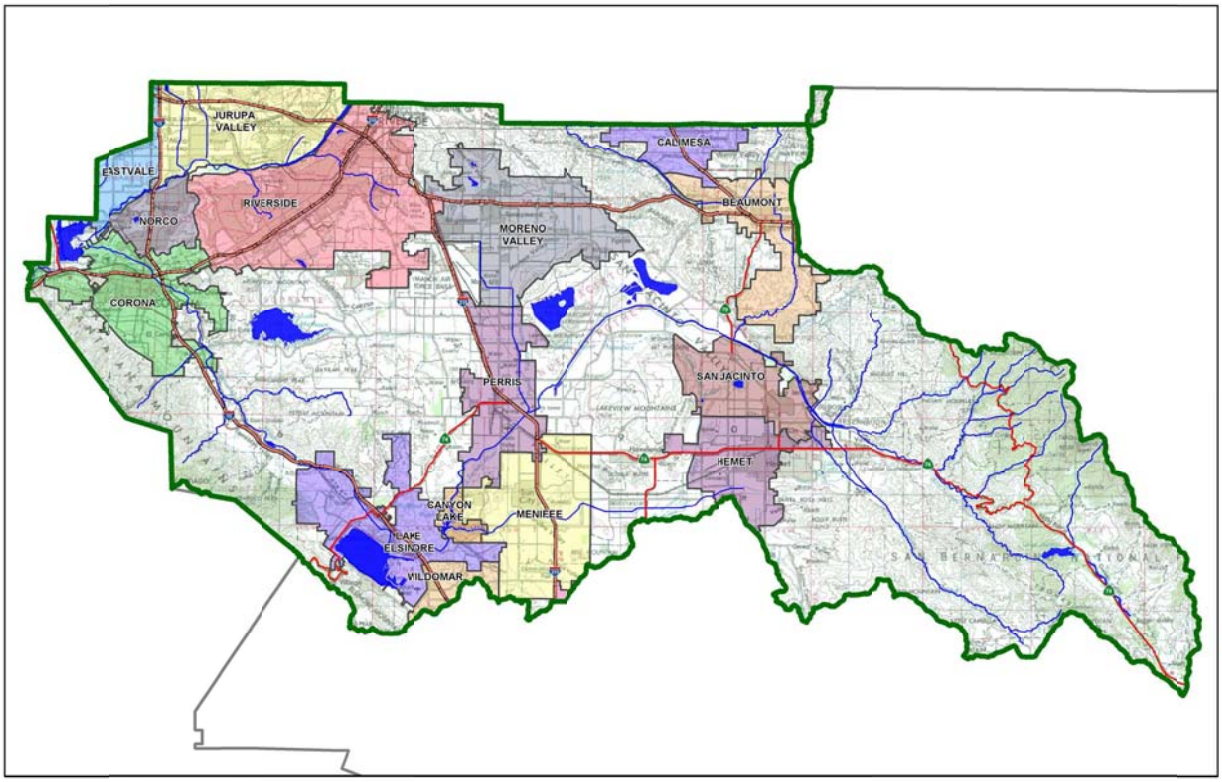
Project Specific Water Quality Management Plan

*A Template for Projects located within the **Santa Ana Watershed** Region of Riverside County*

Project Title: Luiseño Village

Development No: (Parcel Numbers) 433-160-024, -027, -028, -029, -032, -033, and -034

Design Review/Case No: P17-17 / SPDR 17-17



☒ **Preliminary**
☐ **Final**

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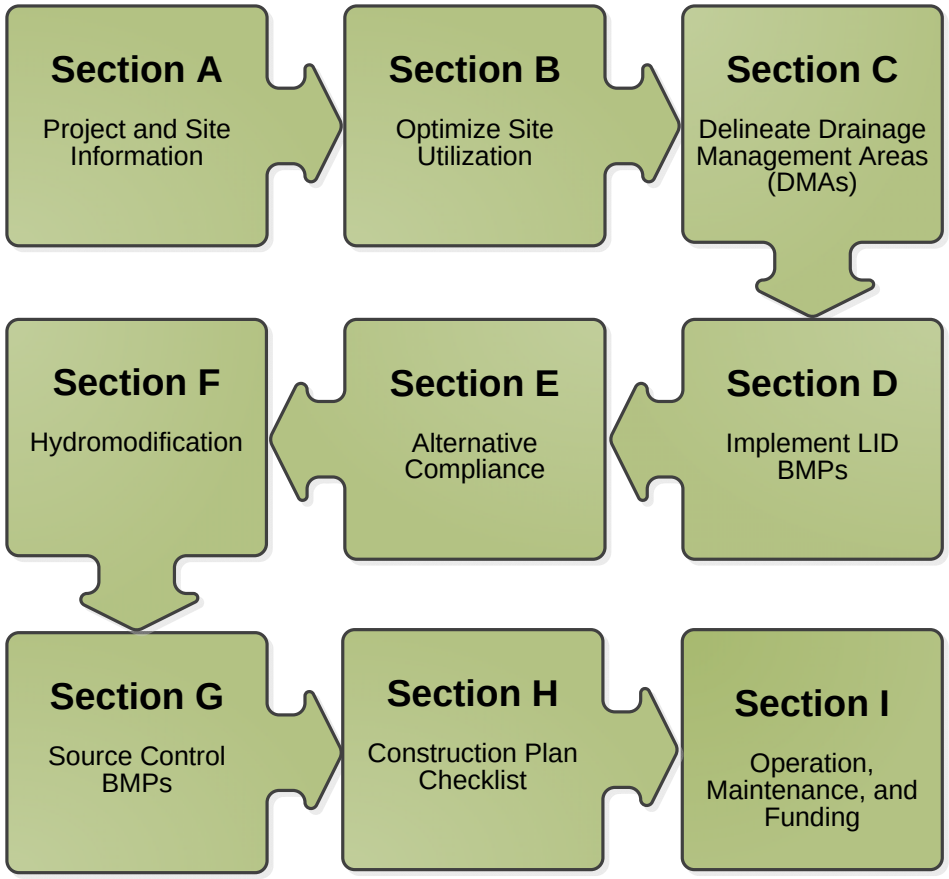
A Brief Introduction

This Project-Specific WQMP Template for the **Santa Ana Region** has been prepared to help guide you in documenting compliance for your project. Because this document has been designed to specifically document compliance, you will need to utilize the WQMP Guidance Document as your "how-to" manual to help guide you through this process. Both the Template and Guidance Document go hand-in-hand, and will help facilitate a well prepared Project-Specific WQMP. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.



OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for Soboba Band of Luiseño Indians by CWE for the Luiseño Village project.

This WQMP is intended to comply with the requirements of the City of San Jacinto for Ordinance No. 1025 which includes the requirement for the preparation and implementation of a Project-Specific WQMP.

The undersigned, while owning the property/project described in the preceding paragraph, shall be responsible for the implementation and funding of this WQMP and will ensure that this WQMP is amended as appropriate to reflect up-to-date conditions on the site. In addition, the property owner accepts responsibility for interim operation and maintenance of Stormwater BMPs until such time as this responsibility is formally transferred to a subsequent owner. This WQMP will be reviewed with the facility operator, facility supervisors, employees, tenants, maintenance and service contractors, or any other party (or parties) having responsibility for implementing portions of this WQMP. At least one copy of this WQMP will be maintained at the project site or project office in perpetuity. The undersigned is authorized to certify and to approve implementation of this WQMP. The undersigned is aware that implementation of this WQMP is enforceable under City of Jacinto Water Quality Ordinance (Municipal Code Section 13.44).

"I, the undersigned, certify under penalty of law that the provisions of this WQMP have been reviewed and accepted and that the WQMP will be transferred to future successors in interest."

Owner's Signature	Date
Owner's Printed Name	Owner's Title/Position

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan meet the requirements of Regional Water Quality Control Board Order No. **R8-2010-0033** and any subsequent amendments thereto."

Preparer's Signature	7-2-19 Date
Steven M. Bell Preparer's Printed Name	Engineer IV Preparer's Title/Position

Preparer's Licensure:

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Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Commercial
Planning Area:	N/A
Community Name:	N/A
Development Name:	Luiseño Village
PROJECT LOCATION	
Latitude & Longitude (DMS): 33°46'58.57"N, 116°56'17.03"W	
Project Watershed and Sub-Watershed: Santa Ana River Watershed, San Jacinto River Subwatershed	
APN(s): 433-160-024, 433-160-027, 433-160-028, 433-160-029, 433-160-032, 433-160-033, and 433-160-034	
Map Book and Page No.: Parcel Map Book 131, Pages 60-63	
PROJECT CHARACTERISTICS	
Proposed or Potential Land Use(s)	Commercial
Proposed or Potential SIC Code(s)	5541, 5812, 5999
Area of Impervious Project Footprint (SF)	309,077 SQ FT
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	309,077 SQ FT
Does the project consist of offsite road improvements?	☐ Y ☒ N
Does the project propose to construct unpaved roads?	☐ Y ☒ N
Is the project part of a larger common plan of development (phased project)?	☐ Y ☒ N
EXISTING SITE CHARACTERISTICS	
Total area of existing Impervious Surfaces within the project limits (SF)	0 SQ FT
Is the project located within any MSHCP Criteria Cell?	☒ Y ☐ N
If so, identify the Cell number:	3098, 3099
Are there any natural hydrologic features on the project site?	☐ Y ☒ N
Is a Geotechnical Report attached?	☒ Y ☐ N
If no Geotech. Report, list the NRCS soils type(s) present on the site (A, B, C and/or D)	N/A
What is the Water Quality Design Storm Depth for the project?	0.70 inch

Project Description

The Luiseño Village project is a proposed commercial center that will bring two retail centers, two fast food restaurants, and a fueling service station with a car wash to the east side of the City of San Jacinto. The proposed project will be located at the southwest corner of Main Street and Ramona Expressway on approximately 9 acres of vacant land. Approximately 76 percent of the site will be covered by impervious surfaces (7.1 acres), either with roofs, sidewalks, driveways or parking lots. This will cause an increase in both the volume and the peak flow rate of stormwater runoff above current conditions. On-site catch basins will be constructed to capture stormwater runoff, and the runoff will be piped to underground infiltration chambers. High infiltration rates measured on-site allow the design to incorporate infiltration chambers that facilitate groundwater recharge, thus mimicking natural watershed processes to improve water quality. During large storms, where rainfall exceeds the water quality rainfall depth, overflow runoff will be diverted to the existing drainage flume on the west side of the property, where it will flow northward and discharge

onto Main Street. From there, the runoff will flow westward to the existing catch basin on the south side of Main Street east of Miracle Drive.

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the local vicinity and existing site. In addition, include all grading, drainage, landscape/plant palette and other pertinent construction plans in Appendix 2. At a **minimum**, your WQMP Site Plan should include the following:

- Drainage Management Areas
- Proposed Structural BMPs
- Drainage Path
- Drainage Infrastructure, Inlets, Overflows
- Source Control BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Standard Labeling

Use your discretion on whether or not you may need to create multiple sheets or can appropriately accommodate these features on one or two sheets. Keep in mind that the Co-Permittee plan reviewer must be able to easily analyze your project utilizing this template and its associated site plans and maps.

A.2 Identify Receiving Waters

Using Table A.1 below, list in order of upstream to downstream, the receiving waters that the project site is tributary to. Continue to fill each row with the Receiving Water's 303(d) listed impairments (if any), designated beneficial uses, and proximity, if any, to a RARE beneficial use. Include a map of the receiving waters in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
San Jacinto River (Reach 5)	None	AGR/GWR/REC1/ REC2/WARM/WILD	Not a water body classified as RARE
San Jacinto River (Reach 4)	None	AGR/GWR/REC1/ REC2/WARM/WILD	Not a water body classified as RARE
San Jacinto River (Reach 3)	None	AGR/GWR/REC1/ REC2/WARM/WILD	Not a water body classified as RARE
Canyon Lake, San Jacinto River (Reach 2)	Pathogens, Nutrients	AGR/GWR/REC1/ REC2/WARM/WILD/MUN	Not a water body classified as RARE
San Jacinto River (Reach 1)	None	AGR/GWR/REC1/ REC2/WARM/WILD/MUN	Not a water body classified as RARE
Lake Elsinore	Nutrients, Organic Enrichment/Low Dissolved Oxygen, PCBs, Sediment Toxicity, Unknown Toxicity	REC1/REC2/WARM/WILD	Not a water body classified as RARE

A.3 Additional Permits/Approvals required for the Project:

Table A.2 Other Applicable Permits

Agency	Permit Required	
State Department of Fish and Game, 1602 Streambed Alteration Agreement	☐ Y	☒ N
State Water Resources Control Board, Clean Water Act (CWA) Section 401 Water Quality Cert.	☐ Y	☒ N
US Army Corps of Engineers, CWA Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☒ Y	☐ N
Other *(please list in the space below as required)* Building and Grading	☒ Y	☐ N

If yes is answered to any of the questions above, the Co-Permittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Section B: Optimize Site Utilization (LID Principles)

Review of the information collected in Section 'A' will aid in identifying the principal constraints on site design and selection of LID BMPs as well as opportunities to reduce imperviousness and incorporate LID Principles into the site and landscape design. For example, constraints might include impermeable soils, high groundwater, groundwater pollution or contaminated soils, steep slopes, geotechnical instability, high-intensity land use, heavy pedestrian or vehicular traffic, utility locations or safety concerns. Opportunities might include existing natural areas, low areas, oddly configured or otherwise unbuildable parcels, easements and landscape amenities including open space and buffers (which can double as locations for bioretention BMPs), and differences in elevation (which can provide hydraulic head). Prepare a brief narrative for each of the site optimization strategies described below. This narrative will help you as you proceed with your LID design and explain your design decisions to others.

The 2010 Santa Ana MS4 Permit further requires that LID Retention BMPs (Infiltration Only or Harvest and Use) be used unless it can be shown that those BMPs are infeasible. Therefore, it is important that your narrative identify and justify if there are any constraints that would prevent the use of those categories of LID BMPs. Similarly, you should also note opportunities that exist which will be utilized during project design. Upon completion of identifying Constraints and Opportunities, include these on your WQMP Site plan in Appendix 1.

Site Optimization

The following questions are based upon Section 3.2 of the WQMP Guidance Document. Review of the WQMP Guidance Document will help you determine how best to optimize your site and subsequently identify opportunities and/or constraints, and document compliance.

Did you identify and preserve existing drainage patterns? If so, how? If not, why?

The existing site slopes very gently from southeast to northwest. Existing flows in excess of the site's natural infiltration ability discharge to Main Street at the northwest corner of the site. The proposed project will divert surface runoff away from buildings and into catch basins, but the overflow from the underground infiltration chambers will discharge to the same location as the existing condition.

Did you identify and protect existing vegetation? If so, how? If not, why?

The project site will be fully developed and only light vegetation currently exists onsite. The project includes landscaping along the perimeter of the project site and planters within the parking lot area.

Did you identify and preserve natural infiltration capacity? If so, how? If not, why?

Infiltration is feasible due to high infiltration rates of the soils as explained in the attached Geotechnical Report. The project site will direct runoffs toward several catch basins. The flows from the catch basins will be collected in one of the four underground retention chambers for infiltration.

Did you identify and minimize impervious area? If so, how? If not, why?

The existing site is 100% pervious. The site will be utilized as a commercial center with plenty of impervious parking. The perimeter along the site and planters within the parking lot will be vegetated (pervious).

Did you identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

The constraints of site development limit the amount of pervious area that can be useful to stormwater dispersal. The site will not require the use of bermed or depressed pervious landscaping to mitigate the increase in impervious area, as the underground infiltration chambers will be sized to accept excess stormwater runoff from impervious surfaces across the entire site. Pervious surfaces may be sloped so that excess runoff may be routed to catch basins

Section C: Delineate Drainage Management Areas (DMAs)

Utilizing the procedure in Section 3.3 of the WQMP Guidance Document which discusses the methods of delineating and mapping your project site into individual DMAs, complete Table C.1 below to appropriately categorize the types of classification (e.g., Type A, Type B, etc.) per DMA for your project site. Upon completion of this table, this information will then be used to populate and tabulate the corresponding tables for their respective DMA classifications.

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
DMA-1-I	Roofs / Concrete / Asphalt	95,389	D
DMA-2-I	Roofs / Concrete / Asphalt	85,209	D
DMA-8-I	Roofs / Concrete / Asphalt	79,762	D
DMA-9-I	Roofs / Concrete / Asphalt	48,717	D
DMA-1-P	Ornamental Landscaping	27,554	A
DMA-2-P	Ornamental Landscaping	34,919	A
DMA-8-P	Ornamental Landscaping	13,896	A
DMA-9-P	Ornamental Landscaping	20,402	A

[1] *Reference Table 2-1 in the WQMP Guidance Document to populate this column*

Table C.2 Type 'A', Self-Treating Areas

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
DMA-1-P	27,554	Ornamental Landscaping	Drip Irrigation
DMA-2-P	34,919	Ornamental Landscaping	Drip Irrigation
DMA-8-P	13,896	Ornamental Landscaping	Drip Irrigation
DMA-9-P	20,402	Ornamental Landscaping	Drip Irrigation

Table C.3 Type 'B', Self-Retaining Areas

Self-Retaining Area				**Type 'C' DMAs that are draining to the Self-Retaining Area**		
DMA Name/ ID	Post-project surface type	Area (square feet) [A]	Storm Depth (inches) [B]	DMA Name / ID	[C] from Table C.4 = [C]	Required Retention Depth (inches) [D]

$$[D] = [B] + \frac{[B] \cdot [C]}{[A]}$$

Table C.4 Type 'C', Areas that Drain to Self-Retaining Areas

DMA					Receiving Self-Retaining DMA		
DMA Name/ ID	Area (square feet)	Post-project surface type	Runoff factor	Product		Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]	DMA name /ID	[D]	[C]/[D]

Table C.5 Type 'D', Areas Draining to BMPs

DMA Name or ID	BMP Name or ID
DMA-1-I	BMP-1
DMA-2-I	BMP-2
DMA-8-I	BMP-8
DMA-9-I	BMP-9

Note: More than one drainage management area can drain to a single LID BMP, however, one drainage management area may not drain to more than one BMP.

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (see discussion in Chapter 2.4.4 of the WQMP Guidance Document for further details)? ☐ Y ☒ N

If yes has been checked, Infiltration BMPs shall not be used for the site. If no, continue working through this section to implement your LID BMPs. It is recommended that you contact your Co-Permittee to verify whether or not your project discharges to an approved downstream 'Highest and Best Use' feature.

Geotechnical Report

A Geotechnical Report or Phase I Environmental Site Assessment may be required by the Copermittee to confirm present and past site characteristics that may affect the use of Infiltration BMPs. In addition, the Co-Permittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the WQMP Guidance Document. If a geotechnical report has been prepared, include it in Appendix 3. In addition, if a Phase I Environmental Site Assessment has been prepared, include it in Appendix 4.

Is this project classified as a small project consistent with the requirements of Chapter 2 of the WQMP Guidance Document? ☐ Y ☒ N

Infiltration Feasibility

Table D.1 below is meant to provide a simple means of assessing which DMAs on your site support Infiltration BMPs and is discussed in the WQMP Guidance Document in Chapter 2.4.5. Check the appropriate box for each question and then list affected DMAs as applicable. If additional space is needed, add a row below the corresponding answer.

Table D.1 Infiltration Feasibility

Does the project site…	YES	NO
…have any DMAs with a seasonal high groundwater mark shallower than 10 feet?		X
If Yes, list affected DMAs:		
…have any DMAs located within 100 feet of a water supply well?		X
If Yes, list affected DMAs:		
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact?		X
If Yes, list affected DMAs:		
…have measured in-situ infiltration rates of less than 1.6 inches / hour?		X
If Yes, list affected DMAs:		
…have significant cut and/or fill conditions that would preclude in-situ testing of infiltration rates at the final infiltration surface?		X
If Yes, list affected DMAs:		
…geotechnical report identify other site-specific factors that would preclude effective and safe infiltration?		X
Describe here:		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs and you should proceed to the assessment for Harvest and Use below.

D.2 Harvest and Use Assessment

Please check what applies*:*

- ☐ Reclaimed water will be used for the non-potable water demands for the project.
- ☐ Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).
- ☒ The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

If any of the above boxes have been checked, Harvest and Use BMPs need not be assessed for the site. If neither of the above criteria applies, follow the steps below to assess the feasibility of irrigation use, toilet use and other non-potable uses (e.g., industrial use).

Irrigation Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for Irrigation Use BMPs on your site:

Step 1: Identify the total area of irrigated landscape on the site, and the type of landscaping used.

Total Area of Irrigated Landscape: Insert Area (Acres)

Type of Landscaping (Conservation Design or Active Turf): List Landscaping Type

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for irrigation use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: Insert Area (Acres)

Step 3: Cross reference the Design Storm depth for the project site (see Exhibit A of the WQMP Guidance Document) with the left column of Table 2-3 in Chapter 2 to determine the minimum area of Effective Irrigated Area per Tributary Impervious Area (EIATIA).

Enter your EIATIA factor: EIATIA Factor

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum irrigated area that would be required.

Minimum required irrigated area: Insert Area (Acres)

Step 5: Determine if harvesting stormwater runoff for irrigation use is feasible for the project by comparing the total area of irrigated landscape (Step 1) to the minimum required irrigated area (Step 4).

Minimum required irrigated area (Step 4)	Available Irrigated Landscape (Step 1)
Insert Area (Acres)	Insert Area (Acres)

Toilet Use Feasibility

Complete the following steps to determine the feasibility of harvesting stormwater runoff for toilet flushing uses on your site:

Step 1: Identify the projected total number of daily toilet users during the wet season, and account for any periodic shut downs or other lapses in occupancy:

Projected Number of Daily Toilet Users: Number of daily Toilet Users

Project Type: Enter 'Residential', 'Commercial', 'Industrial' or 'Schools'

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for toilet use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: Insert Area (Acres)

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-1 in Chapter 2 to determine the minimum number or toilet users per tributary impervious acre (TUTIA).

Enter your TUTIA factor: TUTIA Factor

Step 4: Multiply the unit value obtained from Step 3 by the total of impervious areas from Step 2 to develop the minimum number of toilet users that would be required.

Minimum number of toilet users: Required number of toilet users

Step 5: Determine if harvesting stormwater runoff for toilet flushing use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required Toilet Users (Step 4)	**Projected number of toilet users (Step 1)**
Insert Area (Acres)	Insert Area (Acres)

Other Non-Potable Use Feasibility

Are there other non-potable uses for stormwater runoff on the site (e.g. industrial use)? See Chapter 2 of the Guidance for further information. If yes, describe below. If no, write N/A.

Insert narrative description here.

Step 1: Identify the projected average daily non-potable demand, in gallons per day, during the wet season and accounting for any periodic shut downs or other lapses in occupancy or operation.

Average Daily Demand: Projected Average Daily Use (gpd)

Step 2: Identify the planned total of all impervious areas on the proposed project from which runoff might be feasibly captured and stored for the identified non-potable use. Depending on the configuration of buildings and other impervious areas on the site, you may consider the site as a whole, or parts of the site, to evaluate reasonable scenarios for capturing and storing runoff and directing the stored runoff to the potential use(s) identified in Step 1 above.

Total Area of Impervious Surfaces: Insert Area (Acres)

Step 3: Enter the Design Storm depth for the project site (see Exhibit A) into the left column of Table 2-3 in Chapter 2 to determine the minimum demand for non-potable uses per tributary impervious acre.

Enter the factor from Table 2-3: Enter Value

Step 4: Multiply the unit value obtained from Step 4 by the total of impervious areas from Step 3 to develop the minimum number of gallons per day of non-potable use that would be required.

Minimum required use: Minimum use required (gpd)

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the Number of Daily Toilet Users (Step 1) to the minimum required number of toilet users (Step 4).

Minimum required non-potable use (Step 4)	**Projected average daily use (Step 1)**
Minimum use required (gpd)	Projected Average Daily Use (gpd)

If Irrigation, Toilet and Other Use feasibility anticipated demands are less than the applicable minimum values, Harvest and Use BMPs are not required and you should proceed to utilize LID Bioretention and Biotreatment, unless a site-specific analysis has been completed that demonstrates technical infeasibility as noted in D.3 below.

D.3 Bioretention and Biotreatment Assessment

Other LID Bioretention and Biotreatment BMPs as described in Chapter 2.4.7 of the WQMP Guidance Document are feasible on nearly all development sites with sufficient advance planning.

Select one of the following:

- ☐ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).
- ☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

D.4 Feasibility Assessment Summaries

From the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, complete Table D.2 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D.2 LID Prioritization Summary Matrix

DMA Name/ID	LID BMP Hierarchy				No LID (Alternative Compliance)
	1. Infiltration	2. Harvest and use	3. Bioretention	4. Biotreatment	
DMA-1-I	☒	☐	☐	☐	☐
DMA-2-I	☒	☐	☐	☐	☐
DMA-8-I	☒	☐	☐	☐	☐
DMA-9-I	☒	☐	☐	☐	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section E below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

D.5 LID BMP Sizing

Each LID BMP must be designed to ensure that the Design Capture Volume will be addressed by the selected BMPs. First**,** calculate the Design Capture Volume for each LID BMP using the V_{BMP} worksheet in Appendix F of the LID BMP Design Handbook. Second**,** design the LID BMP to meet the required V_{BMP} using a method approved by the Copermittee. Utilize the worksheets found in the LID BMP Design Handbook or consult with your Copermittee to assist you in correctly sizing your LID BMPs. Complete Table D.3 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. Provide the completed design procedure sheets for each LID BMP in Appendix 6. You may add additional rows to the table below as needed.

Table D.3 DCV Calculations for LID BMPs Collectively

DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Areas x Runoff Factor**	***Infiltration Chamber***		
	[A]		[B]	[C]	[A] x [C]			
DMA-1-I	*95,389*	*Roofs / Conc. / Asphalt*	*1*	*0.89*	*85,087*	*Design Storm Depth (in)*	*Design Capture Volume,* **V_{BMP}** *(cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-2-I	*85,209*	*Roofs / Conc. / Asphalt*	*1*	*0.89*	*76,006*			
DMA-8-I	*79,762*	*Roofs / Conc. / Asphalt*	*1*	*0.89*	*71,148*			
DMA-9-I	*48,717*	*Roofs / Conc. / Asphalt*	*1*	*0.89*	*43,456*			
	309,077				275,697	0.70	16,082	37,043

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.4 DCV Calculations for LID BMP-1

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Infiltration Chamber*		
	[A]		[B]	[C]	[A] x [C]			
DMA-1-I	*95,389*	*Roofs / Conc. / Asphalt*	*1*	*0.89*	*85,087*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	95,389				85,087	0.70	4,963	***11,541***

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.5 DCV Calculations for LID BMP-2

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Infiltration Chamber*		
	[A]		[B]	[C]	[A] x [C]			
DMA-2-I	*85,209*	*Roofs / Conc. / Asphalt*	*1*	*0.89*	*76,006*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	85,209				76,006	0.70	4,434	***11,541***

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.6 DCV Calculations for LID BMP-8

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Infiltration Chamber*		
	[A]		[B]	[C]	[A] x [C]			
DMA-8-I	*79,762*	*Roofs / Conc. / Asphalt*	*1*	*0.89*	*71,148*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	79,762				71,148	0.70	4,150	***7,479***

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Table D.7 DCV Calculations for LID BMP-9

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Infiltration Chamber*		
	[A]		[B]	[C]	[A] x [C]			
DMA-9-I	*48,717*	*Roofs / Conc. / Asphalt*	*1*	*0.89*	*43,456*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	48,717				43,456	0.70	2,535	***6,482***

[B], [C] is obtained as described in Section 2.3.1 of the WQMP Guidance Document

[E] is obtained from Exhibit A in the WQMP Guidance Document

[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to LID waiver approval by the Copermittee). Check one of the following Boxes:

☒ LID Principles and LID BMPs have been incorporated into the site design to fully address all Drainage Management Areas. No alternative compliance measures are required for this project and thus this Section is not required to be completed.

- Or -

☐ The following Drainage Management Areas are unable to be addressed using LID BMPs. A site-specific analysis demonstrating technical infeasibility of LID BMPs has been approved by the Co-Permittee and included in Appendix 5. Additionally, no downstream regional and/or sub-regional LID BMPs exist or are available for use by the project. The following alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

E.1 Identify Pollutants of Concern

Utilizing Table A.1 from Section A above which noted your project's receiving waters and their associated EPA approved 303(d) listed impairments, cross reference this information with that of your selected Priority Development Project Category in Table E.1 below. If the identified General Pollutant Categories are the same as those listed for your receiving waters, then these will be your Pollutants of Concern and the appropriate box or boxes will be checked on the last row. The purpose of this is to document compliance and to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs.

Table E.1 Potential Pollutants by Land Use Type

Priority Development Project Categories and/or Project Features (check those that apply)	General Pollutant Categories							
	Bacterial Indicators	Metals	Nutrients	Pesticides	Toxic Organic Compounds	Sediments	Trash & Debris	Oil & Grease
☐ Detached Residential Development	P	N	P	P	N	P	P	P
☐ Attached Residential Development	P	N	P	P	N	P	P	P[(2)]
☒ Commercial/Industrial Development	P[(3)]	P	P[(1)]	P[(1)]	P[(5)]	P[(1)]	P	P
☐ Automotive Repair Shops	N	P	N	N	P[(4, 5)]	N	P	P
☐ Restaurants (>5,000 ft^2)	P	N	N	N	N	N	P	P
☐ Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P
☒ Parking Lots (>5,000 ft^2)	P[(6)]	P	P[(1)]	P[(1)]	P[(4)]	P[(1)]	P	P
☒ Retail Gasoline Outlets	N	P	N	N	P	N	P	P
Project Priority Pollutant(s) of Concern	☒	☐	☐	☐	☒	☐	☐	☐

P = Potential

N = Not Potential

(1) A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected

(2) A potential Pollutant if the project includes uncovered parking areas; otherwise not expected

(3) A potential Pollutant is land use involving animal waste

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

Projects that cannot implement LID BMPs but nevertheless implement smart growth principles are potentially eligible for Stormwater Credits. Utilize Table 3-8 within the WQMP Guidance Document to identify your Project Category and its associated Water Quality Credit. If not applicable, write N/A.

Table E.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
N/A	N/A
Total Credit Percentage[1]	

[1] *Cannot Exceed 50%*
[2] *Obtain corresponding data from Table 3-8 in the WQMP Guidance Document*

E.3 Sizing Criteria

After you appropriately considered Stormwater Credits for your project, utilize Table E.3 below to appropriately size them to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.2 of the WQMP Guidance Document for further information.

Table E.3 Treatment Control BMP Sizing

DMA Type/ID	**DMA Area (square feet)**	**Post-Project Surface Type**	**Effective Impervious Fraction, I_f**	**DMA Runoff Factor**	**DMA Area x Runoff Factor**		***Enter BMP Name / Identifier Here***		
	[A]		[B]	[C]	[A] x [C]				
N/A	N/A	N/A	N/A	N/A	N/A	*Design Storm Depth (in)*	*Minimum Design Capture Volume or Design Flow Rate (cubic feet or cfs)*	*Total Storm Water Credit % Reduction*	*Proposed Volume or Flow on Plans (cubic feet or cfs)*
	$A_T = \Sigma[A]$			$\Sigma = [D]$		[E]	$[F] = \frac{[D]x[E]}{[G]}$	[F] X (1-[H])	[I]

[B], [C] is obtained as described in Section 2.3.1 from the WQMP Guidance Document
[E] is obtained from Exhibit A in the WQMP Guidance Document
[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12
[H] is from the Total Credit Percentage as Calculated from Table E.2 above
[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

Treatment Control BMPs typically provide proprietary treatment mechanisms to treat potential pollutants in runoff, but do not sustain significant biological processes. Treatment Control BMPs must have a removal efficiency of a medium or high effectiveness as quantified below:

- **High**: equal to or greater than 80% removal efficiency
- **Medium**: between 40% and 80% removal efficiency

Such removal efficiency documentation (e.g., studies, reports, etc.) as further discussed in Chapter 3.5.2 of the WQMP Guidance Document, must be included in Appendix 6. In addition, ensure that proposed Treatment Control BMPs are properly identified on the WQMP Site Plan in Appendix 1.

Table E.4 Treatment Control BMP Selection

Selected Treatment Control BMP Name or ID[1]	Priority Pollutant(s) of Concern to Mitigate[2]	Removal Efficiency Percentage[3]
N/A	N/A	N/A

[1] *Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.*
[2] *Cross Reference Table E.1 above to populate this column.*
[3] *As documented in a Co-Permittee Approved Study and provided in Appendix 6.*

Section F: Hydromodification

F.1 Hydrologic Conditions of Concern (HCOC) Analysis

Once you have determined that the LID design is adequate to address water quality requirements, you will need to assess if the proposed LID Design may still create a HCOC. Review Chapters 2 and 3 (including Figure 3-7) of the WQMP Guidance Document to determine if your project must mitigate for Hydromodification impacts. If your project meets one of the following criteria which will be indicated by the check boxes below, you do not need to address Hydromodification at this time. However, if the project does not qualify for Exemptions 1, 2 or 3, then additional measures must be added to the design to comply with HCOC criteria. This is discussed in further detail below in Section F.2.

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Copermittee has the discretion to require a Project-Specific WQMP to address HCOCs on projects less than one acre on a case by case basis. The disturbed area calculation should include all disturbances associated with larger common plans of development.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply.

HCOC EXEMPTION 2: The volume and time of concentration[1] of storm water runoff for the post-development condition is not significantly different from the pre-development condition for a 2-year return frequency storm (a difference of 5% or less is considered insignificant) using one of the following methods to calculate:

- Riverside County Hydrology Manual
- Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds (NRCS 1986), or derivatives thereof, such as the Santa Barbara Urban Hydrograph Method
- Other methods acceptable to the Co-Permittee

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, report results in Table F.1 below and provide your substantiated hydrologic analysis in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration	N/A	N/A	N/A
Volume (Cubic Feet)	N/A	N/A	N/A

[1] Time of concentration is defined as the time after the beginning of the rainfall when all portions of the drainage basin are contributing to flow at the outlet.

HCOC EXEMPTION 3: All downstream conveyance channels to an adequate sump (for example, Prado Dam, Lake Elsinore, Canyon Lake, Santa Ana River, or other lake, reservoir or naturally erosion resistant feature) that will receive runoff from the project are engineered and regularly maintained to ensure design flow capacity; no sensitive stream habitat areas will be adversely affected; or are not identified on the Co-Permittees Hydromodification Sensitivity Maps.

Does the project qualify for this HCOC Exemption? ☐ Y ☒ N

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier:

F.2 HCOC Mitigation

If none of the above HCOC Exemption Criteria are applicable, HCOC criteria is considered mitigated if they meet one of the following conditions:

a. Additional LID BMPS are implemented onsite or offsite to mitigate potential erosion or habitat impacts as a result of HCOCs. This can be conducted by an evaluation of site-specific conditions utilizing accepted professional methodologies published by entities such as the California Stormwater Quality Association (CASQA), the Southern California Coastal Water Research Project (SCCRWP), or other Co-Permittee approved methodologies for site-specific HCOC analysis.

b. The project is developed consistent with an approved Watershed Action Plan that addresses HCOC in Receiving Waters.

c. Mimicking the pre-development hydrograph with the post-development hydrograph, for a 2-year return frequency storm. Generally, the hydrologic conditions of concern are not significant, if the post-development hydrograph is no more than 10% greater than pre-development hydrograph. In cases where excess volume cannot be infiltrated or captured and reused, discharge from the site must be limited to a flow rate no greater than 110% of the pre-development 2-year peak flow.

Be sure to include all pertinent documentation used in your analysis of the items a, b or c in Appendix 7.

Summary

The infiltration chambers used on-site are designed to be oversized to retain flood flow rates from the 2-year return frequency storm and higher. A hydraulic analysis was conducted for the project that determined the historical discharge from each parcel. The infiltration chambers for each parcel are designed to reduce the post-construction runoff to equal the historical discharge. The drainage report included in Appendix 7 contains supporting documentation.

Section G: Source Control BMPs

Source control BMPs include permanent, structural features that may be required in your project plans — such as roofs over and berms around trash and recycling areas — and Operational BMPs, such as regular sweeping and "housekeeping", that must be implemented by the site's occupant or user. The MEP standard typically requires both types of BMPs. In general, Operational BMPs cannot be substituted for a feasible and effective permanent BMP. Using the Pollutant Sources/Source Control Checklist in Appendix 8, review the following procedure to specify Source Control BMPs for your site:

1. ***Identify Pollutant Sources*:** Review Column 1 in the Pollutant Sources/Source Control Checklist. Check off the potential sources of Pollutants that apply to your site.

2. ***Note Locations on Project-Specific WQMP Exhibit*:** Note the corresponding requirements listed in Column 2 of the Pollutant Sources/Source Control Checklist. Show the location of each Pollutant source and each permanent Source Control BMP in your Project-Specific WQMP Exhibit located in Appendix 1.

3. ***Prepare a Table and Narrative*:** Check off the corresponding requirements listed in Column 3 in the Pollutant Sources/Source Control Checklist. In the left column of Table G.1 below, list each potential source of runoff Pollutants on your site (from those that you checked in the Pollutant Sources/Source Control Checklist). In the middle column, list the corresponding permanent, Structural Source Control BMPs (from Columns 2 and 3 of the Pollutant Sources/Source Control Checklist) used to prevent Pollutants from entering runoff. **Add additional narrative** in this column that explains any special features, materials or methods of construction that will be used to implement these permanent, Structural Source Control BMPs.

4. ***Identify Operational Source Control BMPs:*** To complete your table, refer once again to the Pollutant Sources/Source Control Checklist. List in the right column of your table the Operational BMPs that should be implemented as long as the anticipated activities continue at the site. Copermittee stormwater ordinances require that applicable Source Control BMPs be implemented; the same BMPs may also be required as a condition of a use permit or other revocable Discretionary Approval for use of the site.

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
A. On-site storm drain inlets	Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951-955-1200 to verify.	• Maintain and periodically repaint or replace inlet markings. • Provide stormwater pollution prevention information to new owners, lessees, or operators. • See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com • Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
B. Interior floor drains and elevator shaft sump pumps	Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer (as applicable)	• Inspect and maintain drains to prevent blockages and overflow
D2. 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 stormwater pollution. • Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. • Consider using pest-resistant plants, especially adjacent to hardscape. • To ensure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	• Maintain landscaping using minimum or no pesticides. • See applicable operational BMPs in “What you should know for … Landscape and Gardening”. • Provide IPM information to new owners, lessees and operators.

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
F. Food Service	For restaurants, grocery stores, and other food service operations, floor sinks or other areas for cleaning floor mats, containers, and equipment shall be installed indoors or in a covered area outdoors. The drain shall be connected to a grease interceptor before discharging to the sanitary sewer.	• See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/ • Provide this brochure to new site owners, lessees, and operators.
G. Refuse Areas	• Refuse areas shall be covered, graded, and paved to prevent run-on, and berms shall be placed around the area to prevent runoff if necessary. • Any drains from receptacles shall be connected to a grease removal device before discharge to sanitary sewer. • Signs will be posted on or near dumpsters with the words "Do no dump hazardous materials here" or similar.	• Adequate number of receptacles shall be provided. • Receptacles will be inspected regularly, and leaky receptacles shall be repaired or replaced. • Receptacles shall be kept covered. • Dumping of liquid or hazardous wastes shall be prohibited/prevented. • "No hazardous materials" signs shall be posted. • Litter shall be picked up daily, and spills shall be cleaned up immediately. • Spill control materials shall be kept available on-site. • See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
J. Vehicle and Equipment Cleaning	Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	• Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
L. Fuel Dispensing Areas		• The property owner shall dry sweep the fueling area routinely • See the Fact Sheet SD-30, "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
N. Fire Sprinkler Test Water	A means shall be provided to drain fire sprinkler test water to the sanitary sewer.	• See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
O. Miscellaneous Drain or Wash Water or Other Sources • Roofing, gutters, and trim	• Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff	
P. Plazas, sidewalks, and parking lots		• 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.

Section H: Construction Plan Checklist

Populate Table H.1 below to assist the plan checker in an expeditious review of your project. The first two columns will contain information that was prepared in previous steps, while the last column will be populated with the corresponding plan sheets. This table is to be completed with the submittal of your final Project-Specific WQMP.

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Corresponding Plan Sheet(s)

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. Co-Permittee staff can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

This section will be completed and addressed at the time of the final WQMP Submittal.

Section I: Operation, Maintenance and Funding

The Copermittee will periodically verify that Stormwater BMPs on your site are maintained and continue to operate as designed. To make this possible, your Copermittee will require that you include in Appendix 9 of this Project-Specific WQMP:

1. A means to finance and implement facility maintenance in perpetuity, including replacement cost.
2. Acceptance of responsibility for maintenance from the time the BMPs are constructed until responsibility for operation and maintenance is legally transferred. A warranty covering a period following construction may also be required.
3. An outline of general maintenance requirements for the Stormwater BMPs you have selected.
4. Figures delineating and designating pervious and impervious areas, location, and type of Stormwater BMP, and tables of pervious and impervious areas served by each facility. Geo-locating the BMPs using a coordinate system of latitude and longitude is recommended to help facilitate a future statewide database system.
5. A separate list and location of self-retaining areas or areas addressed by LID Principles that do not require specialized O&M or inspections but will require typical landscape maintenance as noted in Chapter 5, pages 85-86, in the WQMP Guidance. Include a brief description of typical landscape maintenance for these areas.

Your local Co-Permittee will also require that you prepare and submit a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on your site. An agreement assigning responsibility for maintenance and providing for inspections and certification may also be required.

Details of these requirements and instructions for preparing a Stormwater BMP Operation and Maintenance Plan are in Chapter 5 of the WQMP Guidance Document.

Maintenance Mechanism: Insert text here.

Will the proposed BMPs be maintained by a Home Owners' Association (HOA) or Property Owners Association (POA)?

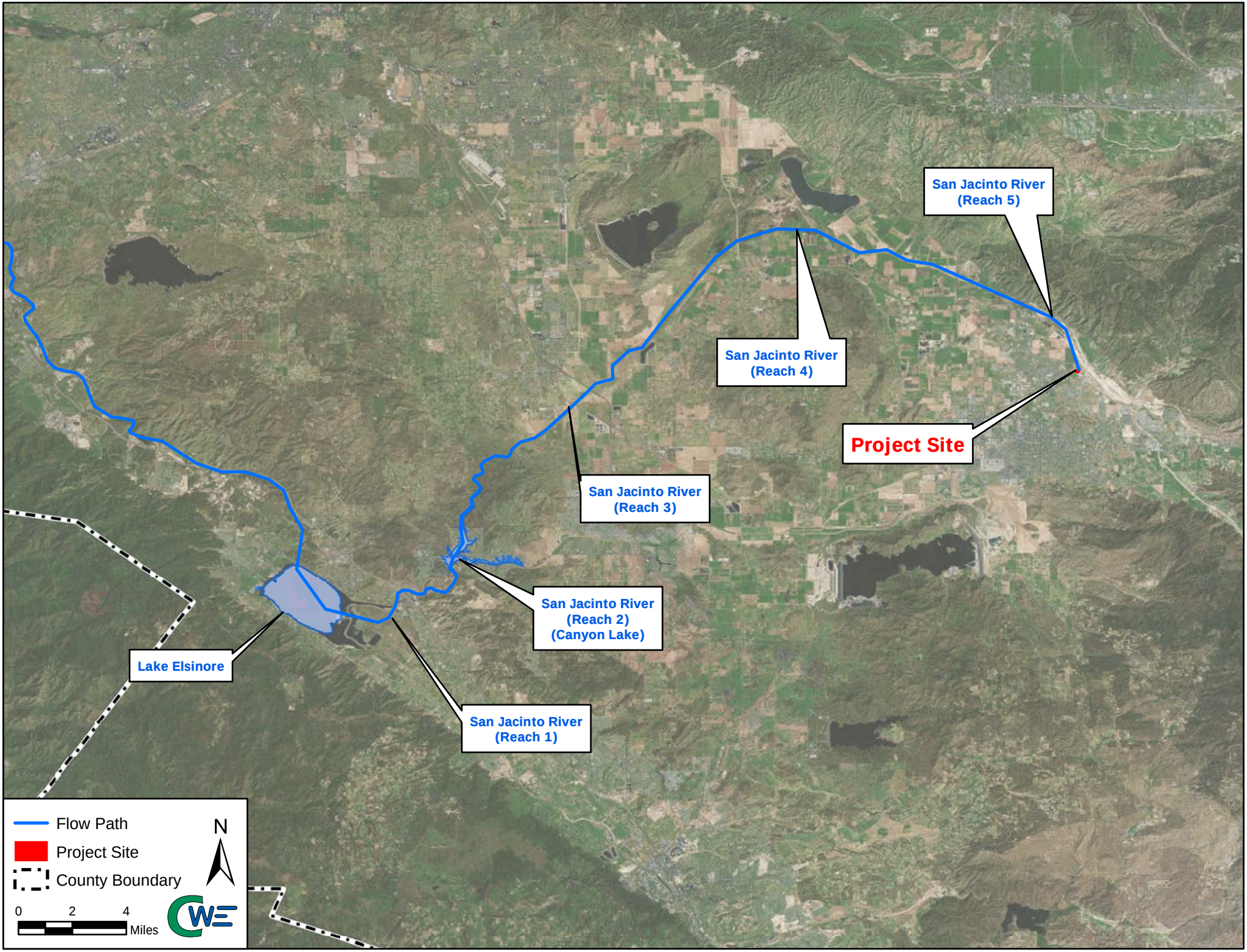
☐ Y ☐ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

This section will be completed and addressed at the time of the final WQMP Submittal.

Appendix 1: Maps and Site Plans

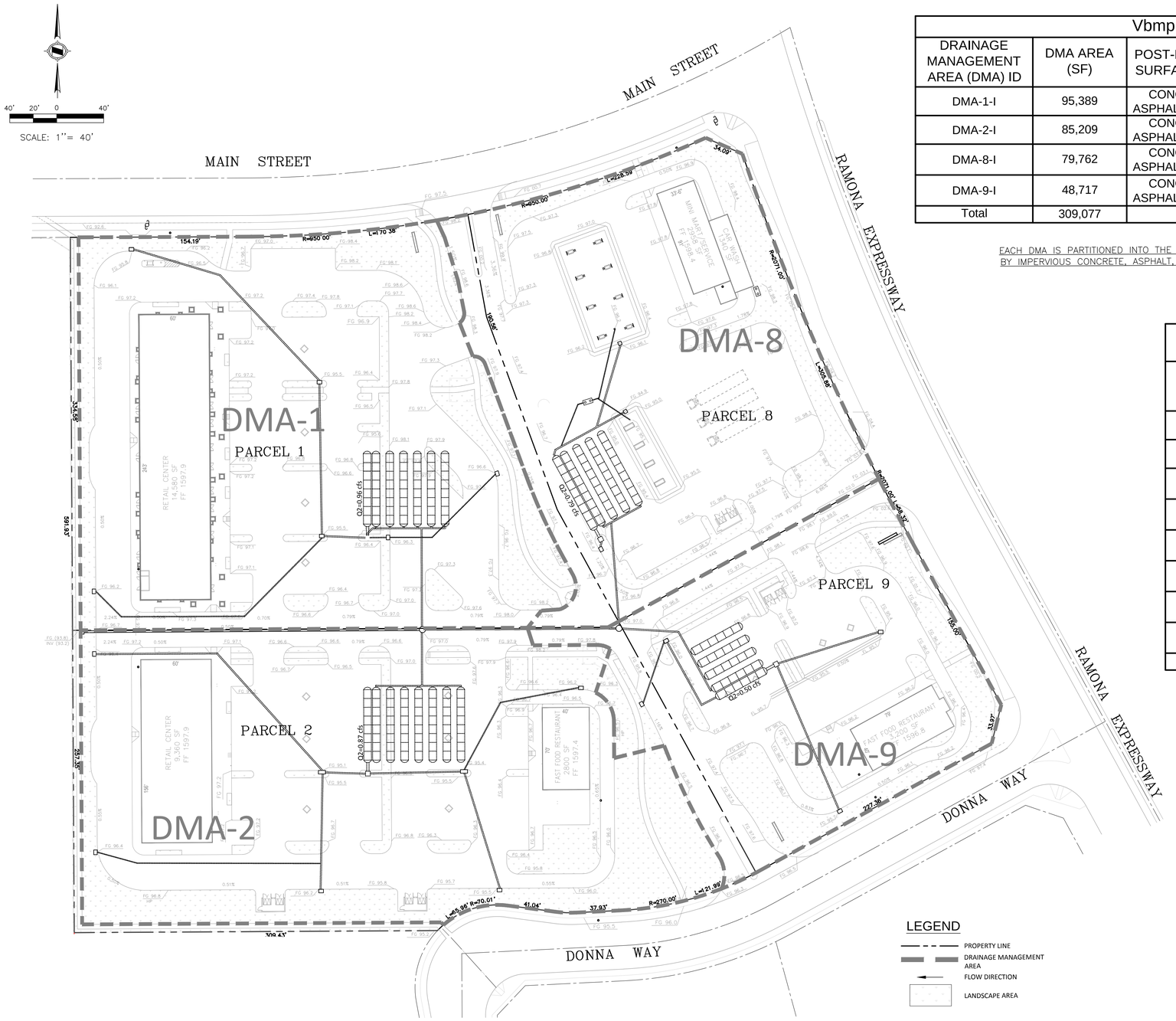
Location Map, WQMP Site Plan and Receiving Waters Map


San Jacinto River
(Reach 5)
San Jacinto River
(Reach 4)
Project Site
San Jacinto River
(Reach 3)
San Jacinto River
(Reach 2)
(Canyon Lake)
Lake Elsinore
San Jacinto River
(Reach 1)
Flow Path
Project Site
County Boundary
N
0
2
4
Miles


Project Site
San Jacinto River
Soboba Rd
N Ramona Expy
Lake Park Dr
Lake Park
Bridle Rd
San Jose Dr
Granite View Dr
Verona Ave
Toulon Ave
Olmstead St
Alessandro Ave
North St
N Vernon Ave
N Camino Los Barros
Cypress Ave
E Artesia St
E Peach St
E 1st St
E Mead St
E 2nd St
E 3rd St
Elderberry St
E Main St
E 5th St
E 6th St
E 7th St
Donna Way
Miracle Dr
Sheriff Ave
Jordan Ave
Albol Ave
S Mistletoe Ave
S Vernon Ave
S Andrews Ave
S Soboba Ave
S Rosario Ave
S Camino Los Barros
Santo Dr
Mirol St
E Shaver St
E Old 2nd St
El Monte St
E Evans St
Justice Ave
Chatham Way
Timothy Dr
Jaca Rosas Dr
Da Vinci Dr
Old Mountain Ave
Osprey St
Via Almahola
Vistadel Rancho
Mountain Ave
Countian Ave
Napoli Way
Appian Way
Independence Ave
E Esplanade Ave
Avenida Roundabout
Rosa Mundi
La Entrada
Mill Iron Dr
Luna Way
E Commonwealth Ave
Reinhart St
Yeats Pl
Faulkner Ave
Crane St
St Emilion Ln
Melville St
Salinger
Hisse Dr
Carrett Way
Wilde Ln
Van Fleet Dr
Rosemont Ct
Caroline Ln
Conrad Pl
Steinbeck Ave
Burns Ln
Tudor Dr
Hooper Dr
Montara Way
E Washington Ave
Villines Ave
Marin Ct
Napa Ct
Callaway Dr
Mouton Dr
Capel St
Versailles St
Amherst Ave
Corwin Pl
Banbury Dr
Paloma Dr
Annisa Ave
Agape Ave
Terrace Dr
Calon St
Park Ave
Soboba Pl
Soboba St
Pike Dr
Colorado Dr
Smith Rd
N Meridian St
N Hemet St
Trell Ln
Bell Ln
Project Site
City Boundary
N
0
1,000
2,000
Feet

DMA MAP

LUISEÑO VILLAGE P17-17
PROPOSED GAS STATION, DRIVE-IN-RESTAURANT,
AND RETAIL CENTER



LEGEND

- PROPERTY LINE
- DRAINAGE MANAGEMENT AREA
- FLOW DIRECTION
- LANDSCAPE AREA

Vbmp CALCULATIONS FOR INFILTRATION CHAMBERS								
DRAINAGE MANAGEMENT AREA (DMA) ID	DMA AREA (SF)	POST-PROJECT SURFACE TYPE	EFFECTIVE IMPERVIOUS FRACTION	DMA RUNOFF FACTOR	DMA AREA X RUNOFF FACTOR	DESIGN STORM DEPTH (IN)	Vbmp (CF)	PROPOSED CAPACITY (CF)
DMA-1-I	95,389	CONCRETE / ASPHALT / ROOFS	1.0000	0.89	85,087	0.70	4963.4	11,541
DMA-2-I	85,209	CONCRETE / ASPHALT / ROOFS	1.0000	0.89	76,006	0.70	4433.7	11,541
DMA-8-I	79,762	CONCRETE / ASPHALT / ROOFS	1.0000	0.89	71,148	0.70	4150.3	7,479
DMA-9-I	48,717	CONCRETE / ASPHALT / ROOFS	1.0000	0.89	43,456	0.70	2534.9	6,482
Total	309,077				275,697		16,082.3	37,043

EACH DMA IS PARTITIONED INTO THE PORTION COVERED BY PERVIOUS LANDSCAPING (DESIGNATED WITH "–P" IN THE WQMP) AND THE PORTION COVERED BY IMPERVIOUS CONCRETE, ASPHALT, OR ROOFING (DESIGNATED WITH "–I" IN THE WQMP).

DMA Classifications			
DRAINAGE MANAGEMENT AREA (DMA) ID	DMA AREA (SF)	POST-PROJECT SURFACE TYPE	DMA Type
DMA-1-I	95,389	CONCRETE / ASPHALT / ROOFS	D
DMA-2-I	85,209	CONCRETE / ASPHALT / ROOFS	D
DMA-8-I	79,762	CONCRETE / ASPHALT / ROOFS	D
DMA-9-I	48,717	CONCRETE / ASPHALT / ROOFS	D
DMA-1-P	27,554	ORNAMENTAL LANDSCAPING	A
DMA-2-P	34,919	ORNAMENTAL LANDSCAPING	A
DMA-8-P	13,896	ORNAMENTAL LANDSCAPING	A
DMA-9-P	20,402	ORNAMENTAL LANDSCAPING	A
Total	405,848		

NOT FOR CONSTRUCTION

NO.	DATE	REVISIONS
7		
6		
5		
4		
3		
2		
1		

DRAWN BY: SB DATE JUL 2019
DESIGNED BY: SB DATE JUL 2019
CHECKED BY: KH DATE JUL 2019

SEAL

REGISTERED PROFESSIONAL ENGINEER STEVEN M. BELL No. 81531 CIVIL STATE OF CALIFORNIA

PREPARED BY:

1561 E. ORANGETHORPE AVE.
SUITE 240
FULLERTON, CA 92831
TEL (714) 526-7500
www.cwecorp.com

PROJECT TITLE
LUISEÑO VILLAGE
PROPOSED GAS STATION, DRIVE-IN-RESTAURANT, AND RETAIL CENTER

PROJECT NO.
SPDR 17-17

SHEET 1
OF 1

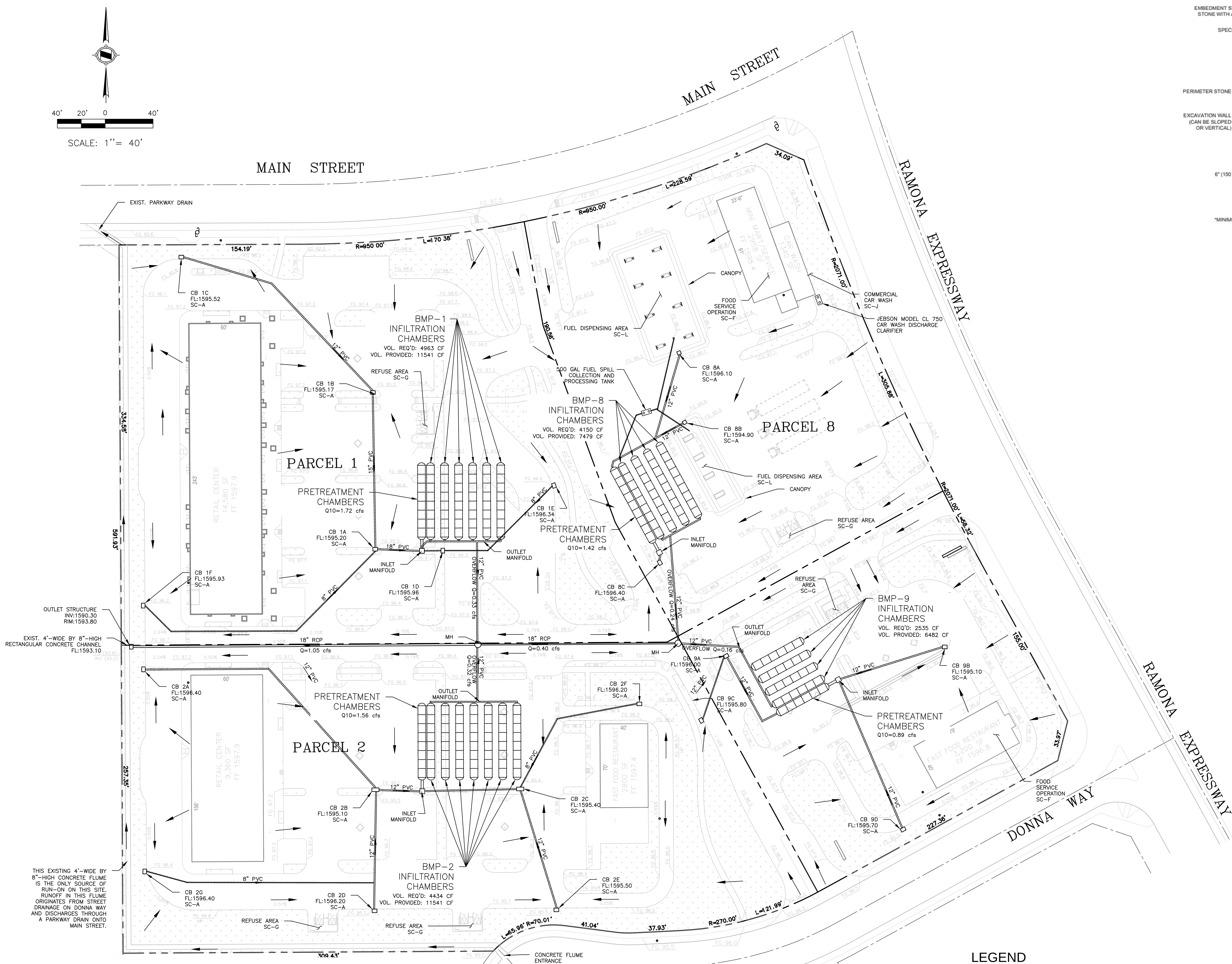
SHEET TITLE
DMA MAP
FOR LUISEÑO VILLAGE P17-17

BMP SITE PLAN

LUISEÑO VILLAGE P17-17

PROPOSED GAS STATION, DRIVE-IN-RESTAURANT,

AND RETAIL CENTER

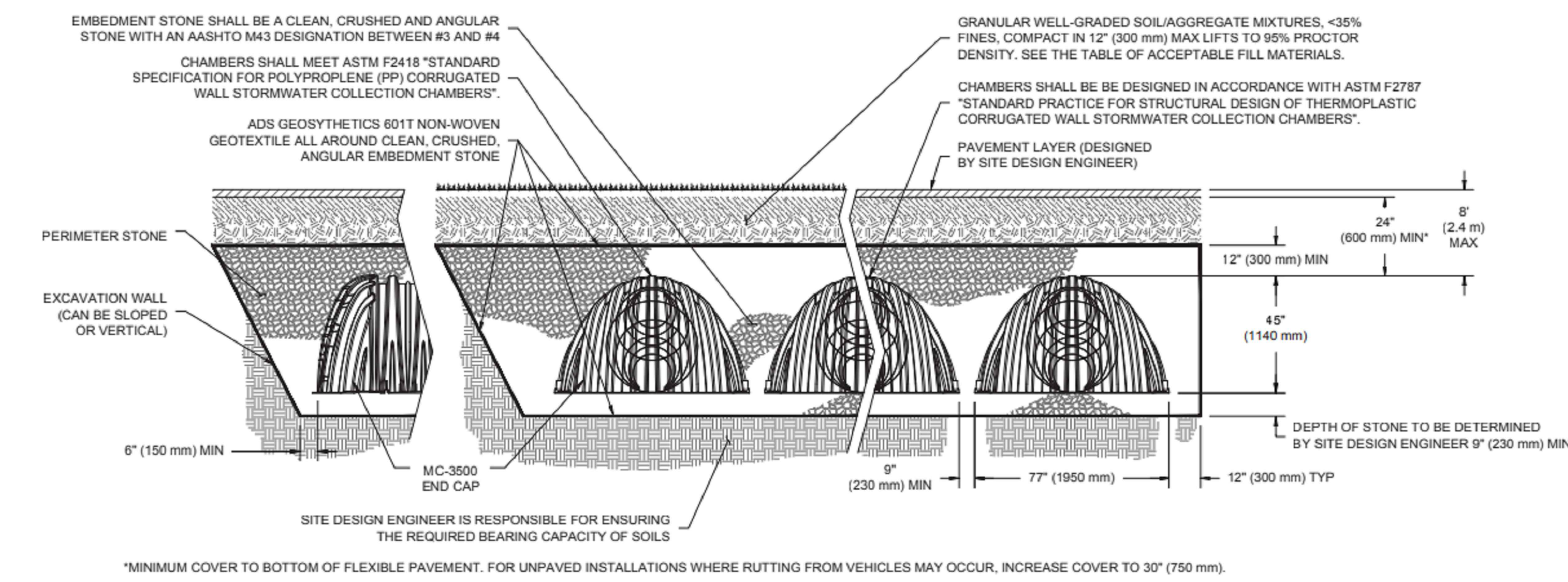


LEGEND

PROPERTY LINE

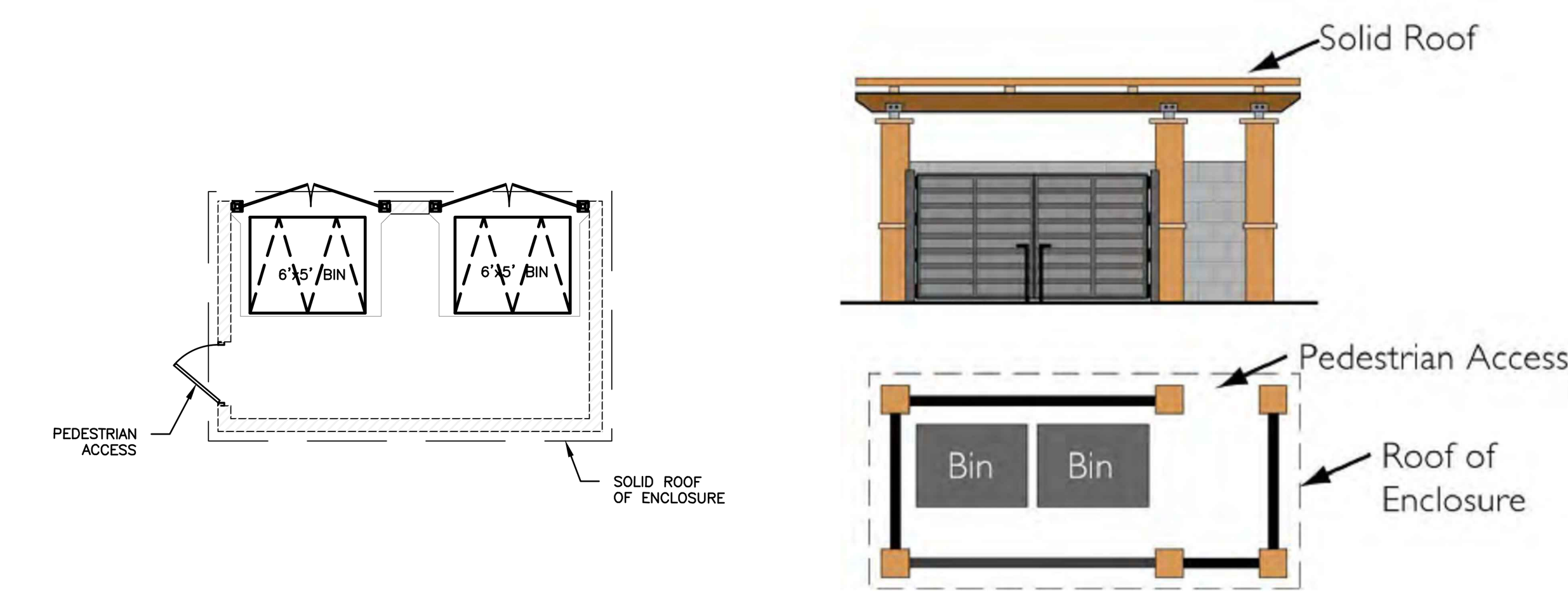
FLOW DIRECTION

LANDSCAPE AREA



INFILTRATION CHAMBER

GENERAL CROSS SECTION



TRASH ENCLOSURE

CONCEPTUAL DETAIL

SOURCE CONTROL BMP NOTES

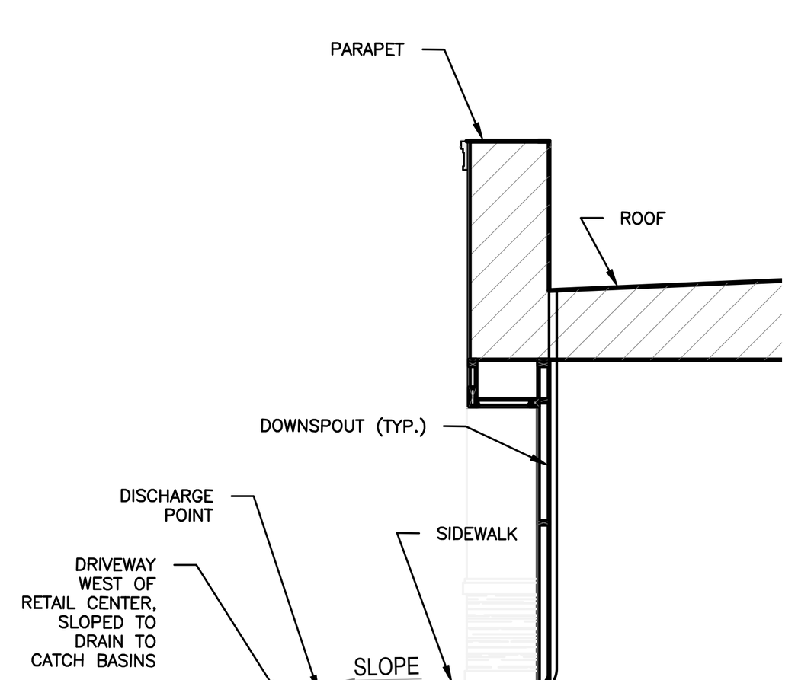
SC-A LOCATION OF INLETS SHOWN ON PLANS. ALL CATCH BASINS SHALL BE MARKED WITH THE WORDS "ONLY RAIN DOWN THE STORM DRAIN".

SC-F FOR RESTAURANTS, GROCERY STORES, AND OTHER FOOD SERVICE OPERATIONS, FLOOR SINKS OR OTHER AREAS FOR CLEANING FLOOR MATS, CONTAINERS, AND EQUIPMENT SHALL BE INSTALLED INDOORS OR IN A COVERED AREA OUTDOORS. THE DRAIN SHALL BE CONNECTED TO A GREASE INTERCEPTOR BEFORE DISCHARGING TO THE SANITARY SEWER.

SC-G REFUSE AREA SHOWN. REFUSE AREA SHALL BE COVERED, GRADED, AND PAVED TO PREVENT RUN-ON, AND BERMS SHALL BE PLACED AROUND THE AREA TO PREVENT RUNOFF. ANY DRAINS FROM RECEPTACLES SHALL BE CONNECTED TO A GREASE REMOVAL DEVICE BEFORE DISCHARGE TO SANITARY SEWER.

SC-J COMMERCIAL CAR WASH FACILITIES SHALL BE DESIGNED SUCH THAT NO RUNOFF FROM THE FACILITY IS DISCHARGED TO THE STORM DRAIN SYSTEM. WASTEWATER FROM THE FACILITY SHALL DISCHARGE TO THE SANITARY SEWER, OR A WASTEWATER RECLAMATION SYSTEM SHALL BE INSTALLED.

SC-L FUEL DISPENSING AREAS SHOWN. FUELING AREAS SHALL HAVE IMPERMEABLE FLOORS (I.E., PORTLAND CEMENT CONCRETE OR EQUIVALENT SMOOTH IMPERVIOUS SURFACE) THAT ARE A) GRADED AT THE MINIMUM SLOPE NECESSARY TO PREVENT PONDING; AND B) SEPARATED FROM THE REST OF THE SITE BY A GRADE BREAK THAT PREVENTS RUN-ON OF STORMWATER TO THE MAXIMUM EXTENT PRACTICABLE. FUELING AREAS SHALL BE COVERED BY A CANOPY THAT EXTENDS A MINIMUM OF TEN FEET IN EACH DIRECTION FROM EACH PUMP. THE CANOPY SHALL NOT DRAIN ONTO THE FUELING AREA



DOWNSPOUT

CONCEPTUAL DETAIL

NOT FOR CONSTRUCTION

NO.	DATE	REVISIONS
7		
6		
5		
4		
3		
2		
1		

		DATE
DRAWN BY:	SB	JUL 2019
DESIGNED BY:	SB	JUL 2019
CHECKED BY:	KH	JUL 2019

SEAL: REGISTERED PROFESSIONAL ENGINEER STEVEN M. BELL No. 81531 CIVIL STATE OF CALIFORNIA

PREPARED BY:

CWE
1561 E. ORANGETHORPE AVE.
SUITE 240
FULLERTON, CA 92831
TEL (714) 526-7500
www.cwecorp.com

PROJECT TITLE

LUISEÑO VILLAGE

PROPOSED GAS STATION, DRIVE-IN-RESTAURANT, AND RETAIL CENTER

SHEET TITLE

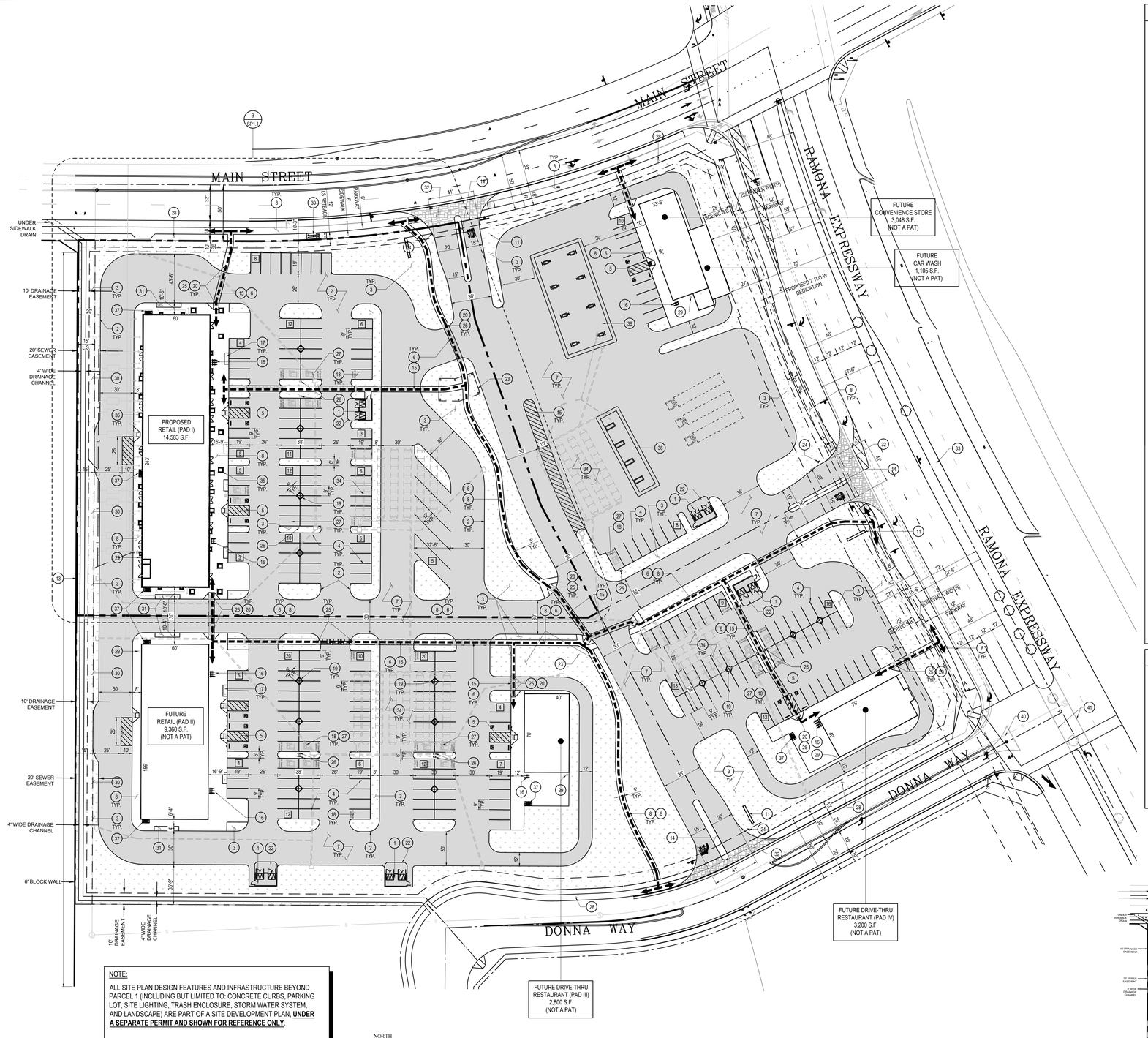
POST-CONSTRUCTION BMP SITE PLAN FOR LUISEÑO VILLAGE P17-17

PROJECT NO. SPDR 17-17

SHEET 1 OF 1

Appendix 2: Construction Plans

Grading and Drainage Plans



NOTE:

ALL SITE PLAN DESIGN FEATURES AND INFRASTRUCTURE BEYOND PARCEL 1 (INCLUDING BUT LIMITED TO: CONCRETE CURBS, PARKING LOT, SITE LIGHTING, TRASH ENCLOSURE, STORM WATER SYSTEM, AND LANDSCAPE) ARE PART OF A SITE DEVELOPMENT PLAN, **UNDER A SEPARATE PERMIT AND SHOWN FOR REFERENCE ONLY**.

NORTH

OVERALL SITE PLAN — A — 1"=40'-0"

SITE ANALYSIS

SITE AREA:	412,058 (9.46 A)
IMPERVIOUS SURFACE COVERAGE (structures + paved area + hardscape):	316,462 S.F. (7.26 A) - 76.8%
STRUCTURES COVERAGE (bldg., canopy, trash enclosure, etc):	36,847 S.F. (0.85 A) - 8.9%
PAVED AREA COVERAGE (parking area + drive isles + hardscape):	279,615 S.F. (6.58 A) - 67.9%
LANDSCAPE AREA COVERAGE:	95,596 S.F. (2.19 A) - 23.2%
LANDSCAPE AREA REQUIRED (MIN. 5% OF PAVED AREA):	12,558 S.F. (MIN.)
PROPOSED TOTAL BLDG. AREA:	28,496 SQ.FT. - 6.91%
FAR:	0.069
EXISTING ZONING:	CN (COMMERCIAL NEIGHBORHOOD)
PROPOSED ZONING:	CG (COMMERCIAL GENERAL)
BUILDING SETBACKS:	
FRONT: 10'	STREET SIDE: 10'
REAR: 10'	INTERIOR SIDE: NOT REQ'D
LANDSCAPE SETBACKS:	
MAIN STREET:	6' PARKWAY + 6' WALK + 12' LANDSCAPE SETBACK
RAMONA EXPRESS WAY:	12' PARKWAY + 8' WALK + 25' SCENIC SETBACK
ADJACENT TO RESIDENTIAL (WEST SIDE):	15'

PARCEL 1

SITE AREA	132,637 S.F. (3 A)
PROPOSED BLDG. AREA:	14,583 S.F.
COVERAGE:	11%
NUMBER OF STORIES (CBC TABLE 504.4):	01
PROPOSED BLDG. HEIGHT (CBC TABLE 504.3):	± 31'-0" A.F.F.
CONSTRUCTION TYPE:	V-B
OCCUPANCY GROUP:	B-M
PROPOSED USE:	RETAIL & FAST FOOT REST.
AREA SEPARATION WALL:	NO
BLDG. SPRINKLER:	TBD

PARCEL 2

SITE AREA	132,018 S.F. (3 A)
PROPOSED BLDG. AREA (PAD2 - RETAIL):	9,360 S.F.
PROPOSED BLDG. AREA (PAD3 - RESTAURANT):	2,800 S.F.
COVERAGE:	9%
NUMBER OF STORIES (CBC TABLE 504.4):	01
PROPOSED BLDG. HEIGHT (CBC TABLE 504.3):	TBD
CONSTRUCTION TYPE:	V-B
OCCUPANCY GROUP:	B-M
PROPOSED USE:	RETAIL & FAST FOOT REST.
AREA SEPARATION WALL:	NO
BLDG. SPRINKLER:	TBD

PARCEL 8

SITE AREA	86,281 S.F. (2 A)
PROPOSED BLDG. AREA (CONVENIENCE STORE):	3,048 S.F.
PROPOSED BLDG. AREA (CAR WASH):	1,105 S.F.
COVERAGE:	5%
NUMBER OF STORIES (CBC TABLE 504.4):	01
PROPOSED BLDG. HEIGHT (CBC TABLE 504.3):	TBD
CONSTRUCTION TYPE:	V-B
OCCUPANCY GROUP:	B
PROPOSED USE:	RETAIL & CAR WASH
AREA SEPARATION WALL:	TBD
BLDG. SPRINKLER:	TBD

PARCEL 9

SITE AREA	61,122 S.F. (1.4 A)
PROPOSED BLDG. AREA:	3,200 S.F.
COVERAGE:	5%
NUMBER OF STORIES (CBC TABLE 504.4):	01
PROPOSED BLDG. HEIGHT (CBC TABLE 504.3):	TBD
CONSTRUCTION TYPE:	V-B
OCCUPANCY GROUP:	B-M
PROPOSED USE:	DRIVE-THRU FAST FOOT REST.
AREA SEPARATION WALL:	NO
BLDG. SPRINKLER:	TBD

R.O.W. IMPROVEMENT NOTES

AT DONNA WAY:

a. ANY EXISTING IMPROVEMENT THAT ARE DEEMED SUBSTANDARD PER FIELD INSPECTION SHALL BE REPLACED IN KIND. THIS INCLUDES AC PAVING, CURB/GUTTER AND SIDEWALK.
b. STREET LIGHTS WILL BE REQUIRED.
c. PARKWAY LANDSCAPE WILL BE REQUIRED.

AT RAMONA EXPRESSWAY:

a. ANY EXISTING IMPROVEMENT THAT ARE DEEMED SUBSTANDARD PER FIELD INSPECTION SHALL BE REPLACED IN KIND. THIS INCLUDES AC PAVING, CURB/GUTTER AND SIDEWALK.
c. PARKWAY LANDSCAPE WILL BE REQUIRED.
d. RAISED MEDIAN WILL BE REQUIRED.

AT RAMONA EXPRESSWAY:

a. ANY EXISTING IMPROVEMENT THAT ARE DEEMED SUBSTANDARD PER FIELD INSPECTION SHALL BE REPLACED IN KIND. THIS INCLUDES AC PAVING, CURB/GUTTER AND SIDEWALK.
b. ADDITIONAL STREET LIGHTS MAY BE REQUIRED, DEPENDING ON PLACEMENT.
c. PARKWAY LANDSCAPE WILL BE REQUIRED.

PARKING ANALYSIS

PARCEL 1

SHOPS BLDG AREA ..... 14,583 SQ.FT.

USE	AREA	REQUIRED	TOTAL
RETAIL	12,396 SQ.FT.	1:250	50 STALLS
RESTAURANT * (15%)	2,000 SQ.FT.	1:200	10 STALLS
	187 SQ.FT.	1:60	3 STALLS
RESTAURANT PATIO	900 SQ.FT.	1:50	18 STALLS

TOTAL PARKING REQUIRED ..... 81 STALLS
TOTAL PARKING PROVIDED ..... 95 STALLS
STANDARD SPACES ..... 83 STALLS
HC SPACES ..... 04 STALLS
CLEAN AIR/VAN POOL/EP PROVIDED ..... 08 STALLS
FUTURE EV SPACES PROVIDED ..... 05 STALLS
BUS PARKING ..... 05 STALLS
BICYCLE PARKING PROVIDED (SHORT-TERM) 06
BICYCLE PARKING PROVIDED (LONG-TERM) 05

PARCEL 2

SHOPS BLDG AREA ..... 9,360 SQ.FT.
RESTAURANT BLDG AREA ..... 2,800 SQ.FT.

USE	AREA	REQUIRED	TOTAL
RETAIL	7,956 SQ.FT.	1:250	32 STALLS
RESTAURANT * (15%)	1,404 SQ.FT.	1:200	7 STALLS
RESTAURANT PATIO	900 SQ.FT.	1:50	18 STALLS
DRIVE-THRU RESTAURANT *	2,000 SQ.FT.	1:200	10 STALLS
	800 SQ.FT.	1:60	13 STALLS
RESTAURANT PATIO	1,000 SQ.FT.	1:50	20 STALLS

TOTAL PARKING REQUIRED ..... 100 STALLS
TOTAL PARKING PROVIDED ..... 101 STALLS
STANDARD SPACES ..... 85 STALLS
HC SPACES ..... 05 STALLS
CLEAN AIR/VAN POOL/EP PROVIDED ..... 11 STALLS
FUTURE EV SPACES PROVIDED ..... 07 STALLS
BICYCLE PARKING PROVIDED (SHORT-TERM) 06
BICYCLE PARKING PROVIDED (LONG-TERM) 05

PARCEL 8

CONVENIENCE STORE BLDG. AREA ..... 3,048 SQ.FT.
CAR WASH BLDG. AREA ..... 1,105 SQ.FT.

USE	AREA	REQUIRED	TOTAL
CONVENIENCE STORE	3,048 SQ.FT.	1:250	12 STALLS
CAR WASH **	1,105 SQ.FT.	1:EACH EMPLOYEE	4 STALLS

TOTAL PARKING REQUIRED ..... 16 STALLS
TOTAL PARKING PROVIDED ..... 18 STALLS
STANDARD SPACES ..... 15 STALLS
HC SPACES ..... 02 STALLS
CLEAN AIR/VAN POOL/EP PROVIDED ..... 01 STALLS
FUTURE EV SPACES PROVIDED ..... 01 STALLS
BICYCLE PARKING PROVIDED (SHORT-TERM) 2

PARCEL 9

RESTAURANT BLDG AREA ..... 3,200 SQ.FT.

USE	AREA	REQUIRED	TOTAL
DRIVE-THRU RESTAURANT *	2,000 SQ.FT.	1:200	10 STALLS
	1,200 SQ.FT.	1:60	20 STALLS
RESTAURANT PATIO	1,000 SQ.FT.	1:50	20 STALLS

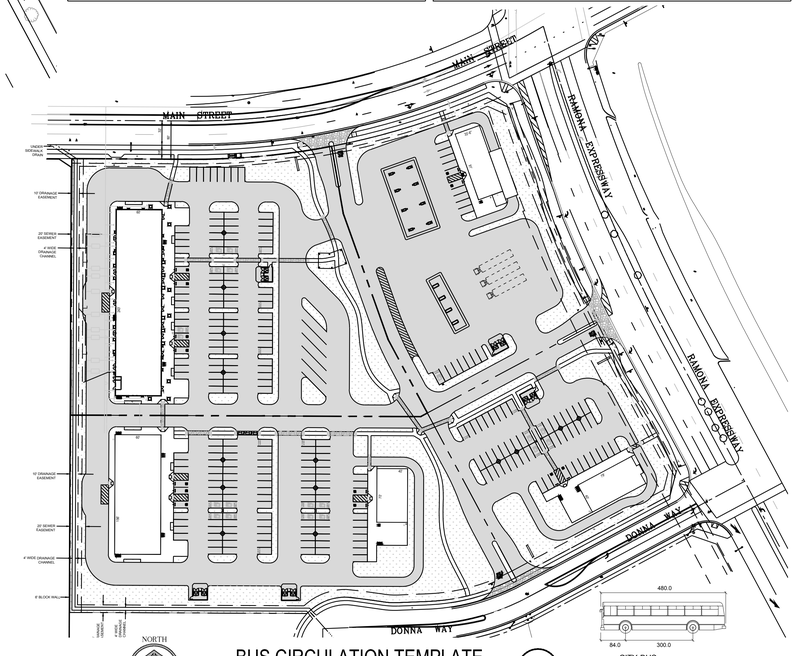
TOTAL PARKING REQUIRED ..... 50 STALLS
TOTAL PARKING PROVIDED ..... 55 STALLS
STANDARD SPACES ..... 47 STALLS
HC SPACES ..... 02 STALLS
CLEAN AIR/VAN POOL/EP PROVIDED ..... 06 STALLS
FUTURE EV SPACES PROVIDED ..... 04 STALLS
BICYCLE PARKING PROVIDED (SHORT-TERM) 4
BICYCLE PARKING PROVIDED (LONG-TERM) 2

TOTAL BICYCLE PARKING REQUIRED (MIN. 10% OF 272 PROVIDED PARKING) 27
TOTAL BICYCLE PARKING PROVIDED 30
SHORT-TERM BICYCLE PARKING PROVIDED 18
LONG-TERM BICYCLE PARKING PROVIDED 12

TOTAL PARKING REQUIRED ..... 247 STALLS
TOTAL PARKING PROVIDED ..... 269 STALLS
PERCENTAGE OF PARKING SPACES IN EXCESS OF MIN. REQUIRED 9%

* RESTAURANT/DRIVE THRU:
UP TO 2,000 SQ. FT. = 1 SPACE FOR EACH 200-SQ. FT. GFA OVER 2,000 SQ. FT. = 1 SPACE FOR EACH ADDITIONAL 60 SQ. FT. GFA; AND STACKING FOR 7 VEHICLES AT EACH BAY, WINDOW, LANE, OR ORDERING STATION FOR EACH NO ADDITIONAL PARKING REQUIRED IF OUTDOOR DINING AREA COMPRISES NO MORE THAN 15 PERCENT OF THE INTERIOR GROSS FLOOR AREA OF THE PRIMARY FOOD SERVICE USE; IF OUTDOOR DINING AREA IS OVER 15%, 1 SPACE FOR EVERY 50-SQ. FT. OR 1 SPACE FOR EVERY 3 SEATS, WHICHEVER IS GREATER.

** CAR WASH:
1 PARKING SPACE PER EACH EMPLOYEE OF THE LARGEST SHIFT; STACKING FOR 4 VEHICLES FOR EACH AUTOMATIC CAR WASH LANE, AND 3 SPACES PER LANE FOR MANUAL DRYING



NORTH

BUS CIRCULATION TEMPLATE — B — 1"=80'-0"

CITY-BUS (inches)

Width	102.0
Track	102.0
Lock to Lock Time	6.0
Steering Angle	41.4

VICINITY MAP

NOT TO SCALE

SITE PLAN SHEET INDEX

1. MASONRY TRASH ENCLOSURE w/ DECORATIVE BLOCK, SOLID TRELLIS FEATURE AND INTERNAL DRAIN. TRASH ENCLOSURE TO COMPLY w/ ALL NEW STATE OF CALIFORNIA & CITY REQUIREMENTS. REFER TO DETAIL A/SPD2.0
2. 6" LANDSCAPE CURB TYPICAL. REFER TO DETAIL F/SPD1.0
3. LANDSCAPED AREA. REFER TO LANDSCAPE PLANS
4. 9'-0" W x 19'-0" D PARKING STALLS PAINTED PER CITY'S REQUIREMENTS.
5. PROPOSED ACCESSIBLE PARKING STALLS. RAMP (WHERE OCCURS) TO COMPLY WITH STATE AND FEDERAL STANDARDS. REFER TO DETAIL A/SPD1.0.
6. PROPOSED PEDESTRIAN ACCESSIBLE PATH OF TRAVEL (DASHED LINE). 5% MAX. SLOPE IN DIRECTION OF TRAVEL & 2% MAX. CROSS-SLOPE.
7. ASPHALT PARKING LOT AND DRIVE AISLES PER CITY OF SAN JACINTO STANDARDS. REFER TO CIVIL PLANS.
8. CONCRETE SIDEWALK. G.C. TO ENSURE 5% MAX. SLOPE & 2% MAX. CROSS-SLOPE REFER TO DETAILS H/SPD1.0 & I/SPD1.0.
9. ~~PROPOSED LOCATION OF POSSIBLE FUTURE ATM DRIVE-THRU MACHINE LOCATION. SHOWN FOR REFERENCE ONLY. NOT A PART OF THIS PERMIT.~~
10. ~~PROPOSED LOCATION OF POSSIBLE FUTURE ATM DRIVE-THRU DIRECTIONAL SIGN. SHOWN FOR REFERENCE ONLY. NOT A PART OF THIS PERMIT.~~
11. APPROXIMATE MONUMENT SIGN LOCATION PER CITY OF SAN JACINTO STANDARDS. **SHOWN FOR REFERENCE ONLY. NOT A PART OF THIS PERMIT.** REFER TO "SEPARATE PERMIT NOTE" ON SHEET T1.0.
12. ~~PROPOSED MONUMENT SIGN LOCATION. SHOWN FOR REFERENCE ONLY. UNDER A SEPARATE PERMIT.~~
13. 6' HIGH CMU WALL ADJACENT TO RESIDENTIAL ZONE.
14. PROPOSED RAISED MEDIAN.
15. DECORATIVE PAVING AT ACCESSIBLE ROUTES (PATTERN TBD).
16. BICYCLE PARKING SPACES REQ'D PER CALGREEN CODE (REFER TO PARKING ANALYSIS). BICYCLE PARKING SHALL COMPLY WITH CGC SEC. 5.106.4. REFER TO DETAIL J/SPD1.0.
17. PROPOSED 10' LONG x 48" WIDE PLANTER AREA ADJACENT TO PARKING SPACES. CENTER BETWEEN SPACES AS SHOWN. REFER TO LANDSCAPE PLANS.
18. DESIGNATED PARKING FOR ANY COMBINATION OF LOW-EMITTING, FUEL-EFFICIENT AND CARPOOL/VAN POOL VEHICLES (REFER TO PARKING ANALYSIS). **PARKING STALL MARKING:** PAINT, IN THE PAINT USED FOR THE STALL STRIPPING, THE FOLLOWING CHARACTERS SUCH THAT THE LOWER EDGE OF THE LAST WORD ALIGNS WITH THE END OF THE STALL STRIPING AND IS VISIBLE BENEATH A PARKED VEHICLE : **CLEAN AIR/ VANPOOL/EV.**
19. 5' SQ. LANDSCAPE DIAMOND w/ 6" CONCRETE CURB.
20. PROPOSED ACCESSIBLE CURB RAMP. RAMP TO COMPLY WITH STATE AND FEDERAL STANDARDS. REFER TO CIVIL PLANS AND DETAIL L/SPD1.0.
21. ~~PROPOSED TRANSFORMER LOCATION. LOCATION TO BE COORDINATED w/ UTILITY CO. REFER TO CIVIL PLANS.~~
22. CONCRETE TO ASPHALT TRANSITION.
23. DECORATIVE TRELLIS.
24. INSTALL HANDICAP ACCESSIBILITY SIGN AT SITE ENTRANCE. REFER TO DETAIL G/SPD1.0.
25. INSTALL DETECTABLE WARNING SURFACE AT "ZERO CURB" AREAS. REFER TO DETAIL K/SPD1.0 AND CIVIL PLANS.
26. FUTURE LOCATION OF ELECTRICAL VEHICLE SUPPLY EQUIPMENT (EVSE). REFER TO POWER PLAN FOR EVSE REQUIREMENTS. FUTURE CHARGING SPACES QUALIFY AS DESIGNATED PARKING FOR CLEAN AIR VEHICLES (CGC 5.106.5.3.5).
27. FUTURE LOCATION OF POTENTIAL ELECTRICAL VEHICLE CHARGING STATION (EVCS). FUTURE CHARGING SPACES QUALIFY AS DESIGNATED PARKING FOR CLEAN AIR VEHICLES (CGC 5.106.5.3.5).
28. PROPOSED WATER METER LOCATION.
29. PROPOSED GAS METER LOCATION.
30. LOADING ZONE.
31. PROPOSED 22' LONG x 48" WIDE PLANTER AREA ADJACENT TO DRIVE ISLE. REFER TO LANDSCAPE PLANS.
32. DECORATIVE PAVING AT DRIVEWAY ENTRANCES (PATTERN TBD).
33. APPROXIMATE LOCATION OF EXITING RAISED MEDIAN.
34. UNDERGROUND RETENTION SYSTEM PER CIVIL PLANS.
35. BUILDING COLUMNS/ARCHITECTURAL PROJECTIONS. REFER TO FLOOR PLANS & EXTERIOR ELEVATIONS
36. GAS STATION CANOPY, BY OTHERS. SHOWN FOR REFERENCE ONLY.
37. LONG-TERM BICYCLE PARKING TO COMPLY w/ CGC SEC. 5.106.4.1.2. BICYCLE PARKING BY CYCLE SAFE, MODEL #PRO-PARK BIKE, DBL TIER - OR APPROVED EQUAL.
38. -
39. APPROX. LOCATION OF BUS STOP w/ 8'x20' SIDEWALK PAD CONNECTED TO BUS SHELTER, BY RIVERSIDE TRANSIT AGENCY - 17' NON-AD CUSTOM DOME RTA BUS SHELTER, OR APPROVED EQUAL.
40. (E) PORK-CHOP TO BE REMOVED.
41. (E) MEDIAN TO BE MODIFIED.

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CLIENT

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10073 VALLEY VIEW ST.
CYPRESS, CA 90630
PHONE: 714-606-9141
e-mail: allspecksinc@yahoo.com

PROJECT

A PROPOSED COMMERCIAL DEVELOPMENT LOCATED AT:

LUISENO VILLAGE

S.E.C. HWY 79 AND MAIN ST.
SAN JACINTO, CA 92583

REVISIONS

NO.	DESCRIPTION	DATE

PLAN SUBMITTAL LOG

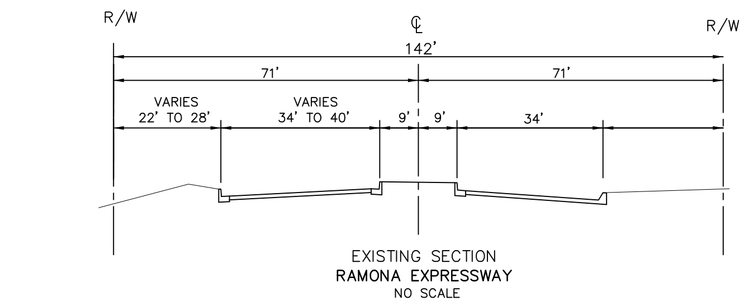
PLAN DATE	DESCRIPTION
08-09-18	PLANNING DEPT. SUBMITTAL - 1st REVIEW
10-22-18	PLANNING DEPT. SUBMITTAL - 2nd REVIEW

LICENSED ARCHITECT — JOHN RUNSER — C-31681 — Exp. 3-31-2019 — STATE OF CALIFORNIA

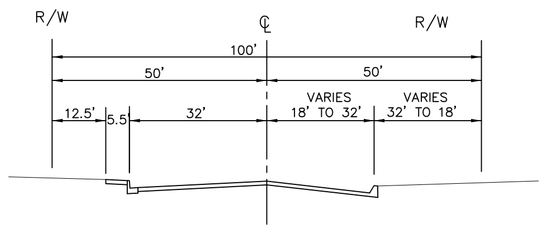
SHEET TITLE

OVERALL SITE PLAN (FOR REFERENCE ONLY)

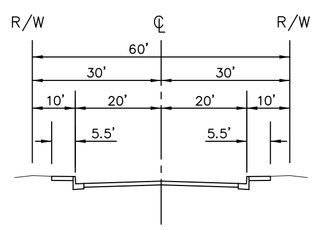
POST DATE:	05-30-19
SCALE:	AS NOTED
DRAWN BY:	L. DALE
DATABASE:	17069
CHECKED BY:	-
SHEET NO:	SP1.0
PROJECT NO:	17069



EXISTING SECTION
RAMONA EXPRESSWAY
NO SCALE

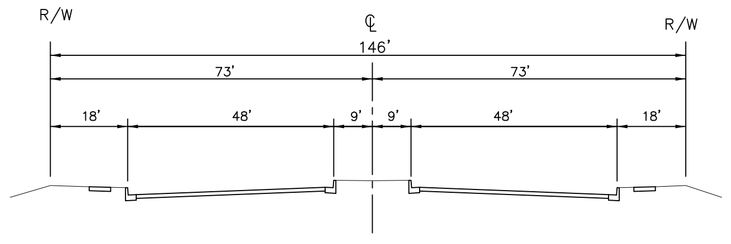


EXISGTING SECTION
EAST MAIN STREET
NO SCALE

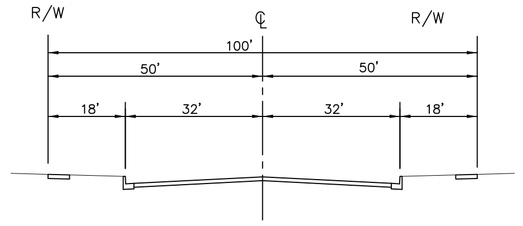


EXISTING SECTION
DONNA WAY
NO SCALE

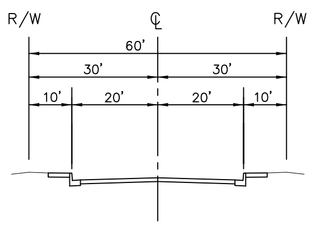
EXISTING SECTIONS



URBAN ARTERIAL HIGHWAY
RAMONA EXPRESSWAY
NO SCALE



SECONDARY HIGHWAY
EAST MAIN STREET
NO SCALE



LOCAL COLLECTOR STREET
DONNA WAY
NO SCALE

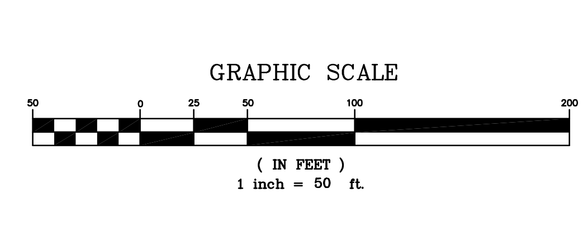
ULTIMATE SECTIONS

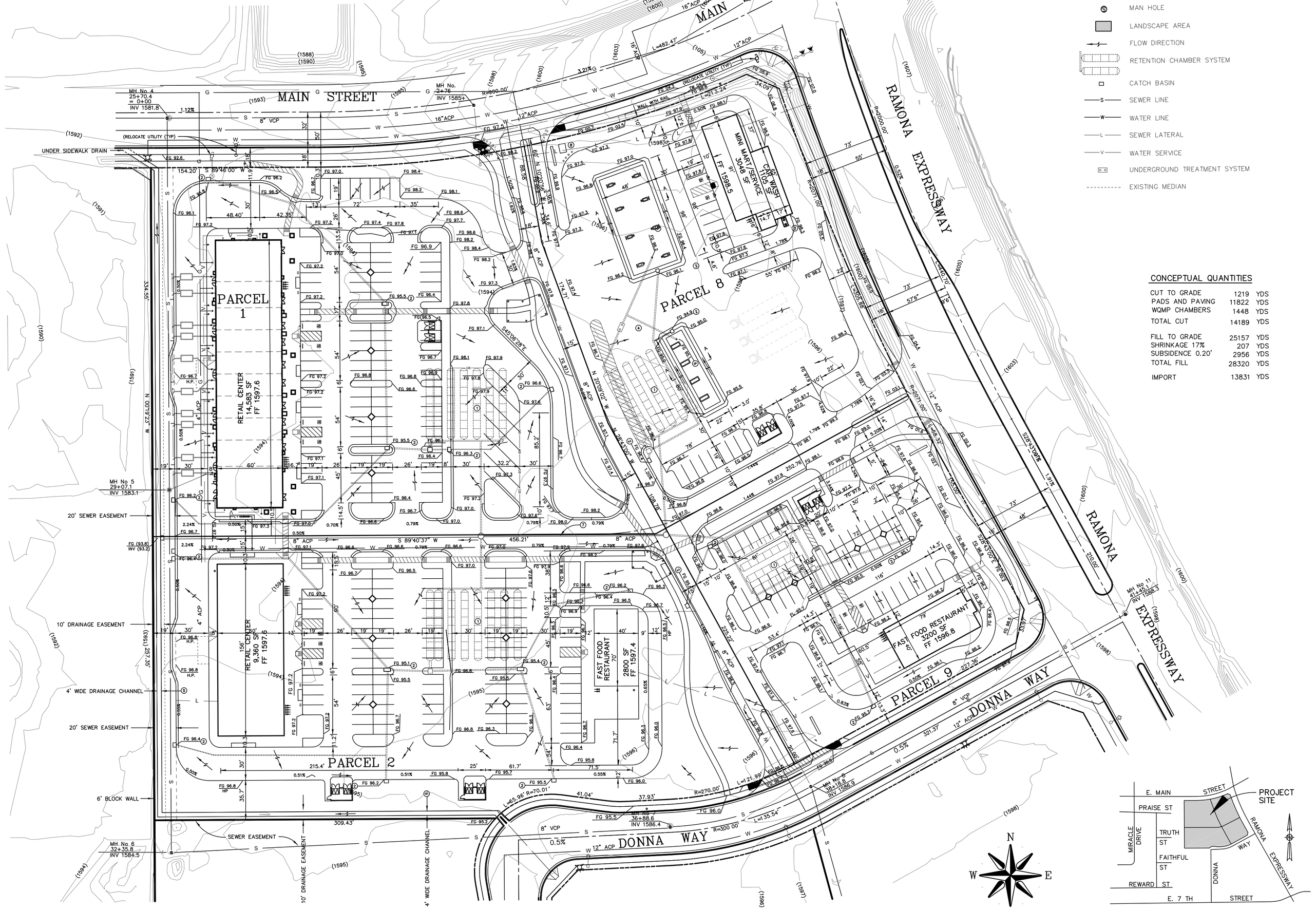
GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

SECTION A–A
FUELING PAD SPILL COLLECTION





LEGEND – EXISTING FEATURES

- POWERPOLE
- STREET LIGHT
- SIGNAL LIGHT
- FIRE HYDRANT
- PEDESTRIAN LIGHT
- MAN HOLE
- LANDSCAPE AREA
- FLOW DIRECTION
- RETENTION CHAMBER SYSTEM
- CATCH BASIN
- SEWER LINE
- WATER LINE
- SEWER LATERAL
- WATER SERVICE
- UNDERGROUND TREATMENT SYSTEM
- EXISTING MEDIAN

CONCEPTUAL QUANTITIES

CUT TO GRADE	1219	YDS
PADS AND PAVING	11822	YDS
WOMP CHAMBERS	1448	YDS
TOTAL CUT	14189	YDS
FILL TO GRADE	25157	YDS
SHRINKAGE 17%	207	YDS
SUBSIDENCE 0.20'	2956	YDS
TOTAL FILL	28320	YDS
IMPORT	13831	YDS

WQMP RELATED CONSTRUCTION NOTES

1. STORMTECH-3500 STORM WATER RETENTION SYSTEM
2. STORM RUNOFF CATCH BASIN
3. JEBSON MODEL CL 750 CAR WASH DISCHARGE CLARIFER
4. 500 GAL FUEL SPILL COLLECTION AND PROCESSING TANK
5. EXISTING CONCRETE STORM WATER OUTLET CHANNEL
6. FUEL SPILL COLLECTION CATCH BASIN
7. COMMON SITE STORM WATER DISCHARGE PIPE
8. TRANSFORMER TO HANDLE ALL FOUR PARCELS

WATER QUALITY CONSIDERATIONS

ALL PRE AND POST DEVELOPMENT STORM RUNOFF RELATED TO THIS PROJECT IS GENERATED ON SITE. IT IS DIRECTED TO A RECTANGULAR CONCRETE STORM DRAIN ON THE WEST BOUNDARY OF THE SITE. THIS STRUCTURE ALSO PROVIDES AN OUTLET FOR STORM RUNOFF GENERATED ON THE PROPERTY TO THE SOUTH; HOWEVER, RUNOFF FROM THE PROPOSED DEVELOPMENT WILL BE REDUCED TO HISTORICAL VALUES BEFORE DISCHARGING INTO THIS COMMUNITY DRAIN AND WILL NOT COMPROMISE THE FACILITIES INTENDED USE. TO MEET THIS REQUIREMENT, DISCHARGE VOLUME WILL HAVE TO BE REDUCED FROM 11.95 cfs (PROPOSED DISCHARGE) TO 1.03 cfs (ORIGINAL DISCHARGE) OR BY A VALUE OF 10.92 cfs.

TO PROVIDE THIS DISCHARGE REQUIREMENT AND ALSO PROVIDE WATER QUALITY CONSIDERATIONS, ALL RUNOFF ORIGINATING ON SITE WILL BE DIRECTED TO SUBSURFACE CHAMBERS WHERE IT WILL BE FILTERED AND A PORTION INFILTRATED INTO THE NATIVE SOIL. AS NOTED, A LIQUEFACTION POTENTIAL DOES EXIST AT THIS SITE AND IS LOCATED ABOUT 40 FEET BELOW THE SURFACE. TO PROTECT THE PROPOSED STRUCTURES, THESE CHAMBERS WILL BE LOCATED NO LESS THAN 90 FEET FROM ANY BUILDING ON THE DEVELOPED SITE WHICH WILL MITIGATE ANY LIQUEFACTION IMPACT.

ALL STORM RUNOFF ORIGINATING A SPECIFIC PARCEL IN THIS DEVELOPMENT WILL BE RETAINED AND TREATED IN CHAMBER PROPERLY SIZED FOR AND LOCATED ON THAT PARTICULAR PARCEL. DISCHARGE FROM THIS CHAMBER SYSTEM WILL BE TRANSPORTED IN A COMMON SUBSURFACE PIPE TO THE CONCRETE DRAINAGE SWALE ON THE WEST BOUNDARY OF THE PROPERTY.

N
W E
S

SCALE 1" = 50'

VICINITY MAP
NO SCALE

DIG ALERT
DIAL TOLL FREE
1-800-227-2600
AT LEAST TWO DAYS BEFORE YOU DIG
UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA

SEAL
REGISTERED PROFESSIONAL ENGINEER
WARREN D. TUTTLE
NO. 30171
EXP MAR 31, 2020
CIVIL
STATE OF CALIFORNIA

PREPARED BY: DATE MAR 26, 2018
WARREN D. TUTTLE
CIVIL ENGINEER
R.C.E. NO. 30171 EXP. DATE MAR 31, 2020

LUISENO VILLAGE
CONCEPTUAL GRADING PLAN
(INCLUDING WQMP RERQUIREMENTS)

SCALE 1" = 50'
DATE JUN 25, 19

BENCHMARK: ALUM. DISK MARKED U.S. ARMY C.O.E. L.A. DIST SURVEY MARK SM5 623 FT NWLY OF LAKE PARK DRIVE IN THE SLY SAN JACINTO RIVER LEVEE
ELEV: 1606.04

CITY OF SAN JACINTO

S.E.C. HWY 79 AND MAIN ST.
SAN JACINTO, CALIFORNIA

APN 433-160-024, 027, 028, 029, 032, 033 & 034

FOR W.O.

SHEET NO. **1** OF 1 SHEET
FILE NO.

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

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

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

Report of
Soils and Foundation Evaluations
Proposed Gas Station, Drive-in-Restaurant and Retail Center
SWC of Main Street and Ramona Expressway
Sobaba area of the City of San Jacinto, California

Project No. 17021-F2

November 8, 2017

Prepared for:

All Speck, Inc.
c/o Mr. William Speck
10073 Valley View Street
Cypress, California 90630

soilssouthwest@aol.com
Established 1984

SOILS SOUTHWEST, INC.

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November 8, 2017 Project No. 17021-F2

All Speck, Inc.
10073 Valley View Street
Cypress, California 90630

Attention: Mr. William Speck

Subject: Report of Soils and Foundation Evaluations
Proposed Gas Station, Drive-in-Restaurant and Retail Center
SWC of Main Street and Ramona Expressway
Sobaba area of the City of San Jacinto, California

Reference: Preliminary Conceptual Plan dated 5-1-17 by MPA Architects, Inc.

Gentlemen:

Presented herewith is the report of soils and foundation evaluations conducted for the site of the proposed gasd station, In-n-Out drive in and retail commercial center to be constructed on vacant parcels located at the southwest intersection of Main Street and Ramona Expressway, City of San Jacinto, Riverside County, California. In absence of detailed grading and/or development plan, the recommendations supplied should be considered as "preliminary", subject to revisions following grading plan rebview.

Based on review of the 1980 CDMG map, attached, it is understood that the site is not situated within an A-P Special Study Zone. However, review of the Riverside County web search indicate the subject property and its vicinity may be moderately susceptible to earthquake induced potential for soil liquefactions.

Based on the investigations completed it is our opinion that the planned development should be considered feasible, provided the recommendations included are incorporated in deign and construction.

The findings and conclusions presented are based on the general principles and practices as per the current CBC, and as used by other geotechnical professionals practicing in Southern California. We offer no other warranty, express or implied.

Respectfully submitted,
Soils Southwest, Inc.

Moloy Gupta, RCE 31708

John Flippin
Project Coordinator

soilssouthwest@aol.com

Established 1984

1.0 Introduction

1.1 Purpose and Scope of Work

This report presents the results of Soils and Foundation Evaluations conducted for the site of the proposed gas station, drive-in restaurant and retail commercial center to be constructed on vacant parcels located at the southwest corner of Main Street and Ramona Expressway, City of San Jacinto, Riverside County, California.

The soils/material descriptions included are based on visual observations during test explorations conducted for the site, supplemented by the necessary laboratory testing completed as described herein. Being beyond Scope of Work no Phase I Environmental Site Assessment (ESA) or geologic evaluations are included. Reports on such will be supplied if, and when requested.

The recommendations contained reflect our best estimate of the soils conditions as encountered during the current field investigations conducted. It is not to be considered as a warranty of the soils existing for other areas, or for the depths beyond the explorations completed at this time.

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

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

1.2 Site Description

The near level rectangular shaped subject site is currently vacant and undeveloped. In general, the site is bounded by Main Street on the north, by the paved Donna Way followed by Sobaba Indian Health Clinic on the south, by Ramona Expressway on the east, and single family dwellings on the west. Overall vertical relief within the property is unknown; however sheet flow from incidental rainfall appears to flow towards the northwest. With the exception of tilled weeds and widely scattered debris, presence of no other significant features are noted.

1.3 Proposed Development

No detailed development and/or grading plans are prepared and none such is available for our review. However, based on the preliminary project information supplied, it is understood that the subject development will primarily include a gas station, In-n-Out drive-in restaurant and retail. Conventional construction of wood frame and stucco is expected, along with associated parking, paving and driveways and others. Based on existing topography and adjacent developments, moderate site preparations and grading, including placement of imported fill soils, are anticipated. Static structural loadings of 40 kip and 4 klf are assumed in preparation this report. Moderate site preparations and grading should be anticipated for the development planned.

1.4 Geotechnical Investigation

The project geotechnical investigation included nine (9) exploratory test borings by using a hollow-stem auger drill rig supplied by Cal Pac Drilling, advanced to maximum 51 feet below grade. Prior to test excavations, an underground utility clearance was established from Underground Service Alert of Southern California and from other involved utility agencies. Approximate test boring locations are shown on the attached Plate 1. Following necessary soil sampling and in-situ testing, the boring locations were backfilled with local soils using minimum compaction effort. Supplemental densifications within the test boring locations should be anticipated within the test locations described.

During test excavations, representative bulk and undisturbed California ring samples were procured and Standard Penetration (SPT) blow-counts were recorded. Collected samples were subsequently sent to our laboratory for necessary geotechnical testing.

1.5 Laboratory Testing

Representative bulk and undisturbed site soils sampled were tested in in-house laboratory to aid in soils classifications and to evaluate relevant engineering properties pertaining to the project requirements. In general, the laboratory testing included the following:

- In-situ moisture contents and dry density (ASTM Standard D2216)
- Maximum dry density and optimum moisture content (ASTM Standard D1557)
- Direct Shear (ASTM Standard D3080)
- Soil Consolidation (ASTM Standard D2435)
- Soil gradation analysis (ASTM Standard D422), and
- Atterburg Limits (ASTM Standard D4318)

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

- Based on the field investigation and laboratory testing, engineering analyses and evaluations were made on which to base our preliminary recommendations for design of foundations, slab-on-grade, paving and parking, site grading, utility trench excavations backfill, estimated soils potential for expansion, site preparations and grading and monitoring during construction.

- Preparation of this report for initial use by the project design professionals. The recommendations supplied should be considered as "preliminary" and may require substantial revisions and/or upgrading following final grading/development plan review.

2.0 Geotechnical Characteristics

2.1 Soils Conditions

Based on the geotechnical investigations completed at this time it is our opinion that the site soils primarily consist of upper loose and low-density fills or upper loose (SPT <10) to slightly dense silty sand and poorly graded sand (SP-SM) estimated to an approximate depth of about 5 to 7 feet below grade, overlying deposits of medium dense to dense gravelly sand (GP-SP) with scattered minor rocks to the maximum 51 feet depth explored. Presence of free groundwater was encountered at about 42 feet below grade.

Based on review of the 1980 CDMG map, attached, it is understood that the site is not situated within an A-P Special Study Zone. However, based on the County of Riverside website, along with the evaluations included herein, it is our opinion that the area of the planned development and its immediate vicinity, may be susceptible to earthquake induced potentials for soil liquefaction causing excessive ground settlements. Presence of the low-density near grade soils as encountered may also cause moderate deformations under static loading conditions

Laboratory shear tests conducted on the upper bulk samples remolded to 90% indicate moderate shear strengths under increased soil moisture conditions. Results of the laboratory shear tests are provided in Plate B-1 of this report. Soil consolidation testing conducted on similar remolded samples indicate potential for "tolerable" soil settlement of less than 2% may be expected from conventional static structural loadings for footings and concrete slab-on-grade . The results of laboratory determined soils consolidation potential is shown on Plate B-2 in Appendix B.

Silty sandy in nature, the near grade soils encountered are considered "very low" in expansion potential requiring no special construction requirements other than those as recommended herein. Supplemental soil expansion testing is recommended following mass grading completion.

A formal liquefaction induced soil settlement analysis is performed based on the recorded SPT blow-counts and using the CivilTech computer program Software V5.2E LiquefyPro using Ishihara/Yoshimine settlement analyses method. Results of the study indicate "pre-construction" potential for overall site-soils liquefaction induced ground settlement of the site and its general vicinity up to about 9.61 inches, while the "Post-Construction" total settlement potential is estimated to about 2.63-inch.The settlement evaluations are attached.

When seismically induced soil liquefaction phenomenon and associated ground settlements potentials and their adverse effects on structures *cannot be fully mitigated,* it is our opinion that implementation of the mitigation measures as described herein, may *minimize* the potentials for seismically induced adverse effects to structures to "a tolerable and to an acceptable level of risks"; more specifically to "effectively minimize/reduce" the adversities to "acceptable levels" (CCR Title 14, Section 3721). Accordingly, th*e geotechnical recommendations included are with an intention to achieve an "acceptable level of risk" to reduce earthquake induced potential excessive ground settlements so as to allow sufficient time for occupants to seek safety without total collapse of the structure built.*

The recommendations described are in no way guarantee total structural integrity following severe ground shaking, therby requiring post-earthquake structural repair.

If "total" or "near total" elimination of the ground distress due to soil liquefaction can not be tolerated, such may be accomplished following additional site explorations, laboratory analyses, engineering evaluations and recommendations to include ground improvements in form of:

(i) Rigid Foundations,
(ii) Compaction grouting,
(iii) Dynamic consolidation;
(iv) Compaction piles;
(v) Compaction with vibratory probes
(vi) Driven pile foundation, and/or
(vii) Post-tension load bearing concrete, or others.

Supplemental recommendations on such will be supplied when requested.

2.2 Subsurface Variations

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

2.3 Groundwater

Fluctuations in groundwater levels can occur due to seasonal variations in the amount of rainfall, runoff, altered natural drainage paths, and other factors not evident at the time the borings were completed. Consequently, the project civil engineer and grading contractor should establish a surface water runoff pattern that is directed away from the structural pads, once constructed. Presence of free groundwater was encountered at about 40-42 feet as described in the test boring logs attached. While the historical ground water is reported at a depth in excess of 50 feet as described in the following table, the presence of the groundwater as encountered may be considered as localized and perched, adverse effect of which, however cannot be ignored.

The following table lists the nearest well to the site as listed by the local reporting agency.

GROUNDWATER TABLE	
Reporting Agency	California Department of Water Resources
Well Number	04S/01W-35J002S
Well Name	EMWD 10346 Site Code 337802N1169483W001
Well Monitoring Agency	5035
Well Location: Township/Range/Section	T04S/R01W-35
Current Depth to Water (Measured in feet)	430.4
Current Date Water was Measured	September 28, 2016
Depth to Water (Measured in feet) (Shallowest)	395.6
Date Water was Measured (Shallowest)	March 27, 2012

2.4 Excavatability

It is our opinion that the grading required for the project may be accomplished using conventional heavy-duty construction equipment. However, some difficulty may be expected during deep trenching due to soil caving. No blasting or jack-hammering, however, is anticipated.

2.5 Soil Corrosivity

Since change in soil chemical compositions are expected during site preparations and grading, no soil laboratory chemical testing on existing soils are evaluated at this time. Following mass grading completions, it is suggested that soil chemical evaluations should be conducted for the soils expected in contact with concrete and metals. Evaluations of such should include, in minimum, pH, sulfate, chloride and resistivity. Post-grading results of such will be supplied, if and, when requested.

3.0 Faulting And Seismicity

3.1 Faulting and Seismicity

Based on the information published by the Department of Conservation, State of California, it is understood that the site is *not* situated within an A-P Special Study Zone (*where a fault(s) run through or adjacent to the development site*) and the site soils are considered non-susceptible to soil liquefaction in event of a strong motion earthquake.

Considering Southern California is in a seismically risky area for structures, with the conventional design/construction know-how currently being used, it is not possible to construct structures economically that are totally resistant to earthquake-related hazards. However, it is our opinion that implementation of the current CBC along with the geotechnical recommendations in design and construction as described in this report may reduce/minimize earthquake induced potential hazards, such as liquefaction-induced ground and structural settlements.

3.2 Direct or Primary Seismic Hazards

Surface ground rupture along with active fault zones and ground shaking represent primary or direct seismic hazards to structures. There are no known active or potentially active faults that pass through or towards the subject site, and the site is not situated within an AP Special Studies Zone. According to the current CBC, the site is considered within Seismic Zone 4. As a result, it is likely that during the life expectancy of the structure built, moderate to severe ground shaking may have potential for adverse effects on the site.

3.3 Induced or Secondary Seismic Hazards

In addition to ground shaking, effects of seismic activity may include flooding, land-sliding, lateral spreading, settlements and subsidence. Potential effects of such are discussed below.

3.3.1 Flooding

Flooding hazards include tsunamis (seismic sea waves), Seiches, and failure of manmade reservoirs, tanks and aqueducts. The potential for these hazards are considered "remote" considering the inland site location and the distance to known nearby bodies of water.

3.3.2 Land Sliding

Considering the subject site being near level, potential for seismically land sliding should be considered as "remote".

3.3.3 Lateral Spreading

Seismically induced lateral spreading involves lateral movement of soils due to ground shaking. Lateral spreading is demonstrated by near vertical cracks with predominantly horizontal movement of the soil mass involved.

Methods for mitigating lateral spread hazards may include, among others, the following:

a. Edge containment structures (e.g.,berms, dikes, sea walls, retaining structures, compacted soil zones);
b. Removal or treatment of liquefiable soils to reduce liquefaction potential;
c. Modification of site geometry to reduce the risk of translational site instability; and/or
d. Drainage to lower the groundwater table below the level of the liquefiable soils,
e. Excavation and removal or recompaction of potentially liquefiable soils,
f. In-situ ground densification (e.g. compaction with vibratory probes, dynamic consolidation, compaction piles, blasting densification, compaction grouting);
g. Other types of ground improvement (eg., permeation grouting, columnar jet grouting, gravel drains, surcharge pre-loading, structural fills, dewatering etc.), and
h. Reinforced shallow foundation (e.g. grade beams, combined footings, reinforced or post-tensioned slabs, rigid raft foundations.

The topography of the site being near level, it is our opinion that the potential for seismically induced lateral spreading should be considered as "remote".

Design of the proposed structures or facilities is recommended to withstand predicted ground softening and/or predicted vertical and lateral ground displacements, to *an acceptable level of risk*.

3.4 Seismically Induced Settlement and Subsidence (Pre and Post-Construction)

The site is situated at about 1.2 miles from the San Jacinto-San Jacinto Valley Fault capable of generating an earthquake magnitude of M=6.9 and PGA of 0.639g (10%) . Considering the proximity of the earthquake fault as described, it is our opinion that potential for some "total and differential settlements" due to ground shaking may be expected, with severity increasing considerably due to potential for site soils liquefaction susceptibility potential. Based on site specific seismically induced settlement analysis using CivilTech Software, V5.2E LiquefyPro, it is our opinion that with a Factor of Safety FS=1.1, earthquake induced total and differential settlements for saturated and dry soils may described below.

The results of the seismically induced pre-construction ground settlement evaluations are provided in the following table and in Appendix D of this report.

TABLE 3.4.1 Preliminary Settlement Analysis (Pre-Construction)

DYNAMIC SETTLEMENT	MEASURED IN INCH.
Settlement of Saturated Soils	2.10
Settlement of Dry Soils	10.20
Total Settlement of Saturated and Dry Soils	12.30
DIFFERENTIAL SETTLEMENT	6.151-8.119

Post-Construction similar analyses indicate a total ground settlements to about 2.11-inch, and differential settlements varying from 1.056-inch to 1.394-inch. Post-Construction settlement evaluations are attached.

3.5 Seismic Design Coordinates

The design spectrum was developed based on the 2016 CBC. Site Coordinates of 33.783601°N, -116.938786 W was used to establish the seismic design parameters presented below.

3.6 Seismic Design Coefficients

For foundation and structural design, the following seismic parameters are suggested based on the current 2016 CBC:

Recommended values are based upon USGS ASCE 7-10 (March 2013 erata) Seismic Hazard Maps-Fault Parameters and the California Geologic Survey: PSHA Ground Motion Interpolator Supplemental seismic parameters are provided in Appendix C of this report.

The following presents the seismic design parameters as based on the currently published California Geological Survey and 2016 CBC.

Seismic Design Parameters

CBC Chapter 16	2016 ASCE 7-10 (March 2013 erata) Seismic Design Parameters	Recommended Values
1613A.3.2	Site Class	D
1613A.3.1	The mapped spectral accelerations at short period	S_s
1613A.3.1	The mapped spectral accelerations at 1.0-second period	S_1
1613A.3.3(1)	Seismic Coefficient, S_s	2.427
1613A.3.3(2)	Seismic Coefficient, S_1	1.081 g
1613A.3.3(1)	Site Class D / Seismic Coefficient, F_a	1.000 g
1613A3.3(2)	Site Class D / Seismic Coefficient, F_v	1.500 g
16A-37 Equation	Spectral Response Accelerations, $S_{Ms} = F_a S_s$	2.427 g
16A-38 Equation	Spectral Response Accelerations, $S_{M1} = F_v S_1$	1.621 g
16A-39 Equation	Design Spectral Response Accelerations, $S_{Ds} = 2/3 \times S_{Ms}$	1.618 g
16A-40 Equation	Design Spectral Response Accelerations, $S_{D1} = 2/3 \times S_{M1}$	1.081 g

TABLE 3.6A.2 Seismic Source Type

Based on California Geological Survey-Probabilistic Seismic Hazard Assessment, Peak Horizontal Ground Acceleration (PHGA) having 10% percent probability of exceedance in a 50- year period is described as below:

Seismic Source Type / Appendix C	
Nearest Maximum Fault Magnitude	M>\=6.9
Peak Horizontal Ground Acceleration (PHGA) @10% "damping"	0.639g

4.0 Evaluations and Recommendations

4.1 General Evaluations

Based on field explorations, laboratory testing and subsequent engineering analysis, the following conclusions and recommendations are presented for the site under study:

(I) From geotechnical viewpoint, the site is considered grossly stable under *static loading* conditions. The proposed development should be considered feasible, provided the recommendations included are incorporated in design and construction. Moderate site preparations and grading should be expected.

With the presence of potentially liquefiable soils capable of excessive ground settlement during a strong motion earthquake, for structural support, site preparation and grading may include use of reinforced engineered fill soils placement, along with implementing the foundation systems as described.

(II) During mass grading the recommended subexcavation depth should be considered as "minimum". Localized deeper subexcavations may be required within areas underlain by buried debris, utilities, presence of deeper undocumented fills and /or soft unstable soils or others. It will be the responsibility of the grading contractor to inform the project soils engineer the presence of such fills, debris or utilities.

(III) In order to minimize potential for dynamically induced excessive differential settlements to load bearing footings, it is recommended that structural footings should be established exclusively into engineered fills of local soils compacted to the minimum percent compaction as described in later section of this report. Construction of footings and slabs straddling over cut/fill transition shall be avoided.

(IV) Structural design consideration should include probability for moderate to high peak ground acceleration from relatively active nearby earthquake faults with the PGA as described. Implementing the seismic design parameters and procedures as outlined in the current CBC are anticipated to minimize the potential adverse effects of ground shaking. Use of more conservative seismic design parameters will be entirely at the discretion of the project structural engineer.

(V) Provisions should be maintained during construction to divert incidental rainfall away from the structural pads, once constructed.

(VI) Along with adequate structural design and construction, it is our opinion that proposed development will not adversely affect the stability of the site or it's adjacent.

(Vii) Considering earthquake Southern California, use of flexible utility connections should be considered along with regular cosmetic repair.

4.1.1 Preparations for Structural Pad

For adequate structural bearing, site preparations and grading should include, in minimum, subexcavations of the near surface soils measuring vertically to either (i) to minimum 5-8 feet below the current grade surface, or (ii) the planned deepest footing embedment + 24-inch, or to the depth of underlying moist and dense natural soils as approved by soils engineer, whichever is greater.

Site grading should also include 6 to 8-inch scarification, moisture conditioning to near Optimum Moisture Content, followed by replacement of the approved local excavated soils in 6 to 8-inch thick vertical lifts compacted to *minimum 95 percent* of the soil's Maximum Dry Density as determined by the ASTM D1557 test method. Proper selection of construction equipment during grading and construction will be contractor's responsibility.

Site preparations and earth work should be in accordance with the applicable grading recommendations as provided in the current CBC, and as recommended in this report.

The subexcavation depths described should be considered "approximate". Localized additional subexcavations may be required within areas underlain by undocumented old fills, buried utilities, abandoned sewer, buried septic systems and others.

Prior to grading, the site should be cleared of surface and subsurface obstructions, including vegetation, roots, organic matter, debris, septic tanks, and cesspools, etc. During grading, it should be the responsibility of the grading contractor to clearly mark the future building footprint areas and minimum five feet beyond, along with the final pad grade elevations that will be established. Being beyond our expertise and scope of work, we assume no responsibility for lines and grades established for the project.

4.2 Foundation Recommendations

To minimize potentials for seismically induced structural distress, it is our opinion that the structure planned may be supported using either (i) conventional checkered rigid footings, or (ii) rigid mat foundation system, adequately reinforced and founded exclusively into engineered fills of local sandy soils or on approved imported non-expansive soils **compacted to minimum 95%.**

4.2.1 Alternative I: Conventional Checkered/WaffleType Rigid Footings

Checkered foundations, in form of exterior load bearing conventional walls along with interior grade beams, may be considered as designed based on the following equations:

Continuous Wall Footing: $q_{allowable} = 600 + 750d + 300b$
Isolated Square: $q_{allowable} = 780 + 750d + 240b$, where

$q_{allowable}$ = allowable soil vertical bearing capacity, in psf.
d= footing depth, min. 18-inch, b = footing width, min. 15-inch.

The above soil bearing capacit0es may be increased for each additional depth in footing and width in excess of the minimum recommended. Total maximum vertical bearing capacity is recommended not to exceed 3500 psf. If normal code requirements are applied, the above capacities may further be increased by an additional 1/3 for short duration of loading which includes the effect of wind and seismic forces. The load bearing footings should be reinforced with minimum 2-#4 near the near the top and 2-#4 rebar near bottom of continuous wall and grade beams recommended.

Actual foundation dimensions (b & d) and reinforcement requirements should be provided by the project structural engineer based on anticipated structural dead loadings, soil bearing capacity and Peak Ground Acceleration (PGA) described.

From geotechnical viewpoint, the perimeter wall footings should be sized to minimum 15-inch wide, embedded to minimum18-inch below the lowest adjacent final grade, reinforced adequately using 2-#4 rebar placed near the top and 2-#4 rebar near bottom of continuous wall and interior grade beams, or as required by the project structural engineer.

In addition to the exterior load bearing foundations described, use of similarly sized and reinforced interior grade beams should be considered spaced at an interval not exceeding 15 feet on-center,

rigidly connected to the exterior load bearing wall foundations and interior isolated pier footings, if any,

4.2.2 Alternative II : Rigid Mat Foundations

As an alternative, for adequate structural support, minimum 18-inch thick rigid mat foundations may be considered bearing on engineered fills and adequately reinforced as recommended by the project structural engineer.

4.3 Foundation Settlements under Static Loading Conditions

Based on the laboratory determined soils consolidation characteristics, settlements to properly designed and constructed foundations supported exclusively into engineered fills of site soils or its equivalent or better, and carrying the maximum anticipated structural loadings, are expected to be within tolerable limits. Under static loading conditions, over a 40-ft. span, estimated total and differential settlements are about 1 and 1/2-inch, respectively. Most of the elastic deformations, however, are expected to occur during construction.

It is recommended that excavated footing trenches should be verified, tested and certified by soils engineer immediately prior to concrete placement. Soils Southwest, Inc. will assume no responsibility for any structural distress in event the excavated footings are not verified prior to concrete placement.

4.4 Concrete Slab-on-Grade

The prepared subgrades to receive footings should be considered adequate for concrete slab-on-grade placement. For commercial/retail use, concrete slabs should be a minimum 4.5-inch thick (net), reinforced with #3 rebar at 18-inch o/c., or as recommended by design engineer considering expected dead and seismic loadings. Use of low-slump concrete is recommended. In order to minimize potentials for cracking and warping, *no concrete should be placed on excessive wet subgrade, or during extreme weather conditions, such as extreme heat and high Santa Ana wind conditions*. Slab subgrades should be moistened to near Optimum Moisture conditions as would be expected in any such concrete placement. Use of low-slump concrete is recommended.

Within moisture sensitive areas (office, store and others), concrete slabs should be underlain by 2-inch of compacted clean sand of Sand Equivalent, SE, of minimum 30, followed by commercially available 10-mil thick Stego Wrap, or its equivalent. Actual slab thickness and reinforcement requirements should be as required by the project structural engineer.

In addition, it is recommended that utility trenches underlying concrete slabs should be thoroughly backfilled with gravelly sandy soils and such should be mechanically compacted to the minimum as recommended. Water jetting should not be allowed in lieu of mechanical compaction recommended. Slab subgrades should be verified and certified by soils engineer immediately prior to concrete pour. Without verifications, Soils Southwest will assume no responsibility, what-so-ever, for any structural distress during life-time use of the development proposed.

Within moisture sensitive areas, concrete slabs should be underlain by 2-inch of compacted clean sand, followed by 10-mil thick commercially available Stego Wrap or Visqueen or others, underlain b an additional 2-oinch thick compacted sand. The gravelly sands used should have a Sand Equivalent, SE of 30, or greater

Subgrades to receive concrete should be "pre-moistened" as would be expected in any such concrete placement. Use of low-slump concrete is recommended. In addition, it is recommended that utility trenches underlying concrete slabs and driveways should be thoroughly backfilled with gravelly sandy soils mechanically compacted to minimum 90% (+2 feet below final grade) and 95% (0-2 feet below final grade) immediately prior to concrete pour.

4.4.1 Concrete Driveways

For estimation purpose, concrete driveways, if any, should be minimum 5.5-inch thick (net), placed over local silty sandy soils compacted to at least 95%. Driveway slab reinforcing and construction and expansion joints etc. should be incorporated as required by the project structural engineer. Actual thickness should be recommended the project structural engineer based on design using a soil Subgrade Reaction (ks) of 150-300 kcf. Supplemental recommendations are provided in the later section of his report.

4.4.2 Concrete Curing

The following recommendations are intended to reduce potential for concrete slabs-on-grade cracking due to concrete inadequate curing or ground settlements. Even when implemented, foundations, stucco walls and concrete slabs-on-grade may display some minor cracking due to minor soil movement and/or concrete shrinkage.

To reduce and/or control concrete shrinkage, curling or cracking, concrete slabs shall be "cured" by using water prior to structural load placement. The following general procedures are recommended:

1. CONCRETE STRENGTH @ 28 DAYS SHOULD BE AS DETERMINED BY STRUCTUAL ENGINEER.
2. WAIT 14 DAYS BEFORE OPERATING VEHICLES AND EQUIPMENT ON SLABS.
3. DO NOT POUR CONCRETE WHEN THE TEMPERATURE EXCEEDS 90^{O} F OR 80^{O} F WHEN THE WIND EXCEEDS 12MPH.
4. START CURING AS SOON AS HARD TROWELING IS DONE. ALL CURING SHALL BE WET CURING BY USING BURLAP FOR A MINIMUM OF 7 DAYS. BURLAP MUST BE PLACED WITHIN 2 HOURS OF POURING (NO SPRAY CURING).
5. WHEN WIND, TEMPERATURE AND HUMIDITY CONDITIONS CAUSE EARLY DISAPPEARANCE OF BLEED WATER, STEPS SHALL BE TAKEN TO USE A FOG SPRAY. CURING SHALL COMMENCE IMMEDIATELY AFTER FINISHING TROWELING.

The occurrence of concrete cracking may also be reduced and/or controlled by limiting the slump of the concrete used, proper concrete placement and curing, and by placement of crack control joints at reasonable intervals, in particular, where re-entrant slab corners occur. For standard crack control maximum expansion joint spacing of 12 feet should not be exceeded. Shorter distance between joint spacing would provide greater crack control. Joints at curves and angle points are suggested as recommended by structural engineer.

4.5 Active Pressure and Passive Resistance

With level backfills, equivalent active lateral fluid pressures of 33 pcf and 60 pcf may be considered for "unrestrained" and "restrained" structural conditions, respectively.Resistance to lateral loads can be provided by friction acting at the base of foundation and by passive earth pressures. A coefficient of friction of 0.3 may be assumed with normal dead load forces for footings established into

compacted fills. An allowable passive lateral earth resistance of 230 lb/ft2./ft depths may be assumed for sides of foundations poured against compacted fills. Maximum passive earth resistance is recommended not to exceed 2300 lb/ft2.

In design, the above values may be increased by 1/3 when designing for short duration wind or seismic forces. The above values are based on footings placed on compacted engineered fills. In the case where footing sides are formed, all backfill placed against the footings should be compacted to at least the minimum compaction requirements as described.

4.6 Shrinkage and Subsidence

With the presence of upper loose and compressible local soils as described; it is our opinion that such soils may be subjected to volume change during grading. In average, such volume change due to shrinkage is estimated to about 15-20 percent, or more.

Further volume change may be expected following removal of undetected buried utilities etc. Supplemental shrinkage is anticipated during preparation of the underlying natural soils prior to compacted fills placement. Such subsoil subsidence may be approximated to about 2.5-inch when conventional construction equipments are used.

4.7 Construction Consideration

4.7.1 Unsupported Excavation

Temporary construction excavations up to an approximate depth of 5 feet may be made without any lateral support. It is recommended that no surcharge loads such as construction equipments, be allowed within a line drawn upward at 45 degree from the toe of temporary excavations. Use of sloping for deep excavation may be considered where plan excavation dimensions are not constrained by existing development.

4.7.2 Supported Excavations

If vertical excavations exceeding 5 feet become warranted, for the excavation adjacent to existing development, such should be achieved using shoring to support side walls.

4.8 Structural Pavement Thickness

Flexible Paving/Parking

Anticipating change in soil-matrix during mass grading, no actual soil R-value determination is currently made. Based on estimated Traffic Index (TI) and on assumed soils R-value of 45, for estimation purpose, the following paving sections may be considered.

Preliminary Pavement Design

Preliminary On-Site Asphalt Concrete (AC) Pavement Thickness	
Assumed Traffic Index	6.5
R-value (assumed)	45
AC Thickness (inches)	4.0*
AB Thickness (inches)	4.5*

Notes: AC - Asphaltic Concrete, AB - Aggregate Base

For a.c over base, upper 12-inch of subgrade soils should be compacted to minimum 90%. Base material used should conform to the Caltrans Class II specifications, compacted to minimum 95%.

4.9 Concrete Flatwork/Driveways

Concrete flatworks (such as walkways and driveways) have potential for cracking due to fluctuations in soil volume in relationship to moisture content changes. In order to prevent excessive cracking or lifting, concrete paving should meet the minimum guidelines as shown in the table below. It is our opinion that when designed and adequately constructed, the following guidelines will help to "reduce" potential for irregular cracking or lifting, but will not eliminate all concrete distress.

	Private Sidewalks	*Private Drives*	*Patios/Entryways*	*City Sidewalk/Curb and Gutters*
Minimum Thickness (in.)	4 (nominal)	5.5 (full)	4 (full)	City/Agency Standard
Pressoaking (+/-2% Optimum)	12 inches	12 inches	12 inches	City/Agency Standard
Reinforcement	—	No. 3 at 24 inches on center	No. 3 at 24 inches on centers	City/Agency Standard
Thickness Edge	—	8" x 8"	8" x 8 "	City/Agency Standard
Crack Control	Saw cut or deep open tool joint to a minimum of 1/3 of concrete thickness	Saw cut or deep open tool joint to a minimum of 1/3 of concrete thickness	Saw cut or deep open tool joint to a minimum of 1/3 of concrete thickness	City/Agency Standard
Maximum Joint Spacing	5 feet	10 feet or quarter cut whichever is closer	6 feet	City/Agency Standard

No concrete slabs, sidewalks and flatworks should be placed bearing directly on the surface soils currently existing. The prepared subgrades to receive footings should be adequate for concrete slab-on-grade placement. The maximum density of the base material should be more than its supporting subgrade material.

Actual driveway slab reinforcing and construction and expansion joints etc. should be incorporated if required by the project structural engineer.

Subgrades to receive concrete should be "pre-moistened" as would be expected in any such concrete placement. Use of low-slump concrete is recommended. In addition, it is recommended that utility trenches underlying concrete slabs and driveways should be thoroughly backfilled with gravelly sandy soils mechanically compacted to minimum 90% (+2 feet below final grade) and 95% (0-2 feet below final grade) immediately prior to concrete pour.

4.10 Utility Trench Backfill

Utility trench backfill within the structural pad and beyond should be placed in accordance with the following recommendations:

- Trench backfill for wet and dry utilities should be placed in 6 to 8-inch thick lifts and mechanically compacted to minimum 90 percent. Jetting is not recommended as a substitute for backfill compaction. Within paving areas, such backfills should be compacted to minimum 90% more than two feet below final grade and 95% from 0 to 2.0 feet.

- Exterior trenches along foundations or a toe of a slope extending below a 1:1 imaginary line projected from outside bottom edge of the footing or toe of the slope, should be compacted to 90 percent of the Maximum Dry Density for the soils used as backfill. All trench excavations should conform to the requirements and safety as specified by the Cal-Osha

4.11 Soil Caving

With the dry silty nature of the local soils, some caving may be expected. Temporary excavations in excess of 5 feet should be feasible at 2 to 1 (h:v) slope ration or flatter, and as per the construction guidelines provided by Cal-Osha.

4.12 Pre-Construction Meeting

It is suggested that no site clearance and grading should be commenced without the presence of a representative of this office. On-site pre-grading meeting should be arranged between the soils engineer and grading contractor. Over-night pre-moistening is recommended.

4.13 Seasonal Limitations

No fill shall be placed, spread or rolled during unfavorable weather conditions. Where the work is interrupted by heavy rains, fill operations shall not be resumed until moisture conditions are considered favorable by the soils engineer.

4.14 Planters

Use of planters requiring heavy irrigation should be restricted adjacent to footings. In event such becomes unavoidable, planter boxes with sealed bottoms, should be considered.

4.15 Landscape Maintenance

Only the amount of irrigation necessary to sustain plant life should be provided. Pad drainage should be directed towards streets and to other approved areas away from foundations. Slope areas should be planted with draught resistant vegetation. Over watering landscape areas could adversely affect the site development during its life-time use.

4.16 Observations and Testing During Construction

Recommendations provided are based on the assumption that structural footings and slab-on-grade be established exclusively into engineered fill of local sandy soils compacted to minimum 90%. Excavated footings and slab subgrades should be inspected, verified and certified by soils engineer prior to steel and concrete placement. Structural backfills discussed, should be placed under direct observations and testing by this facility. Excess soils generated from footing excavations should be removed from pad areas and such should not be allowed on subgrades underlying concrete slab.

In event other geotechnical consultants are retained during grading, Soils Southwest, Inc. will not be held responsible for any distress that may occur during life-time use of the structures constructed.

4.17 Grading Plan and Foundation Details Review

No topographic, grading or development plans are available at this time for review. Precise grading plans, when prepared, should be available to verify applicability of the assumptions and the recommendations supplied. If during construction, conditions are observed different from those as presented, revised and/or supplemental recommendations will be required.

Additionally, foundation details prepared by structural engineer should be available to verify the minimum foundation dimensions and reinforcement requirements as described in this report.

5.0 General Site Preparations and Grading

Site preparations and grading should involve over-excavation and replacement of local soils as structural fill compacted to the minimum relative compactions as described earlier.

Structural Backfill:

Local soils free of debris, large rocks and organic should be considered suitable for reuse as backfill. Loose soils, formwork and debris should be removed prior to backfilling retaining walls. On-site sand backfill should be placed and compacted in accordance with the recommended specifications provided below. Where space limitations do not allow conventional backfilling operations, special backfill materials and procedures may be required. Pea gravel or other select backfill can be used in limited space areas. Recommendations for placement and densification of pea gravel or other special backfill can be provided during construction.

Site Drainage:

Adequate positive drainage should be provided away from the structure to prevent water from ponding and to reduce percolation of water into backfill. A desirable slope for surface drainage is 2 percent in landscape areas and 1 percent in paved areas. Planters and landscaped areas adjacent to building perimeter should be designed to minimize water filtration into sub-soils. Considerations should be given to the use of closed planter bottoms, concrete slabs and perimeter sub-drains where applicable.

Utility Trenches:

Buried utility conduits should be bedded and backfilled around the conduit in accordance with the project specifications. Where conduit underlies concrete slab-on-grade and pavement, the remaining trench backfill above the pipes should be placed and compacted in accordance with the following grading specifications.

General Grading Recommendations:

Recommended general specifications for surface preparation to receive fill and compaction for structural and utility trench backfill and others are presented below.

1. Areas to be graded or paved, shall be grubbed, stripped and cleaned of all buried and undetected debris, structures, concrete, vegetation and other deleterious materials prior to grading.

2. Where compacted fill is to provide vertical support for foundations, all loose, soft and other incompetent soils should be removed to full depth as approved by soils engineer, or at least up to the depth as previously described in this report. The areas of such removal should extend at least 5 feet beyond the perimeter of exterior foundation limit or to the extent as approved by soils engineer during grading.

3. The recommended compaction for fill to support foundations and slab-on-grade is 95% of the maximum dry density at or near optimum moisture content. To minimize any potential differential settlement for foundations and slab-on-grade straddling over cut and fill, the cut portion should be over-excavated and replaced as compacted fill, compacted to the maximum dry density as described in this report.

4. All utility trenches within the building pad areas and beyond, should be backfilled with granular material and such should be compacted to at least 90% of the maximum density for the material used.

5. Compaction for all fill soils shall be determined relative to the maximum dry density as determined by ASTM D1557 compaction method. In-situ field density of compacted fill shall be determined by ASTM Standard D1556, or by other approved procedures.

6. Imported soils if required shall be clean, granular, non-expansive in nature as approved by soils engineer.

7. During grading, fill soils shall be placed as thin layers, thickness of which following compaction, shall not exceed six inches.

8. No rocks over six inches in diameter shall be permitted to use as a grading material without prior approval of soils engineer.

9. No jetting and/or water tampering be considered for backfill compaction for utility trenches without prior approval of the soils engineer. For such backfill, hand tampering with fill layers of 8 to 12 inches in thickness, or as approved by the soils engineer is recommended.

10. Any and all utility trenches at depth as well as cesspool and abandoned septic tank within building pad area and beyond, should either be completely excavated and removed from the site, or should be backfilled with gravel, slurry or by other material, as approved by soils engineer.

11. Any and all grading required for pavement, side-walk or other facilities to be used by general public, should be constructed under direct supervision of soils engineer or as required by the local public agency.

12. A site meeting should be held between the grading contractor and soils engineer prior to actual construction. Two days of notice will be required by soils engineer for such meeting.

6.0 Closure

The conclusions and recommendations presented are based on the findings and observations made at the time of subsurface test explorations. In absence of site specific grading plan, the recommendations supplied should be considered "preliminary", and may require supplemental investigations including additional borings, laboratory testing and engineering evaluations. If during construction, the subsoil conditions appear to be different from those as disclosed during field investigation, this office should be notified to consider any possible need for modification for the geotechnical recommendations provided in this report.

Recommendations provided are based on assumptions that structural footings will be established exclusively into compacted engineered fills of local non-expansive gravelly sandy soils or its similar imported fills. No footings and/or slabs should be allowed straddling over cut/fill transition interface.

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

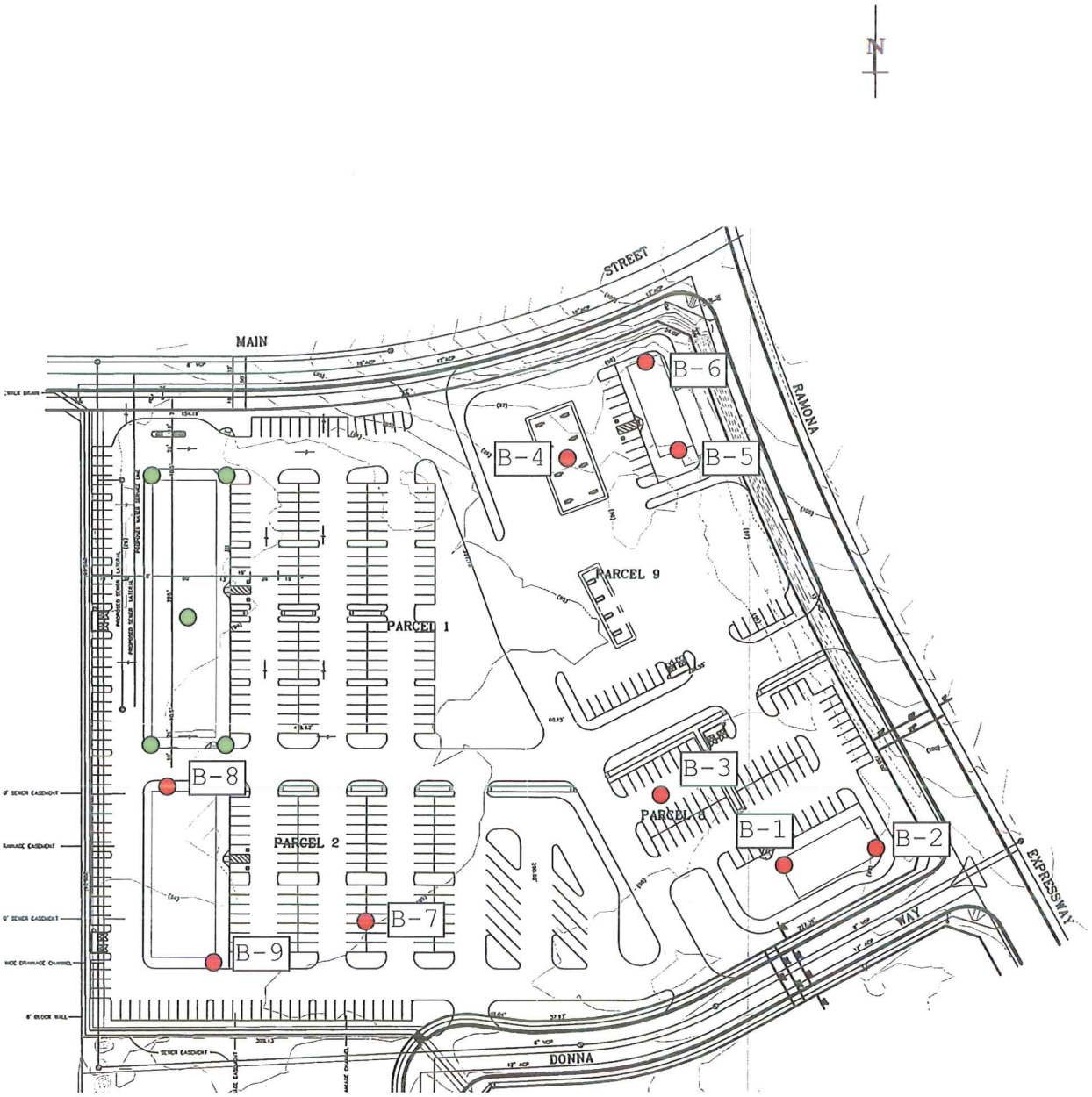
A pre-grading meeting between grading contractor and soils engineer is recommended prior to construction preferably at the site, to discuss the grading procedures to be implemented and other requirements described in this report to be fulfilled.

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

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

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

PLOT PLAN AND TEST LOCATIONS
Proposed 3.5+ Acre Commercial Development
Main Street @ Ramona Expressway
San Jacinto, California
(Not to Scale)



Legend:
- B-1 Approximate Location of Exploratory Test Boring on 10-13-17
- B-1 Approximate Location of Exploratory Test Boring on 5-31-17

Plate 1

7.0 APPENDIX A

Field Explorations

Field evaluations included site reconnaissance and exploratory test boring using a Hollow-Stem Auger (HSA) truck-mounted drill-rig.

Soils encountered during explorations were logged and such were classified by visual observations in accordance with the generally accepted classification system. The field descriptions were modified, where appropriate, to reflect laboratory test results. Approximate test locations are shown on Plate 1.

Relatively undisturbed soils were sampled using a drive sampler lined with soil sampling rings. The split barrel steel sampler was driven into the bottom of test excavations at various depths. Soil samples were retained in brass rings of 2.5 inches in diameter and 1.00 inch in height. The central portion of each sample was enclosed in a close-fitting waterproof container for shipment to our laboratory. In addition to undisturbed sampling, bulk soils were procured along with Standard Penetration Test (SPT) blow-counts as described in the Boring Logs.

Logs of test explorations are presented in the following summary sheets that include the description of the soils and/or fill materials encountered.

LOG OF TEST EXPLORATIONS

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

LOG OF BORING B-1

Project: All Speck, Inc. | **Job No.:** 17021-F2

Logged By: John F. | **Boring Diam.:** 8"HSA | **Date:** October 13, 2017

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					FILL			IN & OUT Restaurant tilled weeds
6							5	SAND - light gray, fine to medium, pebbles, scattered rock fragments, dry, loose - color change to light brown, gravely, medium to medium coarse, pebbles, occasional rock fragments, scattered asphalt debris, loose, dry to damp - (Max Density = 108 pcf @ 7.5%)
10		3.8	103.2	89.7	SP		10	- color change to light yellowish gray fine to medium coarse sugar like sand dry - loose, damp to moist
							15	
					GP-SP		20	- color change to light brown, gravely medium coarse to coarse, pebble, rock fragments, scat 1/2"-1" rock, damp to moist
15					SP		25	- color change to light gray-brown, fine to medium, pebbles, scattered rock fragments, medium dense, dry to damp
							30	
17					GP-SP			- color change to light brown, gravely, coarse, rock fragments, damp to moist. - moist with rock 1/4"-1/2"

Groundwater: +/- 42.0 ft.
Approx. Depth of Bedrock: n/a
Datum: n/a
Elevation: n/a

Site Location
Proposed Commercial Development
SWC Main Street & Ramona Expressway
San Jacinto, California

Plate #

Standard penetration test | Bulk/Grab sample | California sampler

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

LOG OF BORING B-1

Project: All Speck, Inc.		**Job No.:** 17021-F2
Logged By: John F.	**Boring Diam.:** 8"HSA	**Date:** October 13,2017

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
							40	
21					SP-SM			- slightly silty, fine to medium coarse medium dense, very moist - Groundwater encountered @ 42.0 ft.
							45	
25					SP			- medium dense, traces of silts, fine to medium coarse, rock fragments, wet
9							50	
20					VS			- color change to dark gray, silt-silty sand mix, fine, very moist to wet
								- End of test boring @ 51.0 ft. - no bedrock - groundwater @ 42.0 ft.
							55	
							60	
							65	
							70	

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

LOG OF BORING B-2

Project: All Speck, Inc.		**Job No.:**	17021-F2
Logged By: John F.	**Boring Diam.:** 8"HSA	**Date:**	October 13,2017

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					FILL			IN & OUT Restaurant tilled weeds, scattered organic debris
								SAND - light gray, medium to medium coarse pebble, rock fragments, dry
							5	
		2.5	106.9	93.0	SP			- color change to light yellowish gray, fine to medium coarse sugar like sand pebble, rock fragments, dense, dry
14								- medium to coarse, occasional rock fragments, dry to damp
							10	
		3.8	102.9	89.6	GP-SP			- gravely, medium coarse to coarse, rock fragments and rock, dense, dry to damp
							15	
9					SP-SM			- color change to gray-brown, silty, fine to medium, pebble, loose, moist
							20	
		3.2	108.9	94.7	GP-SP			- color change to light yellowish gray to white, gravely, medium coarse to coarse grained with rock fragments and 1/8" rock, very dense, dry to damp
							25	
18								- End of test boring @ 26.0 ft. - no bedrock - no groundwater
							30	

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

Site Location
Proposed Commercial Development
SWC Main Street & Ramona Expressway
San Jacinto, California

Plate #

California sampler Standard penetration test

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

LOG OF BORING B-3

Project: All Speck, Inc.		**Job No.:** 17021-F2
Logged By: John F.	**Boring Diam.:** 8"HSA	**Date:** October 13,2017

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					FILL			PAVING-EAST
								tilled weeds
								SAND - light gray, fine to medium coarse, pebble, rock fragments
								- gravely, medium to medium coarse, pebble, rock fragments, dry
							5	
5	◪							- loose with scattered 1/4" to 1/2" rock, damp
								- End of test boring @ 6.0 ft.
								- no bedrock
								- no groundwater
							10	
							15	
							20	
							25	
							30	

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

Site Location
Proposed Commercial Development
SWC Main Street & Ramona Expressway
San Jacinto, California

Plate #

◪ Standard penetration test

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

LOG OF BORING B-4

Project: All Speck, Inc.		**Job No.:** 17021-F2
Logged By: John F.	**Boring Diam.:** 8"HSA	**Date:** October 13,2017

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					FILL			GAS STATION CANOPY
								tilled weeds
								SAND - gray brown, slightly silty, fine to medium coarse, pebble, rock fragments scattered 1/2" rock, trace odor, damp
							5	
17								- medium dense with pieces of asphalt
								- color change to light brown, slightly silty, fine to medium coarse, pebble, rock fragments, damp
		2.7	104.6	91	GP-SP			
							10	- color change to yellowish light gray to white, gravely, medium to coarse, fragmented 1/8" rock, dry, dense
12					SW-SM			- slightly silty, fine to medium coarse pebble, rock fragments, damp
							15	
					SP			- traces of silts, fine to medium coarse, pebble, rock fragments, damp
							20	
16					GP-SP			- gravely, medium coarse to coarse, pebbles and rock fragments.
								- End of test boring @ 21.0 ft.
								- no bedrock
								- no groundwater
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Proposed Commercial Development SWC Main Street & Ramona Expressway San Jacinto, California	**Plate #**

California sampler Standard penetration test

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

LOG OF BORING B-5

Project: All Speck, Inc.		**Job No.:** 17021-F2
Logged By: John F.	**Boring Diam.:** 8"HSA	**Date:** October 13, 2017

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					FILL			GAS STATION
								tilled weeds and live
								SAND - light gray, fine to medium, occasional pebbles, dry to damp, loose
							5	- color change to gray-brown, gravely, medium to coarse, pebbles with occasional rock fragments, loose, damp
9								- coarse, rock fragments, loose, dry
					GP-SP		10	- medium coarse to coarse, pebbles, rock fragments, damp
							15	
14								- medium dense, dry to damp
								- very damp to moist
							20	
							25	- with 1/4" to 1/2" rock, damp
		3.8	111.9	97.3				- color change to light yellowish gray to white, medium to medium coarse, rock fragments and 1/2" rock, dry to damp
							30	
14					SP-SM			- slightly silty, fine to medium coarse pebble, rock fragments, medium dense moist
								- End of test boring @ 31.0 ft. no bedrock

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Proposed Commercial Development SWC Main Street & Ramona Expressway San Jacinto, California	**Plate #**

California sampler Standard penetration test

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

LOG OF BORING B-5

Project: All Speck, Inc. | **Job No.:** 17021-F2

Logged By: John F. | **Boring Diam.:** 8"HSA | **Date:** October 13,2017

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
								no groundwater
							40	
							45	
							50	
							55	
							60	
							65	
							70	

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

LOG OF BORING B-6

Project: All Speck, Inc.		**Job No.:** 17021-F2
Logged By: John F.	**Boring Diam.:** 8"HSA	**Date:** October 13,2017

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					FILL			GAS STATION tilled weeds and scattered debris
		1.0	100.8	93.3				SAND - light gray brown, slightly silty, fine to medium, pebble, scattered rock fragments and 1/4"to1/2" rock
							5	- color change to light gray to white medium to medium coarse, pebble, rock fragments, scattered 1"-2" rock, very dry, loose
9								
		3.2	103.4	90.0	GP-SP			- color change to light yellowish gray to white, gravely, medium to coarse, rock fragments with 1/4" rock, dense dry
							10	
19					SP			- fine to medium coarse, with greenish gray silts, medium dense,damp to moist
							15	
		3.2	104.2	90.6				
								- End of test boring @ 16.0 ft. - no bedrock - no groundwater
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Proposed Commercial Development SWC Main Street & Ramona Expressway San Jacinto, California	**Plate #**

California sampler Standard penetration test Bulk/Grab sample

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

LOG OF BORING B-7

Project: All Speck, Inc.		**Job No.:** 17021-F2
Logged By: John F.	**Boring Diam.:** 8"HSA	**Date:** October 13,2017

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					FILL			PAVING-southside
								tilled and live weeds
								SAND - light gray, traces of silt, fine to medium, pebble, damp
							5	- color changt to light gray brown, fine to medium coarse, pebble, rock fragments, dry
6								- loose, gravely, medium coarse to coarse, pebble, rock fragments, dry
								- End of test boring @ 6.0 ft.
								- no bedrock
								- no groundwater
							10	
							15	
							20	
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Proposed Commercial Development SWC Main Street & Ramona Expressway San Jacinto, California	**Plate #**

California sampler Standard penetration test Bulk/Grab sample

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

LOG OF BORING B-8

Project: All Speck, Inc.		**Job No.:** 17021-F2
Logged By: John F.	**Boring Diam.:** 8"HSA	**Date:** October 13,2017

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
					FILL			RETAIL BUILDING SOUTHWEST
								tilled weeds
6							5	SAND - light gray-brown, fine to medium coarse, traces of silt, dry - loose, traces of silts, fine to medium, pebbles, dry
		2.7	103.4	89.8	GP-SP			- gravely riverbed type sand, coarse, pebble, rock fragment, dry to damp - color change to light yellowish gray to white wit rock fragments and 1/8" rock, dense
9							10	- loose with scattered 1/4" to 1/2"rock
							15	
							20	
28								- very coarse river bed type sand, fragmented 1/2" to 1" rock, medium dense to dense, dry to damp
								- End of test boring @ 21.0 ft. - no bedrock - no groundwater
							25	
							30	

Groundwater: n/a **Approx. Depth of Bedrock:** n/a **Datum:** n/a **Elevation:** n/a	**Site Location** Proposed Commercial Development SWC Main Street & Ramona Expressway San Jacinto, California	**Plate #**

Standard penetration test California sampler

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

LOG OF BORING B-9

Project: All Speck, Inc. | **Job No.:** 17021-F2

Logged By: John F. | **Boring Diam.:** 8"HSA | **Date:** October 13,2017

Standard Penetration (Blows per Ft.)	Sample Type	Water Content in %	Dry Density in PCF	Percent Compaction	Unified Classification System	Graphic	Depth in Feet	Description and Remarks
								RETAIL BUILDING SOUTHWEST tilled and live weeds
5.0					GP-SP		5	SAND - light gray, slightly silty, fine to medium, pebble, occasional rock fragments, dry, loose - color change to grayish light brown - gravely, coarse, scattered root, medium coarse to coarse, rock fragments, loose, dry - medium to medium coarse, pebble, rock fragments, loose, dry - no sample ring recovery - dry to damp
4					SM-ML		10	- silty, fine to medium, pebble, very loose, moist to ver moist
10					GP-SP		15	- loose, gravely, medium to medium coarse, pebble, rock fragments - End of test boring @ 16.0 ft. - no bedrock - no groundwater
							20	
							25	
							30	

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

Site Location
Proposed Commercial Development
SWC Main Street & Ramona Expressway
San Jacinto, California

Plate #

California sampler | Standard penetration test | Bulk/Grab sample

KEY TO SYMBOLS

Symbol Description

Strata symbols

Fill

Poorly graded gravel and sand

Poorly graded sand

Soil Samplers

California sampler

Standard penetration test

Bulk/Grab sample

Notes:

1. Exploratory borings were drilled on October 13,2017 using a 4-inch diameter continuous flight power auger.

2. No free water was encountered at the time of drilling or when re-checked the following day.

3. Boring locations were taped from existing features and elevations extrapolated from the final design schematic plan.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

5. Results of tests conducted on samples recovered are reported on the logs.

8.0 APPENDIX B

Laboratory Test Programs

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

Moisture Content and Dry Density (D2937):

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

Direct Shear (D3080):

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

Consolidation (D2835):

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

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

Soil samples are usually under light normal load conditions to accommodate seating of the apparatus. Samples were tested at the field moisture conditions at a predetermined normal load. Potentially moisture sensitive soil typically demonstrated significant volume change with the introduction of free water. The results of the consolidation tests are presented in graphical forms on Plate B-2.

Potential Expansion (ASTM Standard D4829-88)

Silty sand to gravely sandy in nature, the site soils are considered 'very low' in expansion characteristic. Supplemental testing for soil expansion should be performed following mass grading completion.

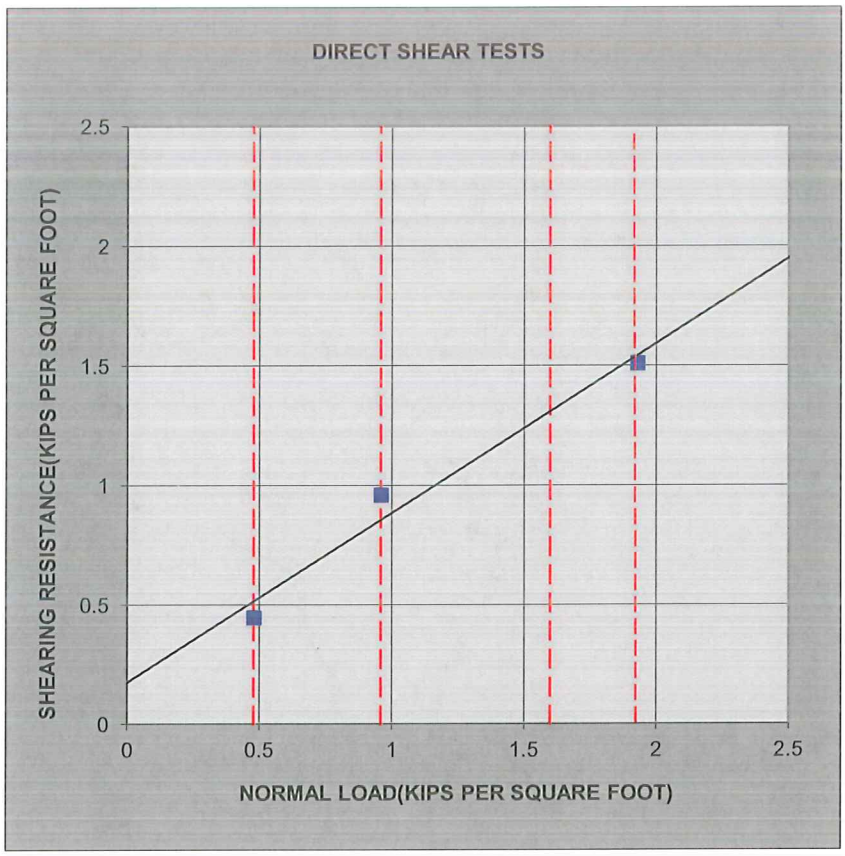
Laboratory Test Results

A Table I: In-Situ Moisture-Density (ASTM D2937)

Test Boring No.	Sample Depth, ft.	% Compaction	Moisture Content, %
1	8	89	3.8
2	5	93	2.5
2	10	89	3.8
2	20	95	3.2
4	8	91	2.7
5	25	97	3.8
6	3	93	1.0
6	8	90	3.2
6	15	91	3.2
8	7	90	2.7

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

Sample Location @ depth, ft.	Max. Dry Density, pcf	Optimum Moisture (%)
B-1 @ 3-5 Sand-silty, gravelly, with scattered rock fragments, broken asphalt, slight odor, very dry	108	7.50



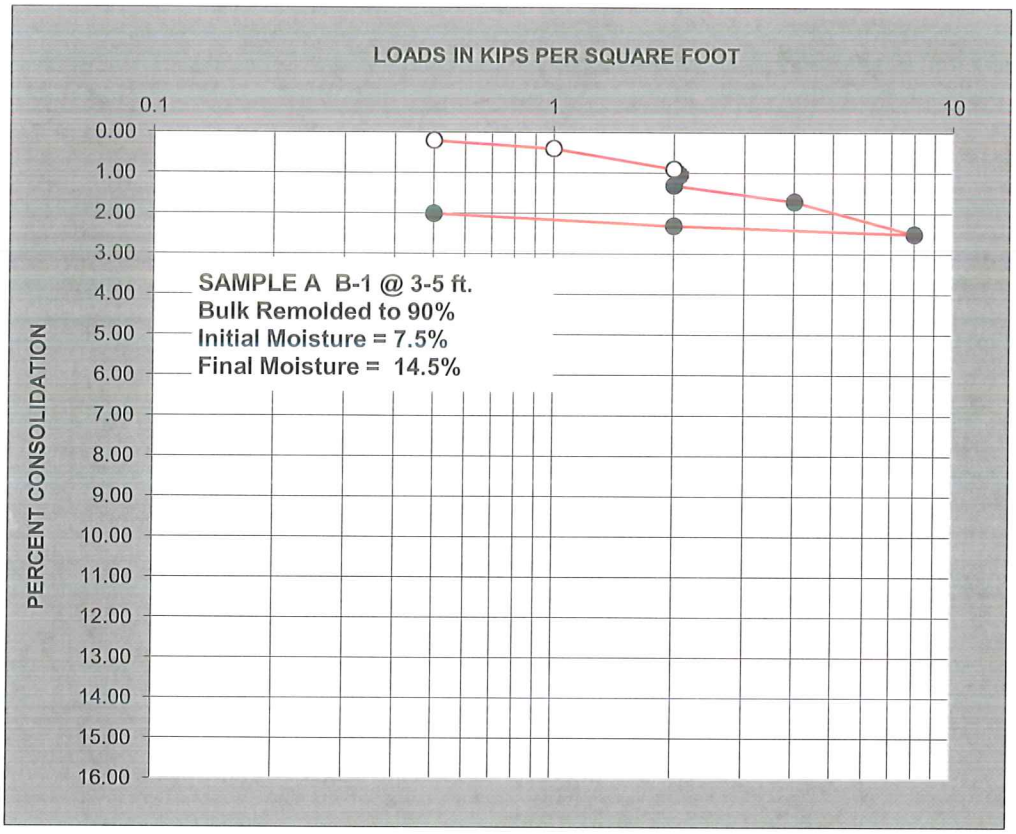
SYMBOL	LOCATION	DEPTH (FT)	TEST CONDITION	COHESION (psf)	FRICTION (degree)
■	B-1	3 to 5	Bulk Remolded to 90%	175.40	35.35

Proposed Commercial Complex
Main Street w/o Ramona Expressway
San Jacinto, California

PROJECT NO.	17021-F2
PLATE	B-1

SOILS SOUTHWEST, INC.
Consulting Foundation Engineers

CONSOLIDATION TESTS

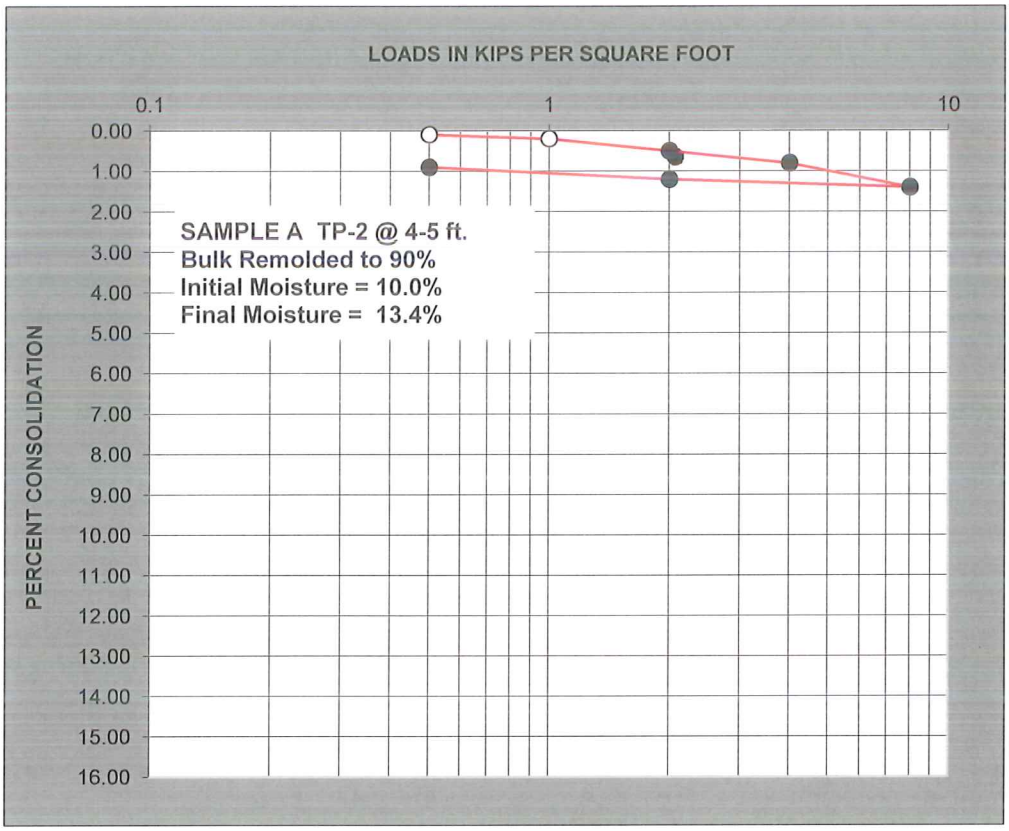


- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Commercial Complex Main Street w/o Ramona Expressway, San Jacinto		
	PROJECT NO.	17021-F2	PLATE	B-2

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

CONSOLIDATION TESTS



- **WATER PERMITTED TO CONTACT SAMPLE**

	PROJECT	Proposed Popeyes Restaraunt & Retail Center 525 S. Citrus Avenue, Covina		
	PROJECT NO.	17053-F	PLATE	B-2

SOILS SOUTHWEST INC.
Consulting Foundation Engineers

APPENDIX C

Seismic Design Parameters

CALIFORNIA DIVISION OF MINES AND GEOLOGY
JAMES E. SLOSSON, STATE GEOLOGIST

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF CONSERVATION

SAN JACINTO QUADRANGLE
CALIFORNIA-RIVERSIDE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

SCALE 1:24 000

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET
DASHED LINES REPRESENT 20 FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

REFERENCES USED TO COMPILE FAULT DATA

San Jacinto Quadrangle

Hart, E.W., "Fault-Evaluation Report, FER-65, San Jacinto Fault, Hemet and San Jacinto Quadrangles," unpublished report, California Division of Mines and Geology, 7 p., figures 1A and B, with supplements.

MAP EXPLANATION

Potentially Active Faults

1926 C — Faults considered to have been active during Quaternary time; solid line where accurately located, long dash where approximately located, short dash where inferred, dotted where concealed, query (?) indicates additional uncertainty. Evidence of historic offset indicated by year of earthquake-associated event or C for displacement caused by creep or possible creep.

— — — Aerial photo lineaments (not field checked), based on youthful geomorphic and other features believed to be the results of Quaternary faulting.

Special Studies Zone Boundaries

These are delineated as straight-line segments that connect encircled turning points so as to define special studies zone segments.

Seaward projection of zone boundary.

STATE OF CALIFORNIA
SPECIAL STUDIES ZONES

Delineated in compliance with
Chapter 7.5, Division 2 of the California Public Resources Code

SAN JACINTO QUADRANGLE

REVISED OFFICIAL MAP
Effective: January 1, 1980

James E. Slosson — State Geologist

IMPORTANT - PLEASE NOTE

1) *This map may not show all potentially active faults either within the special studies zones or outside their boundaries.*
2) Faults shown are the basis for establishing the boundaries of the special studies zones.
3) The identification of these potentially active faults and the location of such fault traces are based on the best available data. Traces have been drawn as accurately as possible at this map scale; however, the quality of data used is varied.
4) Fault information on this map is not sufficient to serve as a substitute for the geologic site investigations (special studies) required under Chapter 7.5, Division 2, Section 2623 of the California Public Resources Code.

State of California
Department of Conservation

Ground Motion Interpolator (2008)

Longitude: -116.938786

Latitude: 33.783601

VS30: 270 (180-1050 m/sec)

Return Period:

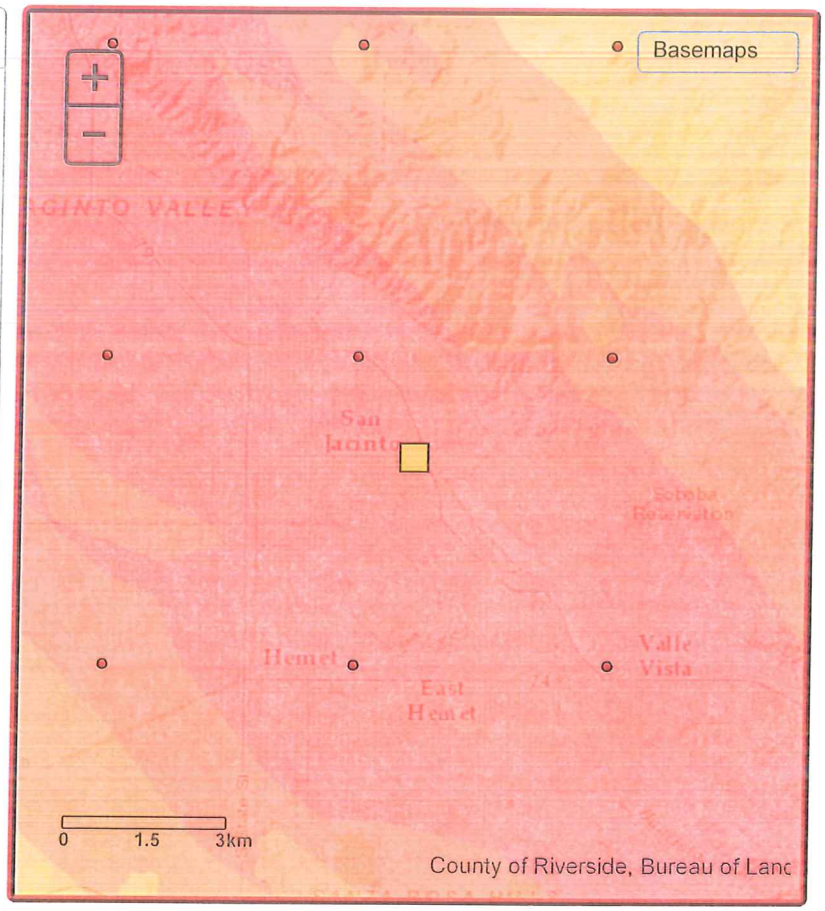
2% in 50 years 10% in 50 years

Spectral Acceleration:

PGA 0.2 second SA 1.0 second SA

Submit

Inputs:	**Result:**
-116.938786, 33.783601 vs30: 270 m/sec 10% in 50 years PGA	0.639 g



Information and Disclaimer

USGS Design Maps Summary Report

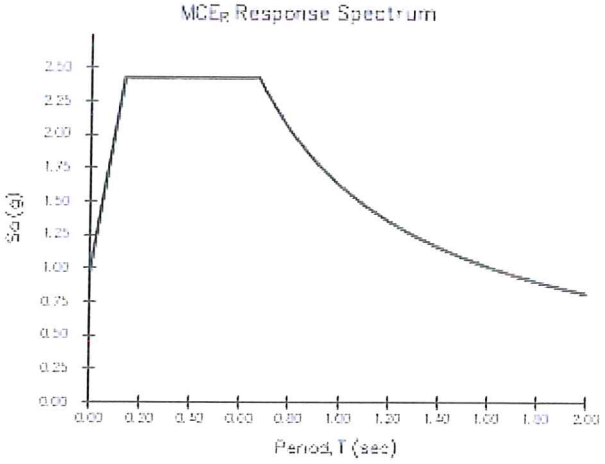
User-Specified Input

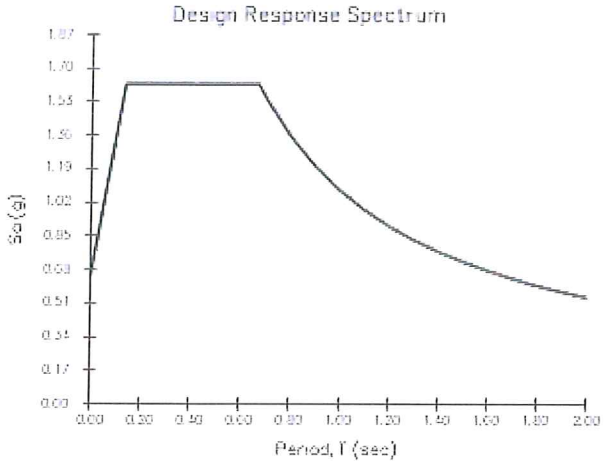
Report Title	All Speck, Inc., Main Street w/o Ramona, San Jacinto, CA Fri July 7, 2017 17:03:16 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	33.7836°N, 116.93879°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

USGS-Provided Output

S_S =	2.427 g	S_{MS} =	2.427 g	S_{DS} =	1.618 g
S_1 =	1.081 g	S_{M1} =	1.621 g	S_{D1} =	1.081 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.





For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

Although this information is a product of the U.S. Geological Survey, we provide no warranty, expressed or implied, as to the accuracy of the data contained therein. This tool is not a substitute for technical subject-matter knowledge.

Design Maps Detailed Report

ASCE 7-10 Standard (33.7836°N, 116.93879°W)

Site Class D – "Stiff Soil", Risk Category I/II/III

Section 11.4.1 — Mapped Acceleration Parameters

Note: Ground motion values provided below are for the direction of maximum horizontal spectral response acceleration. They have been converted from corresponding geometric mean ground motions computed by the USGS by applying factors of 1.1 (to obtain S_s) and 1.3 (to obtain S_1). Maps in the 2010 ASCE-7 Standard are provided for Site Class B. Adjustments for other Site Classes are made, as needed, in Section 11.4.3.

From Figure 22-1 [1]	S_s = 2.427 g
From Figure 22-2 [2]	S_1 = 1.081 g

Section 11.4.2 — Site Class

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class D, based on the site soil properties in accordance with Chapter 20.

Table 20.3–1 Site Classification

Site Class	$\overline{v}_s$	$\overline{N}$ or $\overline{N}_{ch}$	$\overline{s}_u$
A. Hard Rock	>5,000 ft/s	N/A	N/A
B. Rock	2,500 to 5,000 ft/s	N/A	N/A
C. Very dense soil and soft rock	1,200 to 2,500 ft/s	>50	>2,000 psf
D. Stiff Soil	600 to 1,200 ft/s	15 to 50	1,000 to 2,000 psf
E. Soft clay soil	<600 ft/s	<15	<1,000 psf
	Any profile with more than 10 ft of soil having the characteristics: • Plasticity index PI > 20, • Moisture content $w \geq 40\%$, and • Undrained shear strength $\overline{s}_u$ < 500 psf		
F. Soils requiring site response analysis in accordance with Section 21.1	See Section 20.3.1		

For SI: 1ft/s = 0.3048 m/s 1lb/ft² = 0.0479 kN/m²

Section 11.4.3 — Site Coefficients and Risk-Targeted Maximum Considered Earthquake (MCE_R) Spectral Response Acceleration Parameters

Table 11.4-1: Site Coefficient F_a

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at Short Period				
	$S_S \leq 0.25$	$S_S = 0.50$	$S_S = 0.75$	$S_S = 1.00$	$S_S \geq 1.25$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_S

For Site Class = D and S_S = 2.427 g, F_a = 1.000

Table 11.4-2: Site Coefficient F_v

Site Class	Mapped MCE_R Spectral Response Acceleration Parameter at 1-s Period				
	$S_1 \leq 0.10$	$S_1 = 0.20$	$S_1 = 0.30$	$S_1 = 0.40$	$S_1 \geq 0.50$
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.7	1.6	1.5	1.4	1.3
D	2.4	2.0	1.8	1.6	1.5
E	3.5	3.2	2.8	2.4	2.4
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of S_1

For Site Class = D and S_1 = 1.081 g, F_v = 1.500

Equation (11.4-1): $S_{MS} = F_a S_S = 1.000 \times 2.427 = 2.427$ g

Equation (11.4-2): $S_{M1} = F_v S_1 = 1.500 \times 1.081 = 1.621$ g

Section 11.4.4 — Design Spectral Acceleration Parameters

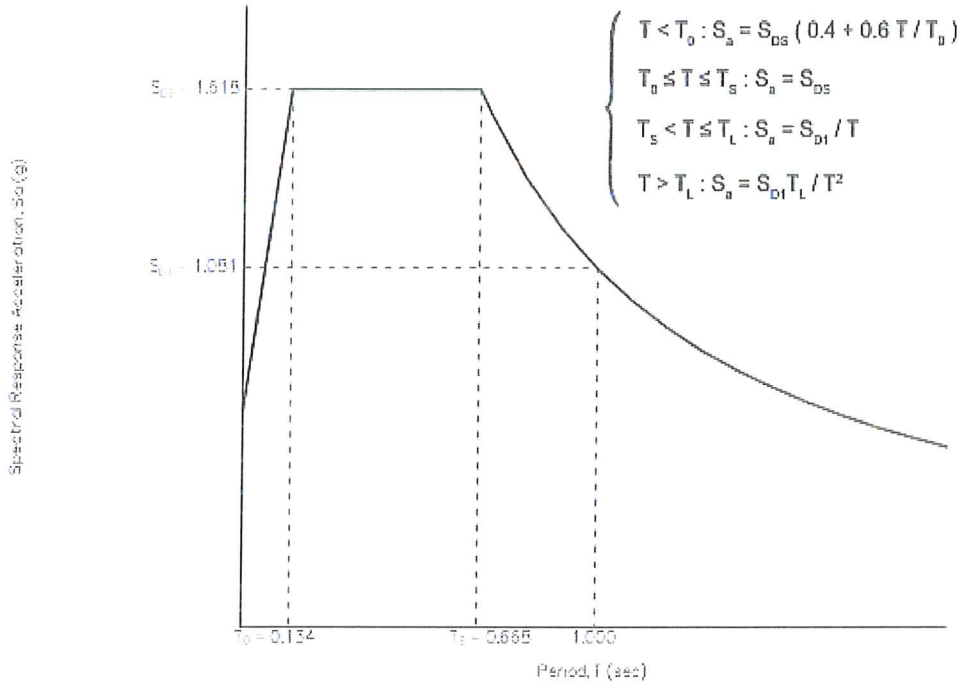
Equation (11.4-3): $S_{DS} = \frac{2}{3} S_{MS} = \frac{2}{3} \times 2.427 = 1.618$ g

Equation (11.4-4): $S_{D1} = \frac{2}{3} S_{M1} = \frac{2}{3} \times 1.621 = 1.081$ g

Section 11.4.5 — Design Response Spectrum

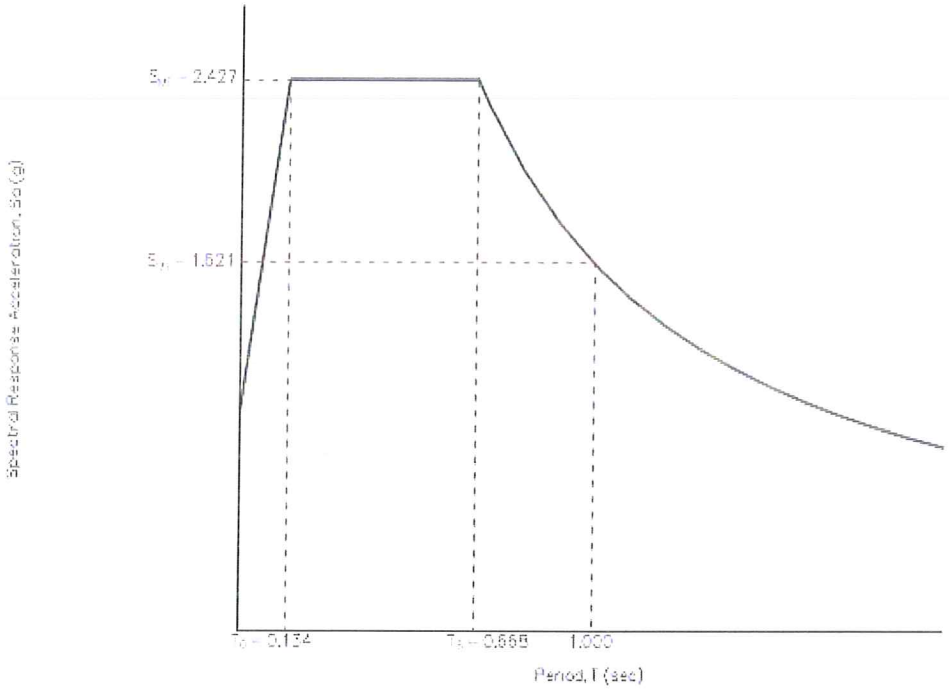
From Figure 22-12 [3] $T_L = 8$ seconds

Figure 11.4-1: Design Response Spectrum



Section 11.4.6 — Risk-Targeted Maximum Considered Earthquake (MCE_R) Response Spectrum

The MCE_R Response Spectrum is determined by multiplying the design response spectrum above by 1.5.



Section 11.8.3 — Additional Geotechnical Investigation Report Requirements for Seismic Design Categories D through F

From Figure 22-7 [4] PGA = 0.933

Equation (11.8-1): $PGA_M = F_{PGA}PGA = 1.000 \times 0.933 = 0.933$ g

Table 11.8-1: Site Coefficient F_{PGA}

Site Class	Mapped MCE Geometric Mean Peak Ground Acceleration, PGA				
	PGA ≤ 0.10	PGA = 0.20	PGA = 0.30	PGA = 0.40	PGA ≥ 0.50
A	0.8	0.8	0.8	0.8	0.8
B	1.0	1.0	1.0	1.0	1.0
C	1.2	1.2	1.1	1.0	1.0
D	1.6	1.4	1.2	1.1	1.0
E	2.5	1.7	1.2	0.9	0.9
F	See Section 11.4.7 of ASCE 7				

Note: Use straight-line interpolation for intermediate values of PGA

For Site Class = D and PGA = 0.933 g, F_{PGA} = 1.000

Section 21.2.1.1 — Method 1 (from Chapter 21 – Site-Specific Ground Motion Procedures for Seismic Design)

From Figure 22-17 [5] C_{RS} = 0.955

From Figure 22-18 [6] C_{R1} = 0.924

Section 11.6 — Seismic Design Category

Table 11.6-1 Seismic Design Category Based on Short Period Response Acceleration Parameter

VALUE OF S_{DS}	RISK CATEGORY		
	I or II	III	IV
$S_{DS} < 0.167g$	A	A	A
$0.167g \le S_{DS} < 0.33g$	B	B	C
$0.33g \le S_{DS} < 0.50g$	C	C	D
$0.50g \le S_{DS}$	D	D	D

For Risk Category = I and S_{DS} = 1.618 g, Seismic Design Category = D

Table 11.6-2 Seismic Design Category Based on 1-S Period Response Acceleration Parameter

VALUE OF S_{D1}	RISK CATEGORY		
	I or II	III	IV
$S_{D1} < 0.067g$	A	A	A
$0.067g \le S_{D1} < 0.133g$	B	B	C
$0.133g \le S_{D1} < 0.20g$	C	C	D
$0.20g \le S_{D1}$	D	D	D

For Risk Category = I and S_{D1} = 1.081 g, Seismic Design Category = D

Note: When S_1 is greater than or equal to 0.75g, the Seismic Design Category is **E** for buildings in Risk Categories I, II, and III, and **F** for those in Risk Category IV, irrespective of the above.

Seismic Design Category ≡ "the more severe design category in accordance with Table 11.6-1 or 11.6-2" = E

Note: See Section 11.6 for alternative approaches to calculating Seismic Design Category.

References

1. *Figure 22-1*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-1.pdf
2. *Figure 22-2*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-2.pdf
3. *Figure 22-12*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-12.pdf
4. *Figure 22-7*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-7.pdf
5. *Figure 22-17*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-17.pdf
6. *Figure 22-18*: https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/2010_ASCE-7_Figure_22-18.pdf

APPENDIX D

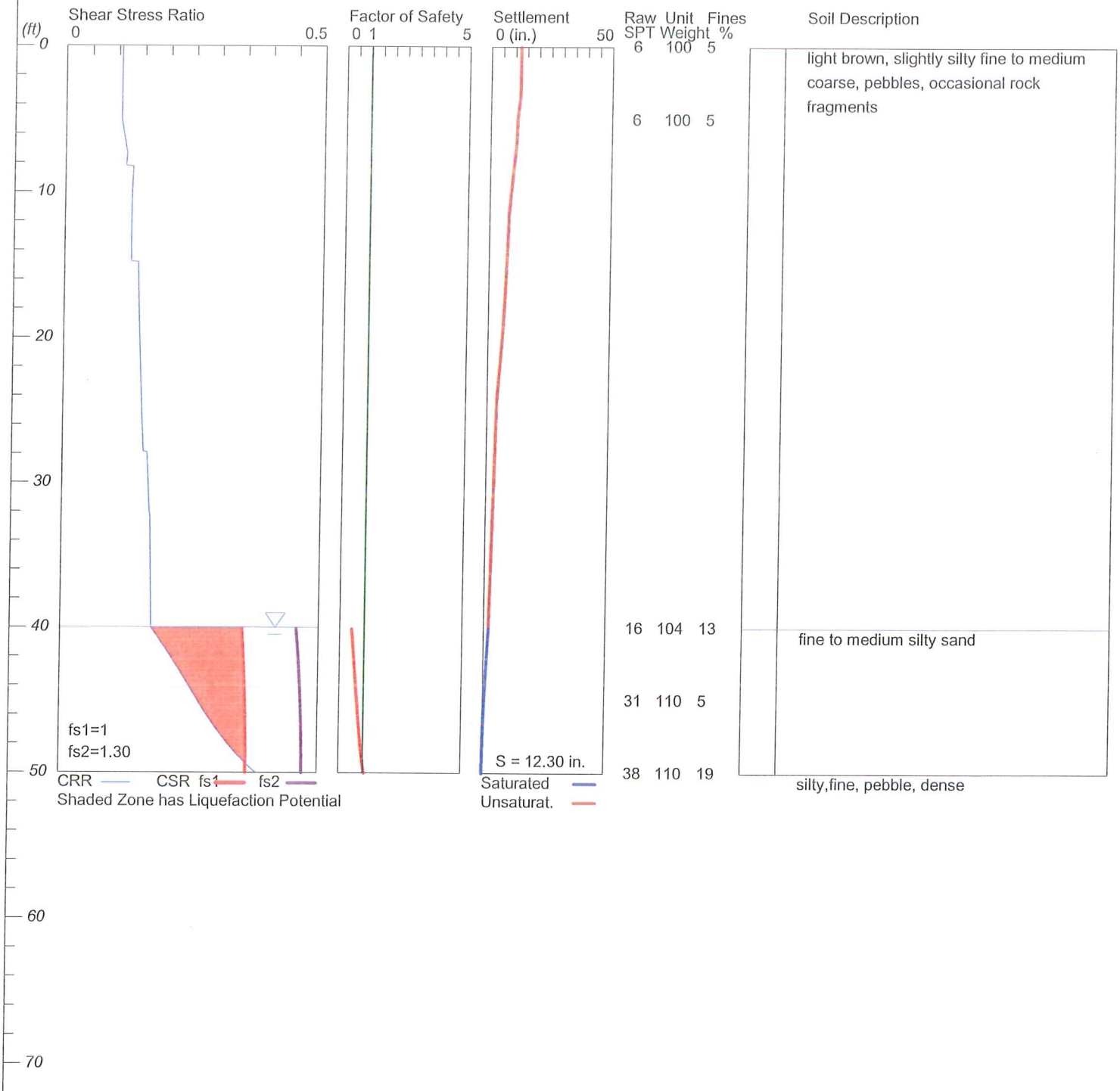
Liquefaction Analyses and Pre and Post-Construction Settlement Evaluations

LIQUEFACTION ANALYSIS

All Specks, Inc.

Hole No.=B-1 Water Depth=40 ft Surface Elev.=1596

Magnitude=6.9
Acceleration=0.639g



LIQUEFACTION ANALYSIS SUMMARY

www.civiltechsoftware.com

****

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Input File Name: UNTITLED

Title: All Specks, Inc.

Subtitle: 17021-F ***Pre-Construction Analysis***

Surface Elev.=1596

Hole No.=B-1

Depth of Hole= 50.00 ft

Water Table during Earthquake= 40.00 ft

Water Table during In-Situ Testing= 400.00 ft

Max. Acceleration= 0.64 g

Earthquake Magnitude= 6.90

Input Data:

Surface Elev.=1596

Hole No.=B-1

Depth of Hole=50.00 ft

Water Table during Earthquake= 40.00 ft

Water Table during In-Situ Testing= 400.00 ft

Max. Acceleration=0.64 g

Earthquake Magnitude=6.90

No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.
2. Settlement Analysis Method: Ishihara / Yoshimine
3. Fines Correction for Liquefaction: Stark/Olson et al.*
4. Fine Correction for Settlement: During Liquefaction*
5. Settlement Calculation in: All zones*
6. Hammer Energy Ratio, Ce = 1
7. Borehole Diameter, Cb= 1
8. Sampling Method, Cs= 1
9. User request factor of safety (apply to CSR) , User= 1.3

   Plot two CSR (fs1=1, fs2=User)
10. Use Curve Smoothing: Yes*

* Recommended Options

In-Situ Test Data:

Depth	SPT	gamma	Fines
ft		pcf	%
0.00	6.00	100.00	5.00
5.00	6.00	100.00	5.00
40.00	16.00	104.00	13.00
45.00	31.00	110.00	5.00
50.00	38.00	110.00	19.00

Output Results:

Settlement of Saturated Sands=**2.10** in.

Settlement of Unsaturated Sands=**10.20** in.

Total Settlement of Saturated and Unsaturated Sands=**12.30** in.

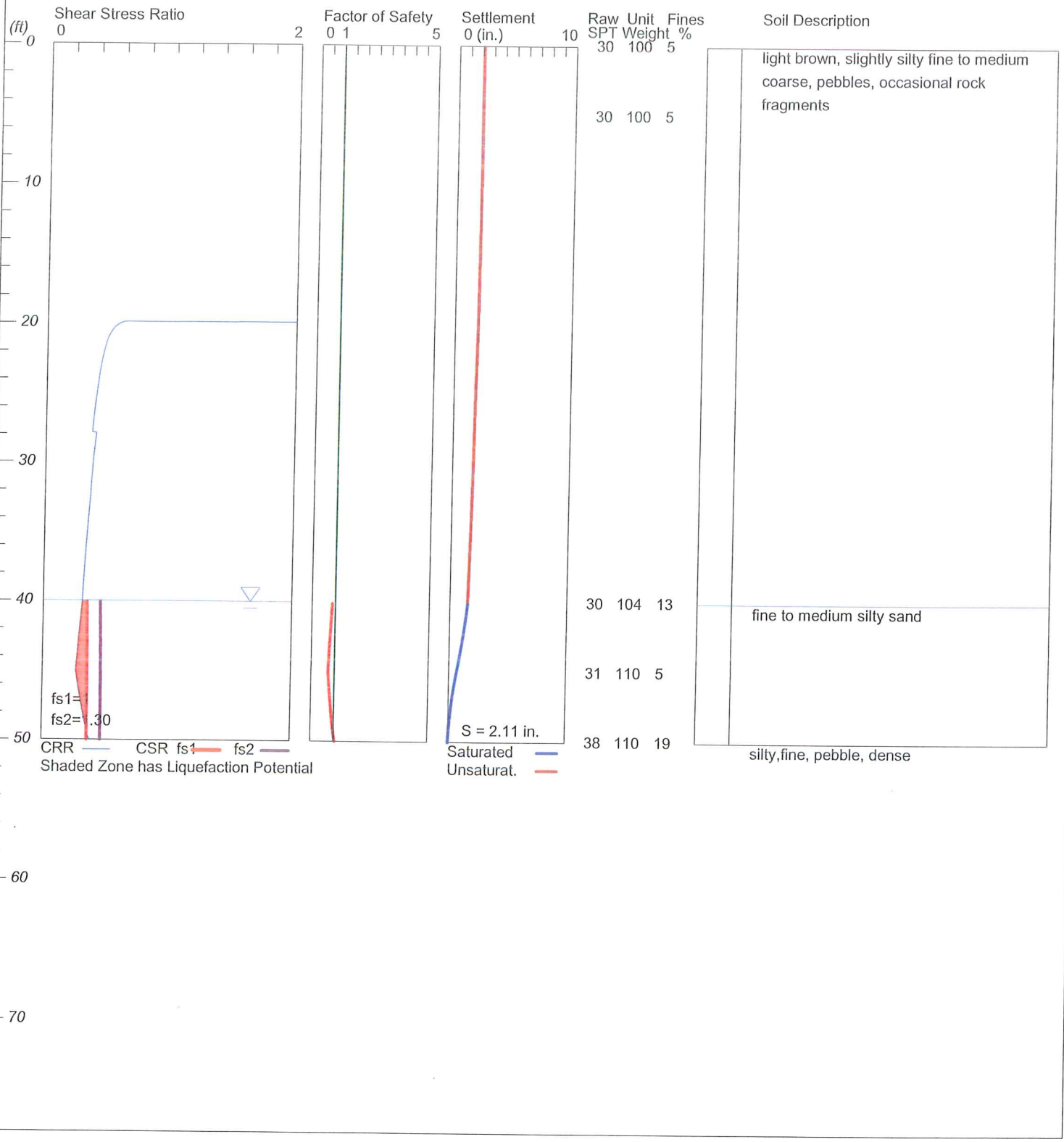
Differential Settlement=***6.151 to 8.119*** in.

LIQUEFACTION ANALYSIS

All Specks, Inc.

Hole No.=B-1 Water Depth=40 ft Surface Elev.=1596

Magnitude=6.9
Acceleration=0.639g



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LIQUEFACTION ANALYSIS SUMMARY

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Input File Name: C:\Users\Soils Southwest\Desktop\Liquefy5\17021Precon.liq

Title: All Specks, Inc.

Subtitle: 17021-F ***Post-Construction***

Surface Elev.=1596

Hole No.=B-1

Depth of Hole= 50.00 ft

Water Table during Earthquake= 40.00 ft

Water Table during In-Situ Testing= 400.00 ft

Max. Acceleration= 0.64 g

Earthquake Magnitude= 6.90

Input Data:

Surface Elev.=1596

Hole No.=B-1

Depth of Hole=50.00 ft

Water Table during Earthquake= 40.00 ft

Water Table during In-Situ Testing= 400.00 ft

Max. Acceleration=0.64 g

Earthquake Magnitude=6.90

No-Liquefiable Soils: CL, OL are Non-Liq. Soil

1. SPT or BPT Calculation.

2. Settlement Analysis Method: Ishihara / Yoshimine

3. Fines Correction for Liquefaction: Stark/Olson et al.*

4. Fine Correction for Settlement: During Liquefaction*

5. Settlement Calculation in: All zones*

6. Hammer Energy Ratio, Ce = 1

7. Borehole Diameter, Cb= 1

8. Sampling Method, Cs= 1

9. User request factor of safety (apply to CSR) , User= 1.3

Plot two CSR (fs1=1, fs2=User)

10. Use Curve Smoothing: Yes*

* Recommended Options

In-Situ Test Data:

Depth	SPT	gamma	Fines
ft		pcf	%
0.00	30.00	100.00	5.00
5.00	30.00	100.00	5.00
40.00	30.00	104.00	13.00
45.00	31.00	110.00	5.00
50.00	38.00	110.00	19.00

Output Results:

Settlement of Saturated Sands=**1.53** in.

Settlement of Unsaturated Sands=**0.59** in.

Total Settlement of Saturated and Unsaturated Sands=**2.11** in.

Differential Settlement=**1.056 to 1.394** in.

PROFESSIONAL LIMITATIONS

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

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

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

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

RECOMMENDED SERVICES

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

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

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

Soils Southwest, Inc. will assume no responsibility for any structural distresses during its life-time use; in event the above conditions are not strictly fulfilled.

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

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

Report of Water Infiltration Rate
Proposed WQMP-BMP Filtration Trench/Detention Basin Design
Planned Commercial Retail Center
Main Street w/o Ramona Expressway
San Jacinto, CA
APN: 433-160-27&32

Project No. 17021-BMP

July 10, 2017

Prepared for:

All Speck, Inc.
c/o Mr. William Speck
10073 Valley View Street
Cypress, CA 90630

soilssouthwest@aol.com
Established 1984

SOILS SOUTHWEST, INC.

SOILS, MATERIALS AND ENVIRONMENTAL ENGINEERING CONSULTANTS

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

June 13, 2017 Project No. 17021-BMP

All Speck, Inc.
10073 Valley View Street
Cypress, CA 90630

Attention: Mr. William Speck

Subject: Report of Water Infiltration Rate
Proposed WQMP-BMP Filtration Trench/Detention Basin Design
Planned Commercial Retail Center
Main Street w/o Ramona Expressway
San Jacinto, CA
APN: 433-160-27&32

Reference: Preliminary Site Plan with Filtration Test Locations Prepared by MPA Architects, Inc.

Gentlemen:

Presented herewith are the results of soils percolation testing performed for the proposed WQMP-BMP detention basin design for the project site described. Infiltration testing was conducted within the area as described in the site plan supplied by MP Architects, and as shown on the attached Plate A.

The in-situ soil infiltration rate is established by testing near surface using the standardized and well-documented Double-Ring Infiltrometer testing in general conformance to the ASTM Standard D3385. The surface soils encountered primarily consist of gravely sands with some silts (SP-SM).

Based on the testing completed for the test locations described, the observed soils percolation rates are provided in Table 4 of Section 4.0 of this report. Lower infiltration rate may be anticipated over prolong use of the detention systems installed due to continual deposits of fines and/or lack of adequate post-instillation maintenance.

We offer no other warranty, express or implied.

Respectfully submitted,
Soils Southwest, Inc.

Moloy Gupta, RCE 31708

John Flippin
Project Coordinator

1.0 Proposed Development

No detailed development plan is available for review. However, based on the preliminary project information supplied, it is understood that the subject parcel will be developed primarily to include one commercial retail building off of Main Street west of Ramona Expressway, along with the planned WQMP-BMP detention basin/filtration basin/trench. Supplemental construction is anticipated to include paving, parking and others. Moderate site preparations and grading should be anticipated with the development planned.

2.0 Soil Percolation Testing

As requested, two (2) percolation testing is performed within the filtration area as delineated in the referenced site plan, and as described in the attached Plate A. Prior to testing, the near surface recently disked 6-inch loose soils were removed to expose the underlying undisturbed natural subgrades. Water used during percolation testing was supplied by the client's using a portable water tank. During testing, equipment used primarily include the following:

- Double Ring Infiltrometer with inner and outer rings of 12-inch and 24-inch (2 to 1 ratio) in diameter, respectively
- Shovel (flat head)
- Level
- Mallet-like small sledge hammer
- 2" x 4" timber (for protecting plate while hammering in rings)
- Plastic measuring rulers (30 cm/12-inc) with millimeter and centimeter scale ruler
- Watch
- Rubber plash guards

3.0 Methodology and Test Procedures

Equipment Set-Up Procedures

Soil infiltration test was performed using two described concentric rings established at about 6 below the ground surface. During testing, the 12-inch diameter inner ring was centered inside the 24-inch diameter outer-ring. Prior to actual testing, the outer ring was driven into local soils to about 10 centimeters, followed by the inner ring to about ½ of the outer ring penetration depth stated. Both the rings were pushed into soil using a sledge hammer and driving plate with a 2" x 4" timber for protecting the driving plate. Water supplied by a portable water tank was used to fill the annular-space to about 4-inch, followed by the inner-ring to the same level described.

4.0 Infiltration Test Results

Based on the soils infiltration testing completed, for WQMP-BMP design the following infiltration rates may be considered. Actual field test data are attached.

Observed Infiltration Rate for Design

Test Date Test No. (5-26-17)	Test Depth (ft.) Below Grade	Observed Rate (inch/hour.) (Inner Ring)
P-1	0.5	23.40
P-2	0.5	8.19

For design, using a Factor of Safety 3.0, suggested design rate is 2.73-inch per hour to account for long-term saturation, inconsistencies in subsoil conditions, along with potential for silting of percolating soils.

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

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

We offer no other warranty, express or implied.

Suggested Site Requirements for Stormwater BMP installation

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

Stormwater infiltration shall not increase the potential for static or seismic settlement of structures on or adjacent to the site. Potential geotechnical hazards that shall be addressed including potentials for collapsible and liquefaction, if any.

Stormwater infiltration shall not place an increased surcharge on structures or foundations on or its adjacents. The pore-water pressure shall not be increased on soil retaining structures on or adjacent to the site.

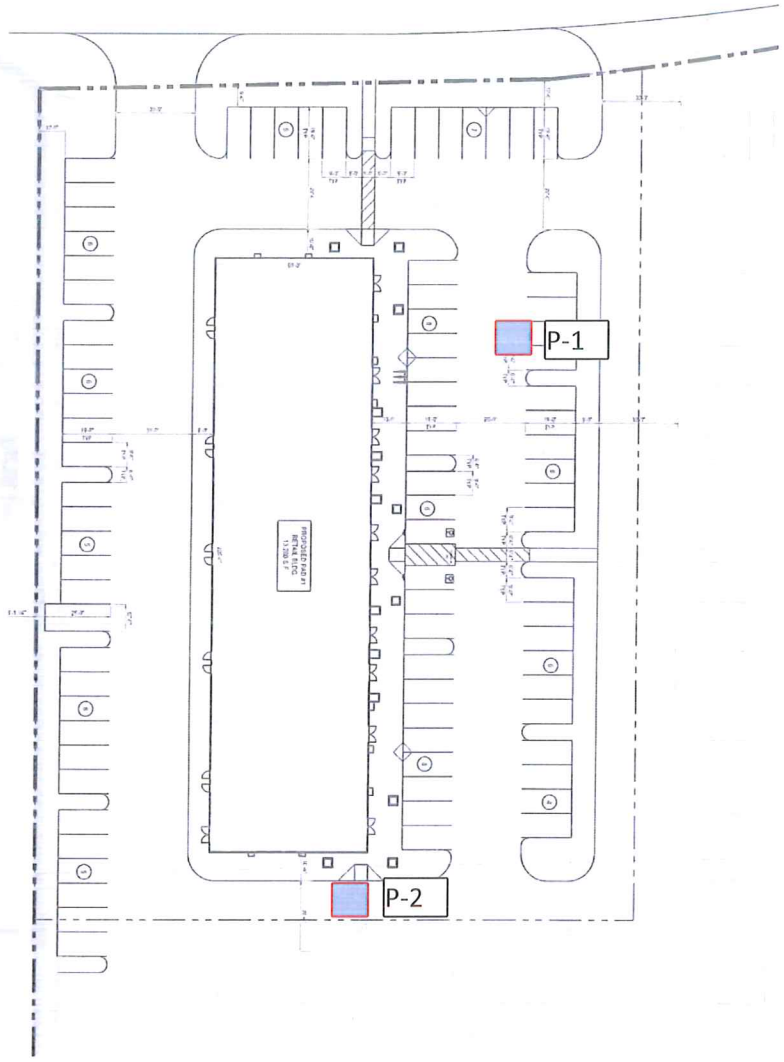
The invert of stormwater infiltration shall be set back at least 15 feet, and outside a 1:1 plan drawn up from the bottom of adjacent foundations.

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

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

PLOT PLAN AND TEST LOCATIONS

Planned Commercial Retail Center
Main Street w/o Ramona Expressway
San Jacinto, CA
APN: 433-160-27&32



Legend: P-1 Approximate Location of BMP-Double Ring Infiltrometer Test

Plate A

Double Ring Infiltrometer- BMP

Field Data Sheet

TEST PIT : P-1

Job No. 17021-BMP

All Speck, Inc.

Date of Test: 5/26/2017

Main Street @ Ramona Expressway, San Jacino

Tested By: JF

Outer Ring: 24-in. Inner Ring: 12-in DROP (cm)

Test Depth (ft) 0.5

Soil Description: SAND-lt. gray, gravely, trace of silt, fine to medium coarse, rock frag,scat rock

Liquid Level Measurement by manual control

Trial No.	1 Test Time Interval (min)	2 Start/End	3 Time hr/min	Flow Reading ANNULAR SPACE/Field 4 cm	5 (cm/min)	Flow Reading INNER RING/Field 6 cm	7 DROP (cm)	Flow Rate Inner 8 (7)/1 cm/ minute	Flow Rate Inner 9 ((8)x60x0.39) in/hr	Remarks (weather conditions,etc. 1 cm = 0.39-in
1	10	S	10:02	10.00		10.00				sunny-cool to warm
		E	10:12	0.00	0.67	0.00	10.00	1.00	23.40	slightly breezy
2	5	S	10:16	10.00		10.00				refill
		E	10:21	5.00	0.33	5.00	5.00	1.00	23.40	
3	5	S	10:30	10.00		10.00				refill
		E	10:35	3.75	0.42	4.50	5.50	1.10	25.74	
5	5	S	10:41	10.00		10.00				refill
		E	10:46	3.75	0.42	5.00	5.00	1.00	23.40	

S = Start

E = End

Double Ring Infiltrometer- BMP

Field Data Sheet

TEST PIT : P-2

Job No. 17021-BMP

All Speck, Inc.

Main Street @ Ramona Expressway, San Jacino

Date of Test: 5/26/2017

Tested By: JF

Outer Ring: 24-in. Inner Ring: 12-in DROP (cm)

Test Depth (ft) 0.5

Soil Description: SAND-lt. gray, gravely, trace of silt, fine to medium coarse, rock frag,scat rock

Liquid Level Measurement by manual control

Trial No.	1 Test Time Interval (min)	2 Start/End	3 Time hr/min	Flow Reading ANNULAR SPACE/Field 4 cm	5 (cm/min)	Flow Reading INNER RING/Field 6 cm	7 DROP (cm)	Flow Rate Inner 8 (7)/1 cm/ minute	Flow Rate Inner 9 ((8)x60x0.39) in/hr	Remarks (weather conditions,etc. 1 cm = 0.39-in
1	15	S	11:00	10.00		10.00				
		E	11:05	3.25	0.45	3.25	6.75	0.45	10.53	sunny-cool to warm slightly breezy
2	15	S	11:11	10.00		10.00				
		E	11:16	4.75	0.35	4.50	5.50	0.37	8.58	refill
3	15	S	11:21	10.00		10.00				
		E	11:26	6.00	0.27	6.25	3.75	0.25	5.85	refill
4	15	S	11:28	10.00		10.00				
		E	11:33	4.75	0.35	4.75	5.25	0.35	8.19	refill

S = Start

E = End

Appendix 4: Historical Site Conditions

Phase I Environmental Site Assessment or Other Information on Past Site Use

Not Applicable

Appendix 5: LID Infeasibility

LID Technical Infeasibility Analysis

Not Applicable

Appendix 6: BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: CWE | Date: 10/22/2018

Designed by: Steven Bell | Case No: P17-17

Company Project Number/Name: Luiseño Village

BMP Identification

BMP NAME / ID: BMP-1

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85} = 0.70 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-1-I	*95389*	*Concrete or Asphalt*	*1*	*0.89*	*85087*			
	95389		***Total***		**85087**	**0.70**	***4963.4***	***11541***

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	CWE	Date	10/22/2018
Designed by	Steven Bell	Case No	P17-17
Company Project Number/Name	Luiseño Village		

BMP Identification

BMP NAME / ID: BMP-2

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.70 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-2-I	*85209*	*Concrete or Asphalt*	*1*	*0.89*	*76006.4*			
	85209		***Total***		**76006.4**	**0.70**	***4433.7***	***11541***

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: CWE | Date: 10/22/2018

Designed by: Steven Bell | Case No: P17-17

Company Project Number/Name: Luiseño Village

BMP Identification

BMP NAME / ID: BMP-8

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.70 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-8-I	*79762*	*Concrete or Asphalt*	*1*	*0.89*	*71147.7*			
	79762		***Total***		**71147.7**	**0.70**	***4150.3***	***7479***

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: CWE | Date: 10/22/2018

Designed by: Steven Bell | Case No: P17-17

Company Project Number/Name: Luiseño Village

BMP Identification

BMP NAME / ID: BMP-9

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.70 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
DMA-9-I	*48717*	*Concrete or Asphalt*	*1*	*0.89*	*43455.6*			
	48717	***Total***			**43455.6**	**0.70**	***2534.9***	***6482***

Notes:

User Inputs

Chamber Model	MC-3500
Outlet Control Structure	Yes (Outlet)
Project Location	San Jacinto, CA
Project Date	03/15/2018
Measurement Type	Imperial
Required Storage Volume	11500 cubic ft.
Stone Porosity	40%
Stone Above Chambers	12 in.
Stone Foundation Depth	9 in.
Average Cover Over Chambers	24 in.
Design Constraint	Length
Design Constraint Dimension	70 ft.

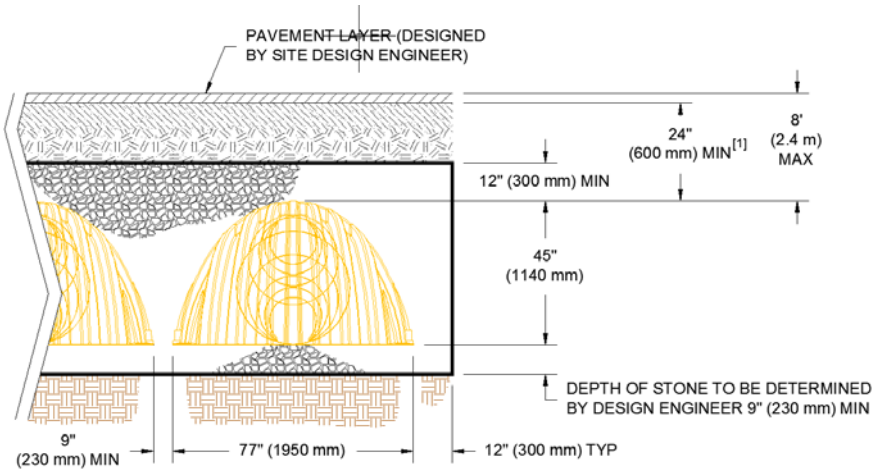
Results

System Volume and Bed Size

Installed Storage Volume	11541 cubic ft.
Storage Volume Per Chamber	178.9 cubic ft.
Storage Volume Per End Cap	46.9 cubic ft.
Number Of Chambers Required	56 each
Number Of End Caps Required	14 each
Rows/Chambers	7 row(s) of 8 chamber(s)
Maximum Length	71.08 ft.
Maximum Width	52.02 ft.
Approx. Bed Size Required	3510 square ft.

System Components

Amount Of Stone Required	479 cubic yards
Volume Of Excavation (Not Including Fill)	715 cubic yards
Non-woven Filter Fabric Required	927 square yards
Length Of Isolator Row	61.03 ft.
Woven Isolator Row Fabric	114 square yards



[1] - TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

User Inputs

Chamber Model	MC-3500
Outlet Control Structure	Yes (Outlet)
Project Location	San Jacinto, CA
Project Date	03/15/2018
Measurement Type	Imperial
Required Storage Volume	11500 cubic ft.
Stone Porosity	40%
Stone Above Chambers	12 in.
Stone Foundation Depth	9 in.
Average Cover Over Chambers	24 in.
Design Constraint	Length
Design Constraint Dimension	70 ft.

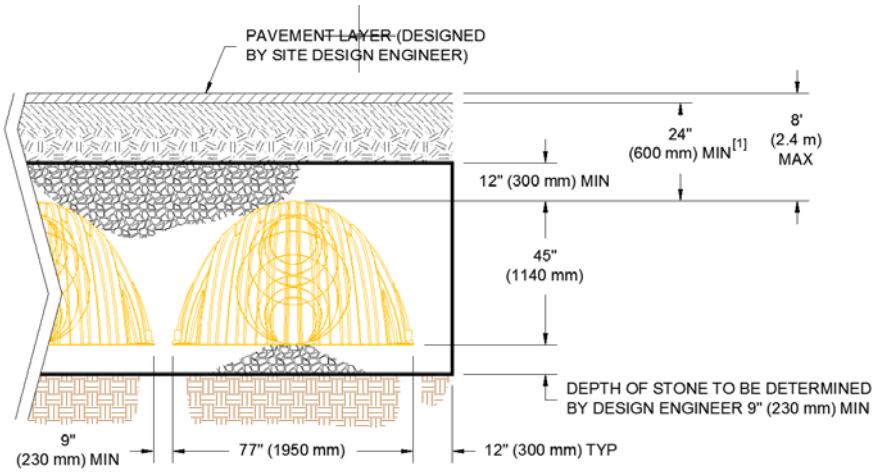
Results

System Volume and Bed Size

Installed Storage Volume	11541 cubic ft.
Storage Volume Per Chamber	178.9 cubic ft.
Storage Volume Per End Cap	46.9 cubic ft.
Number Of Chambers Required	56 each
Number Of End Caps Required	14 each
Rows/Chambers	7 row(s) of 8 chamber(s)
Maximum Length	71.08 ft.
Maximum Width	52.02 ft.
Approx. Bed Size Required	3510 square ft.

System Components

Amount Of Stone Required	479 cubic yards
Volume Of Excavation (Not Including Fill)	715 cubic yards
Non-woven Filter Fabric Required	927 square yards
Length Of Isolator Row	61.03 ft.
Woven Isolator Row Fabric	114 square yards



[1] - TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

User Inputs

Chamber Model	MC-3500
Outlet Control Structure	Yes (Outlet)
Project Name	Luiseño Village
Project Location	San Jacinto, CA
Project Date	03/15/2018
Engineer	Tuttle Engineering
Measurement Type	Imperial
Required Storage Volume	7400 cubic ft.
Stone Porosity	40%
Stone Above Chambers	12 in.
Stone Foundation Depth	9 in.
Average Cover Over Chambers	24 in.
Design Constraint	Length
Design Constraint Dimension	77 ft.

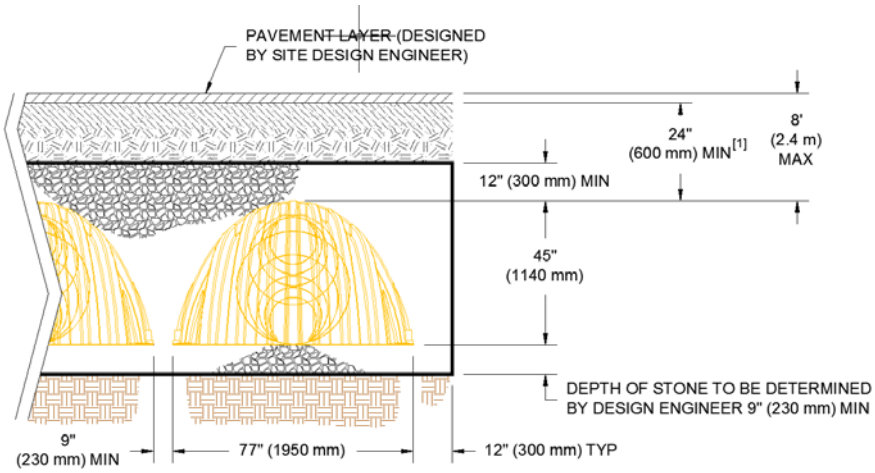
Results

System Volume and Bed Size

Installed Storage Volume	7479 cubic ft.
Storage Volume Per Chamber	178.9 cubic ft.
Storage Volume Per End Cap	46.9 cubic ft.
Number Of Chambers Required	36 each
Number Of End Caps Required	8 each
Rows/Chambers	4 row(s) of 9 chamber(s)
Maximum Length	77.69 ft.
Maximum Width	30.52 ft.
Approx. Bed Size Required	2287 square ft.

System Components

Amount Of Stone Required	315 cubic yards
Volume Of Excavation (Not Including Fill)	466 cubic yards
Non-woven Filter Fabric Required	638 square yards
Length Of Isolator Row	68.20 ft.
Woven Isolator Row Fabric	127 square yards



[1] - TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

User Inputs

Chamber Model	MC-3500
Outlet Control Structure	Yes (Outlet)
Project Name	Luiseño Village
Project Location	San Jacinto, CA
Project Date	03/15/2018
Engineer	Tuttle Engineering
Measurement Type	Imperial
Required Storage Volume	6400 cubic ft.
Stone Porosity	40%
Stone Above Chambers	12 in.
Stone Foundation Depth	9 in.
Average Cover Over Chambers	24 in.
Design Constraint	Length
Design Constraint Dimension	55 ft.

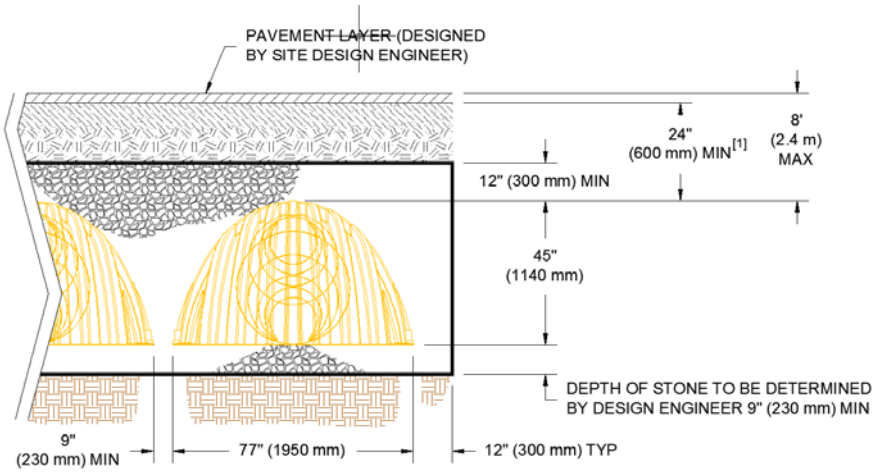
Results

System Volume and Bed Size

Installed Storage Volume	6482 cubic ft.
Storage Volume Per Chamber	178.9 cubic ft.
Storage Volume Per End Cap	46.9 cubic ft.
Number Of Chambers Required	30 each
Number Of End Caps Required	10 each
Rows/Chambers	5 row(s) of 6 chamber(s)
Maximum Length	56.19 ft.
Maximum Width	37.68 ft.
Approx. Bed Size Required	2006 square ft.

System Components

Amount Of Stone Required	281 cubic yards
Volume Of Excavation (Not Including Fill)	409 cubic yards
Non-woven Filter Fabric Required	558 square yards
Length Of Isolator Row	46.70 ft.
Woven Isolator Row Fabric	88 square yards



[1] - TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 30" (750 mm).

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern


HCOC Applicability Map
Legend
Mitigation not required
Mitigation may be required
Site
Google Earth
N
1 mi

Tuttle Engineering

1445 W. Redlands Blvd., Suite A

Redlands, CA 92373

(909) 798-6785 or (909) 798-1343 Fax

warren@tuttleengineering.com

HYDRAULIC ANALYSIS

In the County of Riverside, City of San Jacinto

Parcels 1

Parcel Map 20795

JOB NUMBER: 17-08

May 4, 2018

WARREN D. TUTTLE

R.C.E. 30171

INTRODUCTION

This hydraulic analysis supplements the Hydrology Study accomplished for this location on March 6, 2018. This original study was conducted to ensure that any development in this location could be accomplished without adversely affecting the quality of storm water discharge following a major storm event. Because this proposed development is located on flat terrain having a soil category of "A" there is very little runoff resulting from existing conditions. Following development, this very porous condition will be replaced extensively by highly impervious hardscape. It was determined that the only practical method to reduce the additional runoff to historical values is to direct the discharge to sub surface chambers having sufficient collection volume to meet this requirement. The time necessary to fill these underground chambers would allow the storm to dissipate at a predictable rate which would decrease the discharge exiting the chamber system greatly below the maximum value entering the system. The amount leaving the system is further reduced by the infiltration occurring during the filling process.

The original hydrology study performed for the entire site used the 100-year, 1-hour storm to identify storm intensities, in inches per hour, that are expected at this location. In concert with these local requirements, the value used was that established in the County of Riverside Hydrology Manual of 1.20 inches per hour. Discharge values resulting from this previous analysis established the size of the subsurface collection system necessary to provide both water quality requirements and to reduce discharge to its historical values. It should be noted that the type of the subsurface collection system chosen was comprised of an initial chamber that collects all the surface runoff from the developed site. This initial chamber is separated from the subsequent chambers so that all the flows to these subsequent chambers must first pass through the initial chamber. This initial chamber is designed to allow periodic maintenance to remove and dispose of any materials deleterious to the environment. As such, this initial chamber performs all the WQMP treatment requirements whereas the subsequent chambers provide the additional capture volume necessary to reduce the discharge to historical values.

SCOPE OF STUDY

This project is located in the City of San Jacinto and is a portion of the development of the four Northerly parcels, Parcels 1, 2, 8 and 9 of Parcel Map 20795, County of Riverside. The location of the project is shown in Attachment 1. This hydraulic analysis concentrates on the design of the piping and other conduits used to accommodate storm discharge from Parcel 1 only. To do so it utilizes the rainstorm discharge data developed by NOAA and published in, NOAA Atlas 14, Volume 6, Attachment 2, which defines the100-year, 1-hour storm intensity as 1.72 inches per hour.

While the 1-hour, 100-year storm is used to define the volume of the chamber system, the catch basins and the plumbing connecting each to the clean out entry to the chambers will reach capacity within 10 minutes of the storm onset. Therefore, the storm intensity observed at 10-minute onset of the 100-year, 1-hour storm, as defined in Plat D-4.1 of the Riverside County Hydrology Manual, is used to design these systems. This 10-minute intensity is 2.94 inches per hour.

METHODOLOGY

This analysis uses the Water Surface Pressure Gradient Program "WSPGW" Version 14.10, developed by CIVILDESIGN Corp, 234 North Arrowhead Avenue, San Bernardino, CA 92324. This program is based on Bernoulli's equation for the total energy of each segment of the flow and the Manning's formula for the friction loss between these segments. The program uses basic mathematical and hydraulic principals to calculate all data such as conduit area, wetted perimeter, normal depth, pressure etc. necessary to determine the hydraulic grade line (hgl). The hgl is an important data point because it represents the elevation of the water surface in open conduits or pipes flowing partially full. In particular, the HGL will identify the water surface elevation in the catch basins, the clean out entry into the initial chamber of the infiltration system, and the manhole junction of the discharge from the four developed parcels. These hydraulic grade line locations are fundamental when examining the overall effectiveness of the system.

The Manning's number is an empirical value used to calculate the flow characteristics of water through a defined channel. This number has not yet been defined for flow through a porous media such as the gravel bed between the initial chamber and the adjacent chambers. This media structure is the only connection between these two elements. The WSPGW program requires a Manning's designation for each element of the system being analyzed. Several studies have been completed that relate to the velocity of flow through a pervious media. Attachment 3 is the application of these velocities to previously defined formulas to determine the Manning's value to be used in this program.

In this particular study effort, there are three specific areas, referred to as "Segments", of analysis. First, all flows from the common junction manhole, which receives runoff from all four parcels of the development, to the common site outlet at East Main Street will analyzed. This segment (Segment 1) will also address the flow entering the discharge from the Soboba Medical Clinic. Second is the flow between the entry clean out structure to the to the chamber system, through the system itself, to the manhole collecting runoff from all four parcels (Segment 2). Third is the runoff entering individual catch basins on the site to their discharge either into another catch basin or into the clean out structure to the chamber system (Segment 3).

When continuing upstream from the previous reach, the hydraulic grade line (hgl) at the junction between the two reaches will be held and the hgl at the upstream element, be it the clean out structure or a catch basin, will be calculated from the downstream surface elevation. It is desirable that the hydraulic grade line in each catch basin lies at least 0.50 feet below the inlet elevation of the specific basin to avoid ponding in the basin area. In order to meet this requirement, it is essential that the hgl be maintained at a minimal elevation throughout its travel.

PRE AND POST DISCHARGE VALUES

All discharge values used in this analysis are determined using the Santa Ana Watershed BMP Design Flow Rate Calculator. Values used for defining discharge from the existing site and for discharge entering the finish site infiltration chamber system were based on the storm intensity of 1.72 inches per hour. This intensity is that shown in the NOAA Atlas 14 for the one hour, 100-year storm for that location. The runoff entering the catch basins peak at a much shorter time period. Therefore, the

intensity at 10 minutes following the storm onset was used to determine this discharge rate. Using Plate D-4.1 of the Riverside County Hydrology Manual, this intensity rate was established at 2.94 inches per hour.

The volume (Q) of storm runoff currently discharging through the only existing outlet of the site, the four-foot concrete channel at the West boundary, must first be defined for the entire watershed being analyzed. This existing value establishes the discharge limitations for the future, developed site. The tributary area for this discharge is defined as the areas to be developed consisting of Parcels 1, 2, 8, 9 along with that portion of the site occupied by the Soboba Medical Clinic located South of Donna Way. Runoff from the areas to be developed will be considered as their historical runoff value whereas runoff from the Medical Clinic segment will be calculated in its current configuration. Attachment 4a is a plat depicting the areas or subareas being reviewed along with discharge values currently originating on these specific locations. Table 1 below summarizes these initial values to be used to analyze this segment.

TABLE 1 HISTORICAL DISCHARGE USING 1.72 IN/HR INTENSITY

Parcel 1 – 0.33 cfS
Parcel 2 – 0.32 cfS
Parcel 8 – 0.24 cfS
Parcel 9 – 0.16 cfS
Medical Clinic Area – 7.66 cfs

The existing discharge volume shown for Parcel 1 is the only value that will be affected by this development. It must retain the 0.33 cfs rate and to do so the discharge entering the chamber system must provide this reduction capability by retaining runoff sufficiently to allow discharge rate to decrease through normal storm dissipation and infiltration. The discharge entering the chamber system is the aggregate of discharge from all tributary catch basins on the Parcel. Attachment 4b shows the parcel broken down into the catch basin tributary areas. The aggregate of these tributary areas provides the total amount of discharge entering the clean out structure. The two tables are shown on this attachment, one shows the entry of discharge into the clean out structure based on the one-hour discharge intensity of 1.72 inches per hour and the other showing the entry into the individual catch basins using the 10-minute discharge intensity of 2.94 inches per hour. The reason these values are not identical is that all catch basins will be exposed to the maximum value at some point but it is unlike that they will receive the maximum value at the same time. Consequently, the clean out will receive an aggregate flow lower than that experienced from maximum flow from all catch basins simultaneously.

Table2 and 3 below summarizes the discharge volume results after applying the intensity rates to the Design Flow Rate Calculator

TABLE 2 ADJUSTED DISCHARGE REACHING CHAMBER CLEAN OUT

Tributary Area A – 0.72 cfS
Tributary Area B – 0.70 cfS
Tributary Area C – 0.78 cfS
Tributary Area D – 0.29 cfS
Tributary Area E – 0.48 cfS
Tributary Area F – 0.47 cfS

TABLE 3 MAXIMUM DISCHARGE REACHING CATCH BASIN
Tributary Area A – 1.23 cfS
Tributary Area B – 1.20 cfS
Tributary Area C – 1.33 cfS
Tributary Area D – 0.49 cfS
Tributary Area E – 0.82 cfS
Tributary Area F – 0.81 cfS

SEGMENT 1 ANALYSIS

Attachment 5 is a schematic diagram of Segment 1. It shows the discharge point in the street, where it then travels through an under-sidewalk structure into a four-foot-wide, eight inches high concrete channel along the West side of the site. Near the Southwest corner of Parcel 1, runoff from the Medical Clinic combines with the runoff from an outlet structure serving the areas to be developed. This outlet structure is located on the East side of the channel where the top of the East sidewall of the channel serves as a weir for the outlet structure discharge. Because of the finish grade requirements of the site, this common outlet pipe must be installed with a negative grade of 0.0030. This will also allow the residual runoff following storm termination to drain from the outlet weir back into the individual chamber systems.

The flow values for each element of this segment are subjected to the WSPGW program to identify the discharge characteristics and the hydraulic gradient (hgl) for locations along the route. Again, it must be emphasized that the elevation of the hgl at the common junction manhole for all four parcels must be designed to a minimum value in order to avoid substantial material import. This minimum elevation is developed using the WSPGW program, the output of which is also shown in Attachment 5. The hydraulic grade line at the common manhole is found to be 93.97 ft.

Please note that the WSPGW output file for flow entering the weir at the side of the concrete discharge channel to the outlet pipe leaving this entry weir structure calculates extremely small changes in the flow characteristics of the stream. These small changes have been edited from the output file for the convenience of the reader but do not detract from the accuracy of this flow analysis.

SEGMENT 2 ANALYSIS

This portion of the storm runoff discharge covers the flow from Parcel 1 that begins at the clean out structure leading to the chamber, the collection point for the discharge from all the catch basins on the site. From there the discharge travels through the chamber system of Parcel 1, including the crushed stone pad and the filter underlying the initial chamber, to the manifold that connects the collection chambers of the system, to the common manhole for site. During its flow through the chamber system, substantial volumes of runoff, measured in cubic feet per second (cfs), are removed either by normal storm dissipation or by infiltration into the native soil.

The infiltration rate for the site was determined by field analysis. Two locations on Parcel 1 were tested using a double ring infiltrometer which yielded fairly high infiltration rates, 23.40 and 8.19 inches per hour per square foot. The suggested rate to use in this design was the lower rate with a factor of safety

of 3 or 2.72 inches per hour per square foot. While these tests were conducted near the surface, the suggested rate still seems very low. For this study, an infiltration rate of 4.5 was used in the design of this chamber system. However, this value should be verified by additional investigations.

Attachment 6 is a worksheet used to determine the amount of discharge reduction that is accomplished by the chambers. This reduction must be sufficient that the discharge quantity leaving the system must be equal to, or less than, historic discharge originating on that site. This attachment is linked to a satellite worksheet designed to augment the calculation process. The main worksheet provides the input data whereas the satellite sheet calculates the input data and feeds it back to the main worksheet.

The common inputs to the main worksheet is the 100-year storm intensity of 1.72 in/hr, as defined above, and the duration/intensity slope, 0.50. This latter value indicates the anticipated dissipation rate of the storm for that location, as defined in the Riverside County Hydrology Manual. Also included is the peak discharge time, often referred to as the time of concentration, which is the time required for runoff from the most remote location of the Parcel to reach the entry structure of the basin, and the peak runoff value in cubic feet per second entering the basin. This time of concentration is commonly defined to have a five-minute minimum. However, flow from the catch basins to the clean out structure feeding the chamber system has been estimated to be ten minutes, so this value will be used in the chamber design.

Also included on the main worksheet is the "Chamber System Variables and Results". The cell showing the "Historical Discharge" is based on the existing, undisturbed characteristics of the property being evaluated as shown in Table 1. The three cells to the left of this cell allow the size and configuration of the chambers to be adjusted until the discharge is equal or less than the historical value. The six cells to the right reflect the satellite worksheet results generated by the chamber system as defined by the main worksheet. They also indicate the calculated pad size along with the time required to completely drain the system following the end of the storm.

To use this worksheet, first the basin configuration must be established by estimating the number of units in each row, the number of rows and the distance between rows. This input establishes the total volume of the system which is calculated in the satellite worksheet and then transferred to the "Actual Basin Volume" cell in the primary worksheet. The next step is to adjust the cumulative time in the "Elapsed Time" row until the "Basin Volume at Elapsed Time" and the "Actual Basin Volume" are equal. At this time the "Total Leaving (the chamber)" must be compared to the "Historical Discharge". If it is large, the size of the chamber system must be increased; if smaller, it must be decreased. This action changes the "Actual Basin Volume" which requires the iteration process to be repeated until the "Total Leaving" and the "Historical Discharge" are equal.

Attachment 7 shows a schematic diagram of Segment 2 to be used in the WSPGW flow analysis. This flow analysis is also shown in Attachment 7. The primary result from this flow analysis is the resulting hydraulic grade line. The starting hgl must be the same as the upstream manhole of Segment 1 with the resulting hgl calculated for the clean out structure being the initial hgl for all the area catch basins. All catch basin draining Parcel 1 connect directly, or indirectly, to this clean out and the hgl at that point must be below the surface elevation occurring in each individual catch basin within the system.

SEGMENT 3 ANALYSIS

This segment represents the most upstream portion of this hydraulic analysis. It analyzes the flow from the site catch basins to the clean out for the chamber system. A schematic of this segment is shown in Attachment 8 which also reflects the results of the WSPGW analysis for each catch basin. It should be emphasized that the basins, along with their connecting pipes, were designed using the 10-minute intensity of the 100-year storm. This results in larger connecting pipes but the aggregate discharge anticipated at the clean out is more accurately defined by the 100-year, 1-hour storm. Attachment 8 defines the flow characteristics from each catch basin to the site clean out structure, as determined by the WSGPW program. These design characteristics for each catch basin is summarized in Attachment 9. Table 4 below summarizes the characteristics of the six catch basins in this development.

TABLE 4 CATCH BASIN CHARACTERISTICS

	TC	FL	Dia. Out	Width	Height	Q Out
CB 1A	95.70	95.20	18 in	4.00′	5.20′	4.57 cfs
CB 1B	95.67	95.17	15 in	4.00′	3.77′	2.53 cfs
CB 1C	96.02	95.52	12 in	4.00′	3.50′	1.33 cfs
CB 1D	96.46	95.96	8 in	4.00′	4.96′	1.31 cfs
CB 1E	96.84	96.34	8 in	4.00′	4.34′	0.82 cfs
CB 1F	96.43	95.93	8 in	4.00′	3.50′	0.81 cfs

ATTACHMENTS

1. Vicinity Map

2 NOAA Atlas 14 Intensities for this Location

3. Manning's Number for Flow Through Crushed Rock

4. Plat Showing Area Flow
    a. Total Site Flow
    b Parcel 1 Flow

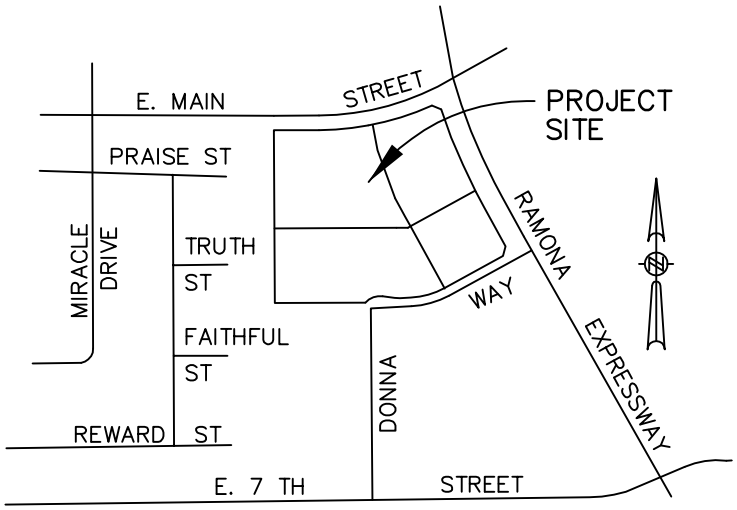
5. Segment 1 Flow Patterns and Analysis

6. Chamber System Volume Reduction Work Sheet

7. Segment 2 Flow Patterns and Analysis

8. Segment 3 Flow Patterns and Analysis

9. Parcel 1 Catch Basin Summary



VICINITY MAP
NO SCALE

ATTACHMENT 1

NOAA Atlas 14, Volume 6, Version 2
Location name: San Jacinto, California, USA*
Latitude: 33.7839°, Longitude: -116.9572°
Elevation: 1567.68 ft**

* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.960** (0.804-1.16)	**1.31** (1.09-1.58)	**1.84** (1.54-2.23)	**2.35** (1.93-2.88)	**3.16** (2.52-4.01)	**3.89** (3.04-5.04)	**4.75** (3.61-6.31)	**5.76** (4.26-7.88)	**7.74** (5.47-11.1)	**10.3** (7.06-15.3)
10-min	**0.690** (0.576-0.834)	**0.936** (0.780-1.13)	**1.32** (1.10-1.60)	**1.68** (1.39-2.06)	**2.26** (1.81-2.87)	**2.79** (2.18-3.61)	**3.40** (2.59-4.52)	**4.13** (3.05-5.65)	**5.54** (3.92-7.92)	**7.41** (5.06-11.0)
15-min	**0.556** (0.464-0.672)	**0.756** (0.632-0.912)	**1.06** (0.884-1.29)	**1.36** (1.12-1.66)	**1.82** (1.46-2.31)	**2.25** (1.75-2.91)	**2.74** (2.08-3.64)	**3.33** (2.46-4.56)	**4.47** (3.16-6.38)	**5.98** (4.08-8.84)
30-min	**0.442** (0.370-0.534)	**0.600** (0.502-0.728)	**0.846** (0.704-1.03)	**1.08** (0.890-1.32)	**1.45** (1.16-1.84)	**1.79** (1.40-2.32)	**2.18** (1.66-2.90)	**2.65** (1.96-3.63)	**3.56** (2.52-5.08)	**4.76** (3.25-7.04)
60-min	**0.348** (0.291-0.421)	**0.473** (0.395-0.573)	**0.667** (0.555-0.810)	**0.851** (0.702-1.04)	**1.14** (0.912-1.45)	**1.41** (1.10-1.83)	**1.72** (1.31-2.29)	**2.09** (1.54-2.86)	**2.80** (1.98-4.00)	**3.75** (2.56-5.55)
2-hr	**0.264** (0.220-0.318)	**0.338** (0.282-0.409)	**0.449** (0.374-0.545)	**0.551** (0.454-0.674)	**0.710** (0.566-0.899)	**0.848** (0.662-1.10)	**1.01** (0.764-1.34)	**1.19** (0.876-1.62)	**1.47** (1.04-2.10)	**1.89** (1.29-2.80)
3-hr	**0.215** (0.179-0.259)	**0.270** (0.225-0.327)	**0.351** (0.292-0.427)	**0.425** (0.351-0.520)	**0.538** (0.429-0.682)	**0.635** (0.496-0.823)	**0.745** (0.566-0.989)	**0.869** (0.642-1.19)	**1.06** (0.748-1.51)	**1.27** (0.868-1.88)
6-hr	**0.150** (0.126-0.182)	**0.186** (0.155-0.225)	**0.238** (0.198-0.289)	**0.284** (0.234-0.348)	**0.353** (0.281-0.447)	**0.411** (0.321-0.533)	**0.475** (0.361-0.632)	**0.547** (0.404-0.749)	**0.655** (0.463-0.935)	**0.746** (0.509-1.11)
12-hr	**0.098** (0.082-0.118)	**0.122** (0.101-0.147)	**0.156** (0.130-0.189)	**0.186** (0.154-0.228)	**0.231** (0.184-0.293)	**0.269** (0.210-0.349)	**0.311** (0.236-0.413)	**0.357** (0.264-0.489)	**0.426** (0.301-0.609)	**0.485** (0.331-0.717)
24-hr	**0.065** (0.057-0.075)	**0.082** (0.073-0.095)	**0.107** (0.094-0.124)	**0.129** (0.113-0.151)	**0.162** (0.137-0.195)	**0.189** (0.157-0.233)	**0.219** (0.178-0.276)	**0.252** (0.199-0.327)	**0.302** (0.228-0.406)	**0.343** (0.251-0.478)
2-day	**0.040** (0.035-0.046)	**0.052** (0.046-0.060)	**0.069** (0.061-0.080)	**0.083** (0.073-0.097)	**0.105** (0.089-0.126)	**0.122** (0.101-0.150)	**0.141** (0.114-0.178)	**0.162** (0.127-0.209)	**0.191** (0.145-0.258)	**0.216** (0.158-0.301)
3-day	**0.029** (0.026-0.034)	**0.039** (0.034-0.045)	**0.052** (0.046-0.060)	**0.063** (0.055-0.074)	**0.080** (0.068-0.096)	**0.093** (0.077-0.114)	**0.107** (0.087-0.135)	**0.122** (0.096-0.158)	**0.144** (0.109-0.194)	**0.162** (0.119-0.225)
4-day	**0.023** (0.021-0.027)	**0.031** (0.028-0.036)	**0.043** (0.038-0.049)	**0.052** (0.046-0.061)	**0.066** (0.056-0.079)	**0.077** (0.064-0.094)	**0.088** (0.071-0.111)	**0.101** (0.079-0.130)	**0.118** (0.090-0.159)	**0.132** (0.097-0.184)
7-day	**0.015** (0.013-0.017)	**0.021** (0.018-0.024)	**0.029** (0.025-0.033)	**0.035** (0.031-0.041)	**0.045** (0.038-0.054)	**0.052** (0.044-0.064)	**0.060** (0.049-0.076)	**0.069** (0.054-0.089)	**0.081** (0.061-0.109)	**0.091** (0.066-0.126)
10-day	**0.011** (0.010-0.013)	**0.016** (0.014-0.018)	**0.022** (0.020-0.026)	**0.028** (0.024-0.032)	**0.035** (0.030-0.042)	**0.041** (0.034-0.051)	**0.047** (0.038-0.060)	**0.054** (0.043-0.070)	**0.064** (0.048-0.086)	**0.071** (0.052-0.099)
20-day	**0.007** (0.006-0.008)	**0.010** (0.009-0.011)	**0.014** (0.012-0.016)	**0.017** (0.015-0.020)	**0.022** (0.019-0.027)	**0.026** (0.022-0.032)	**0.030** (0.024-0.038)	**0.035** (0.027-0.045)	**0.041** (0.031-0.055)	**0.046** (0.033-0.063)
30-day	**0.005** (0.005-0.006)	**0.008** (0.007-0.009)	**0.011** (0.010-0.013)	**0.014** (0.012-0.016)	**0.017** (0.015-0.021)	**0.020** (0.017-0.025)	**0.024** (0.019-0.030)	**0.027** (0.021-0.035)	**0.032** (0.024-0.043)	**0.036** (0.026-0.050)
45-day	**0.004** (0.004-0.005)	**0.006** (0.005-0.007)	**0.009** (0.008-0.010)	**0.011** (0.009-0.012)	**0.014** (0.012-0.016)	**0.016** (0.013-0.020)	**0.019** (0.015-0.023)	**0.021** (0.017-0.028)	**0.025** (0.019-0.034)	**0.028** (0.021-0.039)

CONVERTING CONDUCTIVITY TO MANNING'S NUMBER

This computation is designed to establish the manning's number for the flow through crushed rock. The need to define the Manning number, n, is necessary so that the impact of the transfer from the isolator to the collector chamber can be included in the WSPGW analysis. The basic Manning formula is $v = 1.486/n \times r^{2/3} \times s^{1/2}$ where v is the velocity flowing through the crushed rock, r is the hydraulic radius of the rock media and s is the slope of the hydraulic gradient for flow through the crushed rock. This formula can be transposed to allow $n = 1.486/v \times r^{2/3} \times s^{1/2}$.

The Manning formula closely follows work done by Darcy-Weisbach in the analysis of fluid flow through closed conduits. However, in 1956, Darcy found that the discharge, Q, was proportional to the to the slope of the hydraulic gradient rather the square root of the hydraulic gradient when the flow was through a pervious material. Therefore, when solving for n using the Manning formula, the relationship must be rewritten as:

$$n = 1.486 R^{2/3} s / v$$

Substituting values in this formula can establish the value for n. It should be emphasized that the determination of n in this manner is based on worst case conditions. It would be far more rational to subject these conclusions to empirical procedures in order to establish more conclusive criteria.

The velocity, v, for the flow through the crushed rock base was established from the textbook Principles of Geotechnical Engineering 7th Edition by Braja M. Das regarding fluid flow through pore spaces or fractures in the media. In this case, the media is fairly uniform crush rock having a void ratio of 40% which is considered highly conductive. Therefore, from values contained in Chapter 7, Permeability, Table 7.1- Typical Values of Hydraulic Conductivity, the Hydraulic Conductivity of Saturated Soils, expressed as "k", of clean gravel is considered to be: k=10^2 cm/sec = 3.28 feet/sec or k=200ft/sec = 3.33 ft/sec. This velocity is the value used for v in the above formula.

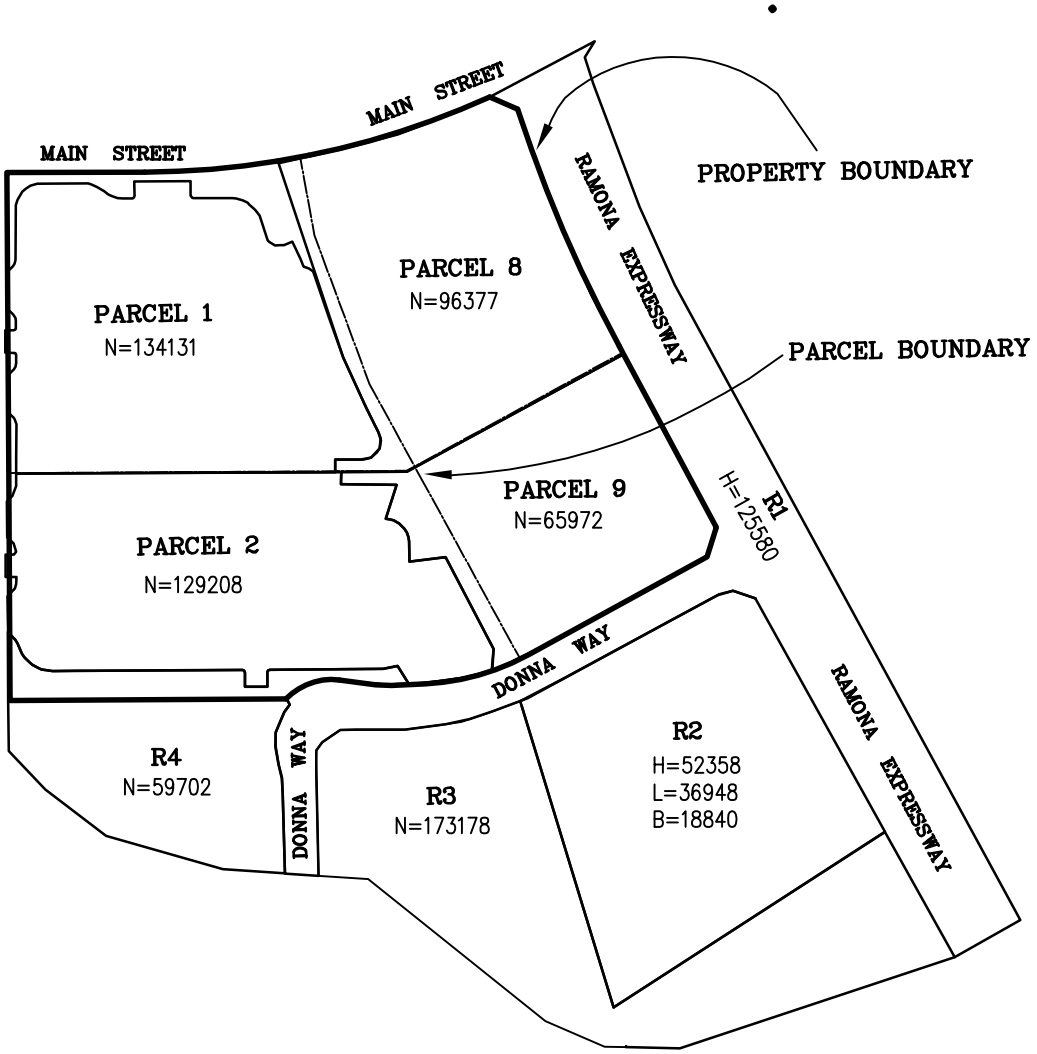
The hydraulic radius, R, for this situation is determined in the following manner. The isolation chamber transfers the runoff into the collector chambers through a segment of crushed rock media in excess of 60 feet wide and ¾ feet deep. The hydraulic radius is 2 times the sum of the width and the thickness, 2 x (w+t). Since the thickness is very small when compared to the width, this value can be considered as 2w. The area is the width times the thickness or w x t. The hydraulic radius is a/wp = (w x t)/2 w = t/2. This provides a hydraulic radius of 0.75/2 = 0.375.

The hydraulic gradient of the system (s) is a bit more difficult to assess. For this determination it is assumed that all the head loss between common outlet pipe and the inlet structure, i.e. the cleanout structure, to the chamber occurs only in the connection between the isolation chamber and the first collection chamber. This connection is a conduit of crush rock having a length equal to the width of distance between the isolation and collector chamber, 1.5 feet. The head at the manhole receiving the runoff from Parcel 1 is 94.00 feet and the rim elevation of the lowest catch basin is 95.10 feet. Assuming that the head loss between the inlet to the underground chambers and the lowest catch basin rim is 0.50 feet, the head loss between the system outlet pipe and the inlet to the chamber system is 95.10 -0.50-94.00 = 0.60. The hydraulic gradient, s, then becomes 0.60/1.5 = 0.40 ft/ft.

The formula, $n = 1.486 R^{2/3} s / v$, becomes $n = 1.486 \times (0.375)^{2/3} \times 0.40 / 3.28 = 0.094$. This will be the value for n used in the flow calculations through the crushed rock pad. It has been determined using assumptions that may be challenged and should be verified by experimental methods.

ATTACHMENT 3

EXISTING DRAINAGE AREA
TOTAL WATERSHED



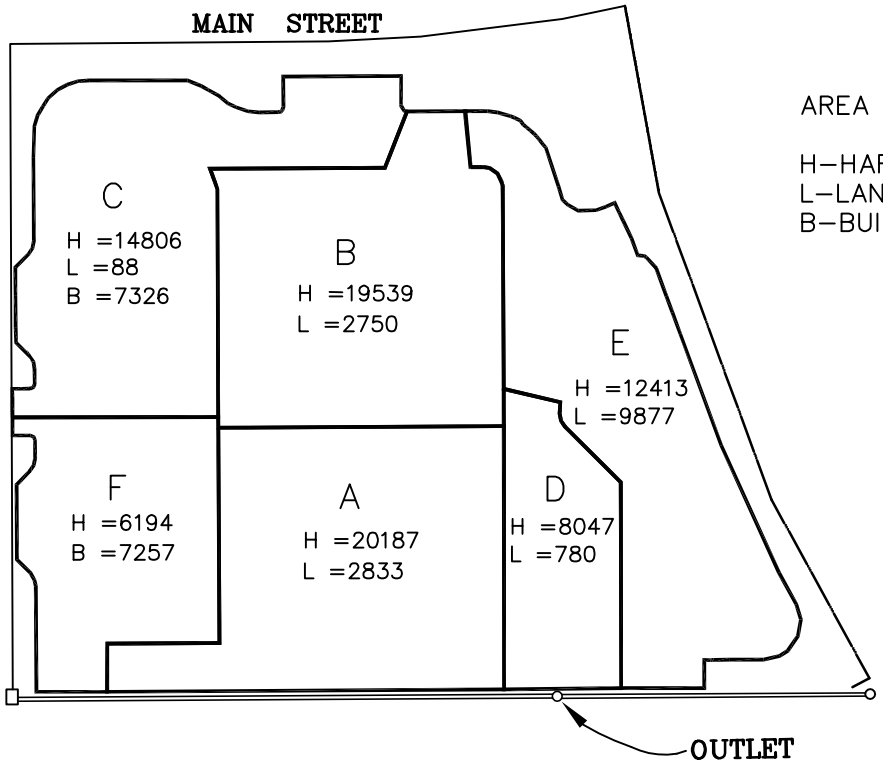
EXSITING DRAINAGE AREAS			
PARCELS		SOUTH PROPERTY	
	DISCHARGE cfs		DISCHARGE cfs
PARCEL 1	0.33	R1	4.42
PARCEL 2	0.32	R2	2.67
PARCEL 8	0.24	R3	0.43
PARCEL 9	0.16	R4	0.14
TOTAL	1.05	TOTAL	7.66

AREA CONTRIBUTION

H–HARDSCAPE
L–LANDSCAPE
B–BUILDING
N–NATURAL

ATTACHMENT 4A

PROPOSED DRAINAGE AREA
PARCEL 1 ONLY



AREA CONTRIBUTION

H–HARDSCAPE
L–LANDSCAPE
B–BUILDING

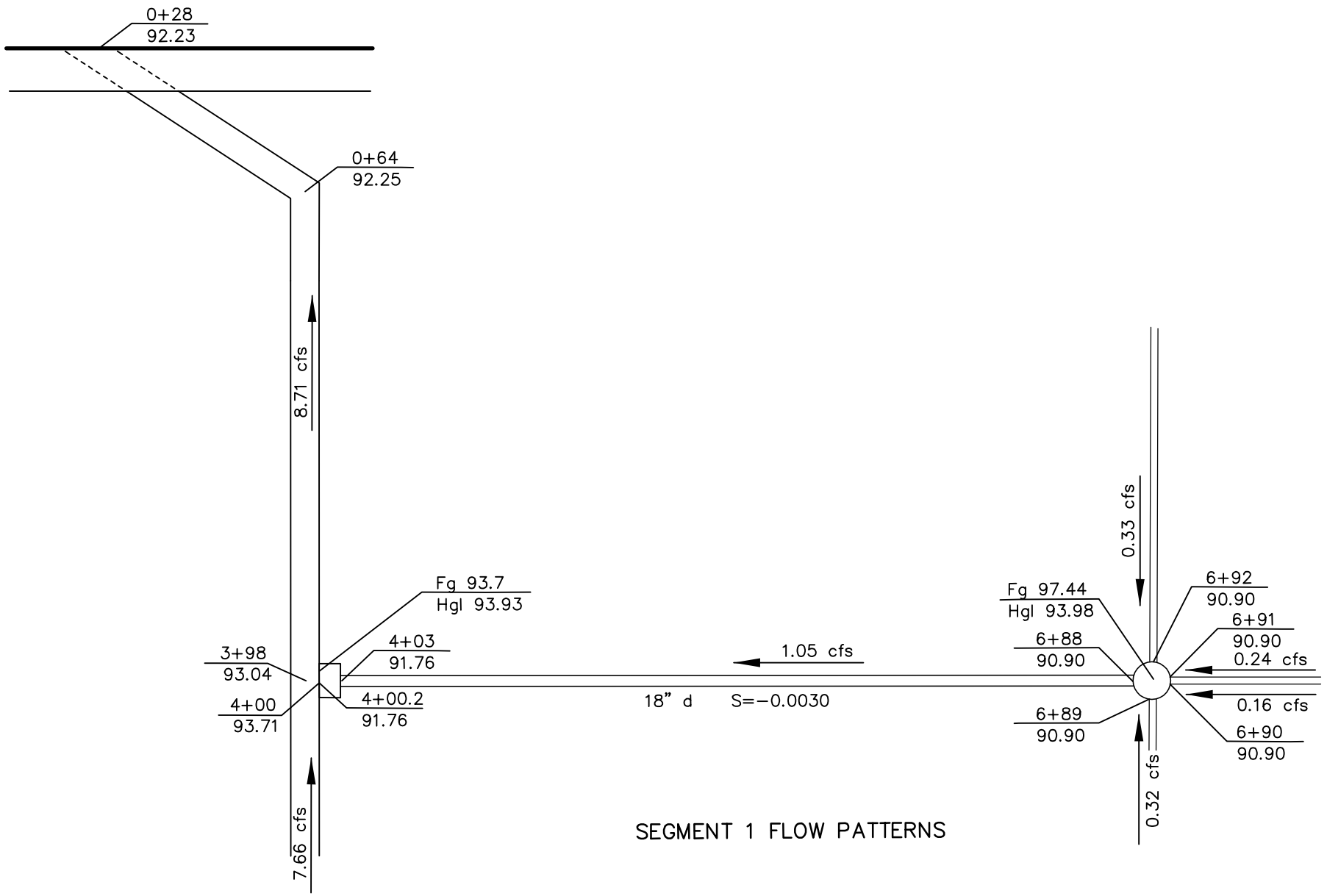
PROPOSED DRAINAGE AREAS		
Parcel 1		
TRIBUTARY AREA	DISCHARGE TO OUTLET ①	DISCHARGE TO CATCH BASIN ②
A	0.72	1.23
B	0.70	1.20
C	0.78	1.33
D	0.29	0.49
E	0.48	0.82
F	0.47	0.81
TOTAL	3.44	5.88

NOTES

1. DISCHARGE IS BASED ON VALUES DETERMINED BY THE SANTA ANA WATERSHED BMP DESIGN FLOW RATE CALCULATOR. USING THE 100 YEAR, 1 HOUR INTESITY OF 1.72 INCHES PER HOUR AS SHOWN IN THE NOAA ATLAS 14

2. DISCHARGE IS BASED ON VALUES DETERMINED BY THE SANTA ANA WATERSHED BMP DESIGN FLOW RATE CALCULATOR. USING THE 100 YEAR, 10 MINUTE INTENSITY OF 2.94 INCHES PER HOUR AS SHOWN IN THE RIVERSIDE COUNTY HYDROLOGY MANUAL, STANDARD INTESITY–DURATION CURVES DATA, PLATE D–4.1 (5 OF 6)

ATTACHMENT 4B



SEGMENT 1 FLOW PATTERNS

ATTACHMENT 5

17-08
Storm Runnoff through Parcel 1 to West Channel
Tuttle Engineering

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
28.000	92.230	.528	92.758	8.71	4.12	.26	93.02	.00	.53	4.00	6.000	4.000	.00	0 .0
.529	.0006					.0039	.00	.53	1.00	1.04	.013	.00	.00	RECTANG
28.529	92.230	.554	92.784	8.71	3.93	.24	93.02	.00	.53	4.00	6.000	4.000	.00	0 .0
1.855	.0006					.0034	.01	.55	.93	1.04	.013	.00	.00	RECTANG
30.384	92.231	.581	92.812	8.71	3.75	.22	93.03	.00	.53	4.00	6.000	4.000	.00	0 .0
3.615	.0006					.0029	.01	.58	.87	1.04	.013	.00	.00	RECTANG
33.999	92.233	.609	92.842	8.71	3.57	.20	93.04	.00	.53	4.00	6.000	4.000	.00	0 .0
5.957	.0006					.0025	.02	.61	.81	1.04	.013	.00	.00	RECTANG
39.955	92.237	.639	92.876	8.71	3.41	.18	93.06	.00	.53	4.00	6.000	4.000	.00	0 .0
9.090	.0006					.0022	.02	.64	.75	1.04	.013	.00	.00	RECTANG
49.045	92.242	.670	92.912	8.71	3.25	.16	93.08	.00	.53	4.00	6.000	4.000	.00	0 .0
13.322	.0006					.0019	.03	.67	.70	1.04	.013	.00	.00	RECTANG
62.367	92.249	.703	92.952	8.71	3.10	.15	93.10	.00	.53	4.00	6.000	4.000	.00	0 .0
1.633	.0006					.0017	.00	.70	.65	1.04	.013	.00	.00	RECTANG
64.000	92.250	.706	92.956	8.71	3.08	.15	93.10	.00	.53	4.00	6.000	4.000	.00	0 .0
35.640	.0024					.0019	.07	.71	.65	.64	.013	.00	.00	RECTANG
99.640	92.335	.673	93.008	8.71	3.23	.16	93.17	.00	.53	4.00	6.000	4.000	.00	0 .0

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
68.150	.0024					.0022	.15	.67	.69	.64	.013	.00	.00	RECTANG
167.790	92.496	.642	93.138	8.71	3.39	.18	93.32	.00	.53	4.00	6.000	4.000	.00	0 .0
67.123	.0024					.0023	.16	.64	.75	.64	.013	.00	.00	RECTANG
234.914	92.655	.636	93.291	8.71	3.42	.18	93.47	.00	.53	4.00	6.000	4.000	.00	0 .0
162.086	.0024					.0024	.38	.64	.76	.64	.013	.00	.00	RECTANG
397.000	93.040	.636	93.676	8.71	3.42	.18	93.86	.00	.53	4.00	6.000	4.000	.00	0 .0
JUNCT STR	.0000					.0012	.00	1.78	.76		.013	.00	.00	RECTANG
398.000	93.040	.818	93.858	1.05	.32	.00	93.86	.01	.13	4.00	6.000	4.000	.00	0 .0
TRANS STR	.3350							.83	.06		.013	.00	.00	RECTANG
400.000	93.710	.156	93.866	1.05	2.24	.08	93.94	.00	.16	3.00	6.000	3.000	.00	0 .0
.000	*******					.0048	.00	.16	1.00	.00	.013	.00	.00	RECTANG
400.100	91.760	2.184	93.944	1.05	.16	.00	93.94	.00	.16	3.00	6.000	3.000	.00	0 .0
2.900	.0000					.0000	.00	2.18	.02	.00	.013	.00	.00	RECTANG
403.000	91.760	2.184	93.944	1.05	.16	.00	93.94	.00	.16	3.00	6.000	3.000	.00	0 .0
WALL	EXIT													
403.000	91.760	2.184	93.944	1.05	.59	.01	93.95	.00	.38	.00	1.500	.000	.00	0 .0
285.000	-.0030					.0001	.03	2.18	.00	.00	.013	.00	.00	PIPE
WALL	ENTRANCE													
688.000	90.900	3.078	93.978	1.05	.11	.00	93.98	.00	.16	3.00	6.000	3.000	.00	0 .0
JUNCT STR	.0000					.0000	.00	3.08	.01		.013	.00	.00	RECTANG

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
689.000	90.900	3.078	93.978	.73	.08	.00	93.98	.00	.12	3.00	6.000	3.000	.00	0 .0
JUNCT STR	.0000					.0000	.00	3.08	.01		.013	.00	.00	RECTANG
690.000	90.900	3.078	93.978	.57	.06	.00	93.98	.00	.10	3.00	6.000	3.000	.00	0 .0
JUNCT STR	.0000					.0000	.00	3.08	.01		.013	.00	.00	RECTANG
691.000	90.900	3.078	93.978	.33	.04	.00	93.98	.00	.07	3.00	6.000	3.000	.00	0 .0
1.000	.0000					.0000	.00	3.08	.00	.00	.013	.00	.00	RECTANG
692.000	90.900	3.078	93.978	.33	.04	.00	93.98	.00	.07	3.00	6.000	3.000	.00	0 .0

WORKSHEET TO DETERMINE STORM DISSIPATION IN BASIN DESIGN 100 YEAR STORM

Parcel 1

This table incorporates the formula Q=CIA to determine the discharge rate "Q" at various intensities. The product of the runoff coefficient "C" and the area "A" is an assumed constant. Therefore, the discharge quantities of "Q" is a direct function of the intensity "I" and their values can be determined at any point and time during storm dissipation. This worksheet evaluates the quantity leaving the site by varying the time of concentration at the basin exit point until the limiting discharge value of the site boundary is reached. The capacity of the basin required to reach this allowable flow can be calculated by integrating the capacities of individual time increments up to the point of time where the maximum allowable discharge value occurs.

Duration Intensity Slope		0.50	(Riverside County Hydrology Manual Platd D-4.1 (5 of 6))	
1 Hour 100 Year Intensity	in per hr	1.72	(Riverside County Hydrology Manual Platd D-4.1 (5 of 6))	
Peak Discharge Time	min	10.00	(Average time to reach basin)	
Area of Site	Acres	2.57		
Peak Discharge at Basin Check Point	cfs	3.44	(Post-development from Santa Ana Design Flow Worksheet)	
Peak Discharge Intensity	in per hr	4.21	(Intensity at Peak Discharge determined from the storm dissipation formula)	
Area Runoff Coefficient Constant (k)		0.82	(Ratio of Peak Discharge at basin check point with Peak Discharge Intensity)	
Runoff Coefficienet for Developed		0.32	(Peak Discharge/Area/Peak Intinsity)	
Basin Requirement by Iteration				
Elapsed Time	min	133.00	(Determine by Iteration)	
Intensity	in per hr	1.16	(Calculated from Elapsed Time)	
Discharge	cfs	0.94	(Product of "k" and Intensity)	

Elapsed Time	min	5.00	7.00	10.00	20.00	30.00	50.00	75.00	100.00	125.00	133.00
Intensity at Elapsed Time	in per hr	5.96	5.04	4.21	2.98	2.43	1.88	1.54	1.33	1.19	1.16
Discharge at Elapsed Time	cfs	4.86	4.11	3.44	2.43	1.99	1.54	1.26	1.09	0.97	0.94
Incremental Basin Runoff Volume	cy	12.74	19.95	25.17	65.25	49.09	78.32	77.63	65.11	57.24	17.03

Basin Volume at Design Elapsed Time	cy	468	(Determined through iteration by combining incremental volumes up to target discharge)	
Elapsed Time to Design Elev	min	133.00	hrs 2.22	
Discharge at Design Volume	cfs	0.94		
Actual Basin Volume	cy	487	(Vary Elapsed Time until this value is the same or near the calculated Basin Volume)	

CHAMBER SYSTEM VARIABLES AND RESULTS

Number of Units in Row	Number of Rows	Row Separation	**Historical Discharge**	Reduced by Basin	**Total Leaving**	Req Addn Reduction	Pad Width	Pad Length	Hours to Drain
8 ea	**7 ea**	**5.25 ft**	**0.33 cfs**	**3.11 cfs**	**0.33 cfs**	**0.00 cfs**	**90 ft**	**65 ft**	**5.55 hrs**

ATTACHMENT 6

PARCEL 1

Determine Void Volume of Estimated System

All collection systems will consist of one isolation row of MC-3500 chambers and a number of MC-3500 collection rows. The number of these collection chamber rows will be estimated initially but will only be established permanently after a combination of the storm dissemination and infiltration effectively reduce the discharge at or below historical.

	Number of Units (Isolator and Collector) =		8			
	Length of Row =		64	ft		
	Volume of all row and end caps would be number of units x 178.9 + 2 x 46 =				1523	cf
	Number of Isolator Rows =		1			
	Number of Collection Rows =		6			
	Total Number of Rows =		7	Collector Volume =	10662	cf
	Total chamber system volume				12186	cf
					487	cy

Determine Infiltration from Estimated Rock Pad Area

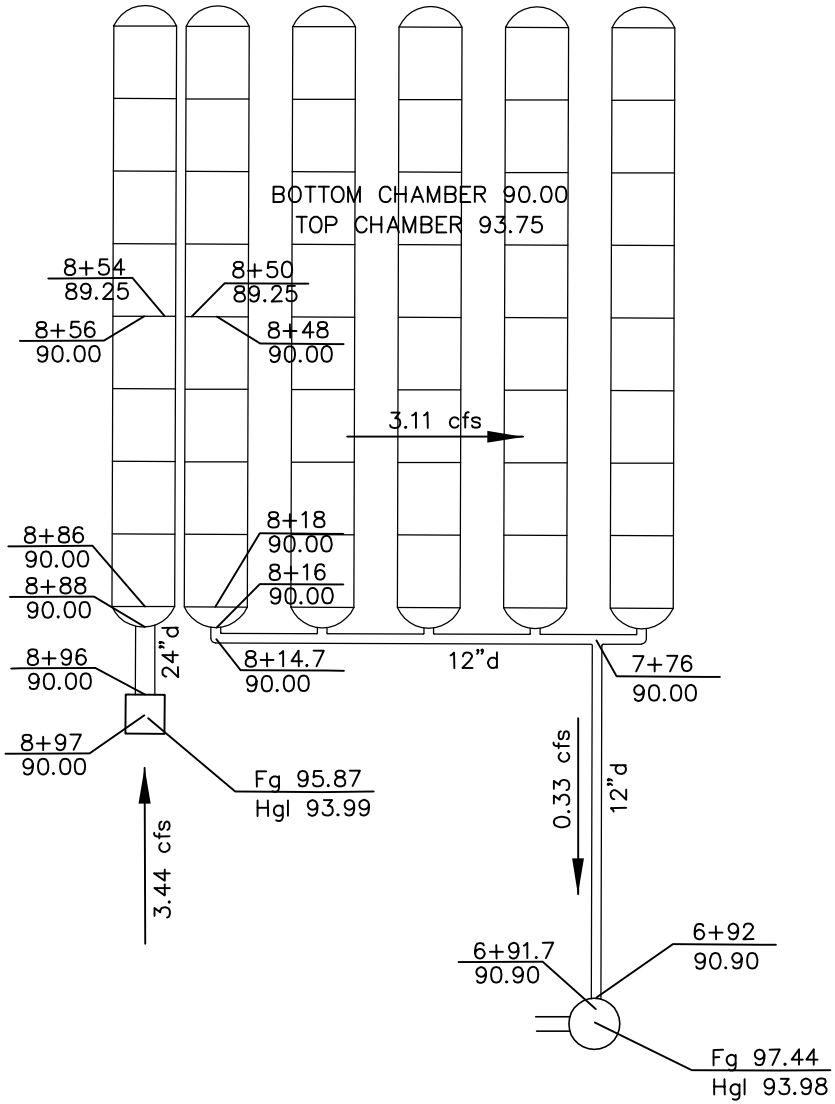
	Infiltration Rate		**4.5**	in/hr	**0.00010417**	**ft/sec**
	Width Isolator and adjacent rock	8.00	ft			
	Width of collector	6.50	ft			
	Space between collectors	5.25	ft			
	Width of Pad	90	ft			
	Length of Pad	65	ft			
	Area	5850	sf			
	Infiltration Discharge		**0.61**	**cfs**		
Maximum Value of Discharge Entering Basin (Lot 1)					**3.44**	**cfs**
Value of Discharge due to Dissipation					**0.94**	**cfs**
Total Value of Discharge Reduction due to Dissipation					**2.50**	**cfs**
Total Value of Discharge Reduction due to Dissipation and Infiltration					**3.11**	**cfs**
Total Discharge Leaving Site					**0.33**	**cfs**
Historical Discharge Value (Lot 8)					**0.33**	**cfs**
Additional Discharge Reduction Required					**0.00**	**cfs**

Time Required to Void ChambersSystem

	Volume of Chamber System				12186	cf
	Time to Depleat all Chambers				**5.55**	**hours**

ATTACHMENT 6

PARCEL 1



SEGMENT 2 FLOW PATTERNS

ATTACHMENT 7

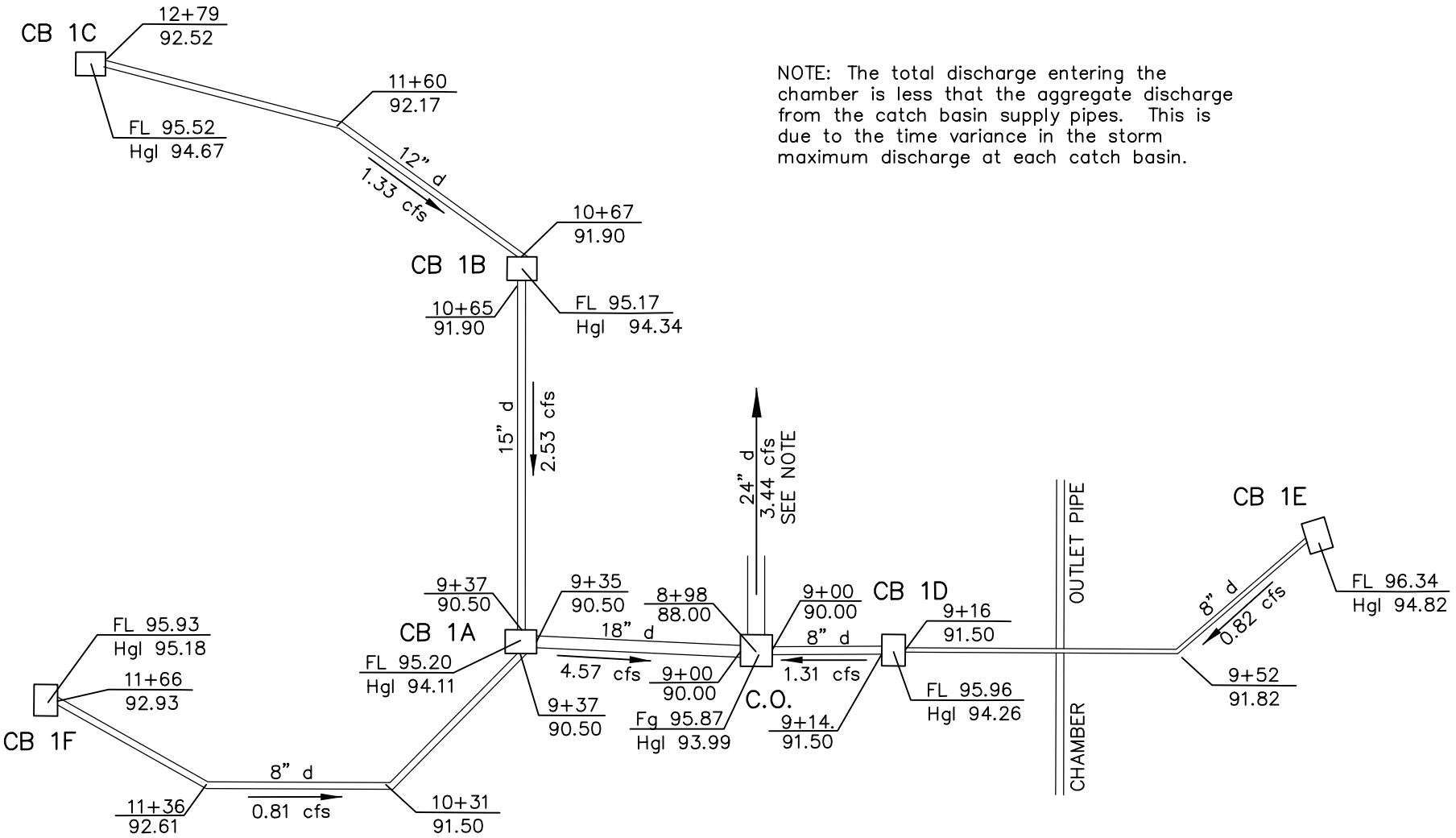
W S P G W - CIVILDESIGN Version 14.08
Program Package Serial Number: 7197
WATER SURFACE PROFILE LISTING

Date: 5- 3-2018 Time: 1:38:50

17-08
Storm Runnoff through Parcel 1 to West Channel
Tuttle Engineering

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
691.700	90.900	3.080	93.980	.33	.04	.00	93.98	.00	.07	3.00	6.000	3.000	.00	0 .0
.300	.0000					.0000	.00	3.08	.00	.00	.013	.00	.00	RECTANG
692.000	90.900	3.080	93.980	.33	.04	.00	93.98	.00	.07	3.00	6.000	3.000	.00	0 .0
WALL	EXIT													
692.000	90.900	3.080	93.980	.33	.43	.00	93.98	.00	.24	.00	1.000	.000	.00	0 .0
84.000	-.0107					.0001	.01	3.08	.00	.00	.013	.00	.00	PIPE
776.000	90.000	3.988	93.988	.33	.43	.00	93.99	.00	.24	.00	1.000	.000	.00	0 .0
38.700	.0000					.0001	.00	3.99	.00	.00	.013	.00	.00	PIPE
814.700	90.000	3.992	93.992	.33	.43	.00	93.99	.00	.24	.00	1.000	.000	.00	0 .0
1.300	.0000					.0001	.00	3.99	.00	.00	.013	.00	.00	PIPE
816.000	90.000	3.993	93.993	.33	.02	.00	93.99	.00	.06	3.90	3.900	3.900	.00	0 .0
2.000	.0000					.0000	.00	3.99	.00	.00	.013	.00	.00	RECTANG
818.000	90.000	3.994	93.994	.33	.02	.00	93.99	.00	.06	3.90	3.900	3.900	.00	0 .0
JUNCT STR	.0000					.0000	.00	3.99	.00		.013	.00	.00	RECTANG
835.000	90.000	3.992	93.992	3.44	.22	.00	93.99	.00	.29	3.90	3.900	3.900	.00	0 .0
13.000	.0000					.0000	.00	3.99	.02	.00	.013	.00	.00	RECTANG
848.000	90.000	3.993	93.993	3.44	.22	.00	93.99	.00	.29	3.90	3.900	3.900	.00	0 .0

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
TRANS STR	-.3750					.0001	.00	3.99	.02		.094	.00	.00	RECTANG
850.000	89.250	4.744	93.994	3.44	.08	.00	93.99	.00	.05	60.00	.750	60.000	.00	0 .0
4.000	.0000					.0001	.00	4.74	.02	.00	.094	.00	.00	BOX
854.000	89.250	4.745	93.995	3.44	.08	.00	93.99	.00	.05	60.00	.750	60.000	.00	0 .0
TRANS STR	.3750					.0000	.00	4.74	.02		.013	.00	.00	BOX
856.000	90.000	3.994	93.994	3.44	.22	.00	94.00	.00	.29	3.90	3.900	3.900	.00	0 .0
30.000	.0000					.0000	.00	3.99	.02	.00	.013	.00	.00	RECTANG
886.000	90.000	3.995	93.995	3.44	.22	.00	94.00	.00	.29	3.90	3.900	3.900	.00	0 .0
TRANS STR	.0000					.0001	.00	4.00	.02		.013	.00	.00	RECTANG
888.000	90.000	3.987	93.987	3.44	1.10	.02	94.01	.00	.65	.00	2.000	.000	.00	0 .0
8.000	.0000					.0002	.00	3.99	.00	.00	.013	.00	.00	PIPE
896.000	90.000	3.988	93.988	3.44	1.10	.02	94.01	.00	.65	.00	2.000	.000	.00	0 .0
WALL	EXIT													
896.000	90.000	3.989	93.989	3.44	.29	.00	93.99	.00	.34	3.00	6.000	3.000	.00	0 .0
1.000	.0000					.0000	.00	3.99	.03	.00	.013	.00	.00	RECTANG
897.000	90.000	3.989	93.989	3.44	.29	.00	93.99	.00	.34	3.00	6.000	3.000	.00	0 .0



SEGMENT 3 FLOW PATTERNS

ATTACHMENT 8

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE	Super Elev / Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
898.000	90.000	3.990	93.990	4.57	.38	.00	93.99	.00	.42	3.00	6.000	3.000	.00	0 .0
2.000	.0500					.0000	.00	3.99	.03	.19	.013	.00	.00	RECTANG
900.000	90.100	3.890	93.990	4.57	.39	.00	93.99	.00	.42	3.00	6.000	3.000	.00	0 .0
TRANS STR	.0000					.0010	.00	3.89	.03		.013	.00	.00	RECTANG
901.000	90.100	3.840	93.940	4.57	2.59	.10	94.04	.00	.82	.00	1.500	.000	.00	0 .0
34.000	.0118					.0019	.06	3.84	.00	.66	.013	.00	.00	PIPE
935.000	90.500	3.505	94.005	4.57	2.59	.10	94.11	.00	.82	.00	1.500	.000	.00	0 .0
WALL	ENTRANCE													
935.000	90.500	3.607	94.107	4.57	.42	.00	94.11	.00	.42	3.00	6.000	3.000	.00	0 .0
1.000	.0000					.0000	.00	3.61	.04	.00	.013	.00	.00	RECTANG
936.000	90.500	3.608	94.108	4.57	.42	.00	94.11	.00	.42	3.00	6.000	3.000	.00	0 .0

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
936.000	90.500	3.610	94.110	2.53	.23	.00	94.11	.00	.28	3.00	6.000	3.000	.00	0 .0
1.000	.0000					.0000	.00	3.61	.02	.00	.013	.00	.00	RECTANG
937.000	90.500	3.610	94.110	2.53	.23	.00	94.11	.00	.28	3.00	6.000	3.000	.00	0 .0
TRANS STR	.0000					.0008	.00	3.61	.02		.013	.00	.00	RECTANG
938.000	90.500	3.578	94.078	2.53	2.06	.07	94.14	.00	.64	.00	1.250	.000	.00	0 .0
127.000	.0110					.0015	.19	3.58	.00	.53	.013	.00	.00	PIPE
1065.000	91.900	2.373	94.273	2.53	2.06	.07	94.34	.00	.64	.00	1.250	.000	.00	0 .0
WALL	ENTRANCE													
1065.000	91.900	2.438	94.338	2.53	.35	.00	94.34	.00	.28	3.00	6.000	3.000	.00	0 .0
1.000	.0000					.0000	.00	2.44	.04	.00	.013	.00	.00	RECTANG
1066.000	91.900	2.438	94.338	2.53	.35	.00	94.34	.00	.28	3.00	6.000	3.000	.00	0 .0

W S P G W - CIVILDESIGN Version 14.08
Program Package Serial Number: 7197
WATER SURFACE PROFILE LISTING
17-08
Storm Runnoff to Catch Basin 1C to Catch Basin 1B
Tuttle Engineering

Date: 5- 3-2018 Time: 3: 6:19

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
1066.000	91.900	2.440	94.340	1.33	.18	.00	94.34	.00	.18	3.00	6.000	3.000	.00	0 .0
1.000	.0000					.0000	.00	2.44	.02	.00	.013	.00	.00	RECTANG
1067.000	91.900	2.440	94.340	1.33	.18	.00	94.34	.00	.18	3.00	6.000	3.000	.00	0 .0
TRANS STR	.0000					.0007	.00	2.44	.02		.013	.00	.00	RECTANG
1067.100	91.900	2.418	94.318	1.33	1.69	.04	94.36	.00	.49	.00	1.000	.000	.00	0 .0
92.900	.0029					.0014	.13	2.42	.00	.61	.013	.00	.00	PIPE
1160.000	92.170	2.284	94.454	1.33	1.69	.04	94.50	.00	.49	.00	1.000	.000	.00	0 .0
119.000	.0029					.0014	.17	2.28	.00	.61	.013	.00	.00	PIPE
1279.000	92.520	2.100	94.620	1.33	1.69	.04	94.66	.00	.49	.00	1.000	.000	.00	0 .0
WALL	ENTRANCE													
1279.000	92.520	2.145	94.665	1.33	.21	.00	94.67	.00	.18	3.00	6.000	3.000	.00	0 .0
1.000	.0000					.0000	.00	2.15	.02	.00	.013	.00	.00	RECTANG
1280.000	92.520	2.145	94.665	1.33	.21	.00	94.67	.00	.18	3.00	6.000	3.000	.00	0 .0

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
898.000	90.000	3.990	93.990	1.31	.11	.00	93.99	.00	.18	3.00	6.000	3.000	.00	0 .0
2.000	.0500					.0000	.00	3.99	.01	.09	.013	.00	.00	RECTANG
900.000	90.100	3.890	93.990	1.31	.11	.00	93.99	.00	.18	3.00	6.000	3.000	.00	0 .0
TRANS STR	.0000					.0057	.01	3.89	.01		.013	.00	.00	RECTANG
901.000	90.100	3.789	93.889	1.31	3.72	.21	94.10	.00	.54	.00	.670	.000	.00	0 .0
13.000	.1077					.0114	.15	3.79	.00	.26	.013	.00	.00	PIPE
914.000	91.500	2.538	94.038	1.31	3.72	.21	94.25	.00	.54	.00	.670	.000	.00	0 .0
WALL	ENTRANCE													
914.000	91.500	2.755	94.255	1.31	.16	.00	94.26	.00	.18	3.00	6.000	3.000	.00	0 .0
1.000	.0000					.0000	.00	2.75	.02	.00	.013	.00	.00	RECTANG
915.000	91.500	2.755	94.255	1.31	.16	.00	94.26	.00	.18	3.00	6.000	3.000	.00	0 .0

W S P G W - CIVILDESIGN Version 14.08
Program Package Serial Number: 7197
WATER SURFACE PROFILE LISTING

Date: 5- 3-2018 Time: 3:43:49

17-08
Storm Runnoff Catch Basin 1E TO Catch Basin 1D
Tuttle Engineering

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
915.000	91.500	2.760	94.260	.82	.10	.00	94.26	.00	.13	3.00	6.000	3.000	.00	0 .0
1.000	.0000					.0000	.00	2.76	.01	.00	.013	.00	.00	RECTANG
916.000	91.500	2.760	94.260	.82	.10	.00	94.26	.00	.13	3.00	6.000	3.000	.00	0 .0
TRANS STR	.0000					.0022	.00	2.76	.01		.013	.00	.00	RECTANG
916.500	91.500	2.719	94.219	.82	2.33	.08	94.30	.00	.43	.00	.670	.000	.00	0 .0
35.500	.0090					.0045	.16	2.72	.00	.42	.013	.00	.00	PIPE
952.000	91.820	2.571	94.391	.82	2.33	.08	94.47	.00	.43	.00	.670	.000	.00	0 .0
76.000	.0089					.0045	.34	2.57	.00	.42	.013	.00	.00	PIPE
1028.000	92.500	2.232	94.732	.82	2.33	.08	94.82	.00	.43	.00	.670	.000	.00	0 .0
WALL	ENTRANCE													
1028.000	92.500	2.317	94.817	.82	.12	.00	94.82	.00	.13	3.00	6.000	3.000	.00	0 .0

CATCH BASIN FLOW CHARACTERISTICS						
CB 1A				**CB 1D**		
TC/FL	95.70	95.20		TC/FL	96.46	95.96
Pipe Size	1.75	18"		Pipe Size	0.67	8"
Area Capture Q	1.23			Area Capture Q	0.49	
Pipe Discharge	4.57			Pipe Discharge	1.31	
Clearance/HGL	1.09	94.11		Clearance/HGL	1.70	94.26
Outlet/HGL	C.O.	93.99		Outlet/HGL	C.O.	93.99
CB Width/Height	4.00	5.20		CB Width/Height	4.00	4.96
Center Outlet	898.00	90.00		Center Outlet	898.00	90.00
Edge Outlet	900.00	90.00		Edge Outlet	900.00	90.00
Edge CB 1A	935.00	90.50		Edge CB 1D	914.00	91.50
Center CB 1A	936.00	90.50		Center CB 1D	915.00	91.50
Slope Conduit	0.0143			Slope Conduit	0.1071	
CB 1B				**CB 1E**		
TC/FL	95.67	95.17		TC/FL	96.84	96.34
Pipe Size	1.25	15"		Pipe Size	0.50	
Area Capture Q	1.20			Area Capture Q	0.82	
Pipe Discharge	2.53			Pipe Discharge	0.82	
Clearance/HGL	0.83	94.34		Clearance/HGL	1.52	94.82
Outlet/HGL	CB 1A	94.11		Outlet/HGL	CB 1D	94.26
CB Width/Height	4.00	3.77		CB Width/Height	4.00	4.34
Center CB 1A	936.00	90.50		Center CB 1D	915.00	91.50
Edge CB 1A	937.00	90.50		Edge CB 1D	916.00	91.50
Edge CB 1B	1065.00	91.90		Angle Point (-45)	952.00	91.82
Center CB 1B	1066.00	91.90		Edge CB 1E	1028.00	92.50
Slope Conduit	0.0109			Center CB 1E	1028.00	92.50
				Slope Conduit	0.0089	
CB 1C				**CB 1F**		
TC/FL	96.02	95.52		TC/FL	96.43	95.93
Pipe Size	1.00	12"		Pipe Size	0.67	8"
Area Capture Q	1.33			Area Capture Q	0.81	
Pipe Discharge	1.33			Pipe Discharge	0.81	
Clearance/HGL	0.85	94.67		Clearance/HGL	0.75	95.18
Outlet/HGL	CB 1B	94.34		Outlet/HGL	CB 1A	94.11
CB Width/Height	4.00	3.50		CB Width/Height	4.00	3.50
Center CB 1B	1066.00	91.90		Center CB 1A	936.00	90.50
Edge CB 1B	1067.00	91.90		Edge CB 1A	937.00	90.50
Angle Point (-45)	1160.00	92.17		Angle Point (+45)	1031.00	91.50
Edge CB 1C	1279.00	92.52		Angle Point (+45)	1136.00	92.61
Center CB 1C	1280.00	92.52		Edge CB 1F	1166.00	92.93
Slope Conduit	0.0029			Center CB 1F	1167.00	92.93
				Slope Conduit	0.0106	
				ATTACHMENT 9		

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

Will be provided in the F-WQMP

Appendix 9: O&M

Operation and Maintenance Plan and Documentation of Finance, Maintenance and Recording Mechanisms

Will be provided in the F-WQMP

Appendix 10: Educational Materials

BMP Fact Sheets, Maintenance Guidelines and Other End-User BMP Information

Will be provided in the F-WQMP