PHASE I CULTURAL RESOURCE SURVEY FOR 1695 SATURN BOULEVARD

CITY OF SAN DIEGO

CONFIDENTIAL APPENDIX

Project No. 566657

Submitted to:

City of San Diego
Development Services Department
1222 First Avenue, MS 501
San Diego, California 92101

Prepared for:

Palm Avenue Realty
950 Garland Drive
San Diego, California 92154

Prepared by:

Brian F. Smith and Associates, Inc.
14010 Poway Road, Suite A
Poway, California 92064

June 12, 2018

ATTACHMENT C

Archaeological Records Search Results

BRIAN F. SMITH and ASSOCIATES

CALIFORNIA HISTORICAL RESOURCES INFORMATION SYSTEMS
RECORDS SEARCH

Company:	Brian F. Smith and Associates
Processed By:	Andrew Garrison
Date Processed:	05-17-18
Project Identification:	Saturn Boulevard (18-111)
Information Center:	South Coastal Information Center
Search Radius:	1/2 Mile

Historical Resources:

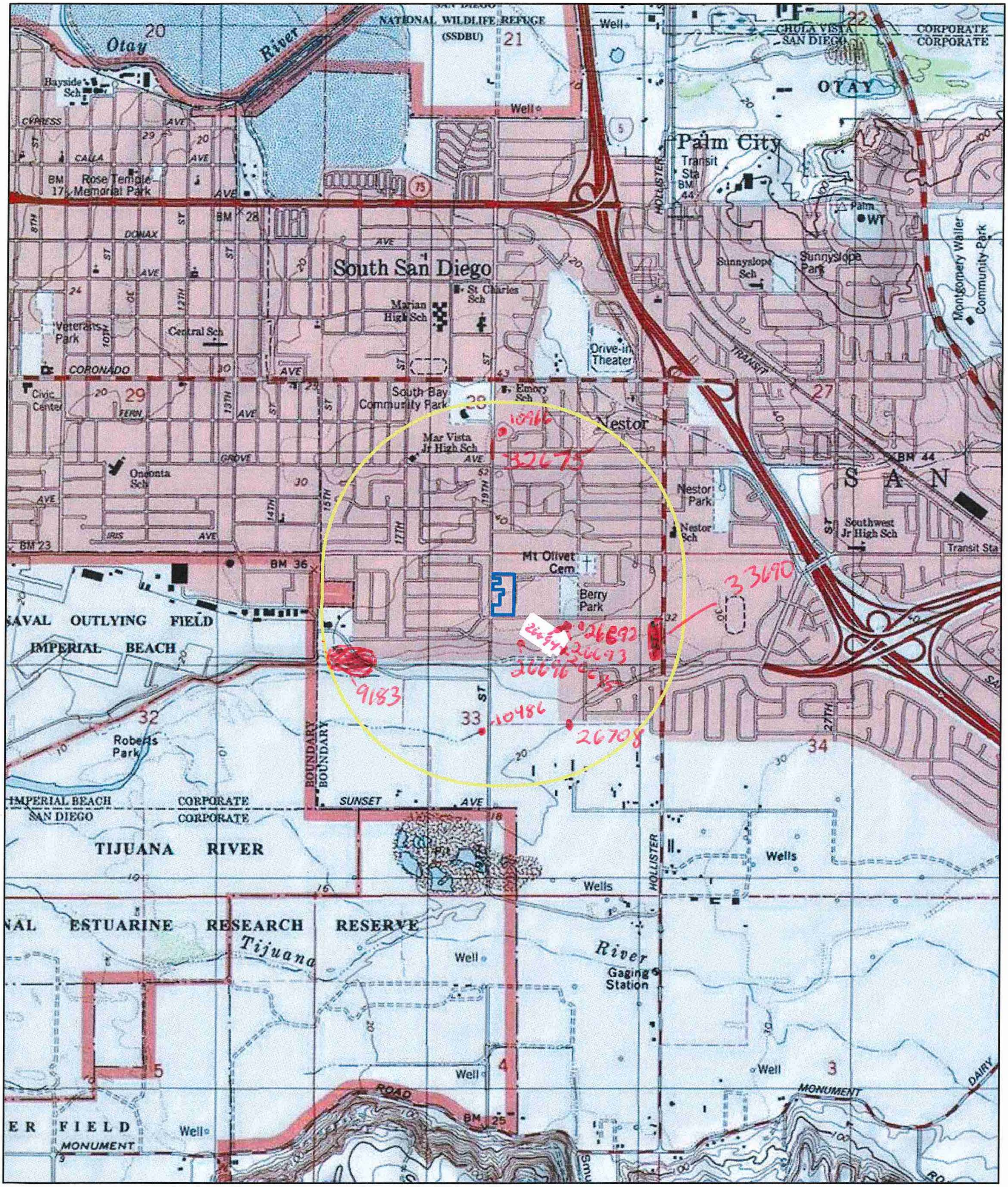
Trinomial and Primary site maps have been reviewed. All sites within the project boundaries and the specified radius of the project area have been plotted. Copies of the site record forms have been reviewed for all recorded sites.

There are 11 resources located within a half mile of the current project area. None intersect the current APE. No historic addresses have been recorded within a half-mile.

Previous Survey Report Boundaries:

Project boundary maps have been reviewed. National Archaeological Database (NADB) citations for reports within the project boundaries and within the specified radius of the project area have been reviewed.

There are 12 reports within a half-mile of the current project area. . None intersect the current APE.



APE

Buffer

Saturn Boulevard (18-111)
USGS *Imperial Beach* Quadrangle
(7.5-minute series)

Resources
P#

N

AJG BFSA: 5/15/2018

1:24,000

Resource List

Saturn Boulevard (18-111)

Primary No.	Trinomial	Other IDs	Type	Age	Attribute codes	Recorded by	Reports
P-37-009183	CA-SDI-009183	Other - CCP-4; Other - W-3647	Site	Prehistoric	AP02 (Lithic scatter); AP16 (Other) - shell scatter	1983 (Henry, Brown, Chambers Consultants and Planners); 1986 (Andrew Pigniolo, WESTEC Services, Inc.)	SD-01337, SD-13215
P-37-010486	CA-SDI-010486	Other - DM-1	Site	Prehistoric	AP02 (Lithic scatter); AP16 (Other) - shell scatter	1986 (Andrew Pigniolo, Lynne Christenson, WESTEC Services, Inc.)	SD-01021, SD-05935
P-37-010966	CA-SDI-010966						
P-37-026692		Other - Ranch Style House				2005 (Brian Smith & Associates)	SD-09688
P-37-026693		Other - Mission Style House				2005 (Brian Smith & Associates)	SD-09688
P-37-026694		Other - Water Tower				2005 (Brian Smith & Associates)	SD-09688
P-37-026695		Other - Garage Residence				2005 (Brian Smith & Associates)	SD-09688
P-37-026696		Other - Small House 3g-1				2005 (Brian Smith & Associates)	SD-09688
P-37-026708	CA-SDI-017505	Other - Historic Surface Artifact Scatter				2005 (Brian Smith & Associates)	SD-09688
P-37-032675	CA-SDI-020703	Other - SB-S-1	Site	Historic	AH04 (Privies/dumps/trash scatters)	2012 (Laguna Mountain)	
P-37-033690	CA-SDI-021168	Other - LSA-Berry Park-1	Site	Prehistoric, Historic	AH04 (Privies/dumps/trash scatters); AP02 (Lithic scatter); AP16 (Other)	2014 (LSA Associates)	

CCP
CHAMBERS CONSULTANTS AND PLANNERS
P.O. Box 356 10557 Beach Boulevard
Stanton, California 90680
714/828-3324

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

SDi- 9183

ARCHEOLOGICAL SITE SURVEY RECORD

University of California, Los Angeles Regional Office

SITE NO. CA- SDi- ~~000~~ see update

County San Diego

1. Previous Site Designation ______ 2. Temporary Field No. CCP-4
3. USGS Quad Imperial Beach 7½' x 15' Year 1967
4. UTM Coordinates Zone 11 ^{36}02860N. ^{4}90750E.
5. Twp. 18S Range 2W ; NW ¼ of NW ¼ of Sec. 33
6. Location On a point approximately 200 m east of southeast corner of the develo[ped] section of the Navy's Imperial Beach Facility. Near horse corrals, the site ove[r]looks the Tijuara River Basin.
7. Contour 40' 8. Owner & Address U.S. Navy, OLF, Imperial
9. Prehistoric X Ethnographic ______ Historic ______ 10. Site Description Sparse shell scatter with associated artifacts at the top of a point above the river.
11. Area 10 x 20 meters, 200 square meters. 12. Depth of Midden Not determined
13. Site Vegetation Grass and weeds Surrounding Vegetation Grass and weeds
14. Location & Proximity of Water Tijuana River 100 m.
15. Site Soil Rocky red/brown Surrounding Soil Rocky red/brown
16. Previous Excavation None known
17. Site Disturbance Heavily grazed
18. Destruction Possibility Likely from grazing and erosion
19. Features Noneobserved
20. Burials None observed
21. Artifacts One mano and several felsite and metavolcanic flakes
22. Faunal Remains Shell - Pecten and Chione
23. Comments

map w/ 9181

24. Accession No. ______ 25. Sketch Map ______ by ______ where ______
26. Date Recorded November 27, 1981 27. Recorded By Henry, Brown
28. Photo Roll No. ______ Frame No. ______ Film Type(s) ______ Taken By Rod Brown

9183 Site No. CCP-

SITE STATUS: Grazing Erosion

% Destroyed ______ How ______ Test Excavated N.A. ______ %, if known.

National Register Status: Listed ______ Potential ______ No Determination X ______ Nominated ______ Ineligible ______

State Historical Landmark (No.) ______ Point of Historical Interest ______

SPECIAL ATTRIBUTES (Place an X in only those spaces which pertain to the site)

Midden/Habitation Debris X Lithic and/or Ceramic Scatter X

Bedrock Mortars/Milling Surfaces ______, Petroglyphs/Pictographs ______, Stone Features ______

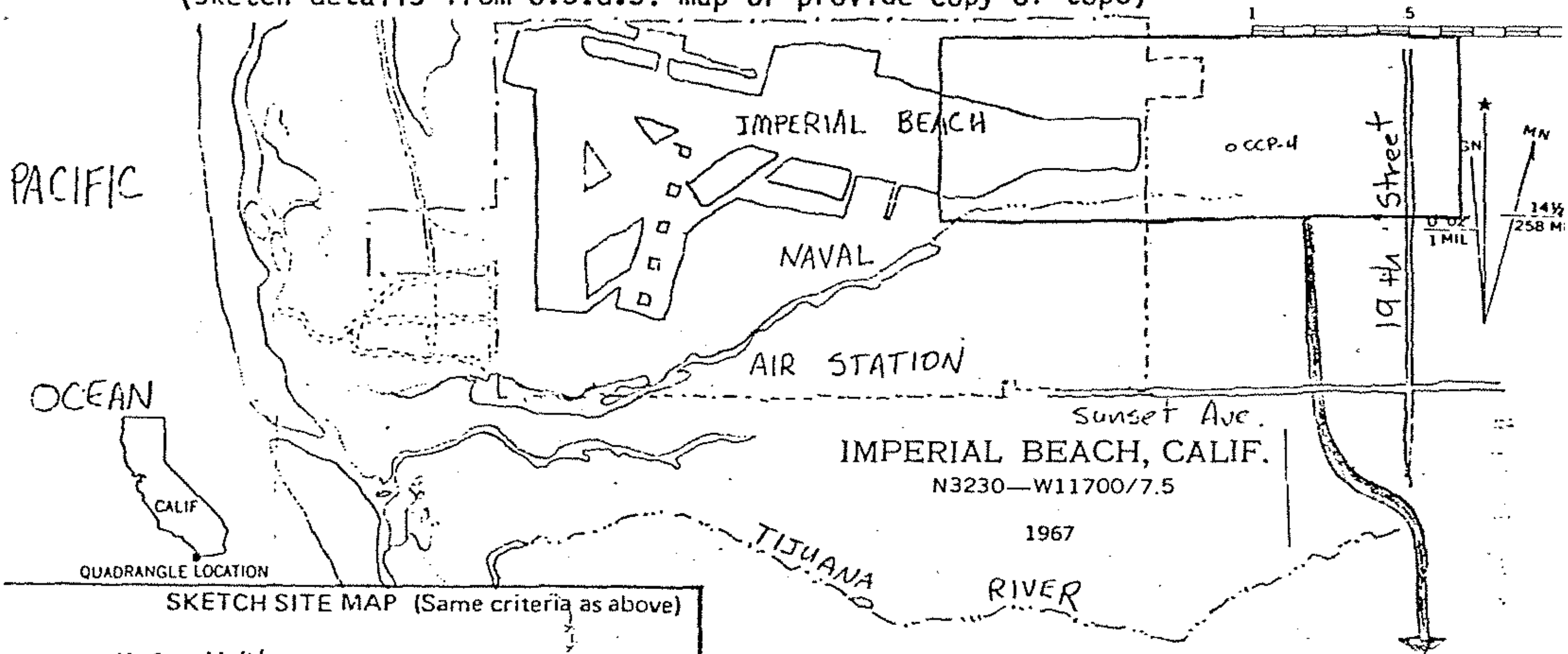
Burials ______, Caches ______, Hearths/Roasting Pits ______, Housepits ______, Structure Remains ______,

Underwater ______, Open Air X ______, Rockshelter ______, Cave ______, Quarry ______, Trails ______

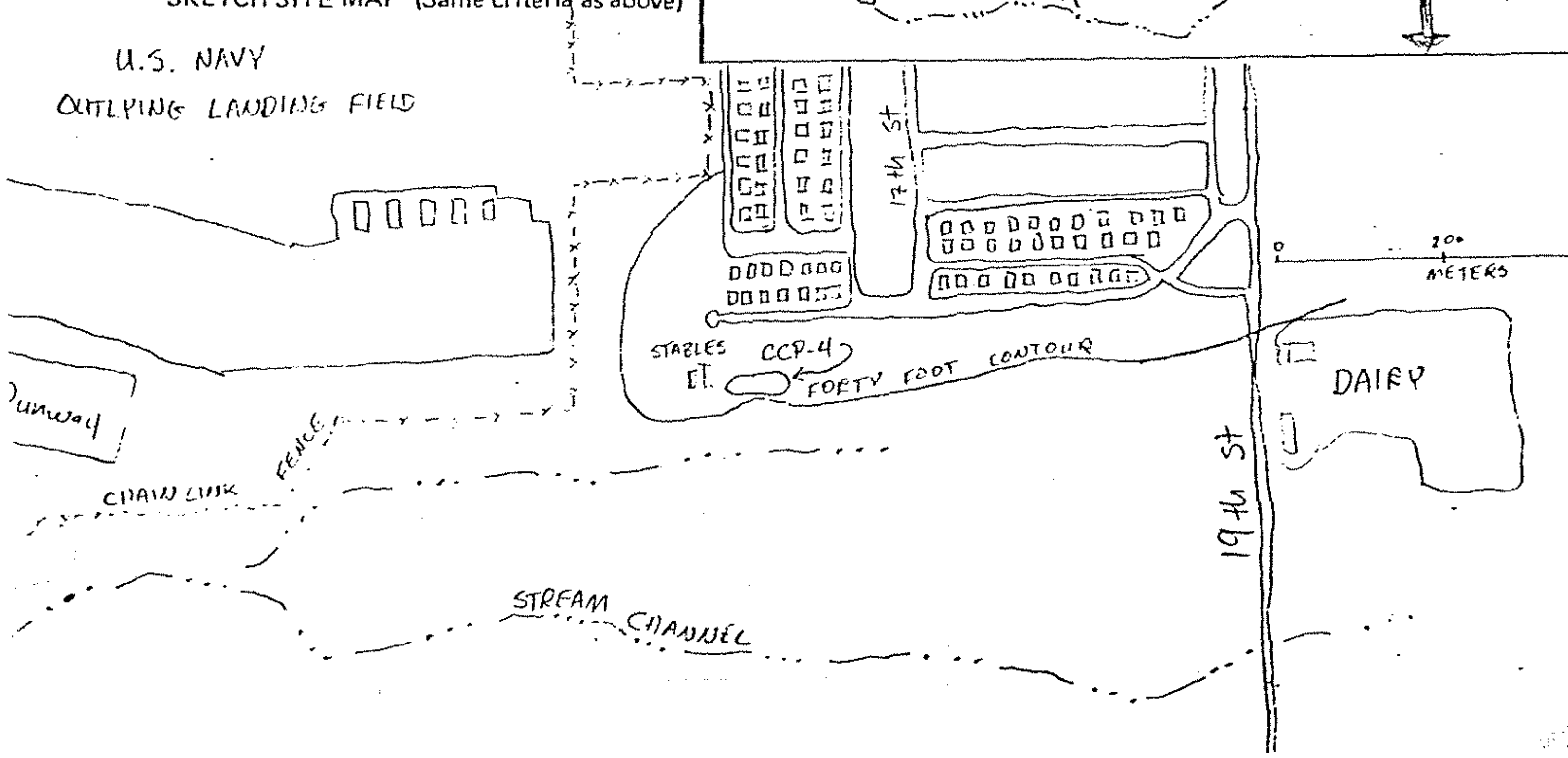
REMARKS ______

Published References ______

SKETCH LOCATION MAP (Include permanent reference markers, North Arrow, and Scale)
(sketch details from U.S.G.S. map or provide copy of topo)



SKETCH SITE MAP (Same criteria as above)



State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

ARCHEOLOGICAL SITE RECORD

Permanent Trinomial: Update SDi-9183/W-3647 Supplement [X]

Temporary Number:

Agency Designation: Site enlarged by update

1. County: San Diego
2. USGS Quad: Imperial Beach (7.5') 1967 (15') Photorevised 1975
3. UTM Coordinates: Zone 11 / 490740 Easting / 3602860 Northing ( )
4. Township 18S Range 2W ; ¼ of NW ¼ of SW ¼ of NW ¼ of Section 33 Base (Mer.) SB ( )
5. Map Coordinates: 278 mmS 200 mmN E (from NW corner of map) 6. Elevation 40 feet AMSL
7. Location: Along terrace edge, with major concentration east and south of barn structure. Major portion of site is 50 meters south of the west end of Leon Street, southeastern Imperial Beach, CA. On north side and over looking the Tijuana River Valley. ( )
8. Prehistoric XX Historic Protohistoric 9. Site Description: Extremely light scatter of shell and lithics over a large area. ( )
10. Area: 150 m(length) x 100 m(width) 15000 m^2. Method of Determination: Surface collection ( )
11. Depth: 20 cm Method of Determination: Posthole test ( )
12. Features: None ( )
13. Artifacts: Surface: 1 flake, 3 angular waste, 32 fragments shell. Subsurface; Postholes; E35/N0 10-20cm. 1 shell frag., E10/N0 10-20cm. 1 shell frag., W20/N0 10-20cm. 1 angular waste, W5/N0 0-10cm. 2 shell frags., E0/N20 0-10cm. 2 shell frags. (X)
14. Non-Artifactual Constitutients: See artifacts. ( )
15. Date Recorded: Update 4/14/86 16. Recorded By: Update by Andrew Pigniolo ( )
17. Affiliation and Address: WESTEC Services, Inc., 3211 Fifth Ave., San Diego, CA 92103 ( )

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

ARCHEOLOGICAL SITE RECORD

Permanent Trinomial: Update SDi-9183/W-3647 / ______ mo. yr.

Temporary Number: ______

Agency Designation: ______

18. Human Remains: None ( )

19. Site Integrity: Heavily disturbed by grazing, erosion, and ORV use. ( )

20. Nearest Water (type, distance and direction): Seasonal drainage 100 meters south ( )

21. Largest Body of Water within 1 km (type, distance and direction): Tijuana River 3/4 miles south ( )

22. Vegetation Community (site vicinity): Riparian [Plant List ( )] ( )

23. Vegetation Community (on site): Introduced herbs and grasses [Plant List ( )] ( )

References for above: -- ( )

24. Site Soil: Compact sandy loam ( )
25. Surrounding Soil: Compact sandy loam ( )

26. Geology: Sedimentary ( )
27. Landform: Terrace edge ( )

28. Slope: 0 to 30 degrees ( )
29. Exposure: South ( )

30. Landowner(s) (and/or tenants) and Address: U.S. Navy ( )

31. Remarks: Site was surface collected and a total of 29 postholes excavated, 9 of which were positive. Road is planned for part of site area. ( )

32. References: Dennis Gallegos and Andrew Pigniolo 1986 Cultural Resource Survey and Test for a Proposed Border Patrol Station, Southeastern San Diego County, CA. ( )

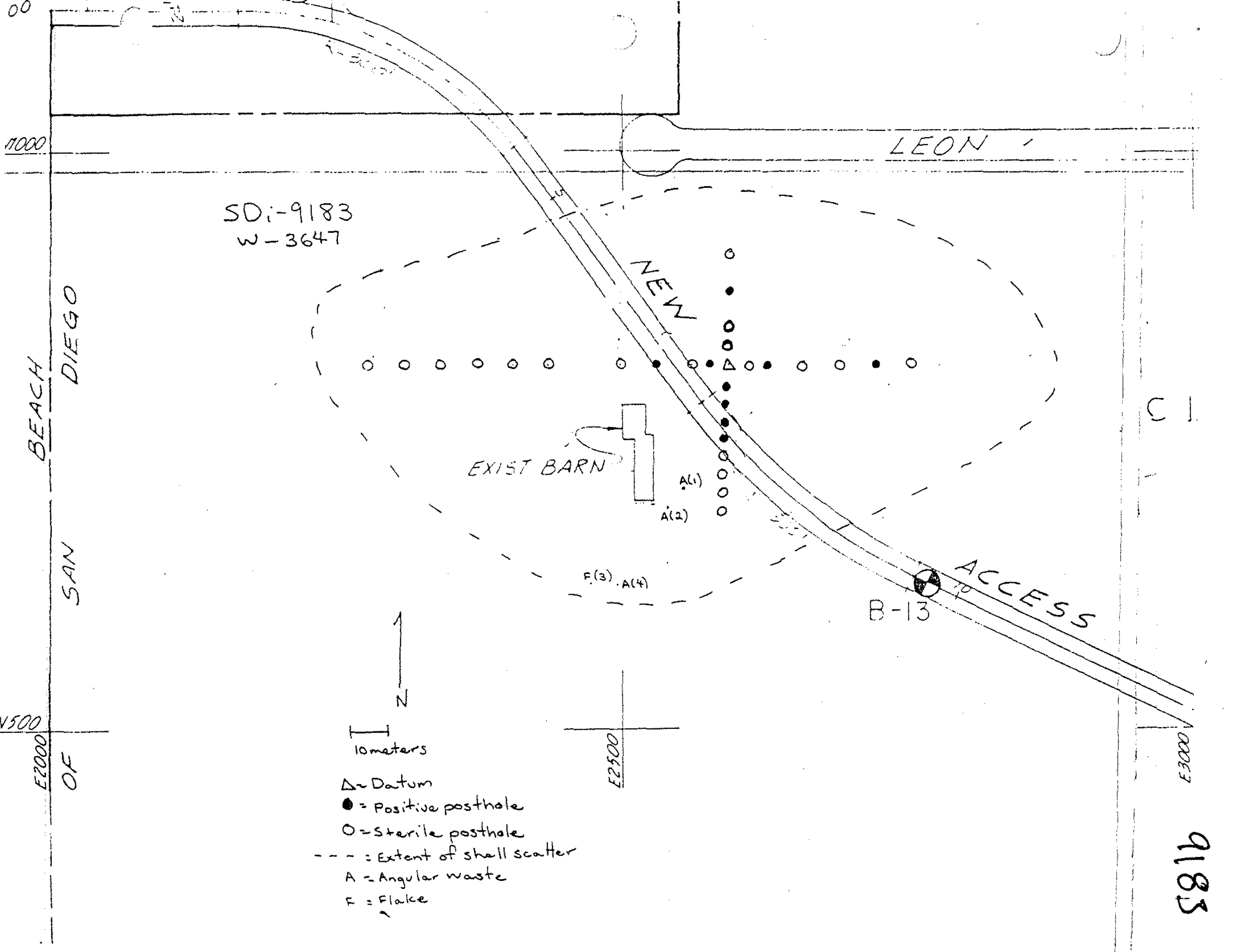
33. Name of Project: Border Patrol Station ( )

34. Type of Investigation: Subsurface test and mitigation. ( )

25. Site Accession Number: -- Curated At: -- ( )

36. Photos: No Taken By: -- ( )

37. Photo Accession Number: -- On File At: -- ( )



SDi-9183
W-3647
LEON
NEW ACCESS
EXIST BARN
B-13
BEACH
SAN DIEGO
OF
C
A(1)
A(2)
F(3)
A(4)
N
E2000
E2500
E3000
10 meters
Δ = Datum
● = Positive posthole
O = Sterile posthole
- - - = Extent of shell scatter
A = Angular waste
F = Flake
9183

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

ARCHEOLOGICAL SITE RECORD
Continuation Sheet

Permanent Trinomial: Update SDi-9183/W-3647/
mo. yr.

Temporary Number:

Agency Designation:

Item No.	Continuation
13.	E0/S10 0-10cm. 1 shell frag., E0/S5 10-20cm. 1 shell frag., E0/S15 10-20cm. 2 shell frags.

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

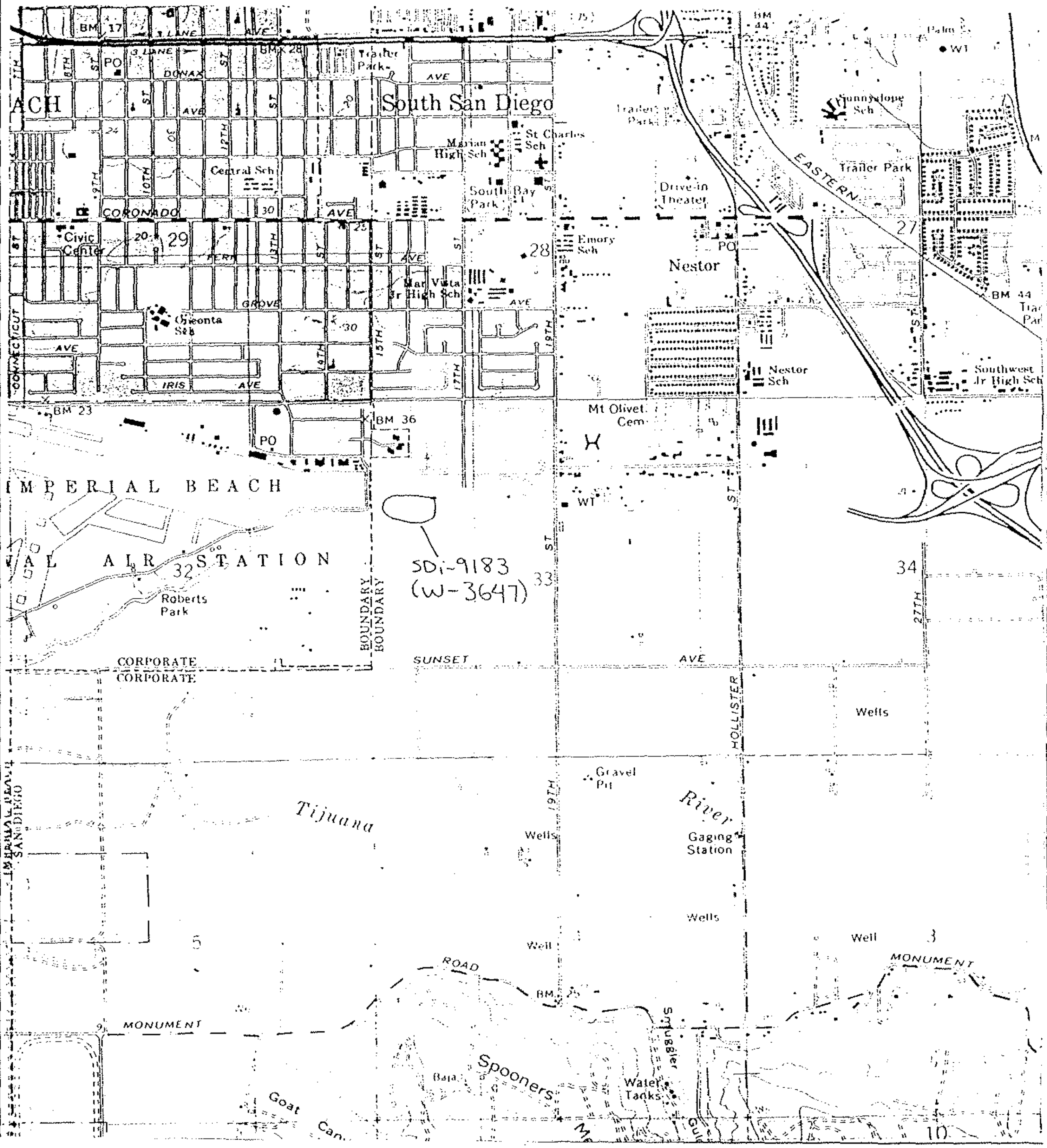
ARCHEOLOGICAL SITE LOCATION MAP

Page 5 of 5.

Permanent Trinomial: Update SDi-9183/W-3647 / ______ mo. ______ yr.

Temporary Number: ______

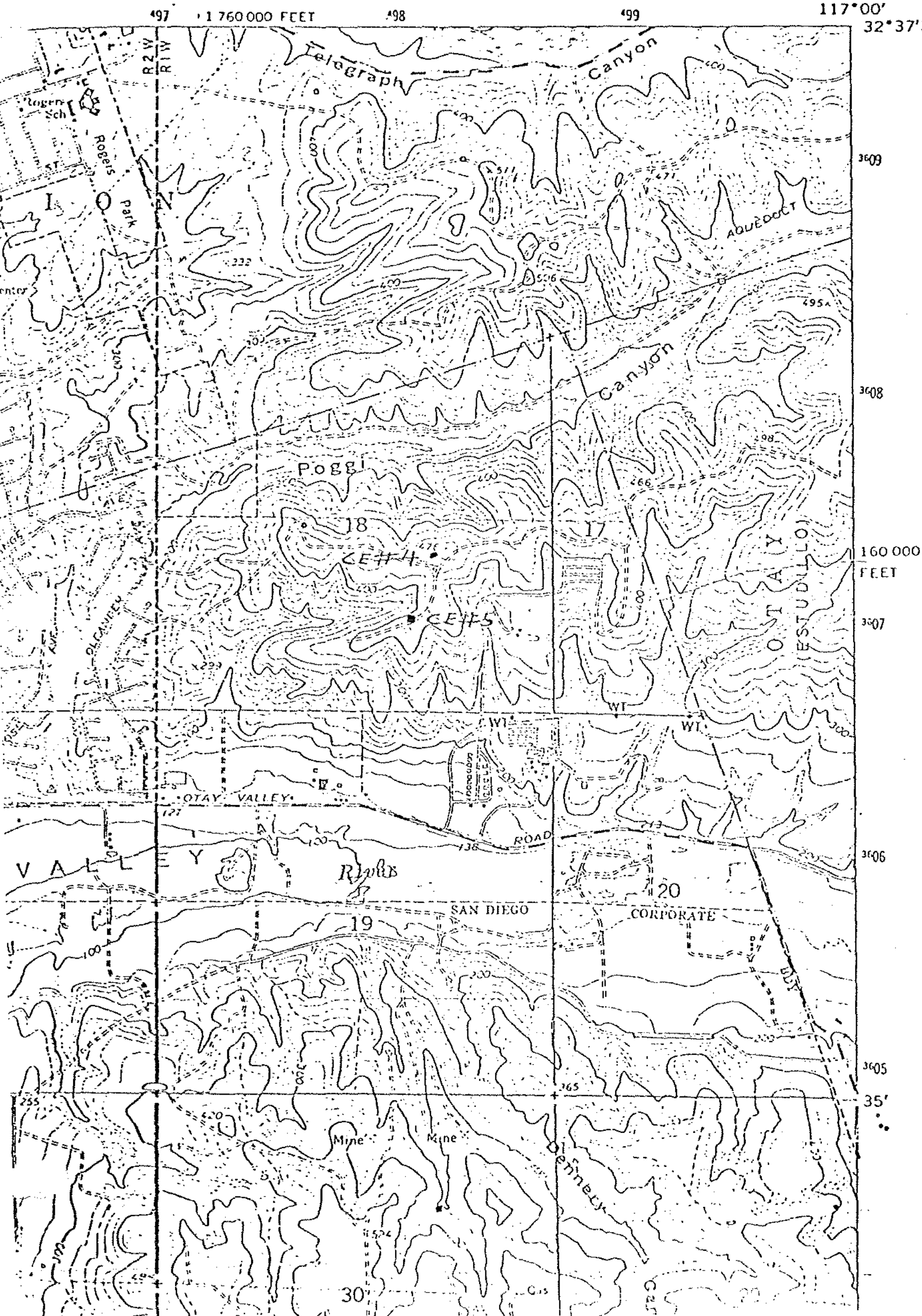
Agency Designation: ______



2649 III NW (JAMUL MOUNTAINS)

9183

IMPERIAL BEACH QUADRANGLE
CALIFORNIA – SAN DIEGO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



SITE LOCATIONS

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

ARCHEOLOGICAL SITE RECORD

Permanent Trinomial: SDi-10,486 Supplement ☐

Temporary Number: DM-1

Agency Designation:

1. County: San Diego

2. USGS Quad: Imperial Beach (7.5') 1967 (15') Photorevised 1975

3. UTM Coordinates: Zone 11 / 491380 Easting / 3602480 Northing ( )

4. Township 18S Range 2W ; ¼ of NW ¼ of NW ¼ of SE ¼ of Section 33 Base (Mer.) SB ( )

5. Map Coordinates: 292 mmS 227 mmE (from NW corner of map) 6. Elevation 20 Feet AMSL

7. Location: Concentrated on the east side of 19th Street in open field presently fallow. Approximately 1/2 way between Sunset Ave. and the first barnlike structure on the east side of 19th Street. Within the Tijuana River floodplain, southwest San Diego County. ( )

8. Prehistoric XX Historic Protohistoric 9. Site Description: Light shell scatter and concentration with some lithic material in plowed agricultural field.

( )

10. Area: 30 m(length) x 30 m(width) 900 m^2. Method of Determination: Rough estimation ( )

11. Depth: At least 10cm. cm Method of Determination: estimation ( )

12. Features: None

( )

13. Artifacts: Three flakes, one angular waste all fine grained meta-volcanic.

( )

14. Non-Artifactual Constitutients: 250+ shell fragments. Species included Mytilus, Pecten, Ostrea, and Chione. ( )

15. Date Recorded: 3/25/86 16. Recorded By: Andrew Pigniolo and Lynne Christenson ( )

17. Affiliation and Address: WESTEC Services, Inc., 3211 Fifth Ave., San Diego, Ca 92103 ( )

State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHEOLOGICAL SITE RECORD

Permanent Trinomial: 10486 / mo. yr.

Temporary Number: DM-1

Agency Designation:

18. Human Remains: None ( )

19. Site Integrity: Fairly poor. Site area is disturbed by 19th Street and has probably been in agricultural use for some time. ( )

20. Nearest Water (type, distance and direction): Seasonal drainage approx. 20m northwest ( )

21. Largest Body of Water within 1 km (type, distance and direction): Tijuana River 1/2 mile south ( )

22. Vegetation Community (site vicinity): Fallow field [Plant List ( )] ( )

23. Vegetation Community (on site): Fallow field [Plant List ( )] ( )

References for above: -- ( )

24. Site Soil: Sandy loam ( ) 25. Surrounding Soil: Sandy loam ( )

26. Geology: Alluvial ( ) 27. Landform: River floodplain ( )

28. Slope: Less than 1% ( ) 29. Exposure: -- ( )

30. Landowner(s) (and/or tenants) and Address: Unknown ( )

31. Remarks: Site represents a concentration of shell within a larger scatter. Boundries difficult to define because of vegetation. ( )

32. References: -- ( )

33. Name of Project: Defensive Measures ( )

34. Type of Investigation: Surface survey ( )

35. Site Accession Number: -- Curated At: -- ( )

36. Photos: No Taken By: -- ( )

37. Photo Accession Number: -- On File At: -- ( )

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

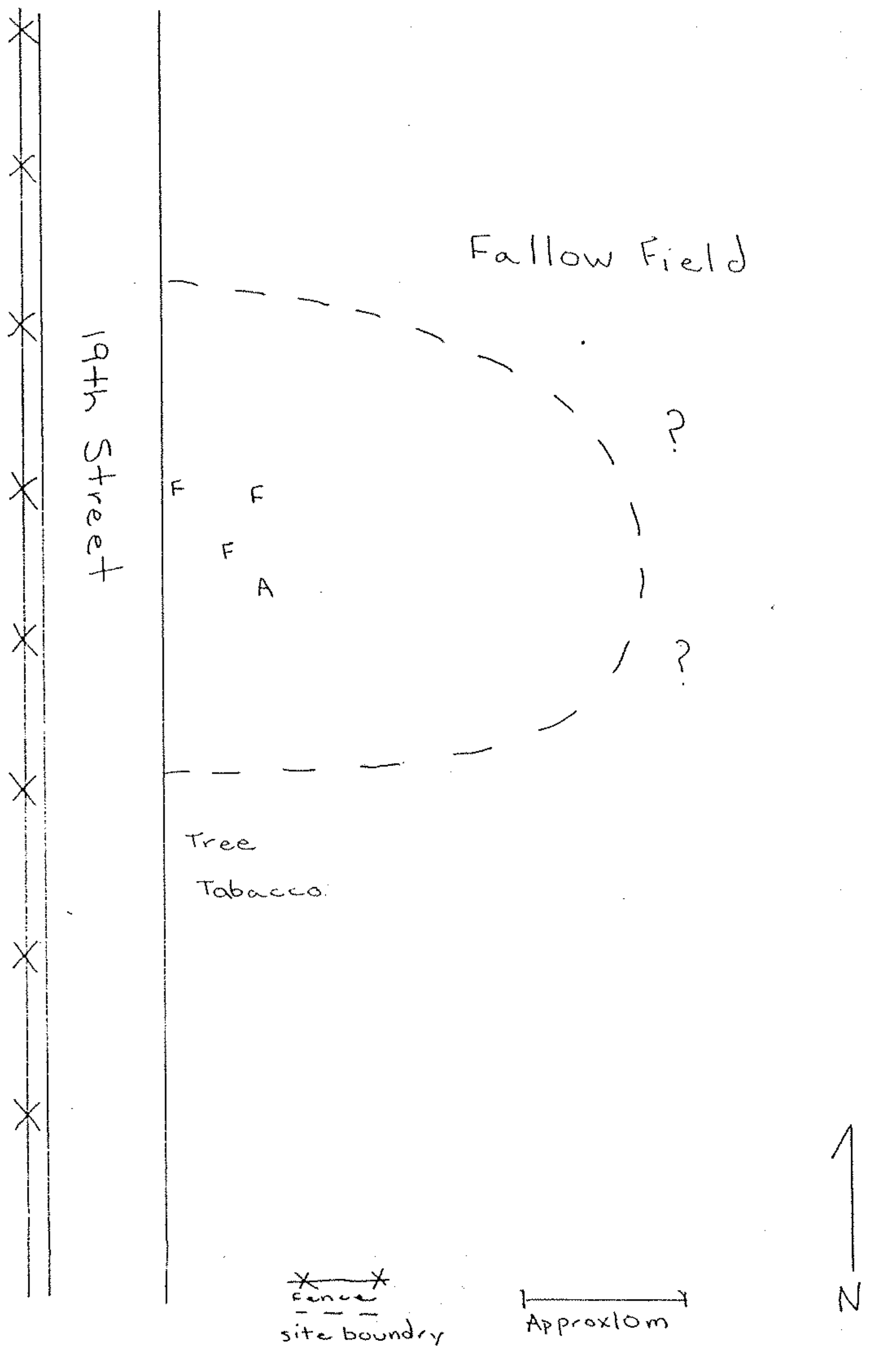
ARCHEOLOGICAL SITE MAP

Page 3 of 4.

Permanent Trinomial: 10486 / mo. yr.

Temporary Number: DM-1

Agency Designation:



State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

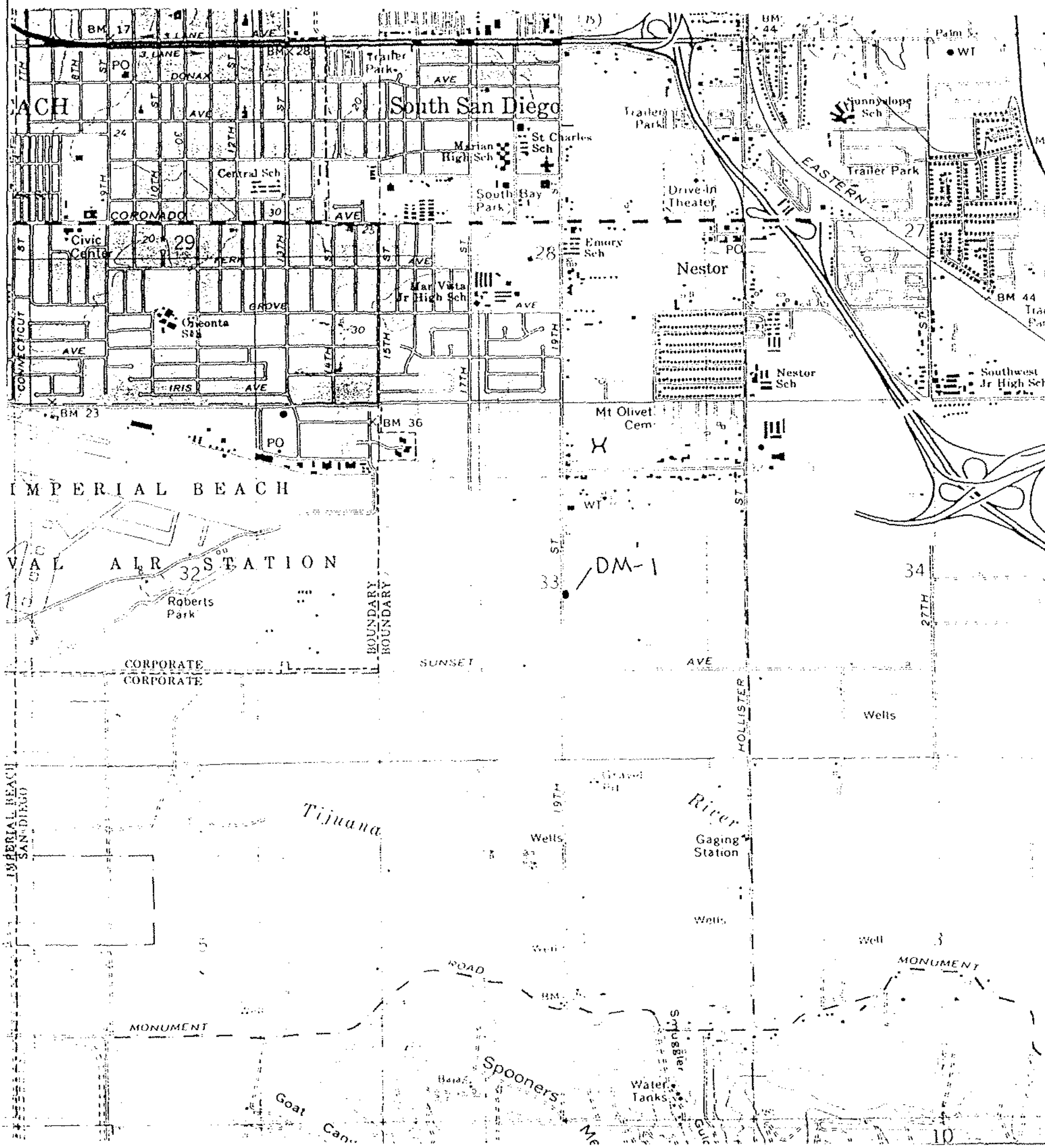
ARCHEOLOGICAL SITE LOCATION MAP

Page 4 of 4.

Permanent Trinomial: 10486 / mo. yr.

Temporary Number: DM-1

Agency Designation:



SAN DIEGO MUSEUM OF MAN

CA-SDi-10,966

ARCHAEOLOGICAL SITE RECORD SHEET

Site No.: SDM W-2245 Other ______ Map No.: XX:8/4

Site Name: Palm City Culture: ?

San Ysidro Quadrangle, S. of the Emory School

USGS Quad: Imperial Beach 7.5" (1967)

Location: Township 18S, Range 2W, ___ ¼ of ___ ¼ of Section 28

UTM: 11/491400/3603900

State: Calif County: San Diego Locality: ______

Elevation: 60 feet Water: none

Soil: ______ Vegetation: ______

Site Area: none Depth: 3 feet?

Site Description: A gravel capping of an old land surface at about 60 feet once existed here. It was then being used as a gravel quarry, and workmen told me of the finding of " large gones". The face of the quarry showed a strongly developed soil profile. In the strongly cemented heavy gravels well beneath the soil profile this very lageg boulder that has been

Features: flaked by prodigous blows was cemented into the gravels. It shows some wear indicating that it has been water transported for some short distance. A 60 foot gravel copped terrace would be of quite great age-- perhaps belonging to

Artifacts: the 130,000 year terrace .

Only this one artifact found

Previous Excavation: ~~none~~

Cultivation: none Erosion: site destroyed

Vandalism: destroyed

Modern Features: none

Possibility of Destruction: destroyed

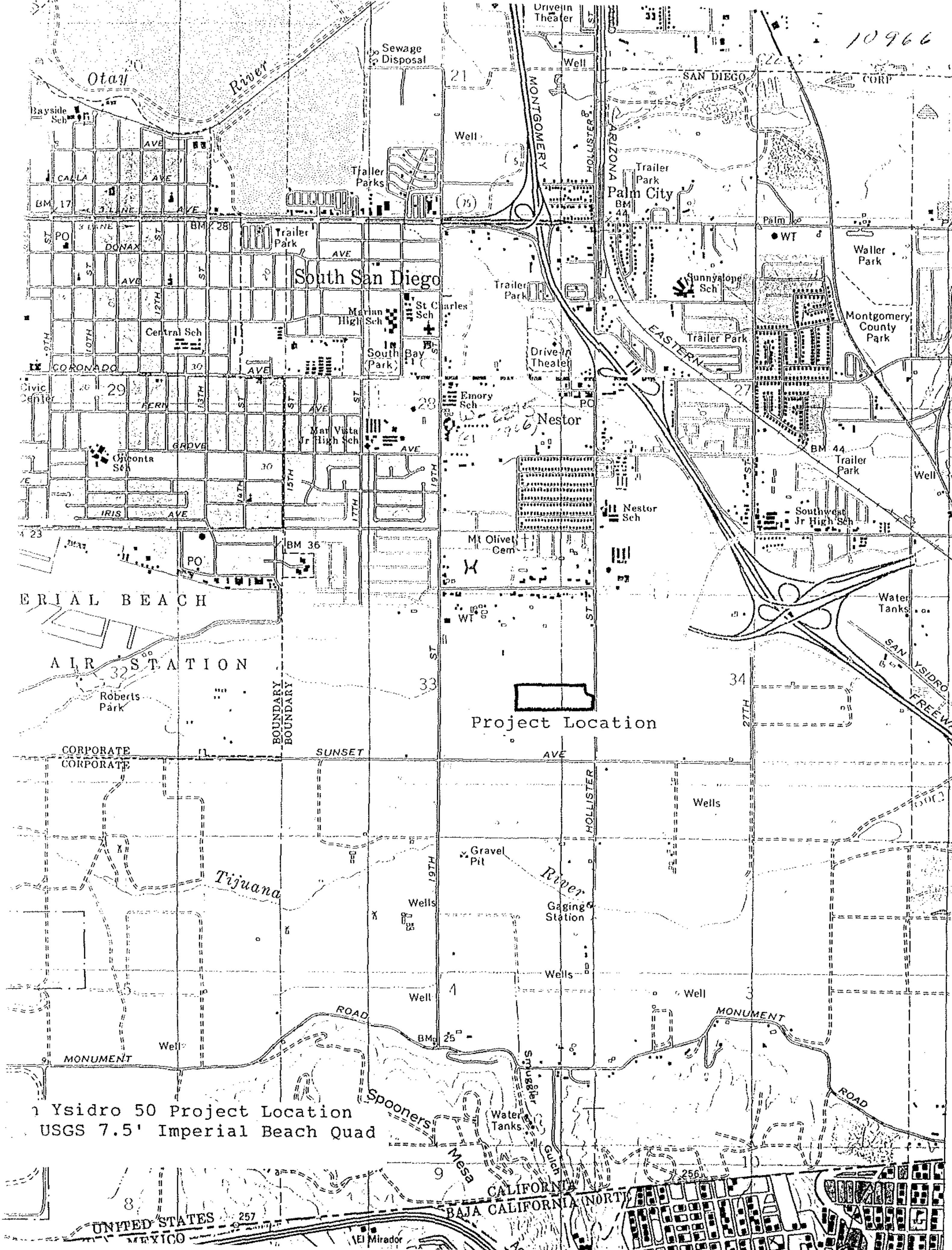
Owner: unknown

Published References: Carter

Remarks: A chance find of an artifact in a geological context of upper Pleistocene age.

Photographs/Drawings: See Carter

Recorded by: G., F. Carter Date: February 1982



n Ysidro 50 Project Location
USGS 7.5' Imperial Beach Quad

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # 3702 6692
HRI #
Trinomial
NRHP Status Code 7

Other Listings
Review Code   Reviewer   Date

 ***Resource Name or #:** Ranch Style House

P1. Other Identifier: #1 on 200-foot scale sketch map

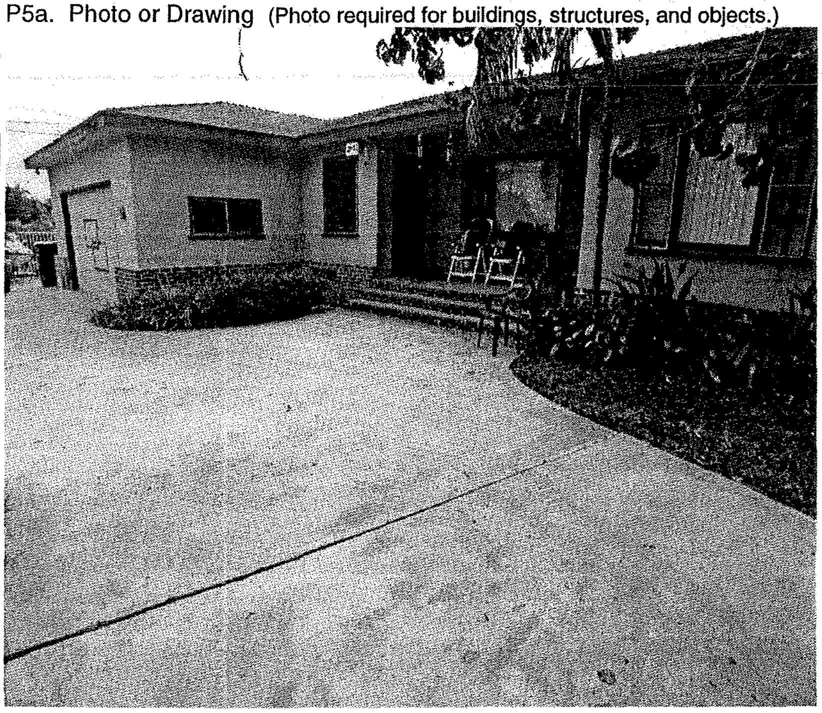
***P2. Location:** ☐ Not for Publication ☑ Unrestricted   ***a. County:** San Diego
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad:** *Imperial Beach*   **Date:** 1975   **T** 18S; **R** 2W ; ¼ **of** NE¼ **of Sec** 33; San Bernadino **B.M.**
c. Address: 2091 Leon Avenue   City: San Ysidro   Zip: 92154
d. UTM: Zone: 11 ; 491750 mE/ 3603000 mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate) Elevation: 45'
APN # 634-100-18, located just east of the intersection of Saturn Boulevard and Leon Avenue in the Nestor neighborhood of San Diego, California.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
This structure is a vernacular ranch style house constructed in 1955 (Building Record). The house is presently used as a single-family residence. It has an ell shaped footprint with a double garage in the ell. It has a low-pitched, hipped roof covered with composition shingles. The front entry is recessed under the roofline and the windows are of the aluminum framed, sliding glass type throughout. Siding on the house is a combination of stucco and wide horizontal clapboard with brick trim covering the majority of the concrete stem-wall foundation. This structure lacks any unusual architectural devices that would create design interest. The building also lacks use of unusual materials or use of native materials in an unusual way. No event or person of historic significance could be attached to the house or property. No architect or builder was identified for this house, but the commonplace design and materials suggests a plan catalog was used.

***P3b. Resource Attributes:** (List attributes and codes) HP2

***P4. Resources Present:** ☑Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5a. Photo or Drawing (Photo required for buildings, structures, and objects.)



P5b. Description of Photo: (View, date, accession #)
North Elevation looking southeast

***P6. Date Constructed/Age and Sources:**
☑Historic ☐Prehistoric ☐Both
1955-Assessor's Building Record

***P7. Owner and Address:**
The Olson Company
9191 Town Center Drive, Suite L-101
San Diego, CA 92122

***P8. Recorded by:** (Name, affiliation, and address)
Larry Pierson/ Michelle Cyrus
Brian F. Smith and Associates
14010 Poway Rd., Suite A,
Poway, CA 92064

***P9. Date Recorded:** June 2005

***P10. Survey Type:** (Describe) Survey & Evaluation

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
An Archaeological/Historical Survey and Evaluation of Cultural Resources at the Rio Walk Project.

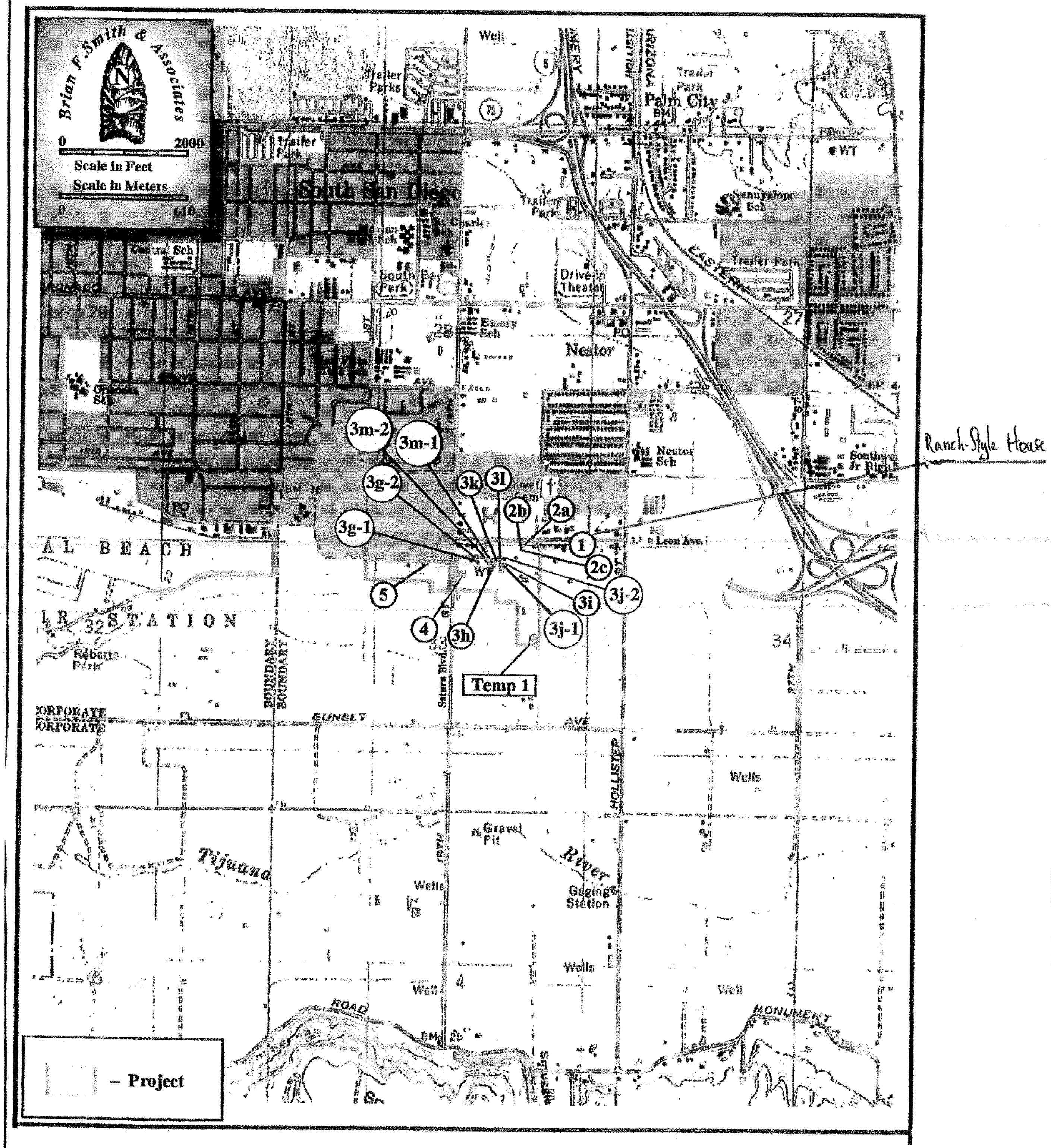
***Attachments:** ☐NONE ☑Location Map ☑Sketch Map ☐Continuation Sheet ☐Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California— The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # 37026692
HRI#
Trinomial

***Resource Name or #:** Ranch-Style House

***Map Name:** Rio Walk, *Imperial Beach* Quadrangle ***Scale:** 1:24,000 ***Date of Map:** 1979 (photorevised)



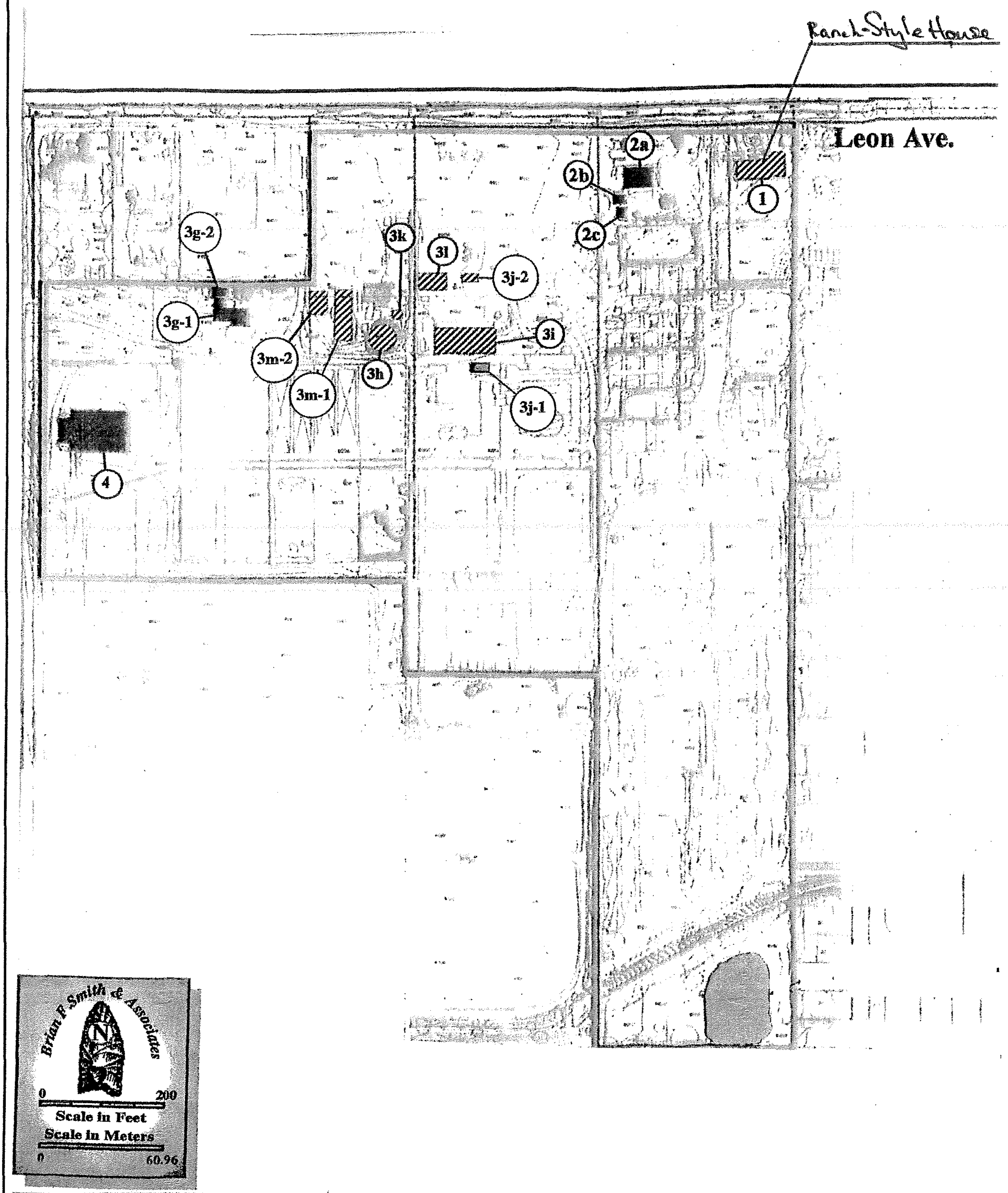
State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary # 3702 6692
HRI#
Trinomial

***Resource Name or #** (Assigned by recorder) Ranch Style House

***Drawn By:** BFSA

***Date:** June 2005



State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # 37 02 6693
HRI #
Trinomial
NRHP Status Code 7

Other Listings
Review Code | Reviewer | Date

Page 1 of 4 | *Resource Name or #: Mission Style House

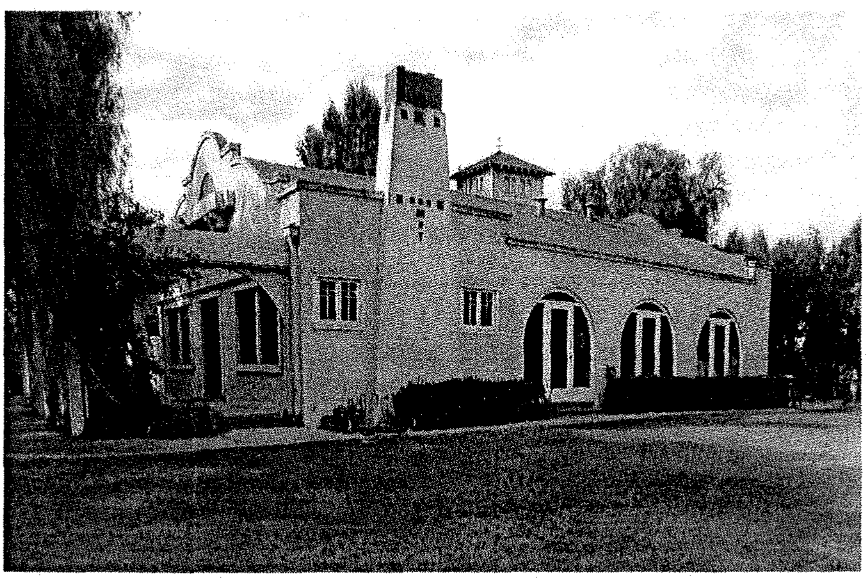
P1. Other Identifier: #2a on the 200-foot scale sketch map

***P2. Location:** ☐ Not for Publication ☑ Unrestricted ***a. County:** San Diego
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad:** Imperial Beach Quadrangle **Date:** 1975 **T** 18S; **R** 2W ; NW ¼ **of** NE¼ **of Sec** 33; San Bernadino **B.M.**
c. Address: 2055 Leon Avenue City: San Ysidro Zip: 92154
d. UTM: Zone: 11 ; 491685 mE/ 3603000 mN (G.P.S.)
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate) Elevation: 45′
APN # 634-100-17

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
This one-story mission style house is the most historically interesting structure in the project. It was built in 1913 according to the Assessor's Building Record. The grounds surrounding the house represent a mature landscape, with a screen of trees and grass. Collectively the landscape, mission style house and water tower exemplifies an attempt to close the residence off from the sights and odors of the dairying operations around them. The exterior is in good condition, however the interior has been remodeled and some windows have been altered. The house is a rectilinear mass on a concrete stem-wall foundation with stucco siding. The east facing façade has a full trellis porch. The façade consists of an entry door flanked by two sets of metal sliding windows with transoms set in older wood frames. The façade's roofline consists of a curvilinear gable with an integral lattice-covered vent and balconet with corbels. The north elevation is comprised of a decorative chimney at the eastern end, and three arched picture windows with inset rectangular casement windows that shelter a sun porch. The west elevation consists of an arched entrance to the sun porch that leads to a glass entry door inset into a picture window that matches the sun porch windows on the north elevation. A small single sash window to the left of an entry door and two 10x10 vertical casement windows with four paned transoms are also present on the west facade. The roofline on the west elevation is a curvilinear gable with lattice covered semi-circular attic vent framed by a balconet in the pediment. The south elevation is obscured by a fenced yard and foliage.
***P3b. Resource Attributes:** (List attributes and codes) HP2

***P4. Resources Present:** ☑Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5a. Photo or Drawing (Photo required for buildings, structures, and objects.)



P5b. Description of Photo: (View, date, accession #)
View of north and east sides looking southwest.

***P6. Date Constructed/Age and Sources:** ☑Historic ☐Prehistoric ☐Both
1913-Assessor's Building Record

***P7. Owner and Address:** The Olson Company, 9191 Town Center Drive, Suite L-101, San Diego, CA 92122

***P8. Recorded by:** (Name, affiliation, and address)
Larry Pierson/ Michelle Cyrus, Brian F. Smith and Associates, 14010 Poway Rd., Suite A, Poway, CA 92064

***P9. Date Recorded:** June 2005

***P10. Survey Type:** (Describe) Survey & Evaluation

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
An Archaeological/Historical Survey and Evaluation of Cultural Resources at the Rio Walk Project.

***Attachments:** ☐NONE ☑Location Map ☑Sketch Map ☐Continuation Sheet ☑Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

Primary # 3702 6693

HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

*NRHP Status Code 7

*Resource Name or # (Assigned by recorder) #2a

B1. Historic Name: Mission Style House

B2. Common Name:

B3. Original Use: Residential

B4. Present Use: Residential

*B5. **Architectural Style:** California Mission

*B6. **Construction History:** (Construction date, alterations, and date of alterations)

This house was constructed in 1913 according to the Assessor's Building Record. The exterior is in good condition, however the interior has been remodeled and some windows have been altered

*B7. **Moved?** ☑No ☐Yes ☐Unknown **Date:** **Original Location:**

*B8. **Related Features:** The water tower, garage converted to living quarters, and a mature landscape of grass and trees.

B9a. Architect: unknown

b. Builder: unknown

*B10. **Significance: Theme:** Mission Style Architecture **Area:** California

Period of Significance: 1913-2005 **Property Type:** Rural Residential **Applicable Criteria:** N/A

(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

The architect or builder of this house could not be identified through the research we performed (i.e. SDHS biographical files, chain of title, building record). The house was constructed in 1913 according to the building record. The chain of title shows that John Cameron and wife owned the parcel (APN 634-100-17) from March of 1907 until May of 1913. The Camerons sold the property to E.W. Peterson in May of 1913 and the property was not resold until March of 1919. It could be the case that the Camerons had the house built and sold it upon completion or that E.W. Peterson had the house built the year he bought the property. In any case, the house was not held by any one owner for a long enough period to be inextricably associated with any one owner. In addition, none of the owners were found to be significant in history at the local, regional, state, or national level. While the house is of a short-lived but popular architectural style of the 1889-1915 period, it is only the east and west elevations that convey that style, and then only in a minimal sense. This is definitely not a landmark example of this architectural style (McAlester and McAlester 1991).

B11. Additional Resource Attributes: (List attributes and codes) HP2

*B12. **References:**

McAlester and McAlester 1991

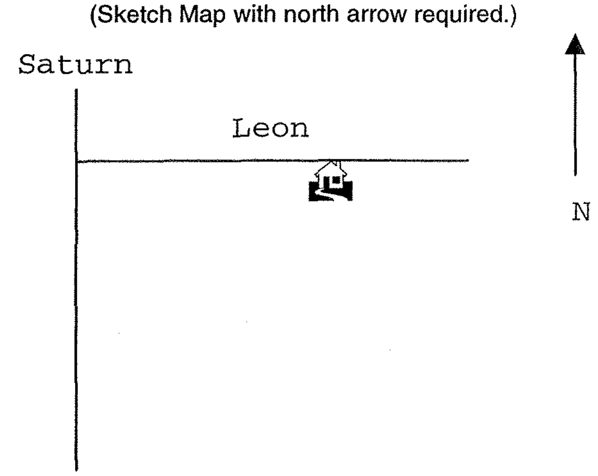
B13. Remarks: Intergrity-fair

*B14. **Evaluator:** Larry Pierson/Michelle Cyrus

*Date of Evaluation: June 2005

(This space reserved for official comments.)

(Sketch Map with north arrow required.)

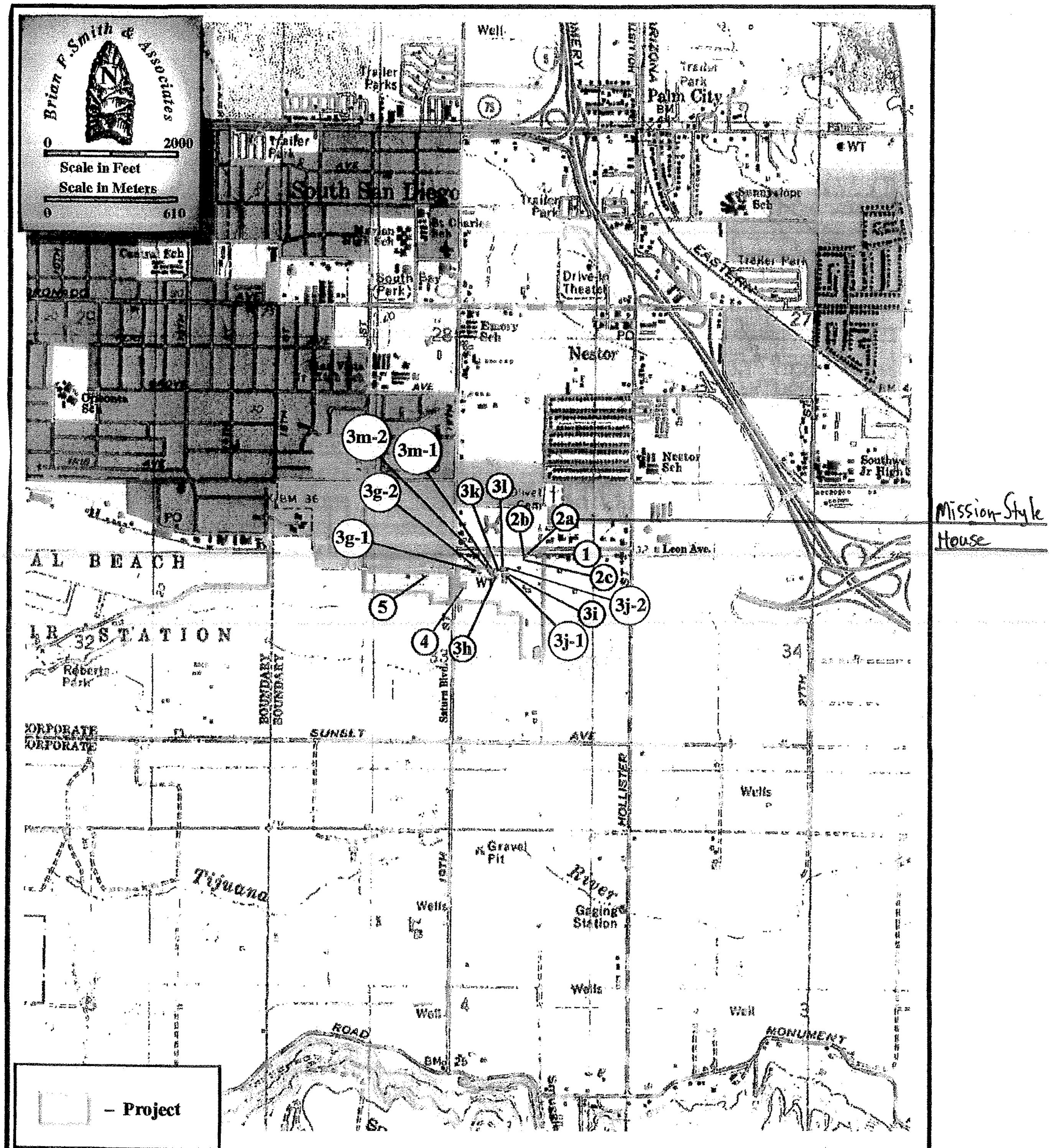


State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # 37 02 6693
HRI#
Trinomial

Page 3 **of** 4 ***Resource Name or #:** Mission-Style House

***Map Name:** Rio Walk, *Imperial Beach* Quadrangle ***Scale:** 1:24,000 ***Date of Map:** 1979 (photorevised)



DPR 523J (1/95) *Required information

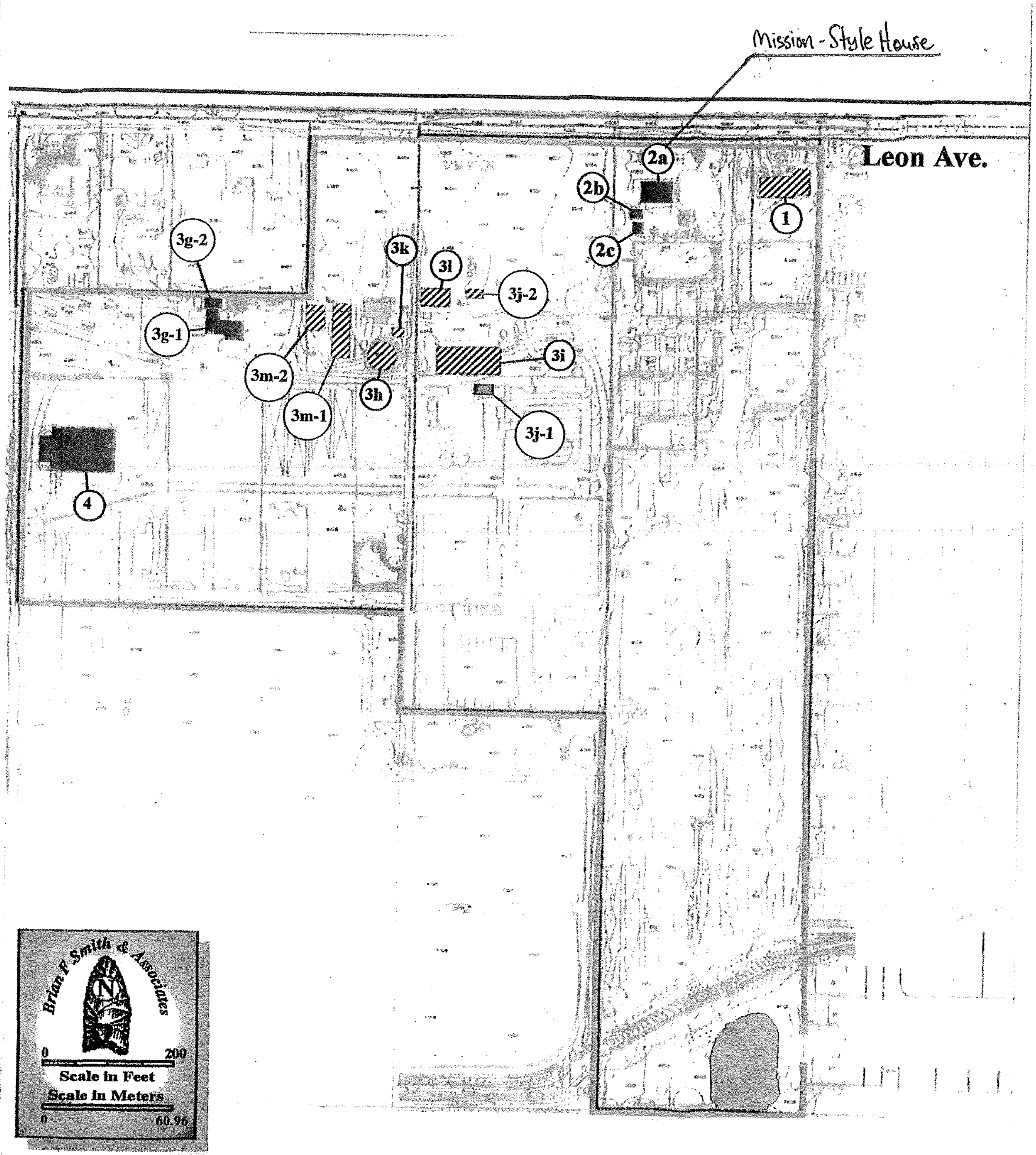
State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary # 3702 6693
HRI#
Trinomial

***Resource Name or #** (Assigned by recorder) Mission-Style House

***Drawn By:** BFSA

***Date:** June 2005



State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # 37026694
HRI #
Trinomial
NRHP Status Code 7

Other Listings
Review Code   Reviewer   Date

*Resource Name or #: Water Tower

P1. Other Identifier: #2b on the 200-foot scale sketch map

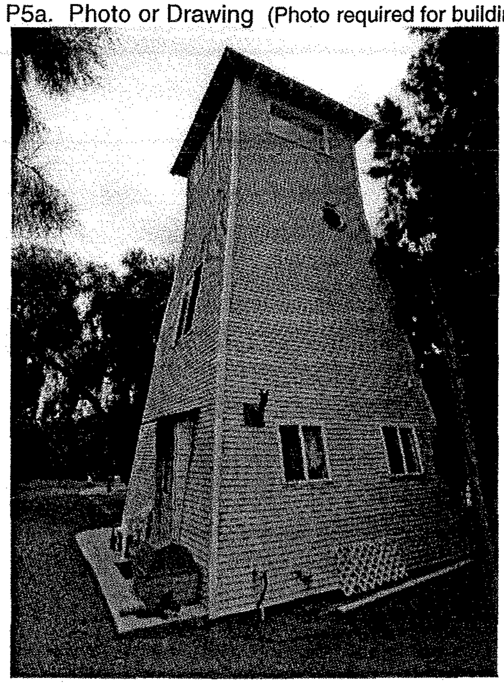
***P2. Location:** ☐ Not for Publication ☑ Unrestricted   ***a. County:** San Diego
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad:** Imperial Beach Quadrangle **Date:** 1975 **T** 18S; **R** 2W ; NW ¼ **of** NE ¼ **of Sec** 33 ; San Bernadino **B.M.**
c. Address: 2055 Leon Avenue   City: San Ysidro   Zip: 92154
d. UTM: Zone: 11 ; 491655 mE/ 3602990 mN (G.P.S.)
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate) Elevation: 45′
APN # 634-100-17

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
This structure was originally a water tower but has now been renovated into a unique residence. Its importance is its association with the Mission style house rather than for its current structural condition. It is covered in vinyl siding and has vinyl windows. The roof is hipped. This structure was originally constructed in 1913 and in 1925 a lath house was constructed adjoining the south side at the base (building record). The lath house no longer exists and nothing now stands at that location. The architect or builder is unknown, but the common shape and utilitarian function of the structure would suggest a standard plan.

***P3b. Resource Attributes:** (List attributes and codes) HP2

***P4. Resources Present:** ☐Building ☑Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5a. Photo or Drawing (Photo required for buildings, structures, and objects.)



P5b. Description of Photo: (View, date, accession #)
View of the south and west elevations facing northeast

***P6. Date Constructed/Age and Sources:**
☑Historic ☐Prehistoric ☐Both
1913-Assessor's Building Record

***P7. Owner and Address:**
The Olson Company
9191 Town Center Drive, Suite L-101
San Diego, CA 92122

***P8. Recorded by:** (Name, affiliation, and address)
Larry Pierson/ Michelle Cyrus
Brian F. Smith and Associates
14010 Poway Rd., Suite A
Poway, CA 92064

***P9. Date Recorded:** June 2005

***P10. Survey Type:** (Describe) Survey & Evaluation

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")

An Archaeological/Historical Survey and Evaluation of Cultural Resources at the Rio Walk Project.

***Attachments:** ☐NONE ☑Location Map ☑Sketch Map ☐Continuation Sheet ☑Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

Primary # 3702 6694
HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

***NRHP Status Code** 7

***Resource Name or #** (Assigned by recorder) #2b

B1. Historic Name: Water Tower
B2. Common Name:
B3. Original Use: Water Tower   B4. Present Use: Residential
***B5. Architectural Style:** Vernacular
***B6. Construction History:** (Construction date, alterations, and date of alterations)
This water tower was constructed in 1913 according to the Assessor's Building Record.

***B7. Moved?** ☑No ☐Yes ☐Unknown **Date:** **Original Location:**
***B8. Related Features:**
Mission style single family residence, lath house-now gone, and garage/dwelling.

B9a. Architect: unknown   b. Builder: unknown
***B10. Significance: Theme:** rural water supply/housing conversion **Area:** USA
Period of Significance: ca 1913-2005 **Property Type:** Rural Residential **Applicable Criteria:** N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)
This structure was originally a water tower but has now been renovated into a unique residence. Its importance was part of the association with the Mission style house and garage, rather than for its current structural condition. It was used to support a large wooden water tank at an elevation that would provide some water pressure to the potable water system. It is covered in vinyl siding and has vinyl windows. The roof is hipped.

B11. Additional Resource Attributes: (List attributes and codes) HP4, HP2

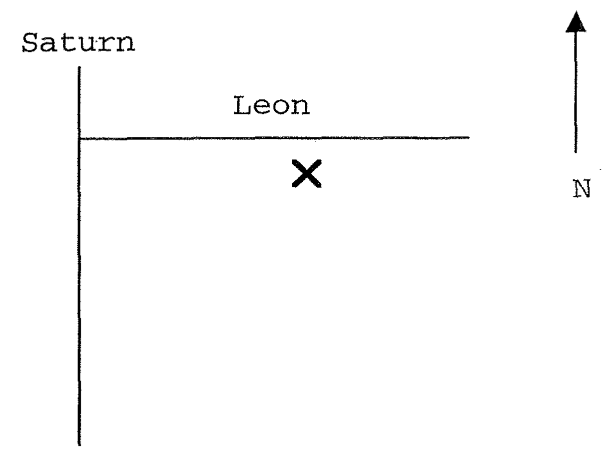
***B12. References:**

B13. Remarks:

***B14. Evaluator:** Larry Pierson/Michelle Cyrus

***Date of Evaluation:** June 2005

(Sketch Map with north arrow required.)



(This space reserved for official comments.)

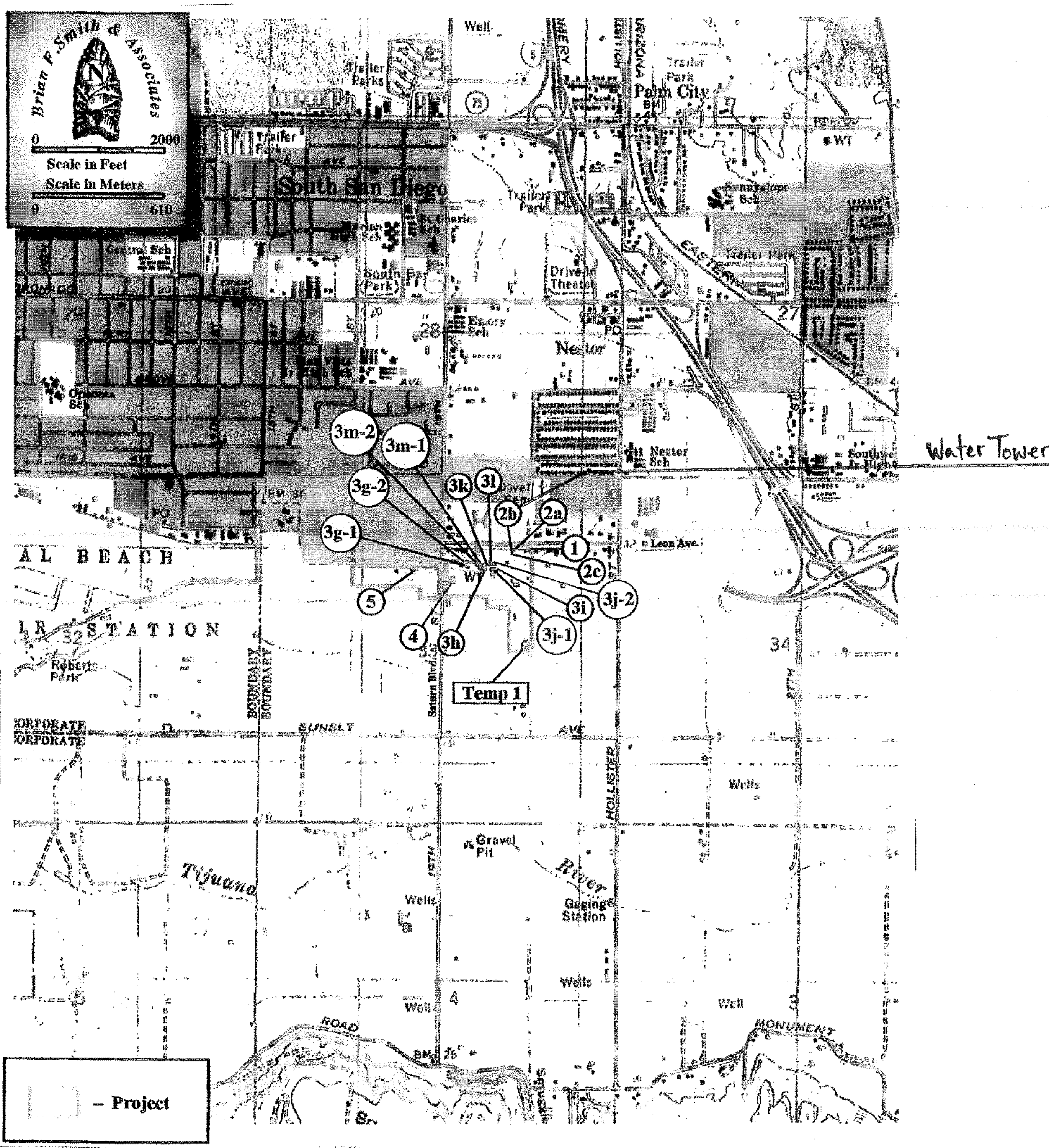
*Required information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # 9702 6694
HRI#
Trinomial

Page 3 of 4 *Resource Name or #: Water Tower

*Map Name: Rio Walk, *Imperial Beach* Quadrangle *Scale: 1:24,000 *Date of Map: 1979 (photorevised)



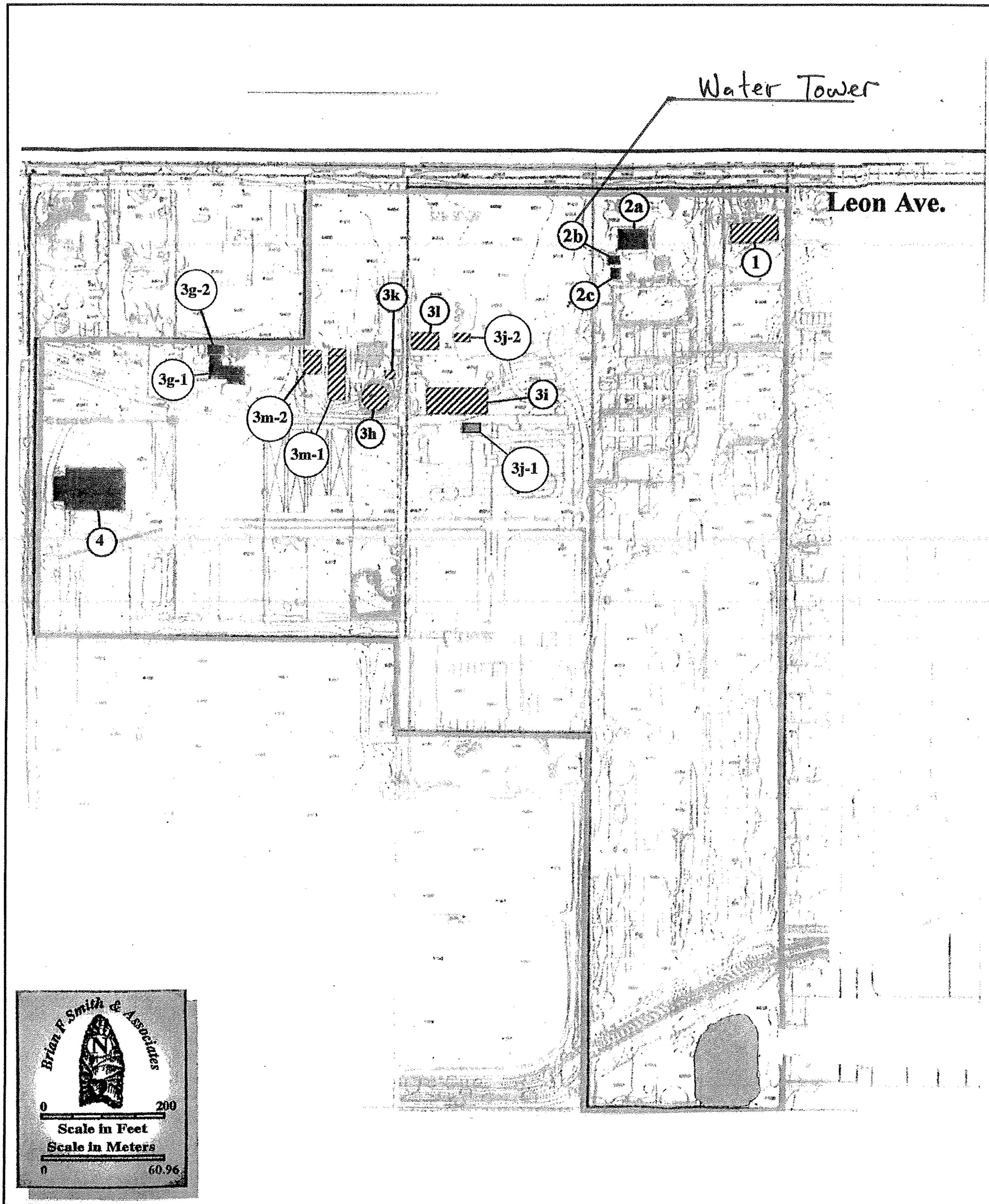
DPR 523J (1/95) *Required information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary # 3702 6694
HRI#
Trinomial

Page 4 of 4 | *Resource Name or # (Assigned by recorder) Water Tower

*Drawn By: BFSA | *Date: June 2005



3702 6695

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary #
HRI #
Trinomial
NRHP Status Code 7

Other Listings
Review Code | Reviewer | Date

 ***Resource Name or #:** Garage/Residence

P1. Other Identifier: #2c on the 200-foot scale sketch map

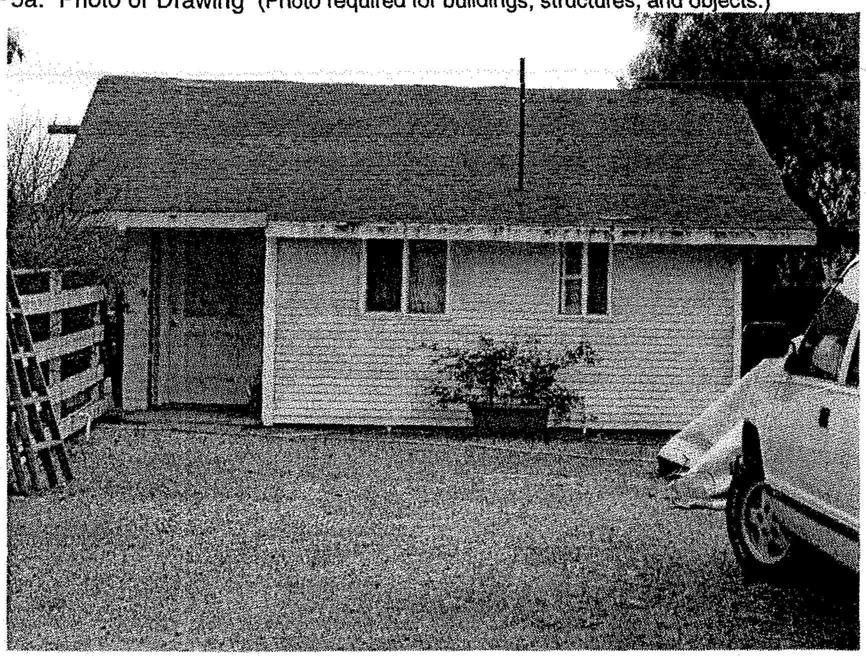
***P2. Location:** ☐ Not for Publication ☑ Unrestricted ***a. County:** San Diego
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad:** *Imperial Beach* **Date:** 1975 **T** 18S; **R** 2W; NW ¼ **of** NE ¼ **of Sec** 33; San Bernadino **B.M.**
c. Address: 2055 Leon Avenue City: San Ysidro Zip: 92154
d. UTM: Zone: 11 ; 3602940 mE/ 491660 mN (G.P.S.)
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate) Elevation: 45′
APN # 634-100-17

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
This small rectangular dwelling appears to date to the early 1900s as evidenced by an exposed portion of the original structure. The building record gives 1913 as the date of construction and identifies its original use as a garage. It has a front addition with vinyl siding and vinyl double hung windows. The original part of the structure has a side gable roof and the addition has a shed extension from the original roofline. It presently serves as a private residence. The location is near to the house (2a) and water tower (2b) described above.

***P3b. Resource Attributes:** (List attributes and codes) HP2

***P4. Resources Present:** ☑Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5a. Photo or Drawing (Photo required for buildings, structures, and objects.)



P5b. Description of Photo: (View, date, accession #)
North elevation

***P6. Date Constructed/Age and Sources:**
☑Historic ☐Prehistoric ☐Both
1913-Assessor's Building Record

***P7. Owner and Address:**
The Olson Company
9191 Town Center Drive, Suite L-101
San Diego, CA 92122

***P8. Recorded by:** (Name, affiliation, and address)
Larry Pierson/ Michelle Cyrus
Brian F. Smith and Associates
14010 Poway Rd., Suite A
Poway, CA 92064

***P9. Date Recorded:** June 2005

***P10. Survey Type:** (Describe) Survey & Evaluation

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
An Archaeological/Historical Survey and Evaluation of Cultural Resources at the Rio Walk Project.

***Attachments:** ☐NONE ☑Location Map ☑Sketch Map ☐Continuation Sheet ☑Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

3702 6695

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

Primary #
HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

*NRHP Status Code 7

*Resource Name or # (Assigned by recorder) #2c

B1. Historic Name: small house
B2. Common Name:
B3. Original Use: garage B4. Present Use: Residential
*B5. Architectural Style: National Folk
*B6. Construction History: (Construction date, alterations, and date of alterations)
This small rectangular dwelling appears to date to the early 1900s as evidenced by an exposed portion of the original structure. It has a front addition with vinyl siding and vinyl double hung windows. The original part of the structure has a side gable roof and the addition has a shed extension from the original roofline.

*B7. Moved? ☐No ☐Yes ☑Unknown Date: Original Location:
*B8. Related Features:
Mission style house and water tower

B9a. Architect: unknown b. Builder: unknown
*B10. Significance: Theme: Rural housing Area: San Diego County
Period of Significance: 1913-2005 Property Type: Rural Residential Applicable Criteria: N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)
The location is near the house (2a) and water tower (2b) described above and is a contributor to that historic landscape because it was originally the garage.

B11. Additional Resource Attributes: (List attributes and codes) HP2

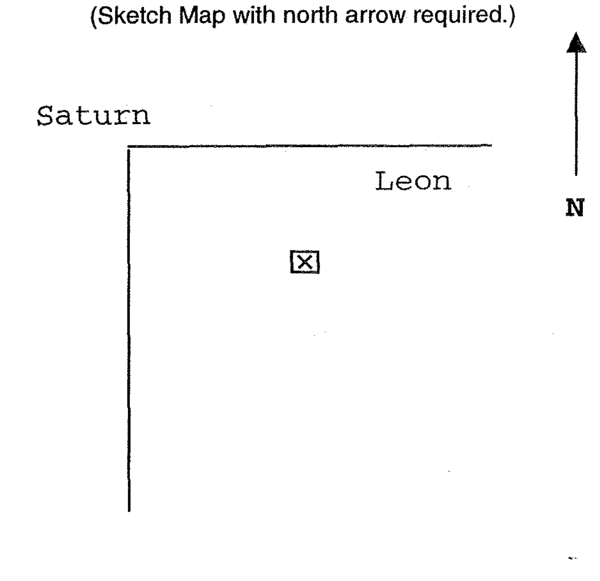
*B12. References:

B13. Remarks:

*B14. Evaluator: Larry Pierson/Michelle Cyrus

*Date of Evaluation: June 2005

(Sketch Map with north arrow required.)



(This space reserved for official comments.)

*Required information

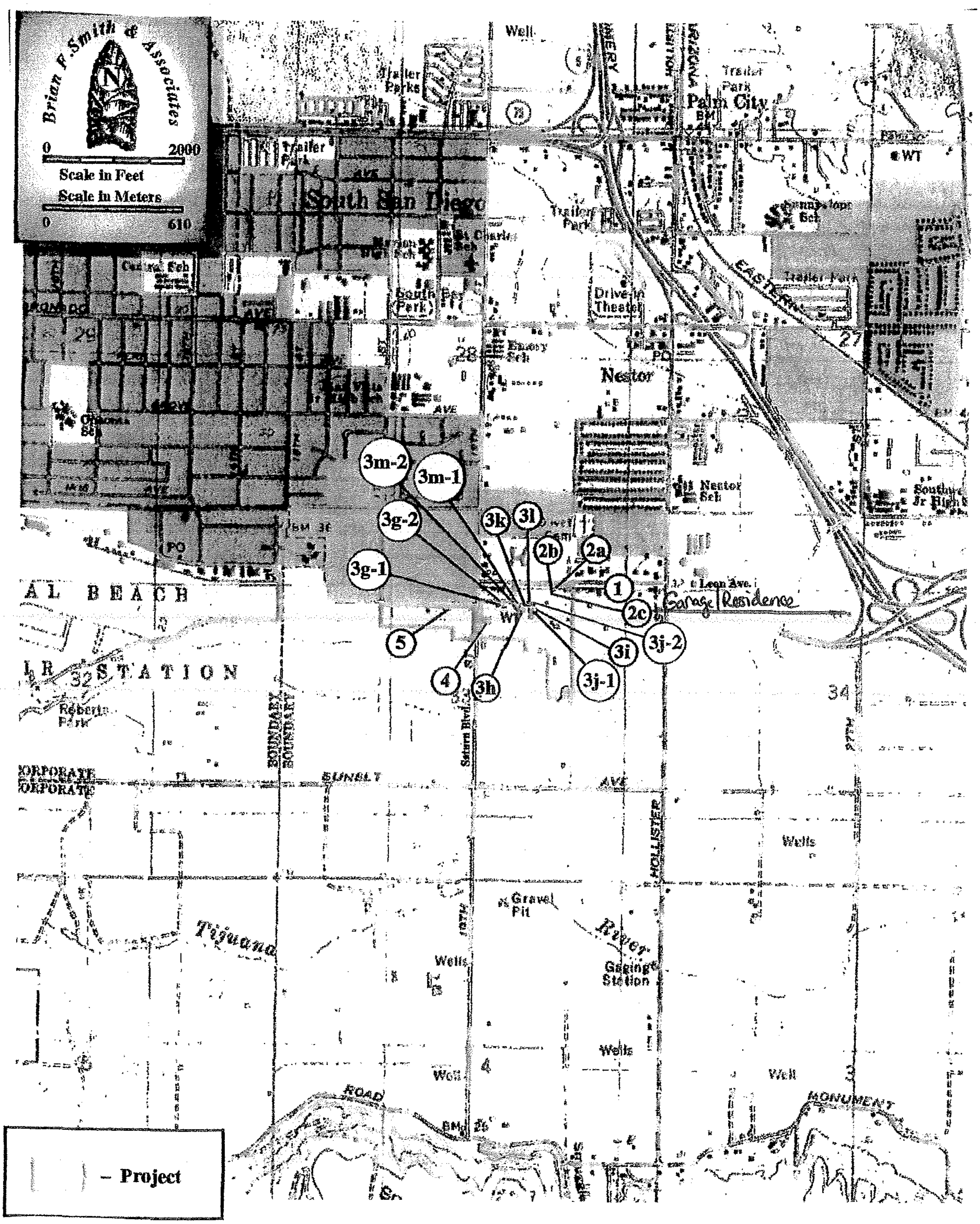
3702 6695

State of California— The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial

Page 3 of 4 *Resource Name or #: Garage/Residence

*Map Name: Rio Walk, *Imperial Beach* Quadrangle *Scale: 1:24,000 *Date of Map: 1979 (photorevised)



DPR 523J (1/95) *Required information

3702 6695

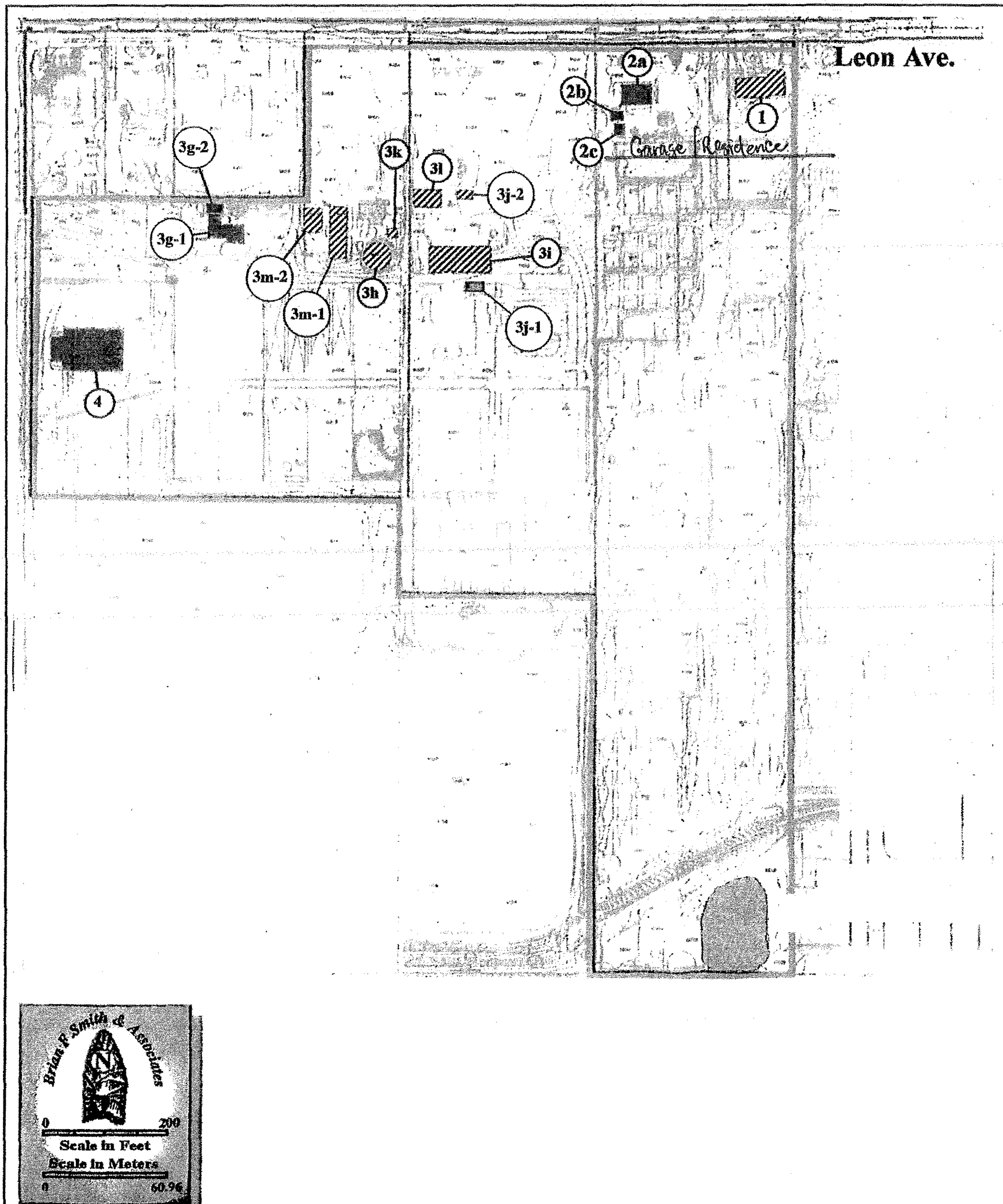
State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #
HRI#
Trinomial

*Resource Name or # (Assigned by recorder) Garage/Residence

*Drawn By: BFSA

*Date: June 2005



*Required information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # 3702 6696
HRI #
Trinomial
NRHP Status Code 7

Other Listings
Review Code Reviewer Date

  ***Resource Name or #:** Small House

P1. Other Identifier: 3g_1 on the 200-foot scale sketch map

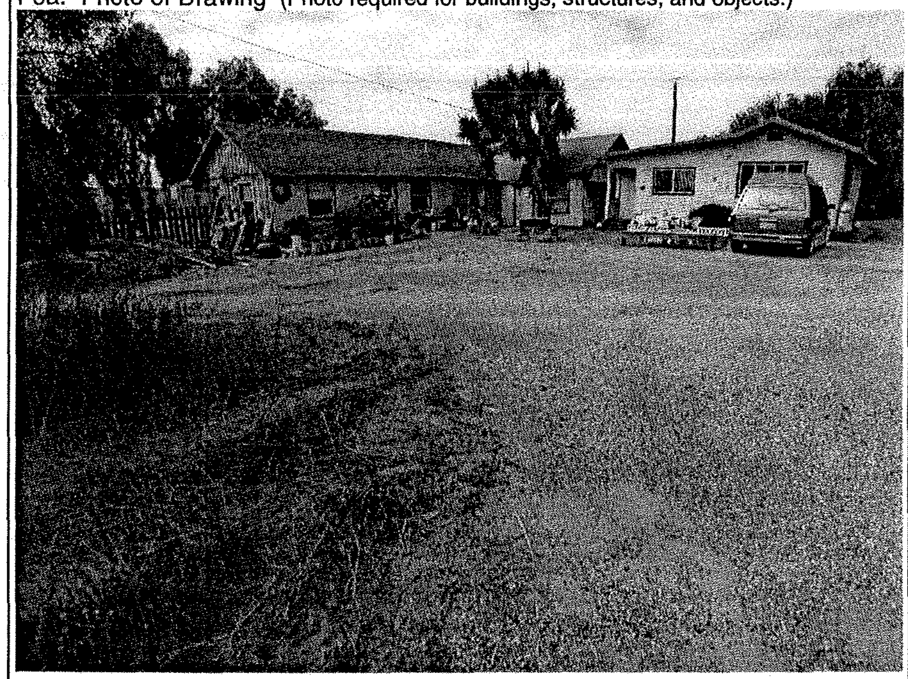
***P2. Location:** ☐ Not for Publication ☑ Unrestricted ***a. County:** San Diego
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
***b. USGS 7.5' Quad:** *Imperial Beach* **Date:** 1975 **T** 18S; **R** 2W; SW¼ **of** NE¼ **of Sec** 33 ; San Bernadino **B.M.**
c. Address: 1953 Leon Avenue City: San Ysidro Zip: 92154
d. UTM: Zone: 11 ; 491440 mE/ 3602935 mN (G.P.S.)
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate) Elevation: 40'
APN # 634-100-74

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
This house is a one story L shaped structure in very poor condition (Plate 6.0-8). It sits on a wood post and pier foundation and has board and batten siding. According to the building record this structure was built in 1912. The roof is cross-gabled and is presently covered with composition shingles and roll roofing. Most of the windows are later double hung wood sashes or aluminum framed sliding glass types. Only two tall and narrow sashes on the east end of the building appear original, as does the siding at that location. A small extension was added to the east end of the building and is consistent with a closet addition. The portion of the house that faces the parking area and front yard is the only part that has been repainted and possibly resided (Plate 6.0-8). The remainder of the house has been left to weather and some of the siding has collapsed (Plate 6.0-9). Overall the integrity of this structure is poor and architecturally redeeming features are lacking altogether.

***P3b. Resource Attributes:** (List attributes and codes) HP2

***P4. Resources Present:** ☑Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5a. Photo or Drawing (Photo required for buildings, structures, and objects.)



P5b. Description of Photo: (View, date, accession #)
Looking southwest at the north and east elevations with 3g_2.

***P6. Date Constructed/Age and Sources:**
☑Historic ☐Prehistoric ☐Both
1912-Assessor's Building Record

***P7. Owner and Address:**
The Olson Company
9191 Town Center Drive, Suite L-101
San Diego, CA 92122

***P8. Recorded by:** (Name, affiliation, and address)
Larry Pierson/ Michelle Cyrus
Brian F. Smith and Associates
14010 Poway Rd., Suite A
Poway, CA 92064

***P9. Date Recorded:** June 2005

***P10. Survey Type:** (Describe) Historical Evaluation

***P11. Report Citation:** (Cite survey report and other sources, or enter "none.")
An Archaeological/Historical Survey and Evaluation of Cultural Resources at the Rio Walk Project.

***Attachments:** ☐NONE ☑Location Map ☑Sketch Map ☐Continuation Sheet ☑Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

Primary # 3702 6696
HRI#

BUILDING, STRUCTURE, AND OBJECT RECORD

***NRHP Status Code** 7

***Resource Name or #** (Assigned by recorder) #3g_1

B1. Historic Name: old house
B2. Common Name:
B3. Original Use: Residential
B4. Present Use: partly collapsed
***B5. Architectural Style:** folk
***B6. Construction History:** (Construction date, alterations, and date of alterations)
The front of the house has been resided and painted. Some windows have been replaced. The rear and both gable ends are original, although a small closet addition is found on the southeast corner of the house. This building was joined to another by a breezeway.

***B7. Moved?** ☐No ☐Yes ☑Unknown **Date:** **Original Location:** unknown
***B8. Related Features:**
Another small dwelling, probably a converted garage, was connected to this one, but has been removed since our first site visit.

B9a. Architect: unknown
b. Builder: unknown
***B10. Significance: Theme:** rural folk houses
Area: San Diego County
Period of Significance: 1912-2000 **Property Type:** rural residential **Applicable Criteria:** N/A
(Discuss importance in terms of historical or architectural context as defined by theme, period, and geographic scope. Also address integrity.)

The house was probably constructed from catalog plans and constructed by the owner or a local carpenter (or both). Although the building was discovered on the same parcel as the dairy and hay barns, there is no guarantee that this was the original building site for the house. Moreover, the last visit by the Assessor's field investigator was variously recorded as 1970 or 1979 and many of the buildings that existed then are no longer on the property or have been relocated. This house lacks integrity and architectural merit. The structure is in poor condition and has been abandoned. There is no unequivocal association between this house and any of the notable owners of this property. For these reasons, a finding of no historical or architectural significance is rendered for this structure.

B11. Additional Resource Attributes: (List attributes and codes) HP2

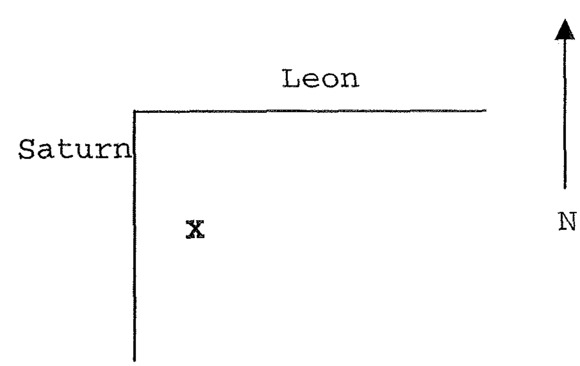
***B12. References:**

B13. Remarks:

***B14. Evaluator:** Larry Pierson/Michelle Cyrus

***Date of Evaluation:** June 2005

(Sketch Map with north arrow required.)



(This space reserved for official comments.)

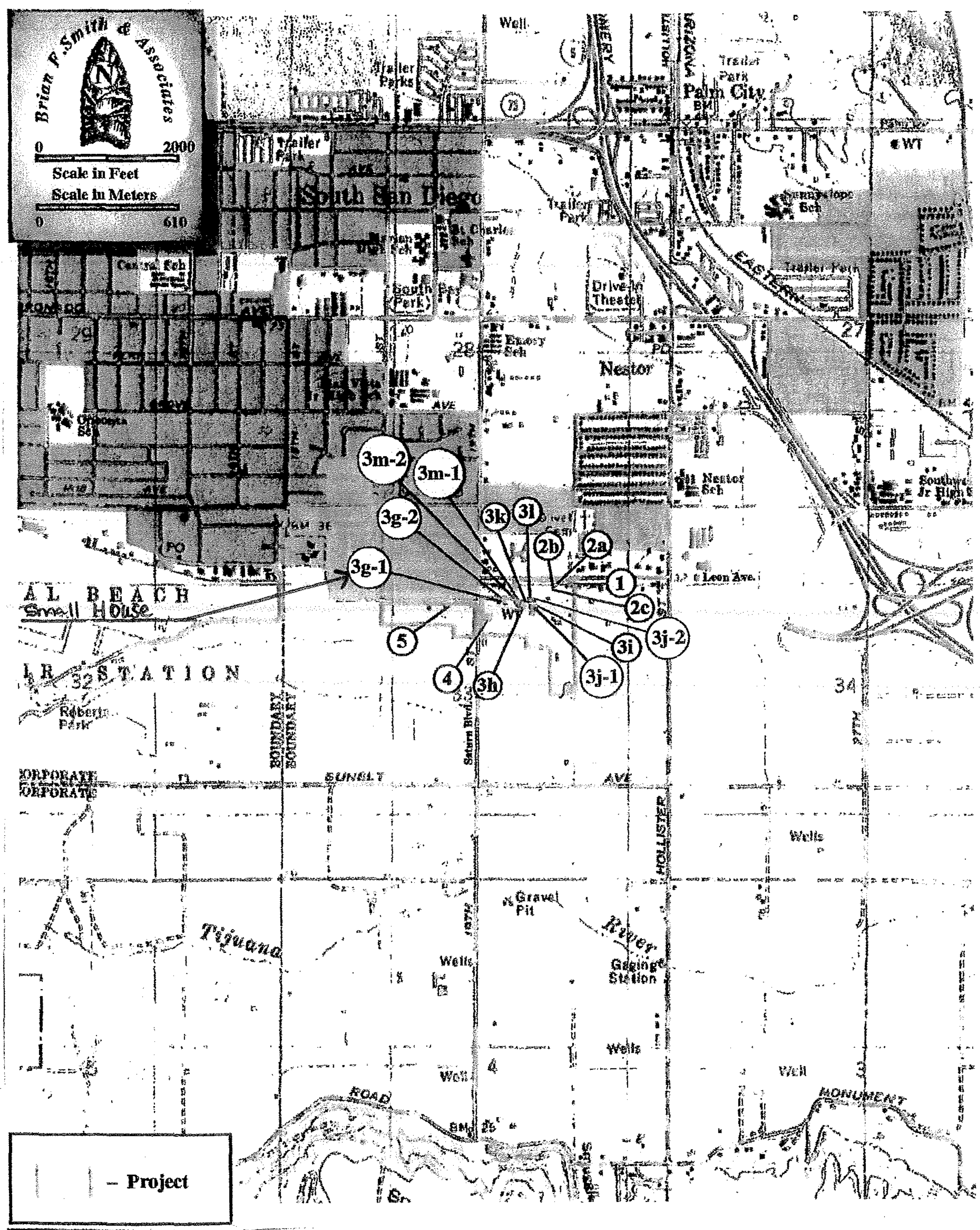
*Required information

State of California— The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # 3702 6696
HRI#
Trinomial

 *Resource Name or #: Small House

*Map Name: Rio Walk, *Imperial Beach* Quadrangle *Scale: 1:24,000 *Date of Map: 1979 (photorevised)



DPR 523J (1/95)

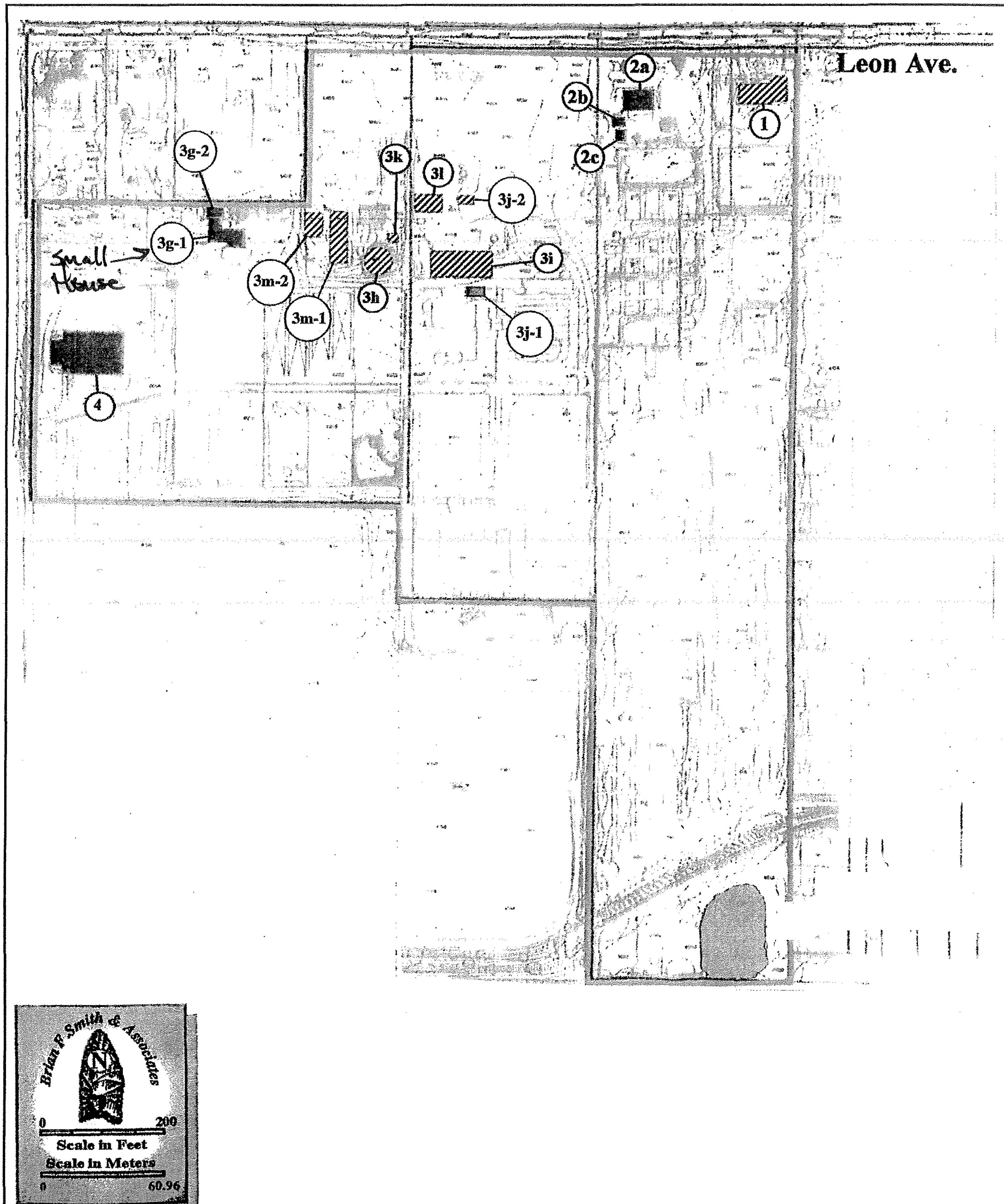
*Required information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary # 3702 6696
HRI#
Trinomial

 *Resource Name or # (Assigned by recorder) Small House

*Drawn By: BFSA *Date: June 2005



State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # 3702 8708
HRI #
Trinomial 17505
NRHP Status Code 7

Other Listings
Review Code Reviewer Date

 *Resource Name or #: Historic Surface Artifact Scatter

P1. Other Identifier: Temp 1 on 200-foot scale map

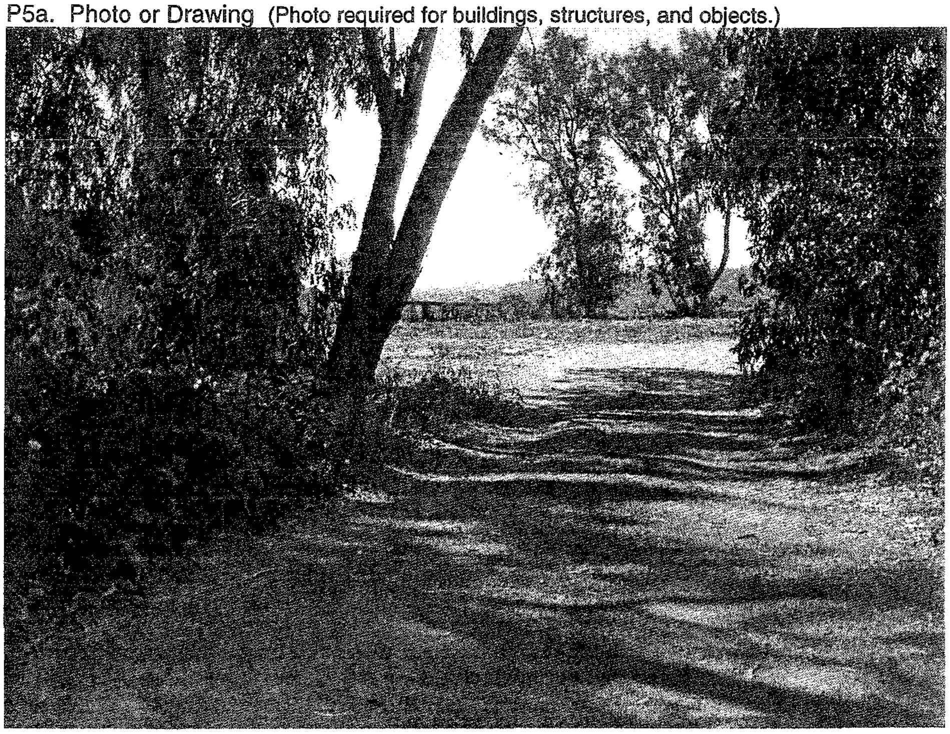
*P2. Location: ☐ Not for Publication ☑ Unrestricted *a. County: San Diego
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
*b. USGS 7.5' Quad: *Imperial Beach* Date: 1975 T 18S; R 2W; ¼ of NE¼ of Sec 33; San Bernadino B.M.
c. Address: 2091 Leon Avenue City: San Ysidro Zip: 92154
d. UTM: Zone: 11 ; 0491649 mE/ 3602757 mN
e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate) Elevation: 45'
APN # 634-100-18, located just east of the intersection of Saturn Boulevard and Leon Avenue in the Nestor neighborhood of San Diego, California. The deposit is located in the river valley in an area that has been elevated by use of fill material

*P3a. Description: (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries)
This site is a surface scatter of highly fragmented historic artifacts that came to this location in fill dirt.

*P3b. Resource Attributes: (List attributes and codes) AH16

*P4. Resources Present: ☐Building ☐Structure ☐Object ☐Site ☐District ☐Element of District ☑Other (Isolates, etc.)

P5a. Photo or Drawing (Photo required for buildings, structures, and objects.)



P5b. Description of Photo: (View, date, accession #)
Looking west from farm road to site

*P6. Date Constructed/Age and Sources:
☑Historic ☐Prehistoric ☐Both

*P7. Owner and Address:
The Olson Company
9191 Town Center Drive, Suite L-101
San Diego, CA 92122

*P8. Recorded by: (Name, affiliation, and address)
Larry Pierson
Brian F. Smith and Associates
14010 Poway Rd., Suite A,
Poway, CA 92064

*P9. Date Recorded: June 2005

*P10. Survey Type: (Describe) Survey & Evaluation

*P11. Report Citation: (Cite survey report and other sources, or enter "none.")
An Archaeological/Historical Survey and Evaluation of Cultural Resources at the Rio Walk Project.

*Attachments: ☐NONE ☑Location Map ☑Sketch Map ☐Continuation Sheet ☐Building, Structure, and Object Record ☐Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☑ Other (List): Summary Artifact Catalog

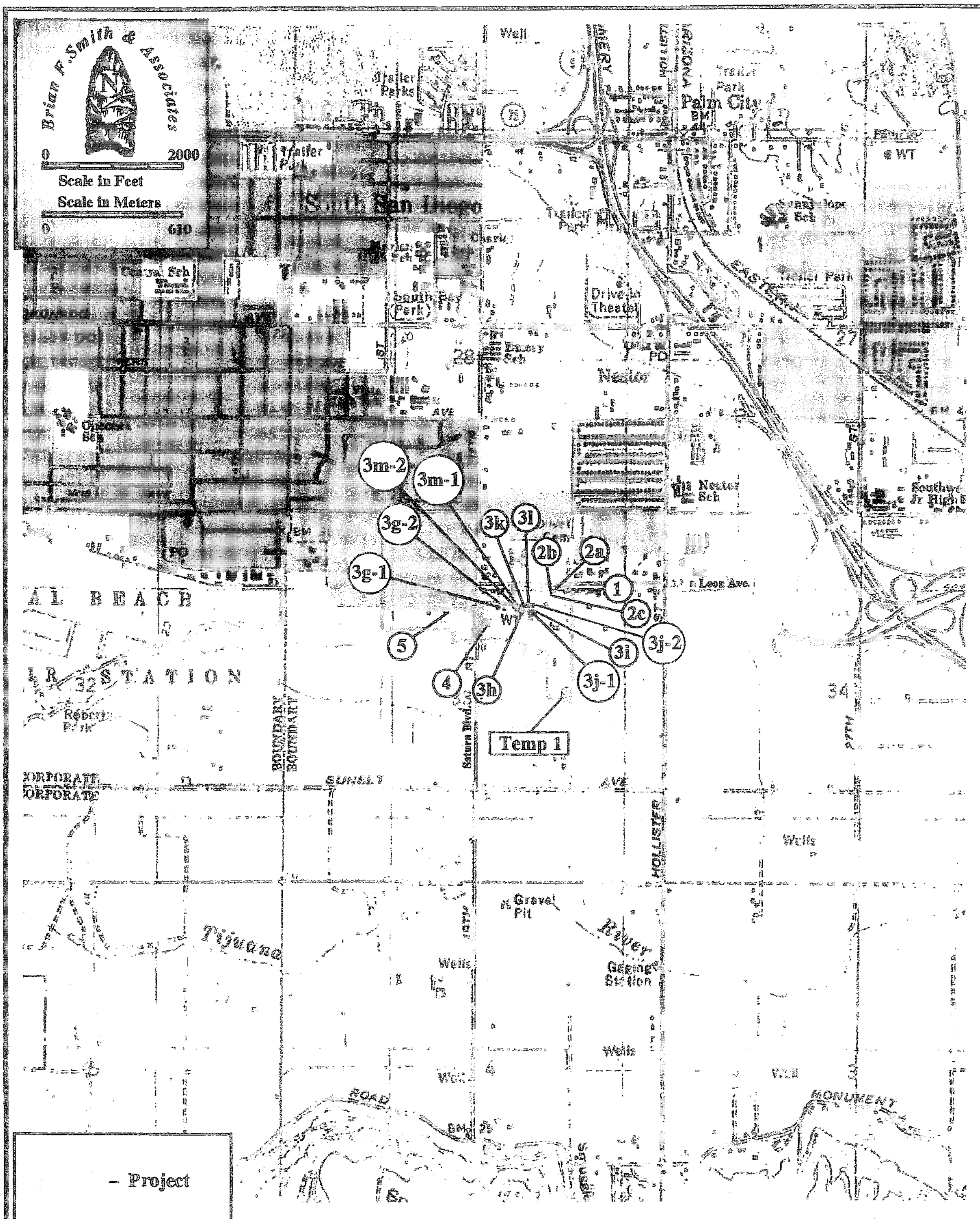
State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #
HRI#
Trinomial 17505

*Resource Name or #: Temp 1

*Map Name: Rio Walk; *Imperial Beach* Quadrangle

*Scale: 1:24,000 *Date of Map: June 2005



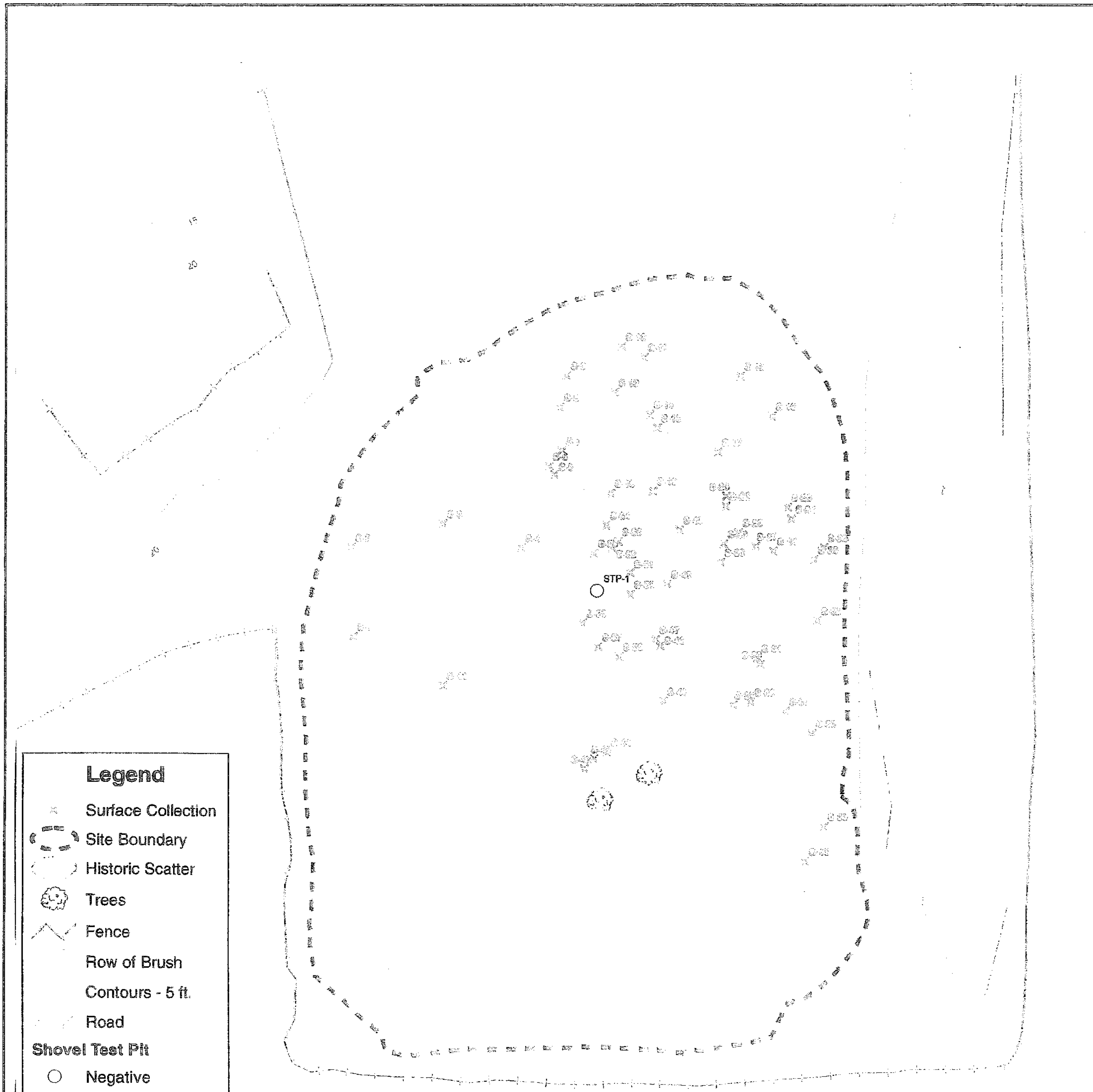
*Required information

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary # 3792 6708
HRI#
Trinomial 17505

Page 3 of 4 *Resource Name or # (Assigned by recorder) Temp 1

*Drawn By: BFSA *Date: June 2005



Locator Map

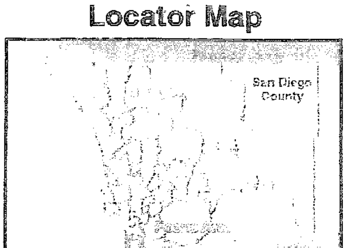


Figure : Data Recovery Map

The Rio Walk Significance Testing Project

Map Notes
1:338
1 inch equals 28.19 feet

0 1.25 2.5 5 7.5 10 Meters

0 4.5 9 18 27 36 Feet

Date Created: May 11, 2005
C:\GIS\projects\05_may_rio_walk_testing.mxd
Data Sources: SanDAG, SanGIS
Projection: NAD 1983 State Plane California VI FIPS 0406

DPR 523K (1/95) *Required information

3702 5706

State of California — The Resource Agency
DEPARTMENT OF PARKS AND RECREATION
ARTIFACT RECORD

Primary #
Trinomial 17505

 *Resource Name or # (Assigned by recorder) Rio Walk – Temp 1

Artifact	Count
Glass	44
Whiteware	10
Porcelain	10
Marbles	2
Shell	4
Ironstone	3
Ceramic	2
Bone	1
Brick	5
Total # of Artifacts	81

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # P-37-032675
HRI # CA-SDI-20703
Trinomial
NRHP Status Code

Other Listings
Review Code **Reviewer** **Date**

  Resource Name or #: SB-S-1

P1. Other Identifier:
P2. Location: ■ **Not for Publication** ☐ **Unrestricted** **a. County:** San Diego
and (P2b and P2c or P2d. Attach a Location Map as necessary.)
b. USGS 7.5' Quad: Imperial Beach **Date:** 1967 (Photorevised 1975) **T** 18S; **R** 2W; SW ¼ of NW ¼ of SE ¼ of **Sec.** 28**;** S.B. **B.M.**
c. Address: across the street (west) from1261 and 1271 Saturn Blvd. City: San Diego Zip: 92154
d. UTM: N.A.D. 83 Zone:11; N end: 491283mE/ 3604012mN; S end: 491283mE/ 3603992mN
e. Other Locational Data: This site is located in the community of Nestor in the County of San Diego. From South San Diego at the southern end of San Diego Bay, from Hwy 75/Palm Ave. (west of I-5), head south on Saturn Blvd. (19th St.) past Coronado Ave., past the South Bay Community Park to the road shoulder across from 1271 Saturn Blvd. about 50 m north of Halo St. (Grove Ave.) at approximately 44 ft. elevation.

P3a. Description: This resource is a deposit of historic trash encountered during monitoring of excavation for underground utilities on the west shoulder of Saturn Blvd., 50+ m north of Halo St. The deposit extended south for 20 m, approximately 45 inches below the road surface in a 2 ft. wide trench. The trash was not visible in the east trench wall, but earlier utility trenching has disturbed much of this area The recovered assemblage dates from the 1900s-1932 (averaging 1920) and includes an unusually high frequency (n=38) of milk bottles (primarily from an apparently undocumented Nestor dairy -Loustalet).

Recovered material consists of 115 items comprised of 78 **consumer** items – primarily glass bottles (68) & jars (7), and 3 metal lids/caps; 23 **kitchen** items consisting of 3 canning jars, 4 canning jar lids, 7 ceramic dishes (5 plates, 1 bowl, and 1 saucer), 2 ceramic serving bowls, 1 sugar bowl lid, 2 storage crocks & 1 lid, 1 mixing bowl, 1 pig longbone, 1 shell; 4 **household** items comprised of 1 terra cotta flower pot, 1 enamelware wash basin, 1 toilet tank float(?), and 1 carbon dry-cell battery core; 5 **building materials** including 4 metal fasteners (2 nails, 1 bolt, 1 rivet) and 1 ceramic tube insulator; 2 **personal** items of a hair brush and a brass “chain mesh” purse; 1 shoe, and 2 unidentified metal items.

P3b. Resource Attributes: AH4. Trash dump/trash scatter

P4. Resources Present: ☐Building ☐Structure ☐Object ■Site ☐District ☐Element of District ☐Other (Isolates, etc.)

P5b. Description of Photo: Looking SSW at trench along Saturn Blvd.; 7/25-04; SB-008.

P6. Date Constructed/Age and Sources:
■Historic ☐Prehistoric ☐Both

P7. Owner and Address:
City of San Diego ROW (trenching)
Underground Utility Conversion Dept.

P8. Recorded by:
J. Dietler
Laguna Mountain Environmental, Inc.
7969 Engineer Rd, Suite 208
San Diego, CA 92111

P9. Date Recorded: July 19, 2004

P10. Project Type:
Mitigation monitoring

P11. Report Citation: Dietler, John, Andrew R. Pigniolo, & Clinton J. Linton. 2004 (revised 2012). *Cultural Resource Monitoring Report for the Saturn Boulevard (Coronado Avenue to Leon Avenue) Utilities Undergrounding Project, City of San Diego, California*.

Attachments: ☐NONE ■Location Map ☐Sketch Map ■Continuation Sheet ☐Building, Structure, and Object Record ■Archaeological Record ☐District Record ☐Linear Feature Record ☐Milling Station Record ☐Rock Art Record ☐Artifact Record ☐Photograph Record ☐ Other (List):

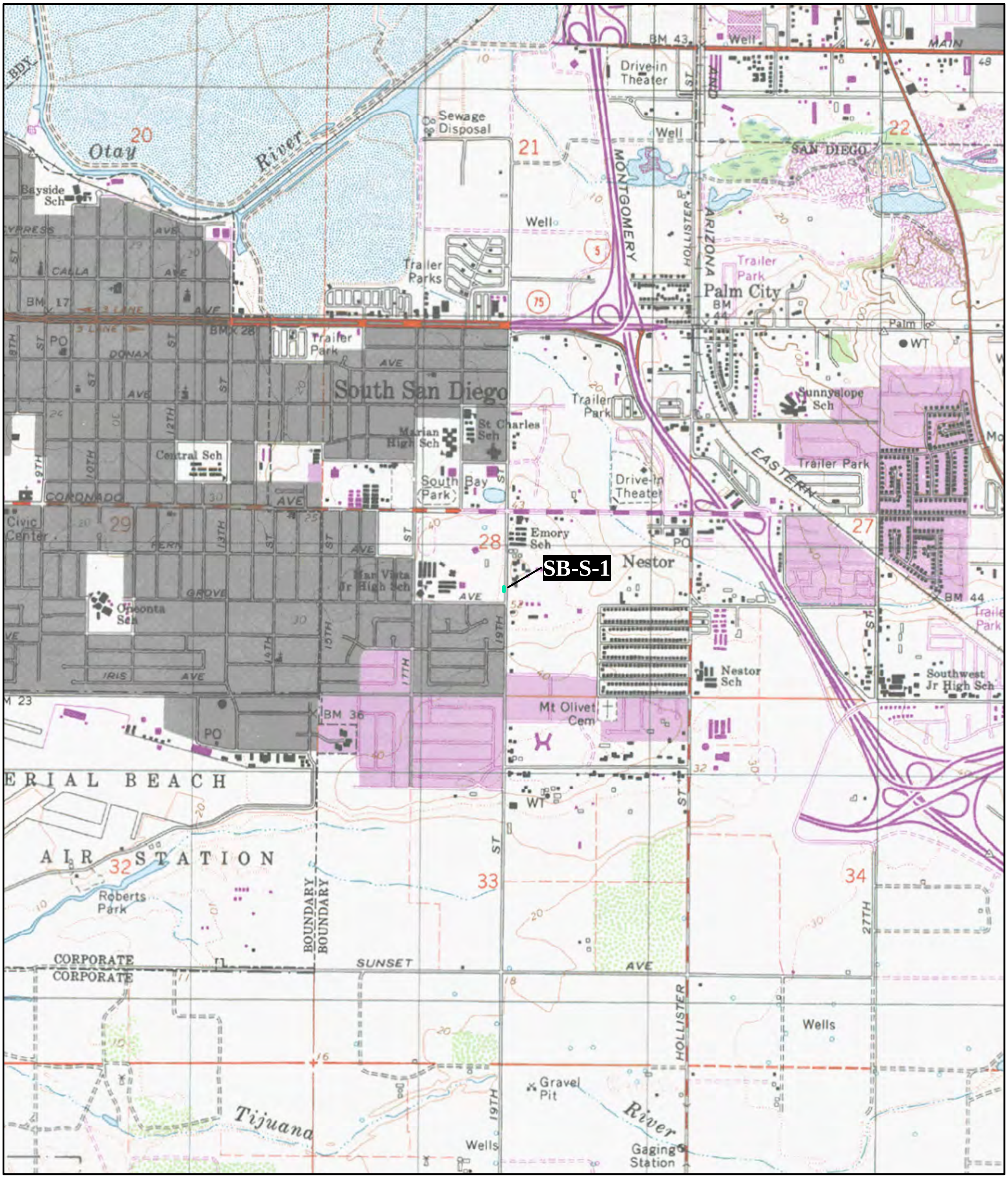
State of California- The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary #: P-37-032675
Trinomial: CA-SDI- CA-SDI-20703

Page 2 of 5

Resource Name or #: SB-S-1

Map Name: Imperial Beach **Scale: 1:24,000** **Date of Map:** 1967; Photorevised 1975



DPR 5231 (1/95) **Required Information is bold**

Resource Name or #: SB-S-1

A1. Dimensions: a. Length: 20 m × **b. Width:** 24+ inches (Extends into west trench wall)
Method of Measurement: ☐ Paced ☐ Taped ■ Visual estimate ■ Other: dimension limits of trenching tool
Method of Determination (Check any that apply.): ■ Artifacts ☐ Features ☐ Soil ☐ Vegetation ☐ Topography ☐ Cut bank ☐ Animal burrow ■ Excavation ☐ Property boundary ■ Other (Explain): Trench excavation
Reliability of Determination: ■ High ☐ Medium ☐ Low Explain: Observed in trench
Limitations (Check any that apply): ☐ Restricted access ☐ Paved/built over ■ Site limits incompletely defined ☐ Disturbances ☐ Vegetation ■ Other (Explain): Trench width

A2. Depth: 38-49 inches below st. ☐ None ☐ Unknown Method of Determination: Extent of excavation

A3. Human Remains: ☐ Present ■ Absent ☐ Possible ☐ Unknown (Explain):

A4. Features: n/a

A5. Cultural Constituents**:** Recovered material consists of 115 items comprised of **82 glass** items – 75 bottles (68) & jars (7), 3 canning jars, & 4 canning jar lids; **16 ceramic** items - 7 dishes (5 plates, 1 bowl, and 1 saucer), 2 serving bowls, 1 sugar bowl lid, 2 storage crocks & 1 lid, 1 mixing bowl, 1 flower pot & 1 tube insulator; **10 metal** items - 4 metal fasteners (2 nails, 1 bolt, 1 rivet), 3 metal lids/caps, 1 brass “chain mesh” purse, & 2 unidentified metal items; **2 composite** items of 1 enamelware wash basin & 1 hair brush; **3 other materials** - 1 carbon dry-cell battery core, 1 shoe, & 1 toilet tank float(?); along with **2 faunal** specimens of 1 pig longbone & 1 *Astrea undosa* shell (see Continuation Sheet summary table).

A6. Were Specimens Collected? ☐ No ■ Yes Temporarily curated at Laguna Mountain Environmental, Inc.

A7. Site Condition: ■ Good ☐ Fair ☐ Poor (Describe disturbances.): material extends into trench west wall

A8. Nearest Water: n/a for historic site

A9. Elevation: 44 ft.

A10. Environmental Setting**:** suburban residential/middle school play field.

A11. Historical Information: The collection contains 24 <u>whole</u> glass containers and over 40 containers or lids with embossed markings (4 have date codes) and 6 ceramics with manufacture marks (see report). Sixty percent of the glass items are of colorless (clear) glass (see Cont. Sheet) with another 17.3% (n=13) that have turned purple from UV light exposure, known as sun-colored amethyst (or SCA). This glass includes manganese dioxide, a decolorant, used to remove the natural aqua tint in glass; use of this chemical was discontinued in bottle machines by 1920 (Miller & McNichol 2002). Eight percent are of aqua glass (5 medicinal, 1 shoe polish); manufacture of glass bottles of this color (except Coca Cola) was essentially discontinued by 1920 (Miller & McNichol 2002). Diagnostic marks date manufacture of glass containers from as early as 1900 to as late as 1931 (pharmacy bottle made by Owens-Illinois Glass Co.).

A12. Age: ☐ Prehistoric ☐ Protohistoric ☐ 1542-1769 ☐ 1769-1848 ☐ 1848-1880 ☐ 1880-1914 ■ 1914-1945 ☐ Post 1945 ☐ Undetermined **Describe position in regional prehistoric chronology or factual historic dates if known:**

A13. Interpretations: The deposit contains items made between 1900 and 1931, probably discarded in the early 1930s.

A14. Remarks:

A15. References:
Miller, George, and Tony McNichol
2002 Dates for Suction Scarred Bottoms: Chronological Changes in Owens Machine-Made Bottles. Paper presented at the 35th Annual Meeting of the Society for Historical Archaeology, Mobile, Alabama.

A16. Photographs: none

A17. Form Prepared by: C. Serr **Date:** June 16, 2012
Affiliation and Address: Laguna Mountain Environmental, Inc. 7969 Engineer Road, Suite 208 San Diego, CA 92111

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION

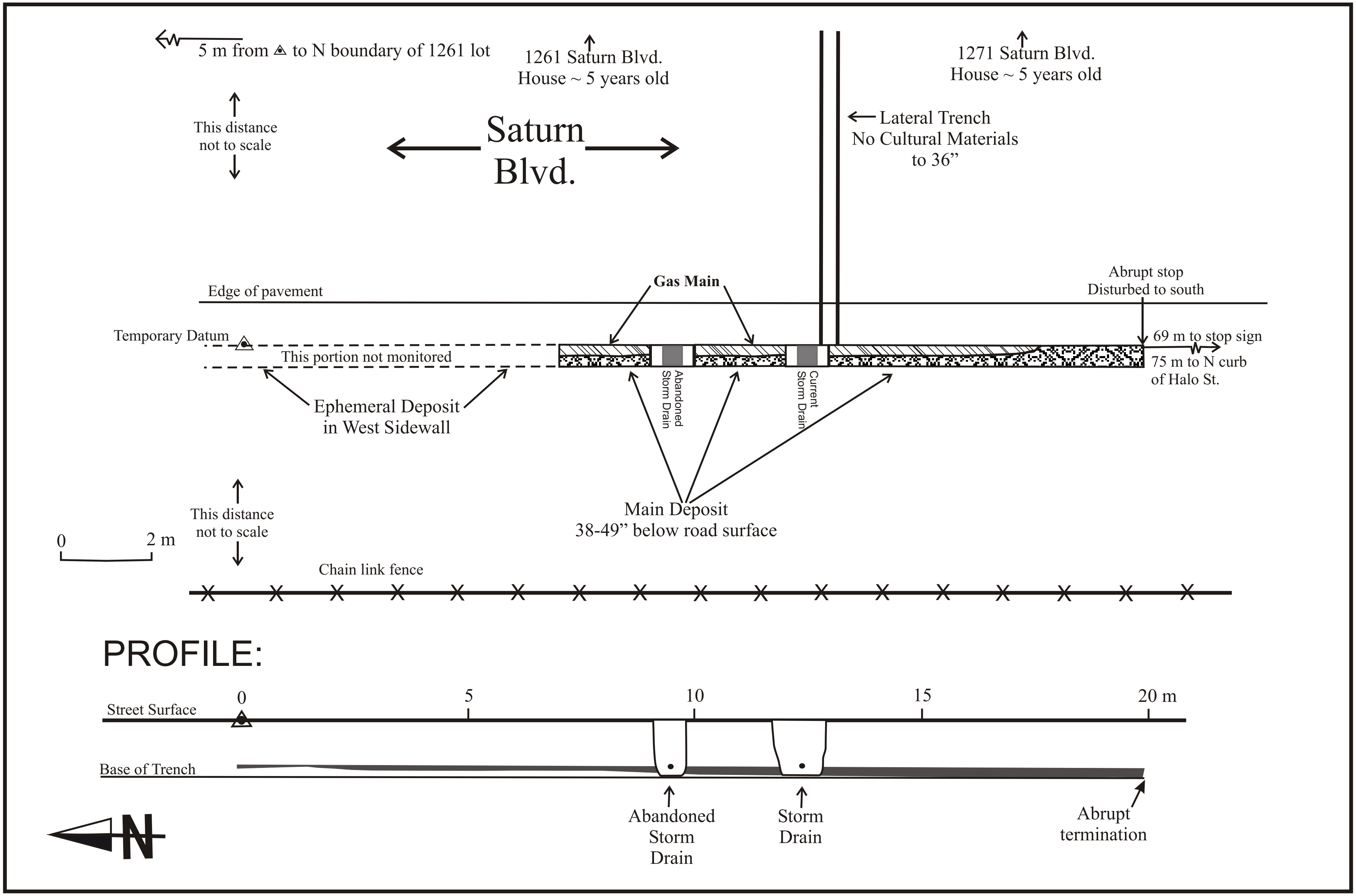
SKETCH MAP

Primary #:
Trinomial: ~~P-37-032675~~ CA-SDI-20703

Resource Name or #: SB-S-1

Drawn By: A. Pigniolo

Date: 7-21-04



Resource Name or #: SB-S-1

Recorded by: J. Dietler (cataloged by C. Serr; 2012)

Date: July 19, 2004 ■ Continuation ☐ Update

SB-S-1 Recovery Summary

Activity Group	Item	Glass	Ceramic	Metal	Composite	Other	Faunal	Total	Percent
		Material							
Consumer	Bottles/Jars	75	—	—	—	—	—	75	65.2
	Food (milk)	38	—	—	—	—	—	38	33.0
	Food	6	—	—	—	—	—	6	5.2
	Medicine	17	—	—	—	—	—	17	14.8
	Alcohol	4	—	—	—	—	—	5	4.3
	Household	4	—	—	—	—	—	4	3.5
	Toiletry	4	—	—	—	—	—	4	3.4
	Beverage	1	—	—	—	—	—	1	0.9
	Cap/Lid	—	—	3	—	—	—	3	2.6
	Subtotal	*75*	*0*	*3*	*0*	*0*	*0*	*78*	*67.8*
Kitchen	Canning jars	3	—	—	—	—	—	3	2.6
	Jar lids/liners	4	—	—	—	—	—	4	3.5
	Tableware	—	7	—	—	—	—	7	6.1
	Serving ware	—	3	—	—	—	—	3	2.6
	Crocks	—	3	—	—	—	—	3	2.6
	Mixing bowl	—	1	—	—	—	—	1	0.9
	Bone/Shell	—	—	—	—	—	2	2	1.7
	Subtotal	*7*	*14*	*0*	*0*	*0*	*2*	*23*	*20.0*
Building Mat.	Nails	—	—	2	—	—	—	2	1.7
	Bolt	—	—	1	—	—	—	1	0.9
	Rivet	—	—	1	—	—	—	1	0.9
	Insulator (tube)	—	1	—	—	—	—	1	0.9
	Subtotal	*0*	*1*	*4*	*0*	*0*	*0*	*5*	*4.3*
Household	Flower pot	—	1	—	—	—	—	1	0.9
	Battery core	—	—	—	—	1	—	1	0.9
	Float ball	—	—	—	—	1	—	1	0.9
	Wash basin?	—	—	—	1	—	—	1	0.9
	Subtotal	*0*	*1*	*0*	*1*	*2*	*0*	*4*	*3.5*
Personal	Hair brush	—	—	—	1	—	—	1	0.9
	Purse	—	—	1	—	—	—	1	0.9
	Subtotal	*0*	*0*	*1*	*1*	*0*	*0*	*2*	*1.7*
Garment	Shoe	0	0	0	0	1	0	1	0.9
Uniden. Metal	Valve?	—	—	1	—	—	—	1	0.9
	Unknown item	—	—	1	—	—	—	1	0.9
	Subtotal	*0*	*0*	*2*	*0*	*0*	*0*	*2*	*1.7*
Total		**82**	**16**	**10**	**2**	**3**	**2**	**115**	**100.0**
Percent		**71.3**	**13.9**	**8.7**	**1.7**	**2.6**	**1.7**	**100.0**	

Glass Container Type	Clear	SCA	Aqua	Brown	Cobalt	White	MNI	Percent
	Glass Color							
Food (milk)	29	9					38	50.7
Food	6						6	8.0
Medicine	6	1	5	2	3		17	22.7
Alcohol	1	1		3			5	6.7
Toiletry	1					3	4	5.3
Household	2	1	1				4	5.3
Beverage		1					1	1.3
Total	**45**	**13**	**6**	**5**	**3**	**3**	**75**	**100.0**
Percent	**60.0**	**17.3**	**8.0**	**6.7**	**4.0**	**4.0**	**100.0**	

SCA = sun-colored amethyst

State of California C The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
PRIMARY RECORD

Primary # P-37-033690
HRI # CA-SDI-21168
Trinomial
NRHP Status Code
Other Listings
Review Code ______ **Reviewer** ____________________ **Date** __________________

 ***Resource Name or #**: (Assigned by recorder) LSA-Berry Park-1

P1. Other Identifier:

***P2. Location:** : **Not for Publication** 9 **Unrestricted** **a. County** San Diego
and (P2b and P2c or P2d. Attach a Location Map as necessary.)

b. USGS 7.5' Quad *Imperial Beach* **Date** 1967 (1975); **T** 18 S; **R** 2W; in the NE ¼ of the SE ¼ of the NE ¼ of Sec 33; San Bernardino **B.M.**

c. Address 2295 Leon Avenue **City** San Diego **Zip** 92154

d. UTM: (Give more than one for large and/or linear resources) **Zone** 11; Northwest corner 492075**mE** / 3603205**mN (NAD83)**

e. Other Locational Data: (e.g., parcel #, directions to resource, elevation, etc., as appropriate) The site is located on the eastern portion of the grounds of the Southwest Baptist Church. The site is bounded by Leon Avenue on the north and Hollister Street on the east. The western boundary appears to be the eastern side of the existing church building. The southern boundary was not confirmed as shell was observed extending south onto an adjacent property that could not be accessed.

***P3a. Description:** (Describe resource and its major elements. Include design, materials, condition, alterations, size, setting, and boundaries) The site is primarily a prehistoric site containing a light to moderate scatter of marine shell, one interior flake of a fine grained igneous material, and one piece of metavolcanic and one piece of igneous shatter. A few fragments of amethyst glass and transfer ware ceramic were also observed in the portion of the site south of the easternmost building on the property.

***P3b. Resource Attributes:** (List attributes and codes) (AP2) Lithic scatter (AP16) Other, Shell scatter (AH4) Privies, dumps, trash scatters,

***P4. Resources Present:** 9 Building 9 Structure 9 Object :Site 9 District 9 Element of District 9 Other (Isolates, etc.)

***P5.** Site overview to the south from the north edge of Leon Avenue.

***P6. Date Constructed/Age and Sources:**
9 Historic 9 Prehistoric : Both

***P7. Owner and Address:**
Southwest Baptist Church
2295 Leon Avenue
San Diego, CA 92154

***P8. Recorded by:** (Name, affiliation, and address):
Phil Fulton
LSA Associates, Inc.
20 Executive Park, Suite 200
Irvine, CA 92614

***P9. Date recorded:** January 28, 2014

***P10. Survey Type:** (Describe)
Reconaissance

*** P11. Report citation:** (Cite survey report and other sources or enter "none.") Fulton 2014. Cultural Resources Assessment, Class III Inventory, Verizon Wireless Services, Berry Park Facility, City of San Diego, San Diego County, California.

Attachments: 9None :Location Map :Sketch Map 9Continuation Sheet 9Building, Structure, and Object Record :Archaeological Record 9District Record 9Linear Feature Record 9Milling Station Record 9Rock Art Record 9Artifact Record 9Photograph Record 9Other (List)

DPR 523A (1/95) ***Required Information**

State of California — The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
ARCHAEOLOGICAL SITE RECORD

Primary # ~~P-37-033690~~
HRI# ~~CA-SDI-21168~~
Trinomial

 ***Resource Name or #**: (Assigned by recorder) LSA-Berry Park-1

***A1.** **Dimensions: Length:** 90+ m **(N-S) x b. Width** 43 m (E-W)
Method of Measurement: ☐ Paced ☐ Taped ☐ Visual estimate ☒ Other: Measured off of aerial photographs.
Method of Determination (Check any that apply): ☒Artifacts ☐ Features ☐ Soil ☐ Vegetation ☐ Topography ☐ Cut bank ☐ Animal burrow ☐ Excavation ☐ Property boundary ☐ Other (Explain):

Reliability of determination: ☐ High ☐ Medium ☒ Low Explain: The site extends south of a fence line marking the southern boundary of the Southwest Baptist Church property.
Limitations (Check any that apply) ☒ Restricted access ☒ Paved/built over ☒ Site limits incompletely defined ☒ Disturbances ☐ Vegetation ☐ Other: (Explain): This adjacent parcel where the site appears to extend to the south was not surveyed; therefore, the southern site boundary has not been determined. Development of the property has disturbed much of the site.

A2. **Depth:** ☐None ☒ Unknown; Method of Determination: While an examination of the roadcut along Hollister Street and the cut at the northern edge of the parking lot at the southern portion of the property did not show any evidence of subsurface material, the absence of subsurface material cannot be confirmed based on this pedestrian survey.

***A3.** **Human Remains:** ☐ Present ☒ Absent ☐ Possible ☐Unknown (Explain):

***A4.** **Features** (Number, briefly describe, indicate size, list associated cultural constituents, and show location of each feature on site map): None observed.

***A5.** **Cultural Constituents:** (Describe and quantify artifacts, ecofacts, cultural residues, etc., not associated with features): The primary consituents present consist of a sparse to moderately dense scatter of marine shell. The majority of the observed shell was *Chione spp.*, with Argo*pectin spp., Ostrea lurida, Tivela stultorum,* and *Olivella spp.* also present. One interior flake of a fine grained igneous material was observed as well as one piece of metavolcanic and one piece of igneous shatter. Historic material observed consisted of a few fragments of brown on white transfer ware and amethyst glass were observed in the area south of the easternmost building on the property.

***A6.** **Were Specimens Collected?** ☒ No ☐ Yes (If yes, attach Artifact Record or catalog and identify where specimens are curated.)

***A7.** **Site Condition:** ☐ Good ☐Fair ☒ Poor (Describe disturbances): The site has been extensively disturbed by development of the parcel.

***A8.** **Nearest Water:** (Type, distance, and direction). The site is approximately 0.7 mile north of the Tijuana River.

***A9.** **Elevation:** 35 ft above mean sea level

A10. **Environmental Setting:** (Describe culturally relevant variables such as vegetation, fauna, soils, geology, landform, slope, aspect, exposure, etc.): The site is located in an open setting on a Middle to Late Pleistocene marine terrace that slopes to the south towards the Tijuana River.

A11. **Historical Information:**

***A12.** **Age:** ☒ Prehistoric ☐ Protohistoric ☐ 1542-1769 ☐ 1769-1848 ☐ 1848-1880 ☐ 1880-1914 ☒ 1914-1945 ☐ Post 1945 ☐ Undetermined Describe position in regional prehistoric chronology or factual historic dates if known:

A13. **Interpretations** (Discuss data potential, function(s), ethnic affiliation, and other interpretations):
A14. **Remarks:**

A15. **References** (Documents, informants, maps, and other references):

A16. **Photographs** (List subjects, direction of view, and accession numbers or attach a Photograph Record):
Original Media/Negatives On File at:

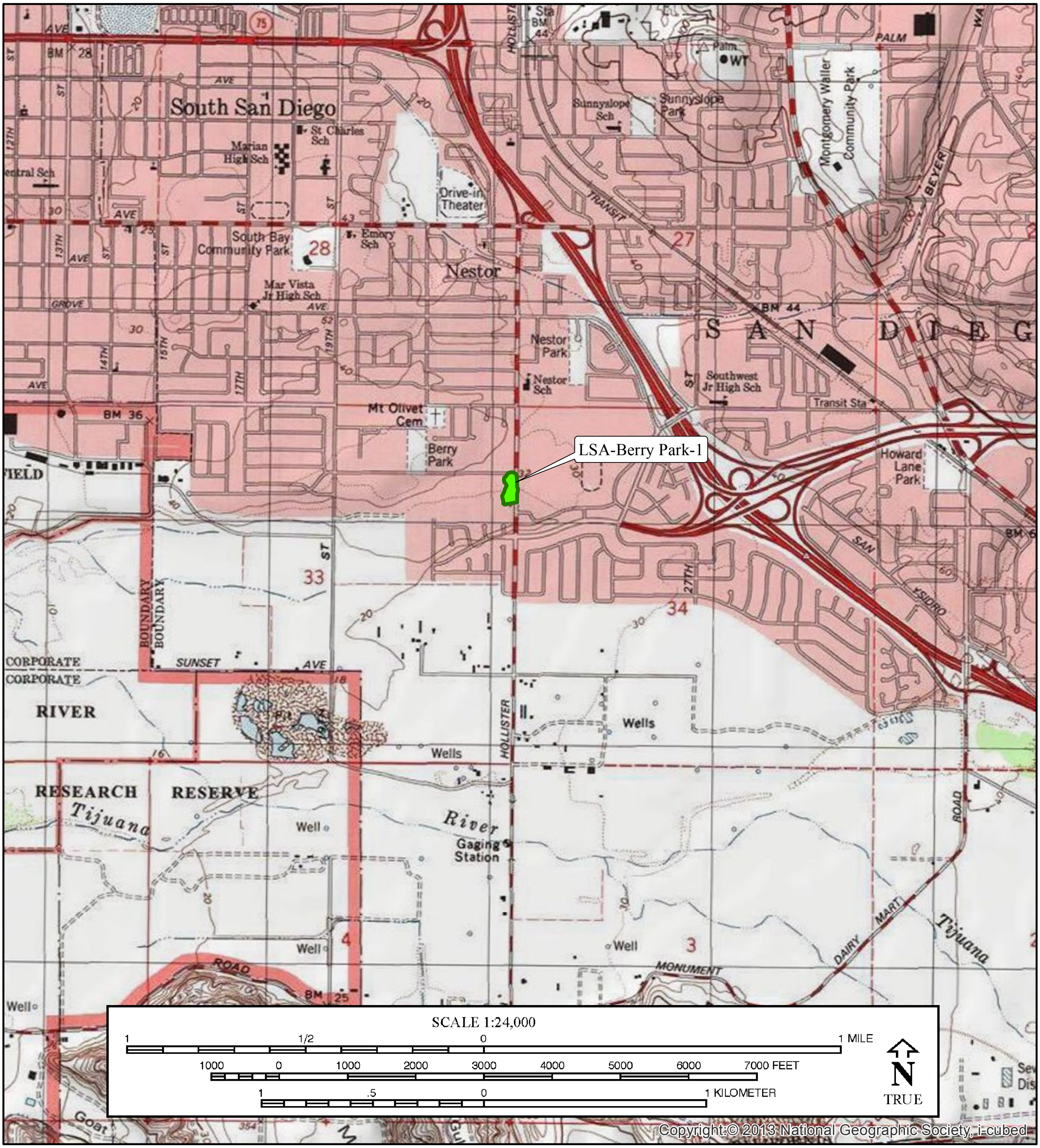
***A17.** **Form Prepared By:** P. Fulton **Date:** April 29, 2014
Affiliation and Address: LSA Associates, Inc., 20 Executive Park, Suite 200, Irvine, CA 92614

State of California - The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
LOCATION MAP

Primary # P-37-033690
HRI # CA-SDI-21168
Trinomial

 ***Resource Name or** # (Assigned by recorder) **LSA-Berry Park-1**

*Map Name: USGS 7.5' Quad, *Imperial Beach*, California *Scale: 1:24,000 *Date of Map: 1975



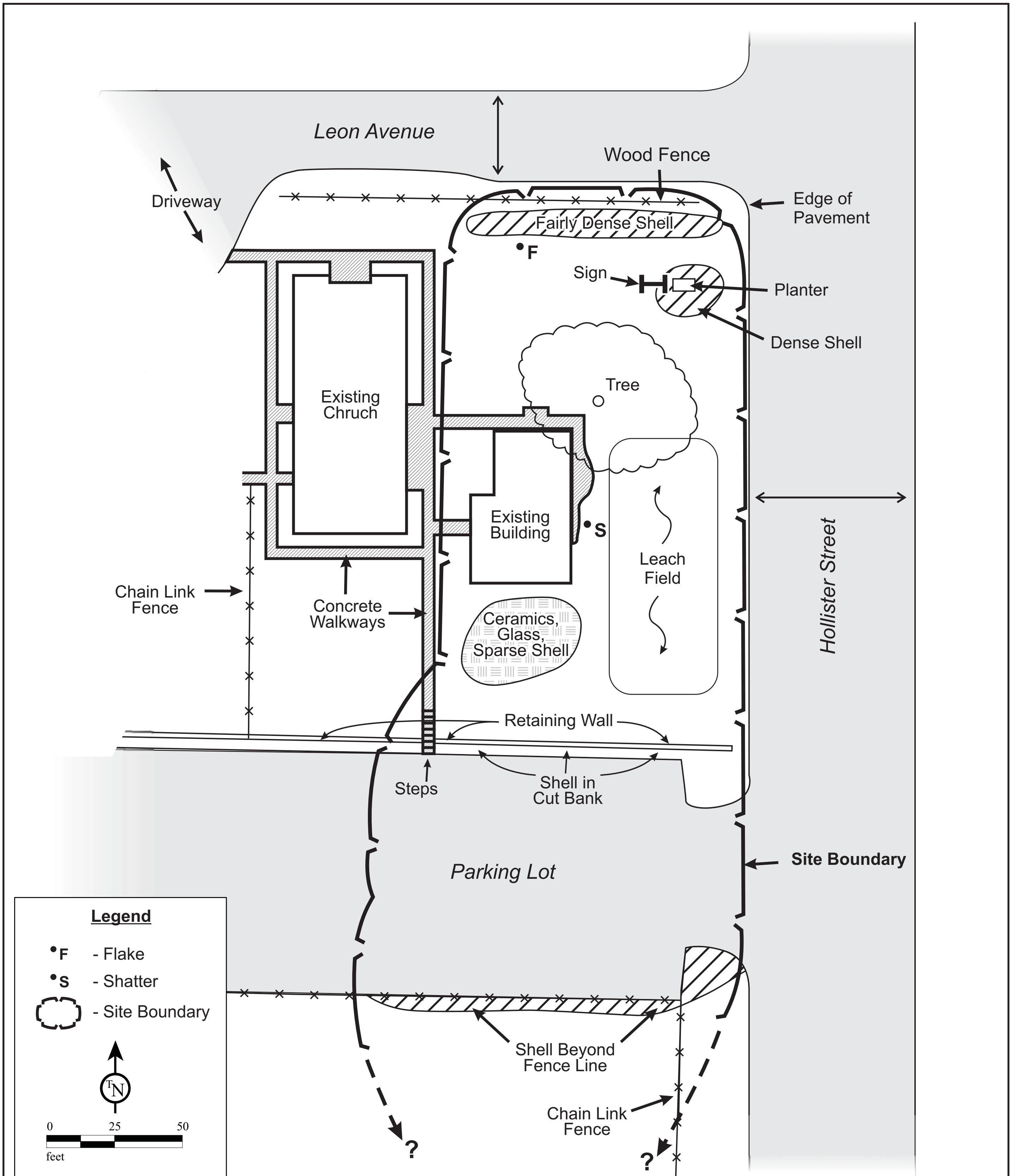
 * Required Information

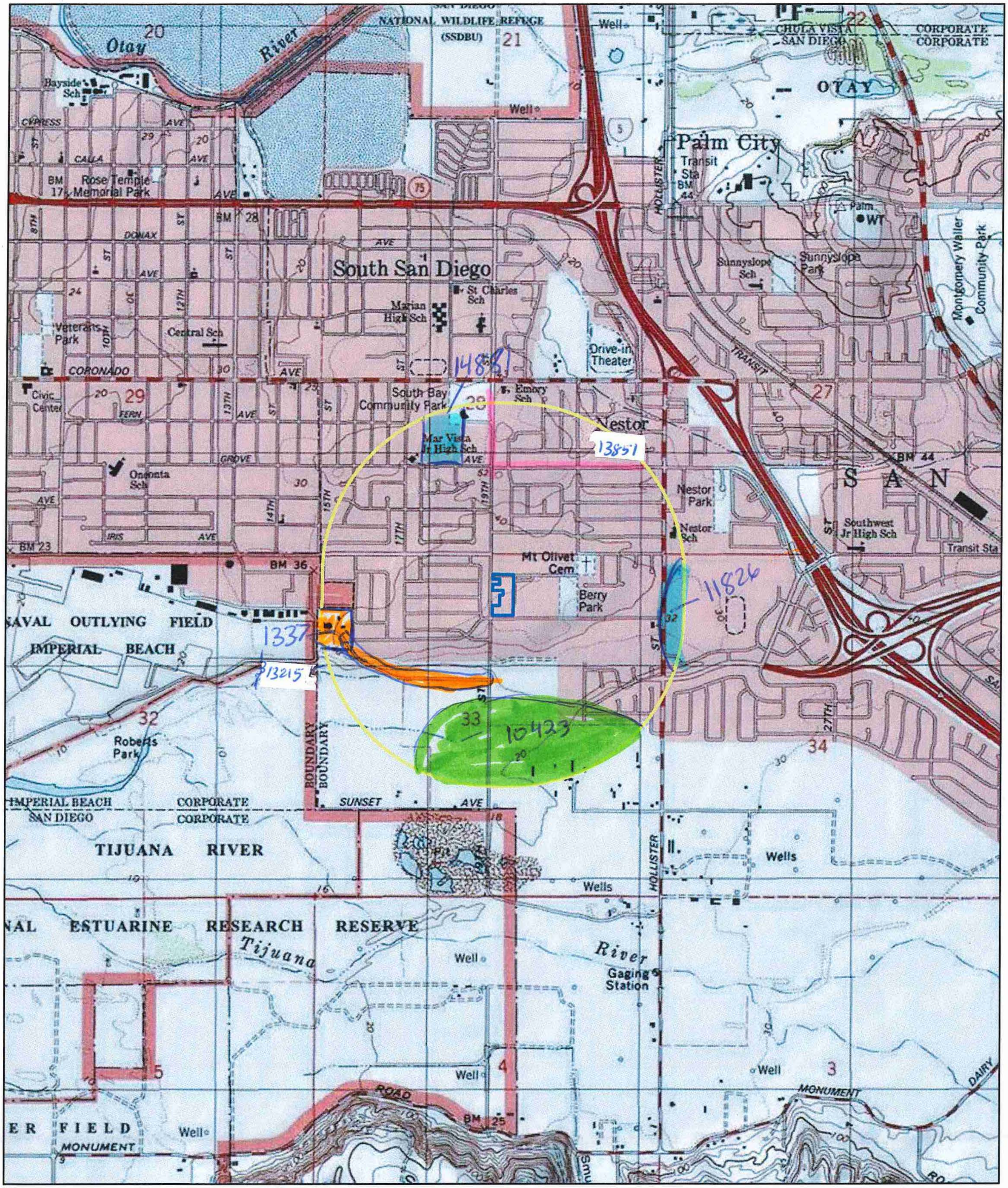
State of California – The Resources Agency
DEPARTMENT OF PARKS AND RECREATION
SKETCH MAP

Primary #
HRI # P-37-033690
Trinomial CA-SDI-21168

Page 4 of 4 | *Resource Name or # (Assigned by recorder) LSA-Berry Park-1

*Drawn By: Phil Fulton | *Date : 3/19/14





APE

Buffer

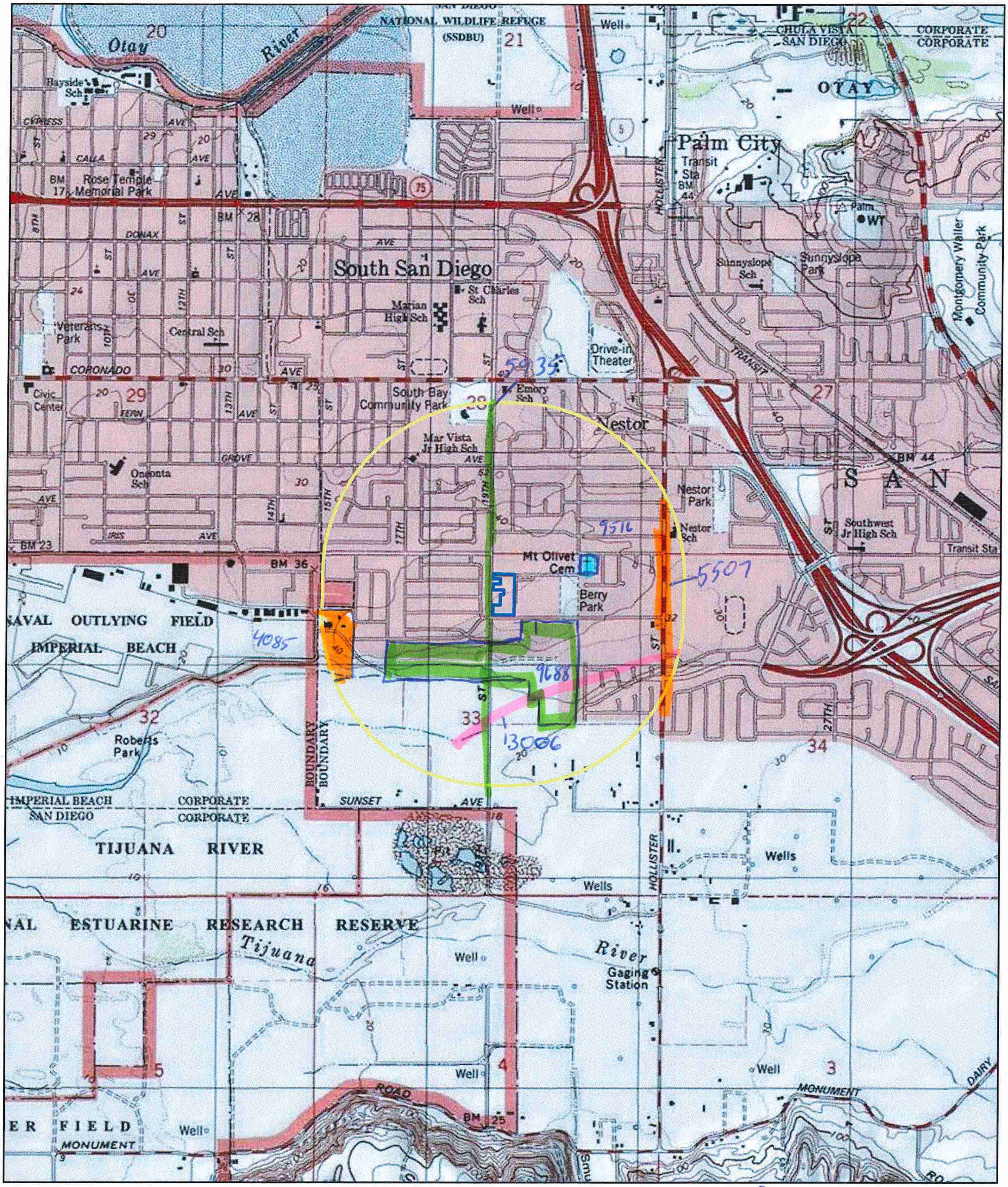
Saturn Boulevard (18-111)
USGS *Imperial Beach* Quadrangle
(7.5-minute series)

Reports 1 of 2

N

AJG BFSA: 5/15/2018

1:24,000



APE

Buffer

Saturn Boulevard (18-111)
USGS *Imperial Beach* Quadrangle
(7.5-minute series)

Reports 2 of 2

N

AJG BFSA: 5/15/2018

1:24,000

Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
SD-01337	NADB-R - 1121337; Voided - PIGNIOLO 3	1986	Pigniolo, Andrew, Dennis Gallegos, and Richard Carrico	Cultural Resource Survey and Test for Significance of Archaeological Site SDI-9183 at a Proposed Border Patrol Satation, Southeast Imperial Beach, California.	WESTEC Services, Inc.	37-009183
SD-04085	NADB-R - 1124085; Voided - GALLEGO183	1997	GALLEGOS, DENNIS R. and CAROLYN E. KYLE	CULTURAL RESOURCE SURVEY FOR THE IMPERIAL BEACH BORDER PATROL STATION EXPANSION SAN DIEGO, CALIFORNIA	GALLEGOS AND ASSOCIATES	
SD-05507	NADB-R - 1125507; Other - R-1835G; Voided - WADE78	1990	WADE, SUE	Historic Properties Inventory for Secondary Treatment Clean Water Program for Greater San Diego: Confidential Appendices	RECON	
SD-05935	NADB-R - 1125935; Voided - GALLEGO225	1986	GALLEGOS, DENNIS	Cultural Resource Survey and Significance Testing for the International Waste Water Project	Westec Service, Inc.	37-004933, 37-008604, 37-008605, 37-010486, 37-010487, 37-010488
SD-09516	NADB-R - 1129516; Voided - CATERINO01	2005	Caterino, David	The Cemeteries and Gravestones of San Diego County: An Archaeological Study	David Caterino	
SD-09688	NADB-R - 1129688; Voided - PIERSON130	2005	Pierson, Larry J.	An Archaeological/Historical Survey and Evaluation of Resources at the Rio Walk Project	Brian F. Smith and Associates	37-026692, 37-026693, 37-026694, 37-026695, 37-026696, 37-026697, 37-026698, 37-026699, 37-026700, 37-026701, 37-026702, 37-026703, 37-026704, 37-026705, 37-026706, 37-026707, 37-026708
SD-10423	NADB-R - 1130423; Voided - HECTOR163	2006	HECTOR, SUSAN M.	CULTURAL RESOURCES SURVEY OF THE TIJUANA RIVER VALLEY CHANNEL DREDGING PROJECT	ASM AFFILIATES	
SD-11826	NADB-R - 1131826; Voided - ROBBINS255	2008	ROBBINS-WADE, MARY	ARCHAEOLOGICAL RESOURCES ANALYSIS FOR THE MASTER STORMWATER SYSTEM MAINTENANCE PROGRAM, SAN DIEGO, CALIFORNIA PROJECT. NO. 42891	AFFINIS	
SD-13006	NADB-R - 1133006; Voided - ROBBINS316	2011	ROBBINS-WADE, MARY	MASTER STORM WATER SYSTEM MAINTENANCE PROGRAM	AFFINIS	
SD-13215	NADB-R - 1133215; Voided - USDHS16	2011	US DEPARTMENT OF HOMELAND SECURITY	SECTION 106 CONSULTATION FOR CONSTRUCTION OF SALLY PORT AND CAMERA POLE UPGRADES, IMPERIAL BEACH STATION, SAN DIEGO COUNTY	US DEPARTMENT OF HOMELAND SECURITY	37-009183
SD-13851	NADB-R - 1133851; Voided - ANDRS01	2003	ANDREWS, SHERRI, MARK S. BECKER, BRIAN F. BYRD, SINEAD NI GHABHLAIN, KEVIN O. POPE, and CATHERINE WRIGHT	ARCHAEOLOGICAL INVESTIGATION OF THE OTAY RIVER PUMP STATION AND CONVENYANCE SYSTEM PROJECT, SAN DIEGO COUNTY, CALIFORNIA	ASM AFFILIATES, INC.	37-007455

Report List

Report No.	Other IDs	Year	Author(s)	Title	Affiliation	Resources
SD-14881	NADB-R - 1134881; Voided - LOFTUSS128	2013	LOFTUS, SHANNON	CULTURAL RESOURCE RECORDS SEARCH AND SITE SURVEY AT&T SITE SD0680 MAR VISTA MIDDLE 1267 THERMAL AVENUE SAN DIEGO, SAN DIEGO COUNTY, CALIFORNIA 92154	ACE ENVIRONMENTAL, LLC	

ATTACHMENT D

NAHC Sacred Lands File Search Results

May 15, 2018

For: Native American Heritage Commission
915 Capitol Mall, Room 364
Sacramento, California 95814

From: Andrew Garrison M.A., RPA
Brian F. Smith and Associates Inc.
14010 Poway Rd. Suite A
Poway, CA 92064

Re: Request for Sacred Lands File and Native American Contact List for the Saturn Boulevard Project (San Diego Project ID 566657), San Diego, San Diego County, California.

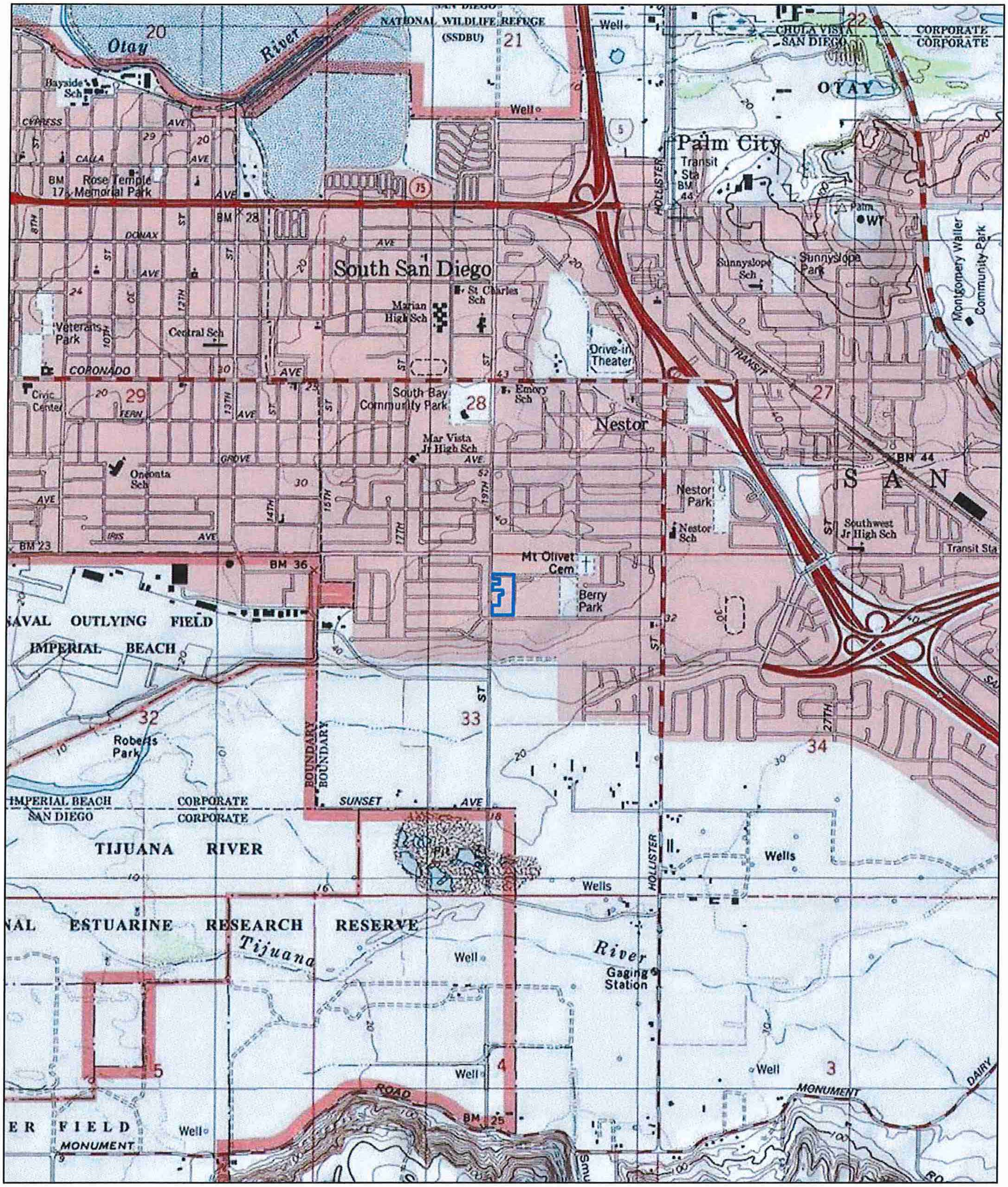
I would like to request a record search of the Sacred Lands File and a list of appropriate Native American contacts for the following project: The Saturn Boulevard Project (San Diego Project ID 566657) (Project No. 18-111). The project is an approximate 4-acre residential development subject to CEQA, located on APN 634-092-01-00, northeast of the intersection of Saturn Boulevard and Leon Avenue in the city of San Diego, San Diego County, California. Specifically, the project is located in Section 33, Township 18 South, Range 2 West on the USGS *Imperial Beach* Quadrangle. A copy of the project map showing the project area to be searched is included for the processing of this request.

Thank you for your time.

Sincerely,

Andrew Garrison M.A., RPA
Project Archaeologist
Billing: 14678 Ibex Court, San Diego, CA 92129
Phone: 858-484-0915
Email: Agarrison@bfsa-ca.com

Attachments:
USGS 7.5 *Imperial Beach,* California, topographic maps with project area delineated.
Sacred Lands File request form



APE

Saturn Boulevard (18-111)
USGS *Imperial Beach* Quadrangle
(7.5-minute series)

N

AJG BFSA: 5/15/2018

1:24,000

Sacred Lands File & Native American Contacts List Request
NATIVE AMERICAN HERITAGE COMMISSION
915 Capitol Mall, RM 364 ∗ Sacramento, CA 95814 ∗ (916) 653-4082
(916) 657-5390 – Fax ∗ nahc@pacbell.net

Information Below is Required for a Sacred Lands File Search

Project: The Saturn Boulevard Project (San Diego Project ID 566657) (Project No. 18-111)

County: San Diego

USGS Quadrangle Name: *Imperial Beach*

Township: 18S Range: 02W

Company/Firm/Agency: Brian F. Smith & Associates Inc.

Contact Person: Andrew Garrison

Street Address: 14010 Poway Road, Suite A

City: Poway Zip: 92064

Phone: 858-484-0915

Fax: 858-679-9896

Email: Agarrison@bfsa-ca.com

Project Description:

The project is an approximate 4-acre residential development subject to CEQA, located on APN 634-092-01-00, northeast of the intersection of Saturn Boulevard and Leon Avenue in the city of San Diego, San Diego County, California. Specifically, the project is located in Section 33, Township 18 South, Range 2 West on the USGS *Imperial Beach* Quadrangle. A copy of the project map showing the project area to be searched is included for the processing of this request.

STATE OF CALIFORNIA Edmund G. Brown, Jr., *Governor*

NATIVE AMERICAN HERITAGE COMMISSION
Cultural and Environmental Department
1550 Harbor Blvd., Suite 100
West Sacramento, CA 95691
(916) 373-3710

May 17, 2018

Andrew Garrison
Brian F. Smith & Association, Inc.

Sent by E-mail: agarrison@bfsa-ca.com

RE: Proposed Saturn Boulevard (San Diego Project ID. 566657) Project, City of San Diego; Imperial Beach USGS Quadrangle, San Diego County, California

Dear Mr. Garrison:

A record search of the Native American Heritage Commission (NAHC) *Sacred Lands File* was completed for the area of potential project effect (APE) referenced above with negative results. Please note that the absence of specific site information in the *Sacred Lands File* does not indicate the absence of Native American cultural resources in any APE.

Attached is a list of tribes culturally affiliated to the project area. I suggest you contact all of the listed Tribes. If they cannot supply information, they might recommend others with specific knowledge. The list should provide a starting place to locate areas of potential adverse impact within the APE. By contacting all those on the list, your organization will be better able to respond to claims of failure to consult. If a response has not been received within two weeks of notification, the NAHC requests that you follow-up with a telephone call to ensure that the project information has been received.

If you receive notification of change of addresses and phone numbers from any of these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information. If you have any questions or need additional information, please contact via email: gayle.totton@nahc.ca.gov.

Sincerely,

Gayle Totton

Gayle Totton, M.A., PhD.
Associate Governmental Program Analyst
(916) 373-3714

Native American Heritage Commission
Native American Contact List
San Diego County
5/17/2018

Barona Group of the Capitan Grande
Edwin Romero, Chairperson
1095 Barona Road — Kumeyaay
Lakeside, CA, 92040
Phone: (619) 443 - 6612
Fax: (619) 443-0681
cloyd@barona-nsn.gov

Campo Band of Mission Indians
Ralph Goff, Chairperson
36190 Church Road, Suite 1 — Kumeyaay
Campo, CA, 91906
Phone: (619) 478 - 9046
Fax: (619) 478-5818
rgoff@campo-nsn.gov

Ewiiaapaayp Tribal Office
Robert Pinto, Chairperson
4054 Willows Road — Kumeyaay
Alpine, CA, 91901
Phone: (619) 445 - 6315
Fax: (619) 445-9126
wmicklin@leaningrock.net

Ewiiaapaayp Tribal Office
Michael Garcia, Vice Chairperson
4054 Willows Road — Kumeyaay
Alpine, CA, 91901
Phone: (619) 445 - 6315
Fax: (619) 445-9126
michaelg@leaningrock.net

Iipay Nation of Santa Ysabel
Clint Linton, Director of Cultural Resources
P.O. Box 507 — Kumeyaay
Santa Ysabel, CA, 92070
Phone: (760) 803 - 5694
cjlinton73@aol.com

Iipay Nation of Santa Ysabel
Virgil Perez, Chairperson
P.O. Box 130 — Kumeyaay
Santa Ysabel, CA, 92070
Phone: (760) 765 - 0845
Fax: (760) 765-0320

Inaja Band of Mission Indians
Rebecca Osuna, Chairperson
2005 S. Escondido Blvd. — Kumeyaay
Escondido, CA, 92025
Phone: (760) 737 - 7628
Fax: (760) 747-8568

Jamul Indian Village
Erica Pinto, Chairperson
P.O. Box 612 — Kumeyaay
Jamul, CA, 91935
Phone: (619) 669 - 4785
Fax: (619) 669-4817
mohusky@jiv-nsn.gov

Kwaaymii Laguna Band of Mission Indians
Carmen Lucas,
P.O. Box 775 — Kumeyaay
Pine Valley, CA, 91962
Phone: (619) 709 - 4207

La Posta Band of Mission Indians
Gwendolyn Parada, Chairperson
8 Crestwood Road — Kumeyaay
Boulevard, CA, 91905
Phone: (619) 478 - 2113
Fax: (619) 478-2125
LP13boots@aol.com

La Posta Band of Mission Indians
Javaughn Miller, Tribal Administrator
8 Crestwood Road — Kumeyaay
Boulevard, CA, 91905
Phone: (619) 478 - 2113
Fax: (619) 478-2125
jmiller@LPtribe.net

Manzanita Band of Kumeyaay Nation
Angela Elliott Santos, Chairperson
P.O. Box 1302 — Kumeyaay
Boulevard, CA, 91905
Phone: (619) 766 - 4930
Fax: (619) 766-4957

This list is current only as of the date of this document. Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources assessment for the proposed Saturn Boulevard Project, San Diego County.

Native American Heritage Commission
Native American Contact List
San Diego County
5/17/2018

Mesa Grande Band of Mission Indians
Mario Morales, Cultural Resources Representative
PMB 366 35008 Pala Temecula Rd.
Pala, CA, 92059
Phone: (760) 622 - 1336
Kumeyaay

Mesa Grande Band of Mission Indians
Virgil Oyos, Chairperson
P.O Box 270
Santa Ysabel, CA, 92070
Phone: (760) 782 - 3818
Fax: (760) 782-9092
mesagrandeband@msn.com
Kumeyaay

San Pasqual Band of Mission Indians
Allen E. Lawson, Chairperson
P.O. Box 365
Valley Center, CA, 92082
Phone: (760) 749 - 3200
Fax: (760) 749-3876
allenl@sanpasqualtribe.org
Kumeyaay

San Pasqual Band of Mission Indians
John Flores, Environmental Coordinator
P. O. Box 365
Valley Center, CA, 92082
Phone: (760) 749 - 3200
Fax: (760) 749-3876
johnf@sanpasqualtribe.org
Kumeyaay

Sycuan Band of the Kumeyaay Nation
Cody J. Martinez, Chairperson
1 Kwaaypaay Court
El Cajon, CA, 92019
Phone: (619) 445 - 2613
Fax: (619) 445-1927
ssilva@sycuan-nsn.gov
Kumeyaay

Sycuan Band of the Kumeyaay Nation
Lisa Haws, Cultural Resources Manager
1 Kwaaypaay Court
El Cajon, CA, 92019
Phone: (619) 312 - 1935
lhaws@sycuan-nsn.gov
Kumeyaay

Viejas Band of Kumeyaay Indians
Julie Hagen,
1 Viejas Grade Road
Alpine, CA, 91901
Phone: (619) 445 - 3810
Fax: (619) 445-5337
jhagen@viejas-nsn.gov
Kumeyaay

Viejas Band of Kumeyaay Indians
Robert Welch, Chairperson
1 Viejas Grade Road
Alpine, CA, 91901
Phone: (619) 445 - 3810
Fax: (619) 445-5337
jhagen@viejas-nsn.gov
Kumeyaay

This list is current only as of the date of this document. Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resource Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources assessment for the proposed Saturn Boulevard Project, San Diego County.

Brian F. Smith and Associates, Inc.

Archaeology / Biology / History / Paleontology / Air Quality / Traffic / Acoustics

May 21, 2018

Alexis M. Vargas
Sycuan Tribal Government
Sycuan Band of the Kumeyaay Nation
1 Kwaaypaay Court
El Cajon, California 92019

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Ms. Vargas:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

The project is an approximate four-acre residential development located on Assessor's Parcel Number 634-092-01-00, northeast of the intersection of Saturn Boulevard and Leon Avenue in the city of San Diego, San Diego County, California. This project is located in Section 33, Township 18 South, Range 2 West on the USGS *Imperial Beach* Quadrangle. Please find enclosed sections of the USGS *Imperial Beach* quadrangle map on which the project is delineated.

Although a records search of the Sacred Lands File has failed to indicate the presence of Native American cultural resources in the immediate Saturn Boulevard Project area, the Native American Heritage Commission requested that we consult with you directly regarding the potential for the presence of Native American cultural resources that may be impacted by this project. If you do have information to provide regarding any resources on or near the project, please contact Brian Smith or myself at (858) 484-0915, or contact the City of San Diego directly. We would like to extend our thanks for your response regarding this issue.

Sincerely,

Tracy A. Stropes

Tracy A. Stropes, M.A., RPA
Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

Brian F. Smith and Associates, Inc.
Archaeology / Biology / History / Paleontology / Air Quality / Traffic / Acoustics

May 21, 2018

Allen E. Lawson
Chairperson
San Pasqual Band of Mission Indians
P.O. Box 365
Valley Center, California 92082

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Lawson:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Sincerely,

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Senior Project Archaeologist
tstropes@bfsa-ca.com

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Brian F. Smith and Associates, Inc.
Archaeology / Biology / History / Paleontology / Air Quality / Traffic / Acoustics

May 21, 2018

Angela Elliott Santos
Chairperson
Manzanita Band of Kumeyaay Nation
P.O. Box 1302
Boulevard, California 91905

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Ms. Santos:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Tracy A. Stropes, M.A., RPA
Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Carmen Lucas
Kwaaymii Laguna Band of Mission Indians
P.O. Box 775
Pine Valley, California 91962

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Ms. Lucas:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

Brian F. Smith and Associates, Inc.

Archaeology / Biology / History / Paleontology / Air Quality / Traffic / Acoustics

May 21, 2018

Clint Linton
Director of Cultural Resources
Iipay Nation of Santa Ysabel
P.O. Box 507
Santa Ysabel, California 92070

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Linton:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Cody J. Martinez
Chairperson
Sycuan Band of the Kumeyaay Nation
1 Kwaaypaay Court
El Cajon, California 92019

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Martinez:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Sincerely,

Tracy A. Stropes

Tracy A. Stropes, M.A., RPA
Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Edwin Romero
Chairperson
Barona Group of the Capitan Grande
1095 Barona Road
Lakeside, California 92040

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Romero:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Sincerely,

Tracy A. Stropes

Tracy A. Stropes, M.A., RPA
Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Erica Pinto
Chairperson
Jamul Indian Village
P.O. Box 612
Jamul, California 91935

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Ms. Pinto:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Sincerely,

Tracy A. Stropes, M.A., RPA
Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Ernest Pingleton
Viejas Band of Kumeyaay Indians
1 Viejas Grade Road
Alpine, California 91901

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Pingleton:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Sincerely,

Tracy A. Stropes, M.A., RPA
Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Gwendolyn Parada
Chairperson
La Posta Band of Mission Indians
8 Crestwood Road
Boulevard, California 91905

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Ms. Parada:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Sincerely,

Tracy A. Stropes, M.A., RPA
Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

Brian F. Smith and Associates, Inc.

Archaeology / Biology / History / Paleontology / Air Quality / Traffic / Acoustics

May 21, 2018

Javaughn Miller
Tribal Administrator
La Posta Band of Mission Indians
8 Crestwood Road
Boulevard, California 91905

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Miller:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Senior Project Archaeologist
tstropes@bfsa-ca.com

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May 21, 2018

Jim McPherson
Manager
San Pasqual Economic Development Agency
28000 Via Viso Road, P.O. Box 10
Valley Center, California 92082

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. McPherson:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Senior Project Archaeologist
tstropes@bfsa-ca.com

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May 21, 2018

John Flores
Environmental Coordinator
San Pasqual Band of Mission Indians
P.O. Box 365
Valley Center, California 92082

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Flores:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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tstropes@bfsa-ca.com

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Brian F. Smith and Associates, Inc.
Archaeology / Biology / History / Paleontology / Air Quality / Traffic / Acoustics

May 21, 2018

Julie Hagen
Viejas Band of Kumeyaay Indians
1 Viejas Grade Road
Alpine, California 91901

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Ms. Hagen:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Sincerely,

Tracy A. Strope

Tracy A. Stropes, M.A., RPA
Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Lisa Haws
Cultural Resources Manager
Sycuan Band of the Kumeyaay Nation
1 Kwaaypaay Court
El Cajon, California 92019

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Ms. Haws:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Lisa K. Cumper
Cultural Resource Manager/Tribal Liaison
Jamul Indian Village
P.O. Box 612
Jamul, California 91935

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Ms. Cumper:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Mariah Banares
Administrative Assistant
San Pasqual Band of Mission Indians
P.O. Box 365
Valley Center, California 92082

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Ms. Banares:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Mario Morales
Cultural Resources Representative
Mesa Grande Band of Mission Indians
PMB 366 35008 Pala Temecula Road
Pala, California 92059

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Morales:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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tstropes@bfsa-ca.com

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USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

Brian F. Smith and Associates, Inc.

Archaeology / Biology / History / Paleontology / Air Quality / Traffic / Acoustics

May 21, 2018

Michael Garcia
Vice Chairperson
Ewiiaapaayp Tribal Office
4054 Willows Road
Alpine, California 91901

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Garcia:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Senior Project Archaeologist
tstropes@bfsa-ca.com

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USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

14010 Poway Road, Suite A, Poway, CA 92064; Phone (858) 679-8218 or (951) 681-9950; Fax (858) 679-9896; www.bfsa-ca.com
Business Office: 14678 Ibex Court, San Diego, CA 92129; Phone (858) 484-0915; Fax (858) 484-0988

May 21, 2018

Ralph Goff
Chairperson
Campo Band of Mission Indians
36190 Church Road, Suite 1
Camp, California 91906

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Goff:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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tstropes@bfsa-ca.com

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USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

Brian F. Smith and Associates, Inc.

Archaeology / Biology / History / Paleontology / Air Quality / Traffic / Acoustics

May 21, 2018

Ray Teran
Grant Writer/Administrator
Viejas Band of Kumeyaay Indians
1 Viejas Grade Road
Alpine, California 91901

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Teran:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Brian F. Smith and Associates, Inc.

Archaeology / Biology / History / Paleontology / Air Quality / Traffic / Acoustics

May 21, 2018

Rebecca Osuna
Chairperson
Inaja Band of Mission Indians
2005 South Escondido Boulevard
Escondido, California 92025

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Ms. Osuna:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Robert Pinto
Chairperson
Ewiiaapaayp Tribal Office
4054 Willows Road
Alpine, California 91901

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Pinto:

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Brian F. Smith and Associates, Inc.
Archaeology / Biology / History / Paleontology / Air Quality / Traffic / Acoustics

May 21, 2018

Robert Welch
Chairperson
Viejas Band of Kumeyaay Indians
1 Viejas Grade Road
Alpine, California 91901

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Welch:

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Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Virgil Oyos
Chairperson
Mesa Grande Band of Mission Indians
P.O. Box 270
Santa Ysabel, California 92070

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Oyos:

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Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

May 21, 2018

Virgil Perez
Chairperson
Iipay Nation of Santa Ysabel
P.O. Box 130
Santa Ysabel, California 92070

Subject: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California

Dear Mr. Perez:

This inquiry is requesting information you may have regarding the existence of Native American cultural resources on or near the Saturn Boulevard Project. The information you provide will be used to assess areas of potential adverse impact within the proposed project's Area of Potential Effect (APE). Any information you might provide will be kept confidential and will not be divulged to the public.

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Senior Project Archaeologist
tstropes@bfsa-ca.com

Attachment:
USGS 7.5-minute *Imperial Beach, California* topographic map with project delineated

From: **Lisa Cumper** lcumper@jiv-nsn.gov
Subject: Re: Information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego
Date: May 21, 2018 at 9:49 AM
To: naconsult@bfsa-ca.com

LC

Hi Chris,

I'd like to request arch reports and the CHRIS file for this project please.

Thank you,
Lisa

Respectfully,

Lisa K. Cumper
Tribal Office Assistant/
Tribal Historic Preservation Officer
Jamul Indian Village of California

P.O. Box 612, Jamul CA 91935
desk: 619.669.4855
cell: 619.928.8689
fax: 619.669.4817

email: lcumper@jiv-nsn.gov
web: www.jamulindianvillage.com

Forget not that the earth delights to feel your bare feet and the winds long to play with your hair - Khalil Gibran

On Mon, May 21, 2018 at 9:42 AM, naconsult@bfsa-ca.com <naconsult@bfsa-ca.com> wrote:

> Good morning,
>
> Please see the attached request for information regarding Native American cultural resources on or near the Saturn Boulevard Project, San Diego County, California.
>
> Should you have any questions or require any further information from us, you may contact myself or Brian Smith at (858) 484-0915.
>
> Sincerely,
>
> Mr. Tracy A. Stropes, M.A., RPA
> Senior Project Archaeologist
> tstropes@bfsa-ca.com
> naconsult@bfsa-ca.com

VIEJAS
TRIBAL GOVERNMENT

P.O. Box 908
Alpine, CA 91903
#1 Viejas Grade Road
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May 21, 2018

Tracy A. Stropes
Senior Project Archaeologist
Brian F. Smith and Associates, Inc.
14010 Poway Road, Suite A
Poway, CA 92064

RE: Saturn Boulevard Project

Dear Mr. Stropes,

The Viejas Band of Kumeyaay Indians ("Viejas") has reviewed the proposed project and at this time we have determined that the project site has cultural significance or ties to Viejas.

Viejas Band request that a Kumeyaay Cultural Monitor be on site for ground disturbing activities to inform us of any new developments such as inadvertent discovery of cultural artifacts, cremation sites, or human remains.

Please call me at 619-659-2312 or Ernest Pingleton at 619-659-2314 or email, rteran@viejas-nsn.gov or epingleton@viejas-nsn.gov , for scheduling. Thank you.

Sincerely,

Ray Teran, Resource Management
VIEJAS BAND OF KUMEYAAY INDIANS

PHASE I CULTURAL RESOURCE SURVEY FOR 1695 SATURN BOULEVARD

CITY OF SAN DIEGO

Project No. 566657

Submitted to:

City of San Diego
Development Services Department
1222 First Avenue, MS 501
San Diego, California 92101

Prepared for:

Palm Avenue Realty
950 Garland Drive
San Diego, California 92154

Prepared by:

Brian F. Smith and Associates, Inc.
14010 Poway Road, Suite A
Poway, California 92064

Brian F. Smith & Associates • Archaeology • History • Paleontology • Biology

June 12, 2018

Archaeological Database Information

Authors:	Andrew J. Garrison and Brian F. Smith
Consulting Firm:	Brian F. Smith and Associates, Inc. 14010 Poway Road, Suite A Poway, California 92064 (858) 484-0915
Report Date:	June 12, 2018
Report Title:	Phase I Cultural Resource Survey for 1695 Saturn Boulevard, City of San Diego (Project No. 566657)
Prepared for:	Palm Avenue Realty 950 Garland Drive San Diego, California 92154
Submitted to:	City of San Diego Development Services Department 1222 First Avenue, MS 501 San Diego, California 92101
Prepared by:	Brian F. Smith and Associates, Inc. 14010 Poway Road, Suite A Poway, California 92064
USGS Quadrangle:	*Imperial Beach, California* (7.5 minute)
Study Area:	Approximately 3.6 acres
Key Words:	Phase I survey; negative; previously evaluated historic structures – not significant; City of San Diego; monitoring recommended.

I. PROJECT DESCRIPTION AND LOCATION

Brian F. Smith and Associates, Inc. (BFSA) conducted an archaeological survey of Assessor's Parcel Number (APN) 634-092-01 in the Otay Mesa-Nestor Community Planning Area of the city of San Diego, California, as part of the environmental review process for a pending development application. The project is located at 1695 Saturn Boulevard, northeast of the intersection of Saturn Boulevard and Leon Avenue and north of the Tijuana River National Estuarine Research Reserve and the United States-Mexico border, within Section 33, Township 18 South, Range 2 West of the *Imperial Beach* USGS 7.5-minute Quadrangle. The project design includes the development of 18 single-family homes within a 20-lot subdivision on approximately 3.6-acres. Maps of the property location and development plan have been included in Attachment B.

The archaeological survey was undertaken in order to determine if cultural resources exist within the property and to assess the possible effects of the development on any cultural resources present within the project. BFSA conducted the archaeological survey on June 1, 2018 accompanied by a Native American monitor from Red Tail Monitoring & Research, Inc. (Red Tail). A single-family residence and four structures associated with the former agricultural use of the property were observed during the survey; however, these structures have already been evaluated and found to lack significance under City of San Diego Historical Resources Board (HRB) Criteria (Moomjian 2017).

II. SETTING

The 3.6-acre project Area of Potential Effect (APE) includes a single-family residence with associated residential landscape and hardscape as well as four associated ancillary farm structures comprising a former agricultural property covered in non-native weeds and grasses (Plate 1). Single-family and multi-family residences are located immediately to the south, east, and north, while the Godfrey G. Berry Elementary School is located on the eastern boundary of the APE.

Plate 1: Overview of the project, facing northwest.

The APE is situated approximately 1.5 miles southwest of the Otay River and just under one mile north of the Tijuana River. San Diego Bay is located about two miles to the northeast on a middle to late Pleistocene terrace that slopes to the south toward the Tijuana River. The deposits within the Nestor community are generally geologically classified as unnamed river terrace deposits that occur at levels above active stream channels and represent sediments of ancient river courses. These river terrace deposits are anywhere from 10,000 to 500,000 years old and occur along the margins of larger coastal river valleys (City of San Diego 2007).

The biological setting of the project area is dominated by residential and agricultural vegetative communities, which primarily consist of introduced grasses and trees. These communities are dependent upon the amount of precipitation that the area receives. The amount of seasonal precipitation is related to the major landforms that exist throughout San Diego County. These environments tend to support a wide variety of wildlife, particularly birds and small mammals (Beauchamp 1986).

Cultural Setting

Archaeological investigations in San Diego County have documented a diverse and rich record of human occupation spanning the past 10,000 years. The first generally accepted culture chronology for San Diego County was developed by Geographer Malcolm Rogers (1939, 1945), who initiated the recordation of sites in the area in the 1920s and 1930s, using his field notes to construct the first cultural sequences based upon artifact assemblages and stratigraphy (Rogers 1966). Subsequent scholars expanded the information gathered by Rogers and offered more academic interpretations of the prehistoric record. Moriarty (1966, 1967, 1969), Warren (1964, 1966), and True (1958, 1966) all produced seminal works that critically defined the various prehistoric cultural phenomena present in this region (Moratto 1984).

Additional studies have sought to refine these earlier works to a greater extent (Cardenas 1986; Moratto 1984; Moriarty 1966, 1967; True 1970, 1980, 1986; True and Beemer 1982; True and Pankey 1985; Waugh 1986). In sharp contrast, the current trend in San Diego prehistory has also resulted in a revisionist group that rejects the established cultural historical sequence for San Diego. This revisionist group (Warren et al. 1998) has replaced the concepts of La Jolla, San Dieguito, and all of their other manifestations with an extensive, all-encompassing, chronologically undifferentiated cultural unit that ranges from the initial occupation of southern California to around A.D. 1000 (Bull 1983, 1987; Ezell 1983, 1987; Gallegos 1987; Kyle et al. 1990; Stropes 2007). For the present study, the prehistory of the region is divided into four major periods: Early Man, Paleo Indian, Early Archaic, and Late Prehistoric.

Early Man Period (Prior to 8500 B.C.)

At the present time, there has been no concrete archaeological evidence to support the occupation of San Diego County prior to 10,500 years ago. Some archaeologists, such as Carter (1957, 1980) and Minshall (1976), have been proponents of Native American occupation of the region as early as 100,000 years ago. However, their evidence for such claims is sparse at best and they have lost much support over the years as more precise dating techniques have become available for skeletal remains thought to represent early man in San Diego. In addition, many of the "artifacts" initially identified as products of early man in the region have since been rejected as natural products of geologic activity. Some of the local, proposed early man sites include Texas Street, Mission Valley (San Diego River Valley), Del Mar, La Jolla, Buchanan Canyon, and Brown (Bada et al. 1974; Carter 1957, 1980; Minshall 1976, 1989; Moriarty and Minshall 1972; Reeves 1985; Reeves et al. 1986).

Paleo Indian Period (8500 to 6000 B.C.)

For the region, it is generally accepted that the earliest identifiable culture in the archaeological record is represented by the material remains of the Paleo Indian Period San Dieguito Complex. The San Dieguito Complex was thought to represent the remains of a group of people who occupied sites in this region between 10,500 and 8,000 years before the present (YBP), and who were related to or contemporaneous with groups in the Great Basin. As of yet, no absolute dates have been forthcoming to support the great age attributed to this cultural phenomenon. The artifacts recovered from San Dieguito Complex sites duplicate the typology attributed to the Western Pluvial Lakes Tradition (Moratto 1984; Davis et al. 1969). These artifacts generally include scrapers, choppers, large bifaces, and large projectile points, with few milling tools. Tools recovered from San Dieguito Complex sites, along with the general pattern of their site locations, led early researchers to believe that the people of the San Dieguito Complex were a wandering hunter/gatherer society (Moriarty 1969; Rogers 1966).

The San Dieguito Complex is the least understood of the cultures that have inhabited the San Diego County region. This is due to an overall lack of stratigraphic information and/or datable materials recovered from sites identified as belonging to the San Dieguito Complex. Currently, controversy exists among researchers regarding the relationship of the San Dieguito Complex and the subsequent cultural manifestation in the area, the La Jolla Complex. Although, firm evidence has not been recovered to indicate whether the San Dieguito Complex "evolved" into the La Jolla Complex, the people of the La Jolla Complex moved into the area and assimilated with the people of the San Dieguito Complex, or the people of the San Dieguito Complex retreated from the area due to environmental or cultural pressures.

Early Archaic Period (6000 B.C. to A.D. 0)

Based upon evidence suggesting climatic shifts and archaeologically observable changes in subsistence strategies, a new cultural pattern is believed to have emerged in the San Diego region around 6000 B.C. Archaeologists believe that this Archaic Period pattern evolved from or replaced the San Dieguito Complex culture, resulting in a pattern referred to as the Encinitas Tradition. In San Diego, the Encinitas Tradition is thought to be represented by the coastal La Jolla Complex and its inland manifestation, the Pauma Complex. The La Jolla Complex is best recognized for its pattern of shell middens and grinding tools closely associated with marine resources and flexed burials (Shumway et al. 1961; Smith and Moriarty 1985). Increasing numbers of inland sites have been identified as dating to the Archaic Period, focusing upon terrestrial subsistence (Cardenas 1986; Smith 1996; Raven-Jennings and Smith 1999a, 1999b).

The tool typology of the La Jolla Complex displays a wide range of sophistication in the lithic manufacturing techniques used to create the tools found at their sites. Scrapers, the dominant flaked tool type, were created by either splitting cobbles or by finely flaking quarried material. Evidence suggests that after about 8,200 YBP, milling tools began to appear in La Jolla Complex sites. Inland sites of the Encinitas Tradition (Pauma Complex) exhibit a reduced quantity of marine-related food refuse and contain large quantities of milling tools and food bone. The lithic tool assemblage shifts slightly to encompass the procurement and processing of terrestrial resources, suggesting seasonal migration from the coast to the inland valleys (Smith 1996). At the present time, the transition from the Archaic Period to the Late Prehistoric Period is not well understood. Many questions remain concerning cultural transformation between periods, possibilities of ethnic replacement, and/or a possible hiatus from the western portion of the county.

Late Prehistoric Period (A.D. 0 to 1769)

The transition into the Late Prehistoric Period in the project area is primarily represented by a marked change in archaeological patterning known as the Yuman Tradition. This tradition is primarily represented by the Cuyamaca Complex, which is believed be derived from the mountains of southern San Diego County. The people of the Cuyamaca Complex are considered ancestral to the ethnohistoric Kumeyaay (Diegueño). Although several archaeologists consider the local Native American tribes to be latecomers, the traditional stories and histories passed down through oral tradition by the local Native American groups speak both presently and ethnographically to tribal presence in the region since the time of creation.

The Kumeyaay Native Americans were a seasonal hunting and gathering people with cultural elements that were very distinct from the people of the La Jolla Complex. Noted variations in material culture included cremation, the use of the bow and arrow, and adaptation to the use of the acorn as a main food staple (Moratto 1984). Along the coast, the Kumeyaay made use of marine resources by fishing and collecting shellfish for food. Seasonally available game and plant food resources (including acorns) were sources of nourishment for the Kumeyaay. By far, the most important food resource for these people was the acorn because it represented a storable surplus, which in turn allowed for seasonal sedentism and its attendant expansion of social phenomena.

Firm evidence has not been recovered to indicate whether the people of the La Jolla Complex were present when the Kumeyaay Native Americans migrated into the coastal zone. However, stratigraphic information recovered from Site SDI-4609 in Sorrento Valley suggests a possible hiatus of 650 ± 100 years between the occupation of the coastal area by the La Jolla Complex (1,730 ± 75 YBP is the youngest date for the La Jolla Complex inhabitants at SDI-4609) and Late Prehistoric cultures (Smith and Moriarty 1983). More recently, a reevaluation of two prone burials at the Spindrift Site excavated by Moriarty (1965) and radiocarbon dates of a pre-ceramic phase of Yuman occupation near Santee suggest a commingling of the latest La Jolla Complex inhabitants and the earliest Yuman inhabitants about 2,000 years ago (Kyle and Gallegos

1993).

History

Exploration Period (1530 to 1769)

The historic period around San Diego Bay began with the landing of Juan Rodriguez Cabrillo and his men in 1542 (Chapman 1925). Sixty years after the Cabrillo expeditions (1602 to 1603), an expedition under Sebastian Vizcaíno made an extensive and thorough exploration of the Pacific coast. Although his voyage did not extend beyond the northern limits of the Cabrillo track, Vizcaíno had the most lasting effect on the nomenclature of the coast. Many of the names Vizcaíno gave to various locations throughout the region have survived to the present time, whereas nearly every one of Cabrillo's has faded from use. For example, Cabrillo gave the name "San Miguel" to the first port at which he stopped in what is now the United States; 60 years later, Vizcaíno changed the port name to "San Diego" (Rolle 1969).

Spanish Colonial Period (1769 to 1821)

The Spanish occupation of the claimed territory of Alta California took place during the reign of King Carlos III of Spain (Engelhardt 1920). A powerful representative of the king in Mexico, Jose de Gálvez conceived the plan to colonize Alta California and thereby secure the area for the Spanish Crown (Rolle 1969). The effort involved both military and religious componenets, where the overall intent of establishing forts and missions was to gain control of the land and the native inhabitants through conversion. Actual colonization of the San Diego area began on July 16, 1769 when the first Spanish exploring party, commanded by Gaspar de Portolá (with Father Junípero Serra in charge of religious conversion of the native populations), arrived by the overland route to San Diego to secure California for the Spanish Crown (Palou 1926). The natural attraction of the harbor at San Diego and the establishment of a military presence in the area solidified the importance of San Diego to the Spanish colonization of the region and the growth of the civilian population.

Missions were constructed from San Diego to as far north as San Francisco. The mission locations were based upon a number of important territorial, military, and religious considerations. Grants of land were made to those who applied, but many tracts reverted back to the government due to lack of use. As an extension of territorial control by the Spanish Empire, each mission was placed so as to command as much territory and as large a population as possible. While primary access to California during the Spanish Period was by sea, the route of El Camino Real served as the land route for transportation, commercial, and military activities within the colony. This route was considered to be the most direct path between the missions (Rolle 1969; Caughey 1970). As increasing numbers of Spanish and Mexican peoples, as well as the later Americans during the Gold Rush, settled in the area, the Native American populations diminished as they were displaced or decimated by disease (Carrico and Taylor 1983).

Mexican Period (1821 to 1846)

On September 16, 1810, the priest Father Miguel Hidalgo y Costilla started a revolt against Spanish rule. He and his untrained Native American followers fought against the Spanish, but his revolt was unsuccessful and Father Hidalgo was executed. After this setback, Father José Morales led the revolutionaries, but he too failed and was executed. These two men are still symbols of Mexican liberty and patriotism. After the Mexican-born Spanish and the Catholic Church joined the revolution, Spain was finally defeated in 1821. Mexican Independence Day is celebrated on September 16 of each year, signifying the anniversary of the start of Father Hidalgo's revolt.

The revolution had repercussions in the northern territories, and by 1834, all of the mission lands had been removed from the control of the Franciscan Order under the Acts of Secularization. Without proper maintenance, the missions quickly began to disintegrate, and after 1836, missionaries ceased to make regular visits inland to minister the needs of the Native Americans (Engelhardt 1920). Large tracts of land continued to be granted those who applied or who had gained favor with the Mexican government. Grants of land were also made to settle government debts and the Mexican government was called upon to reaffirm some older Spanish land grants shortly before the Mexican-American War of 1846 (Moyer 1969).

Anglo-American Period (1846 to Present)

California was invaded by United States troops during the Mexican-American War from 1846 to 1848. The acquisition of strategic Pacific ports and California land was one of the principal objectives of the war (Price 1967). At the time, the inhabitants of California were practically defenseless, and they quickly surrendered to the United States Navy in July 1847 (Bancroft 1886).

The cattle ranchers of the "counties" of southern California prospered during the cattle boom of the early 1850s. They were able to "reap windfall profit … pay taxes and lawyer's bills … and generally live according to custom" (Pitt 1966). However, cattle ranching soon declined, contributing to the expansion of agriculture. With the passage of the "No Fence Act," San Diego's economy shifted from raising cattle to farming (Robinson 1948). The act allowed for the expansion of unfenced farms, which was crucial in an area where fencing material was practically unavailable. Five years after its passage, most of the arable lands in San Diego County had been patented as either ranchos or homesteads, and growing grain crops replaced raising cattle in many of the county's inland valleys (Blick 1976; Elliott 1883 [1965]).

By 1870, farmers had learned to dry farm and were coping with some of the peculiarities of San Diego County's climate (*San Diego Union* 1868; Van Dyke 1886). Between 1869 and 1871, the amount of cultivated acreage in the county rose from less than 5,000, to more than 20,000 acres (*San Diego Union* 1872). Of course, droughts continued to hinder the development of agriculture (Crouch 1915; *San Diego Union* 1870; Shipek 1977). Large-scale farming in San Diego County was limited by a lack of water and the small size of arable valleys. The small urban population and poor roads also restricted commercial crop growing. Meanwhile, cattle continued to be grazed in parts of inland San Diego County. In the Otay Mesa area, for example, the "No

Fence Act" had little effect on cattle farmers because ranches were spaced far apart and natural ridges kept the cattle out of nearby growing crops (Gordinier 1966).

During the first two decades of the twentieth century, the population of San Diego County continued to grow. The population of the inland county declined during the 1890s, but between 1900 and 1910, it rose by about 70 percent. The pioneering efforts were over, the railroads had broken the relative isolation of southern California, and life in San Diego County had become similar to other communities throughout the west. After World War I, the history of San Diego County was primarily determined by the growth of San Diego Bay. In 1919, the United States Navy decided to make the bay the home base for the Pacific Fleet (Pourade 1967), as did the aircraft industry in the 1920s (Heiges 1976). The establishment of these industries led to the growth of the county as a whole; however, most of the civilian population growth occurred in the north county coastal areas, where the population almost tripled between 1920 and 1930. During this time period, the history of inland San Diego County was subsidiary to that of the city of San Diego, which had become a Navy center and an industrial city (Heiges 1976). In inland San Diego County, agriculture became specialized and recreational areas were established in the mountain and desert areas. Just before World War II, urbanization began to spread to the inland parts of the county.

History of the Otay Mesa-Nestor Area

San Diego became part of the Mexican Republic after Mexico gained its independence from Spain. In 1829, Santiago Arguello Moraga was granted the 10,000-acre Rancho Tia Juana. Originally derived from the Kumeyaay word Tihuan, the name was changed several times over the course of its history. Variations include Tia Juana, Tia Juan, Tijuan, and Tehuan (Corona 2004). Rancho Tia Juana extended north to Otay Mesa and south to what is presently called Aguaje de la Tuna, located in Tijuana, Baja California, Mexico. However, due to the ambiguity of the descriptions for the eastern and western boundaries (Datilar and Posa de los Adobes, respectively), it is impossible to determine how far in these directions the rancho extended (Corona 2004).

The international border between the United States and Mexico, established in 1848 by the Treaty of Guadalupe Hidalgo, bisected Rancho Tia Juana and the ranch house itself (Corona 2004). After the installation of the California Southern Railroad in 1885, in 1887, the northern half of the rancho was platted for development by Hart and Stern. The town was named Tia Juana City and was located about four miles southeast of the project. The southern half of the rancho was also developed on the Mexican side of the border and was named Tijuana (City of San Diego and Page and Turnbull, Inc. 2010).

The community of Nestor, located about one mile north of the APE, was developed during the late nineteenth and early twentieth centuries in association with neighboring Tia Juana City to the southeast and Palm City to the north. Luther Johnson became one of the first settlers in the region when he purchased 200 acres of land. Johnson started a large dairy in 1893 and planted alfalfa on the majority of his property. With the establishment of the railroad in the mid-1880s, a station was established in Palm City in 1887 and a post office was established in 1914. During the late nineteenth century, the town of Nestor began to develop around a post office and railroad station about a half mile south of Palm City. It was officially established in 1890. The community was named after Nestor A. Young, who served as a California state assemblyman from 1884 to 1886 and as San Diego harbormaster in 1889. There is some debate as to whether Young ever actually lived in the community of Nestor; regardless, he was closely associated with the town. The region experienced a major flood in 1891, known as the Tia Juana River Valley Flood, which had a devastating impact on the original Nestor townsite (Schoenherr 2015).

In the late nineteenth and early twentieth centuries, the Nestor/Palm City area was predominantly an agricultural community. Crops included grape, lemon, grapefruit, walnut, celery, tomato, cabbage, asparagus, green bean, corn, and strawberry. Pastureland was also established for dairy farms. As agricultural development steadily grew in the early twentieth century, land owners began constructing small farmhouses. In the 1910s, there was a small concentration of Japanese farmers who began to establish successful ranches in the Nestor/Palm City area. However, the agricultural development of the region was abruptly halted in 1916 when another flood devastated the entire region (Schoenherr 2015).

After the flood in 1916, many residents relocated to the Otay Mesa area in search of higher ground; however, the agricultural community of Nestor was reestablished in the early to mid-twentieth century. During the latter half of the twentieth century, the area was developed and subdivided for the construction of single- and multi-family residences to accommodate the baby boom following World War II.

III. AREA OF POTENTIAL EFFECT

This archaeological review encompasses approximately 3.6 acres (APN 634-092-01) in the Otay Mesa-Nestor Community Planning Area at 1695 Saturn Boulevard. The project APE can be characterized as a former agricultural property. The northern two-thirds of the property is vacant, and the southern portion contains a single-family residence and four structures associated with the former agricultural uses. Vegetation within the APE is dominated by non-native weeds, grasses, and trees. The property has been previously disturbed by clearing and possibly superficial grading.

IV. STUDY METHODS

The archaeological assessment included a reconnaissance of the property and an institutional records search review of previous studies in the area. BFSA reviewed the results of a records search for the project completed by the South Coastal Information Center (SCIC) at San Diego State University to determine the presence of any previously recorded cultural resources (Attachment C). The results of the records search indicate that 12 previous investigations have been conducted within one-half mile of the project, none of which included the current APE.

Although not located within the SCIC holdings, one additional study, a Historical Resource Research Report for 1695 Saturn Boulevard, was identified that covered the current APE (Moomjian 2017). Moomjian (2017) documented five historic structures on the property: a wood silo built in 1929; a utility shed built in 1946; a hay barn built in 1946; a concrete silo built in 1957; and a one-story, Modern Tract Ranch-style, single-family residence built in 1963. Moomjian (2017) evaluated the property as lacking any historic or architectural significance under City of San Diego HRB Register Significance Criteria and characterized the property as containing "several different, isolated, and dilapidated buildings and structures which were constructed at different times and are no longer related to one another in terms of function or use." The evaluation of the structures as not retaining any historic or architectural significance was reviewed and accepted by the City of San Diego.

The SCIC records search did not indicate the presence of any previously recorded cultural resources within the APE; however, a total of 11 recorded sites (three prehistoric, seven historic, and one multicomponent) were identified within one-half mile of the property. The prehistoric sites include one shell/lithic scatter and one lithic scatter; the historic sites include five historic structures, one surface historic trash scatter, and one historic trash deposit; and the multicomponent site is a prehistoric shell/lithic scatter and a historic trash scatter.

A Sacred Lands File (SLF) search was also requested by BFSA from the Native American Heritage Commission (NAHC). The NAHC SLF search did not indicate the presence of any sacred sites or locations of religious or ceremonial importance within the search radius (Attachment D).

V. RESULTS OF THE STUDY

Background Research

Both the Otay and Tijuana rivers and associated drainages have been sources of fresh water for humans for thousands of years. The brackish water marsh area at the mouth of the Tijuana Slough to the west of the project provided hunting and foraging resources for both prehistoric and historic peoples. The coastal mesas and wetland areas were important hunting and gathering areas for local human inhabitants in prehistoric times. Because the San Diego area experienced an arid climate for at least the last 9,000 years, sources of fresh water attracted plants and animals, as well as humans who depended upon plants, animals, and fresh water for survival. With the Otay and Tijuana rivers representing large freshwater resources, the general area of the APE became a focal point of human activity.

The 1695 Saturn Boulevard property was originally known as 1695 19th Street (Moomjian 2017). Between 1888 and 1929, the property was owned by several individuals, including Louise Vollers, Mattie M. Snavely, Frederick and Ella Taylor, Edwin and Lottie Sinclair, and Bertha and Lottie Sinclair. The property was acquired by Bertha Sommer and Edna Figi in June 1924; however, it was lost in foreclosure in 1929, when Willis Folks became the owner. However, Folks quickly sold it to Will Ackerman (Moonjian 2017).

According to the County Lot Book Page for the property and the Residential Building Record, the first improvement to the property occurred in 1929 when a wood silo was built. In 1942, Will and Elizabeth Ackerman conveyed the property to rancher Hollis N. Peavey and his wife, Pansy M. Peavey. Between 1942 and 1990, when Hollis Peavey passed away, the property was owned and occupied by the Peavey family and used for residential and ranching purposes. Structures and buildings constructed during this period include: the utility shed and hay barn (1946), the concrete silo (1957), and the single-family residence (1963). The architect (if one was retained) and builder are unknown. In 1966, a family room addition was built along the southeast corner of the residence. Other structures that once existed on the property but have since been removed (at unknown dates) include a 15x50-foot shed built in 1946 and pumps and corrals built in 1957 (Moomjian 2017).

Field Reconnaissance

On June 1, 2018, BFSA Consulting Archaeologist Brian Smith, M.A. directed the field survey of the property with the assistance of Project Archaeologist Andrew Garrison, M.A., RPA. Kaci Brown, a Native American monitor from Red Tail, actively participated in the survey. The survey was conducted by walking transects in 10-meter intervals across the property. Survey conditions were good, but surface visibility (20 percent) was limited by structures, landscaping, hardscape, modern trash, building materials, piles of pushed dirt, and non-native weeds and grasses. During the survey, particular attention was paid to areas with exposed ground surfaces, such as rodent burrows and around the base of vegetation. No archaeological artifacts or deposits were identified on any of the exposed ground surfaces within the property; however, a single-family residence and four structures associated with former agricultural uses were identified within the southern third of the APE. The structures were recently studied and found to lack any historic or architectural significance under City of San Diego HRB Register Significance Criteria (Moomjian 2017).

Evaluation

Based upon the results of the survey, no archaeological artifacts or deposits have been identified on the subject property. The single-family residence and four structures associated with former agricultural uses identified on the southern third of the APE were previously found to lack any historic or architectural significance under City of San Diego HRB Register Significance Criteria (Moomjian 2017). The evaluation of the structures as not retaining any historic or architectural significance was reviewed and accepted by the City of San Diego.

VI. RECOMMENDATIONS

The City of San Diego typically requires two tasks for an archaeological study of this nature: assessment of the potential for cultural resources on the property and a visual inspection for the presence of cultural resources. As noted previously, no archaeological artifacts or deposits were identified during the survey. The five structures noted on the property have already been subjected to an in-depth study and were found to lack any historic or architectural significance under the City of San Diego HRB Register Significance Criteria (Moomjian 2017).

Visibility of the natural ground surface was limited during the survey and previous development of the APE may have impacted or masked resources; therefore, based upon the location of the APE near the Tijuana and Otay rivers, which would have been important resources to prehistoric inhabitants of the region, and the documented presence of early to mid-twentieth century structures on the property, there still remains potential for unobserved buried resources. It is recommended that a qualified archaeologist and a Native American representative monitor any future earthwork required to develop the property.

VII. SOURCES CONSULTED DATE

National Register of Historic Places ☑	Month and Year: May 2018
California Register of Historical Resources ☑	Month and Year: May 2018
City of San Diego Historical Resources Register ☑	Month and Year: May 2018
Archaeological/Historical Site Records: South Coastal Information Center ☑	Month and Year: May 2018
Other Sources Consulted: NAHC Sacred Lands File Search (Attachment D) References (Attachment A)	

VIII. CERTIFICATION

I hereby certify that the statements furnished above and in the attached exhibits present the data and information required for this archaeological report, and that the facts, statements, and information presented are true and correct to the best of my knowledge and belief, and have been compiled in accordance with the California Environmental Quality Act criteria as defined in Section 15064.5 and City of San Diego Historical Resources Guidelines.

June 12, 2018

Brian F. Smith
Principal Investigator

Date

ATTACHMENT A

References
Resumes

REFERENCES

Bada, Jeffrey L., Roy A. Schroeder, and George F. Carter
1974 New Evidence for the Antiquity of Man in America Deduced from Aspartic Acid Racemization. *Science* 184:791-793.

Bancroft, Hubert Howe
1886 *History of California* (Vol. II). The History Company, San Francisco.

Beauchamp, R. Mitchel
1986 *A Flora of San Diego County, California*. Sweetwater River Press, National City, California.

Blick, J.D.
1976 *Agriculture in San Diego County.* In *San Diego – An Introduction to the Area*. Edited by Philip Pryde. Kendall/Hunt Publishing Company, Dubuque, Iowa.

Brian F. Smith and Associates, Inc.
Various dates. Research library holdings including Sanborn maps, city directories, published regional histories, and geologic and paleontological references.

Bull, C.
1983 Shaking the Foundations: The Evidence for San Diego Prehistory. *Cultural Resource Management Casual Papers* 1(3):15-64. Department of Anthropology, San Diego State University.

1987 A New Proposal: Some Suggestions for San Diego Prehistory. In *San Dieguito-La Jolla: Chronology and Controversy*, edited by Dennis Gallegos, pp. 35-42. San Diego County Archaeological Society Research Paper No. 1.

Cardenas, D. Sean
1986 Avocado Highlands: An Inland Late La Jolla and Preceramic Yuman Site from Southern San Diego County. *Cultural Resource Management Casual Paper* 2(2). Department of Anthropology, San Diego State University.

Carrico, Richard L. and Clifford V.F. Taylor
1983 Excavation of a Portion of Ystagua: A Coastal Valley Ipai Settlement. Environmental Impact Report on file at the City of San Diego, Environmental Quality Division.

Carter, George F.
1957 *Pleistocene Man at San Diego.* Johns Hopkins Press, Baltimore.

1980 *Earlier than You Think: A Personal View of Man in America.* Texas A&M University Press, College Station.

Caughey, John W.
1970 *California: A Remarkable State's Life History* (Third Edition). Prentice-Hall, Englewood Cliffs, New Jersey.

Chapman, Charles E.
1925 *A History of California: The Spanish Period*. The Macmillan Company, New York.

City of San Diego
2008 General Plan Final Program EIR. On file at the City of San Diego Planning Department, San Diego, California.

City of San Diego and Page and Turnbull, Inc.
2010 *Historic Context Statement: San Ysidro, San Diego, California*. California Office of Historic Preservation.

Corona, Antonio Padilla
2004 The Rancho Tia Juana (Tijuana) Grant. *The Journal of San Diego History* 50(1).

Crouch, Herbert
1915 Reminiscences, 1868-1915. Unpublished manuscript, California Room, San Diego Public Library; and SDHS Library, Serra Museum.

Davis, E.L., C.W. Brott, and D.L. Weide
1969 The Western Lithic Co-Tradition. *San Diego Museum Papers* (No. 6). San Diego Museum of Man, San Diego.

Elliott, Wallace W.
1883 *History of San Bernardino and San Diego Counties* (1965 Edition). Riverside Museum Press, Riverside, California.

Engelhardt, Zephryn
1920 *San Diego Mission*. James M. Barry Company, San Francisco.

Ezell, Paul H.
1983 A New Look at the San Dieguito Culture. *Cultural Resource Management Casual Papers* 1(3):103-109. Department of Anthropology, San Diego State University, San Diego.

1987 The Harris Site – An Atypical San Dieguito Site, or am I Beating a Dead Horse? In *San Dieguito-La Jolla: Chronology and Controversy*, edited by Dennis Gallegos, pp. 15-22. San Diego County Archaeological Society Research Paper No. 1.

Gallegos, Dennis R.
1987 A Review and Synthesis of Environmental and Cultural Material for the Batiquitos Lagoon Region. In *San Dieguito-La Jolla: Chronology and Controversy,* Edited by D.

Gallegos. San Diego County Archaeological Society Research Paper 1:23-34.

Gordinier, Jerry G.
1966 *Problems of Settlement in the San Diego Foothills.* Unpublished Master's thesis, San Diego State College, San Diego, California.

Heiges, Harvey
1976 The Economic Base of San Diego County. In *San Diego – An Introduction to the Region.* Edited by Philip Pryde. Kendall/Hunt Publishing Company, Dubuque, Iowa.

Kyle, Carolyn E. and Dennis R. Gallegos
1993 Data Recovery Program for a Portion of Prehistoric Site CA-SDI-10148, East Mission Gorge Pump Station and Force Main, San Diego, California. Unpublished report on file at the South Coastal Information Center, San Diego State University, San Diego, California.

Kyle, Carolyn, Adella Schroth, and Dennis R. Gallegos
1990 Early Period Occupation at the Kuebler Ranch Site SDI-8,654 Otay Mesa, San Diego County, California. Prepared for County of San Diego, Department of Public Works by ERCE Environmental and Energy Services Co., San Diego.

Minshall, Herbert L.
1976 *The Broken Stones.* Copley Books, San Diego.

1989 *Buchanan Canyon: Ancient Human Presence in the Americas.* Slawson Communications, San Marcos, California.

Moomjian, Scott A.
2017 Historical Resource Research Report for the 1695 Saturn Boulevard Residence & Structures, San Diego, California 92154. Submitted to the City of San Diego Historical Resources Board, San Diego, California.

Moratto, Michael J.
1984 *California Archaeology*. Academic Press, New York.

Moriarty, James R., III
1965 Cosmogeny, Rituals, and Medical Practice Among the Diegueño Indians of Southern California. *Anthropological Journal of Canada* 3(3):2-14.

1966 Culture Phase Divisions Suggested by Topological Change Coordinated with Stratigraphically Controlled Radiocarbon Dating in San Diego. *Anthropological Journal of Canada* 4(4):20-30.

1967 Transitional Pre-Desert Phase in San Diego, California. *Science* 155(3762):553-336. Scripps Institution – UCSD Contribution No. 2278.

1969 San Dieguito Complex: Suggested Environmental and Cultural Relationships. *Anthropological Journal of Canada* 7(3):2-18.

Moriarty, James Robert, III and Herbert L. Minshall

1972 A New Pre-Desert Site Discovered near Texas Street. *Anthropological Journal of Canada* 10(3):10-13.

Moyer, Cecil C.

1969 *Historic Ranchos of San Diego.* Edited by Richard F. Pourade. Union-Tribune Publishing Company, San Diego.

Palou, Fray Francisco

1926 *Historical Memoirs of New California*. Edited by Herbert Eugene Bolton (4 Volumes). University of California Press, Berkeley.

Pitt, Leonard

1966 *The Decline of the Californios*. University of California Press, Los Angeles.

Pourade, Richard F.

1967 *The Rising Tide: Southern California in the Twenties and Thirties*. Union-Tribune Publishing Company, San Diego.

Price, Glenn W.

1967 *Origins of the War with Mexico*. University of Texas Press, Austin.

Raven-Jennings, Shelly and Brian F. Smith

1999a Final Report for Site SDI-8330/W-240 'Scraper Hill,' Escondido, California. Unpublished report on file at the South Coastal Information Center at San Diego State University, San Diego, California.

1999b Report of Excavations at CA-SDI-4608: Subsistence and Technology Transitions during the Mid-to-Late Holocene in San Diego County (Scripps Poway Parkway*)*. Unpublished report on file at the South Coastal Information Center at San Diego State University, San Diego, California.

Reeves, Brian O.K.

1985 Early Man in the Americas: Who, When, and Why. In *Woman, Poet, Scientist: Essays in New World Anthropology Honoring Dr. Emma Louise Davis,* edited by Thomas C. Blackburn, pp. 79-104. Ballena Press Anthropological Papers No. 29. Los Altos, California.

Reeves, Brian, John M.D. Pohl, and Jason W. Smith.

1986 The Mission Ridge Site and the Texas Street Question. In *New Evidence for the Pleistocene Peopling of the Americas,* edited by Alan Lyle Bryan, pp. 65-80. Center for the Study of Early Man, University of Maine, Orono.

Robinson, W.W.
1948 *Land in California*. University of California Press, Berkeley.

Rogers, Malcolm
1939 Early Lithic Industries of the Lower Basin of the Colorado River and Adjacent Desert Areas. *San Diego Museum Papers* (No. 3 – 1989 printing). San Diego Museum of Man.

1945 An Outline of Yuman Prehistory. Albuquerque: *Southwestern Journal of Anthropology* 1(2):167-198.

1966 *Ancient Hunters of the Far West*. Edited with contributions by H.M. Worthington, E.L. Davis, and Clark W. Brott. Union Tribune Publishing Company, San Diego.

Rolle, Andrew F.
1969 *California: A History* (Second Edition). Thomas Y. Crowell Company, New York.

San Diego Union
1868 San Diego history. 6 February. San Diego, California.

1872 San Diego history. 2 January. San Diego, California.

1870 San Diego history. 10 November. San Diego, California.

Shipek, Florence
1977 *A Strategy for Change: The Luiseño of Southern California.* Unpublished Doctoral dissertation on file at the University of Hawaii.

Schoenherr, Steve
2015 Palm City. South Bay Historical Society. Electronic document, http://sunnycv.com/southbay/exhibits/palmcity.html, accessed June 5, 2018.

Shumway, George, Carl L. Hubbs, and James R. Moriarty
1961 Scripps Estate Site, San Diego, California: A La Jollan Site Dated 5,460-7,370 Years Before the Present. *Annals of the New York Academy of Sciences* 93(3).

Smith, Brian F.
1996 The Results of a Cultural Resource Study at the 4S Ranch. Unpublished report on file at the South Coastal Information Center at San Diego State University, San Diego, California.

Smith, Brian F. and James R. Moriarty
1983 An Archaeological Evaluation of a Drainage Channel Project at the South Sorrento Business Park. Environmental Impact Report on file at the City of San Diego.

1985 The Archaeological Excavations at Site W-20, Sierra Del Mar. Unpublished report on file at the South Coastal Information Center at San Diego State University, San Diego, California.

Stropes, Tracy A.

2007 *Nodule Industries of North Coastal San Diego: Understanding Change and Stasis in 10,000 Years of Lithic Technology.* Submitted to San Diego State University. Thesis/Dissertation on file at the South Coastal Information Center at San Diego State University, San Diego, California.

True, Delbert L.

1958 An Early Complex in San Diego County, California. *American Antiquity* 23(3).

1966 *Archaeological Differentiation of the Shoshonean and Yuman Speaking Groups in Southern California.* Unpublished doctoral dissertation, University of California at Los Angeles.

1970 Investigations of a Late Prehistoric Complex in Cuyamaca Rancho State Park, San Diego County, California. *Archaeological Survey Monograph.* University of California, Los Angeles.

1980 The Pauma Complex in Northern San Diego County: 1978. *Journal of New World Archaeology* 3(4):1-39.

1986 Molpa, a Late Prehistoric Site in Northern San Diego County: The San Luis Rey Complex, 1983. In *Symposium: A New Look at Some Old Sites,* edited by Gary S. Breschini and Trudy Haversat, pp. 29-36. Coyote Press, Salinas.

True, D.L. and Eleanor Beemer

1982 Two Milling Stone Inventories from Northern San Diego County, California. *Journal of California and Great Basin Anthropology* 4:233-261.

True, D.L. and R. Pankey

1985 Radiocarbon Dates for the Pauma Complex Component at the Pankey Site, Northern San Diego County, California. *Journal of California and Great Basin Anthropology* 7:240-244.

Van Dyke, Theodore

1886 *Southern California*. Fords, Howard and Hulbert.

Warren, Claude N.

1964 *Cultural Change and Continuity on the San Diego Coast.* Unpublished Doctoral dissertation on file at the University of California, Los Angeles.

1966 The San Dieguito Type Site: Malcolm J. Roger's 1938 Excavation on the San Dieguito

River. *San Diego Museum Papers* (6).

Waugh, Georgie
1986 *Intensification and Land-use: Archaeological Indication of Transition and Transformation in a Late Prehistoric Complex in Southern California.* Unpublished Ph.D. dissertation, Department of Anthropology, University of California, Davis.

Brian F. Smith, MA

Owner, Principal Investigator

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Education

Master of Arts, History, University of San Diego, California **1982**

Bachelor of Arts, History, and Anthropology, University of San Diego, California **1975**

Professional Memberships

Society for California Archaeology

Experience

Principal Investigator **1977–Present**
Brian F. Smith and Associates, Inc. **Poway, California**

Brian F. Smith is the owner and principal historical and archaeological consultant for Brian F. Smith and Associates. Over the past 32 years, he has conducted over 2,500 cultural resource studies in California, Arizona, Nevada, Montana, and Texas. These studies include every possible aspect of archaeology from literature searches and large-scale surveys to intensive data recovery excavations. Reports prepared by Mr. Smith have been submitted to all facets of local, state, and federal review agencies, including the US Army Crops of Engineers, the Bureau of Land Management, the Bureau of Reclamation, the Department of Defense, and the Department of Homeland Security. In addition, Mr. Smith has conducted studies for utility companies (Sempra Energy) and state highway departments (CalTrans).

Professional Accomplishments

These selected major professional accomplishments represent research efforts that have added significantly to the body of knowledge concerning the prehistoric life ways of cultures once present in the Southern California area and historic settlement since the late 18th century. Mr. Smith has been principal investigator on the following select projects, except where noted.

<u>Downtown San Diego Mitigation and Monitoring Reporting Programs</u>: Large numbers of downtown San Diego mitigation and monitoring projects submitted to the Centre City Development Corporation, some of which included Strata (2008), Hotel Indigo (2008), Lofts at 707 10th Avenue Project (2007), Breeza (2007), Bayside at the Embarcadero (2007), Aria (2007), Icon (2007), Vantage Pointe (2007), Aperture (2007), Sapphire Tower (2007), Lofts at 655 Sixth Avenue (2007), Metrowork (2007), The Legend (2006), The Mark (2006), Smart Corner (2006), Lofts at 677 7th Avenue (2005), Aloft on Cortez Hill (2005), Front and

Beech Apartments (2003), Bella Via Condominiums (2003), Acqua Vista Residential Tower (2003), Northblock Lofts (2003), Westin Park Place Hotel (2001), Parkloft Apartment Complex (2001), Renaissance Park (2001), and Laurel Bay Apartments (2001).

Archaeology at the Padres Ballpark: Involved the analysis of historic resources within a seven-block area of the "East Village" area of San Diego, where occupation spanned a period from the 1870s to the 1940s. Over a period of two years, BFSA recovered over 200,000 artifacts and hundreds of pounds of metal, construction debris, unidentified broken glass, and wood. Collectively, the Ballpark Project and the other downtown mitigation and monitoring projects represent the largest historical archaeological program anywhere in the country in the past decade (2000-2007).

4S Ranch Archaeological and Historical Cultural Resources Study: Data recovery program consisted of the excavation of over 2,000 square meters of archaeological deposits that produced over one million artifacts, containing primarily prehistoric materials. The archaeological program at 4S Ranch is the largest archaeological study ever undertaken in the San Diego County area and has produced data that has exceeded expectations regarding the resolution of long-standing research questions and regional prehistoric settlement patterns.

Charles H. Brown Site: Attracted international attention to the discovery of evidence of the antiquity of man in North America. Site located in Mission Valley, in the city of San Diego.

Del Mar Man Site: Study of the now famous Early Man Site in Del Mar, California, for the San Diego Science Foundation and the San Diego Museum of Man, under the direction of Dr. Spencer Rogers and Dr. James R. Moriarty.

Old Town State Park Projects: Consulting Historical Archaeologist. Projects completed in the Old Town State Park involved development of individual lots for commercial enterprises. The projects completed in Old Town include Archaeological and Historical Site Assessment for the Great Wall Cafe (1992), Archaeological Study for the Old Town Commercial Project (1991), and Cultural Resources Site Survey at the Old San Diego Inn (1988).

Site W-20, Del Mar, California: A two-year-long investigation of a major prehistoric site in the Del Mar area of the city of San Diego. This research effort documented the earliest practice of religious/ceremonial activities in San Diego County (circa 6,000 years ago), facilitated the projection of major non-material aspects of the La Jolla Complex, and revealed the pattern of civilization at this site over a continuous period of 5,000 years. The report for the investigation included over 600 pages, with nearly 500,000 words of text, illustrations, maps, and photographs documenting this major study.

City of San Diego Reclaimed Water Distribution System: A cultural resource study of nearly 400 miles of pipeline in the city and county of San Diego.

Master Environmental Assessment Project, City of Poway: Conducted for the City of Poway to produce a complete inventory of all recorded historic and prehistoric properties within the city. The information was used in conjunction with the City's General Plan Update to produce a map matrix of the city showing areas of high, moderate, and low potential for the presence of cultural resources. The effort also included the development of the City's Cultural Resource Guidelines, which were adopted as City policy.

Draft of the City of Carlsbad Historical and Archaeological Guidelines: Contracted by the City of Carlsbad to produce the draft of the City's historical and archaeological guidelines for use by the Planning Department of the City.

The Mid-Bayfront Project for the City of Chula Vista: Involved a large expanse of undeveloped agricultural land situated between the railroad and San Diego Bay in the northwestern portion of the city. The study included the analysis of some potentially historic features and numerous prehistoric sites.

Cultural Resources Survey and Test of Sites Within the Proposed Development of the Audie Murphy Ranch, Riverside County, California: Project manager/director of the investigation of 1,113.4 acres and 43 sites, both prehistoric and historic—included project coordination; direction of field crews; evaluation of sites for significance based on County of Riverside and CEQA guidelines; assessment of cupule, pictograph, and rock shelter sites, co-authoring of cultural resources project report. February-September 2002.

Cultural Resources Evaluation of Sites Within the Proposed Development of the Otay Ranch Village 13 Project, San Diego County, California: Project manager/director of the investigation of 1,947 acres and 76 sites, both prehistoric and historic—included project coordination and budgeting; direction of field crews; assessment of sites for significance based on County of San Diego and CEQA guidelines; co-authoring of cultural resources project report. May-November 2002.

Cultural Resources Survey for the Remote Video Surveillance Project, El Centro Sector, Imperial County: Project manager/director for a survey of 29 individual sites near the U.S./Mexico Border for proposed video surveillance camera locations associated with the San Diego Border barrier Project—project coordination and budgeting; direction of field crews; site identification and recordation; assessment of potential impacts to cultural resources; meeting and coordinating with U.S. Army Corps of Engineers, U.S. Border Patrol, and other government agencies involved; co-authoring of cultural resources project report. January, February, and July 2002.

Cultural Resources Survey and Test of Sites Within the Proposed Development of the Menifee West GPA, Riverside County, California: Project manager/director of the investigation of nine sites, both prehistoric and historic—included project coordination and budgeting; direction of field crews; assessment of sites for significance based on County of Riverside and CEQA guidelines; historic research; co-authoring of cultural resources project report. January-March 2002.

Mitigation of An Archaic Cultural Resource for the Eastlake III Woods Project for the City of Chula Vista, California: Project archaeologist/ director—included direction of field crews; development and completion of data recovery program including collection of material for specialized faunal and botanical analyses; assessment of sites for significance based on CEQA guidelines; management of artifact collections cataloging and curation; data synthesis; co-authoring of cultural resources project report, in prep. September 2001-March 2002.

Cultural Resources Survey and Test of Sites Within the Proposed French Valley Specific Plan/EIR, Riverside County, California: Project manager/director of the investigation of two prehistoric and three historic sites—included project coordination and budgeting; survey of project area; Native American consultation; direction of field crews; assessment of sites for significance based on CEQA guidelines; cultural resources project report in prep. July-August 2000.

Cultural Resources Survey and Test of Sites Within the Proposed Lawson Valley Project, San Diego County, California: Project manager/director of the investigation of 28 prehistoric and two historic sites—included project coordination; direction of field crews; assessment of sites for significance based on CEQA guidelines; cultural resources project report in prep. July-August 2000.

Cultural Resource Survey and Geotechnical Monitoring for the Mohyi Residence Project, La Jolla, California: Project manager/director of the investigation of a single-dwelling parcel—included project coordination; field survey; assessment of parcel for potentially buried cultural deposits; monitoring of geotechnichal borings; authoring of cultural resources project report. Brian F. Smith and Associates, San Diego, California. June 2000.

Enhanced Cultural Resource Survey and Evaluation for the Prewitt/Schmucker/Cavadias Project, La Jolla, California: Project manager/director of the investigation of a single-dwelling parcel—included project coordination; direction of field crews; assessment of parcel for potentially buried cultural deposits; authoring of cultural resources project report. June 2000.

Cultural Resources Survey and Test of Sites Within the Proposed Development of the Menifee Ranch, Riverside County, California: Project manager/director of the investigation of one prehistoric and five historic sites—included project coordination and budgeting; direction of field crews; feature recordation; historic structure assessments; assessment of sites for significance based on CEQA guidelines; historic research; co-authoring of cultural resources project report. February-June 2000.

Salvage Mitigation of a Portion of the San Diego Presidio Identified During Water Pipe Construction for the City of San Diego, California: Project archaeologist/director—included direction of field crews; development and completion of data recovery program; management of artifact collections cataloging and curation; data synthesis and authoring of cultural resources project report in prep. April 2000.

Enhanced Cultural Resource Survey and Evaluation for the Tyrian 3 Project, La Jolla, California: Project manager/director of the investigation of a single-dwelling parcel—included project coordination; assessment of parcel for potentially buried cultural deposits; authoring of cultural resources project report. April 2000.

Enhanced Cultural Resource Survey and Evaluation for the Lamont 5 Project, Pacific Beach, California: Project manager/director of the investigation of a single-dwelling parcel—included project coordination; assessment of parcel for potentially buried cultural deposits; authoring of cultural resources project report. April 2000.

Enhanced Cultural Resource Survey and Evaluation for the Reiss Residence Project, La Jolla, California: Project manager/director of the investigation of a single-dwelling parcel—included project coordination; assessment of parcel for potentially buried cultural deposits; authoring of cultural resources project report. March-April 2000.

Salvage Mitigation of a Portion of Site SDM-W-95 (CA-SDI-211) for the Poinsettia Shores Santalina Development Project and Caltrans, Carlsbad, California: Project achaeologist/ director—included direction of field crews; development and completion of data recovery program; management of artifact collections cataloging and curation; data synthesis and authoring of cultural resources project report in prep. December 1999-January 2000.

Survey and Testing of Two Prehistoric Cultural Resources for the Airway Truck Parking Project, Otay Mesa, California: Project archaeologist/director—included direction of field crews; development and completion of testing recovery program; assessment of site for significance based on CEQA guidelines; authoring of cultural resources project report, in prep. December 1999-January 2000.

Cultural Resources Phase I and II Investigations for the Tin Can Hill Segment of the Immigration and Naturalization Services Triple Fence Project Along the International Border, San Diego County, California: Project manager/director for a survey and testing of a prehistoric quarry site along the border—NRHP eligibility assessment; project coordination and budgeting; direction of field crews; feature recordation; meeting and coordinating with U.S. Army Corps of Engineers; co-authoring of cultural resources project report. December 1999-January 2000.

Mitigation of a Prehistoric Cultural Resource for the Westview High School Project for the City of San Diego, California: Project archaeologist/ director—included direction of field crews; development and completion of data recovery program including collection of material for specialized faunal and botanical analyses; assessment of sites for significance based on CEQA guidelines; management of artifact collections cataloging and curation; data synthesis; co-authoring of cultural resources project report, in prep. October 1999-January 2000.

Mitigation of a Prehistoric Cultural Resource for the Otay Ranch SPA-One West Project for the City of Chula Vista, California: Project archaeologist/director—included direction of field crews; development of data recovery program; management of artifact collections cataloging and curation; assessment of site for significance based on CEQA guidelines; data synthesis; authoring of cultural resources project report, in prep. September 1999-January 2000.

Monitoring of Grading for the Herschel Place Project, La Jolla, California: Project archaeologist/ monitor—included monitoring of grading activities associated with the development of a single-dwelling parcel. September 1999.

Survey and Testing of a Historic Resource for the Osterkamp Development Project, Valley Center, California: Project archaeologist/ director—included direction of field crews; development and completion of data recovery program; budget development; assessment of site for significance based on CEQA guidelines; management of artifact collections cataloging and curation; data synthesis; authoring of cultural resources project report. July-August 1999.

Survey and Testing of a Prehistoric Cultural Resource for the Proposed College Boulevard Alignment Project, Carlsbad, California: Project manager/director —included direction of field crews; development and completion of testing recovery program; assessment of site for significance based on CEQA guidelines; management of artifact collections cataloging and curation; data synthesis; authoring of cultural resources project report, in prep. July-August 1999.

Survey and Evaluation of Cultural Resources for the Palomar Christian Conference Center Project, Palomar Mountain, California: Project archaeologist—included direction of field crews; assessment of sites for significance based on CEQA guidelines; management of artifact collections cataloging and curation; data synthesis; authoring of cultural resources project report. July-August 1999.

Survey and Evaluation of Cultural Resources at the Village 2 High School Site, Otay Ranch, City of Chula Vista, California: Project manager/director —management of artifact collections cataloging and curation; assessment of site for significance based on CEQA guidelines; data synthesis; authoring of cultural resources project report. July 1999.

Cultural Resources Phase I, II, and III Investigations for the Immigration and Naturalization Services Triple Fence Project Along the International Border, San Diego County, California: Project manager/director for the survey, testing, and mitigation of sites along border—supervision of multiple field crews, NRHP eligibility assessments, Native American consultation, contribution to Environmental Assessment document, lithic and marine shell analysis, authoring of cultural resources project report. August 1997-January 2000.

Phase I, II, and II Investigations for the Scripps Poway Parkway East Project, Poway California: Project archaeologist/project director—included recordation and assessment of multicomponent prehistoric and historic sites; direction of Phase II and III investigations; direction of laboratory analyses including prehistoric and historic collections; curation of collections; data synthesis; coauthorship of final cultural resources report. February 1994; March-September 1994; September-December 1995.

Archaeological Evaluation of Cultural Resources Within the Proposed Corridor for the San Elijo Water Reclamation System Project, San Elijo, California: Project manager/director —test excavations; direction of artifact identification and analysis; graphics production; coauthorship of final cultural resources report. December 1994-July 1995.

Evaluation of Cultural Resources for the Environmental Impact Report for the Rose Canyon Trunk Sewer Project, San Diego, California: Project manager/Director —direction of test excavations; identification and analysis of prehistoric and historic artifact collections; data synthesis; co-authorship of final cultural resources report, San Diego, California. June 1991-March 1992.

Reports/Papers

Author, coauthor, or contributor to over 2,500 cultural resources management publications, a selection of which are presented below.

2015 An Archaeological/Historical Study for the Safari Highlands Ranch Project, City of Escondido, County of San Diego.

2015 A Phase I and II Cultural Resources Assessment for the Decker Parcels II Project, Planning Case No. 36962, Riverside County, California.

2015 A Phase I and II Cultural Resources Assessment for the Decker Parcels I Project, Planning Case No. 36950, Riverside County, California.

2015 Cultural Resource Data Recovery and Mitigation Monitoring Program for Site SDI-10,237 Locus F, Everly Subdivision Project, El Cajon, California.

2015 Phase I Cultural Resource Survey for the Woodward Street Senior Housing Project, City of San Marcos, California (APN 218-120-31).

2015 An Updated Cultural Resource Survey for the Box Springs Project (TR 33410), APNs 255-230-010, 255-240-005, 255-240-006, and Portions of 257-180-004, 257-180-005, and 257-180-006.

2015 A Phase I and II Cultural Resource Report for the Lake Ranch Project, TR 36730, Riverside County, California.

2015 A Phase II Cultural Resource Assessment for the Munro Valley Solar Project, Inyo County, California.

2014 Cultural Resources Monitoring Report for the Diamond Valley Solar Project, Community of Winchester, County of Riverside.

2014 National Historic Preservation Act Section 106 Compliance for the Proposed Saddleback Estates Project, Riverside County, California.

2014 A Phase II Cultural Resource Evaluation Report for RIV-8137 at the Toscana Project, TR 36593, Riverside County, California.

2014 Cultural Resources Study for the Estates at Del Mar Project, City of Del Mar, San Diego, California (TTM 14-001).

2014 Cultural Resources Study for the Aliso Canyon Major Subdivision Project, Rancho Santa Fe, San Diego County, California.

2014 Cultural Resources Due Diligence Assessment of the Ocean Colony Project, City of Encinitas.

2014 A Phase I and Phase II Cultural Resource Assessment for the Citrus Heights II Project, TTM 36475, Riverside County, California.

2013 A Phase I Cultural Resource Assessment for the Modular Logistics Center, Moreno Valley, Riverside County, California.

2013 A Phase I Cultural Resources Survey of the Ivey Ranch Project, Thousand Palms, Riverside County, California.

2013 Cultural Resources Report for the Emerald Acres Project, Riverside County, California.

2013 A Cultural Resources Records Search and Review for the Pala Del Norte Conservation Bank Project, San Diego County, California.

2013 An Updated Phase I Cultural Resources Assessment for Tentative Tract Maps 36484 and 36485, Audie Murphy Ranch, City of Menifee, County of Riverside.

2013 El Centro Town Center Industrial Development Project (EDA Grant No. 07-01-06386); Result of Cultural Resource Monitoring.

2013 Cultural Resources Survey Report for the Renda Residence Project, 9521 La Jolla Farms Road, La Jolla, California.

2013 A Phase I Cultural Resource Study for the Ballpark Village Project, San Diego, California.

2013 Archaeological Monitoring and Mitigation Program, San Clemente Senior Housing Project, 2350 South El Camino Real, City of San Clemente, Orange County, California (CUP No. 06-065; APN-060-032-04).

2012 Mitigation Monitoring Report for the Los Peñasquitos Recycled Water Pipeline.

2012 Cultural Resources Report for Menifee Heights (Tract 32277).

2012 A Phase I Cultural Resource Study for the Altman Residence at 9696 La Jolla Farms Road, La Jolla, California 92037.

2012 Mission Ranch Project (TM 5290-1/MUP P87-036W3): Results of Cultural Resources Monitoring During Mass Grading.

2012 A Phase I Cultural Resource Study for the Payan Property Project, San Diego, California.

2012 Phase I Archaeological Survey of the Rieger Residence, 13707 Durango Drive, Del Mar, California 92014, APN 300-369-49.

2011 Mission Ranch Project (TM 5290-1/MUP P87-036W3): Results of Cultural Resources Monitoring During Mass Grading.

2011 Mitigation Monitoring Report for the 1887 Viking Way Project, La Jolla, California.

2011 Cultural Resource Monitoring Report for the Sewer Group 714 Project.

2011 Results of Archaeological Monitoring at the 10th Avenue Parking Lot Project, City of San Diego, California (APNs 534-194-02 and 03).

2011 Archaeological Survey of the Pelberg Residence for a Bulletin 560 Permit Application; 8335 Camino Del Oro; La Jolla, California 92037 APN 346-162-01-00 .

2011 A Cultural Resources Survey Update and Evaluation for the Robertson Ranch West Project and an Evaluation of National Register Eligibility of Archaeological sites for Sites for Section 106 Review (NHPA).

2011 Mitigation Monitoring Report for the 43rd and Logan Project.

2011 Mitigation Monitoring Report for the Sewer Group 682 M Project, City of San Diego Project #174116.

2011 A Phase I Cultural Resource Study for the Nooren Residence Project, 8001 Calle de la Plata, La Jolla, California, Project No. 226965.

2011 A Phase I Cultural Resource Study for the Keating Residence Project, 9633 La Jolla Farms Road, La Jolla, California 92037.

2010 Mitigation Monitoring Report for the 15th & Island Project, City of San Diego; APNs 535-365-01, 535-365-02 and 535-392-05 through 535-392-07.

2010 Archaeological Resource Report Form: Mitigation Monitoring of the Sewer and Water Group 772 Project, San Diego, California, W.O. Nos. 187861 and 178351.

2010 Pottery Canyon Site Archaeological Evaluation Project, City of San Diego, California, Contract No. H105126.

2010 Archaeological Resource Report Form: Mitigation Monitoring of the Racetrack View Drive Project, San Diego, California; Project No. 163216.

2010 A Historical Evaluation of Structures on the Butterfield Trails Property.

2010 Historic Archaeological Significance Evaluation of 1761 Haydn Drive, Encinitas, California (APN 260-276-07-00).

2010 Results of Archaeological Monitoring of the Heller/Nguyen Project, TPM 06-01, Poway, California.

2010 Cultural Resource Survey and Evaluation Program for the Sunday Drive Parcel Project, San Diego County, California, APN 189-281-14.

2010 Archaeological Resource Report Form: Mitigation Monitoring of the Emergency Garnet Avenue Storm Drain Replacement Project, San Diego, California, Project No. B10062

2010 An Archaeological Study for the 1912 Spindrift Drive Project

2009 Cultural Resource Assessment of the North Ocean Beach Gateway Project City of San Diego #64A-003A; Project #154116.

2009 Archaeological Constraints Study of the Morgan Valley Wind Assessment Project, Lake County, California.

2008 Results of an Archaeological Review of the Helen Park Lane 3.1-acre Property (APN 314-561-31), Poway, California.

2008 Archaeological Letter Report for a Phase I Archaeological Assessment of the Valley Park Condominium Project, Ramona, California; APN 282-262-75-00.

2007 Archaeology at the Ballpark. Brian F. Smith and Associates, San Diego, California. Submitted to the Centre City Development Corporation.

2007 Result of an Archaeological Survey for the Villages at Promenade Project (APNs 115-180-007-3,115-180-049-1, 115-180-042-4, 115-180-047-9) in the City of Corona, Riverside County.

2007 Monitoring Results for the Capping of Site CA-SDI-6038/SDM-W-5517 within the Katzer Jamul Center Project; P00-017.

2006 Archaeological Assessment for The Johnson Project (APN 322-011-10), Poway, California.

2005 Results of Archaeological Monitoring at the El Camino Del Teatro Accelerated Sewer Replacement Project (Bid No. K041364; WO # 177741; CIP # 46-610.6.

2005 Results of Archaeological Monitoring at the Baltazar Draper Avenue Project (Project No. 15857; APN: 351-040-09).

2004 TM 5325 ER #03-14-043 Cultural Resources.

2004 An Archaeological Survey and an Evaluation of Cultural Resources at the Salt Creek Project. Report on file at Brian F. Smith and Associates.

2003 An Archaeological Assessment for the Hidden Meadows Project, San Diego County, TM 5174, Log No. 99-08-033. Report on file at Brian F. Smith and Associates.

2003 An Archaeological Survey for the Manchester Estates Project, Coastal Development Permit #02-009, Encinitas, California. Report on file at Brian F. Smith and Associates.

2003 Archaeological Investigations at the Manchester Estates Project, Coastal Development Permit #02-009, Encinitas, California. Report on file at Brian F. Smith and Associates.

2003 Archaeological Monitoring of Geological Testing Cores at the Pacific Beach Christian Church Project. Report on file at Brian F. Smith and Associates.

2003 San Juan Creek Drilling Archaeological Monitoring. Report on file at Brian F. Smith and Associates.

2003 Evaluation of Archaeological Resources Within the Spring Canyon Biological Mitigation Area, Otay Mesa, San Diego County, California. Brian F. Smith and Associates, San Diego, California.

2002 An Archaeological/Historical Study for the Otay Ranch Village 13 Project (et al.). Brian F. Smith and Associates, San Diego, California.

2002 An Archaeological/Historical Study for the Audie Murphy Ranch Project (et al.). Brian F. Smith and Associates, San Diego, California.

2002 Results of an Archaeological Survey for the Remote Video Surveillance Project, El Centro Sector, Imperial County, California. Brian F. Smith and Associates, San Diego, California.

2002 A Cultural Resources Survey and Evaluation for the Proposed Robertson Ranch Project, City of Carlsbad. Brian F. Smith and Associates, San Diego, California.

2002 Archaeological Mitigation of Impacts to Prehistoric Site SDI-7976 for the Eastlake III Woods Project, Chula Vista, California. Brian F. Smith and Associates, San Diego, California.

2002 An Archaeological/Historical Study for Tract No. 29777, Menifee West GPA Project, Perris Valley, Riverside County. Brian F. Smith and Associates, San Diego, California.

2002 An Archaeological/Historical Study for Tract No. 29835, Menifee West GPA Project, Perris Valley, Riverside County. Brian F. Smith and Associates, San Diego, California.

2001 An Archaeological Survey and Evaluation of a Cultural Resource for the Moore Property, Poway. Brian F. Smith and Associates, San Diego, California.

2001 An Archaeological Report for the Mitigation, Monitoring, and Reporting Program at the Water and Sewer Group Job 530A, Old Town San Diego. Brian F. Smith and Associates, San Diego, California.

2001 A Cultural Resources Impact Survey for the High Desert Water District Recharge Site 6 Project, Yucca Valley. Brian F. Smith and Associates, San Diego, California.

2001 Archaeological Mitigation of Impacts to Prehistoric Site SDI-13,864 at the Otay Ranch SPA-One West Project. Brian F. Smith and Associates, San Diego, California.

2001 A Cultural Resources Survey and Site Evaluations at the Stewart Subdivision Project, Moreno Valley, County of San Diego. Brian F. Smith and Associates, San Diego, California.

2000 An Archaeological/Historical Study for the French Valley Specific Plan/EIR, French Valley, County of Riverside. Brian F. Smith and Associates, San Diego, California.

2000 Results of an Archaeological Survey and the Evaluation of Cultural Resources at The TPM#24003–Lawson Valley Project. Brian F. Smith and Associates, San Diego, California.

2000 Archaeological Mitigation of Impacts to Prehistoric Site SDI-5326 at the Westview High School Project for the Poway Unified School District. Brian F. Smith and Associates, San Diego, California.

2000 An Archaeological/Historical Study for the Menifee Ranch Project. Brian F. Smith and Associates, San Diego, California.

2000 An Archaeological Survey and Evaluation of Cultural Resources for the Bernardo Mountain Project, Escondido, California. Brian F. Smith and Associates, San Diego, California.

2000 A Cultural Resources Impact Survey for the Nextel Black Mountain Road Project, San Diego, California. Brian F. Smith and Associates, San Diego, California.

2000 A Cultural Resources Impact Survey for the Rancho Vista Project, 740 Hilltop Drive, Chula Vista, California. Brian F. Smith and Associates, San Diego, California.

2000 A Cultural Resources Impact Survey for the Poway Creek Project, Poway, California. Brian F. Smith and Associates, San Diego, California.

2000 Cultural Resource Survey and Geotechnical Monitoring for the Mohyi Residence Project. Brian F. Smith and Associates, San Diego, California.

2000 Enhanced Cultural Resource Survey and Evaluation for the Prewitt/Schmucker/ Cavadias Project. Brian F. Smith and Associates, San Diego, California.

2000 Enhanced Cultural Resource Survey and Evaluation for the Lamont 5 Project. Brian F. Smith and Associates, San Diego, California.

2000 Salvage Excavations at Site SDM-W-95 (CA-SDI-211) for the Poinsettia Shores Santalina Development Project, Carlsbad, California. Brian F. Smith and Associates, San Diego, California.

2000 Enhanced Cultural Resource Survey and Evaluation for the Reiss Residence Project, La Jolla, California. Brian F. Smith and Associates, San Diego, California.

2000 Enhanced Cultural Resource Survey and Evaluation for the Tyrian 3 Project, La Jolla, California. Brian F. Smith and Associates, San Diego, California.

2000 A Report for an Archaeological Evaluation of Cultural Resources at the Otay Ranch Village Two SPA, Chula Vista, California. Brian F. Smith and Associates, San Diego, California.

2000 An Archaeological Evaluation of Cultural Resources for the Airway Truck Parking Project, Otay Mesa, County of San Diego. Brian F. Smith and Associates, San Diego, California.

2000 Results of an Archaeological Survey and Evaluation of a Resource for the Tin Can Hill Segment of the Immigration and Naturalization and Immigration Service Border Road, Fence, and Lighting Project, San Diego County, California. Brian F. Smith and Associates, San Diego, California.

1999 An Archaeological Survey of the Home Creek Village Project, 4600 Block of Home Avenue, San Diego, California. Brian F. Smith and Associates, San Diego, California.

1999 An Archaeological Survey for the Sgobassi Lot Split, San Diego County, California. Brian F. Smith and Associates, San Diego, California.

1999 An Evaluation of Cultural Resources at the Otay Ranch Village 11 Project. Brian F. Smith and Associates, San Diego, California.

1999 An Archaeological/Historical Survey and Evaluation of a Cultural Resource for The Osterkamp Development Project, Valley Center, California. Brian F. Smith and Associates, San Diego, California.

1999 An Archaeological Survey and Evaluation of Cultural Resources for the Palomar Christian Conference Center Project, Palomar Mountain, California. Brian F. Smith and Associates, San Diego, California.

1999 An Archaeological Survey and Evaluation of a Cultural Resource for the Proposed College Boulevard Alignment Project. Brian F. Smith and Associates, San Diego, California.

1999 Results of an Archaeological Evaluation for the Anthony's Pizza Acquisition Project in Ocean Beach, City of San Diego (with L. Pierson and B. Smith). Brian F. Smith and Associates, San Diego, California.

1996 An Archaeological Testing Program for the Scripps Poway Parkway East Project. Brian F. Smith and Associates, San Diego, California.

1995 Results of a Cultural Resources Study for the 4S Ranch. Brian F. Smith and Associates, San Diego, California.

1995 Results of an Archaeological Evaluation of Cultural Resources Within the Proposed Corridor for the San Elijo Water Reclamation System. Brian F. Smith and Associates, San Diego, California.

1994 Results of the Cultural Resources Mitigation Programs at Sites SDI-11,044/H and SDI-12,038 at the Salt Creek Ranch Project . Brian F. Smith and Associates, San Diego, California.

1993 Results of an Archaeological Survey and Evaluation of Cultural Resources at the Stallion Oaks Ranch Project. Brian F. Smith and Associates, San Diego, California.

1992 Results of an Archaeological Survey and the Evaluation of Cultural Resources at the Ely Lot Split Project. Brian F. Smith and Associates, San Diego, California.

1991 The Results of an Archaeological Study for the Walton Development Group Project. Brian F. Smith and Associates, San Diego, California.

Andrew J. Garrison, M.A., RPA

Senior Project Archaeologist

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14010 Poway Road • Suite A •
Phone: (858) 679-8218 • Fax: (858) 679-9896 • E-Mail: agarrison@bfsa-ca.com

Education

Master of Arts, Public History, University of California, Riverside **2009**

Bachelor of Science, Anthropology, University of California, Riverside **2005**

Bachelor of Arts, History, University of California, Riverside **2005**

Professional Memberships

Register of Professional Archaeologists
Society for California Archaeology
Society for American Archaeology
California Council for the Promotion of History
Society of Primitive Technology
Lithic Studies Society
California Preservation Foundation
Pacific Coast Archaeological Society

Experience

Senior Project Archaeologist **June 2017–Present**
Brian F. Smith and Associates, Inc. **Poway, California**

Project management of all phases of archaeological investigations for local, state, and federal agencies including National Register of Historic Places (NRHP) and California Environmental Quality Act (CEQA) level projects interacting with clients, sub-consultants, and lead agencies. Supervise and perform fieldwork including archaeological survey, monitoring, site testing, comprehensive site records checks, and historic building assessments. Perform and oversee technological analysis of prehistoric lithic assemblages. Author or co-author cultural resource management reports submitted to private clients and lead agencies.

Senior Archaeologist and GIS Specialist **2009–2017**
Scientific Resource Surveys, Inc. **Orange, California**

Served as Project Archaeologist or Principal Investigator on multiple projects, including archaeological monitoring, cultural resource surveys, test excavations, and historic building assessments. Directed projects from start to finish, including budget and personnel hours proposals, field and laboratory direction, report writing, technical editing, Native American consultation, and final report submittal. Oversaw all GIS projects including data collection, spatial analysis, and map creation.

Preservation Researcher **2009**
City of Riverside Modernism Survey **Riverside, California**

Completed DPR Primary, District, and Building, Structure and Object Forms for five sites for a grant-funded project to survey designated modern architectural resources within the City of Riverside.

Information Officer **2005, 2008–2009**
Eastern Information Center (EIC), University of California, Riverside **Riverside, California**

Processed and catalogued restricted and unrestricted archaeological and historical site record forms. Conducted research projects and records searches for government agencies and private cultural resource firms.

Reports/Papers

2017 A Phase I Cultural Resources Assessment for the Marbella Villa Project, City of Desert Hot Springs, Riverside County, California. Brian F. Smith and Associates, Inc.

2017 Phase I Cultural Resources Survey for TTM 37109, City of Jurupa Valley, County of Riverside. Brian F. Smith and Associates, Inc.

2017 A Phase I Cultural Resources Survey for the Jefferson & Ivy Project, City of Murrieta, California. Brian F. Smith and Associates, Inc.

2017 A Phase I Cultural Resources Assessment for the Nuevo Dollar General Store Project, Riverside County, California. Brian F. Smith and Associates, Inc.

2017 A Phase I Cultural Resource Study for the Westmont Project, Encinitas, California. Brian F. Smith and Associates, Inc.

2017 A Phase I Cultural Resources Assessment for the Winchester Dollar General Store Project, Riverside County, California. Brian F. Smith and Associates, Inc.

2017 Phase I Cultural Resource Assessment for TTM 31810 (42.42 acres) Predico Properties Olive Grove Project. Scientific Resource Surveys, Inc.

2016 John Wayne Airport Jet Fuel Pipeline and Tank Farm Archaeological Monitoring Plan. Scientific Resource Surveys, Inc. On file at the County of Orange, California.

2016 Phase I Cultural Resources Assessment: All Star Super Storage City of Menifee Project, 2015-156. Scientific Resource Surveys, Inc. On file at the Eastern Information Center, University of California, Riverside.

2016 Historic Resource Assessment for 220 South Batavia Street, Orange, CA 92868 Assessor's Parcel Number 041-064-4. Scientific Resource Surveys, Inc. Submitted to the City of Orange as part of Mills Act application.

2015 Historic Resource Report: 807-813 Harvard Boulevard, Los Angeles. Scientific Resource Surveys, Inc. On file at the South Central Coastal Information Center, California State University, Fullerton.

2015 Exploring a Traditional Rock Cairn: Test Excavation at CA-SDI-13/RBLI-26: The Rincon Indian Reservation, San Diego County, California. Scientific Resource Surveys, Inc.

2015 Class III Scientific Resource Surveys, Inc. Survey for The Lynx Cat Granite Quarry and Water Valley Road Widening Project County of San Bernardino, California, Near the Community of Hinkley. Scientific Resource Surveys, Inc. On file at the South Central Coastal Information Center, California State University, Fullerton.

2014 Archaeological Phase I: Cultural Resource Survey of the South West Quadrant of Fairview Park, Costa Mesa. Scientific Resource Surveys, Inc. On file at the South Central Coastal Information Center, California State University, Fullerton.

2014 Archaeological Monitoring Results: The New Los Angeles Federal Courthouse. Scientific Resource Surveys, Inc. On file at the South Central Coastal Information Center, California State University, Fullerton.

2012 Bolsa Chica Archaeological Project Volume 7, Technological Analysis of Stone Tools, Lithic Technology at Bolsa Chica: Reduction Maintenance and Experimentation. Scientific Resource Surveys, Inc.

2010 Phase II Cultural Resources Report Site CA=RIV-2160 PM No. 35164. Scientific Resource Surveys, Inc. On file at the Eastern Information Center, University of California, Riverside.

2009 Riverside Modernism Context Survey, contributing author. Available online at the City of Riverside.

Presentations

2017 "Repair and Replace: Lithic Production Behavior as Indicated by the Debitage Assemblage from CA-MRP-283 the Hackney Site." Presented at the Society for California Archaeology Annual Meeting, Fish Camp, California.

2016 "Bones, Stones, and Shell at Bolsa Chica: A Ceremonial Relationship?" Presented at the Society for California Archaeology Annual Meeting, Ontario, California.

2016 "Markers of Time: Exploring Transitions in the Bolsa Chica Assemblage." Presented at the Society for California Archaeology Annual Meeting, Ontario, California.

2016 "Dating Duress: Understanding Prehistoric Climate Change at Bolsa Chica." Presented at the Society for California Archaeology Annual Meeting, Ontario, California.

2015 "Successive Cultural Phasing Of Prehistoric Northern Orange County, California." Presented at the Society for California Archaeology Annual Meeting, Redding, California.

2015 "Southern California Cogged Stone Replication: Experimentation and Results." Presented at the Society for California Archaeology Annual Meeting, Redding, California.

2015 "Prehistoric House Keeping: Lithic Analysis of an Intermediate Horizon House Pit." Presented at the Society for California Archaeology Annual Meeting, Redding, California.

2015 "Pits and Privies: The Use and Disposal of Artifacts from Historic Los Angeles." Presented at the Society for California Archaeology Annual Meeting, Redding, California.

2015 "Grooving in the Past: A Demonstration of the Manufacturing of OGR beads and a look at Past SRS, Inc. Replicative Studies." Demonstration of experimental manufacturing techniques at the January meeting of The Pacific Coast Archaeological Society, Irvine, California.

2014 "From Artifact to Replication: Examining *Olivella* Grooved Bead Manufacturing." Presented at the Society for California Archaeology Annual Meeting, Visalia, California.

2014 "New Discoveries from an Old Collection: Comparing Recently Identified OGR Beads to Those Previously Analyzed from the Encino Village Site." Presented at the Society for California Archaeology Annual Meeting, Visalia, California.

2012 Bolsa Chica Archaeology: Part Seven: Culture and Chronology. Lithic demonstration of experimental manufacturing techniques at the April meeting of The Pacific Coast Archaeological Society, Irvine, California.

2012 "Expedient Flaked Tools from Bolsa Chica: Exploring the Lithic Technological Organization." Presented at the Society for California Archaeology Annual Meeting, San Diego, California.

2012 "Utilitarian and Ceremonial Ground Stone Production at Bolsa Chica Identified Through Production Tools." Presented at the Society for California Archaeology Annual Meeting, San Diego, California.

2012 "Connecting Production Industries at Bolsa Chica: Lithic Reduction and Bead Manufacturing." Presented at the Society for California Archaeology Annual Meeting, San Diego, California.

2011 Bolsa Chica Archaeology: Part Four: Mesa Production Industries. Co-presenter at the April meeting of The Pacific Coast Archaeological Society, Irvine, California.

2011 "Hammerstones from Bolsa Chica and Their Relationship towards Site Interpretation." Presented at the Society for California Archaeology Annual Meeting, Rohnert Park, California.

2011 "Exploring Bipolar Reduction at Bolsa Chica: Debitage Analysis and Replication." Presented at the Society for California Archaeology Annual Meeting, Rohnert Park, California.

ATTACHMENT B

Project Maps:

General Location Map
USGS Project Location Map
City 800' Project Location Map
Project Development Map

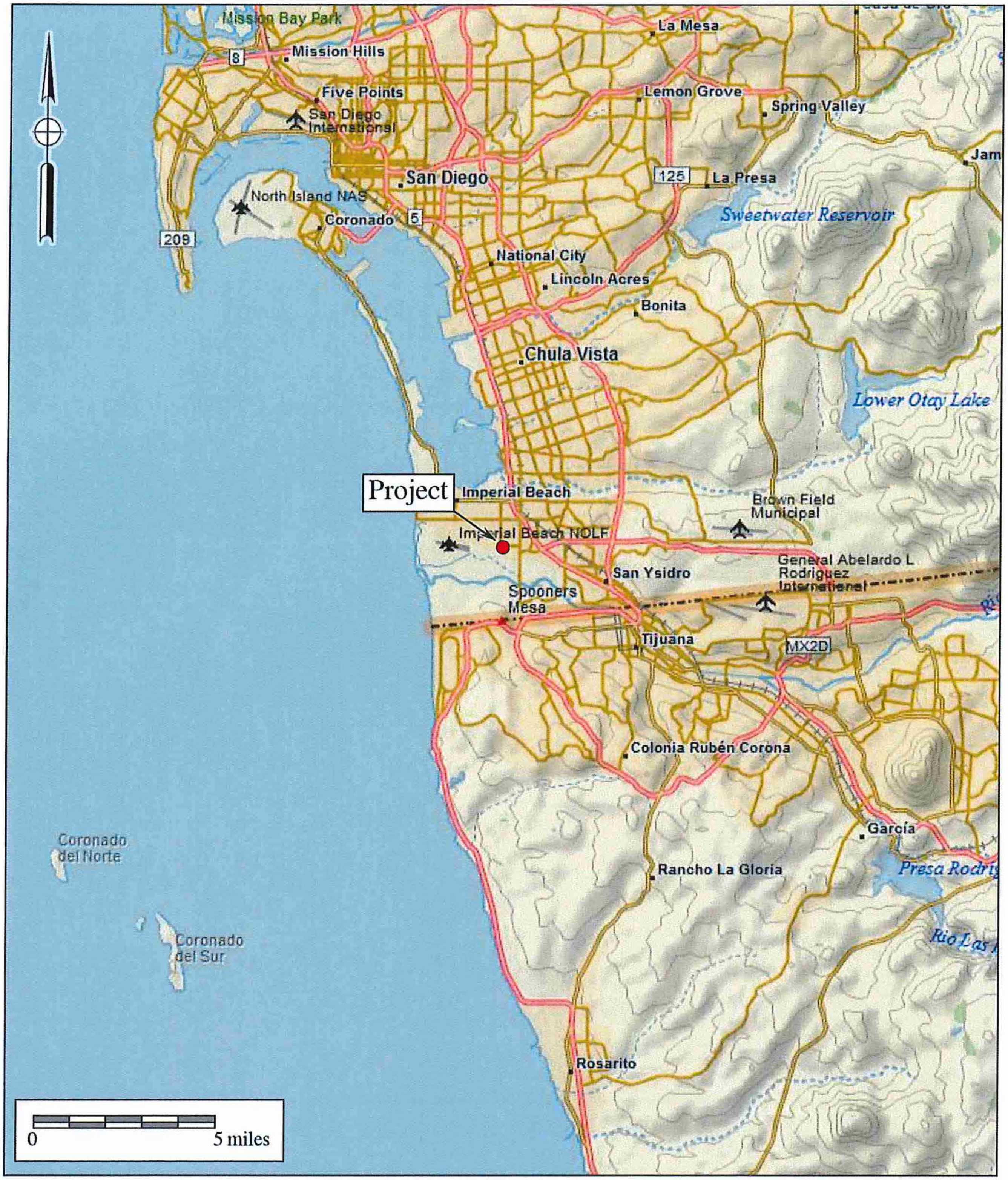

Figure 1

General Location Map

The 1695 Saturn Boulevard Project

DeLorme (1:250,000)

Brian F. Smith & Associates, Inc. • Archaeology • History • Paleontology • Biology

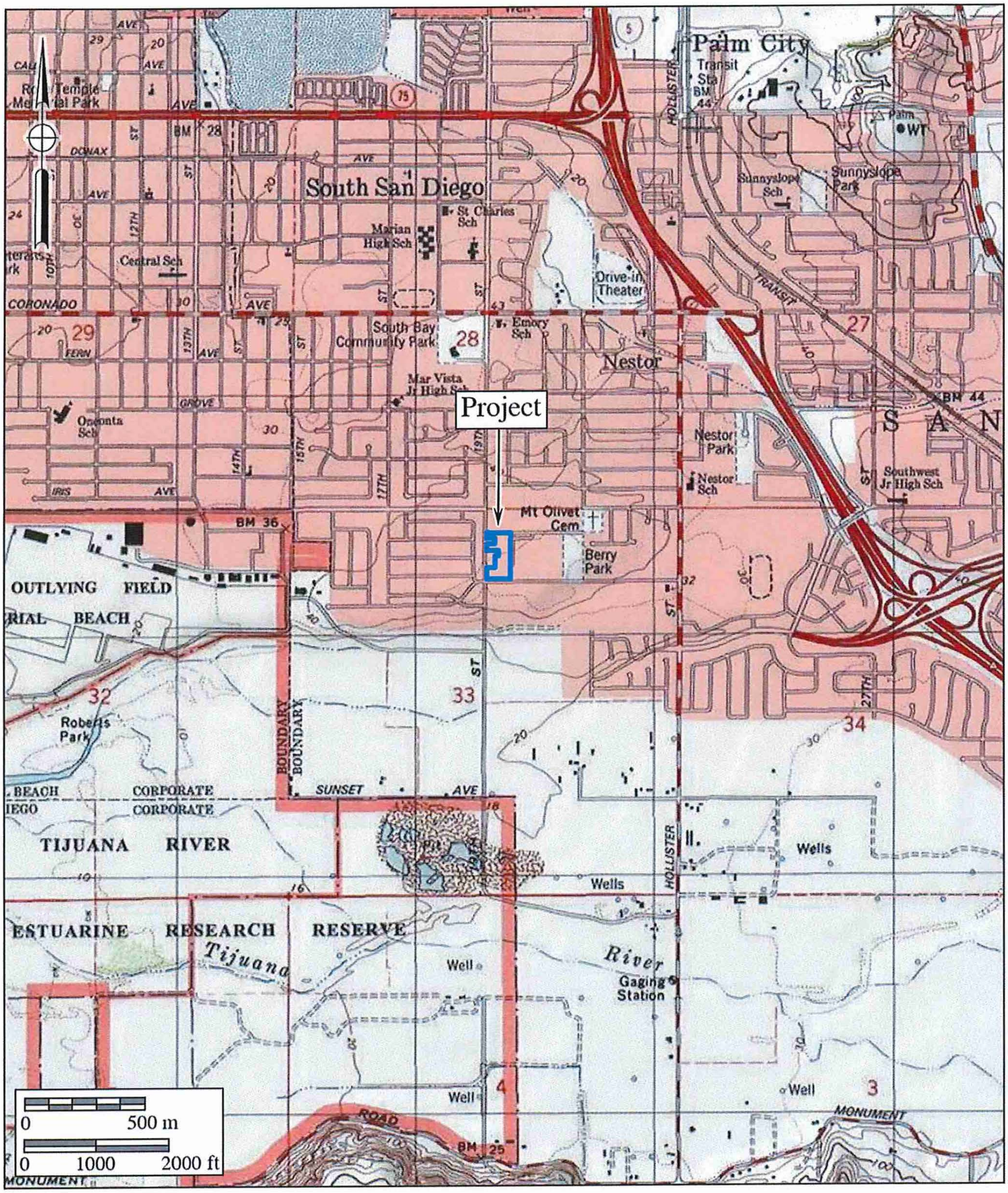

Figure 2

Project Location Map

The 1695 Saturn Boulevard Project

USGS *Imperial Beach* Quadrangle (7.5-minute series)

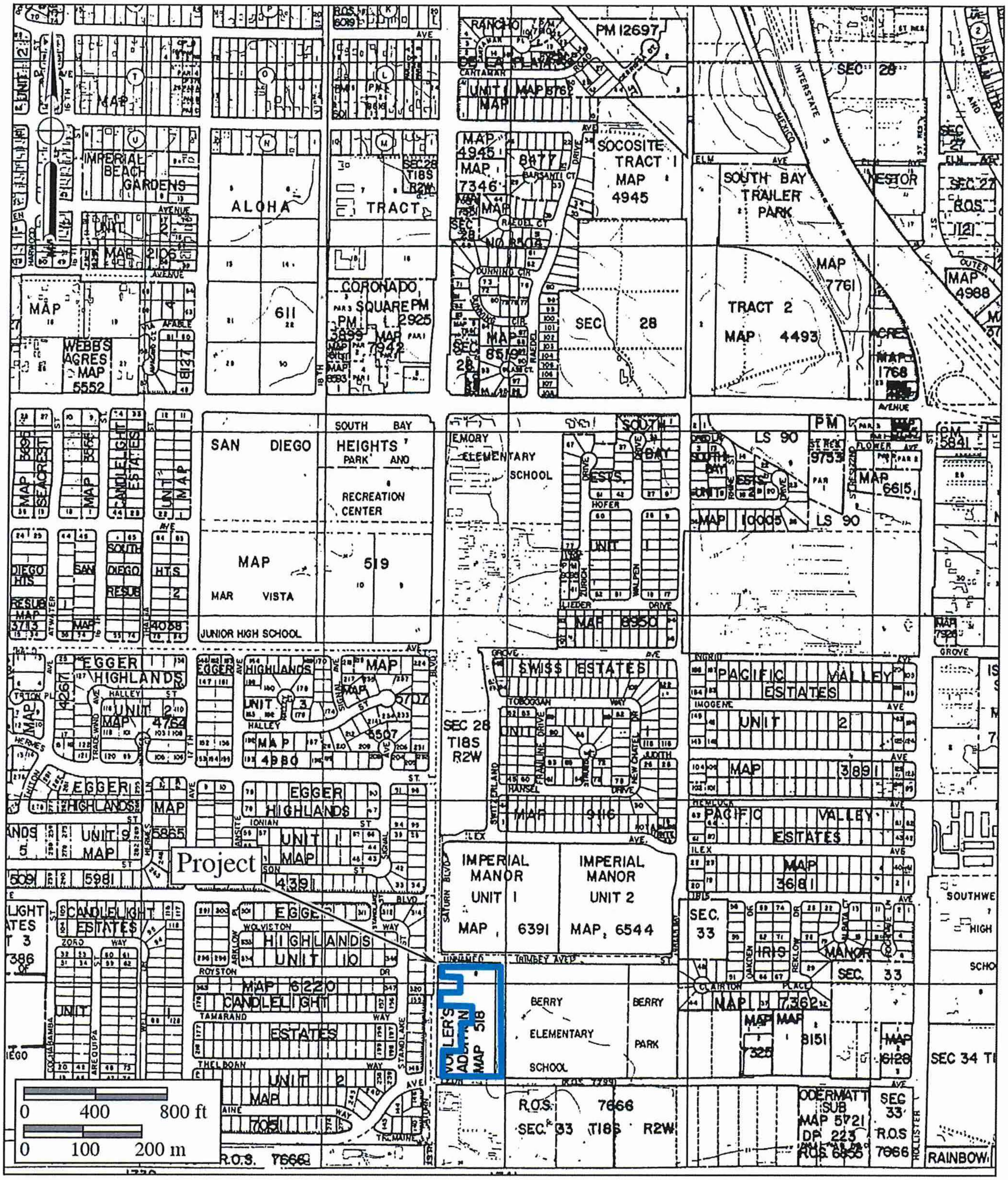

Figure 3

Project Location Map

The 1695 Saturn Boulevard Project

Shown on The City of San Diego 1" to 800' Scale Engineering Map

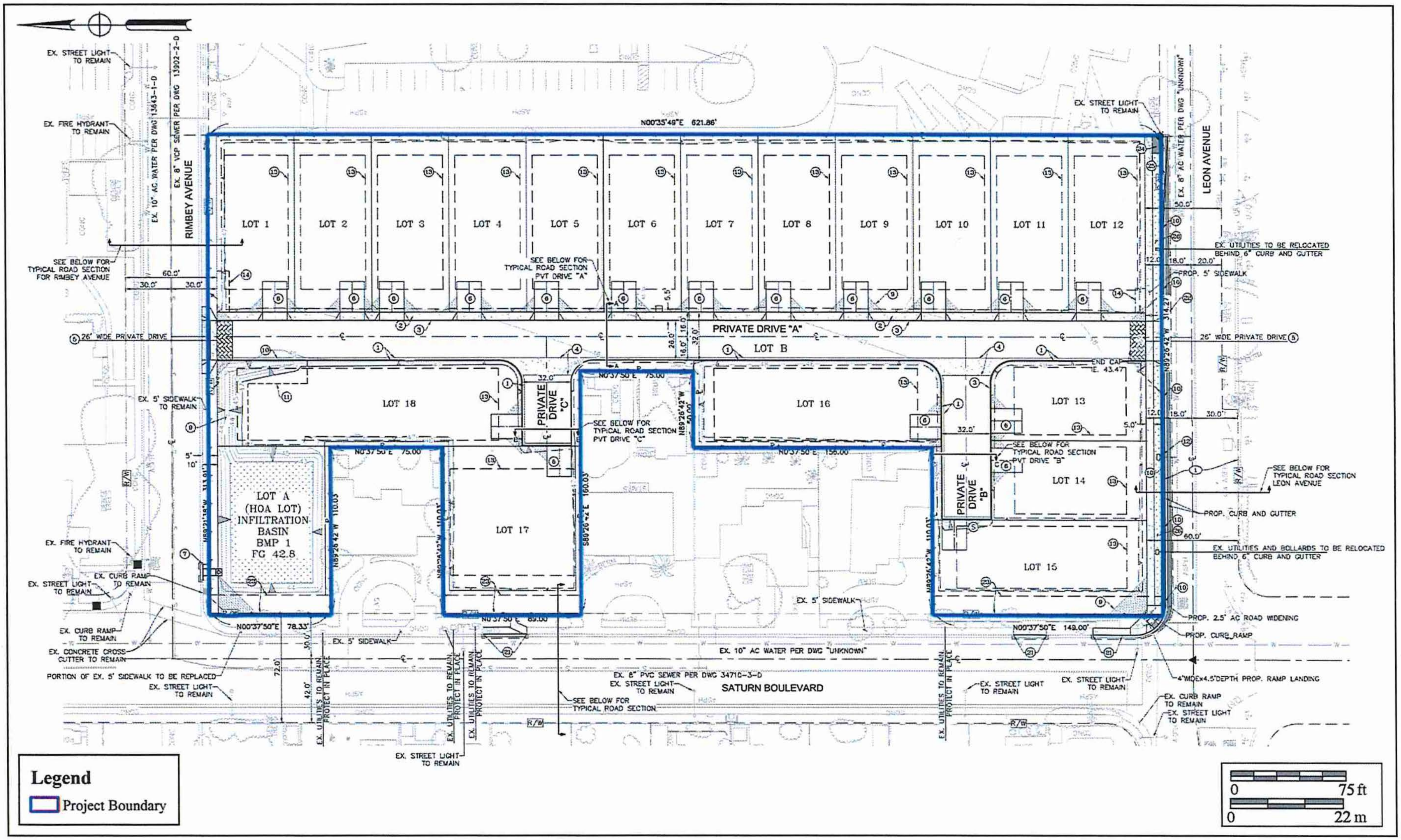

Figure 4

Project Development Map

The 1695 Saturn Boulevard Project

ATTACHMENT C

Archaeological Records Search Results

(Deleted for Public Review; Bound Separately)

ATTACHMENT D

NAHC Sacred Lands File Search Results

(Deleted for Public Review; Bound Separately)

DRAINAGE STUDY

For

1695 SATURN BOULEVARD

SAN DIEGO, CA 92154

TM-1996523, PDP-1996525

Prepared for:

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950 Garland Drive
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Report Prepared:

April 28, 2017, updated February 5,2018

Table of Contents

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CHAPTER 1 - EXECUTIVE SUMMARY

1.1 – Introduction

The 1695 Saturn Boulevard project site is located in the City of San Diego, California.

For drainage analysis, one (1) point of discharge (POD) has been designated within the project site for hydrologic analysis purposes. POD-1 is an existing drainage path located at the northeastern boundary of the project site.

This study analyzes existing and developed condition 100-year peak flowrates from the development to the POD from the project site.

The project site lies outside any FEMA 100-year floodplain zones. Therefore, no Letters of Map Revision will be required.

The project site does not support any wetland habitats, drainages, or waters that would fall under the jurisdiction of the Regional Water Quality Control Board, U.S. Army Corps of Engineers, or the California Department of Fish and Wildlife. Therefore, the project is not subject to the requirements of the Federal Clean Water Act Section 401 and 404, or California Fish and Game Code Section 1602 and is not required to obtain these permits.

Treatment of storm water runoff from the site has been addressed in a separate report - the “Storm Water Quality Management Plan for 1695 Saturn Boulevard” dated April 2017 by REC Consultants.

Per City of San Diego Drainage Design Manual and drainage critieria, the Modified Rational Method should be used to determine peak design flowrates when the contributing drainage area is less than 1.0 square mile. Since the total watershed area discharging from the site is less than 1.0 square mile, the AES computer software was used to model the pre & post developed condition runoff response per the Modified Rational Method.

Methodology used for the computation of design rainfall events, runoff coefficients, and rainfall intensity values are consistent with criteria set forth in the “City of San Diego Drainage Design Manual”. A more detailed explanation of methodology used for this analysis is listed in Chapter 2 of this report. Hydraulic Structures calculations related to the storm drain network are provided in Chapter 8 of this report.

Developed condition peak flows were calculated using AES 2015. The corresponding hydrographs were generated using the RickRat Hydro program by Rick Engineering. Hydraulic Modified-Puls detention basin routing of the AES 2015 rational method hydrology was performed using the Army Corps of Engineers HEC-HMS 4.0 software.

1.2 – Summary of Existing Conditions

In current conditions, the 1695 Saturn Boulevard project site contains an existing single family residence.

Per City of San Diego criteria: a runoff coefficient value of 0.55 (D-type soils/Single Family) was assumed. See table provided in Chapter 2.3. Per City of San Diego rainfall isopluvial maps, the design 100-year rainfall depth for the project site is 2.00 inches. The project site ultimately drains to the receiving Tijuana River 0.5 miles to the south of the project site.

Note that there is a 0.45 acre offsite-existing single-family residential development adjacent to the project site that also drains to the POD.

Table 1 below summarizes the existing condition design 100-year peak flow from the project site and includes the offsite flows.

Table 1–SUMMARY OF EXISTING CONDITIONS FLOWS

Discharge Location	Drainage Area (Ac)	Runoff Coefficient (C)	100-Year Peak Flow (cfs)
POD-1	4.80	0.55	6.46

1.3 – Summary of Developed Conditions

The 1695 Saturn Boulevard project proposes the demolition of the existing residence and the construction of an 18-lot single family residential development, access road, and associated landscaping.

Tributary area (including offsite) to POD-1 will remain as in existing conditions. Runoff from the developed site will drain to one (1) onsite receiving biofiltration BMP. Once flows are routed via the proposed LID BMP, runoff is conveyed via proposed conveyance network to POD-1. In addition to the existing offsite flows, there is also a landscaped portion within the project site that will bypass treatment and go directly to POD-1.

Per City of San Diego criteria: a runoff coefficient value of 0.55 (D-type soils/Single Family) was assumed. See table provided in Chapter 2.3. Per City of San Diego rainfall isopluvial maps, the design 100-year rainfall depth for the project site is 2.00 inches.

Table 2 below summarizes the developed condition design 100-year peak flow from the project site.

Table 2–SUMMARY OF DEVELOPED CONDITIONS FLOWS - UNMITIGATED

Discharge Location	Drainage Area (Ac)	Runoff Coefficient (C)	100-Year Peak Flow (cfs)
POD-1	4.80	0.55	6.83

Prior to discharging from the site, first flush runoff will be treated via one (1) bioretention (infiltration) based BMP in accordance with standards set forth by the Regional Water Quality Control Board and the City of San Diego's BMP Design Manual (see "Storm Water Quality Management Plan for 1695 Saturn Boulevard").

One (1) LID multiple purpose bioretention basin is located within the project site and is responsible for addressing water quality, hydromodification, and 100-year flow requirements for the project. In developed conditions, the basin will have six (6) inches of surface ponding from the first surface outlet to crest and a riser spillway structure (see dimensions in Tables 3 and 4). Flows will then discharge from the basin via the outlet structure or infiltrate through the gravel layer into the native soil. The spillway has sufficient capacity such that peak flows can be safely discharged to the receiving storm drain system.

Table 3–SUMMARY OF BMP BASIN DIMENSIONS

BMP	DIMENSIONS				
	BMP Area(1) (ft^2)	Gravel Depth (in)	Depth Surface Invert (ft.)(2)	Weir Perimeter Length (3) (ft.)	Total Surface Depth (4) (ft.)
BMP-1	4,297	12	3.00-ft	7-ft	0.50-ft

Notes: (1): Area of BMP = Area of Bottom=Area of Gravel
(2): Depth of ponding beneath riser structure's first surface spillway to bottom of gravel layer.
(3): Internal perimeter of riser
(4): Total surface depth of BMP is from top crest elevation to bottom of first surface invert.

Table 4–SUMMARY OF SPILLWAY DETAILS

BMP	Lower Slot		
	Width (ft.)	Height (ft.)	Elevation(1) (ft.)
BMP-1	7.00	0.25	3.00

Notes: (1): Basin ground surface elevation at bottom of gravel layer assumed to be 0.00 ft. elevation.

The developed condition peak flows were calculated using the modified rational method. The corresponding hydrographs were generated using the RickRat Hydro program by Rick Engineering. These hydrographs were then routed through the proposed on-site detention facility in HEC-HMS. The HMS Modified-Puls results are summarized in Table 5.

Table 5–SUMMARY OF DETENTION BASIN ROUTING

Detention Basin	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)	Peak Water Surface Elevation (ft.)
BMP-1	6.83	4.51	2.81

It should be noted that as a conservative design approach, it has been assumed that the detention facility was full up to first invert outlet prior to the routing of the 100-year event storm.

As HEC-HMS uses an elevation-storage-discharge function to model the basin volume (stage-storage) and basin discharge (stage-discharge) relationships, the available storage volume was calculated from the first surface slot to the crest of the basins.

Rational method hydrographs, stage-storage, stage-discharge relationships and HEC-HMS model output is provided in Chapter 6 of this report.

1.4 – Summary of Results

Table 6 summarizes developed and existing condition drainage areas and resultant 100-year peak flow rates at the POD from the 1695 Saturn Boulevard project. Per City of San Diego rainfall isopluvial maps, the design 100-year rainfall depth for the site area is 2.00 inches.

Table 6–SUMMARY OF PEAK FLOWS

Discharge Location	Area (ac)			100 Year Peak Flow (cfs)		
	Existing	Developed	Difference	Existing	Developed*	Difference
POD-1	4.80	4.80	0	6.46	5.08	-1.38

*Flows are mitigated

As shown in the above table, the proposed 1695 Saturn Boulevard project site will result in a net decrease of peak flow discharged from the project site by approximately 1.38 cfs.

No adverse impacts will occur to adjacent properties and downstream storm drain systems due to proposed development.

All developed runoff will receive water quality treatment in accordance with the site specific SWQMP. Additionally, the POD is HMP compliant as analyzed in the Hydromodification Technical Memo.

Final design details are provided in Chapter 8 of this report..

1.5 – References

"*City of San Diego Drainage Design Manual*", dated January 2017
"*County of San Diego Hydrology Manual*", June 2003

"*Stormwater Quality Management Plan for 1695 Saturn Boulevard*", dated April 2017 by REC Consultants.

"*Technical Memorandum: SWMM Modeling for 1695 Saturn Boulevard*", dated April 2017 by REC Consultants

1.6 – Declaration of Responsible Charge

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, 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 CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

Bruce A. Robertson R.C.E. 48529

CHAPTER 2 - METHODOLOGY

2.1 – City of San Diego Design Criteria

Chapter 2

Hydrology

The design discharge depends upon many variables. Some of the more important variables are duration and intensity of rainfall; storm frequency; ground cover; and the size, imperviousness, slope, and shape of the drainage area.

2.1. Discharge Flow Methods

The designer should check with Drainage and Flood Plain Management Section, Public Works Department, to determine if there are established storm discharge flows.

If the project involves a watershed of major size or importance, flood flows may already be established through one or more of the following activities:

1. Master Plan Developments in the City and/or County
2. Studies for Development and Road Projects near the proposed project
3. Flood Insurance Studies prepared by FEMA based on existing land use at the time the study was completed. Urbanization may have caused increased flows. FEMA maps can be viewed at the SanGIS web site (www.sangis.org).
4. Recorded flows may be available from the United States Geological Survey (USGS) or the County of San Diego

If no established storm discharge flows are available, the applicable methods are:

1. Rational Method for watersheds less than 0.5 square miles – See Appendix A
2. Modified Rational Method for watersheds between 0.5 and 1.0 square miles – See Appendix A; or,
3. Natural Resources Conservation Service (NRCS) Method (formally called Soil Conservation Service (SCS) Method) for watersheds greater than 1.0 square miles – See Appendix B; or
4. Hydrologic Engineering Center (HEC) computer method.

2.2 – Design Rainfall Determination

2.2.1 – 100-Year, 6-Hour Rainfall Isopluvial Map

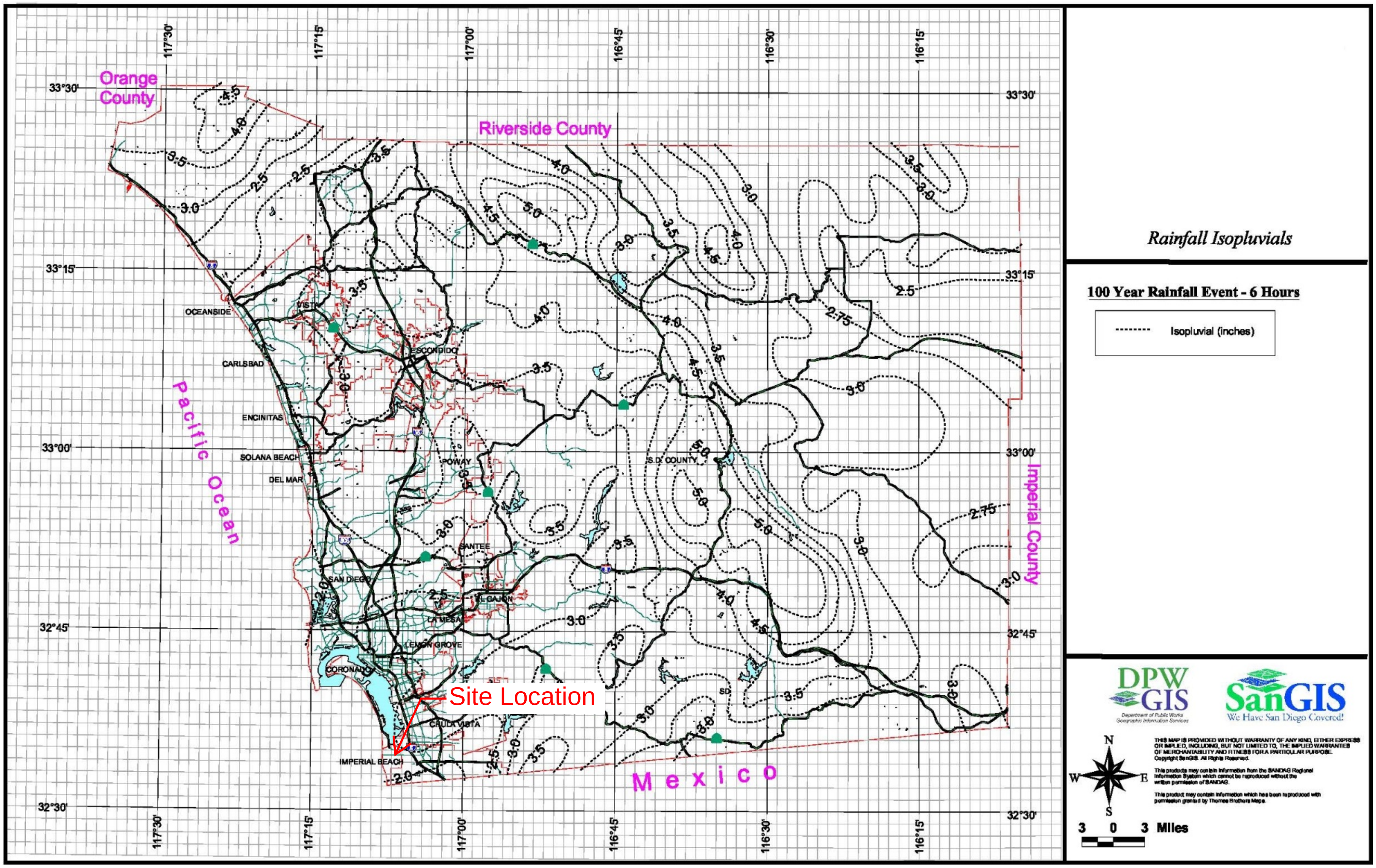


Figure B-2. 100-Year 6-Hour Isopluvials.

2.2.2 – 100-Year, 24-Hour Rainfall Isopluvial Map

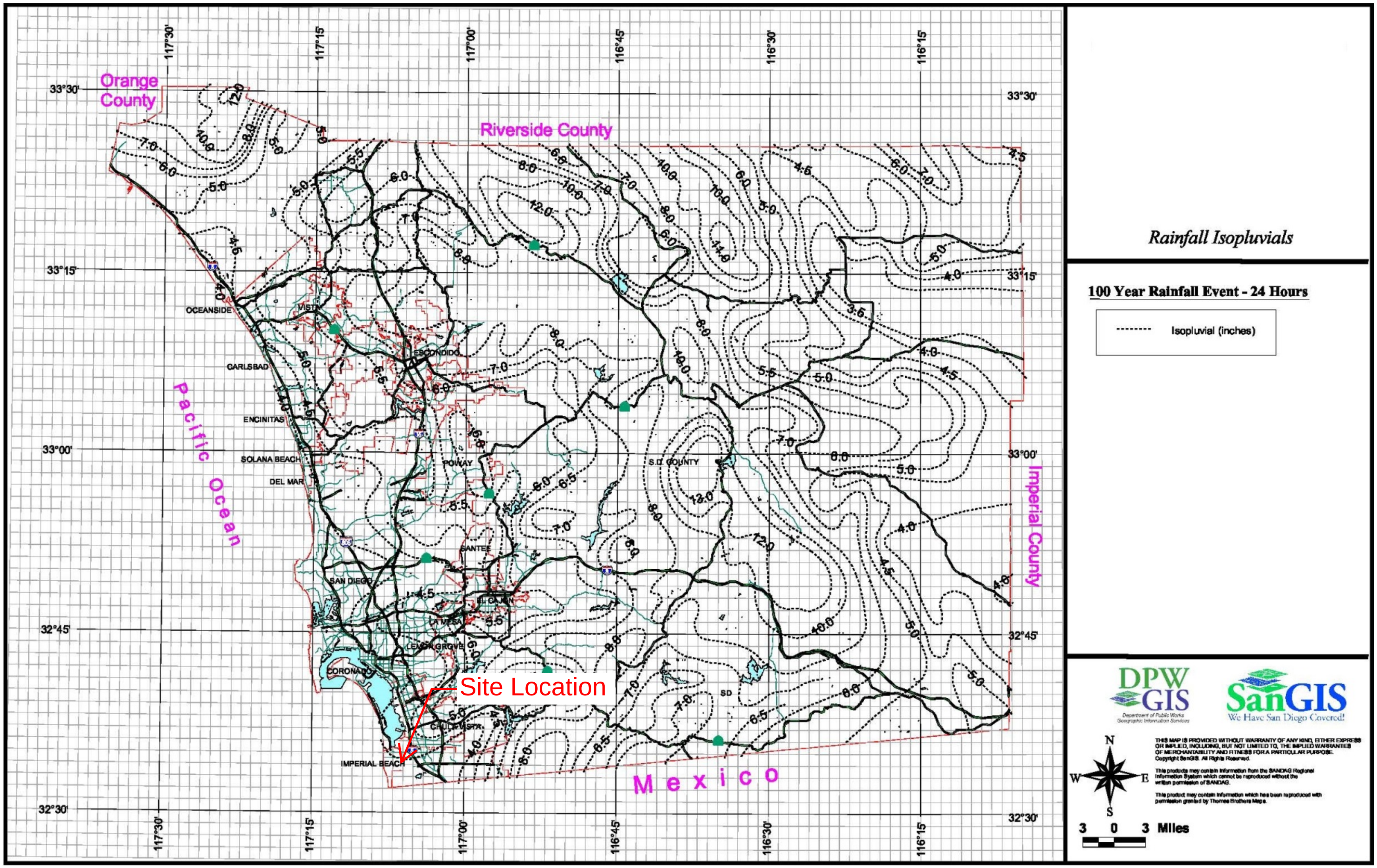


Figure B-3. 100-Year 24-Hour Isopluvials

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	Soil Type [1]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:
[1] Type D soil to be used for all areas.
[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness			=	50%
Tabulated imperviousness			=	80%
Revised C	=	(50/80) x 0.85	=	0.53

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_C for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_C calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).

2.4 – Urban Watershed Overland Time of flow Nomograph

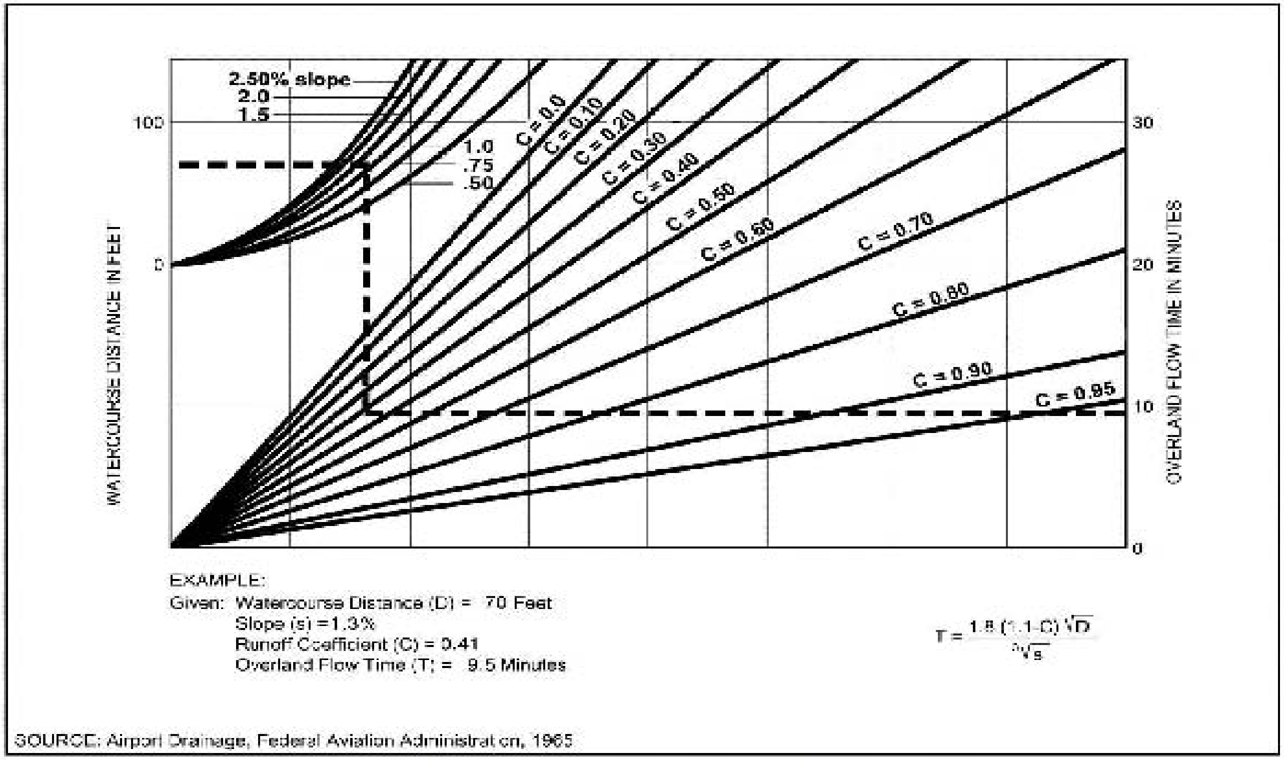


Figure A-4. Rational Formula – Overland Time of Flow Nomograph

Note: Use formula for watercourse distances in excess of 100 feet.

2.5 – City of San Diego Intensity- Duration Curve

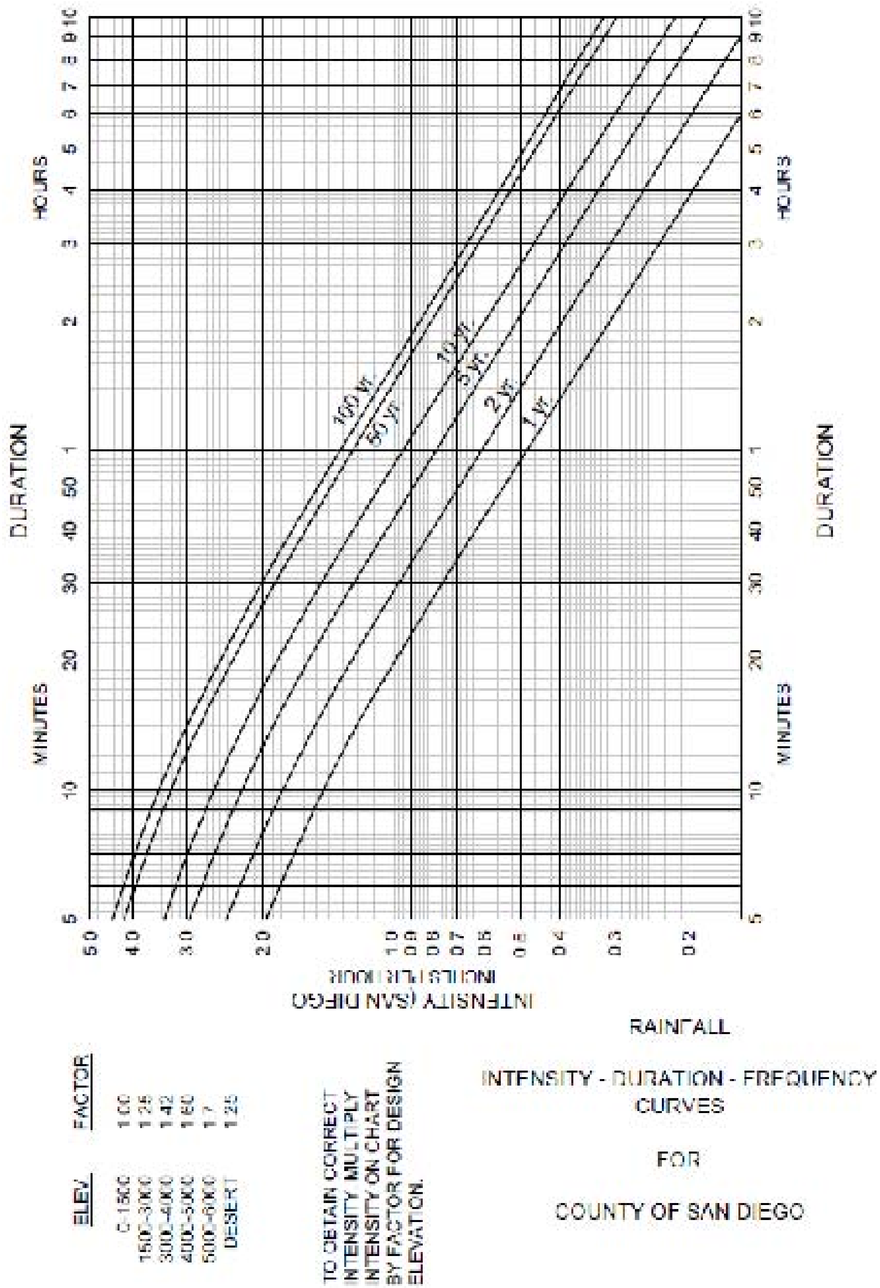


Figure A-1. Intensity-Duration-Frequency Design Chart

2.6 – Model Development Summary (from City of San Diego Drainage Design Manual)

A.1.4. Time of Concentration

The Time of Concentration (T_c) is the time required for runoff to flow from the most remote part of the watershed to the outlet point under consideration.

Methods of calculation differ for natural watersheds (non-urbanized) and for urban drainage systems. Also, when designing storm drain systems, the designer must consider the possibility that an existing natural watershed may become urbanized during the useful life of the storm drain system. Future land uses must be used for Tc and runoff calculations, and can be determined from the Community Plans.

a. Natural watersheds: Obtain Tc from Figures A.2 and A.3

b. Urban drainage systems: In the case of urban drainage systems, the time of concentration at any point within the drainage area is given by:

   $T_c = T_i + T_t$ where

   T_i is the inlet time or the time required for the storm water to flow to the first inlet in the system. It is the sum of time in overland flow across lots and in the street gutter.

   T_t is the travel time or the time required for the storm water to flow in the storm drain from the most upstream inlet to the point in question.

   Travel Time, T_t is computed by dividing the length of storm drain by the computed flow velocity. Since the velocity normally changes at each inlet because of changes in flow rate or slope, total travel time must be computed as the sum of the travel times for each section of the storm drain.

   The overland flow component of inlet time, T_i, may be estimated by the use of the chart shown in Figure A-4. Use Figure A-5 to estimate time of travel for street gutter flow.

CHAPTER 3 - 100 YEAR HYDROLOGIC ANALYSIS FOR EXISTING CONDITIONS

```
****************************************************************************

             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1643

                           Analysis prepared by:


 ************************** DESCRIPTION OF STUDY **************************
 * Existing Conditions Hydrology                                            *
 * 100 Year Storm                                                           *
 * Saturn Street                                                            *
 **************************************************************************


----------------------------------------------------------------------------
  FILE NAME: 1229PRE.DAT
  TIME/DATE OF STUDY: 13:22 01/25/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  1985 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 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.*

+--------------------------------------------------------------------------+
| Nodes 1-1000 represent tributary areas to POD-1. Node 1000 is POD-1.     |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
```

```
  UPSTREAM ELEVATION(FEET) =     49.00
  DOWNSTREAM ELEVATION(FEET) =     48.50
  ELEVATION DIFFERENCE(FEET) =      0.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.241
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE   1000.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     48.50  DOWNSTREAM(FEET) =     44.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   747.00   CHANNEL SLOPE =  0.0051
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.422
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.48
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.29
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   9.68
  Tc(MIN.) =   16.68
  SUBAREA AREA(ACRES) =     4.76       SUBAREA RUNOFF(CFS) =    6.34
  TOTAL AREA(ACRES) =        4.8         PEAK FLOW RATE(CFS) =       6.46

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   1.59
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE   1000.00 =     797.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.8  TC(MIN.) =     16.68
  PEAK FLOW RATE(CFS)   =       6.46
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 4 - 100 YEAR HYDROLOGIC ANALYSIS FOR UNMITIGATED CONDITION

```
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                         2003,1985,1981 HYDROLOGY MANUAL
         (c) Copyright 1982-2015 Advanced Engineering Software (aes)
             Ver. 22.0 Release Date: 07/01/2015  License ID 1643

                           Analysis prepared by:


 ************************** DESCRIPTION OF STUDY **************************
* Proposed Conditions Hydrology - Undetained                               *
* 100 Year Storm                                                           *
* Saturn                                                                   *
 **************************************************************************

----------------------------------------------------------------------------
  FILE NAME: 1229PSTU.DAT
  TIME/DATE OF STUDY: 13:33 01/25/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  1985 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 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.*

+--------------------------------------------------------------------------+
| Nodes 1-1000 represent tributary flows to POD-1. Node 1000 is POD-1.     |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =     49.17
```

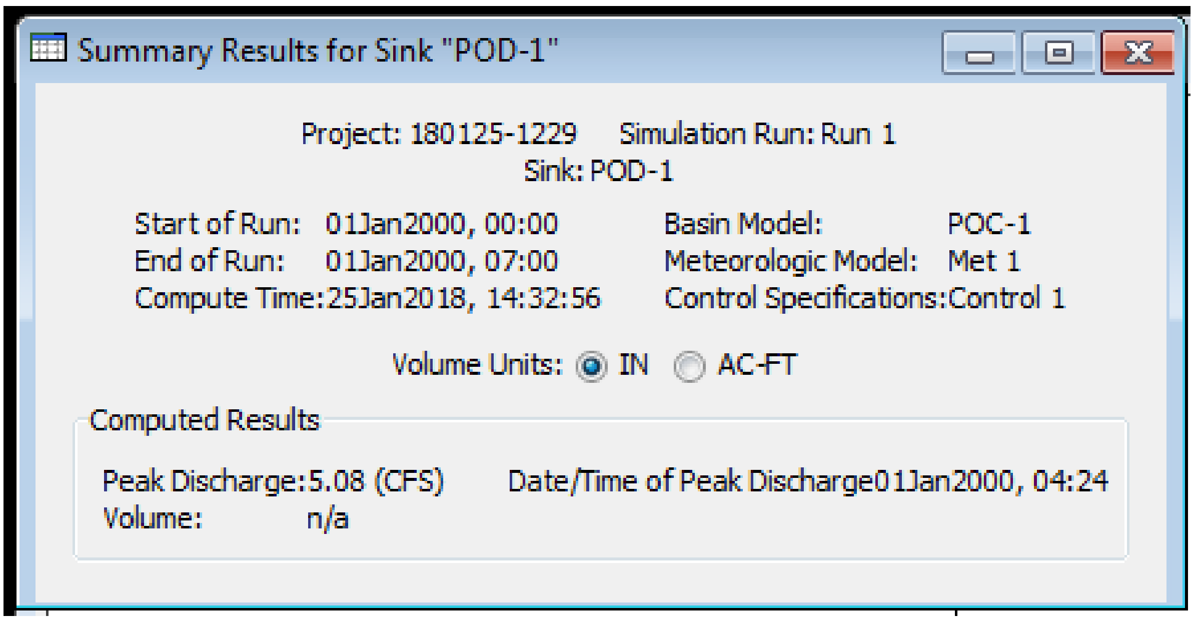
```
  DOWNSTREAM ELEVATION(FEET) =     47.63
  ELEVATION DIFFERENCE(FEET) =      1.54
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.812
  *CAUTION: SUBAREA SLOPE EXCEEDS COUNTY NOMOGRAPH
   DEFINITION. EXTRAPOLATION OF NOMOGRAPH USED.
  TIME OF CONCENTRATION ASSUMED AS 6-MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.685
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.18

+--------------------------------------------------------------------------+
| Node 3 is BMP-1.                                                         |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   47.63  DOWNSTREAM ELEVATION(FEET) =   44.80
  STREET LENGTH(FEET) =   663.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.83
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.40
    HALFSTREET FLOOD WIDTH(FEET) =   13.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.65
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.65
  STREET FLOW TRAVEL TIME(MIN.) =   6.72   Tc(MIN.) =   12.72
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.886
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  SUBAREA AREA(ACRES) =    3.24      SUBAREA RUNOFF(CFS) =    5.14
  TOTAL AREA(ACRES) =        3.3        PEAK FLOW RATE(CFS) =       5.32

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.47   HALFSTREET FLOOD WIDTH(FEET) =  17.07
  FLOW VELOCITY(FEET/SEC.) =  1.90   DEPTH*VELOCITY(FT*FT/SEC.) =   0.89
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     713.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1000.00 TO NODE   1000.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.72
  RAINFALL INTENSITY(INCH/HR) =   2.89
  TOTAL STREAM AREA(ACRES) =     3.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.32
```

```
+--------------------------------------------------------------------------+
| NODES 4-1000 REPRESENT BYPASS AREA TO POD-1. NODE 1000 IS POD-1          |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =     49.70
  DOWNSTREAM ELEVATION(FEET) =     48.70
  ELEVATION DIFFERENCE(FEET) =      1.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.556
  TIME OF CONCENTRATION ASSUMED AS 6-MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.685
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.26

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE   1000.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   48.70  DOWNSTREAM ELEVATION(FEET) =   44.70
  STREET LENGTH(FEET) =   906.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.85
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    7.16
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.30
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.38
  STREET FLOW TRAVEL TIME(MIN.) =  11.61   Tc(MIN.) =   17.61
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.339
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  SUBAREA AREA(ACRES) =    0.88      SUBAREA RUNOFF(CFS) =    1.13
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       1.39

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.34
  FLOW VELOCITY(FEET/SEC.) =  1.43   DEPTH*VELOCITY(FT*FT/SEC.) =   0.47
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE   1000.00 =     956.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1000.00 TO NODE   1000.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
================================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.61
  RAINFALL INTENSITY(INCH/HR) =   2.34
  TOTAL STREAM AREA(ACRES) =     0.98
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.39

+--------------------------------------------------------------------------+
| NODES 6-1000 REPRESENT OFFSITE FLOWS TO BMP-1 AND DISCHARGE POINT POD-1  |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =     49.00
  DOWNSTREAM ELEVATION(FEET) =     48.32
  ELEVATION DIFFERENCE(FEET) =      0.68
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.318
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.531
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     48.32  DOWNSTREAM(FEET) =     44.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   703.00   CHANNEL SLOPE =  0.0050
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.869
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.38
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.63
  AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =  18.63
  Tc(MIN.) =   24.95
  SUBAREA AREA(ACRES) =     0.45       SUBAREA RUNOFF(CFS) =    0.46
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       0.59

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   0.73
  LONGEST FLOWPATH FROM NODE      6.00 TO NODE      3.00 =     753.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1000.00 TO NODE   1000.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   24.95
  RAINFALL INTENSITY(INCH/HR) =   1.87
```

```
TOTAL STREAM AREA(ACRES) =     0.50
PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.59

** CONFLUENCE DATA **
STREAM     RUNOFF       Tc      INTENSITY      AREA
NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
    1        5.32    12.72        2.886          3.31
    2        1.39    17.61        2.339          0.98
    3        0.59    24.95        1.869          0.50

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR  3 STREAMS.

** PEAK FLOW RATE TABLE **
STREAM     RUNOFF      Tc      INTENSITY
NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
    1        6.83    12.72       2.886
    2        6.17    17.61       2.339
    3        5.14    24.95       1.869

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) =       6.83   Tc(MIN.) =   12.72
TOTAL AREA(ACRES) =        4.8
LONGEST FLOWPATH FROM NODE      4.00 TO NODE   1000.00 =     956.00 FEET.
============================================================================
END OF STUDY SUMMARY:
TOTAL AREA(ACRES)     =        4.8  TC(MIN.) =     12.72
PEAK FLOW RATE(CFS)   =       6.83
============================================================================
============================================================================
END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 5 - 100 YEAR HYDROLOGIC ANALYSIS FOR MITIGATED CONDITIONS



Project: 180125-1229 Simulation Run: Run 1
Sink: POD-1

Start of Run: 01Jan2000, 00:00 Basin Model: POC-1
End of Run: 01Jan2000, 07:00 Meteorologic Model: Met 1
Compute Time: 05Feb2018, 13:20:41 Control Specifications: Control 1

Date	Time	Outflow (CFS)
01Jan2000	00:00	0.00
01Jan2000	00:01	0.01
01Jan2000	00:02	0.01
01Jan2000	00:03	0.02
01Jan2000	00:04	0.02
01Jan2000	00:05	0.03
01Jan2000	00:06	0.03
01Jan2000	00:07	0.04
01Jan2000	00:08	0.04
01Jan2000	00:09	0.05
01Jan2000	00:10	0.06
01Jan2000	00:11	0.06
01Jan2000	00:12	0.07
01Jan2000	00:13	0.07
01Jan2000	00:14	0.08
01Jan2000	00:15	0.08
01Jan2000	00:16	0.10
01Jan2000	00:17	0.10
01Jan2000	00:18	0.12
01Jan2000	00:19	0.12
01Jan2000	00:20	0.13
01Jan2000	00:21	0.14
01Jan2000	00:22	0.15
01Jan2000	00:23	0.16
01Jan2000	00:24	0.17
01Jan2000	00:25	0.18

Date	Time	Outflow (CFS)
01Jan2000	00:26	0.19
01Jan2000	00:27	0.21
01Jan2000	00:28	0.22
01Jan2000	00:29	0.23
01Jan2000	00:30	0.24
01Jan2000	00:31	0.25
01Jan2000	00:32	0.26
01Jan2000	00:33	0.27
01Jan2000	00:34	0.27
01Jan2000	00:35	0.28
01Jan2000	00:36	0.29
01Jan2000	00:37	0.29
01Jan2000	00:38	0.30
01Jan2000	00:39	0.31
01Jan2000	00:40	0.31
01Jan2000	00:41	0.32
01Jan2000	00:42	0.32
01Jan2000	00:43	0.33
01Jan2000	00:44	0.33
01Jan2000	00:45	0.34
01Jan2000	00:46	0.34
01Jan2000	00:47	0.34
01Jan2000	00:48	0.35
01Jan2000	00:49	0.35
01Jan2000	00:50	0.35
01Jan2000	00:51	0.36
01Jan2000	00:52	0.36
01Jan2000	00:53	0.36
01Jan2000	00:54	0.36
01Jan2000	00:55	0.37
01Jan2000	00:56	0.37

Date	Time	Outflow (CFS)
01Jan2000	00:57	0.37
01Jan2000	00:58	0.37
01Jan2000	00:59	0.37
01Jan2000	01:00	0.37
01Jan2000	01:01	0.38
01Jan2000	01:02	0.38
01Jan2000	01:03	0.38
01Jan2000	01:04	0.38
01Jan2000	01:05	0.38
01Jan2000	01:06	0.38
01Jan2000	01:07	0.38
01Jan2000	01:08	0.38
01Jan2000	01:09	0.39
01Jan2000	01:10	0.39
01Jan2000	01:11	0.39
01Jan2000	01:12	0.39
01Jan2000	01:13	0.39
01Jan2000	01:14	0.39
01Jan2000	01:15	0.39
01Jan2000	01:16	0.39
01Jan2000	01:17	0.39
01Jan2000	01:18	0.39
01Jan2000	01:19	0.39
01Jan2000	01:20	0.39
01Jan2000	01:21	0.39
01Jan2000	01:22	0.39
01Jan2000	01:23	0.39
01Jan2000	01:24	0.39
01Jan2000	01:25	0.39
01Jan2000	01:26	0.39
01Jan2000	01:27	0.40

Date	Time	Outflow (CFS)
01Jan2000	01:28	0.40
01Jan2000	01:29	0.40
01Jan2000	01:30	0.40
01Jan2000	01:31	0.40
01Jan2000	01:32	0.40
01Jan2000	01:33	0.40
01Jan2000	01:34	0.40
01Jan2000	01:35	0.40
01Jan2000	01:36	0.40
01Jan2000	01:37	0.40
01Jan2000	01:38	0.40
01Jan2000	01:39	0.40
01Jan2000	01:40	0.40
01Jan2000	01:41	0.40
01Jan2000	01:42	0.40
01Jan2000	01:43	0.40
01Jan2000	01:44	0.40
01Jan2000	01:45	0.40
01Jan2000	01:46	0.40
01Jan2000	01:47	0.40
01Jan2000	01:48	0.40
01Jan2000	01:49	0.40
01Jan2000	01:50	0.40
01Jan2000	01:51	0.40
01Jan2000	01:52	0.40
01Jan2000	01:53	0.40
01Jan2000	01:54	0.40
01Jan2000	01:55	0.40
01Jan2000	01:56	0.40
01Jan2000	01:57	0.40
01Jan2000	01:58	0.40

Date	Time	Outflow (CFS)
01Jan2000	01:59	0.40
01Jan2000	02:00	0.40
01Jan2000	02:01	0.40
01Jan2000	02:02	0.40
01Jan2000	02:03	0.41
01Jan2000	02:04	0.41
01Jan2000	02:05	0.41
01Jan2000	02:06	0.42
01Jan2000	02:07	0.42
01Jan2000	02:08	0.42
01Jan2000	02:09	0.43
01Jan2000	02:10	0.43
01Jan2000	02:11	0.43
01Jan2000	02:12	0.44
01Jan2000	02:13	0.44
01Jan2000	02:14	0.45
01Jan2000	02:15	0.45
01Jan2000	02:16	0.45
01Jan2000	02:17	0.45
01Jan2000	02:18	0.46
01Jan2000	02:19	0.46
01Jan2000	02:20	0.46
01Jan2000	02:21	0.46
01Jan2000	02:22	0.47
01Jan2000	02:23	0.47
01Jan2000	02:24	0.47
01Jan2000	02:25	0.47
01Jan2000	02:26	0.47
01Jan2000	02:27	0.48
01Jan2000	02:28	0.48
01Jan2000	02:29	0.48

Date	Time	Outflow (CFS)
01Jan2000	02:30	0.48
01Jan2000	02:31	0.48
01Jan2000	02:32	0.48
01Jan2000	02:33	0.48
01Jan2000	02:34	0.48
01Jan2000	02:35	0.48
01Jan2000	02:36	0.49
01Jan2000	02:37	0.49
01Jan2000	02:38	0.49
01Jan2000	02:39	0.49
01Jan2000	02:40	0.49
01Jan2000	02:41	0.50
01Jan2000	02:42	0.50
01Jan2000	02:43	0.50
01Jan2000	02:44	0.50
01Jan2000	02:45	0.51
01Jan2000	02:46	0.51
01Jan2000	02:47	0.52
01Jan2000	02:48	0.52
01Jan2000	02:49	0.52
01Jan2000	02:50	0.53
01Jan2000	02:51	0.53
01Jan2000	02:52	0.54
01Jan2000	02:53	0.54
01Jan2000	02:54	0.54
01Jan2000	02:55	0.55
01Jan2000	02:56	0.55
01Jan2000	02:57	0.55
01Jan2000	02:58	0.56
01Jan2000	02:59	0.56
01Jan2000	03:00	0.56

Date	Time	Outflow (CFS)
01Jan2000	03:01	0.57
01Jan2000	03:02	0.58
01Jan2000	03:03	0.59
01Jan2000	03:04	0.59
01Jan2000	03:05	0.60
01Jan2000	03:06	0.61
01Jan2000	03:07	0.62
01Jan2000	03:08	0.62
01Jan2000	03:09	0.64
01Jan2000	03:10	0.65
01Jan2000	03:11	0.66
01Jan2000	03:12	0.67
01Jan2000	03:13	0.68
01Jan2000	03:14	0.69
01Jan2000	03:15	0.70
01Jan2000	03:16	0.71
01Jan2000	03:17	0.72
01Jan2000	03:18	0.74
01Jan2000	03:19	0.75
01Jan2000	03:20	0.76
01Jan2000	03:21	0.77
01Jan2000	03:22	0.78
01Jan2000	03:23	0.78
01Jan2000	03:24	0.79
01Jan2000	03:25	0.80
01Jan2000	03:26	0.81
01Jan2000	03:27	0.82
01Jan2000	03:28	0.82
01Jan2000	03:29	0.83
01Jan2000	03:30	0.84
01Jan2000	03:31	0.85

Date	Time	Outflow (CFS)
01Jan2000	03:32	0.86
01Jan2000	03:33	0.87
01Jan2000	03:34	0.87
01Jan2000	03:35	0.88
01Jan2000	03:36	0.89
01Jan2000	03:37	0.90
01Jan2000	03:38	0.91
01Jan2000	03:39	0.91
01Jan2000	03:40	0.92
01Jan2000	03:41	0.93
01Jan2000	03:42	0.94
01Jan2000	03:43	0.95
01Jan2000	03:44	0.96
01Jan2000	03:45	0.98
01Jan2000	03:46	0.99
01Jan2000	03:47	1.01
01Jan2000	03:48	1.03
01Jan2000	03:49	1.05
01Jan2000	03:50	1.07
01Jan2000	03:51	1.10
01Jan2000	03:52	1.12
01Jan2000	03:53	1.15
01Jan2000	03:54	1.17
01Jan2000	03:55	1.26
01Jan2000	03:56	1.34
01Jan2000	03:57	1.42
01Jan2000	03:58	1.49
01Jan2000	03:59	1.56
01Jan2000	04:00	1.63
01Jan2000	04:01	1.69
01Jan2000	04:02	1.75

Date	Time	Outflow (CFS)
01Jan2000	04:03	1.81
01Jan2000	04:04	1.86
01Jan2000	04:05	1.92
01Jan2000	04:06	1.96
01Jan2000	04:07	2.02
01Jan2000	04:08	2.10
01Jan2000	04:09	2.21
01Jan2000	04:10	2.38
01Jan2000	04:11	2.57
01Jan2000	04:12	2.82
01Jan2000	04:13	2.99
01Jan2000	04:14	3.21
01Jan2000	04:15	3.45
01Jan2000	04:16	3.71
01Jan2000	04:17	3.98
01Jan2000	04:18	4.25
01Jan2000	04:19	4.56
01Jan2000	04:20	4.82
01Jan2000	04:21	4.97
01Jan2000	04:22	5.05
01Jan2000	04:23	5.08
01Jan2000	04:24	5.08
01Jan2000	04:25	5.04
01Jan2000	04:26	4.95
01Jan2000	04:27	4.84
01Jan2000	04:28	4.70
01Jan2000	04:29	4.53
01Jan2000	04:30	4.32
01Jan2000	04:31	4.15
01Jan2000	04:32	3.89
01Jan2000	04:33	3.56

Date	Time	Outflow (CFS)
01Jan2000	04:34	3.24
01Jan2000	04:35	2.96
01Jan2000	04:36	2.70
01Jan2000	04:37	2.47
01Jan2000	04:38	2.27
01Jan2000	04:39	2.08
01Jan2000	04:40	1.92
01Jan2000	04:41	1.78
01Jan2000	04:42	1.65
01Jan2000	04:43	1.55
01Jan2000	04:44	1.46
01Jan2000	04:45	1.39
01Jan2000	04:46	1.31
01Jan2000	04:47	1.25
01Jan2000	04:48	1.18
01Jan2000	04:49	1.13
01Jan2000	04:50	1.08
01Jan2000	04:51	1.04
01Jan2000	04:52	1.00
01Jan2000	04:53	0.96
01Jan2000	04:54	0.93
01Jan2000	04:55	0.90
01Jan2000	04:56	0.87
01Jan2000	04:57	0.84
01Jan2000	04:58	0.82
01Jan2000	04:59	0.80
01Jan2000	05:00	0.78
01Jan2000	05:01	0.76
01Jan2000	05:02	0.74
01Jan2000	05:03	0.72
01Jan2000	05:04	0.70

Date	Time	Outflow (CFS)
01Jan2000	05:05	0.69
01Jan2000	05:06	0.67
01Jan2000	05:07	0.66
01Jan2000	05:08	0.65
01Jan2000	05:09	0.63
01Jan2000	05:10	0.62
01Jan2000	05:11	0.62
01Jan2000	05:12	0.61
01Jan2000	05:13	0.60
01Jan2000	05:14	0.60
01Jan2000	05:15	0.59
01Jan2000	05:16	0.59
01Jan2000	05:17	0.58
01Jan2000	05:18	0.58
01Jan2000	05:19	0.57
01Jan2000	05:20	0.57
01Jan2000	05:21	0.56
01Jan2000	05:22	0.56
01Jan2000	05:23	0.56
01Jan2000	05:24	0.55
01Jan2000	05:25	0.55
01Jan2000	05:26	0.55
01Jan2000	05:27	0.54
01Jan2000	05:28	0.54
01Jan2000	05:29	0.54
01Jan2000	05:30	0.53
01Jan2000	05:31	0.53
01Jan2000	05:32	0.52
01Jan2000	05:33	0.52
01Jan2000	05:34	0.51
01Jan2000	05:35	0.51

Date	Time	Outflow (CFS)
01Jan2000	05:36	0.50
01Jan2000	05:37	0.50
01Jan2000	05:38	0.49
01Jan2000	05:39	0.49
01Jan2000	05:40	0.48
01Jan2000	05:41	0.48
01Jan2000	05:42	0.47
01Jan2000	05:43	0.47
01Jan2000	05:44	0.46
01Jan2000	05:45	0.46
01Jan2000	05:46	0.46
01Jan2000	05:47	0.45
01Jan2000	05:48	0.45
01Jan2000	05:49	0.45
01Jan2000	05:50	0.44
01Jan2000	05:51	0.44
01Jan2000	05:52	0.44
01Jan2000	05:53	0.44
01Jan2000	05:54	0.43
01Jan2000	05:55	0.43
01Jan2000	05:56	0.43
01Jan2000	05:57	0.43
01Jan2000	05:58	0.43
01Jan2000	05:59	0.43
01Jan2000	06:00	0.42
01Jan2000	06:01	0.41
01Jan2000	06:02	0.41
01Jan2000	06:03	0.40
01Jan2000	06:04	0.40
01Jan2000	06:05	0.39
01Jan2000	06:06	0.38

Date	Time	Outflow (CFS)
01Jan2000	06:07	0.37
01Jan2000	06:08	0.36
01Jan2000	06:09	0.35
01Jan2000	06:10	0.33
01Jan2000	06:11	0.32
01Jan2000	06:12	0.30
01Jan2000	06:13	0.29
01Jan2000	06:14	0.27
01Jan2000	06:15	0.26
01Jan2000	06:16	0.24
01Jan2000	06:17	0.23
01Jan2000	06:18	0.20
01Jan2000	06:19	0.19
01Jan2000	06:20	0.18
01Jan2000	06:21	0.17
01Jan2000	06:22	0.16
01Jan2000	06:23	0.15
01Jan2000	06:24	0.14
01Jan2000	06:25	0.13
01Jan2000	06:26	0.12
01Jan2000	06:27	0.12
01Jan2000	06:28	0.11
01Jan2000	06:29	0.10
01Jan2000	06:30	0.10
01Jan2000	06:31	0.09
01Jan2000	06:32	0.09
01Jan2000	06:33	0.08
01Jan2000	06:34	0.08
01Jan2000	06:35	0.07
01Jan2000	06:36	0.07
01Jan2000	06:37	0.06

Date	Time	Outflow (CFS)
01Jan2000	06:38	0.06
01Jan2000	06:39	0.06
01Jan2000	06:40	0.05
01Jan2000	06:41	0.05
01Jan2000	06:42	0.05
01Jan2000	06:43	0.04
01Jan2000	06:44	0.04
01Jan2000	06:45	0.04
01Jan2000	06:46	0.04
01Jan2000	06:47	0.03
01Jan2000	06:48	0.03
01Jan2000	06:49	0.03
01Jan2000	06:50	0.03
01Jan2000	06:51	0.03
01Jan2000	06:52	0.03
01Jan2000	06:53	0.02
01Jan2000	06:54	0.02
01Jan2000	06:55	0.02
01Jan2000	06:56	0.02
01Jan2000	06:57	0.02
01Jan2000	06:58	0.02
01Jan2000	06:59	0.02
01Jan2000	07:00	0.02

CHAPTER 6 – MODIFIED-PULS DETENTIONS ROUTING

6.1 – Rational Method Hydrograph

RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE 1/25/2018
HYDROGRAPH FILE NAME BMP-1
TIME OF CONCENTRATION 13 MIN.
6 HOUR RAINFALL 2 INCHES
BASIN AREA 3.81 ACRES
RUNOFF COEFFICIENT 0.55
PEAK DISCHARGE 6.83 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 13	DISCHARGE (CFS) = 0
TIME (MIN) = 26	DISCHARGE (CFS) = 0.3
TIME (MIN) = 39	DISCHARGE (CFS) = 0.3
TIME (MIN) = 52	DISCHARGE (CFS) = 0.3
TIME (MIN) = 65	DISCHARGE (CFS) = 0.3
TIME (MIN) = 78	DISCHARGE (CFS) = 0.3
TIME (MIN) = 91	DISCHARGE (CFS) = 0.3
TIME (MIN) = 104	DISCHARGE (CFS) = 0.3
TIME (MIN) = 117	DISCHARGE (CFS) = 0.3
TIME (MIN) = 130	DISCHARGE (CFS) = 0.4
TIME (MIN) = 143	DISCHARGE (CFS) = 0.4
TIME (MIN) = 156	DISCHARGE (CFS) = 0.4
TIME (MIN) = 169	DISCHARGE (CFS) = 0.5
TIME (MIN) = 182	DISCHARGE (CFS) = 0.5
TIME (MIN) = 195	DISCHARGE (CFS) = 0.6
TIME (MIN) = 208	DISCHARGE (CFS) = 0.7
TIME (MIN) = 221	DISCHARGE (CFS) = 0.8
TIME (MIN) = 234	DISCHARGE (CFS) = 1.2
TIME (MIN) = 247	DISCHARGE (CFS) = 0.8
TIME (MIN) = 260	DISCHARGE (CFS) = 6.83
TIME (MIN) = 273	DISCHARGE (CFS) = 0.9
TIME (MIN) = 286	DISCHARGE (CFS) = 0.6
TIME (MIN) = 299	DISCHARGE (CFS) = 0.5
TIME (MIN) = 312	DISCHARGE (CFS) = 0.4
TIME (MIN) = 325	DISCHARGE (CFS) = 0.4
TIME (MIN) = 338	DISCHARGE (CFS) = 0.3
TIME (MIN) = 351	DISCHARGE (CFS) = 0.3
TIME (MIN) = 364	DISCHARGE (CFS) = 0.3
TIME (MIN) = 377	DISCHARGE (CFS) = 0

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 1/25/2018
HYDROGRAPH FILE NAME BYPASS-1
TIME OF CONCENTRATION 18 MIN.
6 HOUR RAINFALL 2 INCHES
BASIN AREA 0.98 ACRES
RUNOFF COEFFICIENT 0.55
PEAK DISCHARGE 1.39 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 18	DISCHARGE (CFS) = 0.1
TIME (MIN) = 36	DISCHARGE (CFS) = 0.1
TIME (MIN) = 54	DISCHARGE (CFS) = 0.1
TIME (MIN) = 72	DISCHARGE (CFS) = 0.1
TIME (MIN) = 90	DISCHARGE (CFS) = 0.1
TIME (MIN) = 108	DISCHARGE (CFS) = 0.1
TIME (MIN) = 126	DISCHARGE (CFS) = 0.1
TIME (MIN) = 144	DISCHARGE (CFS) = 0.1
TIME (MIN) = 162	DISCHARGE (CFS) = 0.1
TIME (MIN) = 180	DISCHARGE (CFS) = 0.1
TIME (MIN) = 198	DISCHARGE (CFS) = 0.2
TIME (MIN) = 216	DISCHARGE (CFS) = 0.2
TIME (MIN) = 234	DISCHARGE (CFS) = 0.2
TIME (MIN) = 252	DISCHARGE (CFS) = 1.39
TIME (MIN) = 270	DISCHARGE (CFS) = 0.2
TIME (MIN) = 288	DISCHARGE (CFS) = 0.1
TIME (MIN) = 306	DISCHARGE (CFS) = 0.1
TIME (MIN) = 324	DISCHARGE (CFS) = 0.1
TIME (MIN) = 342	DISCHARGE (CFS) = 0.1
TIME (MIN) = 360	DISCHARGE (CFS) = 0.1
TIME (MIN) = 378	DISCHARGE (CFS) = 0

6.2 Stage Storage & Stage-Discharge Relationships

Elevation (ft)			Area(sq-ft)	Volume (ac-ft)	
Actual(in)	Actual(ft)	Model (ft)			
0.00	0.00	0.00	4297	0.0000	
12.00	1.00	0.40	4297	0.0395	**TOP OF GRAVEL[1](0.4 voids)**
13.00	1.08	0.48	4367	0.0477	
14.00	1.17	0.57	4438	0.0562	
15.00	1.25	0.65	4510	0.0647	
16.00	1.33	0.73	4581	0.0734	
17.00	1.42	0.82	4653	0.0823	
18.00	1.50	0.90	4726	0.0912	
19.00	1.58	0.98	4799	0.1003	
20.00	1.67	1.07	4872	0.1096	
21.00	1.75	1.15	4946	0.1190	
22.00	1.83	1.23	5020	0.1285	
23.00	1.92	1.32	5095	0.1382	
24.00	2.00	1.40	5170	0.1480	
25.00	2.08	1.48	5245	0.1580	
26.00	2.17	1.57	5321	0.1681	
27.00	2.25	1.65	5397	0.1783	
28.00	2.33	1.73	5473	0.1887	
29.00	2.42	1.82	5550	0.1993	
30.00	2.50	1.90	5628	0.2100	
31.00	2.58	1.98	5705	0.2208	
32.00	2.67	2.07	5783	0.2318	
33.00	2.75	2.15	5862	0.2429	
34.00	2.83	2.23	5941	0.2542	
35.00	2.92	2.32	6020	0.2657	
36.00	3.00	2.40	6100	0.2773	**EMERGENCY WEIR[2]**
37.00	3.08	2.48	6180	0.2890	
38.00	3.17	2.57	6261	0.3009	
39.00	3.25	2.65	6342	0.3130	
40.00	3.33	2.73	6423	0.3252	
41.00	3.42	2.82	6505	0.3375	
42.00	3.50	2.90	6587	0.3501	**BASIN CREST**

NOTES:

(1): All elevations measured from bottom of gravel layer. These are model elevations, not actual elevations. As such, 1.00-ft of gravel is represented as 0.4-ft due to the 0.4 porosity.

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

Outlet structure for Discharge of BMP 1

Discharge vs Elevation Table

Low orifice	0.625 "	Lower slot		Lower Weir			
Number of orif:	0	Number of slots:	1	Number of weirs:	0		
Cg-low:	0.61	Invert:	2.40 ft	Invert:	0.000 ft		
		B	7.00 ft	B:	0.000 ft		
Middle orifice	1.000 "	hslot	0.250 ft				
Number of orif:	0.000						
Cg-middle:	0.61	Upper slot		Upper Weir		Emergency weir	
invert elev:	0 ft	Number of slots:	0	Number of weirs:	0	Invert:	0.000 ft
		Invert:	0.00 ft	Invert:	0.000 ft	W:	0.00 ft
		B:	0.00 ft	B:	0.00 ft		
		hslot	0.000 ft				

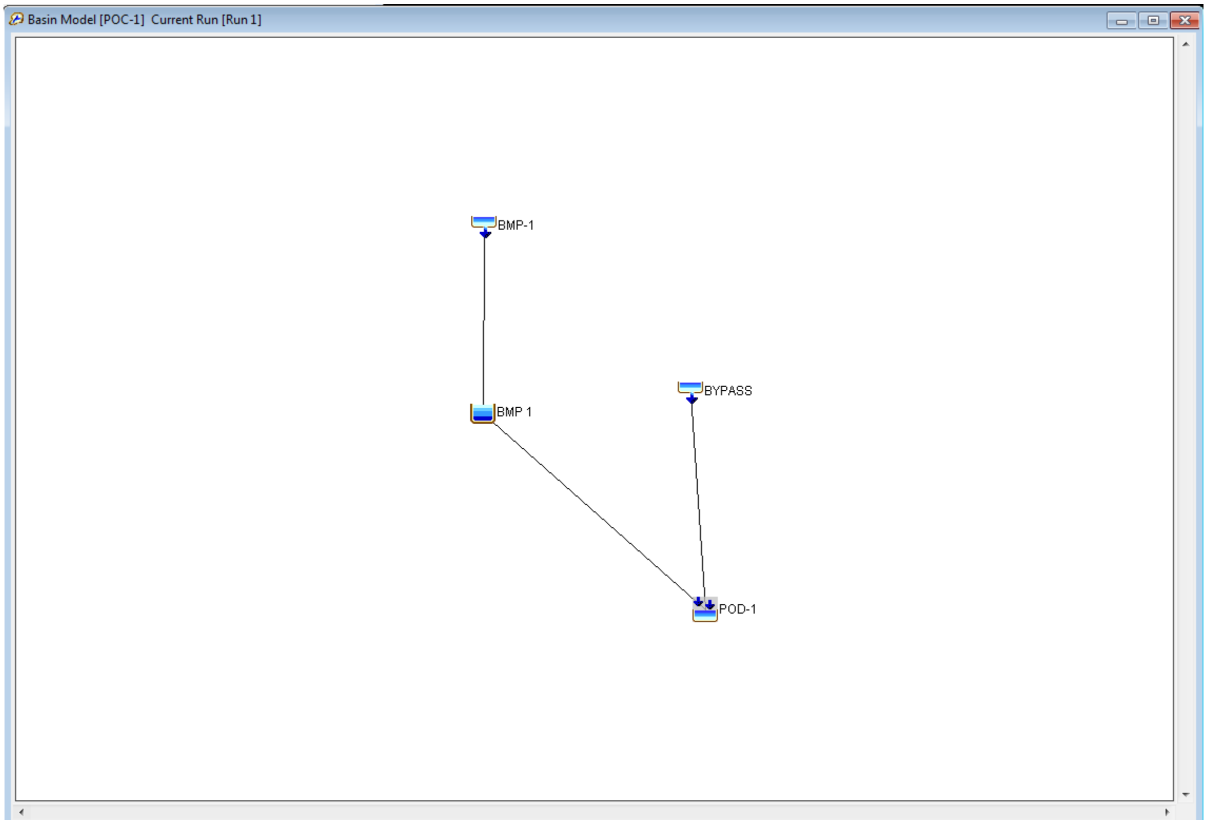
Note: All elevations measured from bottom of gravel layer. These are model elevations, not actual elevations. As such, 1.00-ft of gravel is represented as 0.4-ft due to the 0.4 porosity.

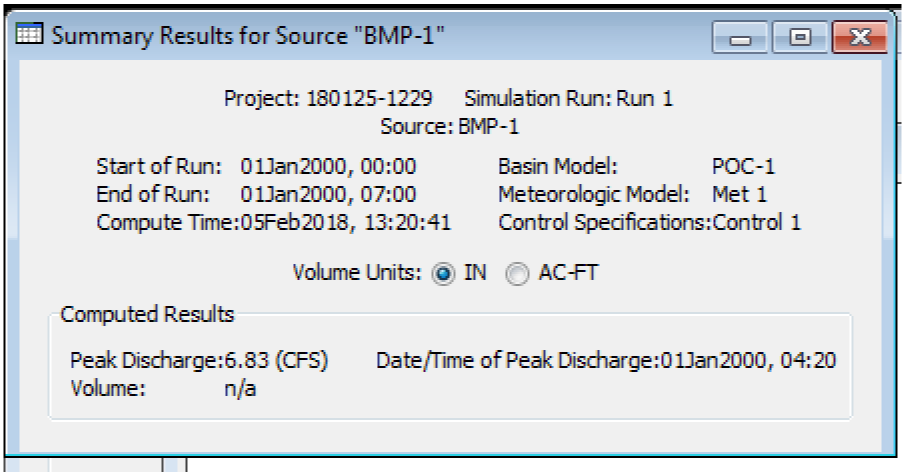
*Note: h = head above the invert of the lowest surface discharge opening.

h* (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qlweir (cfs)	Quweir (cfs)	Qemerg (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.400	46.080	28.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.483	47.680	29.800	0.000	0.000	0.000	0.000	0.000	0.000	0.522	0.000	0.000	0.000	0.000	0.522
2.567	49.280	30.800	0.000	0.000	0.000	0.000	0.000	0.000	1.476	0.000	0.000	0.000	0.000	1.476
2.650	50.880	31.800	0.000	0.000	0.000	0.000	0.000	0.000	2.713	0.000	0.000	0.000	0.000	2.713
2.733	52.480	32.800	0.000	0.000	0.000	0.000	0.000	0.000	3.910	0.000	0.000	0.000	0.000	3.910
2.817	54.080	33.800	0.000	0.000	0.000	0.000	0.000	0.000	4.627	0.000	0.000	0.000	0.000	4.627
2.900	55.680	34.800	0.000	0.000	0.000	0.000	0.000	0.000	5.246	0.000	0.000	0.000	0.000	5.246

6.3 – HEC-HMS Modified-Puls Routing Results

HEC-HMS POST DEVELOPMENT




Summary Results for Source "BMP-1"

Project: 180125-1229 Simulation Run: Run 1
Source: BMP-1

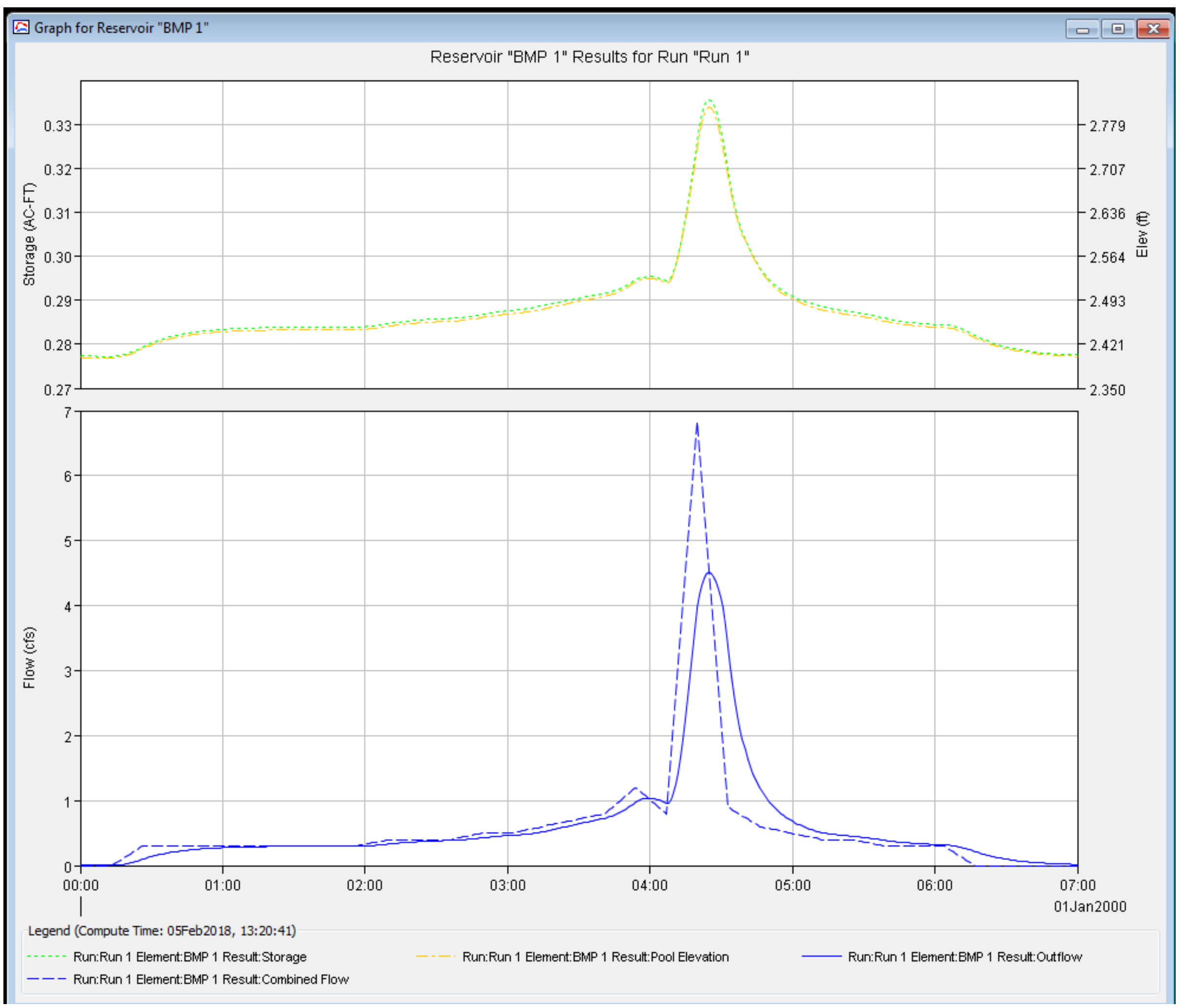
Start of Run: 01Jan2000, 00:00 Basin Model: POC-1
End of Run: 01Jan2000, 07:00 Meteorologic Model: Met 1
Compute Time: 05Feb2018, 13:20:41 Control Specifications: Control 1

Volume Units: IN AC-FT

Computed Results

Peak Discharge: 6.83 (CFS) Date/Time of Peak Discharge: 01Jan2000, 04:20
Volume: n/a

Note: Peak Elevation is based on model elevation which corresponds to an actual elevation of 3.36 feet. See Stage-Storage Table in Section 6.2.



Project: 180125-1229 Simulation Run: Run 1
Reservoir: BMP 1

Start of Run: 01Jan2000, 00:00 Basin Model: POC-1
End of Run: 01Jan2000, 07:00 Meteorologic Model: Met 1
Compute Time: 05Feb2018, 13:20:41 Control Specifications: Control 1

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	00:00	0.00	0.28	2.40	0.00
01Jan2000	00:01	0.00	0.28	2.40	0.00
01Jan2000	00:02	0.00	0.28	2.40	0.00
01Jan2000	00:03	0.00	0.28	2.40	0.00
01Jan2000	00:04	0.00	0.28	2.40	0.00
01Jan2000	00:05	0.00	0.28	2.40	0.00
01Jan2000	00:06	0.00	0.28	2.40	0.00
01Jan2000	00:07	0.00	0.28	2.40	0.00
01Jan2000	00:08	0.00	0.28	2.40	0.00
01Jan2000	00:09	0.00	0.28	2.40	0.00
01Jan2000	00:10	0.00	0.28	2.40	0.00
01Jan2000	00:11	0.00	0.28	2.40	0.00
01Jan2000	00:12	0.00	0.28	2.40	0.00
01Jan2000	00:13	0.00	0.28	2.40	0.00
01Jan2000	00:14	0.02	0.28	2.40	0.00
01Jan2000	00:15	0.05	0.28	2.40	0.00
01Jan2000	00:16	0.07	0.28	2.40	0.01
01Jan2000	00:17	0.09	0.28	2.40	0.01
01Jan2000	00:18	0.12	0.28	2.40	0.02
01Jan2000	00:19	0.14	0.28	2.40	0.02
01Jan2000	00:20	0.16	0.28	2.40	0.03
01Jan2000	00:21	0.18	0.28	2.41	0.04
01Jan2000	00:22	0.21	0.28	2.41	0.05
01Jan2000	00:23	0.23	0.28	2.41	0.06
01Jan2000	00:24	0.25	0.28	2.41	0.07
01Jan2000	00:25	0.28	0.28	2.41	0.08

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	00:26	0.30	0.28	2.41	0.09
01Jan2000	00:27	0.30	0.28	2.42	0.11
01Jan2000	00:28	0.30	0.28	2.42	0.12
01Jan2000	00:29	0.30	0.28	2.42	0.13
01Jan2000	00:30	0.30	0.28	2.42	0.14
01Jan2000	00:31	0.30	0.28	2.42	0.15
01Jan2000	00:32	0.30	0.28	2.42	0.16
01Jan2000	00:33	0.30	0.28	2.42	0.17
01Jan2000	00:34	0.30	0.28	2.43	0.17
01Jan2000	00:35	0.30	0.28	2.43	0.18
01Jan2000	00:36	0.30	0.28	2.43	0.19
01Jan2000	00:37	0.30	0.28	2.43	0.19
01Jan2000	00:38	0.30	0.28	2.43	0.20
01Jan2000	00:39	0.30	0.28	2.43	0.21
01Jan2000	00:40	0.30	0.28	2.43	0.21
01Jan2000	00:41	0.30	0.28	2.43	0.22
01Jan2000	00:42	0.30	0.28	2.43	0.22
01Jan2000	00:43	0.30	0.28	2.43	0.23
01Jan2000	00:44	0.30	0.28	2.43	0.23
01Jan2000	00:45	0.30	0.28	2.44	0.24
01Jan2000	00:46	0.30	0.28	2.44	0.24
01Jan2000	00:47	0.30	0.28	2.44	0.24
01Jan2000	00:48	0.30	0.28	2.44	0.25
01Jan2000	00:49	0.30	0.28	2.44	0.25
01Jan2000	00:50	0.30	0.28	2.44	0.25
01Jan2000	00:51	0.30	0.28	2.44	0.26
01Jan2000	00:52	0.30	0.28	2.44	0.26
01Jan2000	00:53	0.30	0.28	2.44	0.26
01Jan2000	00:54	0.30	0.28	2.44	0.26
01Jan2000	00:55	0.30	0.28	2.44	0.27
01Jan2000	00:56	0.30	0.28	2.44	0.27

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	00:57	0.30	0.28	2.44	0.27
01Jan2000	00:58	0.30	0.28	2.44	0.27
01Jan2000	00:59	0.30	0.28	2.44	0.27
01Jan2000	01:00	0.30	0.28	2.44	0.27
01Jan2000	01:01	0.30	0.28	2.44	0.28
01Jan2000	01:02	0.30	0.28	2.44	0.28
01Jan2000	01:03	0.30	0.28	2.44	0.28
01Jan2000	01:04	0.30	0.28	2.44	0.28
01Jan2000	01:05	0.30	0.28	2.44	0.28
01Jan2000	01:06	0.30	0.28	2.44	0.28
01Jan2000	01:07	0.30	0.28	2.44	0.28
01Jan2000	01:08	0.30	0.28	2.44	0.28
01Jan2000	01:09	0.30	0.28	2.44	0.29
01Jan2000	01:10	0.30	0.28	2.44	0.29
01Jan2000	01:11	0.30	0.28	2.44	0.29
01Jan2000	01:12	0.30	0.28	2.44	0.29
01Jan2000	01:13	0.30	0.28	2.44	0.29
01Jan2000	01:14	0.30	0.28	2.44	0.29
01Jan2000	01:15	0.30	0.28	2.44	0.29
01Jan2000	01:16	0.30	0.28	2.44	0.29
01Jan2000	01:17	0.30	0.28	2.44	0.29
01Jan2000	01:18	0.30	0.28	2.44	0.29
01Jan2000	01:19	0.30	0.28	2.44	0.29
01Jan2000	01:20	0.30	0.28	2.44	0.29
01Jan2000	01:21	0.30	0.28	2.44	0.29
01Jan2000	01:22	0.30	0.28	2.44	0.29
01Jan2000	01:23	0.30	0.28	2.44	0.29
01Jan2000	01:24	0.30	0.28	2.44	0.29
01Jan2000	01:25	0.30	0.28	2.44	0.29
01Jan2000	01:26	0.30	0.28	2.44	0.29
01Jan2000	01:27	0.30	0.28	2.44	0.30

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	01:28	0.30	0.28	2.44	0.30
01Jan2000	01:29	0.30	0.28	2.44	0.30
01Jan2000	01:30	0.30	0.28	2.44	0.30
01Jan2000	01:31	0.30	0.28	2.44	0.30
01Jan2000	01:32	0.30	0.28	2.44	0.30
01Jan2000	01:33	0.30	0.28	2.44	0.30
01Jan2000	01:34	0.30	0.28	2.45	0.30
01Jan2000	01:35	0.30	0.28	2.45	0.30
01Jan2000	01:36	0.30	0.28	2.45	0.30
01Jan2000	01:37	0.30	0.28	2.45	0.30
01Jan2000	01:38	0.30	0.28	2.45	0.30
01Jan2000	01:39	0.30	0.28	2.45	0.30
01Jan2000	01:40	0.30	0.28	2.45	0.30
01Jan2000	01:41	0.30	0.28	2.45	0.30
01Jan2000	01:42	0.30	0.28	2.45	0.30
01Jan2000	01:43	0.30	0.28	2.45	0.30
01Jan2000	01:44	0.30	0.28	2.45	0.30
01Jan2000	01:45	0.30	0.28	2.45	0.30
01Jan2000	01:46	0.30	0.28	2.45	0.30
01Jan2000	01:47	0.30	0.28	2.45	0.30
01Jan2000	01:48	0.30	0.28	2.45	0.30
01Jan2000	01:49	0.30	0.28	2.45	0.30
01Jan2000	01:50	0.30	0.28	2.45	0.30
01Jan2000	01:51	0.30	0.28	2.45	0.30
01Jan2000	01:52	0.30	0.28	2.45	0.30
01Jan2000	01:53	0.30	0.28	2.45	0.30
01Jan2000	01:54	0.30	0.28	2.45	0.30
01Jan2000	01:55	0.30	0.28	2.45	0.30
01Jan2000	01:56	0.30	0.28	2.45	0.30
01Jan2000	01:57	0.30	0.28	2.45	0.30
01Jan2000	01:58	0.31	0.28	2.45	0.30

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	01:59	0.32	0.28	2.45	0.30
01Jan2000	02:00	0.32	0.28	2.45	0.30
01Jan2000	02:01	0.33	0.28	2.45	0.30
01Jan2000	02:02	0.34	0.28	2.45	0.30
01Jan2000	02:03	0.35	0.28	2.45	0.31
01Jan2000	02:04	0.35	0.28	2.45	0.31
01Jan2000	02:05	0.36	0.28	2.45	0.31
01Jan2000	02:06	0.37	0.28	2.45	0.32
01Jan2000	02:07	0.38	0.28	2.45	0.32
01Jan2000	02:08	0.38	0.28	2.45	0.32
01Jan2000	02:09	0.39	0.28	2.45	0.33
01Jan2000	02:10	0.40	0.28	2.45	0.33
01Jan2000	02:11	0.40	0.28	2.45	0.33
01Jan2000	02:12	0.40	0.28	2.45	0.34
01Jan2000	02:13	0.40	0.28	2.45	0.34
01Jan2000	02:14	0.40	0.28	2.45	0.35
01Jan2000	02:15	0.40	0.29	2.45	0.35
01Jan2000	02:16	0.40	0.29	2.45	0.35
01Jan2000	02:17	0.40	0.29	2.45	0.35
01Jan2000	02:18	0.40	0.29	2.45	0.36
01Jan2000	02:19	0.40	0.29	2.45	0.36
01Jan2000	02:20	0.40	0.29	2.46	0.36
01Jan2000	02:21	0.40	0.29	2.46	0.36
01Jan2000	02:22	0.40	0.29	2.46	0.37
01Jan2000	02:23	0.40	0.29	2.46	0.37
01Jan2000	02:24	0.40	0.29	2.46	0.37
01Jan2000	02:25	0.40	0.29	2.46	0.37
01Jan2000	02:26	0.40	0.29	2.46	0.37
01Jan2000	02:27	0.40	0.29	2.46	0.38
01Jan2000	02:28	0.40	0.29	2.46	0.38
01Jan2000	02:29	0.40	0.29	2.46	0.38

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	02:30	0.40	0.29	2.46	0.38
01Jan2000	02:31	0.40	0.29	2.46	0.38
01Jan2000	02:32	0.40	0.29	2.46	0.38
01Jan2000	02:33	0.40	0.29	2.46	0.38
01Jan2000	02:34	0.40	0.29	2.46	0.38
01Jan2000	02:35	0.40	0.29	2.46	0.38
01Jan2000	02:36	0.40	0.29	2.46	0.39
01Jan2000	02:37	0.41	0.29	2.46	0.39
01Jan2000	02:38	0.42	0.29	2.46	0.39
01Jan2000	02:39	0.42	0.29	2.46	0.39
01Jan2000	02:40	0.43	0.29	2.46	0.39
01Jan2000	02:41	0.44	0.29	2.46	0.40
01Jan2000	02:42	0.45	0.29	2.46	0.40
01Jan2000	02:43	0.45	0.29	2.46	0.40
01Jan2000	02:44	0.46	0.29	2.46	0.40
01Jan2000	02:45	0.47	0.29	2.46	0.41
01Jan2000	02:46	0.48	0.29	2.46	0.41
01Jan2000	02:47	0.48	0.29	2.46	0.42
01Jan2000	02:48	0.49	0.29	2.46	0.42
01Jan2000	02:49	0.50	0.29	2.46	0.42
01Jan2000	02:50	0.50	0.29	2.47	0.43
01Jan2000	02:51	0.50	0.29	2.47	0.43
01Jan2000	02:52	0.50	0.29	2.47	0.44
01Jan2000	02:53	0.50	0.29	2.47	0.44
01Jan2000	02:54	0.50	0.29	2.47	0.44
01Jan2000	02:55	0.50	0.29	2.47	0.45
01Jan2000	02:56	0.50	0.29	2.47	0.45
01Jan2000	02:57	0.50	0.29	2.47	0.45
01Jan2000	02:58	0.50	0.29	2.47	0.46
01Jan2000	02:59	0.50	0.29	2.47	0.46
01Jan2000	03:00	0.50	0.29	2.47	0.46

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	03:01	0.50	0.29	2.47	0.46
01Jan2000	03:02	0.50	0.29	2.47	0.47
01Jan2000	03:03	0.51	0.29	2.47	0.47
01Jan2000	03:04	0.52	0.29	2.47	0.47
01Jan2000	03:05	0.52	0.29	2.47	0.47
01Jan2000	03:06	0.53	0.29	2.47	0.48
01Jan2000	03:07	0.54	0.29	2.47	0.48
01Jan2000	03:08	0.55	0.29	2.47	0.48
01Jan2000	03:09	0.55	0.29	2.47	0.49
01Jan2000	03:10	0.56	0.29	2.48	0.49
01Jan2000	03:11	0.57	0.29	2.48	0.50
01Jan2000	03:12	0.58	0.29	2.48	0.50
01Jan2000	03:13	0.58	0.29	2.48	0.51
01Jan2000	03:14	0.59	0.29	2.48	0.51
01Jan2000	03:15	0.60	0.29	2.48	0.52
01Jan2000	03:16	0.61	0.29	2.48	0.52
01Jan2000	03:17	0.62	0.29	2.48	0.53
01Jan2000	03:18	0.62	0.29	2.48	0.54
01Jan2000	03:19	0.63	0.29	2.48	0.55
01Jan2000	03:20	0.64	0.29	2.48	0.56
01Jan2000	03:21	0.65	0.29	2.48	0.57
01Jan2000	03:22	0.65	0.29	2.48	0.58
01Jan2000	03:23	0.66	0.29	2.49	0.58
01Jan2000	03:24	0.67	0.29	2.49	0.59
01Jan2000	03:25	0.68	0.29	2.49	0.60
01Jan2000	03:26	0.68	0.29	2.49	0.61
01Jan2000	03:27	0.69	0.29	2.49	0.62
01Jan2000	03:28	0.70	0.29	2.49	0.62
01Jan2000	03:29	0.71	0.29	2.49	0.63
01Jan2000	03:30	0.72	0.29	2.49	0.64
01Jan2000	03:31	0.72	0.29	2.49	0.65

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	03:32	0.73	0.29	2.49	0.66
01Jan2000	03:33	0.74	0.29	2.49	0.67
01Jan2000	03:34	0.75	0.29	2.49	0.67
01Jan2000	03:35	0.75	0.29	2.49	0.68
01Jan2000	03:36	0.76	0.29	2.50	0.69
01Jan2000	03:37	0.77	0.29	2.50	0.70
01Jan2000	03:38	0.78	0.29	2.50	0.71
01Jan2000	03:39	0.78	0.29	2.50	0.71
01Jan2000	03:40	0.79	0.29	2.50	0.72
01Jan2000	03:41	0.80	0.29	2.50	0.73
01Jan2000	03:42	0.83	0.29	2.50	0.74
01Jan2000	03:43	0.86	0.29	2.50	0.75
01Jan2000	03:44	0.89	0.29	2.50	0.76
01Jan2000	03:45	0.92	0.29	2.50	0.78
01Jan2000	03:46	0.95	0.29	2.51	0.79
01Jan2000	03:47	0.98	0.29	2.51	0.81
01Jan2000	03:48	1.02	0.29	2.51	0.83
01Jan2000	03:49	1.05	0.29	2.51	0.85
01Jan2000	03:50	1.08	0.29	2.51	0.87
01Jan2000	03:51	1.11	0.29	2.52	0.90
01Jan2000	03:52	1.14	0.29	2.52	0.92
01Jan2000	03:53	1.17	0.29	2.52	0.95
01Jan2000	03:54	1.20	0.29	2.52	0.97
01Jan2000	03:55	1.17	0.29	2.52	0.99
01Jan2000	03:56	1.14	0.30	2.53	1.01
01Jan2000	03:57	1.11	0.30	2.53	1.02
01Jan2000	03:58	1.08	0.30	2.53	1.03
01Jan2000	03:59	1.05	0.30	2.53	1.03
01Jan2000	04:00	1.02	0.30	2.53	1.03
01Jan2000	04:01	0.98	0.30	2.53	1.03
01Jan2000	04:02	0.95	0.30	2.53	1.02

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	04:03	0.92	0.30	2.53	1.01
01Jan2000	04:04	0.89	0.29	2.53	1.00
01Jan2000	04:05	0.86	0.29	2.52	0.99
01Jan2000	04:06	0.83	0.29	2.52	0.97
01Jan2000	04:07	0.80	0.29	2.52	0.96
01Jan2000	04:08	1.26	0.29	2.52	0.97
01Jan2000	04:09	1.73	0.30	2.53	1.02
01Jan2000	04:10	2.19	0.30	2.54	1.12
01Jan2000	04:11	2.66	0.30	2.55	1.25
01Jan2000	04:12	3.12	0.30	2.57	1.43
01Jan2000	04:13	3.58	0.30	2.58	1.67
01Jan2000	04:14	4.05	0.31	2.60	1.95
01Jan2000	04:15	4.51	0.31	2.62	2.26
01Jan2000	04:16	4.97	0.31	2.64	2.58
01Jan2000	04:17	5.44	0.32	2.66	2.92
01Jan2000	04:18	5.90	0.32	2.69	3.26
01Jan2000	04:19	6.37	0.32	2.71	3.63
01Jan2000	04:20	6.83	0.33	2.74	3.96
01Jan2000	04:21	6.37	0.33	2.76	4.17
01Jan2000	04:22	5.92	0.33	2.78	4.32
01Jan2000	04:23	5.46	0.33	2.80	4.42
01Jan2000	04:24	5.01	0.34	2.80	4.48
01Jan2000	04:25	4.55	0.34	2.81	4.51
01Jan2000	04:26	4.09	0.34	2.80	4.49
01Jan2000	04:27	3.64	0.33	2.80	4.44
01Jan2000	04:28	3.18	0.33	2.79	4.37
01Jan2000	04:29	2.72	0.33	2.77	4.26
01Jan2000	04:30	2.27	0.33	2.76	4.12
01Jan2000	04:31	1.81	0.33	2.74	3.96
01Jan2000	04:32	1.36	0.32	2.72	3.70
01Jan2000	04:33	0.90	0.32	2.69	3.38

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	04:34	0.88	0.32	2.67	3.06
01Jan2000	04:35	0.85	0.31	2.65	2.79
01Jan2000	04:36	0.83	0.31	2.64	2.53
01Jan2000	04:37	0.81	0.31	2.62	2.31
01Jan2000	04:38	0.78	0.31	2.61	2.11
01Jan2000	04:39	0.76	0.31	2.60	1.93
01Jan2000	04:40	0.74	0.30	2.59	1.78
01Jan2000	04:41	0.72	0.30	2.58	1.64
01Jan2000	04:42	0.69	0.30	2.57	1.52
01Jan2000	04:43	0.67	0.30	2.56	1.42
01Jan2000	04:44	0.65	0.30	2.56	1.34
01Jan2000	04:45	0.62	0.30	2.55	1.27
01Jan2000	04:46	0.60	0.30	2.54	1.20
01Jan2000	04:47	0.59	0.30	2.54	1.14
01Jan2000	04:48	0.58	0.30	2.53	1.08
01Jan2000	04:49	0.58	0.30	2.53	1.03
01Jan2000	04:50	0.57	0.29	2.52	0.98
01Jan2000	04:51	0.56	0.29	2.52	0.94
01Jan2000	04:52	0.55	0.29	2.52	0.90
01Jan2000	04:53	0.55	0.29	2.51	0.86
01Jan2000	04:54	0.54	0.29	2.51	0.83
01Jan2000	04:55	0.53	0.29	2.51	0.80
01Jan2000	04:56	0.52	0.29	2.50	0.77
01Jan2000	04:57	0.52	0.29	2.50	0.74
01Jan2000	04:58	0.51	0.29	2.50	0.72
01Jan2000	04:59	0.50	0.29	2.50	0.70
01Jan2000	05:00	0.49	0.29	2.49	0.68
01Jan2000	05:01	0.48	0.29	2.49	0.66
01Jan2000	05:02	0.48	0.29	2.49	0.64
01Jan2000	05:03	0.47	0.29	2.49	0.62
01Jan2000	05:04	0.46	0.29	2.49	0.60

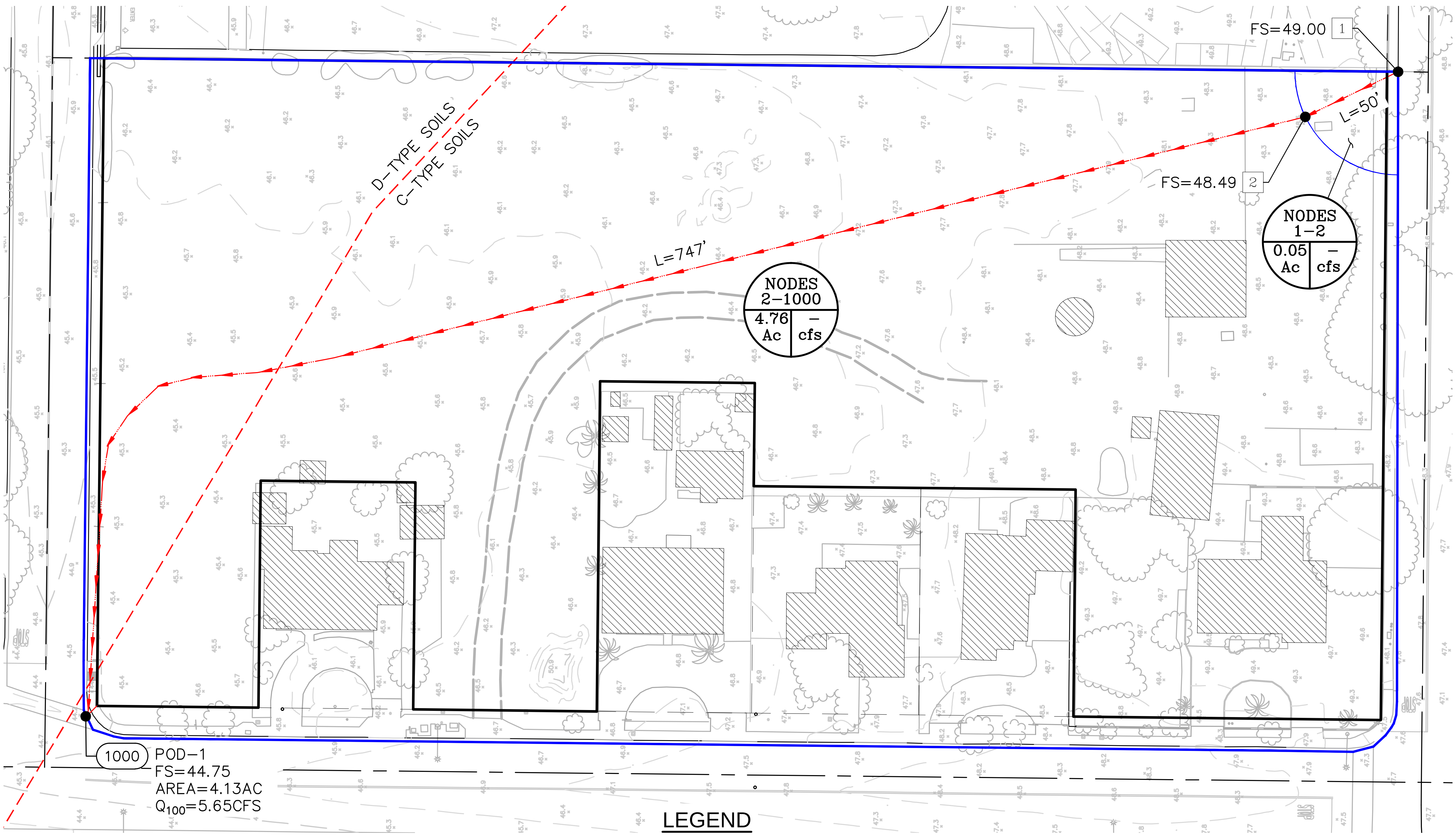
Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	05:05	0.45	0.29	2.49	0.59
01Jan2000	05:06	0.45	0.29	2.48	0.57
01Jan2000	05:07	0.44	0.29	2.48	0.56
01Jan2000	05:08	0.43	0.29	2.48	0.55
01Jan2000	05:09	0.42	0.29	2.48	0.53
01Jan2000	05:10	0.42	0.29	2.48	0.52
01Jan2000	05:11	0.41	0.29	2.48	0.52
01Jan2000	05:12	0.40	0.29	2.48	0.51
01Jan2000	05:13	0.40	0.29	2.48	0.50
01Jan2000	05:14	0.40	0.29	2.48	0.50
01Jan2000	05:15	0.40	0.29	2.47	0.49
01Jan2000	05:16	0.40	0.29	2.47	0.49
01Jan2000	05:17	0.40	0.29	2.47	0.48
01Jan2000	05:18	0.40	0.29	2.47	0.48
01Jan2000	05:19	0.40	0.29	2.47	0.47
01Jan2000	05:20	0.40	0.29	2.47	0.47
01Jan2000	05:21	0.40	0.29	2.47	0.46
01Jan2000	05:22	0.40	0.29	2.47	0.46
01Jan2000	05:23	0.40	0.29	2.47	0.46
01Jan2000	05:24	0.40	0.29	2.47	0.45
01Jan2000	05:25	0.40	0.29	2.47	0.45
01Jan2000	05:26	0.39	0.29	2.47	0.45
01Jan2000	05:27	0.38	0.29	2.47	0.44
01Jan2000	05:28	0.38	0.29	2.47	0.44
01Jan2000	05:29	0.37	0.29	2.47	0.44
01Jan2000	05:30	0.36	0.29	2.47	0.43
01Jan2000	05:31	0.35	0.29	2.46	0.43
01Jan2000	05:32	0.35	0.29	2.46	0.42
01Jan2000	05:33	0.34	0.29	2.46	0.42
01Jan2000	05:34	0.33	0.29	2.46	0.41
01Jan2000	05:35	0.32	0.29	2.46	0.41

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	05:36	0.32	0.29	2.46	0.40
01Jan2000	05:37	0.31	0.29	2.46	0.40
01Jan2000	05:38	0.30	0.29	2.46	0.39
01Jan2000	05:39	0.30	0.29	2.46	0.39
01Jan2000	05:40	0.30	0.29	2.46	0.38
01Jan2000	05:41	0.30	0.29	2.46	0.38
01Jan2000	05:42	0.30	0.29	2.46	0.37
01Jan2000	05:43	0.30	0.29	2.46	0.37
01Jan2000	05:44	0.30	0.29	2.46	0.36
01Jan2000	05:45	0.30	0.29	2.45	0.36
01Jan2000	05:46	0.30	0.29	2.45	0.36
01Jan2000	05:47	0.30	0.29	2.45	0.35
01Jan2000	05:48	0.30	0.29	2.45	0.35
01Jan2000	05:49	0.30	0.29	2.45	0.35
01Jan2000	05:50	0.30	0.28	2.45	0.34
01Jan2000	05:51	0.30	0.28	2.45	0.34
01Jan2000	05:52	0.30	0.28	2.45	0.34
01Jan2000	05:53	0.30	0.28	2.45	0.34
01Jan2000	05:54	0.30	0.28	2.45	0.33
01Jan2000	05:55	0.30	0.28	2.45	0.33
01Jan2000	05:56	0.30	0.28	2.45	0.33
01Jan2000	05:57	0.30	0.28	2.45	0.33
01Jan2000	05:58	0.30	0.28	2.45	0.33
01Jan2000	05:59	0.30	0.28	2.45	0.33
01Jan2000	06:00	0.30	0.28	2.45	0.32
01Jan2000	06:01	0.30	0.28	2.45	0.32
01Jan2000	06:02	0.30	0.28	2.45	0.32
01Jan2000	06:03	0.30	0.28	2.45	0.32
01Jan2000	06:04	0.30	0.28	2.45	0.32
01Jan2000	06:05	0.28	0.28	2.45	0.32
01Jan2000	06:06	0.25	0.28	2.45	0.31

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	06:07	0.23	0.28	2.45	0.31
01Jan2000	06:08	0.21	0.28	2.45	0.30
01Jan2000	06:09	0.18	0.28	2.45	0.30
01Jan2000	06:10	0.16	0.28	2.44	0.29
01Jan2000	06:11	0.14	0.28	2.44	0.28
01Jan2000	06:12	0.12	0.28	2.44	0.27
01Jan2000	06:13	0.09	0.28	2.44	0.26
01Jan2000	06:14	0.07	0.28	2.44	0.25
01Jan2000	06:15	0.05	0.28	2.44	0.24
01Jan2000	06:16	0.02	0.28	2.43	0.23
01Jan2000	06:17	0.00	0.28	2.43	0.22
01Jan2000	06:18	0.00	0.28	2.43	0.20
01Jan2000	06:19	0.00	0.28	2.43	0.19
01Jan2000	06:20	0.00	0.28	2.43	0.18
01Jan2000	06:21	0.00	0.28	2.43	0.17
01Jan2000	06:22	0.00	0.28	2.42	0.16
01Jan2000	06:23	0.00	0.28	2.42	0.15
01Jan2000	06:24	0.00	0.28	2.42	0.14
01Jan2000	06:25	0.00	0.28	2.42	0.13
01Jan2000	06:26	0.00	0.28	2.42	0.12
01Jan2000	06:27	0.00	0.28	2.42	0.12
01Jan2000	06:28	0.00	0.28	2.42	0.11
01Jan2000	06:29	0.00	0.28	2.42	0.10
01Jan2000	06:30	0.00	0.28	2.41	0.10
01Jan2000	06:31	0.00	0.28	2.41	0.09
01Jan2000	06:32	0.00	0.28	2.41	0.09
01Jan2000	06:33	0.00	0.28	2.41	0.08
01Jan2000	06:34	0.00	0.28	2.41	0.08
01Jan2000	06:35	0.00	0.28	2.41	0.07
01Jan2000	06:36	0.00	0.28	2.41	0.07
01Jan2000	06:37	0.00	0.28	2.41	0.06

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	06:38	0.00	0.28	2.41	0.06
01Jan2000	06:39	0.00	0.28	2.41	0.06
01Jan2000	06:40	0.00	0.28	2.41	0.05
01Jan2000	06:41	0.00	0.28	2.41	0.05
01Jan2000	06:42	0.00	0.28	2.41	0.05
01Jan2000	06:43	0.00	0.28	2.41	0.04
01Jan2000	06:44	0.00	0.28	2.41	0.04
01Jan2000	06:45	0.00	0.28	2.41	0.04
01Jan2000	06:46	0.00	0.28	2.40	0.04
01Jan2000	06:47	0.00	0.28	2.40	0.03
01Jan2000	06:48	0.00	0.28	2.40	0.03
01Jan2000	06:49	0.00	0.28	2.40	0.03
01Jan2000	06:50	0.00	0.28	2.40	0.03
01Jan2000	06:51	0.00	0.28	2.40	0.03
01Jan2000	06:52	0.00	0.28	2.40	0.03
01Jan2000	06:53	0.00	0.28	2.40	0.02
01Jan2000	06:54	0.00	0.28	2.40	0.02
01Jan2000	06:55	0.00	0.28	2.40	0.02
01Jan2000	06:56	0.00	0.28	2.40	0.02
01Jan2000	06:57	0.00	0.28	2.40	0.02
01Jan2000	06:58	0.00	0.28	2.40	0.02
01Jan2000	06:59	0.00	0.28	2.40	0.02
01Jan2000	07:00	0.00	0.28	2.40	0.02

CHAPTER 7 – HYDROLOGY MAPS



50 25 0 50 100 150

SCALE: 1" = 50'

PER CITY OF SAN DIEGO HYDROLOGY MANUAL, D-TYPE SOILS ASSUMED

LEGEND

FLOW DIRECTION

PROPERTY BOUNDARY

DRAINAGE BOUNDARY

EXISTING RESIDENCES

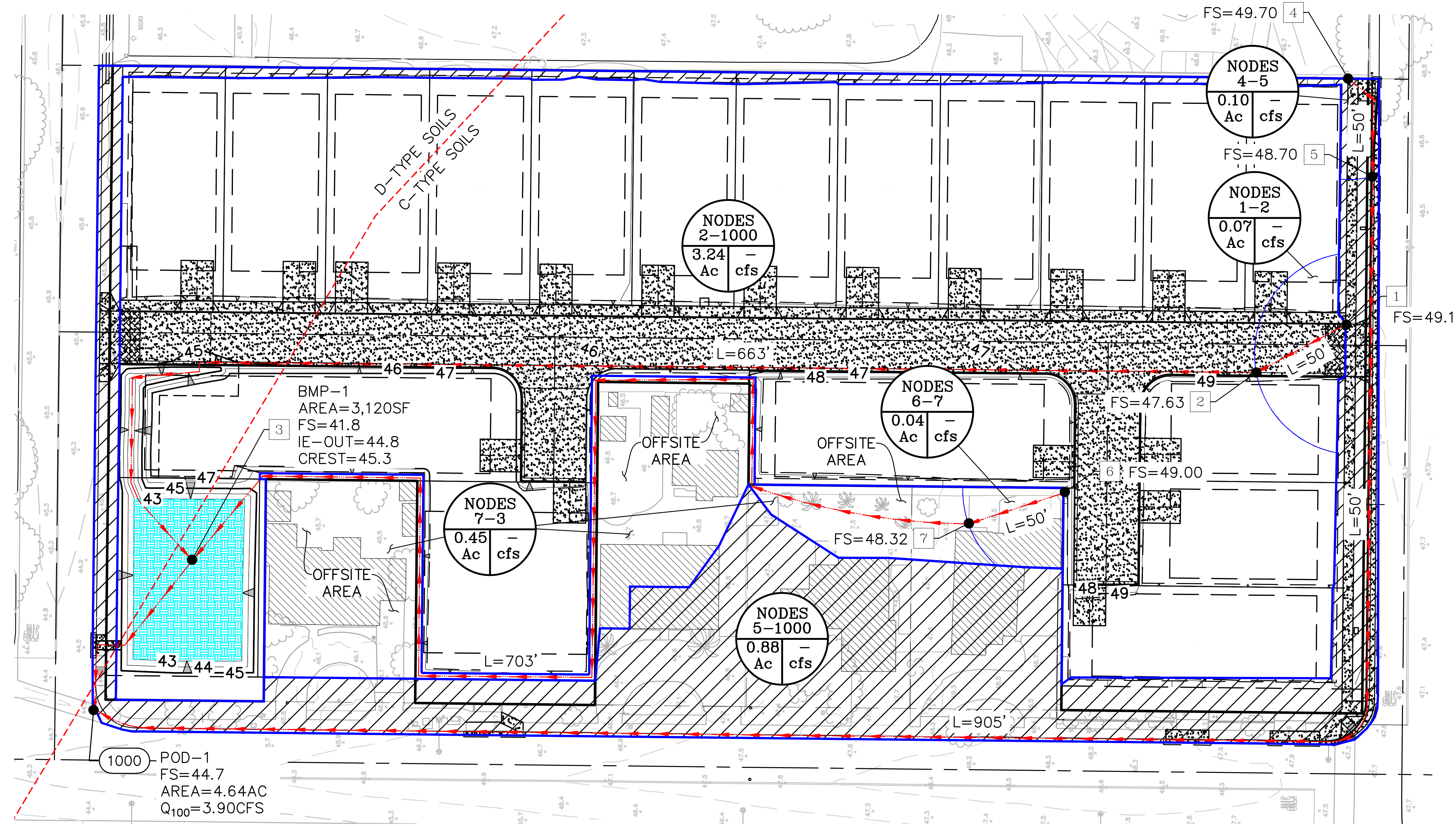
R·E·C Consultants, Inc.
Civil Engineering · Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

DATE: 04/04/17
SCALE: 1" = 50'
DRAWN:
CHECKED:

SHEET TITLE
EXISTING CONDITIONS HYDROLOGY

PROJECT
SATURN BLVD
SAN DIEGO, CA 92154

SHEET 1 OF 1 SHEETS



PER CITY OF SAN DIEGO HYDROLOGY MANUAL, D–TYPE SOILS ASSUMED

50 25 0 50 100 150

SCALE: 1" = 50'

LEGEND

FLOW DIRECTION			
PROPERTY BOUNDARY		PROPOSED IMPERVIOUS SURFACE	
DRAINAGE BOUNDARY		BYPASS AREA	
EXISTING RESIDENCES		BMP AREA	

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

DATE: 04/04/17
SCALE: 1" = 50'
DRAWN:
CHECKED:

SHEET TITLE
PROPOSED CONDITIONS HYDROLOGY

PROJECT
1695 SATURN BOULEVARD
SAN DIEGO, CA 92154

SHEET 1 OF 1 SHEETS

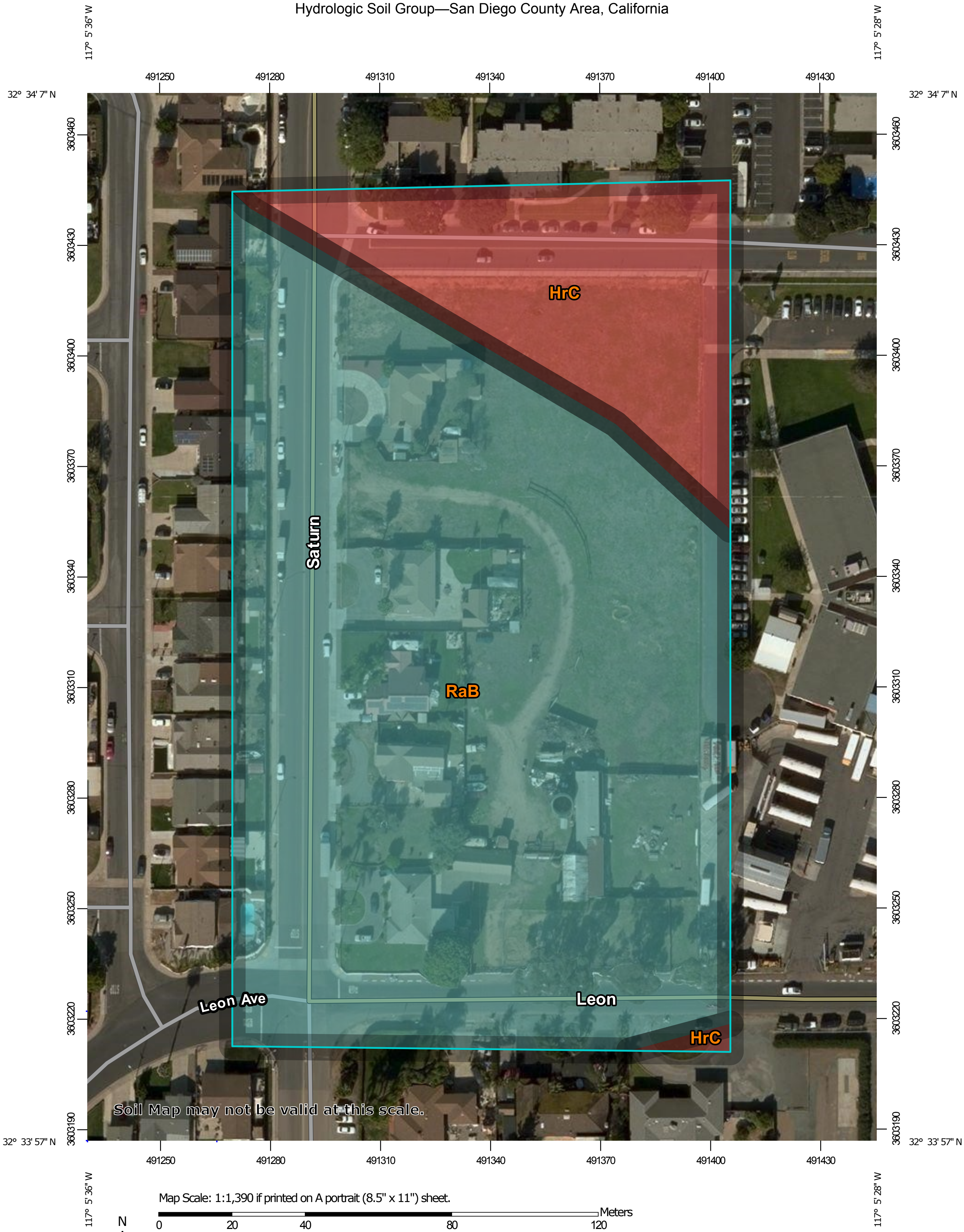
CHAPTER 8 – HYDRAULIC ANALYSIS

8.1 - Catch Basin & Inlet Sizing

Detention Basin	100-year Peak Inflow (cfs)	Peak Emergency Outflow Capacity (cfs)
BMP-1	6.03	7.68

POD	Type of Inlet	Surface Flow[2] Q (cfs)	Gutter Depression a (ft)	Flow Depth[3] y (ft)	Required Length of Opening[4] (ft)	Use Length [5] (ft)
1	Curb Inlet, Sag	6.03	0.33	0.44	5.0	5.0

CHAPTER 9 – APPENDICES



Map Scale: 1:1,390 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 20, 40, 80, 120

Feet: 0, 50, 100, 200, 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 10, Sep 12, 2016

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

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

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
HrC	Huerhuero loam, 2 to 9 percent slopes	D	1.5	19.2%
RaB	Ramona sandy loam, 2 to 5 percent slopes	C	6.4	80.8%
Totals for Area of Interest			**7.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the USDA National Agriculture Imagery Program (NAIP). this information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2009.

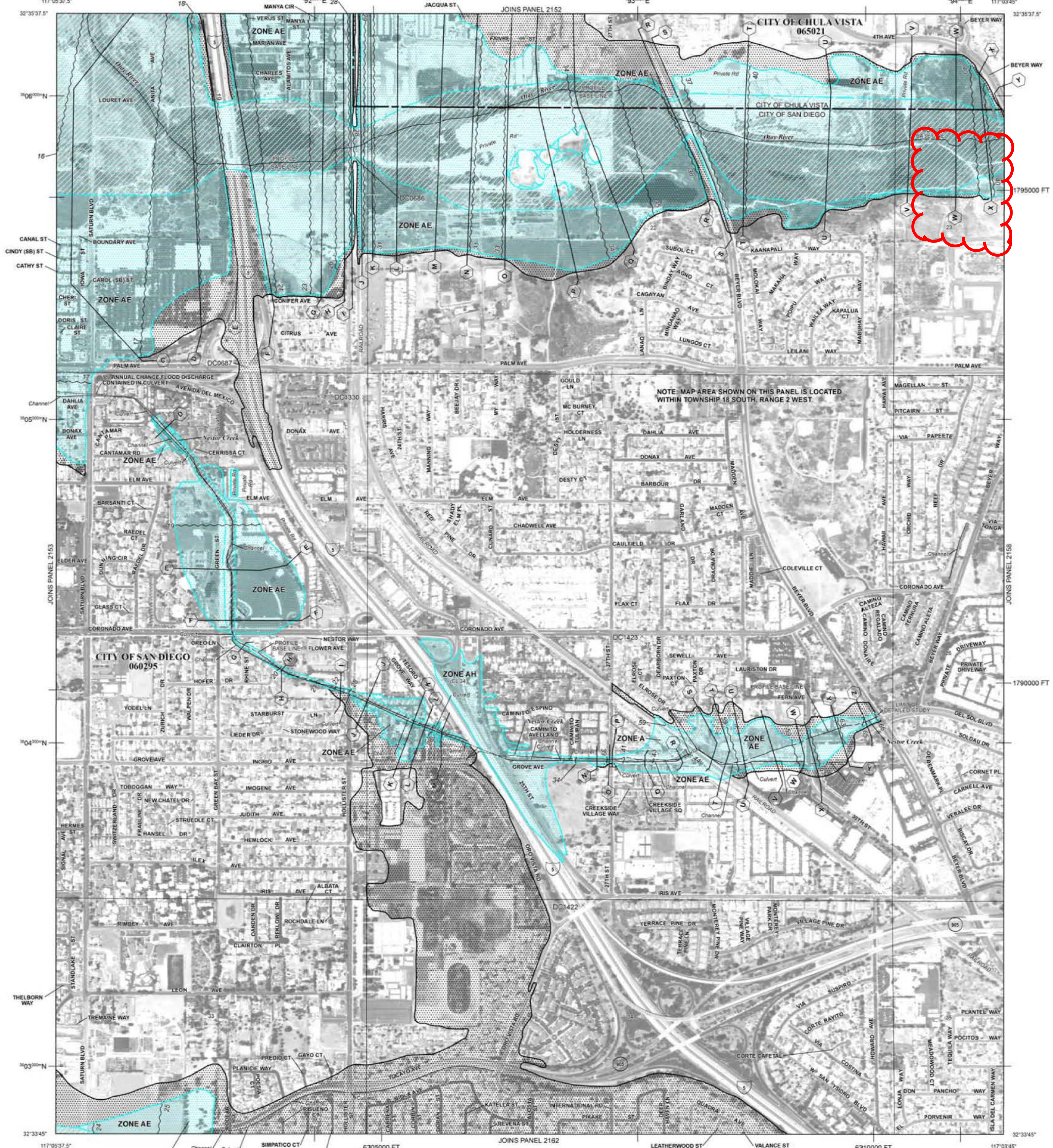
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.



The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)———(A)	Cross section line
(23)- - - - -(23)	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000mE	1000-meter Universal Transverse Mercator grid ticks, zone 11
6000000 FT	5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012 - to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.
April 5, 2016 - to remove Provisionally Accredited Levee note

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2154H

FIRM
FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 2154 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CHULA VISTA, CITY OF	065021	2154	H
SAN DIEGO, CITY OF	060295	2154	H

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

MAP NUMBER
06073C2154H

MAP REVISED

September 26, 2018

Mr. David Larson
Palm Avenue Realty Company
950 Garland Drive
San Diego, CA 92165

Subject: **Feasibility of Onsite Stormwater Infiltration**
Proposed Single-Family Residential Subdivision Development
1695 Saturn Boulevard
San Diego, California
EEI Project AAA-72282.4

References: EEI, 2016, Due diligence Level Geotechnical Review and Results of Preliminary Percolation Study, Proposed Single-Family residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project AAA-72282.4, Dated February 15, 2016. Revised May 11, 2016.

EEI, 2017a, Supplemental Percolation Study, Proposed Single-Family residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project AAA-72282.4, Dated February 28, 2017.

EEI, 2017b, Geotechnical Evaluation, Proposed Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project AAA-72282.4, Dated December 15, 2017.

Dear Mr. Larson:

Pursuant to your request and authorization, EEI has prepared this Feasibility letter regarding proposed onsite stormwater infiltration at the subject property located in the City of San Diego, California.

SUMMARY OF INFILTRATION FEASIBILITY

Site-specific percolation/infiltration testing was performed by EEI during previous subsurface explorations at the site as referenced (EEI, 2017a). The results of our percolation/infiltration studies presented in our referenced geotechnical report (EEI, 2017a) indicate that the upper soil materials on the site are comprised of fine grained silty and clayey sand with reliable infiltration rates of 0.26 to 0.32 inches per hour. These rates are less than the recommended 0.5 inches per hour for full infiltration.

The groundwater levels at the subject site are reported to be greater than 40 feet of existing grades (EEI, 2017b). The site is not susceptible to liquefaction and seismic induced settlement, and is not located within an Alquist-Priolo Earthquake Fault Zone (EEI, 2017a, 2017b and 2017c). Based on these infiltration rates, reported subsurface conditions, and geotechnical/geologic hazards identified in the referenced reports, we consider the native soil materials onsite to be suitable for partial infiltration of stormwater.

<u>As a result, we consider the site to be feasible for partial infiltration of stormwater into the native soil materials onsite.</u>

LIMITATIONS

This Feasibility Evaluation has been conducted in accordance with generally accepted geotechnical engineering principles and practice. EEI's Feasibility Evaluation is based solely upon the site reconnaissance and a review of readily available previous geotechnical reports and publically available geologic information pertinent to the subject property performed by EEI.

EEI assumes no warranty as to the accuracy of the referenced reports. Findings provided herein have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time. This report has been prepared for the sole use of Palm Avenue Realty Company (Client), within a reasonable time from its authorization. Site conditions, land use (both onsite and offsite), or other factors may change as a result of manmade influences, and additional work may be required with the passage of time.

This Feasibility Evaluation should not be relied upon by other parties without the express written consent of EEI and the Client; therefore, any use or reliance upon this geotechnical review by a party other than the Client shall be solely at the risk of such third party and without legal recourse against EEI, its employees, officers, or directors, regardless of whether the action in which recovery of damages is brought or based upon contract, tort, statue, or otherwise. The Client has the responsibility to see that all parties to the project, including the designer, contractor, subcontractor, and building official, etc. are aware of this report in its complete form. This report contains information that may be used in the preparation of contract specifications; however, the report is not designed as a specification document, and may not contain sufficient information for use without additional assessment. EEI assumes no responsibility or liability for work or testing performed by others. In addition, this report may be subject to review by the controlling authorities.

EEI appreciates the opportunity to be of service for this project. If you have any questions, please contact the undersigned at (760) 431-3747.

Sincerely,
EEI

CERTIFIED ENGINEERING GEOLOGIST
JEFFREY P. BLAKE
No. EG 2248
Exp. 6/31/19
STATE OF CALIFORNIA

Jeffrey P. Blake
CEG 2248 (exp. 10/31/19)
Principal Engineering Geologist

REGISTERED PROFESSIONAL ENGINEER
JERRY L. MICHAL
NO. 2515
Exp 3-31-20
GEOTECHNICAL
STATE OF CALIFORNIA

Jerry L. Michal
GE 2515 (exp. 3/31/20)
Senior Geotechnical Engineer

Appendix A: City of San Diego I-8 Forms

Distribution: (2) Addressee (one via electronic copy and one hard copy)

\\Server1\public\EEI Projects\AAA SINGLE PROJ CLIENTS\AAA-72282 Saturn Blvd. LLC, Chula Vista\Geo Evaluation\Report\Infiltration Feasibility\AAA-72282.4 Feasibility Infiltration Letter FNL MC JPB JLM ks 9.27.18).doc

APPENDIX A

Project Name: SATURN BOULEVARD SINGLE FAMILY RESIDENTIAL PROJECT

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.	☑ 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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions[1]		Worksheet C.4-1: Form I-8A[2]
Part 1 - Full Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
1695 Saturn Blvd.		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[3]? ○ 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.	

[1] 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.

[2] 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.

[3] 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[2]
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.

Within the proposed Infiltration Basin, EEI performed borehole percolation tests at depths of 3 to 10 feet below ground surface (EEI, 2017a). Measured percolation rates were converted to measured infiltration rates using the porchet method. Measured infiltration rates varied from 0.53 to 0.63 in/hr. The factor of safety used was 2.0. This is based on the moderately homogenous loamy (silty/clayey sand) soils that were encountered during percolation testing, and the lack of shallow groundwater at the site as determined from our 2017 geotechnical evaluation (EEI, 2017b). When dividing the measured infiltration rates by the factor of safety of 2.0, the resulting reliable infiltration rates range from 0.26 to 0.32 in/hr. These are lower than the minimum 0.5 in/hr rate that the City/County of San Diego recommend for BMP design. Therefore, it is our opinion that full infiltration is not feasible on the subject site.

References: EEI, 2017a, "Supplemental Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4a", dated February 28, 2017

EEI, 2017b, "Geotechnical Evaluation, Saturn Boulevard, LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4", dated December 15, 2017

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
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[2]	
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[2]	
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.

The reliable infiltration rates are less than 0.5 in/hr, therefore Full Infiltration is not feasible at the subject site (EEI, 2017a; EEI, 2017b).

References: EEI, 2017a, "Supplemental Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4a", dated February 28, 2017

EEI, 2017b, "Geotechnical Evaluation, Saturn Boulevard, LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4", dated December 15, 2017

Part 1 Result – Full Infiltration Geotechnical Screening [4]	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

[4] 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[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
1695 Saturn Blvd.		Design
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). Three HSA borings were advanced within the proposed infiltration basin, to depths of 5 to 10 feet (borings B-2, B-3, and B-4). Percolation testing took place within these borings. The borings were emplaced within Pleistocene Old Paralic Deposits consisting of silty/clayey sand. After the borings were excavated, 3-inch diameter perforated PVC pipes were placed within the holes and gravel was placed around the pipe. The hole was pre-soaked with water and then testing was performed in 30 minute intervals to determine the water level until the change in water between three consecutive tests was less than 10%. Measured percolation rates were converted to measured infiltration rates using the Porchet Method. The measured infiltration rates varied from 0.63 to 0.53 in/hr. When applying the factor of safety of 2.0, the reliable infiltration rates for borings B-2, B-3, and B-4 was 0.32, 0.28, and 0.26 in/hr, respectively.		

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
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
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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
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
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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]

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

The site is not located within a liquefaction zone, nor is it susceptible to slope failure or seismically-induced landsliding. The onsite soils are fine-grained silty/clayey sands and the reliable infiltration rates are less than 0.5 in/hr. Due to these fine-grained soils and low infiltration rates, there is a potential for water to mound and cause damage to proposed utilities and the integrity of an existing structure on the southside of the proposed BMP (EEI, 2017a; EEI, 2017b). These problems can be mitigated by lining the proposed basin with impermeable membranes to prevent stormwater from backing up and damaging foundations/utilities.

References: EEI, 2017a, "Supplemental Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4a", dated February 28, 2017

EEI, 2017b, "Geotechnical Evaluation, Saturn Boulevard, LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4", dated December 15, 2017

Part 2 – Partial Infiltration Geotechnical Screening Result[5]	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

[5] 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 Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
1695 Saturn Blvd.	Design
Criteria 1: Groundwater Screening	

1A	**Groundwater Depth.** Is the depth to seasonally high groundwater tables (normal high depth during the wet season) beneath the base of any full infiltration BMP greater than 10 feet? ○ Yes; continue to Step 1B. ○ No; The depth to groundwater is less than or equal to 10 feet, but site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to step 1B. ⦿ No; The depth to groundwater is less than or equal to 10 feet and site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" for Criteria 1 Result.
1B	**Contaminated Soil/Groundwater.** Are proposed full infiltration BMPs at least 250 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP. ○ Yes; continue to Step 1C. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1C. ⦿ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.

[1] 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.

[2] 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.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions		Worksheet C.4-2: Form I-8B[2]
1C	**Inadequate Soil Treatment Capacity.** Are full infiltration BMPs proposed in DMA soils that have adequate soil treatment capacity? The DMA has adequate soil treatment capacity if **ALL** of the following criteria (detailed in C.2.2.1) for all soil layers beneath the infiltrating surface are met: • USDA texture class is sandy loam or loam or silt loam or silt or sandy clay loam or clay loam or silty clay loam or sandy clay or silty clay or clay; and • Cation Exchange Capacity (CEC) greater than 5 milliequivalents/100g; and • Soil organic matter is greater than 1%; and • Groundwater table is equal to or greater than 10 feet beneath the base of the full infiltration BMP. ○ Yes; continue to Step 1D. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1D. ⦿ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.	
1D	**Other Groundwater Contamination Hazards.** Are there site-specific groundwater contamination hazards not already mentioned (refer to Appendix C.2.2) that can be reasonably mitigated to support full infiltration BMPs? ○ Yes; there are other contamination hazards identified that can be mitigated. Answer "Yes" to Criteria 1 Result. ○ No; there are other contamination hazards identified that cannot be mitigated. Answer "No" to Criteria 1 Result. ⦿ N/A; no contamination hazards are identified. Answer "Yes" to Criteria 1 Result.	
Criteria 1 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level? See Appendix C.2.2.8 for a list of typically reasonable and typically unreasonable mitigation measures. ○ Yes; Continue to Part 1, Criteria 2. ⦿ No; Continue to Part 1 Result.	

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Summarize groundwater quality and any mitigation measures proposed. Documentation should focus on groundwater table, mapped soil types and contaminated site locations. Infiltration rates are less than 0.5 in/hr. Therefore, Full Infiltration is not feasible on the subject site.	

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Criteria 2: Water Balance Screening	
2A	**Ephemeral Stream Setback.** Does the proposed full infiltration BMP meet both the following? • The full infiltration BMP is located at least 250 feet away from an ephemeral stream; **AND** • The bottom surface of the full infiltration BMP is at a depth 20 feet or greater from seasonally high groundwater tables. ○ Yes; Answer "Yes" to Criteria 2 Result. ⊙ No; Continue to Step 2B.
2B	**Mitigation Measures.** Can site layout changes be proposed to support full infiltration BMPs? ○ Yes; the site can be reconfigured to mitigate potential water balance issues. Answer "Yes" to Criteria 2 Result. ⊙ No; the site cannot be reconfigured to mitigate potential water balance issues. Continue to Step 2C and provide discussion.
2C	**Additional studies.** Do additional studies support full infiltration BMPs? In the event that water balance effects are used to reject full infiltration (anticipated to be rare), additional analysis shall be completed and documented by a qualified professional indicating the site-specific information evaluated and the technical basis for this finding. ○ Yes; Answer "Yes" to Criteria 2 Result. ⊙ No; Answer "No" to Criteria 2 Result.
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams? ○ Yes; Continue to Part 1 Result. ⊙ No; Continue to Part 1 Result.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]

Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth.

Infiltration rates are below 0.5 in/hr. Therefore, Full Infiltration is not feasible on the subject site.

Part 1 – Full Infiltration Groundwater and Water Balance Screening Result[3]	Result
If answers to Criteria 1 and 2 are "Yes", a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration based on groundwater conditions. If answer to Criteria 1 or Criteria 2 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design based on groundwater conditions. Proceed to Part 2.	○ Full Infiltration ◉ Complete Part 2

[3] 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 Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
1695 Saturn Blvd.	Design
Criteria 3: Groundwater Screening	
Contaminated Soil/Groundwater. Are partial infiltration BMPs proposed at least 100 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. This criterion is intentionally a smaller radius than full infiltration, as the potential quantity of infiltration from partial infiltration BMPs is smaller. ◉ Yes; Answer "Yes" to Criteria 3 Result. ○ No; However, site layout changes can be proposed to avoid contaminated soils or soils that lack adequate treatment capacity. Select "Yes" to Criteria 3 Result. It is a requirement for the SWQMP preparer to identify potential mitigation measures. ○ No; Contaminated soils or soils that lack adequate treatment capacity cannot be avoided and partial infiltration BMPs are not feasible. Select "No" to Criteria 3 Result.	
Criteria 3 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 risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level? ◉ Yes; Continue to Part 2, Criteria 4. ○ No; Skip to Part 2 Result.	
Summarize findings and basis. Documentation should focus on mapped soil types and contaminated site locations. There are no known groundwater contaminants onsite or in the proximity of the site (GeoTracker, 2017). During our 2017 Geotechnical Investigation (EEI, 2017b), groundwater was not encountered to the maximum explored depth of 41.5 feet below ground surface. Groundwater wells north of the subject site record groundwater depths of approximately 20 feet below ground surface (GeoTracker, 2017). Considering all of this, Partial Infiltration should not have any negative effect on the groundwater quality. References: EEI, 2017b, "Geotechnical Evaluation, Saturn Boulevard, LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4", dated December 15, 2017 GeoTracker Website, 2017, State Water Resources Control Board GeoTracker Website, <http://geotracker.waterboards.ca.gov/>, accessed August 7, 2018	

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Criteria 4: Water Balance Screening	
Additional studies. In the event that water balance effects are used to reject partial infiltration (anticipated to be rare), a qualified professional must provide an analysis of the incremental effects of partial infiltration BMPs on the water balance compared to incidental infiltration under a no infiltration scenario (e.g. precipitation, irrigation, etc.).	
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 causing potential water balance issues such as change of seasonality of ephemeral streams? ◉ Yes: Continue to Part 2 Result. ○ No: Continue to Part 2 Result.	
Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth. There are no ephemeral streams within 2000 feet of the subject site. The closest ephemeral stream is the Tijuana River located about half a mile to the south. As mentioned in the previous section, shallow groundwater is not present at the subject site. Partial Infiltration should not pose any challenge to water balance effects.	

Part 2 – Partial Infiltration Groundwater and Water Balance Screening Result[4]	Result
If answers to Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration based on groundwater and water balance conditions. If answer to Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site. The feasibility screening category is No Infiltration based on groundwater or water balance condition.	◉ Partial Infiltration Condition ○ No Infiltration Condition

[4] 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.

Worksheet C.4-3: Infiltration and Groundwater Protection for Full Infiltration BMPs

Infiltration and Groundwater Protection		Worksheet C.4-3	
Criteria	Question	Yes	No
1	Will the storm water runoff undergo pretreatment such as sedimentation or filtration prior to infiltration?	☐	☐
2	Are pollution prevention and source control BMPs implemented at a level appropriate to protect groundwater quality for areas draining to infiltration BMPs?	☐	☐
3	Is the vertical distance from the base of the full infiltration BMP to the seasonal high groundwater mark greater than 10 feet? This vertical distance may be reduced when the groundwater basin does not support beneficial uses and the groundwater quality is maintained	☐	☐
4	Does the soil through which infiltration is to occur have physical and chemical characteristics that are adequate for proper infiltration durations and treatment of runoff for the protection of groundwater beneficial uses? Refer to Appendix C.3.1.	☐	☐
5	Is the following statement true? Full infiltration BMPs are not used for areas of industrial or light industrial activity, and other high threat to water quality land uses and activities, unless source control BMPs to prevent exposure of high threat activities are implemented, or runoff from such activities is first treated or filtered to remove pollutants prior to infiltration.	☐	☐
6	Is the full infiltration BMP located at a distance greater than 100 feet horizontally from any water supply well?	☐	☐
Basis and Documentation: All the answers for Criteria 1 to 6 must be “Yes” for acceptance of a full infiltration BMP.			

April 20, 2018

Mr. David Larson
Saturn Boulevard, LLC
950 Garland Drive
San Diego, California 92165

Subject: **Geotechnical Addendum**
Response to Plan Check Comments for Proposed Residential Development
Saturn Boulevard
LDR-Geology Plan Check Comments dated April 4, 2018, Project Number 566657
1695 Saturn Boulevard, San Diego, California
EEI Project AAA-72282.4

References: EEI 2017, "Geotechnical Evaluation, Saturn Boulevard LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, California," EEI Project AAA-72282.4, dated December 15, 2017.

REC Consultants, 2017, "Preliminary Grading Plan, Saturn Boulevard, 1695 Saturn Boulevard," San Diego, California, Plot dated January 26, 2017.

City of San Diego Development Services Department, 2018, "LDR Geology Plan Check Comments for Geotechnical Evaluation Report, EEI 2017," Project Number 566657, dated April 4, 2018.

Mr. Larson:

In accordance with your request and authorization, EEI presents this geotechnical addendum in response to the current referenced Plan Check Comments. Our response will be in the form of presenting the comments followed by our response.

Comment No. 15: *Provide a geotechnical map on a topographic base that shows geologic conditions, field explorations and proposed construction. Show the location of the cross section.*

Response: EEI has included an updated Figure 3 which is attached to this addendum.

Comment No. 16: *Provide a geologic cross section. Depict the geologic/geotechnical conditions in relationship to the proposed development.*

Response: A geologic cross section A-A', Figure 3A, is attached to this addendum letter.

Comment No. 17: *The geotechnical consultant must comment whether or not the proposed site development as recommended will measurably destabilize neighboring properties or induce settlement of adjacent structures.*

Response: Based on the geotechnical data and analyses contained in the referenced report, it is our opinion that that site will be safe from the hazards of landslides, settlement or slippage, and that the proposed structures and grading will not affect the geologic stability of the neighboring properties or induce settlement of adjacent structures. This opinion is based on the assumption that the geotechnical recommendations contained in our referenced report are properly incorporated into the proposed construction at the site. We also note that the hazard of settlement as indicated in the above opinion refers to that settlement that is in excess of the estimated amounts presented in our referenced report.

All other recommendations presented in the referenced geotechnical report remain applicable to the project and are included by reference herein.

EEI appreciates the opportunity to be of continued service. If you have any questions, please contact the undersigned at (760) 431-3747.

Respectfully submitted,
EEI

REGISTERED PROFESSIONAL ENGINEER
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Senior Geotechnical Engineer

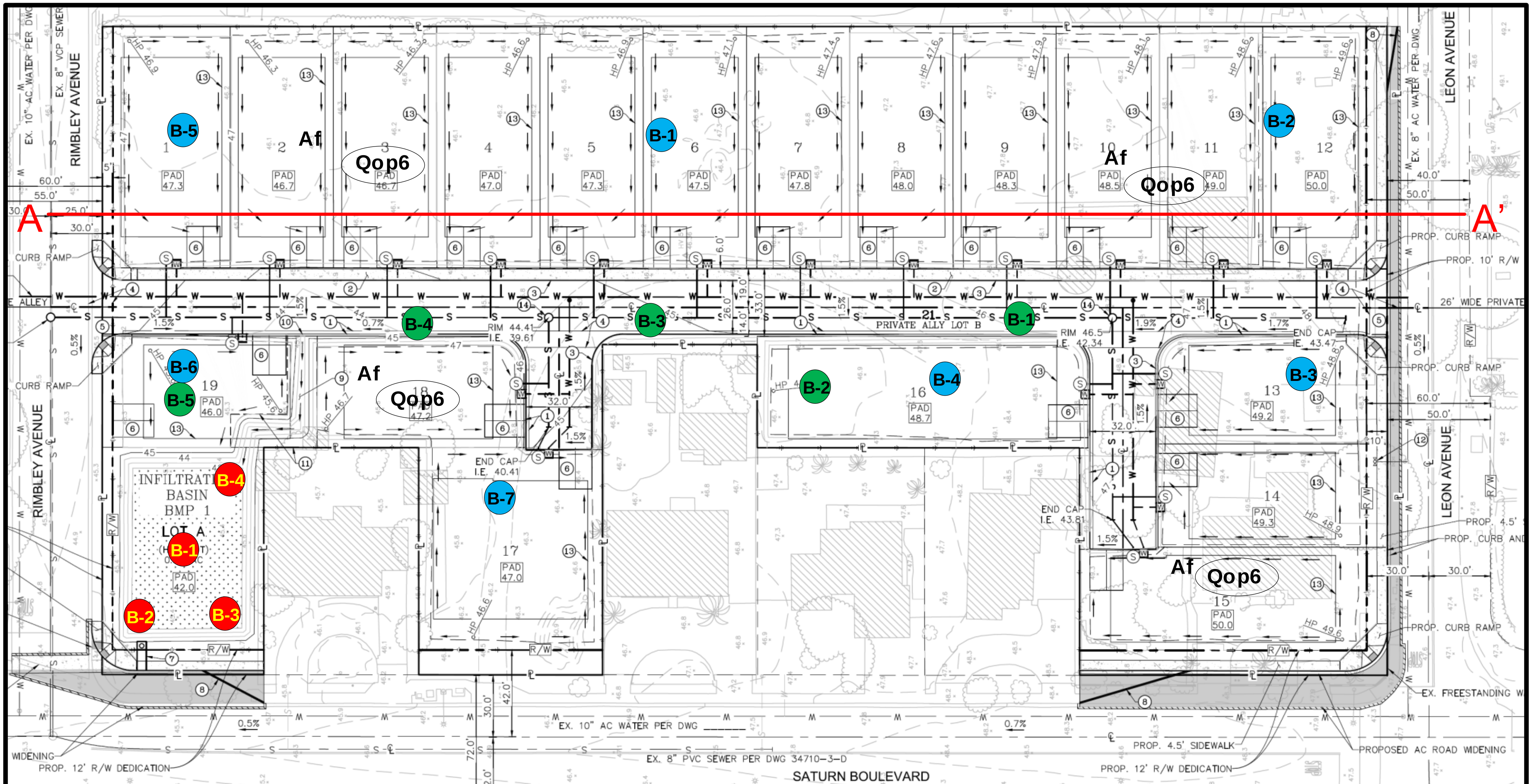
Jeffrey P. Blake
CEG 2248 (exp. 10/31/19)
Principal Engineering Geologist

Attachments: Figure 3 - Geotechnical Map
Figure 3A - Geologic Cross Section A-A'

Distribution: (1) Addressee one via electronic copy
(3) Atlantis Group Land Consultants - Ms. Jeannette Temple one via electronic copy

P:\EEI Projects\AAA SINGLE PROJ CLIENTS\AAA-72282 Saturn Blvd. LLC, Chula Vista\Geo Evaluation\Report\City Comments\AAA-72282.4 Geo Addendum Response to LDR Geology Plan Check Comments (FNL JLM JPB cc 4.20.2018).doc

FIGURES



LEGEND

B-3	***Approximate Boring/Percolation Test Location (EEI, December 2017)***
B-1	***Approximate Boring/Percolation Test Location (EEI, February 2017)***
B-2	***Approximate Boring/Percolation Test Location (EEI, February 2016)***
Af	***Artificial Fill/Topsoil undifferentiated***
Qop6	***Quaternary Old Paralic Deposits; circled where buried***
A —— A'	***Geologic Cross Section***

N

Scale: 1" = 80'

0 40 ft 80 ft 160 ft

Note: All Locations Are Approximate

GEOTECHNICAL MAP

Palm Avenue Realty Company

Proposed Single-Family Residential Subdivision

1695 Saturn Boulevard

San Diego, California

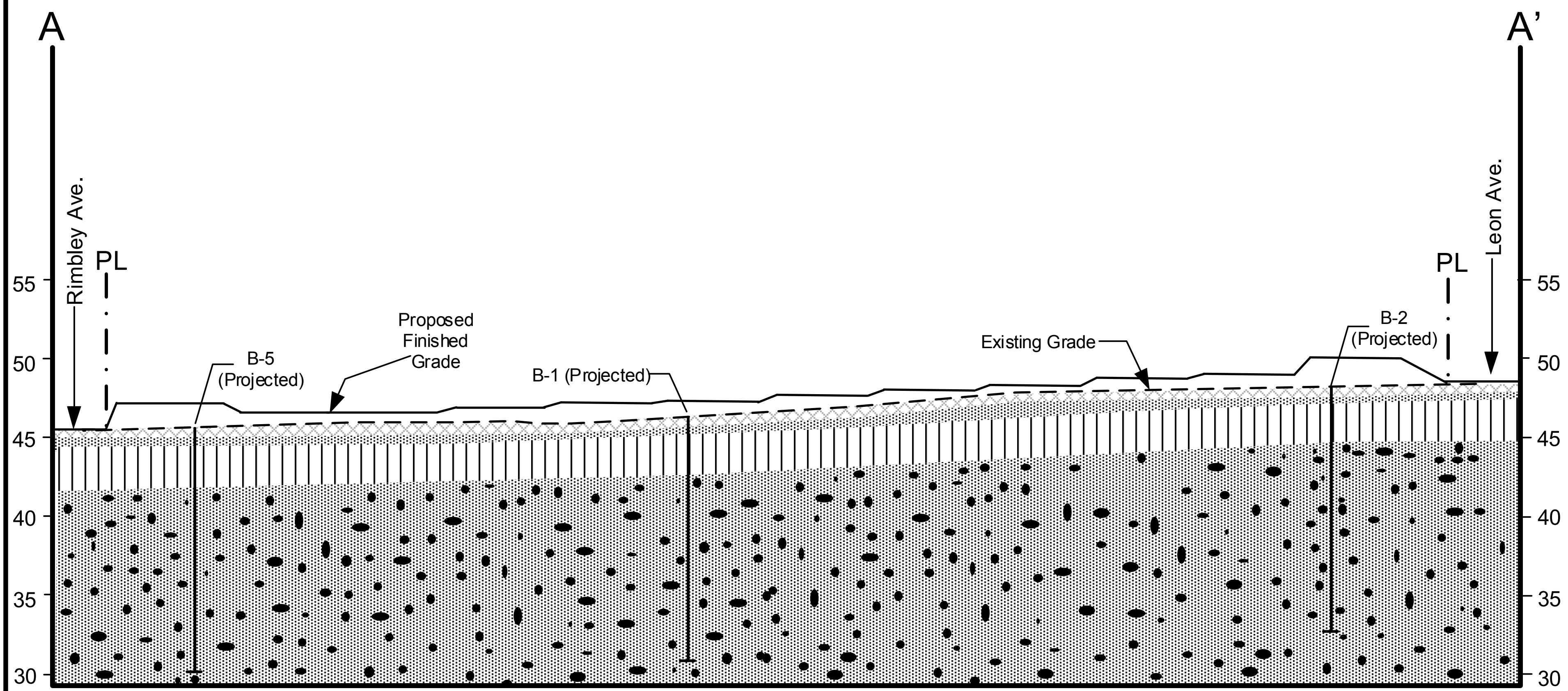
EEI Project No. AAA-72282.4a

Created April, 2018

EEI Geotechnical & Environmental Solutions

FIGURE 3

Source: REC Consultants, Inc., 2016



LEGEND

SILTY SAND with CLAY, dark orange-brown, fine grained, slightly moist, loose

FILL/TOPSOIL

OLD PARALIC DEPOSITS

SILTY SAND, dark orange-brown, fine grained, slightly moist, medium dense

SANDY SILT, orange-brown, fine grained, slightly moist, hard

SILTY SAND, orange-brown to gray-brown, fine to coarse grained, slightly moist to moist, medium dense to dense, gravel and pebbles

N

Vertical Scale: 1" = 10'

Horizontal Scale: 1" = 80'

Vertical Exaggeration = 8

0 40 ft 80 ft 160 ft

Note: All Locations Are Approximate

CROSS-SECTION A-A'

Palm Avenue Realty Company

Proposed Single-Family Residential Subdivision

1695 Saturn Boulevard

San Diego, California

EEI Project No. AAA-72282.4a

Created April, 2018

EEI Geotechnical & Environmental Solutions

FIGURE 3A

Source: REC Consultants, Inc., 2016

February 28, 2017

Mr. David Larson
Palm Avenue Realty Company
950 Garland Drive
San Diego, California 92165

Subject: **Supplemental Percolation Study**
Proposed Single-Family Residential Subdivision Development
1695 Saturn Boulevard
San Diego, California
EEI Project No. AAA-72282.4a

Dear Mr. Larson:

Pursuant to your request and authorization, EEI has prepared this Supplemental Percolation Study for the subject property located in San Diego, California. The scope of EEI's service was to perform percolation testing to provide preliminary information to evaluate the feasibility of the installation of the proposed onsite storm-water disposal system and to assist with the design process.

This supplemental study is based upon information provided to us by Palm Avenue Realty Company and REC Consultants, as well as EEI's fieldwork, our referenced due diligence level geotechnical review and preliminary percolation study, research of readily available geologic reports and regional geologic maps, and our experience in the area. We understand that this supplemental percolation study is requested to be conducted to provide the infiltration characteristics of the subsurface materials to aid in the design of the proposed onsite storm-water disposal system at the subject property. A summary of our findings, conclusions and recommendations is provided herein.

SITE DESCRIPTION

Based on the information provided by Palm Avenue Realty Company and a review of GoogleEarth® online aerial photography, the subject property is generally located at the northeast corner of Saturn Boulevard and Leon Avenue in the City of San Diego, California. The approximately 4.1-acre property is identified by Assessor's Parcel Number (APN) 634-092-0100 and is addressed as 1695 Saturn Boulevard in San Diego, California.

The majority of the subject property appears to be undeveloped land, while the southern portion of the property is developed with a single-family residence, metal storage building and concrete silo. The existing developments on the property are reported to have been constructed in 1964. Additionally, an onsite septic/wastewater disposal system is indicated to be present on the property; the location and nature of the reported septic system is unknown (Ninyo & Moore, 2015). The property is surrounded by residential development to the north, south and west, and by Godfrey G. Berry Elementary School to the east. Access to the property is afforded by unpaved driveways located on Leon Avenue and Saturn Boulevard. Please refer to the Site Location Map-**Figure 1**, Aerial Site Map-**Figure 2**.

The subject property is situated within the United States Geological Survey (USGS) Imperial Beach 7.5 Minute Quadrangle. According to a Preliminary Grading Plan prepared by REC Consultants, Inc. (2016), surface elevations across the property vary from approximately 45 feet to 49 feet (NAVD88), with the highest surface elevations located in the southwestern corner and the lowest surface elevations located in the northwestern corner of the property. Overall surface gradients at the property are in a south to north direction.

Proposed Development

Preliminary grading plans prepared by REC Consultants, Inc., indicate the proposed future development will include up to 19 new single-family residential lots, one infiltration basin, a paved private driveway and other related improvements. Grading at the property will include cut and fill of generally less than 5 feet (exclusive of remedial earthwork) with earthwork quantities estimated at 3,400 cubic yards of cut and fill. No remedial estimates were provided on the plans.

FIELD EXPLORATION AND SUBSURFACE CONDITIONS

Field Exploration and Testing

Field work for our Supplemental Percolation Study was performed on February 17, 2017. A total of four hollow stem auger borings were advanced to depths ranging from approximately 5 to 11 feet below the ground surface in the area of the proposed storm-water/infiltration basin. Refusal was encountered in Boring B-1 at 11 feet below the ground surface due to the presence of gravels and cobbles. Subsurface materials encountered during our Supplemental percolation Study consisted of fill/topsoil overlying Old Paralic Deposits. A brief description of the subsurface conditions is provided in the following section.

Fill/Topsoil – Fill/topsoil was encountered in all of the exploratory borings to a depth of approximately ½ foot below the ground surface. The fill/topsoil consists of dark red-brown to orange-brown silty-sand with clay. The fill/topsoil materials were loose and moist at the time of our field exploration.

Old Paralic Deposits (Qop6) – As encountered in our exploratory borings, old paralic deposits were encountered immediately underlying the fill/topsoil within all four exploratory borings to the maximum explored depth of 11-feet below the existing ground surface. The paralic deposits observed consisted of red- and orange-brown to light brown clayey and silty-sands, sand and sandy-gravel. These materials were observed to be typically moist and medium dense at the time of our field exploration.

Detailed descriptions of the subsurface conditions are provided on the boring logs included in **Appendix A** and the approximate locations of the borings are shown on **Figure 1**.

Groundwater

Groundwater was not encountered in any of our exploratory borings. Based on our review of the Phase I prepared for the subject property (Ninyo & Moore, 2015), groundwater is expected to be at depths greater than 20 feet below the existing ground surface. Our review of the California Department of Water Resources - Water Data Library website indicated that there are no groundwater wells present on the property. It should be noted that variations in groundwater may result from fluctuations in the ground surface topography, subsurface stratification, rainfall, irrigation, and other factors that may not have been evident at the time of our subsurface exploration.

PERCOLATION TESTING

Following the drilling of the exploratory borings B-2 through B-4, a 3-inch diameter perforated polyvinyl chloride (PVC) pipe was placed in the cleaned-out holes and gravel was placed around the pipe. The test holes were presoaked for approximately two hours in general accordance with San Diego Region guidelines.

Percolation testing was performed until consistent results were obtained, which was then used to calculate the pre-adjusted percolation rate for the test hole. Upon conclusion of testing, the perforated pipe was removed from the test hole and the test holes were backfilled.

We note that a soil profile's percolation rate is not the same as its infiltration rate. Therefore, the measured/calculated field percolation rates were converted to an estimated infiltration rate utilizing a reduction factor determined using the Porchet method. The following **Table 1** presents the measured percolation rates and corresponding infiltration rates calculated for each test hole.

TABLE 1
Summary of Percolation Testing

Location	Depth (ft.)	Pre-Adjusted Percolation Rate (in/hr.)	Infiltration Rate (in/hr.)
B-2	~8-10	7.56	0.63
B-3	~3-5	4.80	0.56
B-4	~8-10	6.96	0.53

Summary of Findings

Based on the results of our percolation testing, it appears that a tested infiltration rate of 0.53-inches per hour can be used in the design of subsurface storm-water retention/disposal devices at the subject property. In general, our conclusion is that, on average, the onsite soils in the areas tested appear suitable for storm-water infiltration at the depths and locations tested. We provide the following conclusions regarding the percolation test results.

- It is EEI's professional opinion that the soils conditions and percolation characteristics encountered at the depths explored are representative of the on-site conditions in the vicinity of the boring locations. Percolation testing was performed within natural soils consisting of medium dense old paralic deposits.

- The San Diego Region BMP guidelines indicate that on-site storm-water BMPs can be designed for "Full-Infiltration" for subsurface materials with corrected infiltration rates equal to or greater than 0.5-inches per hour. Design of the storm-water disposal system should be in accordance with the County of San Diego guidelines. The completed Form I-8 of the City of San Diego Storm Water Standards is included as **Appendix B**.

- The project civil engineer should determine the appropriate factor of safety for the proposed disposal system.

We recommend that retention/disposal devices be situated at least three times their depth, or a minimum of 15 feet (whichever is greater), from the outside bottom edge of structural foundations. Structural foundations include (but are not limited to) buildings, loading docks, retaining walls, and screen walls. All stormwater disposal systems should be checked and maintained on regular intervals. Storm-water devices including bioswales that are located closer than 10 feet from any foundations/footings should be lined with an impermeable membrane to reduce the potential for saturation of foundation soils. Foundations may also need to be deepened.

LIMITATIONS

This Supplemental Percolation Study has been conducted in accordance with generally accepted geotechnical engineering principles and practice. EEI's Supplemental Percolation Study is based solely upon the site limited subsurface exploration and a review of publically available geologic information pertinent to the subject property performed by EEI.

EEI assumes no warranty as to the accuracy of the referenced reports. Findings provided herein have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time. This report has been prepared for the sole use of Palm Avenue Realty Company (Client), within a reasonable time from its authorization. Site conditions, land use (both onsite and offsite), or other factors may change as a result of manmade influences, and additional work may be required with the passage of time.

This Supplemental Percolation Study should not be relied upon by other parties without the express written consent of EEI and the Client; therefore, any use or reliance upon this geotechnical review by a party other than the Client shall be solely at the risk of such third party and without legal recourse against EEI, its employees, officers, or directors, regardless of whether the action in which recovery of damages is brought or based upon contract, tort, statue, or otherwise. The Client has the responsibility to see that all parties to the project, including the designer, contractor, subcontractor, and building official, etc. are aware of this report in its complete form. This report contains information that may be used in the preparation of contract specifications; however, the report is not designed as a specification document, and may not contain sufficient information for use without additional assessment. EEI assumes no responsibility or liability for work or testing performed by others. In addition, this report may be subject to review by the controlling authorities.

EEI appreciates the opportunity to be of service for this project. If you have any questions, please contact the undersigned at (760) 431-3747.

Sincerely,

EEI

CERTIFIED ENGINEERING GEOLOGIST
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Exp. 10/31/17
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Jeffrey P. Blake
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Principal Engineering Geologist

REGISTERED PROFESSIONAL ENGINEER
JERRY L. MICHAL
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Exp 3-31-18
GEOTECHNICAL
STATE OF CALIFORNIA

Jerry L. Michal
GE 2515 (exp. 3/31/18)
Senior Geotechnical Engineer

Attachments: Figures
Appendix A – Soil Classification Chart and Boring Logs
Appendix B – Form I-8 Categorization of Infiltration Feasibility Condition

Distribution: (2) Addressee (one via electronic copy and one hard copy)

\\192.168.0.2\public\EEI Projects\AAA SINGLE PROJ CLIENTS\AAA-72282 Palm Avenue Realty Chula Vista\Geo Evaluation\Report\2017 Report\AAA-72282.4 Saturn Blvd Spplmntl Perc Report (FNL JPB JLM ks cea 02.27.2017).doc

REFERENCES

County of San Diego, 2016, County of San Diego BMP Design Manual, For Permanent Site Design, Storm Water Treatment and Hydromodification Management, dated February 2016.

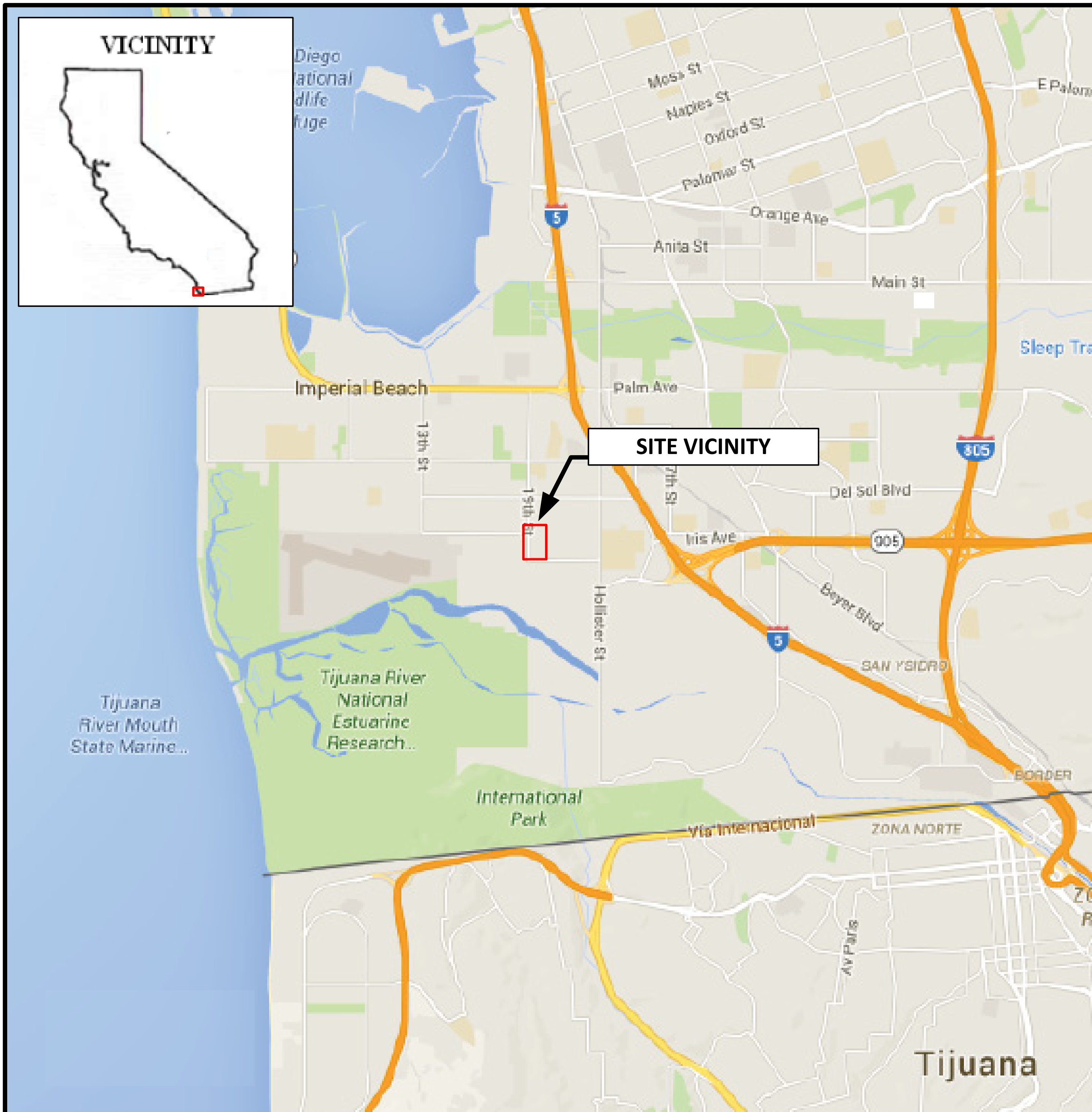
EEI, 2016, Due Diligence Level Geotechnical Review and Results of Preliminary Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project Number AAA-72282.4, dated February 15, 2016. Revised May 11, 2016.

GeoTracker Website, 2016, State Water Resources Control Board GeoTracker Website, website address <*http://geotracker.waterboards.ca.gov/*>, accessed February 2017.

Google Earth®, 2017, Version 7.1.7.2606

Ninyo & Moore, 2015, Phase I, Environmental Site Assessment, 1695 Saturn Boulevard, San Diego, California, Project No. 108063001, dated December 4, 2015.

FIGURES



LEGEND

Scale: 1" = 1mi

0 1mi 2mi

Note: All Locations Are Approximate

SITE VICINITY MAP

Palm Avenue Realty Company

Proposed Single-Family Residential Subdivision

1695 Saturn Boulevard

San Diego, California

EEI Project No. AAA-72282.4a

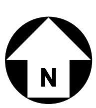
Created February 2017

EEI Geotechnical & Environmental Solutions

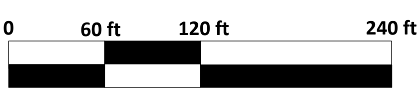
FIGURE 1

Map Source: Google Maps®; Accessed 2017

LEGEND



Scale: 1" = 120'



Note: All Locations Are Approximate

AERIAL SITE MAP

Palm Avenue Realty Company

Proposed Single-Family Residential Subdivision

1695 Saturn Boulevard

San Diego, California

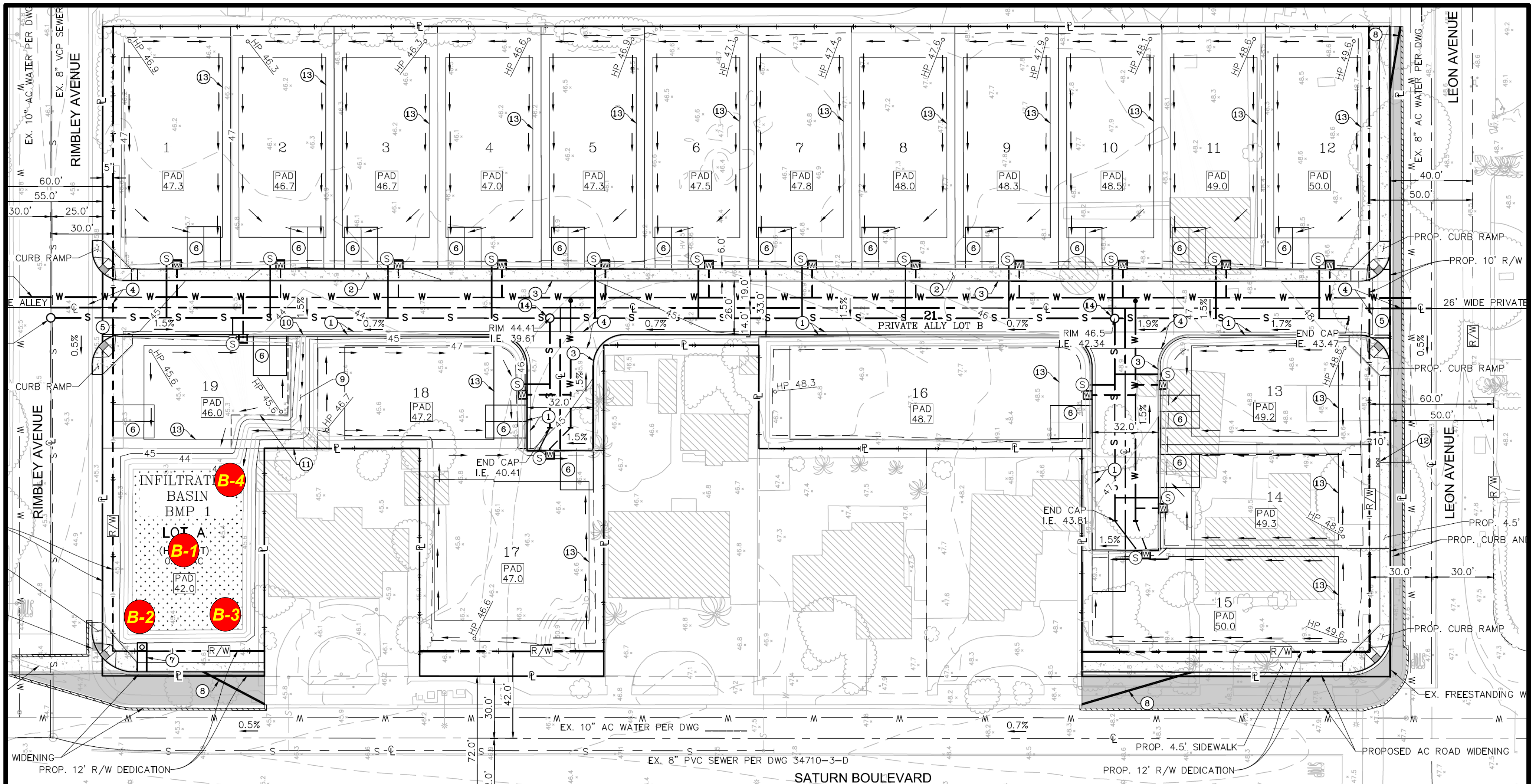
EEI Project No. AAA-72282.4a

Created February 2017

EEI Geotechnical & Environmental Solutions

FIGURE 2

Source: Google Earth, 2017



LEGEND

B-4 ***Approximate Boring/Percolation Test Location***

Scale: 1" = 80'

0 40 ft 80 ft 160 ft

Note: All Locations Are Approximate

GEOTECHNICAL MAP

Palm Avenue Realty Company

Proposed Single-Family Residential Subdivision

1695 Saturn Boulevard

San Diego, California

EEI Project No. AAA-72282.4a

Created February 2017

EEI Geotechnical & Environmental Solutions

FIGURE 3

Source: REC Consultants, Inc., 2016

APPENDIX A
SOIL CLASSIFICATION CHART AND BORING LOGS

UNIFIED SOIL CLASSIFICATION (ASTM D-2487-98)

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SEIVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL- SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND- CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION REATINED ON NO. 4 SEIVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS,GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY-SANDS, SAND – SILT MIXTURES
				SC	CLAYEY SANDS, SAND – CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS

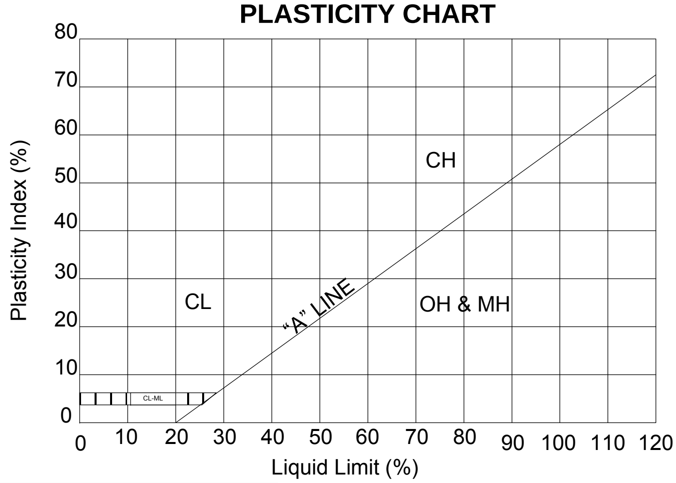
SAMPLER TYPES

- SPT
- Modified California (2.5" I.D.)
- Bulk
- Rock Core
- Shelby Tube
- Water Level

OTHER TESTS

ATT – Atterberg Limit (Plasticity Index)
CD – Consolidated Drained Triaxial
CON – Consolidation
COR – Corrosivity)
DS – Direct Shear
EI – Expansion Index
MAX – Maximum Density
RV – R-Value
SA – Sieve Analysis
-#200 - Percent Passing #200 Sieve
TV – Torvane Shear
UU – Unconsolidated Undrained Triaxial

PLASTICITY CHART



PENETRATION RESISTANCE
(Recorded As Blows/Foot)

SAND & GRAVEL		SILT & CLAY		
Relative Density	Blows/Foot* N_{60}	Consistency	Blows/Foot* N_{60}	Strength**(KSF)
Very Loose	0-4	Very Soft	0 - 2	0 – 0.5
Loose	4-10	Soft	2 - 4	0.5 – 1.0
Medium Dense	10-30	Medium Stiff	4 - 8	1.0 – 2.0
Dense	30-50	Stiff	8 - 15	2.0 – 4.0
Very Dense	Over 50	Very Stiff	15 - 30	4.0 – 8.0
		Hard	Over 30	Over 8.0

* Number of blows of 140LB hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split barrel sampler the last 12 inches of an 18-inch drive (ASTM-1586 Standard Penetration Test)

** Undrained shear strength in kips/sq. ft. As determined by laboratory testing or approximated by the standard penetration test, pocket penetrometer, torvane, or visual observation

EEI
Geotechnical & Environmental Solutions

LEGEND TO SOIL DESCRIPTIONS

APPENDIX A

BORING NUMBER B-1

EEI Geotechnical & Environmental Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 2/17/17 **COMPLETED** 2/17/17
GROUND ELEVATION 47 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-53
HAMMER EFFICIENCY (%) 68
METHOD 140 lb Auto Hammer
SPT CORRECTION 1.13 **CAL CORRECTION** 0.62
LOGGED BY BM **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark red-brown, fine grained, moist, loose	SM									
1–8		**OLD PARALIC DEPOSITS (Qop6)** @ 0.5' CLAYEY-SAND with SILT, light orange-brown, fine grained, moist, dense	SC-SM									
8–10		@ 8' SILTY-SAND, light brown, fine to coarse grained, moist, dense	SM									
10–11		@ 10' SANDY-GRAVEL, orange-brown, fine to coarse-grained with gravel up to 3-inches @ 11' Refusal encountered while drilling	GP									

Total depth: 11-feet (refusal)
No groundwater encountered
Boring backfilled with cuttings

BORING NUMBER B-2

EEI
Geotechnical & Environmental Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 2/17/17 **COMPLETED** 2/17/17
GROUND ELEVATION 47 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-53
HAMMER EFFICIENCY (%) 68
METHOD 140 lb Auto Hammer
SPT CORRECTION 1.13 **CAL CORRECTION** 0.62
LOGGED BY BM **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark red-brown, fine grained, moist, loose	SM									
1–4		**OLD PARALIC DEPOSITS (Qop6)** @ 0.5' SILTY-SAND, dark red-brown, fine grained, moist, medium dense	SM									
4–8		@ 4' CLAYEY-SAND with SILT, light orange-brown, moist, medium dense	SC									
8–10		@ 8' SAND with SILT, orange-brown, fine grained, moist, medium dense	SP-SM	SPT	11 7 8	17						

Total depth: 10-feet
No groundwater encountered
Percolation test performed
Boring backfilled with cuttings

BORING NUMBER B-3

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 2/17/17 **COMPLETED** 2/17/17
GROUND ELEVATION 48 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-53
HAMMER EFFICIENCY (%) 68
METHOD 140 lb Auto Hammer
SPT CORRECTION 1.13 **CAL CORRECTION** 0.62
LOGGED BY BM **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark red-brown, fine grained, moist, loose	SM									
1 2 3		**OLD PARALIC DEPOSITS (Qop6)** @ 0.5' CLAYEY-SAND with SILT, red-brown, fine grained, moist, medium dense	SM									
4		@ 4' SILTY-SAND, orange-brown, fine to medium-grained, some gravel, moist, medium dense	SM	SPT	5 11 7	20						
5												

Total depth: 5-feet
No groundwater encountered
Percolation test performed
Boring backfilled with cuttings

BORING NUMBER B-4

EEI Geotechnical & Environmental Solutions

CLIENT	Palm Avenue Realty Company	**PROJECT NAME**	1995 Saturn Boulevard
PROJECT NUMBER	AAA-72282.4	**PROJECT LOCATION**	San Diego, California
DATE STARTED	2/17/17 **COMPLETED** 2/17/17	**GROUND ELEVATION**	47 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG	Truck Mounted B-53	**HAMMER EFFICIENCY (%)**	68
METHOD	140 lb Auto Hammer	**SPT CORRECTION**	1.13 **CAL CORRECTION** 0.62
LOGGED BY	BM **CHECKED BY** JB	**GROUNDWATER DEPTH (ft)**	Not Encountered
NOTES			

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark orange-brown, fine grained, moist, loose	SM									
1–4		**OLD PARALIC DEPOSITS (Qop6)** @ .5' SILTY-SAND, red-brown, fine grained, moist, medium dense	SM									
4–6		@ 4' CLAYEY-SAND with SILT, red-brown, moist, medium dense	SC-SM									
6–8.5		@ 6' SILTY-SAND, light brown, fine-grained, moist, medium dense	SM									
8.5–10		@ 8.5' SAND, orange-brown, fine to medium-grained, some silt, moist, medium dense	SP	SPT	4 8 8	18						

Total depth: 10-feet
No groundwater encountered
Percolation test performed
Boring backfilled with cuttings

APPENDIX B
FORM I-8 - CATERGORIZATION OF INFILTRATION FEASIBILITY CONDITION

Categorization of Infiltration Feasibility Condition			Form I-8
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	
Provide basis: Infiltration testing indicated 0.53 to 0.63in/hr. Ave.=0.57 in/hr. Full infiltration of surface runoff is considered feasible. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: The subject site is currently a relatively flat undeveloped site. The recommended structural foundation setbacks provided in this report for the proposed storm-water/infiltration basin would mitigate any risks of geotechnical hazards. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Form I-8 Page 2 of 4			
Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: No shallow ground water was encountered during our field investigation. Groundwater is expected to be at depths greater than 20 feet below the proposed storm-water/infiltration basin. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Infiltration testing indicated 0.53 to 0.63in/hr. Ave.=0.57 in/hr. No ephemeral streams are located on, adjacent to, or in the vicinity of the site. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	Part 1 "yes"	

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

Form I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	N/A	
Provide basis: Not Applicable Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	N/A	
Provide basis: Not Applicable Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

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

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

EEI
Engineering Solutions

GEOTECHNICAL EVALUATION

Saturn Boulevard, LLC
Proposed Residential Development
1695 Saturn Boulevard
San Diego, California

EEI Project AAA-72282.4

December 15, 2017

Corporate Office: 2195 Faraday Ave. Suite K, Carlsbad, CA 92008-7207 Ph: 760-431-3747 www.eeitiger.com
Camarillo * Carlsbad * Pleasanton * Sacramento * Reno

GEOTECHNICAL EVALUATION

Prepared for:

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Saturn Boulevard, LLC
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Project Site Location:

Proposed Residential Development
1695 Saturn Boulevard
San Diego, California

Prepared by:

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EEI Project AAA-72282.4

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Distribution: (2) Addressee (one via an electronic copy and one hard copy)

1.0 INTRODUCTION

1.1 Purpose

The purpose of this Geotechnical Evaluation is to provide geotechnical information to Saturn Boulevard, LLC ("Client") regarding the subject property in the City of San Diego, California. EEI understands that the Client is considering developing the subject property and requires a Geotechnical Evaluation.

The information gathered in this evaluation is intended to provide the Client with an understanding of the physical conditions of site-specific subsurface soils, groundwater, and the regional geologic setting which could affect the cost or design of the proposed development at the property (Site Vicinity Map-**Figure 1**, Aerial Site Map-**Figure 2**).

This Geotechnical Evaluation has been conducted in general accordance with accepted geotechnical engineering principles and in general conformance with the approved proposal and cost estimate for the project by EEI, dated November 17, 2017.

EEI conducted previous field subsurface exploration on the subject property during a Due Diligence Level Geotechnical Review and Preliminary Percolation Study (EEI, 2016) and also during a Supplemental Percolation Study (EEI, 2017) as referenced herein. For this Geotechnical Evaluation, EEI conducted onsite field subsurface exploration on December 1st and December 3rd, 2017 that included drilling and sampling of seven (7) geotechnical borings for the proposed development at the subject property. We conducted two percolation tests in conjunction with our field exploration. This Geotechnical Evaluation has been prepared for the sole use of Saturn Boulevard, LLC. Other parties, without the express written consent of EEI and Saturn Boulevard, LLC should not rely upon this Geotechnical Evaluation.

1.2 Project Description

Based on the Preliminary grading plan prepared by REC Consulting Engineers (2017), and a review of GoogleEarth® online imagery, the subject property is generally located at the northeast corner of Saturn Boulevard and Leon Avenue in the City of San Diego, California. The approximately 4.1-acre property is identified by Assessor's Parcel Number (APN) 634-092-0100 and is addressed as 1695 Saturn Boulevard in San Diego, California.

The majority of the subject property appears to be undeveloped land, while the southern portion of the property is developed with a single-family residence, metal storage building and concrete silo. The existing development on the property is reported to have been constructed in 1964. Additionally, an onsite septic/wastewater disposal system is indicated to be present on the property; the location and nature of the reported septic system is unknown (Ninyo & Moore, 2015). The property is surrounded by residential development to the north, south and west, and by Godfrey G. Berry Elementary School to the east. Access to the property is afforded by unpaved driveways located on Leon Avenue and Saturn Boulevard. A site vicinity map is attached as **Figure 1**.

Based on information provided, we understand that the proposed development of the property will include 19 single-family residential lots, and a bio-retention basin. Related site improvements including paved drive areas and underground utilities are also planned. Based on the referenced preliminary grading plans provided, grading is to include estimated cut and fill quantities of 3,400 cubic yards with generally less than five feet of cut and fill across the property (exclusive of remedial grading). No foundation plans were provided to EEI at the time of proposal preparation; however, foundation loads are assumed to be typical for the type of construction. No other information is known at this time.

1.3 Scope of Services

The scope of our services included:

- A review of readily available data pertinent to the subject property, including published and unpublished geologic reports/maps, and soils data for the area (**References**).
- Conducting a geotechnical reconnaissance of the subject property and nearby vicinity.
- Coordination with Underground Service Alert (USA) to identify the presence of underground utilities for clearance of proposed boring locations.
- Drilling and logging of seven (7) small diameter exploratory borings in readily accessible areas of the subject property to depths of approximately 11 feet to 41.5 feet below the ground surface (bgs).
- An evaluation of seismicity and geologic hazards to include an evaluation of faulting and liquefaction and seismic-induced settlement potential.
- Completion of laboratory testing of representative earth materials encountered onsite to ascertain their pertinent soils engineering properties, including corrosion potential (**Appendix B**).
- The preparation of this report which presents our preliminary findings, conclusions, and recommendations.

2.0 BACKGROUND

2.1 Subject Property Description

Based on information provided, we understand the proposed subject single family residential development is generally located at the northeast corner of Saturn Boulevard and Leon Avenue in the City of San Diego, California. The approximately 4.1-acre property is identified by Assessor's Parcel Number (APN) 634-092-0100 and is addressed as 1695 Saturn Boulevard in San Diego, California.

Based on our review of GoogleEarth® online imagery, and observations during our site reconnaissance and field subsurface exploration, the majority of the subject property appears to be undeveloped land, while the southern portion of the property is developed with a single-family residence, metal storage building and concrete silo. The property is surrounded by residential development to the north, south and west, and by Godfrey G. Berry Elementary School to the east. Access to the property is afforded by unpaved driveways located on Leon Avenue and Saturn Boulevard.

The center of the subject property is approximately situated at 32.5674° north latitude and 117.09208° west longitude (GoogleEarth®, 2017).

2.2 Topography

The subject property is situated within the United States Geological Survey (USGS) Imperial Beach 7.5 Minute Quadrangle According to the referenced grading plan prepared by REC Consultants (2017), surface elevations across the property vary from approximately 45 feet to 50 feet (NAVD88), with the highest surface elevations located in the southwestern and the lowest surface elevations located in the northwestern corner of the property. Overall surface gradients at the property are in a south to north direction. An aerial site map is attached as **Figure 2**.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 Field Exploration

Field subsurface exploration work for our subject Geotechnical Evaluation was conducted on December 1st and 3rd, 2017. A total of seven (7) hollow stem auger geotechnical borings were advanced at the subject property. Boring depths ranged from approximately 11 feet to 41.5 feet below ground surface (bgs) and were logged under the supervision of a Registered Professional Engineer and Certified Engineering Geologist at EEI. Refusal was encountered on very dense materials in Borings B-1, B-2 and B-4 through B-7 at depths of 11 to 17 feet and in Boring B-3 at depth of approximately 41 feet. The approximate locations of the borings are shown on **Figure 3**.

A truck mounted hollow stem auger (HSA) drill rig was used to advance the exploratory borings, designated B-1 through B-7. Blow count (N) values were determined utilizing a 140 pound hammer, falling 30-inches onto a Standard Penetration Test (SPT) split-spoon sampler and a Modified California split-tube sampler. The blows per 6-inch increment required to advance the 18-inch long SPT and 18-inch long Modified California split-tube samplers was measured at various depth intervals (varying between 2 to 10 feet), or at changes in lithology, recorded on the boring logs, and are presented in **Appendix A**-Soil Classification Chart and Boring Logs. Energy-corrected SPT N_{60} values are also presented on the borings logs.

Relatively "undisturbed" samples were collected in a 2.42-inch (inside diameter) California Modified split-tube sampler for visual examination and laboratory testing. The soils were classified in accordance with the Unified Soil Classification System (ASTM, 2015). Representative bulk samples were also collected for appropriate laboratory testing.

3.2 Laboratory Testing

Selected samples obtained from our borings were tested to evaluate pertinent soil classification and engineering properties and enable development of geotechnical conclusions and recommendations. The laboratory tests consisted of:

- Moisture Content and Dry Density
- Expansion Index
- Maximum Dry Density and Optimum Moisture Content
- Direct Shear
- R-Value
- #200 Wash
- Corrosivity

The results of the laboratory tests, and brief explanations of test procedures, are presented in **Appendix B**. It should be understood that the results provided in **Appendix B** are based upon pre-development conditions. Verification testing is recommended at the conclusion of grading on samples collected at or near finish grade.

4.0 SUBSURFACE CONDITIONS

4.1 Geologic Setting

Regionally, the subject property lies within the Peninsular Ranges Geomorphic Province of southern California. This province consists of a series of ranges separated by northwest trending valleys; sub parallel to branches of the San Andreas Fault (CGS, 2002). The Peninsular Ranges geomorphic province, one of the largest geomorphic units in western North America, extends from the Transverse Ranges geomorphic province and the Los Angeles Basin, south to Baja California. It is bound on the west by the Pacific Ocean, on the south by the Gulf of California and on the east by the Colorado Desert Province. The Peninsular Ranges are essentially a series of northwest-southeast oriented fault blocks (CGS, 2002). Major fault zones and subordinate fault zones found in the Peninsular Ranges Province typically trend in a northwest-southeast direction.

Regional geologic maps of the subject property and vicinity (Tan and Kennedy, 2008) indicate the area of the subject property is underlain by late to middle Pleistocene-age old paralic deposits (map symbol Qop6). The paralic deposits are typically composed of poorly-sorted, reddish-brown strandline, beach, estuarine or colluvial deposits composed of sandstone, siltstone, and conglomerate.

4.2 Subsurface Conditions

The materials encountered in all of our exploratory borings consisted of a relatively minor layer of artificial fill/topsoil underlain by Pleistocene-aged old Paralic deposits. A brief description of the subsurface conditions is provided in the following section. Detailed descriptions of the subsurface conditions are provided on the boring logs included in **Appendix A**.

Artificial Fill/Topsoil- Artificial fill and topsoil was encountered in our borings at depths of approximately 0.5 to one foot below the existing ground surface. As encountered, the fill consists of orange-brown to dark orange-brown, silty sand with trace clay. These materials were observed to be typically damp to moist and loose at the time of our subsurface exploration.

Quaternary Age Old Paralic Deposits (Qop6) – Late to Middle Pleistocene- age Old Paralic Deposits were encountered underlying the fill/topsoil layer in all of the exploratory borings to the maximum explored depth of 41.5 feet below the existing ground surface. The older paralic deposits were observed to consist of orange-brown to gray-brown, sandy silt, silty sands and gravelly sands with cobbles. These materials were observed to be typically damp to very moist and medium dense to very dense at the time of our subsurface exploration. Refusal on the paralic deposits was encountered during drilling in our exploratory borings at depths of approximately 11 feet to 41.5 feet below the existing ground surface.

4.3 Groundwater

Groundwater was not encountered in any of our exploratory borings to a depth of 41.5 feet bgs at the time of exploration. It should be noted that variations in groundwater may result from fluctuations in the ground surface topography, subsurface stratification, rainfall, irrigation, and other factors that may not have been evident at the time of our subsurface exploration.

5.0 GEOLOGIC HAZARDS

Based upon our review of references for the subject property, and our geotechnical evaluation, it appears that the primary geologic hazard for the property is ground shaking due to an earthquake event occurring along one of the major active faults that are located in the seismically active region of Southern California where the property is situated. Our review of pertinent geologic literature (City of San Diego, 2008) indicates that the property is located within a City of San Diego Geologic Hazards Category 52, identified as "Other level areas, gently sloping to steep terrain, favorable geologic structure, Low Risk".

5.1 California Building Code Seismic Design Parameters

EEI utilized seismic design criteria provided in the CBC (2016) and ASCE 7-10. Final selection of the appropriate seismic design coefficients should be made by the structural consultant based on the local laws and ordinances, expected building response, and desired level of conservatism. The site coefficients and adjusted maximum considered earthquake spectral response accelerations in accordance with the 2016 California Building Code are presented in **Table 1**.

Table 1
2016 CBC Seismic Parameters and Peak Ground Acceleration

Parameter	Value
Site Coordinates	Latitude 32.5674° Longitude -117.09208°
Mapped Spectral Acceleration Value at Short Period: $\mathbf{S_s}$	1.035g
Mapped Spectral Acceleration Value at 1-Second Period: $\mathbf{S_1}$	0.389g
Site Classification	D
Short Period Site Coefficient: $\mathbf{F_a}$	1.086
1-Second Period Site Coefficient: $\mathbf{F_v}$	1.622
Design Spectral Response Acceleration at Short Periods: $\mathbf{S_{DS}}$	0.749g
Design Spectral Response Acceleration at 1-Second Period: $\mathbf{S_{D1}}$	0.421g
Peak Ground Acceleration adjusted for Site Class Effects: $\mathbf{PGA_M}$	0.467g

5.2 Faulting and Surface Rupture

The subject property is located within an area of California known to contain a number of active and potentially active faults and is located within a State of California Earthquake Fault Zone (Hart and Bryant, 1997, CDMG, 2000). Our review indicates that there are no known active faults crossing the property; however, due to the proximity of the property area to several nearby active faults, strong ground shaking could occur at the property as a result of an earthquake on any one of the nearby faults. The closest known active faults are the Newport Inglewood, alt 1 and alt 2 fault zones and Rose Canyon Fault zone, located approximately 3.25 miles from the property (USGS, 2008). Therefore, the potential for surface rupture at the property is considered low. Three of the closest faults along with their distance from the property and Maximum Magnitude are shown in **Table 2.**

Table 2
Nearby Active Faults

Fault	Distance in Miles (Kilometers)[1]	Maximum Magnitude[1]
Newport Inglewood Connected, alt 2	3.25 (5.23)	6.7
Rose Canyon	3.25 (5.23)	6.8
Newport-Inglewood, Alt 1	3.25 (5.23)	6.8

1. USGS Online Fault Search (2008)

5.3 Landslides and Slope Stability

Evidence of landslides or slope instabilities was not observed at the subject property. Due to the property topography, the absence of significant nearby slopes or hills, and the planned site grading, the potential for landslides or slope instabilities to occur at the site is considered low.

5.4 Expansive Soil

Laboratory test results indicate the near surface onsite soils have a low expansion potential with an expansion index (EI) of 21 (as determined by ASTM D4829). The expansive potential of these materials is not considered to pose a hazard for the proposed development.

5.5 Liquefaction and Seismic Settlement

Liquefaction occurs when loose, saturated, generally fine sands and silts are subjected to strong ground shaking. The soils lose shear strength and become liquid; potentially resulting in large total and differential ground surface settlements as well as possible lateral spreading during an earthquake. Seismically induced settlement can occur in response to liquefaction of saturated loose granular soils, as well as the reorientation of soil particles during strong shaking of loose, unsaturated sands. Due to the lack of shallow groundwater at the subject property and the relatively dense underlying sedimentary materials beneath the property, the potential for liquefaction and dynamic settlement to occur is considered very low. The potential for liquefaction induced lateral spreading is also considered to be very low.

5.6 Tsunamis, Flooding and Seiches

The subject property is not located within a Tsunami Evacuation Area or FEMA Flood Zone; therefore, damage due to tsunamis and flooding is considered low.

EEI reviewed the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel 06073C2154H to determine if the subject property was located within an area designated as a Flood Hazard Zone. The property is within Zone X described as an area determined to be outside the 0.2 percent annual chance floodplain.

Seiches are periodic oscillations in large bodies of water such as lakes, harbors, bays, or reservoirs. The subject property is not located immediately adjacent to any lakes or confined bodies of water; therefore, the potential for a seiche to affect the property is considered low.

6.0 CONCLUSIONS

Based on our field exploration, laboratory testing and engineering and geologic analysis, it is our opinion that the subject property is suitable for the proposed residential development project from a geotechnical engineering and geologic viewpoint; however, there are existing geotechnical conditions associated with the property that will warrant mitigation and/or consideration during planning stages. If site plans and/or the proposed building locations are revised, additional field studies may be warranted to address proposed site-specific conditions. The main geotechnical conclusions for the project are presented in the following text.

- A total of seven (7) exploratory HSA borings were advanced within the subject property during this evaluation. The HSA borings were advanced to depths ranging from 11 to 41.5 feet bgs. The property is underlain by fill/topsoil and sedimentary materials named older paralic deposits.

- Moderately difficult to difficult excavation operations should be anticipated during earthwork onsite. Standard heavy duty grading equipment is anticipated to excavate the fill/topsoils, as well as the old paralic deposits; however, localized areas that contain dense and hard cemented zones and cobbles requiring heavy ripping with a single shank, or a "rock breaker" should be anticipated.

- Groundwater was not encountered in any of our exploratory borings to the maximum depth explored of approximately 41.5 feet bgs.

- The results of our laboratory Expansion Index (EI) testing indicate the onsite soils have a very low expansion potential (EI<21).

- The subject property is located within an area of southern California recognized as having a number of active and potentially-active faults located nearby. Our review indicates that there are no known active faults mapped as crossing the property and the property is not located within an Earthquake Fault Zone.

- The surficial soils comprised of fill/topsoil and the upper portions of the Old Paralic deposit soils are variable in moisture and density, and are considered potentially compressible. As such, they are considered unsuitable for the support of settlement-sensitive structures or additional fill in their current condition. Therefore, these materials should be removed and recompacted in those areas to receive additional fill, proposed buildings and other settlement-sensitive improvements. Based on the results of our subsurface exploration, we anticipate that these removals need to extend up to approximately three feet below existing site grades. Localized areas of deeper removals may be necessary depending on field conditions encountered.

- A conventional shallow foundation system in conjunction with a concrete slab-on-grade floor appears to be suitable for support of the proposed residential buildings.

7.0 RECOMMENDATIONS

The recommendations presented herein should be incorporated into the planning and design phases of development. Guidelines for site preparation, earthwork, and onsite improvements are provided in the following sections.

7.1 General

Grading should conform to the guidelines presented in the 2016 California Building Code (CBC, 2016), as well as the requirements of the City of San Diego. Additionally, general Earthwork and Grading Guidelines are provided herein as **Appendix C**.

During earthwork construction, removals and reprocessing of loose or unsuitable soil materials, as well as general grading procedures of the contractor should be observed and the fill placed should be selectively tested by representatives of the Geotechnical Engineer, EEI. If any unusual or unexpected conditions are exposed in the field, they should be reviewed by the Geotechnical Engineer and if warranted, modified and/or additional recommendations will be offered. Specific guidelines and comments pertinent to the planned development are provided herein.

The recommendations presented herein have been completed using the preliminary information provided to us regarding site development. EEI should be provided with grading and foundation plans once they are available so that we can determine if the recommendations provided in this report remain applicable.

7.2 Site Preparation and Grading

Debris and other deleterious material, such as organic soils, tree rootballs and/or environmentally impacted earth materials (if any) should be removed from the subject property prior to the start of grading. All undocumented fill/backfill should be removed and recompacted. Areas to receive fill should be properly scarified and/or benched in accordance with current industry standards of practice and guidelines specified in the CBC (2016) and the requirements of the local jurisdiction.

Abandoned trenches should be properly backfilled and tested. If unanticipated subsurface improvements (utility lines, septic systems, wells, utilities, etc.) are encountered during earthwork construction, the Geotechnical Engineer should be informed and appropriate remedial recommendations would then be provided.

7.3 Remedial Earthwork

Remedial grading for the proposed residential building pads and for pavement and hardscape areas is provided in the following sections. Unless noted otherwise, fill should be moisture conditioned to at least the optimum moisture content and compacted to at least 90 percent of the maximum dry density (based on ASTM D1557).

Building Pads and other Settlement Sensitive Structures: The surficial soils comprised of fill/topsoil and the weathered upper portions of the old paralic deposits vary in density, and are considered potentially compressible. As such, it is considered unsuitable for the support of settlement-sensitive structures or additional fill in its current condition.

Based on this information, we recommend the over-excavation and re-compaction (remedial grading) of the materials within the proposed grading limits of the building pads and other settlement sensitive structures. These removals should extend to a minimum of 3 feet below the existing ground surface or 18-inches below the bottom of foundations, whichever is deeper. The remedial earthwork should encompass the entire building pad area. Note that vertical sides exceeding five feet in depth may be prone to sloughing and may require laying back to an inclination of 1:1 (horizontal to vertical). Some locations that are close to property lines and existing improvements may require temporary shoring.

Other Settlement Sensitive Structures: Similar remedial grading may be performed below other settlement sensitive improvements such as pools, roads, and hardscape. If over-excavations improvements are not performed in these areas, these improvements will be subject to settlement.

7.4 Cut-Fill Transitions and Cut Lots

It is recommended that where cut-fill transitions are located the entire cut portion of the building pad area should be over-excavated to a minimum depth of three feet below finish grade or 18-inches below the bottoms of the proposed footings (whichever is deeper) and replaced with compacted fill possessing a very low to low expansion potential. Over-excavation of transition pads is recommended in order to reduce the potential for differential settlements between cut and fill transitions and to provide uniform bearing conditions. The over-excavation of the transition cut-fill pads should extend at least 5 feet beyond the proposed building footprints, and consideration should be given to the over-excavation of the entire pad area.

In order to provide uniform bearing conditions for any proposed buildings on design cut at the site, we recommend that consideration be given to over-excavation of the pad to a minimum depth of three feet below finish grade or 18-inches below the bottoms of the proposed footings (whichever is deeper) and replaced with compacted fill possessing a very low to low expansion potential. This over excavation should extend at least 5 feet beyond the proposed building footprints, and consideration should be given to the over-excavation of the entire pad area.

7.5 Fill Material and Placement

Fill materials should be compacted to at least 90 percent of the maximum dry density (based on ASTM D1557). Unless noted otherwise, fill should be moisture conditioned to at least 2 percent above the optimum moisture content and compacted to at least 90 percent of the maximum dry density (based on ASTM D1557). Fill material should be free of organic matter (less than 3 percent organics by weight) and other deleterious material. Fill material should not contain rocks greater than 6-inches in maximum dimension, organic debris and other deleterious materials. Rock fragments exceeding 6-inches in one dimension should be segregated and exported from the subject property, or utilized for landscaping.

Conventional Shallow Foundations with Slab on Grade: Fill within 4 feet of pad grade should consist of low expansion potential material (EI < 50). The low-expansion potential material should extend at least 5 feet beyond the building perimeter.

Hardscape: Fill within 2 feet of hardscape subgrade should consist of low-expansive material (EI < 50). The low-expansion potential material should extend at least 2 feet beyond the hardscape.

If import soils are needed, the earthwork contractor should ensure that all proposed fill materials are approved by the Geotechnical Engineer prior to use. Representative soil samples should be made available for testing at least ten (10) working days prior to hauling to the property to allow for laboratory tests.

Those areas to receive fill or surface improvements should be scarified at least 6-inches; moisture conditioned to at least 2 percent over optimum moisture content and re-compacted to at least 90 percent of the maximum dry density (based on ASTM D1557).
The subgrade should be thoroughly and uniformly moistened prior to placing concrete.

7.6 Expansive Soil

The onsite soils are anticipated to possess a very low expansion potential. The recommendations presented in this report reflect a low expansion potential.

7.7 Yielding Subgrade Conditions

The soils encountered at the subject property can exhibit "pumping" or yielding if they become saturated. This can often occur in response to periods of significant precipitation, such as during the winter rainy season. If this occurs and in order to help stabilize the yielding subgrade soils within the bottom of the removal areas, the contractor can consider the placement of stabilization fabric or geo-grid over the yielding areas, depending on the relative severity. Mirafi 600X (or approved equivalent) stabilization fabric may be used for areas with low to moderate yielding conditions.

Geo-grid such as Tensar TX-5 may be used for areas with moderate to severe yielding conditions. Uniform sized, ¾- to 2-inch crushed rock should be placed over the stabilization fabric or geo-grid. A 6- to 12-inch thick section of crushed rock will typically be necessary to stabilize yielding ground.

If significant voids are present in the crushed gravel, a filter fabric should be placed over the crushed gravel to prevent migration of fines into the gravel and subsequent settlement of the overlying fill. Fill soils, which should be placed and compacted in accordance with the recommendations presented herein, should then be placed over the fabric or geo-grid until design finish grades are reached. The crushed gravel and stabilization fabric or geo-grid should extend at least 5 feet laterally beyond the limits of the yielding areas. These operations should be performed under the observation and testing of a representative of EEI in order to evaluate the effectiveness of these measures and to provide additional recommendations for mitigation, as necessary.

7.8 Shrinkage and Bulking

Several factors will impact earthwork balancing on the subject property, including shrinkage, bulking, subsidence, trench spoils from utilities and footing excavations, and final pavement section thickness as well as the accuracy of topography. Shrinkage, bulking and subsidence are primarily dependent upon the degree of compactive effort achieved during construction. Shrinkage, bulking and subsidence should be considered by the project civil engineer relative to final site balancing. It is recommended that the site development be planned to include an area that could be raised or lowered to accommodate final site balancing.

7.9 Temporary Site Excavations

It is anticipated that excavations in the onsite materials can be achieved with conventional earthwork equipment in good working order.

Temporary excavations within the onsite materials (considered to be a Type C soil per OSHA guidelines) should be stable at 1.5H:1V inclinations for short durations during construction, and where cuts do not exceed 20 feet in height. Some sloughing of surface soils should be anticipated. Temporary excavations 4 feet deep or less can be made vertically.

The faces of temporary slopes should be inspected daily by the contractor's Competent Person before personnel are allowed to enter the excavation. Any zones of potential instability, sloughing or raveling should be brought to the attention of the Engineer and corrective action implemented before personnel begin working in the excavation.

Excavated soils should not be stockpiled behind temporary excavations within a distance equal to the depth of the excavation. EEI should be notified if other surcharge loads are anticipated so that lateral load criteria can be developed for the specific situation. If temporary slopes are to be maintained during the rainy season, berms are recommended along the tops of slopes to prevent runoff water from entering the excavation and eroding the slope faces.

8.0 FOUNDATION RECOMMENDATIONS

8.1 General

In the event that plans concerning the proposed building structures are revised in the project design and/or location or loading conditions of the planned structures are made, conclusions and recommendations contained in this report should not be considered valid unless they are reviewed, revised and/or approved in writing by EEI.

8.2 Preliminary Foundation Design

The following design parameters assume that the minimum recommended remedial grading will be performed, and that foundations for the proposed residential building will consist of conventional shallow foundations with a slab on grade. The foundation recommendations provided herein are based on the soil materials within 30-inches of foundation level possessing a low expansion potential (EI<50). Recommendations by the project's design-structural engineer or architect may exceed the following minimum recommendations.

In preparation for foundation construction, the earthwork contractor should ensure that the site has been prepared as recommended, and that field density tests have been performed to adequately document the relative compaction of structural fill. Foundation design recommendations for the proposed structure is provided in the following sections of this report.

8.2.1 Conventional Shallow Foundations

For proposed one-story wood frame residential buildings, conventional continuous and/or isolated shallow spread footings should bear entirely on compacted fill with remedial grading as described in previous sections of this report. Foundations should be constructed with an embedment of at least 12-inches below finish grade and a minimum width of 12-inches. Isolated footings should have a minimum width of 24-inches. An allowable bearing capacity of 2,000 pounds per square foot (psf) can be used for footings extending at least 12-inches below lowest adjacent finished grade. The allowable bearing may be increased by 750 psf for each additional 12-inches of embedment up to a maximum bearing of 3,000 psf. The bearing value can be increased by ⅓ when considering the total of all loads, including wind or seismic forces.

For proposed two-story wood frame residential buildings, conventional continuous and/or isolated shallow spread footings should bear entirely on compacted fill with remedial grading as described in previous sections of this report. Foundations should be constructed with an embedment of at least 18-inches below finish grade and a minimum width of 15-inches.

Isolated footings should have a minimum width of 24-inches. An allowable bearing capacity of 2,000 pounds per square foot (psf) can be used for footings extending at least 12-inches below lowest adjacent finished grade. The allowable bearing may be increased by 750 psf for each additional 12-inches of embedment up to a maximum bearing of 3,000 psf. The bearing value can be increased by ⅓ when considering the total of all loads, including wind or seismic forces.

Based on the prevailing geotechnical conditions encountered during our geotechnical evaluation as described herein, we recommend that foundations be reinforced with at least two No. 4 bars, one placed at the top of the footing and one placed at the bottom.

The recommendations for footings sizes and reinforcement are considered minimums and are not intended to supersede the design of the project structural engineer.

8.3 Lateral loads

Lateral loads will be resisted by friction between the bottoms of foundations and passive pressure on the faces of footings and other structural elements below grade. An allowable passive pressure of 300 psf per foot of depth can be used for the portion of the foundation below grade. An allowable coefficient of friction of 0.30 can be used. The passive pressure can be increased by ⅓ when considering the total of all loads, including wind or seismic forces. The upper one-foot of soil should not be relied on for passive support unless the ground is covered with pavements or slabs.

8.4 Settlement

Settlement estimates for conventional foundations are as follows:

- Static Total Settlement: Less than 1-inch
- Static Differential Settlement: Less than ½-inch over a distance of 40 feet

8.5 Footing Setbacks

Footings adjacent to unlined drainage swales or underground utilities (if any) should be deepened to a minimum of 6-inches below the invert of the adjacent unlined swale or utilities. This distance is measured from the footing face at the bearing elevation. Footings for structures adjacent to retaining walls should be deepened so as to extend below a 1:1 projection from the heel of the wall. Alternatively, walls may be designed to accommodate structural loads from buildings or appurtenances.

8.6 Conventional Retaining Walls

8.6.1 Foundations

The recommendations provided in the conventional foundation section of this report are also applicable to conventional retaining walls.

8.6.2 Lateral Earth Pressure

The following parameters are based on the use of low-expansion potential backfill materials within a 1:1 (H:V) line projected from the heel of the retaining wall.

The active earth pressure for the design of unrestrained earth retaining structures with level backfills can be taken as equivalent to the pressure of a fluid weighing 40 pcf. The at-rest earth pressure for the design of restrained earth retaining structures with level backfills can be taken as equivalent to the pressure of a fluid weighing 60 pcf. The above values assume a granular and drained backfill condition. Higher lateral earth pressures would apply if walls retain expansive clay soils. An additional 20 pcf should be added to these values for walls with a 2:1 (H:V) sloping backfill. An increase in earth pressure equivalent to an additional 2 feet of retained soil can be used to account for surcharge loads from light traffic. The above values do not include a factor of safety. Appropriate factors of safety should be incorporated into the design. Surcharge due to other loading within an approximate 1½:1 (H:V) projection from the back of the wall will increase the lateral pressures provided above and should be incorporated into the wall design.

Retaining walls should be designed to resist hydrostatic pressures or be provided with a back-drain to reduce the accumulation of hydrostatic pressures. Back-drains may consist of a two-foot wide zone of ¾-inch crushed rock. The back-drain should be separated from the adjacent soils using a non-woven filter fabric, such as Mirafi 140N or equivalent. Weep holes should be provided or a perforated pipe (Schedule 40 PVC) should be installed at the base of the back-drain and sloped to discharge to a suitable storm drain facility. As an alternative, a geo-composite drainage system such as Miradrain 6000 or equivalent placed behind the wall and connected to a suitable storm drain facility can be used. The project architect should provide waterproofing specifications and details.

8.6.3 Seismic Earth Pressure

Where required, seismic earth pressures can be taken as equivalent to the pressure of a fluid weighing 44 pounds per cubic foot (pcf) for flexible walls and 79 pcf for stiff walls. These values are for level backfill conditions and do not include a factor of safety. Sloping backfill will increase wall pressures. Appropriate factors of safety should be incorporated into the design. The seismic pressure is in addition to the un-factored static active pressures. The allowable passive pressure and bearing capacity can be increased by ⅓ in determining the stability of the wall.

8.7 Interior Slabs-on-Grade

The project structural engineer should design the interior concrete slab-on-grade floor. We recommend that building slabs be at least 4-inches in thickness and that consideration be given to the slab being reinforced with No. 3 bars spaced 18-inches on center, each way, and placed at slab mid-height, or the slab reinforcement in accordance with the structural engineers design. Subgrade materials should not be allowed to desiccate between grading and the construction of the concrete slabs. The floor slab subgrade should be thoroughly and uniformly moistened prior to placing concrete.

A moisture vapor retarder/barrier should be placed beneath slabs where moisture sensitive floor coverings will be installed. Typically, plastic is used as a vapor retardant. If plastic is used, a minimum 10-mil is recommended. The plastic should comply with ASTM E1745. Plastic installation should comply with ASTM E1643.

Current construction practice typically includes placement of a 2-inch thick sand cushion between the bottom of the concrete slab and the moisture vapor retarder/barrier. This cushion can provide some protection to the vapor retarder/barrier during construction, and may assist in reducing the potential for edge curling in the slab during curing. However, the sand layer also provides a source of moisture vapor to the underside of the slab that can increase the time required to reduce moisture vapor emissions to limits acceptable for the type of floor covering placed on top of the slab. The slab can be placed directly on the vapor retarder/barrier. The floor covering manufacturer should be contacted to determine the volume of moisture vapor allowable and any treatment needed to reduce moisture vapor emissions to acceptable limits for the particular type of floor covering installed. The project team should determine the appropriate treatment for the specific application.

8.8 Exterior Slabs-on-Grade (Hardscape)

The top 24-inches of soil below exterior concrete slabs-on-grade should have an expansion index of 50 or less. Exterior slabs should have a minimum thickness of 4-inches and consideration given to be reinforced with at least No. 3 bars at 18-inches on center each way. Slabs should be provided with weakened plane joints. Joints should be placed in accordance with the American Concrete Institute (ACI) guidelines. Proper control joints should be provided to reduce the potential for damage resulting from shrinkage. Subgrade materials should not be allowed to desiccate between grading and the construction of the concrete slabs. The floor slab subgrade should be thoroughly and uniformly moistened prior to placing concrete.

All dedicated exterior flatwork should conform to standards provided by the governing agency including section composition, supporting material thickness and any requirements for reinforcing steel. Concrete mix proportions and construction techniques, including the addition of water and improper curing, can adversely affect the finished quality of the concrete and result in cracking and spalling of the slab. We recommend that all placement and curing be performed in accordance with procedures outlined by the American Concrete Institute and/or Portland Cement Association. Special consideration should be given to concrete placed and cured during hot or cold weather conditions.

8.9 Corrosivity

One sample of the onsite soils was tested to provide a preliminary indication of the corrosion potential of the onsite soils. The test results are presented in **Appendix B**. A brief discussion of the corrosion test results is provided in the following section.

- The sample tested had a soluble sulfate concentration of 0.014 percent, which indicates the sample has a negligible sulfate corrosion potential relative to concrete.

- It should be noted that soluble sulfate in the irrigation water supply, and/or the use of fertilizer may cause the sulfate content in the surficial soils to increase with time. This may result in a higher sulfate exposure than that indicated by the test results reported herein. Studies have shown that the use of improved cements in the concrete, and a low water-cement ratio will improve the resistance of the concrete to sulfate exposure.

- The sample tested had a chloride concentration of 0.016 percent, which indicates the sample has a negligible chloride corrosion potential relative to metal.

- The sample tested had a minimum resistivity of 1,100 ohm-cm, which indicates the sample is highly corrosive to ferrous metals.

- The sample tested had a pH of 8.3, which indicates the sample is moderately alkaline.

Additional testing should be performed after grading to evaluate the as-graded corrosion potential of the onsite soils. We are not corrosion engineers. A corrosion consultant should be retained to provide corrosion control recommendations if deemed necessary.

9.0 PRELIMINARY PAVEMENT DESIGN RECOMMENDATIONS

Deleterious material, excessively wet or dry pockets, concentrated zones of oversized rock fragments, and any other unsuitable yielding materials encountered during grading should be removed. Once compacted fill and/or native soils are brought to the proposed pavement subgrade elevations, the subgrade should be proof-rolled in order to check for a uniform firm and unyielding surface. Representatives of the project Geotechnical Engineer should observe all grading and fill placement.

The upper 12-inches of pavement subgrade soils should be scarified; moisture conditioned to at least optimum moisture content and compacted to at least 95 percent of the laboratory standard (ASTM D1557). If loose or yielding materials are encountered during subgrade preparation, evaluation should be performed by EEI. Aggregate base materials should be properly prepared (i.e., processed and moisture conditioned) and compacted to at least 95 percent of the maximum dry density as determined by ASTM D1557. Aggregate base materials should conform to Caltrans specifications for Class 2 aggregate base.

All pavement section changes should be properly transitioned. Although not anticipated, if adverse conditions are encountered during the preparation of subgrade materials, special construction methods may need to be employed. A representative of the project Geotechnical Engineer should be present for the preparation of subgrade and aggregate base.

For design purposes we have assumed a Traffic Index (TI) of 5.0 for the drive areas and entrance aprons at the subject property. This assumed TI should be verified as necessary by the Civil Engineer or Traffic Engineer. Based on the results of R-Value testing of the upper materials at the property, we have assumed a preliminary R-Value of 21 for the materials likely to be present at rough grades. The modulus of subgrade reaction (K-Value) was estimated at 80 pounds per square inch per inch (psi/in) for an R-Value of 21 (Caltrans, 1974). Pavement design was calculated for the parking lot structural section requirements for asphaltic concrete in accordance with the guidelines presented in the Caltrans Highway Design Manual. Rigid pavement sections were evaluated in general accordance with ACI 330R-08, based on an average daily truck traffic value of 10.

TABLE 3
Preliminary Pavement Design Recommendations

Traffic Index (TI) / Intended Use	Pavement Surface	Aggregate Base Material (1)
5.0 – Parking/Drive Areas	3.0-inches Asphalt Concrete	7.0-inches
Concrete Pavement - Cars and Trucks	5.0-inches Portland Cement Concrete (2)	4.0-inches
Concrete Pavement Trash Truck Pads/Trash Enclosure	6-inches Portland Cement Concrete (2)	4.0-inches

(1) R-Value of 78 for Caltrans Class 2 aggregate base
(2) Reinforcement and control joints placed in accordance with the structural engineer's requirements

The recommended pavement sections provided in **Table 3** are intended as a minimum guideline. If thinner or highly variable pavement sections are constructed, increased maintenance and repair could be expected. If the actual ADT (average daily traffic), ADTT (average daily truck traffic), or traffic index (TI) increases beyond our assumed values, increased maintenance and repair could be required for the pavement section. Final pavement design should be verified by testing of soils exposed at subgrade after grading has been completed. Thicker pavement sections could result if R-Value testing indicates lower values.

10.0 DEVELOPMENT RECOMMENDATIONS

10.1 Landscape Maintenance and Planting

Water is known to decrease the physical strength of earth materials, significantly reducing stability by high moisture conditions. Surface drainage away from foundations and graded slopes should be maintained. Only the volume and frequency of irrigation necessary to sustain plant life should be applied.

Consideration should be given to selecting lightweight, deep rooted types of landscape vegetation which require low irrigation that are capable of surviving the local climate. From a soils engineering viewpoint, "leaching" of the onsite soils is not recommended for establishing landscaping. If landscape soils are processed for the addition of amendments, the processed soils should be re-compacted to at least 90 percent relative compaction (based on ASTM D1557).

10.2 Site Drainage

Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled over slopes. Runoff should be channeled away from slopes and structures and not allowed to pond and/or seep uncontrolled into the ground. Pad drainage should be directed toward an acceptable outlet. Consideration should be given to eliminating open bottom planters directly adjacent to proposed structures for a minimum distance of 10 feet. As an alternative, closed-bottom type planters could be utilized, with a properly designed drain outlet placed in the bottom of the planter.

Final surface grades around structures should be designed to collect and direct surface water away from structures and toward appropriate drainage facilities. The ground around the structure should be graded so that surface water flows rapidly away from the structure without ponding. In general, we recommend that the ground adjacent to the structure slope away at a gradient of at least 2 percent. Densely vegetated areas where runoff can be impaired should have a minimum gradient of at least 5 percent within the first 5 feet from the structure. Roof gutters with downspouts that discharge directly into a closed drainage system are recommended on structures. Drainage patterns established at the time of fine grading should be maintained throughout the life of the proposed structures.

10.3 Setbacks from Storm-Water Disposal Systems

We recommend that storm-water disposal systems be situated at least three times their depth, or a minimum of 15 feet (whichever is greater), from the outside bottom edge of structural foundations. Structural foundations include (but are not limited to) buildings, loading docks, retaining walls, and screen walls. The invert of storm-water infiltration should be outside a 1:1 (H:V) plane projected from the bottom of adjacent foundations.

Storm-water disposal systems should be checked and maintained on regular intervals. Storm-water devices including bio-swales that are located closer than 10 feet from any foundations/footings should be lined with an impermeable membrane to reduce the potential for saturation of foundation soils. Foundations may also need to be deepened.

Storm-water infiltration should not be located near utility lines where the introduction of storm-water could cause damage to utilities or settlement of trench backfill.

10.4 Additional Site Improvements

Recommendations for additional grading can be provided upon request. If in the future, additional property improvements are planned for the subject property, recommendations concerning the design and construction of improvements would be provided upon request.

10.5 Utility Trench Backfill

Fill around the pipe should be placed in accordance with details shown on the drawings, and should be placed in layers not to exceed 8-inches loose (unless otherwise approved by the Geotechnical Engineer) and compacted to at least 90 percent of the maximum dry density as determined in accordance with ASTM D1557 (Modified Proctor). The Geotechnical Engineer should approve all backfill material. Select material should be used when called for on the drawings, or when recommended by the Geotechnical Engineer. Care should be taken during backfill and compaction operations to maintain alignment and prevent damage to the joints.

The backfill should be kept free from oversized material, chunks of highly plastic clay, or other unsuitable or deleterious material. Backfill soils should be non-expansive, non-corrosive, and compatible with native earth materials. Backfill materials and testing should be in accordance with the CBC (2016), and the requirements of the local governing jurisdiction.

Pipe backfill areas should be graded and maintained in such a condition that erosion or saturation will not damage the pipe bedding or backfill. Flooding trench backfill is not recommended. Heavy equipment should not be operated over any pipe until it has been properly backfilled with a minimum of two to three feet of cover. The utility trench should be systematically backfilled to allow maximum time for natural settlement. Backfill should not occur over porous, wet, or spongy subgrade surfaces. Should these conditions exist, the areas should be removed, replaced and recompacted.

11.0 PLAN REVIEW

Once detailed grading and foundation plans are available, they should be submitted to EEI for review and comment, to reduce the potential for discrepancies between plans and recommendations presented herein. If conditions are found to differ substantially from those stated, appropriate recommendations will be provided. Additional field studies may be warranted.

12.0 LIMITATIONS

This Geotechnical Evaluation has been conducted in accordance with generally accepted geotechnical engineering principles and practices. Findings provided herein have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time. This report has been prepared for the sole use of Saturn Boulevard, LLC (Client), within a reasonable time from its authorization.

Subject property conditions, land use (both onsite and offsite), or other factors may change as a result of manmade influences, and additional work may be required with the passage of time.

This Geotechnical Evaluation should not be relied upon by other parties without the express written consent of EEI and the Client; therefore, any use or reliance upon this Geotechnical Evaluation by a party other than the Client should be solely at the risk of such third party and without legal recourse against EEI, its employees, officers, or directors, regardless of whether the action in which recovery of damages is brought or based upon contract, tort, statue, or otherwise. The Client has the responsibility to see that all parties to the project, including the designer, contractor, subcontractor, and building official, etc. are aware of this report in its complete form. This report contains information that may be used in the preparation of contract specifications; however, the report is not designed as a specification document, and may not contain sufficient information for use without additional assessment. EEI assumes no responsibility or liability for work or testing performed by others. In addition, this report may be subject to review by the controlling authorities.

13.0 REFERENCES

American Society of Civil Engineers (ASCE), 2010, Minimum Design Loads for Buildings and Other Structures, ASCE Document ASCE/SEI 7-10.

American Society for Testing and Materials (ASTM), 2015, Annual Book of ASTM Standards, Volume 04.08, Construction: Soil and Rock (I), Standards D 420 - D 5876.

California Building Code (CBC), 2016, California Code of Regulations, Title 24, Part 2, Volume 2 of 2, California Building Standards Commission, Based on 2015 International Building Code; 2016 California Historical Building Code, Title 24, Part 8; and 2013 California Existing Building Code, Title 24, Part 10, effective January 1, 2017.

California Department of Transportation (Caltrans), 1974, Highway Design Manual, dated October 1, 1974.

California Division of Mines and Geology (CDMG), 2000, California Department of Conservation, Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones of California, Southern Region, DMG CD 2000-003.

California Geological Survey (CGS), 2002, California Geomorphic Provinces Note 36, Electronic Copy, Revised December 2002.

City of San Diego, 2008, Seismic Safety Study, Geologic Hazards and Faults, dated April 3, 2008.

EEI, 2016, Due Diligence Level Geotechnical Review and Results of Preliminary Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project Number AAA-72282.4, dated February 15, 2016. Revised May 11, 2016.

EEI, 2017, Supplemental Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project No. AAA-72282.4a, dated February 28, 2017.

Federal Emergency Management Agency, (FEMA), Flood Insurance Rate Map Panel 06073C2154H, San Diego, California, effective April 5, 2016.

GeoTracker Website, 2016, State Water Resources Control Board GeoTracker Website, website address <*http://geotracker.waterboards.ca.gov/*>, accessed December 2017.

Google Earth®, 2017, Version 7.1.8.3036

Hart, E.W., and Bryant, W.A. (Hart and Bryant), 1997, Fault-Rupture Hazard Zones in California: California Department of Conservation, Division of Mines and Geology, Special Publication 42.

Jennings, C.W., and Bryant, W.A., (Jennings and Bryant) 2010, Fault Activity Map of California and Adjacent Areas: California Geologic Survey, Map Sheet No. 6, scale 1:750,000.

Ninyo & Moore, 2015, Phase I, Environmental Site Assessment, 1695 Saturn Boulevard, San Diego, California, Project No. 108063001, dated December 4, 2015.

REC Consultants, Inc., 2017, Preliminary Grading Plan, 1695 Saturn Boulevard, San Diego, CA, 92154 plot dated January 26, 2017.

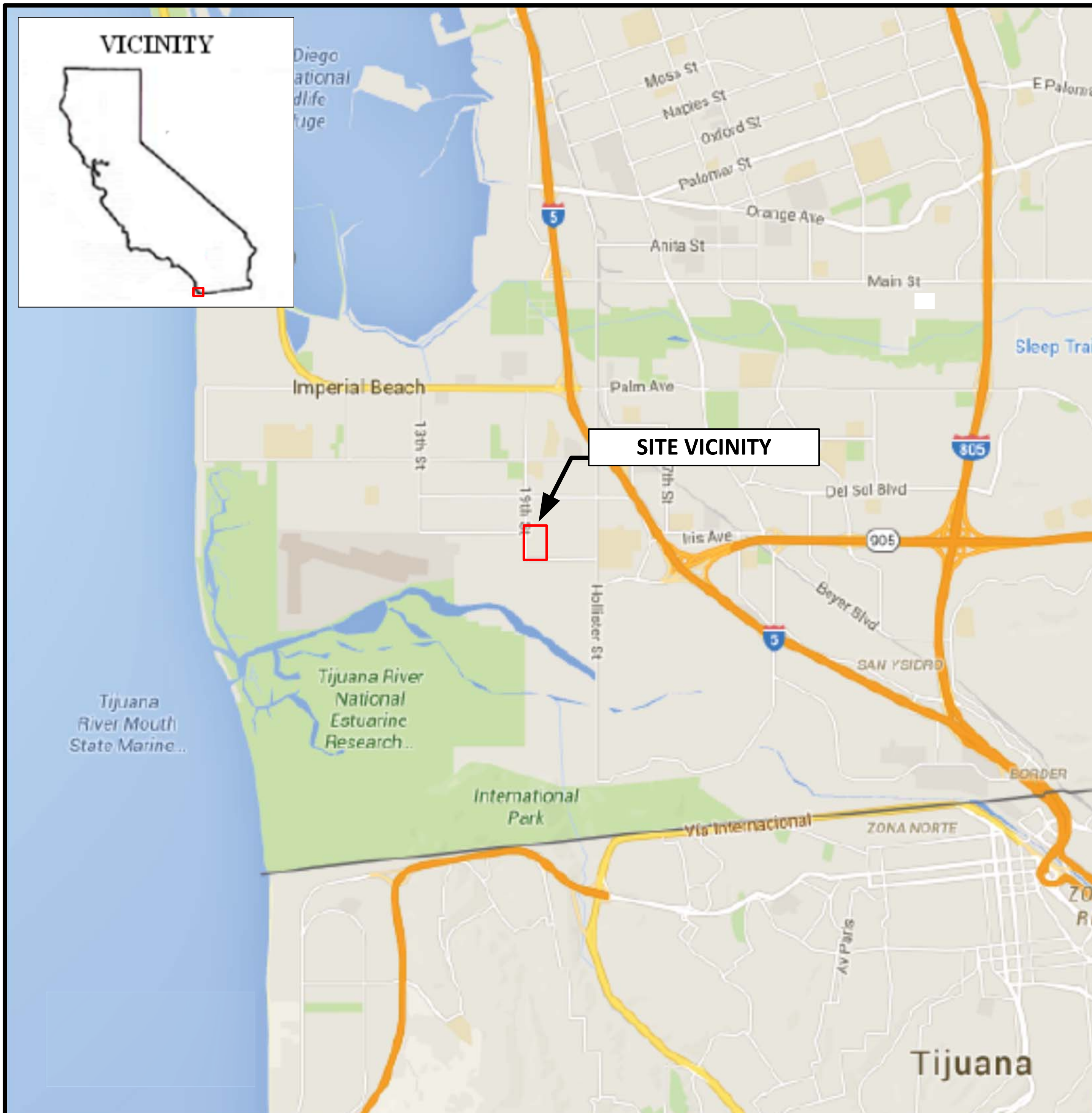
Tan, S.S., and Kennedy, M.P., 2008, Geologic Map of the San Diego 30'x60' Quadrangle, California, California Geological Survey, Regional Geologic Map No. 3, dated 2008

United States Geological Survey (USGS), 2015, Imperial Beach 7.5-Minute Quadrangle Topographic Map, Scale 1:24,000.

United States Geological Survey (USGS), 2008, 2008 National Seismic Hazard Maps – Online Fault Database Search, web address <http://earthquake.usgs.gov/hazards/products/conterminous/>, accessed December 2017.

United States Geological Survey (USGS), 2008, 2008 National Seismic Hazard Maps – Online Fault Database Search, web address < http://earthquake.usgs.gov/hazards/products/conterminous/>, accessed December 2017.

FIGURES



LEGEND

N

Scale: 1" = 1mi

0 1mi 2mi

Note: All Locations Are Approximate

SITE VICINITY MAP

Palm Avenue Realty Company

Proposed Single-Family Residential Subdivision

1695 Saturn Boulevard

San Diego, California

EEI Project No. AAA-72282.4a

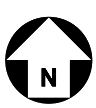
Created December 2017

EEI Geotechnical & Environmental Solutions

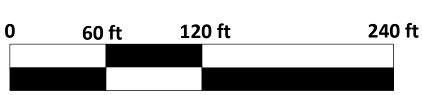
FIGURE 1

Map Source: Google Maps®; Accessed 2017

LEGEND



Scale: 1" = 120'



Note: All Locations Are Approximate

AERIAL SITE MAP

Palm Avenue Realty Company

Proposed Single-Family Residential Subdivision

1695 Saturn Boulevard

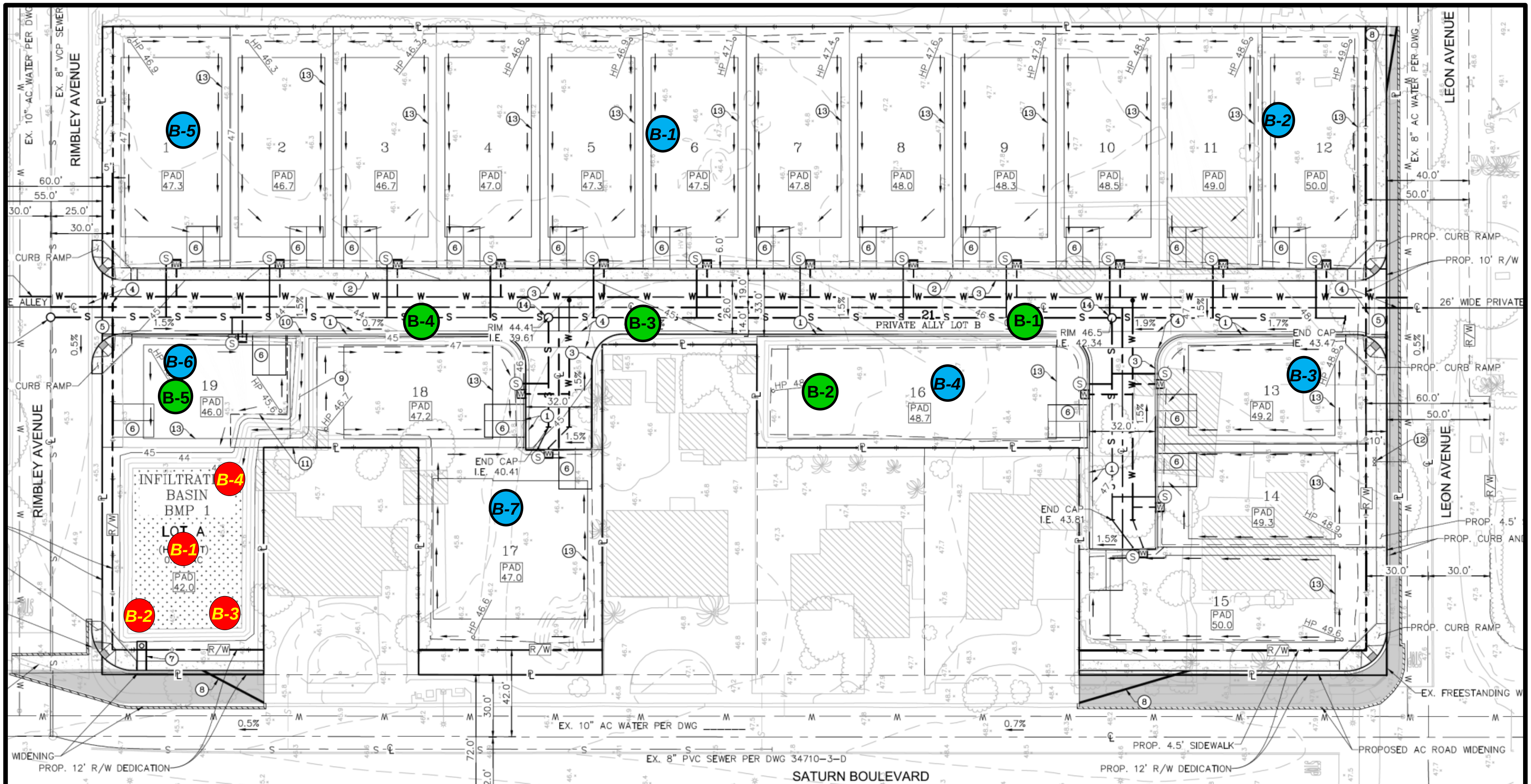
San Diego, California

EEI Project No. AAA-72282.4a

Created December 2017

FIGURE 2

Source: Google Earth, 2017



LEGEND

B-3 *Approximate Boring/Percolation Test Location (EEI, December 2017)*

B-1 *Approximate Boring/Percolation Test Location (EEI, February 2017)*

B-2 *Approximate Boring/Percolation Test Location (EEI, February 2016)*

N

Scale: 1" = 80'

0 40 ft 80 ft 160 ft

Note: All Locations Are Approximate

GEOTECHNICAL MAP

Palm Avenue Realty Company

Proposed Single-Family Residential Subdivision

1695 Saturn Boulevard

San Diego, California

EEI Project No. AAA-72282.4a

Created December 2017

EEI Engineering Solutions

FIGURE 3

Source: REC Consultants, Inc., 2016

APPENDIX A
SOIL CLASSIFICATION CHART AND BORING LOGS

UNIFIED SOIL CLASSIFICATION (ASTM D-2487-98)

MAJOR DIVISIONS			SYMBOLS: GRAPH	SYMBOLS: LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SEIVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL- SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND- CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION REATINED ON NO. 4 SEIVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS,GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY-SANDS, SAND – SILT MIXTURES
				SC	CLAYEY SANDS, SAND – CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS

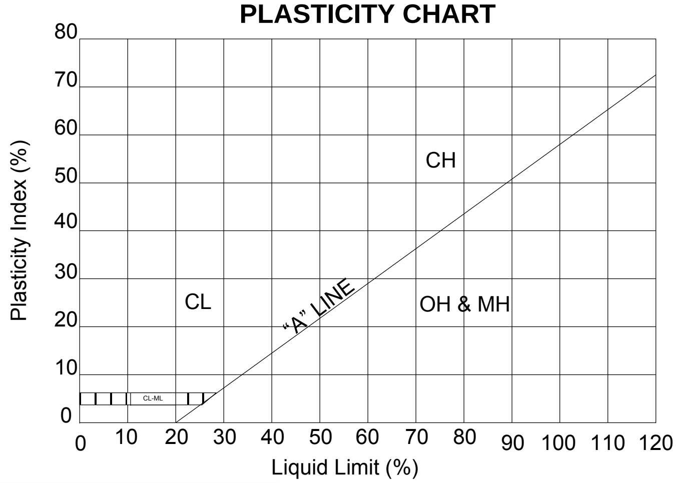
SAMPLER TYPES

- SPT
- Modified California (2.5" I.D.)
- Bulk
- Rock Core
- Shelby Tube
- Water Level

OTHER TESTS

ATT – Atterberg Limit (Plasticity Index)
CD – Consolidated Drained Triaxial
CON – Consolidation
COR – Corrosivity)
DS – Direct Shear
EI – Expansion Index
MAX – Maximum Density
RV – R-Value
SA – Sieve Analysis
-#200 - Percent Passing #200 Sieve
TV – Torvane Shear
UU – Unconsolidated Undrained Triaxial

PLASTICITY CHART



PENETRATION RESISTANCE
(Recorded As Blows/Foot)

SAND & GRAVEL: Relative Density	Blows/Foot* N_{60}	SILT & CLAY: Consistency	Blows/Foot* N_{60}	Strength**(KSF)
Very Loose	0-4	Very Soft	0 - 2	0 – 0.5
Loose	4-10	Soft	2 - 4	0.5 – 1.0
Medium Dense	10-30	Medium Stiff	4 - 8	1.0 – 2.0
Dense	30-50	Stiff	8 - 15	2.0 – 4.0
Very Dense	Over 50	Very Stiff	15 - 30	4.0 – 8.0
		Hard	Over 30	Over 8.0

* Number of blows of 140LB hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split barrel sampler the last 12 inches of an 18-inch drive (ASTM-1586 Standard Penetration Test)

** Undrained shear strength in kips/sq. ft. As determined by laboratory testing or approximated by the standard penetration test, pocket penetrometer, torvane, or visual observation

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LEGEND TO SOIL DESCRIPTIONS

APPENDIX A

BORING NUMBER B-1

EEI Engineering Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 12/1/17 **COMPLETED** 12/1/17
GROUND ELEVATION 47 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-61
HAMMER EFFICIENCY (%) 86
METHOD 6.0" Hollow Stem Auger 140 lb Auto Hammer
SPT CORRECTION 1.43 **CAL CORRECTION** 0.79
LOGGED BY EMH **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0	**FILL/TOPSOIL** SILTY-SAND with CLAY, dark orange-brown, fine grained, slightly moist, loose	SM									
0.5	**OLD PARALIC DEPOSITS (Qop6)** @ 0.5' SILTY-SAND, dark orange-brown, fine grained, slightly moist, medium dense	SM									
2.5	@ 2.5' SANDY-SILT, orange-brown, fine grained, slightly moist, hard	ML	MC	45 50 for 6.0"			6	110			
5	@ 5.0 SILTY-SAND, orange-brown, fine to coarse grained, scattered gravel and pebbles, moist, dense	SM	MC	35 33 25	46		9	115			
7.5	@ 7.5' SILTY-SAND, gray-brown, fine to coarse grained, gravel and pebbles, slightly moist, medium dense, no recovery		MC	12 18 22	32		5				
10	@ 10.0' SILTY-SAND, gray-brown, fine to coarse grained, gravel and pebbles, slightly moist, medium dense		MC	13 14 16	24		8	104			
15			SPT	20 50 for 1.0"							

Total depth: 15.7-feet refusal
No groundwater encountered
Boring backfilled with bentonite

BORING NUMBER B-2

EEI Engineering Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 12/1/17 **COMPLETED** 12/1/17
GROUND ELEVATION 49 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-61
HAMMER EFFICIENCY (%) 86
METHOD 6.0" Hollow Stem Auger 140 lb Auto Hammer
SPT CORRECTION 1.43 **CAL CORRECTION** 0.79
LOGGED BY EMH **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark orange-brown, fine grained, slightly moist, loose	SM									
1		**OLD PARALIC DEPOSITS (Qop6)** @ 0.75' SILTY-SAND, dark orange-brown, fine grained, slightly moist, medium dense	SM									
2.5		@ 2.5' SANDY SILT, orange-brown, fine-grained, slightly moist, hard	ML	BULK / MC	21 30 39	54		4	112			DS COR EI
5.0		@ 5.0' SILTY-SAND, yellow-brown, fine to medium grained, scattered gravel and pebbles,slightly moist, medium dense	SM	MC	22 18 17	28		4	99			
7.5		@ 7.5' SILTY-SAND, yellow-brown, oxidized, fine to coarse grained, pebbles and cobbles, slightly moist, medium dense, no recovery		MC	7 10 20	24		3	110			
10				MC	10 21 23	35		3	113			
15				SPT	50 for 6.0"			2				

Total depth: 15.6-feet refusal
No groundwater encountered
Boring backfilled with bentonite

BORING NUMBER B-3

EEI Engineering Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 12/3/17 **COMPLETED** 12/3/17
GROUND ELEVATION 49 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-61
HAMMER EFFICIENCY (%) 86
METHOD 6.0" Hollow Stem Auger 140 lb Auto Hammer
SPT CORRECTION 1.43 **CAL CORRECTION** 0.79
LOGGED BY EMH **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

MATERIAL DESCRIPTION

DEPTH (ft)	MATERIAL DESCRIPTION	USCS SYMBOL
0	**FILL/TOPSOIL** SILTY-SAND with CLAY, dark orange-brown, fine grained, slightly moist, loose	SM
0.5	**OLD PARALIC DEPOSITS (Qop6** @ 0.5' SILTY-SAND, dark orange-brown, fine grained, moist, medium dense	SM
2.5	@ 2.5' SANDY-SILT, orange-brown, fine grained, slightly moist, hard	ML
5.0	@ 5.0' SILTY-SAND, orange-brown, fine to medium grained, scattered gravel and pebbles, slightly moist, very dense	SM
7.5	@ 7.5' SILTY-SAND, orange-brown, fine to coarse grained, scattered gravel and pebbles, slightly moist, medium dense.	
13.0	@ 13.0', Becomes yellow-brown	
15.0	@ 15.0' SILTY-SAND, yellow-brown, fine to coarse grained, scattered gravel and pebbles, slightly moist, dense	SM
20.0	@ 20.0' SILTY-SAND, yellow-brown, fine to medium grained, gravel and pebbles, slightly moist, very dense	
25.0	@ 25.0' SILTY-SAND, light gray brown, fine grained, gravel and pebbles, slightly moist, dense	
30.0	@ 30.0' SILTY-SAND, gray-brown, fine to coarse grained, scattered gravel and cobbles, moist, very dense	
40.0	@ 40.0' Becomes very moist to wet	

SAMPLES AND TESTS

DEPTH (ft, approx.)	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
2.5	MC	19 / 28 / 60	69		5	125		54.6	# 200
5	MC	13 / 10 / 11	17		5	100		45.7	
7.5	MC	5 / 8 / 12	16		3	103		27.9	
10	MC	5 / 10 / 15	20		3	109		27.7	
15	SPT	9 / 17 / 16	47		2			31.5	
20	SPT	33 / 50 for 4.0"			6			36.8	
25	SPT	9 / 18 / 37	79		11			49.0	
30	SPT	13 / 24 / 30	77		4			31.3	
35	SPT	16 / 30 / 25	79		4			30.3	
40	SPT	15 / 21 / 36	82		22			46.2	

Total depth: 41.5-feet refusal
No groundwater encountered
Boring backfilled with bentonite

BORING NUMBER B-4

EEI Engineering Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 12/3/17 **COMPLETED** 12/3/17
GROUND ELEVATION 48 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-61
HAMMER EFFICIENCY (%) 86
METHOD 6.0" Hollow Stem Auger 140 lb Auto Hammer
SPT CORRECTION 1.43 **CAL CORRECTION** 0.79
LOGGED BY EMH **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark orange-brown, fine grained, slightly moist, loose	SM									
1		**OLD PARALIC DEPOSITS (Qop6)** @ 1.0' SILTY-SAND, dark orange-brown, fine grained, slightly moist, medium dense	SM									
2.5		@ 2.5' SANDY-SILT, orange -brown, fine-grained, slightly moist, hard	ML	MC	50 for 6.0"			102	9			
5		@ 5.0' SILTY-SAND, orange-brown, oxidized, fine to coarse grained, scattered gravel and pebbles, slightly moist, loose	SM	MC	9 8 9	13		102	2			
7.5		@ 7.5' SILTY-SAND, yellow-brown, fine to coarse grained, scattered gravel and pebbles, slightly moist, very dense, no recovery		MC	27 50 for 6.0"							
10		@10.0' No recovery		MC	29 50 for 6.0"							
12												

Total depth: 12-feet refusal
No groundwater encountered
Boring backfilled with bentonite

BORING NUMBER B-5

EEI Engineering Solutions

CLIENT Palm Avenue Realty Company **PROJECT NAME** 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4 **PROJECT LOCATION** San Diego, California
DATE STARTED 12/3/17 **COMPLETED** 12/3/17 **GROUND ELEVATION** 47 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-61 **HAMMER EFFICIENCY (%)** 86
METHOD 6.0" Hollow Stem Auger 140 lb Auto Hammer **SPT CORRECTION** 1.43 **CAL CORRECTION** 0.79
LOGGED BY EMH **CHECKED BY** JB **GROUNDWATER DEPTH (ft)** Not Encountered
NOTES

DEPTH (ft)	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0	**FILL/TOPSOIL** SILTY-SAND with CLAY, dark orange-brown, fine-grained, slightly moist, loose	SM									
0.5	**OLD PARALIC DEPOSITS (Qop6)** @ 0.5' SILTY-SAND, dark orange-brown, fine to medium grained, slightly moist, medium dense	SM	BULK								
2.5	@ 2.5' SANDY-SILT, orange-brown, fine grained, slightly moist, very stiff	ML	MC	8 10 15	20		6	116			RV
5.0	@ 5.0' SILTY-SAND, orange-brown, fine-medium grained, scattered gravel and pebbles, slightly moist, dense	SM	MC	7 17 38	43		14	127			
7.5			MC	7 9 20	23		9	110			
8.5	@ 8.5 SILTY-SAND, gray-brown, fine to medium grained, scattered gravel and pebbles, slightly moist, medium dense										
10			MC	9 15 12	21		7	108			
15	@ 10.0' SILTY-SAND, gray-brown, fine to coarse grained, gravel and cobbles, slightly moist, dense		SPT	9 15 16	44						
17											

Total depth: 17.0-feet refusal
No groudwater encoutered
Borings backfilled with bentonite

BORING NUMBER B-6

EEI Engineering Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 12/3/17 **COMPLETED** 12/3/17
GROUND ELEVATION 45 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-61
HAMMER EFFICIENCY (%) 86
METHOD 6.0" Hollow Stem Auger 140 lb Auto Hammer
SPT CORRECTION 1.43 **CAL CORRECTION** 0.79
LOGGED BY EMH **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark orange-brown, fine grained, slightly moist, loose	SM									
1–2		**OLD PARALIC DEPOSITS (Qop6)** @ 0.75 SILTY-SAND, dark orange-brown, fine to medium grained, slightly moist, medium dense	SM									
3–4		@ 2.5' SANDY-SILT, orange-brown, fine-grained, slightly moist, hard	ML	MC	12 15 50	51		14	120			
5				MC	25 27 24	40		8	106			
6–7		@ 5.5' SILTY-SAND, orange-brown, fine to coarse grained, scattered gravel and pebbles, slightly moist, loose	SM									
8–9		@ 7.5' SILTY-SAND, orange-brown, fine to coarse grained, scattered gravel and pebbles, slightly moist, loose		MC	5 7 10	13		2	94			
10		@ 10.5' Becomes very dense		MC	8 50 for 6.0"			2	96			
11												

Total depth: 11-feet refusal
No groundwater encountered
Boring backfilled with bentonite

BORING NUMBER B-7

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 12/3/17 **COMPLETED** 12/3/17
GROUND ELEVATION 46 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-61
HAMMER EFFICIENCY (%) 86
METHOD 6.0" Hollow Stem Auger 140 lb Auto Hammer
SPT CORRECTION 1.43 **CAL CORRECTION** 0.79
LOGGED BY EMH **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with Clay, dark orange-brown, fine-grained, slightly moist, loose	SM	BULK								
1		**OLD PARALIC DEPOSITS (Qop6)** @ 0.75' SILTY-SAND, dark orange-brown, fine-grained, slightly moist, very dense	SM									
2.5		@ 2.5' SANDY-SILT, orange-brown, fine-grained, slightly moist, hard	ML	MC	50 for 6.0"			5	108			
5				MC	12 26 50	60		10	120			
8		@ 8.0 SILTY-SAND, red-brown, fine to coarse grained, gravel and pebbles, slightly moist, very dense	SP-SM	MC	50 for 4.0"			5	94			
10		@ 10.0' SILTY-SAND, red-brown, fine to coarse grained, oxidized, moist, gravel and pebbles, medium-dense		MC	10 15 18	26		2	101			
12												

Total depth 12.0-feet refusal
No groundwater encountered
Boring backfilled with bentonite

APPENDIX B
Laboratory Tests

LABORATORY TEST DATA

Laboratory tests were performed to provide geotechnical parameters for engineering analyses. The following tests were performed:

- **CLASSIFICATION:** Field classifications were verified in the laboratory by visual examination. The final soil classifications are in accordance with the Unified Soil Classification System.
- **MOISTURE CONTENT and DRY DENSITY:** The in-situ moisture content and dry density of soils was determined for soil samples obtained from the borings, and were determined in general accordance with ASTM D2216 and ASTM 2937, respectively.
- **GRAIN SIZE DISTRIBUTION:** The grain size distribution was determined on select samples in accordance with ASTM D422.
- **PERCENT PASSING #200 SIEVE:** The percent passing the #200 sieve was determined on select samples in accordance with ASTM D422. The test results are presented on the boring logs in Appendix A.
- **DIRECT SHEAR:** Direct shear testing was run in general accordance with ASTM D3080. Samples were tested with normal load increments of approximately 1,000, 1,700 and 3,000 psf.
- **MAXIMUM DRY DENSITY and OPTIMUM MOISTURE CONTENT:** The maximum dry density and optimum moisture content was determined in general accordance with ASTM D1557, Method A.
- **EXPANSION INDEX:** Expansion Index testing was run in general accordance with ASTM D4829.
- **R-VALUE:** R-Value testing was run by Geosoils, Inc. of Carlsbad in general accordance with Caltrans Method 301.
- **CORROSIVITY**: Corrosion testing of representative soil samples included sulfate potential by California Test 417, chloride potential by California Test 422, and soil minimum resistivity and pH by California Test 643. The sample was tested at the Clarkson Laboratory and Supply, Inc. located in Chula Vista, California.

GRAIN SIZE DISTIBUTION - PASSING #200 SIEVE

ASTM METHOD D422

Boring No.	**B-3**	**B-3**	**B-3**	**B-3**	**B-3**	**B-3**	
Depth	2.5	5	7.5	10	15	20	ft
Total Sample Weight	152.0	140.7	155.3	151.2	154.8	146.0	gm
Retained on #200 Sieve	69.0	76.4	112.0	109.3	106.1	92.2	gm
Passing #200 Sieve	83.0	64.3	43.3	41.9	48.7	53.8	gm
Fines Content	**54.6**	**45.7**	**27.9**	**27.7**	**31.5**	**36.8**	%

Boring No.	**B-3**	**B-3**	**B-3**	**B-3**			
Depth	25	30	35	40			ft
Total Sample Weight	139.4	152.9	154.0	131.0			gm
Retained on #200 Sieve	71.1	105.1	107.3	70.5			gm
Passing #200 Sieve	68.3	47.8	46.7	60.5			gm
Fines Content	**49.0**	**31.3**	**30.3**	**46.2**			%

Boring No.							
Depth							ft
Total Sample Weight							gm
Retained on #200 Sieve							gm
Passing #200 Sieve							gm
Fines Content							%

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2195 Faraday Avenue, Suite K, Carlsbad, CA 92008

Client:	Palm Ave. Realty
Project Name:	Saturn Blvd.
Project Number:	AAA-72282.4
Date:	12/5/17
Tested by:	B D
Reviewed by:	

DIRECT SHEAR TEST (ASTM D3080)

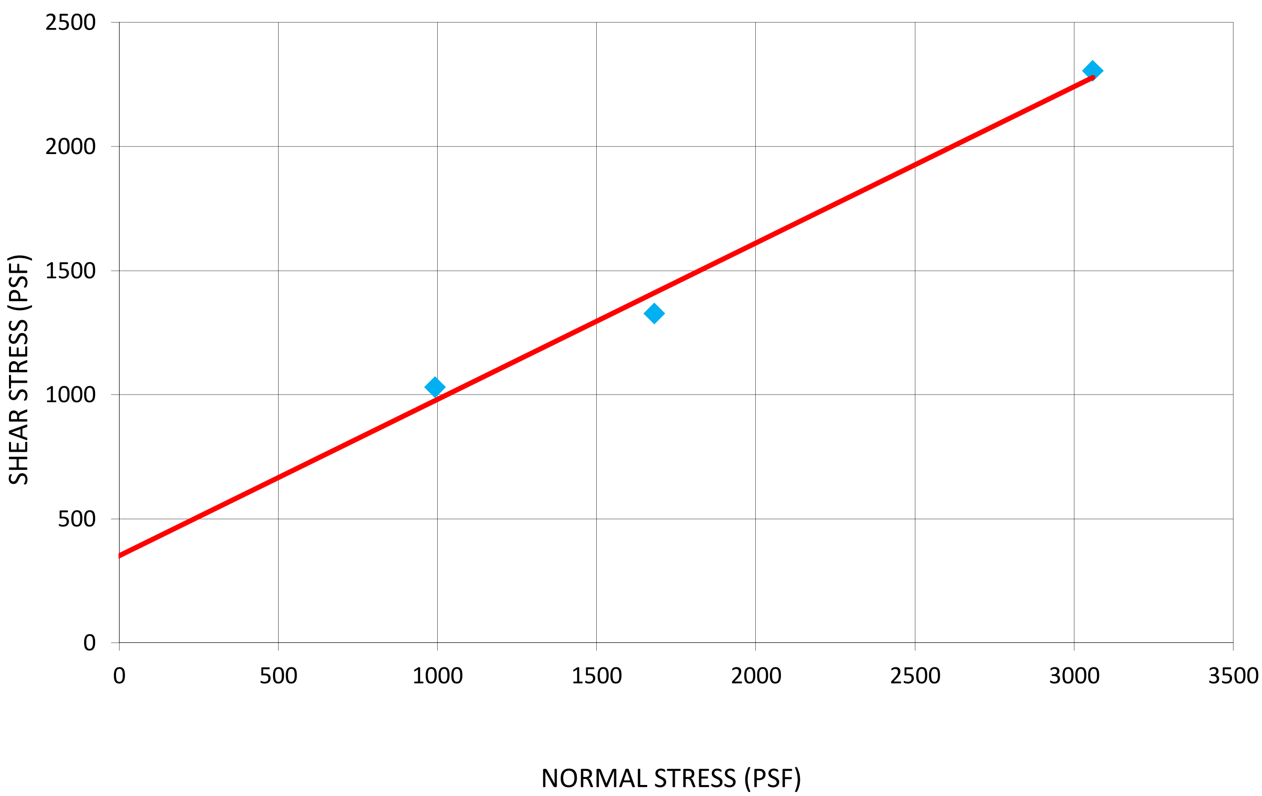
B-2	@	0-5 ft.

Sample Data	
Remolded:	90%
Remarks:	Sample inundated prior to testing
Soil Description:	Reddish Brn. Silty Sand SM

Test Results		
Average Initial Moisture =	7.5	%
Average Dry Density =	118.7	pcf
Average Final Moisture =	13.1	%

Peak Strength	ϕ = 32 deg.	c = 350 psf

SHEAR TEST DIAGRAM



Client:	Palm Ave. Realty
Project Name:	Saturn Ave.
Project No.:	AAA-72282.4
Date:	12/6/17
Boring/Sample No:	B-2
Depth/Location:	0-5 ft.
Soil Description:	Reddish Brn. Silty Sand SM
Tested by:	B D

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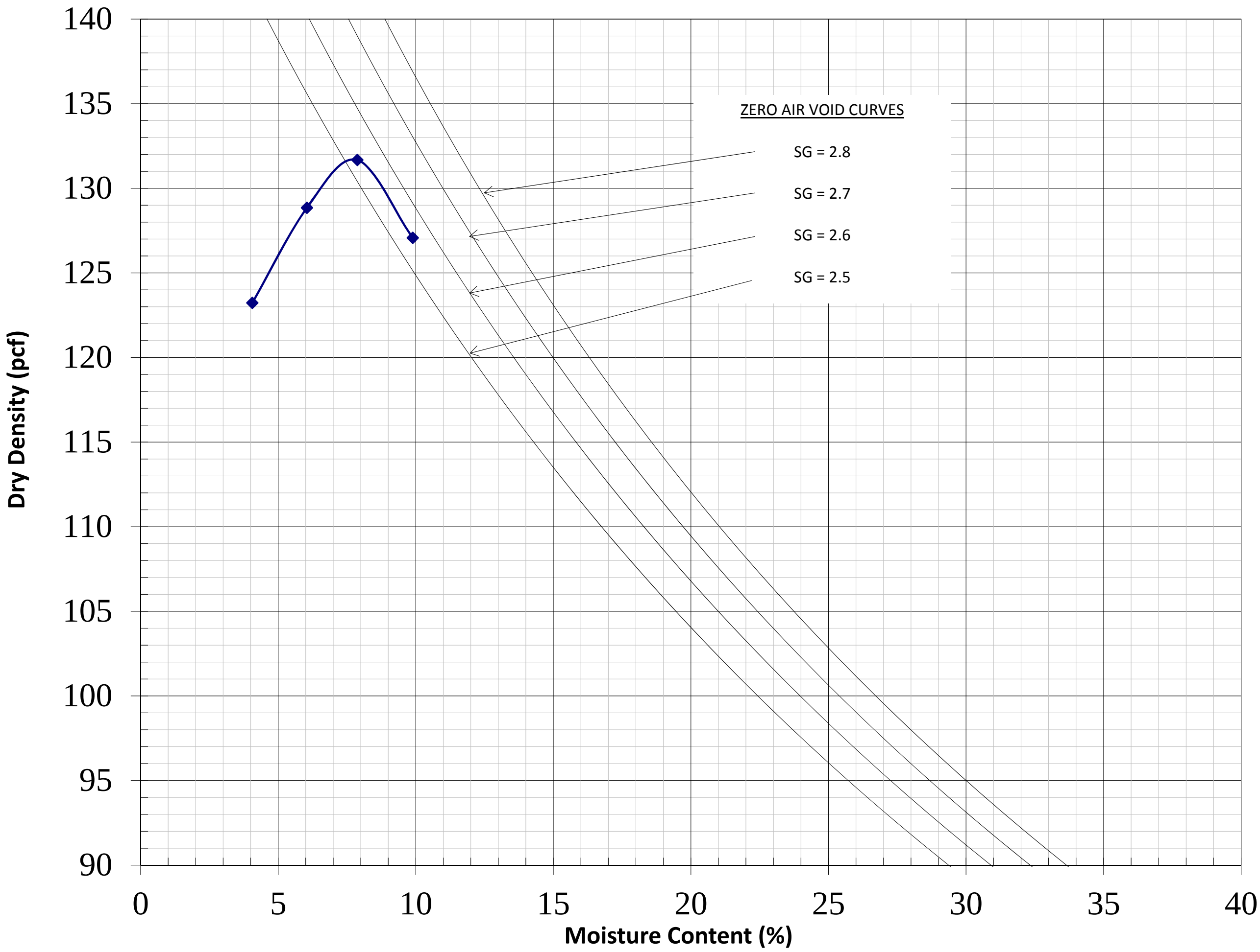
2195 Faraday Avenue, Suite K, Carlsbad, CA 92008

LABORATORY COMPACTION ASTM D 1557

Sample	1	2	3	4
Mold and Wet Soil (lbs.)	8.55	8.83	9.01	8.93
Small Mold (lbs.)	4.28	4.28	4.28	4.28
Wet Soil (lbs.)	4.27	4.55	4.73	4.65
Wet Density (pcf)	128.2	136.6	142.0	139.6
Tare and Wet Soil (gm.)	100.00	100.00	100.00	100.00
Tare and Dry Soil (gm.)	96.10	94.30	92.70	91.00
Moisture (%)	**4.1**	**6.0**	**7.9**	**9.9**
Dry Density (pcf)	**123.2**	**128.8**	**131.7**	**127.1**



Maximum Density 132.0 pcf @ 7.5 % Moisture

Client:	Palm Ave. Realty
Project Name:	Saturn Blvd.
Project Number:	AAA-72282.4
Date:	12/4/2017
Procedure:	D-1557-A
Boring/Sample No.:	B-2
Depth/Location:	0-5 ft.
Soil Description:	Reddish Brn. Silty Sand SM
Tested By:	B D

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Geotechnical & Environmental Solutions
2195 Faraday, Suite K, Carlsbad, CA 92008

EXPANSION INDEX TEST

ASTM METHOD D4829

B-2 @ 0-5 ft.

Moisture Content of Initial Sample		% Saturation of Re-molded Sample		Moisture Content of Final Sample	
Tare No. -	19	Wt. of Soil and Ring (g) -	621	Wt. of Soil and Ring (g) -	642.2
Wet Weight and Tare (g) -	134.5	Ring Weight (g) -	198.7	Ring Weight (g) -	198.7
Dry Weight and Tare (g) -	128.5	Wet Weight of Soil (g) -	422.3	Wet Weight of Soil (g) -	443.5
Tare Weight (g) -	50.4	Dry Weight of Soil (g) -	392.2	Dry Weight of Soil (g) -	392.2
Water Loss (g) -	6.0	Volume of Ring (ft^3) -	0.0073	Weight of Water (g) -	51.3
Dry Weight (g) -	78.1	Dry Density (pcf) -	118.4	Final Moisture (%)	13.1
Initial Moisture (%) -	7.7	Initital Saturation (%) -	49.1	Final Saturation (%) -	83.6

Expansion Test - UBC (144 PSF)				
	Date	Time	Reading	
Add Weight	12/6/17	6:27	0.000	
10 Minutes		6:37	0.000	Initial Reading
Add Water		8:00	0.003	
		12:15	0.006	
	12/7/17	9:00	0.008	Final Reading

EImeasured	=	8
EI_{50}	=	8

Expansion Index, EI_{50}	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
>130	Very High

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2195 Faraday Avenue, Suite K, Carlsbad, CA 92008

Client:	Palm Ave. Realty
Project Name:	Saturn blvd.
Project No.:	AAA-72282.4
Date:	12/6/2017
Boring/Sample No.:	B-2
Depth/Location:	0-5 ft.
Soil Description:	Reddish Brn. Silty Sand SM
Tested By:	B D

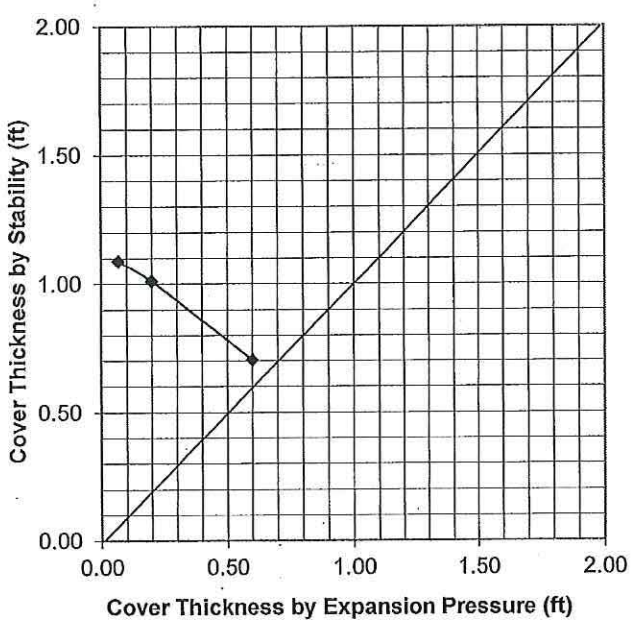
TEST SPECIMEN		A	B	C	D
Compactor air pressure	PSI	350	180	110	
Water added	%	2.9	4.3	5.1	
Moisture at compaction	%	10.4	11.8	12.6	
Height of sample	IN	2.53	2.51	2.55	
Dry density	PCF	126.4	122.7	121.4	
R-Value by exudation		45	21	15	
R-Value by exudation, corrected		45	21	15	
Exudation pressure	PSI	630	300	190	
Stability thickness	FT	0.70	1.01	1.09	
Expansion pressure thickness	FT	0.60	0.20	0.07	

DESIGN CALCULATION DATA	
Traffic index, assumed	5.0
Gravel equivalent factor, assumed	1.25
Expansion, stability equilibrium	0
R-Value by expansion	NA
R-Value by exudation	21
R-Value at equilibrium	**21**

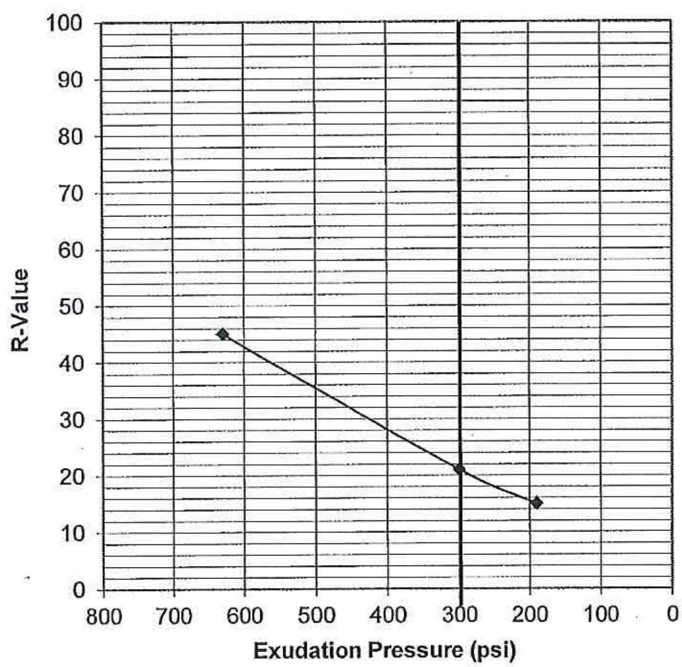
SAMPLE INFORMATION

Sample Location:	B-5 @ 1-5'
Sample Description:	Silty Sand
Notes:	AAA-7228.24 RV-1
	0% Retained on 3/4 inch sieve
Test Method:	Cal-Trans Test 301

Expansion, Stability Equilibrium



R-Value By Exudation



GeoSoils, Inc.
5741 Palmer Way
Carlsbad, CA 92008
Telephone: (760) 438-3155
Fax: (760) 931-0915

9/2/2010

R - VALUE TEST RESULTS

Project: EEI

Number: 5932-A-SC

Date: December 2017 Plate: 1

L A B O R A T O R Y   R E P O R T

Telephone (619) 425-1993   Fax 425-7917   Established 1928

C L A R K S O N L A B O R A T O R Y A N D S U P P L Y I N C.
350 Trousdale Dr. Chula Vista, Ca. 91910 www.clarksonlab.com
A N A L Y T I C A L A N D C O N S U L T I N G C H E M I S T S

Date: December 8, 2017
Purchase Order Number: AAA-72282-4
Sales Order Number: 38258
Account Number: EEI

To:

EEI Environmental Equalizers Inc
2195 Faraday Avenue Suite K
Carlsbad, CA 92008
Attention: Jeff Blake

Laboratory Number: SO6682   Customers Phone: 760-431-3747

Sample Designation:

One soil sample received on 12/05/17 at 9:50am,
from Palm Ave Realty Satrin Blvd Project#AAA-72282-4
marked as B-2@0-5 SM.

Analysis By California Test 643, 1999, Department of Transportation
Division of Construction, Method for Estimating the Service Life of
Steel Culverts.

pH 8.3

Water Added (ml)	Resistivity (ohm-cm)
10	4100
5	2000
5	1500
5	1300
5	1200
5	1100
5	1300
5	1600

32 years to perforation for a 16 gauge metal culvert.
41 years to perforation for a 14 gauge metal culvert.
57 years to perforation for a 12 gauge metal culvert.
73 years to perforation for a 10 gauge metal culvert.
89 years to perforation for a 8 gauge metal culvert.

Water Soluble Sulfate	Calif. Test 417	0.014%
Water Soluble Chloride	Calif. Test 422	0.016%

Rosa M. Bernal
RMB/ilv

APPENDIX C
EARTHWORK AND GRADING GUIDELINES

Geotechnical & Environmental Solutions

EARTHWORK AND GRADING GUIDELINES

GENERAL

These guidelines present general procedures and recommendations for earthwork and grading as required on the approved grading plans, including preparation of areas to be filled, placement of fill and installation of subdrains and excavations. The recommendations contained in the geotechnical report are applicable to each specific project, are part of the earthwork and grading guidelines and would supersede the provisions contained hereafter in the case of conflict. Observations and/or testing performed by the consultant during the course of grading may result in revised recommendations which could supersede these guidelines or the recommendations contained in the geotechnical report. Figures A through O are provided at the back of this appendix, exhibiting generalized cross sections relating to these guidelines.

The contractor is responsible for the satisfactory completion of all earthworks in accordance with provisions of the project plans and specifications. The project soil engineer and engineering geologist (geotechnical consultant) or their representatives should provide observation and testing services, and geotechnical consultation throughout the duration of the project.

EARTHWORK OBSERVATIONS AND TESTING

Geotechnical Consultant

Prior to the commencement of grading, a qualified geotechnical consultant (a soil engineer and engineering geologist) should be employed for the purpose of observing earthwork procedures and testing the fills for conformance with the recommendations of the geotechnical report, the approved grading plans, and applicable grading codes and ordinances.

The geotechnical consultant should provide testing and observation so that determination may be made that the work is being completed as specified. It is the responsibility of the contractor to assist the consultant and keep them aware of work schedules and predicted changes, so that the consultant may schedule their personnel accordingly.

All removals, prepared ground to receive fill, key excavations, and subdrains should be observed and documented by the project engineering geologist and/or soil engineer prior to placing any fill. It is the contractor's responsibility to notify the engineering geologist and soil engineer when such areas are ready for observation.

Laboratory and Field Tests

Maximum dry density tests to determine the degree of compaction should be performed in accordance with American Standard Testing Materials test method ASTM designation D-1557-78. Random field compaction tests should be performed in accordance with test method ASTM designations D-1556-82, D-2937 or D-2922 & D-3017, at intervals of approximately two (2) feet of fill height per 10,000 sq. ft. or every one thousand cubic yards of fill placed. These criteria would vary depending on the soil conditions and the size of the project. The location and frequency of testing would be at the discretion of the geotechnical consultant

Contractor's Responsibility

All clearing, site preparation, and earthwork performed on the project should be conducted by the contractor, with observation by geotechnical consultants and staged approval by the appropriate governing agencies. It is the contractor's responsibility to prepare the ground surface to receive the fill to the satisfaction of the soil engineer, and to place, spread, moisture condition, mix and compact the fill in accordance with the recommendations of the soil engineer. The contractor should also remove all major deleterious material considered unsatisfactory by the soil engineer.

It is the sole responsibility of the contractor to provide adequate equipment and methods to accomplish the earthwork in accordance with applicable grading guidelines, codes or agency ordinances, and approved grading plans. Sufficient watering apparatus and compaction equipment should be provided by the contractor with due consideration for the fill material, rate of placement, and climatic conditions. If, in the opinion of the geotechnical consultant, unsatisfactory conditions such as questionable weather, excessive oversized rock, deleterious material or insufficient support equipment are resulting in a quality of work that is not acceptable, the consultant will inform the contractor, and the contractor is expected to rectify the conditions, and if necessary, stop work until conditions are satisfactory.

The contractor will properly grade all surfaces to maintain good drainage and prevent ponding of water. The contractor will take action to control surface water and to prevent erosion control measures that have been installed.

SITE PREPARATION

All vegetation including brush, trees, thick grasses, organic debris, and other deleterious material should be removed and disposed of offsite, and must be concluded prior to placing fill. Existing fill, soil, alluvium, colluvium, or rock materials determined by the soil engineer or engineering geologist as unsuitable for structural in-place support should be removed prior to fill placement. Depending upon the soil conditions, these materials may be reused as compacted fills. Any materials incorporated as part of the compacted fills should be approved by the soil engineer.

Any underground structures such as cesspools, cisterns, mining shafts, tunnels, septic tanks, wells, pipelines, or other structures not located prior to grading are to be removed or treated in a manner recommended by the soil engineer. Soft, dry, spongy, highly fractured, or otherwise unsuitable ground extending to such a depth that surface processing cannot adequately improve the condition should be over excavated down to firm ground and approved by the soil engineer before compaction and filling operations continue. Over excavated and processed soils which have been properly mixed and moisture-conditioned should be recompacted to the minimum relative compaction as specified in these guidelines.

Existing ground which is determined to be satisfactory for support of the fills should be scarified to a minimum depth of six (6) inches, or as directed by the soil engineer. After the scarified ground is brought to optimum moisture (or greater) and mixed, the materials should be compacted as specified herein. If the scarified zone is greater than 6 inches in depth, it may be necessary to remove the excess and place the material in lifts restricted to six (6) inches in compacted thickness.

Existing grind which is not satisfactory to support compacted fill should be over excavated as required in the geotechnical report or by the onsite soils engineer and/or engineering geologists. Scarification, discing, or other acceptable form of mixing should continue until the soils are broken down and free of large fragments or clods, until the working surface is reasonably uniform and free from ruts, hollows, hummocks, or other uneven features which would inhibit compaction as described above.

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical) gradient, the ground should be benched. The lowest bench, which will act as a key, should be a minimum of 12 feet wide and should be at least two (2) feet deep into competent material, approved by the soil engineer and/or engineering geologist. In fill over cut slope conditions, the recommended minimum width of the lowest bench or key is at least 15 feet with the key excavated on competent material, as designated by the Geotechnical Consultant. As a general rule, unless superseded by the Soil Engineer, the minimum width of fill keys should be approximately equal to one-half (½) the height of the slope.

Standard benching is typically four feet (minimum) vertically, exposing competent material. Benching may be used to remove unsuitable materials, although it is understood that the vertical height of the bench may exceed four feet. Pre stripping may be considered for removal of unsuitable materials in excess of four feet in thickness.

All areas to receive fill, including processed areas, removal areas, and toe of fill benches should be observed and approved by the soil engineer and/or engineering geologist prior to placement of fill. Fills may then be properly placed and compacted until design grades are attained.

COMPACTED FILLS

Earth materials imported or excavated on the property may be utilized as fill provided that each soil type has been accepted by the soil engineer. These materials should be free of roots, tree branches, other organic matter or other deleterious materials. All unsuitable materials should be removed from the fill as directed by the soil engineer. Soils of poor gradation, undesirable expansion potential, or substandard strength characteristics may be designated unsuitable by the consultant and may require mixing with other earth materials to serve as a satisfactory fill material.

Fill materials generated from benching operations should be dispersed throughout the fill area. Benching operations should not result in the benched material being placed only within a single equipment width away from the fill/bedrock contact.

Oversized materials, defined as rock or other irreducible materials with a maximum size exceeding 12 inches in one dimension, should not be buried or placed in fills unless the location of materials and disposal methods are specifically approved by the soil engineer. Oversized material should be taken offsite or placed in accordance with recommendations of the soil engineer in areas designated as suitable for rock disposal. Oversized material should not be placed vertically within 10 feet of finish grade or horizontally within 20 feet of slope faces.

To facilitate trenching, rock should not be placed within the range of foundation excavations or future utilities unless specifically approved by the soil engineer and/or the representative developers.

If import fill material is required for grading, representative samples of the material should be analyzed in the laboratory by the soil engineer to determine its physical properties. If any material other than that previously analyzed is imported to the fill or encountered during grading, analysis of this material should be conducted by the soil engineer as soon as practical.

Fill material should be placed in areas prepared to receive fill in near-horizontal layers that should not exceed six (6) inches compacted in thickness. The soil engineer may approve thicker lifts if testing indicates the grading procedures are such that adequate compaction is being achieved. Each layer should be spread evenly and mixed to attain uniformity of material and moisture suitable for compaction.

Fill materials at moisture content less than optimum should be watered and mixed, and “wet” fill materials should be aerated by scarification, or should be mixed with drier material. Moisture conditioning and mixing of fill materials should continue until the fill materials have uniform moisture content at or above optimum moisture.

After each layer has been evenly spread, moisture-conditioned and mixed, it should be uniformly compacted to a minimum of 90 percent of maximum density as determined by ASTM test designation, D 1557-78, or as otherwise recommended by the soil engineer. Compaction equipment should be adequately sized and should be reliable to efficiently achieve the required degree of compaction.

Where tests indicate that the density of any layer of fill, or portion thereof, is below the required relative compaction or improper moisture content, the particular layer or portion will be reworked until the required density and/or moisture content has been attained. No additional fill will be placed in an area until the last placed lift of fill has been tested and found to meet the density and moisture requirements, and is approved by the soil engineer.

Compaction of slopes should be accomplished by over-building the outside edge a minimum of three (3) feet horizontally, and subsequently trimming back to the finish design slope configuration. Testing will be performed as the fill is horizontally placed to evaluate compaction as the fill core is being developed. Special efforts may be necessary to attain the specified compaction in the fill slope zone. Final slope shaping should be performed by trimming and removing loose materials with appropriate equipment. A final determination of fill slope compaction should be based on observation and/or testing of the finished slope face.

If an alternative to over-building and cutting back the compacted fill slope is selected, then additional efforts should be made to achieve the required compaction in the outer 10 feet of each lift of fill by undertaking the following:

- Equipment consisting of a heavy short-shanked sheepsfoot should be used to roll (horizontal) parallel to the slopes continuously as fill is placed. The sheepsfoot roller should also be used to roll perpendicular to the slopes, and extend out over the slope to provide adequate compaction to the face slope.

- Loose fill should not be spilled out over the face of the slope as each lift is compacted. Any loose fill spilled over a previously completed slope face should be trimmed off or be subject to re-rolling.

- Field compaction tests will be made in the outer two (2) to five (5) feet of the slope at two (2) to three (3) foot vertical intervals, subsequent to compaction operations.

- After completion of the slope, the slope face should be shaped with a small dozer and then re-rolled with a sheepsfoot to achieve compaction to near the slope face. Subsequent to testing to verify compaction, the slopes should be grid-rolled to achieve adequate compaction to the slope face. Final testing should be used to confirm compaction after grid rolling.

- Where testing indicates less than adequate compaction, the contractor will be responsible to process, moisture condition, mix and recompact the slope materials as necessary to achieve compaction. Additional testing should be performed to verify compaction.

- Erosion control and drainage devices should be designed by the project civil engineer in compliance with the ordinances of the controlling governmental agencies, and/or in accordance with the recommendations of the soil engineer or engineering geologist.

EXCAVATIONS

Excavations and cut slopes should be observed and mapped during grading by the engineering geologist. If directed by the engineering geologist, further excavations or over-excavation and refilling of cut areas should be performed. When fills over cut slopes are to be graded, the cut portion of the slope should be observed by the engineering geologist prior to placement of the overlying fill portion of the slope. The engineering geologist should observe all cut slopes and should be notified by the contractor when cut slopes are started.

If, during the course of grading, unanticipated adverse or potentially adverse geologic conditions are encountered, the engineering geologist and soil engineer should investigate, evaluate and make recommendations to mitigate (or limit) these conditions. The need for cut slope buttressing or stabilizing should be based on as-grading evaluations by the engineering geologist, whether anticipated previously or not.

Unless otherwise specified in soil and geological reports, no cut slopes should be excavated higher or steeper than that allowed by the ordinances of controlling governmental agencies. Additionally, short-term stability of temporary cut slopes is the contractor’s responsibility.

Erosion control and drainage devices should be designed by the project civil engineer and should be constructed in compliance with the ordinances of the controlling governmental agencies, and/or in accordance with the recommendations of the soil engineer or engineering geologist.

SUBDRAIN INSTALLATION

Subdrains should be installed in accordance with the approved embedment material, alignment and details indicated by the geotechnical consultant. Subdrain locations or construction materials should not be changed or modified without approval of the geotechnical consultant. The soil engineer and/or engineering geologist may recommend and direct changes in subdrain line, grade and drain material in the field, pending exposed conditions. The location of constructed subdrains should be recorded by the project civil engineer.

COMPLETION

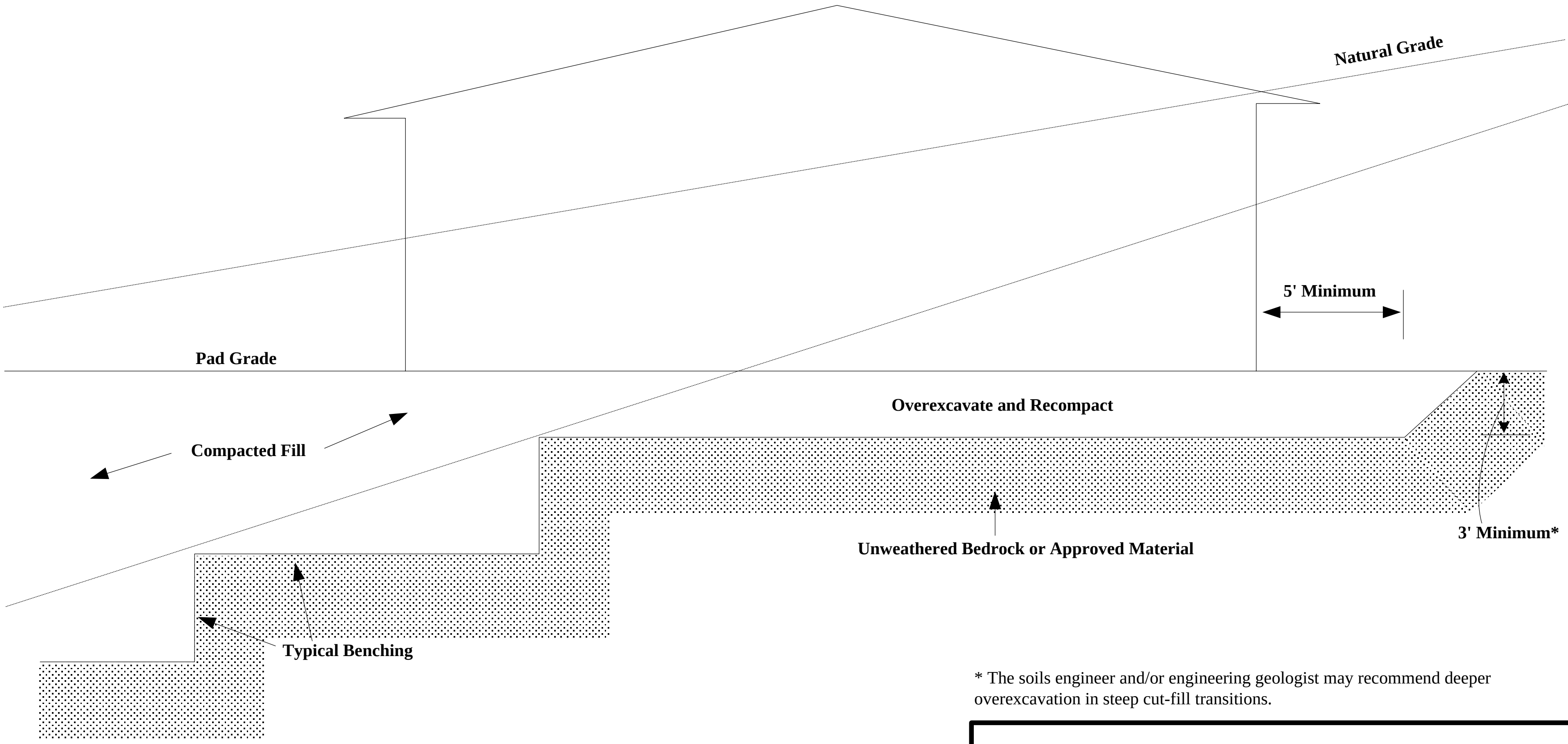
Consultation, observation and testing by the geotechnical consultant should be completed during grading operations in order to state an opinion that all cut and filled areas are graded in accordance with the approved project specifications.

After completion of grading and after the soil engineer and engineering geologist have finished their observations, final reports should be submitted subject to review by the controlling governmental agencies. No additional grading should be undertaken without prior notification of the soil engineer and/or engineering geologist.

All finished cut and fill slopes should be protected from erosion, including but not limited to planting in accordance with the plan design specifications and/or as recommended by a landscape architect. Such protection and/or planning should be undertaken as soon as possible after completion of grading.

ATTACHMENTS

TRANSITION LOT DETAIL
CUT LOT – MATERIAL TYPE
TRANSITION



* The soils engineer and/or engineering geologist may recommend deeper overexcavation in steep cut-fill transitions.

Note: Figure not to scale

EARTHWORK AND GRADING GUIDELINES
TRANSITION LOT DETAIL
CUT LOT – MATERIAL TYPE TRANSITION

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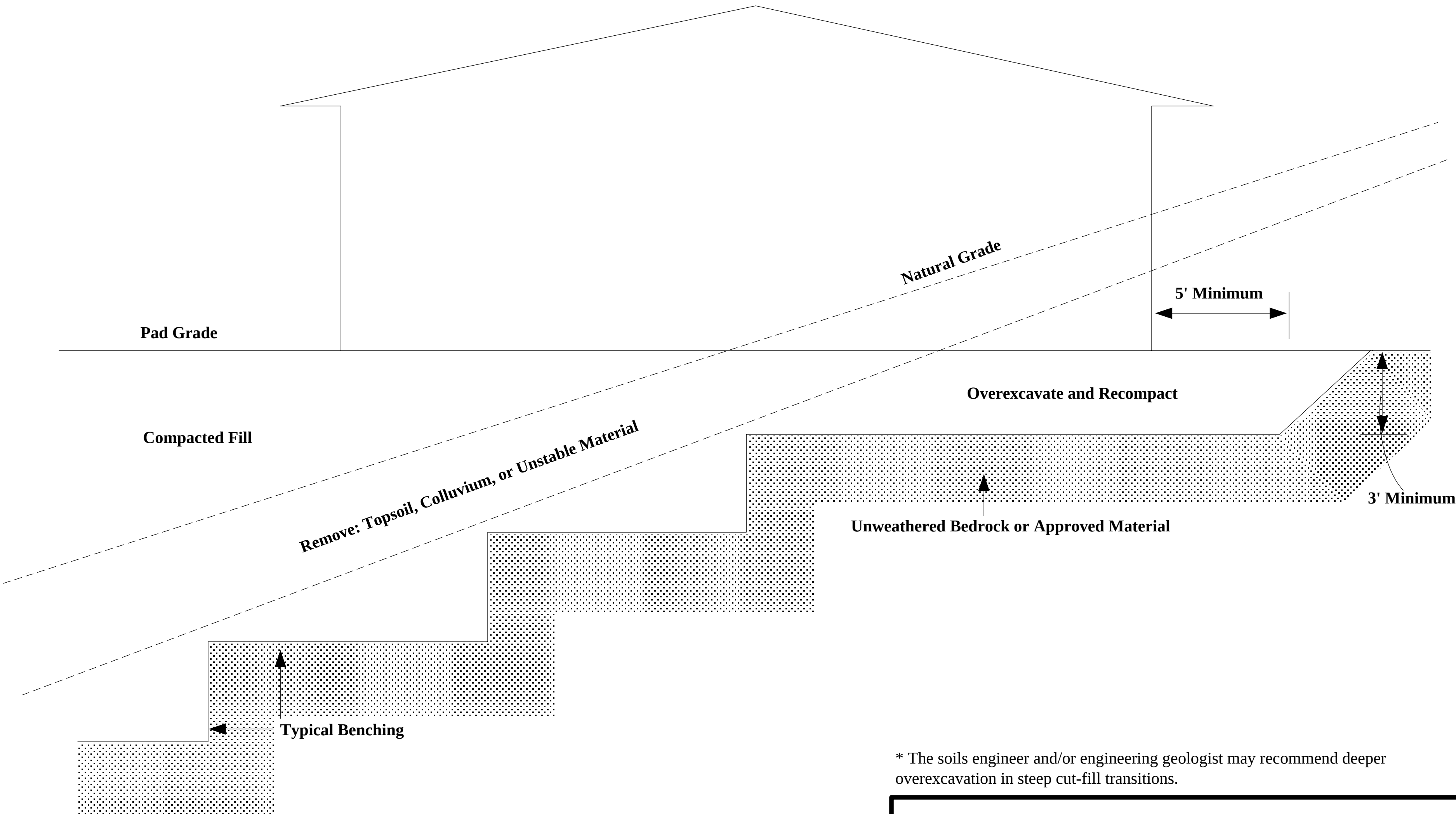
FIGURE A

TRANSITION LOT DETAIL
CUT – FILL – DAYLIGHT TRANSITION



* The soils engineer and/or engineering geologist may recommend deeper overexcavation in steep cut-fill transitions.

Note: Figure not to scale

EARTHWORK AND GRADING GUIDELINES
TRANSITION LOT DETAIL
CUT – FILL – DAYLIGHT TRANSITION

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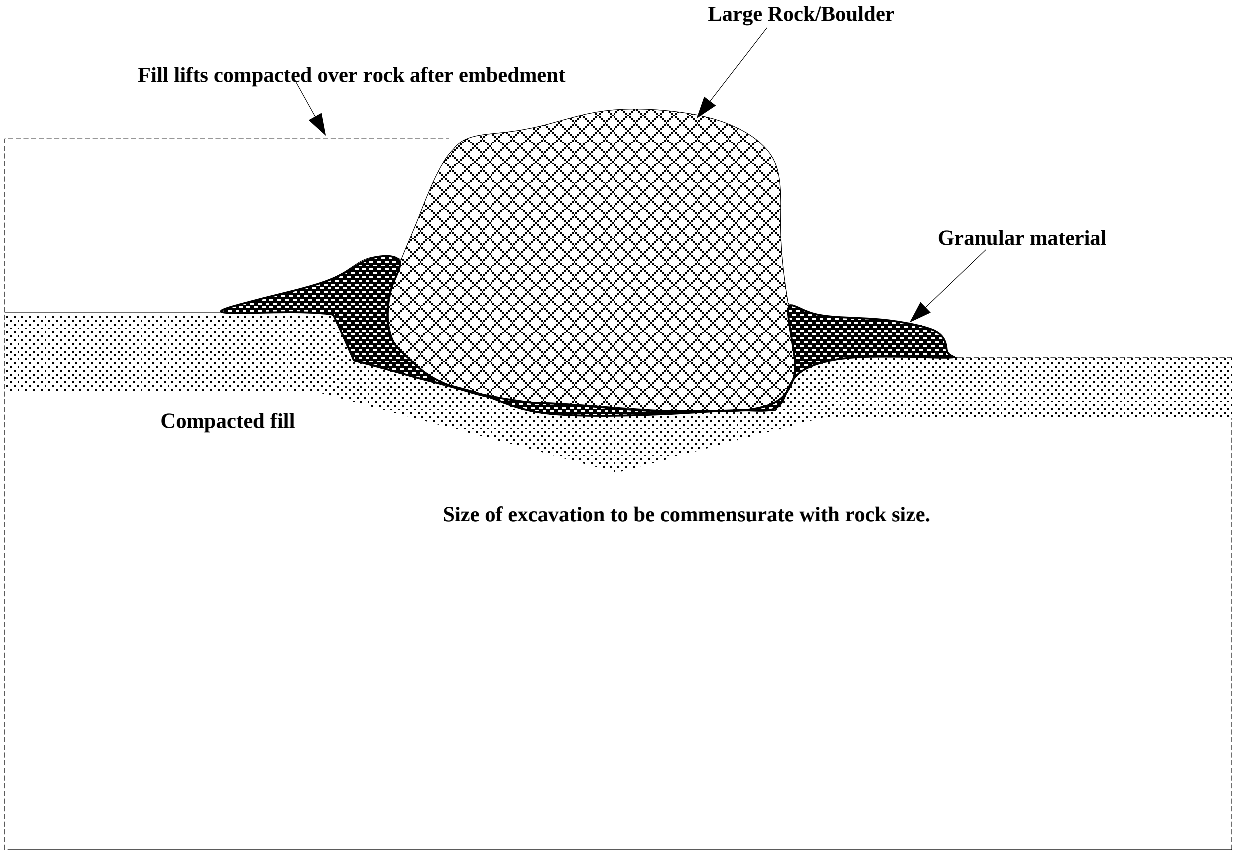
FIGURE B

ROCK DISPOSAL PITS



Note:
(1) Large rock is defined as having a diameter larger than 3 feet in maximum size.
(2) Pit shall be excavated into compacted fill to a depth equal to half of the rock size.
(3) Granular soil shall be pushed into the pit and then flooded around the rock using a sheepsfoot to help with compaction.
(4) A minimum of 3 feet of compacted fill should be laid over each pit.
(5) Pits shall have at least 15 feet of separation between one another, horizontally.
(6) Pits shall be placed at least 20 feet from any fill slope.
(7) Pits shall be used only in deep fill areas.

Note: Figure not to scale

EARTHWORK AND GRADING GUIDELINES
ROCK DISPOSAL PITS

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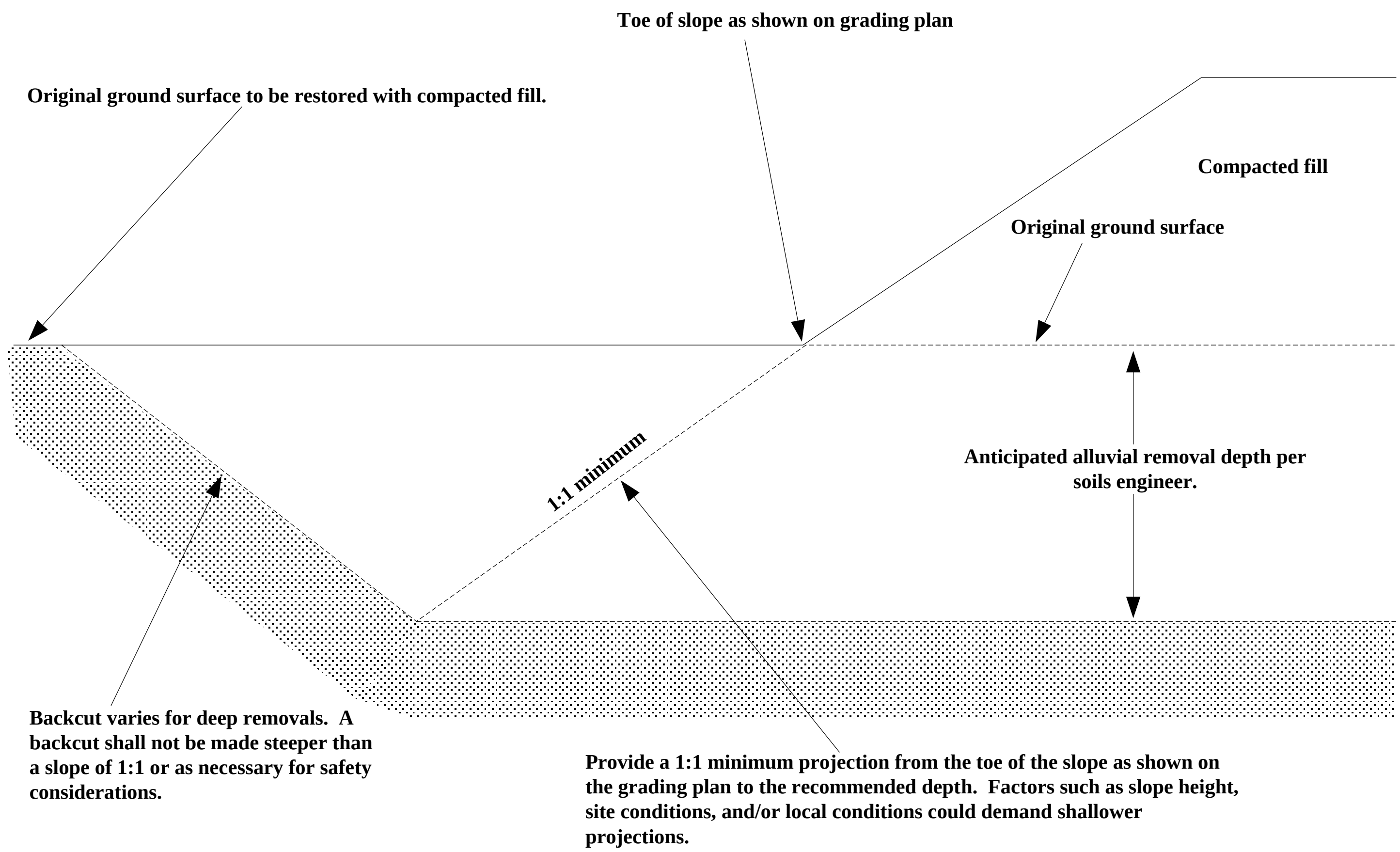
FIGURE C

DETAIL FOR FILL SLOPE TOEING OUT ON FLAT ALLUVIATED CANYON



Note: Figure not to scale

EARTHWORK AND GRADING GUIDELINES

DETAIL FOR FILL SLOPE TOEING OUT ON A FLAT ALLUVIATED CANYON

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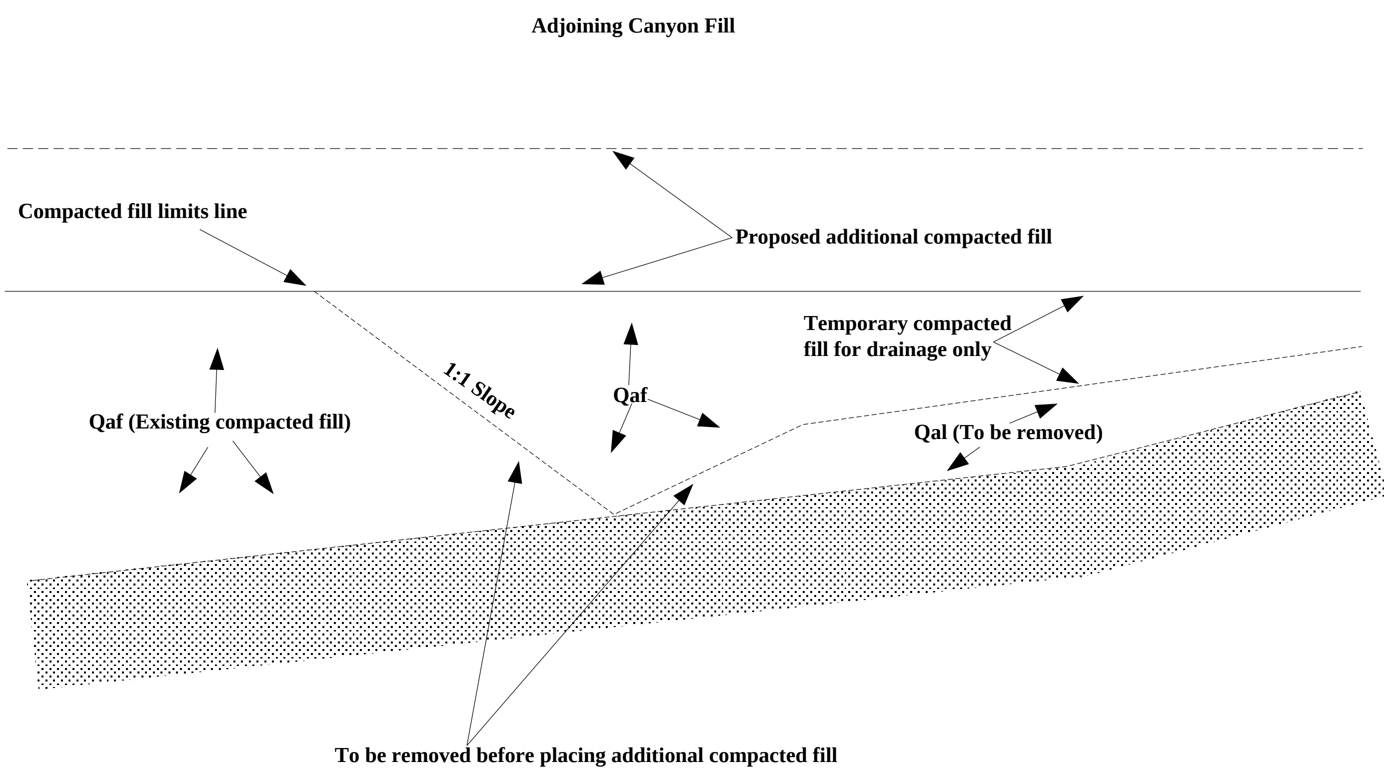
FIGURE D

REMOVAL ADJACENT TO EXISTING FILL



Legend

Qaf - **Artificial Fill**

Qal - **Alluvium**

Note: Figure not to scale

EARTHWORK AND GRADING GUIDELINES
REMOVAL ADJACENT TO EXISTING FILL

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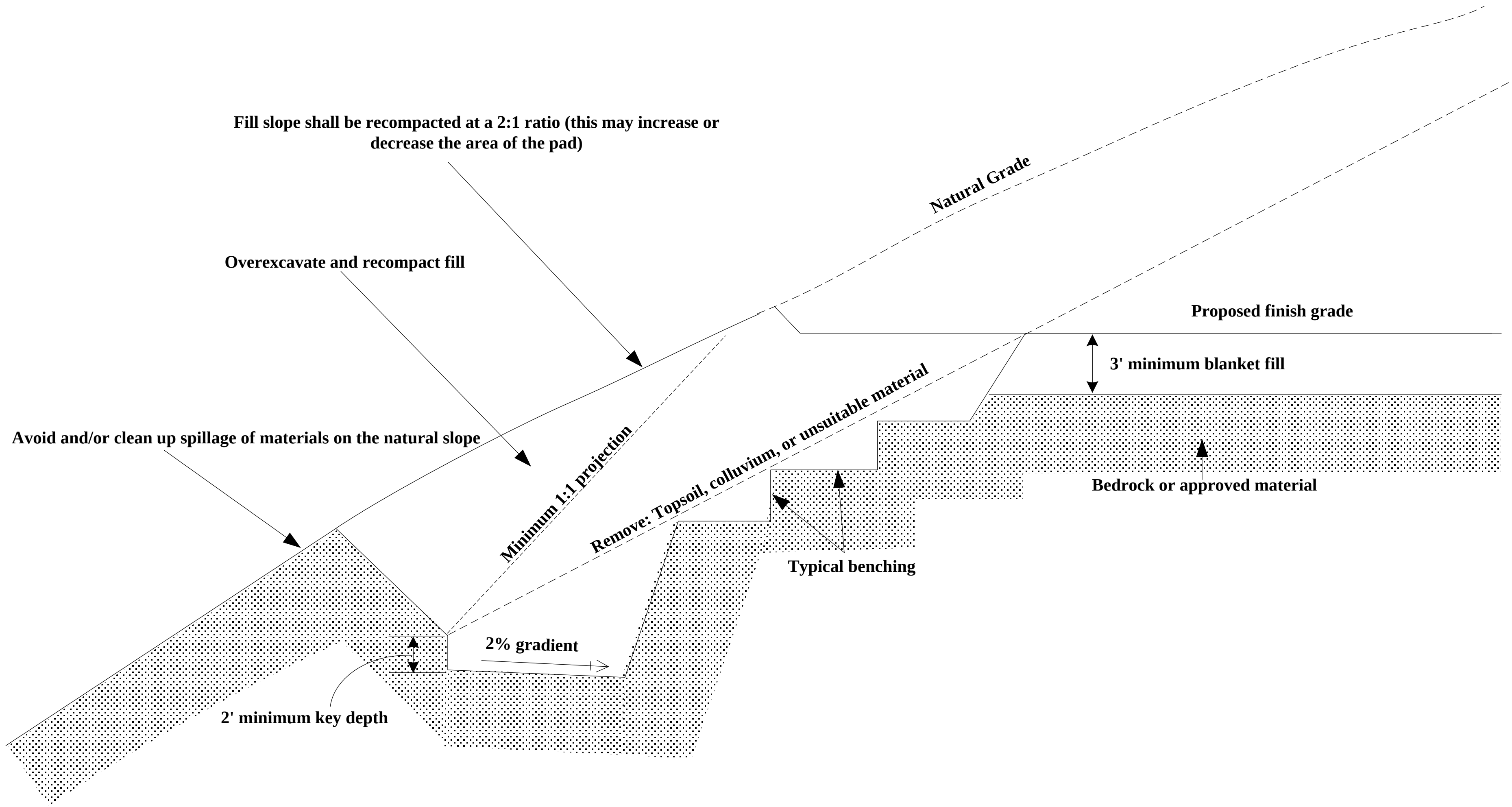
FIGURE E

DAYLIGHT CUT LOT DETAIL



Note: (1) Subdrain and key width requirements shall be determined based on exposed subsurface conditions and the thickness of overburden.

(2) Pad overexcavation and recompaction shall be completed if determined as necessary by the soils engineer and/or engineering geologist.

Note: Figure not to scale

EARTHWORK AND GRADING GUIDELINES
DAYLIGHT CUT LOT DETAIL

EEI
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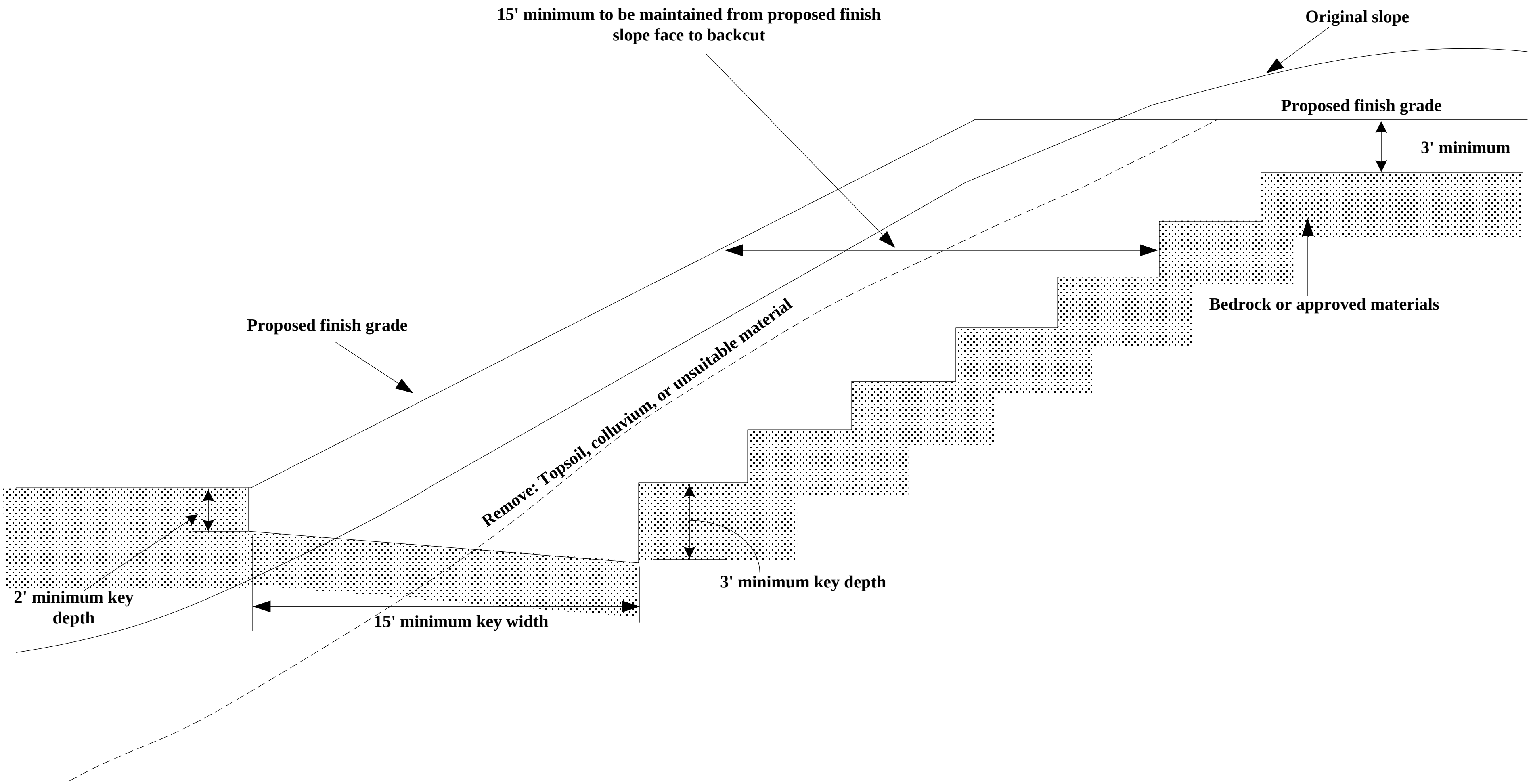
FIGURE F

SKIN FILL OF NATURAL GROUND



Note: (1) The need and disposition of drains will be determined by the soils engineer and/or engineering geologist based on site conditions.

(2) Pad overexcavation and recompaction shall be completed if determined as necessary by the soils engineer and/or engineering geologist.

Note: Figure not to scale

EARTHWORK AND GRADING GUIDELINES
SKIN FILL OF NATURAL GROUND

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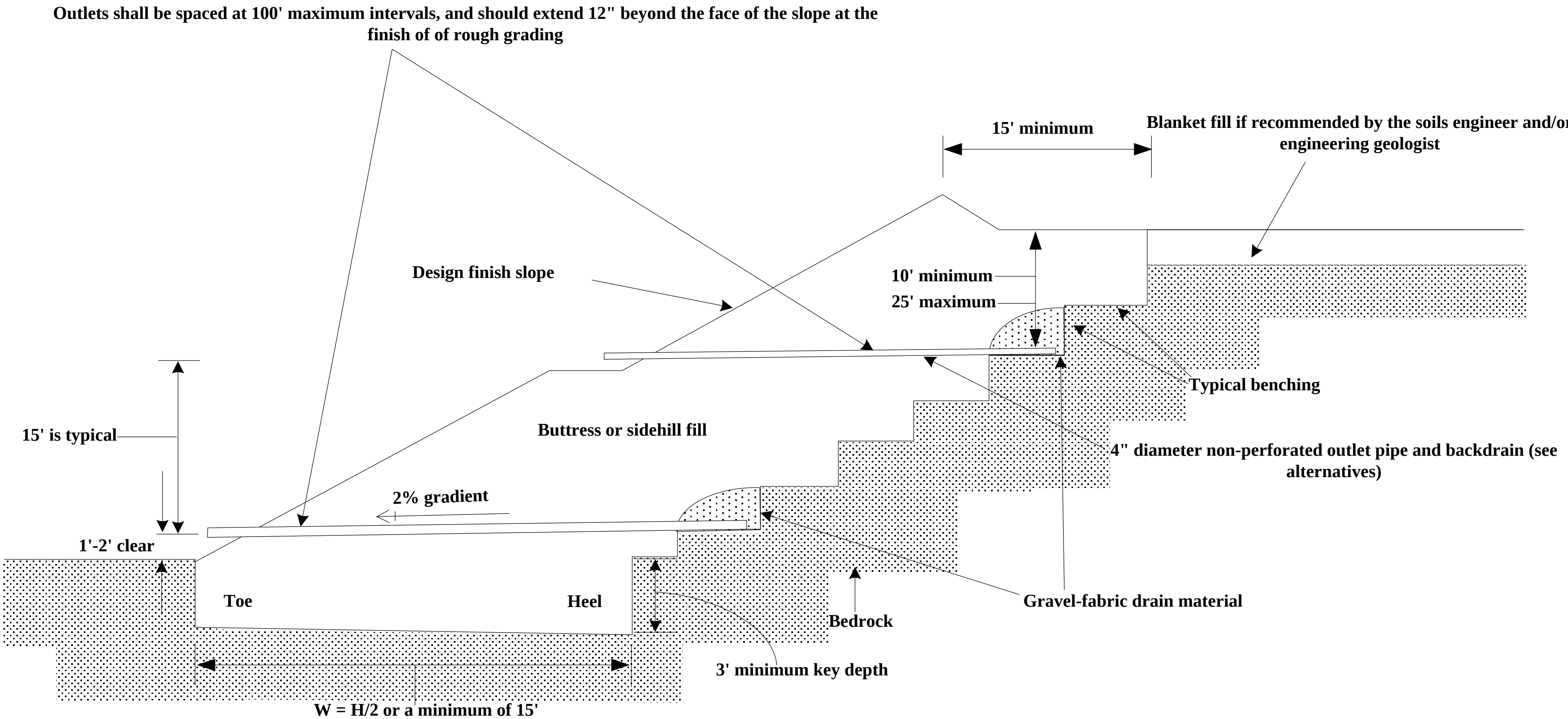
FIGURE G

TYPICAL STABILIZATION BUTTRESS FILL DESIGN



Note: Figure not to scale

EARTHWORK AND GRADING GUIDELINES
TYPICAL STABILIZATION BUTTRESS FILL DESIGN

EEI
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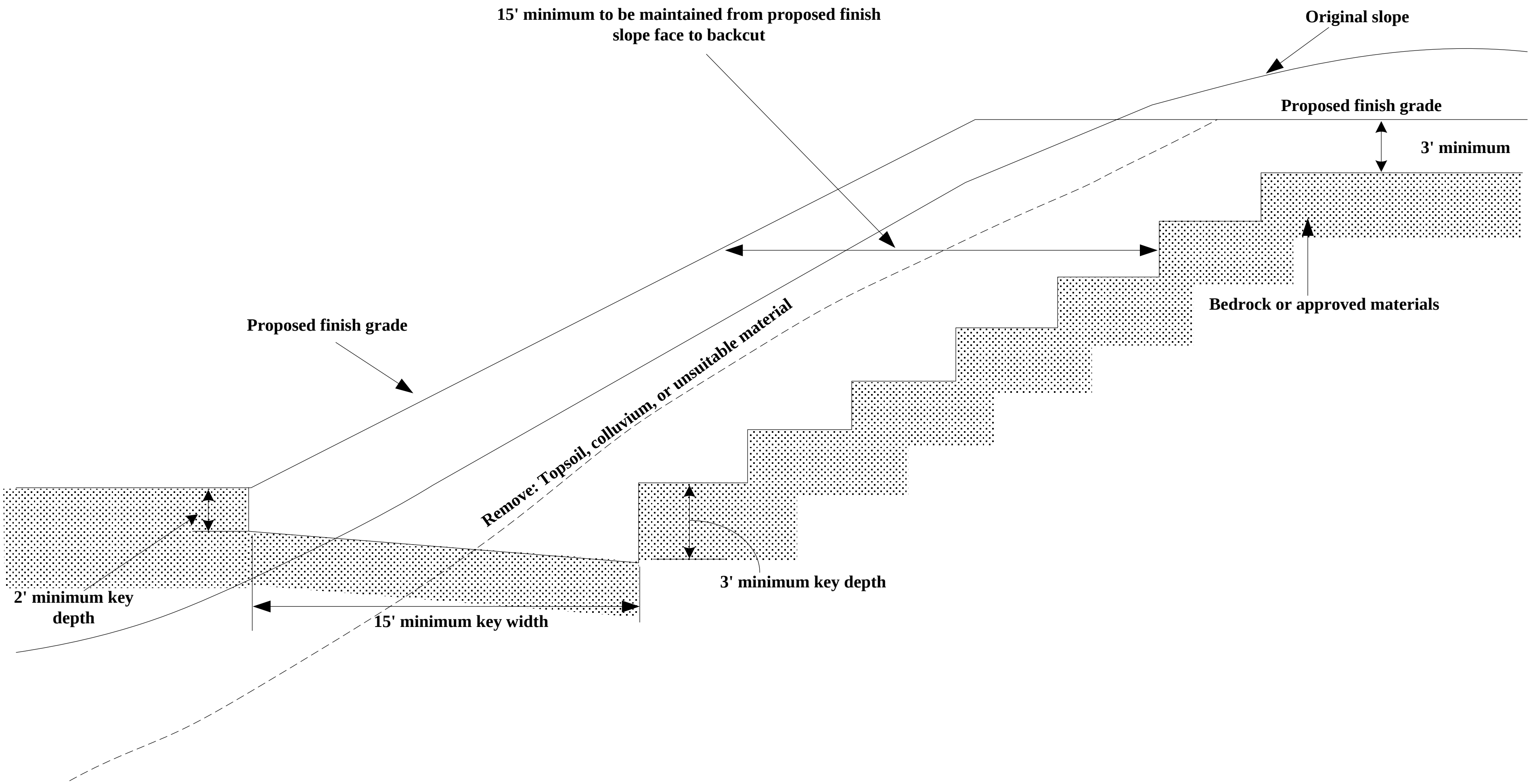
FIGURE H

SKIN FILL OF NATURAL GROUND



Note: (1) The need and disposition of drains will be determined by the soils engineer and/or engineering geologist based on site conditions.

(2) Pad overexcavation and recompaction shall be completed if determined as necessary by the soils engineer and/or engineering geologist.

Note: Figure not to scale

EARTHWORK AND GRADING GUIDELINES
SKIN FILL OF NATURAL GROUND

EEI
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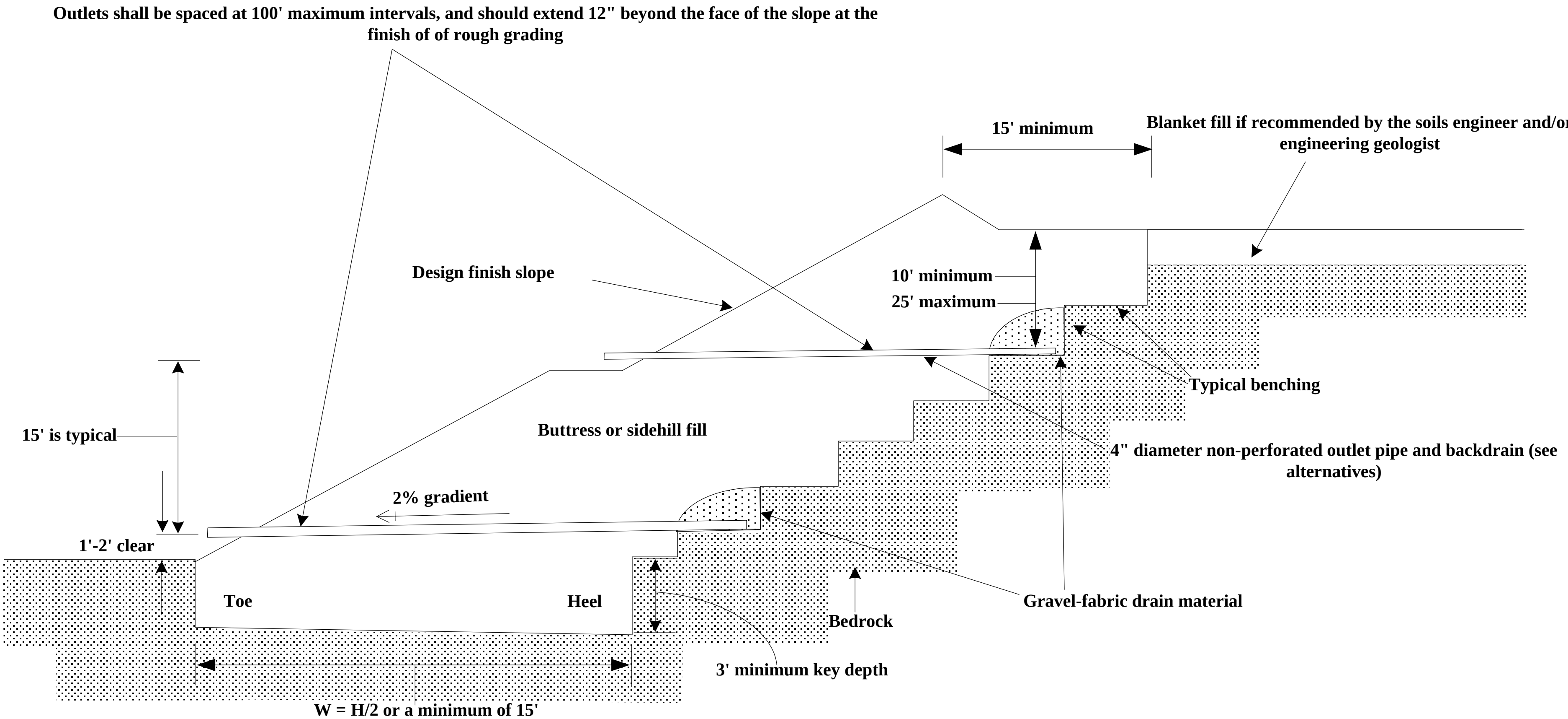
FIGURE G

TYPICAL STABILIZATION BUTTRESS FILL DESIGN



Note: Figure not to scale

EARTHWORK AND GRADING GUIDELINES
TYPICAL STABILIZATION BUTTRESS FILL DESIGN

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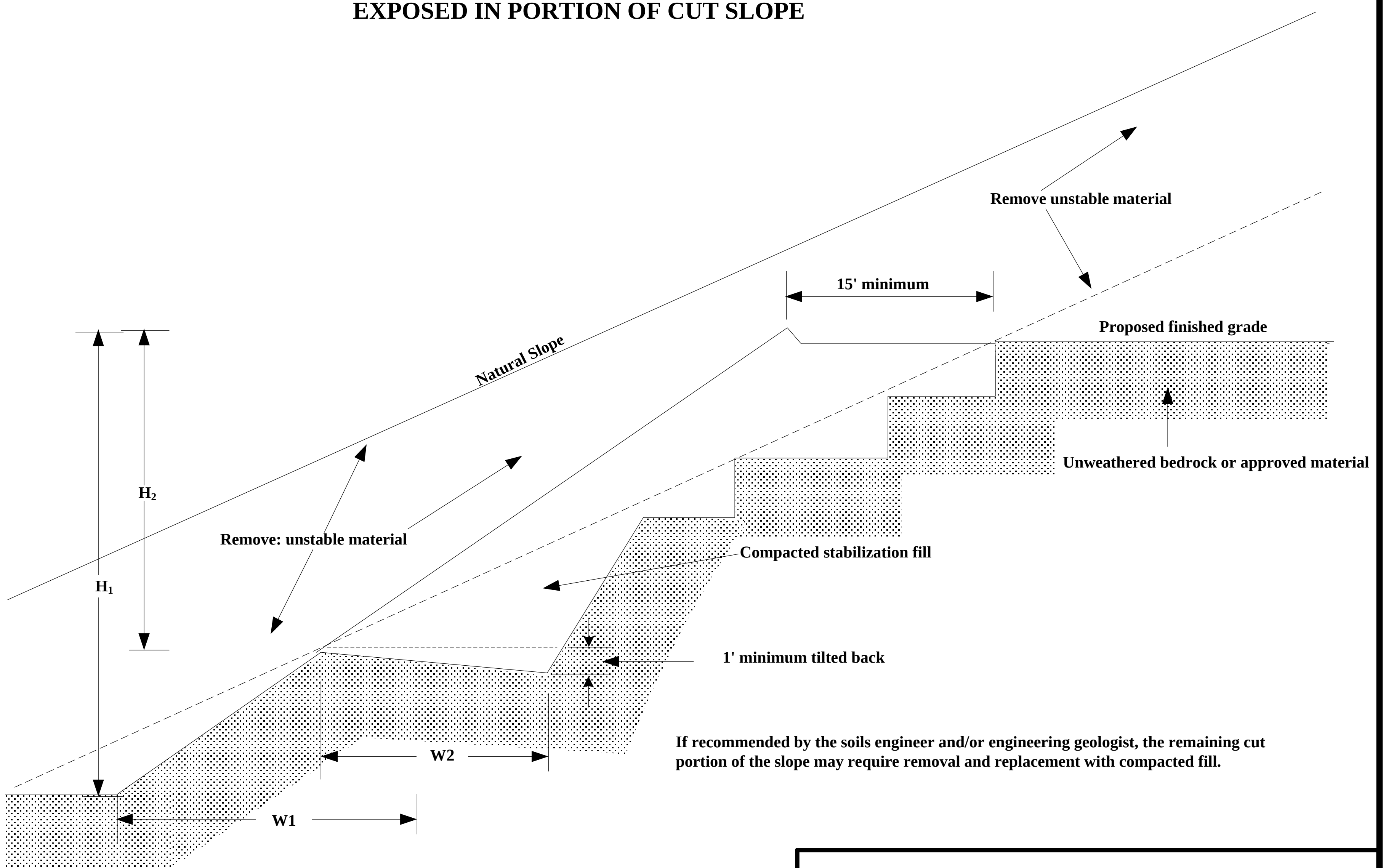
FIGURE H

STABILIZATION FILL FOR UNSTABLE MATERIAL EXPOSED IN PORTION OF CUT SLOPE



Note: (1) Subdrains are required only if specified by the soils engineer and/or engineering geologist.
(2) "W" shall be the equipment width (15') for slope heights less than 25 feet. For slopes greater than 25 feet "W" shall be determined by the project soils engineer and/or the engineering geologist. "W" shall never be less than H/2.

Note: Figure not to scale

EARTHWORK AND GRADING GUIDELINES
STABILIZATION FILL FOR UNSTABLE MATERIAL EXPOSED IN PORTION OF CUT SLOPE

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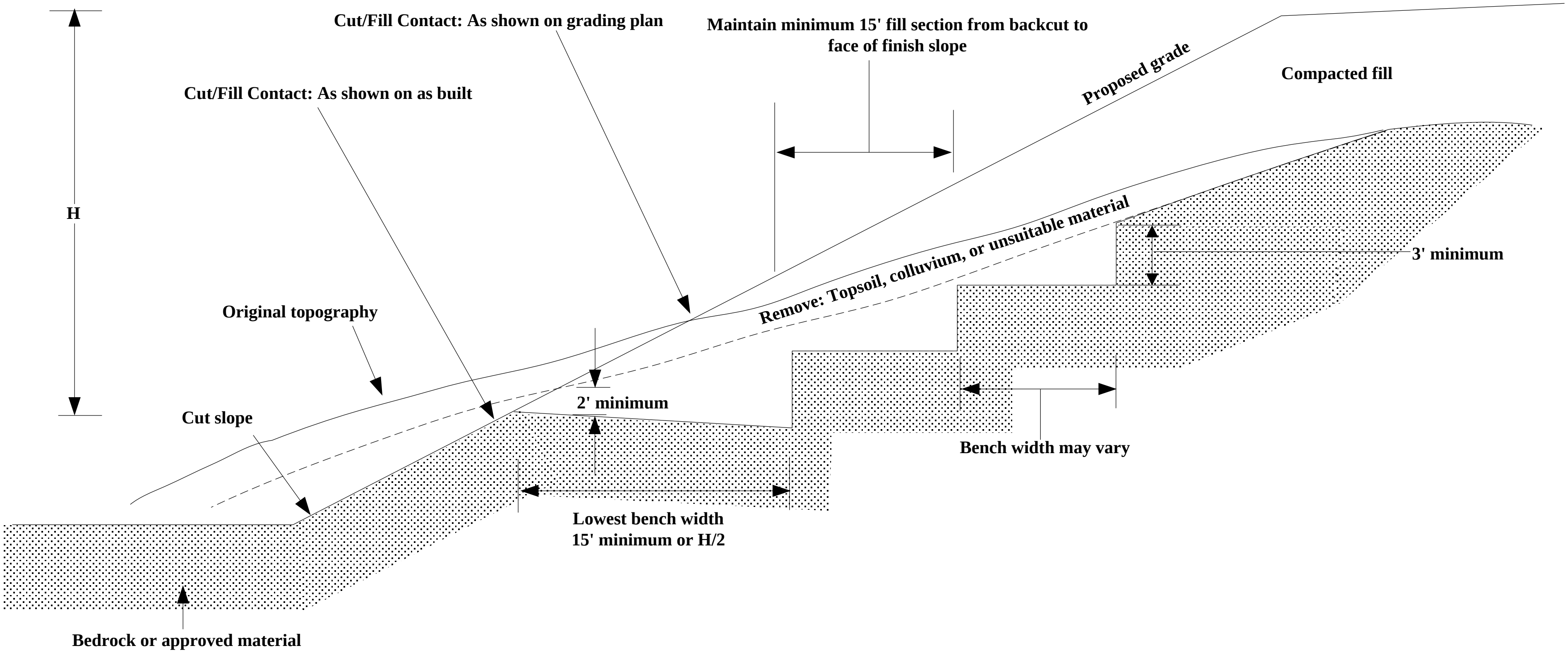
FIGURE I

FILL OVER CUT DETAIL



Note: The cut sectioin shall be excavated and evaluated by the soils engineer/engineering geologist prior to constructing the fill portion.

Note: Figure not to scale

EARTHWORK AND GRADING GUIDELINES
FILL OVER CUT DETAIL

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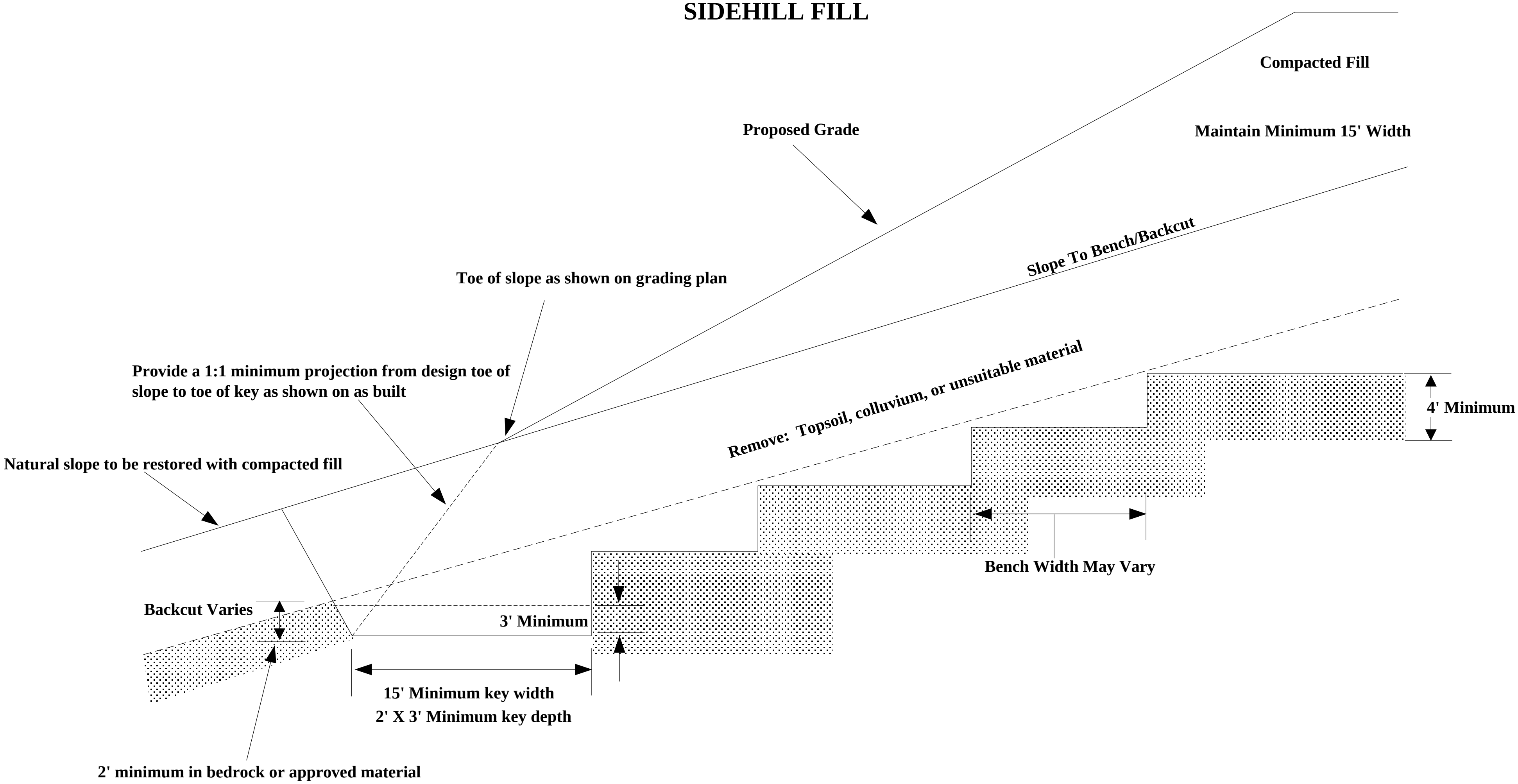
FIGURE J

FILL OVER NATURAL DETAIL
SIDEHILL FILL



Note: (1) Special recommendations shall be provided by the soils engineer/engineering geologist where the natural slope approaches or exceeds the design slope ratio.
(2) The need for and disposition of drains would be determined by the soils engineer/engineering geologist based upon exposed conditions.

Note: Figures not to scale

EARTHWORK AND GRADING GUIDELINES
FILL OVER NATURAL DETAIL
SIDEHILL FILL

EEI
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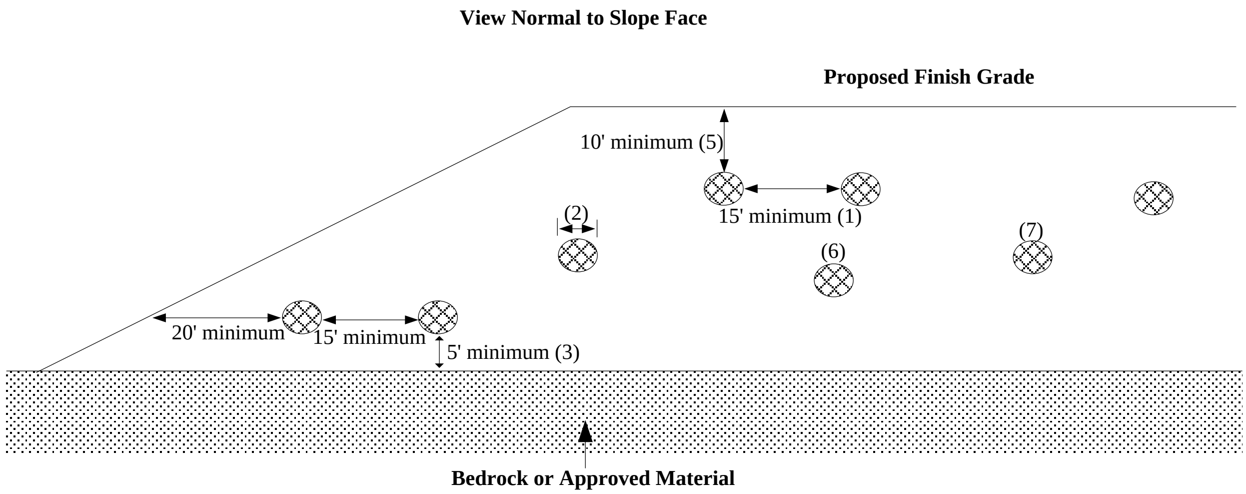
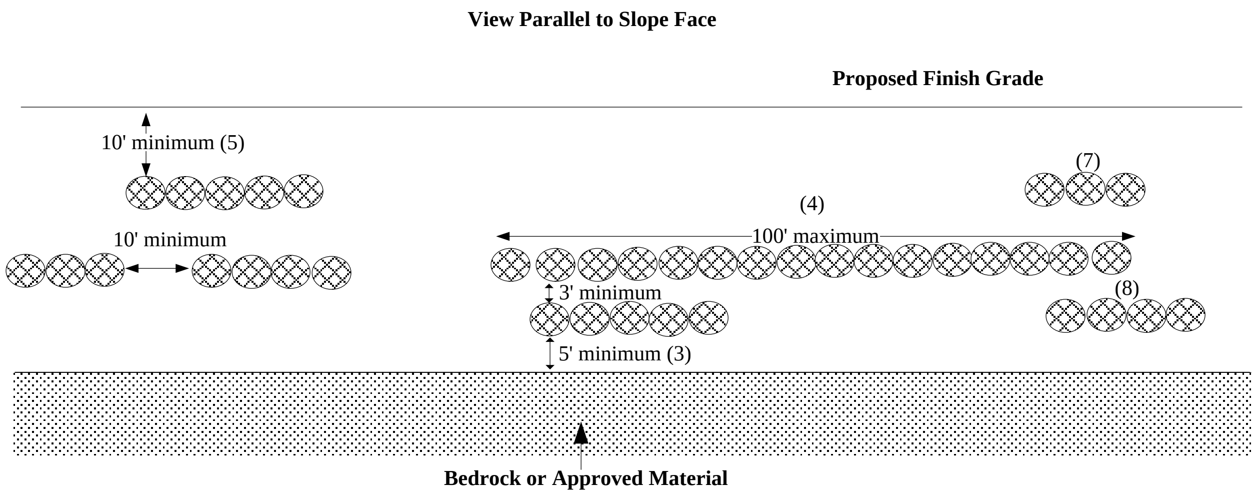
FIGURE K

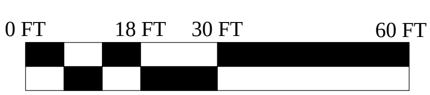
OVERSIZE ROCK DISPOSAL





Note:
(1) One Equipment width or a minimum of 15 feet.
(2) Height and width may vary depending on rock size and type of equipment used. Length of windrow shall be no greater than 100 feet maximum.
(3) If approved by the soils engineer and/or engineering geologist.
(4) Orientation of windrows may vary but shall be as recommended by the soils engineer and/or engineering geologist. Unless recommended staggering of windrows is not necessary.
(5) Areas shall be cleared for utility trenches, foundations, and swimming pools.
(6) Voids in windrows shall be filled by flooding granular soil into place. Granular soil shall be any soil which has a unified soil classification system (Universal Building Code (UBC) 29-1). Designation of SM, SP, SW, GP, or GW.
(7) After fill between windrows is placed and compacted with the lift of fill covering windrow, windrow shall be proof rolled with a D-9 dozer or equivalent.
(8) Oversized rock is defined as larger than 12", and less than 4 feet in size.

Approximate Scale: 1" = 30'



Note: All distances are approximate

EARTHWORK AND GRADING GUIDELINES
OVERSIZE ROCK DISPOSAL

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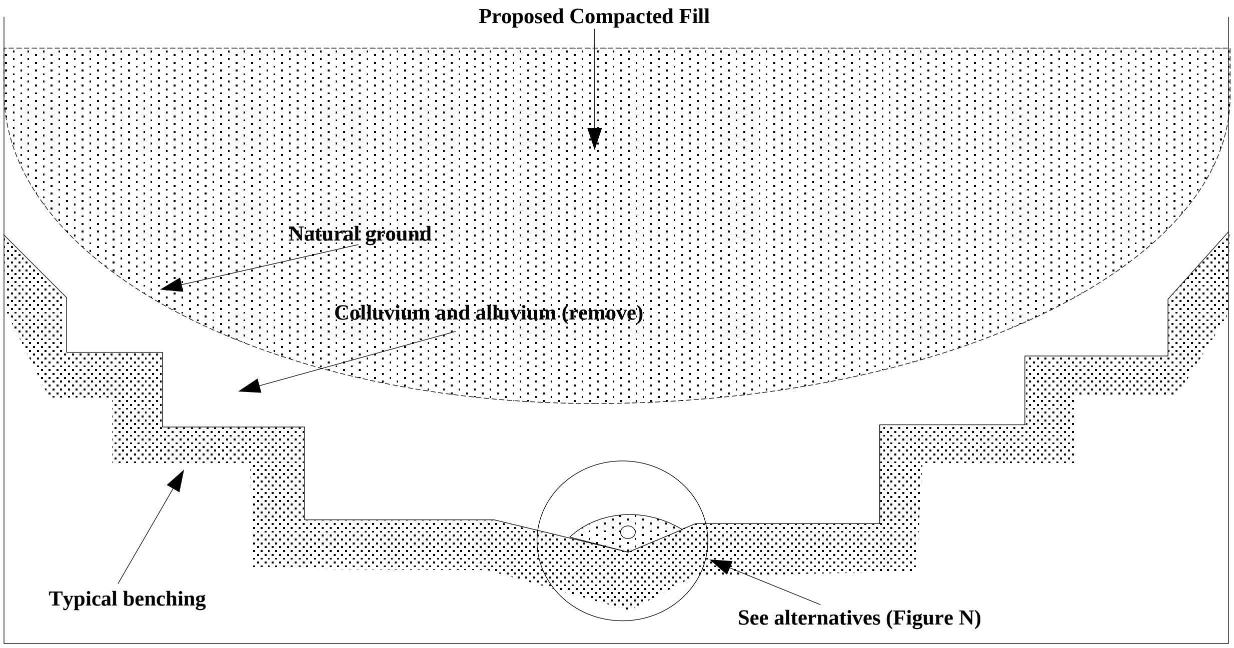
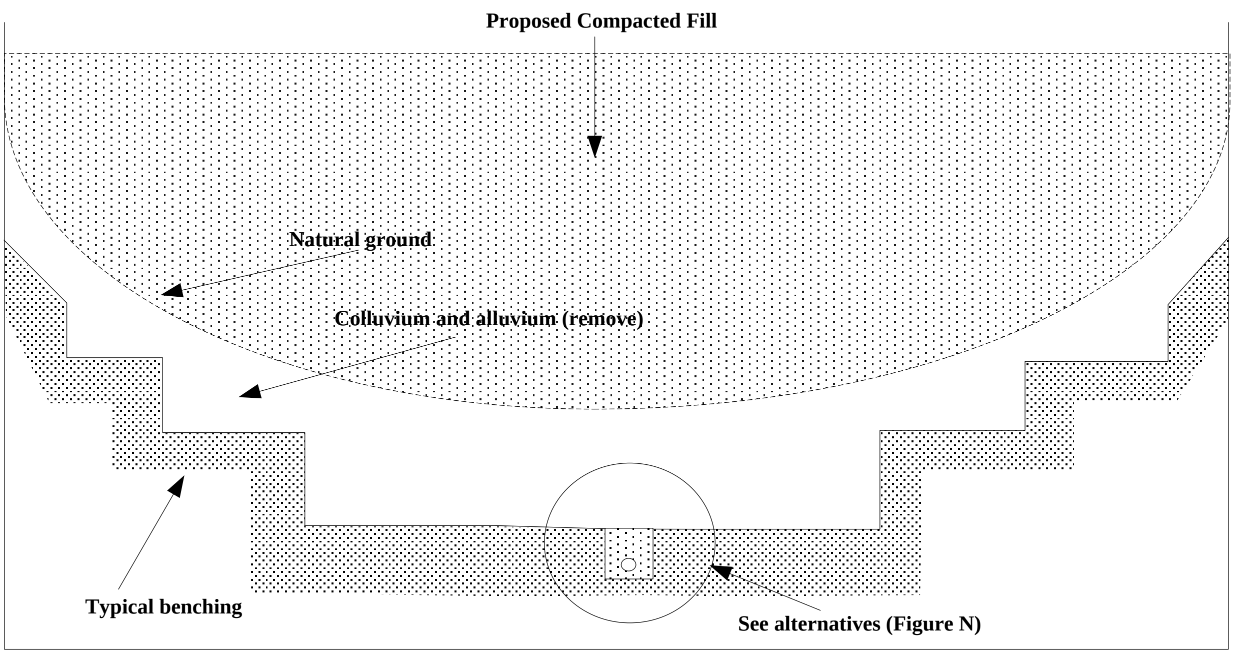
FIGURE L

CANYON SUBDRAIN DETAIL

Type A



Type B



Note: Alternatives, locations, and extent of subdrains should be determined by the soils engineer and/or engineering geologist during actual grading.

Note: Figures not to scale

EARTHWORK AND GRADING GUIDELINES
CANYON SUBDRAIN DETAIL

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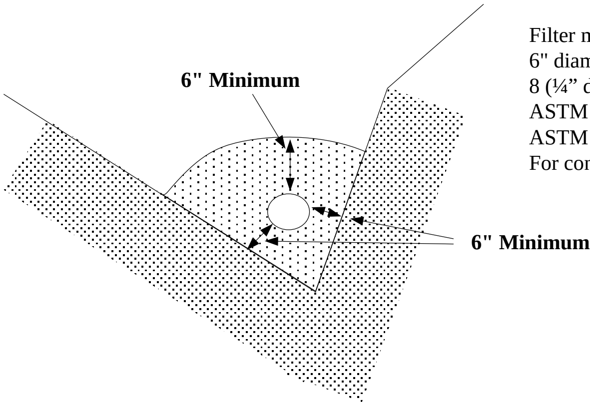
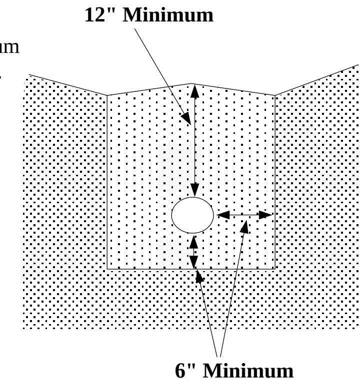
FIGURE M

CANYON SUBDRAIN ALTERNATE DETAILS

Alternate 1: Perforated Pipe and Filter Material



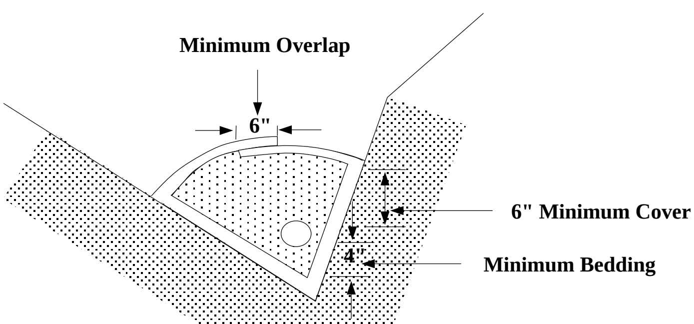
Filter material: Minimum volume of 9 feet^3/linear foot.
6" diameter ABS or PVC pipe or approved substitute with minimum 8 (¼" diameter) perforations per linear foot in bottom half of pipe.
ASTM D 2751, SDR 35 or ASTM D 1527, Schedule 40.
ASTM D 3034, SDR 35 or ASTM D 1785, Schedule 40.
For continuous run in excess of 500 feet use 8" diameter pipe.

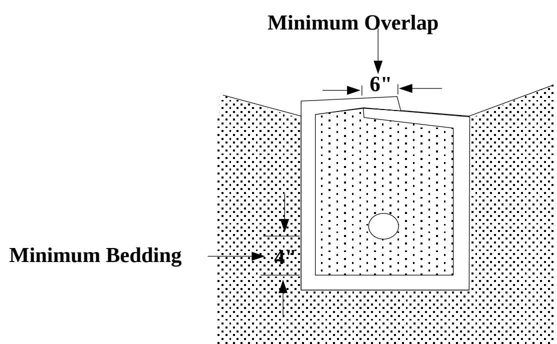


Filter Material

Sieve Size	Percent Passing
1"	100
¾"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

Alternate 2: Perforated Pipe, Gravel and Filter Fabric





Gravel material 9 feet^3/linear foot.
Perforated pipe: see alternate 1.
Gravel: Clean ¾" rock or approved substitute.
Filter Fabric: Mirafi 140 or approved substitute.

Note: Figures not to scale

EARTHWORK AND GRADING GUIDELINES
CANYON SUBDRAIN ALTERNATE DETAILS

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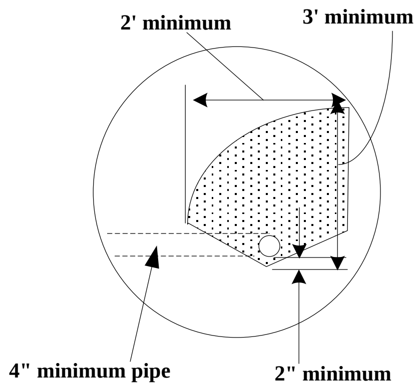
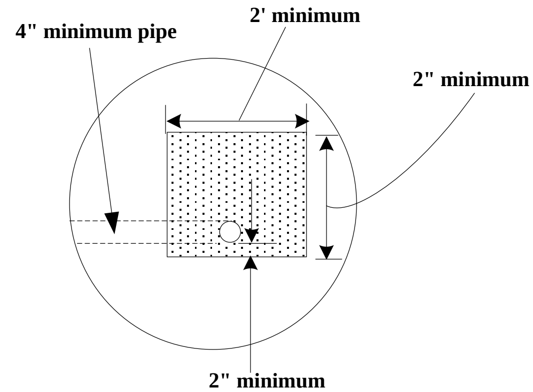
FIGURE N

TYPICAL STABILIZATION BUTTRESS SUBDRAIN DETAIL





Filter Material: Minimum of 5 ft^3/linear foot of pipe or 4 ft^3/linear foot of pipe when placed in square cut trench.

Alternative In Lieu Of Filter Material: Gravel may be encased in approved filter fabric. Filter fabric shall be mirafi 140 or equivalent. Filter fabric shall be lapped a minimum of 12" on all joints.

Minimum 4" Diameter Pipe: ABS-ASTM D-2751, SDR 35 or ASTM D-1527 schedule 40 PVC-ASTM D-3034, SDR 35 or ASTM D-1785 schedule 40 with a crushing strength of 1,000 pounds minimum, and a minimum of 8 uniformly spaced perforations per foot of pipe installed with perforations at bottom of pipe. Provide cap at upstream end of pipe. Slope at 2% to outlet pipe. Outlet pipe shall be connected to the subdrain pipe with tee or elbow.

Note: (1) Trench for outlet pipes shall be backfilled with onsite soil.

(2) Backdrains and lateral drains shall be located at the elevation of every bench drain. First drain shall be located at the elevation just above the lower lot grade. Additional drains may be required at the discretion of the soils engineer and/or engineering geologist.

Filter Material – Shall be of the following specification or an approved equivalent:

Filter Material

Sieve Size	Percent Passing
1"	100
¾"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

Gravel - Shall be of the following specification or an approved equivalent:

Filter Material

Sieve Size	Percent Passing
1½"	100
No. 4	50
No. 200	8

Sand equivalent: Minimum of 50

Note: Figures not to scale

EARTHWORK AND GRADING GUIDELINES

TYPICAL STABILIZATION BUTTRESS SUBDRAIN DETAIL

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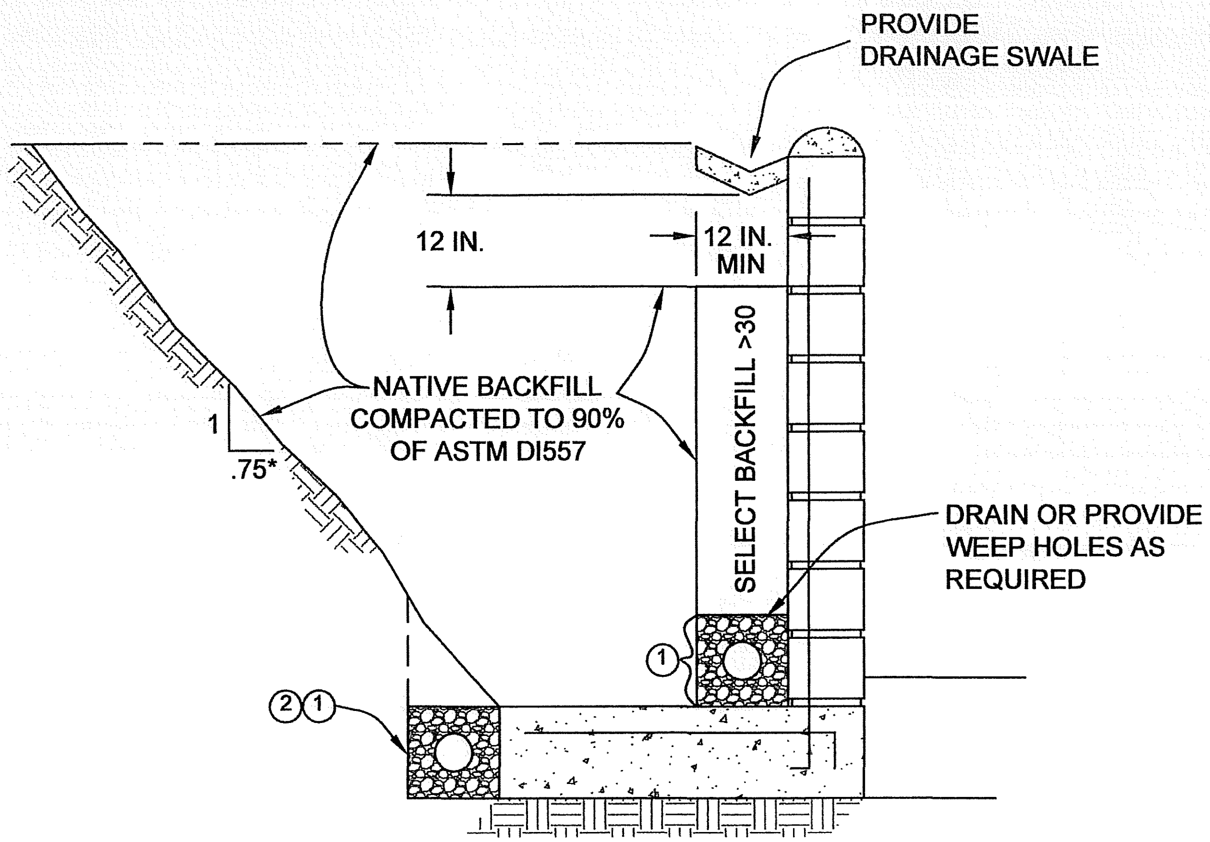
FIGURE O



* OR AS REQUIRED FOR SAFETY

NOTES

(1) 4-INCH PERFORATED PVC SCHEDULE 40 OR APPROVED ALTERNATE. PLACE PERFORATION DOWN AND SURROUND WITH A MINIMUM OF 1 CUBIC FOOT PER LINEAL FOOT (1 FT. /FT.) OF 3/4 INCH ROCK OR APPROVED ALTERNATE AND WRAPPED IN FILTER FABRIC.

(2) PLACE DRAIN AS SHOWN WHERE MOISTURE MIGRATION THROUGH THE WALL IS UNDESIRABLE.

NOTE: FIGURE NOT TO SCALE

EARTHWORK & GRADING GUIDELINES

TYPICAL RETAINING WALL BACKFILL

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FIGURE P

TECHNICAL MEMORANDUM:

SWMM Modeling for Hydromodification Compliance of:

1695 Saturn Boulevard

Prepared For:

Palm Avenue Realty Company

April 28, 2017

Prepared by:

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

REC Consultants
2442 Second Avenue
San Diego, CA 92101
Telephone: (619) 232-9200

R·E·C

TECHNICAL MEMORANDUM

TO: Palm Avenue Realty Company

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

DATE: April 7, 2017

RE: Summary of SWMM Modeling for Hydromodification Compliance for 1695 Saturn Boulevard, San Diego, CA.

INTRODUCTION

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

SWMM Model Development

The 1695 Saturn Boulevard project proposes the demolition of an existing single family residence and redevelopment of 18 residential lots with associated roadways, utilities, landscape and hardscape. Two (2) SWMM models were prepared for this study: the first for the pre-developed and the second for the post-developed conditions. The project site drains to one (1) Point of Compliance (POC), POC-1 is a drainage path located along the northwestern boundary of the project site. Note that there is an existing-offsite single family residential development that also drains to the POC.

The SWMM model was used since we have found it to be more comparable to San Diego area watersheds than the alternative San Diego Hydrology Model (SDHM) and also because it is a non-proprietary model approved by the HMP document. For both SWMM models, flow duration curves were prepared to determine if the proposed HMP facilities are sufficient to meet the current HMP requirements.

The inputs required to develop SWMM models include rainfall, watershed characteristics, and BMP configurations. The Lindbergh rain gauge was selected for the following reasons: a) It is near the project site and has similar elevation to the project, b) all the data from Lindbergh comes from Lindbergh (some rain gauges in surrounding area have data from other rainfall locations), c) the Lindbergh data has perfect precision on its data and d) none of the data from Lindbergh has been disaggregated or aggregated. Therefore, as the Lindbergh gauge is in a location representative of our project site and has perfect data, it was the gauge selected for this project.

In regards to evapotranspiration, per the California Irrigation Management Information System "Reference Evaporation Zones" (CIMIS ETo Zone Map), the project site is located within the Zone 1 Evapotranspiration Area. Thus evapotranspiration values for the site were modeled using Zone 1 average monthly values from Table G.1-1 from the City of San Diego 2016 BMP Design Manual. The site was modeled with Types C and D hydrologic soils as these are the existing soils determined from the NRCS Soil Survey.

As there is an existing residence located within the project boundary, soils located within the property boundary were assumed to be compact in existing conditions. In proposed conditions, soils within the project boundary were also assumed to be compact. Soils located in the offsite development were assumed to be compacted for both existing and proposed conditions. Other SWMM inputs for the subareas are discussed in the appendices to this document, where the selection of the parameters is explained in detail.

HMP MODELING

EXISTING CONDITIONS

In current existing conditions, runoff from both the project site and the aforementioned offsite area discharges to one (1) Point of Compliance (POC). POC-1 is a drainage path located along the northwestern boundary of the project site. The area tributary to POC-1 consists of single family residences and associated landscaping. Run off from the site is conveyed to POC-1 via sheet flow. See Table 1 below for a summary of the existing conditions area.

TABLE 1 – SUMMARY OF EXISTING CONDITIONS

DMA	Area (Ac)	Impervious Percentage, Ip (%)	POC
DMA 1C	3.057	0%(1)	1
DMA 1D	0.619	0%(1)	
OFFSITE-C	0.453	31.8%(2)	
Total	**4.129**	**--**	**--**

Notes: (1) Per the 2013 RWQCB permit, existing condition impervious surfaces within the project site can be accounted for so long as they remain undisturbed in proposed conditions. The SWMM model was run using 0.0% impervious for DMA-1.
(2) As this area is located outside the property boundary, existing condition impervious surfaces can be taken into account for in existing conditions analysis.

DEVELOPED CONDITIONS

Runoff from the proposed 18-lot residential development will drain to one (1) onsite receiving retention (infiltration) basin, BMP-1. Additionally, there are both landscape and driveway areas along the perimeter of the project boundary that bypass the basin and sheet flow directly to POC-1. Runoff from the aforementioned offsite development will also discharge to POC-1 as in existing conditions. Table 2 provides a summary of the developed condition areas.

It is assumed all storm water quality requirements for the project will be met by the retention basin BMP. However, detailed water quality requirements are not discussed within this technical memo. For further information in regards to storm water quality requirements for the project and drawdown calculations, please refer to the site specific Storm Water Quality Management Plan (SWQMP).

TABLE 2 – SUMMARY OF DEVELOPED CONDITIONS

DMA	Area (Ac)	Impervious Percentage, Ip (%)	POC
DMA-1-C(1)	2.922	50.2%	1
DMA-1-D	0.575	55.3%	
BYPASS-C	0.135	37.3%	
BYPASS-D	0.044	32.6%	
OFFSITE-C	0.453	31.8%	
Total	**4.129**	**--**	**--**

Notes: (1) Tributary area includes the area of the basin.

One (1) bioretention basin is located within the project site and is responsible for addressing hydromodification requirements for the project. In developed conditions, the basin will have a surface depth and a spillway structure (see dimensions in Table 3). Flows will then discharge from the basin via the outlet structure or infiltrate through the base of the facility to the receiving gravel layer and existing ground layer below. The spillway has sufficient capacity such that peak flows can be safely discharged to the receiving storm drain system.

Beneath the basin's invert lies a 12 inch gravel layer (pea gravel) to act as a trash and coarse dirt barrier. The BMP will be unlined to allow for infiltration into the underlying soil, per the geotechnical investigation (see Attachment 8). It should be noted that detailed outlet structure location and elevations will be shown on the construction plans based on the recommendations of this study.

BMP MODELING FOR HMP PURPOSES

Modeling of dual purpose Water Quality/HMP BMPs

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

TABLE 3 – SUMMARY OF DEVELOPED DUAL PURPOSE BMP

BMP	Tributary Area (Ac)	DIMENSIONS				
		BMP Area(1), (ft^2)	Gravel Depth (in)	Depth Riser Invert (ft)(2)	Weir Perimeter Length(3) (ft)	Total Surface Depth(4) (ft)
BMP-1	3.497	4,297	12”	3.0’	7.0’	0.5’

Notes:
(1): Area of BMP = Area of Bottom=Area of Gravel
(2): Depth of ponding beneath riser structure's first surface spillway to bottom of gravel layer.
(3): Internal perimeter of riser
(4): Total surface depth of BMP is from top crest elevation to bottom of first surface invert

TABLE 4 – SUMMARY OF SPILLWAY DETAILS

BMP	SLOT		
	Width (ft.)	Height (ft.)	Elevation(1) (ft.)
BMP-1	7.00	0.25	3.00

Notes: (1): Basin ground surface elevation at bottom of gravel layer assumed to be 0.00 ft. elevation.

FLOW DURATION CURVE COMPARISON

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

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

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals; the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period "i" were obtained (Q_i with i=3 to 9). For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate. FDC comparison at the POCs was illustrated in Figures 1 and 2in both normal and logarithmic scale.

As can be seen in Figures 1 & 2, the FDC for the proposed conditions with the HMP BMPs is within 110% of the curve for the existing condition in both peak flows and durations. The additional runoff volume generated from developing the site will be released to the existing point of discharge at a flow rate below the 10% Q_2 lower threshold for POC-1 and POC-2. Additionally, the project will also not increase peak flow rates between the Q_2 and the Q_{10}, as shown in the peak flow tables in Attachment 1.

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

Typically the Manning's coefficient is selected as n = 0.10 for pervious areas and n = 0.012 for impervious areas. However, due to the impact that n has in the continuous simulation a more accurate value of the Manning's coefficient has been chosen for pervious areas. Taken into consideration the study prepared by TRWE (Reference [6]) a value of n = 0.05 has been selected (see Table 1 of Reference [6] included in Attachment 7). An average n value between average grass plus pasture (0.04) and dense grass (0.06) has been selected per the reference cited, for light rain (<0.8 in/hr) as more than 99% of the rainfall has been measured with this intensity.

SUMMARY

This study has demonstrated that the proposed HMP retention BMP provided for the 1695 Saturn Boulevard site is sufficient to meet the current HMP criteria for the one (1) Point of Compliance (POC), if the cross-section areas and volumes recommended within this technical memorandum, and the respective orifices and outlet structures are incorporated as specified within the proposed project site.

KEY ASSUMPTIONS

1. Type C & D Soils are representative of the existing condition site.
2. Infiltration/retention basins will be unlined to allow underlying soil infiltration per the geotechnical investigation and percolation tests. See Attachment 8.

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. Flow Duration Curve Analysis
3. List of the "n" largest Peaks: Pre-Development and Post-Development Conditions
4. Area vs Elevation & Discharge Vs Elevation
5. Pre & Post Development Maps, Project Plan and Section Sketches
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. EPA SWMM Figures and Explanations
8. Soil Maps & Geotechnical Investigation
9. Summary files from the SWMM Model

REFERENCES

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

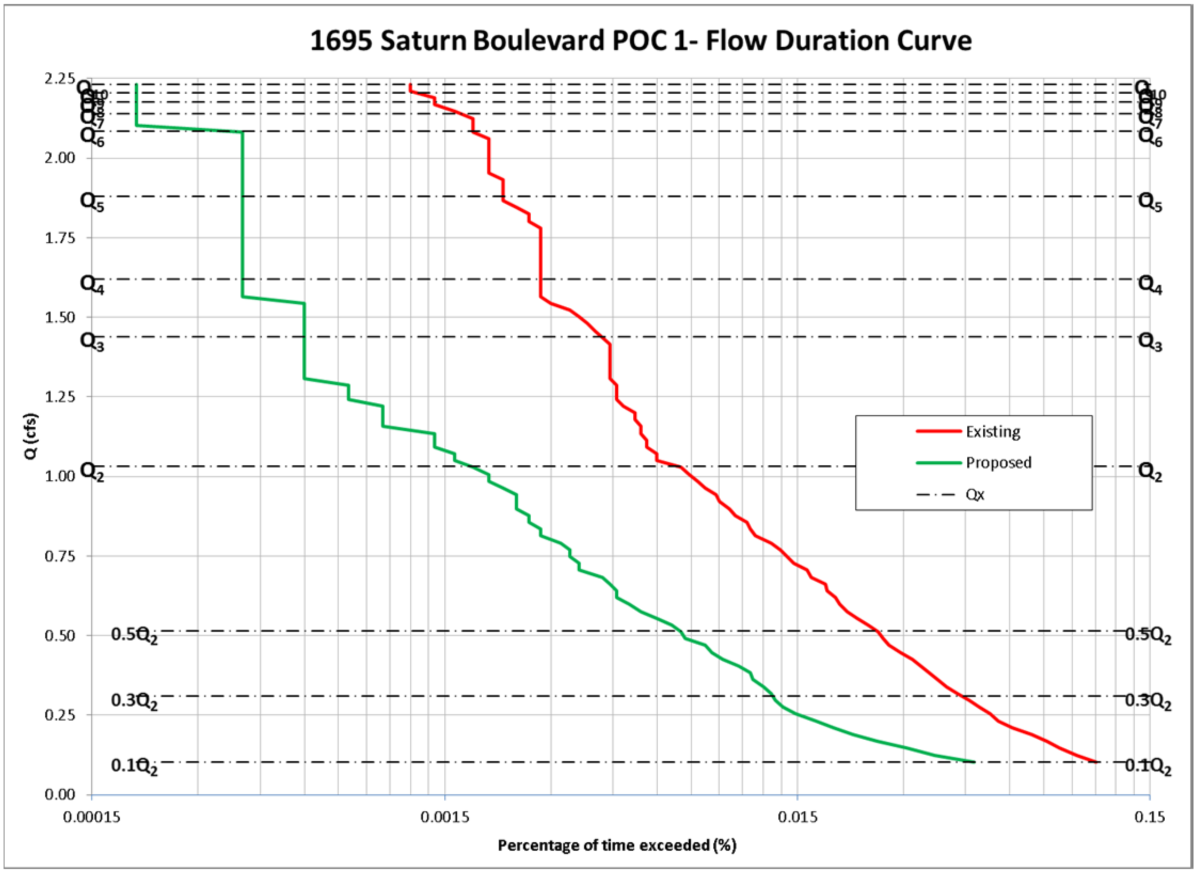
[2] – *"Final Hydromodification Management Plan (HMP) prepared for the County of San Diego",* March 2011, Brown and Caldwell.

[3] - Order R9-2013-001, California Regional Water Quality Control Board San Diego Region (SDRWQCB).

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

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

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



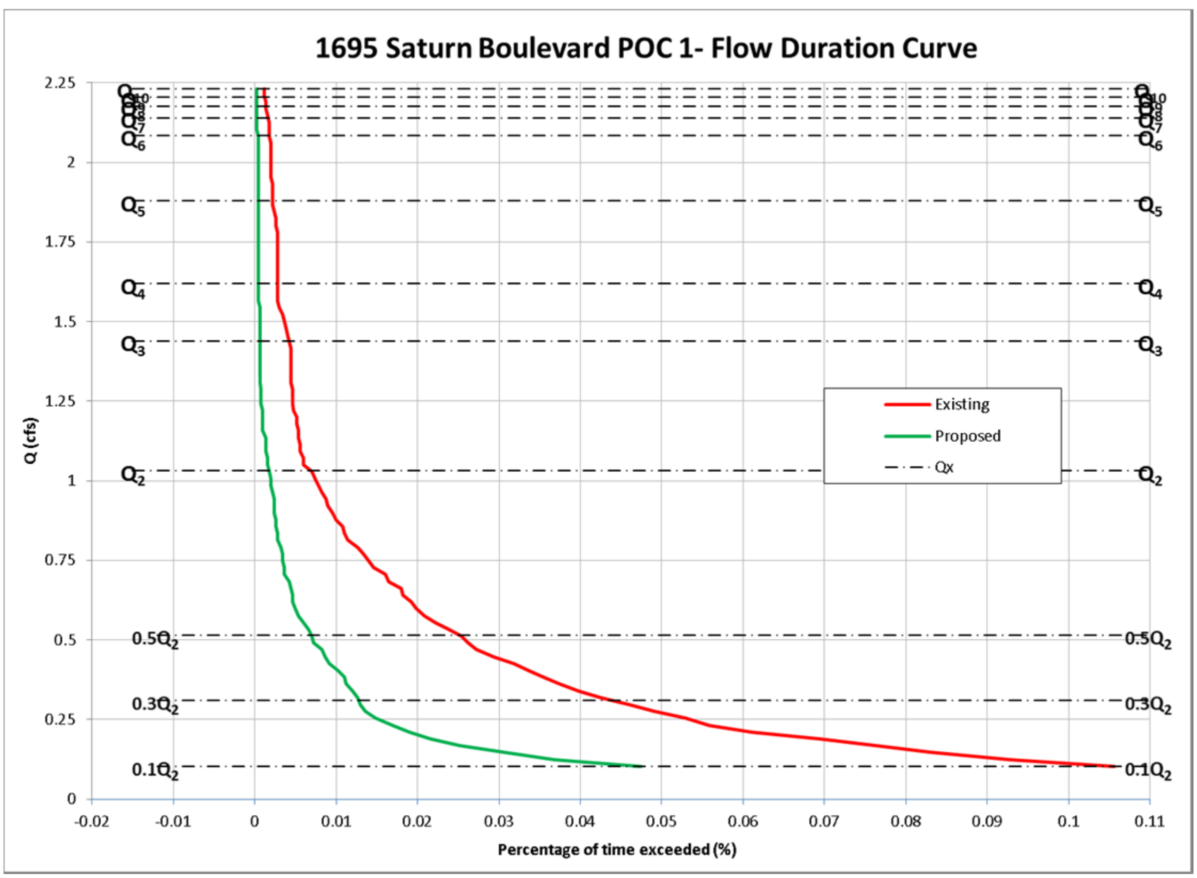


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal "x" scale)

ATTACHMENT 1

Q_2 to Q_{10} Peak Flow Frequency Comparison Table – POC 1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
2-year	1.031	0.380	0.651
3-year	1.439	0.552	0.887
4-year	1.618	0.693	0.925
5-year	1.879	0.800	1.079
6-year	2.084	0.852	1.232
7-year	2.140	0.944	1.196
8-year	2.176	1.066	1.110
9-year	2.204	1.142	1.062
10-year	2.232	1.150	1.082

ATTACHMENT 2

FLOW DURATION CURVE ANALYSIS

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

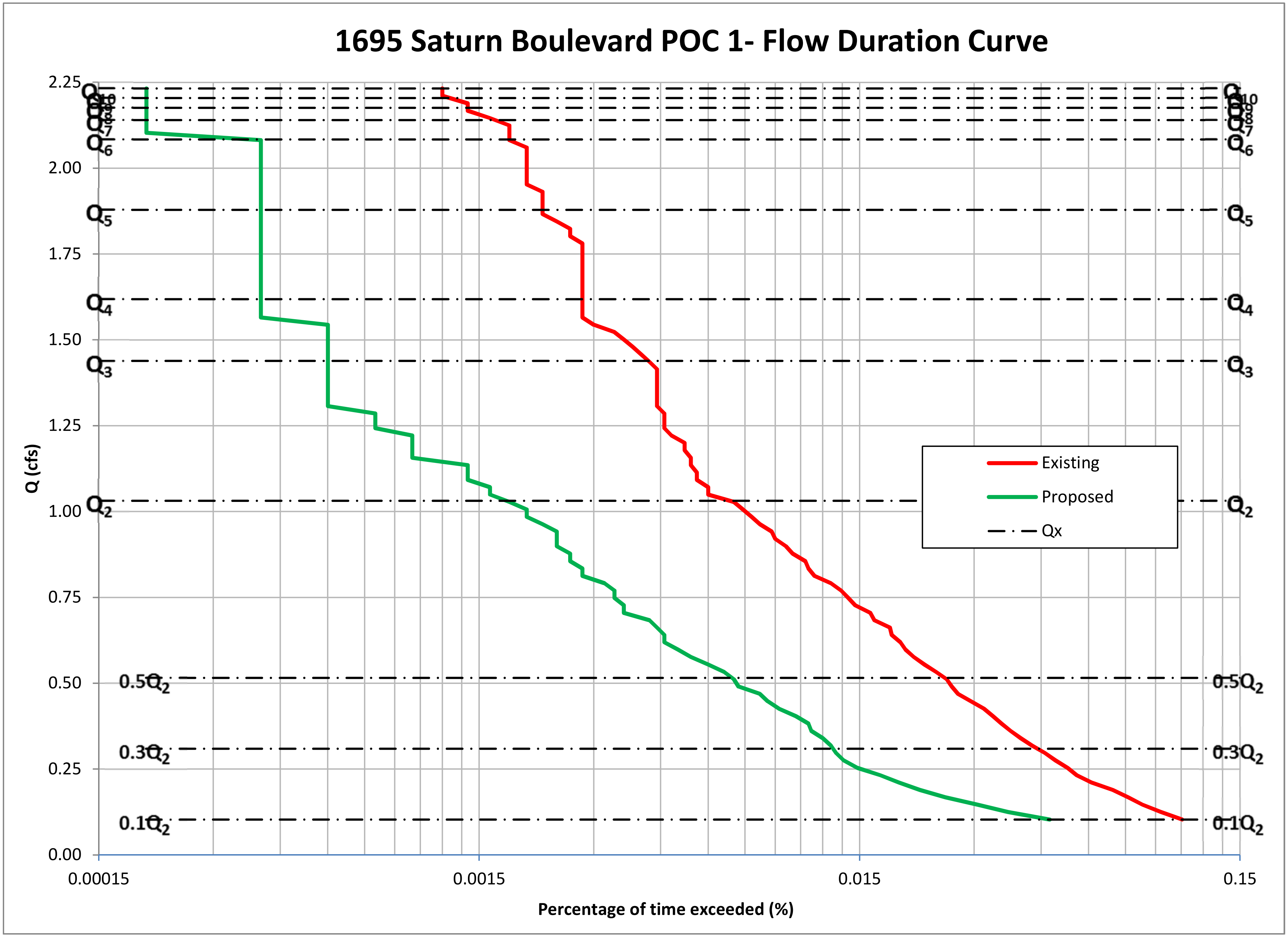
The figures on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration table following the curve shows that if the interval $0.10Q_2 – Q_{10}$ is divided in 100 sub-intervals, then the post development divided by pre-development durations is never larger than 110% (the permit allows up to 110%).

Consequently, the design passes the hydromodification test.

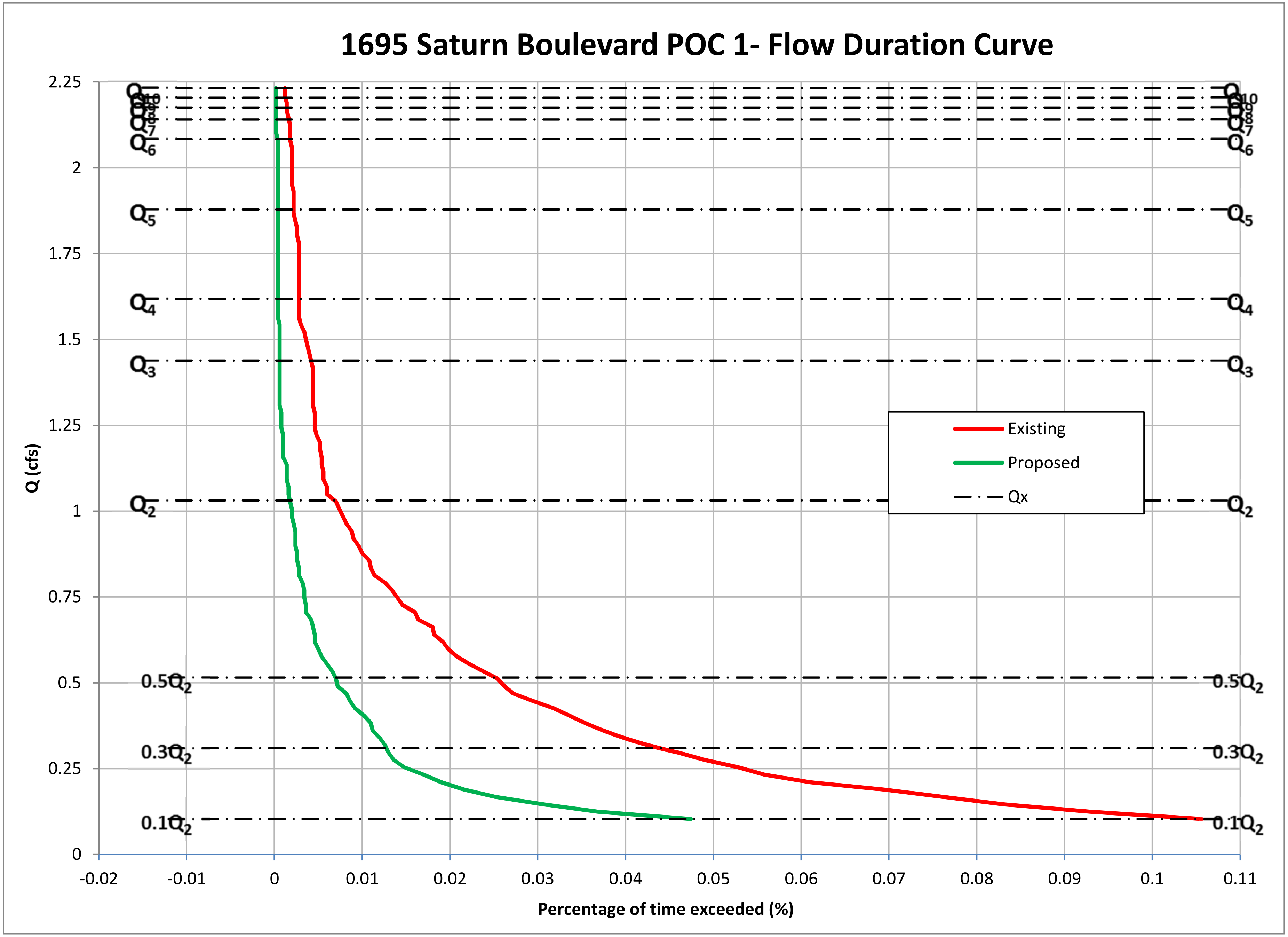
It is important to note that the flow duration curve can be expressed in the “x” axis as percentage of time, hours per year, total number of hours, or any other similar time variable. As those variables only differ by a multiplying constant, their plot in logarithmic scale is going to look exactly the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

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

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



1695 Saturn Boulevard POC 1- Flow Duration Curve
Q (cfs)
Percentage of time exceeded (%)
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
0.00015
0.0015
0.015
0.15
Q10
Q9
Q8
Q7
Q6
Q5
Q4
Q3
Q2
0.5Q2
0.3Q2
0.1Q2
Existing
Proposed
Qx



1695 Saturn Boulevard POC 1- Flow Duration Curve
Q (cfs)
Percentage of time exceeded (%)
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
-0.02
-0.01
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
0.11
Q10
Q9
Q8
Q7
Q6
Q5
Q4
Q3
Q2
0.5Q2
0.3Q2
0.1Q2
Existing
Proposed
Qx

Flow Duration Curve Data for 1695 Saturn Boulevard, City of San Diego CA

Q2 =	1.03	cfs	Fraction	10 %
Q10 =	2.23	cfs		
Step =	0.0215	cfs		
Count =	499679	hours		
	57.00	years		

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
1	0.103	528	1.06E-01	237	4.74E-02	45%	Pass
2	0.125	464	9.29E-02	184	3.68E-02	40%	Pass
3	0.146	415	8.31E-02	153	3.06E-02	37%	Pass
4	0.168	381	7.62E-02	126	2.52E-02	33%	Pass
5	0.189	347	6.94E-02	108	2.16E-02	31%	Pass
6	0.211	305	6.10E-02	95	1.90E-02	31%	Pass
7	0.232	279	5.58E-02	85	1.70E-02	30%	Pass
8	0.254	264	5.28E-02	74	1.48E-02	28%	Pass
9	0.275	245	4.90E-02	68	1.36E-02	28%	Pass
10	0.297	230	4.60E-02	65	1.30E-02	28%	Pass
11	0.318	213	4.26E-02	63	1.26E-02	30%	Pass
12	0.340	199	3.98E-02	60	1.20E-02	30%	Pass
13	0.361	187	3.74E-02	56	1.12E-02	30%	Pass
14	0.383	177	3.54E-02	55	1.10E-02	31%	Pass
15	0.404	168	3.36E-02	51	1.02E-02	30%	Pass
16	0.426	159	3.18E-02	46	9.21E-03	29%	Pass
17	0.447	147	2.94E-02	43	8.61E-03	29%	Pass
18	0.469	136	2.72E-02	41	8.21E-03	30%	Pass
19	0.490	131	2.62E-02	36	7.20E-03	27%	Pass
20	0.512	127	2.54E-02	35	7.00E-03	28%	Pass
21	0.533	119	2.38E-02	33	6.60E-03	28%	Pass
22	0.555	111	2.22E-02	30	6.00E-03	27%	Pass
23	0.576	104	2.08E-02	27	5.40E-03	26%	Pass
24	0.598	99	1.98E-02	25	5.00E-03	25%	Pass
25	0.619	96	1.92E-02	23	4.60E-03	24%	Pass
26	0.641	91	1.82E-02	23	4.60E-03	25%	Pass
27	0.662	90	1.80E-02	22	4.40E-03	24%	Pass
28	0.684	82	1.64E-02	21	4.20E-03	26%	Pass
29	0.705	80	1.60E-02	18	3.60E-03	23%	Pass
30	0.727	73	1.46E-02	18	3.60E-03	25%	Pass
31	0.748	70	1.40E-02	17	3.40E-03	24%	Pass
32	0.770	67	1.34E-02	17	3.40E-03	25%	Pass
33	0.791	63	1.26E-02	16	3.20E-03	25%	Pass
34	0.813	57	1.14E-02	14	2.80E-03	25%	Pass
35	0.834	55	1.10E-02	14	2.80E-03	25%	Pass
36	0.856	54	1.08E-02	13	2.60E-03	24%	Pass
37	0.877	50	1.00E-02	13	2.60E-03	26%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
38	0.899	48	9.61E-03	12	2.40E-03	25%	Pass
39	0.920	45	9.01E-03	12	2.40E-03	27%	Pass
40	0.942	44	8.81E-03	12	2.40E-03	27%	Pass
41	0.963	41	8.21E-03	11	2.20E-03	27%	Pass
42	0.985	39	7.81E-03	10	2.00E-03	26%	Pass
43	1.006	37	7.40E-03	10	2.00E-03	27%	Pass
44	1.028	35	7.00E-03	9	1.80E-03	26%	Pass
45	1.049	30	6.00E-03	8	1.60E-03	27%	Pass
46	1.071	30	6.00E-03	8	1.60E-03	27%	Pass
47	1.092	28	5.60E-03	7	1.40E-03	25%	Pass
48	1.114	28	5.60E-03	7	1.40E-03	25%	Pass
49	1.135	27	5.40E-03	7	1.40E-03	26%	Pass
50	1.157	27	5.40E-03	5	1.00E-03	19%	Pass
51	1.178	26	5.20E-03	5	1.00E-03	19%	Pass
52	1.200	26	5.20E-03	5	1.00E-03	19%	Pass
53	1.221	24	4.80E-03	5	1.00E-03	21%	Pass
54	1.243	23	4.60E-03	4	8.01E-04	17%	Pass
55	1.264	23	4.60E-03	4	8.01E-04	17%	Pass
56	1.286	23	4.60E-03	4	8.01E-04	17%	Pass
57	1.307	22	4.40E-03	3	6.00E-04	14%	Pass
58	1.329	22	4.40E-03	3	6.00E-04	14%	Pass
59	1.350	22	4.40E-03	3	6.00E-04	14%	Pass
60	1.372	22	4.40E-03	3	6.00E-04	14%	Pass
61	1.393	22	4.40E-03	3	6.00E-04	14%	Pass
62	1.415	22	4.40E-03	3	6.00E-04	14%	Pass
63	1.436	21	4.20E-03	3	6.00E-04	14%	Pass
64	1.458	20	4.00E-03	3	6.00E-04	15%	Pass
65	1.479	19	3.80E-03	3	6.00E-04	16%	Pass
66	1.501	18	3.60E-03	3	6.00E-04	17%	Pass
67	1.522	17	3.40E-03	3	6.00E-04	18%	Pass
68	1.544	15	3.00E-03	3	6.00E-04	20%	Pass
69	1.565	14	2.80E-03	2	4.00E-04	14%	Pass
70	1.587	14	2.80E-03	2	4.00E-04	14%	Pass
71	1.608	14	2.80E-03	2	4.00E-04	14%	Pass
72	1.630	14	2.80E-03	2	4.00E-04	14%	Pass
73	1.651	14	2.80E-03	2	4.00E-04	14%	Pass
74	1.673	14	2.80E-03	2	4.00E-04	14%	Pass
75	1.694	14	2.80E-03	2	4.00E-04	14%	Pass
76	1.716	14	2.80E-03	2	4.00E-04	14%	Pass
77	1.737	14	2.80E-03	2	4.00E-04	14%	Pass
78	1.759	14	2.80E-03	2	4.00E-04	14%	Pass
79	1.780	14	2.80E-03	2	4.00E-04	14%	Pass
80	1.802	13	2.60E-03	2	4.00E-04	15%	Pass
81	1.823	13	2.60E-03	2	4.00E-04	15%	Pass
82	1.845	12	2.40E-03	2	4.00E-04	17%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
83	1.866	11	2.20E-03	2	4.00E-04	18%	Pass
84	1.888	11	2.20E-03	2	4.00E-04	18%	Pass
85	1.909	11	2.20E-03	2	4.00E-04	18%	Pass
86	1.931	11	2.20E-03	2	4.00E-04	18%	Pass
87	1.952	10	2.00E-03	2	4.00E-04	20%	Pass
88	1.974	10	2.00E-03	2	4.00E-04	20%	Pass
89	1.995	10	2.00E-03	2	4.00E-04	20%	Pass
90	2.017	10	2.00E-03	2	4.00E-04	20%	Pass
91	2.039	10	2.00E-03	2	4.00E-04	20%	Pass
92	2.060	10	2.00E-03	2	4.00E-04	20%	Pass
93	2.082	9	1.80E-03	2	4.00E-04	22%	Pass
94	2.103	9	1.80E-03	1	2.00E-04	11%	Pass
95	2.125	9	1.80E-03	1	2.00E-04	11%	Pass
96	2.146	8	1.60E-03	1	2.00E-04	13%	Pass
97	2.168	7	1.40E-03	1	2.00E-04	14%	Pass
98	2.189	7	1.40E-03	1	2.00E-04	14%	Pass
99	2.211	6	1.20E-03	1	2.00E-04	17%	Pass
100	2.232	6	1.20E-03	1	2.00E-04	17%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period (years)	Pre-dev. Q (cfs)	Post-Dev. Q (cfs)	Reduction (cfs)
10	2.232	1.150	1.082
9	2.204	1.142	1.062
8	2.176	1.066	1.110
7	2.140	0.944	1.196
6	2.084	0.852	1.232
5	1.879	0.800	1.079
4	1.618	0.693	0.925
3	1.439	0.552	0.887
2	1.031	0.380	0.651

ATTACHMENT 3

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

Basic Probabilistic Equation:

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

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

Cunnane Equation:

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

Weibull Equation:

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

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

n: Number of years analyzed.

Explanation of Variables for the Tables in this Attachment

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

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

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

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

List of Peak events and Determination of Q2 and Q10 (Pre-Development)
1695 Saturn Boulevard. - POC 1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**2.23**	**2.24**
9	**2.20**	**2.22**
8	**2.18**	**2.19**
7	**2.14**	**2.15**
6	**2.08**	**2.09**
5	**1.88**	**1.90**
4	**1.62**	**1.67**
3	**1.44**	**1.44**
2	**1.03**	**1.03**

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

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
0.707	3/12/1978	57	1.02	1.01
0.711	4/22/1988	56	1.04	1.03
0.717	3/11/1995	55	1.05	1.05
0.718	10/10/1986	54	1.07	1.07
0.723	1/29/1983	53	1.09	1.09
0.741	1/16/1978	52	1.12	1.11
0.745	3/16/1958	51	1.14	1.13
0.758	2/23/2000	50	1.16	1.15
0.767	1/12/1993	49	1.18	1.18
0.772	3/2/1983	48	1.21	1.20
0.775	3/22/1954	47	1.23	1.23
0.792	1/13/1993	46	1.26	1.25
0.799	1/18/1993	45	1.29	1.28
0.801	2/14/2003	44	1.32	1.31
0.803	1/14/1978	43	1.35	1.34
0.817	12/5/1966	42	1.38	1.38
0.844	2/8/1998	41	1.41	1.41
0.864	2/19/1993	40	1.45	1.44
0.869	11/16/1965	39	1.49	1.48
0.886	2/6/1950	38	1.53	1.52
0.902	3/6/1975	37	1.57	1.56
0.918	2/3/1958	36	1.61	1.61
0.943	12/21/2002	35	1.66	1.65
0.956	2/17/1998	34	1.71	1.70
0.971	2/8/1976	33	1.76	1.75
0.975	3/1/1983	32	1.81	1.81
0.997	3/17/1982	31	1.87	1.87
1.01	2/14/1995	30	1.93	1.93
1.031	1/6/1979	29	2.00	2.00
1.033	2/12/2003	28	2.07	2.07
1.035	3/24/1983	27	2.15	2.15
1.037	1/15/1993	26	2.23	2.23
1.078	12/31/1976	25	2.32	2.33
1.133	4/21/1988	24	2.42	2.42
1.168	1/4/1995	23	2.52	2.53
1.216	1/18/1952	22	2.64	2.65
1.226	1/14/1969	21	2.76	2.78
1.432	2/21/2005	20	2.90	2.92
1.445	11/5/1987	19	3.05	3.08
1.483	3/1/1981	18	3.22	3.25
1.509	3/8/1968	17	3.41	3.45
1.528	12/4/1974	16	3.63	3.67
1.546	3/16/1986	15	3.87	3.92
1.8	1/12/1960	14	4.14	4.21
1.83	2/28/1970	13	4.46	4.54
1.866	1/10/1978	12	4.83	4.93
1.951	2/24/1998	11	5.27	5.40
2.081	1/25/1995	10	5.80	5.96
2.126	1/31/1979	9	6.44	6.65
2.162	11/16/1972	8	7.25	7.53
2.195	10/27/2004	7	8.29	8.67
2.238	1/10/1955	6	9.67	10.21
2.241	11/21/1967	5	11.60	12.43
2.429	12/29/2004	4	14.50	15.89
2.55	3/7/1952	3	19.33	22.00
2.797	2/20/1980	2	29.00	35.75
4.476	12/10/1965	1	58.00	95.33

List of Peak events and Determination of Q2 and Q10 (Post-Development)
1695 Saturn Boulevard. - POC 1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**1.15**	**1.17**
9	**1.14**	**1.15**
8	**1.07**	**1.10**
7	**0.94**	**0.98**
6	**0.85**	**0.86**
5	**0.80**	**0.80**
4	**0.69**	**0.69**
3	**0.55**	**0.56**
2	**0.38**	**0.38**

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

Peaks (cfs)	Date	Posit	Period of Return (Years)	
			Weibull	Cunnane
0.187	12/5/1966	57	1.02	1.01
0.188	11/16/1965	56	1.04	1.03
0.194	2/23/2000	55	1.05	1.05
0.201	1/12/1993	54	1.07	1.07
0.201	12/21/2002	53	1.09	1.09
0.202	3/11/1995	52	1.12	1.11
0.202	2/17/1998	51	1.14	1.13
0.206	12/28/2004	50	1.16	1.15
0.208	11/17/1986	49	1.18	1.18
0.213	11/23/1965	48	1.21	1.20
0.221	2/6/1950	47	1.23	1.23
0.23	3/24/1983	46	1.26	1.25
0.231	2/12/2003	45	1.29	1.28
0.233	2/3/1958	44	1.32	1.31
0.234	1/6/1979	43	1.35	1.34
0.236	1/14/1969	42	1.38	1.38
0.239	3/1/1983	41	1.41	1.41
0.247	3/6/1975	40	1.45	1.44
0.249	2/14/1995	39	1.49	1.48
0.266	12/31/1976	38	1.53	1.52
0.274	12/6/1966	37	1.57	1.56
0.278	3/1/1981	36	1.61	1.61
0.328	11/5/1987	35	1.66	1.65
0.333	3/16/1986	34	1.71	1.70
0.338	1/12/1960	33	1.76	1.75
0.34	12/4/1974	32	1.81	1.81
0.346	3/8/1968	31	1.87	1.87
0.359	3/17/1982	30	1.93	1.93
0.38	1/10/1978	29	2.00	2.00
0.397	1/10/1955	28	2.07	2.07
0.408	2/24/1998	27	2.15	2.15
0.413	2/28/1970	26	2.23	2.23
0.432	1/18/1952	25	2.32	2.33
0.444	11/16/1972	24	2.42	2.42
0.445	2/23/2005	23	2.52	2.53
0.448	11/21/1967	22	2.64	2.65
0.47	2/10/1976	21	2.76	2.78
0.535	1/16/1993	20	2.90	2.92
0.567	1/16/1978	19	3.05	3.08
0.592	3/1/1991	18	3.22	3.25
0.606	1/18/1993	17	3.41	3.45
0.676	12/29/2004	16	3.63	3.67
0.691	4/21/1988	15	3.87	3.92
0.699	1/14/1978	14	4.14	4.21
0.779	4/22/1988	13	4.46	4.54
0.798	10/27/2004	12	4.83	4.93
0.809	2/14/2003	11	5.27	5.40
0.849	2/8/1976	10	5.80	5.96
0.898	3/2/1983	9	6.44	6.65
1.014	2/20/1980	8	7.25	7.53
1.139	1/15/1993	7	8.29	8.67
1.152	3/7/1952	6	9.67	10.21
1.24	1/31/1979	5	11.60	12.43
1.306	1/4/1995	4	14.50	15.89
1.561	2/21/2005	3	19.33	22.00
2.103	1/25/1995	2	29.00	35.75
4.27	12/10/1965	1	58.00	95.33

ATTACHMENT 4

AREA VS ELEVATION

Volume provided above the first surface outlet is accounted for in the basin module within SWMM. A stage-storage relationship is provided within this Module, a copy of which is located on the following pages.

DISCHARGE VS ELEVATION

A stage-discharge relationship is provided on the following pages for the surface outlet structure. Please refer to Attachment 7 for further information.

DRAWDOWN CALCULATIONS

BMP specific drawdown calculations are provided in the project specific SWQMP. Please refer to this aforementioned document for further information.

Stage-Storage for BMP 1

Elevation (ft)			Area(sq-ft)	Volume (ac-ft)	
Actual(in)	Actual(ft)	Model (ft)			
0.00	0.00	0.00	4297	0.0000	
12.00	1.00	0.40	4297	0.0395	**TOP OF GRAVEL[(1)](0.4 voids)**
13.00	1.08	0.48	4367	0.0477	
14.00	1.17	0.57	4438	0.0562	
15.00	1.25	0.65	4510	0.0647	
16.00	1.33	0.73	4581	0.0734	
17.00	1.42	0.82	4653	0.0823	
18.00	1.50	0.90	4726	0.0912	
19.00	1.58	0.98	4799	0.1003	
20.00	1.67	1.07	4872	0.1096	
21.00	1.75	1.15	4946	0.1190	
22.00	1.83	1.23	5020	0.1285	
23.00	1.92	1.32	5095	0.1382	
24.00	2.00	1.40	5170	0.1480	
25.00	2.08	1.48	5245	0.1580	
26.00	2.17	1.57	5321	0.1681	
27.00	2.25	1.65	5397	0.1783	
28.00	2.33	1.73	5473	0.1887	
29.00	2.42	1.82	5550	0.1993	
30.00	2.50	1.90	5628	0.2100	
31.00	2.58	1.98	5705	0.2208	
32.00	2.67	2.07	5783	0.2318	
33.00	2.75	2.15	5862	0.2429	
34.00	2.83	2.23	5941	0.2542	
35.00	2.92	2.32	6020	0.2657	
36.00	3.00	2.40	6100	0.2773	**EMERGENCY WEIR[(2)]**
37.00	3.08	2.48	6180	0.2890	
38.00	3.17	2.57	6261	0.3009	
39.00	3.25	2.65	6342	0.3130	
40.00	3.33	2.73	6423	0.3252	
41.00	3.42	2.82	6505	0.3375	
42.00	3.50	2.90	6587	0.3501	**BASIN CREST**

NOTES:

(1): All elevations measured from bottom of gravel layer. These are model elevations, not actual elevations. As such, 1.00-ft of gravel is represented as 0.4-ft due to the 0.4 porosity.

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

Outlet structure for Discharge of BMP 1

Discharge vs Elevation Table

Low orifice	0.625 "	Lower slot		Lower Weir			
Number of orif:	0	Number of slots:	1	Number of weirs:	0		
Cg-low:	0.61	Invert:	2.40 ft	Invert:	0.000 ft		
		B	7.00 ft	B:	0.000 ft		
Middle orifice	1.000 "	hslot	0.250 ft				
Number of orif:	0.000						
Cg-middle:	0.61	Upper slot		Upper Weir		Emergency weir	
invert elev:	0 ft	Number of slots:	0	Number of weirs:	0	Invert:	0.000 ft
		Invert:	0.00 ft	Invert:	0.000 ft	W:	0.00 ft
		B:	0.00 ft	B:	0.00 ft		
		hslot	0.000 ft				

Note: All elevations measured from bottom of gravel layer. These are model elevations, not actual elevations. As such, 1.00-ft of gravel is represented as 0.4-ft due to the 0.4 porosity.

*Note: h = head above the invert of the lowest surface discharge opening.

h* (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qlweir (cfs)	Quweir (cfs)	Qemerg (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.400	46.080	28.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.483	47.680	29.800	0.000	0.000	0.000	0.000	0.000	0.000	0.522	0.000	0.000	0.000	0.000	0.522
2.567	49.280	30.800	0.000	0.000	0.000	0.000	0.000	0.000	1.476	0.000	0.000	0.000	0.000	1.476
2.650	50.880	31.800	0.000	0.000	0.000	0.000	0.000	0.000	2.713	0.000	0.000	0.000	0.000	2.713
2.733	52.480	32.800	0.000	0.000	0.000	0.000	0.000	0.000	3.910	0.000	0.000	0.000	0.000	3.910
2.817	54.080	33.800	0.000	0.000	0.000	0.000	0.000	0.000	4.627	0.000	0.000	0.000	0.000	4.627
2.900	55.680	34.800	0.000	0.000	0.000	0.000	0.000	0.000	5.246	0.000	0.000	0.000	0.000	5.246

DISCHARGE EQUATIONS

1) Weir:

$$Q_W = C_W \cdot L \cdot H^{3/2} \quad (1)$$

2) Slot:

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

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

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

3) Vertical Orifices

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

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

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

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

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

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

The following are the variables used above:

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

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

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

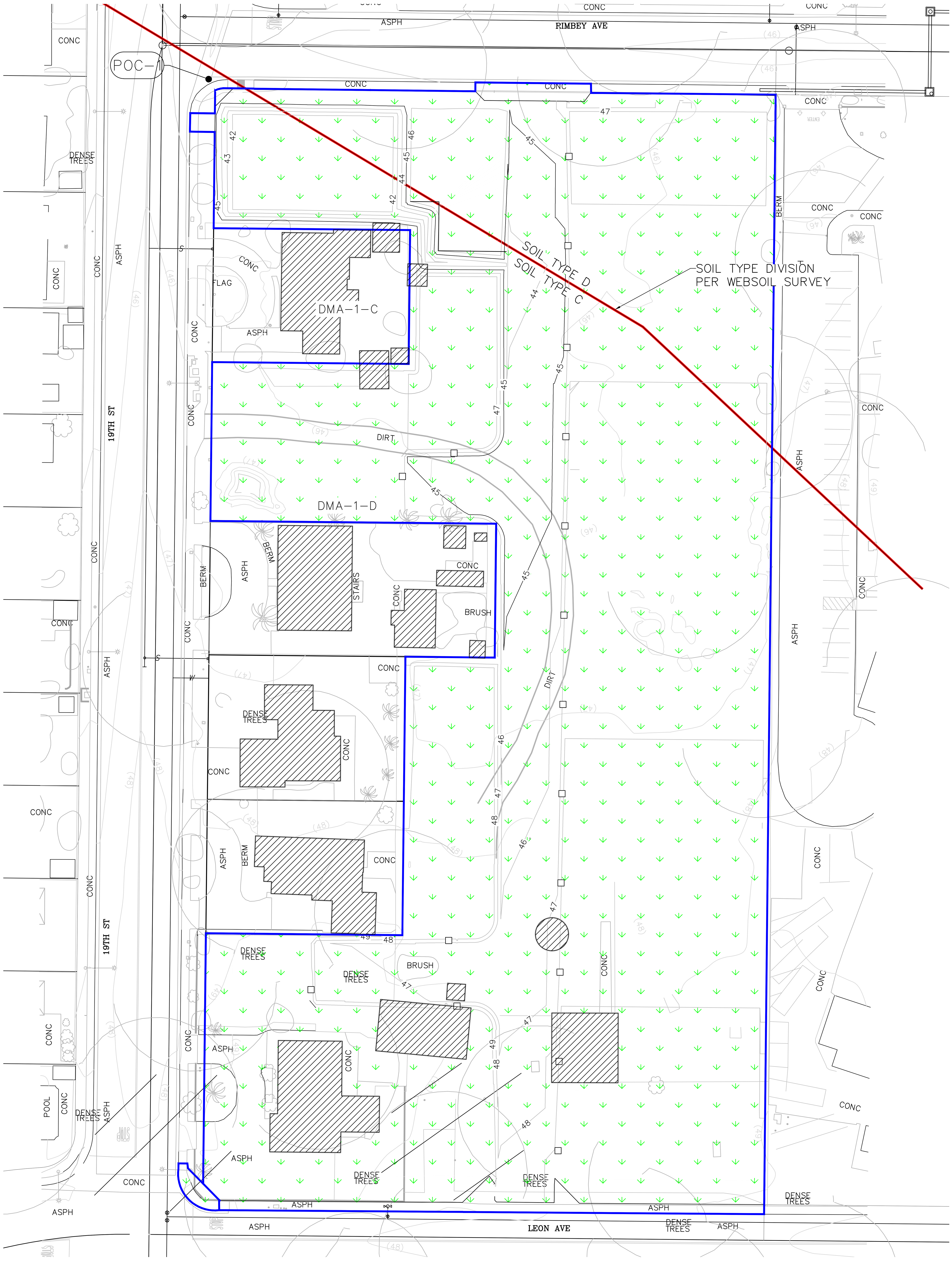
H: Level of water in the pond over the invert of slot, weir or orifice (ft)

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

ATTACHMENT 5

Pre & Post-Developed Maps, Project Plan and Detention

Section Sketches



LEGEND

PROPERTY BOUNDARY

PERVIOUS AREA

EXISTING STRUCTURES

SOIL BOUNDARY

DMA	SOIL TYPE	PERVIOUS AREA (sq-ft)	PERVIOUS AREA (acres)	IMPERVIOUS AREA (sq-ft)	IMPERVIOUS AREA (acres)	TOTAL AREA (sq-ft)	TOTAL AREA (acres)
1-C	C	26808	0.62	0	0.00	26808	0.62
1-D	D	126928	2.91	6444	0.15	133372	3.06
TOTAL	-	153736	3.53	6444	0.15	160180	3.68

SCALE: 1" = 30'

SHEET 1 OF 3 SHEETS

SHEET TITLE
HMP - EXISTING CONDITIONS

PROJECT
SATURN BLVD RESIDENTIAL DEVELOPMENT
1695 SATURN BOULEVARD
SAN DIEGO, CALIFORNIA

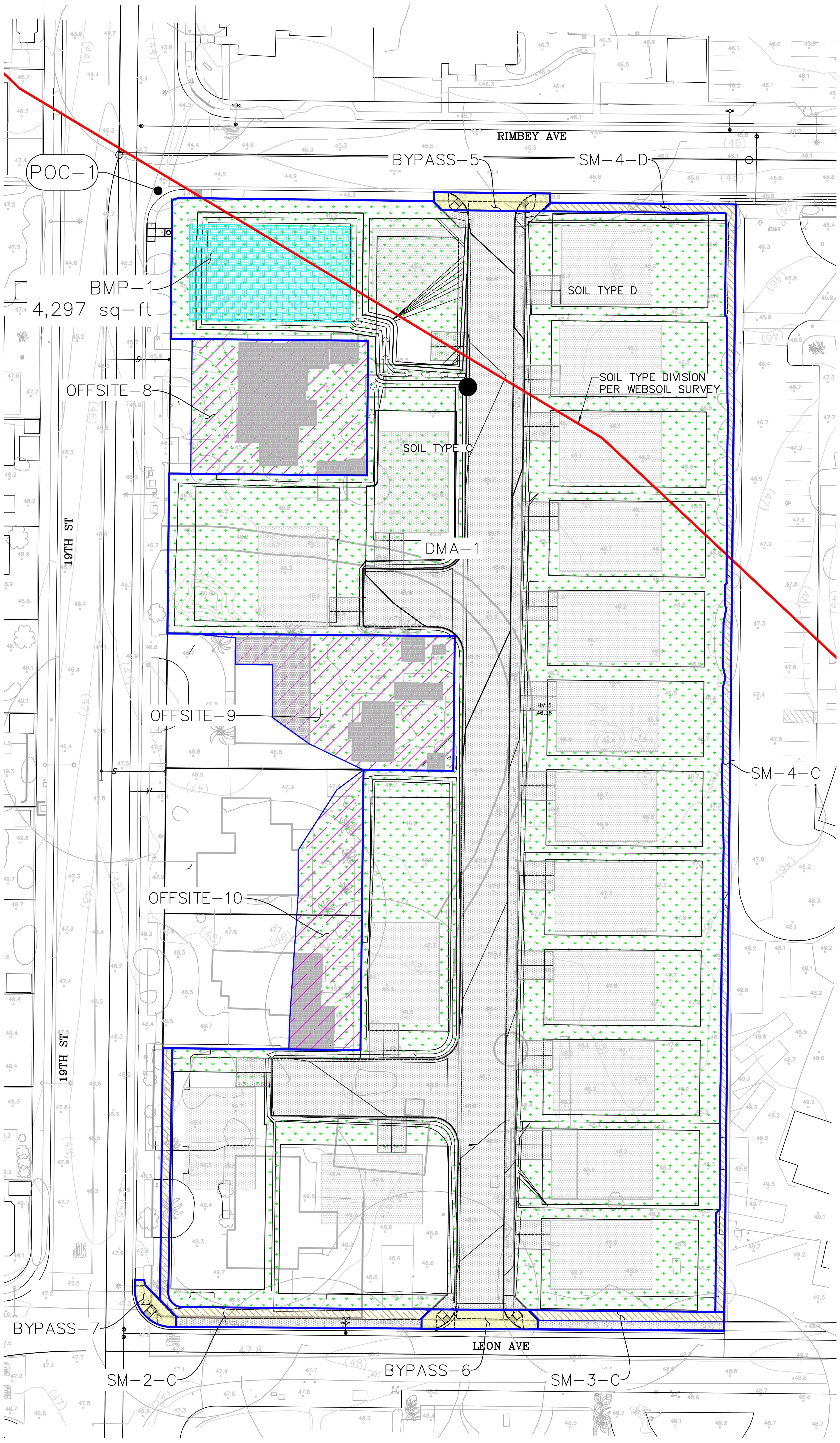
DATE: 04/04/2017
SCALE: 1" = 40'
DRAWN: M.D.
CHECKED:

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

REVISIONS

NO.	DESCRIPTION	DATE	APP'D

SAVE DATE: 4/7/2017 ~ PLOT DATE: 4/9/2017 ~ FILE NAME: P:\Acad\1229 Saturn Blvd\Reports\SWQMP\CAD\170327_1229_DMA_PRE.dwg



LEGEND

PROPERTY BOUNDARY

DMA BOUNDARY

IMPERVIOUS AREA

PERVIOUS AREA

SELF-BYPASS AREA (UNDISTURBED)

AREA NOT DRAINING ONTO BMP

OFFSITE AREA DRAINING ONTO BMP

BMP AREA

SOIL BOUNDARY

EARTHEN SWALE

SAMPLE PROHIBITIVE SIGNAGE

NTS

NOTES

NO CRITICAL COURSE SEDIMENT YIELD AREAS TO PROTECT

DEPTH TO GROUNDWATER > 20 FT

UNDERLYING SOIL TYPES "C" AND "D"

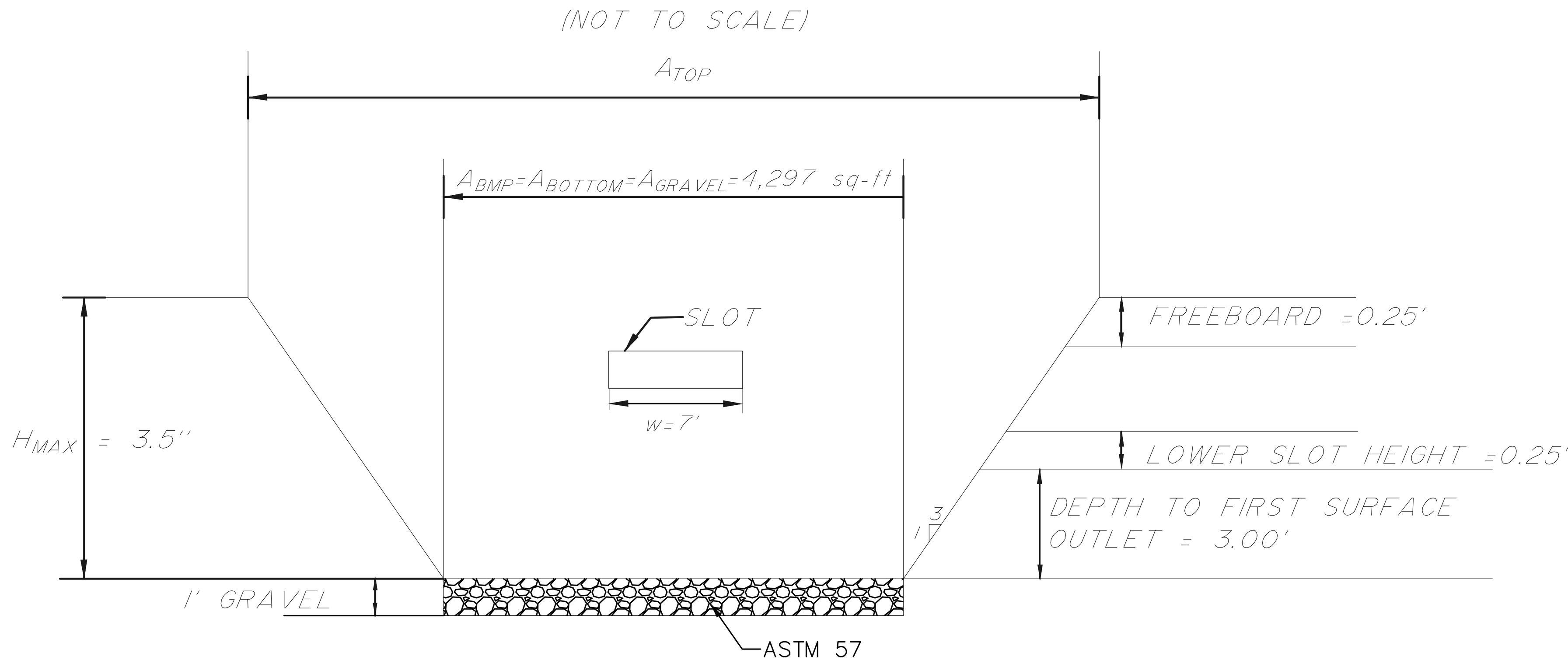
NO EXISTING NATURAL HYDROLOGIC FEATURES

PROPOSED CONDITIONS							
DMA	SUB AREA	SOIL TYPE	IMPERVIOUS (SQ FT)	PERVIOUS (SQ FT)	TOTAL AREA (SQ FT)	DRAINS TO	POC
1	1-C	C	62197	65089	127286	BMP-1	POC-1
	1-D	D	13841	11206	25047		
BYPASS-C	SM-2-C	C	683	1542	2225	BYPASS	
	SM-3-C	C	568	545	1113	BYPASS	
	SM-4-C	C	0	1610	1610	BYPASS	
	OFFSITE-6	C	667	0	667	BYPASS	
	OFFSITE-7	C	311	0	311	BYPASS	
BYPASS-D	SM-4-D	D	0	1294	1294	BYPASS	
	OFFSITE-5	D	627	0	627	BYPASS	
OFFSITE	OFFSITE-8	C	2959	4393	7352	BMP-1	
	OFFSITE-9	C	2573	4731	7304		
	OFFSITE-10	C	1035	4062	5097		
TOTAL		–	85461	94472	179933	–	–
MINIMUM INFILTRATION BASIN AREA			SF REQUIRED		SF PROVIDED		

NOTE: ALL PROPOSED LOTS ARE TO BE ASSUMED TO BE HAVE APPOX. 2,500 SQUARE FEET OF IMPERVIOUS AREA FOR FUTURE CONSTRUCTION

BASIN DETAIL

(NOT TO SCALE)



NOTES: BMP IS A FULL INFINTRATION BASIN, THEREFORE IT HAS NO LID ORIFICE OR UNDERDRAIN.
ALL FACES OF RISER STRUCTURE AS NECESSARY

N

40 20 0 40 80 120

SCALE: 1" = 40'

SHEET 1 OF 1 SHEETS	SHEET TITLE: HMP - PROPOSED CONDITIONS PROJECT: SATURN BLVD RESIDENTIAL DEVELOPMENT 1695 SATURN BOULEVARD SAN DIEGO, CALIFORNIA	DATE: 4/10/2017 SCALE: 1" = 40' DRAWN: M.D. CHECKED:	R·E·C Consultants, Inc. Civil Engineering · Environmental Land Surveying 2442 Second Avenue San Diego, CA 92101 (619)232-9200 (619)232-9210 Fax

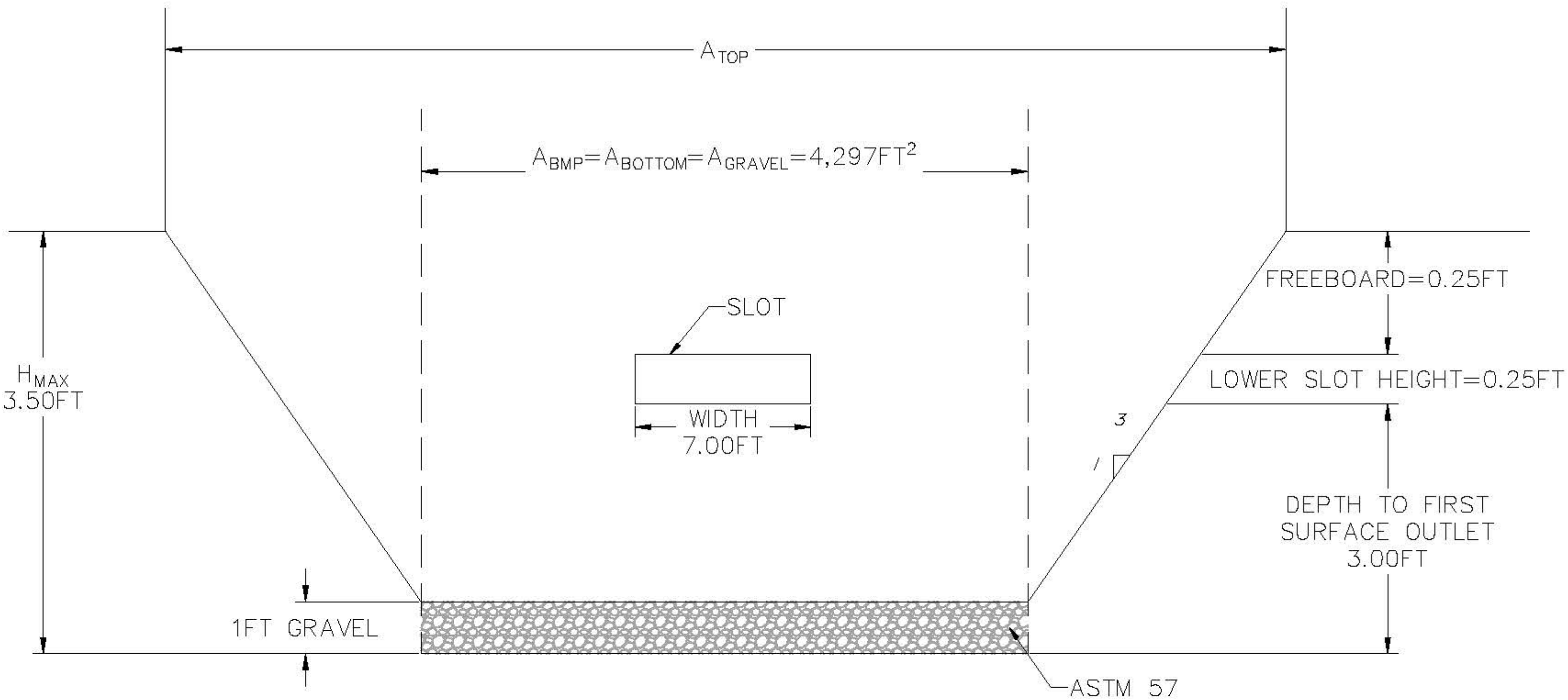
REVISIONS

NO.	DESCRIPTION	DATE	APP'D

SAVE DATE: 4/28/2017 ~ PLOT DATE: 4/28/2017 ~ FILE NAME: P:\Acad\1229 Saturn Blvd\Reports\SWQMP\CAD\170327_1229_DMA_POST.dwg

BASIN 1 DETAIL

(NOT TO SCALE)



NOTES: BMP IS A FULL INFILTRATION BASIN THEREFORE IT HAS NO LID ORIFICE OR UNDERDRAIN.

REC Consultants, Inc.
Civil Engineering · Environmental
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

BMP DETAIL

BMP-1

1695 SATURN BOULEVARD

SAN DIEGO, CALIFORNIA

SHEET 1 OF 1

SAVE DATE: 4/27/2017 ~ PLOT DATE: 4/28/2017 ~ FILE NAME: P:\Acad\1229 Saturn Blvd\Reports\Drainage Study\170327_1229_Drainage_PST.dwg

ATTACHMENT 6

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

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           10/17/1948
START_TIME           00:00:00
REPORT_START_DATE    10/17/1948
REPORT_START_TIME    00:00:00
END_DATE             10/17/2005
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.03   0.05   0.08   0.11   0.13   0.15   0.15   0.13   0.11   0.08   0.04   0.02
DRY_ONLY     NO

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

[SUBCATCHMENTS]
;;                                                 Total    Pcnt.             Pcnt.    Curb
Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length
Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- -
-------
DMA_1-D          LINDBERG         POC-1            0.619    0        103      0.5      0
DMA_1-C          LINDBERG         POC-1            3.057    0        211      0.6      0
OFFSITE-C        LINDBERG         POC-1            0.453    31.8     35       1.2      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA_1-D          0.012      0.05       0.05       0.10       25         OUTLET
DMA_1-C          0.012      0.05       0.05       0.10       25         OUTLET
OFFSITE-C        0.012      0.05       0.05       0.10       25         OUTLET

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

```
;;-------------- ---------- ---------- ----------
DMA_1-D          9          0.01875    0.33
DMA_1-C          6          0.075      0.32
OFFSITE-C        6          0.075      0.32

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

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
LINDBERG         FILE "LbergRain.prn"

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

[TAGS]

[MAP]
DIMENSIONS 2890.000 2950.000 3110.000 4050.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            3000.000           3000.000

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

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA_1-D          3100.000           3500.000
DMA_1-D          3100.000           3500.000
DMA_1-C          2900.000           3500.000
OFFSITE-C        2900.000           3000.000

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
LINDBERG         3000.000           4000.000
```

POST_DEV

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           10/17/1948
START_TIME           00:00:00
REPORT_START_DATE    10/17/1948
REPORT_START_TIME    00:00:00
END_DATE             10/17/2005
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.03   0.05   0.08   0.11   0.13   0.15   0.15   0.13   0.11   0.08   0.04   0.02
DRY_ONLY     NO

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

[SUBCATCHMENTS]
;;                                                 Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
DMA_1-D          LINDBERG         BASIN-1          0.575    55.26    110      0.8      0
DMA_1-C          LINDBERG         BASIN-1          2.922    50.25    174      0.7      0
BYPASS-C         LINDBERG         POC-1            0.136    37.61    15       1        0
BYPASS-D         LINDBERG         POC-1            0.044    32.64    15       1        0
OFFSITE-C        LINDBERG         POC-1            0.453    31.8     40       1.2      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA_1-D          0.012      0.05       0.05       0.10       25         OUTLET
DMA_1-C          0.012      0.05       0.05       0.10       25         OUTLET
BYPASS-C         0.012      0.05       0.05       0.10       25         OUTLET
BYPASS-D         0.012      0.05       0.05       0.10       25         OUTLET
OFFSITE-C        0.012      0.05       0.05       0.10       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
DMA_1-D          9          0.01875    0.33
DMA_1-C          6          0.075      0.32
BYPASS-C         6          0.075      0.32
```

```
BYPASS-D         9          0.01875    0.33
OFFSITE-C        6          0.075      0.32

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

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                      Ponded   Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                     Area     Frac.    Infiltration
Parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- -------- ------------
-----------
BASIN-1          0        2.90     0        TABULAR    BASIN-1                    6587     1        6
0.265    0.32

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

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
OUT-1            Rating     0.000      0.000
OUT-1                       2.400      0.000
OUT-1                       2.483      0.522
OUT-1                       2.567      1.476
OUT-1                       2.650      2.713
OUT-1                       2.733      3.910
OUT-1                       2.817      4.627
OUT-1                       2.900      5.246

BASIN-1          Storage    0.00       4297
BASIN-1                     0.40       4297
BASIN-1                     0.48       4367
BASIN-1                     0.57       4438
BASIN-1                     0.65       4510
BASIN-1                     0.73       4581
BASIN-1                     0.82       4653
BASIN-1                     0.90       4726
BASIN-1                     0.98       4799
BASIN-1                     1.07       4872
BASIN-1                     1.15       4946
BASIN-1                     1.23       5020
BASIN-1                     1.32       5095
BASIN-1                     1.40       5170
BASIN-1                     1.48       5245
BASIN-1                     1.57       5321
BASIN-1                     1.65       5397
BASIN-1                     1.73       5473
BASIN-1                     1.82       5550
BASIN-1                     1.90       5628
BASIN-1                     1.98       5705
BASIN-1                     2.07       5783
BASIN-1                     2.15       5862
BASIN-1                     2.23       5941
BASIN-1                     2.32       6020
BASIN-1                     2.40       6100
BASIN-1                     2.48       6180
BASIN-1                     2.57       6261
BASIN-1                     2.65       6342
BASIN-1                     2.73       6423
BASIN-1                     2.82       6505
```

```
BASIN-1                     2.90       6587

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
LINDBERG         FILE "LbergRain.prn"

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

[TAGS]

[MAP]
DIMENSIONS 2890.000 2962.500 3110.000 3787.500
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            3000.000           3000.000
BASIN-1          3000.000           3250.000

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

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA_1-D          3100.000           3500.000
DMA_1-D          3100.000           3500.000
DMA_1-C          2900.000           3500.000
BYPASS-C         2900.000           3000.000
BYPASS-D         3100.000           3000.000
OFFSITE-C        2900.000           3150.000

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
LINDBERG         3000.000           3750.000
```

ATTACHMENT 7

EPA SWMM FIGURES AND EXPLANATIONS

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

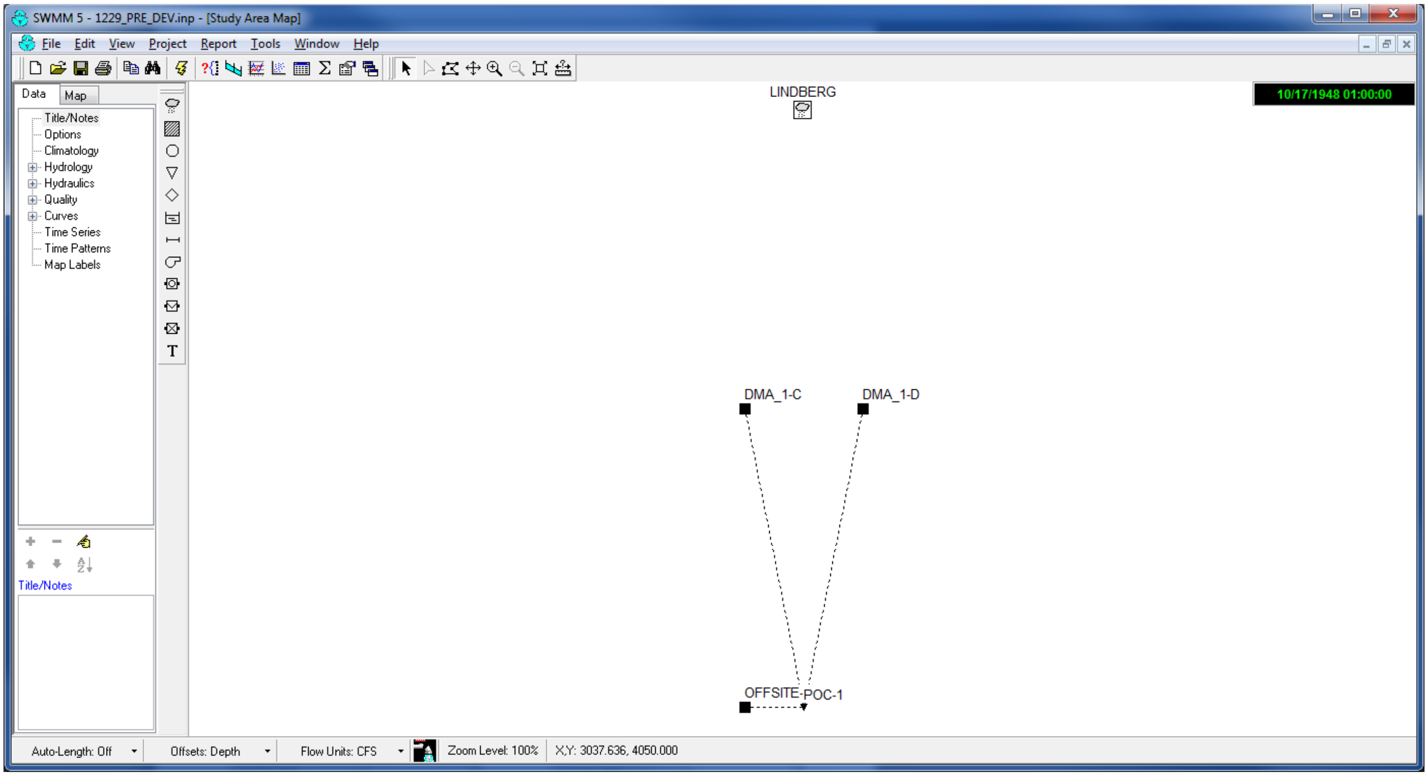
Variables for modeling are associated with typical recommended values by the EPA-SWMM model, typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been attained from the interim Orange County criteria established for their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

Soil characteristics of the existing soils were determined from the site specific NRCS Web Soil Survey and Geotechnical Investigation (both located in Attachment 8 of this report).

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

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

PRE-DEVELOPED CONDITION



Rain Gage LINDBERG

Property	Value
Name	LINDBERG
X-Coordinate	3000.000
Y-Coordinate	4000.000
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	LINDBERG
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

Y coordinate of rain gage on study area map

Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	3000.000
Y-Coordinate	3000.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

Y coordinate of outfall on study area map

Subcatchment DMA_1-C

Property	Value
Name	DMA_1-C
X-Coordinate	2900.000
Y-Coordinate	3500.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	3.057
Width	211
% Slope	0.6
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Y coordinate of subcatchment centroid on map

Subcatchment DMA_1-D

Property	Value
Name	DMA_1-D
X-Coordinate	3100.000
Y-Coordinate	3500.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.619
Width	103
% Slope	0.5
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

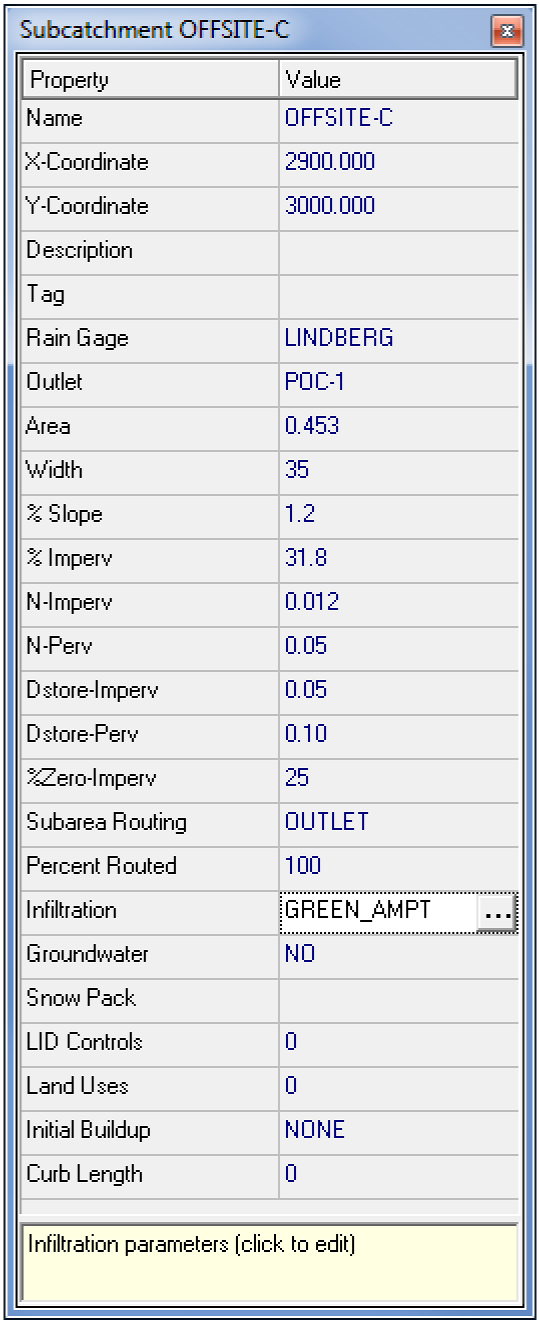
Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.075
Initial Deficit	0.32

Infiltration Editor

Infiltration Method: GREEN_AMPT

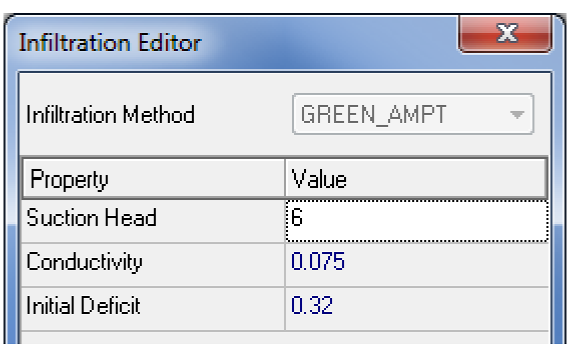
Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



Subcatchment OFFSITE-C

Property	Value
Name	OFFSITE-C
X-Coordinate	2900.000
Y-Coordinate	3000.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.453
Width	35
% Slope	1.2
% Imperv	31.8
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

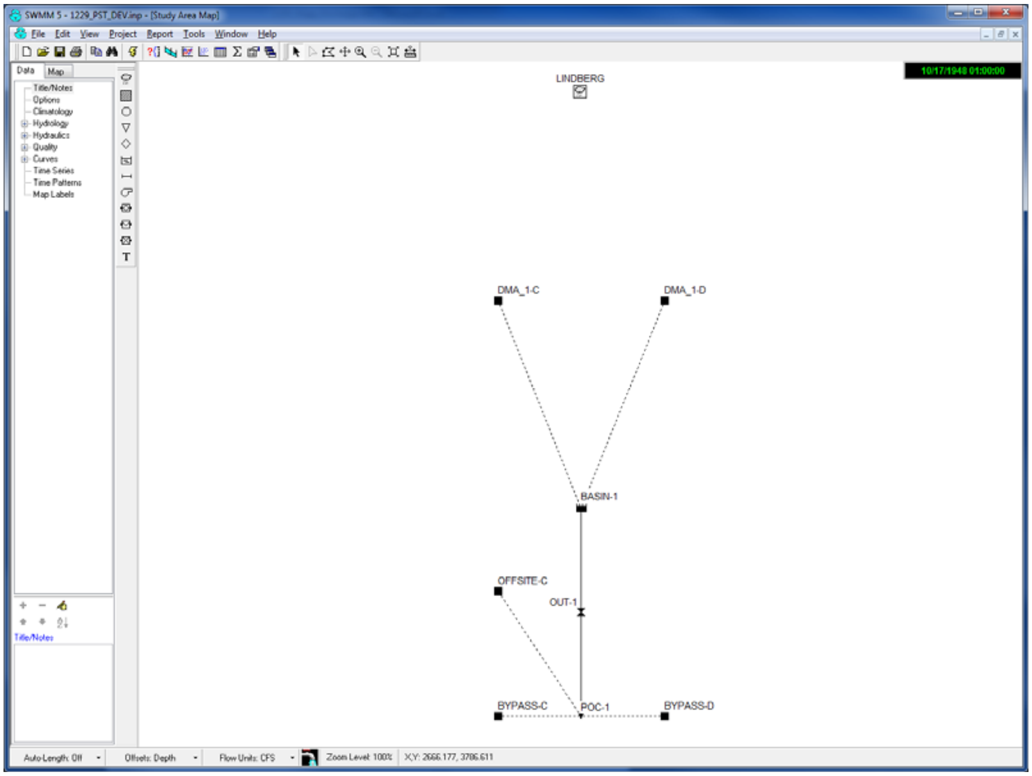


Infiltration Editor

Infiltration Method GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.075
Initial Deficit	0.32

POST-DEVELOPED CONDITION



Rain Gage LINDBERG

Property	Value
Name	LINDBERG
X-Coordinate	3000.000
Y-Coordinate	3750.000
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	LINDBERG
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

User-assigned name of rain gage

Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	3000.000
Y-Coordinate	3000.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

User-assigned name of outfall

Subcatchment DMA_1-C

Property	Value
Name	DMA_1-C
X-Coordinate	2900.000
Y-Coordinate	3500.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	BASIN-1
Area	2.922
Width	174
% Slope	0.7
% Imperv	50.25
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Subcatchment DMA_1-D

Property	Value
Name	DMA_1-D
X-Coordinate	3100.000
Y-Coordinate	3500.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	BASIN-1
Area	0.575
Width	110
% Slope	0.8
% Imperv	55.26
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Infiltration Editor

Infiltration Method GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.075
Initial Deficit	0.32

Infiltration Editor

Infiltration Method GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Subcatchment BYPASS-C

Property	Value
Name	BYPASS-C
X-Coordinate	2900.000
Y-Coordinate	3000.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.136
Width	15
% Slope	1
% Imperv	37.61
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Subcatchment BYPASS-D

Property	Value
Name	BYPASS-D
X-Coordinate	3100.000
Y-Coordinate	3000.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.044
Width	15
% Slope	1
% Imperv	32.64
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

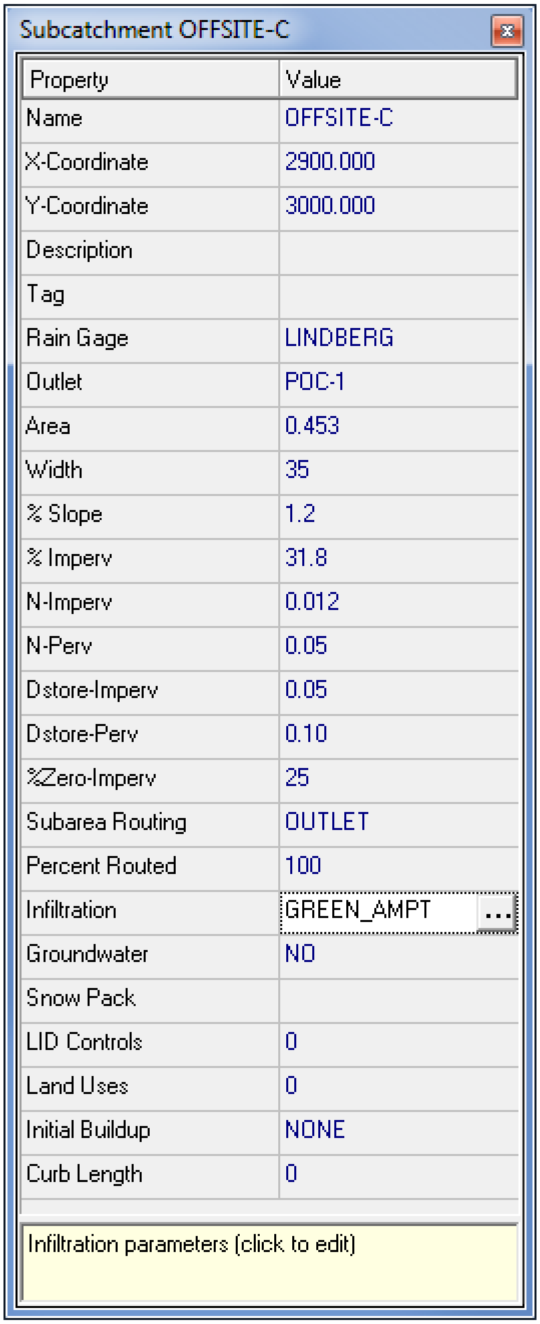
Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.075
Initial Deficit	0.32

Infiltration Editor

Infiltration Method: GREEN_AMPT

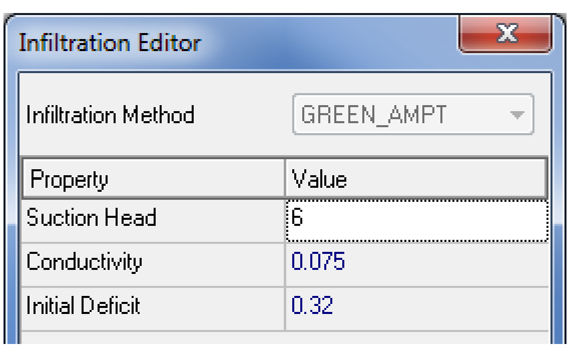
Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33



Subcatchment OFFSITE-C

Property	Value
Name	OFFSITE-C
X-Coordinate	2900.000
Y-Coordinate	3000.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.453
Width	35
% Slope	1.2
% Imperv	31.8
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

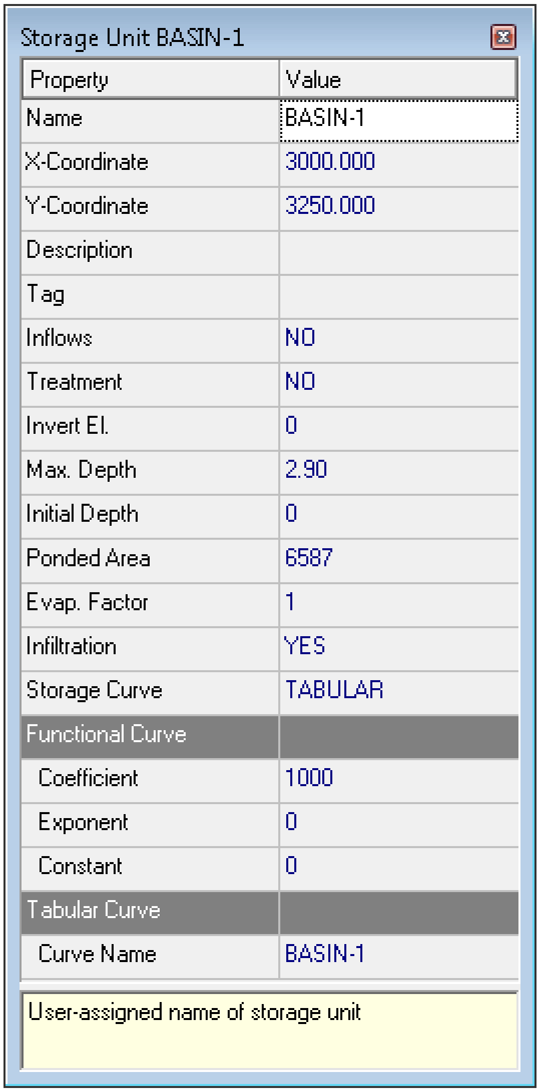


Infiltration Editor

Infiltration Method GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.075
Initial Deficit	0.32

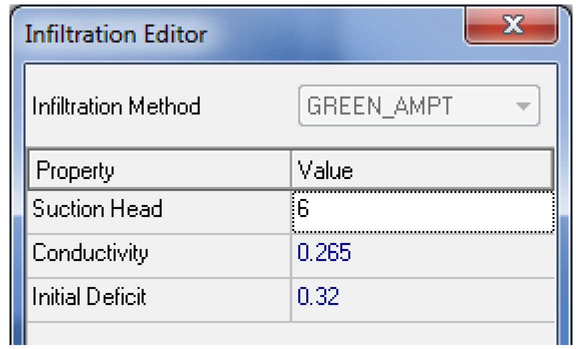
SURFACE STORAGE AND RATING CURVES



Storage Unit BASIN-1

Property	Value
Name	BASIN-1
X-Coordinate	3000.000
Y-Coordinate	3250.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	2.90
Initial Depth	0
Ponded Area	6587
Evap. Factor	1
Infiltration	YES
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	BASIN-1

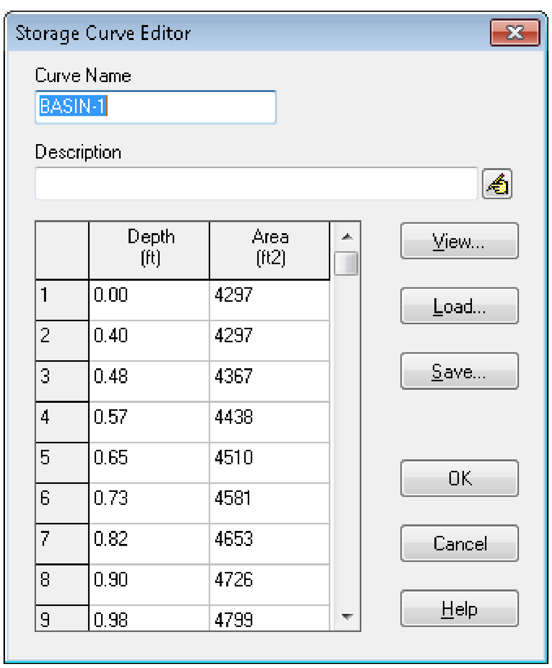
User-assigned name of storage unit



Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.265
Initial Deficit	0.32



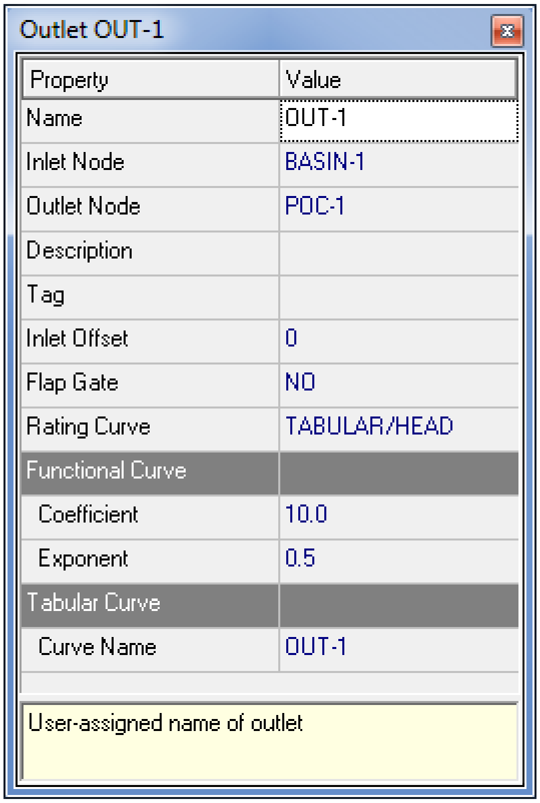
Storage Curve Editor

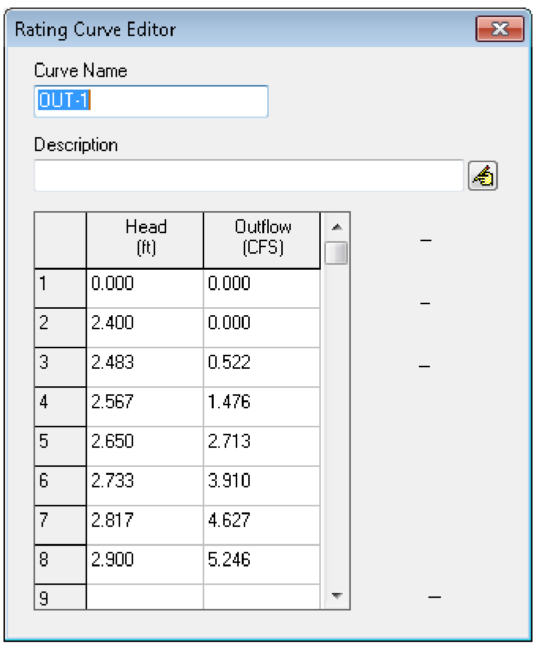
Curve Name: BASIN-1

Description

	Depth (ft)	Area (ft2)
1	0.00	4297
2	0.40	4297
3	0.48	4367
4	0.57	4438
5	0.65	4510
6	0.73	4581
7	0.82	4653
8	0.90	4726
9	0.98	4799

View... Load... Save... OK Cancel Help


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


Rating Curve Editor
Curve Name
OUT-1
Description
Head (ft)
Outflow (CFS)
1
0.000
0.000
2
2.400
0.000
3
2.483
0.522
4
2.567
1.476
5
2.650
2.713
6
2.733
3.910
7
2.817
4.627
8
2.900
5.246
9

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

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

SWMM-Endorsed Values Will Improve Model Quality

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

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

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

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

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

EXPLANATION OF SELECTED VARIABLES

Sub-Catchment Areas:

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

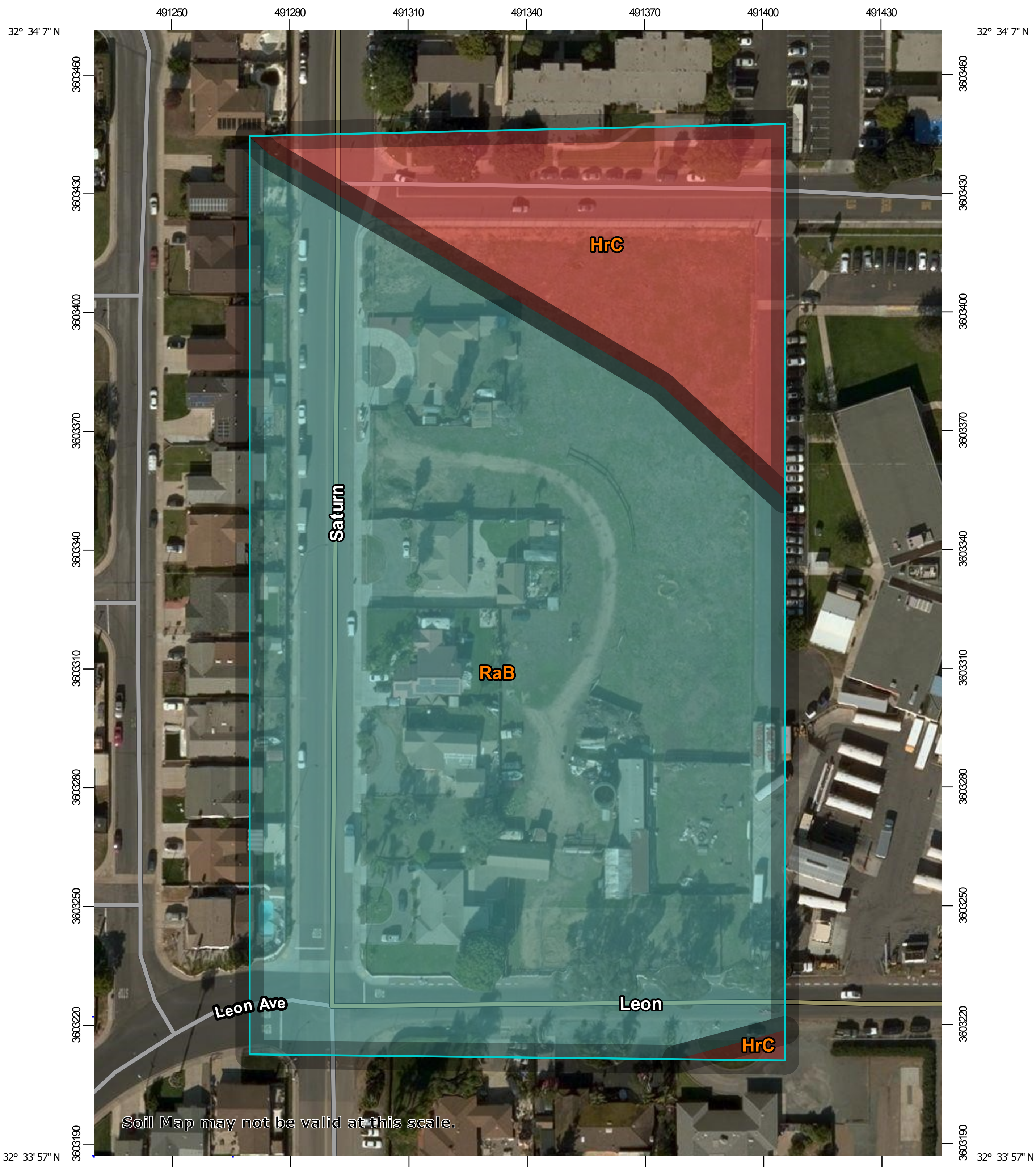
Parameters for the pre- and post-developed models include soil type D as determined from the site specific Natural Resources Conservation Service (NRCS) and geologic review (attached at the end of this appendix). Suction head, conductivity and initial deficit corresponds to average values expected for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

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

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

ATTACHMENT 8

Soils Maps & Geotechnical Report



Map Scale: 1:1,390 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0, 20, 40, 80, 120

Feet: 0, 50, 100, 200, 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 10, Sep 12, 2016

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

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

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
HrC	Huerhuero loam, 2 to 9 percent slopes	D	1.5	19.2%
RaB	Ramona sandy loam, 2 to 5 percent slopes	C	6.4	80.8%
Totals for Area of Interest			**7.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

EEI
Geotechnical & Environmental Solutions

February 28, 2017

Mr. David Larson
Palm Avenue Realty Company
950 Garland Drive
San Diego, California 92165

Subject: **Supplemental Percolation Study**
Proposed Single-Family Residential Subdivision Development
1695 Saturn Boulevard
San Diego, California
EEI Project No. AAA-72282.4a

Dear Mr. Larson:

Pursuant to your request and authorization, EEI has prepared this Supplemental Percolation Study for the subject property located in San Diego, California. The scope of EEI's service was to perform percolation testing to provide preliminary information to evaluate the feasibility of the installation of the proposed onsite storm-water disposal system and to assist with the design process.

This supplemental study is based upon information provided to us by Palm Avenue Realty Company and REC Consultants, as well as EEI's fieldwork, our referenced due diligence level geotechnical review and preliminary percolation study, research of readily available geologic reports and regional geologic maps, and our experience in the area. We understand that this supplemental percolation study is requested to be conducted to provide the infiltration characteristics of the subsurface materials to aid in the design of the proposed onsite storm-water disposal system at the subject property. A summary of our findings, conclusions and recommendations is provided herein.

SITE DESCRIPTION

Based on the information provided by Palm Avenue Realty Company and a review of GoogleEarth® online aerial photography, the subject property is generally located at the northeast corner of Saturn Boulevard and Leon Avenue in the City of San Diego, California. The approximately 4.1-acre property is identified by Assessor's Parcel Number (APN) 634-092-0100 and is addressed as 1695 Saturn Boulevard in San Diego, California.

Detailed descriptions of the subsurface conditions are provided on the boring logs included in **Appendix A** and the approximate locations of the borings are shown on **Figure 1**.

Groundwater

Groundwater was not encountered in any of our exploratory borings. Based on our review of the Phase I prepared for the subject property (Ninyo & Moore, 2015), groundwater is expected to be at depths greater than 20 feet below the existing ground surface. Our review of the California Department of Water Resources - Water Data Library website indicated that there are no groundwater wells present on the property. It should be noted that variations in groundwater may result from fluctuations in the ground surface topography, subsurface stratification, rainfall, irrigation, and other factors that may not have been evident at the time of our subsurface exploration.

PERCOLATION TESTING

Following the drilling of the exploratory borings B-2 through B-4, a 3-inch diameter perforated polyvinyl chloride (PVC) pipe was placed in the cleaned-out holes and gravel was placed around the pipe. The test holes were presoaked for approximately two hours in general accordance with San Diego Region guidelines.

Percolation testing was performed until consistent results were obtained, which was then used to calculate the pre-adjusted percolation rate for the test hole. Upon conclusion of testing, the perforated pipe was removed from the test hole and the test holes were backfilled.

We note that a soil profile's percolation rate is not the same as its infiltration rate. Therefore, the measured/calculated field percolation rates were converted to an estimated infiltration rate utilizing a reduction factor determined using the Porchet method. The following **Table 1** presents the measured percolation rates and corresponding infiltration rates calculated for each test hole.

TABLE 1
Summary of Percolation Testing

Location	Depth (ft.)	Pre-Adjusted Percolation Rate (in/hr.)	Infiltration Rate (in/hr.)
B-2	~8-10	7.56	0.63
B-3	~3-5	4.80	0.56
B-4	~8-10	6.96	0.53

Categorization of Infiltration Feasibility Condition			Form I-8
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	X	
Provide basis: Infiltration testing indicated 0.53 to 0.63in/hr. Ave.=0.57 in/hr. Full infiltration of surface runoff is considered feasible. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	X	
Provide basis: The subject site is currently a relatively flat undeveloped site. The recommended structural foundation setbacks provided in this report for the proposed storm-water/infiltration basin would mitigate any risks of geotechnical hazards. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			

Form I-8 Page 2 of 4			
Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: No shallow ground water was encountered during our field investigation. Groundwater is expected to be at depths greater than 20 feet below the proposed storm-water/infiltration basin. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Infiltration testing indicated 0.53 to 0.63in/hr. Ave.=0.57 in/hr. No ephemeral streams are located on, adjacent to, or in the vicinity of the site. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		Part 1 "yes"

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

Form I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	N/A	
Provide basis: Not Applicable Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	N/A	
Provide basis: Not Applicable Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

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

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

Factor of Safety and Design Infiltration for BMP-1 Rate Worksheet			**Worksheet D.5-1**		
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1
B	Design	Level of pretreatment/ expected sediment loads	0.5	2	1
		Redundancy/resiliency	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2
Combined Safety Factor, $S_{total} = S_A \times S_B$				2	
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)				0.53	
Design Infiltration Rate, in/hr, $K_{design} = K_{observed} / S_{total}$				0.265	
Supporting Data					
Observed infiltratin rate has been determined through perrcolation rated performed by geotechnical enigneer. Testes were performed in accordance with City of San Diego regulations. See attached geotechnical report for detailed information.					

ATTACHMENT 9

Summary Files from the SWMM Model

PRE_DEV

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


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

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Starting Date ............ OCT-17-1948 00:00:00
Ending Date .............. OCT-17-2005 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       193.847       563.372
Evaporation Loss .........         2.663         7.739
Infiltration Loss ........       170.119       494.413
Surface Runoff ...........        21.590        62.747
Final Surface Storage ....         0.000         0.001
Continuity Error (%) .....        -0.271


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        21.590         7.035
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        21.590         7.035
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000


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

----------------------------------------------------------------------------------------------------------
                            Total      Total      Total      Total      Total        Total     Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff       Runoff   Runoff   Coeff
Subcatchment                   in         in         in         in         in     10^6 gal      CFS
----------------------------------------------------------------------------------------------------------
DMA_1-D                    563.37       0.00      12.67     440.57     114.24         1.92     0.80   0.203
DMA_1-C                    563.37       0.00       3.43     525.90      34.87         2.89     3.11   0.062
OFFSITE-C                  563.37       0.00      30.08     355.49     180.52         2.22     0.56   0.320


Analysis begun on:  Wed Apr 26 11:01:13 2017
Analysis ended on:  Wed Apr 26 11:01:27 2017
Total elapsed time: 00:00:14
```

POST_DEV

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


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

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ OCT-17-1948 00:00:00
Ending Date .............. OCT-17-2005 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       193.894       563.372
Evaporation Loss .........        15.782        45.855
Infiltration Loss ........        90.685       263.490
Surface Runoff ...........        88.478       257.078
Final Surface Storage ....         0.006         0.016
Continuity Error (%) .....        -0.544


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        88.478        28.832
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        13.032         4.247
Internal Outflow .........         0.000         0.000
Storage Losses ...........        75.440        24.583
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.005


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


*************************
```

POST_DEV

Routing Time Step Summary
****

Minimum Time Step	:	60.00 sec
Average Time Step	:	60.00 sec
Maximum Time Step	:	60.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	1.00

****
Subcatchment Runoff Summary
****

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA_1-D	563.37	0.00	53.40	193.38	322.14	5.03	0.78	0.572
DMA_1-C	563.37	0.00	47.51	259.86	258.55	20.51	3.67	0.459
BYPASS-C	563.37	0.00	34.85	324.25	207.50	0.77	0.17	0.368
BYPASS-D	563.37	0.00	35.37	290.33	243.62	0.29	0.06	0.432
OFFSITE-C	563.37	0.00	29.94	355.08	181.20	2.23	0.56	0.322

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
POC-1	OUTFALL	0.00	0.00	0.00	0 00:00
BASIN-1	STORAGE	0.03	2.72	2.72	6263 09:04

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
POC-1	OUTFALL	0.79	4.37	6263 09:03	3.286	4.247
BASIN-1	STORAGE	4.45	4.45	6263 09:00	25.543	25.543

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
BASIN-1	STORAGE	499679.02	2.719	0.181

****
Node Flooding Summary

****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
BASIN-1	0.143	1	96	14.082	92	6263 09:04	3.71

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
POC-1	1.65	0.02	4.37	4.247
System	1.65	0.02	4.37	4.247

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
OUT-1	DUMMY	3.71	6263 09:04			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Apr 27 12:44:27 2017
Analysis ended on: Thu Apr 27 12:44:48 2017
Total elapsed time: 00:00:21

The City of San Diego

PDP EXEMPTION
FOR

1695 Saturn Boulevard
VTM 1996532, PDP 1996525
CDP 1996526

ENGINEER OF WORK:

REGISTERED PROFESSIONAL ENGINEER
JONATHAN RAAB RYDEEN
RCE ~ 64811
EXP 6/30/19
CIVIL
STATE OF CALIFORNIA

Jonathan Raab Rydeen

PREPARED FOR:
David Larsen
950 Garland Drive
San Diego, Ca 92165

PREPARED BY:

R·E·C
Consultants, Inc.

REC Consultants
2442 Second Avenue
San Diego, Ca 92101
619-323-9200

DATE:
January 29, 2018
Revised May 31, 2018

Approved by: City of San Diego   Date

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: 1695 Saturn Boulevard, San Diego, California	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 ❑

David Larson	Owner
Name of Owner or Agent *(Please Print)*	Title
Signature	Date

Clear Page 4

Clear Form

BMP Applicability and Selection for Green Street Exemption			Form J-1
Project Identification			
Project Name: 1695 Saturn Boulevard			
Permit Application Number: TBD			Date: May 31, 2018
Project Characterization and Selection Synopsis			
The purpose of this form is to guide the selection of BMPs, given project specific constraints to meet the Green Streets exemption as defined in Appendix J.2 of the BMP Design Manual. In order to qualify for a PDP exemption, the project must incorporate all applicable Green Street BMP elements described in Appendix J.2, based on the applicability guidance provided in Appendix J.2. Complete the sections below providing detailed justification for each selection.			
Step 1: Does this project include retrofitting or redevelopment of an existing alley, street, or roadway criteria? Exemptions do not apply for projects that construct new alleys, streets, or roadways. See Appendix J for additional guidance on distinguishing between redevelopment of a street and new development. ☐ Yes ☐ No (if No is selected, the Green Street exemption is not applicable)			
Provide a brief overview of the project, key details, and site-specific opportunities and constraints: Overview provided on next page.			
Step 2: Complete the BMP-specific applicability checklists on the following pages and attach them to this form. Complete forms for all BMPs, including those that were used and those that were not used.			
Step 3: Summarize the BMP(s) that were selected through the guidance process (Select all that apply):			
BMP Type	Applicable?	Used?	Summary of justification for Inclusion or Finding of Non-applicability
Vegetated Swales	☐	☐	N/A as there is not enough area for sizing
Sidewalk Planters	☑	☑	Considered best option for project needs
Curb Extensions	☐	☐	N/A as sidewalk planters will be used
Permeable Surfaces	☐	☐	N/A - Roads impermeable. Planters used in lieu
Green Gutters	☐	☐	N/A - Planters considered best option
Rain Gardens	☐	☐	N/A - Planters considered best option
Trees	☐	☐	N/A - Planters considered best option
Other__________	☐	☐	

Step 1

Provide a brief overview of the project, key details, and site specific opportunities and constraints:

The proposed project entails the widening of a 315-ft long section of road adjacent to 1695 Saturn Boulevard on Leon Avenue.

Under existing conditions, the surface on the north side of the road is developed with AC curb and sidewalk. The surface to the south of the road is vacant and permeable.

Under proposed conditions, runoff from the widened portion of the road along the north side of Leon Avenue will be conveyed to a proposed planter for water quality treatment via infiltration. Additionally, curb cuts will be included along the proposed non-continuous sidewalk in order to allow for high flows to stream away from the sidewalk planter and surface flow towards Saturn Boulevard.

Form J-1 Page 2 of 8: Vegetated Swale			
Brief Description: Vegetated Swales are shallow, open channels that are designed to remove storm water pollutants by physically straining/filtering runoff through vegetation in the channel.			
Site Type (Check all that apply):	Street Type	Rating[1]	Present in Project?
	Residential Streets	⦿	☐
	Commercial Street/ Business District	○	☐
	Collector Street	⦿	☑
	Arterial and Boulevard	⦿	☐
	Alleys	○	☐
	Parking Areas	⦿	☐
Key Opportunities for Vegetated Swales (Check all that apply):	Parkway strips		☑
	Medians		☐
	Long, mostly continuous space		☐
	Other (must justify below)		☐
Site-Specific Factors (Check all that apply):	Favorable Conditions for Vegetated Swales		
	Slope > 1% and <3%		☑
	Conveying run-on to a site		☐
	Infiltration is partially feasible or not feasible		☑
	Long continuous segments available		☐
	More parkway width		☐
	Unfavorable Conditions for Vegetated Swales		
	Available width is < 8 feet		☑
	Frequent driveway interruption		☐
	ROW width too limited		☑
Summary of Findings:			
Were Vegetated Swales determined to be applicable as part of the Green Streets BMP plan? ☐ Yes ☐ No	If yes, were they used? ☐ Yes ☐ No		
Provide discussion/justifications for selections and decisions above: Proposed public road improvements include a non-contiguous sidewalk with less than 8' of parkway. Vegetated swales are infeasible as there is insufficient area within parkway.			

[1] ● High applicability within this category, however may still be limited by site-specific factors
⦿ Generally applicable in this category; largely dependent on site-specific factors
○ Limited applicability within this category; may still be applicable in some cases; should be considered

<table>
<tr><th colspan="4">Form J-1 Page 3 of 8: Sidewalk Planters</th></tr>
<tr><td colspan="4"><u>Brief Description</u>: A planter imbedded in the sidewalk designed to manage storm water runoff from the adjacent roadway and sidewalk.</td></tr>
<tr><td rowspan="7">Site Type (Check all that apply):</td><td>Street Type</td><td>Rating[2]</td><td>Present in Project?</td></tr>
<tr><td>Residential Streets</td><td>◉</td><td>☐</td></tr>
<tr><td>Commercial Street/ Business District</td><td>◉</td><td>☐</td></tr>
<tr><td>Collector Street</td><td>●</td><td>☑</td></tr>
<tr><td>Arterial and Boulevard</td><td>●</td><td>☐</td></tr>
<tr><td>Alleys</td><td>○</td><td>☐</td></tr>
<tr><td>Parking Areas</td><td>◉</td><td>☐</td></tr>
<tr><td rowspan="4">Key Opportunities for Sidewalk Planters (Check all that apply):</td><td colspan="2">Parkway strips</td><td>☑</td></tr>
<tr><td colspan="2">Medians</td><td>☐</td></tr>
<tr><td colspan="2">Between driveways</td><td>☐</td></tr>
<tr><td colspan="2">Other (must justify below)</td><td>☑</td></tr>
<tr><td rowspan="7">Site-Specific Factors (Check all that apply):</td><td colspan="3">Favorable Conditions for Sidewalk Planters</td></tr>
<tr><td colspan="2">Slope <4%</td><td>☑</td></tr>
<tr><td colspan="2">Wide sidewalks</td><td>☐</td></tr>
<tr><td colspan="2">More parkway width</td><td>☑</td></tr>
<tr><td colspan="3">Unfavorable Conditions for Sidewalk Planters</td></tr>
<tr><td colspan="2">Conflicts with car egress</td><td>☐</td></tr>
<tr><td colspan="2">ROW width too limited</td><td>☐</td></tr>
<tr><td colspan="4">Summary of Findings:</td></tr>
<tr><td colspan="2">Were Sidewalk Planters determined to be applicable as part of the Green Streets BMP plan?
☐ Yes ☐ No</td><td colspan="2">If yes, were they used?
☐ Yes ☐ No</td></tr>
<tr><td colspan="4">Provide discussion/justifications for selections and decisions above:
In proposed conditions, runoff from the widened portion of the road on the north side of Leon Avenue will be conveyed to a proposed sidewalk planter for treatment. Additionally, curb cuts will be included to allow for high flows to stream from the sidewalk planter and surface flow towards Saturn Boulevard. The proposed non-contiguous sidewalk and proposed slope of the road helps satisfy the criteria.</td></tr>
</table>

[2] ● High applicability within this category, however may still be limited by site-specific factors

◉ Generally applicable in this category; largely dependent on site-specific factors

○ Limited applicability within this category; may still be applicable in some cases; should be considered

Form J-1 Page 4 of 8: Curb Extensions			
Brief Description: Curb extensions expand the edge of the sidewalk into the roadway or parking area and allow storm water runoff to collect and infiltrate through a detention area of porous media.			
Site Type (Check all that apply):	Street Type	Rating[3]	Present in Project?
	Residential Streets	●	☐
	Commercial Street/ Business District	●	☐
	Collector Street	⦿	☑
	Arterial and Boulevard	⦿	☐
	Alleys	○	☐
	Parking Areas	⦿	☐
Key Opportunities for Curb Extensions (Check all that apply):	Intersections		☐
	Parking area		☐
	Other (must justify below)		☑
Site-Specific Factors (Check all that apply):	Favorable Conditions for Curb Extensions		
	Slope <4%		☑
	Traffic calming needed		☐
	Unfavorable Conditions for Curb Extensions		
	Conflicts with bike lanes		☑
	Site distance issues at intersection		☐
Summary of Findings:			
Were Curb Extensions determined to be applicable as part of the Green Streets BMP plan? ☐ Yes ☐ No	If yes, were they used? ☐ Yes ☐ No		
Provide discussion/justifications for selections and decisions above: Proposed public road improvements include a non-contiguous sidewalk with less than 8' of parkway. In addition, there is no extra Right-of-Way within the roadway due to the Collector street designation.			

[3] ● High applicability within this category, however may still be limited by site-specific factors
⦿ Generally applicable in this category; largely dependent on site-specific factors
○ Limited applicability within this category; may still be applicable in some cases; should be considered

Form J-1 Page 5 of 8: Permeable Surfaces			
Brief Description: Permeable surfaces are pavement that allows for percolation through void spaces into subsurface layers.			
Site Type (Check all that apply):	Street Type	Rating[4]	Present in Project?
	Residential Streets	●	☐
	Commercial Street/ Business District	●	☐
	Collector Street	◉	☑
	Arterial and Boulevard	◉	☐
	Alleys	●	☐
	Parking Areas	◉	☐
Key Opportunities for Permeable Surfaces (Check all that apply):	Sidewalks		☑
	Parking strips		☐
	Shoulders		☑
	Low traffic roadways		☐
	Other (must justify below)		☑
Site-Specific Factors (Check all that apply):	Favorable Conditions for Permeable Surfaces		
	Slope < 2-3%		☑
	Conveying limited run-on to a site		☐
	Low traffic area		☐
	Unfavorable Conditions for Permeable Surfaces		
	High traffic area		☑
	Run-on has high sediment load		☐
Summary of Findings:			
Were Permeable Surfaces determined to be applicable as part of the Green Streets BMP plan? ☐ Yes ☐ No	If yes, were they used? ☐ Yes ☐ No		
Provide discussion/justifications for selections and decisions above: Existing street is impermeable. The widening area will also be impermeable as to match the existing conditions.			

[4] ● High applicability within this category, however may still be limited by site-specific factors
◉ Generally applicable in this category; largely dependent on site-specific factors
○ Limited applicability within this category; may still be applicable in some cases; should be considered

Form J-1 Page 6 of 8: Green Gutters			
Brief Description: Green Gutters are shallow and narrow strips of landscaping in a typical curb and gutter location with a lower elevation than the street gutter elevation to allow capture of storm water from the sidewalk and street.			
Site Type (Check all that apply):	Street Type	Rating[5]	Present in Project?
	Residential Streets	○	☐
	Commercial Street/ Business District	◉	☐
	Collector Street	●	☑
	Arterial and Boulevard	●	☐
	Alleys	◉	☐
	Parking Areas	○	☐
Key Opportunities for Green Gutters (Check all that apply):	Parkway strips		☐
	Medians		☐
	Long, mostly continuous space		☐
	Other (must justify below)		☐
Site-Specific Factors (Check all that apply):	Favorable Conditions for Green Gutters		
	Slope > 1% and <3%		☐
	Conveying run-on to a site		☐
	Infiltration is partially feasible or not feasible		☐
	Long continuous segments available		☐
	Narrower spaces (as little as 2 to 3 feet)		☑
	Unfavorable Conditions for Green Gutters		
	Frequent driveway interruption		☐
	ROW width too limited		☑

Summary of Findings:

Were Green Gutters determined to be applicable as part of the Green Streets BMP plan? ☐ Yes ☐ No	If yes, were they used? ☐ Yes ☐ No

Provide discussion/justifications for selections and decisions above:

Due to the location of the project, green gutters are not compatible with community design. All road around project have curb and gutters.

[5] ● High applicability within this category, however may still be limited by site-specific factors
◉ Generally applicable in this category; largely dependent on site-specific factors
○ Limited applicability within this category; may still be applicable in some cases; should be considered

Form J-1 Page 7 of 8: Rain Gardens			
Brief Description: Rain Gardens are shallow detention basins with vegetation that temporarily store water to allow for infiltration of the stored volume. Rain Gardens could be bioretention or biofiltration with partial retention or a biofiltration BMP.			
Site Type (Check all that apply):	Street Type	Rating[6]	Present in Project?
	Residential Streets	◉	☐
	Commercial Street/ Business District	◉	☐
	Collector Street	◉	☑
	Arterial and Boulevard	◉	☐
	Alleys	○	☐
	Parking Areas	●	☐
Key Opportunities for Rain Gardens (Check all that apply):	Irregularly shaped areas in ROW		☐
	Broad and flat areas		☑
	Other (must justify below)		☑
Site-Specific Factors (Check all that apply):	Favorable Conditions for Rain Gardens		
	Slope <2%		☑
	Infiltration is partially feasible or not feasible		☐
	Large area available		
	Unfavorable Conditions for Rain Gardens		
	Slope > 2%		☐
	ROW too limited		☑
Summary of Findings:			
Were Rain Gardens determined to be applicable as part of the Green Streets BMP plan? ☐ Yes ☐ No		If yes, were they used? ☐ Yes ☐ No	
Provide discussion/justifications for selections and decisions above: Rain garden cannot be included in project as there is no extra Right-of-Way due to the Collector Street Designation.			

[6] ● High applicability within this category, however may still be limited by site-specific factors
◉ Generally applicable in this category; largely dependent on site-specific factors
○ Limited applicability within this category; may still be applicable in some cases; should be considered

Form J-1 Page 8 of 8: Trees			
Brief Description: Trees planted in the sidewalk right-of-way provide rainfall interception and infiltration benefits and typically supplement other storm water management tools.			
Site Type (Check all that apply):	Street Type	Rating[7]	Present in Project?
	Residential Streets	●	☐
	Commercial Street/ Business District	⦿	☐
	Collector Street	⦿	☑
	Arterial and Boulevard	⦿	☐
	Alleys	⦿	☐
	Parking Areas	●	☐
Key Opportunities for Trees (Check all that apply):	Parkway strips		☐
	Medians		☐
	Irregularly shaped areas		☐
	Extra ROW on back side of sidewalk		☐
	Other (must justify below)		☑
Site-Specific Factors (Check all that apply):	Favorable Conditions for Trees		
	Located outside of clear zone		☐
	Infiltration is feasible		☑
	ROW not limiting		
	Unfavorable Conditions for Trees		
	Limited space for root growth		☐
	Clear zone issues		☑
Summary of Findings:			
Were Trees determined to be applicable as part of the Green Streets BMP plan? ☐ Yes ☐ No	If yes, were they used? ☐ Yes ☐ No		
Provide discussion/justifications for selections and decisions above: Sidewalk planters have been considered to be the best option for project needs, therefore trees are not required.			

[7] ● High applicability within this category, however may still be limited by site-specific factors
⦿ Generally applicable in this category; largely dependent on site-specific factors
○ Limited applicability within this category; may still be applicable in some cases; should be considered

Source Control BMP Checklist for Standard Projects	Form I-4A

All development projects must implement source control BMPs. Refer to Chapter 4 and Appendix E of the BMP Design Manual for information to implement BMPs shown in this checklist.
Note: All selected BMPs must be shown on the construction plans.

Source Control Requirement	Applied[1]?		
4.2.1 Prevention of Illicit Discharges into the MS4	☐ Yes	☐ No	☐ N/A
4.2.2 Storm Drain Stenciling or Signage	☐ Yes	☐ No	☐ N/A
4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☐ N/A
4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☐ N/A
4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal	☐ Yes	☐ No	☐ N/A
4.2.6 BMPs based on Potential Sources of Runoff Pollutants			
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 for <u>all</u> "No" answers shown above:

Discussion/Justification provided on following page

SOURCE CONTROL REQUIREMENTS

4.2.1 Prevention of Illicit Discharges into the MS4

N/A – Runoff from proposed improvements will be directed towards infiltration sidewalk planters. There will be no connection to a stormwater conveyance system.

4.2.2 Storm Drain Stenciling or Signage

N/A – No storm water drainage system is proposed within project site.

4.2.3 Protect Outdoor Materials Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal

N/A – The proposed project does not include material storage areas.

4.2.4 Protect Materials Stored in Outdoor Work Areas from Rainfall, Run-On, Runoff and Wind Dispersal

N/A – The proposed project does not include outdoor work areas.

4.2.5 Protect Trash Storage Areas from Rainfall, Run-On, Runoff, and Wind Dispersal

N/A The proposed project does not include trash storage areas

4.2.6 BMPs based on Potential Sources of Runoff Pollutants:

<u>Landscape/Outdoor Pesticide Use:</u>

Final landscape plans will accomplish the following:

Design landscaping to minimize the use of fertilizers and pesticides that can contribute to storm water pollution. Where landscaped areas are used to retain or detain storm water, specify plants that are tolerant of periodic saturated soil conditions. Consider using pest-resistant plants, especially adjacent to hardscape. To ensure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions. Maintain landscaping using minimum or no pesticides.

<u>Sidewalks:</u>

Sidewalks shall be swept regularly to prevent the accumulation of litter and debris. Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.

The following are not part of the proposed project, therefore are not applicable:

- On-site storm Drain inlets

- Interior floor drains and elevator shaft sump pumps
- Interior parking garages
- Need for future & structural pest control
- Pools, spas, ponds, decorative fountains, and other water features.
- Food service
- Refuse areas, Industrial processes
- Outdoor storage of equipment and Maintenance
- Vehicle/Equipment Repair and Maintenance
- Fuel Dispensing Areas
- Loading Docks
- Fire sprinkler Test Water
- Miscellaneous Drain or Wash Water
- SC-6A: Large Trash Generating Fecilities
- SC-6B: Animal Facilities
- SC-6C: Plant Nurseries and Garden Centers
- SC-6D: Automotive Facilities

Site Design BMP Checklist for Standard Projects	Form I-5A

All development projects must implement site design BMPs. Refer to Chapter 4 and Appendix E of the BMP Design Manual for information to implement BMPs shown in this checklist.
Note: All selected BMPs must be shown on the construction plans.

Site Design Requirement	Applied[1]?		
4.3.1 Maintain Natural Drainage Pathways and Hydrologic Features	☐ Yes	☐ No	☐ N/A
4.3.2 Conserve Natural Areas, Soils, and Vegetation	☐ Yes	☐ No	☐ N/A
4.3.3 Minimize Impervious Area	☐ Yes	☐ No	☐ N/A
4.3.4 Minimize Soil Compaction	☐ Yes	☐ No	☐ N/A
4.3.5 Impervious Area Dispersion	☐ Yes	☐ No	☐ N/A
4.3.6 Runoff Collection	☐ Yes	☐ No	☐ N/A
4.3.7 Landscaping with Native or Drought Tolerant Species	☐ Yes	☐ No	☐ N/A
4.3.8 Harvest and Use Precipitation	☐ Yes	☐ No	☐ N/A

Discussion / justification for **all** "No" answers shown above:

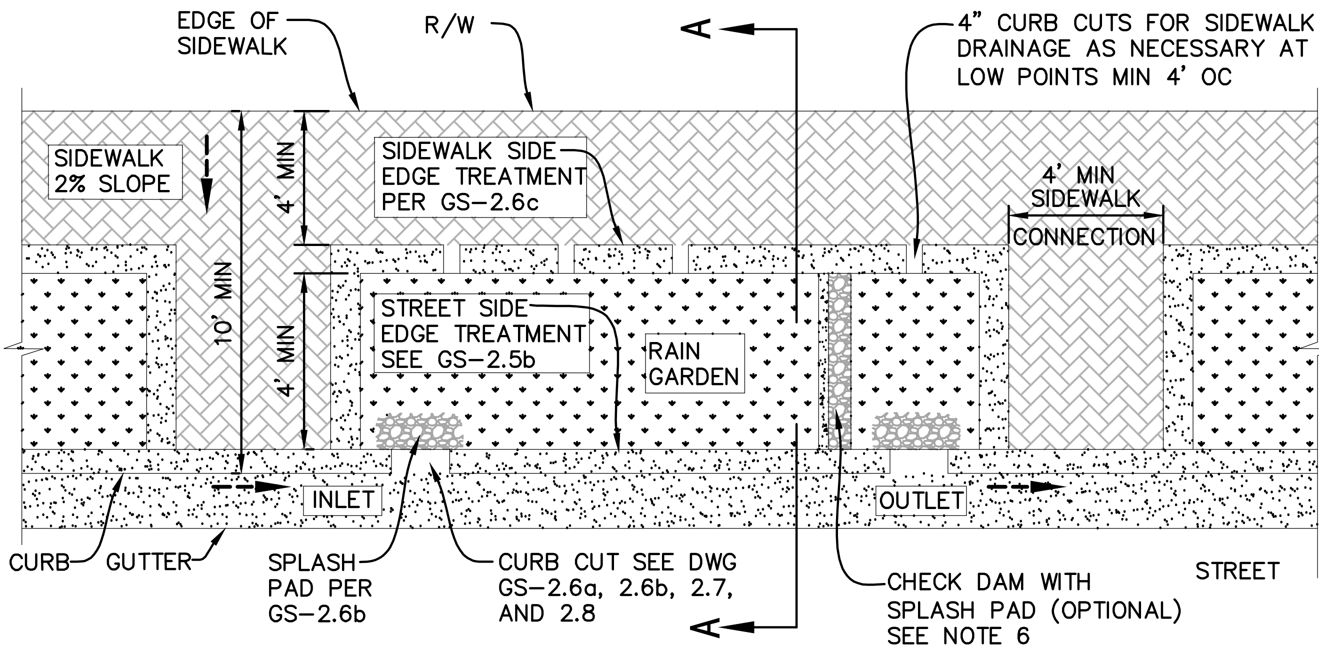
Maintain Natural Drainage Pathways and Hydrologic Features:
Project site has been mass graded, there are no natural pathways to maintain. There are no hydrologic features to maintain within project site.

Runoff Collection:
All runoff will be directed towards proposed infiltration sidewalk planters. Runoff collection is not applicable.

Harvest and Use precipitation:
All runoff will be directed toward proposed infiltration sidewalk planters. Harvest and Use Precipitation is not applicable.

[1] Answer for each source control and site design category shall be pursuant to the following:

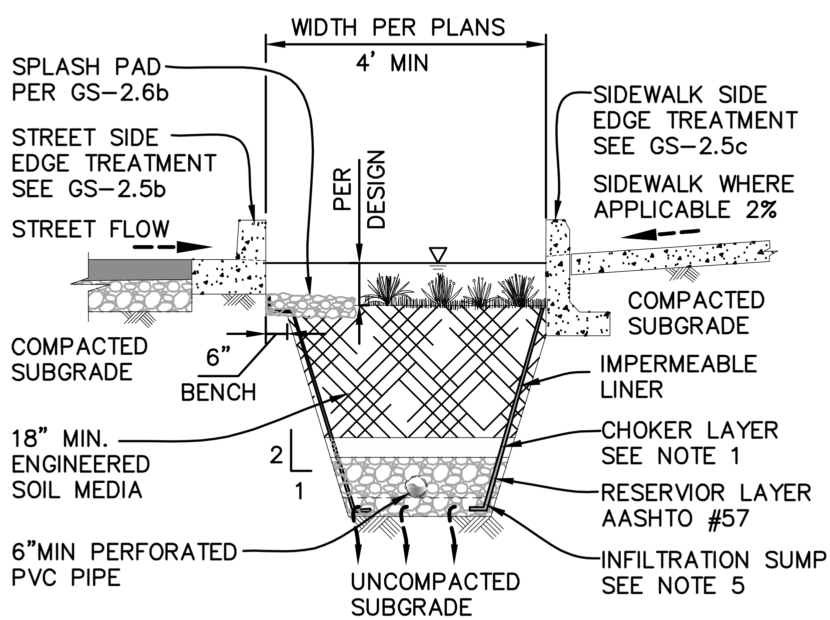
- "Yes" means the project will implement the BMP as described in Chapter 4 and/or Appendix E of the BMP Design Manual. Discussion / justification is not required.
- "No" means the BMP is applicable to the project but it is not feasible to implement. Discussion / justification must be provided.
- "N/A" 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.



PLAN VIEW

NOTES:

1. CHOKER LAYER IS OPTIONAL PER GEOTECHNICAL ENGINEER RECOMMENDATION.
2. MATERIALS AND CONSTRUCTION SHALL MEET CURRENT SPECIFICATION FOR PLANTING AND ENGINEERED SOIL MEDIA.
3. PLANTINGS SHALL BE INSTALLED IN ACCORDANCE WITH DESIGN PLAN.
4. BOTTOM OF RAIN GARDEN SHALL BE AT LEAST 10' ABOVE THE SEASONAL HIGH WATER TABLE OR 2' ABOVE BEDROCK, AS DETERMINED BY GEOTECHNICAL INVESTIGATION.
5. DEPTH OF INFILTRATION SUMP AS SHOWN ON DESIGN PLANS SHALL BE SIZED TO ADDRESS STORMWATER MANAGEMENT REQUIREMENTS.
6. CHECK DAM SHALL BE SPECIFIED AS NECESSARY PER GS-4.1 OR GS-4.2

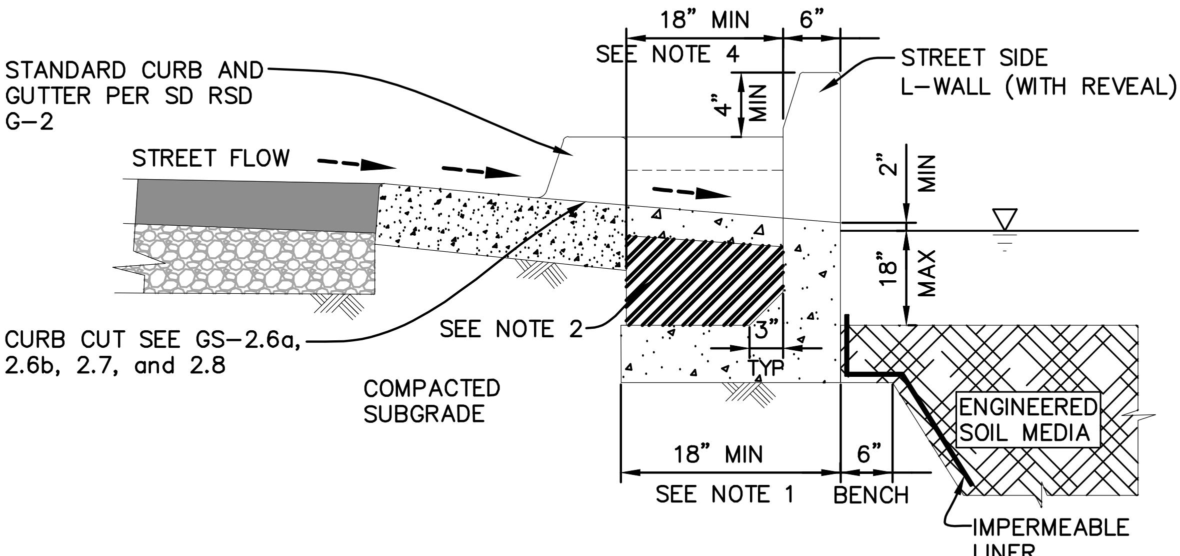


SECTION A-A

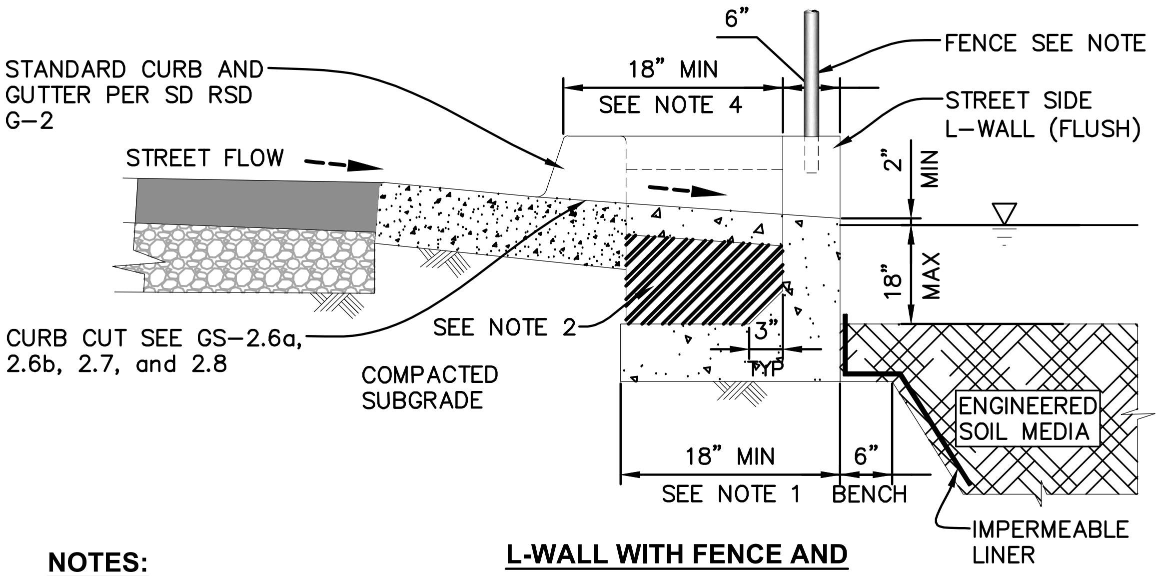
DRAWING NOT TO SCALE

REVISIONS	APPROVED	DATE

RAIN GARDEN PLANTER
ADJACENT TO ROADWAY-1
(NO STEP OUT ZONE)



L-WALL AND STEP OUT ZONE



L-WALL WITH FENCE AND STEP OUT ZONE

NOTES:

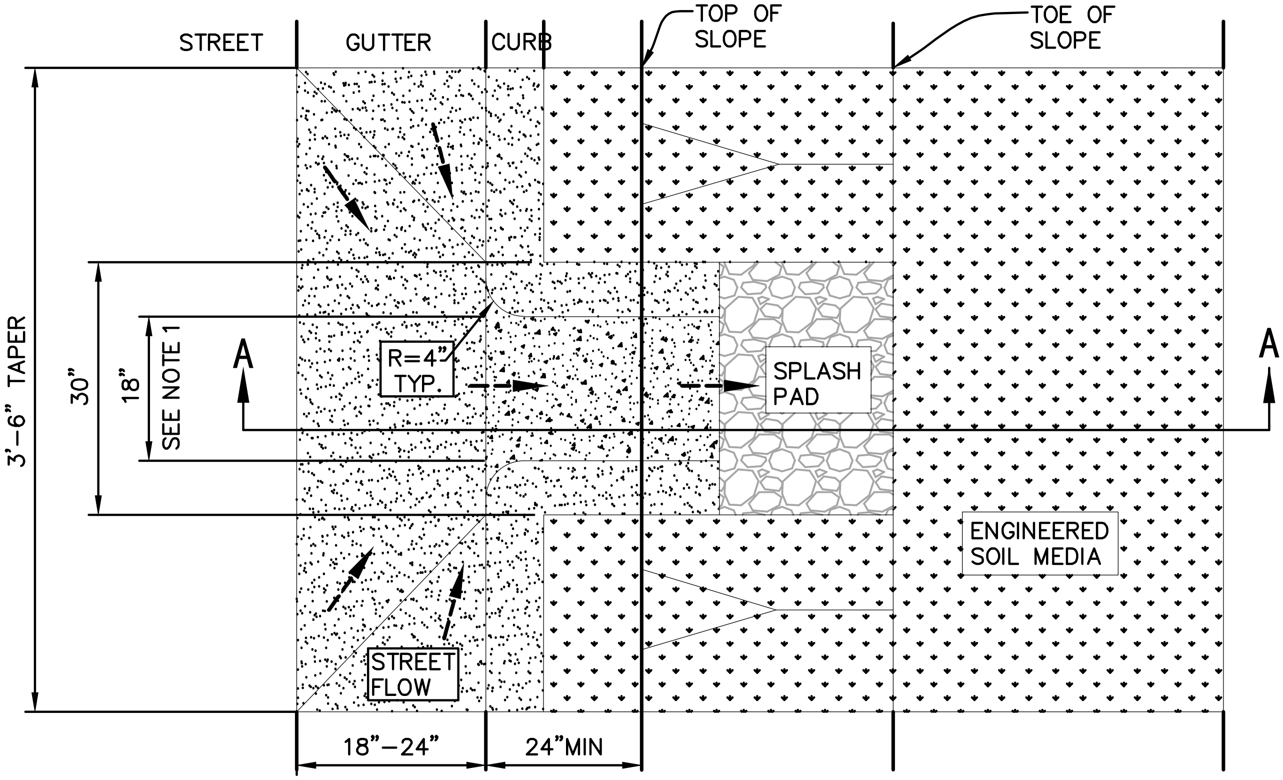
1. WHEN FLUSH WALLS ARE SELECTED, TYPICALLY IN HIGH-VOLUME PEDESTRIAN AREAS, PROVIDE RAILING OR FENCE PER PLAN.
2. 18" BASE WIDTH MAY BE REDUCED TO 15" IF CONCRETE IS USED IN THE HATCHED AREA.
3. FINISH ALL EXPOSED CONCRETE SURFACES.
4. STEP OUT ZONE INSTALLATION MAY BE STANDARD CONCRETE SIDEWALK OR OTHER PAVEMENT AS SHOWN ON PLANS.
5. EXPANSION JOINTS SHALL BE PLACED AT MAXIMUM 90 FOOT INTERVAL. CONTRACTION JOINTS SHALL BE FORMED OR SAWED AT 30 FOOT MAXIMUM INTERVALS BETWEEN EXPANSION JOINTS. WHERE ADJACENT TO CURB, SIDEWALK OR CONCRETE PAVEMENT, JOINTS SHALL LINE UP.

DRAWING NOT TO SCALE

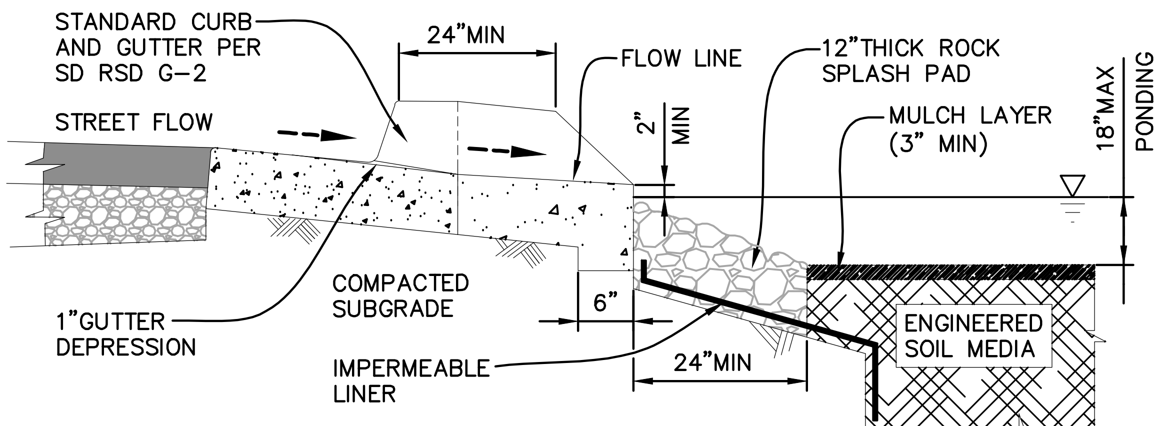
REVISIONS	APPROVED	DATE

STREET SIDE EDGE TREATMENT-2

(WITH STEP OUT ZONE)



CONCRETE FLUME WITH WINGWALLS AND ROCK SPLASH PAD



SECTION A-A

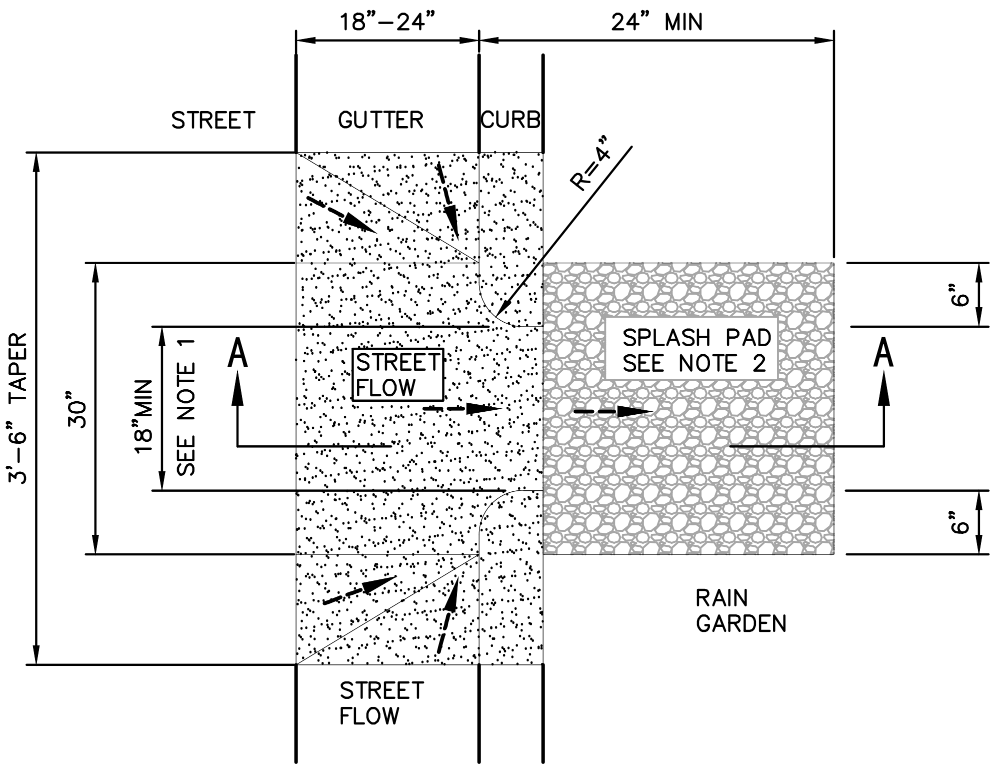
NOTES:

1. CURB OPENING DIMENSION SHOWN IS A MINIMUM. CURB CUT SHALL BE SIZED TO CONVEY 85TH PERCENTILE RAINFALL.
2. SEE DWG GS-2.8 FOR METAL TRENCH DRAIN COVER CURB CUT.
3. SIDE SLOPES STEEPER THAN 3:1 MAY BE ALLOWED WITH COUNTY APPROVAL.

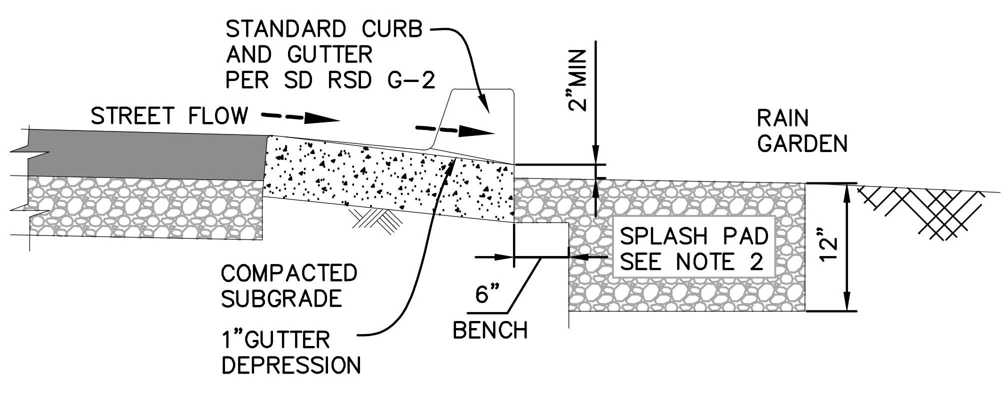
DRAWING NOT TO SCALE

REVISIONS	APPROVED	DATE

CURB CUT WITH SPLASH PAD - 1



CONCRETE FLUME WITH ROCK SPLASH PAD



NOTES:

SECTION A-A

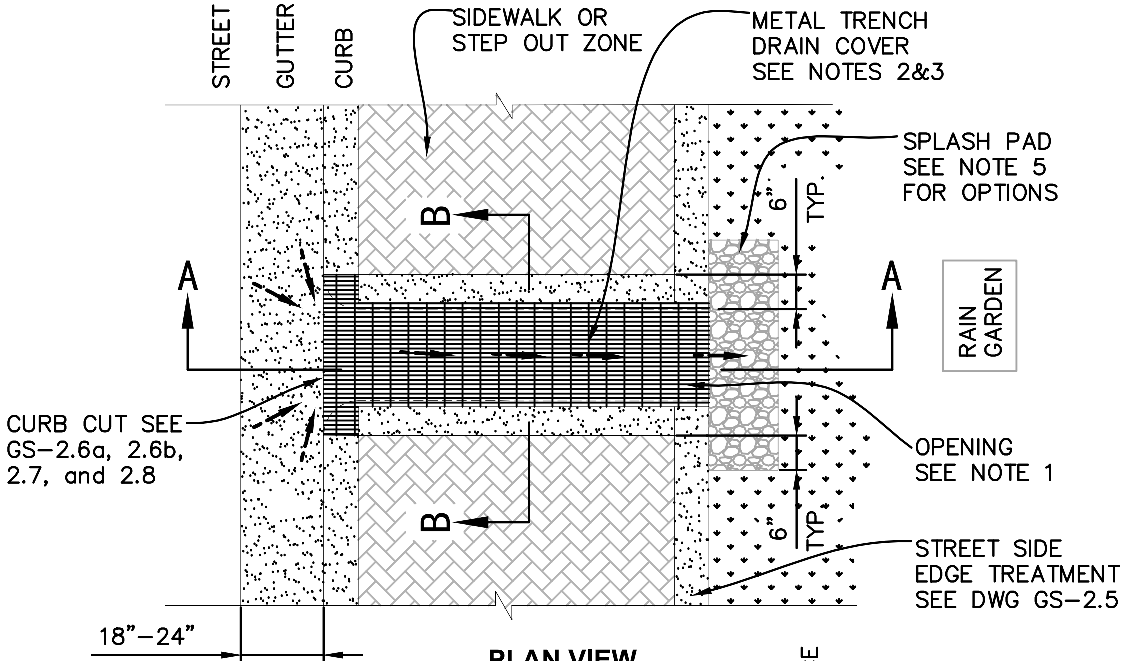
1. CURB OPENING DIMENSION SHOWN IS A MINIMUM. CURB CUT SHALL BE SIZED TO CONVEY 85TH PERCENTILE RAINFALL.

2. SPLASH PAD THICKNESS OPTIONS: 12" STONE #2, 4" CONCRETE SLAB, OR PAVER BLOCKS ON 6" AGGREGATE AASHTO #57.

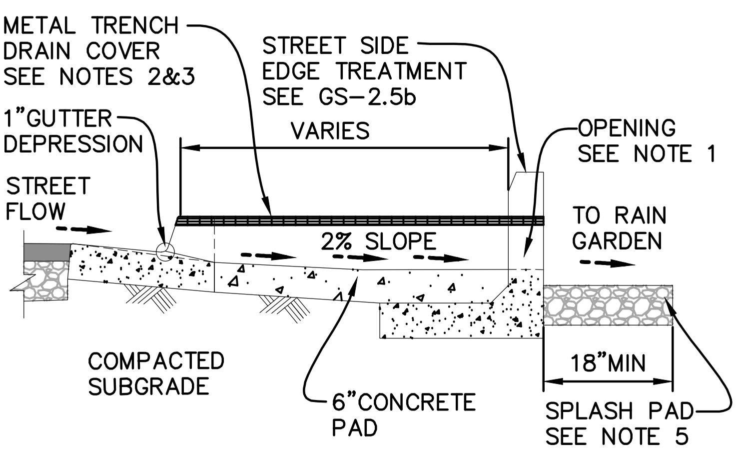
DRAWING NOT TO SCALE

CURB CUT WITH SPLASH PAD – 2

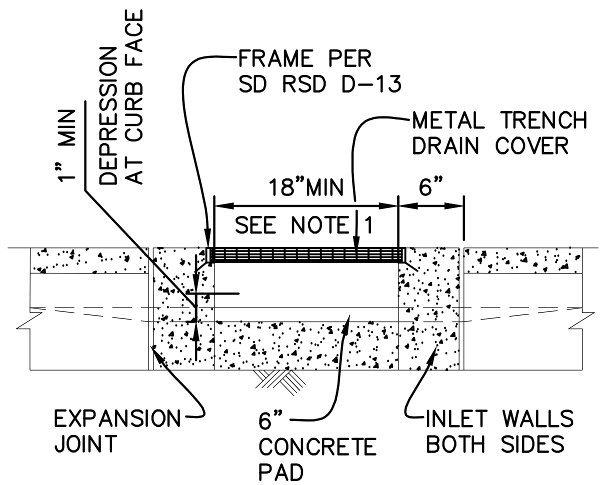
REVISIONS	APPROVED	DATE



PLAN VIEW



SECTION A-A



SECTION B-B

NOTES:

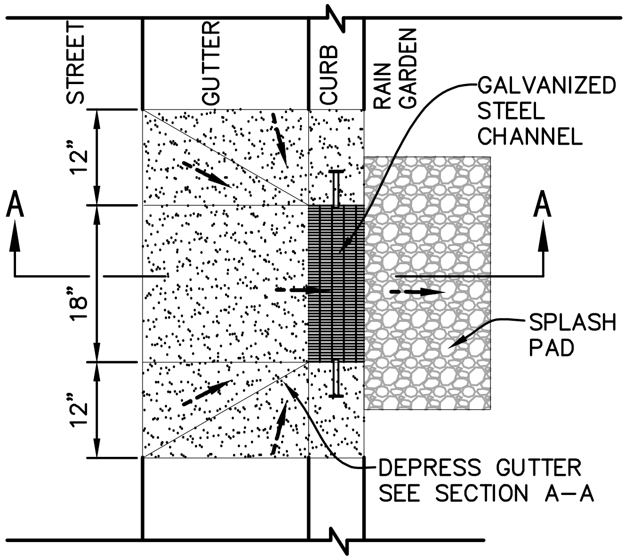
1. CURB OPENING DIMENSION SHOWN IS 18" MINIMUM. CURB CUT SHALL BE SIZED TO CONVEY 85TH PERCENTILE RAINFALL.
2. PROVIDE AND MAINTAIN A SAFE PEDESTRIAN WALKWAY ACCESS THAT COMPLIES WITH APPLICABLE ADA STANDARDS AND SD SUPPLEMENT TO GREEN BOOK SEC 7-10 "PUBLIC CONVENIENCE AND SAFETY".
3. REFER TO DESIGN PLANS FOR SIZE AND TYPE OF COVER.
4. METAL TRENCH DRAIN COVER TO BE BOLTED DOWN (THEFT PROTECTED) BUT REMOVABLE.
5. SPLASH PAD DEPTH OPTIONS: 12" STONE #2, 4" CONCRETE SLAB, OR PAVER BLOCKS ON 6" AGGREGATE AASHTO #57.

DRAWING NOT TO SCALE

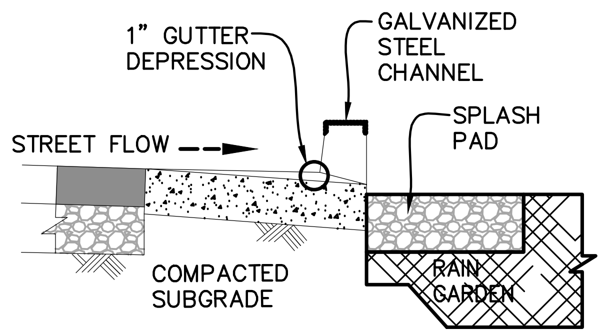
REVISIONS	APPROVED	DATE

CURB CUT METAL TRENCH COVER

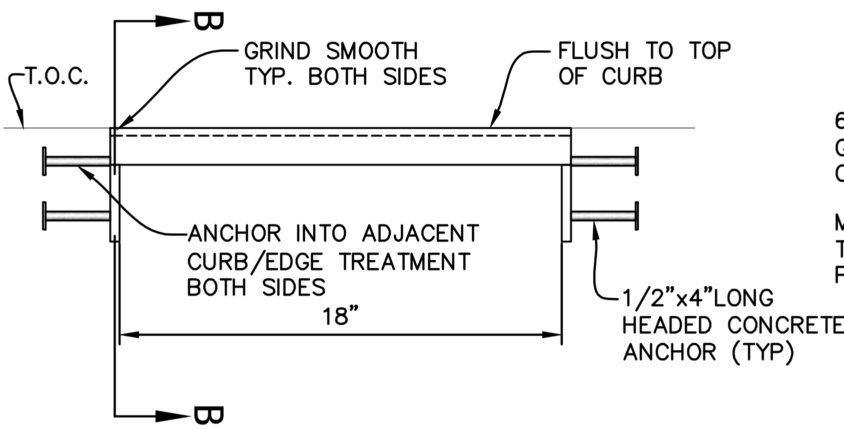
GS-2.7



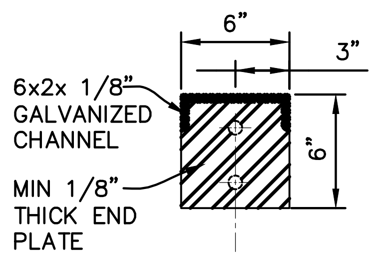
PLAN VIEW



SECTION A-A



ELEVATION



SECTION B-B

NOTES:

1. METAL COVER OVER CURB CUT MAY BE OMITTED WITH COUNTY APPROVAL.
2. ENTIRE ASSEMBLY SHALL BE HOT DIP GALVANIZED STEEL IN ACCORDANCE WITH ASTM A–123.
3. SHARP POINTS, CORNERS AND EDGES OF METAL COVER SHALL BE POLISHED SMOOTH.
4. SINGLE BEVEL GROOVE WELD.
5. DESIGN VERTICAL WHEEL LOAD IS 8.5 KIPS ONE HALF OF TANDEM AXLE WEIGHT SPECIFIED IN FHWA HOP–06–105).
6. ALTERNATE MATERIAL FOR ASSEMBLY MAY BE USED PER COUNTY APPROVAL.

DRAWING NOT TO SCALE

GALVANIZED STEEL CHANNEL OVER CURB CUT

REVISIONS	APPROVED	DATE

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

Property / Development Name:	Responsible Party Name and Phone Number:
Property Address of BMP:	Responsible Party Address:

INSPECTION AND MAINTENANCE CHECKLIST FOR FT-1 VEGETATED SWALE PAGE 1 of 4			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Accumulation of sediment, litter, or debris Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove and properly dispose of accumulated materials, without damage to the vegetation ☐ If accumulation of sediment, litter, or debris is observed blocking drainage, increase the frequency of inspection and maintenance* ☐ Other / Comments:		
Poor vegetation establishment Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		

*Increase inspection frequency to monthly plus after every 0.1-inch or larger storm event. If sediment, trash, or debris accumulation blocking drainage becomes a chronic issue, add pretreatment measures within the watershed to intercept the materials.

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR FT-1 VEGETATED SWALE PAGE 2 of 4			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Dead or diseased vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Remove dead or diseased vegetation, re-seed, re-plant, or re-establish vegetation per original plans ☐ Other / Comments:		
Overgrown vegetation Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Mow or trim as appropriate ☐ Other / Comments:		
Obstructed inlet or outlet structure Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Clear blockage ☐ Other / Comments:		
Damage to structural components such as weirs, inlet or outlet structures Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair or replace as applicable ☐ Other / Comments:		

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR FT-1 VEGETATED SWALE PAGE 3 of 4			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Erosion due to concentrated irrigation flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Repair/re-seed/re-plant eroded areas and adjust the irrigation system ☐ Other / Comments:		
Erosion due to concentrated storm water runoff flow Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ 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 ☐ Other / Comments:		

Date:	Inspector:	BMP ID No.:
Permit No.:	APN(s):	

INSPECTION AND MAINTENANCE CHECKLIST FOR FT-1 VEGETATED SWALE PAGE 4 of 4			
Threshold/Indicator	**Maintenance Recommendation**	**Date**	**Description of Maintenance Conducted**
Standing water in BMP following a storm event* Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ 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. ☐ Other / Comments:		
Presence of mosquitos/larvae For images of egg rafts, larva, pupa, and adult mosquitos, see http://www.mosquito.org/biology Maintenance Needed? ☐ YES ☐ NO ☐ N/A	☐ Apply corrective measures to remove standing water in BMP when standing water occurs for longer than 24-96 hours following a storm event.** ☐ Other / Comments:		

*Surface ponding longer than approximately 24 hours following a storm event may be detrimental to vegetation health, and surface ponding longer than approximately 96 hours following a storm event poses a risk of vector (mosquito) breeding. Poor drainage can result from deposited materials or overgrowth of vegetation within the swale blocking drainage conveyance or blocking an outlet structure, or localized erosion issues that cause channelization and prevent uniform flow throughout the swale. The specific cause of the drainage issue must be determined and corrected. 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.

**If mosquitos persist following corrective measures to remove standing water, the [City Engineer] shall be contacted to determine a solution. A different BMP type, or a Vector Management Plan prepared with concurrence from the County of San Diego Department of Environmental Health, may be required.

WASTE MANAGEMENT PLAN

FOR

Saturn Boulevard

San Diego, California

Project No. 566657

Prepared for:

City of San Diego Environmental Services Department
9601 Ridgehaven Court, Suite 320
San Diego, California 92123-1636

Prepared by:

Atlantis Group,
2488 Historic Decatur Rd Suite. No. 220
San Diego, California 92106
Telephone: 619-523-1930
Email: jtemple@atlantissd.com

February 12, 2018

TABLE OF CONTENTS

1.0 INTRODUCTION

The purpose of this Waste Management Plan (WMP) for the *Saturn Boulevard* project in the City of San Diego is to provide analysis of the solid waste impacts anticipated for the Project. The goal of this WMP is to identify sufficient measures to minimize potential impacts of the *Saturn Boulevard* project on solid waste services such that significant impacts are avoided. Two acceptable approaches to managing waste are to reduce the tons disposed to 60 tons or less, or to provide diversion of 75 percent or more, thus meeting the goal established by Assembly Bill 341.

The 3.63-acre Saturn Boulevard project site is located along Saturn Boulevard, between Rimbey Avenue and Leon Avenue, San Diego, California 92154. The project site is situated east of Saturn Blvd., south of Rimbey Ave. and north of Leon Ave. and is in the Otay-Nestor Community Planning Area. There are four existing single-family homes facing Saturn Boulevard which will remain, resulting in an unusual shape of the project site. The project site is currently developed with a utility shed and hay barn, a concrete silo, a wooden silo and a single-family residence. There are single-family homes to the west and south of the site, multifamily developments to the north and an elementary school directly to the east. The site is zoned AR-1-2 and is proposed to be rezoned to RS-1-7. The site is located within the Otay Mesa-Nestor Community Plan Area.

The proposed project involves demolition of all five existing structures (3,540 sf) and construction of 18 single family residences. The project would create a new single family residential subdivision, consisting of 18 lots for the single-family residences and 2 HOA lots (private driveway and infiltration basin). The proposed project would not exceed 30 feet high.

The proposed Saturn Boulevard project requires a Vesting Tentative Map, Coastal Development Permit, Planned Development Permit and a Rezone to RS-1-7.

Figure 1
Saturn Boulevard - Project Location Map and Aerial

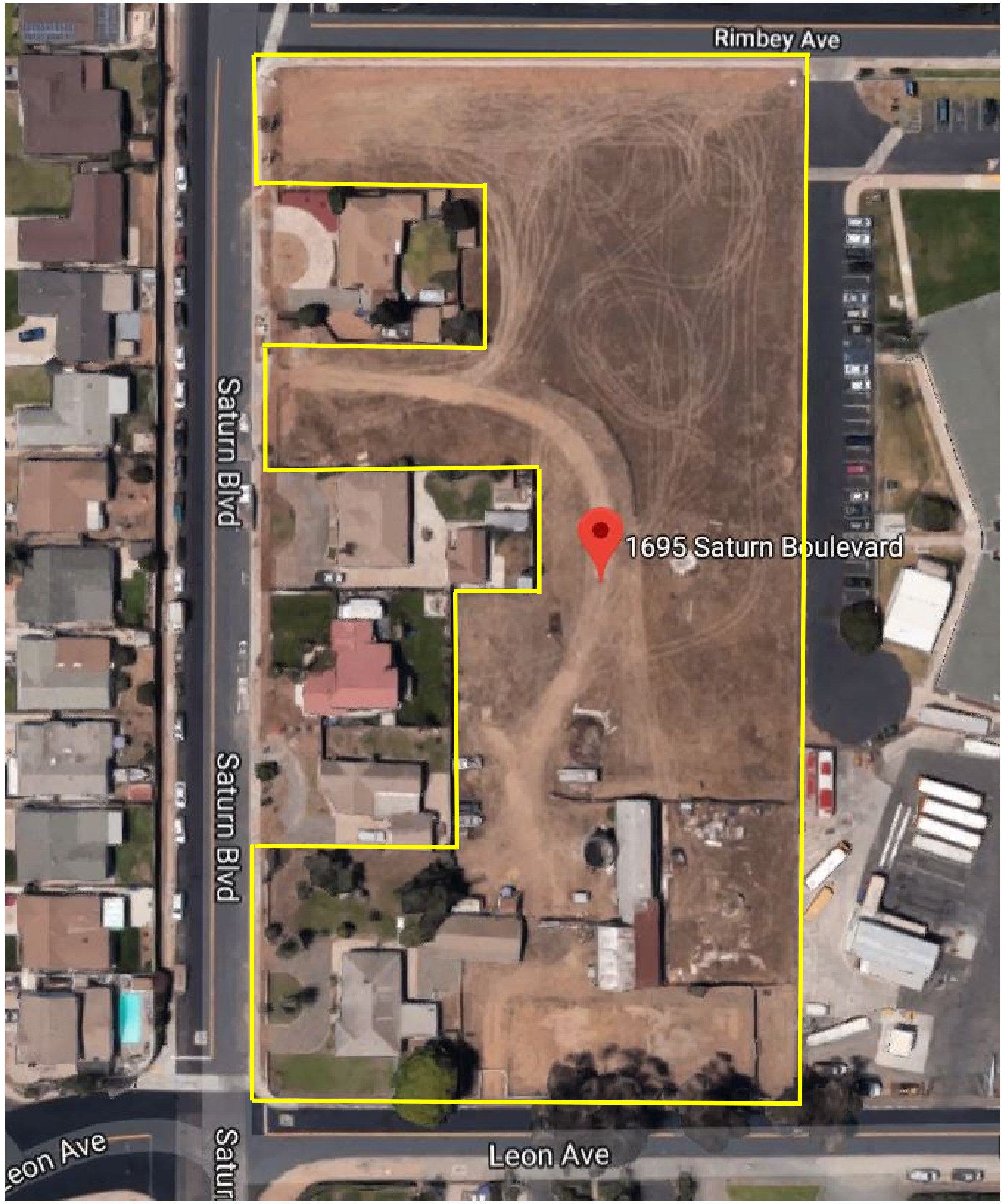
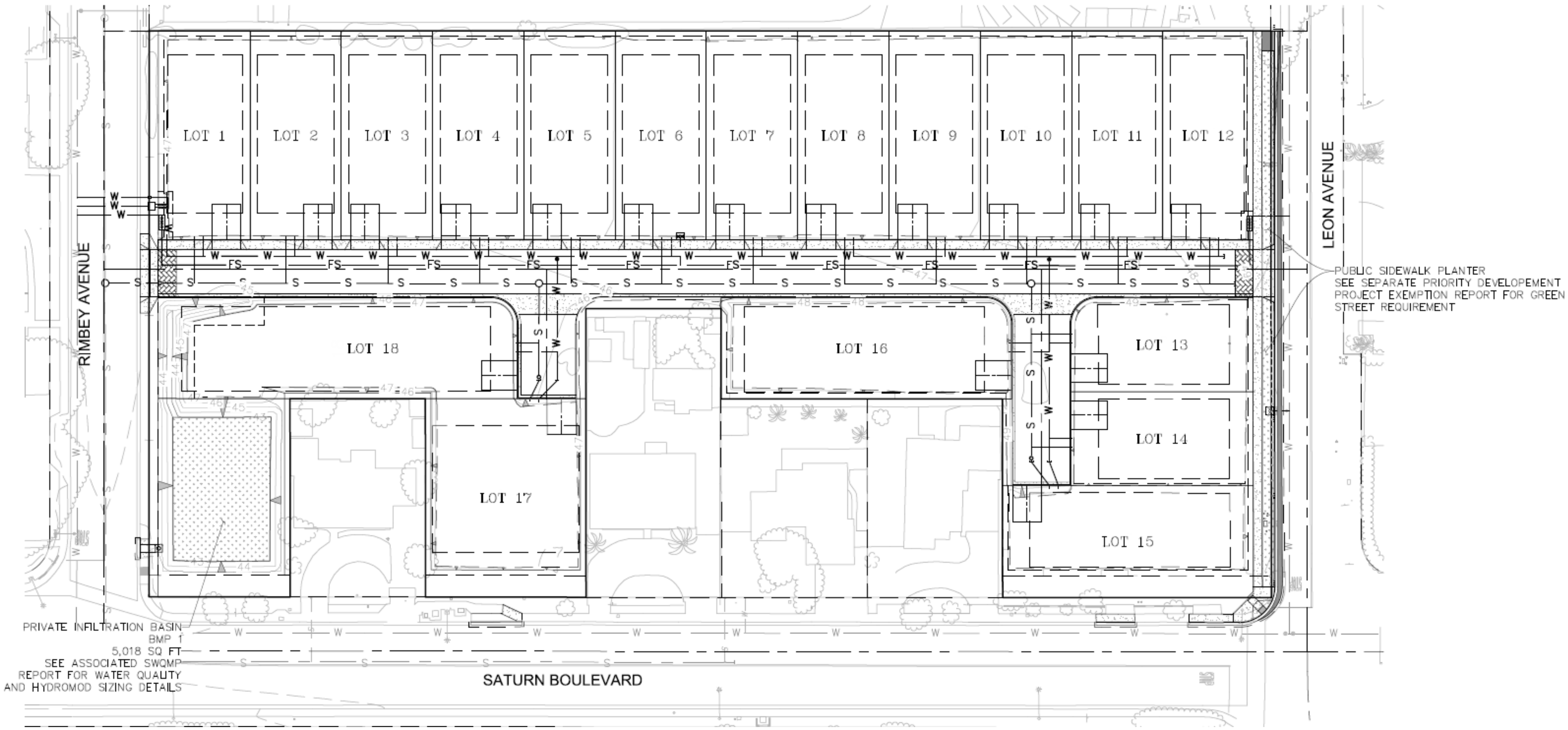


Figure 2
Saturn Boulevard Site Plan



This WMP consists of two sections corresponding to the implementation of site development: The *Construction Phase* (to include demolition) and the *Occupancy Phase* (post-construction). The WMP addresses the projected amount of waste that could be generated by the project based on current City generation rates and estimates; waste reduction goals; and recommended techniques to achieve the waste reduction goals, such as recycling. The project includes one month of demolition. Construction of the project (including demolition) is anticipated to take approximately 12 months. Construction is estimated to begin Spring 2019.

Waste disposal sites and recycling methods and opportunities may change from those available today; however, it is not expected that waste diversion and disposal sites listed in Table 3, *Minimum Exterior Refuse and Recyclable Material Storage Areas for Commercial Development,* would change by the time the project is anticipated to begin construction. This WMP includes the following general information known at the time the WMP was prepared:

- Projected waste generation calculations and identification of types of waste materials generated;
- Source separation techniques for waste generated;
- How materials will be re-used on-site;
- Name and location of current recycling, re-use, and landfill facilities where waste will be disposed of if not re-used on-site;
- A "buy recycled" program;
- Measures to be implemented directed at reducing construction debris;
- Method(s) for communicating waste reduction and recycling goals to subcontractors;
- A general timeline for construction and development; and
- A list of required progress and inspections by City staff, based on current ordinances.

2.0 BACKGROUND

In 1989, the California Legislature passed Assembly Bill (AB) 939: Integrated Waste Management Act, which mandated that all cities reduce waste disposed in landfills from generators within their borders by 50 percent by the year 2000. AB 939 required all local governments to prepare a Source Reduction and Recycling Element, which incorporates waste management policies and programs to achieve the mandated waste reduction. Since 1990, the City has diverted more than 50 percent of its generated waste stream from disposal. This bill specified that solid waste should be considered by the equation GENERATED = DISPOSED + DIVERTED. "Diverted" materials are put into a *hierarchy* in the law, as follows:

- First *source reduction*, such as using a reusable bag, making double-sided copies, or other measure that stops waste at the source.
- Secondary measures include *recycling* and *composting*. Because these measures often have transportation and processing impacts, they are considered less preferable than source reduction.
- In the Public Resources Code, various methods of *transformation* for energy production are limited to ten percent of the total waste reduction target.

In 2008, SB 1016 was chaptered. Known as the Solid Waste Disposal Measurement Act, SB 1016 maintained the 50 percent diversion requirement, but changed to a disposal-based measurement system, expressed as the 50 percent Equivalent Per Capita Disposal Target. This built upon AB 939 by implementing a simplified and timelier indicator of jurisdiction performance that focuses on reported disposal at Board-permitted disposal facilities. This established a goal of not recycling more, but disposing of less. AB 341: Jobs and Recycling, chaptered in 2011, was intended to create green jobs by expanding recycling to every multi-family dwelling and business. It charged CalRecycle with responsibility for ensuring that the State is diverting at least 75 percent of solid waste that is generated within the State by 2020. SB 1016 establishes that compliance with State law is measured by reducing the amount of waste material requiring disposal, and AB 341 increases the diversion target to 75 percent.

Additional local regulation pertaining to solid waste management includes the City of San Diego's Municipal Code Ch.14 Art. 2 Div. 8: §142.0810, §142.0820, Ch. 6 Art. 6 Div. 7; §66.0706, §66.0709, §66.0710; and Ch. 6 Art. 6 Div. 6; §66.0711, §66.0604, §66.0606. These statues designate refuse and recycling space allocation requirements for:

- on-site refuse and recyclable material storage requirements,
- diversion of construction and demolition debris regulations, and
- diversion of recyclable materials generated from residential facilities, businesses, commercial/institutional facilities, apartments, condominiums, and special events requiring a City permit.

The City of San Diego has established a threshold of 40,000 square feet of development as generating sufficient waste (60 tons) to have a potentially cumulatively significant impact on solid waste services. *Saturn Boulevard* as proposed exceeds this threshold. The purpose of this WMP is to identify measures that would be implemented to reduce this potential solid waste impacts such that significant impacts are avoided.

The City Recycling Ordinance is found in Municipal Code section 66.0701 et. seq. It requires the provision of recycling service for all single-family residences; and commercial facilities and multifamily residences with service for four cubic yards or more. In addition, the ordinance also requires development of educational materials to ensure occupants are informed about the City's ordinance and recycling services including information on types of recyclable materials accepted.

Construction and Demolition (C&D) Debris Diversion Deposit Program applies to all applicants for building, demolition, and removal permits. This ordinance requires that the applicant post a deposit (Table 1, *C&D Debris Deposit Table*). The deposit is not returned until the applicant demonstrates that a minimum amount of the material generated has been diverted from disposal in landfills. Mixed construction debris recycling facilities in San Diego are evaluated quarterly to determine how much of the throughput is recycled, and how much is a "residual" material requiring disposal. Facilities that accept mixed debris typically achieve a 68 percent or less diversion rate. Single materials recyclers, such as metal recyclers, often achieve a nearly 100 percent diversion rate. When comingled materials are sent to a mixed facility, the 75 percent diversion goal established by AB 341 will not be met. Depending on the project, to ensure that the overall diversion goal is attained, some materials must often be separated and trucked to facilities with higher diversion rates, such as aggregate and metal recyclers.

Table 1
C&D Debris Deposit Table

Building Category	Sq. Ft. Subject to Ordinance*	Deposit per Sq. Ft.	Range of Deposits
Residential New Construction	500-125,000 detached 500-100,000 attached	$0.40	$200-$50,000 $200-$40,000
Non-residential New Construction	1,000-25,000 commercial 1,000-75,000 industrial	$0.20	$200-$5,000 $200-$15,000
Non-residential Alterations	286 with no maximum	$0.70	$200 and up
Residential Demolition	286 with no maximum	$0.70	$200 and up
Non-residential Demolition	1,000 with no maximum	$0.20	$200 and up
Roof Tear-off	All projects	-	$200
Residential Alterations	500 and above	-	$1,000

* Projects under the minimum square footage subject to the ordinance are exempt from the C&D debris recycling deposit.

2.1 Exterior Refuse and Recyclable Material Storage Area Requirements

Saturn Boulevard would develop over an approximate 12-month period. Development is anticipated to begin Spring 2019. Because Saturn Boulevard includes residential development, exterior refuse and recyclable material storage areas will be provided in accordance with City regulations per Chapter 14, Article 2, Division 8: Refuse and Recyclable Material Storage Regulations, §142.0820.

2.2 Exterior Refuse and Recyclable Material Storage Areas for *Saturn Boulevard*

Saturn Boulevard would develop 18 single family residences averaging approximately 2,600 square feet per residence. Table 2, *Minimum Exterior and Recyclable Material Storage Areas for Residential Development*, shows the required amount of refuse and recyclable storage areas for the project's commercial retail element. As shown in Table 2, the project would be required to provide 96 square feet of exterior refuse and recyclable material storage area.

Table 2
Minimum Exterior Refuse and Recyclable Material Storage Areas for Residential Development

Number of Dwelling Units Per Development	Minimum Refuse Storage Area Per Development (Square Feet)	Minimum *Recyclable Material* Storage Area Per Development (Square Feet)	Total Minimum Storage Area Per Development (Square Feet)
2-6	12	12	24
7-15	24	24	48
16-25	48	48	96
26-50	96	96	192
51-75	144	144	288
76-100	192	192	384
101-125	240	240	480
126-150	288	288	576
151-175	336	336	672
176-200	384	384	768
201+	384 plus 48 square feet for every 25 dwelling units above 201	384 plus 48 square feet for every 25 dwelling units above 201	768 plus 96 square feet for every 25 dwelling units above 201

(Added 12-9-1997 by O-18451 N.S.; effective 1-1-2000.)
(Amended 3-1-2006 by O-19468 N.S.; effective 4-1-2006.)
(Amended 11-13-2008 by O-19799 N.S; effective 12-13-2008.)

3.0 EXISTING CONDITIONS

The *Saturn Boulevard* project encompasses approximately 3.63-acres of a previously developed site. The project site is bordered by Godfrey G. Berry elementary school to the east, Saturn Boulevard to the west, Rimbey Ave to the north and Leon Ave to the south. The project site is currently developed with a utility shed and hay barn, a concrete silo, a wooden silo and a single-family residence. There are single-family homes to the west and south of the site, multifamily developments to the north and an elementary school directly to the east. The site is zoned AR-1-2 and is proposed to be rezoned to RS-1-7. The site is located within the Otay Mesa-Nestor Community Plan Area.

4.0 PROPOSED CONDITIONS

The proposed project involves demolition of all five existing structures (3,540 sf) and construction of 18 single family residences. The project would create a new single family residential subdivision, consisting of 18 lots for the single-family residences and 2 HOA lots (private driveway and infiltration basin). The proposed project would not exceed 30 feet high.

The proposed Saturn Boulevard project requires a vesting tentative map, Coastal Development Permit, Planned Development permit and a Rezone to RS-1-7. Construction will be completed over a 12-month period with construction anticipated to begin in Spring 2019. Construction practices will comply with local, State, and Federal regulations regarding handling of building materials to ensure waste minimization requirements are met.

5.0 CONSTRUCTION WASTE

Construction activities would generate packaging materials and unpainted wood, including wood pallets, and other miscellaneous debris. Construction debris would be separated on-site into material-specific containers to facilitate reuse and recycling and to increase the efficiency of waste reclamation and/or would be collected by a contracted waste hauler and separated at the facility. Source separation of materials at the construction site is essential to (1) ensure appropriate waste diversion rate, (2) minimize costs associated with transportation and disposal, and (3) facilitate compliance with the C&D ordinance. The types of construction waste anticipated to be generated include:

- Asphalt and Concrete
- Brick/Masonry/Tile
- Cardboard
- Carpet, Padding/Foam
- Drywall
- Landscape Debris
- Mixed C&D Debris
- Roofing Materials
- Scrap Metal
- Unpainted Wood and Pallets
- Garbage/Trash

Materials to be recycled would be redirected to appropriate recipients selected from ESD's directory of facilities that recycle construction materials, scrap metal, and yard waste.

5.1 Recycled Construction Materials

Saturn Boulevard will implement a target of 20 percent recycled material.

5.2 Managing Construction Material

Demolition would occur over a period of approximately one month and construction would occur over a period of approximately 12 months. ESD staff would be present for an early pre-construction meeting to evaluate waste segregation, signage, and salvage.

The project site is the location of existing commercial development. The demolition phase will include the deconstruction/demolition and removal of the existing debris. Approximately 5.31 tons of waste is expected to be generated during demolition. Approximately 4.3 tons of material would be recycled, to include landscaping, concrete, asphalt, and curb and gutter. Approximately 1 ton of debris would be disposed in a landfill, to include non-useable asphaltic paving that becomes contaminated with the underlying subgrade soils. Table 3, *Saturn Boulevard Waste Generation – Demolition*, summarizes the type and amount of demolition materials, as well as diversion/disposal.

Table 3
Saturn Boulevard Waste Generation – Demolition

Material Type	Estimated Waste Quantity (tons)	Handling	Estimated Diversion (tons)	Estimated Disposal (tons)
DEMOLITION WASTE				
Asphalt and Concrete, Curb/Gutter	2.98	**Hanson Aggregates** 9229 Harris Plant Road San Diego, CA 92126 (100% diversion)	2.98	0
Landscape Materials	.22	**Miramar Greenery** 5180 Convoy Street San Diego, CA 92111 (100% diversion)	.22	0
Construction and Demolition: Drywall, Wood, Metal, etc.	1.55	**EDCO Recovery & Transfer** 3660 Dalbergia St, San Diego, CA 92113 (70% diversion)	1.05	.5
Garbage/Trash	.55	**Miramar Landfill** 5180 Convoy Street San Diego, CA 92111 (0% diversion)	.05	.5
TOTAL	5.3		4.3	1

In accordance with State diversion targets, a minimum of 75 percent of construction materials will be recycled. Materials to be recycled would be redirected to appropriate recipients selected from ESD's directory of facilities that recycle demolition materials, scrap metal, and yard waste.

To facilitate management of construction materials, the developer shall identify one person or agency connected with the proposed development to act as Solid Waste Management Coordinator, whose responsibility it becomes to work with all contractors and subcontractors to ensure material separation and coordinate proper disposal and diversion of waste generated. The Solid Waste Management Coordinator will help to ensure all diversion practices outlined in this Waste Management Plan are upheld and communicate goals to all contractors involved efficiently.

The responsibilities of the Solid Waste Management Coordinator, include, but are not limited to, the following:

- Review the Solid Waste Management Plan including responsibilities of Solid Waste Management Coordinator.
- Review and update procedures as needed for material separation and verify availability of containers and bins needed to avoid delays.
- Review and update procedures for periodic solid waste collection and transportation to recycling and disposing facilities.
- The authority to issue stop work orders if proper procedures are not being allowed.

The contractors will perform daily inspections of the construction site to ensure compliance with the requirements of the Waste Management Plan and all other applicable laws and ordinances and report directly to Solid Waste Management Coordinator. Daily inspections will include verifying the availability and number of dumpsters based on amount of debris being generated, correct labeling of dumpsters, proper sorting and segregation materials, and salvaging of excess materials. Additionally, the following apply:

- Solid waste management coordinator will be responsible for educating contractors and subcontractors regarding waste management plan requirements and ensuring that contractors and subcontractors carry out the measures described in the WMP.
- Solid waste management coordinator will ensure ESD attendance at a Precon and assure compliance with segregation requirements, and verification of recycled content in base materials.
- Recycling areas will be clearly identified with large signs, approved by ESD, and sufficient amounts of material-specific bins will be provided for necessary segregation.
- Recycling bins will be placed in areas that are readily accessible to contractors/subcontractors and in areas that will minimize misuse or contamination by employees and the public.
- Solid waste management coordinator will be responsible for ensuring that contamination rates in bins remain below 5 percent by weight of the bin.

Table 4, *Saturn Boulevard Waste Generation – Construction*, is included below to summarize the types of waste generated, the approximately amount of each waste type diverted, and the approximate overall amount remaining to be disposed of in landfills. Construction waste processing facilities that may be used for any of the construction phases include but are not limited to those facilities listed in Table 3. Because certified diversion rates and authorized facilities are updated quarterly and the decision on which facility will be contracted for waste hauling will be made at the time of construction based on market conditions and the facility's certified rate, the developer reserves the right to select any authorized facility as long as the facility is City-certified to meet minimum diversion requirements.

Table 4
Dolphin Motel Waste Generation – Construction

Material Type	Estimated Waste Quantity (tons)	Handling	Estimated Diversion (tons)	Estimated Disposal (tons)
		CONSTRUCTION WASTE		
Asphalt and Concrete	16.2	**Hanson Aggregates** 9229 Harris Plant Road San Diego, CA 92126 (100% diversion)	14.256	1.944
Brick/Masonry/ Tile	7.346	**Vulcan Carroll Canyon Landfill and Recycle Site** 10051 Black Mountain Road San Diego, CA 92126 (100% diversion)	7.346	--
Cardboard	6.48	**Allan Company** 6733 Consolidated Way San Diego, CA 92121 (100% diversion)	5.832	.648
Carpet, Padding/Foam	.648	**DFS Flooring** 10178 Willow Creek Road San Diego, CA 92131 (100% diversion)	.648	--
Drywall	4.536	**EDCO Station Transfer and Buy Back Center** 8184 Commercial Street La Mesa, CA 91942 (70% diversion)	3.24	1.296
Landscape Debris	7.128	**Miramar Greenery** 5180 Convoy Street San Diego, CA 92111 (100% diversion)	7.128	–
Mixed C&D Debris	2.592	**Otay C&D/Inert Debris Processing Facility** 1700 Maxwell Road Chula Vista, CA 91913 (76% diversion)	1.944	.648
Roofing Materials	1.296	**LEED Recycling** 8725 Miramar Place San Diego, CA 92121 (100% diversion)	.648	.648
Scrap Metal	1.944	**Allan Company** 6733 Consolidated Way San Diego, CA 92121 (100% diversion)	1.944	--
Unpainted Wood & Pallets	15.55	**Miramar Greenery** 5180 Convoy Street San Diego, CA 92111 (100% diversion)	15.55	--
Garbage/Trash	6.48	**Miramar Landfill** 5180 Convoy Street San Diego, CA 92111 (0% diversion)	0	6.48
TOTAL	**70.2**		**58.53**	**11.67**

Construction debris will be separated onsite into material-specific containers, corresponding to the materials types in Table 4, to facilitate reuse and recycling and to increase the efficiency of waste reclamation. Saturn Boulevard will implement a target of 20 percent recycled material and 75 percent for landfill diversion. As shown in Table 5, the applicant has the goal of 83 percent diversion rate of the construction materials generated by the project are expected to be diverted from landfills.

6.0 OCCUPANCY PHASE

While the construction phase for Saturn Boulevard occurs as a one-time waste generation event as construction of the project proceeds, tenant/owner occupancy requires an on-going plan to manage waste disposal to meet the waste reduction goals established by the City and State.

6.1 Solid Waste Recycling

The following table expresses the anticipated refuse and recyclable storage requirements based on 142.08C of the City of San Diego Municipal Code.

Table 5
Minimum Exterior and Recyclable Material Storage Areas for Saturn Boulevard

Land Use	Gross Floor Area/Units	Minimum Refuse Storage Area (square feet)	Minimum Recyclable Material Storage Area (square feet)	Total Minimum Storage Area (square feet)
Residential	46,800	48	48	96
TOTAL	46,800 sq ft	48	48	96

As shown in Table 6, *Estimated Solid Waste Generation from Saturn Boulevard*, during occupancy, the expected generated waste per year from Saturn Boulevard when fully occupied would be approximately 70 tons.

Table 6
Estimated Solid Waste Generation from Saturn Boulevard – Occupancy Phase

Use	Intensity	Waste Generation Rate	Estimated Waste Generated (tons/year)
Residential	46,800 sq ft	0.0015 tons/year/sq ft	70
		TOTAL	70

On-site recycling service bins shall be provided at the *Saturn Boulevard* and the on-site operator shall participate in a recycling program by separating recyclable materials from other solid waste and depositing the recyclable materials in the recycling container provided for the occupants. Recycling services are required by Section 66.0707 of the City of San Diego Land Development Code. Based on current requirements, these services shall include the following:

- Collection of recyclable materials as frequently as necessary to meet demand;
- Collection of plastic bottles and jars, paper, newspaper, metal containers, cardboard, and glass containers;
- Collection of other recyclable materials for which markets exist, such as scrap metal, wood pallets
- Collection of food waste for recycling by composting, where available (prior to issuance of building and occupancy permits, the project proponent will meet with representatives from ESD to ensure that their educational materials and haulers can comply with the requirements for this service);

- Use of recycling receptacles or containers which comply with the standards in the Container and Signage Guidelines established by the City of San Diego Environmental Services Department;
- Designated recycling collection and storage areas;and signage on all recycling receptacles, containers, chutes, and/or enclosures which complies with the standards described in the Container and Signage Guidelines established by the City of San Diego Environmental Services Department

As required by Section 66.0707 of the City of San Diego Land Development Code, the building management or other designated personnel shall ensure that occupants are educated about the recycling services as follows:

- Information, including the types of recyclable materials accepted, the location of recycling containers, and the occupant's responsibility to recycle shall be distributed annually;
- All new occupants shall be given information and instructions upon occupancy; and
- All occupants shall be given information and instructions upon any change in recycling service to the commercial facility.

6.2 Landscaping and Green Waste Recycling

Plant material selection will be guided by the macro-and micro-climate characteristics of the project site and surrounding region to encourage long-term sustainability without the excessive use of water pesticides and fertilizers. Irrigation of these areas, where practical, will utilize reclaimed water applied via low precipitation rate spray heads, drip emitters, or other highly efficient systems. Landscape maintenance would include the collection of green waste and disposal of green waste at recycling centers that accept green waste. This will help further reduce the waste generated by developments within *the Saturn Boulevard* project during the occupancy.

7.0 CONCLUSION

The City of San Diego Development Services Department is requiring that this WMP be prepared and submitted to the City of San Diego's ESD. Since the project is in the design phase, this is only a preliminary plan, which specifies the intent to meet the requirements of PRC 939 and City ordinances. This WMP will be implemented to the fullest degree of accuracy and efficiency. Additionally, the project will be required to adhere to City ordinances, including the *Construction and Demolition Debris Diversion Deposit Program*, the City's *Recycling Ordinance*, and the *Refuse and Recyclable Materials Storages Regulations*. The WMP plan for Saturn Boulevard is designed to implement and adhere to all city ordnance and regulations with regards to waste management. The measures in the WMP would ensure that significant impacts relative to solid waste are avoided.

Prior to the issuance of any grading or construction permits, the Solid Waste Coordinator will ensure ESD's attendance at a precon. The Solid Waste Coordinator will ensure that 1) the proposed approach to contractor education is approved, 2) the written specifications for base materials, concrete pavers, decomposed granite, and mulch, is approved, and 3) that the ESD inspector approves the separate waste containers, signage, and hauling contract(s) for the following materials:

- Asphalt/concrete
- Brick/masonry/tile
- Cardboard
- Carpet/padding/foam
- Drywall
- Landscape debris
- Mixed C&D debris
- Scrap metal
- UNTREATED woodwaste
- Refuse

The project would be designed to achieve 75+ percent of construction waste to be source reduced and/or recycled. While diversion activities during occupancy will achieve only 40 percent diversion and will not achieve the State target of 75 percent, the project incorporates several measures above and beyond the requirements of local ordinance.

- First, the project exceeds ordinance requirements and even the State waste reduction target during construction.
- Second, the project includes landscaping that will reduce yardwaste, and will provide transportation to a composting facility for the yard waste that is produced. The project proponent will ensure that ESD reviews the landscaping plans and hauling contract for the facility to verify that waste reduction goals are met.
- Third, the project would include Cal-Green measures to reduce waste, including separate Rubbish and Recycle bins.

The project would target 20 percent of solid waste to be recycled material and 75 percent for landfill diversion.

These measures ensure that the waste generated by the project will be properly managed and that solid waste services will not be impacted.

The following measures apply to the project to reduce cumulative impacts on solid waste to below a level of significance:

1.0 Prior to Permit Issuance or Bid opening/Bid award

A. LDR Plan check

1. Prior to the issuance of any construction permit, including but is not limited to, demolition, grading, building or any other construction permit, the Assistant Deputy Director (ADD) Environmental Designee shall verify that the all the requirements of the Refuse & Recyclable Materials Storage Regulations and all of the requirements of the waste management plan are shown and noted on the appropriate construction documents. All requirements, notes and graphics shall be in substantial conformance with the conditions and exhibits of the associated discretionary approval.

   The construction documents shall include a waste management plan.

Notification shall be sent to:

MMC Environmental Review Specialist
Development Service Department
9601 Ridgehaven Court
Ste. 220, MS 1102 B
San Diego, California 92123 1636
(619) 980 7122

Environmental Services Department (ESD)
9601 Ridgehaven Court
Ste. 210, MS 1102 A
San Diego, California 92123 1636
(858) 573-1236

II. Prior to Start of Construction

A. Grading and Building Permit - Prior to issuance of any grading or building permit, the permittee shall be responsible to arrange a preconstruction meeting to coordinate the implementation of the WMP. The Precon Meeting that shall include: the Construction Manager, Building/Grading Contractor; MMC; and ESD and the Building Inspector and/or the RE (whichever is applicable) to verify that implementation of the waste management plan shall be performed in compliance with the plan approved by LDR and the San Diego ESD, to ensure that impacts to solid waste facilities are below a level of significance.

1. At the Precon Meeting, the Permittee shall submit reduced copies (11" x 17") of the approved waste management plan, the RE, BI, MMC, and ESD.
2. Prior to the start of construction, the Permittee/Construction Manager shall submit a construction schedule to the RE, BI, MMC, and ESD.

III. During Construction

The Permittee/Construction Manager shall call for inspections by the RE/BI and both MMC and ESD, who will periodically visit the demolition/construction site to verify implementation of the waste management plan. The Consultant Site Visit Record (CSVR) shall be used to document the Daily Waste Management Activity/progress.

IV. Post Construction

A. For any demolition or construction permit, a final results report shall be submitted to both MMC and ESD for review and approval to the satisfaction of the City. MMC will coordinate the approval with ESD and issue the approval notification. ESD will review/approve City Recycling Ordinance-required educational materials prior to occupancy.

HYDROMODIFICATION SCREENING
FOR
1695 SATURN BOULEVARD

May 13, 2016

Wayne W. Chang, MS, PE 46548

ChangConsultants
Civil Engineering ◦ Hydrology ◦ Hydraulics ◦ Sedimentation

P.O. Box 9496
Rancho Santa Fe, CA 92067
(858) 692-0760

FOR REVIEW ONLY

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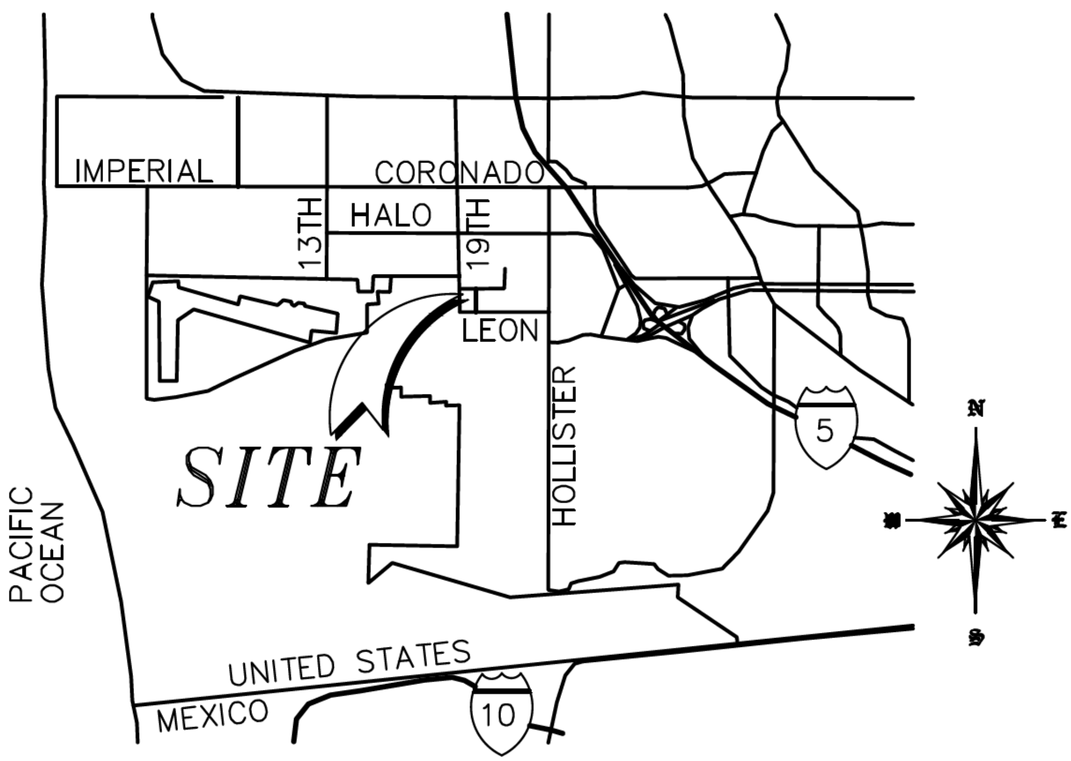
APPENDICES

INTRODUCTION

The City of San Diego's January 2016 Edition, *Storm Water Standards,* outline low flow thresholds for hydromodification analyses. The thresholds are based on a percentage of the pre-project 2-year flow (Q_2), i.e., $0.1Q_2$ (low flow threshold and high susceptibility to erosion), $0.3Q_2$ (medium flow threshold and medium susceptibility to erosion), or $0.5Q_2$ (high flow threshold and low susceptibility to erosion). A flow threshold of $0.1Q_2$ represents a natural downstream receiving conveyance system with a high susceptibility to bed and/or bank erosion. This is the default value used for hydromodification analyses and will result in the most conservative (largest) on-site facility sizing. A flow threshold of $0.3Q_2$ or $0.5Q_2$ represents downstream receiving conveyance systems with a medium or low susceptibility to erosion, respectively. In order to qualify for a medium or low erosion susceptibility rating, a project must perform a channel screening analysis based on the March 2010, *Hydromodification Screening Tools: Field Manual for Assessing Channel Susceptibility,* developed by the Southern California Coastal Water Research Project (SCCWRP). The SCCWRP results are compared with the critical shear stress calculator results from the County of San Diego's Critical Flow Calculator spreadsheet to establish the appropriate erosion susceptibility threshold of low, medium, or high.



Vicinity Map

This report provides a hydromodification screening analysis for the single-family residential subdivision proposed at 1695 Saturn Boulevard. The 3.63 acre site is located on the east side of Saturn Boulevard between Rimbey Avenue to the north and Leon Avenue to the south in the city of San Diego (see the Vicinity Map). The site currently contains a single-family residence and adjacent structures at the southwest corner that will be demolished prior to the new construction.

The site is surrounded on the north, west, and south by residential development and on the west by the Berry Elementary School. The proposed project will be developed with 18 single-family residential lots ranging from 5,500 to nearly 9,800 square feet, three HOA lots, and private driveways. The project is being designed by Kettler Leweck Engineering.

Under pre-project conditions, storm runoff within the project footprint primarily sheet flows northerly along the gently sloping ground surface. This runoff enters the adjacent streets and is conveyed away from the site northerly within Saturn Boulevard. The runoff continues approximately 1,000 feet north to an existing curb inlet on the east side of Saturn Boulevard. The curb inlet is connected to an underground storm drain that continues east, then north and ultimately outlets into Nestor Creek just south of Coronado Avenue over 3,100 feet northeast of the site. Nestor Creek is a concrete-lined channel at the storm drain outlet, but becomes a natural channel on the north side of Coronado Avenue approximately 200 feet downstream of the outlet (see the Flow Direction Exhibit in Appendix A for the above described flow paths). Nestor Creek continues northwest and eventually confluences with the Otay River, which drains into the southerly end of San Diego Bay. There is a small area at the southwest corner of the site (less than half an acre) that flows onto the adjacent streets and then away from the site in a westerly direction along Leon Avenue.

Under post-project conditions, the project's storm runoff will be collected by proposed on-site drainage facilities and treated by two biofiltration basins. The on-site facilities will convey the runoff to a proposed off-site storm drain that will be constructed north along Saturn Boulevard. The proposed off-site storm drain will connect to the existing storm drain north of the site. From here, the runoff will be conveyed to Nestor Creek similar to existing conditions.

The SCCWRP screening tool requires both office and field work to establish the vertical and lateral susceptibility of a natural downstream receiving channel to erosion. The vertical and lateral assessments are performed independently of each other although the lateral results can be affected by the vertical rating. A screening analysis was performed to assess the low flow threshold for the project's point of compliance, which is the first location downstream of the site containing a natural drainage course with the potential for erosion. In this case, the point of compliance is at the natural Nestor Creek channel beginning on the north side of Coronado Avenue (see the Study Area Exhibit in Appendix A).

The initial step in performing the SCCWRP screening analysis is to establish the domain of analysis and the study reaches within the domain. This is followed by office and field components of the screening tool along with the associated analyses and results. The following sections cover these procedures in sequence.

DOMAIN OF ANALYSIS

SCCWRP defines an upstream and downstream domain of analysis, which establish the study limits. The County of San Diego's HMP specifies the downstream domain of analysis based on the SCCWRP criteria. The HMP indicates that the downstream domain is the first point where one of these is reached:

- at least one reach downstream of the first grade control point (or to the second grade control)
- tidal backwater/lentic waterbody
- equal order tributary
- accumulation of 50 percent drainage area for stream systems or 100 percent drainage area for urban conveyance systems (storm drains, hardened channels, etc.)

The upstream limit is defined as:

- proceed upstream for 20 channel top widths or to the first grade control point, whichever comes first. Identify hard points that can check headward migration and evidence of active headcutting.

SCCWRP defines the maximum spatial unit, or reach (a reach is circa 20 channel widths), for assigning a susceptibility rating within the domain of analysis to be 200 meters (656 feet). If the domain of analysis is greater than 200 meters, the study area should be subdivided into smaller reaches of less than 200 meters for analysis. Most of the units in the HMP's SCCWRP analysis are metric. Metric units are used in this report only where given so in the HMP. Otherwise English units are used.

Downstream Domain of Analysis

The downstream domain of analysis location for the study area has been determined by assessing and comparing the four bullet items above. As discussed in the Introduction, the project runoff will be conveyed by proposed and existing storm drain systems to a concrete-lined segment of the Nestor Creek channel over 3,100 feet northeast of the site. The concrete-lined channel ends and Nestor Creek becomes a natural drainage course on the north side of Coronado Avenue. The location where Nestor Creek becomes natural is the point of compliance (POC) for the project. The downstream domain of analysis is selected below this POC.

Per the first bullet item, the first permanent grade control below the POC was located. A site inspection and review of Google Earth revealed that the first permanent grade control below the POC occurs at the Cerrissa Court culvert crossing of Nestor Creek (see Figure 9). The reinforced concrete box culverts under Cerrissa Court are considered permanent facilities and will maintain the grade of the upstream channel bed. This permanent grade control is approximately 1,893 feet downstream of the POC.

The second bullet item is the tidal backwater or lentic (standing or still water such as ponds, pools, marshes, lakes, etc.) waterbody location. The nearest such waterbody is San Diego Bay. San Diego Bay is downstream of the first permanent grade control, so the second bullet item will not govern over the first bullet item in establishing the downstream domain of analysis location.

The final two bullet items are related to the tributary drainage area. As mentioned in the Introduction, Nestor Creek confluences with the Otay River below the POC. According to the Federal Emergency Management Agency's May 16, 2012, *Flood Insurance Study, San Diego*

County, California (FIS), the Nestor Creek drainage area at Palm Avenue, which is near the confluence with the Otay River, covers 2.75 square miles (see the FIS excerpt in Appendix A). The FIS reveals that the Otay River drainage area at Otay Valley Road, which is near the confluence with Nestor Creek, covers 122.7 square miles. Therefore, the confluence of Nestor Creek with the Otay River meets both the third and fourth bullet criteria. The Nestor Creek tributary area at the confluence encounters a much larger (greater than 50 or 100 percent/equal order) tributary area from the Otay River watershed. The confluence is downstream of the first grade control, so the third and fourth bullet items will not govern over the first bullet item in establishing the downstream domain of analysis location.

From the above assessment, the downstream domain of analysis location for the POC is based on the first bullet item, i.e., the grade control criteria. This is the location closest to the POC from the four bullet criteria. As stated in the first bullet item, the downstream domain of analysis should extend one reach below the grade control or to the second grade control. The site investigation revealed a second grade control (reinforced concrete box culverts) approximately 483 feet downstream of the first grade control (see Figure 13). Therefore, the downstream domain of analysis location was set at the second grade control.

Upstream Domain of Analysis

The average channel top width upstream of the POC is approximately 90 feet based on a review of topographic mapping, so 20 channel top widths is 1,800 feet. On the other hand, the closest upstream grade control occurs at the existing culverts under Hollister Street, which are approximately 1,400 feet upstream of the POC (see Figure 1). Based on this information, the upstream domain of analysis location was selected to be at the Hollister Street culverts. This is the first location reached from the two upstream domain of analysis criteria.

Study Reaches within Domain of Analysis

The entire domain of analysis extends from the upstream domain of analysis location at the outlet of the Hollister Street culverts to the downstream domain of analysis location at the second grade control below the POC. The domain of analysis along Nestor Creek was subdivided into three study reaches. Reach 1 begins at the upstream domain of analysis location and extends downstream approximately 1,112 feet to the beginning of the concrete channel segment near Coronado Avenue. Reach 2 begins at the lower end of the concrete channel segment, which corresponds to the POC, and extends downstream approximately 1,893 feet to the first grade control at the entrance to the culverts under Carrissa Court. Reach 3 extends from the outlet of the Carrissa Court culverts approximately 483 feet downstream to the downstream domain of analysis location.

Reaches 1, 2, and 3 are greater than the 656 foot (200 meters) maximum reach length specified by SCCWRP. Review of topographic mapping, aerial photographs, and field conditions reveals that the physical (channel geometry and longitudinal slope), vegetative, hydraulic, and soil conditions within each reach are relatively uniform. Subdividing the reaches into smaller subreaches of less than 656 feet will not yield varying conclusions within a reach. Although the screening tool was applied across the entire length of each of these reaches, the results will be identical for shorter subreaches within each reach.

INITIAL DESKTOP ANALYSIS

After the domain of analysis is established, SCCWRP requires an "initial desktop analysis" that involves office work. The initial desktop analysis establishes the watershed area, mean annual precipitation, valley slope, and valley width. These terms are defined in Form 1, which is included in Appendix A. SCCWRP recommends the use of National Elevation Data (NED) to determine the watershed area, valley slope, and valley width. The NED data is similar to USGS quadrangle mapping. For the study area, more detailed information and better topographic mapping was available, so it was used instead of USGS mapping.

The watershed area was based on the FEMA FIS data (see Appendix A). The FIS indicates that the Nestor Creek drainage area tributary to Elm Avenue is 2.45 square miles. Elm Avenue is near the downstream domain of analysis location, so this area applies to Reach 2 and 3. In addition, the FIS indicates that the Nestor Creek drainage area tributary to Coronado Avenue is 2.33 square miles. The lower end of Reach 1 is near Coronado Avenue, so this area applies to Reach 1.

The valley slope of Reach 1, 2, and 3 were obtained from the FIS Nestor Creek Flood Profiles. The relevant profile sheets are included in Appendix A and provide a detailed channel bed profile along all three reaches. The valley slope is the longitudinal slope of the channel bed along the flow line and was measured from the Flood Profiles.

The valley width of Reach 1, 2, and 3 were obtained from SANGIS' 2-foot contour interval topographic mapping (see the Study Area Exhibit in Appendix A), which will yield more accurate results than NED data. The valley width is the valley bottom width dictated by breaks in the hillslope, i.e., the average bottom width of the unnamed natural drainage course, which was measured from the mapping. The tributary drainage area, valley slope, and valley width for Reach 1, 2, and 3 are summarized in Table 1.

Reach	Tributary Drainage Area, sq. mi.	Valley Slope, m/m	Valley Width, m
1	2.33	0.0026	12.80
2	2.45	0.0007	7.32
3	2.45	0.0002	10.97

Table 1. Summary of Drainage Area, Valley Slope, and Valley Width

The mean annual precipitation was obtained from the rain gage closest to the site. This is the Western Regional Climate Center's Chula Vista gage (see Appendix A). The average annual rainfall measured at the Chula Vista gage for the period of record from 1918 to 2015 is 9.73 inches.

The above described values were input to a spreadsheet to calculate the simulated peak flow, screening index, and valley width index outlined in Form 1. The input data and results are tabulated in Appendix A. This completes the initial desktop analysis.

FIELD SCREENING

After the initial desktop analysis is complete, a field assessment must be performed. The field assessment is used to establish a natural channel's vertical and lateral susceptibility to erosion. SCCWRP states that although they are admittedly linked, vertical and lateral susceptibility are assessed separately for several reasons. First, vertical and lateral responses are primarily controlled by different types of resistance, which, when assessed separately, may improve ease of use and lead to increased repeatability compared to an integrated, cross-dimensional assessment. Second, the mechanistic differences between vertical and lateral responses point to different modeling tools and potentially different management strategies. Having separate screening ratings may better direct users and managers to the most appropriate tools for subsequent analyses.

The field screening tool uses combinations of decision trees and checklists. Decision trees are typically used when a question can be answered fairly definitively and/or quantitatively (e.g., $d_{50} < 16$ mm). Checklists are used where answers are relatively qualitative (e.g., the condition of a grade control). Low, medium, high, and very high ratings are applied separately to the vertical and lateral analyses. When the vertical and lateral analyses return divergent values, the most conservative value shall be selected as the flow threshold for the hydromodification analyses.

Vertical Stability

The purpose of the vertical stability decision tree (Figure 6-4 in the County of San Diego HMP) is to assess the state of the channel bed with a particular focus on the risk of incision (i.e., down cutting). The decision tree is included in Figure 15. The first step is to assess the channel bed resistance. There are three categories defined as follows:

1. Labile Bed – sand-dominated bed, little resistant substrate.

2. Transitional/Intermediate Bed – bed typically characterized by gravel/small cobble, Intermediate level of resistance of the substrate and uncertain potential for armoring.

3. Threshold Bed (Coarse/Armored Bed) – armored with large cobbles or larger bed material or highly-resistant bed substrate (i.e., bedrock).

Figures 14 contains a photograph of the typical channel material within the three reaches. A gravelometer is included for reference. Each square on the gravelometer indicates grain size in millimeters (the squares range from 2 mm to 180 mm). Based on Figure 14, the channel photographs in the figures, and a site investigation, the bed material and resistance (associated with the dense, mature vegetation) is generally within the transitional/intermediate bed category. Some bed areas contain smaller grain sizes typically found in a labile bed. Although the Nestor Creek channel generally contains small median grain sizes, the channel does not meet the criteria of containing loosely-packed material. The material is moderately-packed with dense vegetation binding the soil, which is a characteristic of an intermediate bed.

In addition to the material size and compaction, there are several factors that establish the erodibility of a channel such as the flow rate (i.e., size of the tributary area), grade controls, channel slope, vegetative cover, channel planform, etc. The Introduction of the SCCWRP

Hydromodification Screening Tools: Field Manual identifies several of these factors. When multiple factors influence erodibility, it is appropriate to perform the more detailed SCCWRP analysis, which is to analyze a channel according to SCCWRP's transitional/intermediate bed procedure. This requires the most rigorous steps and will generate appropriate results given the range of factors that define erodibility. The transitional/intermediate bed procedure takes into account that bed material may fall within the labile category (the bed material size is used in SCCWRP's Form 3 Figure 4), but other factors may trend towards a less erodible condition. Dr. Eric Stein from SCCWRP, who co-authored the Hydromodification Screening Tools: Field Manual in the Final Hydromodification Management Plan (HMP), indicated that it would be appropriate to analyze channels with multiple factors that impact erodibility using the transitional/intermediate bed procedure. Consequently, this procedure was used to produce more accurate results.

Transitional/intermediate beds cover a wide susceptibility/potential response range and need to be assessed in greater detail to develop a weight of evidence for the appropriate screening rating. The three primary risk factors used to assess vertical susceptibility for channels with transitional/intermediate bed materials are:

1. Armoring potential – three states (Checklist 1)

2. Grade control – three states (Checklist 2)

3. Proximity to regionally-calibrated incision/braiding threshold (Mobility Index Threshold – Probability Diagram)

These three risk factors are assessed using checklists and a diagram (see Appendix B), and the results of each are combined to provide a final vertical susceptibility rating for the intermediate/transitional bed-material group. Each checklist and diagram contains a Category A, B, or C rating. Category A is the most resistant to vertical changes while Category C is the most susceptible.

Checklist 1 determines armoring potential of the channel bed. The channel bed along Reach 1, 2, and 3 are within Category B, which represents intermediate bed material of unknown resistance or unknown armoring potential. The soil was probed and penetration was relatively difficult through the underlying layer, but the resistance is unknown without a soils investigation.

Checklist 2 determines grade control characteristics of the channel bed. This is reliant on the spacing of the grade controls. The three categories for Checklist 2 are related to a grade control spacing of $2/S_v$ and $4/ S_v$, where S_v is the valley slope from Appendix A. The $2/S_v$ and $4/ S_v$ results are in meters, so a factor is applied to convert to feet. A reach is in Category A if it has a spacing of less than $2/S_v$. The $2/S_v$ values for Reach 1, 2, and 3 are 2,537, 9,186, and 34,120 feet, respectively. A grade control (culvert) is present at the downstream end of all three reaches, and the length of the reaches are 1,112, 1,893, and 483 feet, respectively. Therefore, Reach 1, 2, and each contain a grade control well within their 2/Sv values, so each reach is within Category A on Checklist 2.

The Screening Index Threshold is a probability diagram that depicts the risk of incising or braiding based on the potential stream power of the valley relative to the median particle diameter. The threshold is based on regional data from Dr. Howard Chang of Chang Consultants and others. The probability diagram is based on d_{50} as well as the screening index value determined in the initial desktop analysis (see Appendix A). The Form 1 results in Appendix A determined an INDEX of 0.0064, 0.0018, and 0.0005 for Reach 1, 2, and 3, respectively. The Screening Index Threshold diagram shows that the probability of incising or braiding is less than 50 percent regardless of d50 for an INDEX value of 0.015 or less. Since each reach's Screening Index value is less than the smallest 50 percent value, Reach 1, 2, and 3 are within Category A.

The overall vertical rating is determined from the Checklist 1, Checklist 2, and Screening Index Threshold results. The scoring is based on the following values:

Category A = 3, Category B = 6, Category C = 9

The vertical rating score for Reach 1, 2, and 3 are based on these values and the equation (the three reaches have identical values in the equation):

$$\begin{aligned} \text{Vertical Rating} &= [(\text{armoring} \times \text{grade control})^{1/2} \times \text{screening index score}]^{1/2} \\ &= [(6 \times 3)^{1/2} \times 3]^{1/2} \\ &= 3.6 \end{aligned}$$

Since the vertical rating is less than 4.5, Reach 1, 2, and 3 have a low threshold for vertical susceptibility.

Lateral Stability

The purpose of the lateral decision tree (Figure 6-5 from County of San Diego HMP is included in Figure 16) is to assess the state of the channel banks with a focus on the risk of widening. Channels can widen from either bank failure or through fluvial processes such as chute cutoffs, avulsions, and braiding. Widening through fluvial avulsions/active braiding is a relatively straightforward observation. If braiding is not already occurring, the next logical step is to assess the condition of the banks. Banks fail through a variety of mechanisms; however, one of the most important distinctions is whether they fail in mass (as many particles) or by fluvial detachment of individual particles. Although much research is dedicated to the combined effects of weakening, fluvial erosion, and mass failure, SCCWRP found it valuable to segregate bank types based on the inference of the dominant failure mechanism (as the management approach may vary based on the dominant failure mechanism). A decision tree (Form 4 in Appendix B) is used in conducting the lateral susceptibility assessment. Definitions and photographic examples are also provided below for terms used in the lateral susceptibility assessment.

The first step in the decision tree is to determine if lateral adjustments are occurring. The adjustments can take the form of extensive mass wasting (greater than 50 percent of the banks are exhibiting planar, slab, or rotational failures and/or scalloping, undermining, and/or tension cracks). The adjustments can also involve extensive fluvial erosion (significant and frequent bank cuts on over 50 percent of the banks). Neither mass wasting nor extensive fluvial erosion was evident within Reach 1, 2, or 3 during a field investigation (see Figures 2 through 4, 6 through 8, and 10 through 12).

The next step in the Form 4 decision tree is to assess the consolidation of the bank material. The banks in Reach 1, 2, and 3 are moderate to well-consolidated. This determination was made because the ground surface was difficult to penetrate with a probe. In addition, the banks showed no evidence of crumbling, were composed of relatively well-packed particles, and supported mature vegetation.

Form 6 (see Appendix B) is used to assess the probability of mass wasting. Form 6 identifies a 10, 50, and 90 percent probability based on the bank angle and bank height. From the site investigation and SANGIS' 2-foot contour interval topographic mapping, the average bank angle in the study reach is 2:1 (26 degrees) or flatter. Form 6 shows that the probably of mass wasting and bank failure has less than 10 percent risk for a 26 degree bank angle or less regardless of the bank height.

The final two steps in the Form 4 decision tree are based on the braiding risk determined from the vertical rating as well as the Valley Width Index (VWI) calculated in Appendix A. If the vertical rating is high, the braiding risk is considered to be greater than 50 percent. Excessive braiding can lead to lateral bank failure. For Reach 1, 2, and 3 the vertical rating is low, so the braiding risk is less than 50 percent. Furthermore, a VWI greater than 2 represents channels unconfined by bedrock or hillslope and, hence, subject to lateral migration. The VWI calculation in the spreadsheet in Appendix A shows that the VWI for Reach 1 (0.82), Reach 2 (0.46), and Reach 3 (0.69) are much less than 2.

From the above steps, the lateral susceptibility rating is low for Reach 1, 2, and 3 (colored circles are included on the Form 4: Lateral Susceptibility Field Sheet decision tree in Appendix B showing the decision path).

CONCLUSION

The SCCWRP channel screening tools were used to assess the downstream channel susceptibility for the 1695 Saturn Boulevard single-family residential project being designed by Kettler Leweck Engineering. The project runoff will be collected, treated, and then conveyed by a storm drain system that discharges at a single location into Nestor Creek over 3,100 feet northeast of the site. Nestor Creek at the outlet is concrete-lined, but becomes a natural channel a short distance downstream on the north side of Coronado Avenue. A downstream channel assessment for the POC at beginning of the natural channel was performed based on office analyses and field work. The results indicate a low threshold for vertical and lateral susceptibility for the entire study area.

The HMP requires that these results be compared with the critical flow calculator results outlined in the County of San Diego HMP. The critical flow calculator results are included in Appendix B for Reach 1, 2, and 3 using the spreadsheet provided by the County. The channel dimensions were estimated from the topographic mapping. Based on these values, the critical flow results returned a low threshold. Therefore, the SCCWRP analyses and critical flow calculator demonstrate that the project can be designed assuming a low susceptibility to erosion, i.e., 0.5Q2.

Figure 1. Culverts Under Hollister Street

Figure 2. Upstream End of Reach 1

Figure 3. Middle of Reach 1

Figure 4. Lower End of Reach 1 at Concrete-Lined Channel

Figure 5. Coronado Avenue Box Culverts between Reach 1 and 2 (Point of Compliance)

Figure 6. Upstream End of Reach 2

Figure 7. Middle of Reach 2

Figure 8. Lower End of Reach 2

Figure 9. Box Culverts at Cerrissa Court (Grade Control between Reach 2 and 3)

Figure 10. Upper End of Reach 3

Figure 11. Middle of Reach 3

Figure 12. Lower End of Reach 3

Figure 13. Box Culverts at Lower End of Reach 3

Figure 14. Gravelometer Reflecting Typical Material in Study Reaches

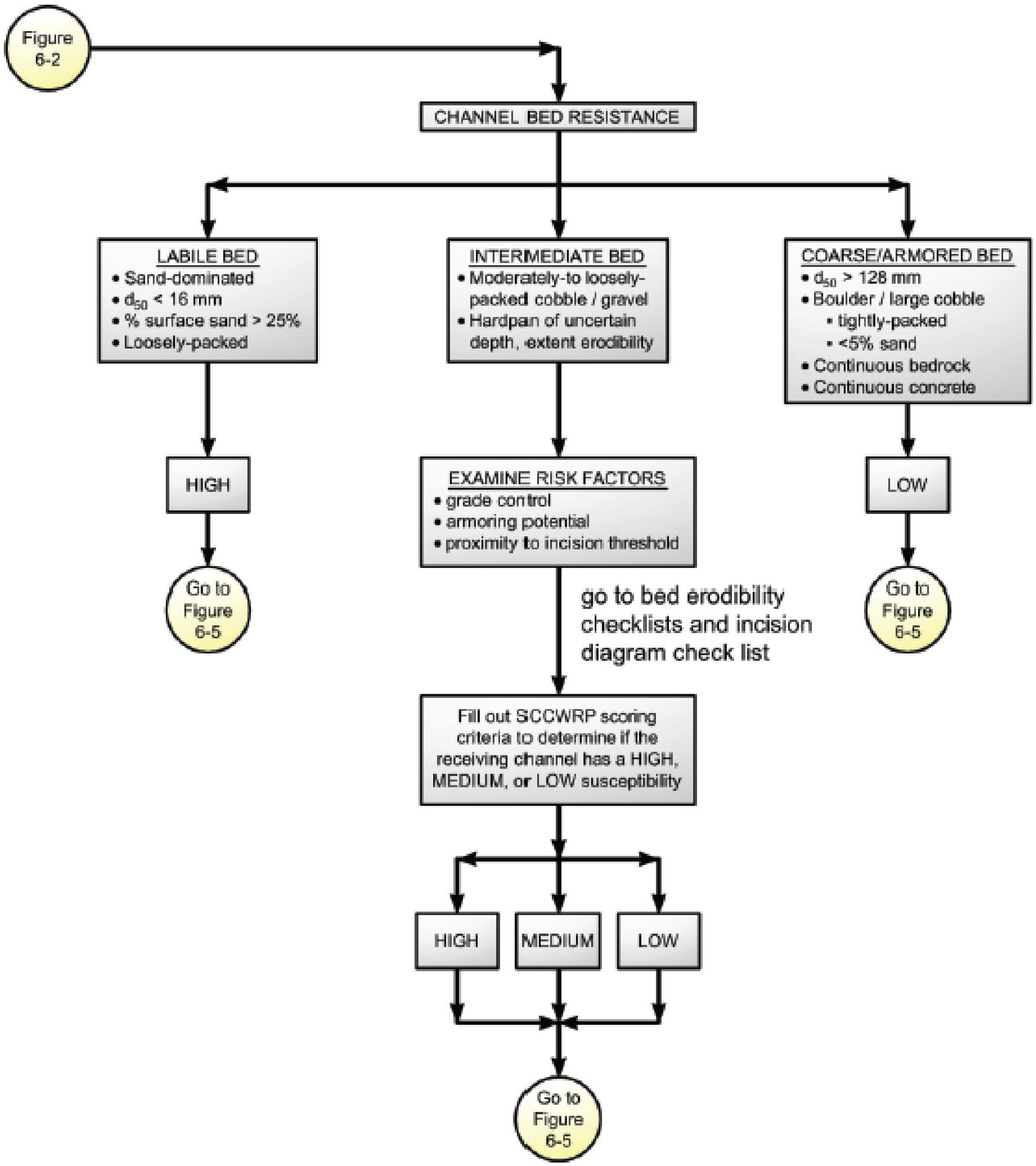


Figure 6-4. SCCWRP Vertical Susceptibility

Figure 15. SCCWRP Vertical Channel Susceptibility Matrix

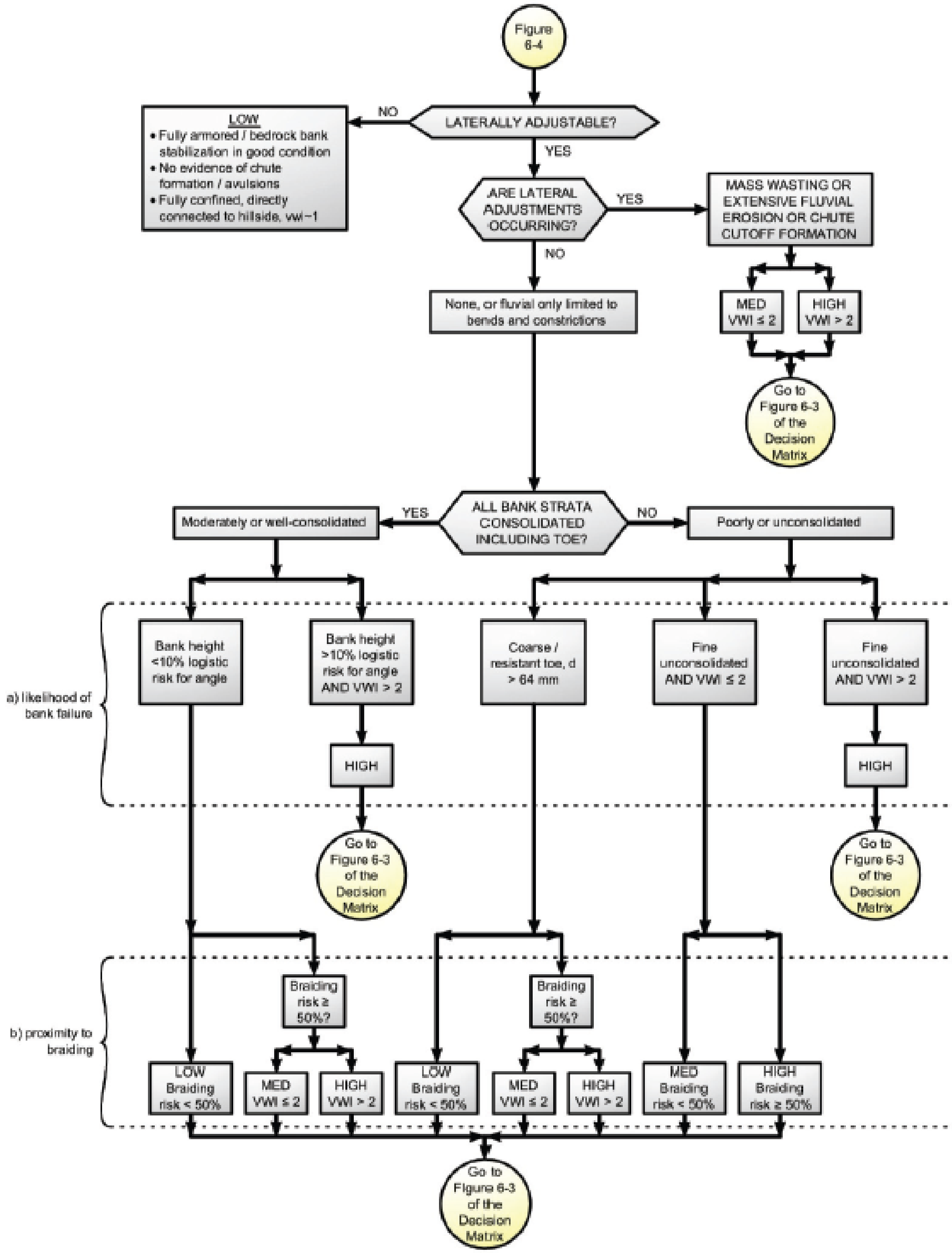


Figure 6-5. Lateral Channel Susceptibility

Figure 16. SCCWRP Lateral Channel Susceptibility Matrix

APPENDIX A

SCCWRP INITIAL DESKTOP ANALYSIS

FORM 1: INITIAL DESKTOP ANALYSIS

Complete all shaded sections.

IF required at multiple locations, circle one of the following site types:

Applicant Site / Upstream Extent / Downstream Extent

Location: Latitude: 32.5797 Longitude: -117.0880

Description (river name, crossing streets, etc.): Nestor Creek - from Hollister Street to 483 feet downstream of Carrissa Court.

GIS Parameters: The International System of Units (SI) is used throughout the assessment as the field standard and for consistency with the broader scientific community. However, as the singular exception, US Customary units are used for contributing drainage area (A) and mean annual precipitation (P) to apply regional flow equations after the USGS. See SCCWRP Technical Report 607 for example measurements and "Screening Tool Data Entry.xls" for automated calculations.

Form 1 Table 1. Initial desktop analysis in GIS.

	Symbol	Variable	Description and Source	Value
Watershed properties (English units)	**A**	Area (mi^2)	Contributing drainage area to screening location via published Hydrologic Unit Codes (HUCs) and/or ≤ 30 m National Elevation Data (NED), USGS seamless server	See attached Form 1 table on next page for calculated values for each reach.
	P	Mean annual precipitation (in)	Area-weighted annual precipitation via USGS delineated polygons using records from 1900 to 1960 (which was more significant in hydrologic models than polygons delineated from shorter record lengths)	
Site properties (SI units)	**S_v**	Valley slope (m/m)	Valley slope at site via NED, measured over a relatively homogenous valley segment as dictated by hillslope configuration, tributary confluences, etc., over a distance of up to ~500 m or 10% of the main-channel length from site to drainage divide	
	W_v	Valley width (m)	Valley bottom width at site between natural valley walls as dictated by clear breaks in hillslope on NED raster, irrespective of potential armoring from floodplain encroachment, levees, etc. (imprecise measurements have negligible effect on rating in wide valleys where VWI is >> 2, as defined in lateral decision tree)	

Form 1 Tabl e 2. Simplif ied peak flo w, screening index, and valley width index. Values for this table should be calculated in the sequence shown in this table, using values from Form 1 Table 1.

Symbol	Dependent Variable	Equation	Required Units	Value
Q_{10cfs}	10-yr peak flow (ft^3/s)	$Q_{10cfs} = 18.2 * A^{0.87} * P^{0.77}$	A (mi^2) P (in)	See attached Form 1 table on next page for calculated values for each reach.
Q_{10}	10-yr peak flow (m^3/s)	$Q_{10} = 0.0283 * Q_{10cfs}$	Q_{10cfs} (ft^3/s)	
INDEX	10-yr screening index ($m^{1.5}/s^{0.5}$)	$INDEX = S_v * Q_{10}^{0.5}$	Sv (m/m) Q_{10} (m^3/s)	
W_{ref}	Reference width (m)	$W_{ref} = 6.99 * Q_{10}^{0.438}$	Q_{10} (m^3/s)	
VWI	Valley width index (m/m)	$VWI = W_v/W_{ref}$	W_v (m) W_{ref} (m)	

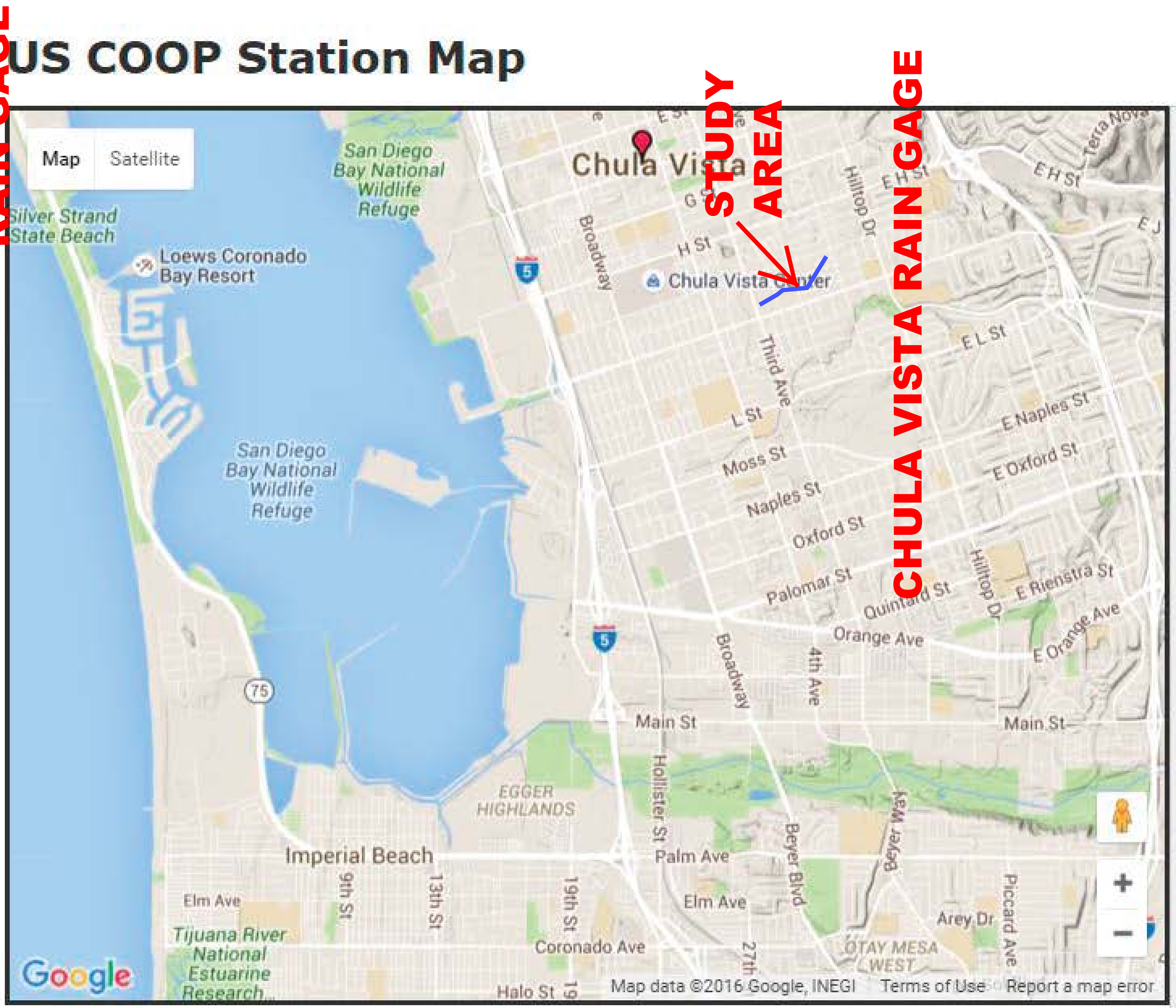
(Sheet 1 of 1)

SCCWRP FORM 1 ANALYSES

Reach	Area A, sq. mi.	Mean Annual Precip. P, inches	Valley Slope Sv, m/m	Valley Width Wv, m	10-Year Flow Q10cfs, cfs	10-Year Flow Q10, cms
1	2.33	9.73	0.0026	12.80	219	6.20
2	2.45	9.73	0.0007	7.32	229	6.48
3	2.45	9.73	0.0002	10.97	229	6.48

Reach	10-Year Screening Index INDEX	Reference Width Wref, m	Valley Width Index VWI, m/m
1	0.0064	15.54	0.82
2	0.0018	15.84	0.46
3	0.0005	15.84	0.69

US COOP Station Map



CHULA VISTA, CALIFORNIA (041758)

Period of Record Monthly Climate Summary

Period of Record : 09/01/1918 to 01/20/2015

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max. Temperature (F)	64.2	64.5	64.7	65.9	67.3	69.0	72.5	74.2	74.1	71.7	69.0	65.1	68.5
Average Min. Temperature (F)	43.8	45.7	48.4	51.6	56.0	59.1	63.1	64.2	61.7	55.8	48.5	44.5	53.5
Average Total Precipitation (in.)	1.76	1.92	1.61	0.82	0.21	0.05	0.02	0.06	0.16	0.51	0.98	1.63	9.73
Average Total SnowFall (in.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Average Snow Depth (in.)	0	0	0	0	0	0	0	0	0	0	0	0	0

Percent of possible observations for period of record.
Max. Temp.: 93.2% Min. Temp.: 93.1% Precipitation: 98.7% Snowfall: 98.8% Snow Depth: 98.6%
Check Station Metadata or Metadata graphics for more detail about data completeness.

Western Regional Climate Center, wrcc@dri.edu

FLOOD INSURANCE STUDY

SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

VOLUME 1 OF 11

Community Name	Community Number
SAN DIEGO COUNTY, UNINCORPORATED AREAS	060284
CARLSBAD, CITY OF	060285
CHULA VISTA, CITY OF	065021
CORONADO, CITY OF	060287
DEL MAR, CITY OF	060288
EL CAJON, CITY OF	060289
ENCINITAS, CITY OF	060726
ESCONDIDO, CITY OF	060290
IMPERIAL BEACH, CITY OF	060291
LA MESA, CITY OF	060292
LEMON GROVE, CITY OF	060723
NATIONAL CITY, CITY OF	060293
OCEANSIDE, CITY OF	060294
POWAY, CITY OF	060702
SAN DIEGO, CITY OF	060295
SAN MARCOS, CITY OF	060296
SANTEE, CITY OF	060703
SOLANA BEACH, CITY OF	060725
VISTA, CITY OF	060297

REVISED
May 16, 2012

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
06073CV001C

TABLE 8: SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. miles)	Peak Discharges (cubic feet per second) 10% Annual-Chance	2% Annual-Chance	1% Annual-Chance	0.2% Annual-Chance
Downstream of Balboa Boulevard	5.9	550	1,400	1,700	3,300
Upstream of Balboa Boulevard	5.9	550	1,400	1,700	3,300
Downstream of Confluence with Unnamed Tributary	5.8	550	1,400	1,700	3,300
Downstream of Clairmont Mesa Boulevard	3.4	350	800[2]	1,000[2]	1,850[2]
Upstream of Clairmont Mesa Boulevard	3.4	350	950	1,400	2,800
Murray Canyon Creek					
At Mouth	3.93	1,200	2,400	3,100	4,800
Upstream of Unnamed Tributary	2.74	1,000	1,700	2,100	3,300
Downstream of Interstate Highway 805	1.76	800	1,200[3]	1,400[3]	1,800[3]
Upstream of Interstate Highway 805	1.76	800	1,600	2,100	3,400
Nestor Creek					
At Palm Avenue	2.75	--	--	1,093	--

-- Data Not Available
[2] Decreases Due to Ponding Upstream
[3] Decrease Due to Overbank Losses Upstream
[4] Decrease Due to Construction of "Lot 6 Detention Basin" Upstream of Railroad

TABLE 8: SUMMARY OF PEAK DISCHARGES

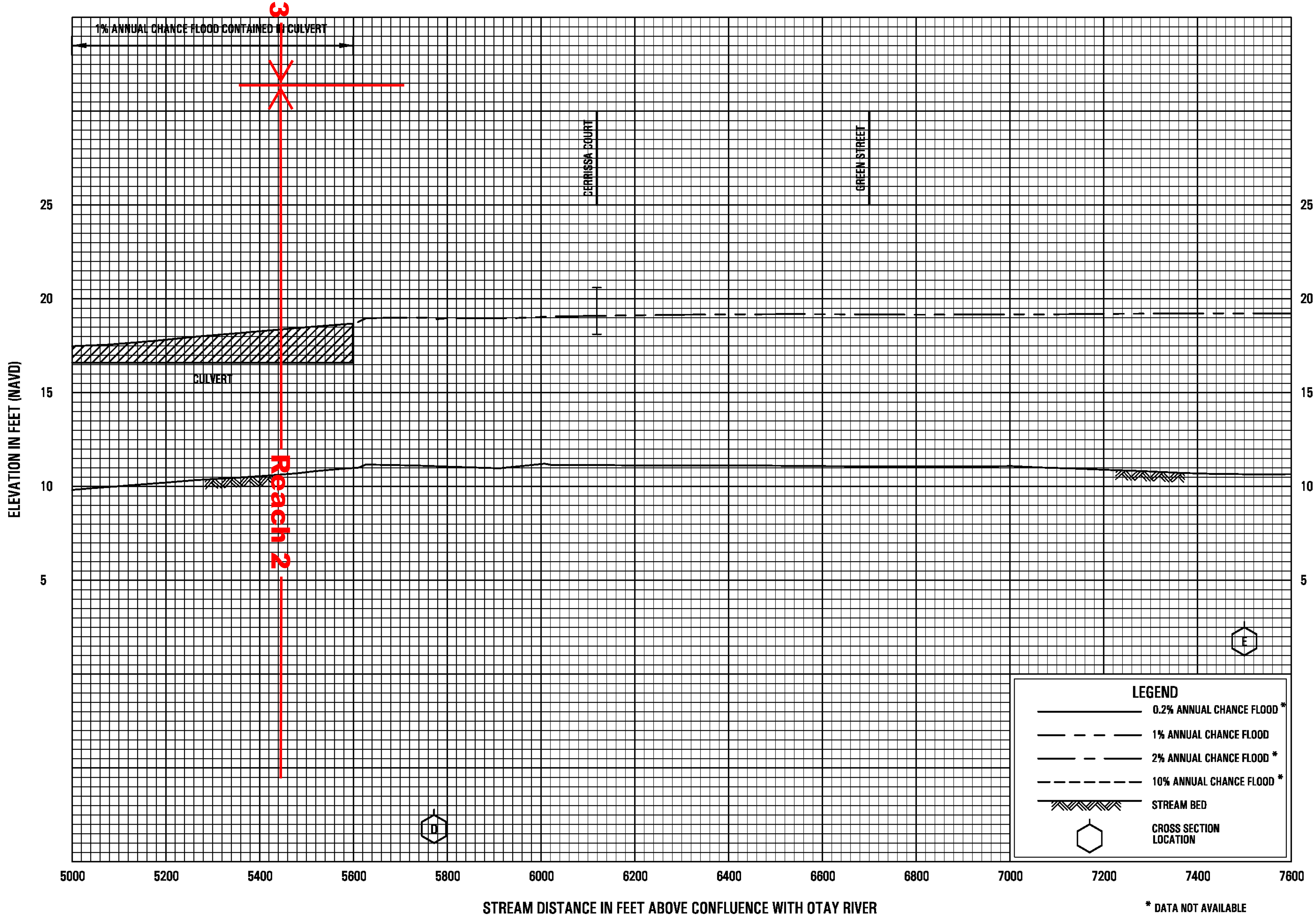
Flooding Source and Location	Drainage Area (sq. miles)	Peak Discharges (cubic feet per second) 10% Annual-Chance	2% Annual-Chance	1% Annual-Chance	0.2% Annual-Chance
At 19th Street	--	--	--	864[4]	--
At Elm Avenue	2.45	--	--	796[4]	--
At Coronado Avenue	2.33	--	--	698[4]	--
At Hollister Street	1.99	--	--	496[4]	--
At 25th Street/Interstate 5	1.71	--	--	456[4]	--
At San Diego and Arizona Eastern Railroad	1.40	555	860	1,015	2,295
North Avenue Tributary					
Approximately 1,730 feet upstream of North Broadway	0.5	--	--	440	--
North Branch Poway Creek					
At Sycamore Canyon Road	4.5	650	2,000	3,000	7,200
North Tributary to Santa Maria					
At Mouth	1.6	100	600	1,100	2,900
Olive Creek					
At Mouth	1.0	--	--	1,370	--

-- Data Not Available
[4] Decrease Due to Construction of "Lot 6 Detention Basin" Upstream of Railroad

TABLE 8: SUMMARY OF PEAK DISCHARGES

Flooding Source and Location	Drainage Area (sq. miles)	Peak Discharges (cubic feet per second) 10% Annual-Chance	2% Annual-Chance	1% Annual-Chance	0.2% Annual-Chance
Otay River					
At Otay Valley Road	122.7	1,200	12,000	22,000	50,000
Pala Mesa Creek					
Approximately 265 Feet Upstream of Interstate Highway 15	2.1	--	--	1,700	--
Paradise Creek – Valley Road Branch					
At Confluence with Paradise Creek	0.68	--	--	468	--
Pauma Creek					
At Apex of Alluvial Fan	14.7	1,550	6,270	10,480	30,460
Pilgrim Creek					
Upstream End of Oceanside Golf Course	14.0	--	--	5,775	--
Downstream End of Oceanside Golf Course	14.0	--	--	1,244	--
Just Upstream of the Confluence with Windmill Creek	15.8	--	--	1,888	--
At Mouth	19.0	--	--	1,925	--

-- Data Not Available

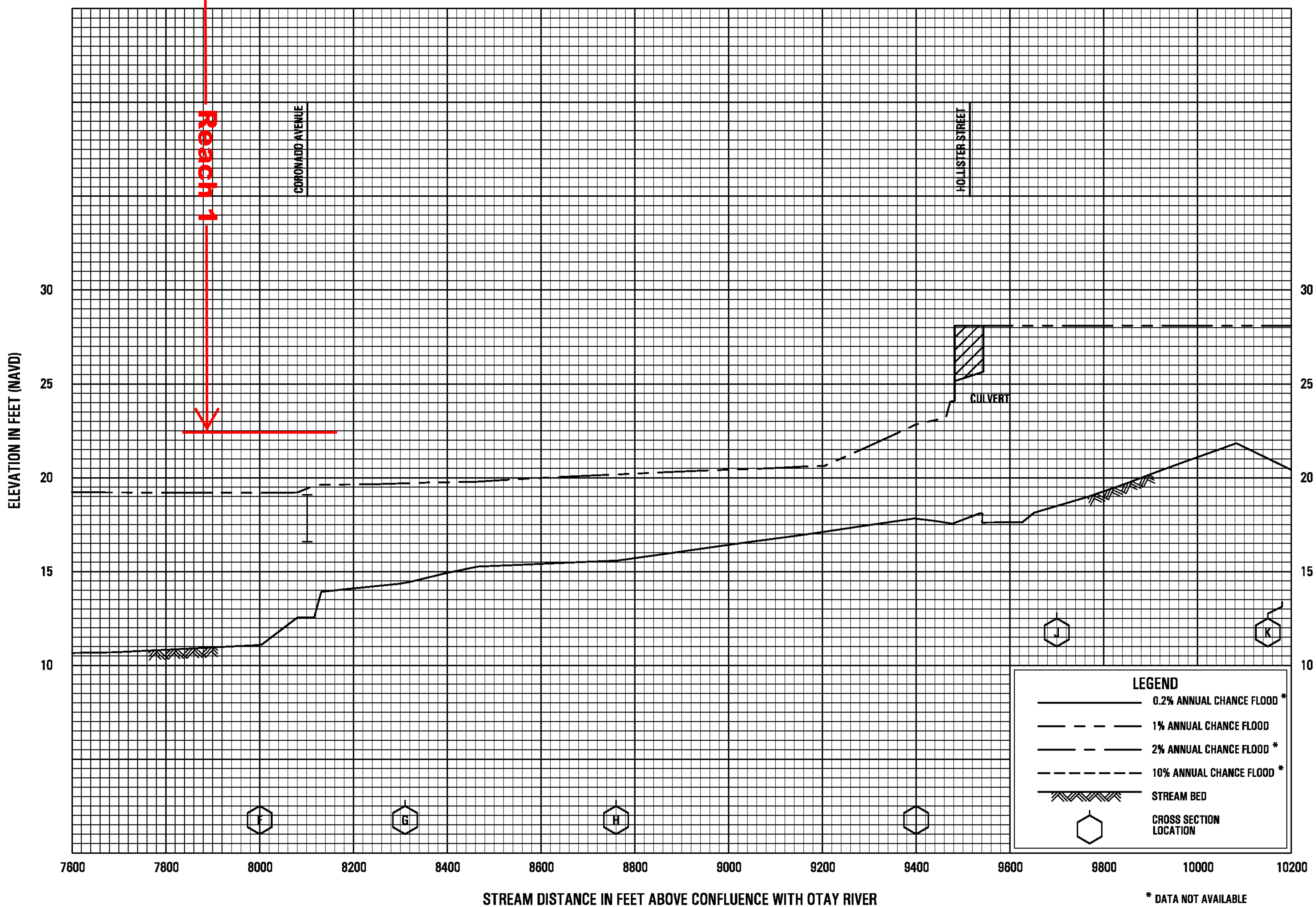


FLOOD PROFILES

NESTOR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN DIEGO COUNTY, CA
(AND INCORPORATED AREAS)

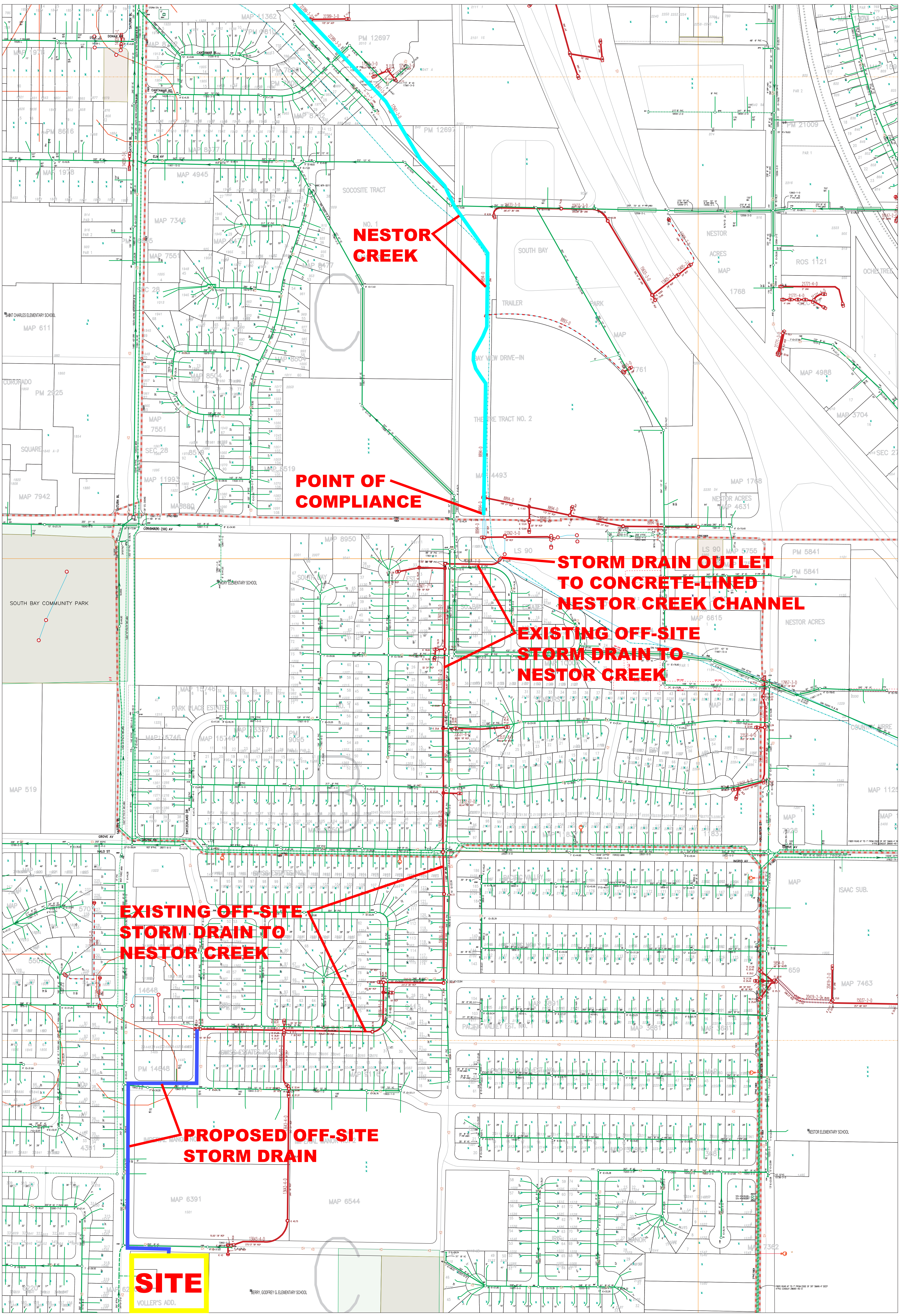


FLOOD PROFILES

NESTOR CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

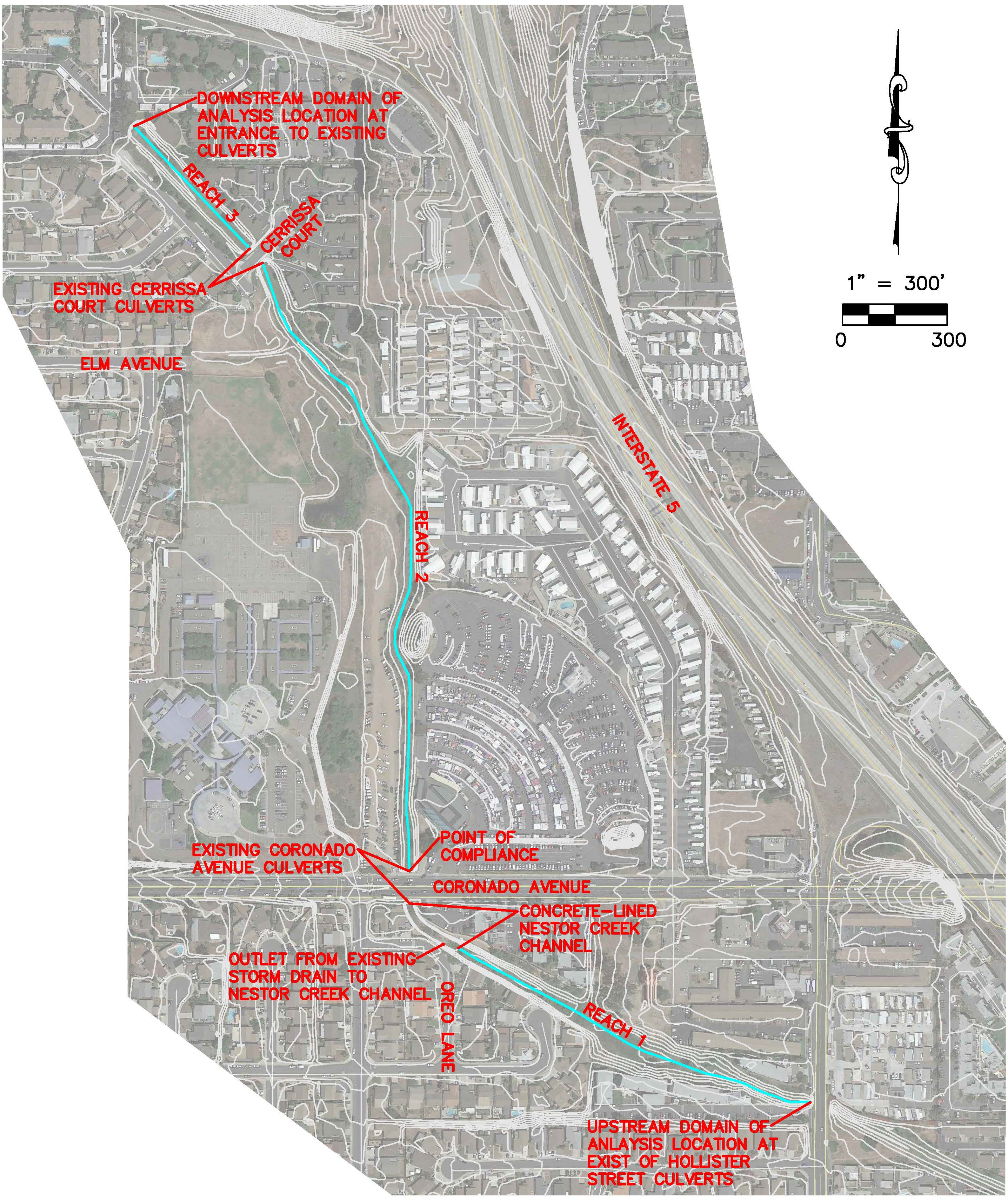
SAN DIEGO COUNTY, CA
(AND INCORPORATED AREAS)



FLOW DIRECTION EXHIBIT

City of San Diego Public Utilities Water & Wastewater

Date Printed: 11-25-15



STUDY AREA EXHIBIT
1695 SATURN BOULEVARD

APPENDIX B

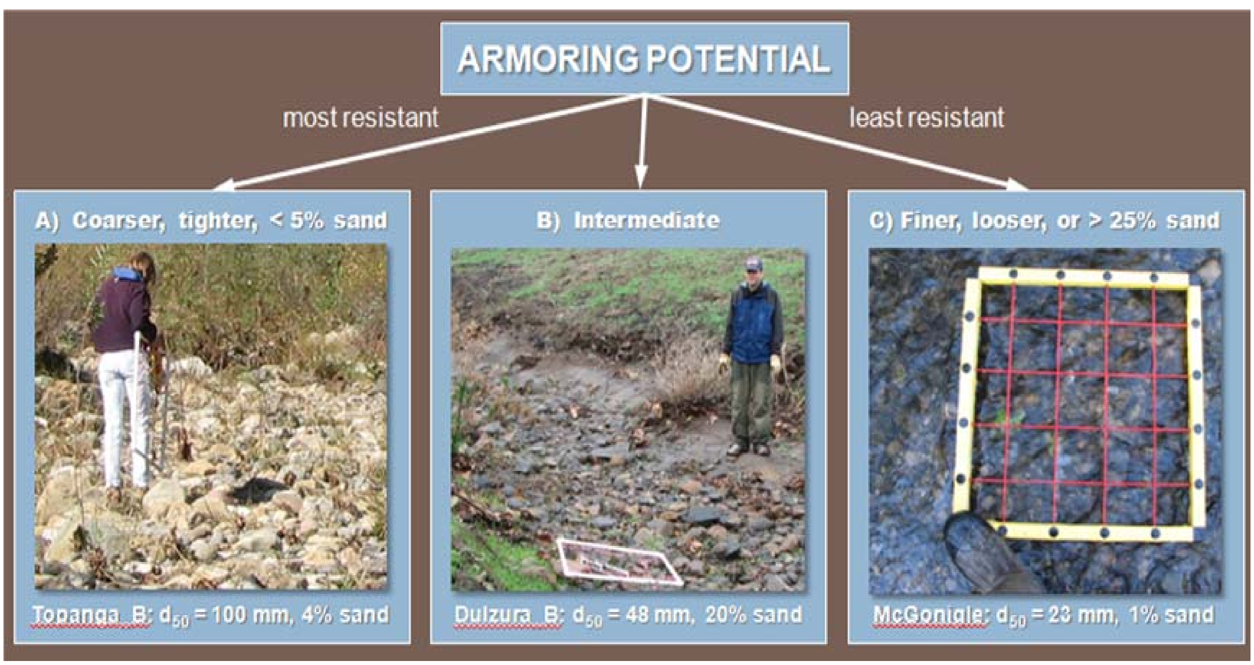
SCCWRP FIELD SCREENING DATA

Form 3 Support Materials

Form 3 Checklists 1 and 2, along with information recording in Form 3 Table 1, are intended to support the decisions pathways illustrated in Form 3 Overall Vertical Rating for Intermediate/Transitional Bed.

Form 3 Checklist 1: Armoring Potential

□	A	A mix of coarse gravels and cobbles that are tightly packed with <5% surface material of diameter <2 mm
X	B	Intermediate to A and C or hardpan of unknown resistance, spatial extent (longitudinal and depth), or unknown armoring potential due to surface veneer covering gravel or coarser layer encountered with probe
□	C	Gravels/cobbles that are loosely packed or >25% surface material of diameter <2 mm



Form 3 Figure 2. Armoring potential photographic supplement for assessing intermediate beds (16 < d_{50} < 128 mm) to be used i**n conjunction with Form 3 Checklist 1.**

(Sheet 2 of 4)

RESULT FOR ALL STUDY REACHES

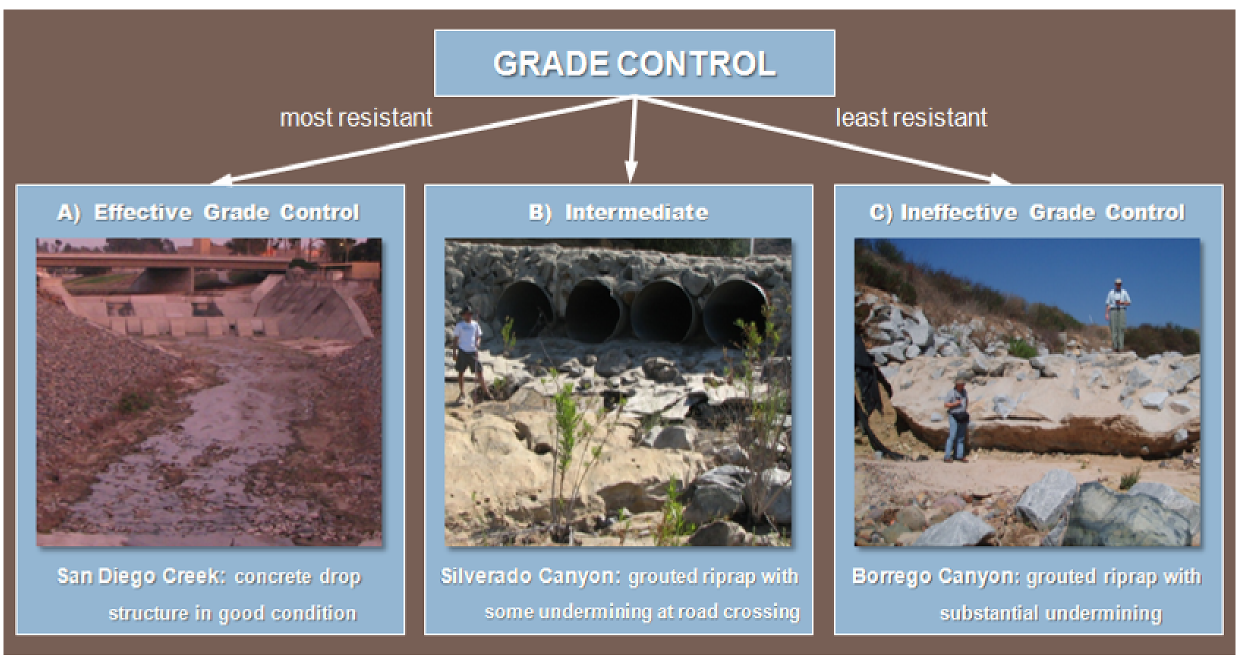
Form 3 Checklist 2: Grade Control

☒ A Grade control is present with spacing <50 m or 2/S_v m

- No evidence of failure/ineffectiveness, e.g., no headcutting (>30 cm), no active mass wasting (analyst cannot say grade control sufficient if mass-wasting checklist indicates presence of bank failure), no exposed bridge pilings, no culverts/structures undermined
- Hard points in serviceable condition at decadal time scale, e.g., no apparent undermining, flanking, failing grout
- If geologic grade control, rock should be resistant igneous and/or metamorphic; For sedimentary/hardpan to be classified as 'grade control', it should be of demonstrable strength as indicated by field testing such as hammer test/borings and/or inspected by appropriate stakeholder

□ B Intermediate to A and C – artificial or geologic grade control present but spaced 2/Sv m to 4/Sv m or potential evidence of failure or hardpan of uncertain resistance

□ C Grade control absent, spaced >100 m or >4/S_v m, or clear evidence of ineffectiveness



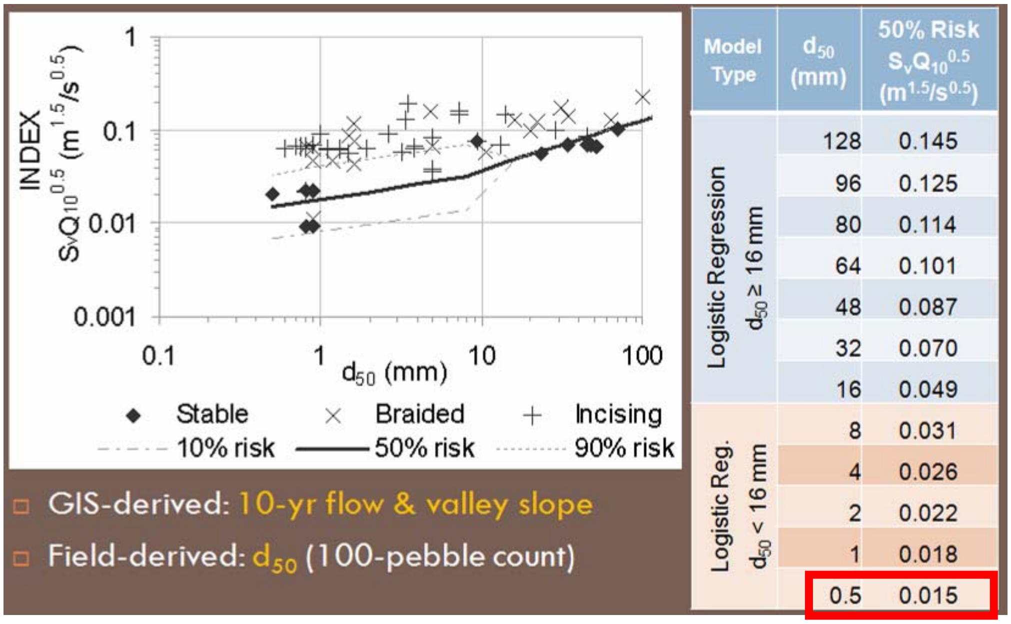
Form 3 Figure 3. Grade-control (condition) photographic supplement for assessing intermediate beds (16 < d_{50} < 128 mm) to be used in conjunction with Form 3 Checklist 2.

(Sheet 3 of 4)

RESULT FOR ALL STUDY REACHES

Regionally-Calibrated Screening Index Threshold for Incising/Braiding

For transitional bed channels (d_{50} between 16 and 128 mm) or labile beds (channel not incised past critical bank height), use Form 3 Figure 3 to determine Screening Index Score and complete Form 3 Table 1.



Form 3 Figure 4. Probability of incising/braiding based on logistic regression of Screening Index and d_{50} to be used in conjunction with Form 3 Table 1.

Form 3 Table 1. Values for Screening Index Threshold (probability of incising/braiding) to be used in conjunction with Form 3 Figure 4 (above) to complete Form 3 Overall Vertical Rating for Intermediate/Transitional Bed (below).. Screening Index Score: A = <50% probability of incision for current Q_{10}, valley slope, and d_{50}; B = Hardpan/d_{50} indeterminate; and C = $\geq$50% probability of incising/braiding for current Q_{10}, valley slope, and d_{50}.

d_{50} (mm) *From Form 2*	**S_v*$Q_{10}^{0.5}$ $(m^{1.5}/s^{0.5})$** *From Form 1*	**S_v*$Q_{10}^{0.5}$ $(m^{1.5}/s^{0.5})$** *50% risk of incising/braiding from table in Form 3 Figure 3 above*	**Screening Index Score (A, B, C)**

Overall Vertical Rating for Intermediate/Transitional Bed

Calculate the overall Vertical Rating for Transitional Bed channels using the formula below. Numeric values for responses to Form 3 Checklists and Table 1 as follows: A = 3, B = 6, C = 9.

$$\textit{Vertical Rating} = \sqrt{\{(\sqrt{armoring * grade\ control}) * screening\ index\ score\}}$$

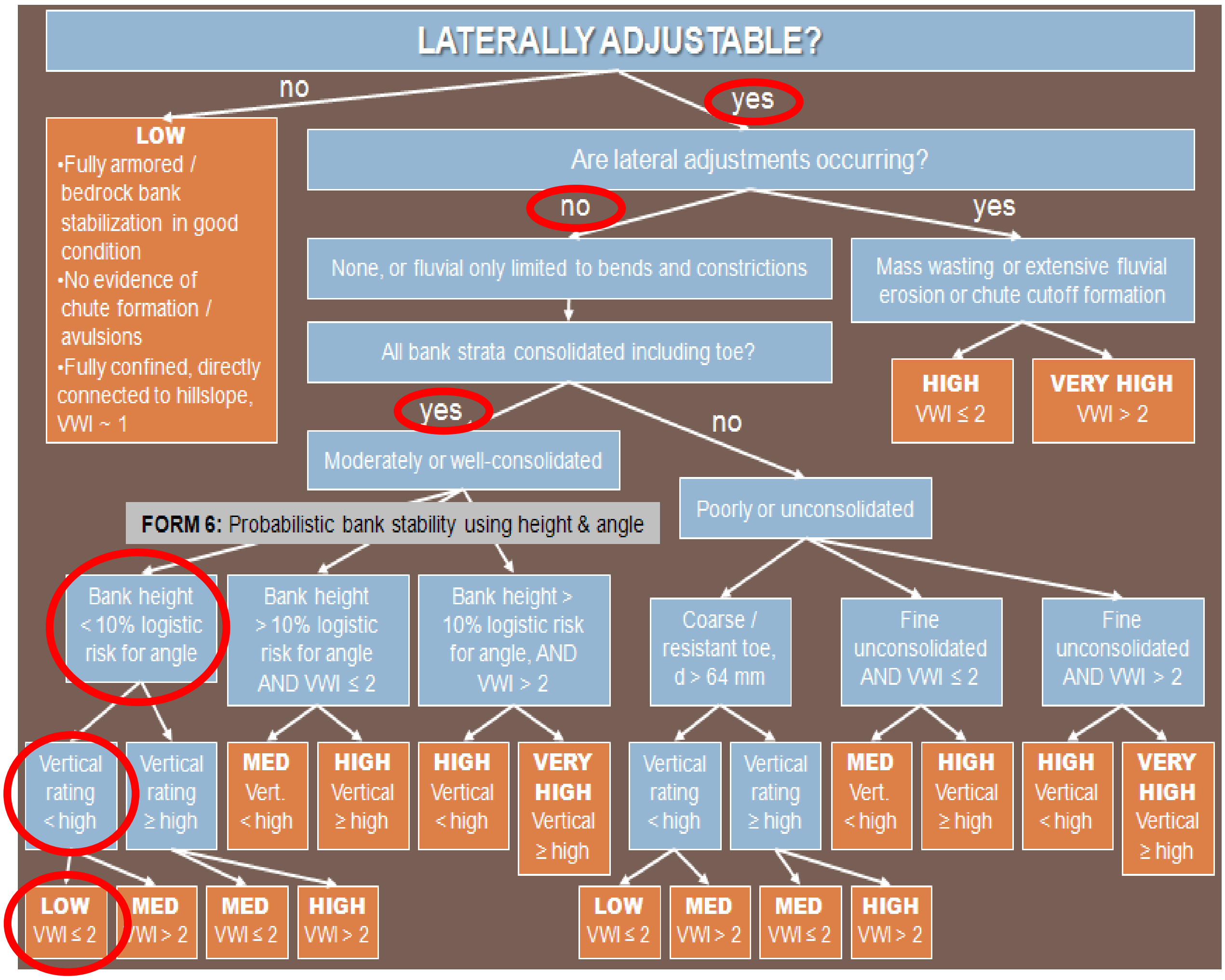
Vertical Susceptibility based on Vertical Rating: <4.5 = LOW; 4.5 to 7 = MEDIUM; and >7 = HIGH.

(Sheet 4 of 4)

RESULT FOR ALL STUDY REACHES

FORM 4: LATERAL SUSCEPTIBILTY FIELD SHEET

Circle appropriate nodes/pathway for proposed site
OR use sequence of questions provided in Form 5.



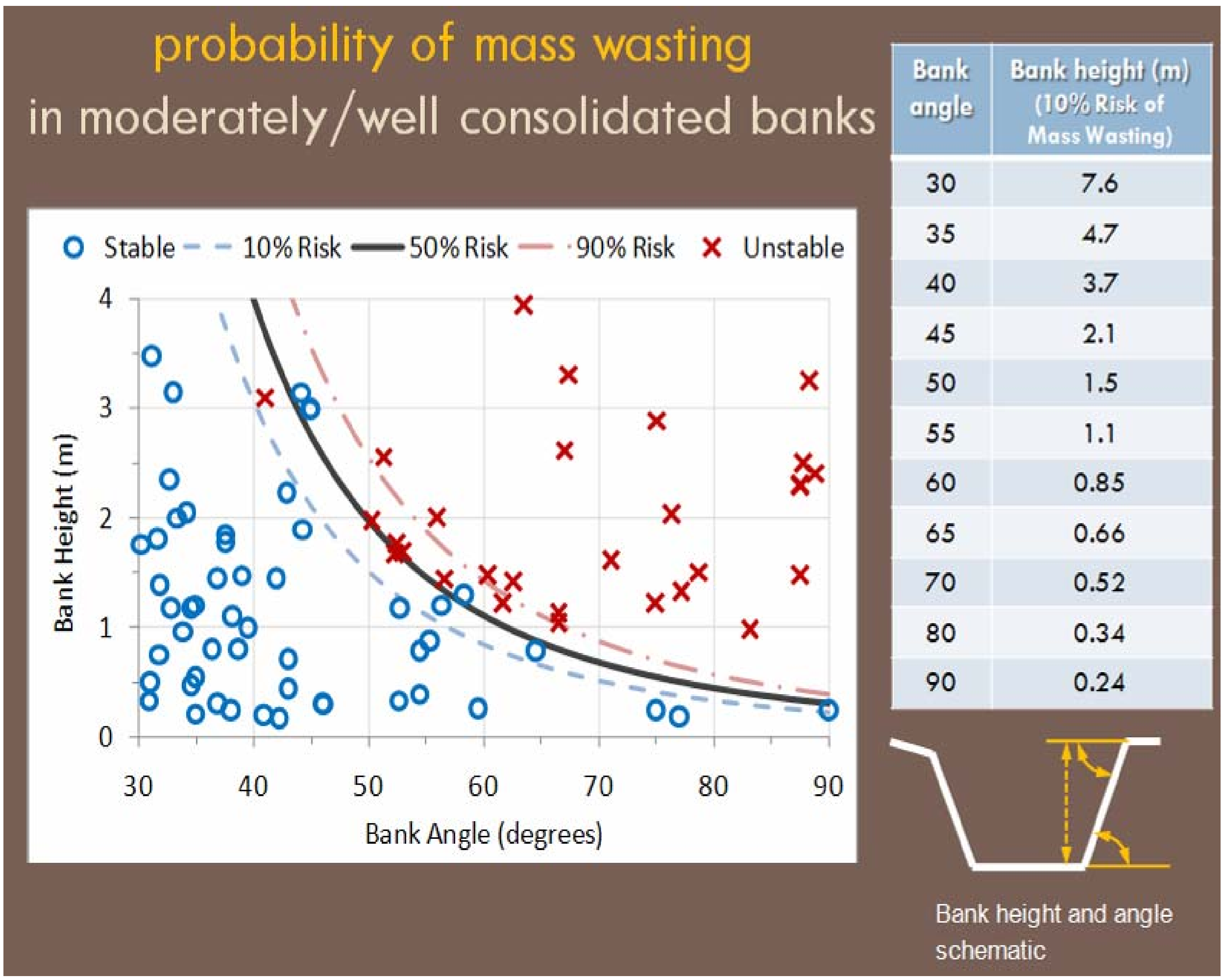
(Sheet 1 of 1)

RESULT FOR ALL STUDY REACHES

FORM 6: PROBABILITY OF MASS WASTING BANK FAILURE

If mass wasting is not currently extensive and the banks are moderately- to well-consolidated, measure bank height and angle at several locations (i.e., at least three locations that capture the range of conditions present in the study reach) to estimate representative values for the reach. Use Form 6 Figure 1 below to determine if risk of bank failure is >10% and complete Form 6 Table 1. Support your results with photographs that include a protractor/rod/tape/person for scale.

	Bank Angle (degrees) *(from Field)*	**Bank Height (m)** *(from Field)*	**Corresponding Bank Height for 10% Risk of Mass Wasting (m)** *(from Form 6 Figure 1 below)*	**Bank Failure Risk** *(<10% Risk)* *(>10% Risk)*
Left Bank	<2:1 (26.6 deg)	varies	---	<10%
Right Bank	<2:1 (26.6 deg)	varies	---	<10%



Form 6 Figure 1. Probability Mass Wasting diagram, Bank Angle:Height/% Risk table, and Band Height:Angle schematic.

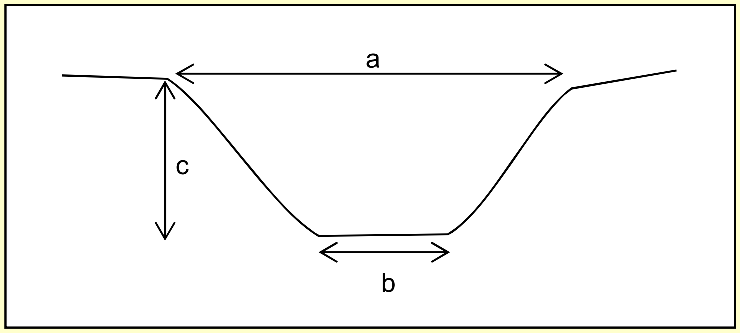
(Sheet 1 of 1)

RESULT FOR ALL STUDY REACHES

Critical Flow Calculator

enter all values in green cells
and drop down boxes

Reach 1



Inputs

a) Receiving channel width at top of bank (ft) - see figure on right	110.0
b) Channel width at bed (ft)	42.0
c) Bank height at top of bank (ft)	5.0
Channel gradient (ft/ft)	0.0026
Receiving channel roughness	Light brush and trees, leaves not present n=0.06

Channel materials (use weakest of bed or banks). If materials are varied use weakest material covering more than 20% of channel.

- unconsolidated sandy loam 0.035 lb/sq ft
- alluvial silt (non coloidal) 0.045 lb/sq ft
- medium gravel 0.12 lb/sq ft
- alluvial silt/clay 0.26 lb/sq ft
- 2.5 inch cobble 1.1 lb/sq ft
- enter own d50 (variable)
- vegetation (bed and banks) 0.6 lb/sq ft

Select method of calculating Q2

- Input own Q2
- Calculate Q2 using USGS regression

Receiving water watershed annual precip (inches)	9.73	Receiving water watershed area at PoC (sq mi)	2.3300
Project watershed annual precipitation (inches)	9.73	Project watershed area draining to PoC (sq mi)	2.3300

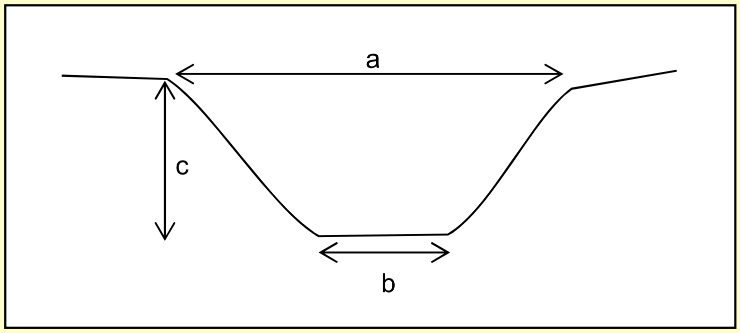
Outputs - Flow control range

Receiving water Q2	10.3	**Point of Compliance low flow rate (cfs)**	**5.1**
Project site Q2	10.3	**Low flow class**	**0.5Q2**
		Channel vulnerability	**Low**

Critical Flow Calculator

Reach 2

enter all values in green cells
and drop down boxes



Inputs

a) Receiving channel width at top of bank (ft) - see figure on right	42.0
b) Channel width at bed (ft)	24.0
c) Bank height at top of bank (ft)	4.0
Channel gradient (ft/ft)	0.0007
Receiving channel roughness	Light brush and trees, leaves not present n=0.06

Channel materials (use weakest of bed or banks). If materials are varied use weakest material covering more than 20% of channel.

- unconsolidated sandy loam 0.035 lb/sq ft
- alluvial silt (non coloidal) 0.045 lb/sq ft
- medium gravel 0.12 lb/sq ft
- alluvial silt/clay 0.26 lb/sq ft
- 2.5 inch cobble 1.1 lb/sq ft
- enter own d50 (variable)
- vegetation (bed and banks) 0.6 lb/sq ft

Select method of calculating Q2

- Input own Q2
- Calculate Q2 using USGS regression

Receiving water watershed annual precip (inches)	9.73	Receiving water watershed area at PoC (sq mi)	2.4500
Project watershed annual precipitation (inches)	9.73	Project watershed area draining to PoC (sq mi)	2.4500

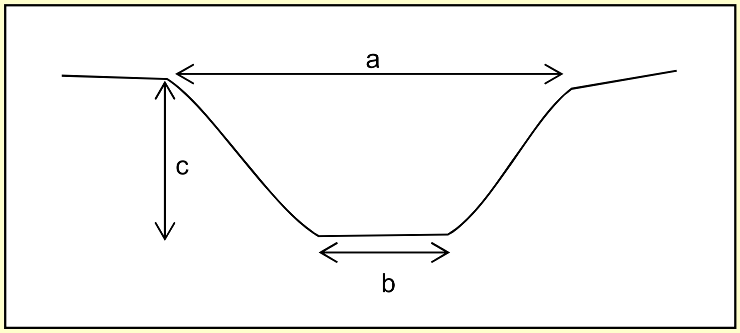
Outputs - Flow control range

Receiving water Q2	10.6	**Point of Compliance low flow rate (cfs)**	**5.3**
Project site Q2	10.6	**Low flow class**	**0.5Q2**
		Channel vulnerability	**Low**

Critical Flow Calculator

Reach 3

enter all values in green cells
and drop down boxes



Inputs

a) Receiving channel width at top of bank (ft) - see figure on right	64.0
b) Channel width at bed (ft)	36.0
c) Bank height at top of bank (ft)	5.0
Channel gradient (ft/ft)	0.0002
Receiving channel roughness	Light brush and trees, leaves not present n=0.06

Channel materials (use weakest of bed or banks). If materials are varied use weakest material covering more than 20% of channel.

unconsolidated sandy loam 0.035 lb/sq ft
alluvial silt (non coloidal) 0.045 lb/sq ft
medium gravel 0.12 lb/sq ft
alluvial silt/clay 0.26 lb/sq ft
2.5 inch cobble 1.1 lb/sq ft
enter own d50 (variable)
vegetation (bed and banks) 0.6 lb/sq ft

Select method of calculating Q2

Input own Q2
Calculate Q2 using USGS regression

Receiving water watershed annual precip (inches)	9.73	Receiving water watershed area at PoC (sq mi)	2.4500
Project watershed annual precipitation (inches)	9.73	Project watershed area draining to PoC (sq mi)	2.4500

Outputs - Flow control range

Receiving water Q2	10.6	**Point of Compliance low flow rate (cfs)**	**5.3**
Project site Q2	10.6	**Low flow class**	**0.5Q2**
		Channel vulnerability	**Low**

Priority Development Project (PDP)
Storm Water Quality Management Plan (SWQMP)

SATURN BOULEVARD SINGLE FAMILY RESIDENTIAL PROJECT

VTM 1996523 PDP 1996525 CDP 1996526, REZONE 1996524

[Insert Drawing Number (if applicable) and Internal Order Number (if applicable)]

☐ **Check if electing for offsite alternative compliance**

Engineer of Work:

REGISTERED PROFESSIONAL ENGINEER
JONATHAN RAAB RYDEEN
C 64811
Exp. 6/30/19
CIVIL
STATE OF CALIFORNIA

JONATHAN RAAB RYDEEN R.C.E. 64811; EXP: 6/30/19
Provide Wet Signature and Stamp Above Line

Prepared For:

DAVID LARSEN

950 GARLAND DRIVE

SAN DIEGO, CA 92154

619-623-4488

Prepared By:

R·E·C
Consultants, Inc.

REC CONSULTANTS,INC.
2442 SECOND AVENUE
SAN DIEGO, CA 92101
619-232-9200

Date:

AUGUST 1, 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: SATURN BOULEVARD SINGLE FAMILY RESIDENTIAL PROJECT
Permit Application VTM 1996523 PDP 1996525 CDP 1996526, REZONE 1996524

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

64811

PE#

6/30/19

Expiration Date

Jonathan Raab Rydeen

Print Name

REC Consultants, Inc

Company

10/2/18

Date

REGISTERED PROFESSIONAL ENGINEER
JONATHAN RAAB RYDEEN
C 64811
Exp. 6/30/19
CIVIL
STATE OF CALIFORNIA

Engineer's Stamp

Project Name:

Submittal Record

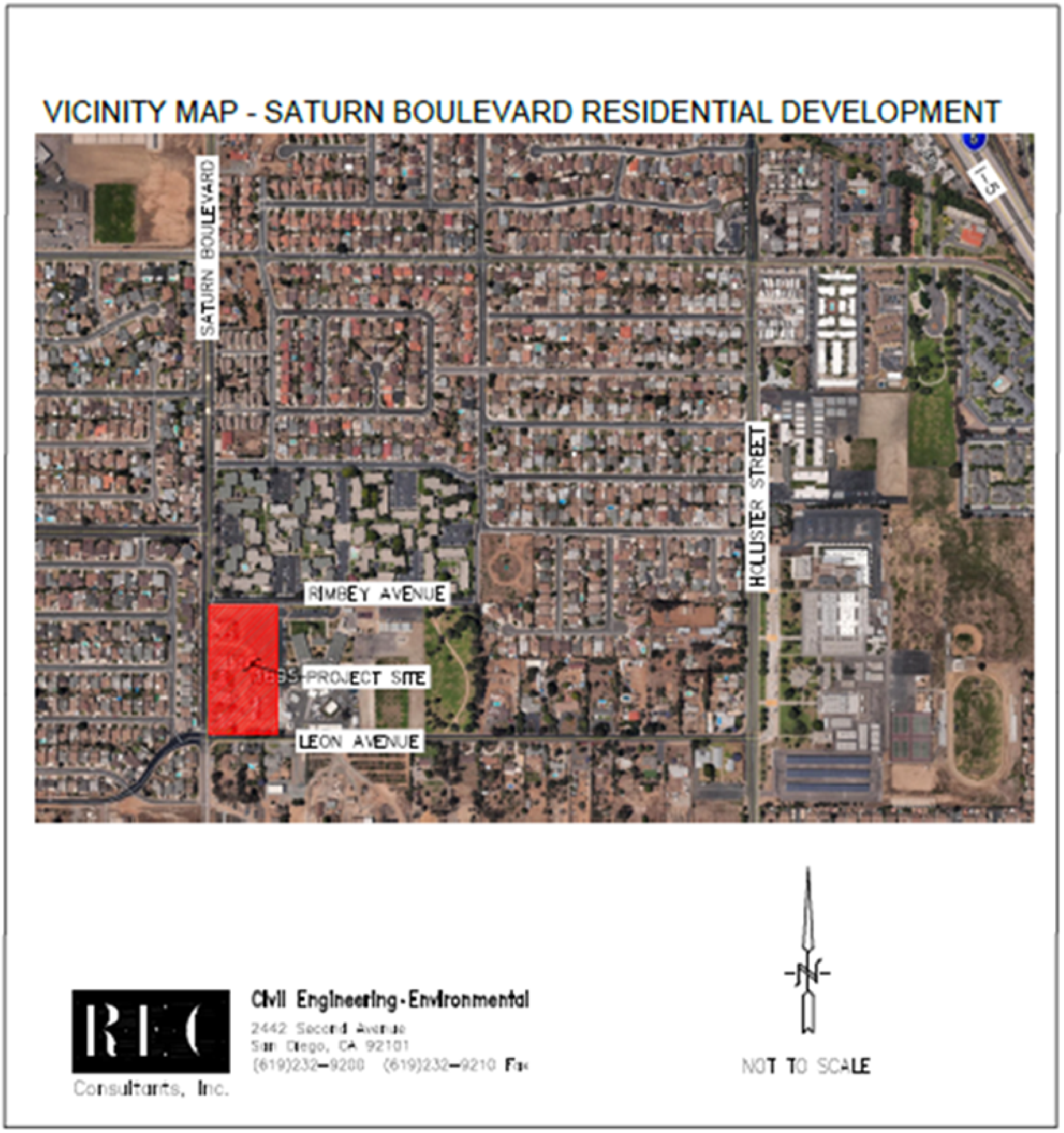
Use this Table to keep a record of submittals of this PDP SWQMP. Each time the PDP SWQMP is re-submitted, provide the date and status of the project. In last column indicate changes that have been made or indicate if response to plancheck comments is included. When applicable, insert response to plancheck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

Submittal Number	Date	Project Status	Changes
1	4/13/17	Preliminary Design/Planning/CEQA Final Design	**Initial Submittal**
2	1/29/18	Preliminary Design/Planning/CEQA Final Design	1st Submittal
3	6/1/18	Preliminary Design/Planning/CEQA Final Design	Response to Comments
4	7/31/2018	Preliminary Design/Planning/CEQA Final Design	Response to Comments

Project Name:

Project Vicinity Map

Project Name: SATURN BOULEVARD SINGLE FAMILY RESIDENTIAL PROJECT
Permit Application



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: 1695 Saturn Boulevard, San Diego, California	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

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

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 ☒

David Larson	Owner
Name of Owner or Agent *(Please Print)*	Title
	01/29/2018
Signature	Date

Applicability of Permanent, Post-Construction Storm Water BMP Requirements			Form I-1
Project Identification			
Project Name: Saturn Boulevard Residential Development			
Permit Application Number: VTM 1996523, PDP 1996525 CDP 1996526, REZONE 1996524			Date: 1/29/18
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: Redevelopment project is considered a PDP because it will replace more than 5,000 sq-ft of impervious surface area, and includes streets and driveways. The project area is approximately 3.7 acres.			

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: The State Water Resources Board provides a Google Earth layer of critical source sediment yield areas, none of which are in close proximity to the subject redevelopment. See Hydromodification Exhibit in Attachment 2.		

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.

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Project Name:

Site Information Checklist For PDPs	Form I-3B
Project Summary Information	
Project Name	Saturn Boulevard Residential Development
Project Address	1695 Saturn Boulevard
Assessor's Parcel Number(s) (APN(s))	634-092-0100
Permit Application Number	VTM 1996523, PDP 1996525 CDP 1996526, REZONE 1996524
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)	Tijuana Valley Hydrologic area 911.1
Project Area (total area of Assessor's Parcel(s) associated with the project or total area of the right-of-way)	3.63 Acres (160,180 Square Feet)
Area to be disturbed by the project (Project Footprint)	3.60 Acres (156,484 Square Feet)
Project Proposed Impervious Area (subset of Project Footprint)	1.71 Acres (74,398 Square Feet)
Project Proposed Pervious Area (subset of Project Footprint)	1.89 Acres (82,086 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	41 %

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:
Existing Land Cover Includes (select all that apply): ☐Vegetative Cover ☑Non-Vegetated Pervious Areas ☑Impervious Areas Description / Additional Information:
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: There are no hydrologic features on or in the immediate vicinity of the subject property; additionally, project site has been mass graded.

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 site in existing condition is partially developed with a single family residential home and agricultural area in the southern section of the project site. The northern part of the site is mass graded, but undeveloped. The whole area is relatively flat with a slight slope from southeast to northwest. Everything surface flows over non-vegetated soil and onto adjacent Rimbey Avenue to the north, Saturn Street to the west. There are no existing storm drain systems on the project site or on the adjacent streets.

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 proposed project consists of a residential development that will include up to 18 new single-family residential lots, one infiltration basin, a paved private driveway. Public improvements include a road widening on Leon Avenue with new non-contiguous sidewalk, sidewalk planter, curb and gutter and curb ramp. (see separate PDP exemption for green street sidewalk planter design) Public Improvements along Saturn Blvd include 3 Driveway closures. Public Improvements along Rimbey Avenue include Driveway and modified D-25 outlet
List/describe proposed impervious features of the project (e.g., buildings, roadways, parking lots, courtyards, athletic courts, other impervious features): Impervious features within proposed project consist of 18 single family homes, private driveways, a paved drive isle and sidewalk.
List/describe proposed pervious features of the project (e.g., landscape areas): Sidewalk improvements along Leon Avenue include a new non-contiguous sidewalk. Landscape Parkway will be modified to a sidewalk planter for green street exemption. (see separate PDP exemption)
Does the project include grading and changes to site topography? ☐ Yes ☐ No Description / Additional Information: Project does not significantly alter the sight topography, however, it does include grading for the roadway, building pads and driveways.

Project Name:

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 proposed project site drainage include earthen swales that will direct runoff towards one (1) infiltration basin located on the northwestern corner of the project site. Onsite runoff not collected by swales will overland flow towards the same basin. This basin will infiltrate onto the soil and any overflow will be directed towards adjacent Rimbey Avenue, where it will travel as sheet flow to the east, as in existing conditions. There is no existing storm drain conveyance system in the adjacent street of the project site to connect to. Flow from the driveways located on the north and south of the proposed driveway will flow directly onto adjacent Rimbey and Leon Avenues. Improvements along Leon Avenue will be treated with sidewalk planters that shall meet min. green street standards. Sidewalk planters shall be located within landscape parkway between proposed curb and sidewalk. (see separate PDP exemption) Please refer to project drainage report for detailed calculations.

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: For Onsite storm drain inlets: Mark all inlets with the words “No Dumping! Flows to Bay” or similar. Maintain and periodically repaint or replace inlet markings. Provide storm water pollution prevention information to new site owners, lessees, or operators. See applicable operational BMPs Fact Sheet SC-44, “Drainage System Maintenance”, in the CASQA Sotrm Water Quality Handbooks at www.casqa.org/resources/bmp-handbooks/municipal-bmp-handbook. Include the following in lease agreements: “Tenant shall not allow anyone to discharge anything to storm drains or to store or deposite materials so as to create a potential discharge to storm drains. For landscape/outdoor pesticide use: Final landscape plans will accomplish all of the following: Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to storm water pollution.

Where landscaped areas are used to retain or detain storm water, specify plants that are tolerant of periodic saturated soil conditions.
Consider using pest-resistant plants, especially adjacent to hardscape.
To ensure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.
Maintain landscaping using minimum or no pesticides.

<u>For need for future indoor and structural pest control:</u>
Note building design features that discourage entry of pests
Provide integrated pest management information to owners, lessees, and operators.

<u>For plazas, sidewalks, and parking lots:</u>
Plazas, sidewalks, and parking lots shall be swept regularly to prevent the accumulation of litter and debris.
Debris from pressure washing shall be collected to prevent entry into the storm drain system. Washwater containing any cleaning agent or degreaser shall be collected and discharged to the sanitary sewer and not discharged to a storm drain.

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)
Storm water runoff from project site will drain onto an infiltration basin located in the northwest corner of the project site. Overflow from proposed basin will be directed towards adjacent Rimbey avenue to the north where it will sheet flow in a western direction. Flow from the proposed driveway located on Rimbey Avenue and Leon Avenue will flow east to west directly onto Saturn Blvd. Runoff onto the streets will flow in a northwestern direction. This portion of the city discharges onto the Tijuana River to the south. The Tijuana River reaches the Pacific Ocean at the Tijuana River Estuary. According to the San Diego Region Hydrologic Basin Pan Area Map the site is located within the Tijuana Valley 911.1 hydrologic unit, in the Tijuana River Watershed.
Provide a summary of all beneficial uses of receiving waters downstream of the project discharge locations
Tijuana River: REC2, BIOL, WARM, WILD, RARE Tijuana River Estuary: REC1, REC2, COMM, BIOL, EST, WILD, RARE, MAR, MIGR, SPWN, WARM, SHELL. Pacific Ocean Shoreline, Tijuana HU, at Tijuana River Mouth: IND, NAV, REC1, REC2, COMM, BIOL, WILD, RARE, MAR, AQUA, MIG, SPWN, SHELL
Identify all ASBS (areas of special biological significance) receiving waters downstream of the project discharge locations
N/A according to the information available on the State Water Resources Control Board (SWRCB) ASBS webpage (http://www.waterboards.ca.gov/water_issues/programs/ocean/asbs_areas.shtml and http://cordc.ucsd.edu/projects/asbs/) there are only 2 ASBSs within SanDiego region (near Scripps Beach and in La Jolla Shores), neither of which receive runoff from the site.
Provide distance from project outfall location to impaired or sensitive receiving waters
The site is approximately 0.5 miles north of the Tijuana River and 1.1 miles northeast of the Tijuana Estuary both of which are impaired.
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 site is approximately 0.5 miles north of non-City Owned Land identified as Multi-habitat Planning Area on Figure CE-2 within the City of San Diego General Plan.

Form I-3B Page 8 of 11

Identification of Receiving Water Pollutants of Concern

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

303(d) Impaired Water Body	Pollutant(s)/Stressor(s)	TMDLs/ WQIP Highest Priority Pollutant
Tijuana River	Ammonia as N, Benthic community Effects, Eutrophic, Indicator Bacteria, Low dissolved oxygen, pesticides, phosphorous, sedimentation /siltation, selenium, soils, surfactants, synthetic organics, toxicity, trace elements, trash	Eutrophic, indicator bacteria, lead, low dissolved oxygen, nickel, pesticides, phosphorous, sedimentation/siltation, selenium, solids, surfactants (MBAS), synthetic organics, thalium, total nitrogen as N, toxicity, trace elements, trash.
Tijuana River Estuary.	Eutrophic, Indicator bacteria, lead, nickel, pesticides, thalium,, trash, turbidity.	Eutrophic, indicator bacteria, lead, low dissolved oxygen, nickel, pesticides, pH, solids, synthetic organics, thalium, trash, turbidity.
Pacific Ocean Shoreline, Tijuana HU, at Tijuana River Mouth.		Enterococcus, fecal coliform, total coliform.

Identification of Project Site Pollutants*

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

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

Pollutant	Not Applicable to the Project Site	Anticipated from the Project Site	Also a Receiving Water Pollutant of Concern
Sediment	☐	☐	☐
Nutrients	☐	☐	☐
Heavy Metals	☐	☐	☐
Organic Compounds	☐	☐	☐
Trash and Debris	☐	☐	☐
Oxygen Demanding Substances	☐	☐	☐
Oil & Grease	☐	☐	☐
Bacteria and 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: Based on the Critical Course Sediment Yield Areas layer (PPCSYA_082514 kmz file) for Google Earth, there are no CCSYAs on or contributing runoff to the subject property.

Project Name:

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. The project has only one point of compliance (POC) located near the northwest corner of the proposed improvements where stormwater runoff from the infiltration basin flows onto the adjacent Rimbey Avenue and northwest onto Saturn Blvd. See Hydromodification Exhibit in Attachment 2. Public street improvements along Leon Avenue shall be treated via sidewalk planters along the landscape parkway between the proposed curb and sidewalk on Leon Avenue. Sidewalk planters shall meet green street standards (see separate PDP exemption). Flows from Leon Avenue flow from east to west to the intersection of Saturn Blvd and Leon Avenue. And flows north along Saturn Blvd to said POC.
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: The hydromodification management analysis uses the low flow threshold of 0.1Q because a geomorphic assessment has not been performed.
Discussion / Additional Information: (optional) For further details, please refer to the documentation included in Attachment 2 of this SWQMP report.

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. Site constraints influential to the storm water BMP design include the previous development of the site (i.e. all native vegetation and natural flow paths have been replaced with structures, driveways or have been mass graded, all native soils have been compacted as part of past construction. Other factors that are critical to the storm water design are the lack of storm water conveyance systems in the streets adjacent to the project site, and existing elevations. Topographic constraints related to the surrounding roadways and neighboring properties.
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.

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:			
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:			
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:			

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: The project site has been mass graded, there are no natural drainage pathways within the project site or in the area surrounding the subject matter. Nevertheless the overall flow pattern and point of discharge will remain more or less unchanged by the proposed improvements.			
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: The project is a redevelopment from industrial and residential areas to a multi-single family residential development. The area does not contain any existing natural areas, soil, or vegetation.			

Project Name:

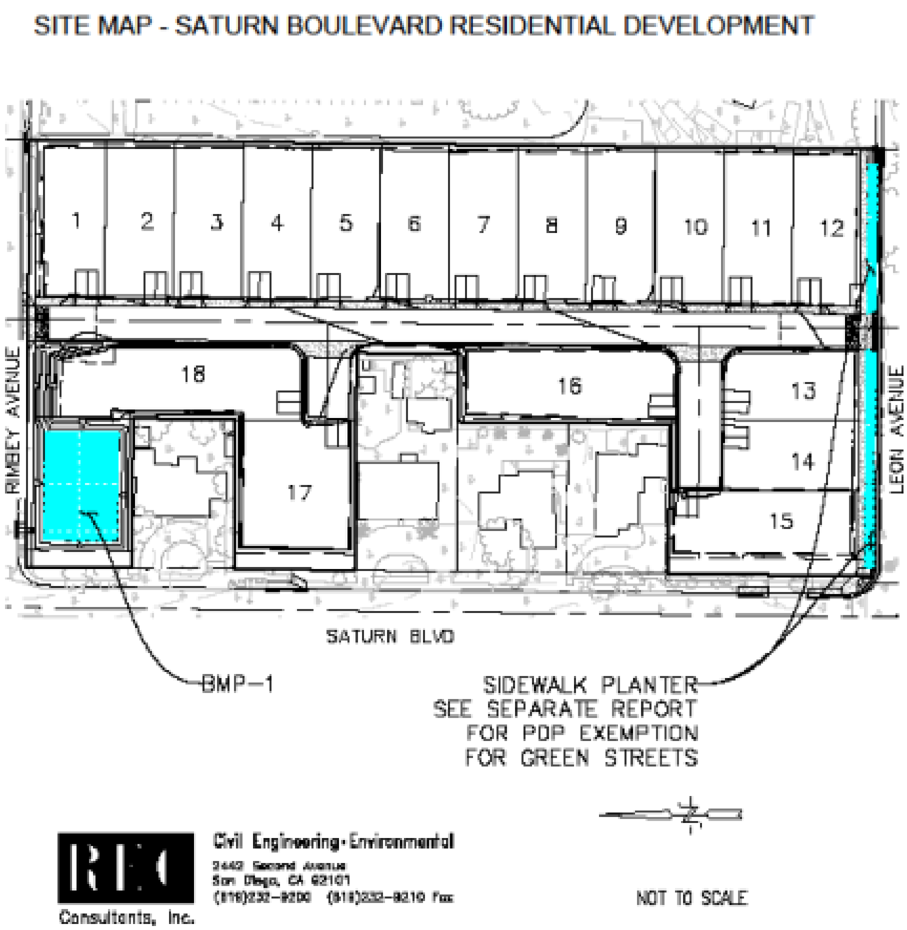
Form I-5B Page 2 of 4			
Site Design Requirement	Applied?		
4.3.3 Minimize Impervious Area	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.3 not implemented: The proposed development design includes pervious areas where possible.			
4.3.4 Minimize Soil Compaction	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.4 not implemented: Although the soils onsite were compacted during the previous development of the site, the design looks to implement limited compaction in the proposed BMP site.			
4.3.5 Impervious Area Dispersion	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.5 not implemented: The site has been designed to disperse runoff from impervious surfaces to depressed permeable areas, and to an infiltration BMP located at the northwest corner of project area.			
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

Project Name:

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: Although the site has been designed to collect runoff from impervious surfaces and disperse it to depressed permeable areas, those areas have not been evaluated as SD-6 but instead have been designed as an Infiltration BMP.			
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: Please refer to Landscape Plans for further details.			
4.3.8 Harvest and Use Precipitation	☐ Yes	☐ No	☐ N/A
Discussion / justification if 4.3.8 not implemented: Harvest and re-use is not implemented because entire site will flow onto one (1) infiltration BMP. Results from Worksheet B.3-1, included in Attachment 1, indicate that the project qualifies as Feasibility Category No. 4 (requiring standard unlined biofiltration BMPs), and does not qualify for Feasibilty Category No. 2 (requiring capture and use).			
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:

Form I-5B Page 4 of 4
Insert Site Map with all site design BMPs identified:



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. The site was designed to drain all proposed impervious surfaces to permeable landscaped areas to promote onsite infiltration and address the City's water quality and hydromodification requirements. Onsite percolation testing was performed by CTE, Inc. indicating that soils onsite infiltrate relatively well (infiltration > 0.5 in/hr) thus, proposed basin has been designed as an infiltration basin. Rainwater harvest and re-use was also considered, but was not determined to be a viable option according to the results from Worksheet B.3-1, included under Attachment 1. (Continue on page 2 as necessary.)	

Project Name:

Form I-6 Page 2 of
(Continued from page 1)

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) ☐ 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	Jonathan Raab Rydeen REC Consultants, Inc. (619) 232-9200
Who will be the final owner of this BMP?	HOA
Who will maintain this BMP into perpetuity?	HOA
What is the funding mechanism for maintenance?	Funds to be collected by HOA

Project Name:

Form I-6 Page 1 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):

Project Name: **Saturn Boulevard Single Family Residential Development**

THE CITY OF SAN DIEGO	City of San Diego **Development Services** 1222 First Ave., MD-302 San Diego, CA 92101 (619) 446-5000	**Permenant BMP Construction** **Self Certification Form**	FORM DS-563 January 2016

Date Prepared: 05/31/2018.	Project No.: Click here to enter text.
Project Applicant: Palm Avenue Realty.	Phone: (619) 623-4488.
Project Address: 1695 Saturn Boulevard, San Diego, California.	
Project Engineer: Jonathan Raab Rydeen.	Phone: (619) 232-9200.

The purpose of this form is to verify that the site improvements for the project, identified above, have been constructed in conformance with the approved Storm Water Quality Management Plan (SWQMP) documents and drawings.

This form must be completed by the engineer and submitted prior to final inspection of the construction permit. Completion and submittal of this form is required for all new development and redevelopment projects in order to comply with the City's Storm Water ordinances and NDPES Permit Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100. Final inspection for occupancy and/or release of grading or public improvement bonds may be delayed if this form is not submitted and approved by the City of San Diego.

CERTIFICATION:

As the professional in responsible charge for the design of the above project, I certify that I have inspected all constructed Low Impact Development (LID) site design, source control and structural BMP's required per the approved SWQMP and Construction Permit No. Click here to enter text.; and that said BMP's have been constructed in compliance with the approved plans and all applicable specifications, permits, ordinances and Order No. R9-2013-0001 as amended by R9-2015-0001 and R9-2015-0100 of the San Diego Regional Water Quality Control Board.

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

Signature: ____________________

Date of Signature: 06/04/2018

Printed Name: Jonathan Raab Rydeen

Title: Principal Engineer.

Phone No. (619) 232-9200.

Engineer's

DS-563 (12-15)

Attachment 1
Backup For PDP Pollutant Control BMPs

This is the cover sheet for Attachment 1.

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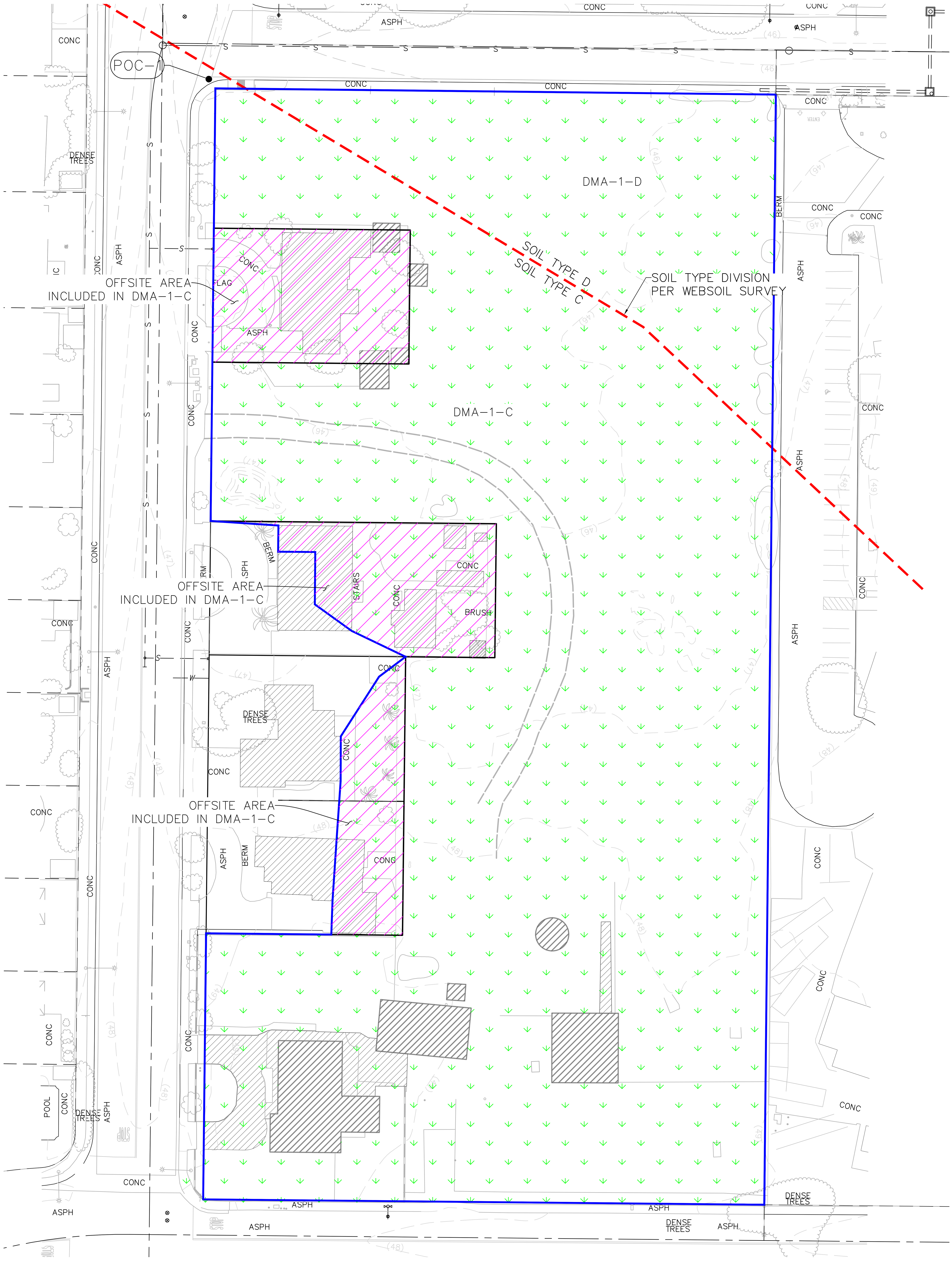
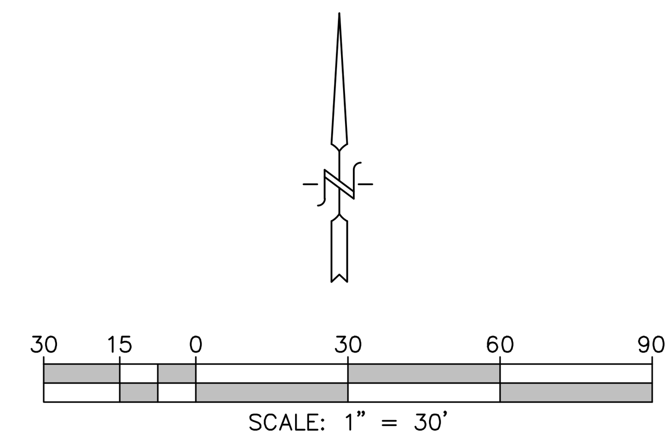


LEGEND

- PROPERTY BOUNDARY
- DMA BOUNDARY
- PERVIOUS AREA
- EXISTING IMPERVIOUS AREA
- SOIL BOUNDARY
- OFFSITE AREA DRAINING ONTO BMP

EXISTING CONDITIONS						
DMA	SUB AREA	SOIL TYPE	IMPERVIOUS (SQ FT)	PERVIOUS (SQ FT)	TOTAL AREA (SQ FT)	POC
DMA-1	C	C		133163	133163	POC-1
	D	D		26964	26964	
OFFSITE	C	C	6275	13458	19733	
TOTAL		–	6275	173585	179860	–



SHEET 1 OF 3 SHEETS

SHEET TITLE
DMA - EXISTING CONDITIONS

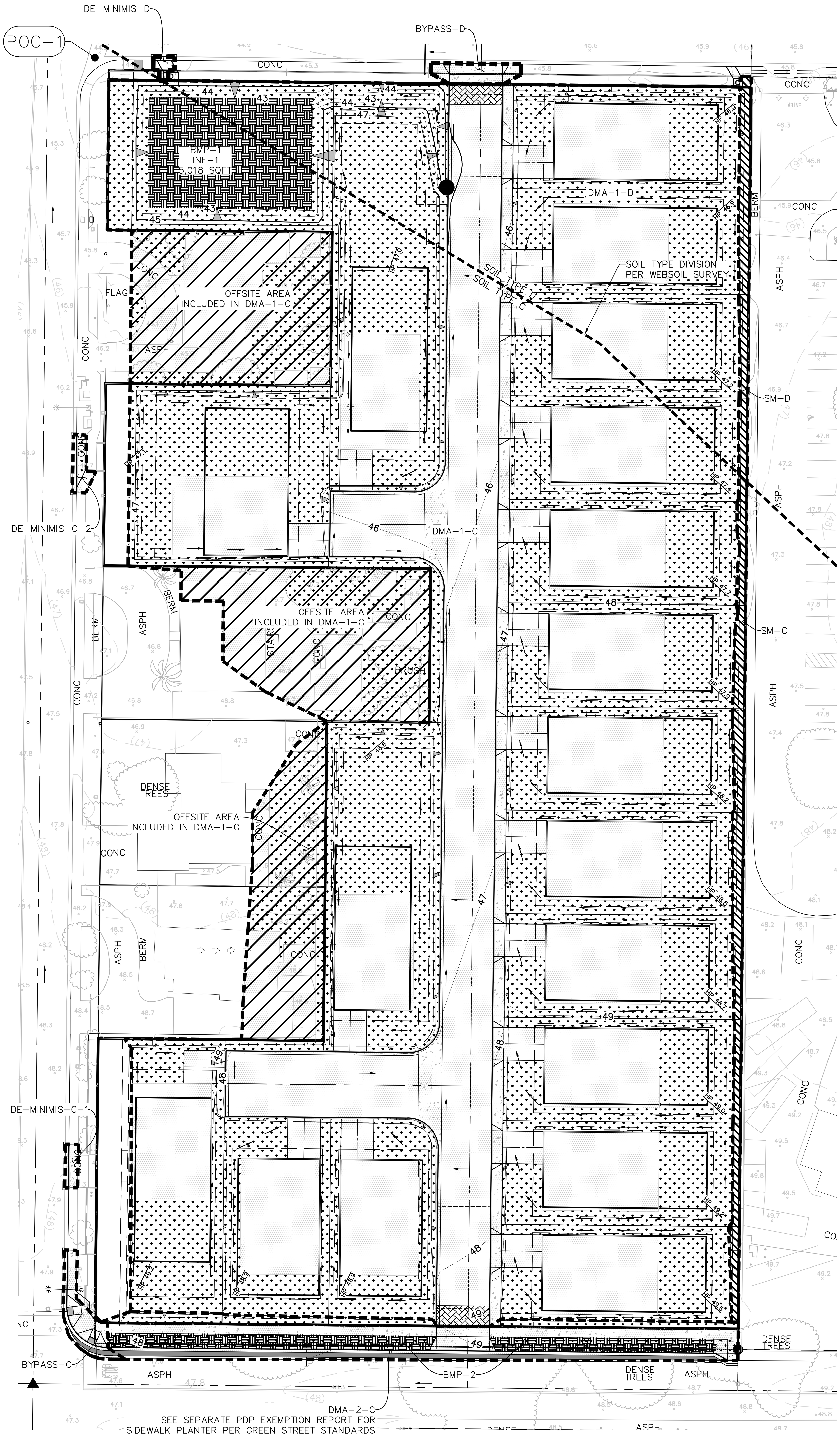
PROJECT
SATURN BLVD RESIDENTIAL DEVELOPMENT
1695 SATURN BOULEVARD
SAN DIEGO, CALIFORNIA

DATE: 04/04/2017
SCALE: 1" = 40'
DRAWN: M.D.
CHECKED:

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

REVISIONS			
NO.	DESCRIPTION	DATE	APP'D

SAVE DATE: 2/7/2018 ~ PLOT DATE: 2/7/2018 ~ FILE NAME: P:\Acad\1229 Saturn Blvd\Reports\SWQMP\CAD\170327_1229_DMA_PRE.dwg



LEGEND

- PROPERTY BOUNDARY
- DMA BOUNDARY
- IMPERVIOUS AREA
- PERVIOUS AREA
- SELF-MITIGATING AREA NOT DRAINING ONTO BMP
- OFFSITE AREA DRAINING ONTO BMP
- BMP AREA
- SOIL BOUNDARY
- EARTHEN SWALE

SOURCE CONTROL BMPs

- PROHIBITIVE SIGNAGE
- INDOOR PEST CONTROL
- PERVIOUS AREA
  - * MINIMIZED IMPERVIOUS AREA
  - * MINIMIZED SOIL COMPACTION
  - * LANDSCAPE WITH NATIVE OR DROUGHT TOLERANT SPECIES

NOTES

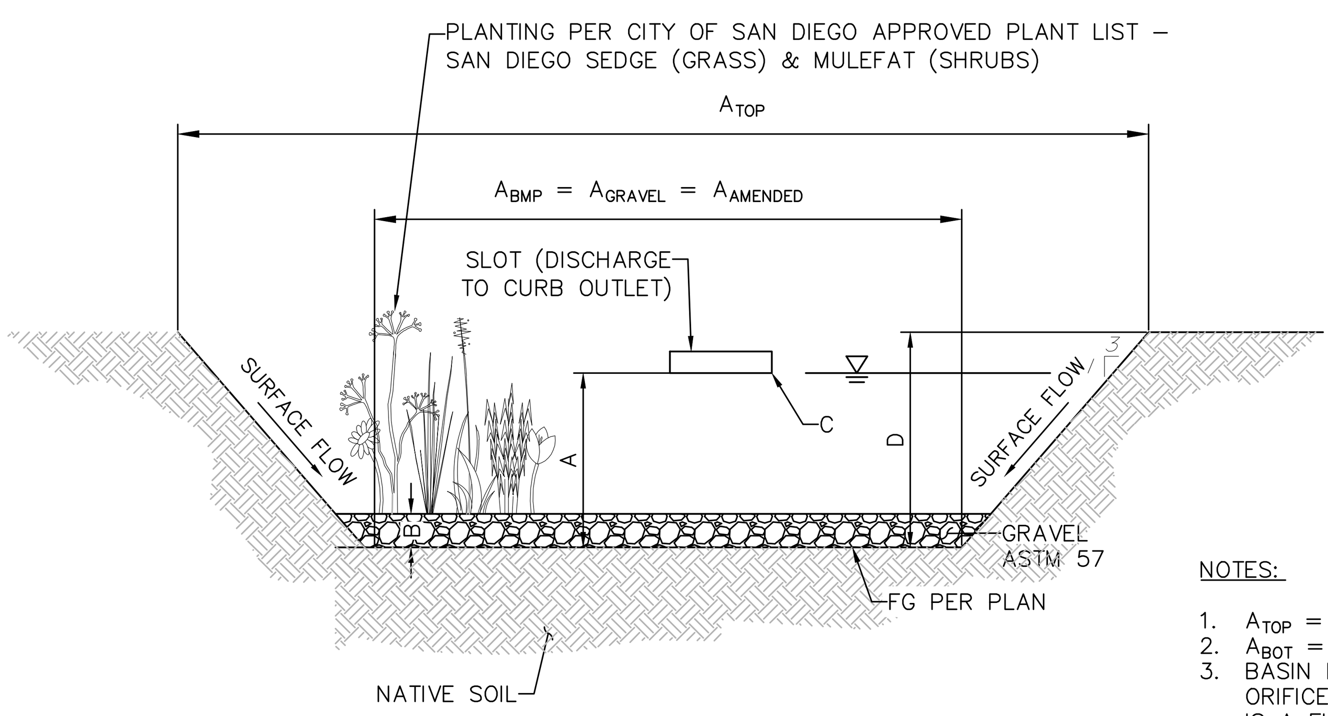
- NO CRITICAL COURSE SEDIMENT YIELD AREAS TO PROTECT
- DEPTH TO GROUNDWATER > 20 FT
- UNDERLYING SOIL TYPES "C" AND "D"
- NO EXISTING NATURAL HYDROLOGIC FEATURES
- OFFSITE AREA (AS SHOWN) DRAINS TO INFILTRATION BASIN

SAMPLE PROHIBITIVE SIGNAGE
NTS

PROPOSED CONDITIONS

DMA	SUB AREA	SOIL TYPE	IMPERVIOUS (SQ FT)	PERVIOUS (SQ FT)	TOTAL AREA (SQ FT)	DRAINS TO	POC
DMA-1	1-C	C	71368	71260	142628	BMP-1	POC-1
	1-D	D	9311	13903	23214		
DMA-2	2-C	C	3109	3091	6200	BMP-2	
SELF MITIGATING	SM-C	C	0	1807	1807	BYPASS	
	SM-D	D	0	961	961		
DE-MINIMIS-C	DE-MINIMIS-C-1	C	136	0	136		
	DE-MINIMIS-C-2	C	107	100	207		
DE-MINIMIS-D	DE-MINIMIS-D	D	91	0	91		
BYPASS	BYPASS-C	C	594	0	594		
	BYPASS-D	D	398	0	398		
TOTAL		-	85114	91122	176236	-	-
MINIMUM INFILTRATION BASIN AREA			5,018 SF REQUIRED		5,018 SF PROVIDED		

NOTE: ALL PROPOSED LOTS ARE TO BE ASSUMED TO BE HAVE APPOX. 2,181 SQUARE FEET OF IMPERVIOUS AREA FOR FUTURE CONSTRUCTION



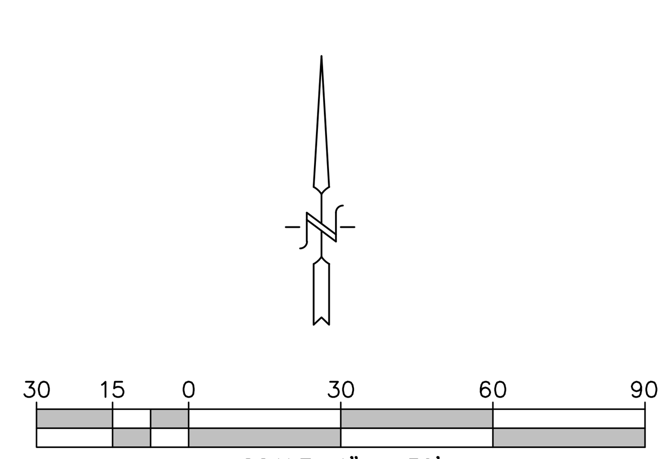
BMP-1 INFILTRATION BASIN
NOT TO SCALE

TABULATED DATA

A	3.00'
B	1.00'
C	0.25' x 7.0"
D	3.50'

NOTES:

1. $A_{TOP} = 6{,}587\ FT^2$
2. $A_{BOT} = 5{,}018\ FT^2$
3. BASIN DOES NOT HAVE AN LID ORIFICE OR FRENCH DRAIN AS IT IS A FULL INFILTRATION BASIN



SHEET 1 OF 1 SHEETS	SHEET TITLE: DMA - PROPOSED CONDITIONS PROJECT: SATURN BLVD RESIDENTIAL DEVELOPMENT 1695 SATURN BOULEVARD SAN DIEGO, CALIFORNIA	DATE: 1-26-18 SCALE: 1" = 40' DRAWN: R.J.D. CHECKED:	REC Consultants, Inc. Civil Engineering · Environmental Land Surveying 2442 Second Avenue San Diego, CA 92101 (619)232-9200 (619)232-9210 Fax

REVISIONS

NO.	DESCRIPTION	DATE	APP'D

SAVE DATE: 8/9/2018 ~ PLOT DATE: 10/1/2018 ~ FILE NAME: P:\Acad\1229 Saturn Blvd\Reports\SWQMP\CAD\180801_1229_DMA_HMP-POST.dwg

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.	☑ 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

Project Name:

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

The DMA Exhibit must identify:

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

EEI
Engineering Solutions

September 26, 2018

Mr. David Larson
Palm Avenue Realty Company
950 Garland Drive
San Diego, CA 92165

Subject: **Feasibility of Onsite Stormwater Infiltration**
Proposed Single-Family Residential Subdivision Development
1695 Saturn Boulevard
San Diego, California
EEI Project AAA-72282.4

References: EEI, 2016, Due diligence Level Geotechnical Review and Results of Preliminary Percolation Study, Proposed Single-Family residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project AAA-72282.4, Dated February 15, 2016. Revised May 11, 2016.

EEI, 2017a, Supplemental Percolation Study, Proposed Single-Family residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project AAA-72282.4, Dated February 28, 2017.

EEI, 2017b, Geotechnical Evaluation, Proposed Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project AAA-72282.4, Dated December 15, 2017.

Dear Mr. Larson:

Pursuant to your request and authorization, EEI has prepared this Feasibility letter regarding proposed onsite stormwater infiltration at the subject property located in the City of San Diego, California.

SUMMARY OF INFILTRATION FEASIBILITY

Site-specific percolation/infiltration testing was performed by EEI during previous subsurface explorations at the site as referenced (EEI, 2017a). The results of our percolation/infiltration studies presented in our referenced geotechnical report (EEI, 2017a) indicate that the upper soil materials on the site are comprised of fine grained silty and clayey sand with reliable infiltration rates of 0.26 to 0.32 inches per hour. These rates are less than the recommended 0.5 inches per hour for full infiltration.

The groundwater levels at the subject site are reported to be greater than 40 feet of existing grades (EEI, 2017b). The site is not susceptible to liquefaction and seismic induced settlement, and is not located within an Alquist-Priolo Earthquake Fault Zone (EEI, 2017a, 2017b and 2017c). Based on these infiltration rates, reported subsurface conditions, and geotechnical/geologic hazards identified in the referenced reports, we consider the native soil materials onsite to be suitable for partial infiltration of stormwater.

<u>As a result, we consider the site to be feasible for partial infiltration of stormwater into the native soil materials onsite.</u>

LIMITATIONS

This Feasibility Evaluation has been conducted in accordance with generally accepted geotechnical engineering principles and practice. EEI's Feasibility Evaluation is based solely upon the site reconnaissance and a review of readily available previous geotechnical reports and publically available geologic information pertinent to the subject property performed by EEI.

EEI assumes no warranty as to the accuracy of the referenced reports. Findings provided herein have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time. This report has been prepared for the sole use of Palm Avenue Realty Company (Client), within a reasonable time from its authorization. Site conditions, land use (both onsite and offsite), or other factors may change as a result of manmade influences, and additional work may be required with the passage of time.

This Feasibility Evaluation should not be relied upon by other parties without the express written consent of EEI and the Client; therefore, any use or reliance upon this geotechnical review by a party other than the Client shall be solely at the risk of such third party and without legal recourse against EEI, its employees, officers, or directors, regardless of whether the action in which recovery of damages is brought or based upon contract, tort, statue, or otherwise. The Client has the responsibility to see that all parties to the project, including the designer, contractor, subcontractor, and building official, etc. are aware of this report in its complete form. This report contains information that may be used in the preparation of contract specifications; however, the report is not designed as a specification document, and may not contain sufficient information for use without additional assessment. EEI assumes no responsibility or liability for work or testing performed by others. In addition, this report may be subject to review by the controlling authorities.

EEI appreciates the opportunity to be of service for this project. If you have any questions, please contact the undersigned at (760) 431-3747.

Sincerely,
EEI

CERTIFIED ENGINEERING GEOLOGIST
JEFFREY P. BLAKE
No. EG 2248
Exp. 10/31/19
STATE OF CALIFORNIA

Jeffrey P. Blake
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REGISTERED PROFESSIONAL ENGINEER
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GEOTECHNICAL
STATE OF CALIFORNIA

Appendix A: City of San Diego I-8 Forms

Distribution: (2) Addressee (one via electronic copy and one hard copy)

\\Server1\public\EEI Projects\AAA SINGLE PROJ CLIENTS\AAA-72282 Saturn Blvd. LLC, Chula Vista\Geo Evaluation\Report\Infiltration Feasibility\AAA-72282.4 Feasibility Infiltration Letter FNL MC JPB JLM ks 9.27.18).doc

APPENDIX A

Project Name: SATURN BOULEVARD SINGLE FAMILY RESIDENTIAL PROJECT

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: o Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*) o Form I-8A (optional) o Form I-8B (optional) • Partial Infiltration Condition: o Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*) o Form I-8A o Form I-8B • Full Infiltration Condition: o Form I-8A o Form I-8B o Worksheet C.4-3 o Form I-9 Refer to Appendices C and D of the BMP Design Manual for guidance.	☑ 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

<table>
<tr><th colspan="2">Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions[1]</th><th>Worksheet C.4-1: Form I-8A[2]</th></tr>
<tr><td colspan="3">Part 1 - Full Infiltration Feasibility Screening Criteria</td></tr>
<tr><td colspan="2">DMA(s) Being Analyzed:</td><td>Project Phase:</td></tr>
<tr><td colspan="2">1695 Saturn Blvd.</td><td>Design</td></tr>
<tr><td colspan="3">Criteria 1: Infiltration Rate Screening</td></tr>
<tr><td>1A</td><td colspan="2">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[3]?
○ 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).</td></tr>
<tr><td>1B</td><td colspan="2">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.</td></tr>
<tr><td>1C</td><td colspan="2">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.</td></tr>
<tr><td>1D</td><td colspan="2">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.</td></tr>
</table>

[1] 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.

[2] 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.

[3] 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[2]
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.

Within the proposed Infiltration Basin, EEI performed borehole percolation tests at depths of 3 to 10 feet below ground surface (EEI, 2017a). Measured percolation rates were converted to measured infiltration rates using the porchet method. Measured infiltration rates varied from 0.53 to 0.63 in/hr. The factor of safety used was 2.0. This is based on the moderately homogenous loamy (silty/clayey sand) soils that were encountered during percolation testing, and the lack of shallow groundwater at the site as determined from our 2017 geotechnical evaluation (EEI, 2017b). When dividing the measured infiltration rates by the factor of safety of 2.0, the resulting reliable infiltration rates range from 0.26 to 0.32 in/hr. These are lower than the minimum 0.5 in/hr rate that the City/County of San Diego recommend for BMP design. Therefore, it is our opinion that full infiltration is not feasible on the subject site.

References: EEI, 2017a, "Supplemental Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4a", dated February 28, 2017

EEI, 2017b, "Geotechnical Evaluation, Saturn Boulevard, LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4", dated December 15, 2017

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions			Worksheet C.4-1: Form I-8A[2]
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[2]	
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[2]	
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. The reliable infiltration rates are less than 0.5 in/hr, therefore Full Infiltration is not feasible at the subject site (EEI, 2017a; EEI, 2017b). References: EEI, 2017a, "Supplemental Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4a", dated February 28, 2017 EEI, 2017b, "Geotechnical Evaluation, Saturn Boulevard, LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4", dated December 15, 2017			
Part 1 Result – Full Infiltration Geotechnical Screening[4]		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	

[4] 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[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria		
DMA(s) Being Analyzed:		Project Phase:
1695 Saturn Blvd.		Design
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). Three HSA borings were advanced within the proposed infiltration basin, to depths of 5 to 10 feet (borings B-2, B-3, and B-4). Percolation testing took place within these borings. The borings were emplaced within Pleistocene Old Paralic Deposits consisting of silty/clayey sand. After the borings were excavated, 3-inch diameter perforated PVC pipes were placed within the holes and gravel was placed around the pipe. The hole was pre-soaked with water and then testing was performed in 30 minute intervals to determine the water level until the change in water between three consecutive tests was less than 10%. Measured percolation rates were converted to measured infiltration rates using the Porchet Method. The measured infiltration rates varied from 0.63 to 0.53 in/hr. When applying the factor of safety of 2.0, the reliable infiltration rates for borings B-2, B-3, and B-4 was 0.32, 0.28, and 0.26 in/hr, respectively.		

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions			Worksheet C.4-1: Form I-8A[2]
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
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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
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
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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]

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

The site is not located within a liquefaction zone, nor is it susceptible to slope failure or seismically-induced landsliding. The onsite soils are fine-grained silty/clayey sands and the reliable infiltration rates are less than 0.5 in/hr. Due to these fine-grained soils and low infiltration rates, there is a potential for water to mound and cause damage to proposed utilities and the integrity of an existing structure on the southside of the proposed BMP (EEI, 2017a; EEI, 2017b). These problems can be mitigated by lining the proposed basin with impermeable membranes to prevent stormwater from backing up and damaging foundations/utilities.

References: EEI, 2017a, "Supplemental Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4a", dated February 28, 2017

EEI, 2017b, "Geotechnical Evaluation, Saturn Boulevard, LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4", dated December 15, 2017

Part 2 – Partial Infiltration Geotechnical Screening Result[5]	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

[5] 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 Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	**Project Phase:**
1695 Saturn Blvd.	Design
Criteria 1: Groundwater Screening	

1A	**Groundwater Depth.** Is the depth to seasonally high groundwater tables (normal high depth during the wet season) beneath the base of any full infiltration BMP greater than 10 feet? ○ Yes; continue to Step 1B. ○ No; The depth to groundwater is less than or equal to 10 feet, but site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to step 1B. ⦿ No; The depth to groundwater is less than or equal to 10 feet and site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" for Criteria 1 Result.
1B	**Contaminated Soil/Groundwater.** Are proposed full infiltration BMPs at least 250 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP. ○ Yes; continue to Step 1C. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1C. ⦿ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.

[1] 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.

[2] 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.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions		Worksheet C.4-2: Form I-8B[2]
1C	**Inadequate Soil Treatment Capacity.** Are full infiltration BMPs proposed in DMA soils that have adequate soil treatment capacity? The DMA has adequate soil treatment capacity if **ALL** of the following criteria (detailed in C.2.2.1) for all soil layers beneath the infiltrating surface are met: • USDA texture class is sandy loam or loam or silt loam or silt or sandy clay loam or clay loam or silty clay loam or sandy clay or silty clay or clay; and • Cation Exchange Capacity (CEC) greater than 5 milliequivalents/100g; and • Soil organic matter is greater than 1%; and • Groundwater table is equal to or greater than 10 feet beneath the base of the full infiltration BMP. ○ Yes; continue to Step 1D. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1D. ⦿ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.	
1D	**Other Groundwater Contamination Hazards.** Are there site-specific groundwater contamination hazards not already mentioned (refer to Appendix C.2.2) that can be reasonably mitigated to support full infiltration BMPs? ○ Yes; there are other contamination hazards identified that can be mitigated. Answer "Yes" to Criteria 1 Result. ○ No; there are other contamination hazards identified that cannot be mitigated. Answer "No" to Criteria 1 Result. ⦿ N/A; no contamination hazards are identified. Answer "Yes" to Criteria 1 Result.	
Criteria 1 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level? See Appendix C.2.2.8 for a list of typically reasonable and typically unreasonable mitigation measures. ○ Yes; Continue to Part 1, Criteria 2. ⦿ No; Continue to Part 1 Result.	

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Summarize groundwater quality and any mitigation measures proposed. Documentation should focus on groundwater table, mapped soil types and contaminated site locations. Infiltration rates are less than 0.5 in/hr. Therefore, Full Infiltration is not feasible on the subject site.	

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Criteria 2: Water Balance Screening	
2A	**Ephemeral Stream Setback.** Does the proposed full infiltration BMP meet both the following? • The full infiltration BMP is located at least 250 feet away from an ephemeral stream; **AND** • The bottom surface of the full infiltration BMP is at a depth 20 feet or greater from seasonally high groundwater tables. ○ Yes; Answer “Yes” to Criteria 2 Result. ◉ No; Continue to Step 2B.
2B	**Mitigation Measures.** Can site layout changes be proposed to support full infiltration BMPs? ○ Yes; the site can be reconfigured to mitigate potential water balance issues. Answer “Yes” to Criteria 2 Result. ◉ No; the site cannot be reconfigured to mitigate potential water balance issues. Continue to Step 2C and provide discussion.
2C	**Additional studies.** Do additional studies support full infiltration BMPs? In the event that water balance effects are used to reject full infiltration (anticipated to be rare), additional analysis shall be completed and documented by a qualified professional indicating the site-specific information evaluated and the technical basis for this finding. ○ Yes; Answer “Yes” to Criteria 2 Result. ◉ No; Answer “No” to Criteria 2 Result.
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams? ○ Yes; Continue to Part 1 Result. ◉ No; Continue to Part 1 Result.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth. Infiltration rates are below 0.5 in/hr. Therefore, Full Infiltration is not feasible on the subject site.	

Part 1 – Full Infiltration Groundwater and Water Balance Screening Result[3]	Result
If answers to Criteria 1 and 2 are "Yes", a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration based on groundwater conditions. If answer to Criteria 1 or Criteria 2 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design based on groundwater conditions. Proceed to Part 2.	○ Full Infiltration ◉ Complete Part 2

[3] 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 Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
1695 Saturn Blvd.	Design
Criteria 3: Groundwater Screening	
Contaminated Soil/Groundwater. Are partial infiltration BMPs proposed at least 100 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. This criterion is intentionally a smaller radius than full infiltration, as the potential quantity of infiltration from partial infiltration BMPs is smaller. ◉ Yes; Answer "Yes" to Criteria 3 Result. ○ No; However, site layout changes can be proposed to avoid contaminated soils or soils that lack adequate treatment capacity. Select "Yes" to Criteria 3 Result. It is a requirement for the SWQMP preparer to identify potential mitigation measures. ○ No; Contaminated soils or soils that lack adequate treatment capacity cannot be avoided and partial infiltration BMPs are not feasible. Select "No" to Criteria 3 Result.	
Criteria 3 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 risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level? ◉ Yes; Continue to Part 2, Criteria 4. ○ No; Skip to Part 2 Result.	
Summarize findings and basis. Documentation should focus on mapped soil types and contaminated site locations. There are no known groundwater contaminants onsite or in the proximity of the site (GeoTracker, 2017). During our 2017 Geotechnical Investigation (EEI, 2017b), groundwater was not encountered to the maximum explored depth of 41.5 feet below ground surface. Groundwater wells north of the subject site record groundwater depths of approximately 20 feet below ground surface (GeoTracker, 2017). Considering all of this, Partial Infiltration should not have any negative effect on the groundwater quality. References: EEI, 2017b, "Geotechnical Evaluation, Saturn Boulevard, LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4", dated December 15, 2017 GeoTracker Website, 2017, State Water Resources Control Board GeoTracker Website, <http://geotracker.waterboards.ca.gov/>, accessed August 7, 2018	

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Criteria 4: Water Balance Screening	
Additional studies. In the event that water balance effects are used to reject partial infiltration (anticipated to be rare), a qualified professional must provide an analysis of the incremental effects of partial infiltration BMPs on the water balance compared to incidental infiltration under a no infiltration scenario (e.g. precipitation, irrigation, etc.).	
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 causing potential water balance issues such as change of seasonality of ephemeral streams? ◉ Yes: Continue to Part 2 Result. ○ No: Continue to Part 2 Result.	
Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth. There are no ephemeral streams within 2000 feet of the subject site. The closest ephemeral stream is the Tijuana River located about half a mile to the south. As mentioned in the previous section, shallow groundwater is not present at the subject site. Partial Infiltration should not pose any challenge to water balance effects.	

Part 2 – Partial Infiltration Groundwater and Water Balance Screening Result[4]	Result
If answers to Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration based on groundwater and water balance conditions. If answer to Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site. The feasibility screening category is No Infiltration based on groundwater or water balance condition.	◉ Partial Infiltration Condition ○ No Infiltration Condition

[4] 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.

Worksheet C.4-3: Infiltration and Groundwater Protection for Full Infiltration BMPs

Infiltration and Groundwater Protection		Worksheet C.4-3	
Criteria	Question	Yes	No
1	Will the storm water runoff undergo pretreatment such as sedimentation or filtration prior to infiltration?	☐	☐
2	Are pollution prevention and source control BMPs implemented at a level appropriate to protect groundwater quality for areas draining to infiltration BMPs?	☐	☐
3	Is the vertical distance from the base of the full infiltration BMP to the seasonal high groundwater mark greater than 10 feet? This vertical distance may be reduced when the groundwater basin does not support beneficial uses and the groundwater quality is maintained	☐	☐
4	Does the soil through which infiltration is to occur have physical and chemical characteristics that are adequate for proper infiltration durations and treatment of runoff for the protection of groundwater beneficial uses? Refer to Appendix C.3.1.	☐	☐
5	Is the following statement true? Full infiltration BMPs are not used for areas of industrial or light industrial activity, and other high threat to water quality land uses and activities, unless source control BMPs to prevent exposure of high threat activities are implemented, or runoff from such activities is first treated or filtered to remove pollutants prior to infiltration.	☐	☐
6	Is the full infiltration BMP located at a distance greater than 100 feet horizontally from any water supply well?	☐	☐
Basis and Documentation: All the answers for Criteria 1 to 6 must be “Yes” for acceptance of a full infiltration BMP.			

Factor of Safety and Design Infiltration Rate Worksheet				Worksheet D.5-1: Form I-9	
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1
B	Design	Level of pretreatment/ expected sediment loads	0.5	2	1
		Redundancy/resiliency	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2
Combined Safety Factor, $S_{total} = S_A \times S_B$ [Minimum of 2 and Maximum of 9]				2	
Observed Infiltration Rate, inch/hr., $K_{observed}$ (corrected for test-specific bias) Note: This worksheet is only applicable when the observed infiltration rate is greater than or equal to 1 inch/hr.				0.53	
Design Infiltration Rate, in/hr., $K_{design} = K_{observed} / S_{total}$ Note: If the estimated design infiltration rate is less than or equal to 0.5 inch/hr. then the applicant may choose to implement partial infiltration BMPs.				0.265	
Supporting Data					
Briefly describe infiltration test and provide reference to test forms: Observed infiltration rate has been determined through percolation tests performed by geotechnical engineer. Tests were performed in accordance with City of San Diego regulations. See attached geotechnical report for detailed information.					

Note: Worksheet D.5-1: Form I-9 is only applicable to design BMPs in "full infiltration condition". This form is not applicable for categorization of infiltration feasibility (Worksheet C.4-1: Form I-8) and/or for designing BMPs in "partial infiltration condition" or "no infiltration condition".

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Project Name:

Tabular Summary of DMAs								Worksheet B-1	
DMA Unique Identifier	Area (acres)	Impervious Area (acres)	% Imp	HSG	Area Weighted Runoff Coefficient	DCV (cubic feet)	Treated By (BMP ID)	Pollutant Control Type	Drains to (POC ID)
DMA-1-C	3.28	1.64	50.04	C	0.57	3292	BMP-1	INFILTRATION	POC-1
DMA-1-D	0.53	0.21	40.11	D	0.54	512	BMP-1	INFILTRATION	POC-1
DMA-2-C	0.14	0.07	50.15	C	0.57	143	BMP-1	INFILTRATION	POC-1
SM-C*	0.04	0	0	C	0.23	17	-	Self-Mitigating	POC-1
SM-D*	0.02	0	0	D	0.30	12	-	Self-Mitigating	POC-1
DM-C-1*	0.003	0.002	66.67	C	0.90	5	-	BYPASS	POC-1
DM-C-2*	0.005	0.002	51.69	C	0.58	5	-	BYPASS	POC-1
DM-D*	0.002	0.002	100	D	0.9	3	-	BYPASS	POC-1
BYPASS-C	0.01	0.01	100	C	0.9	22	-	BYPASS	POC-1
BYPASS-D	0.009	0.009	100	D	0.9	15	-	BYPASS	POC-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
10	4.05	1.95	48.3		0.56	4026	3.95		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

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Weighted Runoff Factor					
DMA	Type of Surface	Area (acres)	Runoff Factor	C x A	Weighted C
1-C	Roof, Concrete, Asphalt	1.64	0.9	1.475	0.57
	Pervious, Natural (Type C Soil)	1.64	0.23	0.376	
1-D	Roof, Concrete, Asphalt	0.21	0.9	0.192	0.54
	Pervious, Natural (Type D Soil)	0.32	0.3	0.096	
2-C	Roof, Concrete, Asphalt	0.07	0.9	0.064	0.57
	Pervious, Natural (Type C Soil)	0.07	0.23	0.016	
SM-C	Roof, Concrete, Asphalt	0.00	0.9	0.000	0.23
	Pervious, Natural (Type C Soil)	0.04	0.23	0.010	
SM-D	Roof, Concrete, Asphalt	0.00	0.9	0.000	0.30
	Pervious, Natural (Type D Soil)	0.02	0.3	0.007	
DM-C-1	Roof, Concrete, Asphalt	0.00	0.9	0.003	0.90
	Pervious, Natural (Type C Soil)	0.00	0.23	0.000	
DM-C-2	Roof, Concrete, Asphalt	0.00	0.9	0.002	0.58
	Pervious, Natural (Type C Soil)	0.00	0.23	0.001	
DM-D	Roof, Concrete, Asphalt	0.00	0.9	0.002	0.90
	Pervious, Natural (Type D Soil)	0.00	0.3	0.000	
BYPASS-C	Roof, Concrete, Asphalt	0.01	0.9	0.012	0.90
	Pervious, Natural (Type C Soil)	0.00	0.23	0.000	
BYPASS-D	Roof, Concrete, Asphalt	0.01	0.9	0.008	0.90
	Pervious, Natural (Type D Soil)	0.00	0.3	0.000	

Weighted Runoff Factor					
DMA	Type of Surface	Area (acres)	Runoff Factor	C x A	Weighted C
ALL	Roof, Concrete, Asphalt	1.95	0.9	1.755	0.56
	Pervious, Natural (Type C Soil)	1.75	0.23	0.403	
	Pervious, Natural (Type D Soil)	0.34	0.3	0.102	

Design Capture Volume for BMP-1		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.49	inches
2	Area tributary to BMP(S)	A=	3.95	acres
3	Area weighted runoff facotr (estimate using Appendix B.1.1 and B.2.1)	C=	0.56	unitless
4	Trees Credit Volume Note: In the SWQMP list the number of trees, size of each tree, amount of soil volime installed for each tree, contributing area to each treee and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and use the captured storm water runoff.	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x D x A) - TCV - RCV	DCV=	3943	cubic-feet

Weighted Runoff Factor					
BMP	Type of Surface	Area (acres)	Runoff Factor	C x A	Weighted C
1	Roof, Concrete, Asphalt	1.92	0.9	1.728	0.56
	Pervious, Natural (Type C Soil)	1.71	0.23	0.393	
	Pervious, Natural (Type D Soil)	0.32	0.3	0.096	

Simple Sizing Method for Infiltration BMPs		Worksheet B.4-1		
1	DCV (Worksheet B-2.1)	DCV=	3805	cubic-feet
2	Estimated design infiltration rate (Worksheet D.5-1)	K_{design}=	0.265	in/hr
3	Available BMP surface area	A_{BMP}=	5018	sq-ft
4	Average effective depth in the BMP footprint (DCV/A_{BMP})	D_{avg}=	0.76	feet
5	Drawdown time, T (D_{avg} *12/K_{design})	T=	34.4	hours
6	Provide alternative calculation of drawdown time, if needed. Conclusion: DCV is fully retained (i.e., no surface discharge during the design event) abd the stored effective depth draws down below 36 hours within design BMP).			
7	Provide calculations for effective depth provided in the BMP: Effective Depth = Surface ponding (below the overflow elevation) + gravel storage thickness x gravel porosity (0.4) Surface ponding = 2 ft Gravel storage thickness = 1 ft Effective Depth = 2 + (1*0.4) = 2.4 feet			

Notes:

1. Drawdown time must be less than 36 hours. This criterion was set to achieve average annual capture of 80% to account for back to back storms (See rationale in Appendix B.4.3). In order to use a different drawdown time, BMPs should be sized using the percent capture method (Appendix B.4.2).
2. The average effective depth calculation should account for any aggregate/media in the BMP. For example, 4 feet of stone at a porosity of 0.4 would equate to 1.6 feet of effective depth.
3. This method may overestimate drawdown time for BMPs that drain through both the bottom and walls of the system. BMP specific calculations of drawdown time may be provided that account for BMP-specific geometry.

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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).

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TECHNICAL MEMORANDUM:

SWMM Modeling for Hydromodification Compliance of:

1695 Saturn Boulevard

Prepared For:

Palm Avenue Realty Company

April 28, 2017, Updated February 7, 2018

Prepared by:

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

REC Consultants
2442 Second Avenue
San Diego, CA 92101
Telephone: (619) 232-9200

R·E·C

TECHNICAL MEMORANDUM

TO: Palm Avenue Realty Company

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

DATE: April 7, 2017, Updated February 7, 2018

RE: Summary of SWMM Modeling for Hydromodification Compliance for 1695 Saturn Boulevard, San Diego, CA.

INTRODUCTION

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

SWMM Model Development

The 1695 Saturn Boulevard project proposes the demolition of an existing single family residence and redevelopment of 18 residential lots with associated roadways, utilities, landscape and hardscape. Two (2) SWMM models were prepared for this study: the first for the pre-developed and the second for the post-developed conditions. The project site drains to one (1) Point of Compliance (POC), POC-1 is a drainage path located along the northwestern boundary of the project site.

The SWMM model was used since we have found it to be more comparable to San Diego area watersheds than the alternative San Diego Hydrology Model (SDHM) and also because it is a non-proprietary model approved by the HMP document. For both SWMM models, flow duration curves were prepared to determine if the proposed HMP facilities are sufficient to meet the current HMP requirements.

The inputs required to develop SWMM models include rainfall, watershed characteristics, and BMP configurations. The Lindbergh rain gauge was selected for the following reasons: a) It is near the project site and has similar elevation to the project, b) all the data from Lindbergh comes from Lindbergh (some rain gauges in surrounding area have data from other rainfall locations), c) the Lindbergh data has perfect precision on its data and d) none of the data from Lindbergh has been disaggregated or aggregated. Therefore, as the Lindbergh gauge is in a location representative of our project site and has perfect data, it was the gauge selected for this project.

In regards to evapotranspiration, per the California Irrigation Management Information System "Reference Evaporation Zones" (CIMIS ETo Zone Map), the project site is located within the Zone 1 Evapotranspiration Area. Thus evapotranspiration values for the site were modeled using Zone 1 average monthly values from Table G.1-1 from the City of San Diego 2016 BMP Design Manual.

As there is an existing residence located within the project boundary, soils located within the property boundary were assumed to be mass graded in existing conditions. In proposed conditions, soils within the project boundary were also assumed to be compact. The site was modeled with Types C and D hydrologic soils as these are the existing soils determined from the NRCS Soil Survey. Soils located in the offsite development were assumed to be compacted for both existing and proposed conditions. Other SWMM inputs for the subareas are discussed in the appendices to this document, where the selection of the parameters is explained in detail.

HMP MODELING

EXISTING CONDITIONS

In current existing conditions, runoff from both the project site and the aforementioned offsite area discharges to one (1) Point of Compliance (POC). POC-1 is located within the drainage path located along the northwestern boundary of the project site. The area tributary to POC-1 consists of single family residences and associated landscaping. Runoff from the site is conveyed to POC-1 via sheet flow. See Table 1 below for a summary of the existing conditions area.

TABLE 1 – SUMMARY OF EXISTING CONDITIONS

DMA	Area (Ac)	Impervious Percentage, Ip (%)	POC
DMA 1C	3.057	0%(1)	1
DMA 1D	0.619	0%(1)	
OFFSITE-C	0.453	31.8%(2)	
Total	**4.129**	**--**	**--**

Notes: (1) Per the 2013 RWQCB permit, existing condition impervious surfaces within the project site can be accounted for so long as they remain undisturbed in proposed conditions. The SWMM model was run using 0.0% impervious for DMA-1.
(2) As this area is located outside the property boundary, existing condition impervious surfaces can be taken into account for in existing conditions analysis.

DEVELOPED CONDITIONS

Runoff from the proposed 18-lot residential development will drain to one (1) onsite receiving retention (infiltration) basin, BMP-1. Runoff from existing offsite developed areas immediately to the west of the project site will also be directed towards the proposed basin. These areas have been included as part of DMA-1-C. Additionally, there are both landscape and driveway areas along the perimeter of the project boundary that bypass the basin and sheet flow directly to POC-1, these areas have been called "bypass" areas. The southernmost section of the project site (DMA-2-C) has been designed as a green street and therefore is exempt from hydromodification requirements. Table 2 provides a summary of the developed condition areas.

It is assumed all storm water quality requirements for the project will be met by the retention basin BMP. However, detailed water quality requirements are not discussed within this technical memo. For further information in regards to storm water quality requirements for the project and drawdown calculations, please refer to the site specific Storm Water Quality Management Plan (SWQMP).

TABLE 2 – SUMMARY OF DEVELOPED CONDITIONS

DMA	Area (Ac)	Impervious Percentage, Ip (%)	POC
DMA-1-C(1)	3.274	51.4%	1
DMA-1-D(1)	0.533	41.99%	
DMA-2(2)	0.142	50.15%	
SM-1-C	0.042	0%	
SM-1-D	0.022	0%	
BYPASS-C-1	0.005	51.69%	
BYPASS-C-2	0.003	100%	
BYPASS-C-3	0.014	100%	
BYPASS-D-1	0.009	100%	
BYPASS-D-2	0.002	100%	
Total	**4.046**	--	--

Notes: (1) Tributary area includes the area of the basin.
(2) Green street area exempt from hydromodification requirements

One (1) bioretention basin is located within the project site and is responsible for addressing hydromodification requirements for the project. In developed conditions, the basin will have a surface depth and a spillway structure (see dimensions in Table 3). Flows will then discharge from the basin via the outlet structure or infiltrate through the base of the facility to the receiving gravel layer and existing ground layer below. The spillway has sufficient capacity such that peak flows can be safely discharged to the receiving storm drain system.

Beneath the basin's invert lies a 12 inch gravel layer (pea gravel) to act as a trash and coarse dirt barrier. The BMP will be unlined to allow for infiltration into the underlying soil, per the geotechnical investigation (see Attachment 8). It should be noted that detailed outlet structure location and elevations will be shown on the construction plans based on the recommendations of this study.

BMP MODELING FOR HMP PURPOSES

Modeling of dual purpose Water Quality/HMP BMPs

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

TABLE 3 – SUMMARY OF DEVELOPED DUAL PURPOSE BMP

BMP	Tributary Area (Ac)	DIMENSIONS				
		BMP Area(1), (ft^2)	Gravel Depth (in)	Depth Riser Invert (ft)(2)	Weir Perimeter Length(3) (ft)	Total Surface Depth(4) (ft)
BMP-1	3.949	5018	12”	3.0’	7.0’	0.5’

Notes:
(1): Area of BMP = Area of Bottom=Area of Gravel
(2): Depth of ponding beneath riser structure's first surface spillway to bottom of gravel layer.
(3): Internal perimeter of riser
(4): Total surface depth of BMP is from top crest elevation to bottom of first surface invert

TABLE 4 – SUMMARY OF SPILLWAY DETAILS

BMP	SLOT		
	Width (ft.)	Height (ft.)	Elevation(1) (ft.)
BMP-1	7.00	0.25	3.00

Notes: (1): Basin ground surface elevation at bottom of gravel layer assumed to be 0.00 ft. elevation.

FLOW DURATION CURVE COMPARISON

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

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

The range between 10% of Q_2 and Q_{10} was divided into 100 equal time intervals; the number of hours that each flow rate was exceeded was counted from the hourly series. Additionally, the intermediate peaks with a return period "i" were obtained (Q_i with i=3 to 9). For the purpose of the plot, the values were presented as percentage of time exceeded for each flow rate. FDC comparison at the POCs was illustrated in Figures 1 and 2in both normal and logarithmic scale.

As can be seen in Figures 1 & 2, the FDC for the proposed conditions with the HMP BMPs is within 110% of the curve for the existing condition in both peak flows and durations. The additional runoff volume generated from developing the site will be released to the existing point of discharge at a flow rate below the 10% Q_2 lower threshold for POC-1 and POC-2. Additionally, the project will also not increase peak flow rates between the Q_2 and the Q_{10}, as shown in the peak flow tables in Attachment 1.

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

Typically the Manning's coefficient is selected as n = 0.10 for pervious areas and n = 0.012 for impervious areas. However, due to the impact that n has in the continuous simulation a more accurate value of the Manning's coefficient has been chosen for pervious areas. Taken into consideration the study prepared by TRWE (Reference [6]) a value of n = 0.05 has been selected (see Table 1 of Reference [6] included in Attachment 7). An average n value between average grass plus pasture (0.04) and dense grass (0.06) has been selected per the reference cited, for light rain (<0.8 in/hr) as more than 99% of the rainfall has been measured with this intensity.

SUMMARY

This study has demonstrated that the proposed HMP retention BMP provided for the 1695 Saturn Boulevard site is sufficient to meet the current HMP criteria for the one (1) Point of Compliance (POC), if the cross-section areas and volumes recommended within this technical memorandum, and the respective orifices and outlet structures are incorporated as specified within the proposed project site.

KEY ASSUMPTIONS

1. Type C & D Soils are representative of the existing condition site.
2. Infiltration/retention basins will be unlined to allow underlying soil infiltration per the geotechnical investigation and percolation tests. See Attachment 8.

ATTACHMENTS

1. Q_2 to Q_{10} Comparison Tables
2. Flow Duration Curve Analysis
3. List of the "n" largest Peaks: Pre-Development and Post-Development Conditions
4. Area vs Elevation & Discharge Vs Elevation
5. Pre & Post Development Maps, Project Plan and Section Sketches
6. SWMM Input Data in Input Format (Existing and Proposed Models)
7. EPA SWMM Figures and Explanations
8. Soil Maps & Geotechnical Investigation
9. Summary files from the SWMM Model

REFERENCES

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

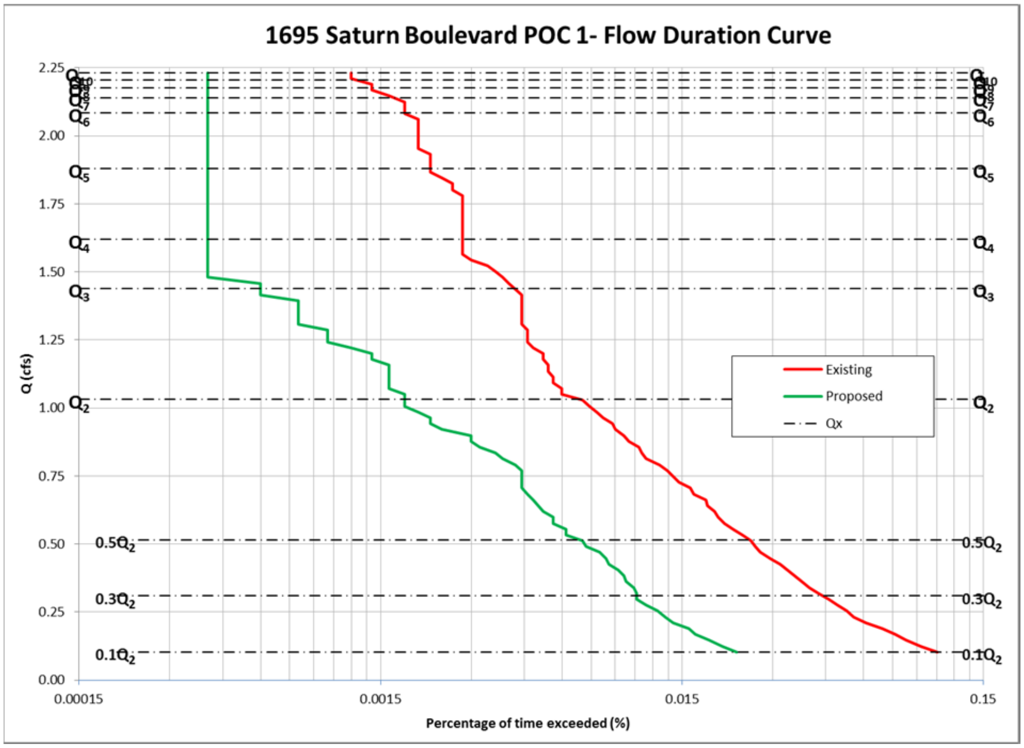
[2] – *"Final Hydromodification Management Plan (HMP) prepared for the County of San Diego",* March 2011, Brown and Caldwell.

[3] - Order R9-2013-001, California Regional Water Quality Control Board San Diego Region (SDRWQCB).

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

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

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



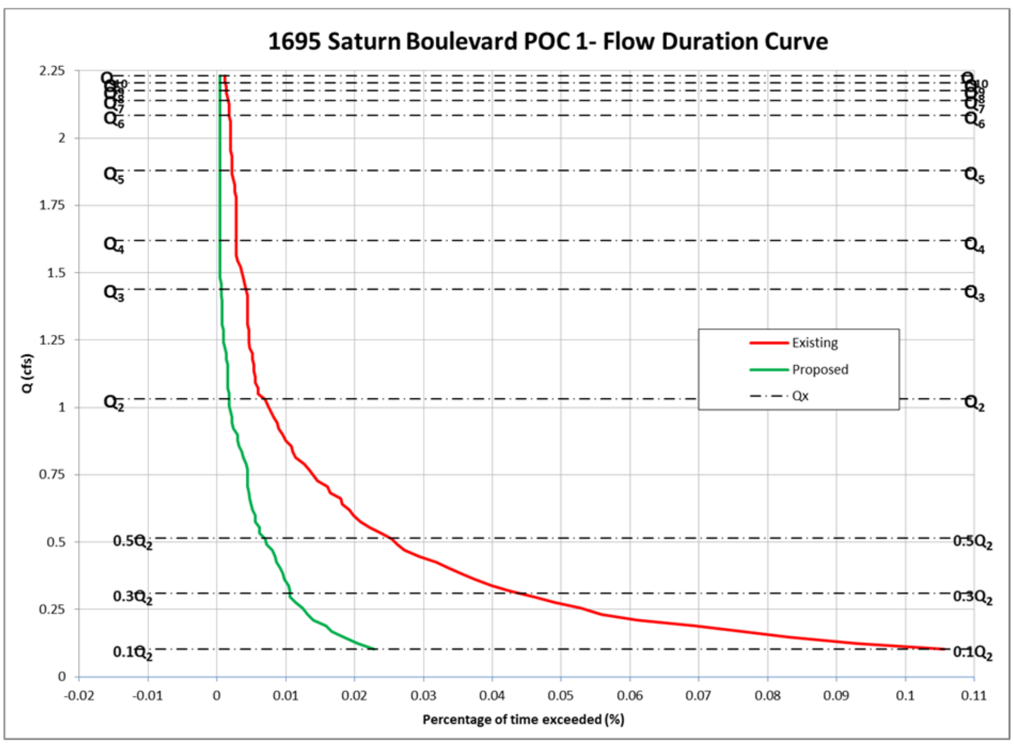


Figure 1a and 1b. Flow Duration Curve Comparison (logarithmic and normal “x” scale)

ATTACHMENT 1

Q_2 to Q_{10} Peak Flow Frequency Comparison Table – POC 1

Return Period	Existing Condition (cfs)	Mitigated Condition (cfs)	Reduction, Exist - Mitigated (cfs)
2-year	1.031	0.270	0.761
3-year	1.439	0.586	0.853
4-year	1.618	0.803	0.816
5-year	1.879	0.844	1.034
6-year	2.084	0.902	1.181
7-year	2.140	0.992	1.149
8-year	2.176	1.124	1.052
9-year	2.204	1.209	0.996
10-year	2.232	1.234	0.998

ATTACHMENT 2

FLOW DURATION CURVE ANALYSIS

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

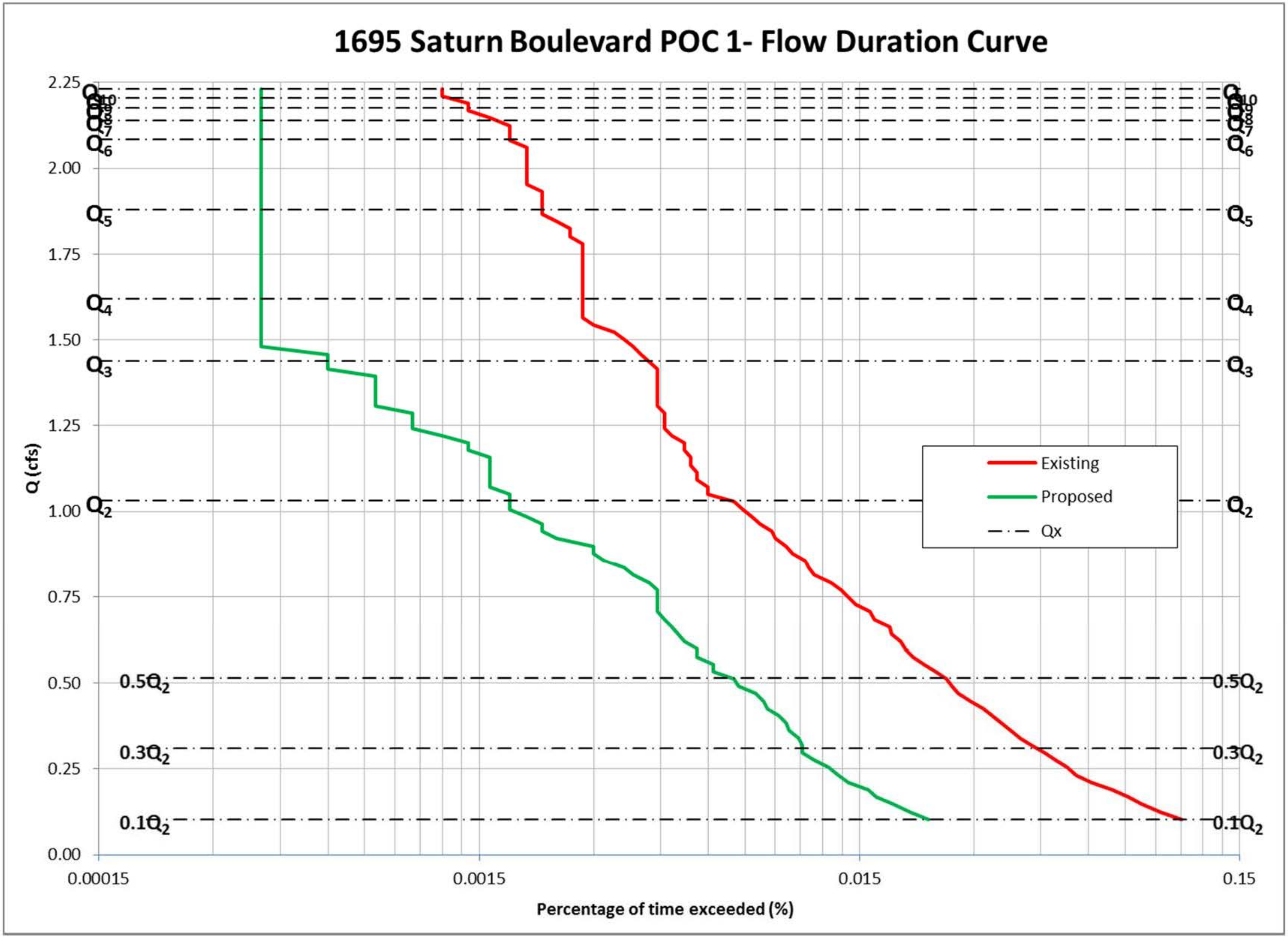
The figures on the following pages illustrate that the flow duration curve in post-development conditions after the proposed BMP is below the existing flow duration curve. The flow duration table following the curve shows that if the interval $0.10Q_2 – Q_{10}$ is divided in 100 sub-intervals, then the post development divided by pre-development durations is never larger than 110% (the permit allows up to 110%).

Consequently, the design passes the hydromodification test.

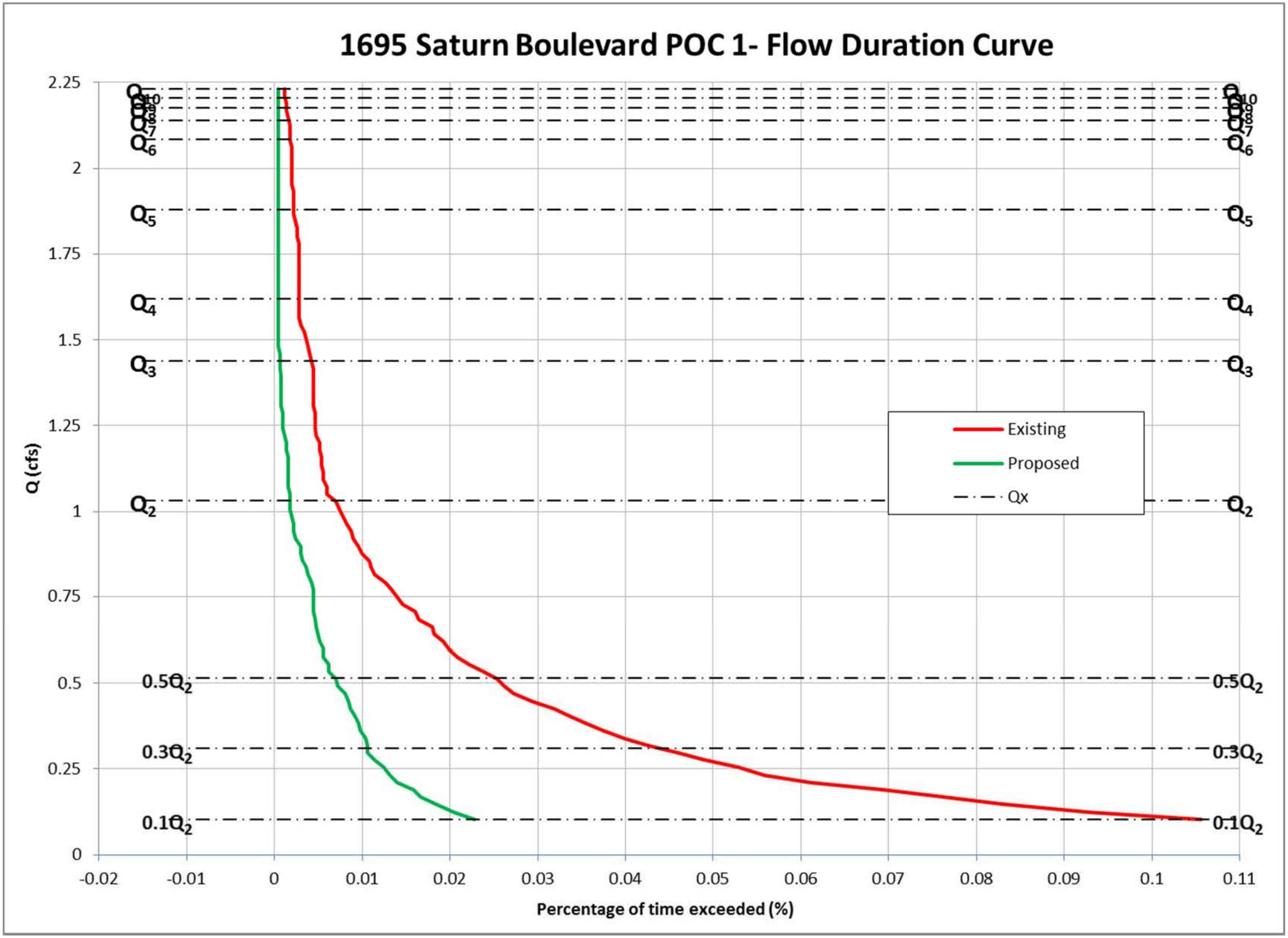
It is important to note that the flow duration curve can be expressed in the “x” axis as percentage of time, hours per year, total number of hours, or any other similar time variable. As those variables only differ by a multiplying constant, their plot in logarithmic scale is going to look exactly the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

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

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



1695 Saturn Boulevard POC 1- Flow Duration Curve
Q (cfs)
Percentage of time exceeded (%)
2.25
2.00
1.75
1.50
1.25
1.00
0.75
0.50
0.25
0.00
0.00015
0.0015
0.015
0.15
Q_{10}
Q_9
Q_8
Q_7
Q_6
Q_5
Q_4
Q_3
Q_2
$0.5Q_2$
$0.3Q_2$
$0.1Q_2$
Existing
Proposed
Qx



1695 Saturn Boulevard POC 1- Flow Duration Curve
Q (cfs)
Percentage of time exceeded (%)
2.25
2
1.75
1.5
1.25
1
0.75
0.5
0.25
0
-0.02
-0.01
0
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.1
0.11
Q10
Q9
Q8
Q7
Q6
Q5
Q4
Q3
Q2
0.5Q2
0.3Q2
0.1Q2
Existing
Proposed
Qx

Flow Duration Curve Data for 1695 Saturn Boulevard, City of San Diego CA

Q2 =	1.03	cfs	Fraction	10 %
Q10 =	2.23	cfs		
Step =	0.0215	cfs		
Count =	499679	hours		
	57.00	years		

	Existing Condition			Detention Optimized			Pass or
Interval	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	Fail?
1	0.103	528	1.06E-01	114	2.28E-02	22%	Pass
2	0.125	464	9.29E-02	102	2.04E-02	22%	Pass
3	0.146	415	8.31E-02	92	1.84E-02	22%	Pass
4	0.168	381	7.62E-02	83	1.66E-02	22%	Pass
5	0.189	347	6.94E-02	79	1.58E-02	23%	Pass
6	0.211	305	6.10E-02	70	1.40E-02	23%	Pass
7	0.232	279	5.58E-02	66	1.32E-02	24%	Pass
8	0.254	264	5.28E-02	62	1.24E-02	23%	Pass
9	0.275	245	4.90E-02	57	1.14E-02	23%	Pass
10	0.297	230	4.60E-02	53	1.06E-02	23%	Pass
11	0.318	213	4.26E-02	53	1.06E-02	25%	Pass
12	0.340	199	3.98E-02	52	1.04E-02	26%	Pass
13	0.361	187	3.74E-02	49	9.81E-03	26%	Pass
14	0.383	177	3.54E-02	48	9.61E-03	27%	Pass
15	0.404	168	3.36E-02	46	9.21E-03	27%	Pass
16	0.426	159	3.18E-02	43	8.61E-03	27%	Pass
17	0.447	147	2.94E-02	42	8.41E-03	29%	Pass
18	0.469	136	2.72E-02	40	8.01E-03	29%	Pass
19	0.490	131	2.62E-02	36	7.20E-03	27%	Pass
20	0.512	127	2.54E-02	35	7.00E-03	28%	Pass
21	0.533	119	2.38E-02	31	6.20E-03	26%	Pass
22	0.555	111	2.22E-02	31	6.20E-03	28%	Pass
23	0.576	104	2.08E-02	28	5.60E-03	27%	Pass
24	0.598	99	1.98E-02	28	5.60E-03	28%	Pass
25	0.619	96	1.92E-02	26	5.20E-03	27%	Pass
26	0.641	91	1.82E-02	25	5.00E-03	27%	Pass
27	0.662	90	1.80E-02	24	4.80E-03	27%	Pass
28	0.684	82	1.64E-02	23	4.60E-03	28%	Pass
29	0.705	80	1.60E-02	22	4.40E-03	28%	Pass
30	0.727	73	1.46E-02	22	4.40E-03	30%	Pass
31	0.748	70	1.40E-02	22	4.40E-03	31%	Pass
32	0.770	67	1.34E-02	22	4.40E-03	33%	Pass
33	0.791	63	1.26E-02	21	4.20E-03	33%	Pass
34	0.813	57	1.14E-02	19	3.80E-03	33%	Pass
35	0.834	55	1.10E-02	18	3.60E-03	33%	Pass
36	0.856	54	1.08E-02	16	3.20E-03	30%	Pass
37	0.877	50	1.00E-02	15	3.00E-03	30%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
38	0.899	48	9.61E-03	15	3.00E-03	31%	Pass
39	0.920	45	9.01E-03	12	2.40E-03	27%	Pass
40	0.942	44	8.81E-03	11	2.20E-03	25%	Pass
41	0.963	41	8.21E-03	11	2.20E-03	27%	Pass
42	0.985	39	7.81E-03	10	2.00E-03	26%	Pass
43	1.006	37	7.40E-03	9	1.80E-03	24%	Pass
44	1.028	35	7.00E-03	9	1.80E-03	26%	Pass
45	1.049	30	6.00E-03	9	1.80E-03	30%	Pass
46	1.071	30	6.00E-03	8	1.60E-03	27%	Pass
47	1.092	28	5.60E-03	8	1.60E-03	29%	Pass
48	1.114	28	5.60E-03	8	1.60E-03	29%	Pass
49	1.135	27	5.40E-03	8	1.60E-03	30%	Pass
50	1.157	27	5.40E-03	8	1.60E-03	30%	Pass
51	1.178	26	5.20E-03	7	1.40E-03	27%	Pass
52	1.200	26	5.20E-03	7	1.40E-03	27%	Pass
53	1.221	24	4.80E-03	6	1.20E-03	25%	Pass
54	1.243	23	4.60E-03	5	1.00E-03	22%	Pass
55	1.264	23	4.60E-03	5	1.00E-03	22%	Pass
56	1.286	23	4.60E-03	5	1.00E-03	22%	Pass
57	1.307	22	4.40E-03	4	8.01E-04	18%	Pass
58	1.329	22	4.40E-03	4	8.01E-04	18%	Pass
59	1.350	22	4.40E-03	4	8.01E-04	18%	Pass
60	1.372	22	4.40E-03	4	8.01E-04	18%	Pass
61	1.393	22	4.40E-03	4	8.01E-04	18%	Pass
62	1.415	22	4.40E-03	3	6.00E-04	14%	Pass
63	1.436	21	4.20E-03	3	6.00E-04	14%	Pass
64	1.458	20	4.00E-03	3	6.00E-04	15%	Pass
65	1.479	19	3.80E-03	2	4.00E-04	11%	Pass
66	1.501	18	3.60E-03	2	4.00E-04	11%	Pass
67	1.522	17	3.40E-03	2	4.00E-04	12%	Pass
68	1.544	15	3.00E-03	2	4.00E-04	13%	Pass
69	1.565	14	2.80E-03	2	4.00E-04	14%	Pass
70	1.587	14	2.80E-03	2	4.00E-04	14%	Pass
71	1.608	14	2.80E-03	2	4.00E-04	14%	Pass
72	1.630	14	2.80E-03	2	4.00E-04	14%	Pass
73	1.651	14	2.80E-03	2	4.00E-04	14%	Pass
74	1.673	14	2.80E-03	2	4.00E-04	14%	Pass
75	1.694	14	2.80E-03	2	4.00E-04	14%	Pass
76	1.716	14	2.80E-03	2	4.00E-04	14%	Pass
77	1.737	14	2.80E-03	2	4.00E-04	14%	Pass
78	1.759	14	2.80E-03	2	4.00E-04	14%	Pass
79	1.780	14	2.80E-03	2	4.00E-04	14%	Pass
80	1.802	13	2.60E-03	2	4.00E-04	15%	Pass
81	1.823	13	2.60E-03	2	4.00E-04	15%	Pass
82	1.845	12	2.40E-03	2	4.00E-04	17%	Pass

Interval	Existing Condition			Detention Optimized			Pass or Fail?
	Q (cfs)	Hours > Q	% time	Hours>Q	% time	Post/Pre	
83	1.866	11	2.20E-03	2	4.00E-04	18%	Pass
84	1.888	11	2.20E-03	2	4.00E-04	18%	Pass
85	1.909	11	2.20E-03	2	4.00E-04	18%	Pass
86	1.931	11	2.20E-03	2	4.00E-04	18%	Pass
87	1.952	10	2.00E-03	2	4.00E-04	20%	Pass
88	1.974	10	2.00E-03	2	4.00E-04	20%	Pass
89	1.995	10	2.00E-03	2	4.00E-04	20%	Pass
90	2.017	10	2.00E-03	2	4.00E-04	20%	Pass
91	2.039	10	2.00E-03	2	4.00E-04	20%	Pass
92	2.060	10	2.00E-03	2	4.00E-04	20%	Pass
93	2.082	9	1.80E-03	2	4.00E-04	22%	Pass
94	2.103	9	1.80E-03	2	4.00E-04	22%	Pass
95	2.125	9	1.80E-03	2	4.00E-04	22%	Pass
96	2.146	8	1.60E-03	2	4.00E-04	25%	Pass
97	2.168	7	1.40E-03	2	4.00E-04	29%	Pass
98	2.189	7	1.40E-03	2	4.00E-04	29%	Pass
99	2.211	6	1.20E-03	2	4.00E-04	33%	Pass
100	2.232	6	1.20E-03	2	4.00E-04	33%	Pass

Peak Flows calculated with Cunnane Plotting Position

Return Period (years)	Pre-dev. Q (cfs)	Post-Dev. Q (cfs)	Reduction (cfs)
10	2.232	1.234	0.998
9	2.204	1.209	0.996
8	2.176	1.124	1.052
7	2.140	0.992	1.149
6	2.084	0.902	1.181
5	1.879	0.844	1.034
4	1.618	0.803	0.816
3	1.439	0.586	0.853
2	1.031	0.270	0.761

ATTACHMENT 3

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

Basic Probabilistic Equation:

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

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

Cunnane Equation:

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

Weibull Equation:

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

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

n: Number of years analyzed.

Explanation of Variables for the Tables in this Attachment

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

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

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

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

List of Peak events and Determination of Q2 and Q10 (Pre-Development)
1695 Saturn Boulevard. - POC 1

T (Year)	Cunnane (cfs)	Weibull (cfs)
10	**2.232**	**2.24**
9	**2.204**	**2.22**
8	**2.176**	**2.19**
7	**2.140**	**2.15**
6	**2.084**	**2.09**
5	**1.879**	**1.90**
4	**1.618**	**1.67**
3	**1.439**	**1.44**
2	**1.031**	**1.03**

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

Peaks (cfs)	Date	Posit	Period of Return (Years) Weibull	Period of Return (Years) Cunnane
0.707	3/12/1978	57	1.02	1.01
0.711	4/22/1988	56	1.04	1.03
0.717	3/11/1995	55	1.05	1.05
0.718	10/10/1986	54	1.07	1.07
0.723	1/29/1983	53	1.09	1.09
0.741	1/16/1978	52	1.12	1.11
0.745	3/16/1958	51	1.14	1.13
0.758	2/23/2000	50	1.16	1.15
0.767	1/12/1993	49	1.18	1.18
0.772	3/2/1983	48	1.21	1.20
0.775	3/22/1954	47	1.23	1.23
0.792	1/13/1993	46	1.26	1.25
0.799	1/18/1993	45	1.29	1.28
0.801	2/14/2003	44	1.32	1.31
0.803	1/14/1978	43	1.35	1.34
0.817	12/5/1966	42	1.38	1.38
0.844	2/8/1998	41	1.41	1.41
0.864	2/19/1993	40	1.45	1.44
0.869	11/16/1965	39	1.49	1.48
0.886	2/6/1950	38	1.53	1.52
0.902	3/6/1975	37	1.57	1.56
0.918	2/3/1958	36	1.61	1.61
0.943	12/21/2002	35	1.66	1.65
0.956	2/17/1998	34	1.71	1.70
0.971	2/8/1976	33	1.76	1.75
0.975	3/1/1983	32	1.81	1.81
0.997	3/17/1982	31	1.87	1.87
1.01	2/14/1995	30	1.93	1.93
1.031	1/6/1979	29	2.00	2.00
1.033	2/12/2003	28	2.07	2.07
1.035	3/24/1983	27	2.15	2.15
1.037	1/15/1993	26	2.23	2.23
1.078	12/31/1976	25	2.32	2.33
1.133	4/21/1988	24	2.42	2.42
1.168	1/4/1995	23	2.52	2.53
1.216	1/18/1952	22	2.64	2.65
1.226	1/14/1969	21	2.76	2.78
1.432	2/21/2005	20	2.90	2.92
1.445	11/5/1987	19	3.05	3.08
1.483	3/1/1981	18	3.22	3.25
1.509	3/8/1968	17	3.41	3.45
1.528	12/4/1974	16	3.63	3.67
1.546	3/16/1986	15	3.87	3.92
1.8	1/12/1960	14	4.14	4.21
1.83	2/28/1970	13	4.46	4.54
1.866	1/10/1978	12	4.83	4.93
1.951	2/24/1998	11	5.27	5.40
2.081	1/25/1995	10	5.80	5.96
2.126	1/31/1979	9	6.44	6.65
2.162	11/16/1972	8	7.25	7.53
2.195	10/27/2004	7	8.29	8.67
2.238	1/10/1955	6	9.67	10.21
2.241	11/21/1967	5	11.60	12.43
2.429	12/29/2004	4	14.50	15.89
2.55	3/7/1952	3	19.33	22.00
2.797	2/20/1980	2	29.00	35.75
4.476	12/10/1965	1	58.00	95.33

List of Peak events and Determination of Q2 and Q10 (Post-Development)
1695 Saturn Boulevard. - POC 1

T (Year)	Cunnane (cfs)	Weibull (cfs)	Peaks (cfs)	Date	Posit	Period of Return (Years) Weibull	Period of Return (Years) Cunnane
10	**1.234**	**1.25**					
9	**1.209**	**1.22**	0.07	2/3/1958	57	1.02	1.01
8	**1.124**	**1.16**	0.07	12/31/1976	56	1.04	1.03
7	**0.992**	**1.03**	0.07	1/6/1979	55	1.05	1.05
6	**0.902**	**0.91**	0.07	2/25/1981	54	1.07	1.07
5	**0.844**	**0.85**	0.07	3/1/1983	53	1.09	1.09
4	**0.803**	**0.80**	0.07	11/17/1986	52	1.12	1.11
3	**0.586**	**0.59**	0.07	12/4/1987	51	1.14	1.13
2	**0.270**	**0.27**	0.07	1/31/1993	50	1.16	1.15
			0.07	2/14/1995	49	1.18	1.18
			0.08	3/6/1975	48	1.21	1.20
			0.08	10/28/2004	47	1.23	1.23
			0.09	1/12/1960	46	1.26	1.25
			0.09	3/16/1986	45	1.29	1.28
			0.09	11/5/1987	44	1.32	1.31
			0.1	3/22/1954	43	1.35	1.34
			0.1	3/8/1968	42	1.38	1.38
			0.1	12/4/1974	41	1.41	1.41
			0.1	1/10/1978	40	1.45	1.44
			0.11	1/10/1955	39	1.49	1.48
			0.11	2/24/1998	38	1.53	1.52
			0.12	11/16/1972	37	1.57	1.56
			0.13	11/21/1967	36	1.61	1.61
			0.13	3/3/1983	35	1.66	1.65
			0.14	11/16/1965	34	1.71	1.70
			0.14	1/14/1969	33	1.76	1.75
			0.17	12/30/1951	32	1.81	1.81
			0.19	11/25/1985	31	1.87	1.87
			0.25	12/5/1966	30	1.93	1.93
			0.27	1/29/1950	29	2.00	2.00
			0.28	11/23/1965	28	2.07	2.07
			0.34	1/29/1980	27	2.15	2.15
			0.34	3/17/1982	26	2.23	2.23
			0.44	3/1/1981	25	2.32	2.33
			0.47	2/10/1976	24	2.42	2.42
			0.52	1/16/1993	23	2.52	2.53
			0.52	2/23/2005	22	2.64	2.65
			0.53	1/18/1952	21	2.76	2.78
			0.57	2/28/1970	20	2.90	2.92
			0.6	3/1/1991	19	3.05	3.08
			0.62	12/29/2004	18	3.22	3.25
			0.68	1/16/1978	17	3.41	3.45
			0.77	10/27/2004	16	3.63	3.67
			0.8	1/18/1993	15	3.87	3.92
			0.81	2/8/1976	14	4.14	4.21
			0.82	1/14/1978	13	4.46	4.54
			0.84	2/14/2003	12	4.83	4.93
			0.87	4/22/1988	11	5.27	5.40
			0.9	3/2/1983	10	5.80	5.96
			0.94	2/20/1980	9	6.44	6.65
			1.07	1/15/1993	8	7.25	7.53
			1.2	1/31/1979	7	8.29	8.67
			1.24	1/4/1995	6	9.67	10.21
			1.3	4/21/1988	5	11.60	12.43
			1.41	3/7/1952	4	14.50	15.89
			1.47	2/21/2005	3	19.33	22.00
			2.36	1/25/1995	2	29.00	35.75
			4.32	12/10/1965	1	58.00	95.33

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

ATTACHMENT 4

AREA VS ELEVATION

A stage-storage relationship is provided within the basin module, a copy of which is located on the following pages.

DISCHARGE VS ELEVATION

A stage-discharge relationship is provided on the following pages for the surface outlet structure. Please refer to Attachment 7 for further information.

DRAWDOWN CALCULATIONS

BMP specific drawdown calculations are provided in the project specific SWQMP. Please refer to this aforementioned document for further information.

Stage-Storage for BMP 1

Elevation (ft)			Area(sq-ft)	Volume (ac-ft)	
Actual(in)	Actual(ft)	Model (ft)			
0.00	0.00	0.00	5018	0.0000	
12.00	1.00	0.40	5018	0.0461	**TOP OF GRAVEL[1](0.4 voids)**
13.00	1.08	0.48	5081	0.0557	
14.00	1.17	0.57	5144	0.0655	
15.00	1.25	0.65	5208	0.0754	
16.00	1.33	0.73	5272	0.0854	
17.00	1.42	0.82	5336	0.0956	
18.00	1.50	0.90	5401	0.1059	
19.00	1.58	0.98	5466	0.1163	
20.00	1.67	1.07	5532	0.1268	
21.00	1.75	1.15	5598	0.1374	
22.00	1.83	1.23	5665	0.1482	
23.00	1.92	1.32	5731	0.1591	
24.00	2.00	1.40	5799	0.1701	
25.00	2.08	1.48	5866	0.1813	
26.00	2.17	1.57	5934	0.1926	
27.00	2.25	1.65	6003	0.2040	
28.00	2.33	1.73	6071	0.2155	
29.00	2.42	1.82	6141	0.2272	
30.00	2.50	1.90	6210	0.2390	
31.00	2.58	1.98	6280	0.2510	
32.00	2.67	2.07	6351	0.2631	
33.00	2.75	2.15	6421	0.2753	
34.00	2.83	2.23	6492	0.2876	
35.00	2.92	2.32	6564	0.3001	
36.00	3.00	2.40	6636	0.3128	**EMERGENCY WEIR[2]**
37.00	3.08	2.48	6708	0.3255	
38.00	3.17	2.57	6781	0.3384	
39.00	3.25	2.65	6854	0.3515	
40.00	3.33	2.73	6928	0.3646	
41.00	3.42	2.82	7002	0.3780	
42.00	3.50	2.90	7076	0.3914	**BASIN CREST**

NOTES:

(1): All elevations measured from bottom of gravel layer. These are model elevations, not actual elevations. As such, 1.00-ft of gravel is represented as 0.4-ft due to the 0.4 porosity.

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

Outlet structure for Discharge of BMP 1

Discharge vs Elevation Table

Low orifice	0.625 "	Lower slot		Lower Weir			
Number of orif:	0	Number of slots:	1	Number of weirs:	0		
Cg-low:	0.61	Invert:	2.40 ft	Invert:	0.000 ft		
		B	7.00 ft	B:	0.000 ft		
Middle orifice	1.000 "	hslot	0.250 ft				
Number of orif:	0.000						
Cg-middle:	0.61	Upper slot		Upper Weir		Emergency weir	
invert elev:	0 ft	Number of slots:	0	Number of weirs:	0	Invert:	0.000 ft
		Invert:	0.00 ft	Invert:	0.000 ft	W:	0.00 ft
		B:	0.00 ft	B:	0.00 ft		
		hslot	0.000 ft				

Note: All elevations measured from bottom of gravel layer. These are model elevations, not actual elevations. As such, 1.00-ft of gravel is represented as 0.4-ft due to the 0.4 porosity.

*Note: h = head above the invert of the lowest surface discharge opening.

h* (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qlweir (cfs)	Quweir (cfs)	Qemerg (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.400	46.080	28.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.483	47.680	29.800	0.000	0.000	0.000	0.000	0.000	0.000	0.522	0.000	0.000	0.000	0.000	0.522
2.567	49.280	30.800	0.000	0.000	0.000	0.000	0.000	0.000	1.476	0.000	0.000	0.000	0.000	1.476
2.650	50.880	31.800	0.000	0.000	0.000	0.000	0.000	0.000	2.713	0.000	0.000	0.000	0.000	2.713
2.733	52.480	32.800	0.000	0.000	0.000	0.000	0.000	0.000	3.910	0.000	0.000	0.000	0.000	3.910
2.817	54.080	33.800	0.000	0.000	0.000	0.000	0.000	0.000	4.627	0.000	0.000	0.000	0.000	4.627
2.900	55.680	34.800	0.000	0.000	0.000	0.000	0.000	0.000	5.246	0.000	0.000	0.000	0.000	5.246

DISCHARGE EQUATIONS

1) Weir:

$$Q_W = C_W \cdot L \cdot H^{3/2} \quad (1)$$

2) Slot:

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

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

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

3) Vertical Orifices

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

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

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

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

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

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

The following are the variables used above:

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

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

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

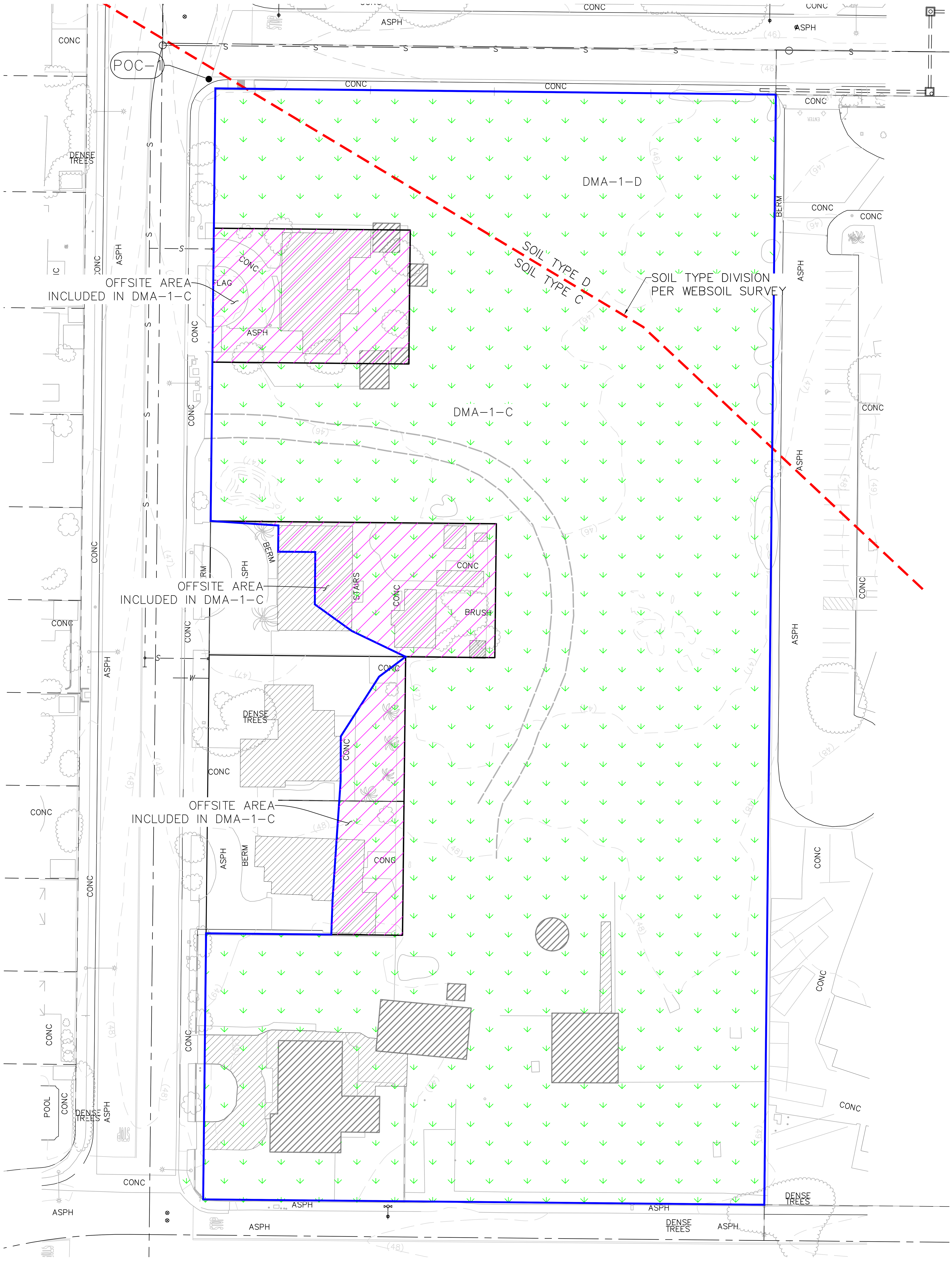
H: Level of water in the pond over the invert of slot, weir or orifice (ft)

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

ATTACHMENT 5

Pre & Post-Developed Maps, Project Plan and Detention

Section Sketches



LEGEND

PROPERTY BOUNDARY

DMA BOUNDARY

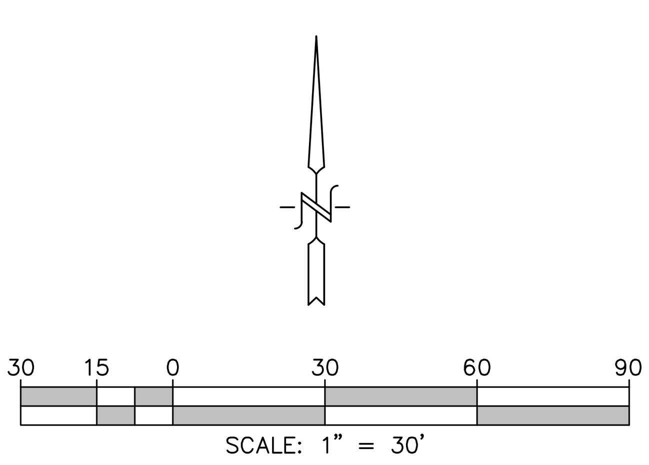
PERVIOUS AREA

EXISTING IMPERVIOUS AREA

SOIL BOUNDARY

OFFSITE AREA DRAINING ONTO BMP

EXISTING CONDITIONS						
DMA	SUB AREA	SOIL TYPE	IMPERVIOUS (SQ FT)	PERVIOUS (SQ FT)	TOTAL AREA (SQ FT)	POC
DMA-1	C	C		133163	133163	POC-1
	D	D		26964	26964	
OFFSITE	C	C	6275	13458	19733	
TOTAL		–	6275	173585	179860	–



SHEET 1 OF 3 SHEETS

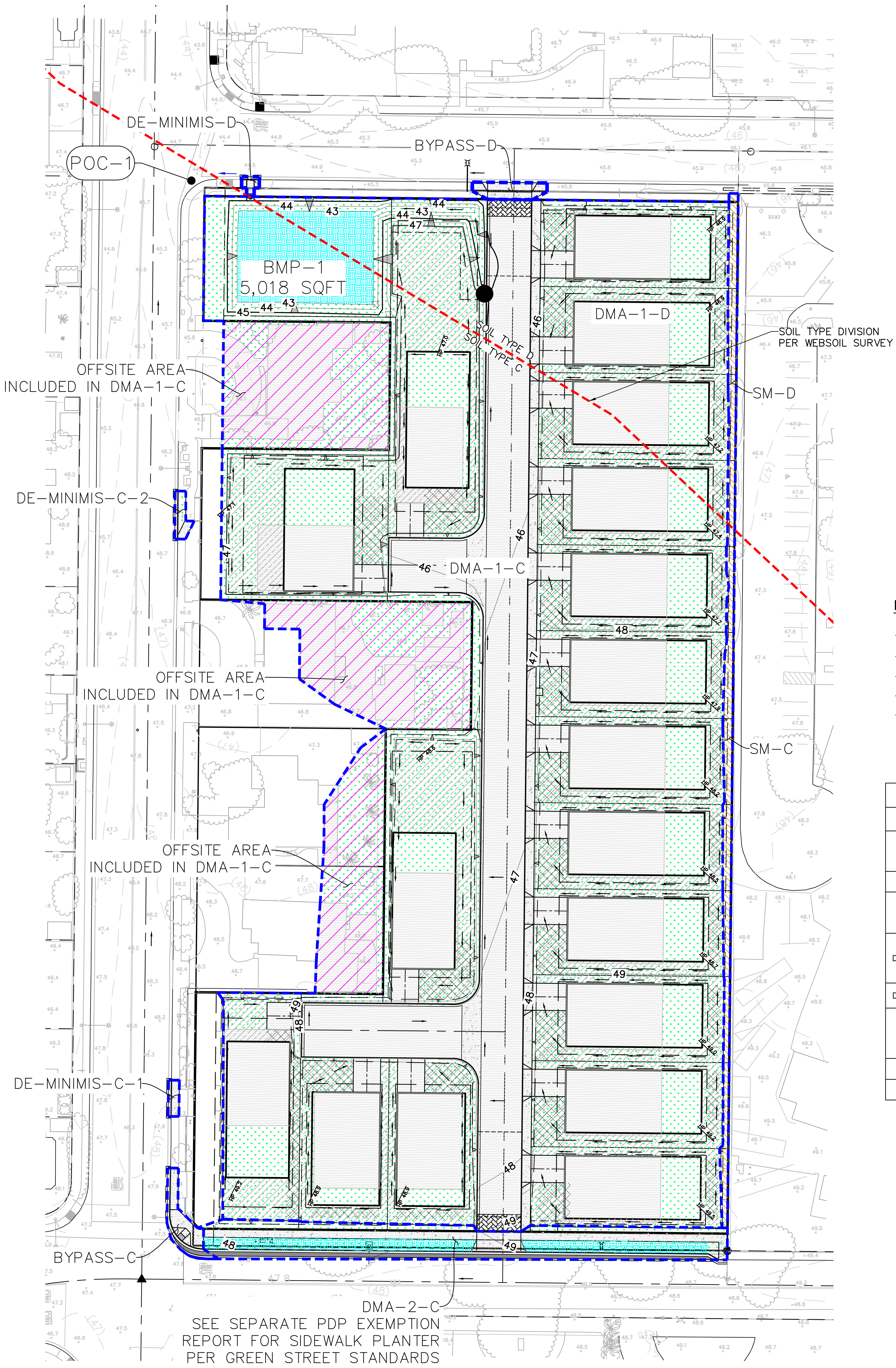
SHEET TITLE
DMA - EXISTING CONDITIONS

PROJECT
SATURN BLVD RESIDENTIAL DEVELOPMENT
1695 SATURN BOULEVARD
SAN DIEGO, CALIFORNIA

DATE: 04/04/2017
SCALE: 1" = 40'
DRAWN: M.D.
CHECKED:

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

REVISIONS			
NO.	DESCRIPTION	DATE	APP'D



LEGEND

- PROPERTY BOUNDARY
- DMA BOUNDARY
- IMPERVIOUS AREA
- PERVIOUS AREA
- SELF-MITIGATING AREA NOT DRAINING ONTO BMP
- OFFSITE AREA DRAINING ONTO BMP
- BMP AREA
- SOIL BOUNDARY
- EARTHEN SWALE

NOTES

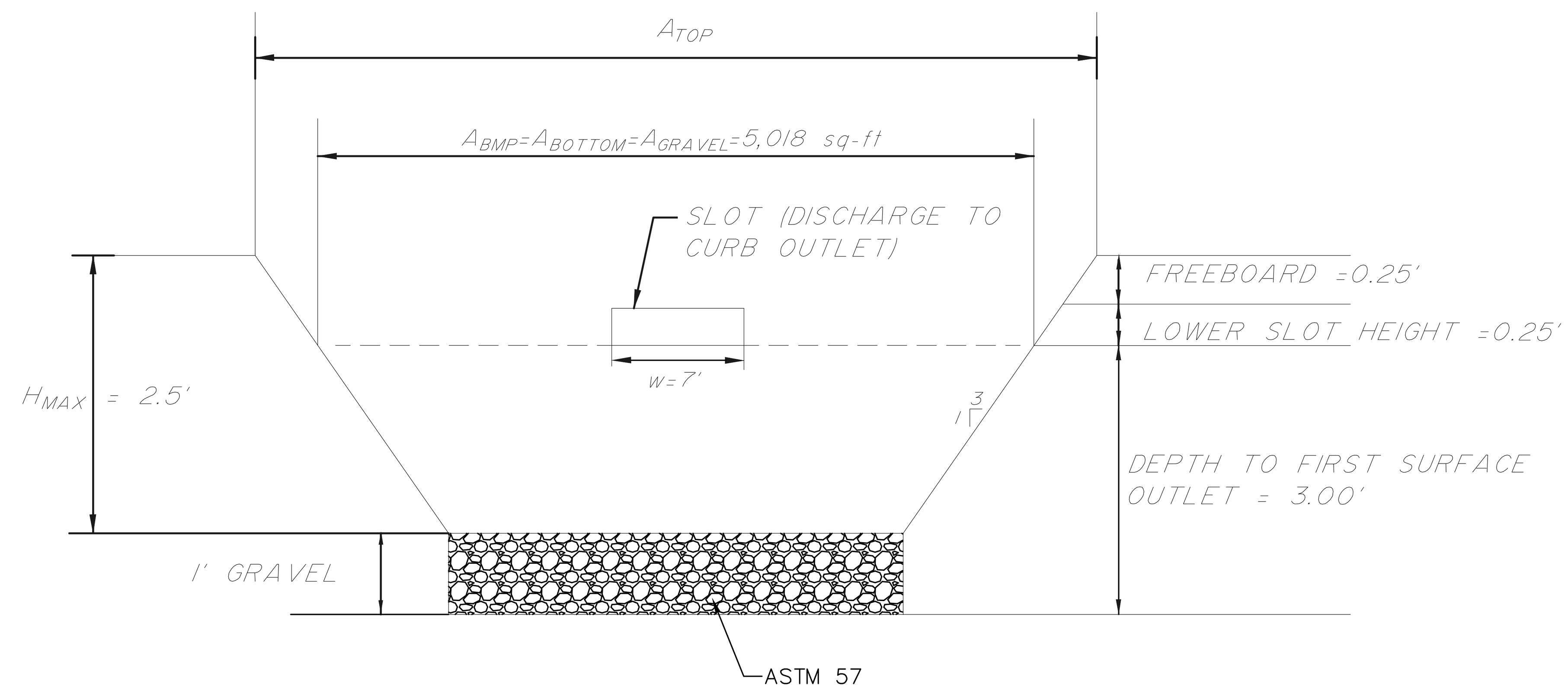
- NO CRITICAL COURSE SEDIMENT YIELD AREAS TO PROTECT
- DEPTH TO GROUNDWATER > 20 FT
- UNDERLYING SOIL TYPES "C" AND "D"
- NO EXISTING NATURAL HYDROLOGIC FEATURES
- OFFSITE AREA (AS SHOWN) DRAINS TO INFILTRATION BASIN

PROPOSED CONDITIONS							
DMA	SUB AREA	SOIL TYPE	IMPERVIOUS (SQ FT)	PERVIOUS (SQ FT)	TOTAL AREA (SQ FT)	DRAINS TO	POC
DMA-1	1-C	C	71368	71260	142628	BMP-1	POC-1
	1-D	D	9311	13903	23214		
DMA-2	2-C	C	3109	3091	6200	BMP-2	
SELF MITIGATING	SM-C	C	0	1807	1807	BYPASS	
	SM-D	D	0	961	961		
DE-MINIMIS-C	DE-MINIMIS-C-1	C	136	0	136		
	DE-MINIMIS-C-2	C	107	100	207		
DE-MINIMIS-D	DE-MINIMIS-D	D	91	0	91		
BYPASS	BYPASS-C	C	594	0	594		
	BYPASS-D	D	398	0	398		
TOTAL		–	85114	91122	176236	–	–
MINIMUM INFILTRATION BASIN AREA			5,018 SF REQUIRED		5,018 SF PROVIDED		

NOTE: ALL PROPOSED LOTS ARE TO BE ASSUMED TO BE HAVE APPOX. 2,181 SQUARE FEET OF IMPERVIOUS AREA FOR FUTURE CONSTRUCTION

BMP-1: INFILTRATION BASIN DETAIL

(NOT TO SCALE)



NOTES: BMP IS A FULL INFINTRATION BASIN, THEREFORE IT HAS NO LID ORIFICE OR UNDERDRAIN.

40 20 0 40 80 120

SCALE: 1" = 40'

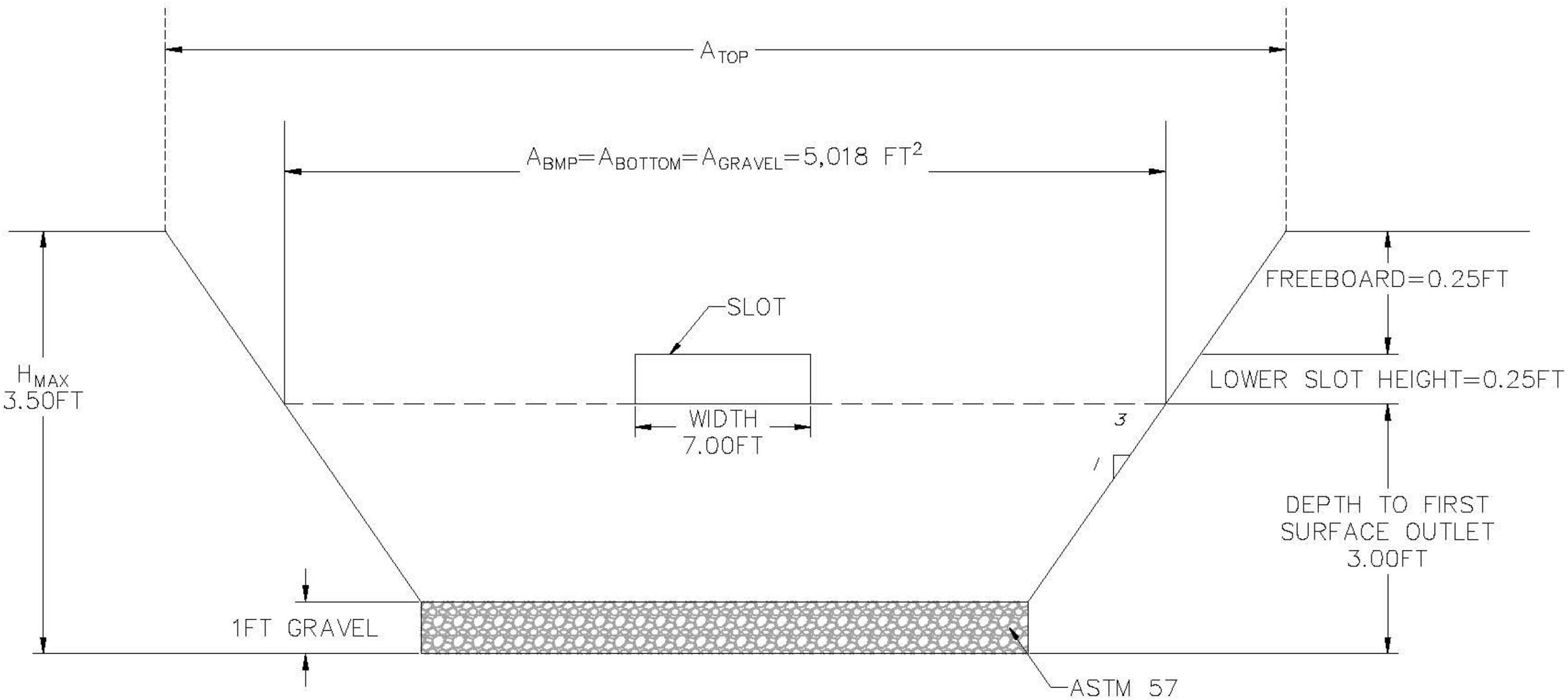
SHEET 1 OF 1 SHEETS	SHEET TITLE: HMP - PROPOSED CONDITIONS	DATE: 1-26-18
	PROJECT: SATURN BLVD RESIDENTIAL DEVELOPMENT, 1695 SATURN BOULEVARD, SAN DIEGO, CALIFORNIA	SCALE: 1" = 40'
		DRAWN: R.J.D.
		CHECKED:

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

REVISIONS			
NO.	DESCRIPTION	DATE	APP'D

BASIN 1 DETAIL

(NOT TO SCALE)



NOTES: BMP IS A FULL INFILTRATION BASIN THEREFORE IT HAS NO LID ORIFICE OR UNDERDRAIN.

REC Consultants, Inc.
Civil Engineering · Environmental
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

BMP DETAIL
BMP-1
1695 SATURN BOULEVARD
SAN DIEGO, CALIFORNIA

SHEET 1 OF 1

SAVE DATE: 1/30/2018 ~ PLOT DATE: 2/7/2018 ~ FILE NAME: P:\Acad\1229 Saturn Blvd\Reports\Drainage Study\170327_1229_Drainage_PST.dwg

ATTACHMENT 6

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

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           10/17/1948
START_TIME           00:00:00
REPORT_START_DATE    10/17/1948
REPORT_START_TIME    00:00:00
END_DATE             10/17/2005
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.03   0.05   0.08   0.11   0.13   0.15   0.15   0.13   0.11   0.08   0.04   0.02
DRY_ONLY     NO

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

[SUBCATCHMENTS]
;;                                                Total    Pcnt.             Pcnt.    Curb
Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length
Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- -
-------
DMA-1-D          LINDBERG         POC-1            0.619    0        103      0.5      0
DMA-1-C          LINDBERG         POC-1            3.057    0        211      0.6      0
OFFSITE-C        LINDBERG         POC-1            0.453    31.8     35       1.2      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1-D          0.012      0.05       0.05       0.10       25         OUTLET
DMA-1-C          0.012      0.05       0.05       0.10       25         OUTLET
OFFSITE-C        0.012      0.05       0.05       0.10       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
DMA-1-D          9          0.01875    0.33
DMA-1-C          6          0.075      0.32
OFFSITE-C        6          0.075      0.32

[OUTFALLS]
;;               Invert     Outfall    Stage/Table      Tide
;;Name           Elev.      Type       Time Series      Gate
;;-------------- ---------- ---------- ---------------- ----
```

```
POC-1            0          FREE                        NO

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
LINDBERG         FILE "LbergRain.prn"

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

[TAGS]

[MAP]
DIMENSIONS 2890.000 2950.000 3110.000 4050.000
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            3000.000           3000.000

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

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1-D          3100.000           3500.000
DMA-1-D          3100.000           3500.000
DMA-1-C          2900.000           3500.000
OFFSITE-C        2900.000           3000.000

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
LINDBERG         3000.000           4000.000
```

POST_DEV

```
[TITLE]

[OPTIONS]
FLOW_UNITS           CFS
INFILTRATION         GREEN_AMPT
FLOW_ROUTING         KINWAVE
START_DATE           10/17/1948
START_TIME           00:00:00
REPORT_START_DATE    10/17/1948
REPORT_START_TIME    00:00:00
END_DATE             10/17/2005
END_TIME             23:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          01:00:00
WET_STEP             00:15:00
DRY_STEP             04:00:00
ROUTING_STEP         0:01:00
ALLOW_PONDING        NO
INERTIAL_DAMPING     PARTIAL
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         0
NORMAL_FLOW_LIMITED  BOTH
SKIP_STEADY_STATE    NO
FORCE_MAIN_EQUATION  H-W
LINK_OFFSETS         DEPTH
MIN_SLOPE            0

[EVAPORATION]
;;Type       Parameters
;;---------- ----------
MONTHLY      0.03   0.05   0.08   0.11   0.13   0.15   0.15   0.13   0.11   0.08   0.04   0.02
DRY_ONLY     NO

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

[SUBCATCHMENTS]
;;                                                 Total    Pcnt.             Pcnt.    Curb     Snow
;;Name           Raingage         Outlet           Area     Imperv   Width    Slope    Length   Pack
;;-------------- ---------------- ---------------- -------- -------- -------- -------- -------- --------
DMA-1-D          LINDBERG         BASIN-1          0.51     41.99    91.6     0.8      0
DMA-1-C          LINDBERG         BASIN-1          3.18     51.47    284      0.7      0
BYPASS-C-1       LINDBERG         POC-1            0.005    51.69    13.8     0.5      0
SM-1-C           LINDBERG         POC-1            0.04     0        6.1      .4       0
SM-1-D           LINDBERG         POC-1            0.02     0        5        .4       0
BYPASS-C-2       LINDBERG         POC-1            0.003    100      9        0.5      0
BYPASS-C-3       LINDBERG         POC-1            0.014    100      39.6     0.5      0
BYPASS-D-1       LINDBERG         POC-1            0.009    100      49.75    0.5      0
BYPASS-D-2       LINDBERG         POC-1            0.002    100      10.1     0.5      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo    PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ---------- ----------
DMA-1-D          0.012      0.05       0.05       0.10       25         OUTLET
DMA-1-C          0.012      0.05       0.05       0.10       25         OUTLET
BYPASS-C-1       0.012      0.05       0.05       0.10       25         OUTLET
SM-1-C           0.01       0.1        0.05       0.05       25         OUTLET
SM-1-D           0.01       0.1        0.05       0.05       25         OUTLET
BYPASS-C-2       0.01       0.1        0.05       0.05       25         OUTLET
BYPASS-C-3       0.01       0.1        0.05       0.05       25         OUTLET
BYPASS-D-1       0.01       0.1        0.05       0.05       25         OUTLET
BYPASS-D-2       0.01       0.1        0.05       0.05       25         OUTLET

[INFILTRATION]
;;Subcatchment   Suction    HydCon     IMDmax
;;-------------- ---------- ---------- ----------
DMA-1-D          9          0.01875    0.33
DMA-1-C          6          0.075      0.32
BYPASS-C-1       6          0.075      0.32
SM-1-C           3.5        0.5        0.25
SM-1-D           3.5        0.5        0.25
```

```
BYPASS-C-2       3.5        0.5        0.25
BYPASS-C-3       3.5        0.5        0.25
BYPASS-D-1       3.5        0.5        0.25
BYPASS-D-2       3.5        0.5        0.25

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

[STORAGE]
;;               Invert   Max.     Init.    Storage    Curve                      Ponded   Evap.
;;Name           Elev.    Depth    Depth    Curve      Params                     Area     Frac.    Infiltration
Parameters
;;-------------- -------- -------- -------- ---------- -------- -------- -------- -------- -------- ------------
-----------
BASIN-1          0        2.90     0        TABULAR    BASIN-1                    5018     1        6
0.265    0.32

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

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
OUT-1            Rating     0.000      0.000
OUT-1                       2.400      0.000
OUT-1                       2.483      0.522
OUT-1                       2.567      1.476
OUT-1                       2.650      2.713
OUT-1                       2.733      3.910
OUT-1                       2.817      4.627
OUT-1                       2.900      5.246

BASIN-1          Storage    0.00       5018
BASIN-1                     0.40       5018
BASIN-1                     0.48       5081
BASIN-1                     0.57       5144
BASIN-1                     0.65       5208
BASIN-1                     0.73       5272
BASIN-1                     0.82       5336
BASIN-1                     0.90       5401
BASIN-1                     0.98       5466
BASIN-1                     1.07       5532
BASIN-1                     1.15       5598
BASIN-1                     1.23       5665
BASIN-1                     1.32       5731
BASIN-1                     1.40       5799
BASIN-1                     1.48       5866
BASIN-1                     1.57       5934
BASIN-1                     1.65       6003
BASIN-1                     1.73       6071
BASIN-1                     1.82       6141
BASIN-1                     1.90       6210
BASIN-1                     1.98       6280
BASIN-1                     2.07       6351
BASIN-1                     2.15       6421
BASIN-1                     2.23       6492
BASIN-1                     2.32       6564
BASIN-1                     2.40       6636
BASIN-1                     2.48       6708
BASIN-1                     2.57       6781
BASIN-1                     2.65       6854
BASIN-1                     2.73       6928
BASIN-1                     2.82       7002
BASIN-1                     2.90       7076

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
LINDBERG         FILE "LbergRain.prn"

[REPORT]
```

POST_DEV

```
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 2890.000 2962.500 3110.000 3787.500
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
POC-1            3000.000           3000.000
BASIN-1          3000.000           3250.000

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

[Polygons]
;;Subcatchment   X-Coord            Y-Coord
;;-------------- ------------------ ------------------
DMA-1-D          3100.000           3500.000
DMA-1-D          3100.000           3500.000
DMA-1-C          2900.000           3500.000
BYPASS-C-1       2832.894           3093.438
SM-1-C           2922.628           3152.039
SM-1-D           3066.385           3149.292
BYPASS-C-2       2816.412           3047.655
BYPASS-C-3       2811.834           3002.789
BYPASS-D-1       3115.830           3088.860
BYPASS-D-2       3130.480           3025.680

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
LINDBERG         3000.000           3750.000
```

ATTACHMENT 7

EPA SWMM FIGURES AND EXPLANATIONS

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

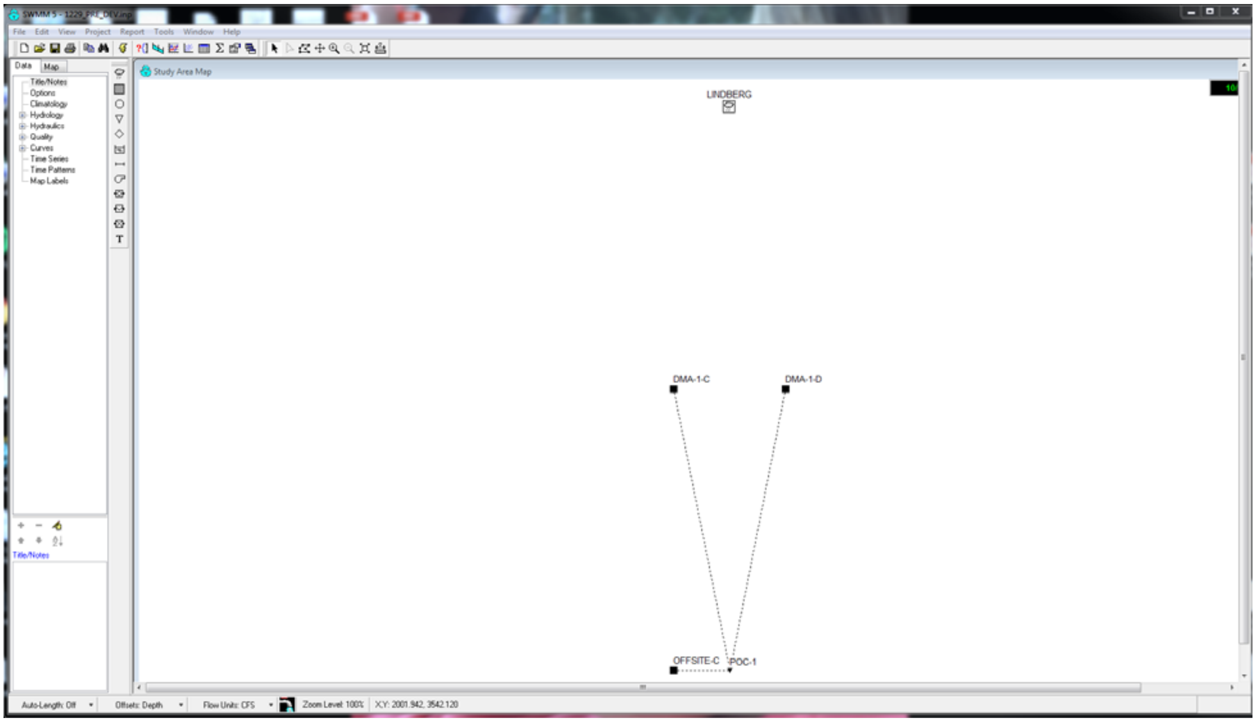
Variables for modeling are associated with typical recommended values by the EPA-SWMM model, typical values found in technical literature (such as Maidment's Handbook of Hydrology). Recommended values for the SWMM model have been attained from the interim Orange County criteria established for their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

Soil characteristics of the existing soils were determined from the site specific NRCS Web Soil Survey and Geotechnical Investigation (both located in Attachment 8 of this report).

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

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

PRE-DEVELOPED CONDITION



Rain Gage LINDBERG

Property	Value
Name	LINDBERG
X-Coordinate	3000.000
Y-Coordinate	4000.000
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	LINDBERG
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	3000.000
Y-Coordinate	3000.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

Subcatchment DMA-1-C

Property	Value
Name	DMA-1-C
X-Coordinate	2900.000
Y-Coordinate	3500.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	3.057
Width	211
% Slope	0.6
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Optional category or classification

Subcatchment DMA-1-D

Property	Value
Name	DMA-1-D
X-Coordinate	3100.000
Y-Coordinate	3500.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.619
Width	103
% Slope	0.5
% Imperv	0
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Y coordinate of subcatchment centroid on map

Infiltration Editor

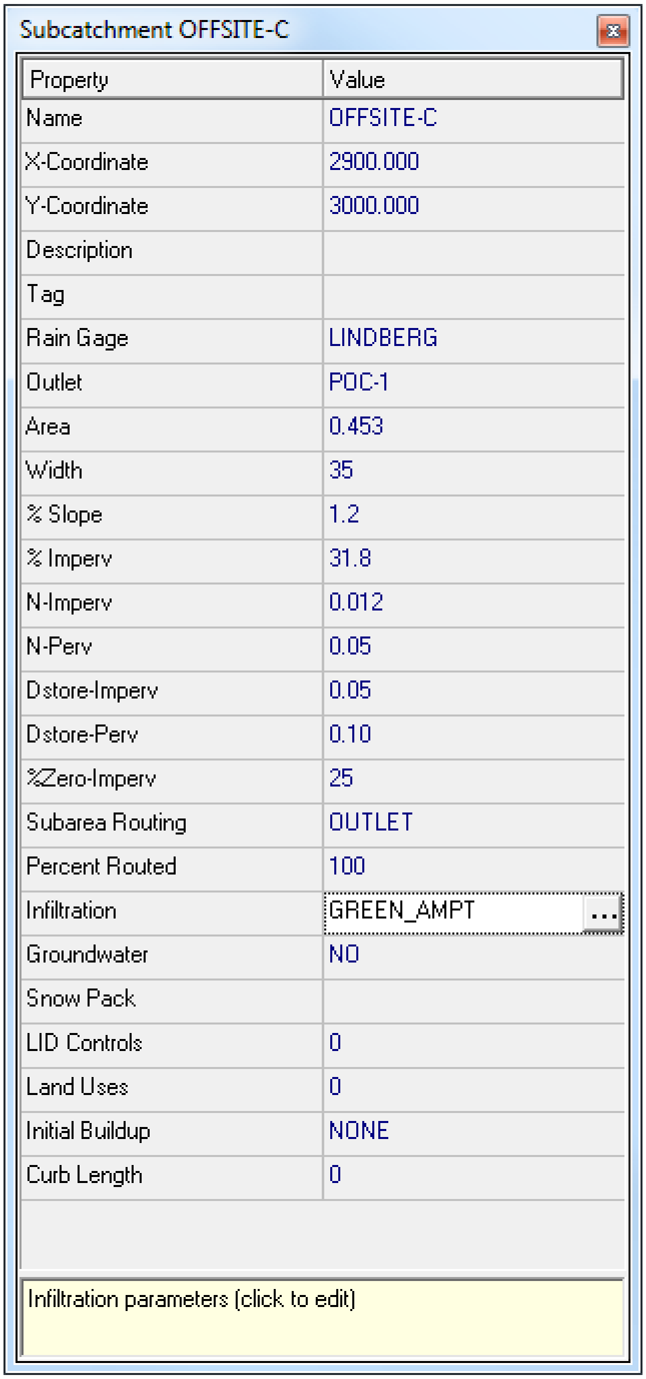
Infiltration Method GREEN_AMPT

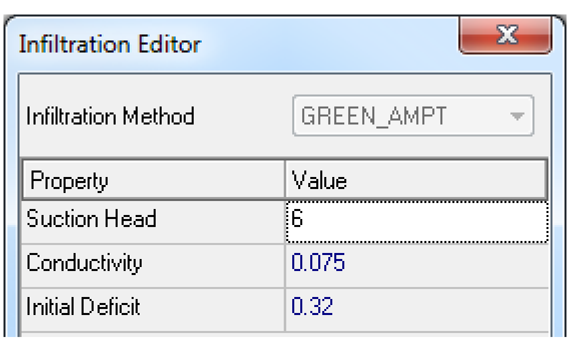
Property	Value
Suction Head	6
Conductivity	0.075
Initial Deficit	0.32

Infiltration Editor

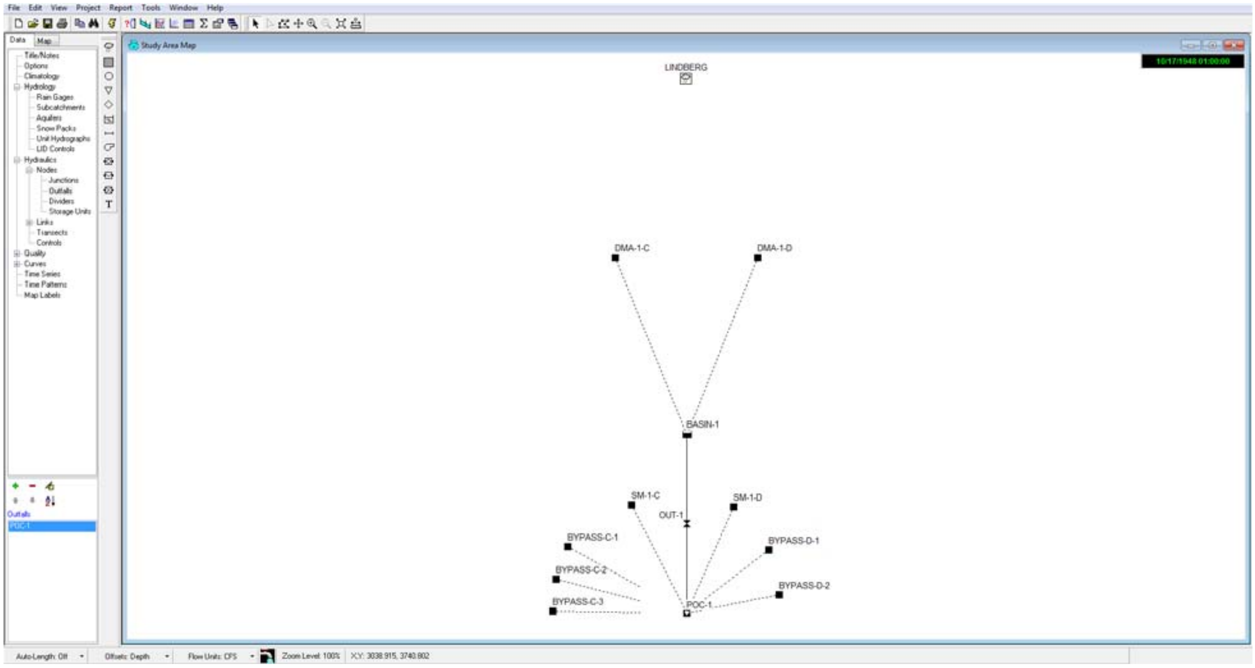
Infiltration Method GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33


Subcatchment OFFSITE-C
Property
Value
Name
OFFSITE-C
X-Coordinate
2900.000
Y-Coordinate
3000.000
Description
Tag
Rain Gage
LINDBERG
Outlet
POC-1
Area
0.453
Width
35
% Slope
1.2
% Imperv
31.8
N-Imperv
0.012
N-Perv
0.05
Dstore-Imperv
0.05
Dstore-Perv
0.10
%Zero-Imperv
25
Subarea Routing
OUTLET
Percent Routed
100
Infiltration
GREEN_AMPT
Groundwater
NO
Snow Pack
LID Controls
0
Land Uses
0
Initial Buildup
NONE
Curb Length
0
Infiltration parameters (click to edit)


Infiltration Editor
Infiltration Method
GREEN_AMPT
Property
Value
Suction Head
6
Conductivity
0.075
Initial Deficit
0.32

POST-DEVELOPED CONDITION



Rain Gage LINDBERG

Property	Value
Name	LINDBERG
X-Coordinate	3000.000
Y-Coordinate	3750.000
Description	
Tag	
Rain Format	INTENSITY
Time Interval	1:00
Snow Catch Factor	1.0
Data Source	TIMESERIES
TIME SERIES:	
- Series Name	LINDBERG
DATA FILE:	
- File Name	*
- Station ID	*
- Rain Units	IN

Outfall POC-1

Property	Value
Name	POC-1
X-Coordinate	3000.000
Y-Coordinate	3000.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Tide Gate	NO
Type	FREE
Fixed Outfall	
Fixed Stage	0
Tidal Outfall	
Curve Name	*
Time Series Outfall	
Series Name	*

Subcatchment DMA-1-C

Property	Value
Name	DMA-1-C
X-Coordinate	2900.000
Y-Coordinate	3500.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	BASIN-1
Area	3.18
Width	284
% Slope	0.7
% Imperv	51.47
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

User-assigned name of subcatchment

Subcatchment DMA-1-D

Property	Value
Name	DMA-1-D
X-Coordinate	3100.000
Y-Coordinate	3500.000
Description	
Tag	
Rain Gage	LINDBERG
Outlet	BASIN-1
Area	0.51
Width	91.6
% Slope	0.8
% Imperv	41.99
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.075
Initial Deficit	0.32

Infiltration Editor

Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	9
Conductivity	0.01875
Initial Deficit	0.33

Subcatchment SM-1-C

Property	Value
Name	SM-1-C
X-Coordinate	2922.628
Y-Coordinate	3152.039
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.04
Width	6.1
% Slope	.4
% Imperv	0
N-Imperv	0.01
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Subcatchment SM-1-D

Property	Value
Name	SM-1-D
X-Coordinate	3066.385
Y-Coordinate	3149.292
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.02
Width	5
% Slope	.4
% Imperv	0
N-Imperv	0.01
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

Infiltration Method GREEN_AMPT

Property	Value
Suction Head	3.5
Conductivity	0.5
Initial Deficit	0.25

Infiltration Editor

Infiltration Method GREEN_AMPT

Property	Value
Suction Head	3.5
Conductivity	0.5
Initial Deficit	0.25

Subcatchment BYPASS-C-1

Property	Value
Name	BYPASS-C-1
X-Coordinate	2832.894
Y-Coordinate	3093.438
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.005
Width	13.8
% Slope	0.5
% Imperv	51.69
N-Imperv	0.012
N-Perv	0.05
Dstore-Imperv	0.05
Dstore-Perv	0.10
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Subcatchment BYPASS-C-2

Property	Value
Name	BYPASS-C-2
X-Coordinate	2816.412
Y-Coordinate	3047.655
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.003
Width	9
% Slope	0.5
% Imperv	100
N-Imperv	0.01
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

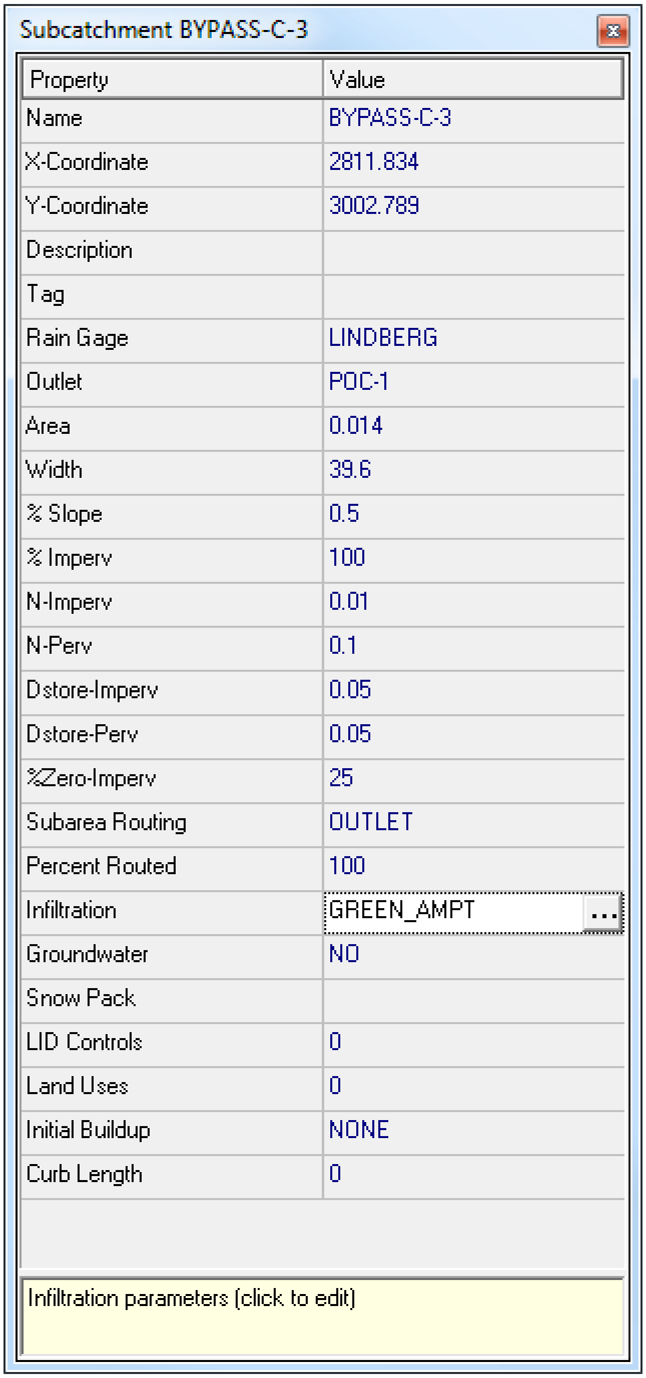
Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	6
Conductivity	0.075
Initial Deficit	0.32

Infiltration Editor

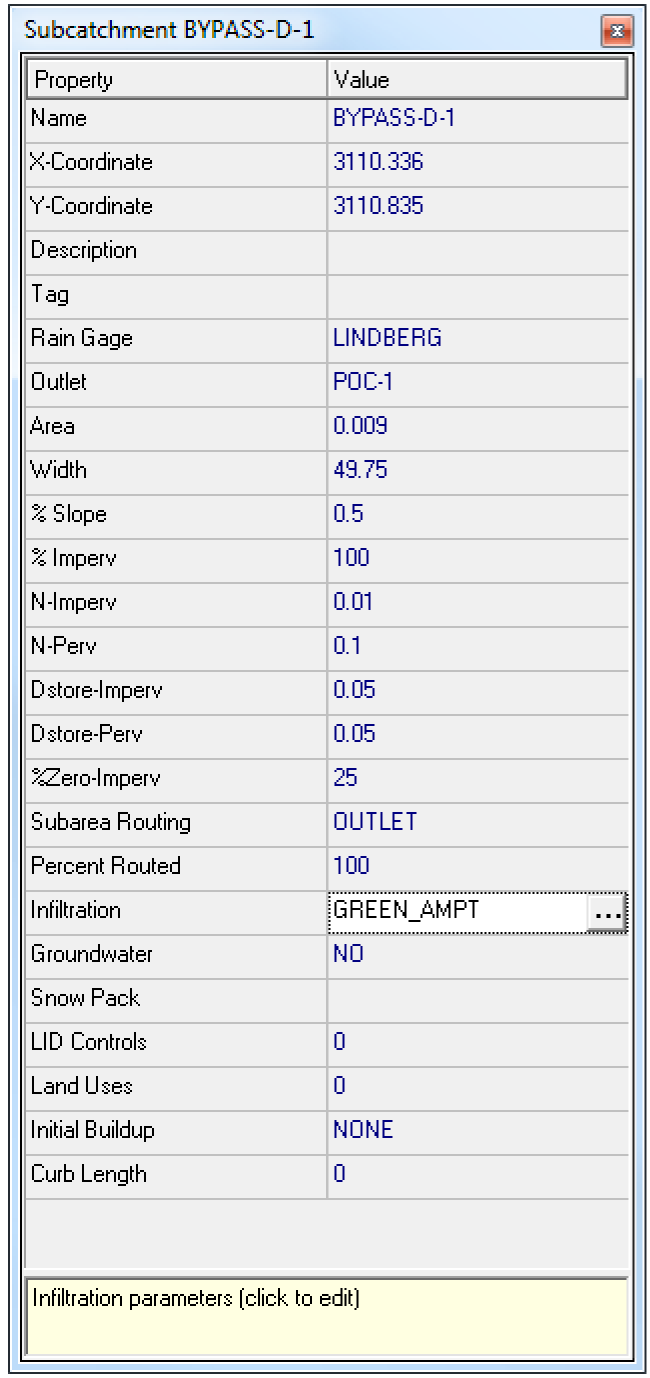
Infiltration Method: GREEN_AMPT

Property	Value
Suction Head	3.5
Conductivity	0.5
Initial Deficit	0.25


Subcatchment BYPASS-C-3

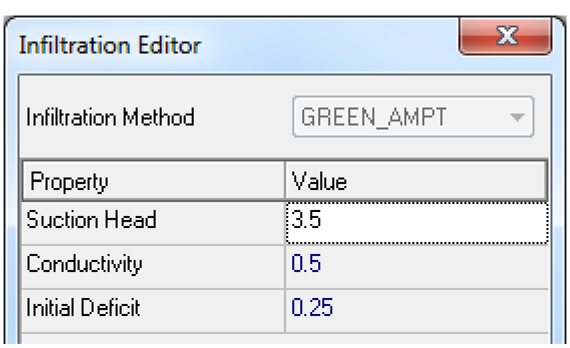
Property	Value
Name	BYPASS-C-3
X-Coordinate	2811.834
Y-Coordinate	3002.789
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.014
Width	39.6
% Slope	0.5
% Imperv	100
N-Imperv	0.01
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)


Subcatchment BYPASS-D-1

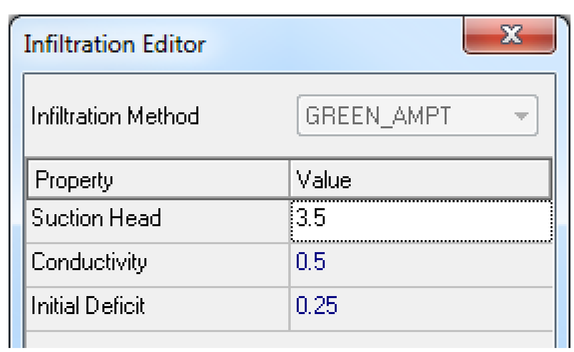
Property	Value
Name	BYPASS-D-1
X-Coordinate	3110.336
Y-Coordinate	3110.835
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.009
Width	49.75
% Slope	0.5
% Imperv	100
N-Imperv	0.01
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)


Infiltration Editor

Infiltration Method GREEN_AMPT

Property	Value
Suction Head	3.5
Conductivity	0.5
Initial Deficit	0.25


Infiltration Editor

Infiltration Method GREEN_AMPT

Property	Value
Suction Head	3.5
Conductivity	0.5
Initial Deficit	0.25

Subcatchment BYPASS-D-2

Property	Value
Name	BYPASS-D-2
X-Coordinate	3124.986
Y-Coordinate	3059.559
Description	
Tag	
Rain Gage	LINDBERG
Outlet	POC-1
Area	0.002
Width	10.1
% Slope	0.5
% Imperv	100
N-Imperv	0.01
N-Perv	0.1
Dstore-Imperv	0.05
Dstore-Perv	0.05
%Zero-Imperv	25
Subarea Routing	OUTLET
Percent Routed	100
Infiltration	GREEN_AMPT ...
Groundwater	NO
Snow Pack	
LID Controls	0
Land Uses	0
Initial Buildup	NONE
Curb Length	0

Infiltration parameters (click to edit)

Infiltration Editor

Infiltration Method GREEN_AMPT

Property	Value
Suction Head	3.5
Conductivity	0.5
Initial Deficit	0.25

SURFACE STORAGE AND RATING CURVES

Storage Unit BASIN-1

Property	Value
Name	BASIN-1
X-Coordinate	3000.000
Y-Coordinate	3250.000
Description	
Tag	
Inflows	NO
Treatment	NO
Invert El.	0
Max. Depth	2.90
Initial Depth	0
Ponded Area	5018
Evap. Factor	1
Infiltration	YES
Storage Curve	TABULAR
Functional Curve	
Coefficient	1000
Exponent	0
Constant	0
Tabular Curve	
Curve Name	BASIN-1

Infiltration Editor

Infiltration Method: GREEN_AMPT

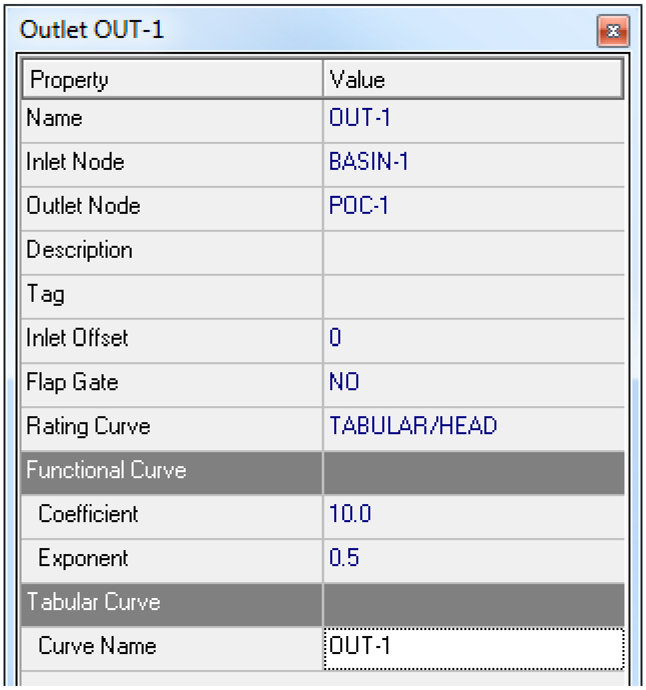
Property	Value
Suction Head	6
Conductivity	0.265
Initial Deficit	0.32

Storage Curve Editor

Curve Name: BASIN-1

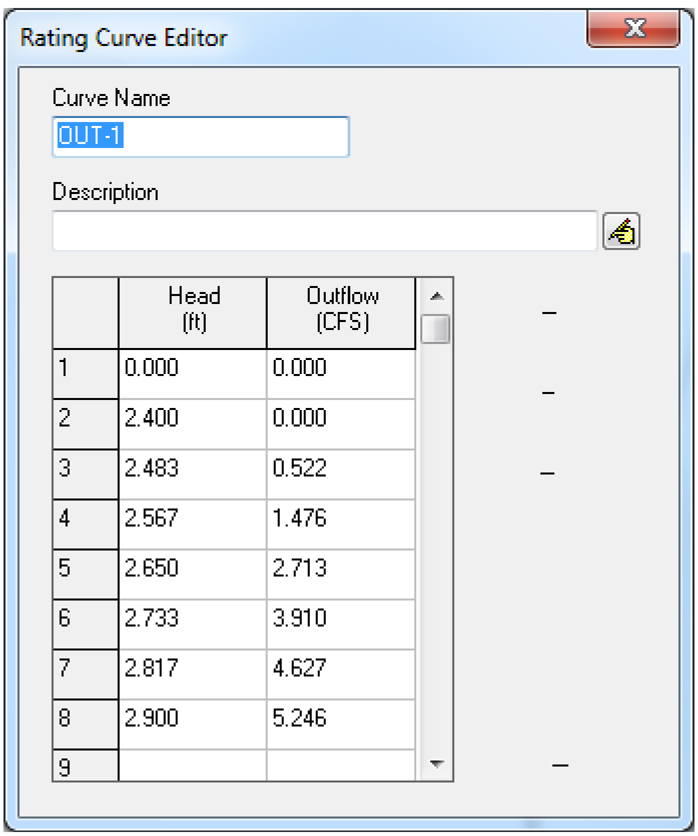
Description:

	Depth (ft)	Area (ft2)
1	0.00	5018
2	0.40	5018
3	0.48	5081
4	0.57	5144
5	0.65	5208
6	0.73	5272
7	0.82	5336
8	0.90	5401
9	0.98	5466



Outlet OUT-1

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



Rating Curve Editor

Curve Name

OUT-1

Description

	Head (ft)	Outflow (CFS)
1	0.000	0.000
2	2.400	0.000
3	2.483	0.522
4	2.567	1.476
5	2.650	2.713
6	2.733	3.910
7	2.817	4.627
8	2.900	5.246
9		

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

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

SWMM-Endorsed Values Will Improve Model Quality

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

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

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

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

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

EXPLANATION OF SELECTED VARIABLES

Sub-Catchment Areas:

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

Parameters for the pre- and post-developed models include soil types C and D as determined from the site specific Natural Resources Conservation Service (NRCS) and geologic review (attached at the end of this appendix). Suction head, conductivity and initial deficit corresponds to average values expected for these soils types, according to sources consulted, professional experience, and approximate values obtained by the interim San Diego County modeling approach.

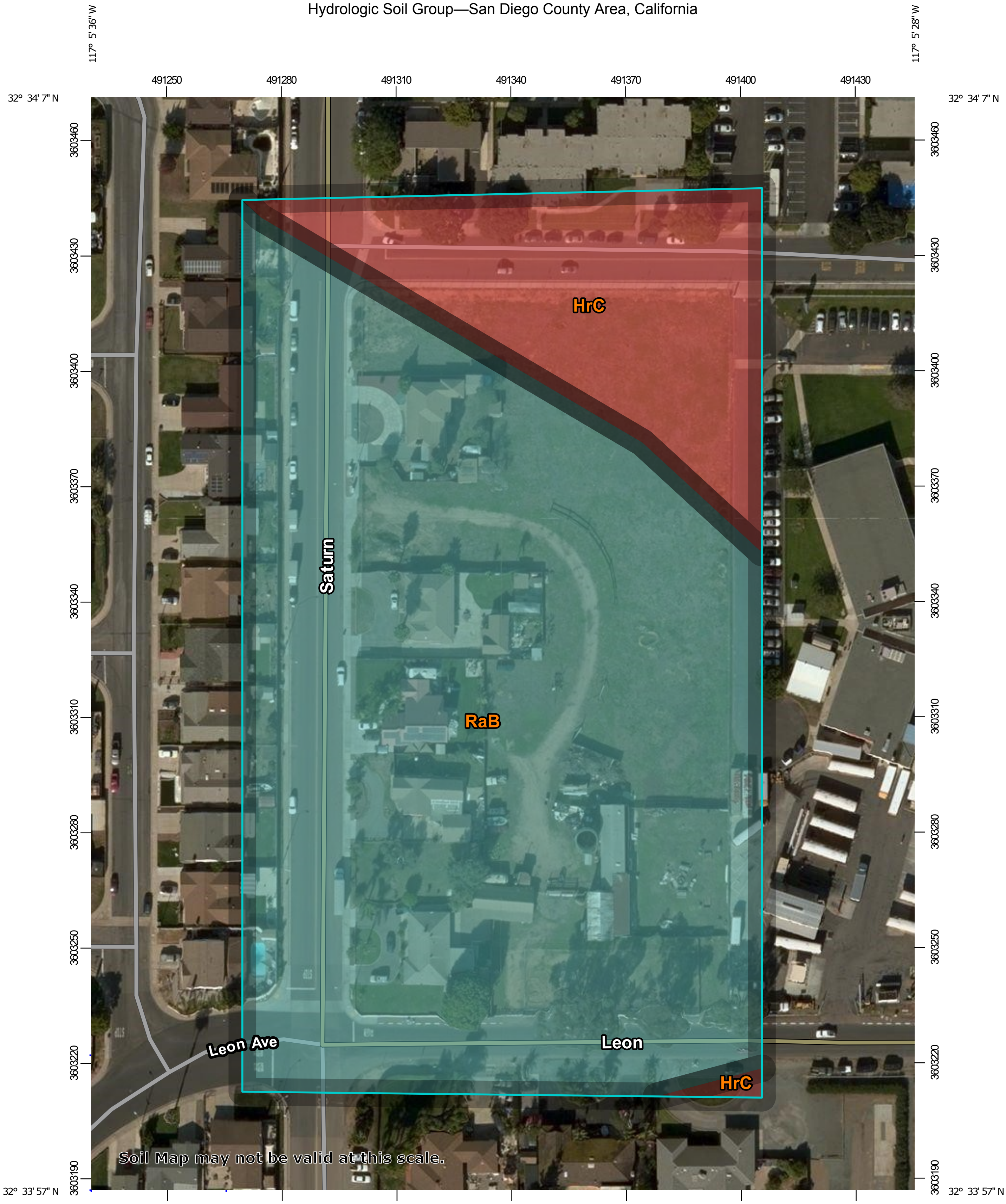
REC selected infiltration values, such that the percentage of total precipitation that becomes runoff is realistic for the soil types and slightly smaller than measured values for Southern California watersheds.

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

ATTACHMENT 8

Soils Maps & Geotechnical Report

Hydrologic Soil Group—San Diego County Area, California



Map Scale: 1:1,390 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 20, 40, 80, 120

Feet: 0, 50, 100, 200, 300

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 10, Sep 12, 2016

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

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

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
HrC	Huerhuero loam, 2 to 9 percent slopes	D	1.5	19.2%
RaB	Ramona sandy loam, 2 to 5 percent slopes	C	6.4	80.8%
Totals for Area of Interest			**7.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

EEI
Geotechnical & Environmental Solutions

February 28, 2017

Mr. David Larson
Palm Avenue Realty Company
950 Garland Drive
San Diego, California 92165

Subject: **Supplemental Percolation Study**
Proposed Single-Family Residential Subdivision Development
1695 Saturn Boulevard
San Diego, California
EEI Project No. AAA-72282.4a

Dear Mr. Larson:

Pursuant to your request and authorization, EEI has prepared this Supplemental Percolation Study for the subject property located in San Diego, California. The scope of EEI's service was to perform percolation testing to provide preliminary information to evaluate the feasibility of the installation of the proposed onsite storm-water disposal system and to assist with the design process.

This supplemental study is based upon information provided to us by Palm Avenue Realty Company and REC Consultants, as well as EEI's fieldwork, our referenced due diligence level geotechnical review and preliminary percolation study, research of readily available geologic reports and regional geologic maps, and our experience in the area. We understand that this supplemental percolation study is requested to be conducted to provide the infiltration characteristics of the subsurface materials to aid in the design of the proposed onsite storm-water disposal system at the subject property. A summary of our findings, conclusions and recommendations is provided herein.

SITE DESCRIPTION

Based on the information provided by Palm Avenue Realty Company and a review of GoogleEarth® online aerial photography, the subject property is generally located at the northeast corner of Saturn Boulevard and Leon Avenue in the City of San Diego, California. The approximately 4.1-acre property is identified by Assessor's Parcel Number (APN) 634-092-0100 and is addressed as 1695 Saturn Boulevard in San Diego, California.

Detailed descriptions of the subsurface conditions are provided on the boring logs included in **Appendix A** and the approximate locations of the borings are shown on **Figure 1**.

Groundwater

Groundwater was not encountered in any of our exploratory borings. Based on our review of the Phase I prepared for the subject property (Ninyo & Moore, 2015), groundwater is expected to be at depths greater than 20 feet below the existing ground surface. Our review of the California Department of Water Resources - Water Data Library website indicated that there are no groundwater wells present on the property. It should be noted that variations in groundwater may result from fluctuations in the ground surface topography, subsurface stratification, rainfall, irrigation, and other factors that may not have been evident at the time of our subsurface exploration.

PERCOLATION TESTING

Following the drilling of the exploratory borings B-2 through B-4, a 3-inch diameter perforated polyvinyl chloride (PVC) pipe was placed in the cleaned-out holes and gravel was placed around the pipe. The test holes were presoaked for approximately two hours in general accordance with San Diego Region guidelines.

Percolation testing was performed until consistent results were obtained, which was then used to calculate the pre-adjusted percolation rate for the test hole. Upon conclusion of testing, the perforated pipe was removed from the test hole and the test holes were backfilled.

We note that a soil profile's percolation rate is not the same as its infiltration rate. Therefore, the measured/calculated field percolation rates were converted to an estimated infiltration rate utilizing a reduction factor determined using the Porchet method. The following **Table 1** presents the measured percolation rates and corresponding infiltration rates calculated for each test hole.

TABLE 1
Summary of Percolation Testing

Location	Depth (ft.)	Pre-Adjusted Percolation Rate (in/hr.)	Infiltration Rate (in/hr.)
B-2	~8-10	7.56	0.63
B-3	~3-5	4.80	0.56
B-4	~8-10	6.96	0.53

Categorization of Infiltration Feasibility Condition			Form I-8	
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?				
Criteria	Screening Question		Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X	
Provide basis: Infiltration testing indicated 0.53 to 0.63in/hr. Ave.=0.57 in/hr. Full infiltration of surface runoff is considered feasible. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.				
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X	
Provide basis: The subject site is currently a relatively flat undeveloped site. The recommended structural foundation setbacks provided in this report for the proposed storm-water/infiltration basin would mitigate any risks of geotechnical hazards. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.				

<table>
<tr><th colspan="4">Form I-8 Page 2 of 4</th></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>3</td><td>Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

No shallow ground water was encountered during our field investigation. Groundwater is expected to be at depths greater than 20 feet below the proposed storm-water/infiltration basin.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>4</td><td>Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.</td><td>X</td><td></td></tr>
<tr><td colspan="4">Provide basis:

Infiltration testing indicated 0.53 to 0.63in/hr.
Ave.=0.57 in/hr.
No ephemeral streams are located on, adjacent to, or in the vicinity of the site.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.</td></tr>
<tr><td>Part 1 Result*</td><td colspan="2">If all answers to rows 1 - 4 are “Yes” a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration

If any answer from row 1-4 is “No”, infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a “full infiltration” design. Proceed to Part 2</td><td>Part 1 "yes"</td></tr>
</table>

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

Form I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	N/A	
Provide basis: Not Applicable Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	N/A	
Provide basis: Not Applicable Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

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

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

Factor of Safety and Design Infiltration for BMP-1 Rate Worksheet			Worksheet D.5-1		
Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1
B	Design	Level of pretreatment/ expected sediment loads	0.5	2	1
		Redundancy/resiliency	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2
Combined Safety Factor, $S_{total} = S_A \times S_B$				2	
Observed Infiltration Rate, inch/hr, $K_{observed}$ (corrected for test-specific bias)				0.53	
Design Infiltration Rate, in/hr, $K_{design} = K_{observed} / S_{total}$				0.265	
Supporting Data					
Observed infiltratin rate has been determined through perrcolation rated performed by geotechnical enigneer. Testes were performed in accordance with City of San Diego regulations. See attached geotechnical report for detailed information.					

ATTACHMENT 9

Summary Files from the SWMM Model

PRE_DEV

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


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

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Starting Date ............ OCT-17-1948 00:00:00
Ending Date .............. OCT-17-2005 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       193.847       563.372
Evaporation Loss .........         2.663         7.739
Infiltration Loss ........       170.119       494.413
Surface Runoff ...........        21.590        62.747
Final Surface Storage ....         0.000         0.001
Continuity Error (%) .....        -0.271


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        21.590         7.035
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........        21.590         7.035
Internal Outflow .........         0.000         0.000
Storage Losses ...........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.000


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

--------------------------------------------------------------------------------------------------------
                            Total      Total      Total      Total      Total       Total     Peak  Runoff
                           Precip      Runon       Evap      Infil     Runoff      Runoff   Runoff   Coeff
Subcatchment                   in         in         in         in         in    10^6 gal      CFS
--------------------------------------------------------------------------------------------------------
DMA-1-D                    563.37       0.00      12.67     440.57     114.24        1.92     0.80   0.203
DMA-1-C                    563.37       0.00       3.43     525.90      34.87        2.89     3.11   0.062
OFFSITE-C                  563.37       0.00      30.08     355.49     180.52        2.22     0.56   0.320


Analysis begun on:  Wed Feb 07 12:58:37 2018
Analysis ended on:  Wed Feb 07 12:58:47 2018
Total elapsed time: 00:00:10
```

POST_DEV

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


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

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... GREEN_AMPT
Flow Routing Method ...... KINWAVE
Starting Date ............ OCT-17-1948 00:00:00
Ending Date .............. OCT-17-2005 23:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 01:00:00
Wet Time Step ............ 00:15:00
Dry Time Step ............ 04:00:00
Routing Time Step ........ 60.00 sec


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......       177.603       563.372
Evaporation Loss .........        14.707        46.653
Infiltration Loss ........        80.532       255.453
Surface Runoff ...........        83.448       264.704
Final Surface Storage ....         0.005         0.016
Continuity Error (%) .....        -0.613


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......        83.448        27.193
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........         0.000         0.000
External Outflow .........         3.823         1.246
Internal Outflow .........         0.000         0.000
Storage Losses ...........        79.621        25.946
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......         0.000         0.000
Continuity Error (%) .....         0.005


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

```
************************
Routing Time Step Summary
************************
Minimum Time Step           :    60.00 sec
Average Time Step           :    60.00 sec
Maximum Time Step           :    60.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.00


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

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS	Runoff Coeff
DMA-1-D	563.37	0.00	43.36	251.88	273.60	3.79	0.68	0.486
DMA-1-C	563.37	0.00	47.74	252.50	266.25	22.99	4.06	0.473
BYPASS-C-1	563.37	0.00	44.54	247.92	278.34	0.04	0.01	0.494
SM-1-C	563.37	0.00	0.03	562.46	0.94	0.00	0.03	0.002
SM-1-D	563.37	0.00	0.03	562.29	1.12	0.00	0.02	0.002
BYPASS-C-2	563.37	0.00	83.78	0.00	488.76	0.04	0.00	0.868
BYPASS-C-3	563.37	0.00	83.84	0.00	488.65	0.19	0.02	0.867
BYPASS-D-1	563.37	0.00	83.25	0.00	489.96	0.12	0.01	0.870
BYPASS-D-2	563.37	0.00	83.31	0.00	489.76	0.03	0.00	0.869

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

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min
POC-1	OUTFALL	0.00	0.00	0.00	0 00:00
BASIN-1	STORAGE	0.03	2.71	2.71	6263 09:06

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

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal
POC-1	OUTFALL	0.09	3.68	6263 09:06	0.411	1.246
BASIN-1	STORAGE	4.75	4.75	6263 09:00	26.779	26.779

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

Surcharging occurs when water rises above the top of the highest conduit.
```

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet

BASIN-1	STORAGE	499679.02	2.712	0.188

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	E&I Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
BASIN-1	0.142	1	97	15.748	92	6263 09:05	3.61

****
Outfall Loading Summary
****

Outfall Node	Flow Freq. Pcnt.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10^6 gal
POC-1	0.78	0.01	3.68	1.246
System	0.78	0.01	3.68	1.246

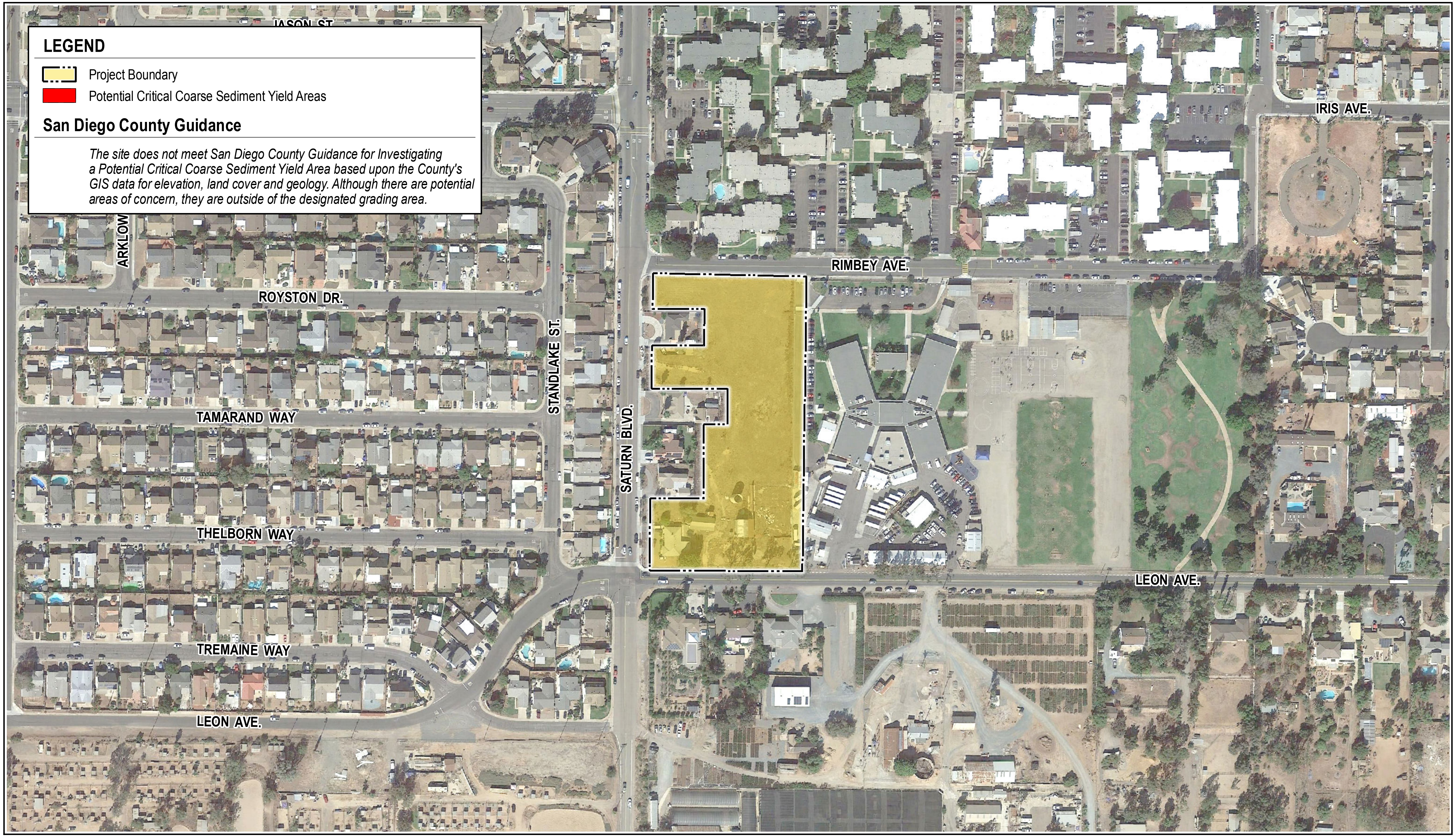
****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
OUT-1	DUMMY	3.61	6263 09:06			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Wed Feb 07 15:42:03 2018
Analysis ended on: Wed Feb 07 15:42:20 2018
Total elapsed time: 00:00:17



R·E·C Consultants, Inc.

Potential Critical Coarse Sediment Yield Areas Mapping

SATURN BLVD. DEVELOPMENT

Feet 0 100 200

Source: SanGIS 2016.

April 2017

Attachment 3
Structural BMP Maintenance Information

This is the cover sheet for Attachment 3.

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Project Name: **Saturn Boulevard Single Family Residential Development**

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

Preliminary Design / Planning / CEQA level submittal:

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

Final Design level submittal:

Attachment 3a must identify:

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

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

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

Structural BMP Maintenance Thresholds and Actions (3A)

The table below identifies the specific maintenance indicators and actions for the proposed structural BMP.
Proposed BMP shall be access via proposed access road.
No features proposed to facilitate inspections as all inspections/measurements are based on visual observation.
For most maintenance actions, truck is sufficient. A 10-15yd truck or backhoe may be necessary when removing sediment from BMP.
No proprietary parts or training necessary to perform activities for proposed BMPs.

BMP: Infiltration Basin MAINTENANCE ACTIVITIES					
ROUTINE ACTION	**MAINTENANCE INDICATOR**	**FIELD MEASUREMENT**	**MEASUREMENT FREQUENCY**	**MAINTENANCE ACTIVITY**	**Frequency (# of times per year)**
Vegetation Management for Aesthetics (optional)	Average vegetation height greater than 12-inches, emergence of trees or woody vegetation,	Visual observation and random measurements throughout the side slope area	Annually, prior to start of wet season	Cut vegetation to an average height of 6-inches and remove trimmings. Remove any trees, or woody vegetation.	1.0
Soil Repair	Evidence of erosion	Visual observation	Annually, prior to start of wet season	Reseed/revegetate barren spots prior to wet season.	1.0
Standing Water	Standing water for more than 96 hrs	Visual observation	Annually, 96 hours after a target storm (0.60 in) event	Drain facility. Corrective action prior to wet season. Consult engineers if immediate solution is not evident.	1.0
Trash and Debris	Trash and Debris present	Visual observation	Annually, prior to start of wet season	Remove and dispose of trash and debris	1.0
Sediment Management	Sediment depth exceeds 10% of the facility design	Measure depth at apparent maximum and minimum accumulation of sediment. Calculate average depth	Annually, prior to start of wet season	Remove and properly dispose of sediment. Regrade if necessary. (expected every 2 years)	0.5
Underdrains	Evidence of Clogging	Visual Observation	Annually, prior to start of wet season	Corrective action prior to wet season. Consult engineers if immediate solution is not evident.	1.0
General Maintenance Inspection	Inlet structures, outlet structures, side slopes or other features damaged, significant erosion, burrows, emergence of trees or woody vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Annually, prior to start of wet season	Corrective action prior to wet season. Consult engineers if immediate solution is not evident.	1.0
Reporting					1.0

E.9. INF-1 Infiltration Basin

Photo Credit:
http://www.stormwaterpartners.com/facilities/basin.html

MS4 Permit Category
Retention
Manual Category
Infiltration
Applicable Performance Standard
Pollutant Control Flow Control
Primary Benefits
Volume Reduction Peak Flow Attenuation

Description

An infiltration basin typically consists of an earthen basin with a flat bottom constructed in naturally pervious soils. An infiltration basin retains storm water and allows it to evaporate and/or percolate into the underlying soils. The bottom of an infiltration basin is typically vegetated with native grasses or turf grass; however other types of vegetation can be used if they can survive periodic inundation and long inter-event dry periods. Treatment is achieved primarily through infiltration, filtration, sedimentation, biochemical processes and plant uptake. Infiltration basins can be constructed as linear **trenches** or as **underground infiltration galleries**.

Typical infiltration basin components include:

- Inflow distribution mechanisms (e.g., perimeter flow spreader or filter strips)
- Energy dissipation mechanism for concentrated inflows (e.g., splash blocks or riprap)
- Forebay to provide pretreatment surface ponding for captured flows
- Vegetation selected based on basin use, climate, and ponding depth
- Uncompacted native soils at the bottom of the facility
- Overflow structure

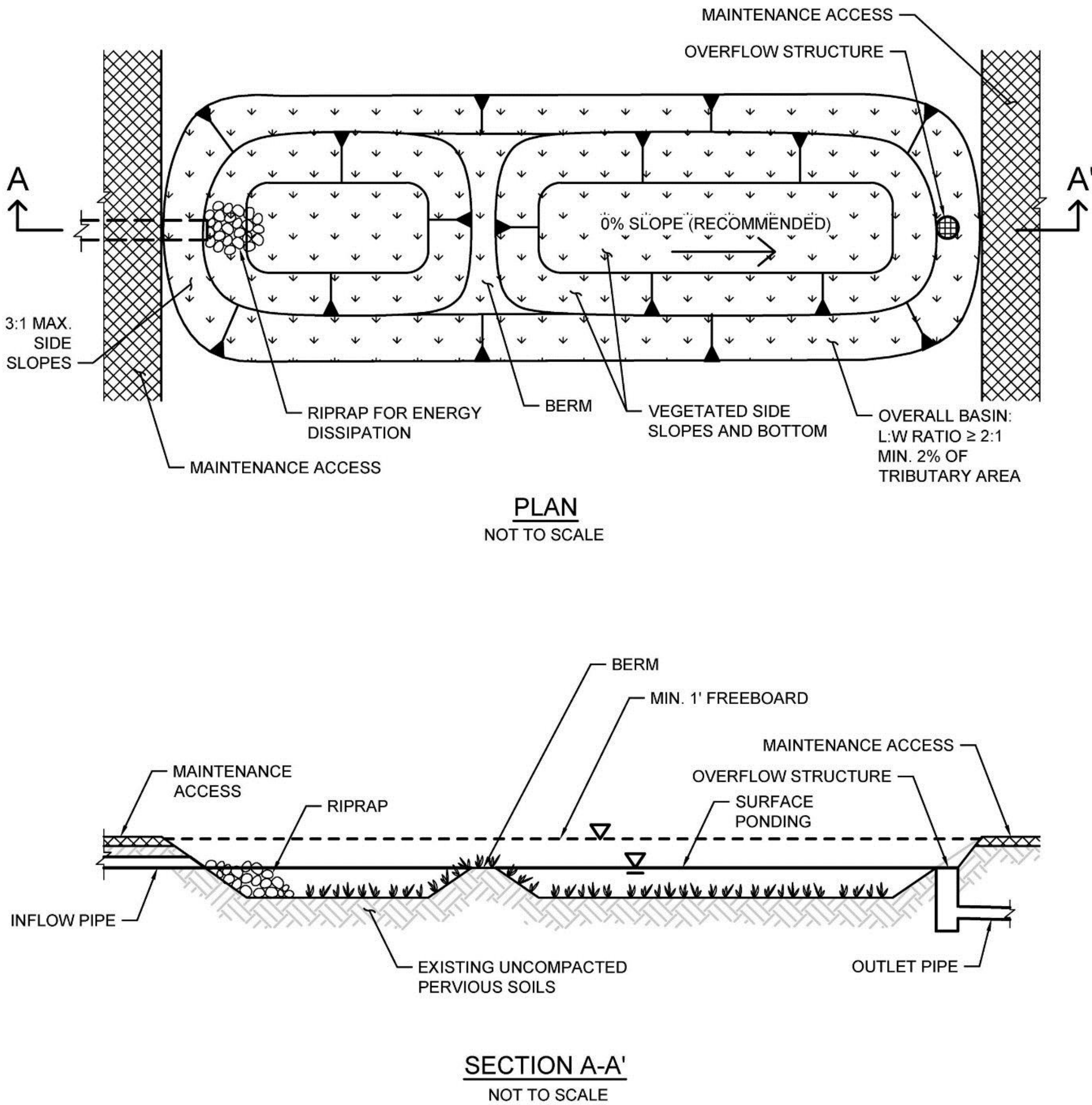


Figure E.9-E.9-1: Typical plan and section view of an Infiltration BMP

Design Adaptations for Project Goals

Full infiltration BMP for storm water pollutant control. Infiltration basins can be used as a pollutant control BMP, designed to infiltrate runoff from direct rainfall as well as runoff from adjacent areas that are tributary to the BMP. Infiltration basins must be designed with an infiltration storage volume (a function of the surface ponding volume) equal to the full DCV and able to meet drawdown time limitations.

Integrated storm water flow control and pollutant control configuration. Infiltration basins can also be designed for flow rate and duration control by providing additional infiltration storage through increasing the surface ponding volume.

Design Criteria and Considerations

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

	Siting and Design	Intent/Rationale
☐	Placement observes geotechnical recommendations regarding potential hazards (e.g., slope stability, landslides, liquefaction zones) and setbacks (e.g., slopes, foundations, utilities).	Must not negatively impact existing site geotechnical concerns.
☐	Selection and design of basin is based on infiltration feasibility criteria and appropriate design infiltration rate (See Appendix C and D).	Must operate as a full infiltration design and must be supported by drainage area and in-situ infiltration rate feasibility findings.
☐	Finish grade of the facility is ≤ 2% (0% recommended).	Flatter surfaces reduce erosion and channelization with the facility.
☐	Settling forebay has a volume ≥ 25% of facility volume below the forebay overflow.	A forebay to trap sediment can decrease frequency of required maintenance.
☐	Infiltration of surface ponding is limited to a 36-hour drawdown time.	Prolonged surface ponding reduce volume available to capture subsequent storms. The applicant has an option to use a different drawdown time up to 96 hours if the volume of the facility is adjusted using the percent capture method in Appendix B.4.2.
☐	Minimum freeboard provided is ≥1 foot.	Freeboard minimizes risk of uncontrolled surface discharge.
☐	Side slopes are = 3H:1V or shallower.	Gentler side slopes are safer, less prone to erosion, able to establish vegetation more quickly and easier to maintain.
Inflow and Overflow Structures		
☐	Inflow and outflow structures are accessible by required equipment (e.g., vactor truck) for inspection and maintenance.	Maintenance will prevent clogging and ensure proper operation of the flow control structures.
☐	Inflow velocities are limited to 3 ft/s or less or use energy dissipation methods (e.g., riprap, level spreader) for concentrated inflows.	High inflow velocities can cause erosion, scour and/or channeling.

	Siting and Design	Intent/Rationale
☐	Overflow is safely conveyed to a downstream storm drain system or discharge point. Size overflow structure to pass 100-year peak flow for on-line basins and water quality peak flow for off-line basins.	Planning for overflow lessens the risk of property damage due to flooding.

Conceptual Design and Sizing Approach for Storm Water Pollutant Control

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

1. Verify that siting and design criteria have been met, including placement and basin area requirements, forebay volume, and maximum slopes for basin sides and bottom.
2. Calculate the DCV per Appendix B based on expected site design runoff for tributary areas.
3. Use the sizing worksheet (Appendix B.4) to determine if full infiltration of the DCV is achievable based on the infiltration storage volume calculated from the surface ponding area and depth for a maximum 36-hour drawdown time. The drawdown time can be estimated by dividing the average depth of the basin by the design infiltration rate. Appendix D provides guidance on evaluating a site's infiltration rate.

Conceptual Design and Sizing Approach for Storm Water Pollutant Treatment and Flow Control

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

1. Verify that siting and design criteria have been met, including placement and basin area requirements, forebay volume, and maximum slopes for basin sides and bottom.
2. Iteratively determine the surface ponding required to provide infiltration storage to reduce flow rates and durations to allowable limits while adhering to the maximum 36-hour drawdown time. Flow rates and durations can be controlled using flow splitters that route the appropriate inflow amounts to the infiltration basin and bypass excess flows to the downstream storm drain system or discharge point.
3. If an infiltration basin cannot fully provide the flow rate and duration control required by this manual, an upstream or downstream structure with appropriate storage volume such as an underground vault can be used to provide additional control.
4. After the infiltration basin has been designed to meet flow control requirements, calculations must be completed to verify if storm water pollutant control requirements to treat the DCV have been met.

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:

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

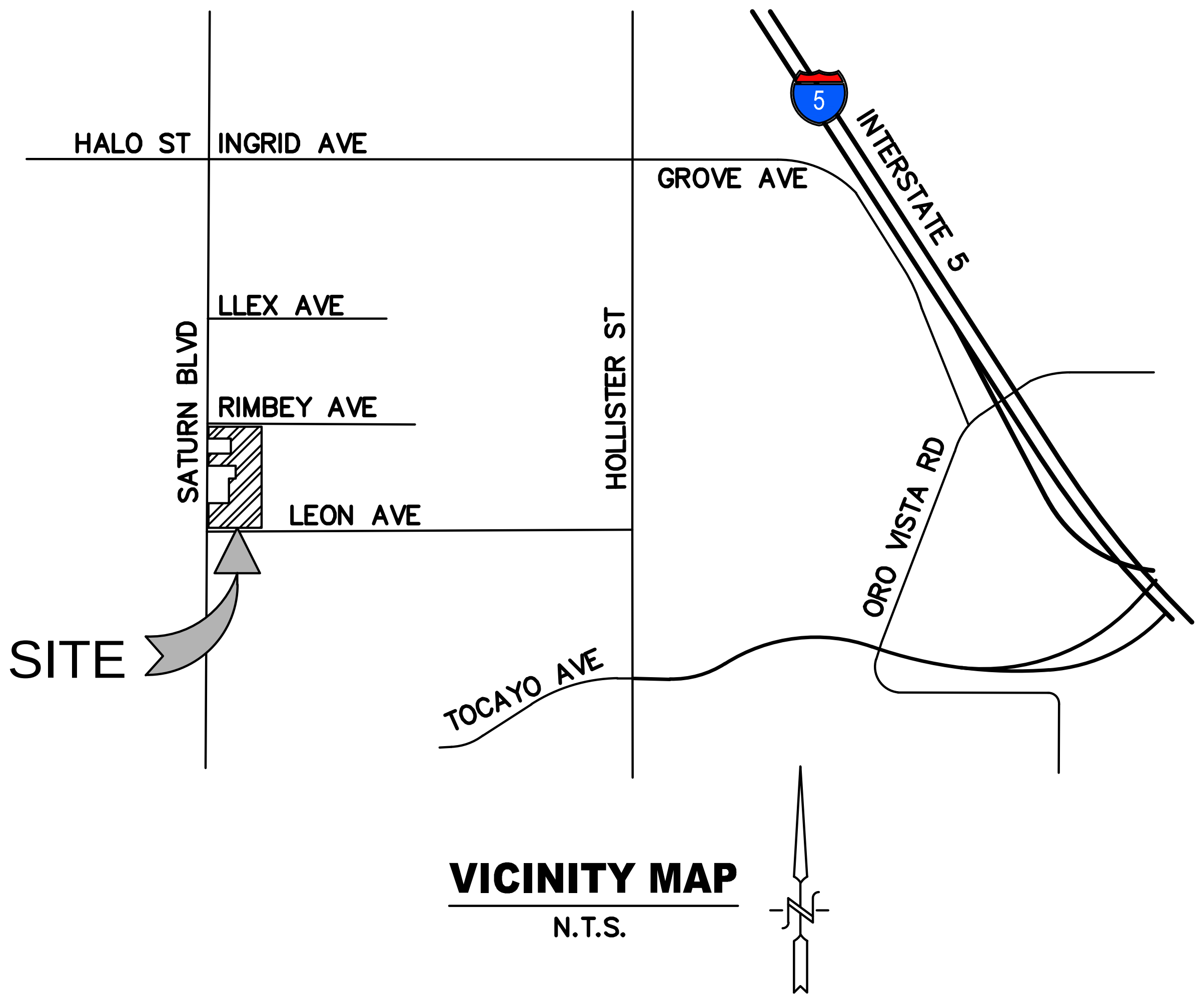
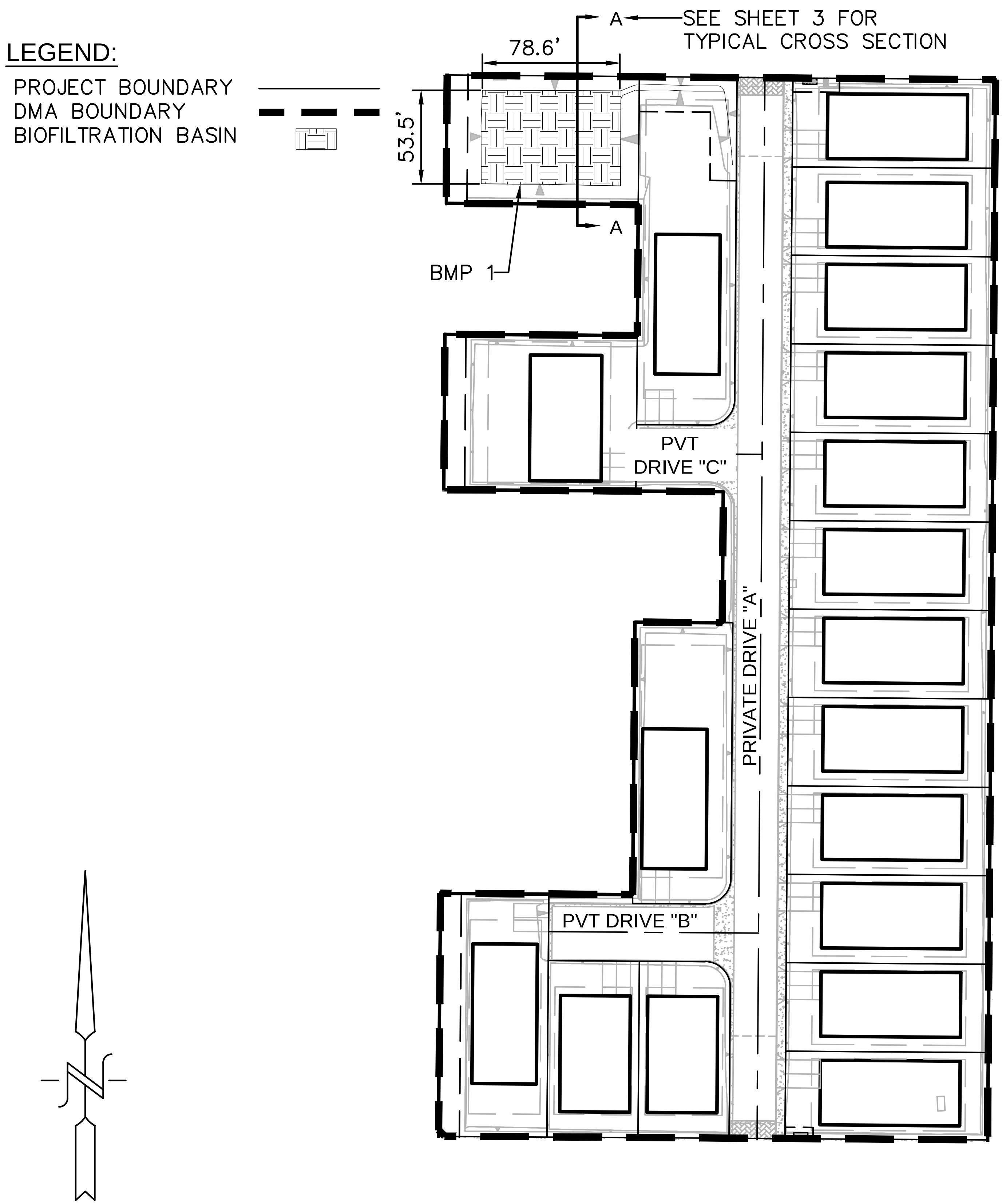


EXHIBIT "A" - VICINITY MAP
SHEET 1 OF 4
SATURN BLVD
STORM WATER MAINTENANCE EXHIBIT



80 40 0 80 160 240

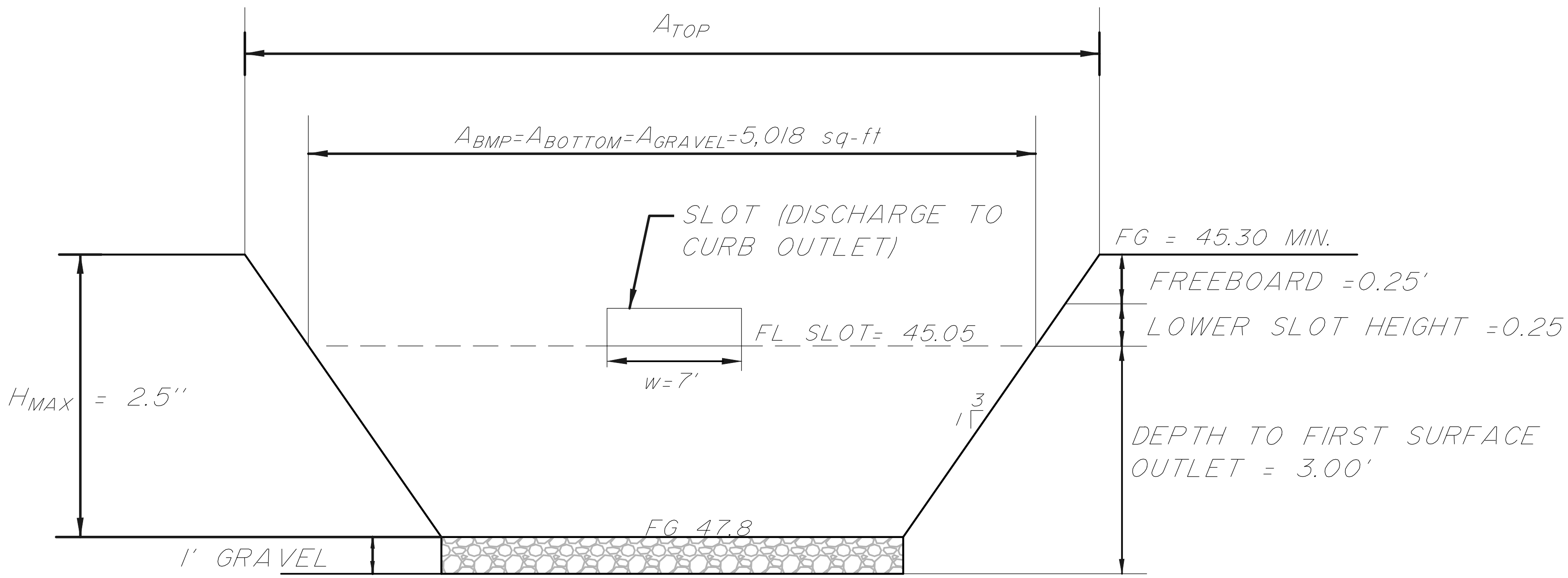
SCALE: 1" = 80'

EXHIBIT "A" - BMP MAP

SHEET 2 OF 4

SATURN BVLD

STORM WATER MAINTENANCE EXHIBIT



NOTES: BMP IS A FULL INFINTRATION BASIN, THEREFORE IT HAS NO LID ORIFICE OR UNDERDRAIN.

PRIVATE INFILTRATION BASIN DETAIL - TYPICAL SECTION A

EXHIBIT "A" - TYPICAL BMP SECTION
SHEET 3 OF 4
SATURN BVLD
STORM WATER MAINTENANCE EXHIBIT

Structural BMP Maintenance Thresholds and Actions (3A)

The table below identifies the specific maintenance indicators and actions for the proposed structural BMP.
Proposed BMP shall be access via proposed access road.
No features proposed to facilitate inspections as all inspections/measurements are based on visual observation.
For most maintenance actions, truck is sufficient. A 10-15yd truck or backhoe may be necessary when removing sediment from BMP.
No proprietary parts or training necessary to perform activities for proposed BMPs.

BMP: Infiltration Basin MAINTENANCE ACTIVITIES					
ROUTINE ACTION	MAINTENANCE INDICATOR	FIELD MEASUREMENT	MEASUREMENT FREQUENCY	MAINTENANCE ACTIVITY	Frequency (# of times per year)
Vegetation Management for Aesthetics (optional)	Average vegetation height greater than 12-inches, emergence of trees or woody vegetation,	Visual observation and random measurements throughout the side slope area	Annually, prior to start of wet season	Cut vegetation to an average height of 6-inches and remove trimmings. Remove any trees, or woody vegetation.	1.0
Soil Repair	Evidence of erosion	Visual observation	Annually, prior to start of wet season	Reseed/revegetate barren spots prior to wet season.	1.0
Standing Water	Standing water for more than 96 hrs	Visual observation	Annually, 96 hours after a target storm (0.60 in) event	Drain facility. Corrective action prior to wet season. Consult engineers if immediate solution is not evident.	1.0
Trash and Debris	Trash and Debris present	Visual observation	Annually, prior to start of wet season	Remove and dispose of trash and debris	1.0
Sediment Management	Sediment depth exceeds 10% of the facility design	Measure depth at apparent maximum and minimum accumulation of sediment. Calculate average depth	Annually, prior to start of wet season	Remove and properly dispose of sediment. Regrade if necessary. (expected every 2 years)	0.5
Underdrains	Evidence of Clogging	Visual Observation	Annually, prior to start of wet season	Corrective action prior to wet season. Consult engineers if immediate solution is not evident.	1.0
General Maintenance Inspection	Inlet structures, outlet structures, side slopes or other features damaged, significant erosion, burrows, emergence of trees or woody vegetation, graffiti or vandalism, fence damage, etc.	Visual observation	Annually, prior to start of wet season	Corrective action prior to wet season. Consult engineers if immediate solution is not evident.	1.0
Reporting					1.0

EXHIBIT "A" - MAINTENANCE MATRIX
SHEET 4 OF 4
SATURN BVLD
STORM WATER MAINTENANCE EXHIBIT

Project Name:

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.

VESTING TENTATIVE MAP #1996523, PLANNED DEVELOPMENT PERMIT #1996525, COASTAL DEVELOPMENT PERMIT #1996526, AND REZONE #1996524

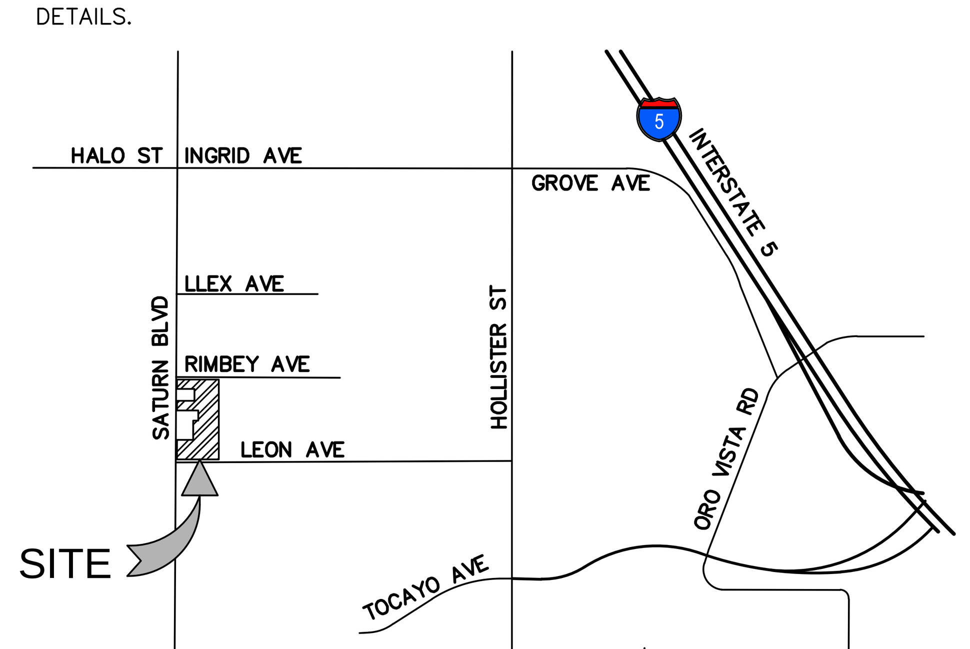
FOR 1695 SATURN BOULEVARD, SAN DIEGO, CA 92154

GENERAL NOTES:

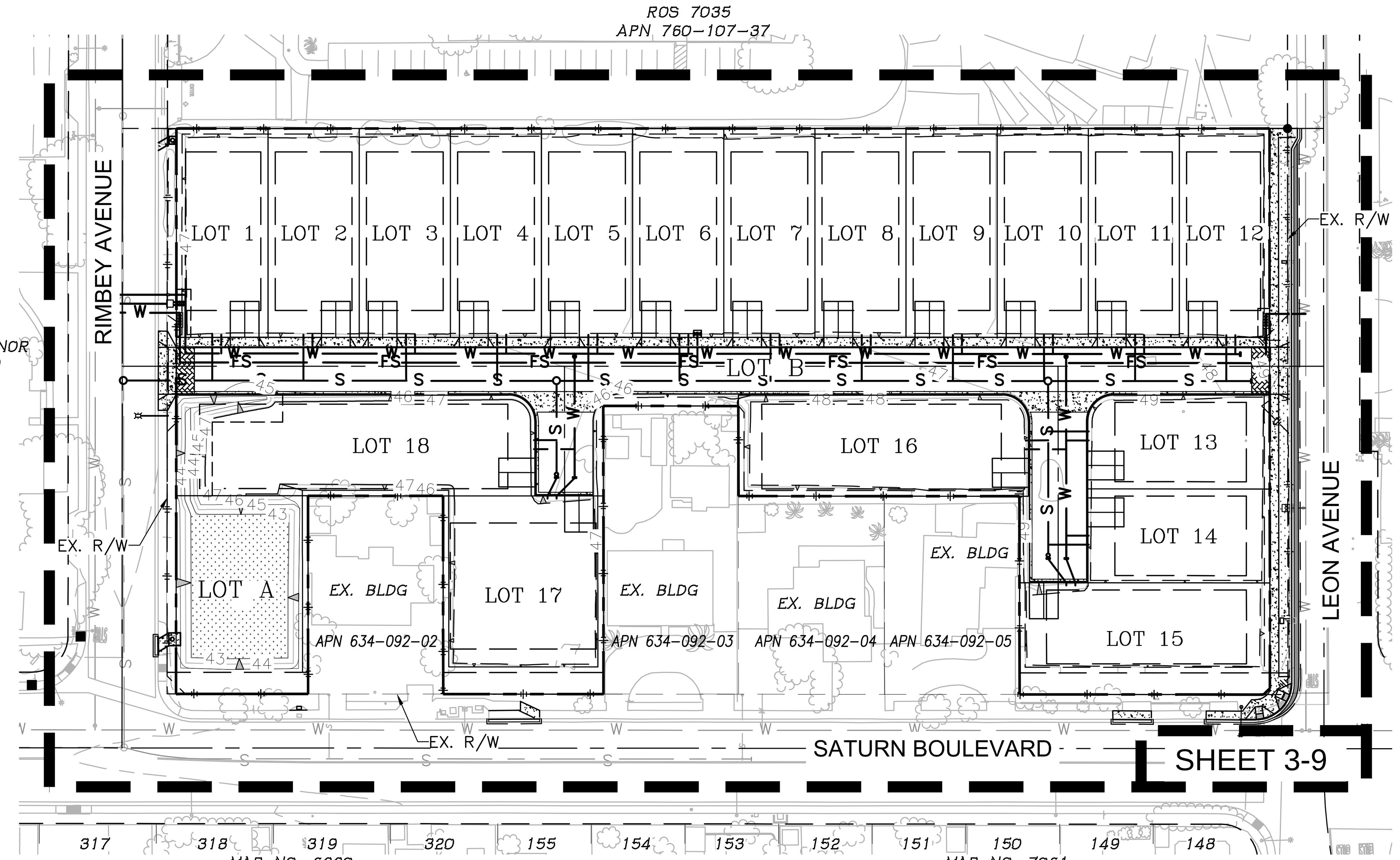
1. EXISTING GENERAL PLAN LAND USE DESIGNATION: AR (AGRICULTURE/RESIDENTIAL)
2. PROPOSED GENERAL PLAN LAND USE DESIGNATION: RS (SINGLE FAMILY RESIDENTIAL)
3. EXISTING ZONING IS: RS (SINGLE FAMILY RESIDENTIAL)
   PROPOSED ZONING IS: RS–1–7 (SINGLE FAMILY RESIDENTIAL)
4. ELEVATIONS HEREON ARE APPROXIMATE AND SUBJECT TO REVISIONS DURING FINAL DESIGN.
5. EXISTING PRIVATE EASEMENT AND IMPROVEMENT AS PLOTTED ARE APPROXIMATE AND BASED ON AVAILABLE RECORD INFORMATION.
6. ALL STORM DRAIN FACILITIES SHOWN ARE TENTATIVE IN NATURE. ACTUAL STORM DRAIN SIZES WILL BE CALCULATED WITH THE FINAL HYDROLOGICAL/HYDRAULIC CALCULATIONS.
7. EASEMENTS SHALL BE PROVIDED AS REQUIRED BY THE CITY ENGINEER, PUBLIC UTILITIES AND DISTRICTS.
8. ALL BOUNDARY INFORMATION SHOWN HEREON IS BASED ON RECORD DATA AND LEGAL DESCRIPTION AS SHOWN IN PROJECT GRANT DEED.
9. PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT WAS DONE BY GEOSOIL, INC. DATED AUGUST 3, 2015.
10. DRIVEABLE SURFACE AREA IS 25,674 S.F
11. SCHOOLS: SAN DIEGO UNIFIED SCHOOL DISTRICT
12. GRADING SHOWN IS APPROXIMATE AND SUBJECT TO FINAL DESIGN
13. MAXIMUM SLOPE 2:1, EXCEPT WHEN IN ACCORDANCE WITH SECTION 620415 OF THE MUNICIPAL CODE. SLOPE LESS THAN 10' VERTICAL HEIGHT MAY BE CONSTRUCTED AT A GRADIENT OF 1.5:1
14. PERMANENT BEST MANAGEMENT PRACTICES (BMP'S) SHALL STORE AND TREAT ALL STORM WATER PRIOR TO IT BEING DISCHARGED INTO THE CITY STORM WATER SYSTEM, ANY DISCHARGE WATER INTO THE CITY STORM WATER SYSTEM WILL NOT CONTAIN POLLUTANTS OR PARTICULATE.
15. PEDESTRIAN RAMPS ARE REQUIRED AT ALL STREET INTERSECTIONS
16. NO OBJECTS HIGHER THAN 36" ARE PROPOSED IN VISIBILITY AREAS
17. THE PROPOSED SUBDIVISION IS A VESTING TENTATIVE MAP AND IS FILED PURSUANT TO THE SUBDIVISION MAP ACT. THIS PROJECT RESERVES THE RIGHT TO DEVELOP AS A MULTI–UNIT SUBDIVISION. MULTIPLE FINAL MAPS MAY BE FILED PURSUANT TO SECTION 66456.1 OF THE SUBDIVISION MAP ACT.
18. BUILDING COVERAGE IS LIMITED TO 60% OF THE SITE AREA.
19. FENCES OR WALLS THAT ARE GENERALLY PARALLEL TO THE PUBLIC RIGHT–OF–WAY AND THAT EXCEED 100' IN LENGTH SHALL BE ARTICULATED WITH VERTICAL ELEMENTS SPACED AT NO MORE THAN 25 FEET ON CENTER. THE VERTICAL ELEMENTS SHALL BE MADE AN INTEGRAL PART OF THE FENCE OR WALL AND SHALL BE A MINIMUM OF 12 INCHES WIDE. INDICATE COMPLIANCE ON PLANS FOR FRONTAGES ALONG RIMBEY AVE., LEON AVE., AND SATURN BLVD

PROJECT DESCRIPTION:

1. PROPOSED SINGLE FAMILY RESIDENTIAL SUBDIVISION
   – NUMBER OF EXISTING LOTS: 1
   – NUMBER OF PROPOSED LOTS: 20
     *18 SINGLE FAMILY RESIDENCES
     *2 HOA LOTS (PRIVATE DRIVE AND INFILTRATION BASIN)
2. PROPOSED PERMITS:
   A. VESTING TENTATIVE MAP
   B. COASTAL DEVELOPMENT PERMIT
   C. PLANNED DEVELOPMENT PERMIT
   D. REZONE
3. PROPOSED DEVELOPMENT REGULATION DEVIATIONS:
   A. LOTS 1–18 ACCESS VIA PRIVATE DRIVEWAY IN LIEU OF PUBLIC STREET
   B. LOTS 2–11 AND 16 NO FRONTAGE ON PUBLIC RIGHT OF WAY
4. ZONE DESIGNATIONS
   EXISTING: AGRICULTURE/RESIDENTIAL (AR–1–2)
   PROPOSED: RS–1–7
5. WASTE MANAGEMENT NOTE: FUTURE ON–SITE BUILDINGS ARE NOT PART OF THIS PLAN APPROVAL. TOTAL BUILDING AREAS IN PROPOSED PLANNED COMMUNITY TO BE OVER 40,000 SQ FT. SEE WASTE MANAGEMENT PLAN FOR DETAILS.



VICINITY MAP
N.T.S.



KEY MAP
1"=60'

LEGEND

IMPROVEMENT — SYMBOL

- DAYLIGHT LINE
- EXISTING CONTOUR
- FINISH SPOT ELEVATION — 50.00 FS
- EXISTING SEWER
- EXISTING WATER
- EXISTING GAS
- EXISTING FORCE MAIN
- PROPOSED WATER
- PROPOSED SEWER
- PROPOSED PROPERTY LINE/VTM BOUNDARY
- PROPERTY RIGHT–OF–WAY
- BIO–RETENTION LID AREA
- PROPOSED BUILDING ENVELOPE
- PROPOSED CURB RAMP
- PROPOSED NON–CONTIGUOUS SIDEWALK
- PROPOSED CURB AND GUTTER
- PROPOSED D–25 CURB OUTLET
- PROPOSED FIRE HYDRANT
- EXISTING SURVEY MONUMENTS (AS NOTED)
- PROPOSED INFILTATION BASIN
- PROPOSED SIDEWALK PLANTER

EXISTING LOT SUMMARY:

TOTAL/PORTION LOT 8: 3.63 ACRES

LOT	Square Feet	Acres
1	157,976	3.63

PROPOSED LOT SUMMARY:

TOTAL SINGLE FAMILY RESIDENCES: 18
TOTAL HOA LOTS: 2 (1 PRIVATE DRIVE AND 1 INFILTRATION BASIN)

LOT	SQ FT	ACRES	DEVELOPMENT TYPE
1	5,905	0.14	RESIDENTIAL
2	5,870	0.14	RESIDENTIAL
3	5,870	0.14	RESIDENTIAL
4	5,870	0.14	RESIDENTIAL
5	5,870	0.14	RESIDENTIAL
6	5,870	0.14	RESIDENTIAL
7	5,870	0.14	RESIDENTIAL
8	5,870	0.14	RESIDENTIAL
9	5,870	0.14	RESIDENTIAL
10	5,870	0.14	RESIDENTIAL
11	5,870	0.14	RESIDENTIAL
12	5,805	0.13	RESIDENTIAL
13	5,217	0.12	RESIDENTIAL
14	5,266	0.12	RESIDENTIAL
15	8,618	0.20	RESIDENTIAL
16	8,989	0.21	RESIDENTIAL
17	9,792	0.23	RESIDENTIAL
18	11,094	0.26	RESIDENTIAL
LOT A HOA LOT	8,059	0.19	RESIDENTIAL (COMMON USE)
LOT B PVT DRIVE	25,822	0.59	RESIDENTIAL MOTOR COURSE

PUBLIC UTILITIES:

SEWER................................CITY OF SAN DIEGO
WATER................................CALIFORNIA AMERICAN WATER COMPANY
STORM DRAIN.....................CITY OF SAN DIEGO
GAS & ELECTRIC................SDG&E
TELEPHONE..........................AT&T
CABLE TELEVISION..............SOUTHERN CABLE TELEVISION

HYDROLOGIC SOIL GROUP:

PER WEBSOIL SURVEY

SOIL TYPE C
SOIL TYPE D

PROJECT NO.:

566657

VESTING TENTATIVE MAP NO.:

NO. 1996523

SHEET INDEX:

SITE RESTRICTIONS:

PROPOSED ZONING: RS–1–7 (RESIDENTIAL)
SAN DIEGO MUNICIPAL CODE TABLE 131–04D
SETBACKS:
– FRONT = 15' MIN.
– SIDE = 0.08 * ACTUAL LOT WIDTH
– STREET SIDE = 0.10* ACTUAL LOT WIDTH
– REAR = 13'
LOT GEOMETRY:
– LOT AREA (MIN.) = 5,000 SF
– LOT WIDTH (MIN.) = 50'
– LOT WIDTH (CORNER) = 55'
– LOT DEPTH (MIN.) = 95'
FRONTAGE REQUIREMENT:
– 50' MIN.

ZONE AND LAND USE:

GENERAL PLAN: OTAY MESA–NESTOR COMMUNITY PLAN
EXISTING ZONE: AR–1–2
PROPOSED ZONE: RS–1–7

LAND AREA:

GROSS AREA: 3.63 ACRES
PROPOSED NET AREA: 3.43 ACRES

EARTHWORK QUANTITIES:

CUT: 5,596 CY
FILL: 7,542 CY
IMPORT: 1,946 CY
EXPORT: 0 CY

MAXIMUM HEIGHT OF CUT SLOPE: 3' AT 2:1 SLOPE RATIO MAX.

MAXIMUM HEIGHT OF FILL SLOPE: 3' AT 2:1 SLOPE RATIO MAX.

EARTHWORK QUANTITIES SHOWN ARE APPROXIMATE AND ARE SUBJECT TO REVISIONS DURING FINAL DESIGN. ADJUSTMENTS HAVE NOT BEEN MADE FOR SHRINKAGE AND SWELL

TOTAL DISTURBANCE AREA:

3.63 ACRES

PROJECT TEAM:

CIVIL ENGINEER:
REC CONSULTANTS INC.
2442 2ND AVENUE
SAN DIEGO, CA 92101

SOIL ENGINEER:
EEI GEOTECHNICAL & ENVIRONMENTAL SOLUTIONS
2195 FARADAY AVENUE, SUITE K
CARLSBAD CA 92008
760–431–3747

LAND/USE CONSULTANT/PLANNER:
ATLAS GROUP
2488 HISTORIC DECATUR ROAD, SUITE 200
SAN DIEGO, CA 92106
619–523–1930

OWNER/DEVELOPER:

DAVID W. LARSON
950 GARLAND DRIVE
SAN DIEGO, CA 92165
619–535–8855

BASIS OF BEARINGS:

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE CCS 83, ZONE 6, GRID BEARING BETWEEN STA 1373 (CONVERGENCE, –00° 27' 55.905", ELEVATION: 36.61 NGVD29) AND 1441 PER RECORD OF SURVEY 14492
IE. S 65°22'46" E

TOPOGRAPHY SOURCE:

THE TOPOGRAPHY FOR THIS SITE IS BASED ON AN AERIAL SURVEY PERFORMED BY PHOTO GEODETIC CORPORATION ON OCTOBER 20, 2015

ASSESSOR'S PARCEL NO.:

634–092–01

BENCHMARK:

DESCRIPTION: * NWBP

LOCATION: PRIMARY STREET: SATURN BLVD
SECONDARY STREET: TREMAINE WAY

ELEVATION: 41.569 MSL

COORDINATE INDEX:

L.C.: 146–1739
NAD83: 1786–6299

ENVIRONMENTALLY SENSITIVE LANDS:

NOT APPLICABLE

CERTIFICATION STATEMENT:

I HEREBY ACKNOWLEDGE AND CERTIFY THAT:
1. I AM ACCOUNTABLE FOR KNOWING AND COMPLYING WITH THE GOVERNING POLICIES, REGULATIONS AND SUBMITTAL REQUIREMENTS APPLICABLE TO THIS PROPOSED DEVELOPMENT;
2. I HAVE PERFORMED REASONABLE RESEARCH TO DETERMINE THE REQUIRED APPROVALS AND DECISION PROCESS FOR THE PROPOSED PROJECT, AND THAT FAILURE TO ACCURATELY IDENTIFY AN APPROVAL OR DECISION PROCESS COULD SIGNIFICANTLY DELAY THE PERMITTING PROCESS;
3. I HAVE TAKEN THE PROFESSIONAL CERTIFICATION FOR DEVELOPMENT PERMIT COMPLETENESS REVIEW TRAINING AND AM ON THE APPROVED LIST FOR PROFESSIONAL CERTIFICATION;
4. MAINTAINING MY PROFESSIONAL CERTIFICATION FOR DEVELOPMENT PERMIT COMPLETENESS REVIEW PRIVILEGE REQUIRES ACCURATE SUBMITTALS ON A CONSISTENT BASIS;
5. SUBMITTING INCOMPLETE DOCUMENTS AND PLANS ON A CONSISTENT BASIS MAY RESULT IN THE REVOCATION OF MY PROFESSIONAL CERTIFICATION FOR DEVELOPMENT PERMIT COMPLETENESS REVIEW;
6. IF REQUIRED DOCUMENTS OR PLAN CONTENT IS MISSING, PROJECT REVIEW WILL BE DELAYED; AND
7. THIS SUBMITTAL PACKAGE MEETS ALL OF THE MINIMUM SUBMITTAL REQUIREMENTS CONTAINED IN LAND DEVELOPMENT MANUAL, VOLUME 1, CHAPTER 1, SECTION 4.

RESPONSIBLE CERTIFIED PROFESSIONAL:

NAME:______________________

SIGNATURE:__________________ DATE: _______

DECLARATION OF RESPONSIBLE CHARGE:

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, 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 CURRENT STANDARDS.

REGISTERED PROFESSIONAL ENGINEER
JONATHAN RAAB RYDEEN
RCE ~ 64811
EXP 6/30/19
CIVIL
STATE OF CALIFORNIA

JONATHAN RAAB RYDEEN ~ RCE 64811 EXP 6/30/19

LEGAL DESCRIPTION:

THE LAND REFERRED TO HEREIN IS SITUATED IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, AND IS DESCRIBED AS FOLLOWS:

LOT 8 OF VOLLER'S ADDITION TO ONEOTA, IN THE CITY OF SAN DIEGO, COUNTY OF SAN DIEGO, STATE OF CALIFORNIA, ACCORDING TO MAP THEREOF NO. 518, FILED IN THE OFFICE OF THE COUNTY RECORDER OF SAN DIEGO COUNTY, MARCH 27, 1888.

EXCEPTING THOSE PORTIONS DESCRIBED AS FOLLOWS:
THE NORTH 75 FEET OF THE SOUTH 564 FEET OF THE WEST 110 FEET OF LOT 8;
THE NORTH 75 FEET OF THE SOUTH 400 FEET OF THE WEST 160 FEET OF LOT 8;
THE NORTH 81 FEET OF THE SOUTH 325 FEET OF THE WEST 110 FEET OF LOT 8;
THE NORTH 75 FEET OF THE SOUTH 244 FEET OF THE WEST 110 FEET OF LOT 8

ABBREVIATIONS

HP = HIGH POINT
EG = EXISTING GROUND
FL = FLOW LINE
BMP = BEST MANAGEMENT PRACTICE
RPDA = REDUCE PRESSURE DETECTOR ASSEMBLY
FOC = FACE OF CURB
PL = PROPERTY LINE
R/W = RIGHT–OF–WAY

REVISIONS			
NO.	DESCRIPTION	DATE	APP'D

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

DATE: 1/9/18
SCALE: 1" = 30'
DRAWN: R.J.D.
CHECKED: J.R.R.

SHEET TITLE: TITLE SHEET

PROJECT: SATURN BOULEVARD
1695 SATURN BOULEVARD
SAN DIEGO, CA 92154

SHEET C-1 OF 11 SHEETS

SAVE DATE: 10/2/2018 ~ PLOT DATE: 10/2/2018 ~ FILE NAME: P:\Acad\1229 Saturn Blvd\Civil\Preliminary Grading Plan\Preliminary Grading Plan.dwg

VESTING TENTATIVE MAP #1996523, PLANNED DEVELOPMENT PERMIT #1996525, COASTAL DEVELOPMENT PERMIT #1996526, AND REZONE #1996524

FOR 1695 SATURN BOULEVARD, SAN DIEGO, CA 92154

MAPPING NOTE:

A FINAL MAP SHALL BE FILED AT THE COUNTY RECORDER'S OFFICE PRIOR TO THE EXPIRATION OF THE TENTATIVE MAP, IF APPROVED. A DETAILED PROCEDURE OF SURVEY SHALL BE SHOWN ON THE FINAL MAP AND ALL PROPERTY CORNERS SHALL BE MARKED WITH DURABLE SURVEY MONUMENTS.

DECLARATION OF COVENANTS NOTE:

THE SUBDIVIDER SHALL RECORD A DECLARATION OF COVENANTS AND RESERVATIONS OF EASEMENTS FOR THE SHARED ACCESS EASEMENT FOR THE PROJECT SITES CURRENLTY HELD BY THE SAME OWNER. THE DECLARATION OF COVENANTS AND RESERVATIONS OF EASEMENTS SHALL STATE: SINCE THE MUTUAL ACCESS EASEMENT AGREEMENT IS PRIVATE AND NOT A PUBLIC ISSUE, THE CITY OF SAN DIEGO IS NOT RESPONSIBLE FOR ANY DISPUTRE THAT MIGHT ARISE IN THE FUTURE BETWEEN THE PRIVATE PARTIES.

FAA NOTE:

A PRE-CONSTRUCTION INSPECTION IS REQUIRED DUE TO THE HEIGHT OF THE PROPOSED STRUCTURE IN RELATION TO THE FAA PART 77 NOTIFICATION SURFACE REQUIREMENTS. THE PRE-CONSTRUCTION INSPECTION MUST BE SCHEDULED AND CLEAR BY THE FIELD INSPECTOR BEFORE ANY SUBSEQUENT INSPECTIONS CAN BE SCHEDULED. CALL (858-581-7111 TO SCHEDULE THE PRE-CONSTRUCTION INSPECTION. CONTACT THE INSPECTION SERVICES OFFICE AT (858) 492-5070, IF YOU HAVE ANY QUESTIONS PERTAINING TO THE PRE-CONSTRUCTION INSPECTION.

UNDERGROUND UTILITY NOTE:

NO EXISTING OVERHEAD UTILITIES LOCATED ONSITE. ALL NEW UTILITES SHALL BE UNDERGOUNDED.

SOURCE OF TOPOGRAPHY:

THE TOPOGRAPHY FOR THIS SITE IS BASED ON AN AERIAL SURVEY PERFORMED BY PHOTO GEODETIC CORPORATION ON OCTOBER 20, 2015.

FLOOD NOTE:

ZONE - "X" PER FEDERAL EMERGENCY MANAGEMENT AGENCY MAP. NO. 06073C2154G DATED MAY 16, 2012

ZONE "X" DENOTES AREAS DETERMINED TO BE OUTSIDE 500 YEAR FLOODPLAIN.

REFERENCE DRAWINGS:

IMPROVEMENT PLANS FOR 1651 SATURN BOULEVARD...............34710-D

PLANS FOR IMPROVEMENT OF SATURN BOULEVARD, ILEX AVENUE RIMBEY AVENUE, IMPERIAL MANOR UNIT NO. 1...13643-D

PLANS FOR IMPROVEMENT OF THERMAL AVENUE, TAMARAND WAY, THELBORN WAY, TREMAIN WAY, LEON AVENUE, SANDLAKE STREET AND SATURN BOULEVARD............14719-D

PLANS FOR THE IMPROVEMENT OF RIMBEY AVENUE AND SATURN BOULEVARD...13902-D

EGGER HIGHLANDS UNIT NO. 1 SATURN BOULEVARD................ 7874-D

PARCEL MAP..MAP NO. 518

GRADING NOTES:

1. ALL GRADED AREAS THAT WILL NOT BE PERMANENTLY PAVED, COVERED BY STRUCTURE, ORPLANTED WITHIN 90 DAYS OF GRADING SHALL BE TEMPORARY REVEGATED WITH NON-IRRIGATED HYDROSEED MIX, APPLIED WITHIN 90 DAYS OF THE COMPLETION OF GRADING ACTIVITIES.

2. ALL GRADED, DISTURBED OR ERODED AREAS THAT WILL NOT BE PERMANENTLY PAVED OR COVERED BY STRUCTURES SHALL PER PERMANENTLY REVEGETATED AND IRRIGATED AS SHOWN IN TABLE 142-04F AND IN ACCORDANCE WITH THE STANDARDS IN THE SDMC 142.0411. ALL REQUIRED REVEGETATION AND EROSION CONTROL SHALL BE COMPLETED WHITHIN 90 CALENDAR DAYS OF THE COMPLETION OF GRADING OR DISTURBANCE.

3. INTERIM BINDER NOTE: GRADED, DISTRUBED, OR ERODED AREAS TO BE TREATED WITH A NON-IRRIGATED HYDROSEED MAX SHALL RECEIVE AN INTERIM BINDER/TACKIFIER AS NEEDED BETWEEN APRIL 2 AND AUGUST 31 FOR DUST-EROSION CONTROL WITH SUBSEQUENT APPLICVATION OF HYDROSEED MIX DURING THE RAINY SEASON BETWEEN OCTOBER 1 AND APRIL 1.

MAPPING NOTE:

A FINAL MAP SHALL BE FILED AT THE COUNTY RECORDER'S OFFICE PRIOR TO THE EXPIRATION OF THE TENTATIVE MAP, IF APPROVED. A DETAILED PROCEDURE OF SURVEY SHALL BE SHOWN ON THE FINAL MAP AND ALL PROPERTY SHALL BE MARKED WITH DURABLE SURVEY MONUMENTS.

EXISTING ADJACENT/ONSITE UTILITIES:

ALL EXISTING UTILITIES ADJACENT AND ONSITE ARE UNDERGROUNDED.

ALL FUTURE UTILITIES SHALL BE UNDERGROUNDED.

REVISIONS

NO.	DESCRIPTION	DATE	APP'D

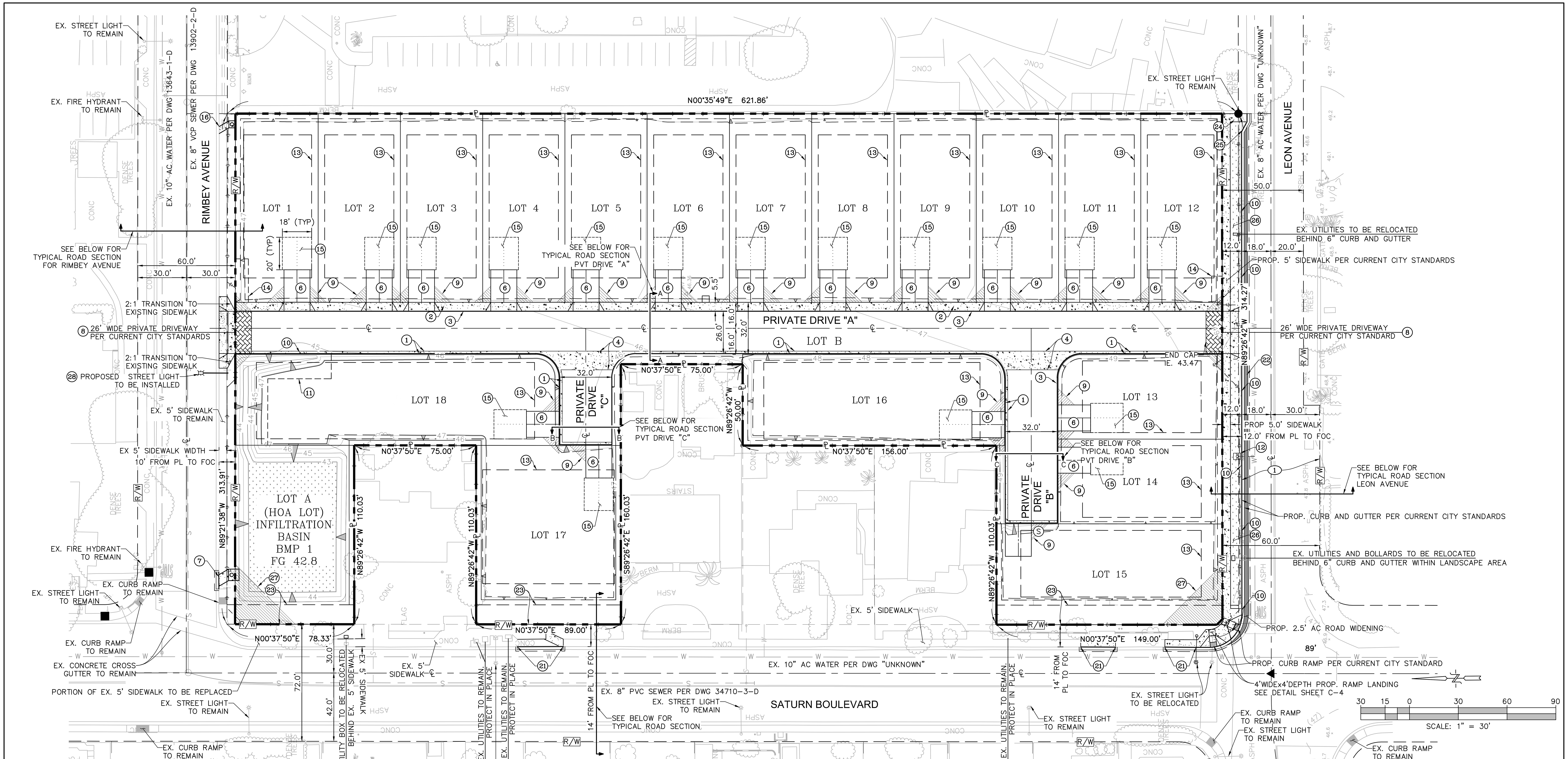
R·E·C Consultants, Inc.
Civil Engineering · Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax

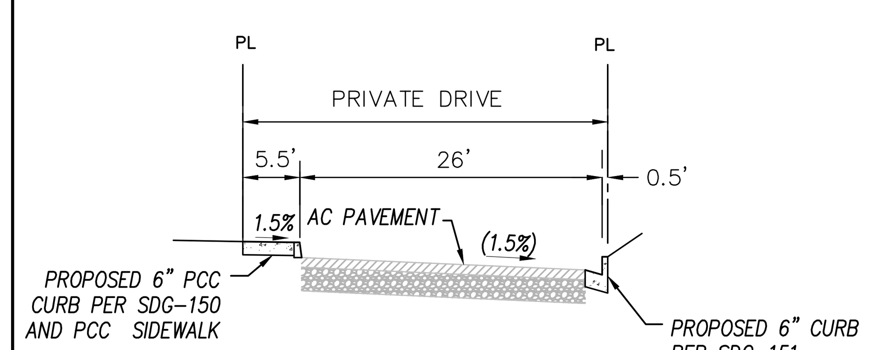
DATE: 1/9/18
SCALE: 1" = 30'
DRAWN: R.J.D.
CHECKED: J.R.R.

SHEET TITLE: NOTES

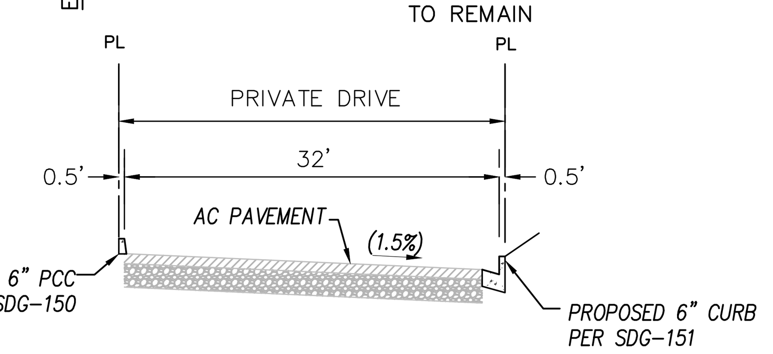
PROJECT: SATURN BOULEVARD
1695 SATURN BOULEVARD
SAN DIEGO, CA 92154

SHEET C-2 OF 11 SHEETS

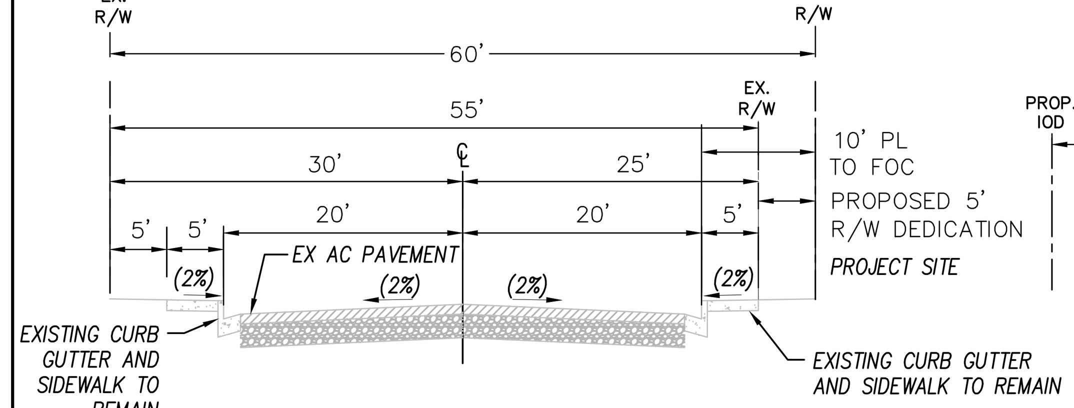




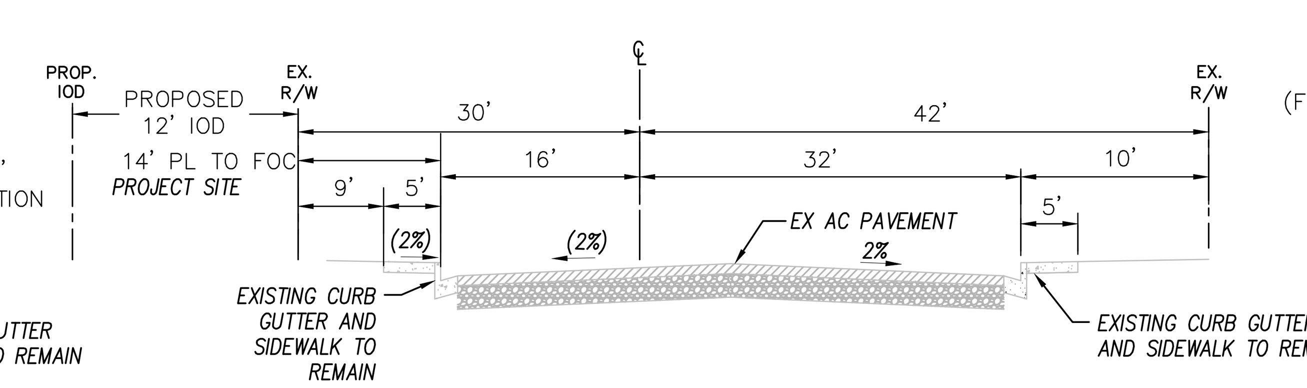
PROPOSED DRIVE A TYPICAL SECTION
NOT TO SCALE



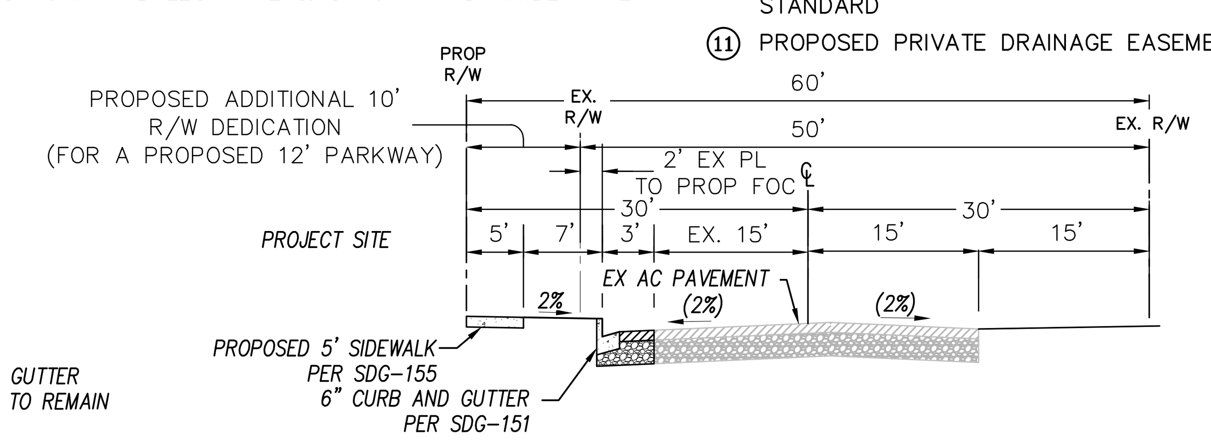
PROPOSED DRIVE B AND C TYPICAL SECTION
NOT TO SCALE



EX. RIMBEY AVENUE - TYPICAL SECTION
NOT TO SCALE



EX. SATURN BLVD - TYPICAL SECTION PROPOSED IOD
NOT TO SCALE



EX. LEON AVENUE - PROPOSED IMPROVEMENTS SECTION
NOT TO SCALE

VISIBILITY TRIANGLE NOTE:
1. NO OBSTRUCTIONS INCLUDING SOLID WALLS IN THE VISIBILITY AREA SHALL EXCEED 3 FEET IN HEIGHT. PLANT MATERIAL, OTHER THAN TREES, WITHIN THE PUBLIC RIGHT-OF-WAY THAT IS LOCATED WITHIN VISIBILITY AREAS SHALL NOT EXCEED 24 INCHES IN HEIGHT, MEASURED FROM THE TOP OF ADJACENT CURB.

PRIVATE LOT DRIVEWAYS:
1. ALL PRIVATE DRIVEWAYS SERVICING INDIVIDUAL LOTS SHALL BE AT MINIMUM 20' IN DEPTH AND 16' WIDE

ROOF DRAIN AND DECK DRAIN NOTE:
1. NO ROOF, DECK OR BALCONY DRAINS ARE PROPOSED AS PART OF THIS PERMIT

DRIVE ISLE CURB NOTE:
1. ALL CURB ALONG BOTH SIDES OF ALL PRIVATE DRIVE ISLES SHALL BE PAINTED RED.

FUTURE BUILDING ADDRESS NOTE:
1. BUILDING ADDRESS NUMBERS SHALL BE PROVIDED FOR EACH FUTURE BUILDING. NUMBERS SHALL BE VISIBLE AND LEGIBLE FROM THE PRIVATE DRIVE A.

DIRECTORY NOTE:
1. AN ILLUMINATED DIRECTORY, IN ACCORDANCE WITH FHPS POLICY I-00-6, SHALL BE PROVIDED AT THE CORNERS OF SATURN AND LEON AVE & SATURN AND RIMBEY AVE.

PROPOSED CONSTRUCTION NOTES:

1. PROPOSED CURB AND GUTTER PER SDG-151 (PVT)
2. PROPOSED 5' SIDEWALK (PVT)
3. PROPOSED 6" CURB PER SDG-150 (PVT)
4. PROPOSED CONCRETE CROSS GUTTER (PVT)
5. NOT USED
6. PROPOSED 16' WIDE (20' MIN DEPTH) PRIVATE DRIVEWAY
7. PROPOSED CURB OUTLET PER MODIFIED CURRENT CITY STANDARD WITH SLOTTED INLET SEE SHEET 9 FOR DETAILS (PVT)
8. PROPOSED 26' DRIVE PER CURRENT CITY STANDARD (PVT)
9. PROPOSED SITE VISIBILITY TRIANGLE 10'x10' (DRIVEWAY) PER SDMC DIAGRAM 113-02SS
10. PROPOSED REVERSE CURB INLET PER MODIFIED CURRENT CITY STANDARD
11. PROPOSED PRIVATE DRAINAGE EASEMENT
12. EX. FIRE HYDRANT TO BE RELOCATED BEHIND PROPOSED SIDEWALK
13. PROPOSED BUILDING SETBACK (SEE C-1 FOR SITE RESTRICTIONS)
14. PROPOSED PRIVATE UTILITY EASEMENT
15. APPROX. FUTURE OUTLINE OF 18' WIDE MIN (20' MIN DEPTH) PRIVATE GARAGE (PROVIDING 2 PRIVATE PARKING SPACES)
16. PROPOSED CURB OUTLET PER CURRENT CITY STANDARDS
17. NOT USED
18. NOT USED
19. NOT USED
20. NOT USED
21. EX. DRIVEWAY TO BE REMOVED AND REPLACED WITH CUURENT STANDARD CITY OF SAN DIEGO CURB, GUTTER & SIDEWALK
22. PROPOSED 3' ROAD WIDENING
23. PROPOSED 12' IOD
24. 5' WIDE PCC SIDEWALK TRANSITION TO OFFSITE AC SIDEWALK PER CURRENT CITY STANDARD
25. 2:1 PCC CURB AND GUTTER TRANSITION FROM PROPOSED SIDEWALK TO EX. AC SIDEWALK PER CURRENT CITY STANDARD
26. PROPOSED SIDEWALK PLANTAR SEE POST-CONSTRUCTION BMP SHEET 9
27. PROPOSED SITE VISIBILITY TRIANGLE 25'x25' (STREET CORNER AT ULTIMATE R/W) PER SDMC DIAGRAM 113-02SS
28. PROPOSED STREET LIGHT TO BE INSTALLED. 3' MIN. SEPARATION BETWEEN THE PROPOSED DRIVEWAY APRON AND NEW STREET LIGHT.

EXISTING EASEMENT NOTES:

1. AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS GRANTED IN A DOCUMENT:

GRANTED TO:	THE COUNTY OF SAN DIEGO
PURPOSE:	PUBLIC ROAD
RECORDING DATE:	AUGUST 24, 1896
RECORDING NO.:	BOOK 257, PAGE 144
AFFECTS:	PLOTTED HEREON

REGISTERED PROFESSIONAL ENGINEER
JONATHAN RAAB RYDEEN
RCE – 64811
EXP 6/30/19
CIVIL
STATE OF CALIFORNIA

REVISIONS

NO.	DESCRIPTION	DATE	APP'D

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

SCALE: 1" = 30'

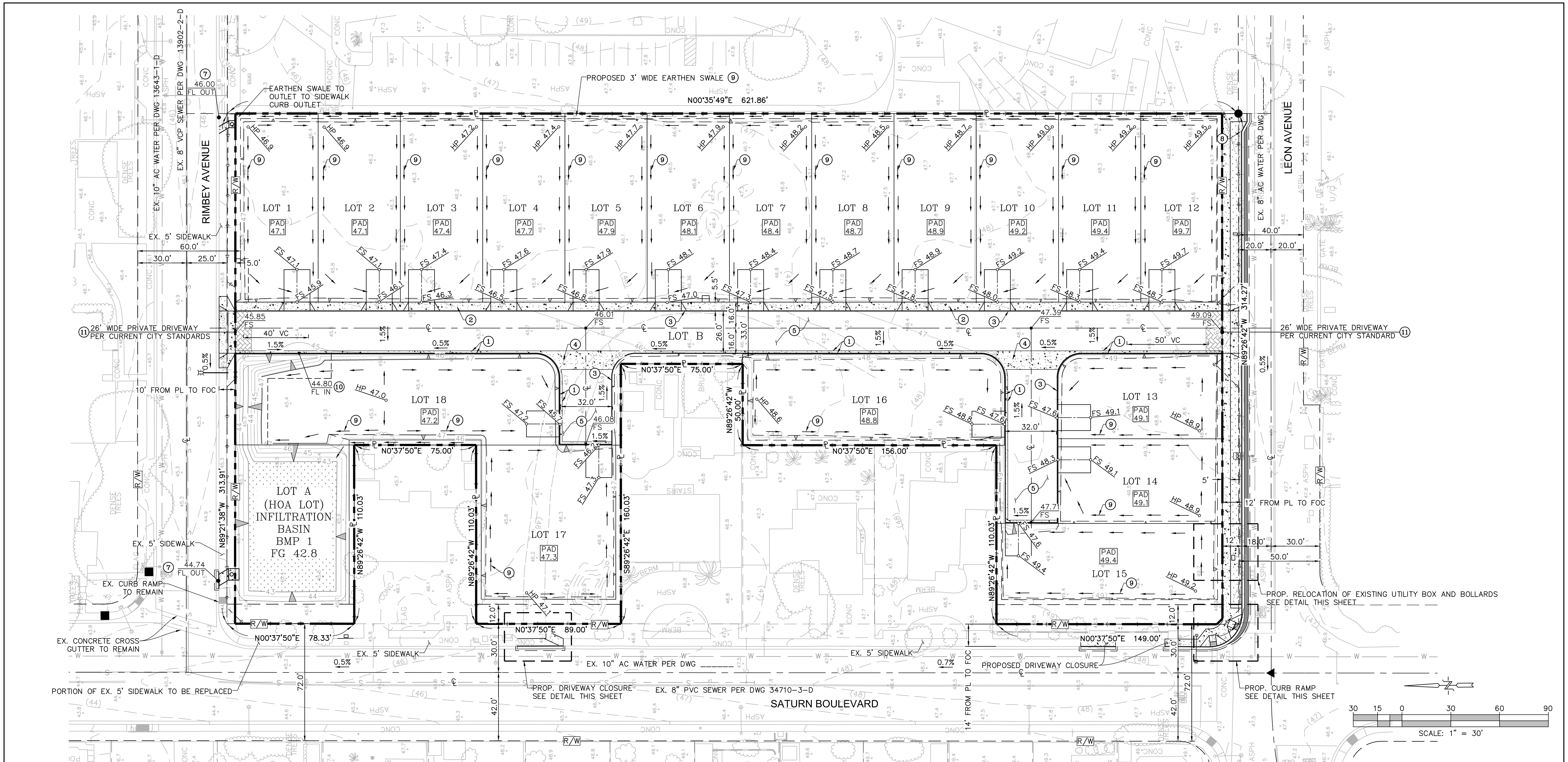
DATE:	SCALE:	DRAWN:	CHECKED:
1/9/18	1" = 30'	R.J.D.	J.R.R.

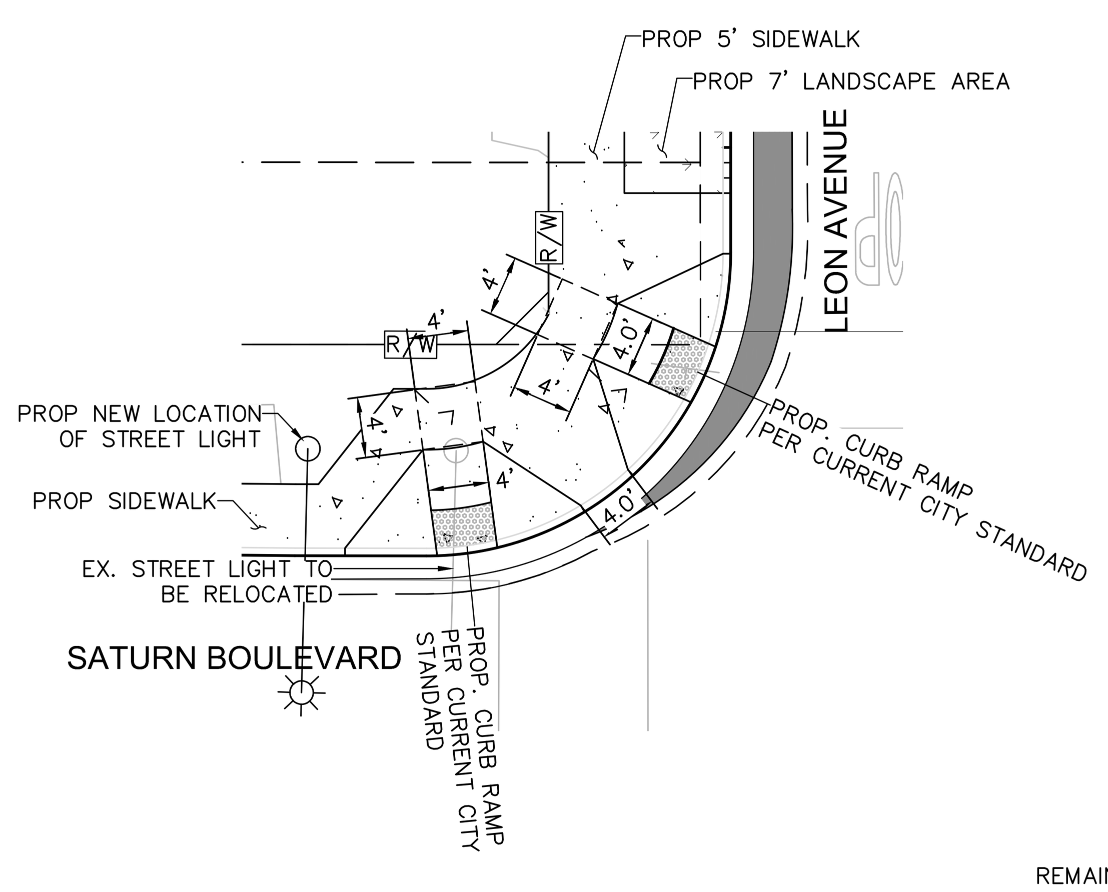
SHEET TITLE: SITE PLAN

PROJECT: SATURN BOULEVARD
1695 SATURN BOULEVARD
SAN DIEGO, CA 92154

SHEET C-3
OF 11 SHEETS

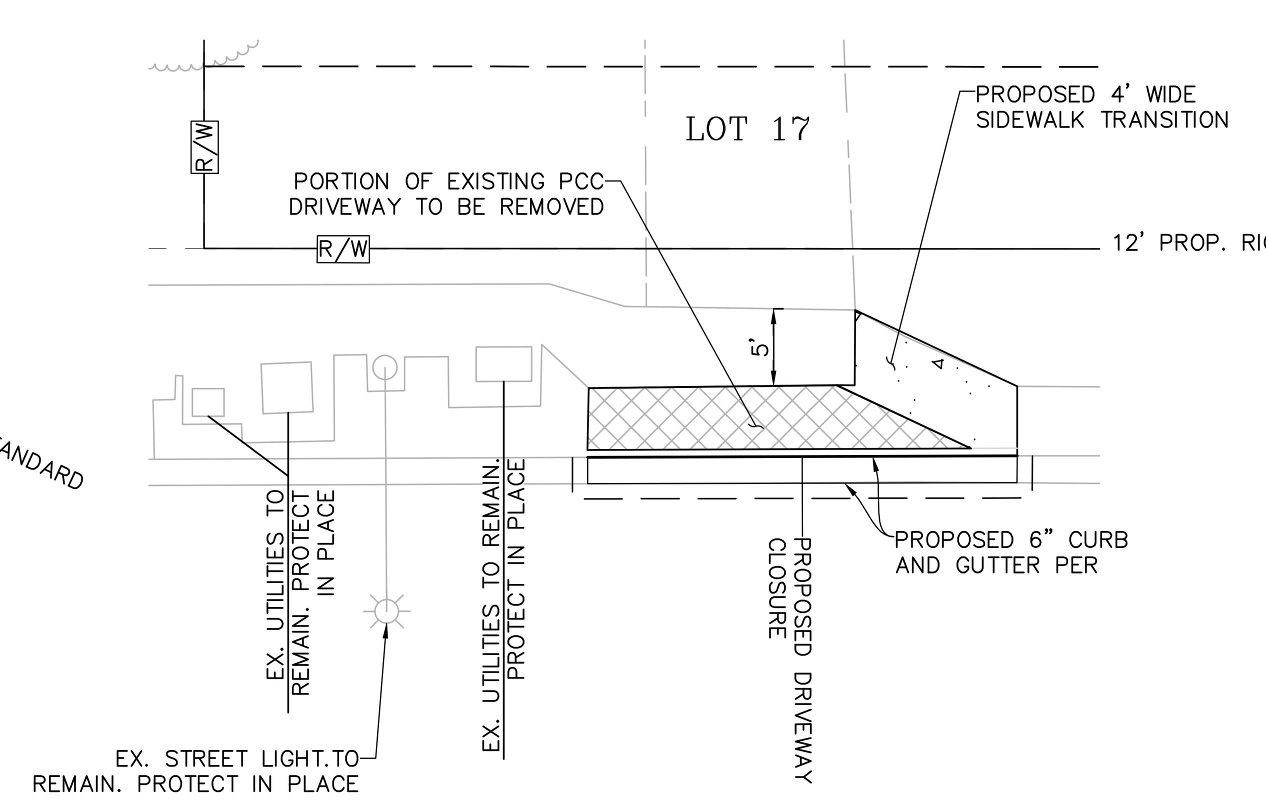
SAVE DATE 10/2/2018 – PLOT DATE 10/2/2018 – FILE NAME P:\Acad\1229 Saturn Blvd\Civil\Preliminary Grading Plan\Preliminary Grading Plan.dwg





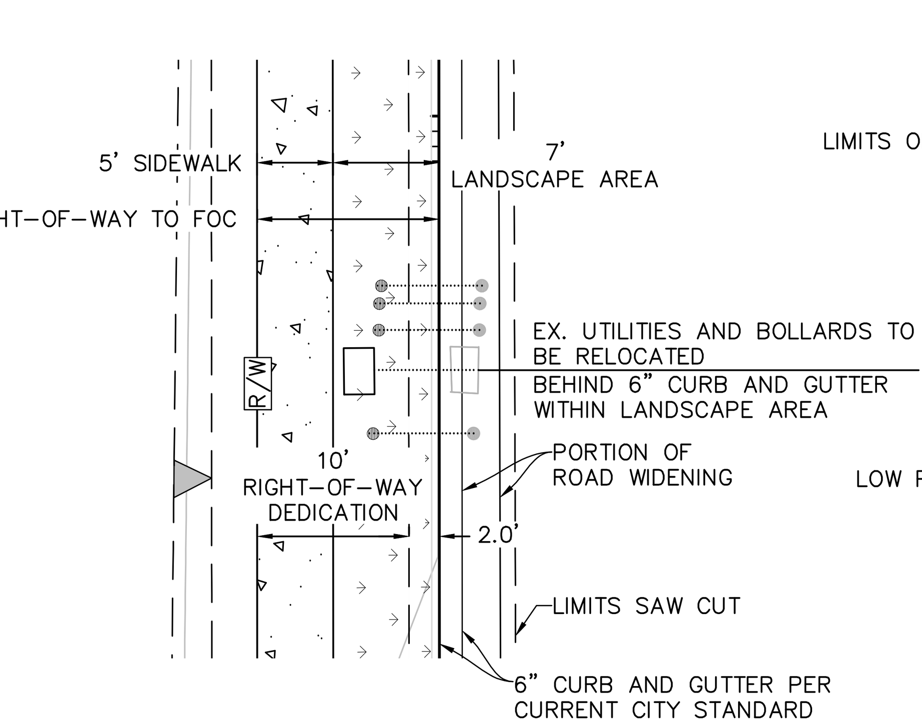
CURB RAMP DETAIL: NE CORNER OF SATURN BLVD AND LEON AVE.

NO SCALE



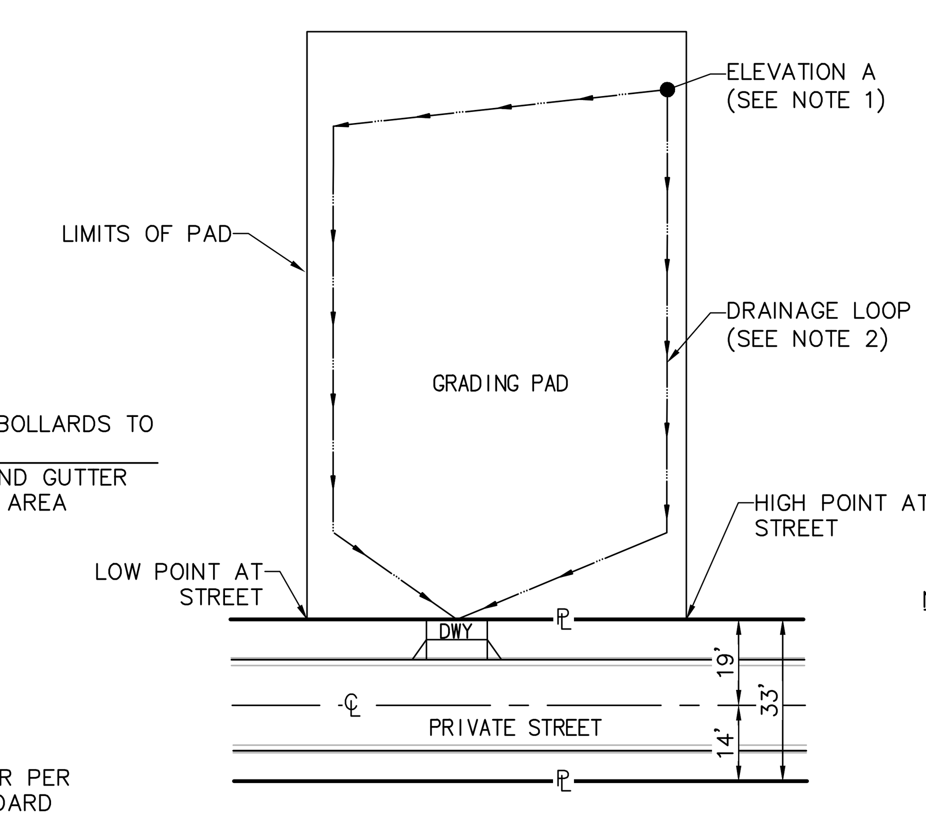
PROPOSED EX. DRIVEWAY CLOSURE AND SIDEWALK TRANSITION DETAIL ALONG THE FRONTAGE OF PROPOSED LOT 17

NO SCALE



PROPOSED RELOCATION OF EXISTING UTILITY BOX AND BOLLARDS

NO SCALE



TYPICAL RESIDENTIAL PAD DRAINAGE

NO SCALE

PROPOSED CONSTRUCTION NOTES:

1. PROPOSED PRIVATE 6" CURB AND GUTTER
2. PROPOSED PRIVATE 5' PCC SIDEWALK
3. PROPOSED PRIVATE 6" CURB
4. PROPOSED PRIVATE CONCRETE CROSS GUTTER
5. PROPOSED PRIVATE 26' AC DRIVE
6. NOT USED
7. PROPOSED PRIVATE CURB OUTLET PER CURRENT CITY STANDARDS
8. TEMPORARY 2:1 CURB AND GUTTER TRANSITION FROM PROPOSED SIDEWALK TO EX. AC SIDEWALK
9. PROPOSED PRIVATE EARTHEN SWALE
10. PROPOSED PRIVATE REVERSE CURB INLET PER D-25
11. PROPOSED 26' WIDE PRIVATE DRIVEWAY PER CURRENT CITY STANDARDS

NOTES:

1. ELEVATION "A" IS LOCATED AT THE MOST REMOTE CORNER OF THE PAD FROM THE DRIVEWAY.
2. MINIMUM 1% SWALE TO STREET OR OTHER DISCHARGE POINT.
3. ALL SLOPE SURFACES SHALL BE PROTECTED BY APPROVED EROSION CONTROL MATERIAL.
4. ALL PADS TO BE BERMED TO PREVENT RUN-OFF TO ADJACENT PADS.

REGISTERED PROFESSIONAL ENGINEER JONATHAN RAAB RYDEEN RCE – 64811 EXP 6/30/19 CIVIL STATE OF CALIFORNIA

REVISIONS			
NO.	DESCRIPTION	DATE	APP'D

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

DATE: 1/9/18
SCALE: 1" = 30'
DRAWN: R.J.D.
CHECKED: J.R.R.

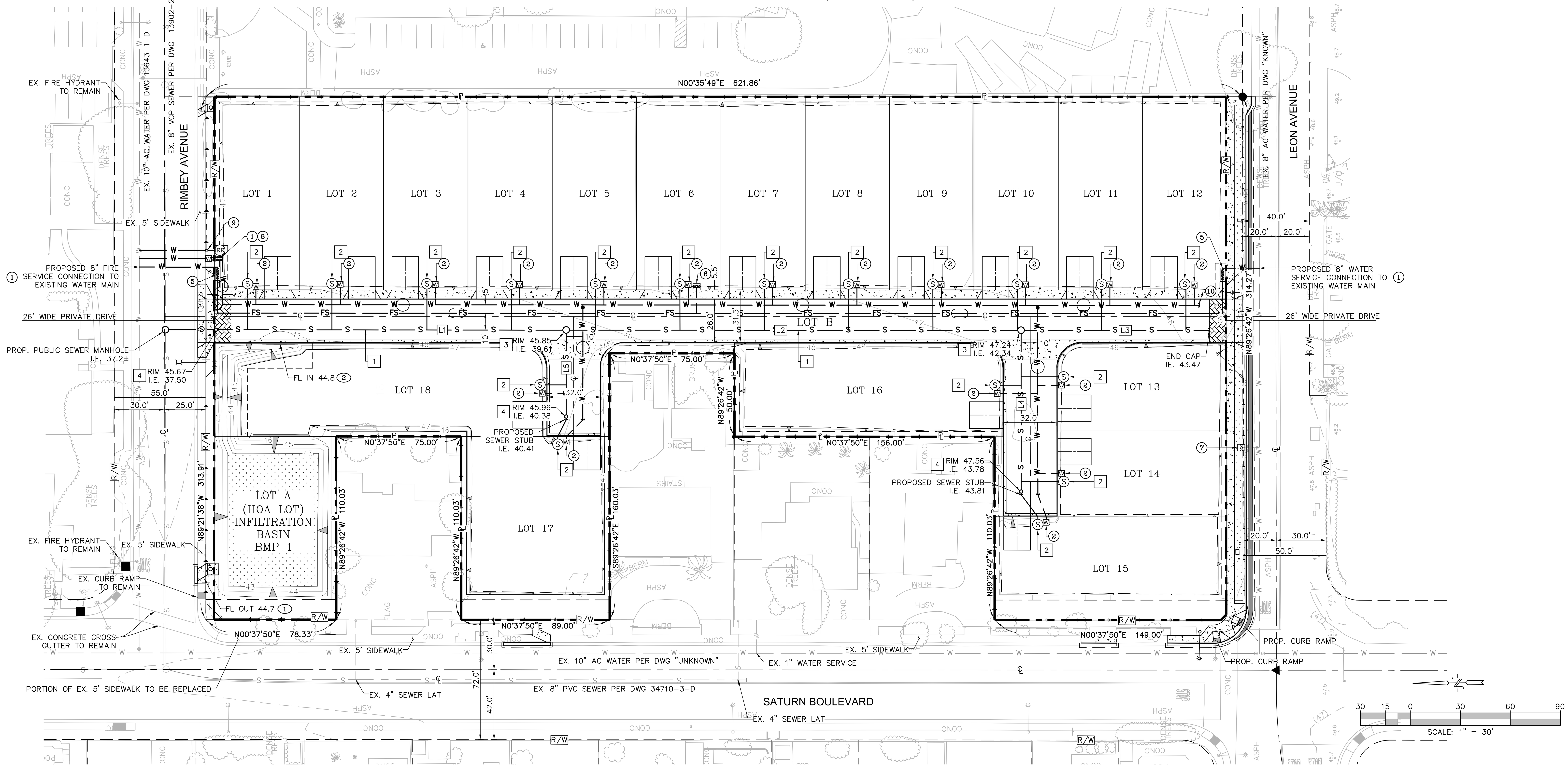
SHEET TITLE PRELIMINARY GRADING PLAN

PROJECT SATURN BOULEVARD
1695 SATURN BOULEVARD
SAN DIEGO, CA 92154

SHEET C-4 OF 11 SHEETS

VESTING TENTATIVE MAP #1996523, PLANNED DEVELOPMENT PERMIT #1996525, COASTAL DEVELOPMENT PERMIT #1996526, AND REZONE #1996524

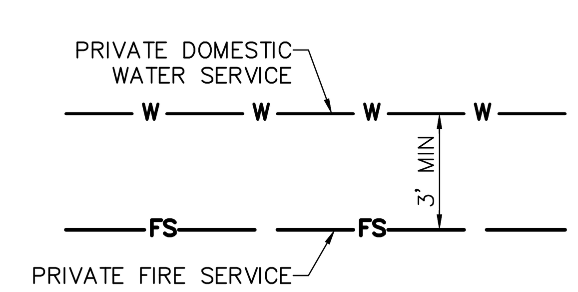
FOR 1695 SATURN BOULEVARD, SAN DIEGO, CA 92154



SEWER DATA TABLE (PRIVATE)				
#	BEARING/DELTA	RADIUS	LENGTH	NOTES
L1	S 00°39'47" W		240.47'	8" PVC
L2	S 00°36'07" W		272.92'	8" PVC
L3	S 00°37'50" W		113.00'	8" PVC
L4	S 89°26'42" E		98.83'	8" PVC
L5	S 89°22'10" E		53.86'	8" PVC

WATER DATA TABLE (PRIVATE)				
#	BEARING/DELTA	RADIUS	LENGTH	NOTES
L1	N 89°21'38" W		32.60'	6" PVC
L2	S 00°37'50" W		216.10'	6" PVC
L3	S 00°37'50" W		272.90'	6" PVC
L4	S 00°37'50" W		96.92'	6" PVC
L6	S 89°22'10" E		64.00'	6" PVC
L7	S 89°26'42" E		108.83'	6" PVC

FIRE WATER DATA TABLE (PRIVATE)				
#	BEARING/DELTA	RADIUS	LENGTH	NOTES
L1	N 89°21'28" W		19.56'	8" PVC
L2	S 00°37'50" W		287.37'	8" PVC
L3	S 00°37'50" W		315.69'	8" PVC
L4	S 89°28'17" E		19.30'	8" PVC



HORIZONTAL CONTROL: PRIVATE FIRE AND WATER SERVICE SEPARATION (3') MIN

NOTES:
1. THE PROJECT SITE IS LOCATED WITHIN THE CALIFORNIA AMERICAN WATER (CALAM) SERVICE SERVICE AREA. IT IS THE SOLE RESPONSIBILITY OF THE APPLICANT TO APPLY FOR WATER SERVICE WITH CALAM AND MEET CALAM 'S STANDARDS.

PROPOSED CONSTRUCTION NOTES:

PRIVATE WATER / FIRE / IRRIGATION SERVICE

1. PROPOSED PRIVATE 8" WATER SERVICE
2. PROPOSED PRIVATE 1" WATER SERVICE AND SUBMETER
3. NOT USED
4. NOT USED
5. PROPOSED PRIVATE RPDA
6. PROPOSED PRIVATE FIRE HYDRANT
7. EX PUBLIC FIRE HYDRANT TO BE RELOCATED BEHIND PROPOSED CURB
8. PROPOSED PRIVATE BACKFLOW PREVENTOR
9. PROPOSED 2" IRRIGATION SERVICE AND METER
10. PROPOSED PRIVATE WATER END PLUG

PRIVATE SEWER SERVICE

1. PROPOSED PRIVATE 6" SEWER SERVICE
2. PROPOSED PRIVATE 4" SEWER LATERAL
3. PROPOSED PRIVATE SEWER MANHOLE
4. PROPOSED PRIVATE SEWER CLEANOUT

STORM DRAIN – SHOWN FOR REFERENCE SEE SHEET C-4

1. PROPOSED PRIVATE CURB OUTLET – TYPE A PER D-25
2. PROPOSED PRIVATE MODIFIED CURB INLET PER D-25

REGISTERED PROFESSIONAL ENGINEER
JONATHAN RAAB RYDEEN
RCE – 64811
EXP 6/30/19
CIVIL
STATE OF CALIFORNIA

REVISIONS			
NO.	DESCRIPTION	DATE	APP'D

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

DATE: 1/9/18
SCALE: 1" = 30'
DRAWN: R.J.D.
CHECKED: J.R.R.

SHEET TITLE: Water and Sewer Plan

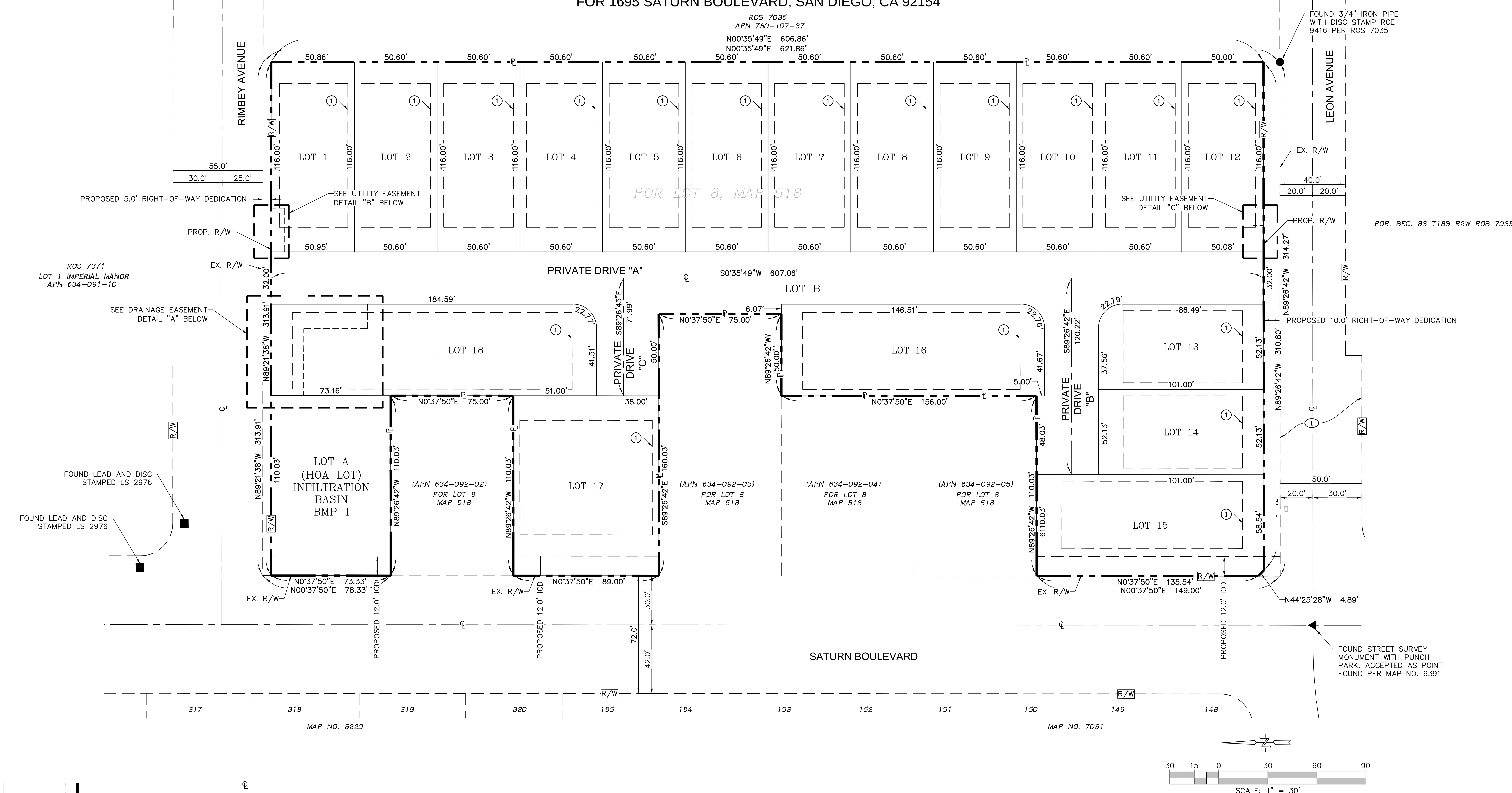
PROJECT: SATURN BOULEVARD
1695 SATURN BOULEVARD
SAN DIEGO, CA 92154

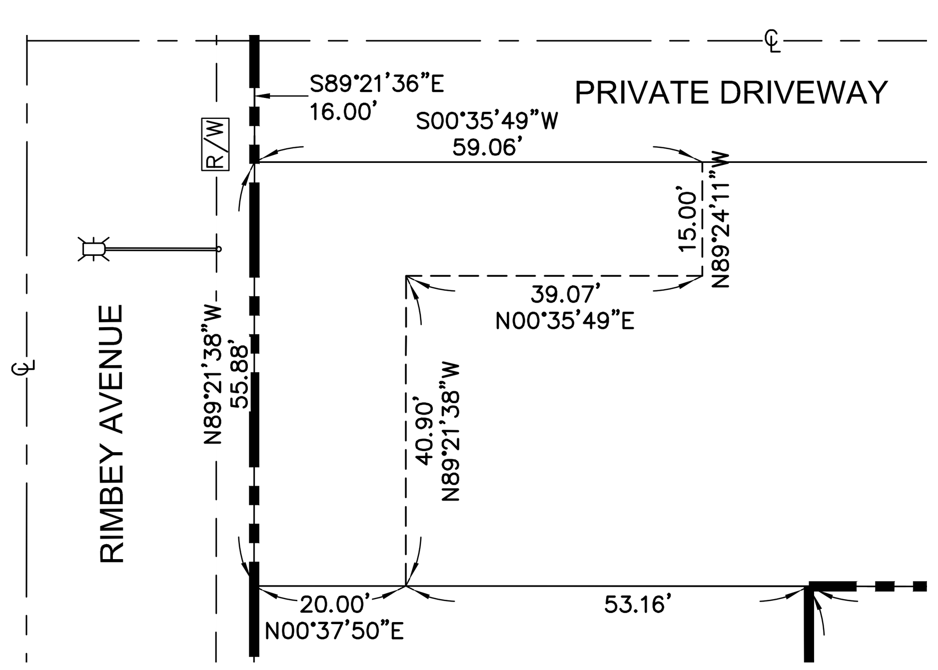
SHEET C-5 OF 11 SHEETS

SAVE DATE: 10/2/2018 ~ PLOT DATE: 10/2/2018 ~ FILE NAME: P:\Acad\1229 Saturn Blvd\Civil\Preliminary Grading Plan\Preliminary Grading Plan.dwg

VESTING TENTATIVE MAP #1996523, PLANNED DEVELOPMENT PERMIT #1996525, COASTAL DEVELOPMENT PERMIT #1996526, AND REZONE #1996524

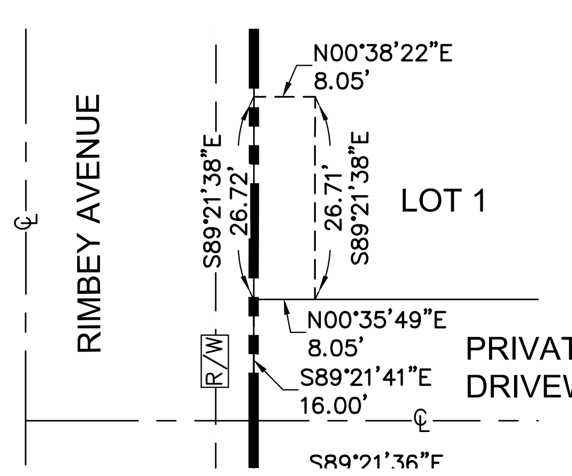
FOR 1695 SATURN BOULEVARD, SAN DIEGO, CA 92154





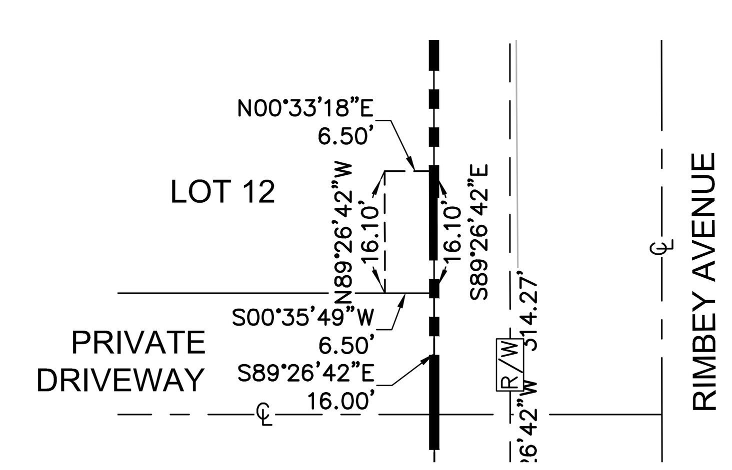
DETAIL A: PRIVATE DRAINAGE EASEMENT

SCALE: 1"=20'



DETAIL B: PRIVATE UTILITY EASEMENT

SCALE: 1"=20'



DETAIL C: PRIVATE UTILITY EASEMENT

SCALE: 1"=20'

NOTES:

(1) PROPERTY SETBACKS

EXISTING EASEMENT NOTES:

(1) AN EASEMENT FOR THE PURPOSE SHOWN BELOW AND RIGHTS INCIDENTAL THERETO AS GRANTED IN A DOCUMENT;

GRANTED TO:	THE COUNTY OF SAN DIEGO
PURPOSE:	PUBLIC ROAD
RECORDING DATE:	AUGUST 24, 1896
RECORDING NO.:	BOOK 257, PAGE 144
AFFECTS:	PLOTTED HEREON

MONUMENTATION NOTE:

	SYMBOL
INDICATES FOUND STREET SURVEY MONUMENT AS NOTES HEREON.	▲
INDICATES FOUND LEAD AND DISC STAMPED LS 2976 UNLESS OTHERWISE NOTED HEREON.	■
INDICATES FOUND 3/4" IRON PIPE WITH DISC STAMPED RCE 9416 PER ROS 7035	●

NO.	DESCRIPTION	DATE	APP'D
REVISIONS			

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

DATE: 1/9/18
SCALE: 1" = 30'
DRAWN: R.JD
CHECKED: J.R.R.

SHEET TITLE: Proposed Lot Line and Easements

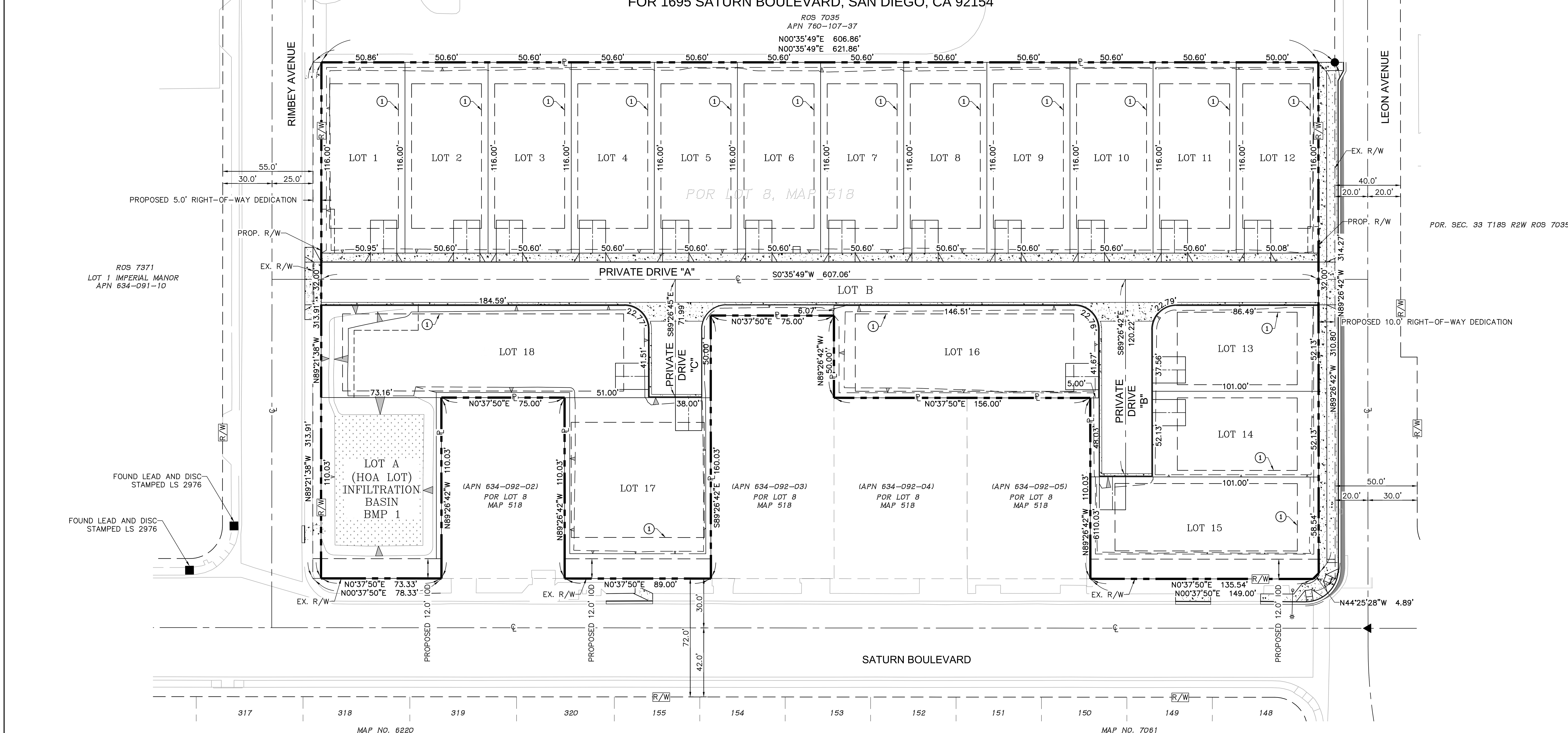
PROJECT: SATURN BOULEVARD
1695 SATURN BOULEVARD
SAN DIEGO, CA 92154

SHEET C-6 OF 11 SHEETS

SAVE DATE 10/2/2018 -- PLOT DATE 10/2/2018 -- FILE NAME P:\Acad\1229 Saturn Blvd\Civil\Preliminary Grading Plan\Preliminary Grading Plan.dwg

VESTING TENTATIVE MAP #1996523, PLANNED DEVELOPMENT PERMIT #1996525, COASTAL DEVELOPMENT PERMIT #1996526, AND REZONE #1996524

FOR 1695 SATURN BOULEVARD, SAN DIEGO, CA 92154



OPEN SPACE/USABLE OPEN SPACE TABLE:

LOT	USABLE OPEN SPACE	OPEN SPACE
1	750 SQ FT	1,688 SQ FT
2	750 SQ FT	2,259 SQ FT
3	750 SQ FT	2,299 SQ FT
4	750 SQ FT	2,293 SQ FT
5	750 SQ FT	2,311 SQ FT
6	750 SQ FT	2,258 SQ FT
7	750 SQ FT	2,247 SQ FT
8	750 SQ FT	2,240 SQ FT
9	750 SQ FT	2,305 SQ FT
10	750 SQ FT	2,339 SQ FT
11	750 SQ FT	2,341 SQ FT
12	750 SQ FT	1,912 SQ FT
13	750 SQ FT	1,766 SQ FT
14	750 SQ FT	1,873 SQ FT
15	750 SQ FT	2,632 SQ FT
16	750 SQ FT	4,076 SQ FT
17	750 SQ FT	3,963 SQ FT
18	750 SQ FT	5,345 SQ FT
TOTAL USABLE OPEN SPACE	13,500 SQ FT	
TOTAL OPEN SPACE	46,147 SQ FT	

OPEN SPACE/USABLE OPEN SPACE REQUIREMENTS:

MIN. USABLE OPEN SPACE REQUIRED PER DWELLING UNIT IS 750 SQ FT
MIN. TOTAL OPEN SPACE REQUIREMENT PER DWELLING UNIT IS 1,500 SQ FT
TOTAL USABLE OPEN SPACE REQUIRED ONSITE: 13,500 SQ FT MIN.
TOTAL OPEN SPACE REQUIRED ONSITE: 27,000 SQ FT MIN.

NOTES:

(1) PROPERTY SETBACKS

LEGEND

IMPROVEMENT	SYMBOL
USABLE OPEN SPACE AREA	
OPEN SPACE AREA	

30 15 0 30 60 90
SCALE: 1" = 30'

NO.	REVISIONS DESCRIPTION	DATE	APP'D

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

DATE: 1/9/18
SCALE: 1" = 30'
DRAWN: R.J.D
CHECKED: J.R.R.

SHEET TITLE: OPEN SPACE EXHIBIT

PROJECT: SATURN BOULEVARD
1695 SATURN BOULEVARD
SAN DIEGO, CA 92154

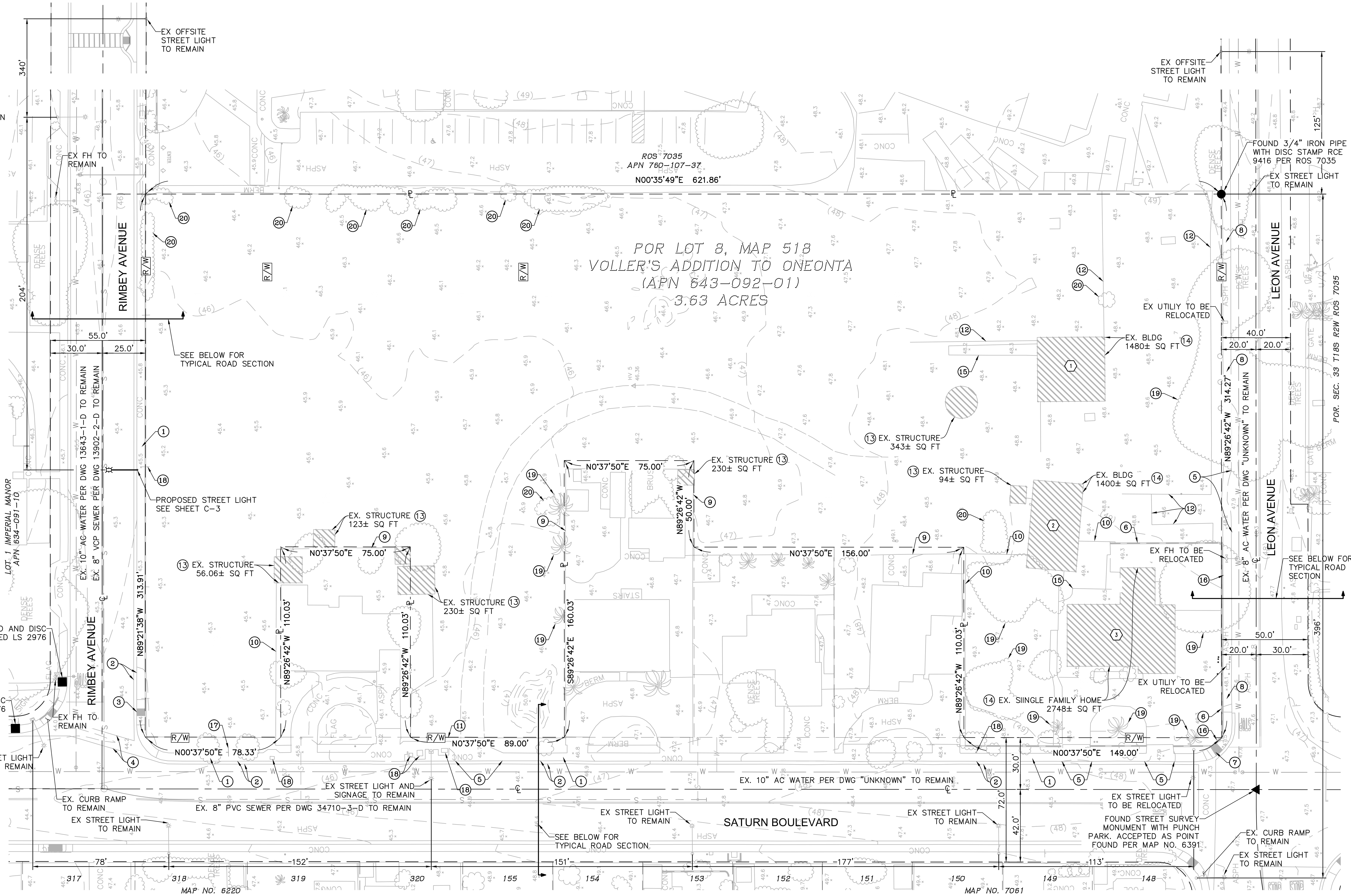
SHEET C-7 OF 11 SHEETS

DEMOLITION NOTES:

1. EXISTING 5' SIDEWALK TO REMAIN
2. EXISTING PCC CURB AND GUTTER TO REMAIN
3. EXISTING PEDESTRIAN RAMP WITH TRUNCATED DOMES TO REMAIN
4. EXISTING CROSS GUTTER TO REMAIN
5. EXISTING DRIVEWAY TO BE REMOVED
6. EXISTING FREE STANDING WALL TO BE REMOVED
7. EXISTING CURB RAMP TO BE REMOVED
8. EXISTING AC BERM AND SIDEWALK TO BE REMOVED
9. EXISTNG WOODEN FENCE TO REMAIN
10. EXISTNG WOODEN FENCE TO BE REMOVED
11. EXISTING CHAINLINK FENCE TO REMAIN
12. EXISTING CHAINLINK FENCE TO BE REMOVED
13. EXISTING STRUCTURE TO BE REMOVED
14. EXISTING BUILDING TO BE REMOVED
15. EXISTING CONCRETE TO BE REMOVED
16. EXISTING SIGNAGE TO BE RELOCATED
17. EXISTING SIGNAGE TO BE REMAIN
18. EXISTING UTILITY TO REMAIN

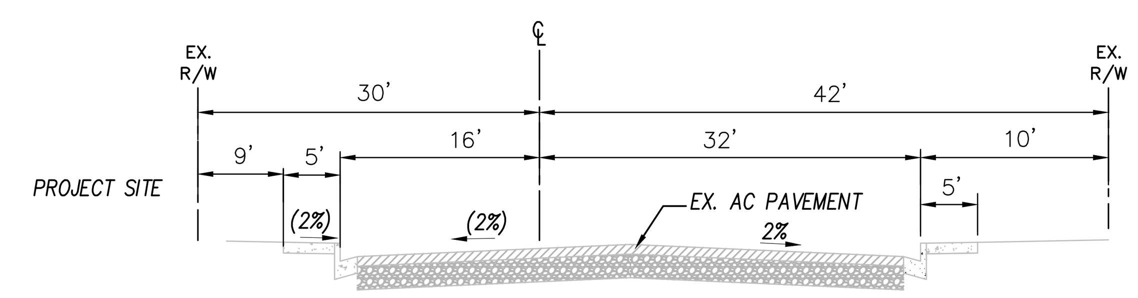
LANDSCAPE

19. EXISTING TREE TO BE REMOVED
20. EXISTING BUSH TO BE REMOVED

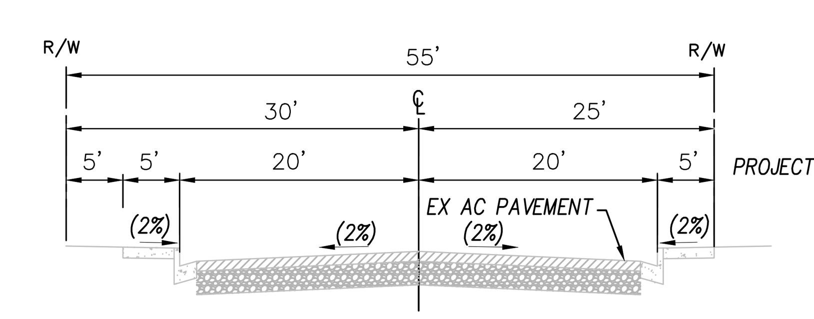


EXISTING ONSITE BUILDING:

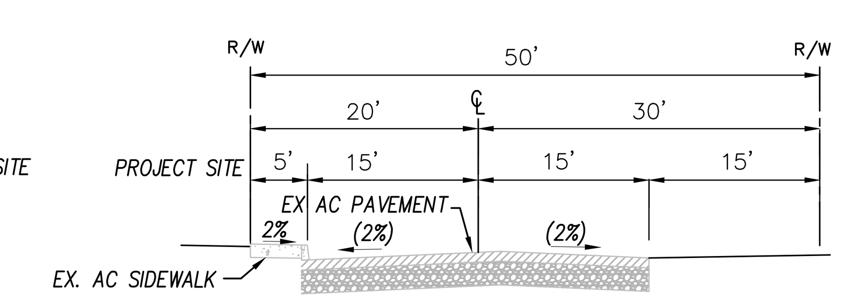
STRUCTURE #	YEAR CONSTRUCTED	SQ FT
1	–	1,480
2	–	1,400
3	–	2,748



EXISTING ROAD
SATURN BLVD - TYPICAL SECTION
NOT TO SCALE



EXISTING ROAD
RIMBEY AVENUE - TYPICAL SECTION
NOT TO SCALE



EXISTING ROAD
LEON AVENUE - TYPICAL SECTION
NOT TO SCALE

NO.	REVISIONS DESCRIPTION	DATE	APP'D

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

DATE: 1/9/18
SCALE: 1" = 30'
DRAWN: R.J.D
CHECKED: J.R.R.

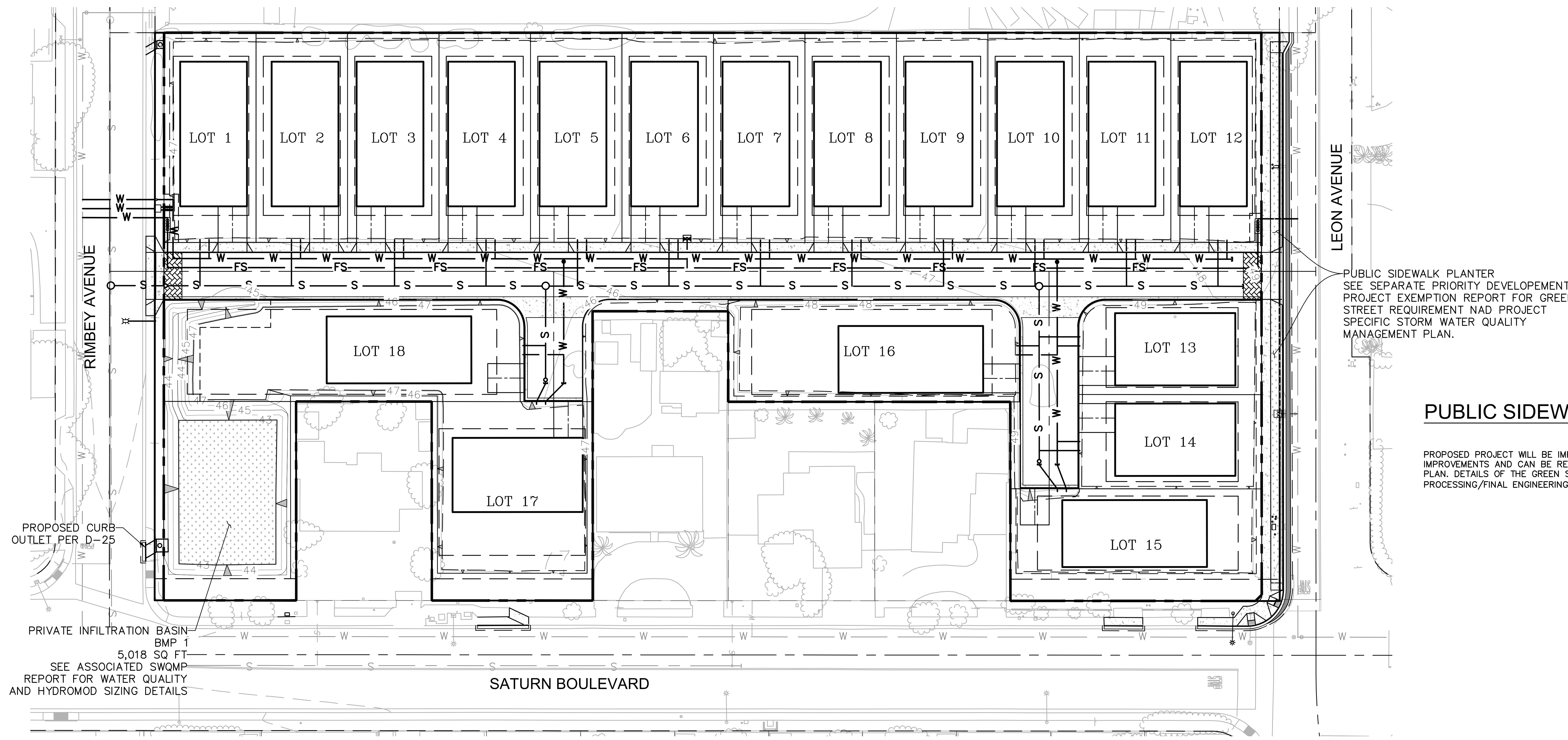
SHEET TITLE: EXISTING CONDITIONS

PROJECT: SATURN BOULEVARD
1695 SATURN BOULEVARD
SAN DIEGO, CA 92154

SHEET C-8 OF 11 SHEETS

VESTING TENTATIVE MAP #1996523, PLANNED DEVELOPMENT PERMIT #1996525, COASTAL DEVELOPMENT PERMIT #1996526, AND REZONE #1996524

FOR 1695 SATURN BOULEVARD, SAN DIEGO, CA 92154



PUBLIC SIDEWALK PLANTER NOTES:

PROPOSED PROJECT WILL BE IMPLEMENTING GREEN STREET ELEMENTS FOR (LEON AVENUE ROAD IMPROVEMENTS AND CAN BE REFERENCE IN PROJECT SPECIFIC STORM WATER QUALITY MANANGEMENT PLAN. DETAILS OF THE GREEN STREET ELEMENTS TO BE FINALIZED DURING MINISTERIAL PERMIT PROCESSING/FINAL ENGINEERING.

BMP-1 DRAINAGE MANAGEMENT AREA

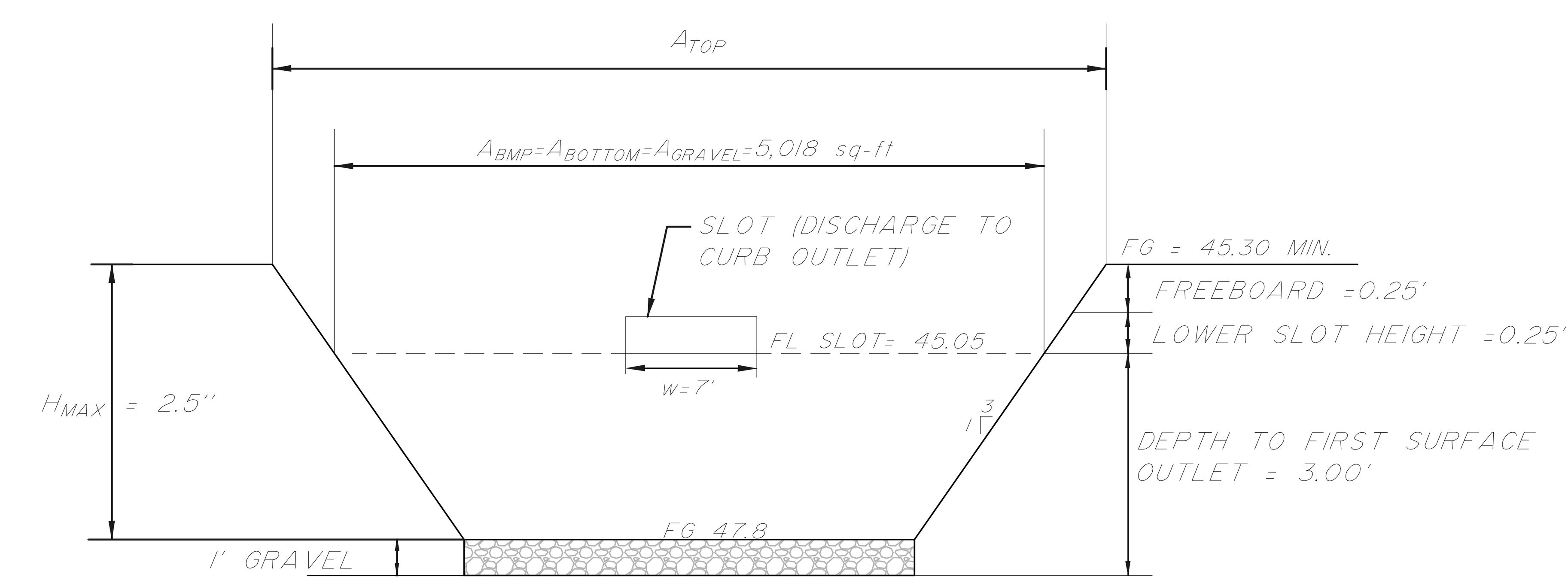
DMA	SUB AREA	SOIL TYPE	IMPERVIOUS (SQ FT)	PERVIOUS (SQ FT)	TOTAL AREA (SQ FT)	DRAINS TO	POC
DMA-1	C	C	71368	71260	142628	BMP-1	POC-1
	D	D	9311	13903	23214		
TOTAL		–	80679	85163	165842	–	–
MINIMUM INFILTRATION BASIN AREA			5,018 SF REQUIRED		5,018 SF PROVIDED		

Design Capture Volume for BMP-1		Worksheet B.2-1		
1	85th percentile 24-hr storm depth from Figure B.1-1	d=	0.49	inches
2	Area tributary to BMP(S)	A=	3.95	acres
3	Area weighted runoff facotr (estimate using Appendix B.1.1 and B.2.1)	C=	0.56	unitless
4	Trees Credit Volume Note: In the SWQMP list the number of trees, size of each tree, amount of soil volime installed for each tree, contributing area to each treee and the inlet opening dimension for each tree.	TCV=	0	cubic-feet
5	Rain barrels Credit Volume Note: In the SWQMP list the number of rain barrels, size of each rain barrel and use the captured storm water runoff.	RCV=	0	cubic-feet
6	Calculate DCV = (3630 x C x D x A) - TCV - RCV	DCV=	3943	cubic-feet

Simple Sizing Method for Infiltration BMPs		Worksheet B.4-1		
1	DCV (Worksheet B-2.1)	DCV=	3805	cubic-feet
2	Estimated design infiltration rate (Worksheet D.5-1)	K_{design}=	0.265	in/hr
3	Available BMP surface area	A_{BMP}=	5018	sq-ft
4	Average effective depth in the BMP footprint (DCV/A_{BMP})	D_{avg}=	0.76	feet
5	Drawdown time, T (D_{avg} *12/K_{design})	T=	34.4	hours
6	Provide alternative calculation of drawdown time, if needed. Conclusion: DCV is fully retained (i.e., no surface discharge during the design event) abd the stored effective depth draws down below 36 hours within design BMP).			
7	Provide calculations for effective depth provided in the BMP: Effective Depth = Surface ponding (below the overflow elevation) + gravel storage thickness x gravel porosity (0.4) Surface ponding = 2 ft Gravel storage thickness = 1 ft Effective Depth = 2 + (1*0.4) = 2.4 feet			

Notes:

1. Drawdown time must be less than 36 hours. This criterion was set to achieve average annual capture of 80% to account for back to back storms (See rationale in Appendix B.4.3). In order to use a different drawdown time, BMPs should be sized using the percent capture method (Appendix B.4.2).
2. The average effective depth calculation should account for any aggregate/media in the BMP. For example, 4 feet of stone at a porosity of 0.4 would equate to 1.6 feet of effective depth.
3. This method may overestimate drawdown time for BMPs that drain through both the bottom and walls of the system. BMP specific calculations of drawdown time may be provided that account for BMP-specific geometry.



NOTES: BMP IS A FULL INFINTRATION BASIN, THEREFORE IT HAS NO LID ORIFICE OR UNDERDRAIN.

PRIVATE INFILTRATION BASIN DETAIL - TYPICAL SECTION

NOTES:

PRIVATE INFILTRATION BASIN HAS BEEN SIZED TO MEET CITY OF SAN DIEGO MIN. REQUIREMENTS FOR PRIORITY DEVELOPMENT PROJECT. SEE ASSOCIATED SWQMP, AND DRAINAGE STUDY FOR WATER QUALITY, HYDROMODIFICATION AND 100 YEAR DETAILS AND REQUIREMENTS

PRIVATE INFILTRATION BASIN DETAIL - TYPICAL SECTION

NOT TO SCALE

NO.	DATE	REVISIONS DESCRIPTION	APP'D

R·E·C Consultants, Inc.
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(619)232-9200 (619)232-9210 Fax

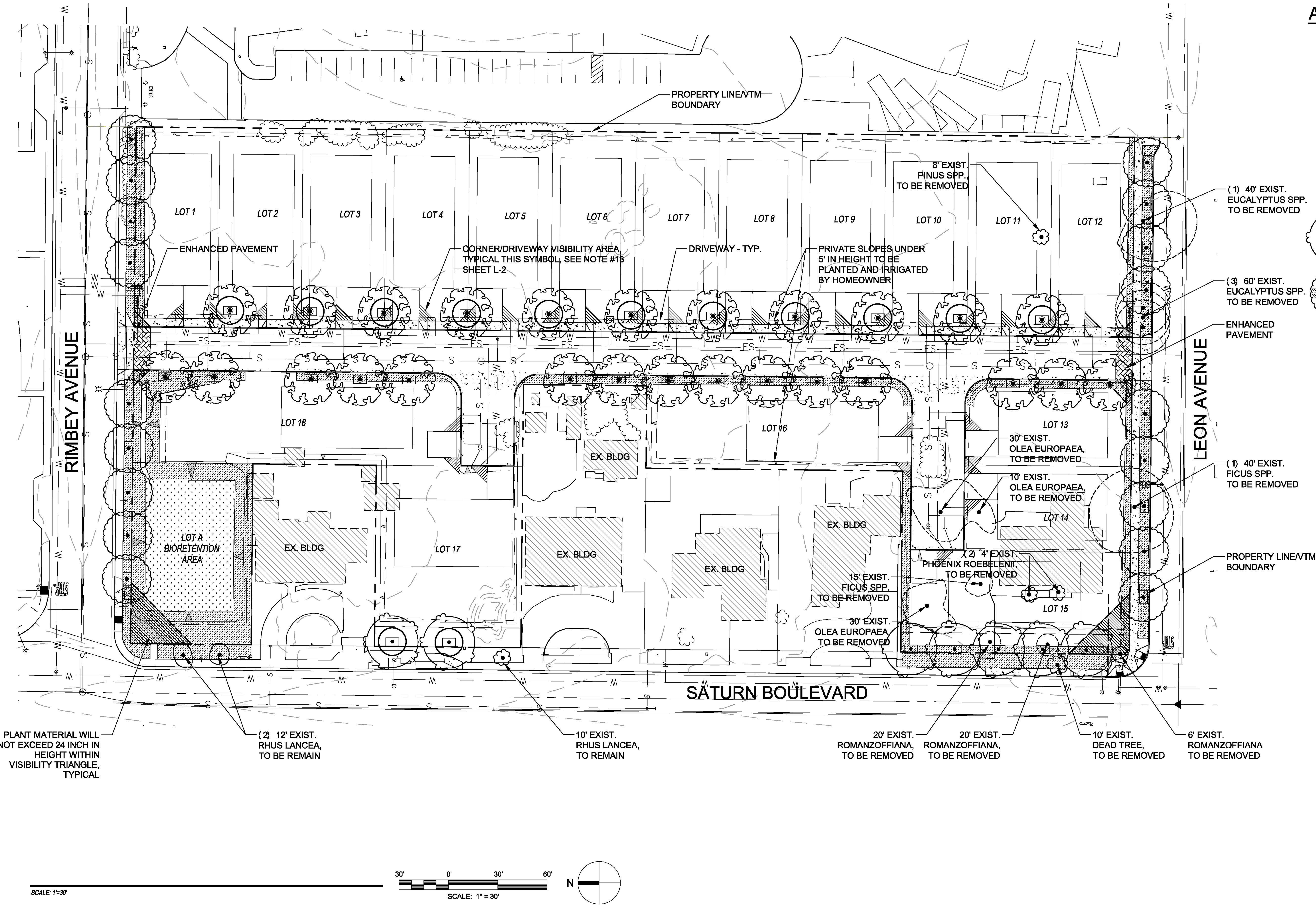
DATE: 1/9/18
SCALE: 1" = 30'
DRAWN: R.J.D.
CHECKED: J.R.R.

SHEET TITLE: TITLE SHEET

PROJECT: SATURN BOULEVARD
1695 SATURN BOULEVARD
SAN DIEGO, CA 92154

SAVE DATE: 9/21/2018 ~ PLOT DATE: 10/2/2018 ~ FILE NAME: P:\Acad\1229 Saturn Blvd\Civil\Preliminary Grading Plan\Post-Construction BMP Plan.dwg

VESTING TENTATIVE MAP NO. 1996523, COASTAL DEVELOPMENT PERMIT NO. 1996526, PLANNED DEVELOPMENT PERMIT NO. 1996525, REZONE NO. 1996525



ABBREVIATED LEGEND (SEE SHEET L-2 FOR FULL LEGEND)

- H.O.A. MAINTAINED BIO-RETENTION - 4,286 SF (SEE SHEET L-2 FOR PLANT PALETTE)
- H.O.A. MAINTAINED SLOPES & LANDSCAPE AREA - 15,080 SF (SEE SHEET L-2 FOR PLANT PALETTE)
- SATURN BOULEVARD BROAD CANOPY STREET TREE WITH 40 SF ROOT ZONE - QTY 7 (SEE SHEET L-2 FOR PLANT PALETTE)
- RIMBEY AVENUE AND LEON AVENUE BROAD CANOPY STREET TREES WITH 40 SF ROOT ZONE - QTY 18 (SEE SHEET L-2 FOR PLANT PALETTE)
- PRIVATE HOMEOWNER MAINTAINED STREET TREE BROAD CANOPY STREET TREES WITH 40 SF ROOT ZONE - QTY 13 (SEE SHEET L-2 FOR PLANT PALETTE, SYMBOL VARIES PER STREET LOCATION)
- HOA MAINTAINED STREET TREE BROAD CANOPY STREET TREES WITH 40 SF ROOT ZONE - QTY 38 (SEE SHEET L-2 FOR PLANT PALETTE, SYMBOL VARIES PER STREET LOCATION)
- EXISTING TREES TO BE REMOVED - QTY 16 (SEE PLAN NOTATIONS THIS SHEET)

DESIGN STATEMENT

THE LANDSCAPE IS ENVISIONED TO PROVIDE SEASONAL INTEREST THROUGH VARIOUS FLOWERS/COLORS/TEXTURES, TO ATTRACT BIRDS AND BUTTERFLIES UTILIZING MANY NATIVE SPECIES,TO CONSERVE WATER BY UTILIZING LOW WATER USE PLANTS, AND TO BE LOW MAINTENANCE.

PREPARED BY:

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ADDRESS: 2850 WOMBLE RD. SUITE 100-403 SAN DIEGO, CA 92106
PHONE: (619) 795-7603
FAX:

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REVISION 7:		
REVISION 6:		
REVISION 5:	10-01-18	
REVISION 4:	09-24-18	
REVISION 3:	05-22-18	
REVISION 2:	12-21-17	
REVISION 1:	05-29-17	
ORIGINAL:	04-29-16	1ST CITY SUBMITTAL

SHEET TITLE:

CONCEPTUAL LANDSCAPE PLAN

SHEET NO. L-1 OF 12

PTS# TBD

PROJECT# 16104

IN-SITE LANDSCAPE ARCHITECTURE INC.

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LICENSED LANDSCAPE ARCHITECT
Jim Jachlewski
No. 4347
11-30-19
09-24-18
STATE OF CALIFORNIA

PALM AVENUE REALTY

SINGLE FAMILY RESIDENTIAL SUBDIVISION

1695 SATURN BOULEVARD
SAN DIEGO, CALIFORNIA 92154

VESTING TENTATIVE MAP NO. 1996523, COASTAL DEVELOPMENT PERMIT NO. 1996526, PLANNED DEVELOPMENT PERMIT NO. 1996525, REZONE NO. 1996525

GENERAL NOTES

1. ALL LANDSCAPE AND IRRIGATION SHALL CONFORM TO THE STANDARDS OF THE CITY-WIDE LANDSCAPE REGULATIONS AND THE CITY OF SAN DIEGO LAND DEVELOPMENT MANUAL LANDSCAPE STANDARDS AND ALL OTHER LANDSCAPE RELATED CITY AND REGIONAL STANDARDS.
2. MINIMUM TREE SEPARATION DISTANCE:
   TRAFFIC SIGNALS/ STOP SIGNS - 20 FEET
   UNDERGROUND UTILITY LINES - 10 FEET WATER ; 10 FEET FOR SEWER
   ABOVE GROUND UTILITY STRUCTURES - 10 FEET
   DRIVEWAYS (ENTRIES) - 5 FEET
   INTERSECTIONS (INTERSECTING CURB LINES OF TWO STREETS) - 25 FEET
3. IRRIGATION: AN AUTOMATIC, ELECTRICALLY CONTROLLED IRRIGATION SYSTEM SHALL BE PROVIDED AS REQUIRED BY LDC 142.0403(c) FOR PROPER IRRIGATION, DEVELOPMENT, AND MAINTENANCE OF THE VEGETATION IN A HEALTHY, DISEASE-RESISTANT CONDITION. THE DESIGN OF THE SYSTEM SHALL PROVIDE ADEQUATE SUPPORT FOR THE VEGETATION SELECTED. THE TYPE OF SYSTEM SHALL BE A COMBINATION OF IN-LINE DRIP TUBING FOR FLAT AREAS AND SLOPED AREAS LESS THAN 8' WIDE AND MP ROTATORS FOR SLOPED AREAS GREATER THAN 8' WIDE.
4. ALL GRADED, DISTURBED OR ERODED AREAS THAT WILL NOT BE PERMANENTLY PAVED OR COVERED BY STRUCTURES SHALL BE PERMANENTLY REVEGETATED AND IRRIGATED AS SHOWN IN TABLE 142-04F AND IN ACCORDANCE WITH THE STANDARDS IN THE LAND DEVELOPMENT MANUAL [142.0411(A)].
5. MAINTENANCE: ALL REQUIRED LANDSCAPE AREAS SHALL BE MAINTAINED BY THE HOA OR PRIVATE HOMEOWNER PER THE KEY PLAY ON SHEET L-1. LANDSCAPE AND IRRIGATION AREAS IN THE PUBLIC RIGHT OF WAY SHALL BE MAINTAINED BY THE HOA. THE LANDSCAPE AREAS SHALL BE MAINTAINED FREE OF DEBRIS AND LITTER, AND ALL PLANT MATERIAL SHALL BE MAINTAINED IN A HEALTHY GROWING CONDITION. DISEASED OR DEAD PLANT MATERIAL SHALL BE SATISFACTORILY TREATED OR REPLACED PER THE CONDITIONS OF THE PERMIT.
6. ROOT ZONE NOTE: A MINIMUM ROOT ZONE OF 40 S.F. IN AREA SHALL BE PROVIDED FOR ALL TREES. THE MINIMUM DIMENSION FOR THIS AREA SHALL BE 5 FEET PER LDC 142.0403 (b)(5).
7. ALL PLANTING AREAS SHALL RECEIVE A 3" LAYER OF COMPOSTED MULCH.
8. ROOT BARRIERS SHALL BE INSTALLED FOR ALL TREES WITHIN 6' OF HARDSCAPE.
9. ALL EXISTING SHRUBS NOT SHOWN ON THIS PLAN ARE TO BE REMOVED. ANY EXISTING SHRUBS TO REMAIN ARE NOTED ON THIS PLAN.
10. TREES SHALL BE MAINTAINED SO THAT ALL BRANCHES OVER PEDESTRIAN WALKWAYS ARE 6 FEET ABOVE THE WALKWAY GRADE AND BRANCHES OVER VEHICULAR TRAVEL WAYS ARE 16 FEET ABOVE THE GRADE OF THE TRAVEL WAY PER THE SAN DIEGO MUNICIPAL CODE §142.0403(B)(10).
11. EXISTING TREES TO REMAIN ON SITE WITHIN THE AREA OF WORK WILL BE PROTECTED IN PLACE. THE FOLLOWING PROTECTION MEASURES WILL BE PROVIDED:
    A BRIGHT YELLOW OR ORANGE TEMPORARY FENCE WILL BE PLACED AROUND EXISTING TREES AT THE DRIP LINE.
    STOCKPILING, TOPSOIL DISTURBANCE, VEHICLE USE, AND MATERIAL STORAGE OF ANY KIND IS PROHIBITED WITHIN THE DRIP LINE.
    A TREE WATERING SCHEDULE WILL BE MAINTAINED AND DOCUMENTED DURING CONSTRUCTION.
    ALL DAMAGED TREES WILL BE REPLACED WITH ONE OF EQUAL OR GREATER SIZE.
12. FENCES AND WALLS THAT ARE GENERALLY PARALLEL TO THE PUBLIC RIGHT-OF-WAY AND EXCEED 100 FEET IN LENGTH SHALL BE ARTICULATED WITH VERTICAL ELEMENTS SPACED AT NO MORE THAN 25 FEET ON CENTER. THE VERTICAL ELEMENTS SHALL BE MADE AN INTEGRAL PART OF THE FENCE OR WALL AND SHALL BE A MINIMUM OF 12 INCHES WIDE.
13. NO OBSTRUCTIONS INCLUDING LANDSCAPING OR SOLID WALLS WITHIN THE VISIBILITY AREAS SHALL EXCEED 3 FEET IN HEIGHT. PLANT MATERIAL, OTHER THAN TREES, WITHIN THE PUBLIC RIGHT OF WAY THAT ARE LOCATED WITHIN VISIBILITY TRIANGLES SHALL NOT EXCEED 24 INCHES IN HEIGHT , MEASURED FROM THE TOP OF THE ADJACENT CURB.
14. NO TREES OR SHRUBS EXCEEDING 3 FEET IN HEIGHT AT MATURITY SHALL BE INSTALLED WITHIN 10 FEET OF ANY WATER AND SEWER FACILITIES.

WATER USE CALCULATIONS

Project Title

Evapotranspiration (Eto)	44.2		Water Efficient Landscape Worksheet		Residential		
Hydrozone # / Planting Description	Plant Factor (PF)	Irrigation Method	Irrigation Efficiency	ETAF (PF/IE)	Landscape Area (sq.ft.)	ETAF X Area	Estimated Total Water Use (ETWU)
Regular Landscape Areas							
Zone 1	0.2	Drip	0.81	0.25	15,080	3,723	102,038
Zone 2	0.5	MP ROTATOR	0.75	0.67	4,268	2,845	77,974
				Totals	19,348	6,569	180,011
Special Landscape Areas							
Zone A				1	-	-	-
Zone B				1	-	-	-
Zone C				1	-	-	-
				Totals	-	-	-
						ETWU Total	180,011
MAWA Formula =	(ETo) x (0.62) x [(0.55 x LA) + (1 - .55) X SLA)]					**MAWA**	291,617
						% of MAWA	62%

ETAF Caclculations

Regular Landscape Areas			All Landscape Areas	
Total ETAF x Area	6,569		Total ETAF x Area	6,569
Total Area	19,348		Total Area	19,348
Average ETAF	0.34		Sitewide ETAF	0.34

CONCEPTUAL PLANT PALETTE

ABBREVIATION	SCIENTIFIC NAME	COMMON NAME	SIZE	SPACING	WATER USE (WUCOLS-Z3)	MATURE HEIGHT	MATURE WIDTH	REMARKS
	SATURN BOULEVARD - BROAD CANOPY STREET TREE SUCH AS:							
	CALODENDRUM CAPENSE	CAPE CHESTNUT	15 GAL.	PER PLAN	MED	20'-40'	40'	RESTRICTED TO SATURN BLVD.
	RIMBEY AVENUE AND LEON AVENUE - BROAD CANOPY STREET TREES SUCH AS:							
	MAGNOLIA GRANDIFLORA 'ST. MARY'	ST. MARY'S MAGNOLIA	15 GAL	PER PLAN	MED	20'-25'	25'	RESTRICTED TO RIMBEY AVE. AND LEON AVE.
	METROSIDEROS EXCELSUS	NEW ZEALAND CHRISTMAS TREE	15 GAL	PER PLAN	MED	30'-40'	30'-40'	RESTRICTED TO RIMBEY AVE. AND LEON AVE.
	PRIVATE STREET - BROAD CANOPY STREET TREES SUCH AS:							
	CERCIDIUM 'DESERT MUSEUM'	DESERT MUSEUM PALO VERDE	15 GAL	PER PLAN	V LOW	35'	30'	RESTRICTED TO PRIVATE STREET
	QUERCUS ILEX	HOLLY OAK	15 GAL.	PER PLAN	LOW	30'-60'	30'-60'	RESTRICTED TO PRIVATE STREET
	RHUS LANCEA	AFRICAN SUMAC	15 GAL.	PER PLAN	LOW	20'-30'	20'-35'	RESTRICTED TO PRIVATE STREET
	LAURUS NOBILIS 'SARATOGA"	SWEET BAY	15 GAL.	PER PLAN	LOW	20'-30'	15'-25'	RESTRICTED TO PRIVATE STREET
	OLEA EUROPAEA 'SWAN HILL'	FRUITLESS OLIVE	15 GAL.	PER PLAN	LOW	25'-30'	25'-30'	RESTRICTED TO PRIVATE STREET
	BIO-RETENTION BASIN SHRUBS AND GRASSES SUCH AS:							
	ACHILLEA 'MOONSHINE'	MOONSHINE FERN LEAF YARROW	1 GAL.	3' O.C.	LOW	1'-2'	2'-3'	
	CAREX PRAEGRACILIS	CLUSTERED FIELD SEDGE	2" PLUGS	10" O.C.	MED	12"	18"	
	JUNCUS PATENS	CALIFORNIA GRAY RUSH	1 GAL.	2' O.C.	LOW	2'	2'	
	LEYMUS CONDENSATUS 'CANYON PRINCE'	BLUE LYME GRASS	1 GAL.	30" O.C.	LOW	2'-3'	2'-3'	
	MUHLENBERGIA RIGENS	DEER GRASS	1 GAL.	3' O.C.	LOW	4'	4'	
	H.O.A. MAINTAINED OPEN SPACE							
	SHRUBS SUCH AS:							
	AGAVE SPP.	AGAVE SPECIES	5 GAL.	ACCENT	LOW	3'-4'	3'-4'	
	ALOE SPP.	ALOE SPECIES	1 GAL.	3' O.C.	LOW	2'-4'	2'-4'	
	ARISTIDA PURPUREA	PURPLE THREE AWN	1 GAL.	2' O.C.	V LOW	2'	2'	
	ASCLEPIAS FASCICULARIS	NARROW LEAF MILKWEED	1 GAL.	3' O.C.	V LOW	1.5'-3'	1'-2'	
	CISTUS X PURPUREUS	ORCHID ROCKROSE	5 GAL.	4' O.C.	LOW	4'	4'	
	ENCELIA CALIFORNICA	CALIFORNIA ENCELIA	1 GAL.	4' O.C.	V LOW	3'	4'	
	EPILOBIUM CALIFORNICA 'CATALINA'	CALIFORNIA FUCHSIA	5 GAL	4' O.C.	LOW	3'	4'-5'	
	ERIOGONUM FASCICULATUM	CALIFORNIA BUCKWHEAT	1 GAL.	3' O.C.	V LOW	1'-3'	4'	
	EREMOPHILA HYGROPHANA 'BLUE BELLS'	BLUE BELLS EMU BUSH	5 GAL.	3' O.C.	LOW	2'-3'	3'	
	GALVEZIA SPECIOSA 'FIRECRACKER'	ISLAND BUSH SNAPDRAGON	5 GAL.	3' O.C.	V LOW	2'-3'	3'	
	LANTANA 'NEW GOLD'	NEW GOLD LANTANA	1 GAL.	3' O.C.	V LOW	2'-3'	3'-4'	
	LEYMUS CONDENSATUS 'CANYON PRINCE'	BLUE LYME GRASS	1 GAL.	30" O.C.	LOW	2'-3'	2'-3'	
	MUHLENBERGIA RIGENS	DEER GRASS	1 GAL.	3' O.C.	LOW	4'	4'	
	RHAMNUS CALIFORNICA 'MOUND SAN BRUNO'	COFFEEBERRY	5 GAL.	5' O.C.	V LOW	4'-6'	4'-6'	
	RHAPHIOLEPIS UMBELLATA 'MINOR'	YEDDO HAWTHORN	5 GAL.	3' O.C.	LOW	3'-4'	3'-4'	
	RHUS INTEGRIFOLIA	LEMONADE BERRY	1 GAL.	10' O.C.	V LOW	3'-10'	3'-10'	
	SALVIA CLEVELANDII 'POZO BLUE'	CLEVELAND SAGE	5 GAL.	4' O.C.	V LOW	3'-5'	5'-8'	
	GROUNDCOVERS SUCH AS:							
	SALVIA BEE'S BLISS	BEE'S BLISS SALVIA	1 GAL.	4' O.C.	LOW	8"	8'	
	BACCHARIS PILULARIS 'TWIN PEAKS'	DWARF COYOTE BRUSH	1 GAL.	4' O.C.	LOW	8"-24"	6'	
	PORTULACARIA AFRA 'PROSTRATE FORM'	PROSTRATE ELEPHANT'S FOOD	1 GAL.	3' O.C.	LOW	6"	3'-6'	
	ROSMARINUS OFF. 'HUNTINGTON CARPET'	HUNTINGTON CARPET ROSEMARY	1 GAL.	30" O.C.	V LOW	1.5'	3'-5'	
	SENECIO MANDRALISCAE	BLUE PICKLE	1 GAL.	12" O.C.	LOW	1'	2'	

PREPARED BY:

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REVISION 5:	10-01-18	
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REVISION 3:	05-22-18	
REVISION 2:	12-21-17	
REVISION 1:	05-29-17	
ORIGINAL :	04-29-16	1ST CITY SUBMITTAL

SHEET TITLE:

CONCEPTUAL LANDSCAPE LEGEND

SHEET NO. L-2 OF 12

PTS# TBD

PROJECT# 16104

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LICENSED LANDSCAPE ARCHITECT
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STATE OF CALIFORNIA

PALM AVENUE REALTY
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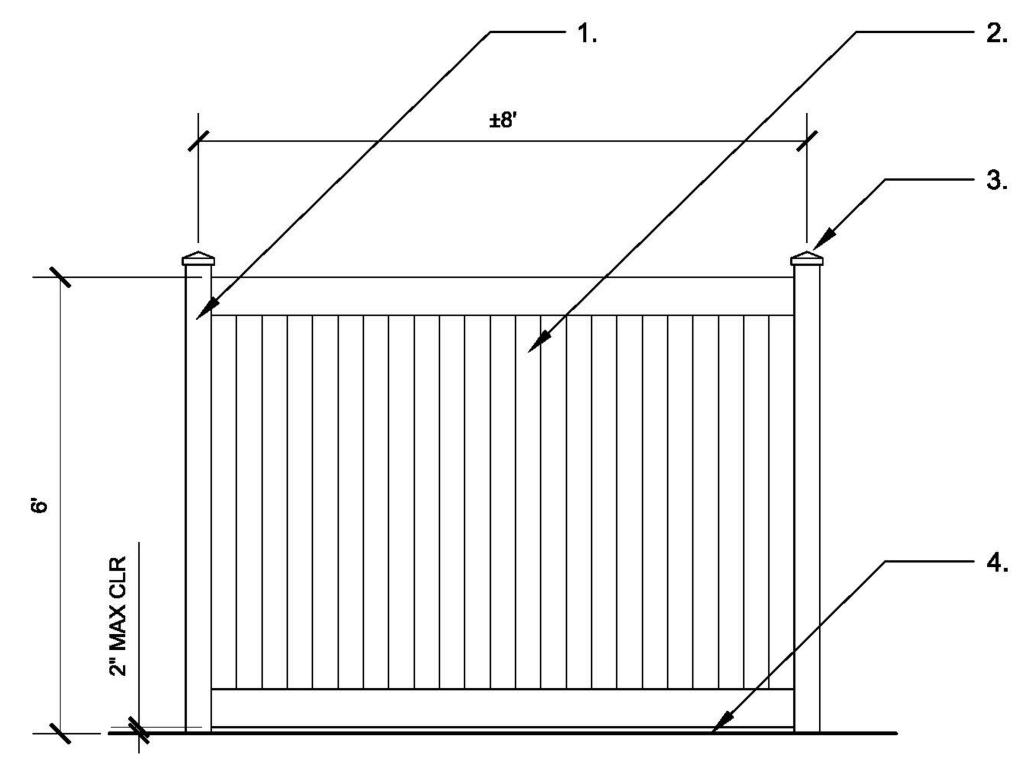
1695 SATURN BOULEVARD
SAN DIEGO, CALIFORNIA 92154

VESTING TENTATIVE MAP NO. 1996523, COASTAL DEVELOPMENT PERMIT NO. 1996526, PLANNED DEVELOPMENT PERMIT NO. 1996525, REZONE NO. 1996525

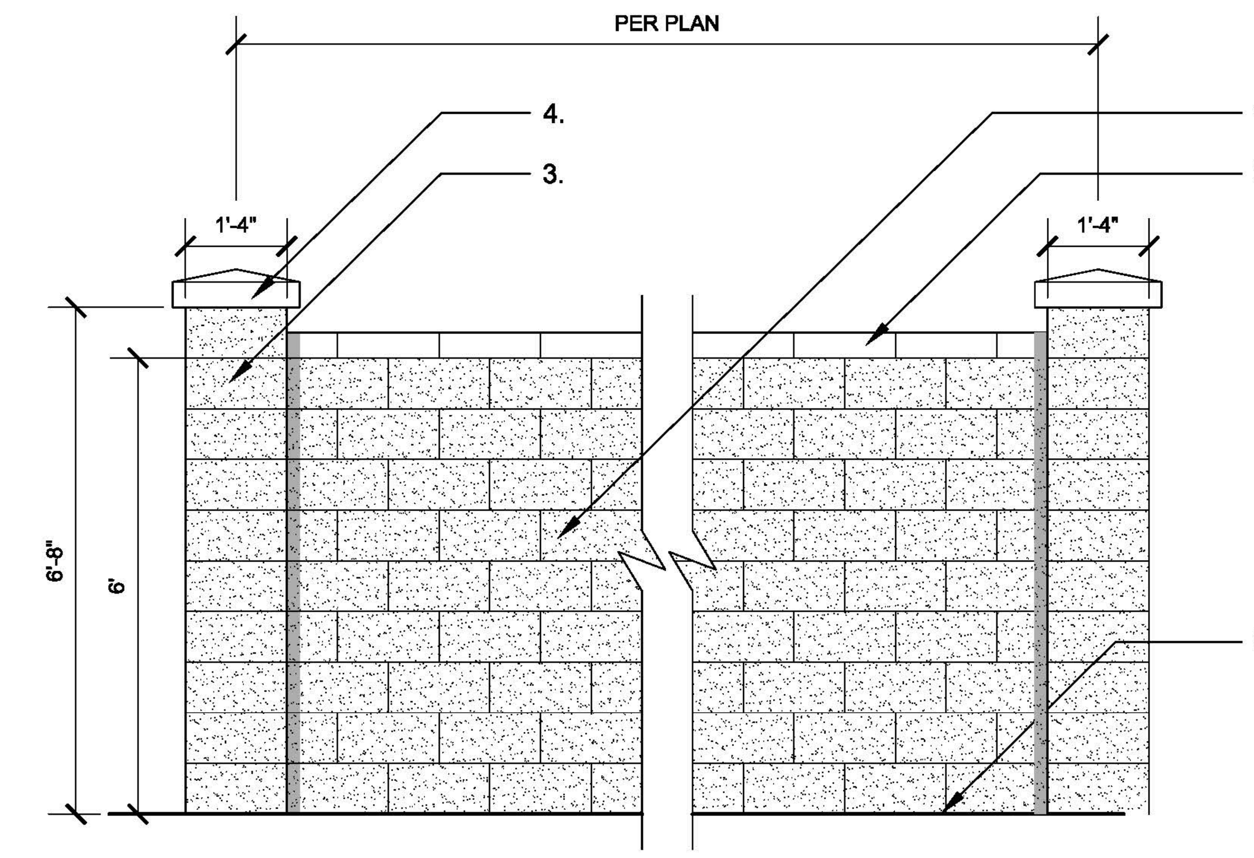


1. FENCE POST, COLOR AND FINISH TO BE DETERMINED.
2. PRIVACY FENCE PANEL, COLOR AND FINISH TO BE DETERMINED.
3. FENCE POST CAP, COLOR TO MATCH POST.
4. FINISH GRADE

C-01 PRIVACY FENCE

NATURAL WOOD OR VINYL

SCALE: 1/2" = 1'-0"



1. 8"x16"x8" SPLIT FACE CMU WALL BLOCK, COLOR: TAN
2. STANDARD CMU WALL CAP, COLOR: TAN
3. 16"x16"x8" SPLIT FACE CMU PILASTER BLOCK, COLOR: TAN. PILASTERS TO OCCUR AT ENDS, CORNERS, AND PER PLAN
4. PRECAST CAP AT PILASTER, COLOR: TAN.
5. FINISH GRADE

C-02 CMU WALL & PILASTER

SPLIT FACE CMU BLOCK WITH CAP

SCALE: 1/2" = 1'-0"

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REVISION 6:		
REVISION 5:	10-01-18	
REVISION 4:	09-24-18	
REVISION 3:	05-22-18	
REVISION 2:	12-21-17	
REVISION 1:	05-29-17	
ORIGINAL :	04-29-16	1ST CITY SUBMITTAL

SHEET TITLE:

WALL AND FENCE ELEVATIONS

SHEET NO. L-3 OF 12

PTS# TBD

PROJECT# 16104

2850 Womble Rd., Suite 100-403 San Diego, CA 92106 619-795-7603
www.insitelandarch.com

STATE OF CALIFORNIA

PALM AVENUE REALTY

SINGLE FAMILY RESIDENTIAL SUBDIVISION

1695 SATURN BOULEVARD

SAN DIEGO, CALIFORNIA 92154

Attachment 5
Drainage Report

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

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DRAINAGE STUDY

For

1695 SATURN BOULEVARD
SAN DIEGO, CA 92154

TM-1996523, PDP-1996525

Prepared for:

Palm Avenue Realty Company
950 Garland Drive
San Diego, Ca 92154
619-623-4488

Prepared by:

REC Consultants, Inc.

Bruce A. Robertson
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San Diego, Ca 92101
Telephone: 619-232-9200

Report Prepared:

April 28, 2017, updated February 5,2018

Table of Contents

List of Tables

CHAPTER 1 - EXECUTIVE SUMMARY

1.1 – Introduction

The 1695 Saturn Boulevard project site is located in the City of San Diego, California.

For drainage analysis, one (1) point of discharge (POD) has been designated within the project site for hydrologic analysis purposes. POD-1 is an existing drainage path located at the northeastern boundary of the project site.

This study analyzes existing and developed condition 100-year peak flowrates from the development to the POD from the project site.

The project site lies outside any FEMA 100-year floodplain zones. Therefore, no Letters of Map Revision will be required.

The project site does not support any wetland habitats, drainages, or waters that would fall under the jurisdiction of the Regional Water Quality Control Board, U.S. Army Corps of Engineers, or the California Department of Fish and Wildlife. Therefore, the project is not subject to the requirements of the Federal Clean Water Act Section 401 and 404, or California Fish and Game Code Section 1602 and is not required to obtain these permits.

Treatment of storm water runoff from the site has been addressed in a separate report - the “Storm Water Quality Management Plan for 1695 Saturn Boulevard” dated April 2017 by REC Consultants.

Per City of San Diego Drainage Design Manual and drainage critieria, the Modified Rational Method should be used to determine peak design flowrates when the contributing drainage area is less than 1.0 square mile. Since the total watershed area discharging from the site is less than 1.0 square mile, the AES computer software was used to model the pre & post developed condition runoff response per the Modified Rational Method.

Methodology used for the computation of design rainfall events, runoff coefficients, and rainfall intensity values are consistent with criteria set forth in the “City of San Diego Drainage Design Manual”. A more detailed explanation of methodology used for this analysis is listed in Chapter 2 of this report. Hydraulic Structures calculations related to the storm drain network are provided in Chapter 8 of this report.

Developed condition peak flows were calculated using AES 2015. The corresponding hydrographs were generated using the RickRat Hydro program by Rick Engineering. Hydraulic Modified-Puls detention basin routing of the AES 2015 rational method hydrology was performed using the Army Corps of Engineers HEC-HMS 4.0 software.

1.2 – Summary of Existing Conditions

In current conditions, the 1695 Saturn Boulevard project site contains an existing single family residence.

Per City of San Diego criteria: a runoff coefficient value of 0.55 (D-type soils/Single Family) was assumed. See table provided in Chapter 2.3. Per City of San Diego rainfall isopluvial maps, the design 100-year rainfall depth for the project site is 2.00 inches. The project site ultimately drains to the receiving Tijuana River 0.5 miles to the south of the project site.

Note that there is a 0.45 acre offsite-existing single-family residential development adjacent to the project site that also drains to the POD.

Table 1 below summarizes the existing condition design 100-year peak flow from the project site and includes the offsite flows.

Table 1–SUMMARY OF EXISTING CONDITIONS FLOWS

Discharge Location	Drainage Area (Ac)	Runoff Coefficient (C)	100-Year Peak Flow (cfs)
POD-1	4.80	0.55	6.46

1.3 – Summary of Developed Conditions

The 1695 Saturn Boulevard project proposes the demolition of the existing residence and the construction of an 18-lot single family residential development, access road, and associated landscaping.

Tributary area (including offsite) to POD-1 will remain as in existing conditions. Runoff from the developed site will drain to one (1) onsite receiving biofiltration BMP. Once flows are routed via the proposed LID BMP, runoff is conveyed via proposed conveyance network to POD-1. In addition to the existing offsite flows, there is also a landscaped portion within the project site that will bypass treatment and go directly to POD-1.

Per City of San Diego criteria: a runoff coefficient value of 0.55 (D-type soils/Single Family) was assumed. See table provided in Chapter 2.3. Per City of San Diego rainfall isopluvial maps, the design 100-year rainfall depth for the project site is 2.00 inches.

Table 2 below summarizes the developed condition design 100-year peak flow from the project site.

Table 2–SUMMARY OF DEVELOPED CONDITIONS FLOWS - UNMITIGATED

Discharge Location	Drainage Area (Ac)	Runoff Coefficient (C)	100-Year Peak Flow (cfs)
POD-1	4.80	0.55	6.83

Prior to discharging from the site, first flush runoff will be treated via one (1) bioretention (infiltration) based BMP in accordance with standards set forth by the Regional Water Quality Control Board and the City of San Diego's BMP Design Manual (see "Storm Water Quality Management Plan for 1695 Saturn Boulevard").

One (1) LID multiple purpose bioretention basin is located within the project site and is responsible for addressing water quality, hydromodification, and 100-year flow requirements for the project. In developed conditions, the basin will have six (6) inches of surface ponding from the first surface outlet to crest and a riser spillway structure (see dimensions in Tables 3 and 4). Flows will then discharge from the basin via the outlet structure or infiltrate through the gravel layer into the native soil. The spillway has sufficient capacity such that peak flows can be safely discharged to the receiving storm drain system.

Table 3–SUMMARY OF BMP BASIN DIMENSIONS

BMP	DIMENSIONS				
	BMP Area(1) (ft^2)	Gravel Depth (in)	Depth Surface Invert (ft.)(2)	Weir Perimeter Length (3) (ft.)	Total Surface Depth (4) (ft.)
BMP-1	4,297	12	3.00-ft	7-ft	0.50-ft

Notes: (1): Area of BMP = Area of Bottom=Area of Gravel
(2): Depth of ponding beneath riser structure's first surface spillway to bottom of gravel layer.
(3): Internal perimeter of riser
(4): Total surface depth of BMP is from top crest elevation to bottom of first surface invert.

Table 4–SUMMARY OF SPILLWAY DETAILS

BMP	Lower Slot		
	Width (ft.)	Height (ft.)	Elevation(1) (ft.)
BMP-1	7.00	0.25	3.00

Notes: (1): Basin ground surface elevation at bottom of gravel layer assumed to be 0.00 ft. elevation.

The developed condition peak flows were calculated using the modified rational method. The corresponding hydrographs were generated using the RickRat Hydro program by Rick Engineering. These hydrographs were then routed through the proposed on-site detention facility in HEC-HMS. The HMS Modified-Puls results are summarized in Table 5.

Table 5–SUMMARY OF DETENTION BASIN ROUTING

Detention Basin	100-Year Peak Inflow (cfs)	100-Year Peak Outflow (cfs)	Peak Water Surface Elevation (ft.)
BMP-1	6.83	4.51	2.81

It should be noted that as a conservative design approach, it has been assumed that the detention facility was full up to first invert outlet prior to the routing of the 100-year event storm.

As HEC-HMS uses an elevation-storage-discharge function to model the basin volume (stage-storage) and basin discharge (stage-discharge) relationships, the available storage volume was calculated from the first surface slot to the crest of the basins.

Rational method hydrographs, stage-storage, stage-discharge relationships and HEC-HMS model output is provided in Chapter 6 of this report.

1.4 – Summary of Results

Table 6 summarizes developed and existing condition drainage areas and resultant 100-year peak flow rates at the POD from the 1695 Saturn Boulevard project. Per City of San Diego rainfall isopluvial maps, the design 100-year rainfall depth for the site area is 2.00 inches.

Table 6–SUMMARY OF PEAK FLOWS

Discharge Location	Area (ac)			100 Year Peak Flow (cfs)		
	Existing	Developed	Difference	Existing	Developed*	Difference
POD-1	4.80	4.80	0	6.46	5.08	-1.38

*Flows are mitigated

As shown in the above table, the proposed 1695 Saturn Boulevard project site will result in a net decrease of peak flow discharged from the project site by approximately 1.38 cfs.

No adverse impacts will occur to adjacent properties and downstream storm drain systems due to proposed development.

All developed runoff will receive water quality treatment in accordance with the site specific SWQMP. Additionally, the POD is HMP compliant as analyzed in the Hydromodification Technical Memo.

Final design details are provided in Chapter 8 of this report..

1.5 – References

"*City of San Diego Drainage Design Manual*", dated January 2017
"*County of San Diego Hydrology Manual*", June 2003

"*Stormwater Quality Management Plan for 1695 Saturn Boulevard*", dated April 2017 by REC Consultants.

"*Technical Memorandum: SWMM Modeling for 1695 Saturn Boulevard*", dated April 2017 by REC Consultants

1.6 – Declaration of Responsible Charge

I HEREBY DECLARE THAT I AM THE ENGINEER OF WORK FOR THIS PROJECT, 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 CURRENT STANDARDS.

I UNDERSTAND THAT THE CHECK OF PROJECT DRAWINGS AND SPECIFICATIONS BY THE CITY OF SAN DIEGO IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE ME, AS ENGINEER OF WORK, OF MY RESPONSIBILITIES FOR PROJECT DESIGN.

Bruce A. Robertson R.C.E. 48529

CHAPTER 2 - METHODOLOGY

2.1 – City of San Diego Design Criteria

DRAINAGE DESIGN MANUAL

Chapter 2

Hydrology

The design discharge depends upon many variables. Some of the more important variables are duration and intensity of rainfall; storm frequency; ground cover; and the size, imperviousness, slope, and shape of the drainage area.

2.1. Discharge Flow Methods

The designer should check with Drainage and Flood Plain Management Section, Public Works Department, to determine if there are established storm discharge flows.

If the project involves a watershed of major size or importance, flood flows may already be established through one or more of the following activities:

1. Master Plan Developments in the City and/or County
2. Studies for Development and Road Projects near the proposed project
3. Flood Insurance Studies prepared by FEMA based on existing land use at the time the study was completed. Urbanization may have caused increased flows. FEMA maps can be viewed at the SanGIS web site (www.sangis.org).
4. Recorded flows may be available from the United States Geological Survey (USGS) or the County of San Diego

If no established storm discharge flows are available, the applicable methods are:

1. Rational Method for watersheds less than 0.5 square miles – See Appendix A
2. Modified Rational Method for watersheds between 0.5 and 1.0 square miles – See Appendix A; or,
3. Natural Resources Conservation Service (NRCS) Method (formally called Soil Conservation Service (SCS) Method) for watersheds greater than 1.0 square miles – See Appendix B; or
4. Hydrologic Engineering Center (HEC) computer method.

2.2 – Design Rainfall Determination

2.2.1 – 100-Year, 6-Hour Rainfall Isopluvial Map

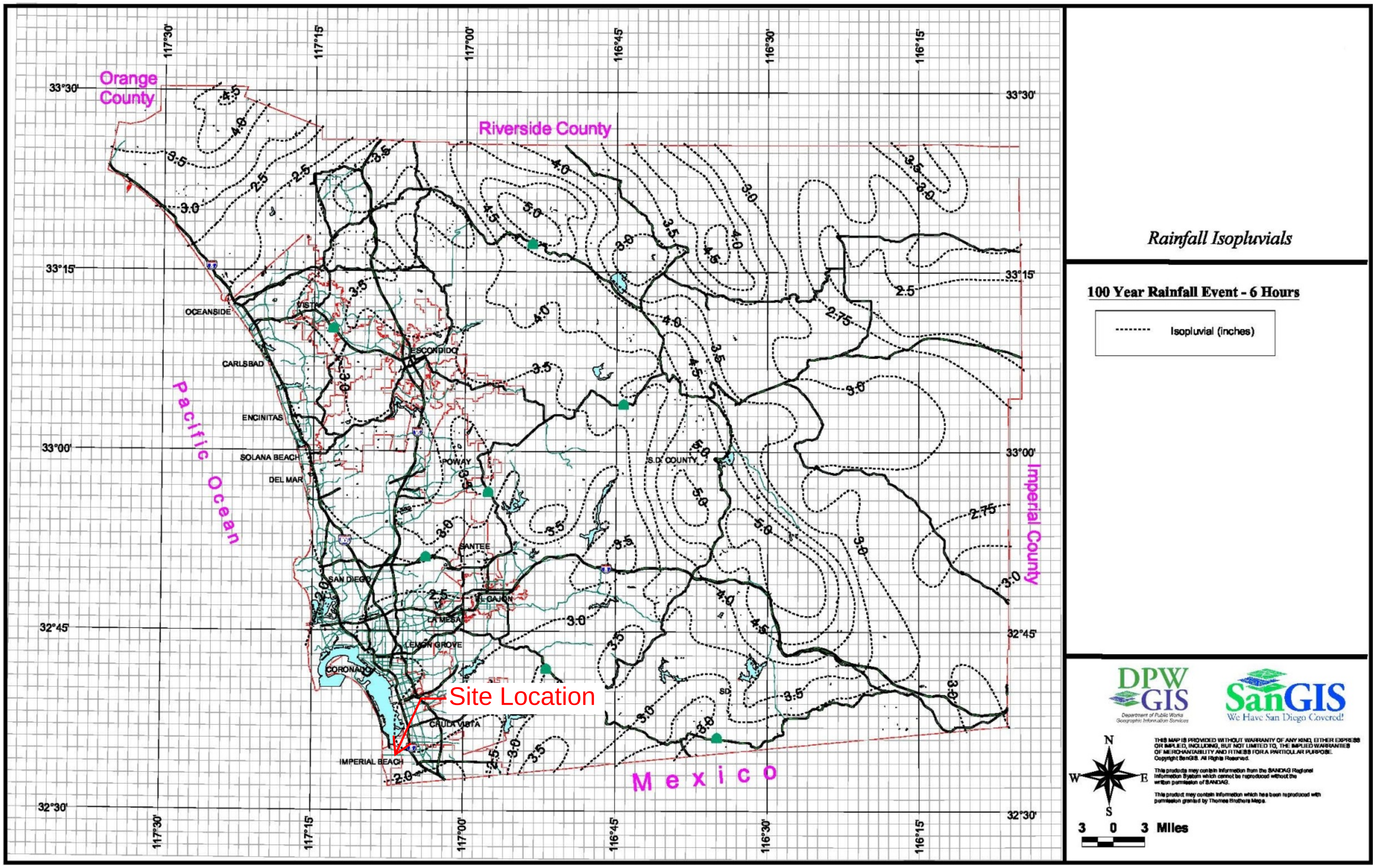


Figure B-2. 100-Year 6-Hour Isopluvials.

2.2.2 – 100-Year, 24-Hour Rainfall Isopluvial Map

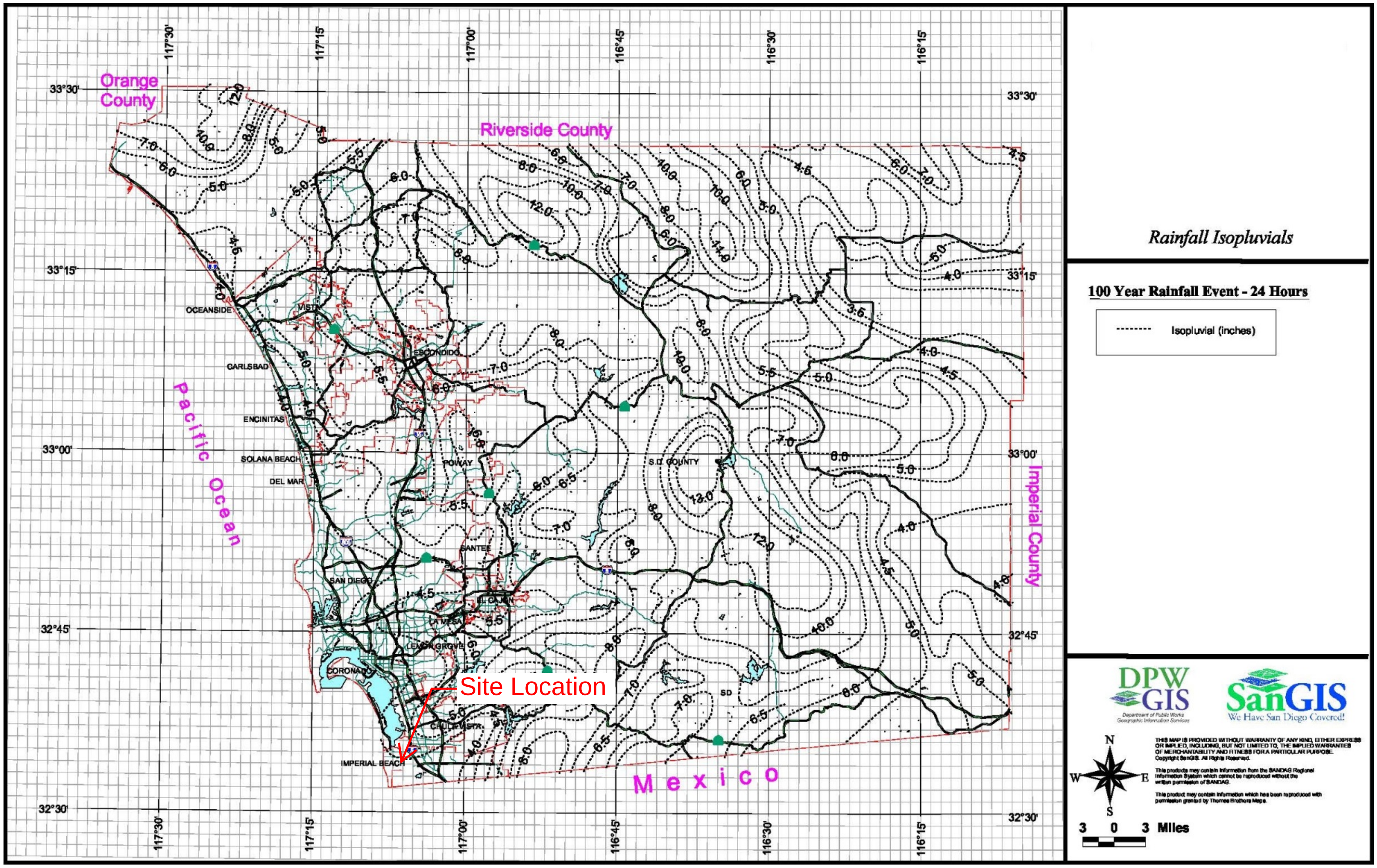


Figure B-3. 100-Year 24-Hour Isopluvials

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	Soil Type [1]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:
[1] Type D soil to be used for all areas.
[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%
Tabulated imperviousness = 80%
Revised C = (50/80) x 0.85 = 0.53

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_C for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_C calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).

2.4 – Urban Watershed Overland Time of flow Nomograph

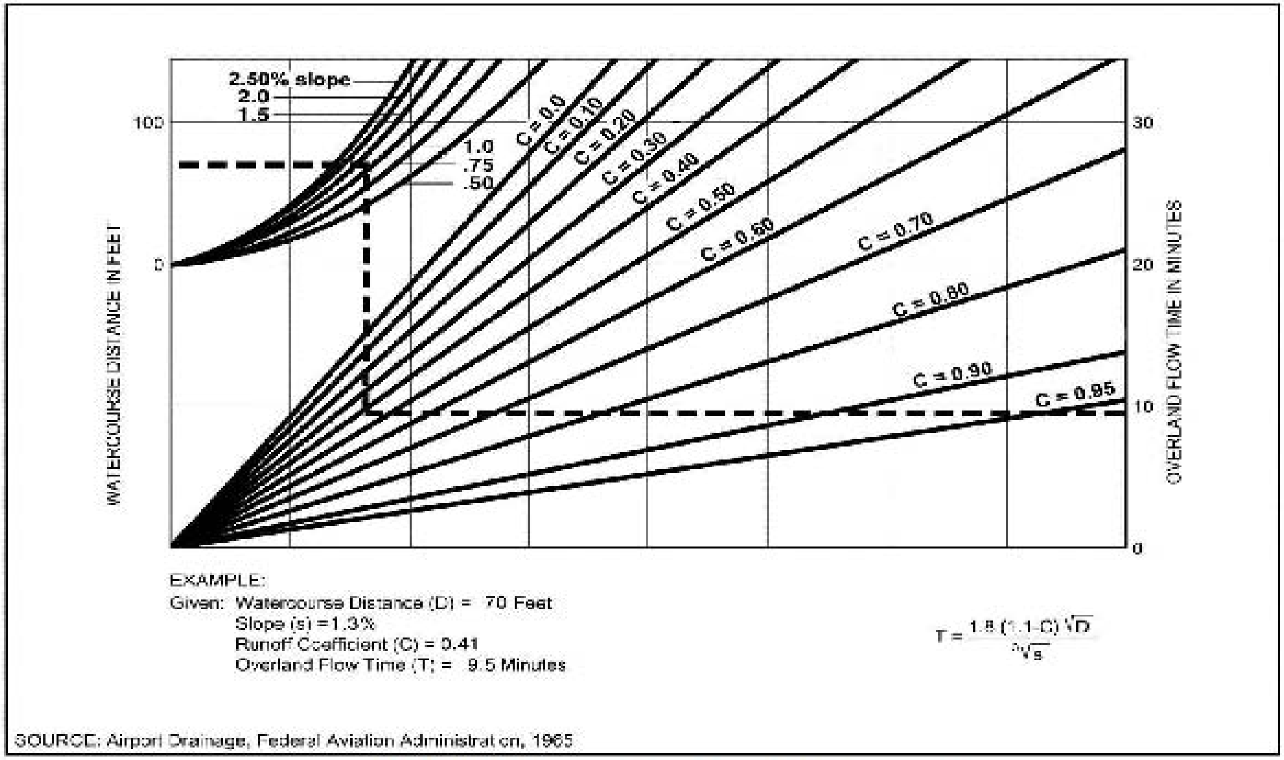


Figure A-4. Rational Formula – Overland Time of Flow Nomograph

Note: Use formula for watercourse distances in excess of 100 feet.

2.5 – City of San Diego Intensity- Duration Curve

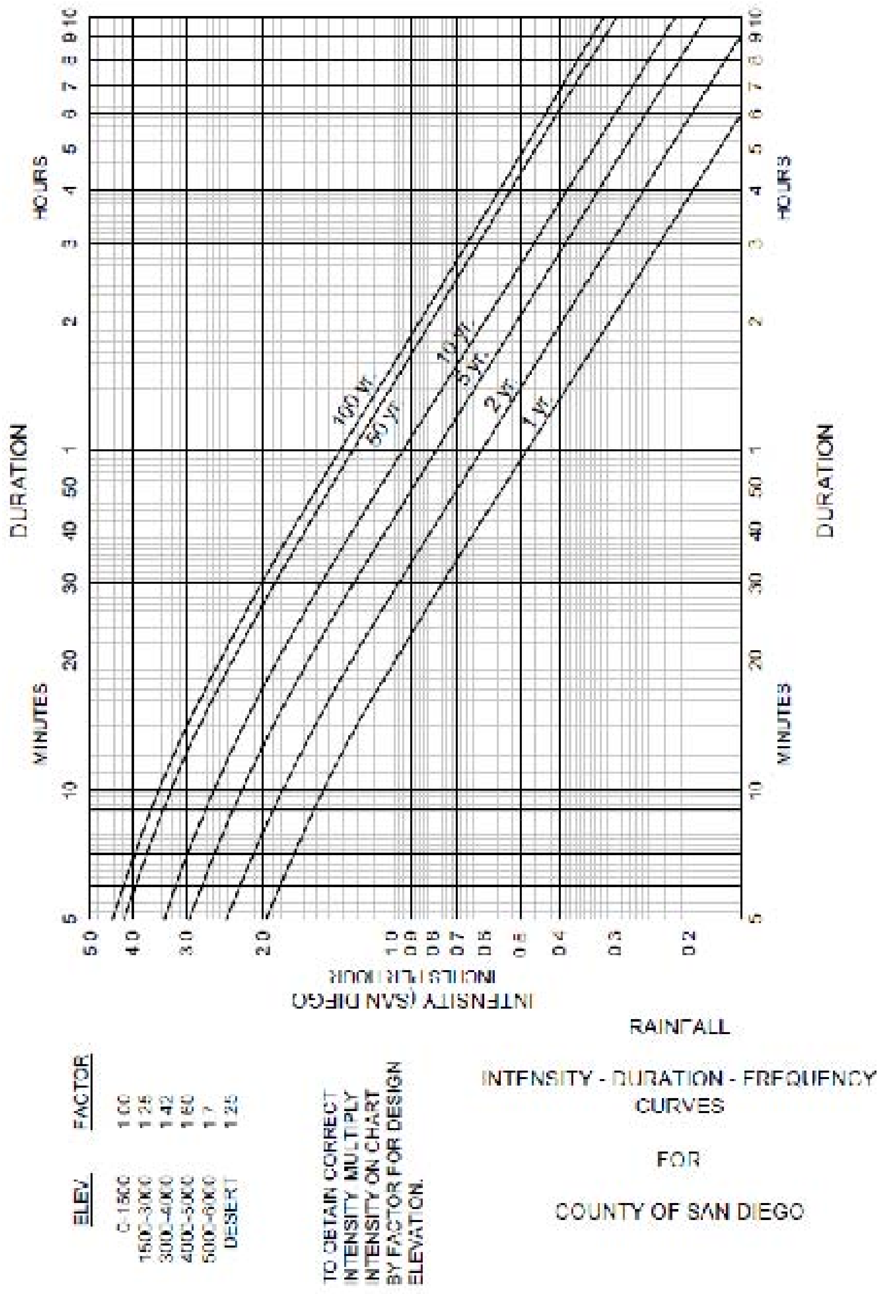


Figure A-1. Intensity-Duration-Frequency Design Chart

2.6 – Model Development Summary (from City of San Diego Drainage Design Manual)

A.1.4. Time of Concentration

The Time of Concentration (T_c) is the time required for runoff to flow from the most remote part of the watershed to the outlet point under consideration.

Methods of calculation differ for natural watersheds (non-urbanized) and for urban drainage systems. Also, when designing storm drain systems, the designer must consider the possibility that an existing natural watershed may become urbanized during the useful life of the storm drain system. Future land uses must be used for Tc and runoff calculations, and can be determined from the Community Plans.

a. Natural watersheds: Obtain Tc from Figures A.2 and A.3

b. Urban drainage systems: In the case of urban drainage systems, the time of concentration at any point within the drainage area is given by:

   $T_c = T_i + T_t$ where

   T_i is the inlet time or the time required for the storm water to flow to the first inlet in the system. It is the sum of time in overland flow across lots and in the street gutter.

   T_t is the travel time or the time required for the storm water to flow in the storm drain from the most upstream inlet to the point in question.

   Travel Time, T_t is computed by dividing the length of storm drain by the computed flow velocity. Since the velocity normally changes at each inlet because of changes in flow rate or slope, total travel time must be computed as the sum of the travel times for each section of the storm drain.

   The overland flow component of inlet time, T_i, may be estimated by the use of the chart shown in Figure A-4. Use Figure A-5 to estimate time of travel for street gutter flow.

CHAPTER 3 - 100 YEAR HYDROLOGIC ANALYSIS FOR EXISTING CONDITIONS

```
****************************************************************************

            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
            Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                       2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
             Ver. 22.0 Release Date: 07/01/2015  License ID 1643

                          Analysis prepared by:


 ************************** DESCRIPTION OF STUDY **************************
* Existing Conditions Hydrology                                            *
* 100 Year Storm                                                           *
* Saturn Street                                                            *
 **************************************************************************

----------------------------------------------------------------------------
  FILE NAME: 1229PRE.DAT
  TIME/DATE OF STUDY: 13:22 01/25/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  1985 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 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.*

+--------------------------------------------------------------------------+
| Nodes 1-1000 represent tributary areas to POD-1. Node 1000 is POD-1.     |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
```

```
  UPSTREAM ELEVATION(FEET) =     49.00
  DOWNSTREAM ELEVATION(FEET) =     48.50
  ELEVATION DIFFERENCE(FEET) =      0.50
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    7.000
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.241
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE   1000.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     48.50  DOWNSTREAM(FEET) =     44.70
  CHANNEL LENGTH THRU SUBAREA(FEET) =   747.00   CHANNEL SLOPE =  0.0051
  CHANNEL BASE(FEET) =   10.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.030   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.422
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.48
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   1.29
  AVERAGE FLOW DEPTH(FEET) =   0.24   TRAVEL TIME(MIN.) =   9.68
  Tc(MIN.) =   16.68
  SUBAREA AREA(ACRES) =     4.76       SUBAREA RUNOFF(CFS) =    6.34
  TOTAL AREA(ACRES) =        4.8         PEAK FLOW RATE(CFS) =       6.46

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.35   FLOW VELOCITY(FEET/SEC.) =   1.59
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE   1000.00 =     797.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.8  TC(MIN.) =     16.68
  PEAK FLOW RATE(CFS)   =       6.46
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 4 - 100 YEAR HYDROLOGIC ANALYSIS FOR UNMITIGATED CONDITION

```
****************************************************************************

             RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
             Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
                          2003,1985,1981 HYDROLOGY MANUAL
          (c) Copyright 1982-2015 Advanced Engineering Software (aes)
              Ver. 22.0 Release Date: 07/01/2015  License ID 1643

                           Analysis prepared by:


 ************************** DESCRIPTION OF STUDY **************************
 * Proposed Conditions Hydrology - Undetained                               *
 * 100 Year Storm                                                           *
 * Saturn                                                                   *
 **************************************************************************

----------------------------------------------------------------------------
  FILE NAME: 1229PSTU.DAT
  TIME/DATE OF STUDY: 13:33 01/25/2018
----------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------------
  1985 SAN DIEGO MANUAL CRITERIA

  USER SPECIFIED STORM EVENT(YEAR) = 100.00
  6-HOUR DURATION PRECIPITATION (INCHES) =   2.000
  SPECIFIED MINIMUM PIPE SIZE(INCH) =   6.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: ONLY PEAK CONFLUENCE VALUES CONSIDERED
  *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   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 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.*

+--------------------------------------------------------------------------+
| Nodes 1-1000 represent tributary flows to POD-1. Node 1000 is POD-1.     |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =     49.17
```

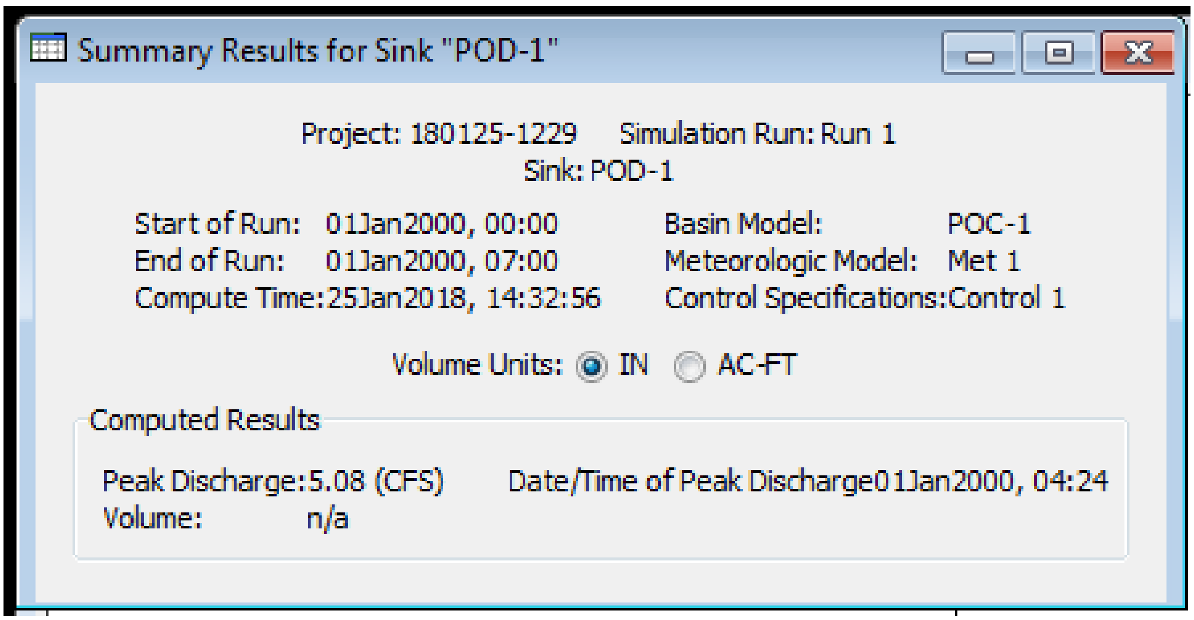
```
  DOWNSTREAM ELEVATION(FEET) =     47.63
  ELEVATION DIFFERENCE(FEET) =      1.54
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    4.812
  *CAUTION: SUBAREA SLOPE EXCEEDS COUNTY NOMOGRAPH
   DEFINITION. EXTRAPOLATION OF NOMOGRAPH USED.
  TIME OF CONCENTRATION ASSUMED AS 6-MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.685
  SUBAREA RUNOFF(CFS) =      0.18
  TOTAL AREA(ACRES) =      0.07   TOTAL RUNOFF(CFS) =      0.18

+--------------------------------------------------------------------------+
| Node 3 is BMP-1.                                                         |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   47.63  DOWNSTREAM ELEVATION(FEET) =   44.80
  STREET LENGTH(FEET) =   663.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.83
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.40
    HALFSTREET FLOOD WIDTH(FEET) =   13.09
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.65
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.65
  STREET FLOW TRAVEL TIME(MIN.) =   6.72   Tc(MIN.) =   12.72
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.886
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  SUBAREA AREA(ACRES) =    3.24      SUBAREA RUNOFF(CFS) =    5.14
  TOTAL AREA(ACRES) =        3.3        PEAK FLOW RATE(CFS) =       5.32

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.47   HALFSTREET FLOOD WIDTH(FEET) =  17.07
  FLOW VELOCITY(FEET/SEC.) =  1.90   DEPTH*VELOCITY(FT*FT/SEC.) =   0.89
  LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =     713.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1000.00 TO NODE   1000.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.72
  RAINFALL INTENSITY(INCH/HR) =   2.89
  TOTAL STREAM AREA(ACRES) =     3.31
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      5.32
```

```
 +--------------------------------------------------------------------------+
 | NODES 4-1000 REPRESENT BYPASS AREA TO POD-1. NODE 1000 IS POD-1          |
 |                                                                          |
 |                                                                          |
 +--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      4.00 TO NODE      5.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =     49.70
  DOWNSTREAM ELEVATION(FEET) =     48.70
  ELEVATION DIFFERENCE(FEET) =      1.00
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    5.556
  TIME OF CONCENTRATION ASSUMED AS 6-MIN.
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.685
  SUBAREA RUNOFF(CFS) =      0.26
  TOTAL AREA(ACRES) =      0.10   TOTAL RUNOFF(CFS) =      0.26

****************************************************************************
  FLOW PROCESS FROM NODE      5.00 TO NODE   1000.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =   48.70  DOWNSTREAM ELEVATION(FEET) =   44.70
  STREET LENGTH(FEET) =   906.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.85
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    7.16
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    1.30
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.38
  STREET FLOW TRAVEL TIME(MIN.) =  11.61   Tc(MIN.) =   17.61
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  2.339
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  SUBAREA AREA(ACRES) =    0.88      SUBAREA RUNOFF(CFS) =    1.13
  TOTAL AREA(ACRES) =        1.0        PEAK FLOW RATE(CFS) =       1.39

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.33   HALFSTREET FLOOD WIDTH(FEET) =   9.34
  FLOW VELOCITY(FEET/SEC.) =  1.43   DEPTH*VELOCITY(FT*FT/SEC.) =   0.47
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE   1000.00 =     956.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1000.00 TO NODE   1000.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
=============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =   17.61
  RAINFALL INTENSITY(INCH/HR) =   2.34
  TOTAL STREAM AREA(ACRES) =     0.98
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      1.39

+--------------------------------------------------------------------------+
| NODES 6-1000 REPRESENT OFFSITE FLOWS TO BMP-1 AND DISCHARGE POINT POD-1  |
|                                                                          |
|                                                                          |
+--------------------------------------------------------------------------+

****************************************************************************
  FLOW PROCESS FROM NODE      6.00 TO NODE      7.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    50.00
  UPSTREAM ELEVATION(FEET) =     49.00
  DOWNSTREAM ELEVATION(FEET) =     48.32
  ELEVATION DIFFERENCE(FEET) =      0.68
  URBAN SUBAREA OVERLAND TIME OF FLOW(MIN.) =    6.318
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  4.531
  SUBAREA RUNOFF(CFS) =      0.12
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.12

****************************************************************************
  FLOW PROCESS FROM NODE      7.00 TO NODE      3.00 IS CODE =  51
----------------------------------------------------------------------------
  >>>>>COMPUTE TRAPEZOIDAL CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA (EXISTING ELEMENT)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =     48.32  DOWNSTREAM(FEET) =     44.80
  CHANNEL LENGTH THRU SUBAREA(FEET) =   703.00   CHANNEL SLOPE =  0.0050
  CHANNEL BASE(FEET) =    5.00   "Z" FACTOR =   5.000
  MANNING'S FACTOR = 0.035   MAXIMUM DEPTH(FEET) =   2.00
   100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.869
  SINGLE FAMILY DEVELOPMENT RUNOFF COEFFICIENT = .5500
  SOIL CLASSIFICATION IS "D"
  S.C.S. CURVE NUMBER (AMC II) =  88
  TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.38
  TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =   0.63
  AVERAGE FLOW DEPTH(FEET) =   0.11   TRAVEL TIME(MIN.) =  18.63
  Tc(MIN.) =   24.95
  SUBAREA AREA(ACRES) =     0.45       SUBAREA RUNOFF(CFS) =    0.46
  TOTAL AREA(ACRES) =        0.5         PEAK FLOW RATE(CFS) =       0.59

  END OF SUBAREA CHANNEL FLOW HYDRAULICS:
  DEPTH(FEET) =  0.14   FLOW VELOCITY(FEET/SEC.) =   0.73
  LONGEST FLOWPATH FROM NODE      6.00 TO NODE      3.00 =     753.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE   1000.00 TO NODE   1000.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   24.95
  RAINFALL INTENSITY(INCH/HR) =   1.87
```

```
  TOTAL STREAM AREA(ACRES) =     0.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      0.59

  ** CONFLUENCE DATA **
  STREAM     RUNOFF       Tc      INTENSITY      AREA
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)    (ACRE)
      1        5.32    12.72        2.886          3.31
      2        1.39    17.61        2.339          0.98
      3        0.59    24.95        1.869          0.50

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
  STREAM     RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)
      1        6.83    12.72       2.886
      2        6.17    17.61       2.339
      3        5.14    24.95       1.869

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.83   Tc(MIN.) =   12.72
  TOTAL AREA(ACRES) =       4.8
  LONGEST FLOWPATH FROM NODE      4.00 TO NODE   1000.00 =     956.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        4.8  TC(MIN.) =     12.72
  PEAK FLOW RATE(CFS)   =       6.83
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

CHAPTER 5 - 100 YEAR HYDROLOGIC ANALYSIS FOR MITIGATED CONDITIONS


Summary Results for Sink "POD-1"

Project: 180125-1229 Simulation Run: Run 1
Sink: POD-1

Start of Run: 01Jan2000, 00:00 Basin Model: POC-1
End of Run: 01Jan2000, 07:00 Meteorologic Model: Met 1
Compute Time: 25Jan2018, 14:32:56 Control Specifications: Control 1

Volume Units: IN AC-FT

Computed Results

Peak Discharge: 5.08 (CFS) Date/Time of Peak Discharge 01Jan2000, 04:24
Volume: n/a

Project: 180125-1229 Simulation Run: Run 1
Sink: POD-1

Start of Run:	01Jan2000, 00:00	Basin Model:	POC-1
End of Run:	01Jan2000, 07:00	Meteorologic Model:	Met 1
Compute Time:	05Feb2018, 13:20:41	Control Specifications:	Control 1

Date	Time	Outflow (CFS)
01Jan2000	00:00	0.00
01Jan2000	00:01	0.01
01Jan2000	00:02	0.01
01Jan2000	00:03	0.02
01Jan2000	00:04	0.02
01Jan2000	00:05	0.03
01Jan2000	00:06	0.03
01Jan2000	00:07	0.04
01Jan2000	00:08	0.04
01Jan2000	00:09	0.05
01Jan2000	00:10	0.06
01Jan2000	00:11	0.06
01Jan2000	00:12	0.07
01Jan2000	00:13	0.07
01Jan2000	00:14	0.08
01Jan2000	00:15	0.08
01Jan2000	00:16	0.10
01Jan2000	00:17	0.10
01Jan2000	00:18	0.12
01Jan2000	00:19	0.12
01Jan2000	00:20	0.13
01Jan2000	00:21	0.14
01Jan2000	00:22	0.15
01Jan2000	00:23	0.16
01Jan2000	00:24	0.17
01Jan2000	00:25	0.18

Date	Time	Outflow (CFS)
01Jan2000	00:26	0.19
01Jan2000	00:27	0.21
01Jan2000	00:28	0.22
01Jan2000	00:29	0.23
01Jan2000	00:30	0.24
01Jan2000	00:31	0.25
01Jan2000	00:32	0.26
01Jan2000	00:33	0.27
01Jan2000	00:34	0.27
01Jan2000	00:35	0.28
01Jan2000	00:36	0.29
01Jan2000	00:37	0.29
01Jan2000	00:38	0.30
01Jan2000	00:39	0.31
01Jan2000	00:40	0.31
01Jan2000	00:41	0.32
01Jan2000	00:42	0.32
01Jan2000	00:43	0.33
01Jan2000	00:44	0.33
01Jan2000	00:45	0.34
01Jan2000	00:46	0.34
01Jan2000	00:47	0.34
01Jan2000	00:48	0.35
01Jan2000	00:49	0.35
01Jan2000	00:50	0.35
01Jan2000	00:51	0.36
01Jan2000	00:52	0.36
01Jan2000	00:53	0.36
01Jan2000	00:54	0.36
01Jan2000	00:55	0.37
01Jan2000	00:56	0.37

Date	Time	Outflow (CFS)
01Jan2000	00:57	0.37
01Jan2000	00:58	0.37
01Jan2000	00:59	0.37
01Jan2000	01:00	0.37
01Jan2000	01:01	0.38
01Jan2000	01:02	0.38
01Jan2000	01:03	0.38
01Jan2000	01:04	0.38
01Jan2000	01:05	0.38
01Jan2000	01:06	0.38
01Jan2000	01:07	0.38
01Jan2000	01:08	0.38
01Jan2000	01:09	0.39
01Jan2000	01:10	0.39
01Jan2000	01:11	0.39
01Jan2000	01:12	0.39
01Jan2000	01:13	0.39
01Jan2000	01:14	0.39
01Jan2000	01:15	0.39
01Jan2000	01:16	0.39
01Jan2000	01:17	0.39
01Jan2000	01:18	0.39
01Jan2000	01:19	0.39
01Jan2000	01:20	0.39
01Jan2000	01:21	0.39
01Jan2000	01:22	0.39
01Jan2000	01:23	0.39
01Jan2000	01:24	0.39
01Jan2000	01:25	0.39
01Jan2000	01:26	0.39
01Jan2000	01:27	0.40

Date	Time	Outflow (CFS)
01Jan2000	01:28	0.40
01Jan2000	01:29	0.40
01Jan2000	01:30	0.40
01Jan2000	01:31	0.40
01Jan2000	01:32	0.40
01Jan2000	01:33	0.40
01Jan2000	01:34	0.40
01Jan2000	01:35	0.40
01Jan2000	01:36	0.40
01Jan2000	01:37	0.40
01Jan2000	01:38	0.40
01Jan2000	01:39	0.40
01Jan2000	01:40	0.40
01Jan2000	01:41	0.40
01Jan2000	01:42	0.40
01Jan2000	01:43	0.40
01Jan2000	01:44	0.40
01Jan2000	01:45	0.40
01Jan2000	01:46	0.40
01Jan2000	01:47	0.40
01Jan2000	01:48	0.40
01Jan2000	01:49	0.40
01Jan2000	01:50	0.40
01Jan2000	01:51	0.40
01Jan2000	01:52	0.40
01Jan2000	01:53	0.40
01Jan2000	01:54	0.40
01Jan2000	01:55	0.40
01Jan2000	01:56	0.40
01Jan2000	01:57	0.40
01Jan2000	01:58	0.40

Date	Time	Outflow (CFS)
01Jan2000	01:59	0.40
01Jan2000	02:00	0.40
01Jan2000	02:01	0.40
01Jan2000	02:02	0.40
01Jan2000	02:03	0.41
01Jan2000	02:04	0.41
01Jan2000	02:05	0.41
01Jan2000	02:06	0.42
01Jan2000	02:07	0.42
01Jan2000	02:08	0.42
01Jan2000	02:09	0.43
01Jan2000	02:10	0.43
01Jan2000	02:11	0.43
01Jan2000	02:12	0.44
01Jan2000	02:13	0.44
01Jan2000	02:14	0.45
01Jan2000	02:15	0.45
01Jan2000	02:16	0.45
01Jan2000	02:17	0.45
01Jan2000	02:18	0.46
01Jan2000	02:19	0.46
01Jan2000	02:20	0.46
01Jan2000	02:21	0.46
01Jan2000	02:22	0.47
01Jan2000	02:23	0.47
01Jan2000	02:24	0.47
01Jan2000	02:25	0.47
01Jan2000	02:26	0.47
01Jan2000	02:27	0.48
01Jan2000	02:28	0.48
01Jan2000	02:29	0.48

Date	Time	Outflow (CFS)
01Jan2000	02:30	0.48
01Jan2000	02:31	0.48
01Jan2000	02:32	0.48
01Jan2000	02:33	0.48
01Jan2000	02:34	0.48
01Jan2000	02:35	0.48
01Jan2000	02:36	0.49
01Jan2000	02:37	0.49
01Jan2000	02:38	0.49
01Jan2000	02:39	0.49
01Jan2000	02:40	0.49
01Jan2000	02:41	0.50
01Jan2000	02:42	0.50
01Jan2000	02:43	0.50
01Jan2000	02:44	0.50
01Jan2000	02:45	0.51
01Jan2000	02:46	0.51
01Jan2000	02:47	0.52
01Jan2000	02:48	0.52
01Jan2000	02:49	0.52
01Jan2000	02:50	0.53
01Jan2000	02:51	0.53
01Jan2000	02:52	0.54
01Jan2000	02:53	0.54
01Jan2000	02:54	0.54
01Jan2000	02:55	0.55
01Jan2000	02:56	0.55
01Jan2000	02:57	0.55
01Jan2000	02:58	0.56
01Jan2000	02:59	0.56
01Jan2000	03:00	0.56

Date	Time	Outflow (CFS)
01Jan2000	03:01	0.57
01Jan2000	03:02	0.58
01Jan2000	03:03	0.59
01Jan2000	03:04	0.59
01Jan2000	03:05	0.60
01Jan2000	03:06	0.61
01Jan2000	03:07	0.62
01Jan2000	03:08	0.62
01Jan2000	03:09	0.64
01Jan2000	03:10	0.65
01Jan2000	03:11	0.66
01Jan2000	03:12	0.67
01Jan2000	03:13	0.68
01Jan2000	03:14	0.69
01Jan2000	03:15	0.70
01Jan2000	03:16	0.71
01Jan2000	03:17	0.72
01Jan2000	03:18	0.74
01Jan2000	03:19	0.75
01Jan2000	03:20	0.76
01Jan2000	03:21	0.77
01Jan2000	03:22	0.78
01Jan2000	03:23	0.78
01Jan2000	03:24	0.79
01Jan2000	03:25	0.80
01Jan2000	03:26	0.81
01Jan2000	03:27	0.82
01Jan2000	03:28	0.82
01Jan2000	03:29	0.83
01Jan2000	03:30	0.84
01Jan2000	03:31	0.85

Date	Time	Outflow (CFS)
01Jan2000	03:32	0.86
01Jan2000	03:33	0.87
01Jan2000	03:34	0.87
01Jan2000	03:35	0.88
01Jan2000	03:36	0.89
01Jan2000	03:37	0.90
01Jan2000	03:38	0.91
01Jan2000	03:39	0.91
01Jan2000	03:40	0.92
01Jan2000	03:41	0.93
01Jan2000	03:42	0.94
01Jan2000	03:43	0.95
01Jan2000	03:44	0.96
01Jan2000	03:45	0.98
01Jan2000	03:46	0.99
01Jan2000	03:47	1.01
01Jan2000	03:48	1.03
01Jan2000	03:49	1.05
01Jan2000	03:50	1.07
01Jan2000	03:51	1.10
01Jan2000	03:52	1.12
01Jan2000	03:53	1.15
01Jan2000	03:54	1.17
01Jan2000	03:55	1.26
01Jan2000	03:56	1.34
01Jan2000	03:57	1.42
01Jan2000	03:58	1.49
01Jan2000	03:59	1.56
01Jan2000	04:00	1.63
01Jan2000	04:01	1.69
01Jan2000	04:02	1.75

Date	Time	Outflow (CFS)
01Jan2000	04:03	1.81
01Jan2000	04:04	1.86
01Jan2000	04:05	1.92
01Jan2000	04:06	1.96
01Jan2000	04:07	2.02
01Jan2000	04:08	2.10
01Jan2000	04:09	2.21
01Jan2000	04:10	2.38
01Jan2000	04:11	2.57
01Jan2000	04:12	2.82
01Jan2000	04:13	2.99
01Jan2000	04:14	3.21
01Jan2000	04:15	3.45
01Jan2000	04:16	3.71
01Jan2000	04:17	3.98
01Jan2000	04:18	4.25
01Jan2000	04:19	4.56
01Jan2000	04:20	4.82
01Jan2000	04:21	4.97
01Jan2000	04:22	5.05
01Jan2000	04:23	5.08
01Jan2000	04:24	5.08
01Jan2000	04:25	5.04
01Jan2000	04:26	4.95
01Jan2000	04:27	4.84
01Jan2000	04:28	4.70
01Jan2000	04:29	4.53
01Jan2000	04:30	4.32
01Jan2000	04:31	4.15
01Jan2000	04:32	3.89
01Jan2000	04:33	3.56

Date	Time	Outflow (CFS)
01Jan2000	04:34	3.24
01Jan2000	04:35	2.96
01Jan2000	04:36	2.70
01Jan2000	04:37	2.47
01Jan2000	04:38	2.27
01Jan2000	04:39	2.08
01Jan2000	04:40	1.92
01Jan2000	04:41	1.78
01Jan2000	04:42	1.65
01Jan2000	04:43	1.55
01Jan2000	04:44	1.46
01Jan2000	04:45	1.39
01Jan2000	04:46	1.31
01Jan2000	04:47	1.25
01Jan2000	04:48	1.18
01Jan2000	04:49	1.13
01Jan2000	04:50	1.08
01Jan2000	04:51	1.04
01Jan2000	04:52	1.00
01Jan2000	04:53	0.96
01Jan2000	04:54	0.93
01Jan2000	04:55	0.90
01Jan2000	04:56	0.87
01Jan2000	04:57	0.84
01Jan2000	04:58	0.82
01Jan2000	04:59	0.80
01Jan2000	05:00	0.78
01Jan2000	05:01	0.76
01Jan2000	05:02	0.74
01Jan2000	05:03	0.72
01Jan2000	05:04	0.70

Date	Time	Outflow (CFS)
01Jan2000	05:05	0.69
01Jan2000	05:06	0.67
01Jan2000	05:07	0.66
01Jan2000	05:08	0.65
01Jan2000	05:09	0.63
01Jan2000	05:10	0.62
01Jan2000	05:11	0.62
01Jan2000	05:12	0.61
01Jan2000	05:13	0.60
01Jan2000	05:14	0.60
01Jan2000	05:15	0.59
01Jan2000	05:16	0.59
01Jan2000	05:17	0.58
01Jan2000	05:18	0.58
01Jan2000	05:19	0.57
01Jan2000	05:20	0.57
01Jan2000	05:21	0.56
01Jan2000	05:22	0.56
01Jan2000	05:23	0.56
01Jan2000	05:24	0.55
01Jan2000	05:25	0.55
01Jan2000	05:26	0.55
01Jan2000	05:27	0.54
01Jan2000	05:28	0.54
01Jan2000	05:29	0.54
01Jan2000	05:30	0.53
01Jan2000	05:31	0.53
01Jan2000	05:32	0.52
01Jan2000	05:33	0.52
01Jan2000	05:34	0.51
01Jan2000	05:35	0.51

Date	Time	Outflow (CFS)
01Jan2000	05:36	0.50
01Jan2000	05:37	0.50
01Jan2000	05:38	0.49
01Jan2000	05:39	0.49
01Jan2000	05:40	0.48
01Jan2000	05:41	0.48
01Jan2000	05:42	0.47
01Jan2000	05:43	0.47
01Jan2000	05:44	0.46
01Jan2000	05:45	0.46
01Jan2000	05:46	0.46
01Jan2000	05:47	0.45
01Jan2000	05:48	0.45
01Jan2000	05:49	0.45
01Jan2000	05:50	0.44
01Jan2000	05:51	0.44
01Jan2000	05:52	0.44
01Jan2000	05:53	0.44
01Jan2000	05:54	0.43
01Jan2000	05:55	0.43
01Jan2000	05:56	0.43
01Jan2000	05:57	0.43
01Jan2000	05:58	0.43
01Jan2000	05:59	0.43
01Jan2000	06:00	0.42
01Jan2000	06:01	0.41
01Jan2000	06:02	0.41
01Jan2000	06:03	0.40
01Jan2000	06:04	0.40
01Jan2000	06:05	0.39
01Jan2000	06:06	0.38

Date	Time	Outflow (CFS)
01Jan2000	06:07	0.37
01Jan2000	06:08	0.36
01Jan2000	06:09	0.35
01Jan2000	06:10	0.33
01Jan2000	06:11	0.32
01Jan2000	06:12	0.30
01Jan2000	06:13	0.29
01Jan2000	06:14	0.27
01Jan2000	06:15	0.26
01Jan2000	06:16	0.24
01Jan2000	06:17	0.23
01Jan2000	06:18	0.20
01Jan2000	06:19	0.19
01Jan2000	06:20	0.18
01Jan2000	06:21	0.17
01Jan2000	06:22	0.16
01Jan2000	06:23	0.15
01Jan2000	06:24	0.14
01Jan2000	06:25	0.13
01Jan2000	06:26	0.12
01Jan2000	06:27	0.12
01Jan2000	06:28	0.11
01Jan2000	06:29	0.10
01Jan2000	06:30	0.10
01Jan2000	06:31	0.09
01Jan2000	06:32	0.09
01Jan2000	06:33	0.08
01Jan2000	06:34	0.08
01Jan2000	06:35	0.07
01Jan2000	06:36	0.07
01Jan2000	06:37	0.06

Date	Time	Outflow (CFS)
01Jan2000	06:38	0.06
01Jan2000	06:39	0.06
01Jan2000	06:40	0.05
01Jan2000	06:41	0.05
01Jan2000	06:42	0.05
01Jan2000	06:43	0.04
01Jan2000	06:44	0.04
01Jan2000	06:45	0.04
01Jan2000	06:46	0.04
01Jan2000	06:47	0.03
01Jan2000	06:48	0.03
01Jan2000	06:49	0.03
01Jan2000	06:50	0.03
01Jan2000	06:51	0.03
01Jan2000	06:52	0.03
01Jan2000	06:53	0.02
01Jan2000	06:54	0.02
01Jan2000	06:55	0.02
01Jan2000	06:56	0.02
01Jan2000	06:57	0.02
01Jan2000	06:58	0.02
01Jan2000	06:59	0.02
01Jan2000	07:00	0.02

CHAPTER 6 – MODIFIED-PULS DETENTIONS ROUTING

6.1 – Rational Method Hydrograph

RATIONAL METHOD HYDROGRAPH PROGRAM
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RUN DATE 1/25/2018
HYDROGRAPH FILE NAME BMP-1
TIME OF CONCENTRATION 13 MIN.
6 HOUR RAINFALL 2 INCHES
BASIN AREA 3.81 ACRES
RUNOFF COEFFICIENT 0.55
PEAK DISCHARGE 6.83 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 13	DISCHARGE (CFS) = 0
TIME (MIN) = 26	DISCHARGE (CFS) = 0.3
TIME (MIN) = 39	DISCHARGE (CFS) = 0.3
TIME (MIN) = 52	DISCHARGE (CFS) = 0.3
TIME (MIN) = 65	DISCHARGE (CFS) = 0.3
TIME (MIN) = 78	DISCHARGE (CFS) = 0.3
TIME (MIN) = 91	DISCHARGE (CFS) = 0.3
TIME (MIN) = 104	DISCHARGE (CFS) = 0.3
TIME (MIN) = 117	DISCHARGE (CFS) = 0.3
TIME (MIN) = 130	DISCHARGE (CFS) = 0.4
TIME (MIN) = 143	DISCHARGE (CFS) = 0.4
TIME (MIN) = 156	DISCHARGE (CFS) = 0.4
TIME (MIN) = 169	DISCHARGE (CFS) = 0.5
TIME (MIN) = 182	DISCHARGE (CFS) = 0.5
TIME (MIN) = 195	DISCHARGE (CFS) = 0.6
TIME (MIN) = 208	DISCHARGE (CFS) = 0.7
TIME (MIN) = 221	DISCHARGE (CFS) = 0.8
TIME (MIN) = 234	DISCHARGE (CFS) = 1.2
TIME (MIN) = 247	DISCHARGE (CFS) = 0.8
TIME (MIN) = 260	DISCHARGE (CFS) = 6.83
TIME (MIN) = 273	DISCHARGE (CFS) = 0.9
TIME (MIN) = 286	DISCHARGE (CFS) = 0.6
TIME (MIN) = 299	DISCHARGE (CFS) = 0.5
TIME (MIN) = 312	DISCHARGE (CFS) = 0.4
TIME (MIN) = 325	DISCHARGE (CFS) = 0.4
TIME (MIN) = 338	DISCHARGE (CFS) = 0.3
TIME (MIN) = 351	DISCHARGE (CFS) = 0.3
TIME (MIN) = 364	DISCHARGE (CFS) = 0.3
TIME (MIN) = 377	DISCHARGE (CFS) = 0

RATIONAL METHOD HYDROGRAPH PROGRAM

RUN DATE 1/25/2018
HYDROGRAPH FILE NAME BYPASS-1
TIME OF CONCENTRATION 18 MIN.
6 HOUR RAINFALL 2 INCHES
BASIN AREA 0.98 ACRES
RUNOFF COEFFICIENT 0.55
PEAK DISCHARGE 1.39 CFS

TIME (MIN) = 0	DISCHARGE (CFS) = 0
TIME (MIN) = 18	DISCHARGE (CFS) = 0.1
TIME (MIN) = 36	DISCHARGE (CFS) = 0.1
TIME (MIN) = 54	DISCHARGE (CFS) = 0.1
TIME (MIN) = 72	DISCHARGE (CFS) = 0.1
TIME (MIN) = 90	DISCHARGE (CFS) = 0.1
TIME (MIN) = 108	DISCHARGE (CFS) = 0.1
TIME (MIN) = 126	DISCHARGE (CFS) = 0.1
TIME (MIN) = 144	DISCHARGE (CFS) = 0.1
TIME (MIN) = 162	DISCHARGE (CFS) = 0.1
TIME (MIN) = 180	DISCHARGE (CFS) = 0.1
TIME (MIN) = 198	DISCHARGE (CFS) = 0.2
TIME (MIN) = 216	DISCHARGE (CFS) = 0.2
TIME (MIN) = 234	DISCHARGE (CFS) = 0.2
TIME (MIN) = 252	DISCHARGE (CFS) = 1.39
TIME (MIN) = 270	DISCHARGE (CFS) = 0.2
TIME (MIN) = 288	DISCHARGE (CFS) = 0.1
TIME (MIN) = 306	DISCHARGE (CFS) = 0.1
TIME (MIN) = 324	DISCHARGE (CFS) = 0.1
TIME (MIN) = 342	DISCHARGE (CFS) = 0.1
TIME (MIN) = 360	DISCHARGE (CFS) = 0.1
TIME (MIN) = 378	DISCHARGE (CFS) = 0

6.2 Stage Storage & Stage-Discharge Relationships

Elevation (ft)			Area(sq-ft)	Volume (ac-ft)	
Actual(in)	Actual(ft)	Model (ft)			
0.00	0.00	0.00	4297	0.0000	
12.00	1.00	0.40	4297	0.0395	**TOP OF GRAVEL[1](0.4 voids)**
13.00	1.08	0.48	4367	0.0477	
14.00	1.17	0.57	4438	0.0562	
15.00	1.25	0.65	4510	0.0647	
16.00	1.33	0.73	4581	0.0734	
17.00	1.42	0.82	4653	0.0823	
18.00	1.50	0.90	4726	0.0912	
19.00	1.58	0.98	4799	0.1003	
20.00	1.67	1.07	4872	0.1096	
21.00	1.75	1.15	4946	0.1190	
22.00	1.83	1.23	5020	0.1285	
23.00	1.92	1.32	5095	0.1382	
24.00	2.00	1.40	5170	0.1480	
25.00	2.08	1.48	5245	0.1580	
26.00	2.17	1.57	5321	0.1681	
27.00	2.25	1.65	5397	0.1783	
28.00	2.33	1.73	5473	0.1887	
29.00	2.42	1.82	5550	0.1993	
30.00	2.50	1.90	5628	0.2100	
31.00	2.58	1.98	5705	0.2208	
32.00	2.67	2.07	5783	0.2318	
33.00	2.75	2.15	5862	0.2429	
34.00	2.83	2.23	5941	0.2542	
35.00	2.92	2.32	6020	0.2657	
36.00	3.00	2.40	6100	0.2773	**EMERGENCY WEIR[2]**
37.00	3.08	2.48	6180	0.2890	
38.00	3.17	2.57	6261	0.3009	
39.00	3.25	2.65	6342	0.3130	
40.00	3.33	2.73	6423	0.3252	
41.00	3.42	2.82	6505	0.3375	
42.00	3.50	2.90	6587	0.3501	**BASIN CREST**

NOTES:

(1): All elevations measured from bottom of gravel layer. These are model elevations, not actual elevations. As such, 1.00-ft of gravel is represented as 0.4-ft due to the 0.4 porosity.

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

Outlet structure for Discharge of BMP 1

Discharge vs Elevation Table

Low orifice	0.625 "	Lower slot		Lower Weir			
Number of orif:	0	Number of slots:	1	Number of weirs:	0		
Cg-low:	0.61	Invert:	2.40 ft	Invert:	0.000 ft		
		B	7.00 ft	B:	0.000 ft		
Middle orifice	1.000 "	hslot	0.250 ft				
Number of orif:	0.000						
Cg-middle:	0.61	Upper slot		Upper Weir		Emergency weir	
invert elev:	0 ft	Number of slots:	0	Number of weirs:	0	Invert:	0.000 ft
		Invert:	0.00 ft	Invert:	0.000 ft	W:	0.00 ft
		B:	0.00 ft	B:	0.00 ft		
		hslot	0.000 ft				

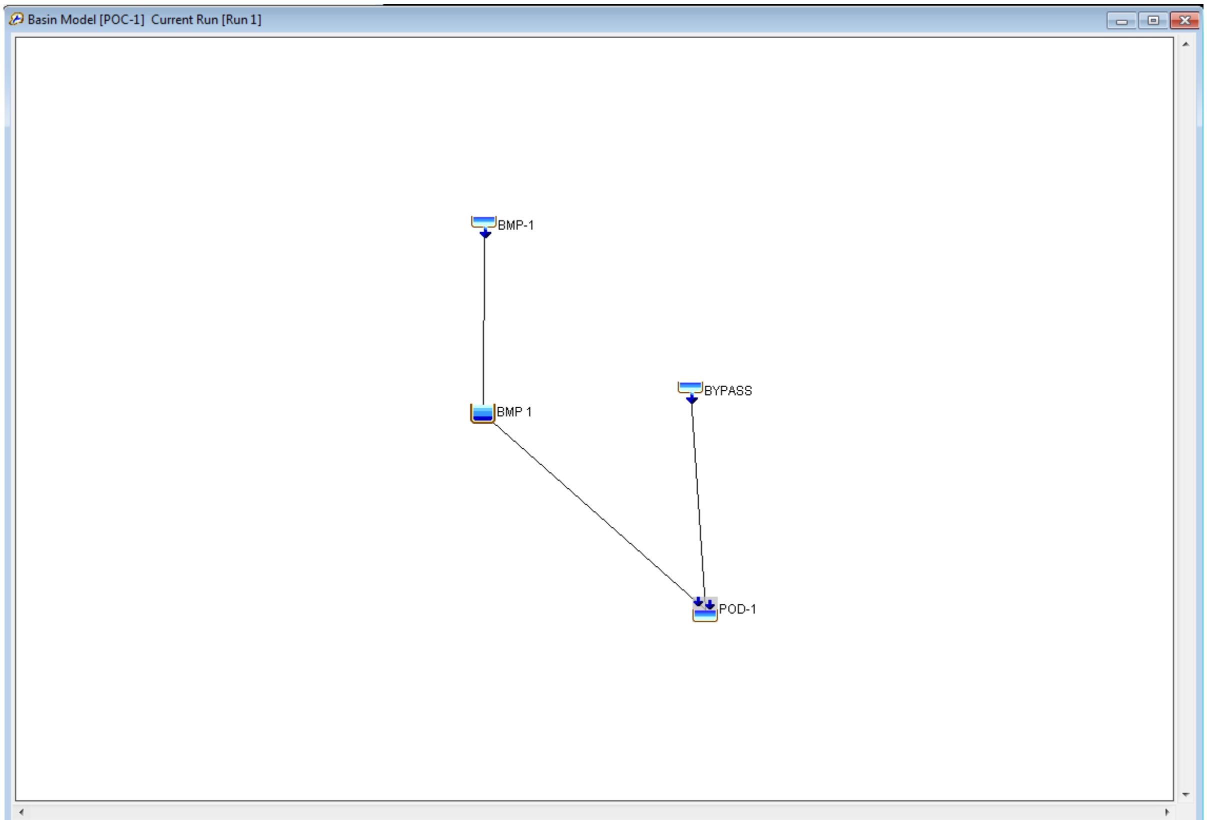
Note: All elevations measured from bottom of gravel layer. These are model elevations, not actual elevations. As such, 1.00-ft of gravel is represented as 0.4-ft due to the 0.4 porosity.

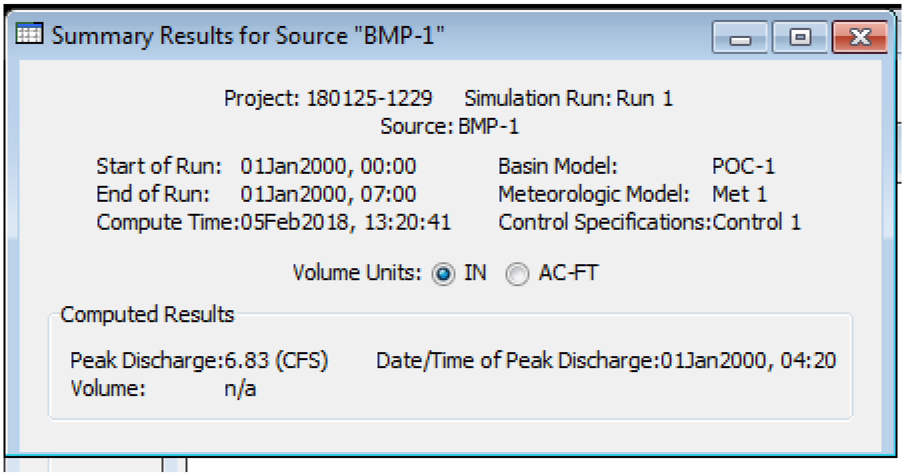
*Note: h = head above the invert of the lowest surface discharge opening.

h* (ft)	H/D-low -	H/D-mid -	Qlow-orif (cfs)	Qlow-weir (cfs)	Qtot-low (cfs)	Qmid-orif (cfs)	Qmid-weir (cfs)	Qtot-med (cfs)	Qslot-low (cfs)	Qslot-upp (cfs)	Qlweir (cfs)	Quweir (cfs)	Qemerg (cfs)	Qtot (cfs)
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.400	46.080	28.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2.483	47.680	29.800	0.000	0.000	0.000	0.000	0.000	0.000	0.522	0.000	0.000	0.000	0.000	0.522
2.567	49.280	30.800	0.000	0.000	0.000	0.000	0.000	0.000	1.476	0.000	0.000	0.000	0.000	1.476
2.650	50.880	31.800	0.000	0.000	0.000	0.000	0.000	0.000	2.713	0.000	0.000	0.000	0.000	2.713
2.733	52.480	32.800	0.000	0.000	0.000	0.000	0.000	0.000	3.910	0.000	0.000	0.000	0.000	3.910
2.817	54.080	33.800	0.000	0.000	0.000	0.000	0.000	0.000	4.627	0.000	0.000	0.000	0.000	4.627
2.900	55.680	34.800	0.000	0.000	0.000	0.000	0.000	0.000	5.246	0.000	0.000	0.000	0.000	5.246

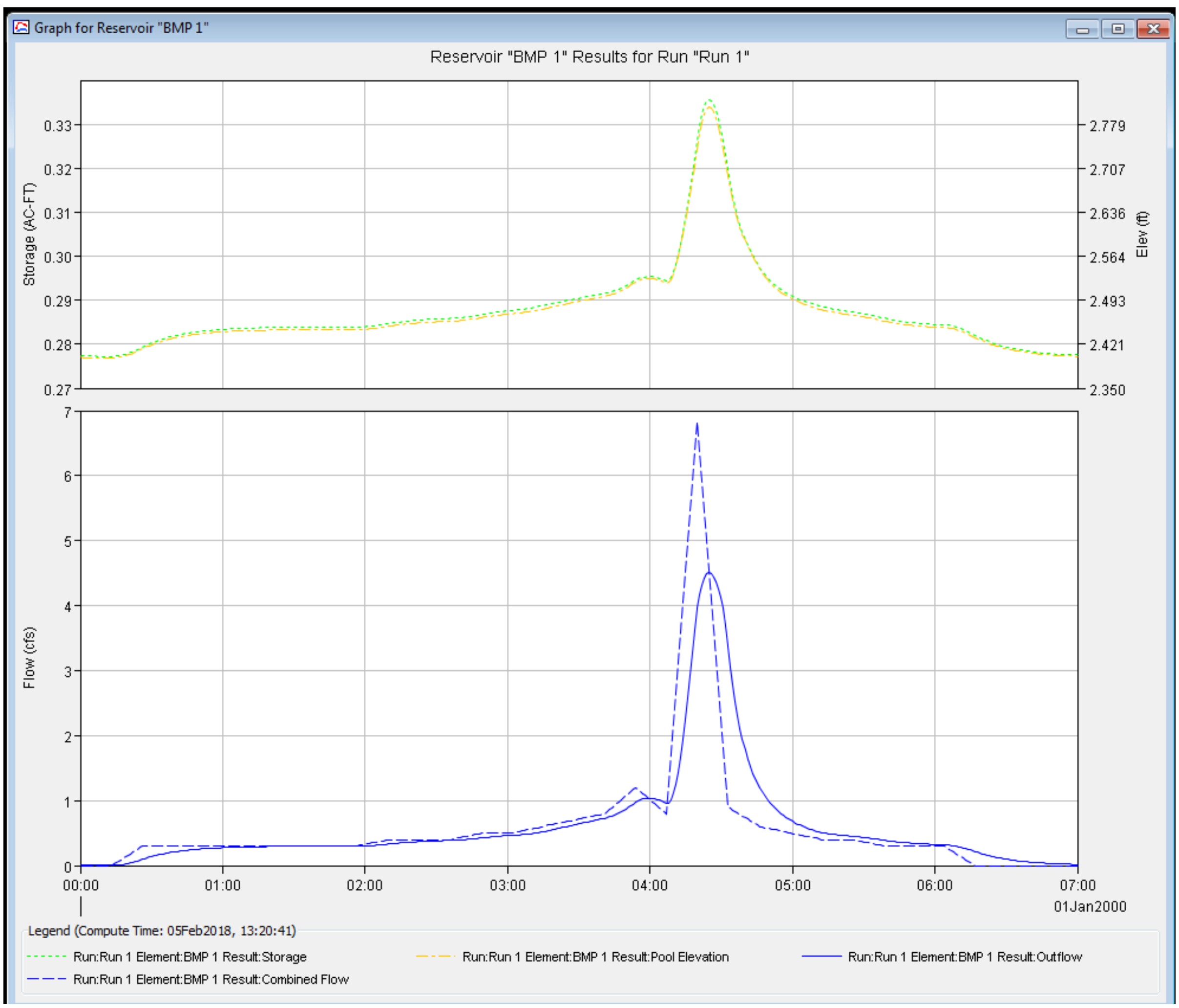
6.3 – HEC-HMS Modified-Puls Routing Results

HEC-HMS POST DEVELOPMENT





Note: Peak Elevation is based on model elevation which corresponds to an actual elevation of 3.36 feet. See Stage-Storage Table in Section 6.2.



Project: 180125-1229 Simulation Run: Run 1
Reservoir: BMP 1

Start of Run: 01Jan2000, 00:00 Basin Model: POC-1
End of Run: 01Jan2000, 07:00 Meteorologic Model: Met 1
Compute Time: 05Feb2018, 13:20:41 Control Specifications: Control 1

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	00:00	0.00	0.28	2.40	0.00
01Jan2000	00:01	0.00	0.28	2.40	0.00
01Jan2000	00:02	0.00	0.28	2.40	0.00
01Jan2000	00:03	0.00	0.28	2.40	0.00
01Jan2000	00:04	0.00	0.28	2.40	0.00
01Jan2000	00:05	0.00	0.28	2.40	0.00
01Jan2000	00:06	0.00	0.28	2.40	0.00
01Jan2000	00:07	0.00	0.28	2.40	0.00
01Jan2000	00:08	0.00	0.28	2.40	0.00
01Jan2000	00:09	0.00	0.28	2.40	0.00
01Jan2000	00:10	0.00	0.28	2.40	0.00
01Jan2000	00:11	0.00	0.28	2.40	0.00
01Jan2000	00:12	0.00	0.28	2.40	0.00
01Jan2000	00:13	0.00	0.28	2.40	0.00
01Jan2000	00:14	0.02	0.28	2.40	0.00
01Jan2000	00:15	0.05	0.28	2.40	0.00
01Jan2000	00:16	0.07	0.28	2.40	0.01
01Jan2000	00:17	0.09	0.28	2.40	0.01
01Jan2000	00:18	0.12	0.28	2.40	0.02
01Jan2000	00:19	0.14	0.28	2.40	0.02
01Jan2000	00:20	0.16	0.28	2.40	0.03
01Jan2000	00:21	0.18	0.28	2.41	0.04
01Jan2000	00:22	0.21	0.28	2.41	0.05
01Jan2000	00:23	0.23	0.28	2.41	0.06
01Jan2000	00:24	0.25	0.28	2.41	0.07
01Jan2000	00:25	0.28	0.28	2.41	0.08

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	00:26	0.30	0.28	2.41	0.09
01Jan2000	00:27	0.30	0.28	2.42	0.11
01Jan2000	00:28	0.30	0.28	2.42	0.12
01Jan2000	00:29	0.30	0.28	2.42	0.13
01Jan2000	00:30	0.30	0.28	2.42	0.14
01Jan2000	00:31	0.30	0.28	2.42	0.15
01Jan2000	00:32	0.30	0.28	2.42	0.16
01Jan2000	00:33	0.30	0.28	2.42	0.17
01Jan2000	00:34	0.30	0.28	2.43	0.17
01Jan2000	00:35	0.30	0.28	2.43	0.18
01Jan2000	00:36	0.30	0.28	2.43	0.19
01Jan2000	00:37	0.30	0.28	2.43	0.19
01Jan2000	00:38	0.30	0.28	2.43	0.20
01Jan2000	00:39	0.30	0.28	2.43	0.21
01Jan2000	00:40	0.30	0.28	2.43	0.21
01Jan2000	00:41	0.30	0.28	2.43	0.22
01Jan2000	00:42	0.30	0.28	2.43	0.22
01Jan2000	00:43	0.30	0.28	2.43	0.23
01Jan2000	00:44	0.30	0.28	2.43	0.23
01Jan2000	00:45	0.30	0.28	2.44	0.24
01Jan2000	00:46	0.30	0.28	2.44	0.24
01Jan2000	00:47	0.30	0.28	2.44	0.24
01Jan2000	00:48	0.30	0.28	2.44	0.25
01Jan2000	00:49	0.30	0.28	2.44	0.25
01Jan2000	00:50	0.30	0.28	2.44	0.25
01Jan2000	00:51	0.30	0.28	2.44	0.26
01Jan2000	00:52	0.30	0.28	2.44	0.26
01Jan2000	00:53	0.30	0.28	2.44	0.26
01Jan2000	00:54	0.30	0.28	2.44	0.26
01Jan2000	00:55	0.30	0.28	2.44	0.27
01Jan2000	00:56	0.30	0.28	2.44	0.27

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	00:57	0.30	0.28	2.44	0.27
01Jan2000	00:58	0.30	0.28	2.44	0.27
01Jan2000	00:59	0.30	0.28	2.44	0.27
01Jan2000	01:00	0.30	0.28	2.44	0.27
01Jan2000	01:01	0.30	0.28	2.44	0.28
01Jan2000	01:02	0.30	0.28	2.44	0.28
01Jan2000	01:03	0.30	0.28	2.44	0.28
01Jan2000	01:04	0.30	0.28	2.44	0.28
01Jan2000	01:05	0.30	0.28	2.44	0.28
01Jan2000	01:06	0.30	0.28	2.44	0.28
01Jan2000	01:07	0.30	0.28	2.44	0.28
01Jan2000	01:08	0.30	0.28	2.44	0.28
01Jan2000	01:09	0.30	0.28	2.44	0.29
01Jan2000	01:10	0.30	0.28	2.44	0.29
01Jan2000	01:11	0.30	0.28	2.44	0.29
01Jan2000	01:12	0.30	0.28	2.44	0.29
01Jan2000	01:13	0.30	0.28	2.44	0.29
01Jan2000	01:14	0.30	0.28	2.44	0.29
01Jan2000	01:15	0.30	0.28	2.44	0.29
01Jan2000	01:16	0.30	0.28	2.44	0.29
01Jan2000	01:17	0.30	0.28	2.44	0.29
01Jan2000	01:18	0.30	0.28	2.44	0.29
01Jan2000	01:19	0.30	0.28	2.44	0.29
01Jan2000	01:20	0.30	0.28	2.44	0.29
01Jan2000	01:21	0.30	0.28	2.44	0.29
01Jan2000	01:22	0.30	0.28	2.44	0.29
01Jan2000	01:23	0.30	0.28	2.44	0.29
01Jan2000	01:24	0.30	0.28	2.44	0.29
01Jan2000	01:25	0.30	0.28	2.44	0.29
01Jan2000	01:26	0.30	0.28	2.44	0.29
01Jan2000	01:27	0.30	0.28	2.44	0.30

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	01:28	0.30	0.28	2.44	0.30
01Jan2000	01:29	0.30	0.28	2.44	0.30
01Jan2000	01:30	0.30	0.28	2.44	0.30
01Jan2000	01:31	0.30	0.28	2.44	0.30
01Jan2000	01:32	0.30	0.28	2.44	0.30
01Jan2000	01:33	0.30	0.28	2.44	0.30
01Jan2000	01:34	0.30	0.28	2.45	0.30
01Jan2000	01:35	0.30	0.28	2.45	0.30
01Jan2000	01:36	0.30	0.28	2.45	0.30
01Jan2000	01:37	0.30	0.28	2.45	0.30
01Jan2000	01:38	0.30	0.28	2.45	0.30
01Jan2000	01:39	0.30	0.28	2.45	0.30
01Jan2000	01:40	0.30	0.28	2.45	0.30
01Jan2000	01:41	0.30	0.28	2.45	0.30
01Jan2000	01:42	0.30	0.28	2.45	0.30
01Jan2000	01:43	0.30	0.28	2.45	0.30
01Jan2000	01:44	0.30	0.28	2.45	0.30
01Jan2000	01:45	0.30	0.28	2.45	0.30
01Jan2000	01:46	0.30	0.28	2.45	0.30
01Jan2000	01:47	0.30	0.28	2.45	0.30
01Jan2000	01:48	0.30	0.28	2.45	0.30
01Jan2000	01:49	0.30	0.28	2.45	0.30
01Jan2000	01:50	0.30	0.28	2.45	0.30
01Jan2000	01:51	0.30	0.28	2.45	0.30
01Jan2000	01:52	0.30	0.28	2.45	0.30
01Jan2000	01:53	0.30	0.28	2.45	0.30
01Jan2000	01:54	0.30	0.28	2.45	0.30
01Jan2000	01:55	0.30	0.28	2.45	0.30
01Jan2000	01:56	0.30	0.28	2.45	0.30
01Jan2000	01:57	0.30	0.28	2.45	0.30
01Jan2000	01:58	0.31	0.28	2.45	0.30

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	01:59	0.32	0.28	2.45	0.30
01Jan2000	02:00	0.32	0.28	2.45	0.30
01Jan2000	02:01	0.33	0.28	2.45	0.30
01Jan2000	02:02	0.34	0.28	2.45	0.30
01Jan2000	02:03	0.35	0.28	2.45	0.31
01Jan2000	02:04	0.35	0.28	2.45	0.31
01Jan2000	02:05	0.36	0.28	2.45	0.31
01Jan2000	02:06	0.37	0.28	2.45	0.32
01Jan2000	02:07	0.38	0.28	2.45	0.32
01Jan2000	02:08	0.38	0.28	2.45	0.32
01Jan2000	02:09	0.39	0.28	2.45	0.33
01Jan2000	02:10	0.40	0.28	2.45	0.33
01Jan2000	02:11	0.40	0.28	2.45	0.33
01Jan2000	02:12	0.40	0.28	2.45	0.34
01Jan2000	02:13	0.40	0.28	2.45	0.34
01Jan2000	02:14	0.40	0.28	2.45	0.35
01Jan2000	02:15	0.40	0.29	2.45	0.35
01Jan2000	02:16	0.40	0.29	2.45	0.35
01Jan2000	02:17	0.40	0.29	2.45	0.35
01Jan2000	02:18	0.40	0.29	2.45	0.36
01Jan2000	02:19	0.40	0.29	2.45	0.36
01Jan2000	02:20	0.40	0.29	2.46	0.36
01Jan2000	02:21	0.40	0.29	2.46	0.36
01Jan2000	02:22	0.40	0.29	2.46	0.37
01Jan2000	02:23	0.40	0.29	2.46	0.37
01Jan2000	02:24	0.40	0.29	2.46	0.37
01Jan2000	02:25	0.40	0.29	2.46	0.37
01Jan2000	02:26	0.40	0.29	2.46	0.37
01Jan2000	02:27	0.40	0.29	2.46	0.38
01Jan2000	02:28	0.40	0.29	2.46	0.38
01Jan2000	02:29	0.40	0.29	2.46	0.38

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	02:30	0.40	0.29	2.46	0.38
01Jan2000	02:31	0.40	0.29	2.46	0.38
01Jan2000	02:32	0.40	0.29	2.46	0.38
01Jan2000	02:33	0.40	0.29	2.46	0.38
01Jan2000	02:34	0.40	0.29	2.46	0.38
01Jan2000	02:35	0.40	0.29	2.46	0.38
01Jan2000	02:36	0.40	0.29	2.46	0.39
01Jan2000	02:37	0.41	0.29	2.46	0.39
01Jan2000	02:38	0.42	0.29	2.46	0.39
01Jan2000	02:39	0.42	0.29	2.46	0.39
01Jan2000	02:40	0.43	0.29	2.46	0.39
01Jan2000	02:41	0.44	0.29	2.46	0.40
01Jan2000	02:42	0.45	0.29	2.46	0.40
01Jan2000	02:43	0.45	0.29	2.46	0.40
01Jan2000	02:44	0.46	0.29	2.46	0.40
01Jan2000	02:45	0.47	0.29	2.46	0.41
01Jan2000	02:46	0.48	0.29	2.46	0.41
01Jan2000	02:47	0.48	0.29	2.46	0.42
01Jan2000	02:48	0.49	0.29	2.46	0.42
01Jan2000	02:49	0.50	0.29	2.46	0.42
01Jan2000	02:50	0.50	0.29	2.47	0.43
01Jan2000	02:51	0.50	0.29	2.47	0.43
01Jan2000	02:52	0.50	0.29	2.47	0.44
01Jan2000	02:53	0.50	0.29	2.47	0.44
01Jan2000	02:54	0.50	0.29	2.47	0.44
01Jan2000	02:55	0.50	0.29	2.47	0.45
01Jan2000	02:56	0.50	0.29	2.47	0.45
01Jan2000	02:57	0.50	0.29	2.47	0.45
01Jan2000	02:58	0.50	0.29	2.47	0.46
01Jan2000	02:59	0.50	0.29	2.47	0.46
01Jan2000	03:00	0.50	0.29	2.47	0.46

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	03:01	0.50	0.29	2.47	0.46
01Jan2000	03:02	0.50	0.29	2.47	0.47
01Jan2000	03:03	0.51	0.29	2.47	0.47
01Jan2000	03:04	0.52	0.29	2.47	0.47
01Jan2000	03:05	0.52	0.29	2.47	0.47
01Jan2000	03:06	0.53	0.29	2.47	0.48
01Jan2000	03:07	0.54	0.29	2.47	0.48
01Jan2000	03:08	0.55	0.29	2.47	0.48
01Jan2000	03:09	0.55	0.29	2.47	0.49
01Jan2000	03:10	0.56	0.29	2.48	0.49
01Jan2000	03:11	0.57	0.29	2.48	0.50
01Jan2000	03:12	0.58	0.29	2.48	0.50
01Jan2000	03:13	0.58	0.29	2.48	0.51
01Jan2000	03:14	0.59	0.29	2.48	0.51
01Jan2000	03:15	0.60	0.29	2.48	0.52
01Jan2000	03:16	0.61	0.29	2.48	0.52
01Jan2000	03:17	0.62	0.29	2.48	0.53
01Jan2000	03:18	0.62	0.29	2.48	0.54
01Jan2000	03:19	0.63	0.29	2.48	0.55
01Jan2000	03:20	0.64	0.29	2.48	0.56
01Jan2000	03:21	0.65	0.29	2.48	0.57
01Jan2000	03:22	0.65	0.29	2.48	0.58
01Jan2000	03:23	0.66	0.29	2.49	0.58
01Jan2000	03:24	0.67	0.29	2.49	0.59
01Jan2000	03:25	0.68	0.29	2.49	0.60
01Jan2000	03:26	0.68	0.29	2.49	0.61
01Jan2000	03:27	0.69	0.29	2.49	0.62
01Jan2000	03:28	0.70	0.29	2.49	0.62
01Jan2000	03:29	0.71	0.29	2.49	0.63
01Jan2000	03:30	0.72	0.29	2.49	0.64
01Jan2000	03:31	0.72	0.29	2.49	0.65

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	03:32	0.73	0.29	2.49	0.66
01Jan2000	03:33	0.74	0.29	2.49	0.67
01Jan2000	03:34	0.75	0.29	2.49	0.67
01Jan2000	03:35	0.75	0.29	2.49	0.68
01Jan2000	03:36	0.76	0.29	2.50	0.69
01Jan2000	03:37	0.77	0.29	2.50	0.70
01Jan2000	03:38	0.78	0.29	2.50	0.71
01Jan2000	03:39	0.78	0.29	2.50	0.71
01Jan2000	03:40	0.79	0.29	2.50	0.72
01Jan2000	03:41	0.80	0.29	2.50	0.73
01Jan2000	03:42	0.83	0.29	2.50	0.74
01Jan2000	03:43	0.86	0.29	2.50	0.75
01Jan2000	03:44	0.89	0.29	2.50	0.76
01Jan2000	03:45	0.92	0.29	2.50	0.78
01Jan2000	03:46	0.95	0.29	2.51	0.79
01Jan2000	03:47	0.98	0.29	2.51	0.81
01Jan2000	03:48	1.02	0.29	2.51	0.83
01Jan2000	03:49	1.05	0.29	2.51	0.85
01Jan2000	03:50	1.08	0.29	2.51	0.87
01Jan2000	03:51	1.11	0.29	2.52	0.90
01Jan2000	03:52	1.14	0.29	2.52	0.92
01Jan2000	03:53	1.17	0.29	2.52	0.95
01Jan2000	03:54	1.20	0.29	2.52	0.97
01Jan2000	03:55	1.17	0.29	2.52	0.99
01Jan2000	03:56	1.14	0.30	2.53	1.01
01Jan2000	03:57	1.11	0.30	2.53	1.02
01Jan2000	03:58	1.08	0.30	2.53	1.03
01Jan2000	03:59	1.05	0.30	2.53	1.03
01Jan2000	04:00	1.02	0.30	2.53	1.03
01Jan2000	04:01	0.98	0.30	2.53	1.03
01Jan2000	04:02	0.95	0.30	2.53	1.02

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	04:03	0.92	0.30	2.53	1.01
01Jan2000	04:04	0.89	0.29	2.53	1.00
01Jan2000	04:05	0.86	0.29	2.52	0.99
01Jan2000	04:06	0.83	0.29	2.52	0.97
01Jan2000	04:07	0.80	0.29	2.52	0.96
01Jan2000	04:08	1.26	0.29	2.52	0.97
01Jan2000	04:09	1.73	0.30	2.53	1.02
01Jan2000	04:10	2.19	0.30	2.54	1.12
01Jan2000	04:11	2.66	0.30	2.55	1.25
01Jan2000	04:12	3.12	0.30	2.57	1.43
01Jan2000	04:13	3.58	0.30	2.58	1.67
01Jan2000	04:14	4.05	0.31	2.60	1.95
01Jan2000	04:15	4.51	0.31	2.62	2.26
01Jan2000	04:16	4.97	0.31	2.64	2.58
01Jan2000	04:17	5.44	0.32	2.66	2.92
01Jan2000	04:18	5.90	0.32	2.69	3.26
01Jan2000	04:19	6.37	0.32	2.71	3.63
01Jan2000	04:20	6.83	0.33	2.74	3.96
01Jan2000	04:21	6.37	0.33	2.76	4.17
01Jan2000	04:22	5.92	0.33	2.78	4.32
01Jan2000	04:23	5.46	0.33	2.80	4.42
01Jan2000	04:24	5.01	0.34	2.80	4.48
01Jan2000	04:25	4.55	0.34	2.81	4.51
01Jan2000	04:26	4.09	0.34	2.80	4.49
01Jan2000	04:27	3.64	0.33	2.80	4.44
01Jan2000	04:28	3.18	0.33	2.79	4.37
01Jan2000	04:29	2.72	0.33	2.77	4.26
01Jan2000	04:30	2.27	0.33	2.76	4.12
01Jan2000	04:31	1.81	0.33	2.74	3.96
01Jan2000	04:32	1.36	0.32	2.72	3.70
01Jan2000	04:33	0.90	0.32	2.69	3.38

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	04:34	0.88	0.32	2.67	3.06
01Jan2000	04:35	0.85	0.31	2.65	2.79
01Jan2000	04:36	0.83	0.31	2.64	2.53
01Jan2000	04:37	0.81	0.31	2.62	2.31
01Jan2000	04:38	0.78	0.31	2.61	2.11
01Jan2000	04:39	0.76	0.31	2.60	1.93
01Jan2000	04:40	0.74	0.30	2.59	1.78
01Jan2000	04:41	0.72	0.30	2.58	1.64
01Jan2000	04:42	0.69	0.30	2.57	1.52
01Jan2000	04:43	0.67	0.30	2.56	1.42
01Jan2000	04:44	0.65	0.30	2.56	1.34
01Jan2000	04:45	0.62	0.30	2.55	1.27
01Jan2000	04:46	0.60	0.30	2.54	1.20
01Jan2000	04:47	0.59	0.30	2.54	1.14
01Jan2000	04:48	0.58	0.30	2.53	1.08
01Jan2000	04:49	0.58	0.30	2.53	1.03
01Jan2000	04:50	0.57	0.29	2.52	0.98
01Jan2000	04:51	0.56	0.29	2.52	0.94
01Jan2000	04:52	0.55	0.29	2.52	0.90
01Jan2000	04:53	0.55	0.29	2.51	0.86
01Jan2000	04:54	0.54	0.29	2.51	0.83
01Jan2000	04:55	0.53	0.29	2.51	0.80
01Jan2000	04:56	0.52	0.29	2.50	0.77
01Jan2000	04:57	0.52	0.29	2.50	0.74
01Jan2000	04:58	0.51	0.29	2.50	0.72
01Jan2000	04:59	0.50	0.29	2.50	0.70
01Jan2000	05:00	0.49	0.29	2.49	0.68
01Jan2000	05:01	0.48	0.29	2.49	0.66
01Jan2000	05:02	0.48	0.29	2.49	0.64
01Jan2000	05:03	0.47	0.29	2.49	0.62
01Jan2000	05:04	0.46	0.29	2.49	0.60

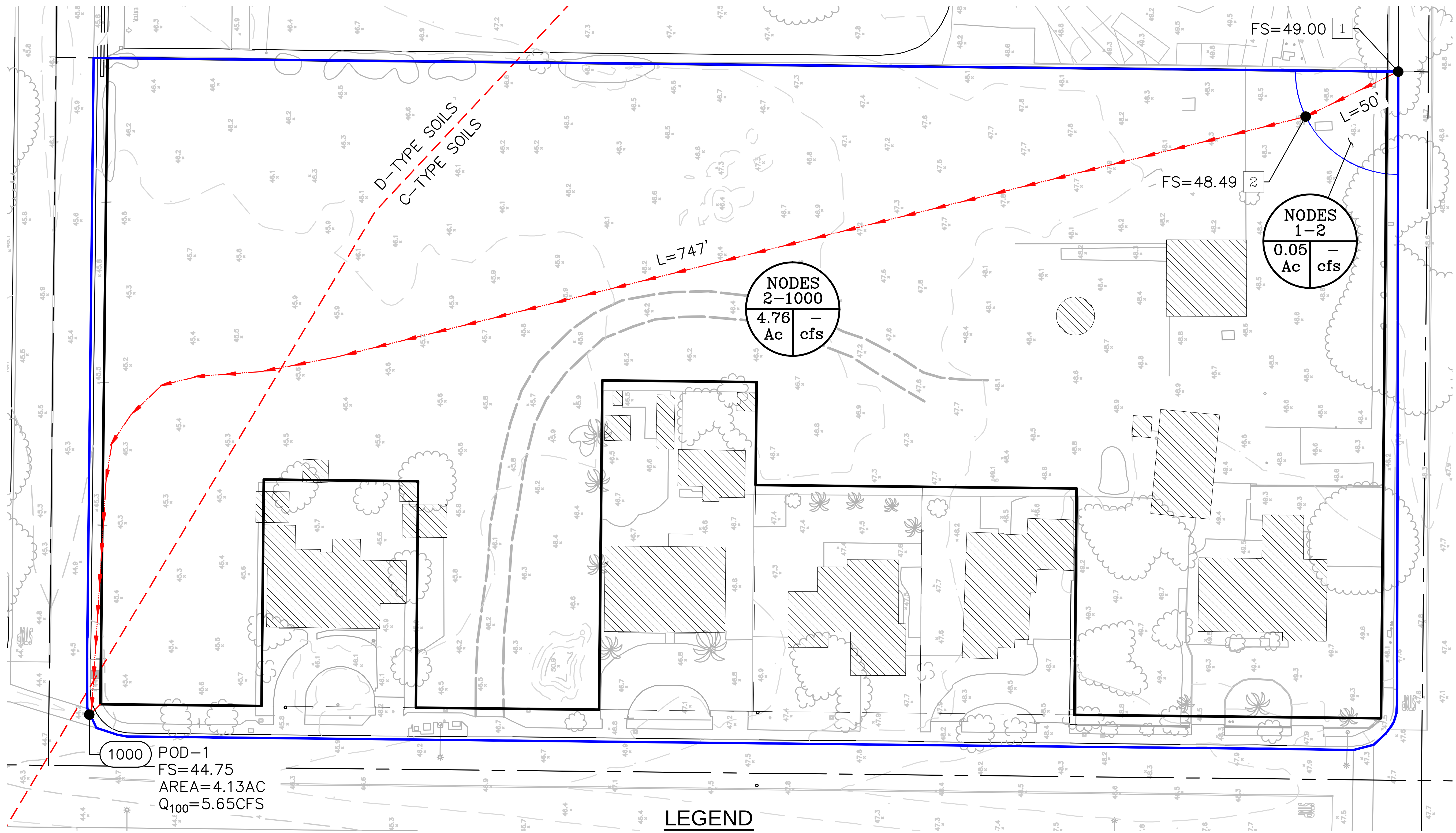
Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	05:05	0.45	0.29	2.49	0.59
01Jan2000	05:06	0.45	0.29	2.48	0.57
01Jan2000	05:07	0.44	0.29	2.48	0.56
01Jan2000	05:08	0.43	0.29	2.48	0.55
01Jan2000	05:09	0.42	0.29	2.48	0.53
01Jan2000	05:10	0.42	0.29	2.48	0.52
01Jan2000	05:11	0.41	0.29	2.48	0.52
01Jan2000	05:12	0.40	0.29	2.48	0.51
01Jan2000	05:13	0.40	0.29	2.48	0.50
01Jan2000	05:14	0.40	0.29	2.48	0.50
01Jan2000	05:15	0.40	0.29	2.47	0.49
01Jan2000	05:16	0.40	0.29	2.47	0.49
01Jan2000	05:17	0.40	0.29	2.47	0.48
01Jan2000	05:18	0.40	0.29	2.47	0.48
01Jan2000	05:19	0.40	0.29	2.47	0.47
01Jan2000	05:20	0.40	0.29	2.47	0.47
01Jan2000	05:21	0.40	0.29	2.47	0.46
01Jan2000	05:22	0.40	0.29	2.47	0.46
01Jan2000	05:23	0.40	0.29	2.47	0.46
01Jan2000	05:24	0.40	0.29	2.47	0.45
01Jan2000	05:25	0.40	0.29	2.47	0.45
01Jan2000	05:26	0.39	0.29	2.47	0.45
01Jan2000	05:27	0.38	0.29	2.47	0.44
01Jan2000	05:28	0.38	0.29	2.47	0.44
01Jan2000	05:29	0.37	0.29	2.47	0.44
01Jan2000	05:30	0.36	0.29	2.47	0.43
01Jan2000	05:31	0.35	0.29	2.46	0.43
01Jan2000	05:32	0.35	0.29	2.46	0.42
01Jan2000	05:33	0.34	0.29	2.46	0.42
01Jan2000	05:34	0.33	0.29	2.46	0.41
01Jan2000	05:35	0.32	0.29	2.46	0.41

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	05:36	0.32	0.29	2.46	0.40
01Jan2000	05:37	0.31	0.29	2.46	0.40
01Jan2000	05:38	0.30	0.29	2.46	0.39
01Jan2000	05:39	0.30	0.29	2.46	0.39
01Jan2000	05:40	0.30	0.29	2.46	0.38
01Jan2000	05:41	0.30	0.29	2.46	0.38
01Jan2000	05:42	0.30	0.29	2.46	0.37
01Jan2000	05:43	0.30	0.29	2.46	0.37
01Jan2000	05:44	0.30	0.29	2.46	0.36
01Jan2000	05:45	0.30	0.29	2.45	0.36
01Jan2000	05:46	0.30	0.29	2.45	0.36
01Jan2000	05:47	0.30	0.29	2.45	0.35
01Jan2000	05:48	0.30	0.29	2.45	0.35
01Jan2000	05:49	0.30	0.29	2.45	0.35
01Jan2000	05:50	0.30	0.28	2.45	0.34
01Jan2000	05:51	0.30	0.28	2.45	0.34
01Jan2000	05:52	0.30	0.28	2.45	0.34
01Jan2000	05:53	0.30	0.28	2.45	0.34
01Jan2000	05:54	0.30	0.28	2.45	0.33
01Jan2000	05:55	0.30	0.28	2.45	0.33
01Jan2000	05:56	0.30	0.28	2.45	0.33
01Jan2000	05:57	0.30	0.28	2.45	0.33
01Jan2000	05:58	0.30	0.28	2.45	0.33
01Jan2000	05:59	0.30	0.28	2.45	0.33
01Jan2000	06:00	0.30	0.28	2.45	0.32
01Jan2000	06:01	0.30	0.28	2.45	0.32
01Jan2000	06:02	0.30	0.28	2.45	0.32
01Jan2000	06:03	0.30	0.28	2.45	0.32
01Jan2000	06:04	0.30	0.28	2.45	0.32
01Jan2000	06:05	0.28	0.28	2.45	0.32
01Jan2000	06:06	0.25	0.28	2.45	0.31

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	06:07	0.23	0.28	2.45	0.31
01Jan2000	06:08	0.21	0.28	2.45	0.30
01Jan2000	06:09	0.18	0.28	2.45	0.30
01Jan2000	06:10	0.16	0.28	2.44	0.29
01Jan2000	06:11	0.14	0.28	2.44	0.28
01Jan2000	06:12	0.12	0.28	2.44	0.27
01Jan2000	06:13	0.09	0.28	2.44	0.26
01Jan2000	06:14	0.07	0.28	2.44	0.25
01Jan2000	06:15	0.05	0.28	2.44	0.24
01Jan2000	06:16	0.02	0.28	2.43	0.23
01Jan2000	06:17	0.00	0.28	2.43	0.22
01Jan2000	06:18	0.00	0.28	2.43	0.20
01Jan2000	06:19	0.00	0.28	2.43	0.19
01Jan2000	06:20	0.00	0.28	2.43	0.18
01Jan2000	06:21	0.00	0.28	2.43	0.17
01Jan2000	06:22	0.00	0.28	2.42	0.16
01Jan2000	06:23	0.00	0.28	2.42	0.15
01Jan2000	06:24	0.00	0.28	2.42	0.14
01Jan2000	06:25	0.00	0.28	2.42	0.13
01Jan2000	06:26	0.00	0.28	2.42	0.12
01Jan2000	06:27	0.00	0.28	2.42	0.12
01Jan2000	06:28	0.00	0.28	2.42	0.11
01Jan2000	06:29	0.00	0.28	2.42	0.10
01Jan2000	06:30	0.00	0.28	2.41	0.10
01Jan2000	06:31	0.00	0.28	2.41	0.09
01Jan2000	06:32	0.00	0.28	2.41	0.09
01Jan2000	06:33	0.00	0.28	2.41	0.08
01Jan2000	06:34	0.00	0.28	2.41	0.08
01Jan2000	06:35	0.00	0.28	2.41	0.07
01Jan2000	06:36	0.00	0.28	2.41	0.07
01Jan2000	06:37	0.00	0.28	2.41	0.06

Date	Time	Inflow (CFS)	Storage (AC-FT)	Elevation (FT)	Outflow (CFS)
01Jan2000	06:38	0.00	0.28	2.41	0.06
01Jan2000	06:39	0.00	0.28	2.41	0.06
01Jan2000	06:40	0.00	0.28	2.41	0.05
01Jan2000	06:41	0.00	0.28	2.41	0.05
01Jan2000	06:42	0.00	0.28	2.41	0.05
01Jan2000	06:43	0.00	0.28	2.41	0.04
01Jan2000	06:44	0.00	0.28	2.41	0.04
01Jan2000	06:45	0.00	0.28	2.41	0.04
01Jan2000	06:46	0.00	0.28	2.40	0.04
01Jan2000	06:47	0.00	0.28	2.40	0.03
01Jan2000	06:48	0.00	0.28	2.40	0.03
01Jan2000	06:49	0.00	0.28	2.40	0.03
01Jan2000	06:50	0.00	0.28	2.40	0.03
01Jan2000	06:51	0.00	0.28	2.40	0.03
01Jan2000	06:52	0.00	0.28	2.40	0.03
01Jan2000	06:53	0.00	0.28	2.40	0.02
01Jan2000	06:54	0.00	0.28	2.40	0.02
01Jan2000	06:55	0.00	0.28	2.40	0.02
01Jan2000	06:56	0.00	0.28	2.40	0.02
01Jan2000	06:57	0.00	0.28	2.40	0.02
01Jan2000	06:58	0.00	0.28	2.40	0.02
01Jan2000	06:59	0.00	0.28	2.40	0.02
01Jan2000	07:00	0.00	0.28	2.40	0.02

CHAPTER 7 – HYDROLOGY MAPS



50 25 0 50 100 150

SCALE: 1" = 50'

PER CITY OF SAN DIEGO HYDROLOGY MANUAL, D–TYPE SOILS ASSUMED

LEGEND

FLOW DIRECTION	
PROPERTY BOUNDARY	
DRAINAGE BOUNDARY	
EXISTING RESIDENCES	

SAVE DATE: 1/25/2018 ~ PLOT DATE: 1/29/2018 ~ FILE NAME: P:\Acad\1229 Saturn Blvd\Reports\Drainage Study\170327_1229_Drainage_PRE.dwg

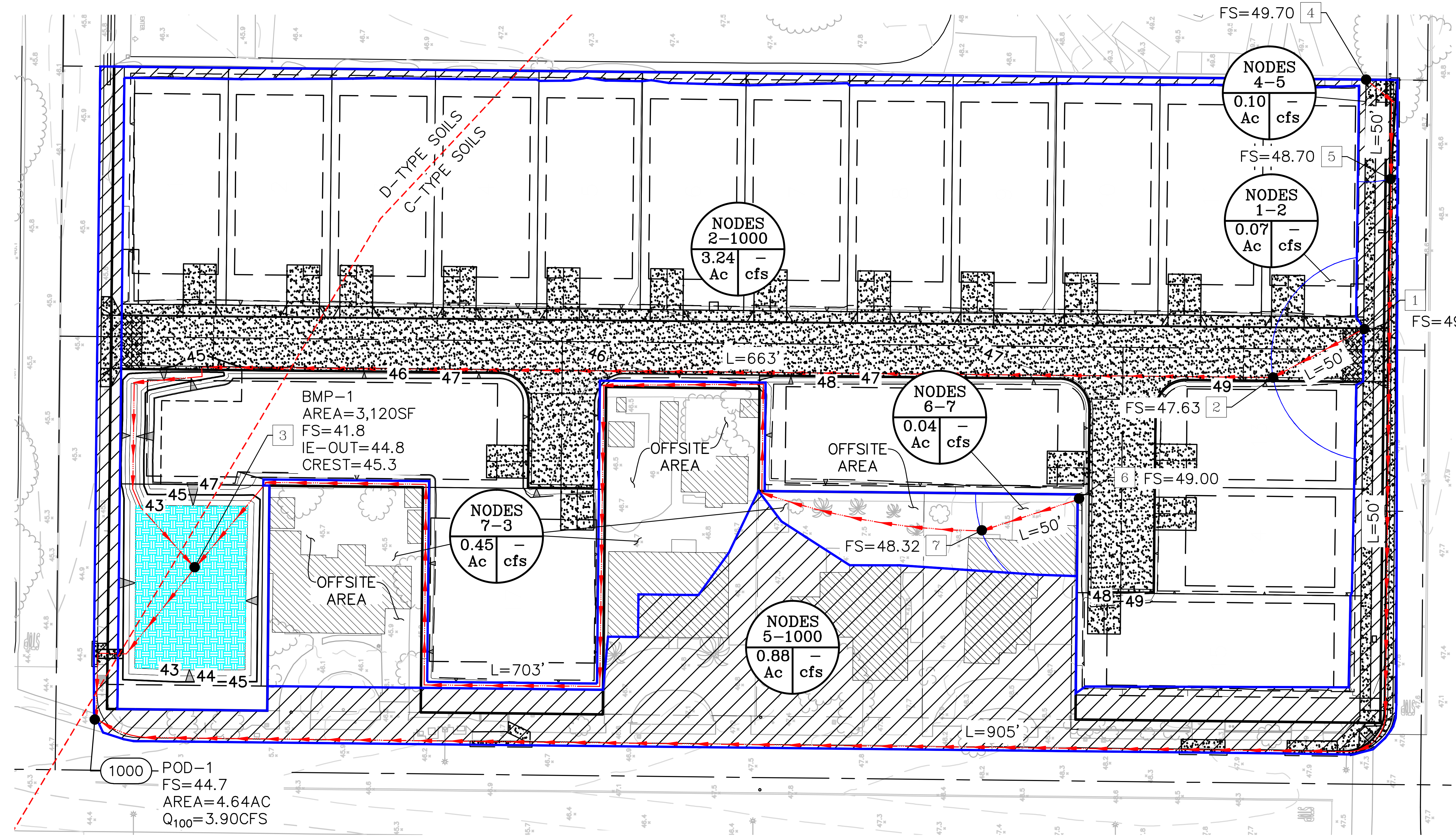
Civil Engineering · Environmental
Land Surveying
2442 Second Avenue
San Diego, CA 92101
(619)232-9200 (619)232-9210 Fax
REC Consultants, Inc.

DATE: 04/04/17
SCALE: 1" = 50'
DRAWN:
CHECKED:

SHEET TITLE
EXISTING CONDITIONS HYDROLOGY

PROJECT
SATURN BLVD
SAN DIEGO, CA 92154

SHEET 1 OF 1 SHEETS



PER CITY OF SAN DIEGO HYDROLOGY MANUAL, D-TYPE SOILS ASSUMED

50 25 0 50 100 150

SCALE: 1" = 50'

LEGEND

FLOW DIRECTION			
PROPERTY BOUNDARY		PROPOSED IMPERVIOUS SURFACE	
DRAINAGE BOUNDARY		BYPASS AREA	
EXISTING RESIDENCES		BMP AREA	

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

DATE: 04/04/17
SCALE: 1" = 50'
DRAWN:
CHECKED:

SHEET TITLE
PROPOSED CONDITIONS HYDROLOGY

PROJECT
1695 SATURN BOULEVARD
SAN DIEGO, CA 92154

SHEET 1 OF 1 SHEETS

CHAPTER 8 – HYDRAULIC ANALYSIS

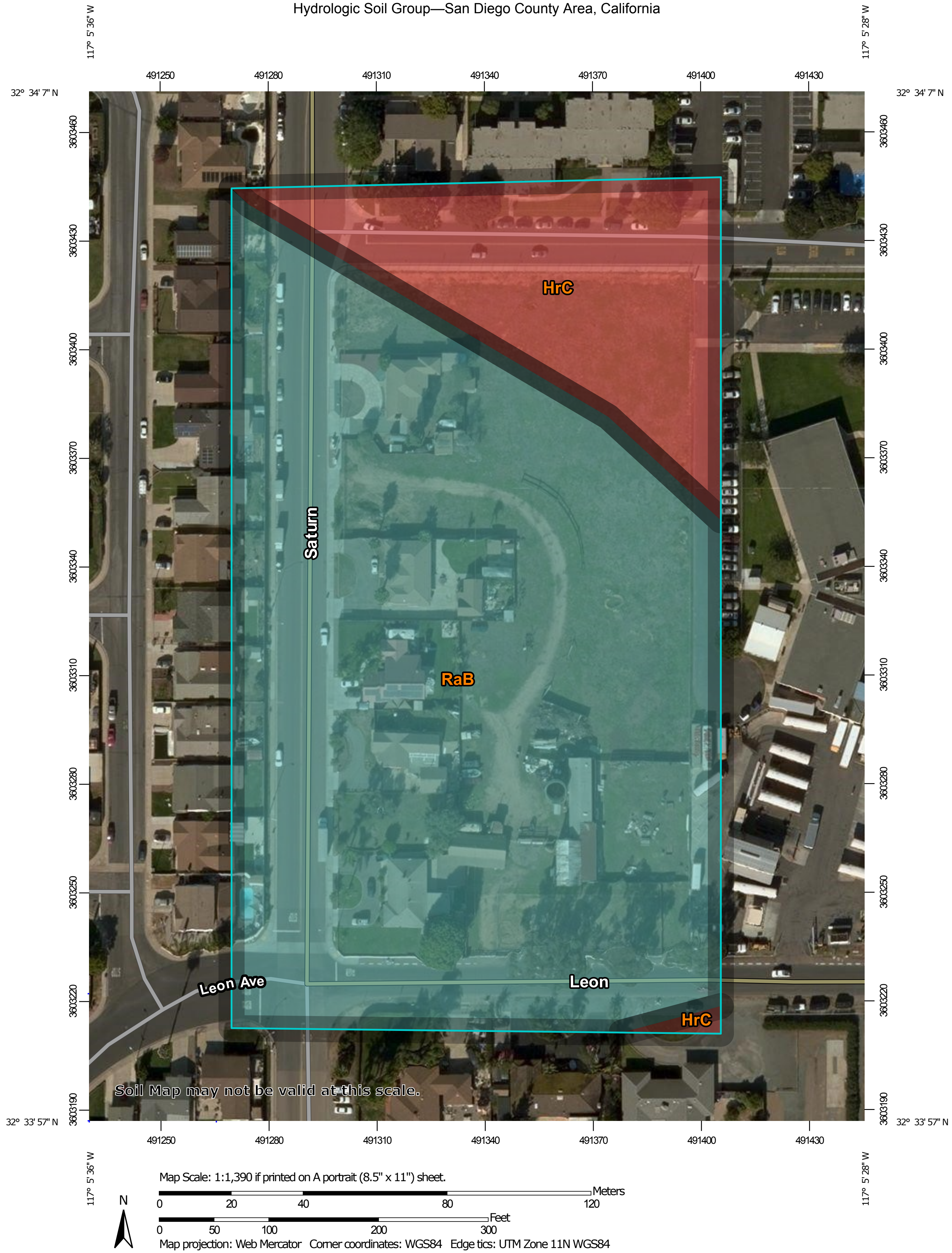
8.1 - Catch Basin & Inlet Sizing

Detention Basin	100-year Peak Inflow (cfs)	Peak Emergency Outflow Capacity (cfs)
BMP-1	6.03	7.68

POD	Type of Inlet	Surface Flow[2] Q (cfs)	Gutter Depression a (ft)	Flow Depth[3] y (ft)	Required Length of Opening[4] (ft)	Use Length [5] (ft)
1	Curb Inlet, Sag	6.03	0.33	0.44	5.0	5.0

CHAPTER 9 – APPENDICES

Hydrologic Soil Group—San Diego County Area, California



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

Streams and Canals

Transportation

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

Background

Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 10, Sep 12, 2016

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

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

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
HrC	Huerhuero loam, 2 to 9 percent slopes	D	1.5	19.2%
RaB	Ramona sandy loam, 2 to 5 percent slopes	C	6.4	80.8%
Totals for Area of Interest			**7.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the USDA National Agriculture Imagery Program (NAIP). this information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2009.

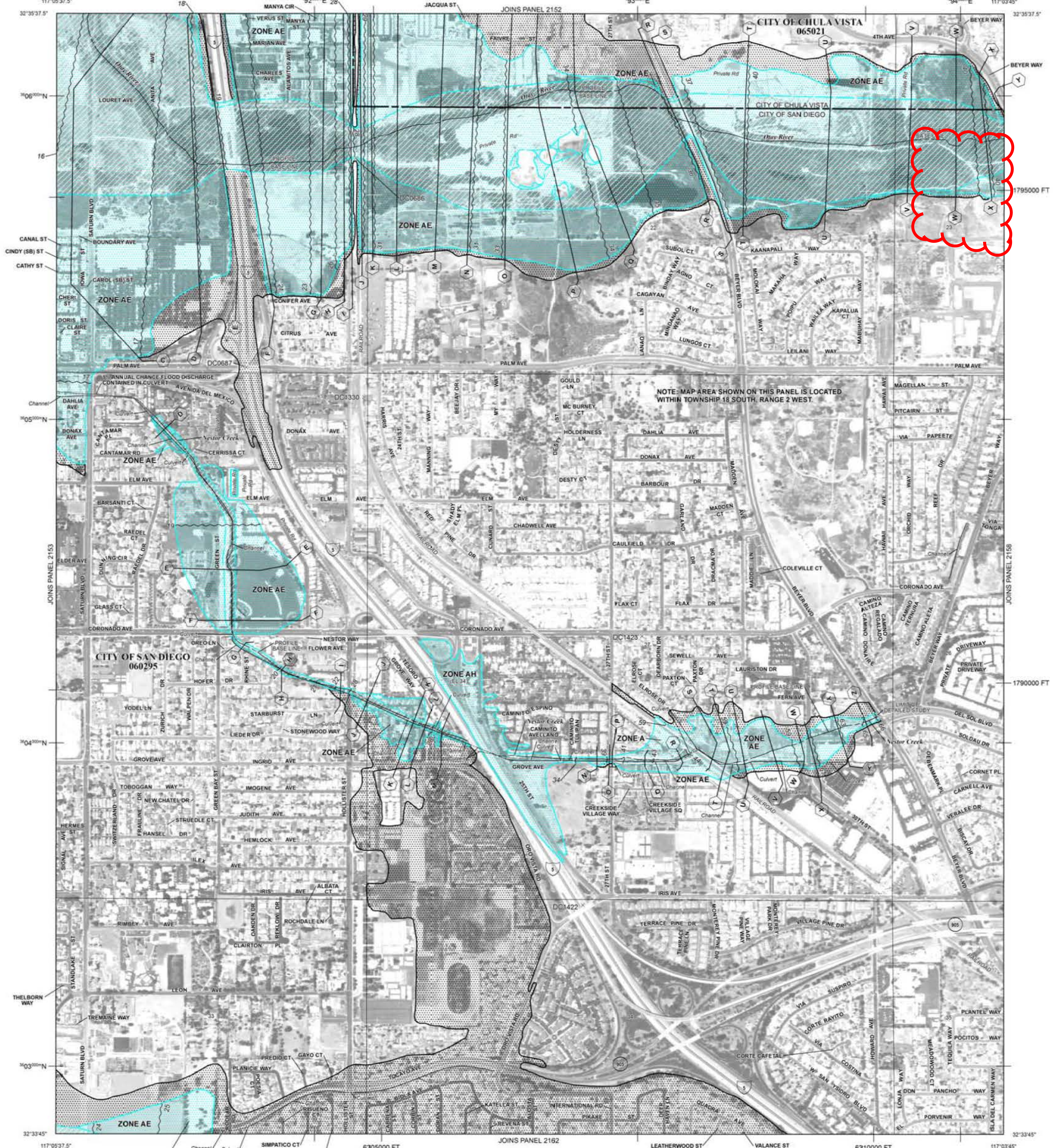
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information and questions about this map, available products associated with this FIRM including historic versions of this FIRM, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange at 1-877-FEMA-MAP (1-877-336-2627) or visit the FEMA Map Service Center website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the website. Users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website or by calling the FEMA Map Information eXchange.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.



1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)——(A)	Cross section line
(23)- - - -(23)	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000mE	1000-meter Universal Transverse Mercator grid ticks, zone 11
6000000 FT	5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012 - to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.
April 5, 2016 - to remove Provisionally Accredited Levee note

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2154H

FIRM
FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 2154 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CHULA VISTA, CITY OF	065021	2154	H
SAN DIEGO, CITY OF	060295	2154	H

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

MAP NUMBER
06073C2154H

MAP REVISED

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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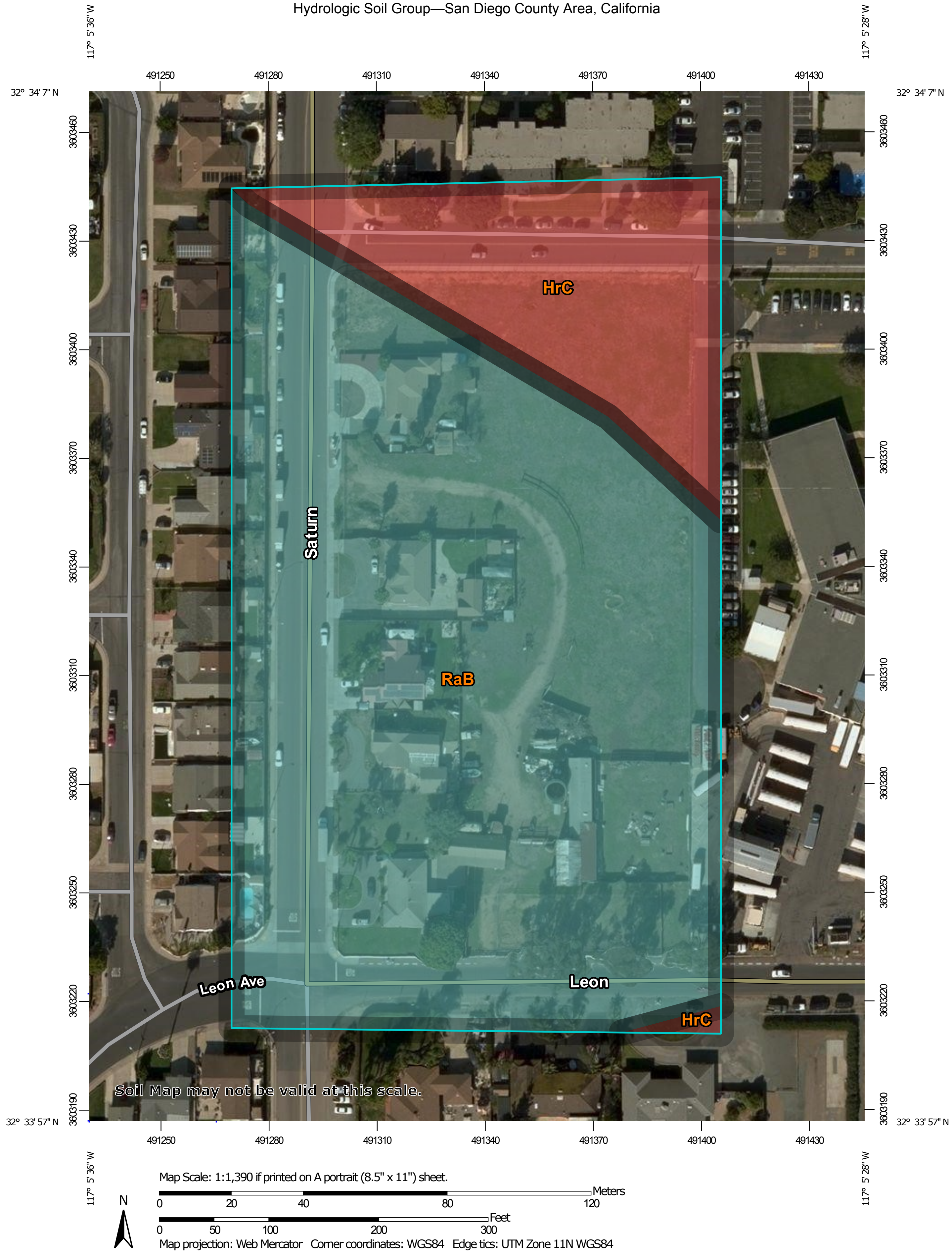
Hydrologic Soil Group—San Diego County Area, California



MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 10, Sep 12, 2016

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

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

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
HrC	Huerhuero loam, 2 to 9 percent slopes	D	1.5	19.2%
RaB	Ramona sandy loam, 2 to 5 percent slopes	C	6.4	80.8%
Totals for Area of Interest			**7.9**	**100.0%**

Description

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

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Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the USDA National Agriculture Imagery Program (NAIP). this information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2009.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

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Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

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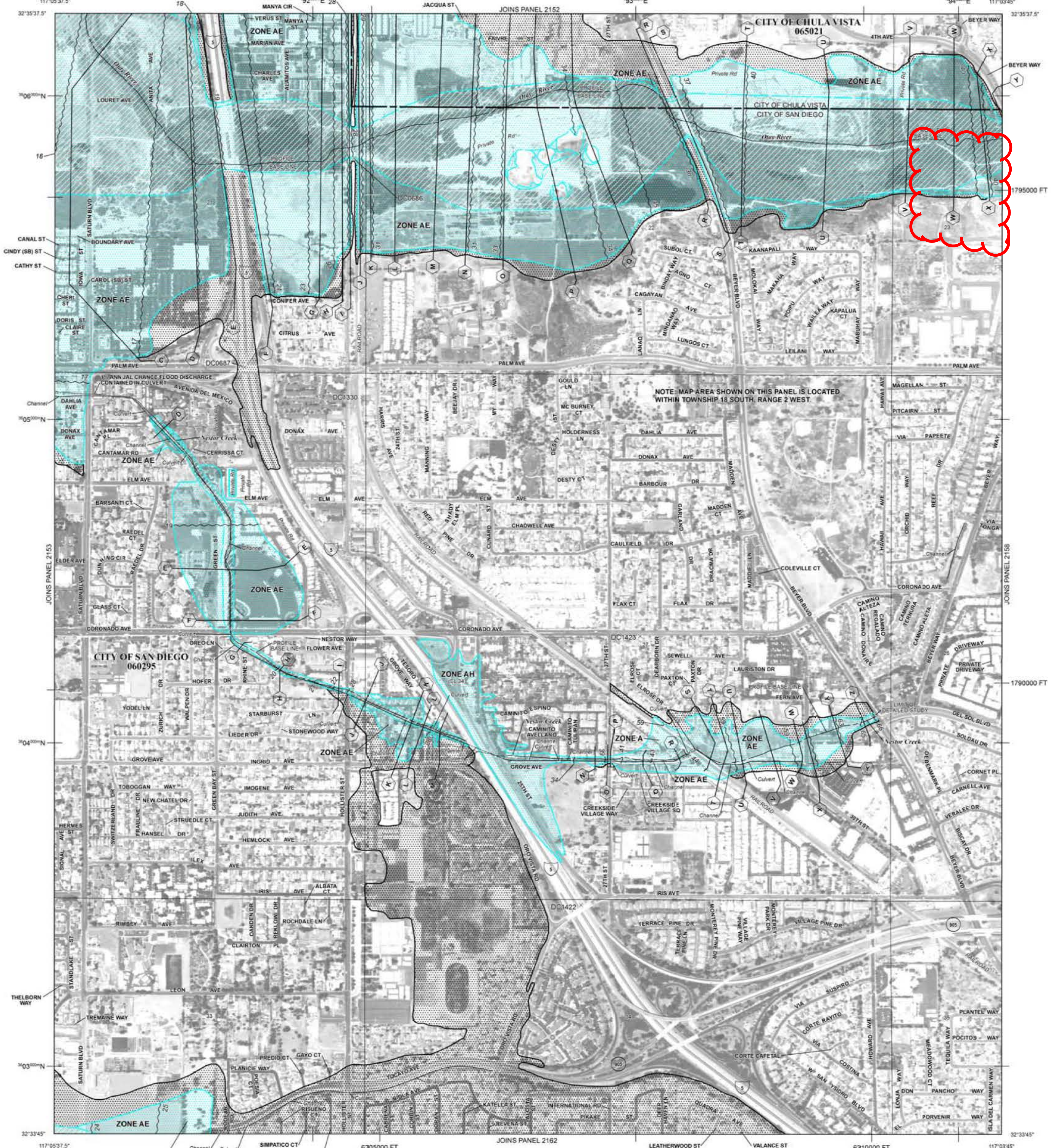
The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.



1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities

513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 - - - 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
4275000mE	1000-meter Universal Transverse Mercator grid ticks, zone 11
6000000 FT	5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
May 16, 2012 - to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.
April 5, 2016 - to remove Provisionally Accredited Levee note

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 2154H

FIRM
FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 2154 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CHULA VISTA, CITY OF	065021	2154	H
SAN DIEGO, CITY OF	060295	2154	H

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

MAP NUMBER
06073C2154H

MAP REVISED

September 26, 2018

Mr. David Larson
Palm Avenue Realty Company
950 Garland Drive
San Diego, CA 92165

Subject: **Feasibility of Onsite Stormwater Infiltration**
Proposed Single-Family Residential Subdivision Development
1695 Saturn Boulevard
San Diego, California
EEI Project AAA-72282.4

References: EEI, 2016, Due diligence Level Geotechnical Review and Results of Preliminary Percolation Study, Proposed Single-Family residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project AAA-72282.4, Dated February 15, 2016. Revised May 11, 2016.

EEI, 2017a, Supplemental Percolation Study, Proposed Single-Family residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project AAA-72282.4, Dated February 28, 2017.

EEI, 2017b, Geotechnical Evaluation, Proposed Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project AAA-72282.4, Dated December 15, 2017.

Dear Mr. Larson:

Pursuant to your request and authorization, EEI has prepared this Feasibility letter regarding proposed onsite stormwater infiltration at the subject property located in the City of San Diego, California.

SUMMARY OF INFILTRATION FEASIBILITY

Site-specific percolation/infiltration testing was performed by EEI during previous subsurface explorations at the site as referenced (EEI, 2017a). The results of our percolation/infiltration studies presented in our referenced geotechnical report (EEI, 2017a) indicate that the upper soil materials on the site are comprised of fine grained silty and clayey sand with reliable infiltration rates of 0.26 to 0.32 inches per hour. These rates are less than the recommended 0.5 inches per hour for full infiltration.

The groundwater levels at the subject site are reported to be greater than 40 feet of existing grades (EEI, 2017b). The site is not susceptible to liquefaction and seismic induced settlement, and is not located within an Alquist-Priolo Earthquake Fault Zone (EEI, 2017a, 2017b and 2017c). Based on these infiltration rates, reported subsurface conditions, and geotechnical/geologic hazards identified in the referenced reports, we consider the native soil materials onsite to be suitable for partial infiltration of stormwater.

<u>As a result, we consider the site to be feasible for partial infiltration of stormwater into the native soil materials onsite.</u>

LIMITATIONS

This Feasibility Evaluation has been conducted in accordance with generally accepted geotechnical engineering principles and practice. EEI's Feasibility Evaluation is based solely upon the site reconnaissance and a review of readily available previous geotechnical reports and publically available geologic information pertinent to the subject property performed by EEI.

EEI assumes no warranty as to the accuracy of the referenced reports. Findings provided herein have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time. This report has been prepared for the sole use of Palm Avenue Realty Company (Client), within a reasonable time from its authorization. Site conditions, land use (both onsite and offsite), or other factors may change as a result of manmade influences, and additional work may be required with the passage of time.

This Feasibility Evaluation should not be relied upon by other parties without the express written consent of EEI and the Client; therefore, any use or reliance upon this geotechnical review by a party other than the Client shall be solely at the risk of such third party and without legal recourse against EEI, its employees, officers, or directors, regardless of whether the action in which recovery of damages is brought or based upon contract, tort, statue, or otherwise. The Client has the responsibility to see that all parties to the project, including the designer, contractor, subcontractor, and building official, etc. are aware of this report in its complete form. This report contains information that may be used in the preparation of contract specifications; however, the report is not designed as a specification document, and may not contain sufficient information for use without additional assessment. EEI assumes no responsibility or liability for work or testing performed by others. In addition, this report may be subject to review by the controlling authorities.

EEI appreciates the opportunity to be of service for this project. If you have any questions, please contact the undersigned at (760) 431-3747.

Sincerely,
EEI

Jeffrey P. Blake
CEG 2248 (exp. 10/31/19)
Principal Engineering Geologist

Jerry L. Michal
GE 2515 (exp. 3/31/20)
Senior Geotechnical Engineer

Appendix A: City of San Diego I-8 Forms

Distribution: (2) Addressee (one via electronic copy and one hard copy)

\\Server1\public\EEI Projects\AAA SINGLE PROJ CLIENTS\AAA-72282 Saturn Blvd. LLC, Chula Vista\Geo Evaluation\Report\Infiltration Feasibility\AAA-72282.4 Feasibility Infiltration Letter FNL MC JPB JLM ks 9.27.18).doc

APPENDIX A

Project Name: SATURN BOULEVARD SINGLE FAMILY RESIDENTIAL PROJECT

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: o Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*) o Form I-8A (optional) o Form I-8B (optional) • Partial Infiltration Condition: o Infiltration Feasibility Condition Letter (*Note: must be stamped and signed by licensed geotechnical engineer*) o Form I-8A o Form I-8B • Full Infiltration Condition: o Form I-8A o Form I-8B o Worksheet C.4-3 o Form I-9 Refer to Appendices C and D of the BMP Design Manual for guidance.	☑ 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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions[1]	Worksheet C.4-1: Form I-8A[2]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
1695 Saturn Blvd.	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[3]? ○ 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.

[1] 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.

[2] 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.

[3] 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[2]
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.

Within the proposed Infiltration Basin, EEI performed borehole percolation tests at depths of 3 to 10 feet below ground surface (EEI, 2017a). Measured percolation rates were converted to measured infiltration rates using the porchet method. Measured infiltration rates varied from 0.53 to 0.63 in/hr. The factor of safety used was 2.0. This is based on the moderately homogenous loamy (silty/clayey sand) soils that were encountered during percolation testing, and the lack of shallow groundwater at the site as determined from our 2017 geotechnical evaluation (EEI, 2017b). When dividing the measured infiltration rates by the factor of safety of 2.0, the resulting reliable infiltration rates range from 0.26 to 0.32 in/hr. These are lower than the minimum 0.5 in/hr rate that the City/County of San Diego recommend for BMP design. Therefore, it is our opinion that full infiltration is not feasible on the subject site.

References: EEI, 2017a, "Supplemental Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4a", dated February 28, 2017

EEI, 2017b, "Geotechnical Evaluation, Saturn Boulevard, LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4", dated December 15, 2017

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
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[2]	
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[2]	
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. The reliable infiltration rates are less than 0.5 in/hr, therefore Full Infiltration is not feasible at the subject site (EEI, 2017a; EEI, 2017b). References: EEI, 2017a, "Supplemental Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4a", dated February 28, 2017 EEI, 2017b, "Geotechnical Evaluation, Saturn Boulevard, LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4", dated December 15, 2017			
Part 1 Result – Full Infiltration Geotechnical Screening [4]		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	

[4] 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[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
1695 Saturn Blvd.	Design
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). Three HSA borings were advanced within the proposed infiltration basin, to depths of 5 to 10 feet (borings B-2, B-3, and B-4). Percolation testing took place within these borings. The borings were emplaced within Pleistocene Old Paralic Deposits consisting of silty/clayey sand. After the borings were excavated, 3-inch diameter perforated PVC pipes were placed within the holes and gravel was placed around the pipe. The hole was pre-soaked with water and then testing was performed in 30 minute intervals to determine the water level until the change in water between three consecutive tests was less than 10%. Measured percolation rates were converted to measured infiltration rates using the Porchet Method. The measured infiltration rates varied from 0.63 to 0.53 in/hr. When applying the factor of safety of 2.0, the reliable infiltration rates for borings B-2, B-3, and B-4 was 0.32, 0.28, and 0.26 in/hr, respectively.	

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
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
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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions		Worksheet C.4-1: Form I-8A[2]	
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
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

Categorization of Infiltration Feasibility Condition based on Geotechnical Conditions	Worksheet C.4-1: Form I-8A[2]
Summarize findings and basis; provide references to related reports or exhibits. The site is not located within a liquefaction zone, nor is it susceptible to slope failure or seismically-induced landsliding. The onsite soils are fine-grained silty/clayey sands and the reliable infiltration rates are less than 0.5 in/hr. Due to these fine-grained soils and low infiltration rates, there is a potential for water to mound and cause damage to proposed utilities and the integrity of an existing structure on the southside of the proposed BMP (EEI, 2017a; EEI, 2017b). These problems can be mitigated by lining the proposed basin with impermeable membranes to prevent stormwater from backing up and damaging foundations/utilities. References: EEI, 2017a, "Supplemental Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4a", dated February 28, 2017 EEI, 2017b, "Geotechnical Evaluation, Saturn Boulevard, LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4", dated December 15, 2017	

Part 2 – Partial Infiltration Geotechnical Screening Result[5]	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

[5] 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 Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Part 1 - Full Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
1695 Saturn Blvd.	Design
Criteria 1: Groundwater Screening	
1A	**Groundwater Depth.** Is the depth to seasonally high groundwater tables (normal high depth during the wet season) beneath the base of any full infiltration BMP greater than 10 feet? ○ Yes; continue to Step 1B. ○ No; The depth to groundwater is less than or equal to 10 feet, but site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to step 1B. ⊙ No; The depth to groundwater is less than or equal to 10 feet and site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" for Criteria 1 Result.
1B	**Contaminated Soil/Groundwater.** Are proposed full infiltration BMPs at least 250 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. The setbacks must be the closest horizontal radial distance from the surface edge (at the overflow elevation) of the BMP. ○ Yes; continue to Step 1C. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1C. ⊙ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.

[1] 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.

[2] 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.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
1C	**Inadequate Soil Treatment Capacity.** Are full infiltration BMPs proposed in DMA soils that have adequate soil treatment capacity? The DMA has adequate soil treatment capacity if **ALL** of the following criteria (detailed in C.2.2.1) for all soil layers beneath the infiltrating surface are met: • USDA texture class is sandy loam or loam or silt loam or silt or sandy clay loam or clay loam or silty clay loam or sandy clay or silty clay or clay; and • Cation Exchange Capacity (CEC) greater than 5 milliequivalents/100g; and • Soil organic matter is greater than 1%; and • Groundwater table is equal to or greater than 10 feet beneath the base of the full infiltration BMP. ○ Yes; continue to Step 1D. ○ No; However, site layout changes or reasonable mitigation measures can be proposed to support full infiltration BMPs. Continue to Step 1D. ◉ No; Site layout changes or reasonable mitigation measures cannot be proposed to support full infiltration BMPs. Answer "No" to Criteria 1 Result.
1D	**Other Groundwater Contamination Hazards.** Are there site-specific groundwater contamination hazards not already mentioned (refer to Appendix C.2.2) that can be reasonably mitigated to support full infiltration BMPs? ○ Yes; there are other contamination hazards identified that can be mitigated. Answer "Yes" to Criteria 1 Result. ○ No; there are other contamination hazards identified that cannot be mitigated. Answer "No" to Criteria 1 Result. ◉ N/A; no contamination hazards are identified. Answer "Yes" to Criteria 1 Result.
Criteria 1 Result	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level? See Appendix C.2.2.8 for a list of typically reasonable and typically unreasonable mitigation measures. ○ Yes; Continue to Part 1, Criteria 2. ◉ No; Continue to Part 1 Result.

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Summarize groundwater quality and any mitigation measures proposed. Documentation should focus on groundwater table, mapped soil types and contaminated site locations. Infiltration rates are less than 0.5 in/hr. Therefore, Full Infiltration is not feasible on the subject site.	

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions		Worksheet C.4-2: Form I-8B[2]
Criteria 2: Water Balance Screening		
2A	**Ephemeral Stream Setback.** Does the proposed full infiltration BMP meet both the following? • The full infiltration BMP is located at least 250 feet away from an ephemeral stream; **AND** • The bottom surface of the full infiltration BMP is at a depth 20 feet or greater from seasonally high groundwater tables. ○ Yes; Answer "Yes" to Criteria 2 Result. ⦿ No; Continue to Step 2B.	
2B	**Mitigation Measures.** Can site layout changes be proposed to support full infiltration BMPs? ○ Yes; the site can be reconfigured to mitigate potential water balance issues. Answer "Yes" to Criteria 2 Result. ⦿ No; the site cannot be reconfigured to mitigate potential water balance issues. Continue to Step 2C and provide discussion.	
2C	**Additional studies.** Do additional studies support full infiltration BMPs? In the event that water balance effects are used to reject full infiltration (anticipated to be rare), additional analysis shall be completed and documented by a qualified professional indicating the site-specific information evaluated and the technical basis for this finding. ○ Yes; Answer "Yes" to Criteria 2 Result. ⦿ No; Answer "No" to Criteria 2 Result.	
Criteria 2 Result	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams? ○ Yes; Continue to Part 1 Result. ⦿ No; Continue to Part 1 Result.	

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions		Worksheet C.4-2: Form I-8B[2]
Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth. Infiltration rates are below 0.5 in/hr. Therefore, Full Infiltration is not feasible on the subject site.		
Part 1 – Full Infiltration Groundwater and Water Balance Screening Result[3]	**Result**	
If answers to Criteria 1 and 2 are "Yes", a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration based on groundwater conditions. If answer to Criteria 1 or Criteria 2 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design based on groundwater conditions. Proceed to Part 2.	○ Full Infiltration ◉ Complete Part 2	

[3] 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 Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Part 2 – Partial vs. No Infiltration Feasibility Screening Criteria	
DMA(s) Being Analyzed:	Project Phase:
1695 Saturn Blvd.	Design
Criteria 3: Groundwater Screening	
Contaminated Soil/Groundwater. Are partial infiltration BMPs proposed at least 100 feet away from contaminated soil or groundwater sites? This can be confirmed using GeoTracker (geotracker.waterboards.ca.gov) to identify open contaminated sites. This criterion is intentionally a smaller radius than full infiltration, as the potential quantity of infiltration from partial infiltration BMPs is smaller. ◉ Yes; Answer "Yes" to Criteria 3 Result. ○ No; However, site layout changes can be proposed to avoid contaminated soils or soils that lack adequate treatment capacity. Select "Yes" to Criteria 3 Result. It is a requirement for the SWQMP preparer to identify potential mitigation measures. ○ No; Contaminated soils or soils that lack adequate treatment capacity cannot be avoided and partial infiltration BMPs are not feasible. Select "No" to Criteria 3 Result.	
Criteria 3 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 risk of groundwater contamination that cannot be reasonably mitigated to an acceptable level? ◉ Yes; Continue to Part 2, Criteria 4. ○ No; Skip to Part 2 Result.	
Summarize findings and basis. Documentation should focus on mapped soil types and contaminated site locations. There are no known groundwater contaminants onsite or in the proximity of the site (GeoTracker, 2017). During our 2017 Geotechnical Investigation (EEI, 2017b), groundwater was not encountered to the maximum explored depth of 41.5 feet below ground surface. Groundwater wells north of the subject site record groundwater depths of approximately 20 feet below ground surface (GeoTracker, 2017). Considering all of this, Partial Infiltration should not have any negative effect on the groundwater quality. References: EEI, 2017b, "Geotechnical Evaluation, Saturn Boulevard, LLC, Proposed Residential Development, 1695 Saturn Boulevard, San Diego, CA, EEI Project No. AAA-72282.4", dated December 15, 2017 GeoTracker Website, 2017, State Water Resources Control Board GeoTracker Website, <http://geotracker.waterboards.ca.gov/>, accessed August 7, 2018	

Categorization of Infiltration Feasibility Condition based on Groundwater and Water Balance Conditions	Worksheet C.4-2: Form I-8B[2]
Criteria 4: Water Balance Screening	
Additional studies. In the event that water balance effects are used to reject partial infiltration (anticipated to be rare), a qualified professional must provide an analysis of the incremental effects of partial infiltration BMPs on the water balance compared to incidental infiltration under a no infiltration scenario (e.g. precipitation, irrigation, etc.).	
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 causing potential water balance issues such as change of seasonality of ephemeral streams? ◉ Yes: Continue to Part 2 Result. ○ No: Continue to Part 2 Result.	
Summarize potential water balance effects. Documentation should focus on mapping and soil data regarding proximity to ephemeral streams and groundwater depth. There are no ephemeral streams within 2000 feet of the subject site. The closest ephemeral stream is the Tijuana River located about half a mile to the south. As mentioned in the previous section, shallow groundwater is not present at the subject site. Partial Infiltration should not pose any challenge to water balance effects.	

Part 2 – Partial Infiltration Groundwater and Water Balance Screening Result[4]	Result
If answers to Criteria 3 and Criteria 4 are "Yes", a partial infiltration design is potentially feasible. The feasibility screening category is Partial Infiltration based on groundwater and water balance conditions. If answer to Criteria 3 or Criteria 4 is "No", then infiltration of any volume is considered to be infeasible within the site. The feasibility screening category is No Infiltration based on groundwater or water balance condition.	◉ Partial Infiltration Condition ○ No Infiltration Condition

[4] 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.

Worksheet C.4-3: Infiltration and Groundwater Protection for Full Infiltration BMPs

Infiltration and Groundwater Protection		Worksheet C.4-3	
Criteria	Question	Yes	No
1	Will the storm water runoff undergo pretreatment such as sedimentation or filtration prior to infiltration?	☐	☐
2	Are pollution prevention and source control BMPs implemented at a level appropriate to protect groundwater quality for areas draining to infiltration BMPs?	☐	☐
3	Is the vertical distance from the base of the full infiltration BMP to the seasonal high groundwater mark greater than 10 feet? This vertical distance may be reduced when the groundwater basin does not support beneficial uses and the groundwater quality is maintained	☐	☐
4	Does the soil through which infiltration is to occur have physical and chemical characteristics that are adequate for proper infiltration durations and treatment of runoff for the protection of groundwater beneficial uses? Refer to Appendix C.3.1.	☐	☐
5	Is the following statement true? Full infiltration BMPs are not used for areas of industrial or light industrial activity, and other high threat to water quality land uses and activities, unless source control BMPs to prevent exposure of high threat activities are implemented, or runoff from such activities is first treated or filtered to remove pollutants prior to infiltration.	☐	☐
6	Is the full infiltration BMP located at a distance greater than 100 feet horizontally from any water supply well?	☐	☐
Basis and Documentation: All the answers for Criteria 1 to 6 must be "Yes" for acceptance of a full infiltration BMP.			

EEI
Geotechnical & Environmental Solutions

February 28, 2017

Mr. David Larson
Palm Avenue Realty Company
950 Garland Drive
San Diego, California 92165

Subject: **Supplemental Percolation Study**
Proposed Single-Family Residential Subdivision Development
1695 Saturn Boulevard
San Diego, California
EEI Project No. AAA-72282.4a

Dear Mr. Larson:

Pursuant to your request and authorization, EEI has prepared this Supplemental Percolation Study for the subject property located in San Diego, California. The scope of EEI's service was to perform percolation testing to provide preliminary information to evaluate the feasibility of the installation of the proposed onsite storm-water disposal system and to assist with the design process.

This supplemental study is based upon information provided to us by Palm Avenue Realty Company and REC Consultants, as well as EEI's fieldwork, our referenced due diligence level geotechnical review and preliminary percolation study, research of readily available geologic reports and regional geologic maps, and our experience in the area. We understand that this supplemental percolation study is requested to be conducted to provide the infiltration characteristics of the subsurface materials to aid in the design of the proposed onsite storm-water disposal system at the subject property. A summary of our findings, conclusions and recommendations is provided herein.

SITE DESCRIPTION

Based on the information provided by Palm Avenue Realty Company and a review of GoogleEarth® online aerial photography, the subject property is generally located at the northeast corner of Saturn Boulevard and Leon Avenue in the City of San Diego, California. The approximately 4.1-acre property is identified by Assessor's Parcel Number (APN) 634-092-0100 and is addressed as 1695 Saturn Boulevard in San Diego, California.

The majority of the subject property appears to be undeveloped land, while the southern portion of the property is developed with a single-family residence, metal storage building and concrete silo. The existing developments on the property are reported to have been constructed in 1964. Additionally, an onsite septic/wastewater disposal system is indicated to be present on the property; the location and nature of the reported septic system is unknown (Ninyo & Moore, 2015). The property is surrounded by residential development to the north, south and west, and by Godfrey G. Berry Elementary School to the east. Access to the property is afforded by unpaved driveways located on Leon Avenue and Saturn Boulevard. Please refer to the Site Location Map-**Figure 1**, Aerial Site Map-**Figure 2**.

The subject property is situated within the United States Geological Survey (USGS) Imperial Beach 7.5 Minute Quadrangle. According to a Preliminary Grading Plan prepared by REC Consultants, Inc. (2016), surface elevations across the property vary from approximately 45 feet to 49 feet (NAVD88), with the highest surface elevations located in the southwestern corner and the lowest surface elevations located in the northwestern corner of the property. Overall surface gradients at the property are in a south to north direction.

Proposed Development

Preliminary grading plans prepared by REC Consultants, Inc., indicate the proposed future development will include up to 19 new single-family residential lots, one infiltration basin, a paved private driveway and other related improvements. Grading at the property will include cut and fill of generally less than 5 feet (exclusive of remedial earthwork) with earthwork quantities estimated at 3,400 cubic yards of cut and fill. No remedial estimates were provided on the plans.

FIELD EXPLORATION AND SUBSURFACE CONDITIONS

Field Exploration and Testing

Field work for our Supplemental Percolation Study was performed on February 17, 2017. A total of four hollow stem auger borings were advanced to depths ranging from approximately 5 to 11 feet below the ground surface in the area of the proposed storm-water/infiltration basin. Refusal was encountered in Boring B-1 at 11 feet below the ground surface due to the presence of gravels and cobbles. Subsurface materials encountered during our Supplemental percolation Study consisted of fill/topsoil overlying Old Paralic Deposits. A brief description of the subsurface conditions is provided in the following section.

Fill/Topsoil – Fill/topsoil was encountered in all of the exploratory borings to a depth of approximately ½ foot below the ground surface. The fill/topsoil consists of dark red-brown to orange-brown silty-sand with clay. The fill/topsoil materials were loose and moist at the time of our field exploration.

Old Paralic Deposits (Qop6) – As encountered in our exploratory borings, old paralic deposits were encountered immediately underlying the fill/topsoil within all four exploratory borings to the maximum explored depth of 11-feet below the existing ground surface. The paralic deposits observed consisted of red- and orange-brown to light brown clayey and silty-sands, sand and sandy-gravel. These materials were observed to be typically moist and medium dense at the time of our field exploration.

Detailed descriptions of the subsurface conditions are provided on the boring logs included in **Appendix A** and the approximate locations of the borings are shown on **Figure 1**.

Groundwater

Groundwater was not encountered in any of our exploratory borings. Based on our review of the Phase I prepared for the subject property (Ninyo & Moore, 2015), groundwater is expected to be at depths greater than 20 feet below the existing ground surface. Our review of the California Department of Water Resources - Water Data Library website indicated that there are no groundwater wells present on the property. It should be noted that variations in groundwater may result from fluctuations in the ground surface topography, subsurface stratification, rainfall, irrigation, and other factors that may not have been evident at the time of our subsurface exploration.

PERCOLATION TESTING

Following the drilling of the exploratory borings B-2 through B-4, a 3-inch diameter perforated polyvinyl chloride (PVC) pipe was placed in the cleaned-out holes and gravel was placed around the pipe. The test holes were presoaked for approximately two hours in general accordance with San Diego Region guidelines.

Percolation testing was performed until consistent results were obtained, which was then used to calculate the pre-adjusted percolation rate for the test hole. Upon conclusion of testing, the perforated pipe was removed from the test hole and the test holes were backfilled.

We note that a soil profile's percolation rate is not the same as its infiltration rate. Therefore, the measured/calculated field percolation rates were converted to an estimated infiltration rate utilizing a reduction factor determined using the Porchet method. The following **Table 1** presents the measured percolation rates and corresponding infiltration rates calculated for each test hole.

TABLE 1
Summary of Percolation Testing

Location	Depth (ft.)	Pre-Adjusted Percolation Rate (in/hr.)	Infiltration Rate (in/hr.)
B-2	~8-10	7.56	0.63
B-3	~3-5	4.80	0.56
B-4	~8-10	6.96	0.53

Summary of Findings

Based on the results of our percolation testing, it appears that a tested infiltration rate of 0.53-inches per hour can be used in the design of subsurface storm-water retention/disposal devices at the subject property. In general, our conclusion is that, on average, the onsite soils in the areas tested appear suitable for storm-water infiltration at the depths and locations tested. We provide the following conclusions regarding the percolation test results.

- It is EEI's professional opinion that the soils conditions and percolation characteristics encountered at the depths explored are representative of the on-site conditions in the vicinity of the boring locations. Percolation testing was performed within natural soils consisting of medium dense old paralic deposits.

- The San Diego Region BMP guidelines indicate that on-site storm-water BMPs can be designed for "Full-Infiltration" for subsurface materials with corrected infiltration rates equal to or greater than 0.5-inches per hour. Design of the storm-water disposal system should be in accordance with the County of San Diego guidelines. The completed Form I-8 of the City of San Diego Storm Water Standards is included as **Appendix B**.

- The project civil engineer should determine the appropriate factor of safety for the proposed disposal system.

We recommend that retention/disposal devices be situated at least three times their depth, or a minimum of 15 feet (whichever is greater), from the outside bottom edge of structural foundations. Structural foundations include (but are not limited to) buildings, loading docks, retaining walls, and screen walls. All stormwater disposal systems should be checked and maintained on regular intervals. Storm-water devices including bioswales that are located closer than 10 feet from any foundations/footings should be lined with an impermeable membrane to reduce the potential for saturation of foundation soils. Foundations may also need to be deepened.

LIMITATIONS

This Supplemental Percolation Study has been conducted in accordance with generally accepted geotechnical engineering principles and practice. EEI's Supplemental Percolation Study is based solely upon the site limited subsurface exploration and a review of publically available geologic information pertinent to the subject property performed by EEI.

EEI assumes no warranty as to the accuracy of the referenced reports. Findings provided herein have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time. This report has been prepared for the sole use of Palm Avenue Realty Company (Client), within a reasonable time from its authorization. Site conditions, land use (both onsite and offsite), or other factors may change as a result of manmade influences, and additional work may be required with the passage of time.

This Supplemental Percolation Study should not be relied upon by other parties without the express written consent of EEI and the Client; therefore, any use or reliance upon this geotechnical review by a party other than the Client shall be solely at the risk of such third party and without legal recourse against EEI, its employees, officers, or directors, regardless of whether the action in which recovery of damages is brought or based upon contract, tort, statue, or otherwise. The Client has the responsibility to see that all parties to the project, including the designer, contractor, subcontractor, and building official, etc. are aware of this report in its complete form. This report contains information that may be used in the preparation of contract specifications; however, the report is not designed as a specification document, and may not contain sufficient information for use without additional assessment. EEI assumes no responsibility or liability for work or testing performed by others. In addition, this report may be subject to review by the controlling authorities.

EEI appreciates the opportunity to be of service for this project. If you have any questions, please contact the undersigned at (760) 431-3747.

Sincerely,

EEI

Jeffrey P. Blake
CEG 2248 (exp. 10/31/17)
Principal Engineering Geologist

Jerry L. Michal
GE 2515 (exp. 3/31/18)
Senior Geotechnical Engineer

Attachments: Figures
Appendix A – Soil Classification Chart and Boring Logs
Appendix B – Form I-8 Categorization of Infiltration Feasibility Condition

Distribution: (2) Addressee (one via electronic copy and one hard copy)

\\192.168.0.2\public\EEI Projects\AAA SINGLE PROJ CLIENTS\AAA-72282 Palm Avenue Realty Chula Vista\Geo Evaluation\Report\2017 Report\AAA-72282.4 Saturn Blvd Spplmntl Perc Report (FNL JPB JLM ks cea 02.27.2017).doc

REFERENCES

County of San Diego, 2016, County of San Diego BMP Design Manual, For Permanent Site Design, Storm Water Treatment and Hydromodification Management, dated February 2016.

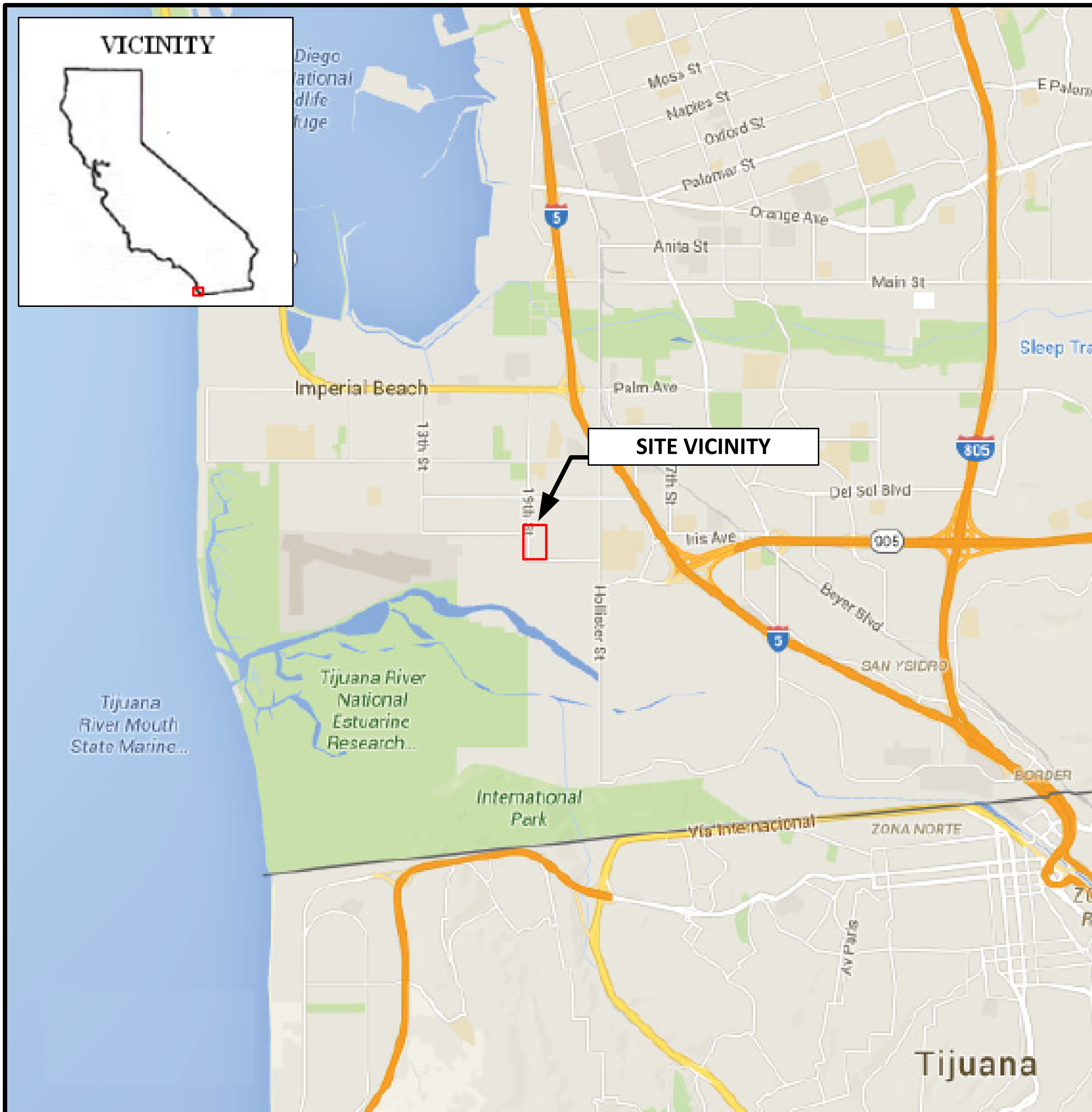
EEI, 2016, Due Diligence Level Geotechnical Review and Results of Preliminary Percolation Study, Proposed Single-Family Residential Subdivision Development, 1695 Saturn Boulevard, San Diego, California, EEI Project Number AAA-72282.4, dated February 15, 2016. Revised May 11, 2016.

GeoTracker Website, 2016, State Water Resources Control Board GeoTracker Website, website address <*http://geotracker.waterboards.ca.gov/*>, accessed February 2017.

Google Earth®, 2017, Version 7.1.7.2606

Ninyo & Moore, 2015, Phase I, Environmental Site Assessment, 1695 Saturn Boulevard, San Diego, California, Project No. 108063001, dated December 4, 2015.

FIGURES



LEGEND

N

Scale: 1" = 1mi

0 1mi 2mi

Note: All Locations Are Approximate

SITE VICINITY MAP

Palm Avenue Realty Company

Proposed Single-Family Residential Subdivision

1695 Saturn Boulevard
San Diego, California
EEI Project No. AAA-72282.4a
Created February 2017

EEI Geotechnical & Environmental Solutions

FIGURE 1

Map Source: Google Maps®; Accessed 2017

LEGEND

N

Scale: 1" = 120'

0 60 ft 120 ft 240 ft

Note: All Locations Are Approximate

AERIAL SITE MAP

Palm Avenue Realty Company

Proposed Single-Family Residential Subdivision

1695 Saturn Boulevard

San Diego, California

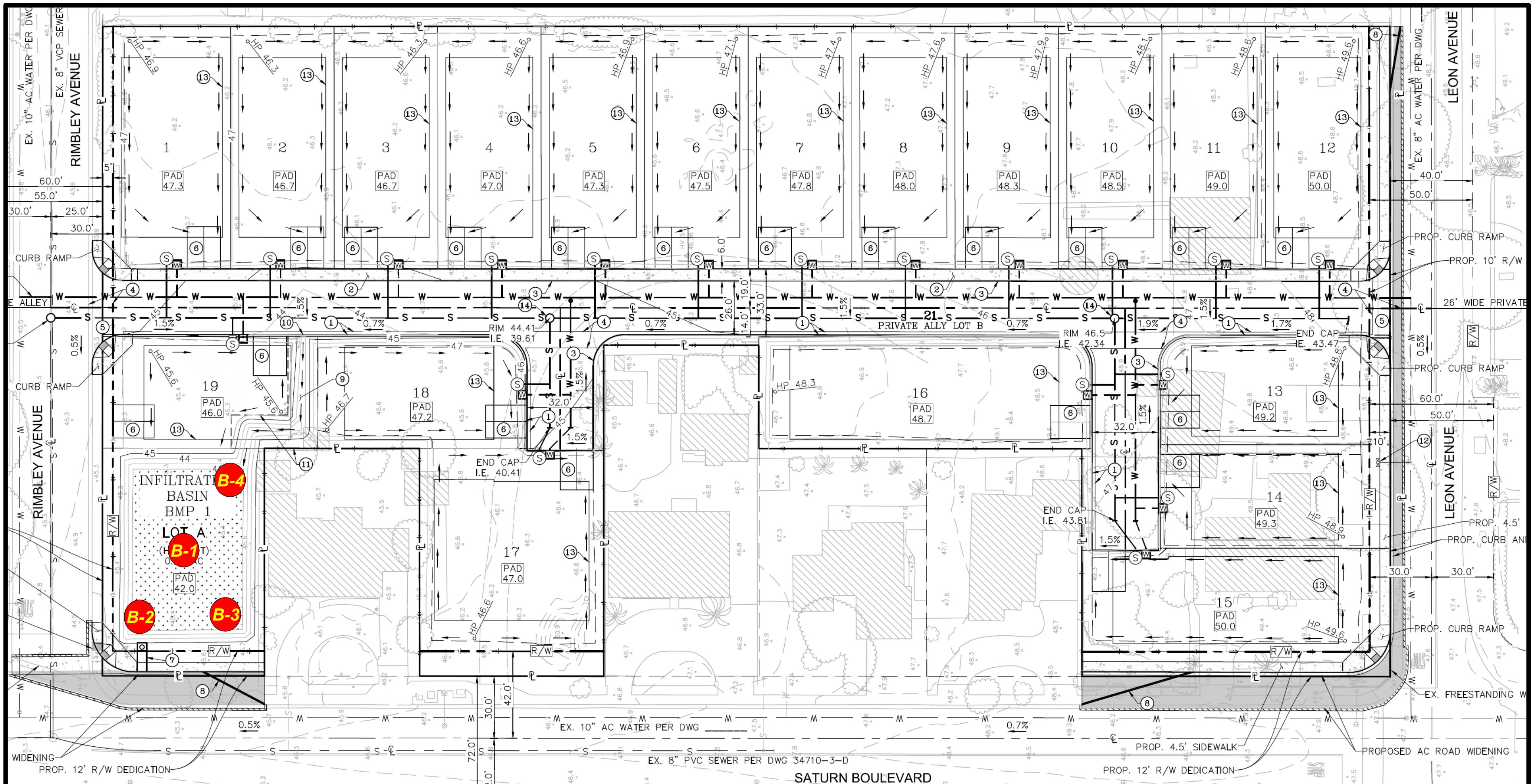
EEI Project No. AAA-72282.4a

Created February 2017

EEI Geotechnical & Environmental Solutions

FIGURE 2

Source: Google Earth, 2017



LEGEND

B-4 *Approximate Boring/Percolation Test Location*

Scale: 1" = 80'

0 40 ft 80 ft 160 ft

Note: All Locations Are Approximate

GEOTECHNICAL MAP

Palm Avenue Realty Company

Proposed Single-Family Residential Subdivision

1695 Saturn Boulevard

San Diego, California

EEI Project No. AAA-72282.4a

Created February 2017

EEI Geotechnical & Environmental Solutions

FIGURE 3

Source: REC Consultants, Inc., 2016

APPENDIX A
SOIL CLASSIFICATION CHART AND BORING LOGS

UNIFIED SOIL CLASSIFICATION (ASTM D-2487-98)

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SEIVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL- SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND- CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION REATINED ON NO. 4 SEIVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS,GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY-SANDS, SAND – SILT MIXTURES
				SC	CLAYEY SANDS, SAND – CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS

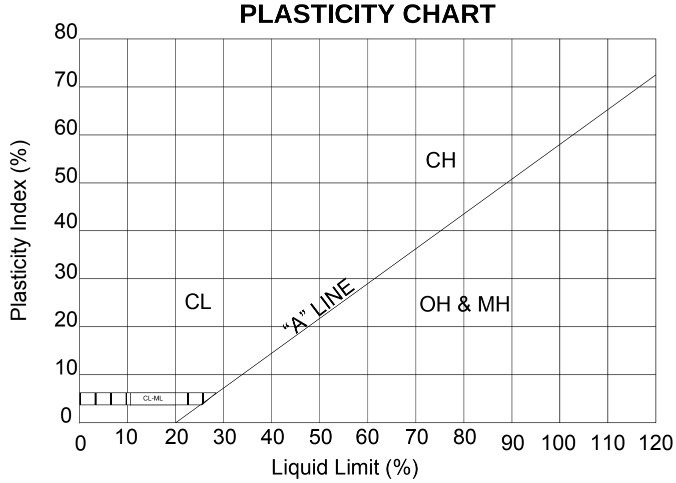
SAMPLER TYPES

- SPT
- Modified California (2.5" I.D.)
- Bulk
- Rock Core
- Shelby Tube
- Water Level

OTHER TESTS

- ATT – Atterberg Limit (Plasticity Index)
- CD – Consolidated Drained Triaxial
- CON – Consolidation
- COR – Corrosivity)
- DS – Direct Shear
- EI – Expansion Index
- MAX – Maximum Density
- RV – R-Value
- SA – Sieve Analysis
- -#200 - Percent Passing #200 Sieve
- TV – Torvane Shear
- UU – Unconsolidated Undrained Triaxial

PLASTICITY CHART



PENETRATION RESISTANCE
(Recorded As Blows/Foot)

SAND & GRAVEL		SILT & CLAY		
Relative Density	Blows/Foot* N_{60}	Consistency	Blows/Foot* N_{60}	Strength**(KSF)
Very Loose	0-4	Very Soft	0 - 2	0 – 0.5
Loose	4-10	Soft	2 - 4	0.5 – 1.0
Medium Dense	10-30	Medium Stiff	4 - 8	1.0 – 2.0
Dense	30-50	Stiff	8 - 15	2.0 – 4.0
Very Dense	Over 50	Very Stiff	15 - 30	4.0 – 8.0
		Hard	Over 30	Over 8.0

* Number of blows of 140LB hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split barrel sampler the last 12 inches of an 18-inch drive (ASTM-1586 Standard Penetration Test)

** Undrained shear strength in kips/sq. ft. As determined by laboratory testing or approximated by the standard penetration test, pocket penetrometer, torvane, or visual observation

EEI Geotechnical & Environmental Solutions

LEGEND TO SOIL DESCRIPTIONS

APPENDIX A

BORING NUMBER B-1

EEI Geotechnical & Environmental Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 2/17/17 **COMPLETED** 2/17/17
GROUND ELEVATION 47 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-53
HAMMER EFFICIENCY (%) 68
METHOD 140 lb Auto Hammer
SPT CORRECTION 1.13 **CAL CORRECTION** 0.62
LOGGED BY BM **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark red-brown, fine grained, moist, loose	SM									
0.5		**OLD PARALIC DEPOSITS (Qop6)** @ 0.5' CLAYEY-SAND with SILT, light orange-brown, fine grained, moist, dense	SC-SM									
8		@ 8' SILTY-SAND, light brown, fine to coarse grained, moist, dense	SM									
10		@ 10' SANDY-GRAVEL, orange-brown, fine to coarse-grained with gravel up to 3-inches	GP									
11		@ 11' Refusal encountered while drilling										

Total depth: 11-feet (refusal)
No groundwater encountered
Boring backfilled with cuttings

GEOTECH LOG - COLUMNS AAA-72882.4.GPJ GINT STD US LAB.GDT 2/21/17

BORING NUMBER B-2

EEI Geotechnical & Environmental Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 2/17/17 **COMPLETED** 2/17/17
GROUND ELEVATION 47 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-53
HAMMER EFFICIENCY (%) 68
METHOD 140 lb Auto Hammer
SPT CORRECTION 1.13 **CAL CORRECTION** 0.62
LOGGED BY BM **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark red-brown, fine grained, moist, loose	SM									
1–4		**OLD PARALIC DEPOSITS (Qop6)** @ 0.5' SILTY-SAND, dark red-brown, fine grained, moist, medium dense	SM									
4–8		@ 4' CLAYEY-SAND with SILT, light orange-brown, moist, medium dense	SC									
8–10		@ 8' SAND with SILT, orange-brown, fine grained, moist, medium dense	SP-SM	SPT	11 7 8	17						

Total depth: 10-feet
No groundwater encountered
Percolation test performed
Boring backfilled with cuttings

BORING NUMBER B-3

EEI Geotechnical & Environmental Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 2/17/17 **COMPLETED** 2/17/17
GROUND ELEVATION 48 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-53
HAMMER EFFICIENCY (%) 68
METHOD 140 lb Auto Hammer
SPT CORRECTION 1.13 **CAL CORRECTION** 0.62
LOGGED BY BM **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark red-brown, fine grained, moist, loose	SM									
1 2 3		**OLD PARALIC DEPOSITS (Qop6)** @ 0.5' CLAYEY-SAND with SILT, red-brown, fine grained, moist, medium dense	SM									
4		@ 4' SILTY-SAND, orange-brown, fine to medium-grained, some gravel, moist, medium dense	SM	SPT	5 11 7	20						
5												

Total depth: 5-feet
No groundwater encountered
Percolation test performed
Boring backfilled with cuttings

BORING NUMBER B-4

EEI Geotechnical & Environmental Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 2/17/17 **COMPLETED** 2/17/17
GROUND ELEVATION 47 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Truck Mounted B-53
HAMMER EFFICIENCY (%) 68
METHOD 140 lb Auto Hammer
SPT CORRECTION 1.13 **CAL CORRECTION** 0.62
LOGGED BY BM **CHECKED BY** JB
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark orange-brown, fine grained, moist, loose	SM									
1–4		**OLD PARALIC DEPOSITS (Qop6)** @ .5' SILTY-SAND, red-brown, fine grained, moist, medium dense	SM									
4–6		@ 4' CLAYEY-SAND with SILT, red-brown, moist, medium dense	SC-SM									
6–8.5		@ 6' SILTY-SAND, light brown, fine-grained, moist, medium dense	SM									
8.5–10		@ 8.5' SAND, orange-brown, fine to medium-grained, some silt, moist, medium dense	SP	SPT	4 8 8	18						
10												

Total depth: 10-feet
No groundwater encountered
Percolation test performed
Boring backfilled with cuttings

APPENDIX B
FORM I-8 - CATERGORIZATION OF INFILTRATION FEASIBILITY CONDITION

Categorization of Infiltration Feasibility Condition				**Form I-8**
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?				
Criteria	Screening Question		Yes	No
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X	
Provide basis: Infiltration testing indicated 0.53 to 0.63in/hr. Ave.=0.57 in/hr. Full infiltration of surface runoff is considered feasible. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.				
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.		X	
Provide basis: The subject site is currently a relatively flat undeveloped site. The recommended structural foundation setbacks provided in this report for the proposed storm-water/infiltration basin would mitigate any risks of geotechnical hazards. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.				

Form I-8 Page 2 of 4			
Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: No shallow ground water was encountered during our field investigation. Groundwater is expected to be at depths greater than 20 feet below the proposed storm-water/infiltration basin. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	X	
Provide basis: Infiltration testing indicated 0.53 to 0.63in/hr. Ave.=0.57 in/hr. No ephemeral streams are located on, adjacent to, or in the vicinity of the site. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2	Part 1 "yes"	

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

Form I-8 Page 3 of 4			
Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?			
Criteria	Screening Question	Yes	No
5	Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.	N/A	
Provide basis: Not Applicable Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			
6	Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	N/A	
Provide basis: Not Applicable Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.			

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

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

February 15, 2016
Revised May 11, 2016

Mr. David Larson
Palm Avenue Realty Company
950 Garland Drive
San Diego, California 92165

Subject: **Due Diligence Level Geotechnical Review and Results of Preliminary Percolation Study**
Proposed Single-Family Residential Subdivision Development
1695 Saturn Boulevard
San Diego, California
EEI Project No. AAA-72282.4

Dear Mr. Larson:

Pursuant to your request and authorization, EEI has prepared this Due Diligence Level Geotechnical Review and Preliminary Percolation Study for the subject property located in San Diego, California. This report presents the findings and opinions of our geotechnical review with regard to the property and the geotechnical factors that may have an impact on the proposed site construction. This report is based on our review of readily available geologic and geotechnical information online, including a review of City of San Diego files and a site reconnaissance.

Additionally, a limited subsurface exploration for preliminary percolation testing was performed as part of our scope of services. The percolation testing was performed to provide preliminary information to evaluate the feasibility of the installation of an onsite stormwater disposal system and to assist with the initial stages of the design process.

This geotechnical review and percolation study has been conducted in general accordance with the accepted geotechnical engineering principles and in general conformance with the approved proposal and cost estimate for the project by EEI, dated December 14, 2015.

SITE DESCRIPTION

Based on the information provided by Kettler Leweck Engineering and a review of GoogleEarth® online aerial photography, the subject property is generally located at the northeast corner of Saturn Boulevard and Leon Avenue in the City of San Diego, California. The approximately 4.1-acre property is identified by Assessor's Parcel Number (APN) 634-092-0100 and is addressed as 1695 Saturn Boulevard in San Diego, California.

The majority of the subject property appears to be undeveloped land, while the southern portion of the property is developed with a single-family residence, metal storage building and concrete silo. The existing developments on the property are reported to have been constructed in 1964. Additionally, an onsite septic/wastewater disposal system is indicated to be present on the property; the location and nature of the reported septic system is unknown (Ninyo & Moore, 2015). The property is surrounded by residential development to the north, south and west, and by Godfrey G. Berry Elementary School to the east. Access to the property is afforded by unpaved driveways located on Leon Avenue and Saturn Boulevard. A site vicinity map is attached as **Figure 1**.

The subject property is situated within the United States Geological Survey (USGS) Imperial Beach 7.5 Minute Quadrangle. According to Conceptual Lotting Study prepared by Kettler Leweck Engineering (2015), surface elevations across the property vary from approximately 45 feet to 51 feet (NAVD88), with the highest surface elevations located in the southwestern and the lowest surface elevations located in the northwestern corner of the property. Overall surface gradients at the property are in a south to north direction. An aerial site map is attached as **Figure 2**.

Proposed Development

Based on the information provided by Kettler Leweck Engineering, the proposed future development will include up to 18 new single-family residential lots, two detention basins, a paved private driveway and other related improvements. EEI understands that a Geotechnical Review is required to support a Section 4 Development Permit (Tentative Map/Planned Development Permit) at the subject property. No further information is known at this time.

Previous Geotechnical Work

As a part of our Geotechnical Review of the subject property, a review of City of San Diego Building Department files was performed in conjunction with our field exploration and site reconnaissance of the property on February 4, 2016. No geotechnical reports pertaining to the property or adjacent properties were found within the City of San Diego files.

SUMMARY OF GENERAL GEOLOGY AND SUBSURFACE GEOTECHNICAL CONDITIONS

General Geology

Regionally, the subject property lies within the Peninsular Ranges Geomorphic Province of southern California. This province consists of a series of ranges separated by northwest trending valleys; sub parallel to branches of the San Andreas Fault (CGS, 2002). The Peninsular Ranges geomorphic province, one of the largest geomorphic units in western North America, extends from the Transverse Ranges geomorphic province and the Los Angeles Basin, south to Baja California. It is bound on the west by the Pacific Ocean, on the south by the Gulf of California and on the east by the Colorado Desert Province. The Peninsular Ranges are essentially a series of northwest-southeast oriented fault blocks (CGS, 2002). Major fault zones and subordinate fault zones found in the Peninsular Ranges Province typically trend in a northwest-southeast direction.

Regional geologic maps of the subject property and vicinity (Tan and Kennedy, 2008) indicate the area of the subject property is underlain by late to middle Pleistocene-age old paralic deposits (map symbol Qop6). The paralic deposits are typically composed of poorly-sorted, reddish-brown strandline, beach, estuarine or colluvial deposits composed of sandstone, siltstone, and conglomerate.

Faulting and Seismicity

Based upon our review of available references, no active or potentially active faults are known to cross the subject property. Therefore, the likelihood of ground surface rupture due to faulting occurring at the property is considered low. The property is not situated within an Earthquake Fault Zone as defined by the State of California (Hart and Bryant, 1997, CDMG, 2000). There are a number of faults in this region that are considered active and would generate ground shaking, should they be the source of an earthquake. Some of the nearest active faults that could produce secondary effects include the Rose Canyon fault, located approximately 3.3 miles from the property, and the Coronado Bank fault, located approximately 11.3 miles from the property.

Geologic Hazards

Based upon our review of limited references for the subject property, it appears that the primary geologic hazard for the property is ground shaking due to an earthquake event occurring along one of the major active faults that are located in the seismically active region of Southern California where the property is situated. Our review of pertinent geologic literature (City of San Diego, 2008) indicates that the property is located within a City of San Diego Geologic Hazards Category 52, identified as “Other level areas, gently sloping to steep terrain, favorable geologic structure, Low Risk”. However, a review of the CGS seismic hazards website indicates that a State of California seismic hazard study has not been completed for the Imperial Beach Quadrangle. Furthermore, liquefaction potential and other geologic hazards (i.e. slope stability, expansive soil, tsunamis, etc.) have not been analyzed for the property.

SUMMARY OF SITE AND GEOTECHNICAL CONDITIONS

Site Reconnaissance

A representative of EEI performed a reconnaissance of the subject property on February 4, 2016. EEI accessed the subject property from the southern portion of the property, along Leon Avenue. EEI staff traversed the property by vehicle where accessible and by foot where inaccessible. The property was fenced off on all boundaries, excluding the access points on Leon Avenue and Saturn Boulevard. The southwestern corner of the property is currently developed with a private residence, and as a result was not able to be accessed during our reconnaissance.

The majority property is currently undeveloped, lightly vegetated land. The ground surface on the subject property consists of natural soils and minor vegetative growth. The southern portion of the property is developed with a single-family residence, metal storage building and concrete silo. The overall property locale is generally level grade and characterized by low topographic relief. Signs of previous grading at the property were not observed during our site reconnaissance.

Field Exploration and Testing

Field work was performed on February 4, 2016 and included the drilling of five (5) small diameter exploratory boring with a tri-pod auger drill rig to evaluate shallow subsurface conditions and to perform percolation testing. The exploratory boring was advanced to depths ranging from approximately 5 to 8 feet below the ground surface in the areas of the proposed stormwater detention/disposal facilities. The exploratory borings were logged and continuously sampled by one of EEI’s field geologists under the supervision of EEI’s Certified Engineering Geologist and Registered Geotechnical Engineer. Soils encountered were classified in accordance with the American Society of Testing Materials (ASTM) Unified Soil Classification System (ASTM, 2015), and representative samples were collected at various depths for laboratory testing from the exploratory boring. The boring logs are presented in **Appendix A.**

Percolation testing was performed in our exploratory boring in general accordance with the San Diego Region guidelines (San Diego County Copermittees, 2015). Results of the percolation test are presented herein. The location of the boring/percolation test is presented on the Boring Location Plan **- Figure 3**.

Geologic and Subsurface Conditions

Based on the results of our limited geotechnical evaluation for percolation testing, the subject property is underlain by fill/topsoil materials and old paralic deposits. The fill/topsoil material was encountered in borings B-1, B-2, B-3 and B-4 to a maximum depth of 1-foot below the ground surface. The fill materials generally consist of dark orange-brown, loose silty-sand with trace clay. The old paralic materials underlie the fill materials, and generally consist of dark orange-brown to yellow-brown, medium dense to very dense sand and silty-sand with trace gravel.

A log of our exploratory boring and more detailed descriptions of the encountered earth materials are provided in **Appendix A.**

Groundwater

Groundwater was not encountered in any of our exploratory borings. Based on our review of the Phase I prepared for the subject property (Ninyo & Moore, 2015), groundwater is expected to be at depths greater than 20 feet below the existing ground surface. Our review of the California Department of Water Resources - Water Data Library website indicated that there are no groundwater wells present on the property. It should be noted that variations in groundwater may result from fluctuations in the ground surface topography, subsurface stratification, rainfall, irrigation, and other factors that may not have been evident at the time of our subsurface exploration.

PERCOLATION TESTING

Following the drilling of the exploratory borings, a 3-inch diameter perforated polyvinyl chloride (PVC) pipe was placed in the hole and gravel was placed around the pipe. The test holes were presoaked for approximately 2 hours in general accordance with San Diego Region guidelines.

Percolation testing was performed until consistent results were obtained, which was then used to calculate the pre-adjusted percolation rate for the test hole. Upon conclusion of testing, the perforated pipe was removed from the test hole and the test hole was backfilled.

We note that a soil profile’s percolation rate is not the same as its infiltration rate. Therefore, the measured/calculated field percolation rate was converted to an estimated infiltration rate utilizing a reduction factor determined using the Porchet method. The following **Table 1** presents the measured percolation rate and corresponding infiltration rate calculated for the test hole.

TABLE 1
Summary of Percolation Testing

Location	Depth (ft.)	Pre-Adjusted Percolation Rate (in/hr.)	Infiltration Rate (in/hr.)
B-1	~8	6.48	0.44
B-2	~5	0.96	0.06
B-3	~5	0.24	0.01
B-4	~8	0.36	0.02
B-5	~5	0.24	0.01

Conclusions and Recommendations

It is EEI's professional opinion that the soils conditions and percolation characteristics encountered at the depths explored are representative of the site conditions in the vicinity of the test excavation. Percolation testing was performed within natural soils consisting of dense old paralic deposits. It is our opinion that the percolation/infiltration rates and overall underlying subsurface soil and geologic conditions presented herein are not conducive to direct infiltration (No Infiltration) for proposed stormwater disposal systems. This should be taken into consideration for the preliminary design of the proposed stormwater disposal system at the tested locations and depths within the subject property. Design of the stormwater disposal system should be in accordance with the County of San Diego guidelines. The completed Form I-8 of the City of Sand Diego Storm Water Standards is included as **Appendix B**.

We recommend that retention/disposal devices be situated at least three times their depth, or a minimum of 15 feet (whichever is greater), from the outside bottom edge of structural foundations. Structural foundations include (but are not limited to) buildings, loading docks, retaining walls, and screen walls. All stormwater disposal systems should be checked and maintained on regular intervals. Stormwater devices including bioswales that are located closer than 10 feet from any foundations/footings should be lined with an impermeable membrane to reduce the potential for saturation of foundation soils. Foundations may also need to be deepened.

SUMMARY OF OVERALL DEVELOPMENT FEASIBILITY

Based on our limited review of the referenced documents and site reconnaissance, and the results of our Due Diligence Level Geotechnical Review, residential development of the subject property appears feasible from a geotechnical viewpoint. No significant geotechnical constraints were identified during our limited evaluation that would preclude development.

However, no site specific geotechnical information was available at the time of our review within City files. Because previous site specific geotechnical information is not available, a detailed design-level Geotechnical Investigation report of the property will be required to obtain site-specific geologic/subsurface information prior to initiating any further permitting activities for the proposed development (City of San Diego Information Bulletin 515, 2009) and to provide the Client with preliminary geotechnical, foundation and grading recommendations for the proposed development and to identify any geologic/geotechnical constraints to site development.

RECOMMENDATIONS

The purpose of this Due Diligence Level Geotechnical Review for the subject property was for EEI to conduct initial geotechnical research to identify any local geologic/geotechnical site conditions that could have substantial development cost impacts on the proposed site re-development, and to meet the minimum Geotechnical Study Requirements for a Tentative Map/Planned Development Permit (City of San Diego, 2009). Based on City of San Diego (2009) requirements, a design-level Geotechnical Evaluation will need to be performed for any further permitting activities for the development. EEI can prepare a proposal to perform a design-level Geotechnical Investigation if requested by the Client.

LIMITATIONS

This Due Diligence Level Geotechnical Review and Preliminary Percolation Study has been conducted in accordance with generally accepted geotechnical engineering principles and practice.

EEI's Due Diligence Level Geotechnical Review and Preliminary Percolation Study is based solely upon the site reconnaissance, limited subsurface exploration and a review of publically available geologic information pertinent to the subject property performed by EEI.

EEI assumes no warranty as to the accuracy of the referenced reports. Findings provided herein have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time. This report has been prepared for the sole use of Palm Avenue Realty Company (Client), within a reasonable time from its authorization. Site conditions, land use (both onsite and offsite), or other factors may change as a result of manmade influences, and additional work may be required with the passage of time.

This Due Diligence Level Geotechnical Review and Preliminary Percolation Study should not be relied upon by other parties without the express written consent of EEI and the Client; therefore, any use or reliance upon this geotechnical review by a party other than the Client shall be solely at the risk of such third party and without legal recourse against EEI, its employees, officers, or directors, regardless of whether the action in which recovery of damages is brought or based upon contract, tort, statue, or otherwise. The Client has the responsibility to see that all parties to the project, including the designer, contractor, subcontractor, and building official, etc. are aware of this report in its complete form. This report contains information that may be used in the preparation of contract specifications; however, the report is not designed as a specification document, and may not contain sufficient information for use without additional assessment. EEI assumes no responsibility or liability for work or testing performed by others. In addition, this report may be subject to review by the controlling authorities.

EEI appreciates the opportunity to be of service for this project. If you have any questions, please contact the undersigned at (760) 431-3747.

Sincerely,
EEI

CERTIFIED ENGINEERING GEOLOGIST
JEFFREY P. BLAKE
No. EG 2248
Exp. 10/31/17
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Jeffrey P. Blake
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Principal Engineering Geologist

LICENSED PROFESSIONAL ENGINEER
MATTHEW R. LOVE
C 84154
EXP. 9-30-17
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Matthew R. Love
PE 84154 (exp. 9/30/17)
Project Engineer

Attachments: Figures
Soil Classification Chart and Boring Logs
Form I-8 – Category of Infiltration Feasibility Condition

Distribution: (2) Addressee (one via electronic copy and one hard copy)

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REFERENCES

California Building Code (CBC), 2013, California Code of Regulations, Title 24, Part 2, Volume 2 of 2, California Building Standards Commission, Based on 2012 International Building Code; 2013 California Historical Building Code, Title 24, Part 8; and 2013 California Existing Building Code, Title 24, Part 10, effective January 1, 2014.

California Department of Water Resources, Water Data Library (WDL), Website (http://www.water.ca.gov/waterdatalibrary), accessed November 2015.

California Division of Mines and Geology (CDMG), 2000, California Department of Conservation, Digital Images of Official Maps of Alquist-Priolo Earthquake Fault Zones of California, Southern Region, DMG CD 2000-003.

California Geological Survey (CGS), 2002, California Geomorphic Provinces Note 36, Electronic Copy, Revised December 2002.

California Geological Survey (CGS), 2010, Geologic Data Map Number 2, Electronic Copy, Revised 2010.

City of San Diego, 2008, Seismic Safety Study, Geologic Hazards and Faults, dated April 3, 2008.

County of San Diego, 2013, Design Manual for Onsite Wastewater Disposal Treatment Systems, Department of Environmental Health, Land and Water Quality Division, dated March 22, 2010, revised November 25, 2013.

Google Earth®, 2015, Version 7.1.5.1557

Hart, Earl W. and Bryant, William A., 1997, Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Zoning Act with Index to Earthquake Fault Zones Maps, CDMG Special Publication 42, Supplements 1 and 2 added 1999.

Jennings, C.W. and Bryant, W.A., 2010, Fault Activity Map of California, California Geological Survey, Map Sheet No. 6, scale 1:750,000.

Kettler Leweck Engineering, 2015, 1695 Saturn Boulevard Conceptual Lotting Study, San Diego, California 92154, dated December 8, 2015.

Ninyo & Moore, 2015, Phase I, Environmental Site Assessment, 1695 Saturn Boulevard, San Diego, California, Project No. 108063001, dated December 4, 2015.

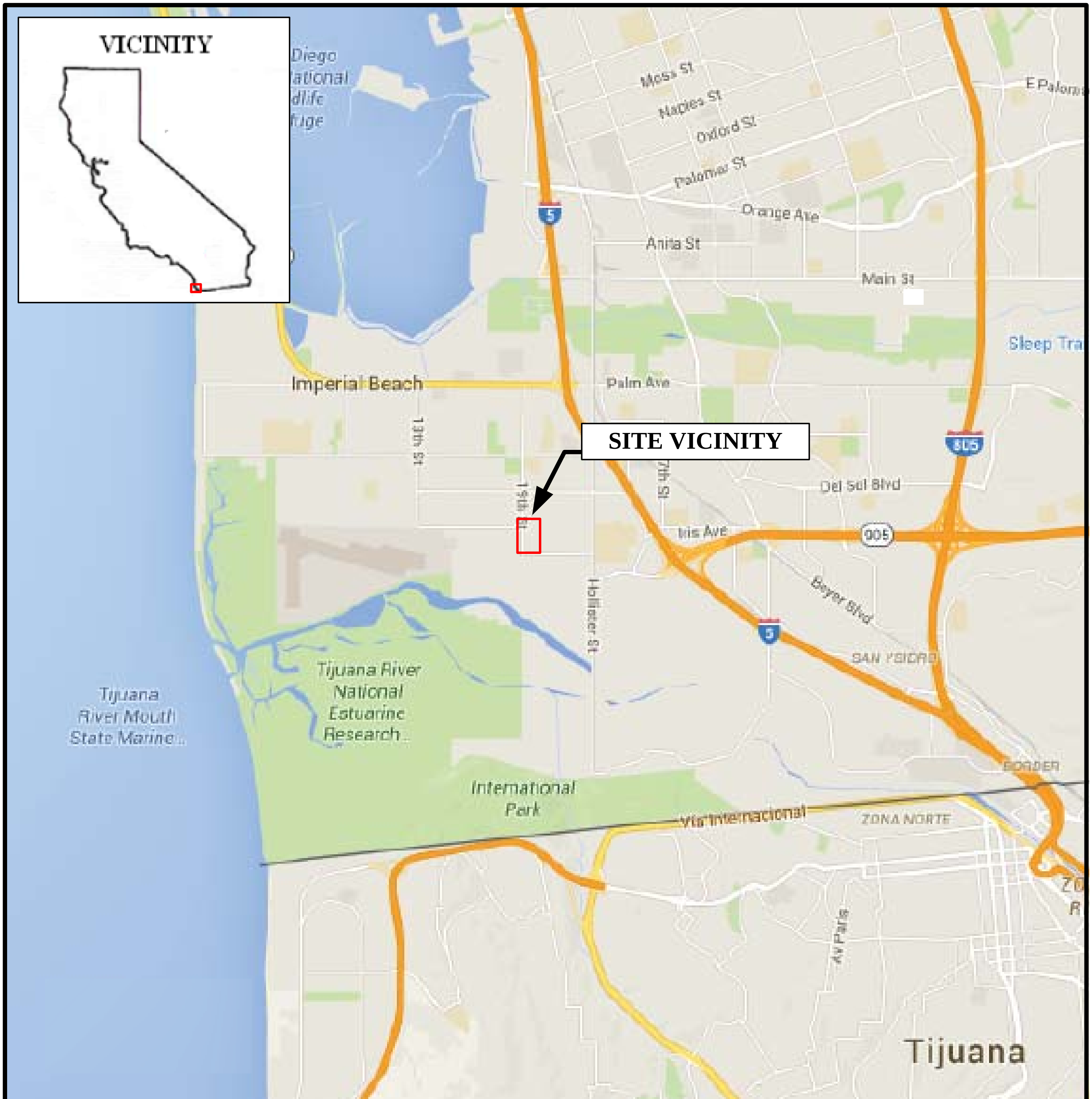
San Diego County Copermittees, 2015, Storm Water Standards, Part 1: Best Management Practices (BMP) Design Manual, San Diego Region, For Permanent Site Design, Storm Water Treatment and Hydromodification Management, dated June 2015.

Tan, S.S., and Kennedy, M.P., 2008, Geologic Map of the San Diego 30’x60’ Quadrangle, California, California Geological Survey, Regional Geologic Map No. 3, dated 2008

United States Geological Survey (USGS), 2015, Imperial Beach 7.5-Minute Quadrangle Topographic Map, Scale 1:24,000.

United States Geological Survey (USGS), 2008, 2008 National Seismic Hazard Maps – Online Fault Database Search, web address < http://earthquake.usgs.gov/hazards/products/conterminous/>, accessed November 2015.

FIGURES



LEGEND

N

Scale: 1" = 1mi

0 1mi 2mi

Note: All Locations Are Approximate

SITE VICINITY MAP

Palm Avenue Realty Company

Proposed Residential Subdivision Development

1695 Saturn Boulevard

San Diego, CA

EEI Project No. AAA-7228.4

Created February 2016

FIGURE 1

Map Source: Google Maps®; Accessed 2016

LEGEND

Scale: 1" = 120'

0 120 FT 240 FT

Note: All Locations Are Approximate

AERIAL SITE MAP

Palm Avenue Realty Company

Proposed Residential Subdivision Development

1695 Saturn Boulevard

San Diego, CA

EEI Project No. AAA-7228.4

Created February 2016

EEI Geotechnical & Environmental Solutions

FIGURE 2

Source: Google Earth, 2016; Image Date: February 8, 2016

Source: Kettler Leweck Engineering, 2015, Conceptual Lotting Study, 1695 Saturn Boulevard, San Diego, California, dated December 8, 2015

LEGEND

B-5 - Approximate Boring/Percolation Test Location

Scale: 1" = 80'

0 FT 80 FT 160 FT

BORING LOCATION MAP
Palm Avenue Realty Company
Proposed Residential Subdivision Development
1695 Saturn Boulevard
San Diego, CA
EEI Project No. AAA-72282.4
Created February 2016

EEI Geotechnical & Environmental Solutions

FIGURE 3

APPENDIX A
SOIL CLASSIFICATION CHART AND BORING LOGS

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SEIVE	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SANDS		SW	WELL-GRADED SANDS,GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE		(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION REATINED ON NO. 4 SEIVE	SANDS WITH FINES		SM	SILTY-SANDS, SAND – SILT MIXTURES
		(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND – CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

BORING NUMBER B-1

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 2/4/16 **COMPLETED** 2/4/16
GROUND ELEVATION 49 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Tripod
HAMMER EFFICIENCY (%)
METHOD 6" Solid Stem Auger / Manual Hammer
SPT CORRECTION **CAL CORRECTION**
LOGGED BY BM **CHECKED BY** ML
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark orange-brown, fine grained, moist, loose	SM									
1		**OLD PARALIC DEPOSITS (Qop6)** @ 0.5' SILTY-SAND, dark orange-brown, fine grained, moist, medium dense										
2				BULK								
3			SM									
4		@ 4.5' Becomes dense										
5		@ 5' SAND with GRAVEL, yellow-brown, fine to coarse grained, abundant gravels, trace silt, moist, dense										
6		@ 6.5' Becomes medium to coarse grained sand	SP	BULK								
7												
8												

Total depth: 8-feet
No groundwater encountered
Percolation test performed
Boring backfilled with cuttings

BORING NUMBER B-2

EEI Geotechnical & Environmental Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 2/4/16 **COMPLETED** 2/4/16
GROUND ELEVATION 47 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Tripod
HAMMER EFFICIENCY (%)
METHOD 6" Solid Stem Auger / Manual Hammer
SPT CORRECTION **CAL CORRECTION**
LOGGED BY BM **CHECKED BY** ML
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark orange-brown, fine grained, moist, loose	SM									
1		**OLD PARALIC DEPOSITS (Qop6)** @ 0.75' SILTY-SAND, dark orange-brown, fine grained, moist, medium dense		BULK								
2		@ 2' Becomes dense										
3			SM									
4		@ 3.5' Becomes very dense, light orange-brown		BULK								
5												

Total depth: 5-feet
No groundwater encountered
Percolation test performed
Boring backfilled with cuttings

BORING NUMBER B-3

CLIENT Palm Avenue Realty Company	**PROJECT NAME** 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4	**PROJECT LOCATION** San Diego, California
DATE STARTED 2/4/16 **COMPLETED** 2/4/16	**GROUND ELEVATION** 46 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Tripod	**HAMMER EFFICIENCY (%)**
METHOD 6" Solid Stem Auger / Manual Hammer	**SPT CORRECTION** **CAL CORRECTION**
LOGGED BY BM **CHECKED BY** ML	**GROUNDWATER DEPTH (ft)** Not Encountered
NOTES	

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark orange-brown, fine grained, moist, loose	SM									
1		**OLD PARALIC DEPOSITS (Qop6)** SILTY-SAND, dark orange-brown, fine grained, moist, medium dense		BULK								
2			SM									
		@ 2.5' Becomes dense										
3												
		@ 3.5' SILTY-SAND with GRAVEL, orange-brown, fine grained with scattered gravels, moist, very dense										
4			SM	BULK								
5												

Total depth: 5-feet
No groundwater encountered
Percolation test performed
Boring backfilled with cuttings

BORING NUMBER B-4

EEI
Geotechnical & Environmental Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 2/4/16 **COMPLETED** 2/4/16
GROUND ELEVATION 46 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Tripod
HAMMER EFFICIENCY (%)
METHOD 6" Solid Stem Auger / Manual Hammer
SPT CORRECTION **CAL CORRECTION**
LOGGED BY BM **CHECKED BY** ML
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**FILL/TOPSOIL** SILTY-SAND with CLAY, dark orange-brown, fine grained, moist, loose	SM									
1		**OLD PARALIC DEPOSITS (Qop6)** @ 1' SILTY-SAND, dark orange-brown, fine grained, moist, medium dense		BULK								
2												
3												
4			SM	BULK								
5		@ 5' Becomes very dense										
6												
7				BULK								
8												

Total depth: 8-feet
No groundwater encountered
Percolation test performed
Boring backfilled with cuttings

BORING NUMBER B-5

EEI Geotechnical & Environmental Solutions

CLIENT Palm Avenue Realty Company
PROJECT NAME 1995 Saturn Boulevard
PROJECT NUMBER AAA-72282.4
PROJECT LOCATION San Diego, California
DATE STARTED 2/4/16 **COMPLETED** 2/4/16
GROUND ELEVATION 45 feet **BORING DIAMETER** 6-inch
EQUIPMENT / RIG Tripod
HAMMER EFFICIENCY (%)
METHOD 6" Solid Stem Auger / Manual Hammer
SPT CORRECTION **CAL CORRECTION**
LOGGED BY BM **CHECKED BY** ML
GROUNDWATER DEPTH (ft) Not Encountered
NOTES

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	USCS SYMBOL	SAMPLE TYPE	PENETRATION RESISTANCE (blows/6-inches)	SPT N60	POCKET PEN (tsf)	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	ATTERBERG LIMITS (PI:LL)	FINES CONTENT (%)	OTHER TESTS
0		**OLD PARALIC DEPOSITS (Qop6)** SILTY-SAND, dark orange-brown, fine to medium grained, moist, medium dense		BULK								
1			SM									
2		@ 2' Becomes dense										
3		@ 3' SILTY-SAND with GRAVEL, light orange-brown, fine to medium grained with scattered gravels, moist, very dense		BULK								
4			SM									
5												

Total depth: 5-feet
No groundwater encountered
Percolation test performed
Boring backfilled with cuttings

APPENDIX B
FORM I-8 - CATERGORIZATION OF INFILTRATION FEASIBILITY CONDITION

Categorization of Infiltration Feasibility Condition				**Form I-8**
Part 1 - Full Infiltration Feasibility Screening Criteria Would infiltration of the full design volume be feasible from a physical perspective without any undesirable consequences that cannot be reasonably mitigated?				
Criteria	Screening Question	Yes	No	
1	Is the estimated reliable infiltration rate below proposed facility locations greater than 0.5 inches per hour? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.		X	
Provide basis: Infiltration testing using the Riverside County Borehole Percolation method was used to evaluate stormwater infiltration at the site. A total of 5 percolation tests were performed within the proposed BMP at the site. Percolation rates obtained during testing were converted to infiltration rates using the Porchet Method. Based on the results of our testing, infiltration rates greater than 0.5 inches per hour were not measured at the site. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.				
2	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.	N/A		
Provide basis: Not applicable based on answer to Criteria 1. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.				

Form I-8 Page 2 of 4			
Criteria	Screening Question	Yes	No
3	Can infiltration greater than 0.5 inches per hour be allowed without increasing risk of groundwater contamination (shallow water table, storm water pollutants or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	N/A	
Provide basis: Not applicable based on answer to Criteria 1. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
4	Can infiltration greater than 0.5 inches per hour be allowed without causing potential water balance issues such as change of seasonality of ephemeral streams or increased discharge of contaminated groundwater to surface waters? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.3.	N/A	
Provide basis: Not applicable based on answer to Criteria 1. Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability.			
Part 1 Result*	If all answers to rows 1 - 4 are "Yes" a full infiltration design is potentially feasible. The feasibility screening category is Full Infiltration If any answer from row 1-4 is "No", infiltration may be possible to some extent but would not generally be feasible or desirable to achieve a "full infiltration" design. Proceed to Part 2		See Part 2

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

<table>
<tr><th colspan="4">Form I-8 Page 3 of 4</th></tr>
<tr><td colspan="4">Part 2 – Partial Infiltration vs. No Infiltration Feasibility Screening Criteria
Would infiltration of water in any appreciable amount be physically feasible without any negative consequences that cannot be reasonably mitigated?</td></tr>
<tr><td>Criteria</td><td>Screening Question</td><td>Yes</td><td>No</td></tr>
<tr><td>5</td><td>Do soil and geologic conditions allow for infiltration in any appreciable rate or volume? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2 and Appendix D.</td><td></td><td>X</td></tr>
<tr><td colspan="4">Provide basis:
Based on the results of our testing, infiltration rates for the majority of the locations tested (4 of 5) were less than 0.15 inches per hour. The location tested with an infiltration rate greater than 0.15 inches per hour but less than 0.50 inches per hour is not considered to be reliable for design of BMP due to an isolated and discontinuous layer of coarse-grained material in the boring that likely influenced the test data. Therefore, we consider the geologic conditions at the site (dense old paralic deposits) to not be conducive for direct infiltration of stormwater for BMP design.

Summarize findings of studies; provide reference to studies, calculations, maps, data sources, etc. Provide narrative discussion of study/data source applicability and why it was not feasible to mitigate low infiltration rates.</td></tr>
<tr><td>6</td><td>Can Infiltration in any appreciable quantity be allowed without increasing risk of geotechnical hazards (slope stability, groundwater mounding, utilities, or other factors) that cannot be mitigated to an acceptable level? The response to this Screening Question shall be based on a comprehensive evaluation of the factors presented in Appendix C.2.</td><td colspan="2">N/A</td></tr>
<tr><td colspan="4">Provide basis:
Not applicable based on answer to Criteria 5.

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

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

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