway Trips***: The total number of trips that are generated by a site. The sum of cumulative trips plus the pass-by trips.
- ***Cumulative Trips:*** New vehicle trips added to a community. Cumulative trips are driveway trips minus pass-by trips.
- ***Pass-by Trips***: A trip that is deviated from the roadway to a site for a stop-over to sites such as retail establishments, banks, restaurants, service stations, etc. A trip made to a site from traffic already "passing by" that site on an adjacent street that contains direct access to the generator. These are existing vehicle trips in a community.

For the purposes of this study, the driveway trip rates were used to analyze the intersections of Aero Drive / Sandrock Road and Aero Drive / Project Driveway as well as the segment of Aero Drive between Sandrock Road and the Project Driveway. The cumulative trip rates were used to analyze the remainder of the study intersections and street segments.

Table 7–1 shows the total driveway trip generation summary for the proposed Project. As shown in *Table 7-1*, the Project is calculated to generate 5,082 driveway ADT with 175 additional AM peak hour trips (115 inbound/ 60 outbound) and 434 additional PM peak hour trips (156 inbound trips/ 278 outbound).

Table 7–2 shows the total cumulative trip generation summary for the proposed Project. As shown in *Table 7-2*, the Project is calculated to generate 359 cumulative ADT with 109 fewer AM peak hour trips (111 fewer inbound trips / 2 additional outbound) and 39 fewer PM peak hour trips (15 additional inbound trips/ 54 fewer outbound trips).

7.2 Trip Distribution/Assignment

Project traffic was distributed to the street system based on the Project's planned service area, expected client / employee residential locations, existing traffic patterns, the proximity of the Project site to I-805 and I-15, and knowledge of the local area.

Using the City's cumulative trip rate, the Project is calculated to add 2 additional outbound trips during the AM peak hour. For trip assignment purposes, this number was conservatively increased to 20 additional trips. Similarly, using the City's cumulative trip rate, the Project is calculated to add 15 additional inbound trips during the PM peak hour. For trip assignment purposes, this number was conservatively increased to 50 additional trips

Figure 7–1 shows the Project's traffic distribution. ***Figure 7–2*** shows the Project traffic assignment.

TABLE 7–1
TRIP GENERATION – DRIVEWAY RATES

Land Use	Size	Daily Trip Ends (ADT)		AM Peak Hour					PM Peak Hour				
		Rate[a]	ADT	% of ADT[b]	In:Out Split	Volume			% of ADT[b]	In:Out Split	Volume		
						In	Out	Total			In	Out	Total
Proposed													
Medical Office	138.915 KSF	50 / KSF	6,946	6%	80:20	333	84	417	10%	30:70	208	487	695
Existing (recently vacated)													
Commercial Office (to be removed)	113.981 KSF	LN Formula	(1,864)	13%	90:10	(218)	(24)	(242)	14%	20:80	(52)	(209)	(261)
Net New			***5,082***			***115***	***60***	***175***			***156***	***278***	***434***

Footnotes:

a. LN FORMULA: Ln(T) = 0.756 Ln (x) + 3.95. ~16.35 ADT / KSF

b. Medical Office and Commercial Office rates as shown in San Diego Municipal Code Trip Generation Manual, 2003.

TABLE 7–2
TRIP GENERATION – CUMULATIVE RATES

Land Use	Size	Daily Trip Ends (ADT)		AM Peak Hour					PM Peak Hour				
		Rate[a]	ADT	% of ADT[b]	In:Out Split	Volume			% of ADT[b]	In:Out Split	Volume		
						In	Out	Total			In	Out	Total
Proposed													
Medical Office	138.915 KSF	16 / KSF	2,223	6%	80:20	107	26	133	10%	30:70	67	155	222
Existing (recently vacated)													
Commercial Office (to be removed)	113.981 KSF	LN Formula	(1,864)	13%	90:10	(218)	(24)	(242)	14%	20:80	(52)	(209)	(261)
Net New			***359***			***(111)***	***2[c]***	***(109)***			***15[d]***	***(54)***	***(39)***

Footnotes:

a. LN FORMULA: Ln(T) = 0.756 Ln (x) + 3.95. ~16.35 ADT / KSF

b. Medical Office and Commercial Office rates as shown in San Diego Municipal Code Trip Generation Manual, 2003

c. The Project is calculated to add 2 additional outbound trips during the AM peak hour. For trip assignment purposes, this number was conservatively increased to 20 additional trips.

d. The Project is calculated to add 15 additional inbound trips during the PM peak hour. For trip assignment purposes, this number was conservatively increased to 50 additional trips.

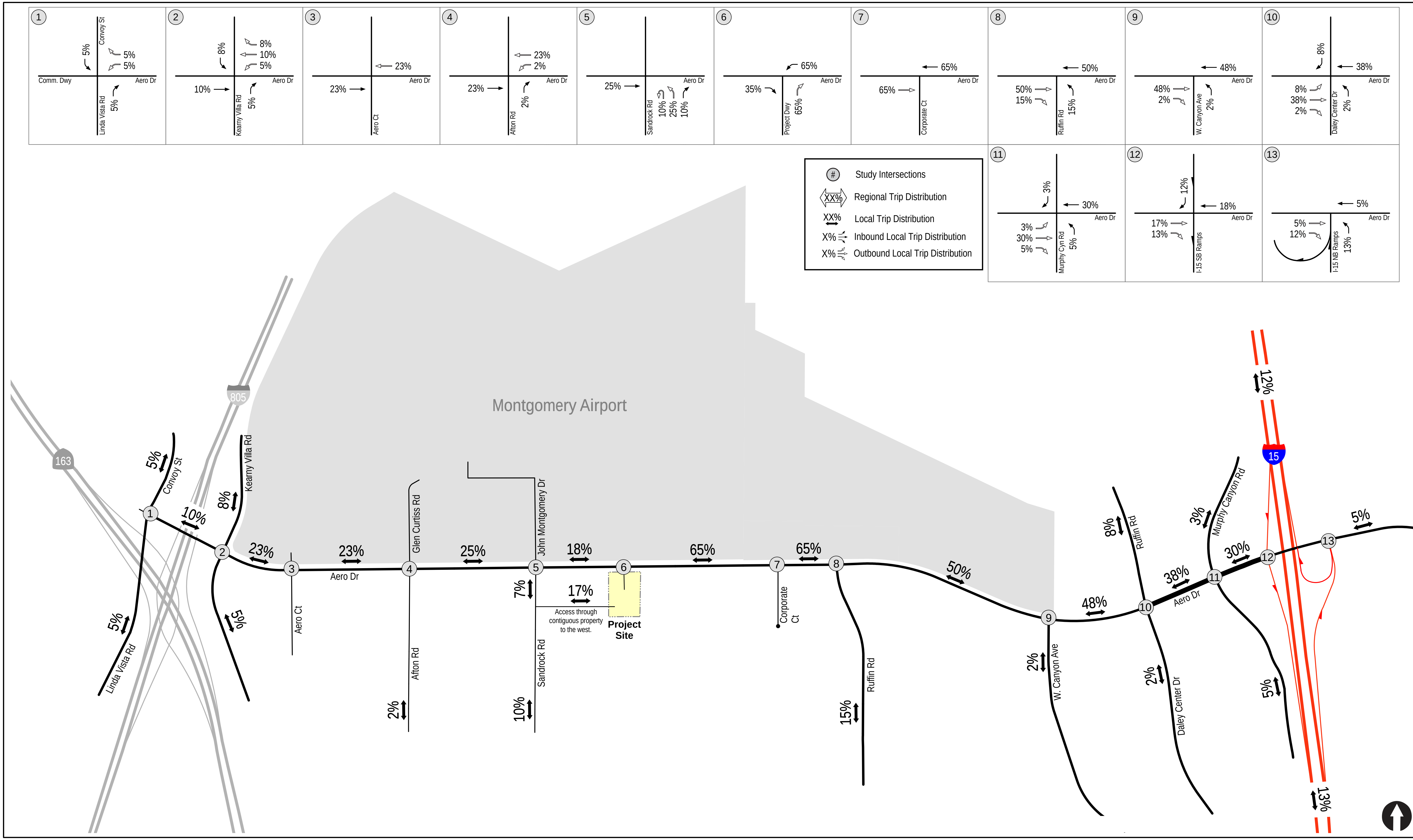

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Figure 7-1

Project Traffic Distribution

Aero Drive VA Facility

Figure 7-2

Project Traffic Volumes

AERO DRIVE VA FACILITY

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8.0 Existing + Project Analysis

Project traffic was added onto existing traffic volumes to determine Existing + Project volumes.

Figure 8–1 shows the Existing + Project peak hour turning movement volumes and daily traffic volumes. A detailed description of the Project distribution and assignment is included in *Section 7.0*.

8.1.1 *Intersection Analysis*

Table 8–1 summarizes the peak hour intersection operations under Existing + Project conditions. As shown in *Table 8–1,* the following study area intersections are calculated to operate at LOS E or F:

1. Aero Drive / Convoy Street (LOS E during the AM peak hour)
2. Aero Drive / Kearny Villa Road (LOS E during the AM peak / LOS F during PM peak)
5. Aero Drive / Sandrock Road (LOS E during the PM peak hour)
7. Aero Drive / Corporate Court (LOS E during the PM peak hour)
8. Aero Drive / Ruffin Road (LOS E during the AM peak hour)
10. Aero Drive / Daley Center Drive (LOS E during AM peak hour)
12. Aero Drive / I-15 Southbound Ramps (LOS F during the AM peak hour)
13. Aero Drive / I-15 Northbound Ramps (LOS F during the AM peak hour)

Based on the City of San Diego's significance criteria, a significant direct impact is calculated at the intersection of Aero Drive / Sandrock Road.

Appendix D contains the intersection analysis sheets for the Existing + Project scenario.

8.1.2 *Street Segment Analysis*

Table 8–2 summarizes the Existing + Project street segment operations. As shown in *Table 8–2*, the study street segments are currently calculated to operate at LOS D or better with the exception of Aero Drive between Murphy Canyon Road and I-15 Southbound Ramps which is calculated to operate at LOS F. It should be noted that the segment of Aero Drive between Sandrock Road and the Project Driveway was analyzed as a 4-lane Major under Existing + Project conditions since the Project will construct a raised median along its frontage, connecting to the existing median to the west of the Project site, in order to satisfy the City's Major Roadway requirements as part of the project.

Based on the City of San Diego's significance criteria, no significant impacts are calculated along the study area street segments as the Project contribution does not exceed the allowable thresholds.

Table 8–1
Existing + Project Intersection Operations

Intersection	Control Type	Peak Hour	Existing Delay[a]	Existing LOS[b]	Existing + Project Delay	Existing + Project LOS	Δ[c]	Significant Impact?
1. Aero Drive / Convoy Street	Signal	AM	55.2	E	55.2	E	0.0	No
		PM	45.6	D	45.9	D	0.3	No
2. Aero Drive / Kearny Villa Road	Signal	AM	64.2	E	64.5	E	0.3	No
		PM	85.3	F	86.2	F	0.9	No
3. Aero Drive / Aero Court	Signal	AM	11.1	B	11.1	B	0.0	No
		PM	23.8	C	24.3	C	0.5	No
4. Aero Drive / Afton Road	Signal	AM	19.6	B	19.6	B	0.0	No
		PM	27.4	C	28.1	C	0.7	No
5. Aero Drive / Sandrock Road	Signal	AM	22.4	C	22.8	C	0.4	No
		PM	**62.4**	**E**	**65.0**	**E**	**2.6**	**Yes**
6. Aero Drive / Project Driveway[e]	MSSC[d]	AM	-	-	11.3	B	11.3	No
		PM	-	-	31.9	D	31.9	No
7. Aero Drive / Corporate Court	MSSC[d]	AM	15.3	C	15.4	C	0.1	No
		PM	40.8	E	40.8	E	0.0	No
8. Aero Drive / Ruffin Road	Signal	AM	62.1	E	63.1	E	1.0	No
		PM	28.1	C	28.4	C	0.3	No
9. Aero Drive / W. Canyon Avenue	Signal	AM	17.8	B	19.2	B	1.4	No
		PM	26.8	C	28.3	C	1.5	No
10. Aero Drive / Daley Center Drive	Signal	AM	58.4	E	58.6	E	0.2	No
		PM	50.7	D	51.4	D	0.7	No
11. Aero Drive / Murphy Canyon Road	Signal	AM	28.4	C	28.4	C	0.0	No
		PM	51.4	D	51.5	D	0.1	No
12. Aero Drive / I-15 SB Ramps	Signal	AM	121.6	F	122.0	F	0.4	No
		PM	23.5	C	23.6	C	0.1	No
13. Aero Drive / I-15 NB Ramps	Signal	AM	154.6	F	154.6	F	0.0	No
		PM	22.6	C	22.6	C	0.0	No

Footnotes:

a. Average delay expressed in seconds per vehicle.
b. Level of Service.
c. "Δ" denotes the Project-induced increase in delay.
d. Minor-Street Stop-Controlled intersection. Worst-Case delay is reported.
e. The Project site is currently vacant, and therefore there is no traffic using the driveway.

SIGNALIZED DELAY/LOS THRESHOLDS Delay	LOS	UNSIGNALIZED DELAY/LOS THRESHOLDS Delay	LOS
0.0 ≤ 10.0	A	0.0 ≤ 10.0	A
10.1 to 20.0	B	10.1 to 15.0	B
20.1 to 35.0	C	15.1 to 25.0	C
35.1 to 55.0	D	25.1 to 35.0	D
55.1 to 80.0	E	35.1 to 50.0	E
≥ 80.1	F	≥ 50.1	F

TABLE 8–2
EXISTING + PROJECT STREET SEGMENT OPERATIONS

Street Segment	Capacity (LOS E)[a]	Existing			Existing + Project			Δ[e]	Significant Impact?
		ADT[b]	LOS[c]	V/C[d]	ADT	LOS	V/C		
Aero Drive									
Convoy Street to Kearny Villa Road	40,000	23,760	C	0.594	23,796	C	0.595	0.001	No
Kearny Villa Road to Aero Court	40,000	32,980	D	0.825	33,063	D	0.827	0.002	No
Aero Court to Afton Road	40,000	29,990	C	0.750	30,073	D	0.752	0.002	No
Afton Road to Sandrock Road	40,000	6,250	C	0.656	26,340	C	0.659	0.003	No
Sandrock Road to Project Driveway	30,000 / 40,000[f]	21,310	D	0.710	22,225	C	0.556	(0.154)	No
Project Driveway to Corporate Court	30,000	21,310	D	0.710	21,544	D	0.718	0.008	No
Corporate Court to Ruffin Road	30,000	21,310	D	0.710	21,544	D	0.718	0.008	No
Ruffin Road to West Canyon Avenue	40,000	25,020	C	0.626	25,200	C	0.630	0.004	No
West Canyon Avenue to Daley Center Drive	40,000	25,020	C	0.626	25,193	C	0.630	0.004	No
Daley Center Drive to Murphy Canyon Road	40,000	34,580	D	0.865	34,717	D	0.868	0.003	No
Murphy Canyon Road to I-15 SB Ramps	45,000	46,790	F	1.040	46,898	F	1.042	0.002	No
I-15 SB Ramps to I-15 NB Ramps	45,000	32,460	C	0.721	32,525	C	0.723	0.002	No

Footnotes:

a. Capacities based on City of San Diego Roadway Classification Table (*See Appendix C*).
b. Average Daily Traffic.
c. Level of Service.
d. Volume to Capacity ratio.
e. "Δ" denotes the Project-induced increase in Volume to Capacity ratio.
f. The Project will construct a raised median on Aero Drive along the Project frontage, connecting to the existing median to the west of the Project site, in order to satisfy the City's Major Roadway requirement. Therefore, this segment was analyzed as a 4-Lane Major under Existing + Project conditions.

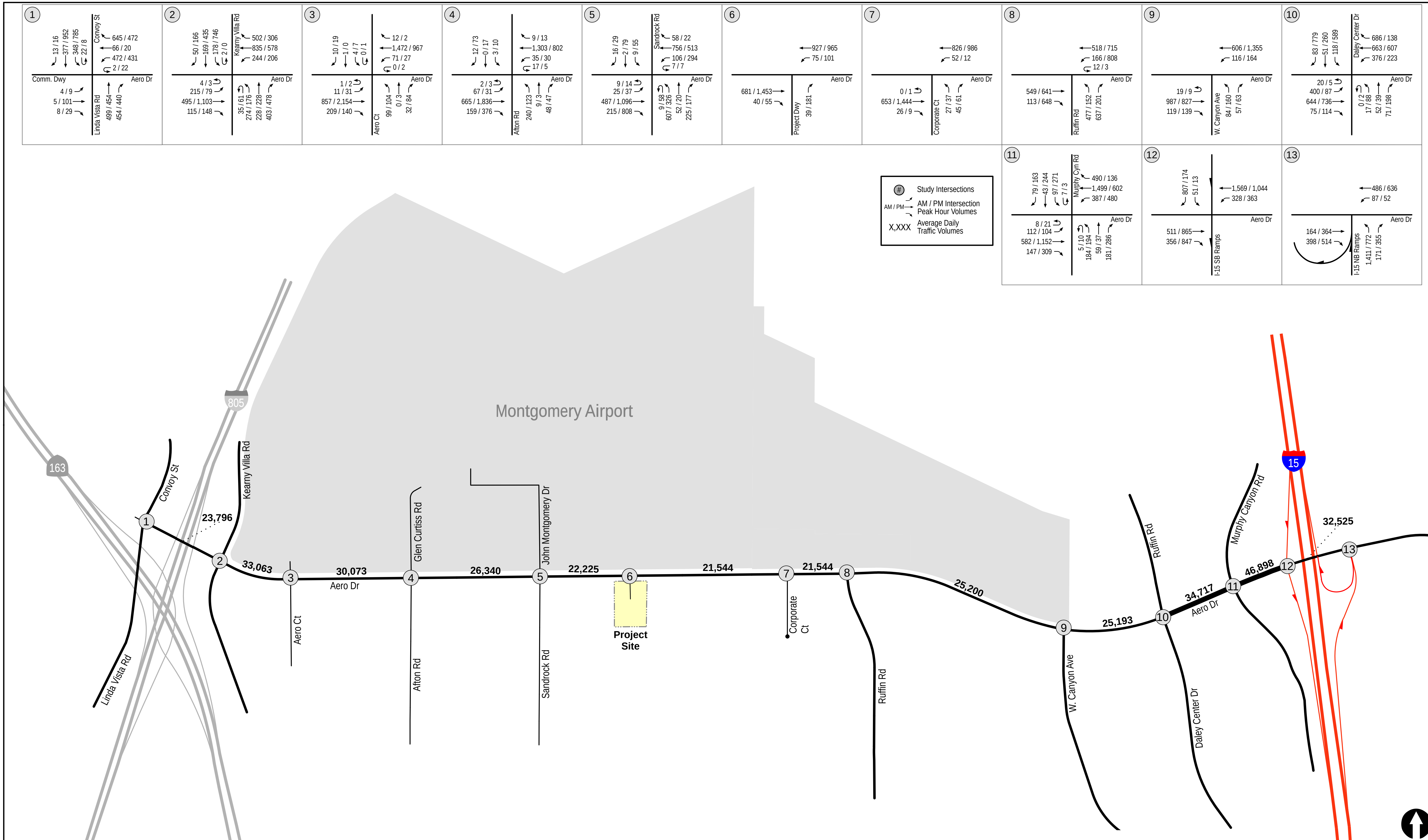

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Figure 8-1

Existing + Project Traffic Volumes

Aero Drive VA Facility

9.0 CUMULATIVE PROJECTS

Cumulative projects represent reasonably foreseeable planned development that contributes to background traffic conditions for the Near-Term (2020) scenario.

9.1 Cumulative Project Research

LLG researched ongoing cumulative project development in the study area and identified 14 cumulative projects for consideration in the Near-Term (2020). It is important to note that some of these projects may not be constructed prior to the Project's opening day in 2020. In any case, they were included as a part of the background traffic growth to be conservative.

Table 9–1 contains a list of cumulative projects that were considered in the Near-Term (2020) analysis. ***Figure 9–1*** shows the cumulative projects traffic volumes and ***Figure 9-2*** shows the locations of the cumulative projects.

TABLE 9-1
CUMULATIVE PROJECTS (OPENING DAY 2020)

Project Name	Location	Type	Size	ADT	Status
1. Atlas Street	3455 Atlas Street	Residential: Single Family Detached	9 Units	81	In Review
2. The Aero	8225 Aero Drive	Residential: Multiple Dwelling Units	434 Units	2,604	In Review
3. Greenhouse MMCC	7865 Balboa Ave	Dispensary	2.5 KSF	625	In Review
4. Marijuana Production Facility	8859 Balboa Ave	Production: Manufacturing Rate	4.998 KSF	20	In Review
5. Le Petitie Ecole - Phase 2[a]	8401 Aero Drive	Private School (ITE Rate)	240 Students	359	In Review
6. Centrum 2	Kearny Villa Road between Lightwave Ave and Spectrum Center Blvd	Office: Commercial Office	284 KSF	3,717	In Review
7. Sunroad Future Resident	East of Centrum 2 Project	Residential: Multiple Dwelling Units	803 DU	4,818	In Review
8. Tech Way Motel	North side of Tech Way midway between Kearny Villa Rd and Overland Ave	Lodging: Motel	108 Rooms	972	In Review
9. New Mark Retail	Northwest quadrant of Overland Ave / Lightwave Ave intersection	Commercial Retail: Strip Commercial	13.3 KSF	479	In Review
10. New Office Building	Southwest quadrant of Overland Ave / Lightwave Ave intersection	Office: Commercial Office	66 KSF	1,233	In Review
11. Kyocera	East of Kearny Villa Rd and South of Clairemont Mesa Blvd	Office: Commercial Office	104 KSF	1,499	In Review
12. Kaiser-Medical Office Building[b]	East side of Ruffin Road between Clairemont Mesa Blvd and Ruffin Ct	Office: Medical Office	75 KSF	1,500	Approved, not yet constructed
13. Kearny Mesa Ramada Inn	Northwest quadrant of Kearny Mesa Rd / Clairemont Mesa Blvd	Lodging: Hotel	130 Rooms	1,300	Approved, not yet constructed
14. 8575 Aero Drive	8575 Aero Drive	Residential: Multiple Dwelling Units	130 DU	780	In Review

Footnotes:

a. Phase 2 of the Le Petite Ecole project is estimated to be complete in 2022. However, in order to provide a conservative analysis, Phase 2 was considered under Near-Term conditions.

b. Phase 1 of the Kaiser project includes a 321-bed hospital and a 75,000 SF medical office building. The hospital portion of Phase I has been completed and was open at the time this study was prepared. The medical office building portion of Phase 1 was assumed to be forthcoming and is therefore included in the cumulative analysis. Phase 2 of the project contains a 129-bed hospital and a 105,000 SF medical office building and will not be constructed prior to the opening day of the Project.

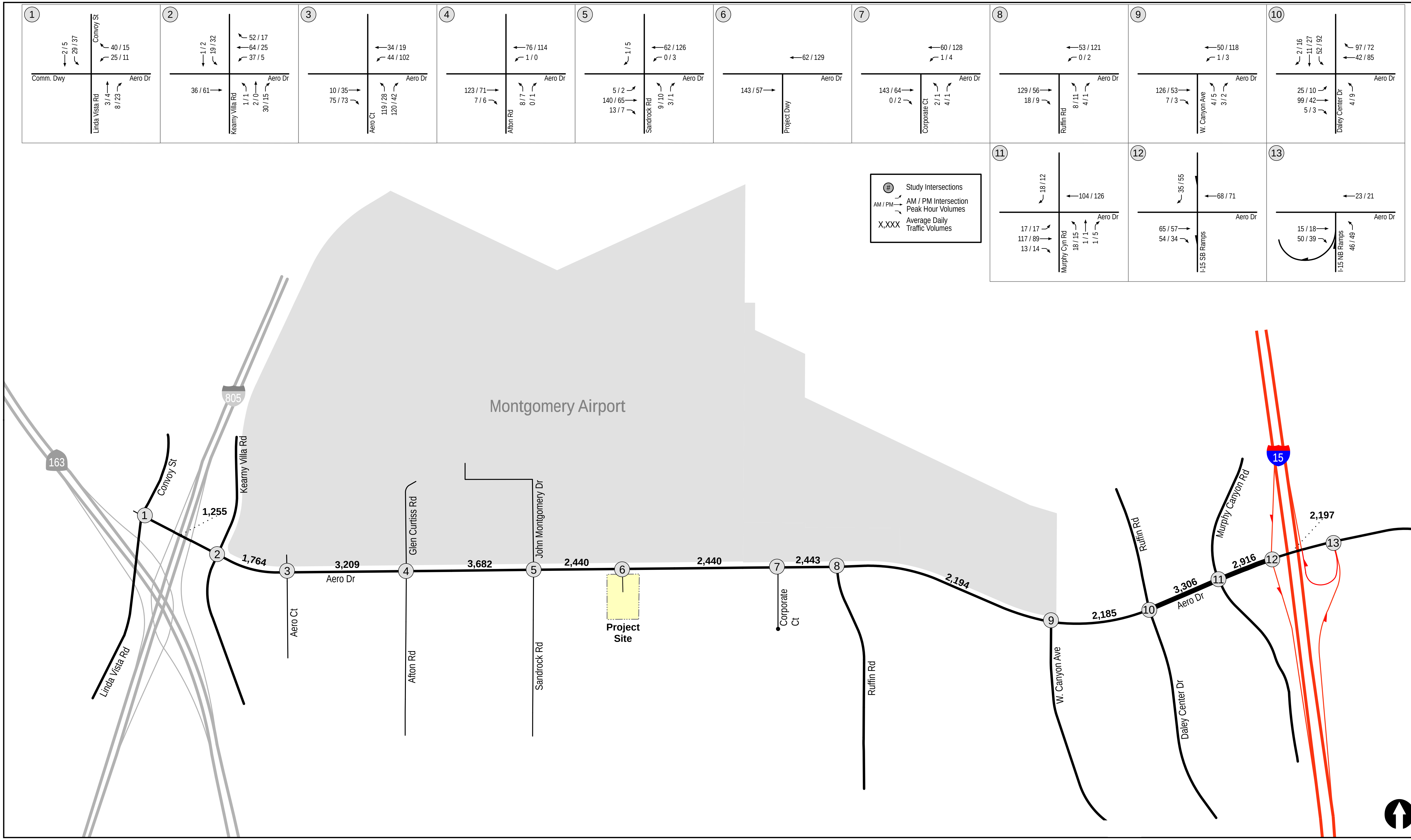

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Figure 9-1

Cumulative Projects Traffic Volumes

AERO DRIVE VA FACILITY

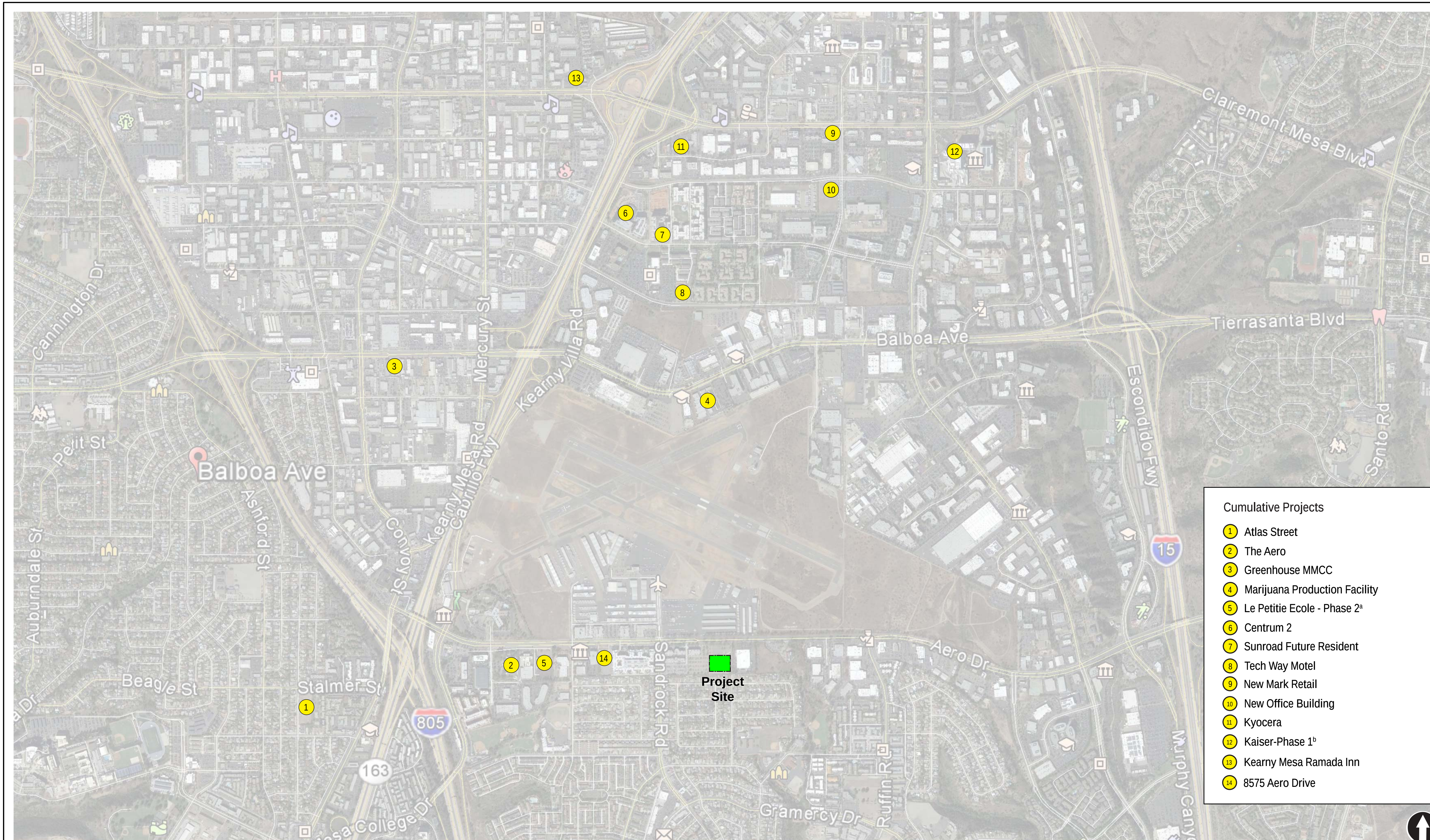

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Figure 9-2

Cumulative Projects Location Map

AERO DRIVE VA FACILITY

10.0 Near-Term (Year 2020) Analysis

The following section presents the analysis of study area intersections and street segments under Near-Term (Year 2020) conditions without and with the proposed Project.

10.1 Near-Term (Year 2020) Traffic Volumes

Near-Term (Year 2020) traffic volumes were calculated for the study area by adding the cumulative project volumes onto the existing traffic volumes. Near-Term (Year 2020) + Project traffic volumes were calculated by then adding the Project traffic volumes.

Figure 10–1 shows the Near-Term (Year 2020) traffic volumes. ***Figure 10–2*** shows the Near-Term (Year 2020) + Project traffic volumes.

10.2 Near-Term (Year 2020) without Project Operations

10.2.1 *Intersection Analysis*

Table 10–1 summarizes the peak hour intersection operations for the Near-Term (Year 2020) scenario. As seen in *Table 10–1*, the following study area intersections are calculated to operate at LOS E or F:

1. Aero Drive / Convoy Street (LOS E during the AM peak hour)
2. Aero Drive / Kearny Villa Road (LOS F during the AM and PM peak hours)
3. Aero Drive / Aero Court (LOS E during the PM peak hour)
5. Aero Drive / Sandrock Road (LOS E during the PM peak hour)
7. Aero Drive / Corporate Court (LOS F during the PM peak hour)
8. Aero Drive / Ruffin Road (LOS E during the AM peak hour)
10. Aero Drive / Daley Center Drive (LOS E during the AM and PM peak hours)
12. Aero Drive / I-15 Southbound Ramps (LOS F during the AM peak hour)
13. Aero Drive / I-15 Northbound Ramps (LOS F during the AM peak hour)

Appendix E contains the intersection analysis sheets for the Near-Term (Year 2020) scenario.

10.2.2 *Street Segment Analysis*

Table 10–2 summarizes the Near-Term (Year 2020) street segment operations. As shown in *Table 10–2*, the following study street segments are calculated to operate at LOS E or F:

10. Aero Drive: Daley Center Drive to Murphy Canyon Road (LOS E)
11. Aero Drive: Murphy Drive to I-15 Southbound Ramps (LOS F)

10.3 Near-Term (2020) + Project Operations

10.3.1 *Intersection Analysis*

Table 10–1 summarizes the peak hour intersection operations for the Near-Term (Year 2020) + Project scenario. As seen in *Table 10–1*, the following study area intersections are calculated to operate at LOS E or F:

1. Aero Drive / Convoy Street (LOS E during the AM peak hour)
2. Aero Drive / Kearny Villa Road (LOS F during the AM and PM peak hours)
3. Aero Drive / Aero Court (LOS E during the PM peak hour)
5. Aero Drive / Sandrock Road (LOS E during the PM peak hour)
7. Aero Drive / Corporate Court (LOS F during the PM peak hour)
8. Aero Drive / Ruffin Road (LOS E during the AM peak hour)
10. Aero Drive / Daley Center Drive (LOS E during AM and PM peak hours)
12. Aero Drive / I-15 Southbound Ramps (LOS F during the AM peak hour)
13. Aero Drive / I-15 Northbound Ramps (LOS F during the AM peak hour)

Based on the City of San Diego's significance criteria, no significant impacts are calculated at the study area intersections as the Project contribution does not exceed the allowable thresholds. However, it should be noted that the intersection of Aero Drive / Sandrock Road is significantly impacted by the Project under Existing + Project conditions.

Appendix F contains the intersection analysis sheets for the Near-Term (Year 2020) + Project scenario.

10.3.2 *Street Segment Analysis*

Table 10–2 summarizes the Near-Term (Year 2020) + Project street segment operations. As shown in *Table 10–2*, the following study street segments are calculated to operate at LOS E or F:

10. Aero Drive: Daley Center Drive to Murphy Canyon Road (LOS E)
11. Aero Drive: Murphy Drive to I-15 Southbound Ramps (LOS F)

It should be noted that the segment of Aero Drive between Sandrock Road and the Project Driveway was analyzed as a 4-lane Major under Near-Term (Year 2020) + Project conditions since the Project will construct a raised median along its frontage, connecting to the existing median to the west of the Project site, in order to satisfy the City's Major Roadway requirements as part of the project.

Based on the City of San Diego's significance criteria, no significant impacts are calculated at the study area street segments as the Project contribution does not exceed the allowable thresholds.

TABLE 10–1
NEAR-TERM (YEAR 2020) + PROJECT INTERSECTION OPERATIONS

Intersection	Control Type	Peak Hour	Near-Term (Year 2020)		Near-Term (Year 2020) +Project		Δ[c]	Significant Impact?
			Delay[a]	LOS[b]	Delay	LOS		
1. Aero Drive / Convoy Street	Signal	AM	65.7	E	65.7	E	0.0	No
		PM	50.8	D	51.3	D	0.5	No
2. Aero Drive / Kearny Villa Road	Signal	AM	80.2	F	80.6	F	0.4	No
		PM	95.1	F	96.1	F	1.0	No
3. Aero Drive / Aero Court	Signal	AM	25.5	C	25.6	C	0.1	No
		PM	62.7	E	63.8	E	1.1	No
4. Aero Drive / Afton Road	Signal	AM	21.6	C	21.7	C	0.1	No
		PM	32.6	C	33.6	C	1.0	No
5. Aero Drive / Sandrock Road	Signal	AM	22.9	C	23.4	C	0.5	No
		PM	63.1	E	64.9	E	1.8	No
6. Aero Drive / Project Driveway[e]	MSSC[d]	AM	-	-	12.2	B	12.2	No
		PM	-	-	34.8	D	34.8	No
7. Aero Drive / Corporate Road	MSSC[d]	AM	17.6	C	17.8	C	0.2	No
		PM	54.5	F	54.5	F	0.0	No
8. Aero Drive / Ruffin Road	Signal	AM	62.3	E	62.4	E	0.1	No
		PM	28.6	C	28.8	C	0.2	No
9. Aero Drive / W. Canyon Road	Signal	AM	20.8	C	21.0	C	0.2	No
		PM	37.3	D	40.3	D	3.0	No
10. Aero Drive / Daley Center Drive	Signal	AM	74.8	E	75.3	E	0.5	No
		PM	55.2	E	55.5	E	0.3	No
11. Aero Drive / Murphy Canyon Road	Signal	AM	30.4	C	30.4	C	0.0	No
		PM	53.6	D	53.8	D	0.2	No
12. Aero Drive / I-15 SB Ramps	Signal	AM	128.0	F	128.0	F	0.0	No
		PM	24.2	C	24.2	C	0.0	No
13. Aero Drive / I-15 NB Ramps	Signal	AM	180.9	F	180.8	F	0.0	No
		PM	22.8	C	22.8	C	0.0	No

Footnotes:

a. Average delay expressed in seconds per vehicle.
b. Level of Service.
c. "Δ" denotes the Project-induced increase in delay.
d. Minor-Street Stop-Controlled intersection. Worst-Case movement delay is reported.
e. The Project site is currently vacant, and therefore there is no traffic using the driveway.

SIGNALIZED DELAY/LOS THRESHOLDS Delay	LOS	UNSIGNALIZED DELAY/LOS THRESHOLDS Delay	LOS
0.0 ≤ 10.0	A	0.0 ≤ 10.0	A
10.1 to 20.0	B	10.1 to 15.0	B
20.1 to 35.0	C	15.1 to 25.0	C
35.1 to 55.0	D	25.1 to 35.0	D
55.1 to 80.0	E	35.1 to 50.0	E
≥ 80.1	F	≥ 50.1	F

TABLE 10–2
NEAR-TERM (YEAR 2020) + PROJECT STREET SEGMENT OPERATIONS

Street Segment	Capacity (LOS E)[a]	Near-Term (Year 2020)			Near-Term (Year 2020) + Project			Δ[e]	Significant Impact?
		ADT[b]	LOS[c]	V/C[d]	ADT	LOS	V/C		
Aero Drive									
Convoy Street to Kearny Villa Road	40,000	25,015	C	0.625	25,051	C	0.626	0.001	No
Kearny Villa Road to Aero Court	40,000	34,744	D	0.869	34,827	D	0.871	0.002	No
Aero Court to Afton Road	40,000	33,199	D	0.830	33,282	D	0.832	0.002	No
Afton Road to Sandrock Road	40,000	29,932	C	0.748	30,022	D	0.751	0.003	No
Sandrock Road to Project Driveway	30,000 / 40,000[f]	23,750	D	0.792	24,665	C	0.617	(0.175)	No
Project Driveway to Corporate Court	30,000	23,750	D	0.792	23,984	D	0.799	0.007	No
Corporate Court to Ruffin Road	30,000	23,753	D	0.792	23,987	D	0.800	0.008	No
Ruffin Road to West Canyon Avenue	40,000	27,214	C	0.680	27,394	C	0.685	0.005	No
West Canyon Avenue to Daley Center Drive	40,000	27,205	C	0.680	27,378	C	0.684	0.004	No
Daley Center Drive to Murphy Canyon Road	40,000	37,886	E	0.947	38,023	E	0.951	0.004	No
Murphy Canyon Road to I-15 SB Ramps	45,000	49,706	F	1.105	49,814	F	1.107	0.002	No
I-15 SB Ramps to I-15 NB Ramps	45,000	34,657	C	0.770	34,722	C	0.772	0.002	No

Footnotes:

a. Capacities based on City of San Diego Roadway Classification Table (See Appendix C).
b. Average Daily Traffic.
c. Level of Service.
d. Volume to Capacity ratio.
e. "Δ" denotes the Project-induced increase in Volume to Capacity ratio.
f. The Project will construct a raised median on Aero Drive along the Project frontage, connecting to the existing median to the west of the Project site, in order to satisfy the City's Major Roadway requirement. Therefore, this segment was analyzed as a 4-Lane Major under Near-Term + Project conditions.

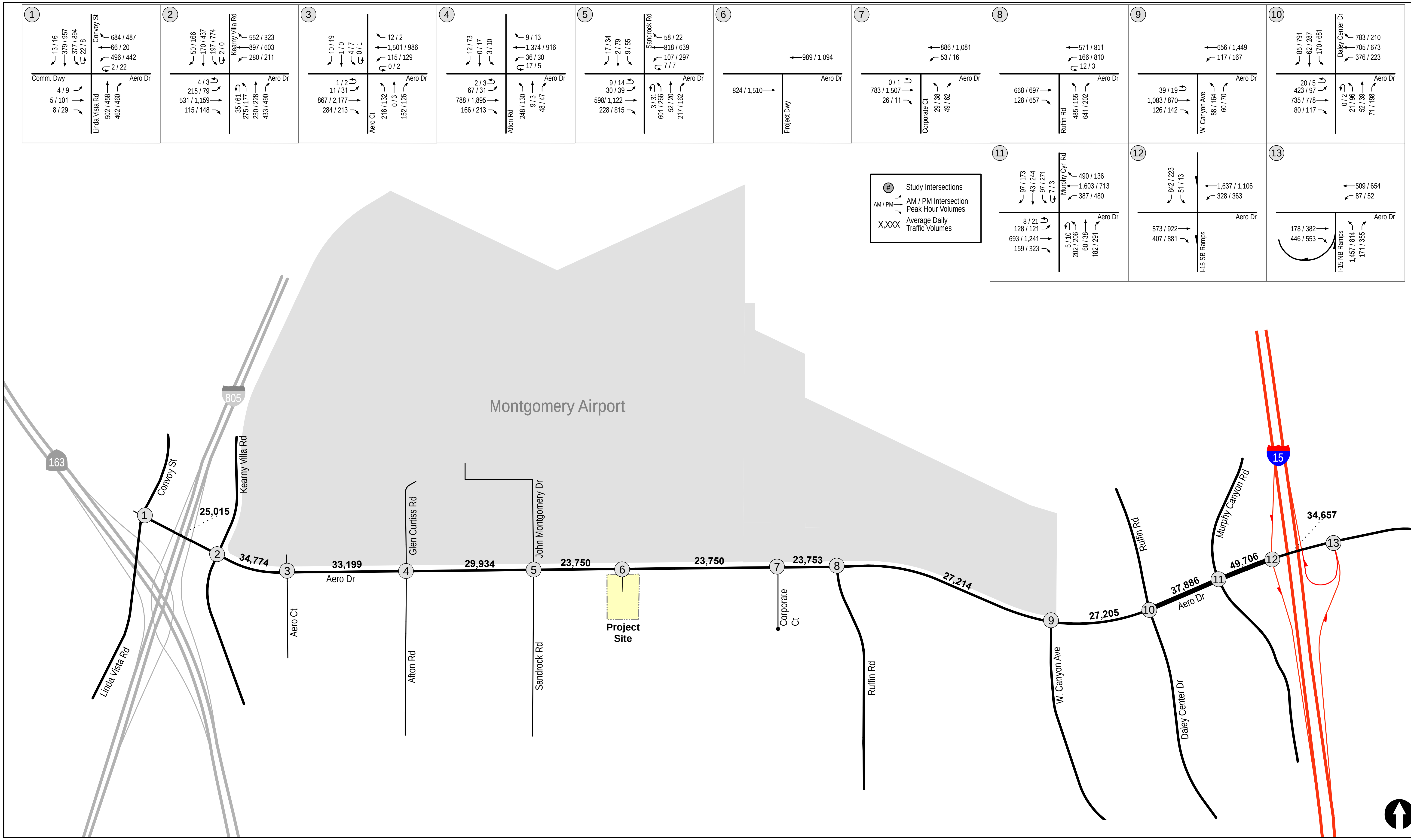

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Figure 10-1

Near-Term (Year 2020) without Project Traffic Volumes

AERO DRIVE VA FACILITY

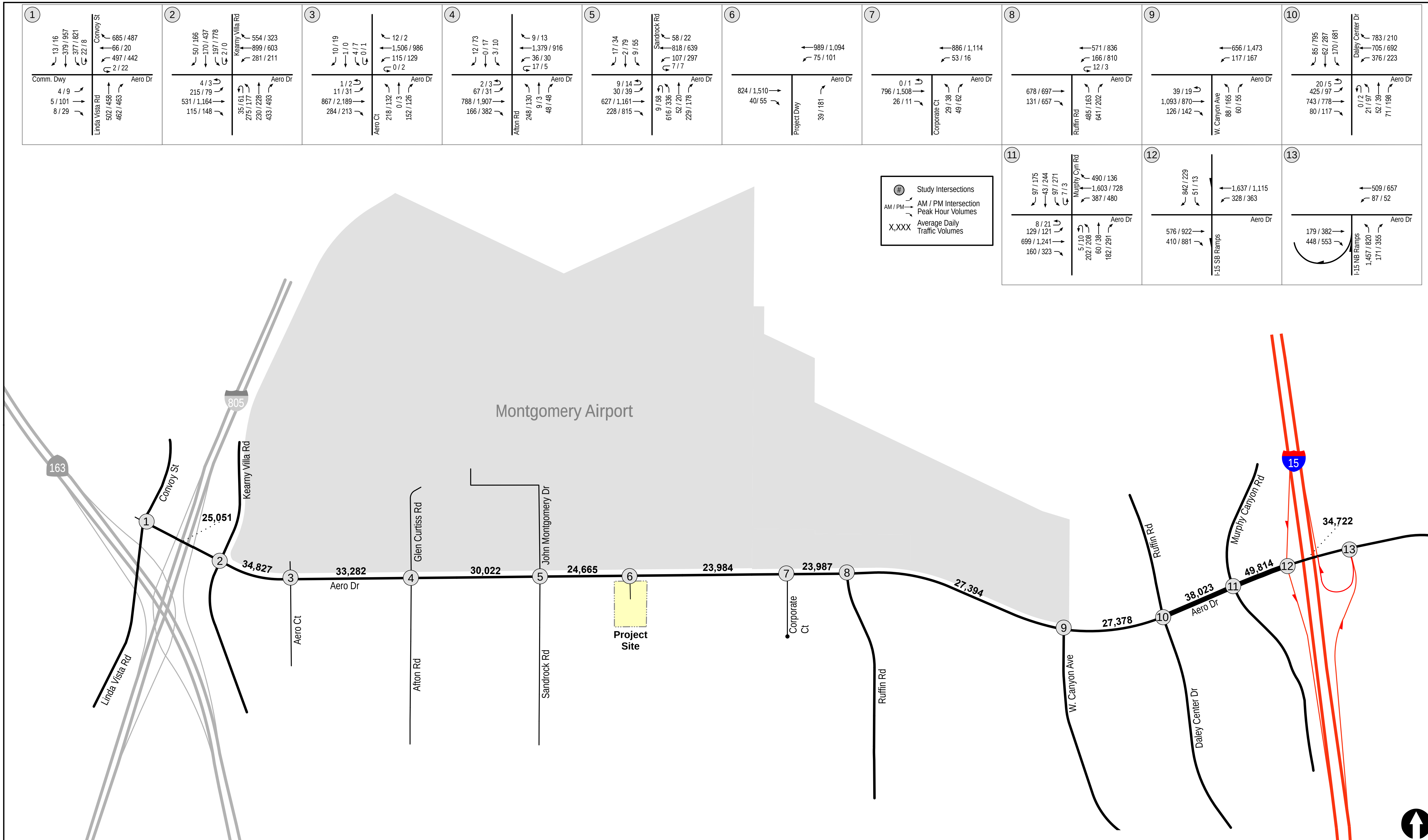

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Figure 10-2

Near-Term (Year 2020) + Project Traffic Volumes

AERO DRIVE VA FACILITY

11.0 LONG-TERM (YEAR 2035) ANALYSIS

The following section presents the analysis of study area intersections and street segments under Long-Term (Year 2035) conditions without and with the proposed Project.

11.1 Long-Term (Year 2035) Conditions and Traffic Volumes

Planned Improvements

No network improvements were assumed under Long-Term (Year 2035) conditions).

Long-Term (Year 2035) Traffic Volumes

Long-Term (Year 2035) traffic volumes were forecasted for the study area using the SANDAG Series 12 Regional Traffic Model (included in ***Appendix L***). Based on the projected forecast ADT volumes, the Long-Term (Year 2035) peak hour volumes were calculated based on the existing relationship between ADT and peak hour volumes. The forecast volumes were also checked for consistency between intersections, where no driveways or roadways exist between intersections, and were compared to existing volumes for accuracy.

Figure 11–1 shows the Long-Term (Year 2035) traffic volumes. ***Figure 11–2*** shows the Long-Term (Year 2035) + Project traffic volumes.

11.2 Long-Term (2035) without Project Operations

11.2.1 *Intersection Analysis*

Table 11–1 summarizes the peak hour intersection operations for the Long-Term (Year 2035) scenario. As seen in *Table 11–1*, the following study area intersections are calculated to operate at LOS E or F:

1. Aero Drive / Convoy Street (LOS E during the AM peak / LOS F during PM peak)
2. Aero Drive / Kearny Villa Road (LOS F during the AM and PM peak hours)
3. Aero Drive / Aero Court (LOS E during the PM peak hour)
5. Aero Drive / Sandrock Road (LOS E during the PM peak hour)
7. Aero Drive / Corporate Court (LOS F during the PM peak hour)
8. Aero Drive / Ruffin Road (LOS E during the AM peak hour)
10. Aero Drive / Daley Center Drive (LOS F during the AM peak / LOS E during PM peak)
11. Aero Drive / Murphy Canyon Road (LOS E during the PM peak hour)
12. Aero Drive / I-15 Southbound Ramps (LOS F during the AM peak hour)
13. Aero Drive / I-15 Northbound Ramps (LOS F during the AM peak hour)

Appendix G contains the intersection analysis sheets for the Long-Term (Year 2035) scenario.

11.2.2 *Street Segment Analysis*

Table 11–2 summarizes the Long-Term (Year 2035) street segment operations. As shown in *Table 11–2*, the following study street segments are calculated to operate at LOS E or F:

2. Aero Drive: Kearny Villa Road to Aero Court (LOS E)
5. Aero Drive: Sandrock Road to the Project Driveway (LOS E)
6. Aero Drive: Project Driveway to Corporate Court (LOS E)
7. Aero Drive: Corporate Court to Ruffin Road (LOS E)
10. Aero Drive: Daley Center Drive to Murphy Canyon Road (LOS F)
11. Aero Drive: Murphy Drive to I-15 Southbound Ramps (LOS F)

11.3 Long-Term (Year 2035) + Project Operations

11.3.1 *Intersection Analysis*

Table 11–1 summarizes the peak hour intersection operations for the Long-Term (Year 2035) + Project scenario. As seen in *Table 11–1*, the following study area intersections are calculated to operate at LOS E or F:

1. Aero Drive / Convoy Street (LOS E during the AM peak / LOS F during PM peak)
2. Aero Drive / Kearny Villa Road (LOS F during the AM and PM peak hours)
3. Aero Drive / Aero Court (LOS E during the PM peak hour)
5. Aero Drive / Sandrock Road (LOS E during the PM peak hour)
7. Aero Drive / Corporate Court (LOS F during the PM peak hour)
8. Aero Drive / Ruffin Road (LOS E during the AM peak hour)
10. Aero Drive / Daley Center Drive (LOS F during the AM peak / LOS E during PM peak)
11. Aero Drive / Murphy Canyon Road (LOS E during the PM peak hour)
12. Aero Drive / I-15 Southbound Ramps (LOS F during the AM peak hour)
13. Aero Drive / I-15 Northbound Ramps (LOS F during the AM peak hour)

Based on the City of San Diego's significance criteria, a significant cumulative impact is calculated at the intersection of Aero Drive / Sandrock Road.

Appendix H contains the intersection analysis sheets for the Long-Term (Year 2035) + Project scenario.

11.3.2 *Street Segment Analysis*

Table 11–2 summarizes the Long-Term (2035) + Project street segment operations. As shown in *Table 11–2*, the following study street segments are calculated to operate at LOS E or F:

2. Aero Drive: Kearny Villa Road to Aero Court (LOS E)
6. Aero Drive: Project Driveway to Corporate Court (LOS E)
7. Aero Drive: Corporate Court to Ruffin Road (LOS E)
10. Aero Drive: Daley Center Drive to Murphy Canyon Road (LOS F)
11. Aero Drive: Murphy Drive to I-15 Southbound Ramps (LOS F)

It should be noted that the segment of Aero Drive between Sandrock Road and the Project Driveway was analyzed as a 4-lane Major under Long Term (Year 2035) + Project conditions since the Project will construct a raised median along its frontage, connecting to the existing median to the west of the Project site, in order to satisfy the City's Major Roadway requirements as part of the project.

Based on the City of San Diego's significance criteria, no significant impacts are calculated at the study area street segments as the Project contribution does not exceed the allowable thresholds.

TABLE 11–1
LONG-TERM (YEAR 2035) + PROJECT INTERSECTION OPERATIONS

Intersection	Control Type	Peak Hour	Long-Term Year (Year 2035)		Long-Term (Year 2035) +Project		Δ[c]	Significant Impact?
			Delay[a]	LOS[b]	Delay	LOS		
1. Aero Drive / Convoy Street	Signal	AM	69.0	E	69.1	E	0.1	No
		PM	85.6	F	86.2	F	0.6	No
2. Aero Drive / Kearny Villa Road	Signal	AM	84.2	F	84.6	F	0.4	No
		PM	127.3	F	128.2	F	0.9	No
3. Aero Drive / Aero Court	Signal	AM	30.6	C	30.7	C	0.1	No
		PM	76.2	E	76.8	E	0.6	No
4. Aero Drive / Afton Road	Signal	AM	26.3	C	26.5	C	0.2	No
		PM	47.1	D	48.1	D	1.0	No
5. Aero Drive / Sandrock Road	Signal	AM	25.2	C	25.7	C	0.5	No
		PM	**69.5**	**E**	**73.0**	**E**	**3.5**	**Yes**
6. Aero Drive / Project Driveway[e]	MSSC[d]	AM	-	-	12.3	B	12.3	No
		PM	-	-	34.8	D	34.8	No
7. Aero Drive / Corporate Court	MSSC[d]	AM	19.2	C	19.4	C	0.2	No
		PM	52.5	F	52.5	F	0.0	No
8. Aero Drive / Ruffin Road	Signal	AM	63.1	E	63.1	E	0.0	No
		PM	46.4	D	46.4	D	0.0	No
9. Aero Drive / W. Canyon Road	Signal	AM	20.6	C	20.8	C	0.2	No
		PM	41.0	D	42.5	D	1.5	No
10. Aero Drive / Daley Center Drive	Signal	AM	81.4	F	81.6	F	0.2	No
		PM	66.4	E	67.5	E	1.1	No
11. Aero Drive / Murphy Canyon Road	Signal	AM	44.4	D	44.4	D	0.0	No
		PM	73.1	E	73.1	E	0.0	No
12. Aero Drive / I-15 SB Ramps	Signal	AM	132.6	F	132.6	F	0.0	No
		PM	24.9	C	37.4	D	12.5	No
13. Aero Drive / I-15 NB Ramps	Signal	AM	192.4	F	192.4	F	0.0	No
		PM	23.2	C	28.4	C	5.2	No

Footnotes:

a. Average delay expressed in seconds per vehicle.
b. Level of Service.
c. "Δ" denotes the Project-induced increase in delay.
d. Minor-Street Stop-Controlled intersection. Worst-Case movement delay is reported.
e. The Project site is currently vacant, and therefore there is no traffic using the driveway.

SIGNALIZED DELAY/LOS THRESHOLDS Delay	LOS	UNSIGNALIZED DELAY/LOS THRESHOLDS Delay	LOS
0.0 ≤ 10.0	A	0.0 ≤ 10.0	A
10.1 to 20.0	B	10.1 to 15.0	B
20.1 to 35.0	C	15.1 to 25.0	C
35.1 to 55.0	D	25.1 to 35.0	D
55.1 to 80.0	E	35.1 to 50.0	E
≥ 80.1	F	≥ 50.1	F

TABLE 11–2
LONG-TERM (YEAR 2035) + PROJECT STREET SEGMENT OPERATIONS

Street Segment	Capacity (LOS E)[a]	Long-Term (Year 2035)			Long-Term (Year 2035) + Project			Δ[e]	Significant Impact?
		ADT[b]	LOS[c]	V/C[d]	ADT	LOS	V/C		
Aero Drive									
Convoy Street to Kearny Villa Road	40,000	26,000	C	0.650	26,036	C	0.651	0.001	No
Kearny Villa Road to Aero Court	40,000	35,900	E	0.898	35,983	E	0.900	0.002	No
Aero Court to Afton Road	40,000	34,340	D	0.859	34,423	D	0.861	0.002	No
Afton Road to Sandrock Road	40,000	31,870	D	0.797	31,960	D	0.799	0.002	No
Sandrock Road to Project Driveway	30,000 / 40,000[f]	27,800	E	0.927	28,715	C	0.718	(0.209)	No
Project Driveway to Corporate Court	30,000	27,820	E	0.927	28,054	E	0.935	0.008	No
Corporate Court to Ruffin Road	30,000	27,820	E	0.927	28,054	E	0.935	0.008	No
Ruffin Road to West Canyon Avenue	40,000	29,240	C	0.731	29,420	C	0.736	0.005	No
West Canyon Avenue to Daley Center Drive	40,000	29,240	C	0.731	29,413	C	0.735	0.004	No
Daley Center Drive to Murphy Canyon Road	40,000	40,970	F	1.024	41,107	F	1.028	0.004	No
Murphy Canyon Road to I-15 SB Ramps	45,000	53,920	F	1.198	54,028	F	1.201	0.003	No
I-15 SB Ramps to I-15 NB Ramps	45,000	37,620	D	0.836	37,685	D	0.837	0.001	No

Footnotes:

a. Capacities based on City of San Diego Roadway Classification Table (See Appendix C).
b. Average Daily Traffic.
c. Level of Service.
d. Volume to Capacity ratio.
e. "Δ" denotes the Project-induced increase in Volume to Capacity ratio.
f. The Project will construct a raised median on Aero Drive along the Project frontage, connecting to the existing median to the west of the Project site, in order to satisfy the City's Major Roadway requirement. Therefore, this segment was analyzed as a 4-Lane Major under Long-Term + Project conditions.

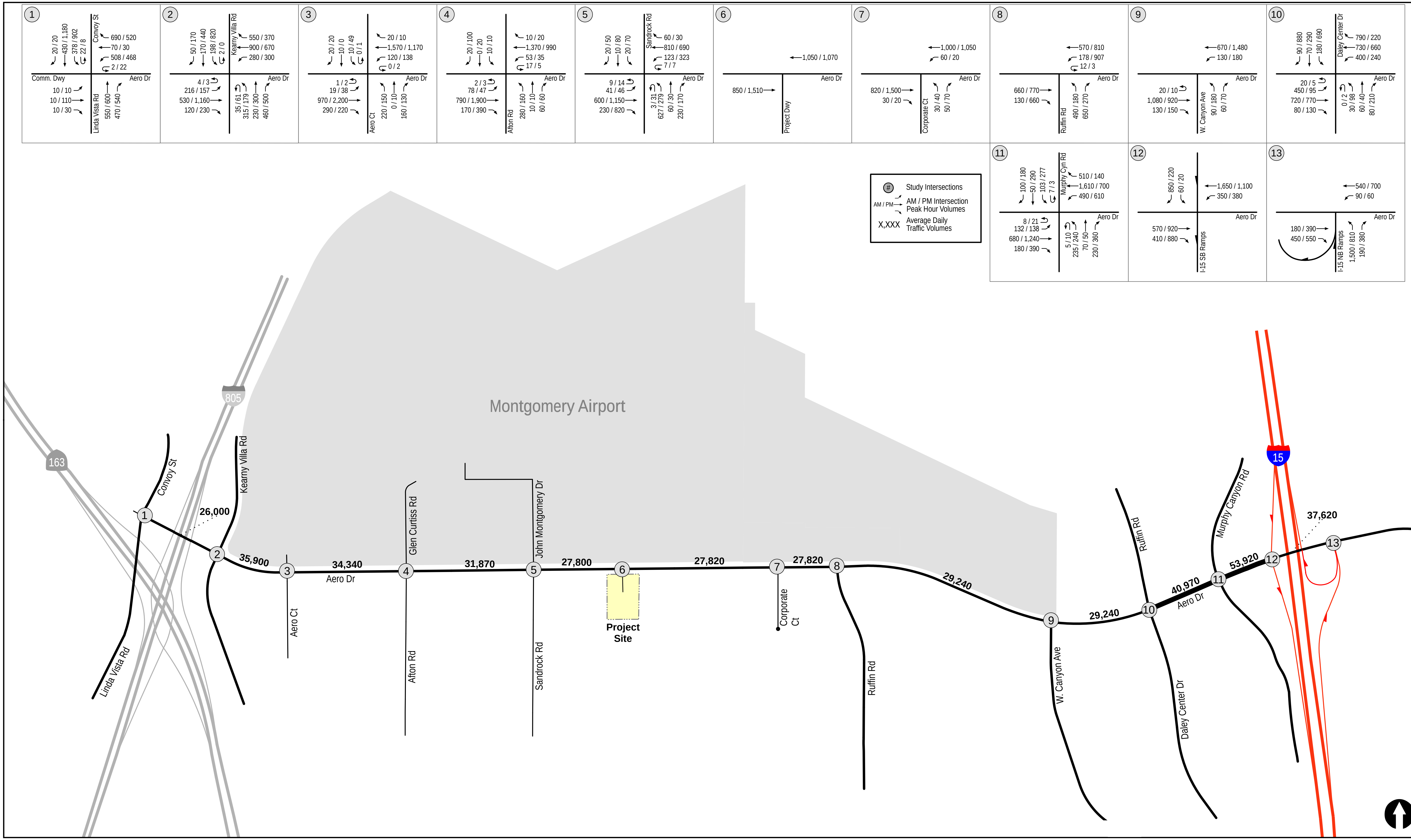

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Figure 11-1

Long-Term (Year 2035) without Project Traffic Volumes

AERO DRIVE VA FACILITY

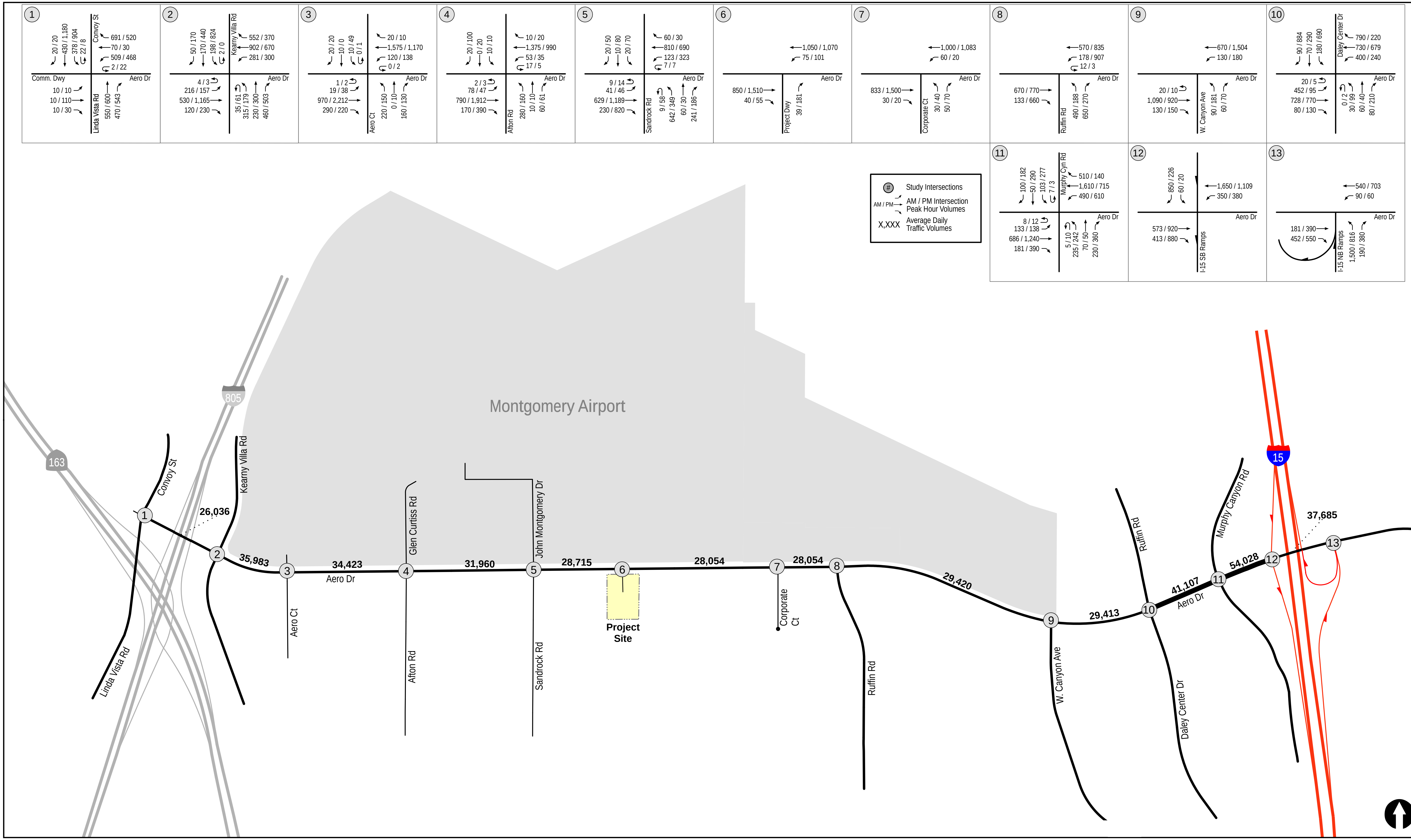

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Figure 11-2

Long-Term (2035) + Project Traffic Volumes

AERO DRIVE VA FACILITY

12.0 SITE ACCESS AND CIRCULATION

Access to the site will continue to be primarily from Aero Drive, with one existing driveway being closed. The Project will construct a raised median on Aero Drive along the project frontage in order to satisfy the City's Major Roadway requirements. A median break will be provided to allow for left-turns into the site. Left-turns out of the site will be prohibited. The Project site has a legal easement to access Sandrock Road thru the contiguous properties to the west. Therefore, a portion of the Project trips were assumed to exit via Sandrock Road.

The Project Driveway is calculated to operate acceptably at LOS D under all analysis scenarios. A 95th percentile outbound right-turn queue of 101 feet (approximately 4 vehicles) is calculated during the PM peak hour under Year 2035 conditions. A 95th percentile inbound left-turn queue of 30 feet (or approximately one to two vehicles) is calculated during the PM peak hour under Year 2035 conditions. The queuing analysis sheets are included in ***Appendix J***.

13.0 PARKING

The Project proposes to provide a 138,915 SF Veterans Affairs Hospital Annex. Based on the City of San Diego's parking requirement of 3.5 spaces per 1,000 SF per LDC Section 142.0530, Table 142-05G for medical office use with the project being located in the 2035 Transit Priority Area (TPA), a minimum of 487 parking spaces are required. The project site will provide 637 spaces, including 525 standard stalls, 25 accessible stalls, 44 clean air / carpool / vanpool stalls, 33 electric vehicle stalls and 10 motorcycle stalls, and will therefore exceed the City's minimum parking requirement.

14.0 TRANSPORTATION DEMAND MANAGEMENT

The project includes a Transportation Demand Management Program that includes the following measures:

- Carpool/vanpool parking spaces will be provided in preferentially located areas (closest to building entrances) for use by qualified employees. These spaces will be signed and striped "Car/Vanpool Parking Only". Information about the availability of and the means of accessing the car/vanpool parking spaces will be posted on Transportation Information Displays located in back-offices, common areas or on intranets, as appropriate.

- The project will maintain an employer network in the SANDAG iCommute program and employees will be offered the opportunity to register for commuter ridematching provided through publicly sponsored services (e.g., SANDAG sponsored "iCommute Ridetracker" or similar program).

- The project will reduce the demand for trips by participating in the Veterans Affairs Veterans Transportation Program which dedicates Veterans Affairs resources to subsidize carpool, vanpool, and transit travel options.

- The project is within ¼-mile of numerous services that reduce the need to drive including the following (map provided in ***Appendix M***):
    - Cafes, restaurants, and dry cleaners available in the Olympus Corsair project which is on the southwest corner of Aero Drive and Sandrock Drive;
    - Cafes, restaurants, and other commercial services such as cleaners and a barber shop in the commercial shopping center on the northwest corner of Aero Drive and Sandrock Drive;
    - A café located to the west in the building immediately adjacent to the project site; and
    - The Serra Mesa-Kearny Mesa Branch library which includes numerous resources such as computer and internet access to the east of the project site on the south side of Aero Drive.

Additionally, the project is 2,135 feet from the social security office and there are two bus stops that are 1,375 feet from each other which further provide access to the social security office while reducing trips.

15.0 SIGNIFICANCE OF IMPACTS AND MITIGATION MEASURES

Based on the City of San Diego's significance criteria, a significant impact is calculated at the intersection of Aero Drive / Sandrock Road under Existing + Project and Long-Term (Year 2035) + Project conditions.

It is recommended that the Project reconfigure the northbound and southbound approaches, currently controlled with split signal phasing, to provide protected left-turn signal phasing on the northbound and southbound approaches. The northbound approach would be restriped to provide two dedicated left-turn lanes and a shared thru / right-turn lane. Modifications to the southbound approach include replacing the existing 9-foot center raised median with a 4-foot raised median and restriping to provide a shared thru / right-turn lane, a 10-foot painted median with chevron markings and a dedicated left-turn lane. A concept plan showing the recommended improvements is included in ***Appendix I***.

As shown in ***Tables 15-1*** and ***15-2***, the recommended improvement to the northbound and southbound approaches of Aero Drive / Sandrock Road would mitigate the Project's significant impact to below a level of significance. ***Appendix J*** contains the post mitigation intersection analysis sheets.

TABLE 15–1
EXISTING + PROJECT INTERSECTION POST–MITIGATION ANALYSIS

Intersection	Control Type	Peak Hour	Existing		Existing + Project		Existing + Project with Mitigation		
			Delay[a]	LOS[b]	Delay	LOS	Delay	LOS	Δ[c]
5. Aero Drive / Sandrock Road	Signal	PM	62.4	E	65.0	E	59.0	E	(3.4)

Footnotes:
a. Average delay expressed in seconds per vehicle.
b. Level of Service.
c. Δ denotes the change in delay as compared to Existing conditions with the addition of Project trips and proposed mitigation measures.

TABLE 15–2
LONG-TERM (YEAR 2035) + PROJECT INTERSECTION POST–MITIGATION ANALYSIS

Intersection	Control Type	Peak Hour	Long-Term (Year 2035)		Long-Term (Year 2035) + Project		Long-Term (Year 2035) + Project with Mitigation		
			Delay[a]	LOS[b]	Delay	LOS	Delay	LOS	Δ[c]
5. Aero Drive / Sandrock Road	Signal	PM	69.5	E	73.0	E	68.4	E	(1.1)

Footnotes:
a. Average delay expressed in seconds per vehicle.
b. Level of Service.
c. Δ denotes the change in delay as compared to Long-Term (Year 2035) conditions with the addition of Project trips and proposed mitigation measures.