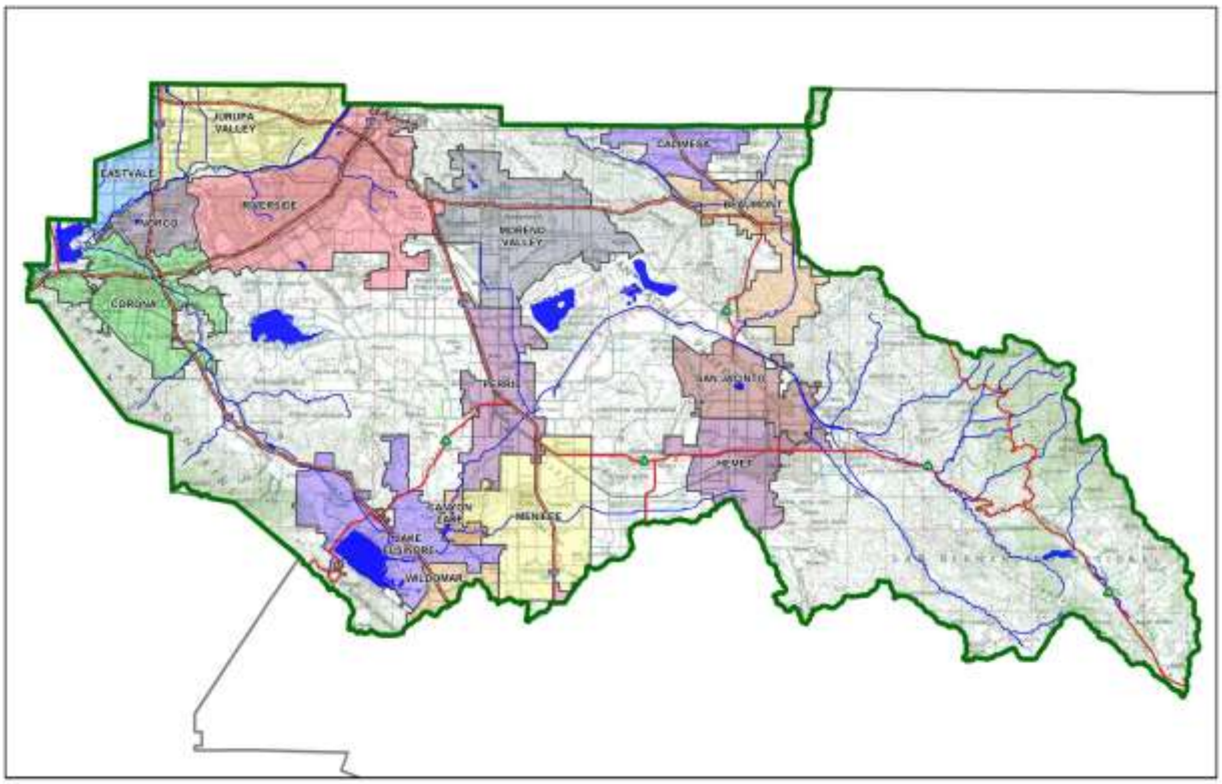
Project Specific Water Quality Management Plan

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

Project Title: Beaumont Village

Development No: APN 404-190-001 and 003

Design Review/Case No: PW2021-0659



☒ **Preliminary**
☐ **Final**

Original Date Prepared: January 6, 2021

Revision Date(s): May 10, 2022
December 09, 2022, September 5, 2023

Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**
Template revised June 30, 2016

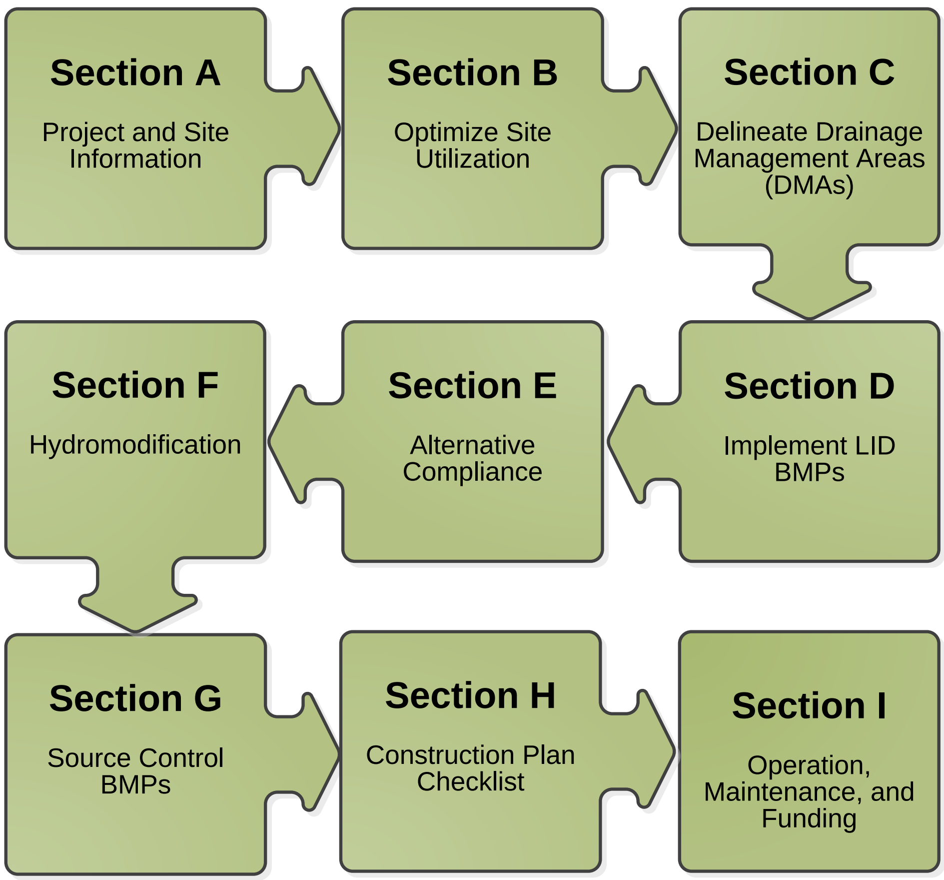
Contact Information:

Prepared for:
Santiago Holdings, LLC
c/o Camden Holdings, LLC
9454 Wilshire Blvd. 6th Floor
Beverly Hills, CA 90212
(310) 553-1031

Prepared by:
CASC Engineering and Consulting
1470 E. Cooley Drive
Colton, CA 92324
(909) 783-0101
Attn: Patrick C. Flanagan, Jr., PE

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 Santiago Holdings, LLC by CASC Engineering and Consulting for the Beaumont Village project, at the northwest corner of Oak Valley Parkway and Beaumont Avenue in the City of Beaumont.

This WQMP is intended to comply with the requirements of the City of Beaumont municipal code 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 the County of Riverside Water Quality Ordinance.

"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	Date
Patrick C. Flanagan, Jr.	Project Engineer
Preparer's Printed Name	Preparer's Title/Position

Preparer's Licensure: C86046

Table of Contents

List of Tables

List of Appendices

Section A: Project and Site Information

PROJECT INFORMATION	
Type of Project:	Commercial Retail Center
Planning Area:	N/A
Community Name:	N/A
Development Name:	Northwest Corner of Oak Valley Parkway and Beaumont Avenue, City of Beaumont
PROJECT LOCATION	
Latitude & Longitude (DMS): 33.947376, -116.977854	
Project Watershed and Sub-Watershed: Santa Ana / San Timoteo Creek	
APN(s): 404-190-001 and 003	
Tentative Parcel Map 37440	

PROJECT CHARACTERISTICS		
Proposed or Potential Land Use(s)	Restaurants / Retail/ Office / Car Wash / Fuel Station	
Proposed or Potential SIC Code(s)	Retail, office (specific SIC unknown); 7542, 5541, 5812	
Area of Impervious Project Footprint (SF)	449,578 SF	
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	211,208 SF	
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 SF	
Is the project located within any MSHCP Criteria Cell?	☐ Y	☒ N
If so, identify the Cell number:	N/A	
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)		
What is the Water Quality Design Storm Depth for the project?	0.85	

The project site is currently vacant. The project proposes to develop a commercial retail center including drive-thru restaurants, retail/office buildings, a car wash, a convenience store and fuel station, along with associated access, parking and landscape improvements. The existing project site is approximately 10.32 acres in size and consists of two parcels: APN 404-190-001 and 003. The project is located at the northwest corner of Oak Valley Parkway and Beaumont Avenue in the City of Beaumont. Tentative Parcel Map 37440 is being processed concurrently to subdivide the property into seven numbered parcels for commercial development and one lettered lot (Lot A), which will remain natural and undisturbed.

The project will be divided into four drainage areas (DAs): DA A, DA B, DA C and DA D which are 3.59, 5.17, 0.85 and 0.71, respectively. DA A is a natural area as explained above and will be considered self-treating. DA C and D both contain above ground basins. Both basins do not have the capacity to treat the full DCV for each respective drainage area. Once basin capacity has been reached both basin C and D will overflow towards the above ground basin in DA B. The above ground basin in DA B does not provide sufficient volume either so once the above ground basin reaches capacity it will then overflow to an underground basin in Parcel 6 (SW corner). To help capture as much runoff as possible before reaching the above ground basin, DA B contains depressed landscaped areas throughout which are separated and shown on the site plan in Appendix A. The above ground basin in DA D is the only basin that contains an ADS pretreatment due to the proposed gas station. The full DCV is captured on site and a table breakdown is shown on the site plan in appendix A.

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.

Receiving Waters	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Marshall Creek			N/A
Noble Creek			N/A
San Timoteo Creek Reach 3		MUN, GWR, REC1, REC2, WARM, WILD, RARE	4 Mi
San Timoteo Creek Reach 2		MUN, GWR, REC1, REC2, WARM, WILD, RARE	11.5 Mi
San Timoteo Creek Reach 1B		MUN, AGR, GWR, REC1, REC2, WARM, WILD, RARE	16 Mi
San Timoteo Creek Reach 1A		MUN, AGR, REC1, REC2, WARM, WILD, RARE	18.5 Mi
Santa Ana River Reach 5		MUN, AGR, GWR, REC1, REC2, WARM, WILD, RARE	23 Mi
Santa Ana River Reach 4	Pathogens	MUN, GWR,REC1, REC2, WARM, WILD, RARE, SPWN	N/A
Santa Ana River Reach 3	Copper, Lead, Pathogens	MUN, AGR, GWR, REC1, REC2, WARM WILD, RARE, SPWN	33 Mi

Santa Ana River Reach 2	Indicator Bacteria	MUN, AGR, GWR, REC1, REC2, WARM, WILD, RARE	46 Mi
Santa Ana River Reach 1		MUN, REC1, REC2, WARM, WILD	N/A

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

Table A.1 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)*	☐ 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?

Pre-development, the site drains from east to west, directly into Marshall Creek. While un-infiltrated post-development flows will drain to Beaumont Avenue, they will eventually reach Marshall Creek as they do historically.
Drainage Area A will remain undeveloped and continue to drain west into Marshall Creek.

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

Yes, the west portion of the site (DA A) will remain undisturbed, and existing vegetation will be protected.

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

Yes. All impervious areas, with the exception of minimal portions of driveways and ADA access which drain off to Beaumont Avenue due to grading constraints, drain to one of the proposed infiltration basins for treatment. The entire westerly portion of the site will remain undisturbed and infiltration capacity is maintained.

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

Yes. The entire westerly portion of the site will remain undisturbed, and 100% pervious.

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

No. Due to the nature of the development proposed, and the required grading, impervious areas are directed to one of the underground basins for treatment via curb, gutter and storm drain.

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
DA A	Natural – 'B' Soil	156,279	Self Treating Area
DA B	Mixed Surface	181,923	Type D
DA C	Mixed Surface	36,959	Type D
DA D	Mixed Surface	30,825	Type D
DMA B-1	Mixed Surface	12,423	Type D
DMA B-2	Mixed Surface	1,217	Type D
DMA B-3	Mixed Surface	1,743	Type D
DMA B-4	Mixed Surface	2,388	Type D
DMA B-5	Mixed Surface	3,272	Type D
DMA B-6	Mixed Surface	5,489	Type D
DMA B-7	Mixed Surface	4,677	Type D
DMA B-8	Mixed Surface	2,440	Type D
DMA B-9	Mixed Surface	9,944	Type D

[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)
DA A	156,279	Native Landscaping	N/A

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	DMA name /ID	Area (square feet)	Ratio
	[A]		[B]	[C] = [A] x [B]		[D]	[C]/[D]

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

DMA Name or ID	BMP Name or ID
DA B	Basin B
DA C	Basin C
DA D	Basin D
DMA B-1	Basin B-1
DMA B-2	Basin B-2
DMA B-3	Basin B-3
DMA B-4	Basin B-4
DMA B-5	Basin B-5
DMA B-6	Basin B-6
DMA B-7	Basin B-7
DMA B-8	Basin B-8
DMA B-9	Basin B-9

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 Co-Permittee 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:		

Average infiltration rate onsite per Infiltration Report by LOR Geotechnical (Appendix 3) dated April 7, 2020: 3.1+1.5+0.9+0.4+0.3+0.3+8.9+4.0 = 19.4 / 8 = 2.43" / hr

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.
***See email correspondence in Appendix 6 deeming the rates acceptable for infiltration.**

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 – N/A

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: 1.29 AC (*Note: This is less than the treated landscape area since a portion of the treated area is within Cal Trans Right-of-Way and not irrigated as part of this project.)

Type of Landscaping (Conservation Design or Active Turf):

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:

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:

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:

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)

Toilet Use Feasibility – N/A

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:

Project Type: Commercial

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:

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:

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:

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)**

Other Non-Potable Use Feasibility – N/A

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.

N/A

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:

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:

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:

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:

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)**

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 N/A

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	
DA B	☒	☐	☐	☐	☐
DA C	☒	☐	☐	☐	☐
DA D	☒	☐	☐	☐	☐
DMA B-1	☒	☐	☐	☐	☐
DMA B-2	☒	☐	☐	☐	☐
DMA B-3	☒	☐	☐	☐	☐
DMA B-4	☒	☐	☐	☐	☐
DMA B-5	☒	☐	☐	☐	☐
DMA B-6	☒	☐	☐	☐	☐
DMA B-7	☒	☐	☐	☐	☐
DMA B-8	☒	☐	☐	☐	☐
DMA B-9	☒	☐	☐	☐	☐

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

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious 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)*
	[A]		[B]	[C]	[A] x [C]			
B	*15,770*	*Roofs*	*1*	*0.89*	*14066.8*			
B	*124,824*	*Concrete or Asphalt*	*1*	*0.89*	*111343*			
B	*41,329*	*Ornamental Landscaping*	*0.1*	*0.11*	*4565.1*			
Sum	*181923*				*129974.9*	*0.85*	*9206.6*	*27,305*
C	*3,605*	*Roofs*	*1*	*0.89*	*3215.7*			
C	*25,445*	*Concrete or Asphalt*	*1*	*0.89*	*22696.9*			
C	*7,909*	*Ornamental Landscaping*	*0.1*	*0.11*	*873.6*			
Sum	*36,959*				*26786.2*	*0.85*	*1,897.4*	*1,430*
D	*3,130*	*Roofs*	*1*	*0.89*	*2792*			
D	*20,864*	*Concrete or Asphalt*	*1*	*0.89*	*18610.7*			
D	*6,831*	*Ornamental Landscaping*	*0.1*	*0.11*	*754.5*			
Sum	*30,825*				*22,157.2*	*0.85*	*1,569.5*	*1,240*

B-1	*11,061*	*Concrete or Asphalt*	*1*	*0.89*	*9866.4*				
B-1	*1,361*	*Ornamental Landscaping*	*0.1*	*0.11*	*150.3*				
Sum	*12422*				*10016.7*		*0.85*	*709.5*	*60*
B-2	*1,096*	*Concrete or Asphalt*	*1*	*0.89*	*977.6*				
B-2	*121*	*Ornamental Landscaping*	*0.1*	*0.11*	*13.4*				
Sum	*1217*				*991*		*0.85*	*70.2*	*35*
B-3	*1,494*	*Concrete or Asphalt*	*1*	*0.89*	*1332.6*				
B-3	*249*	*Ornamental Landscaping*	*0.1*	*0.11*	*27.5*				
Sum	*1743*				*1360.1*		*0.85*	*96.3*	*100*
B-4	*2,139*	*Concrete or Asphalt*	*1*	*0.89*	*1908*				
B-4	*249*	*Ornamental Landscaping*	*0.1*	*0.11*	*27.5*				
Sum	*2388*				*1935.5*		*0.85*	*137.1*	*100*
B-5	*1,781*	*Concrete or Asphalt*	*1*	*0.89*	*1588.7*				
B-5	*1,491*	*Ornamental Landscaping*	*0.1*	*0.11*	*164.7*				
Sum	*3272*				*1753.4*		*0.85*	*124.2*	*290*
B-6	*4,990*	*Concrete or Asphalt*	*1*	*0.89*	*4451.1*				
B-6	*498*	*Ornamental Landscaping*	*0.1*	*0.11*	*55*				
Sum	*2488*				*4506.1*		*0.85*	*319.2*	*155*
B-7	*4,242*	*Concrete or Asphalt*	*1*	*0.89*	*3783.9*				
B-7	*435*	*Ornamental Landscaping*	*0.1*	*0.11*	*48*				
Sum	*4677*				*3831.9*		*0.85*	*271.4*	*155*
B-8	*1,906*	*Concrete or Asphalt*	*1*	*0.89*	*1700.2*				
B-8	*534*	*Ornamental Landscaping*	*0.1*	*0.11*	*59*				
Sum	*2440*				*1759.2*		*0.85*	*124.6*	*155*
B-9	*1,096*	*Roofs*	*1*	*0.89*	*977.6*				
B-9	*7,054*	*Concrete or Asphalt*	*1*	*0.89*	*6292.2*				
B-9	*1,794*	*Ornamental Landscaping*	*0.1*	*0.11*	*198.2*				
Sum	*9944*				*7468*		*0.85*	*529*	*425*

[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

***See email in appendix 6 from the City approving the following method to treat the full DCV.**

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.

N/A

E.1 Identify Pollutants of Concern N/A

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.

N/A

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 N/A

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.

There are no alternative LIDs. N/A

Table E.2 Water Quality Credits

Qualifying Project Categories	Credit Percentage[2]
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 N/A

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]				
						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 N/A

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]

[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			
Volume (Cubic Feet)			

[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.

See Appendix 7 for Drainage Report.

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
Landscape/Outdoor Pesticide Use	Project plan designs maximize natural water storage and infiltration opportunities, and protect slopes and channels. Plants are grouped with similar water requirements in order to reduce excess irrigation runoff and promote surface infiltration. Landscaping correlates to the climate, soil, related natural resources and existing vegetation of the site, as well as the type of development proposed. Irrigation methods will be utilized to minimize runoff of excess irrigation water across impervious surfaces. Such	Landscape maintenance will begin upon construction completion and will occur on a monthly basis (or more frequently if desired) for all landscaped areas. The Owner will be responsible for maintaining all site landscaping and irrigation. Site trees and shrubs are to be trimmed as necessary and all wastes disposed of offsite. Wood mulch that has been disturbed is to be replaced. Ongoing maintenance shall be consistent with local guidelines, and fertilizer and pesticide usage shall be consistent with the instructions contained on product

	measures will include employing rain-triggered shutoff devices to eliminate or reduce irrigation during and immediately after precipitation, using mulches (such as wood chips) to minimize sediment in runoff and to maintain soil infiltration capacity, and coordinating design of the irrigation system and landscape to minimize overspray and runoff. Irrigation systems will use flow reducers or shutoff valves triggered by pressure drop to control water loss in the event of broken sprinkler heads or water supply lines. Water conservation devices such as programmable irrigation timers will be used.	labels and with the regulations administered by the State Department of Pesticide Regulation. Clippings and yard waste shall be composted. Any breaks or leaks in piping must be repaired within 5 business days of report to the landscaper. Scrap pipe and extra materials shall be recycled if possible. All non-recyclable wastes shall be landfilled. Hazardous wastes shall be disposed of per County hazardous material disposal regulations. Stormwater pollution information shall be provided to new site owners, lessees or operators.
On-Site Storm Drain Inlets	The inlets shall be marked with the words "Only Rain Down the Storm Drain" or similar.	This BMP will begin upon construction completion. Inspections will be done by Owner's designated staff after the first storm of the rainy season and bi-monthly thereafter for the duration of the rainy season. The inspector is also required to clean the facility as needed or when filled to 25% capacity. Cleaning can be by pump or shopvac or by hand. Debris and trash shall be placed inside bins. The signage shall be maintained and repainted as needed. Stormwater pollution information shall be provided to new site owners, lessees or operators.
Roofing, Gutters, Trim	Roofing, gutters and trim made of copper or other unprotected metals will not be used.	
Sidewalks, Parking Lots		This BMP will begin upon construction completion. The Owners will contract with a sweeping service to sweep the lot monthly.
Refuse Area	Drainage is not directed to the trash enclosure but away from it. A sign shall be provided in the dumpster that states "Do not dump hazardous materials here."	This BMP will begin upon construction completion and will occur on a monthly basis or more frequently as dictated by volume of trash. The Owner will be responsible for having staff or contracting with a landscape maintenance service that will be responsible for litter control. They are to ensure that the entire site is trash free. Litter from the site shall be

		picked up and placed in trash bins daily. Trash is to be removed and placed in bins. Damaged bins shall be replaced and spills cleaned up immediately. Spill clean up materials shall be kept onsite. Stormwater pollution information shall be provided to new site owners, lessees or operators.
Food Preparation Areas	The Final WQMP will include locations of floor sinks and other areas for cleaning floor mats, containers and equipment, as well as the proposed connection to a grease interceptor prior to discharging to sanitary sewer.	There will be a contained area or sink with sanitary sewer connection for disposal of wash waters containing kitchen and food wastes. No food Preparation will take place outdoors. Adequate signs shall be provided and appropriately placed stating the prohibition of discharging wash water to the storm drain system. Stormwater pollution information shall be provided to new site owners, lessees or operators.
Fuel Areas	A tank is proposed at the fueling area to capture fuel from potential spills. All site drainage is directed away from the fuel area.	Stormwater pollution information shall be provided to new site owners, lessees or operators.
Infiltration Basin Maintenance		The isolator row of the underground basins shall be inspected at the beginning of the wet and dry seasons or more frequently as needed and shall be cleaned out when the average depth of sediment exceeds 3" throughout the length of the isolator row using Jetvac process per manufacturer's recommendations. If inspection indicates the need for maintenance access is necessary, OSHA rules for contained space entries shall be followed.
Car Washing	The Final WQMP shall include details to show how car washing runoff will be directed to sanitary sewer.	Stormwater pollution information shall be provided to new site owners, lessees or operators.
Condensate drain lines	Condensate drain lines will discharge to landscaped areas where flow is small enough where runoff will not occur.	

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.

To be completed in Final 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.

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: The Owner(s) will be responsible for maintenance of all BMPs.

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

☐ Y ☒ N

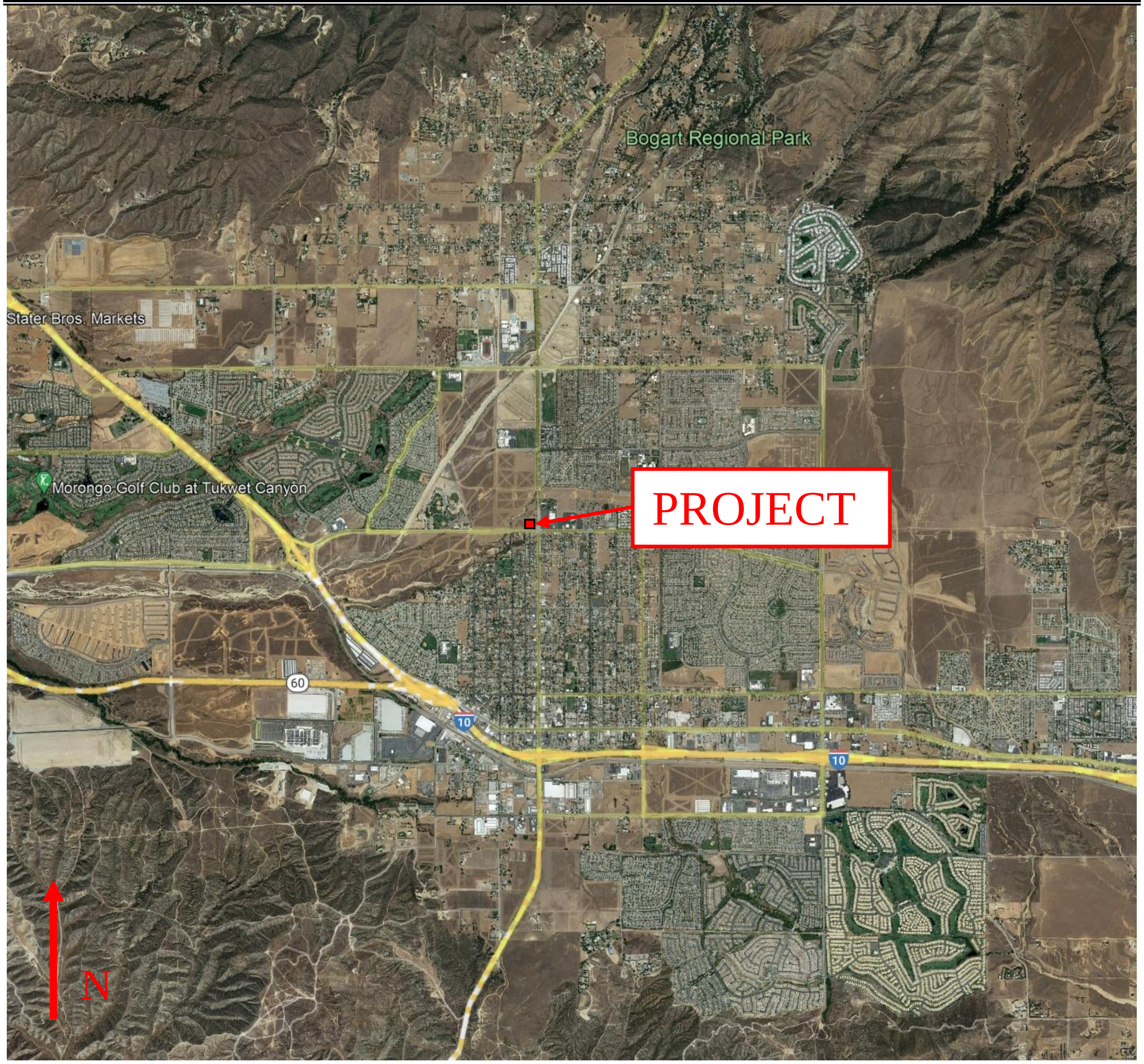
Santiago Holdings, LLC will be assuming ownership of the BMPs and will be responsible for maintenance.

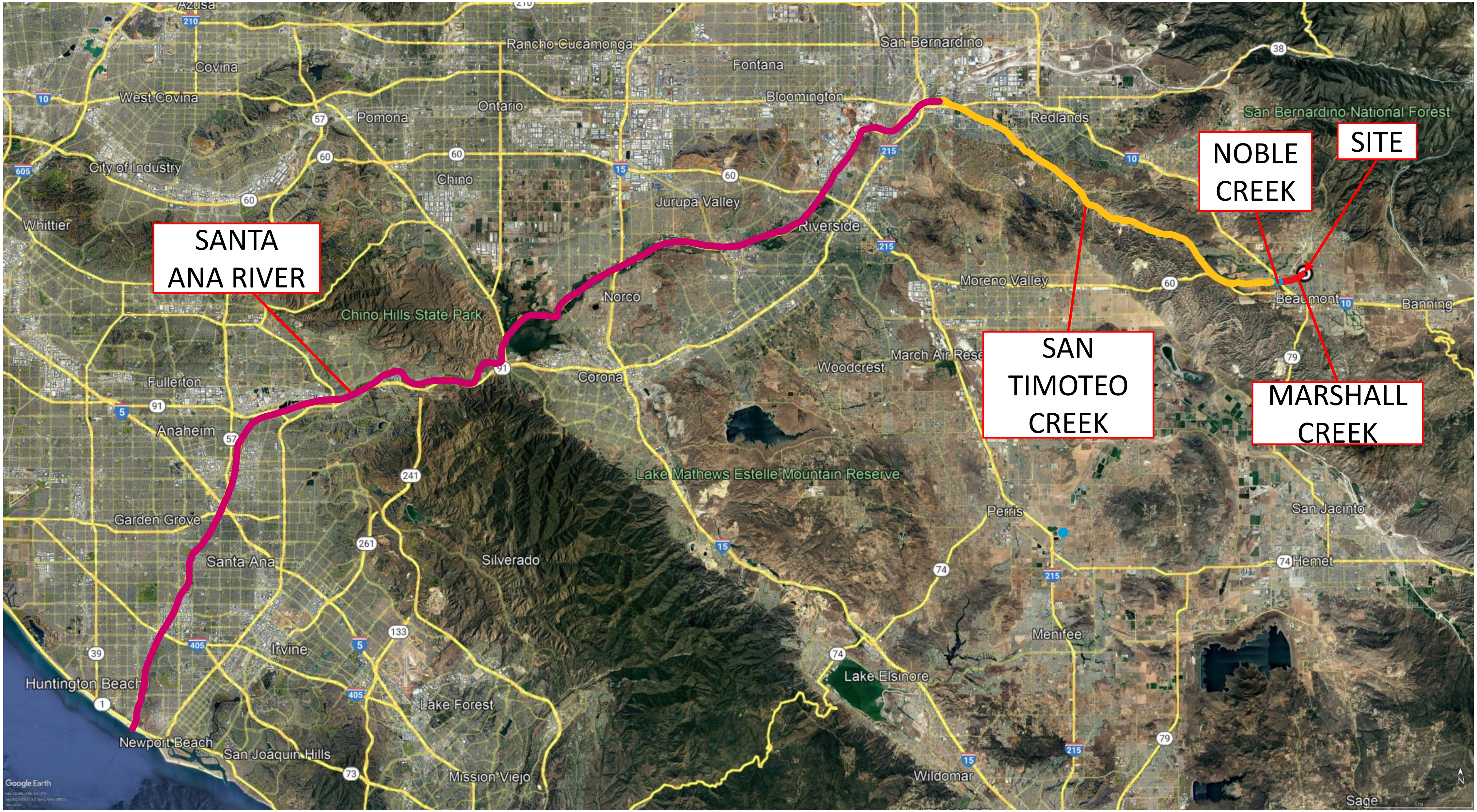
Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9. Additionally, include all pertinent forms of educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP in Appendix 10.

Appendix 1: Maps and Site Plans

WQMP Site Plan and Receiving Water exhibit

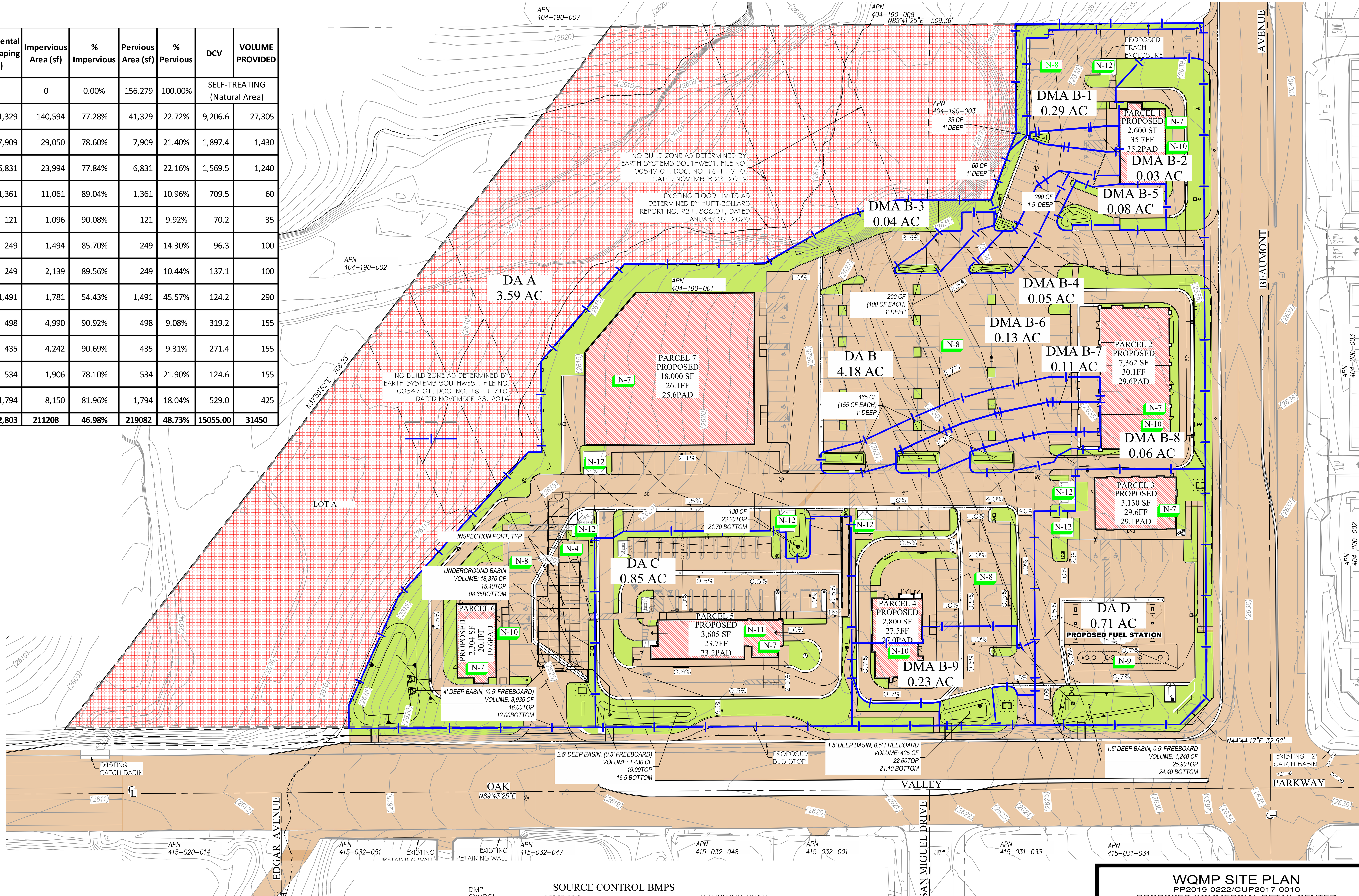
REGIONAL VICINITY MAP





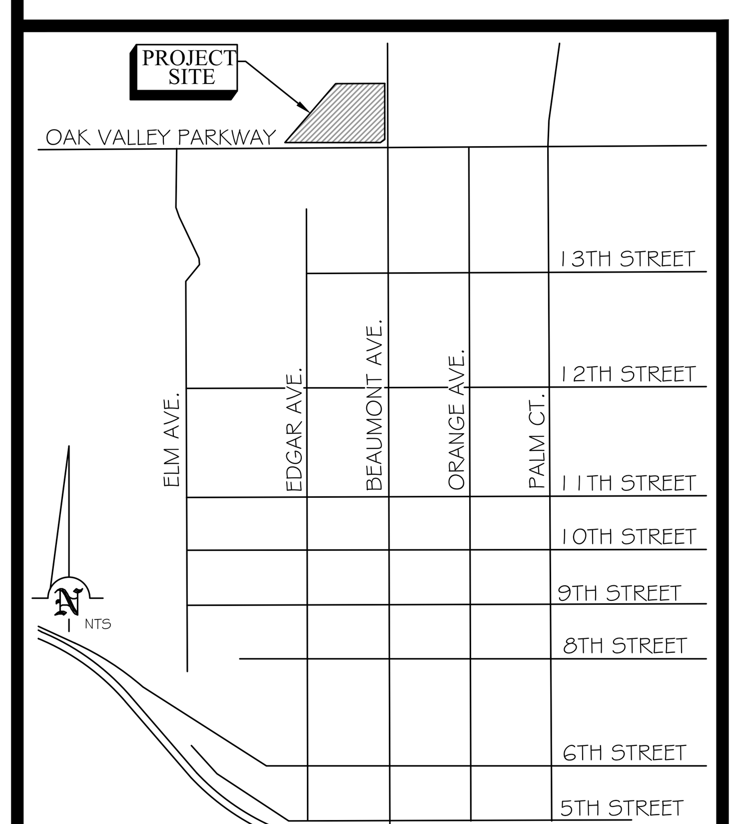
RECEIVING WATERS MAP

DA/DMA	Area (ac)	Area (sf)	Roof Area (sf)	Concrete / Asphalt (sf)	Ornamental Landscaping (sf)	Impervious Area (sf)	% Impervious	Pervious Area (sf)	% Pervious	DCV	VOLUME PROVIDED
DA A	3.59	156,279	-	0	0	0	0.00%	156,279	100.00%	SELF-TREATING (Natural Area)	
DA B	4.18	181,923	15,770	124,824	41,329	140,594	77.28%	41,329	22.72%	9,206.6	27,305
DA C	0.85	36,959	3,605	25,445	7,909	29,050	78.60%	7,909	21.40%	1,897.4	1,430
DA D	0.71	30,825	3,130	20,864	6,831	23,994	77.84%	6,831	22.16%	1,569.5	1,240
DMA B-1	0.29	12,423	-	11,061	1,361	11,061	89.04%	1,361	10.96%	709.5	60
DMA B-2	0.03	1,217	-	1,096	121	1,096	90.08%	121	9.92%	70.2	35
DMA B-3	0.04	1,743	-	1,494	249	1,494	85.70%	249	14.30%	96.3	100
DMA B-4	0.05	2,388	-	2,139	249	2,139	89.56%	249	10.44%	137.1	100
DMA B-5	0.08	3,272	-	1,781	1,491	1,781	54.43%	1,491	45.57%	124.2	290
DMA B-6	0.13	5,489	-	4,990	498	4,990	90.92%	498	9.08%	319.2	155
DMA B-7	0.11	4,677	-	4,242	435	4,242	90.69%	435	9.31%	271.4	155
DMA B-8	0.06	2,440	-	1,906	534	1,906	78.10%	534	21.90%	124.6	155
DMA B-9	0.23	9,944	1,096	7,054	1,794	8,150	81.96%	1,794	18.04%	529.0	425
Total	**10.32**	**449578**	**23,601**	**206,895**	**62,803**	**211208**	**46.98%**	**219082**	**48.73%**	**15055.00**	**31450**



LEGEND

- PROJECT BOUNDARY
- DRAINAGE AREA BOUNDARY
- ROOF AREA
- ORNAMENTAL LANDSCAPING
- CONCRETE/ASPHALT
- SELF-TREATING AREA



VICINITY MAP

SITE WIDE BMP'S

N-1, N-2, N-3, N-5, N-6, N-7, N-8

SOURCE CONTROL BMPS

BMP SYMBOL	DESCRIPTION	RESPONSIBLE PARTY
N-1	EDUCATION OF PROPERTY OWNERS, OPERATORS, TENANTS OCCUPANTS, OR EMPLOYEES	DEVELOPER/OWNERS
N-2	IRRIGATION AND LANDSCAPE MAINTENANCE	OWNERS
N-3	COMMON AREA LITTER CONTROL	OWNERS
N-4	DRAINAGE FACILITY INSPECTION AND MAINTENANCE	OWNERS
N-5	LANDSCAPE AND IRRIGATION SYSTEM DESIGN	DEVELOPER
N-6	LANDSCAPE/OUTDOOR PESTICIDE USE	OWNERS
N-7	CONDENSING DRAIN LINES/ROOFING, GUTTERS, TRIM	DEVELOPER
N-8	PLAZAS, SIDEWALKS AND PARKING LOT MAINTENCE	OWNERS
N-9	FUEL AREA MAINTENANCE	OWNERS
N-10	FOOD PREPARATION AREAS	OWNERS
N-11	CAR WASH AREA	OWNERS
N-12	REFUSE AREAS	OWNERS

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

PROPERTY OWNER/APPLICANT:

SANTIAGO HOLDINGS, LLC
C/O CAMDEN HOLDINGS, LLC
ATTN: MR. ARI MILLER
9454 WILSHIRE BLVD., 6TH FLOOR
BEVERLY HILLS, CA 90212
(310) 553-1031

WQMP SITE PLAN

PP2019-0222/CUP2017-0010
PROPOSED COMMERCIAL RETAIL CENTER
APN 404-190-001 & 003
NORTHWEST CORNER OF BEAUMONT AVENUE & OAK VALLEY PARKWAY
CITY OF BEAUMONT

CASC
Engineering and Consulting
1470 EAST COOLEY DRIVE
COLTON, CA 92324
PH. (909) 783-0101 FAX (909) 783-0108

REGISTERED PROFESSIONAL ENGINEER
PATRICK C. FLANAGAN, JR.
NO. C 086046
CIVIL
STATE OF CALIFORNIA

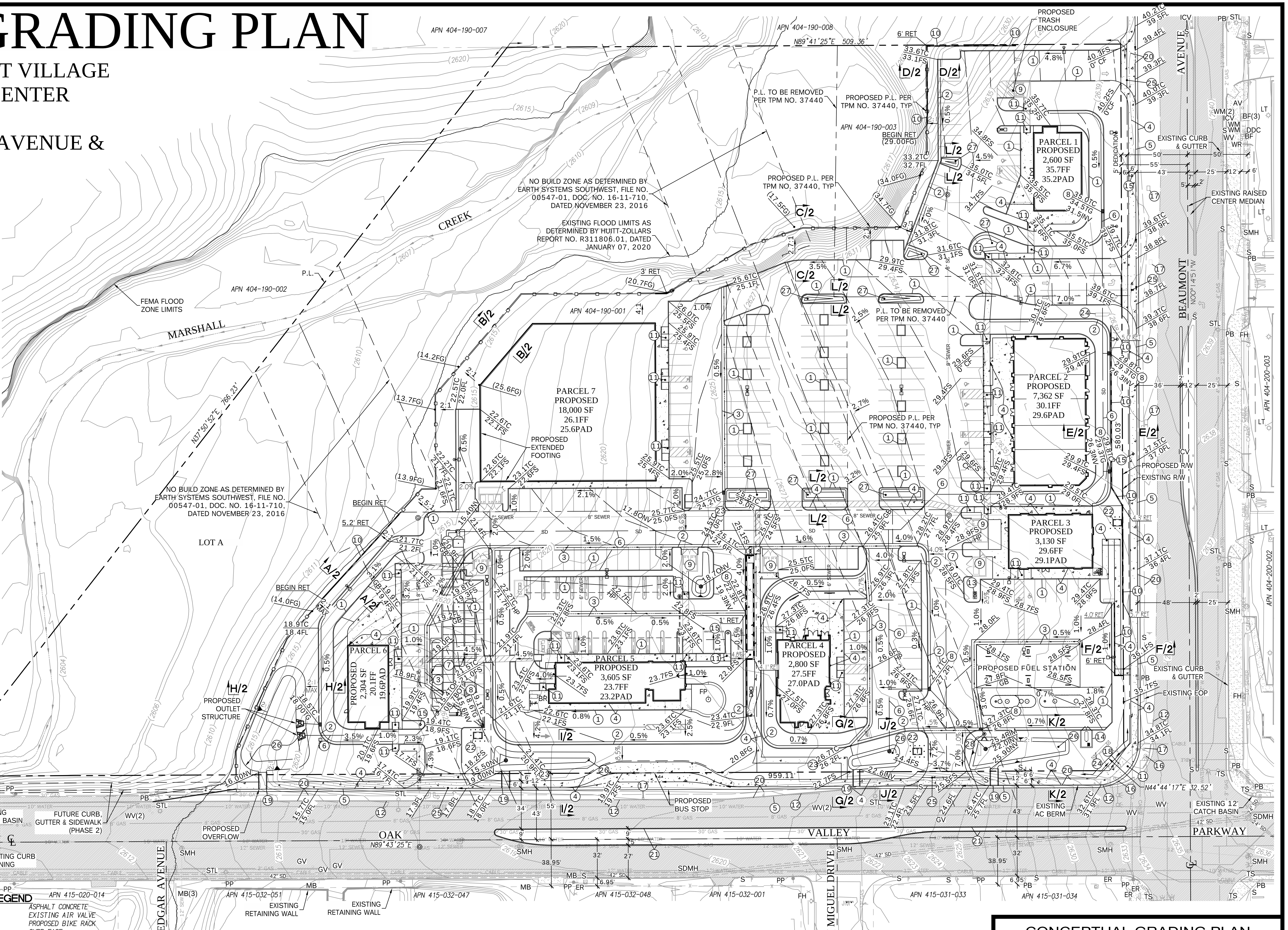
Job Number:	Date Prepared:	Drawn By:	Reference Number:	
1512-0001	09/01/2023	KJ	1512-0001 WQMP	SHEET 1 OF 1

1512-0001 PWQMP

Appendix 2: Construction Plans

CONCEPTUAL GRADING PLAN

PP2019-0222 / CUP 2017-0010 - BEAUMONT VILLAGE
PROPOSED COMMERCIAL RETAIL CENTER
APN 404-190-001 & 003
NORTHWEST CORNER OF BEAUMONT AVENUE & OAK VALLEY PARKWAY
CITY OF BEAUMONT



LEGAL DESCRIPTION

PARCEL C AS SHOWN ON LOT LINE ADJUSTMENT NO. 07-LLA-02 AS EVIDENCED BY DOCUMENT RECORDED OCTOBER 29, 2007 AS INSTRUMENT NO. 07-663184 OF OFFICIAL RECORDS, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

THAT PORTION OF THE SOUTH HALF OF THE SOUTHWEST QURTER OF THE SOUTHWEST QUARTER OF SECTION 34, IN TOWNSHIP 2 SOUTH, RANGE 1 WEST, SAN BERNARDINO BASE AND MERIDIAN ACCORDING TO THE OFFICIAL PLAT THEREOF, IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF THE SOUTHWEST QUARTER OF SAID SECTION 34 AS SHOWN ON PARCEL MAP NO. 26229, PM 173/21, RECORDS OF RIVERSIDE COUNTY;

THENCE NORTH 00°49'05" EAST 657 FEET ALONG THE WEST LINE OF SAID SECTION 34 TO THE NORTH LINE OF THE NORTH HALF OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 34;

THENCE EASTERLY ALONG THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 34, NORTH 89°42'10" EAST 840.87 FEET TO THE TRUE POINT OF BEGINNING.

THENCE CONTINUING EASTERLY ALONG SAID NORTH LINE, NORTH 89°42'10" EAST 482.81 FEET TO THE EAST LINE OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 34;
THENCE SOUTHERLY ALONG THE EAST LINE OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 34, SOUTH 00°46'11" WEST 208.71 FEET;

THENCE NORTH 89°42'10" EAST 35.34 FEET TO A LINE 50 FEET WEST AND PARALLEL TO THE CENTER LINE OF BEAUMONT AVENUE AS SHOWN ON PARCEL MAP NO. 26229, PM 173/21;

THENCE SOUTHERLY ALONG SAID PARALLEL LINE, SOUTH 00°14'51" EAST 371.32 FEET;

THENCE SOUTH 36°12'03" WEST 28.49 FEET TO A LINE 55 FEET NORTH AND PARALLEL TO THE CENTER LINE OF FOURTEENTH STREET, FOURTEENTH STREET CENTERLINE BEING THE SOUTH LINE OF SAID SECTION 34;

THENCE WESTERLY ALONG SAID PARALLEL LINE, SOUTH 89°43'07" WEST 970.14 FEET TO THE SOUTHWEST CORNER OF PARCEL 1 OF PARCEL MAP NO. 26229, PM 173/21;

THENCE NORTHEASTERLY ALONG THE WEST LINE OF SAID PARCEL 1, NORTH 37°50'21" EAST 766.17 FEET TO THE TRUE POINT OF BEGINNING.

EXISTING EASEMENTS

NO KNOWN EASEMENTS PER TITLE REPORT DATED 05/17/2022 BY NORTH AMERICAN TITLE COMPANY.

UTILITIES:

ELECTRIC:
SOUTHERN CALIFORNIA EDISON COMPANY
287 TENNESSEE STREET
REDLANDS, CA 92373
(909) 307-6788

TELEPHONE:
VERIZON
9 S. 4TH STREET
REDLANDS, CA 92373
(909) 748-6640

WATER:
BEAUMONT-CHERRY VALLEY WATER DISTRICT
560 MAGNOLIA AVENUE
BEAUMONT, CA 92223
(951) 845-9581

GAS:
SOUTHERN CALIFORNIA GAS COMPANY
1981 WEST LUGONIA AVENUE
REDLANDS, CA 92373
(909) 335-7836

CABLE:
CHARTER COMMUNICATIONS
1500 AUTO CENTER DRIVE
ONTARIO, CA 91761
(909) 634-3224

SEWER:
CITY OF BEAUMONT
550 E. 6TH STREET
BEAUMONT, CA 92223
(951) 769-8518

SOURCE OF SURVEY

TOPOGRAPHIC SURVEY
DATED NOVEMBER 2017
AS CONDUCTED BY
INLAND AERIAL SURVEYS, INC.
7117 ARLINGTON AVE., SUITE A
RIVERSIDE, CA 92503
PHONE: (951) 687-4252

SOIL ENGINEER

REPORT DATED APRIL 7, 2020
PROJECT NO. 13627-1
AS CONDUCTED BY
LOR GEOTECHNICAL GROUP, INC.
6121 QUAIL VALLEY COURT
RIVERSIDE, CA 92507
PHONE: (951) 653-1760
FAX: (951) 653-1741

SOURCE OF FLOOD LIMITS

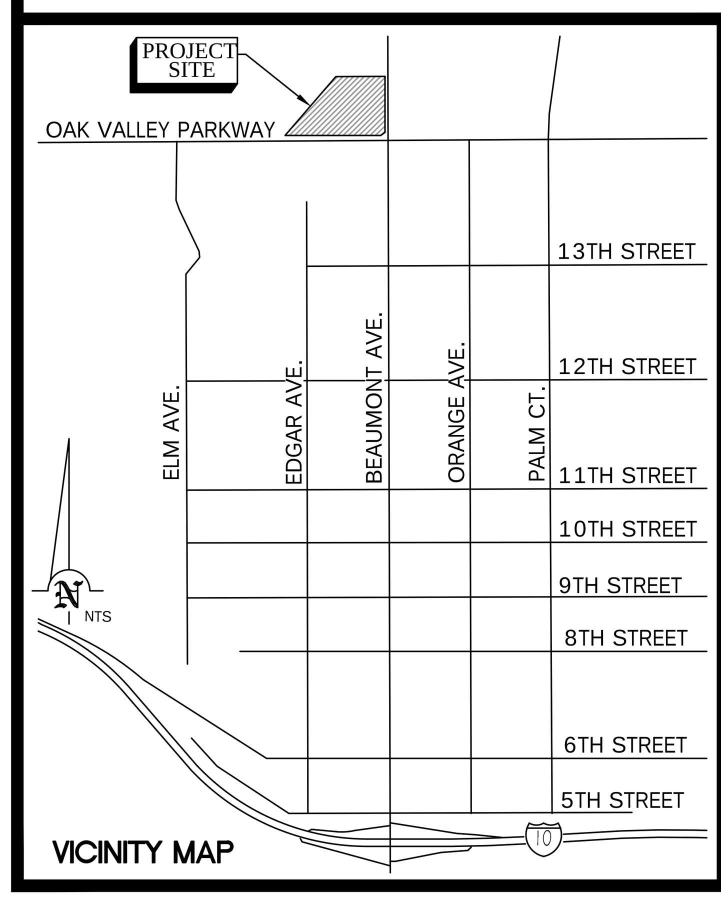
REPORT DATED JANUARY 7, 2020
PROJECT NO. R311806.01
AS CONDUCTED BY
HUITT-ZOLLARS, INC.
2603 MAIN STREET, SUITE 400
IRVINE, CA 92614
PHONE: (949) 988-5815
FAX: (949) 988-5820

SOURCE OF NO BUILD ZONE

REPORT DATED NOVEMBER 23, 2016
FILE NO. 00547-01, DOC. NO. 16-11-710
AS CONDUCTED BY
EARTH SYSTEMS SOUTHWEST
1680 ILLINOIS AVE, SUITE 20
PERRIS, CA 92571
PHONE: (951) 928-9799
FAX: (951) 928-9948

PROJECT NOTES

1. ASSESSOR'S PARCEL NUMBER: 404-190-001 & 003
2. EXISTING GROSS AREA: 539,773 SF = 12.39 AC
3. EXISTING NET AREA: 452,398 SF = 10.38 AC
4. PROPOSED DEDICATION: 2,820 SF = 0.06 AC
5. PROPOSED NET AREA: 449,578 SF = 10.32 AC
6. EXISTING / PROPOSED ZONE DESIGNATION: COMMERCIAL NEIGHBORHOOD
7. EXISTING LAND USE: VACANT
8. PROPOSED LAND USE: COMMERCIAL RETAIL CENTER
9. PROJECT SITE IS LOCATED WITHIN ZONE X (0.2% ANNUAL CHANCE FLOOD HAZARD, AREAS OF 1% ANNUAL CHANCE FLOOD WITH AVERAGE DEPTH LESS THAN ONE FOOT OR WITH DRAINAGE AREAS OF LESS THAN ONE SQUARE MILES) & ZONE AE (REGULATORY FLOODWAY)



VICINITY MAP

KEY NOTES

1. PROPOSED 6" CURB
2. PROPOSED 6" CURB & GUTTER
3. PROPOSED RIBBON GUTTER
4. PROPOSED SIDEWALK/PCC
5. PROPOSED 8" CURB & GUTTER
6. PROPOSED STORM DRAIN PIPE
7. PROPOSED STORMTECH SYSTEM
8. PROPOSED DROP INLET WITH "NO DUMPING" SIGNAGE
9. PROPOSED TRASH ENCLOSURE
10. PROPOSED RETAINING WALL
11. PROPOSED ADA RAMP
12. EXISTING AC BERM TO BE REMOVED
13. PROPOSED AIR/VAC MACHINE
14. PROPOSED CLEAN AIR SEPARATOR
15. PROPOSED FIRE HYDRANT
16. EXISTING TRAFFIC SIGNAL TO BE RELOCATED
17. EXISTING PULL BOX TO BE RELOCATED
18. EXISTING WATER METER TO BE REMOVED
19. PROPOSED PARKWAY DRAIN
20. EXISTING AC WALKWAY TO BE REMOVED
21. PROPOSED RAISED CENTER MEDIAN
22. PROPOSED TRANSFORMER
23. PROPOSED CURB OPENING
24. PROPOSED MONUMENT SIGN
25. PROPOSED DRIVEWAY
26. PROPOSED RETENTION BASIN
27. PROPOSED DEPRESSED LANDSCAPE
28. PROPOSED PRE-TREATMENT DEVICE

LEGEND

AC	ASPHALT CONCRETE
AV	EXISTING AIR VALVE
BR	PROPOSED BIKE RACK
CF	CURB FACE
DDC	EXISTING DOUBLE DETECTOR CHECK
EOP	EDGE OF PAVEMENT
ER	EXISTING ELECTRIC RISER
FP	PROPOSED FLAG POLE
FS	FINISHED SURFACE
GB	GRADE BREAK
GV	EXISTING GAS VALVE
FH	EXISTING FIRE HYDRANT
ICV	EXISTING IRRIGATION CONTROL VALVE
LT	EXISTING LIGHT
PB	EXISTING PULL BOX
PCC	PORTLAND CEMENT CONCRETE
P.L.	PROPERTY LINE
R/W	RIGHT-OF-WAY
S	EXISTING SIGN
SDMH	EXISTING STORM DRAIN MANHOLE
SMH	EXISTING SEWER MANHOLE
STL	EXISTING STREET LIGHT
TG	TOP OF GRATE
TS	EXISTING TRAFFIC SIGNAL
TYP	TYPICAL
	PROPOSED LIGHT
WV	EXISTING WATER VALVE
WM	EXISTING WATER METER
WR	EXISTING WATER RISER

HATCH LEGEND

- PROPOSED PCC SIDEWALK
- PROPOSED AC / PCC DRIVE AISLE / PARKING LOT
- EXISTING PCC PAVING
- EXISTING AC PAVING TO REMAIN

PRELIMINARY EARTHWORK QUANTITIES

CUT	19,000 CY	(RAW/UNADJUSTED)
FILL	11,200 CY	(SITE ANTICIPATED TO BALANCE AFTER LOSSES)

NOTE: THE PROPOSED GRADING ON THIS PLAN IS STRICTLY CONCEPTUAL AND SHOULD ONLY BE USED FOR PLANNING PURPOSES.

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

N

PROPERTY OWNER/APPLICANT:

SANTIAGO HOLDINGS, LLC
C/O CAMDEN HOLDINGS, LLC
ATTN: MR. ARI MILLER
9454 WILSHIRE BLVD., 6TH FLOOR
BEVERLY HILLS, CA 90212
(310) 553-1031

CONCEPTUAL GRADING PLAN

PP2019-0222/CUP2017-0010
PROPOSED COMMERCIAL RETAIL CENTER
APN 404-190-001 & 003
NORTHWEST CORNER OF BEAUMONT AVENUE & OAK VALLEY PARKWAY
CITY OF BEAUMONT

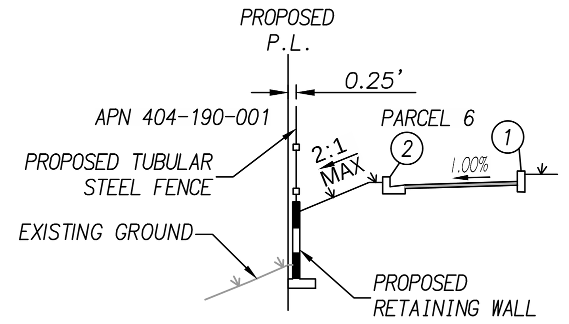
CASC
Engineering and Consulting
1470 EAST COOLEY DRIVE
COLTON, CA 92324
PH. (909) 783-0101 FAX (909) 783-0108

REGISTERED PROFESSIONAL ENGINEER
PATRICK C. FLANAGAN JR.
NO. C 086046
CIVIL
STATE OF CALIFORNIA

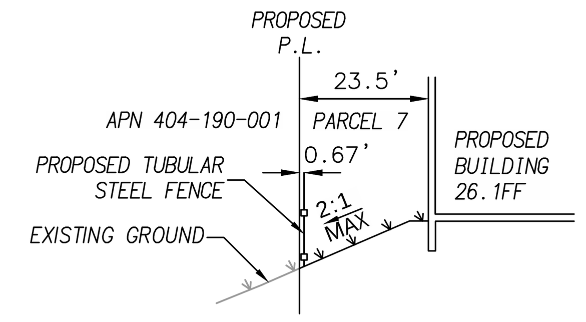
Patrick C. Flanagan, Jr. R.C.E. 86046 Exp. Sep 30, 2024

Job Number:	Date Prepared:	Drawn By:	Reference Number:	
1512-0001	12/13/2022	RL	1512-0001 CGP	SHEET 1 OF 2

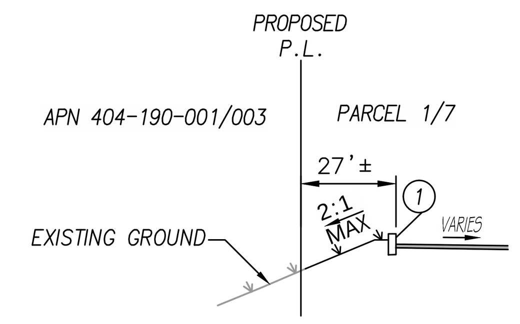
1512-0001 CGP



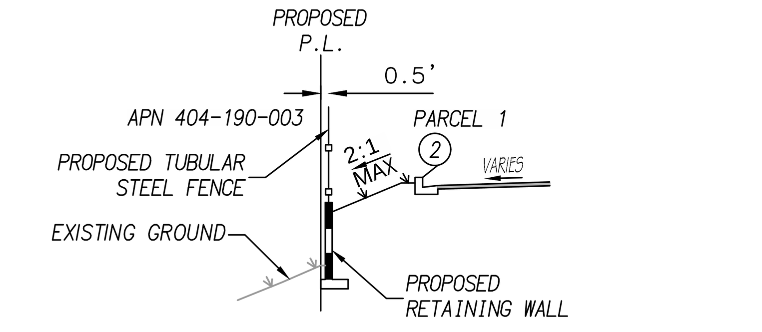
SECTION A/2-A/2
NTS



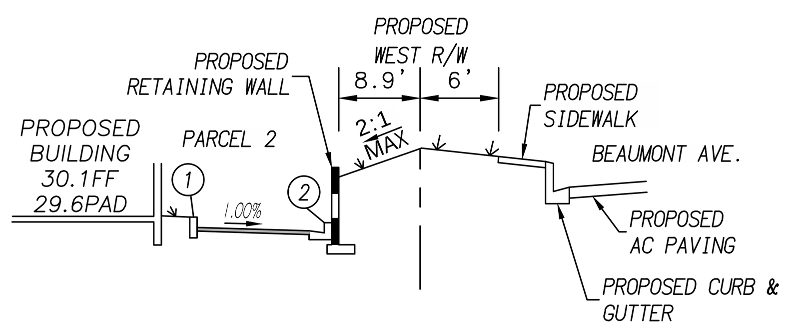
SECTION B/2-B/2
NTS



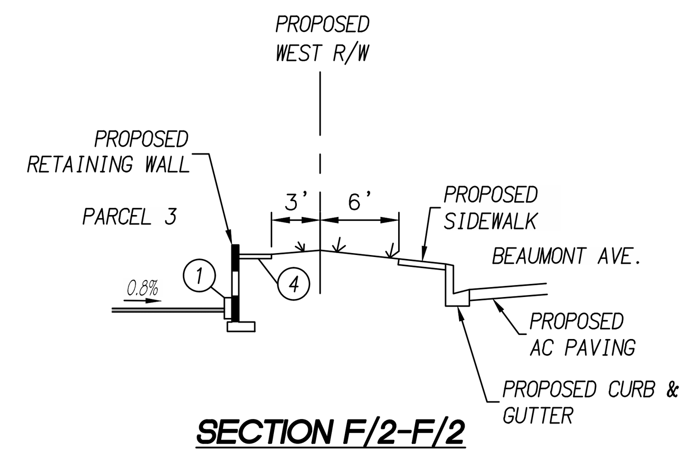
SECTION C/2-C/2
NTS



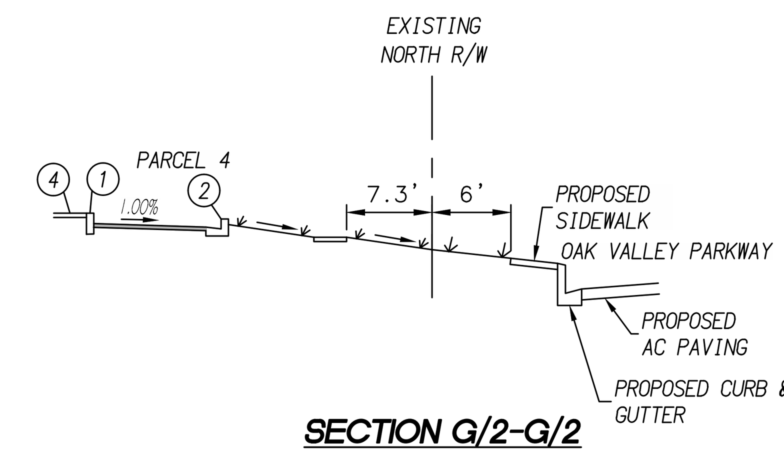
SECTION D/2-D/2
NTS



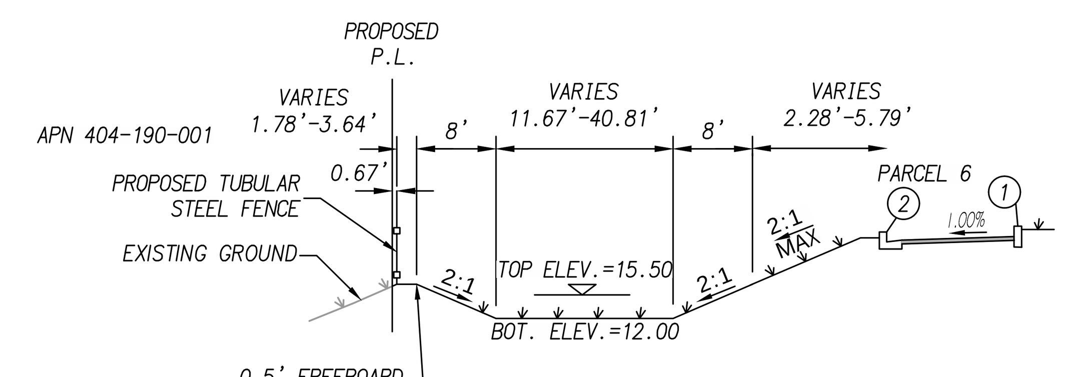
SECTION E/2-E/2
NTS



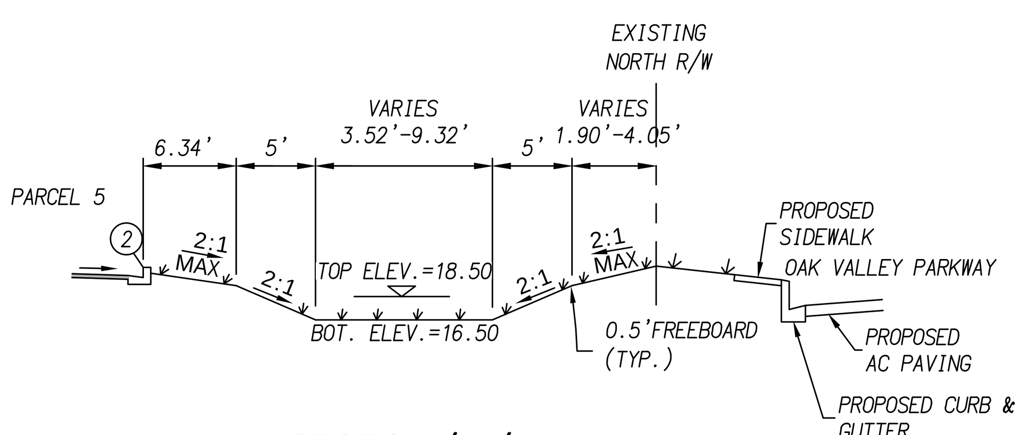
SECTION F/2-F/2
NTS



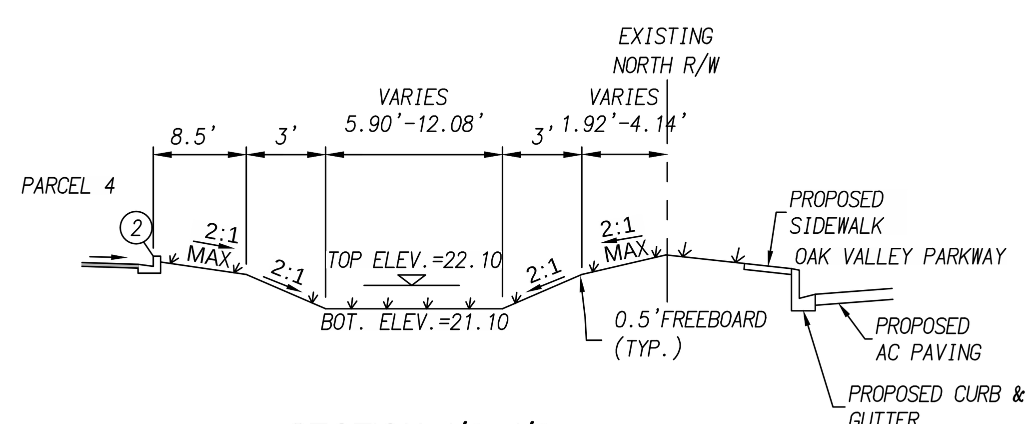
SECTION G/2-G/2
NTS



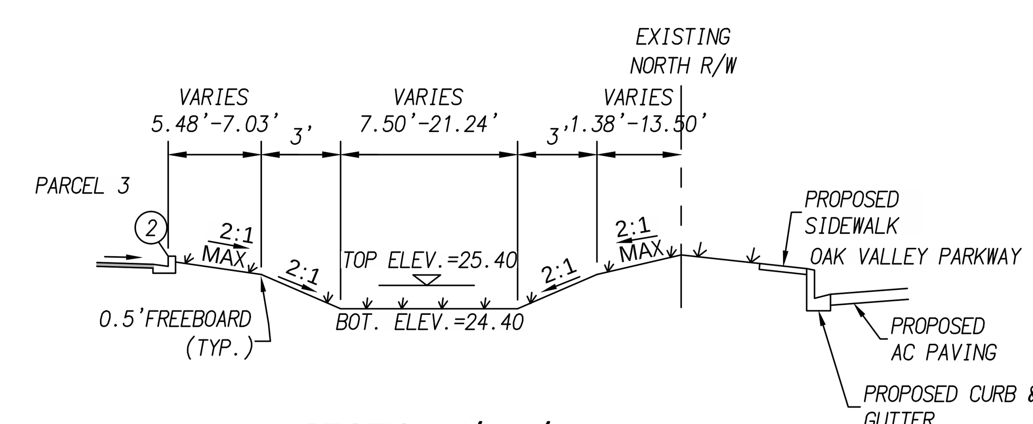
SECTION H/2-H/2
NTS



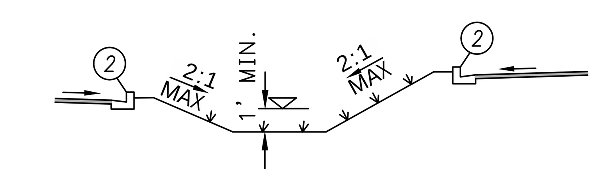
SECTION I/2-I/2
NTS



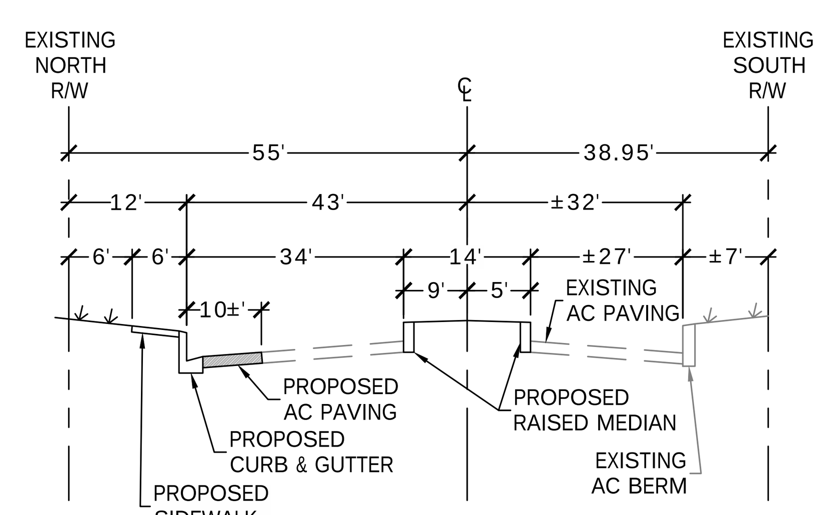
SECTION J/2-J/2
NTS



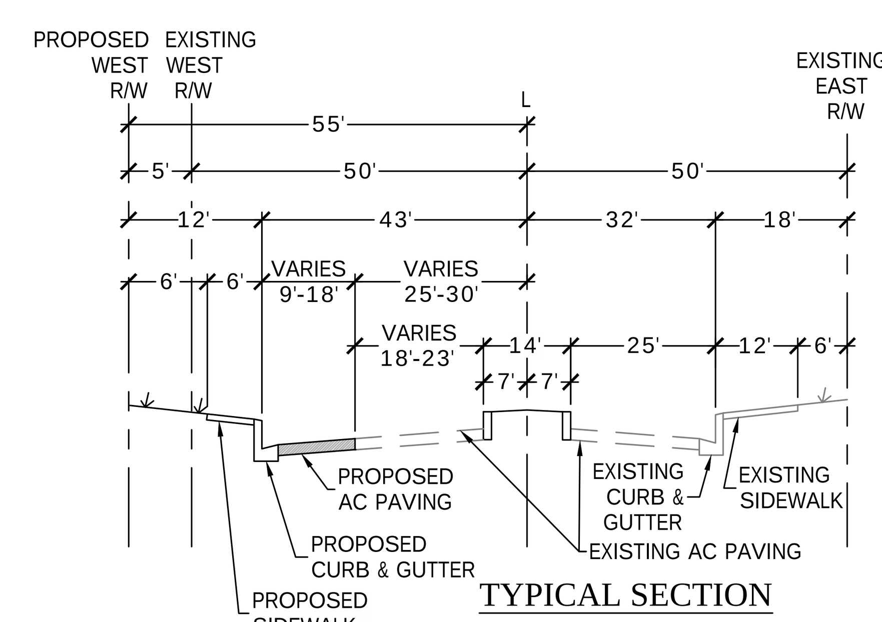
SECTION K/2-K/2
NTS



SECTION L/2-L/2
(TYPICAL LANDSCAPE DEPRESSION)
NTS



TYPICAL SECTION
ARTERIAL (MODIFIED)
OAK VALLEY PARKWAY - FACING EAST
NTS



TYPICAL SECTION
ARTERIAL (MODIFIED)
BEAUMONT AVE. - FACING NORTH
NTS

PROPERTY OWNER/APPLICANT:

SANTIAGO HOLDINGS, LLC
C/O CAMDEN HOLDINGS, LLC
ATTN: MR. ARI MILLER
9454 WILSHIRE BLVD., 6TH FLOOR
BEVERLY HILLS, CA 90212
(310) 553-1031

CONCEPTUAL GRADING PLAN

PP2019-0222/CUP2017-0010
PROPOSED COMMERCIAL RETAIL CENTER
APN 404-190-001 & 003
NORTHWEST CORNER OF BEAUMONT
AVENUE & OAK VALLEY PARKWAY
CITY OF BEAUMONT

CASC
Engineering and Consulting
1470 EAST COOLEY DRIVE
COLTON, CA 92324
PH. (909) 783-0101 FAX (909) 783-0108

REGISTERED PROFESSIONAL ENGINEER
PATRICK C. FLANAGAN JR.
NO. C 086046
CIVIL
STATE OF CALIFORNIA

Patrick C. Flanagan, Jr. R.C.E. 86046 Exp. Sep 30, 2024

Job Number:	Date Prepared:	Drawn By:	Reference Number:	
1512-0001	12/13/2022	RL	1512-0001 CGP	SHEET 2 OF 2

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

March 14, 2022

Santiago Holdings, LLC
9454 Wilshire Boulevard
Beverly Hills, California 90212

Project No. 13627.11

Attention: Mr. Ari Miller

Subject: Additional Infiltration Testing, Proposed Beaumont Village Commercial/Retail Center, APN 404-190-001 and -003, Beaumont, California.

At your request, we have conducted additional infiltration testing for the subject project. This additional testing was conducted at the locations and depths provided by CASC Engineering & Consulting.

A total of 2 double ring infiltration tests were conducted at the requested locations as illustrated on the attached Site Plan, Enclosure 1. Testing was requested at depths from 12 to 13 feet, therefore, testing was conducted at depths of approximately 12.5 feet.

A 12-inch diameter steel casing (ring) was installed within the center of each test location, with a 24-inch diameter steel ring centered around it. Each ring was imbedded approximately 3 to 3.5-inches. These rings extended approximately 16.5 to 17-inches above the bottom of each test location. Each test location was tested immediately after the rings were installed by filling both the inside and outside rings and maintaining a water level to a depth of approximately 3.5-inches above the ground surface. Water was then metered into the test hole to maintain this water level within both rings. The volume of water used in a given time period was recorded at various time intervals to establish the infiltration rate of water within the inner ring.

The infiltration rate is measured as the drop in water level compared to the permeability of the bottom surface area soils in the bottom of the test hole. If a ring is not used, the water column in the test hole is allowed to seep into both the bottom and sidewalls of the hole, for which the drop in water level must be corrected and reduced for the volume of water seeping into the sidewall and for the diameter of the test hole. As described above, the tests described herein were conducted using a 12-inch diameter inner ring and 24-inch diameter outer ring.

The test holes were found to have the following measured clear water infiltration rates:

Infiltration Test No.	Depth (ft.)*	Clear Water Infiltration Rate** (inches/hour)
DRI-9	12.5	0.4
DRI-10	12.5	0.2
* below existing ground surface ** average of final 2 readings rounded to the nearest tenth		

The results of our double ring infiltrometer tests are attached as Enclosures 2 and 3.

The results of our field investigation and test data indicates the site soils at the depths and locations tested are not conducive to infiltration. Therefore, shallow water quality storm water systems should not incorporate on-site infiltration when determining storm water treatment capacity in these locations.

We trust this information meets your present needs. If you have any questions, please do not hesitate to contact this firm at your convenience.

Respectively Submitted
LOR Geotechnical Group, Inc.

REGISTERED PROFESSIONAL ENGINEER
JOHN P. LEUER
NO. 2030
GEOTECHNICAL
STATE OF CALIFORNIA

John P. Leuer, GE 2030
President

AAT:JPL:ss

Attachments: Enclosure 1 - Site Plan
Enclosures 2 and 3 - Infiltration Test Data

Distribution: Addressee (1) via email ari@camdenholdings.com

cc: CASC Engineering & Consulting via email amistretta@cascinc.com

REFERENCES

Riverside County Flood Control and Water Conservation District, 2011, Design Handbook for Low Impact Development Best Management Practices, dated September 2011.

LOR Geotechnical Group, Inc., 2020, Preliminary Geotechnical and Infiltration Feasibility Investigation, Proposed Retail Development, APN's 404-190-001 and -003, Northwest Corner of Beaumont Avenue and Oak Valley Parkway, Beaumont, California, Project No. 13627.11, dated April 7, 2020.

TRIBUTARY AREA MAP

POST-DEVELOPMENT
BEAUMONT VILLAGE - PROPOSED COMMERCIAL RETAIL CENTER
APN 404-190-001 & 003
NORTHWEST CORNER OF BEAUMONT AVENUE & OAK VALLEY PARKWAY
CITY OF BEAUMONT

LEGAL DESCRIPTION

PARCEL C AS SHOWN ON LOT LINE ADJUSTMENT NO. 07-LLA-02 AS EVIDENCED BY DOCUMENT RECORDED OCTOBER 29, 2007 AS INSTRUMENT NO. 07-663184 OF OFFICIAL RECORDS, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

THAT PORTION OF THE SOUTH HALF OF THE SOUTHWEST QURTER OF THE SOUTHWEST QUARTER OF SECTION 34, IN TOWNSHIP 2 SOUTH, RANGE 1 WEST, SAN BERNARDINO BASE AND MERIDIAN ACCORDING TO THE OFFICIAL PLAT THEREOF, IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF THE SOUTHWEST QUARTER OF SAID SECTION 34 AS SHOWN ON PARCEL MAP NO. 26229, PM 173/21, RECORDS OF RIVERSIDE COUNTY;

THENCE NORTH 00°49'05" EAST 657 FEET ALONG THE WEST LINE OF SAID SECTION 34 TO THE NORTH LINE OF THE NORTH HALF OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 34;

THENCE EASTERLY ALONG THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 34, NORTH 89°42'10" EAST 840.87 FEET TO THE TRUE POINT OF BEGINNING.

THENCE CONTINUING EASTERLY ALONG SAID NORTH LINE, NORTH 89°42'10" EAST 482.81 FEET TO THE EAST LINE OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 34;
THENCE SOUTHERLY ALONG THE EAST LINE OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 34, SOUTH 00°46'11" WEST 208.71 FEET;

THENCE NORTH 89°42'10" EAST 35.34 FEET TO A LINE 50 FEET WEST AND PARALLEL TO THE CENTER LINE OF BEAUMONT AVENUE AS SHOWN ON PARCEL MAP NO. 26229, PM 173/21;

THENCE SOUTHERLY ALONG SAID PARALLEL LINE, SOUTH 00°14'51" EAST 371.32 FEET;

THENCE SOUTH 36°12'03" WEST 28.49 FEET TO A LINE 55 FEET NORTH AND PARALLEL TO THE CENTER LINE OF FOURTEENTH STREET, FOURTEENTH STREET CENTERLINE BEING THE SOUTH LINE OF SAID SECTION 34;

THENCE WESTERLY ALONG SAID PARALLEL LINE, SOUTH 89°43'07" WEST 970.14 FEET TO THE SOUTHWEST CORNER OF PARCEL 1 OF PARCEL MAP NO. 26229, PM 173/21;

THENCE NORTHEASTERLY ALONG THE WEST LINE OF SAID PARCEL 1, NORTH 37°50'21" EAST 766.17 FEET TO THE TRUE POINT OF BEGINNING.

APN: 404-190-001 AND 404-190-003

EXISTING EASEMENTS

NO KNOWN EASEMENTS PER TITLE REPORT DATED 08/29/2019 BY NORTH AMERICAN TITLE COMPANY

UTILITIES:

ELECTRIC:
SOUTHERN CALIFORNIA EDISON COMPANY
287 TENNESSEE STREET
REDLANDS, CA 92373
(909) 307-6788

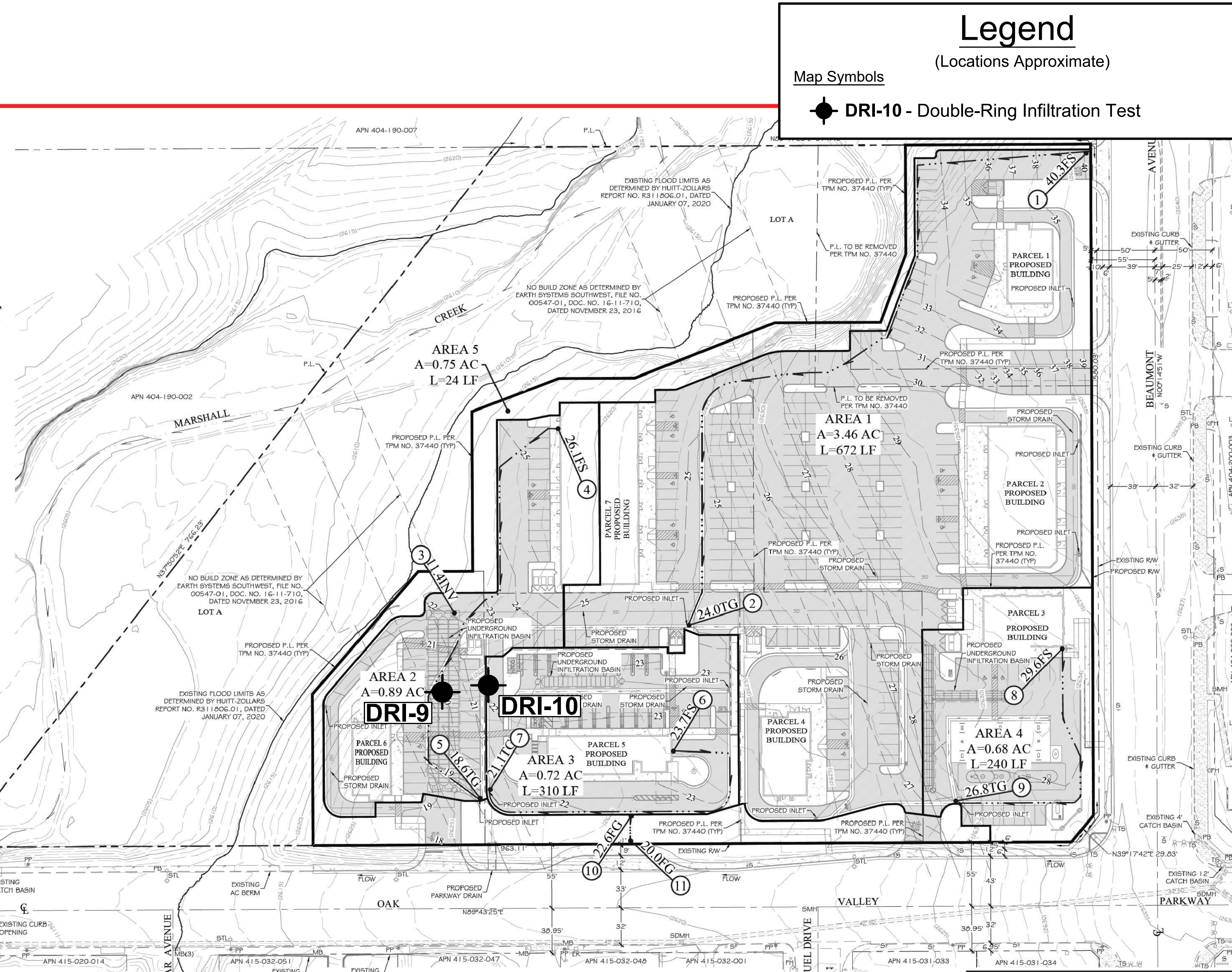
GAS:
SOUTHERN CALIFORNIA GAS COMPANY
1981 WEST LUGONIA AVENUE
REDLANDS, CA 92373
(909) 335-7836

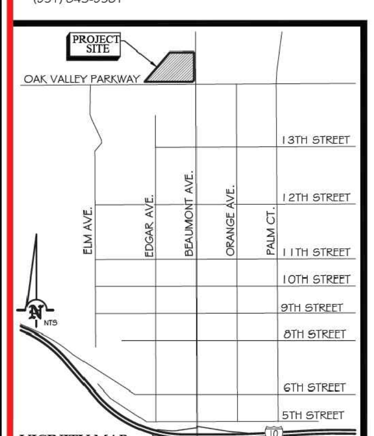
TELEPHONE:
VERIZON
9 S. 4TH STREET
REDLANDS, CA 92373
(909) 748-6640

CABLE:
CHARTER COMMUNICATIONS
1500 AUTO CENTER DRIVE
ONTARIO, CA 91761
(909)634-3224

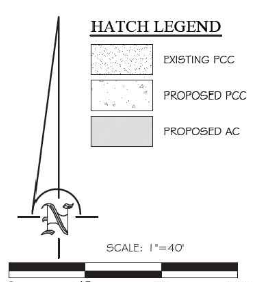
WATER:
BEAUMONT-CHERRY VALLEY WATER DISTRICT
560 MAGNOLIA AVENUE
BEAUMONT, CA 92223
(951) 845-9581

SEWER:
CITY OF BEAUMONT
550 E. 6TH STREET
BEAUMONT, CA 92223
(951)769-8518





VICINITY MAP



HATCH LEGEND

- EXISTING PCC
- PROPOSED PCC
- PROPOSED AC

LEGEND

AC	ASPHALT CONCRETE
ER	ELECTRIC RISER
EX	EXISTING
FH	FIRE HYDRANT
LT	LIGHT
PB	PULL BOX
PCC	PORTLAND CEMENT CONCRETE
P.L.	PROPERTY LINE
R/W	RIGHT-OF-WAY
S	SIGN
SDMH	STORM DRAIN MANHOLE
STL	STREET LIGHT
TS	TRAFFIC SIGNAL
TYP	TYPICAL

LEGEND

1 ELEV.	NODE # & ELEV.
L=165'	FLOWLINE LENGTH
A=1.44 AC	SUB AREA
	FLOWLINE
	TRIBUTARY BOUNDARY

TOTAL ON-SITE POST-DEVELOPMENT FLOWS LEAVING THE SITE TO MARSHALL CREEK
Q(10) = 2.41 CFS
Q(100) = 4.32 CFS

SOURCE OF NO BUILD ZONE

REPORT DATED NOVEMBER 23, 2016
FILE NO. 00547-01, DOC. NO. 16-11-710
AS CONDUCTED BY
EARTH SYSTEMS SOUTHWEST
1680 ILLINOIS AVE, SUITE 20
PERRIS, CA 92571
PHONE: (951) 928-9799
FAX: (951) 928-9948

SOURCE OF FLOOD LIMITS

REPORT DATED JANUARY 7, 2020
PROJECT NO. R311806.01
AS CONDUCTED BY
HUITT-ZOLLARS, INC.
2603 MAIN STREET, SUITE 400
IRVINE, CA 92614
PHONE: (949) 988-5815
FAX: (949) 988-5820

SOIL ENGINEER

REPORT DATED APRIL 7, 2020
PROJECT NO. 13627-1
AS CONDUCTED BY
LOR GEOTECHNICAL GROUP, INC.
6121 QUAIL VALLEY COURT
RIVERSIDE, CA 92507
PHONE: (951) 653-1760
FAX: (951) 653-1741

SOURCE OF SURVEY

TOPOGRAPHIC SURVEY
DATED NOVEMBER 2017
AS CONDUCTED BY
INLAND AERIAL SURVEYS, INC.
7117 ARLINGTON AVE., SUITE A
RIVERSIDE, CA 92503
PHONE: (951) 687-4252

PROPERTY OWNER/APPLICANT:

SANTIAGO HOLDINGS, LLC
C/O CAMDEN HOLDINGS, LLC
ATTN: MR. ARI MILLER
9454 WILSHIRE BLVD., 6TH FLOOR
BEVERLY HILLS, CA 90212
(310) 553-1031

TRIBUTARY AREA MAP
POST-DEVELOPMENT
PP2019-0222 / CUP2017-0010 / PM2019-0006 - BEAUMONT VILLAGE
PROPOSED COMMERCIAL RETAIL CENTER
APN 404-190-001 & 003
NORTHWEST CORNER OF BEAUMONT AVENUE & OAK VALLEY PARKWAY
CITY OF BEAUMONT

- land planning
- civil engineering
- landscape architecture

est. 1989
phone 909.748.7777
fax 909.748.7776
thatcher engineering & associates, inc.
1461 ford street, suite 105, redlands, ca 92373

REGISTERED PROFESSIONAL ENGINEER
PATRICK C. FLANAGAN, JR.
No. 86046
Exp. 9/30/22
CIVIL
STATE OF CALIFORNIA

Patrick C. Flanagan, Jr. R.C.E. 86046 Exp. Sep 30, 2022

Job Number:	Date Prepared:	Drawn By:	Reference Number:
171601	2/4/21	RL	171601TAM

171601TAM

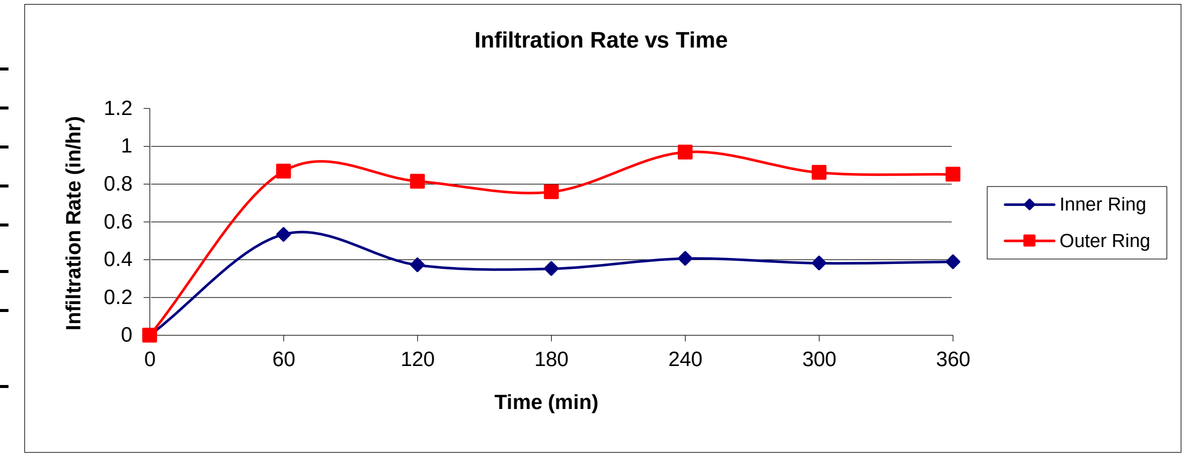
SITE PLAN

PROJECT NO.:	13627.11
ENCLOSURE:	1
DATE:	March 2022
SCALE:	1" ≈ 100'
PROJECT:	Beaumont Village, Beaumont, California
CLIENT:	Santiago Holdings, LLC

LOR GEOTECHNICAL GROUP, INC.

DOUBLE RING INFILTROMETER TEST DATA

Project:	Beaumont Village	**Client:**	Santiago Holdings, LLC
Project No.:	13627.11	**Test Date:**	March 2, 2022
Soil Classification:	(SM) Silty sand	**Test Hole No.:**	DRI-1
Depth of Test Hole:	12.5 ft.	**Test Hole Diameter:**	12 in. inner, 24 in. annular
Liquid Used:	Tap Water	**Date Excavated:**	March 1, 2022
Area of Rings:	Inner = 0.785 ft^2 , Annular 2.36 ft^2	**pH:**	7.8
Tested By:	A.L.	**Depth of Water in Rings:**	3.0 in.
Liquid Level Maintained Using:	Vacuum Seal	**Ring Penetration:**	3.5 in.
Depth to Water Table:	300+ ft		

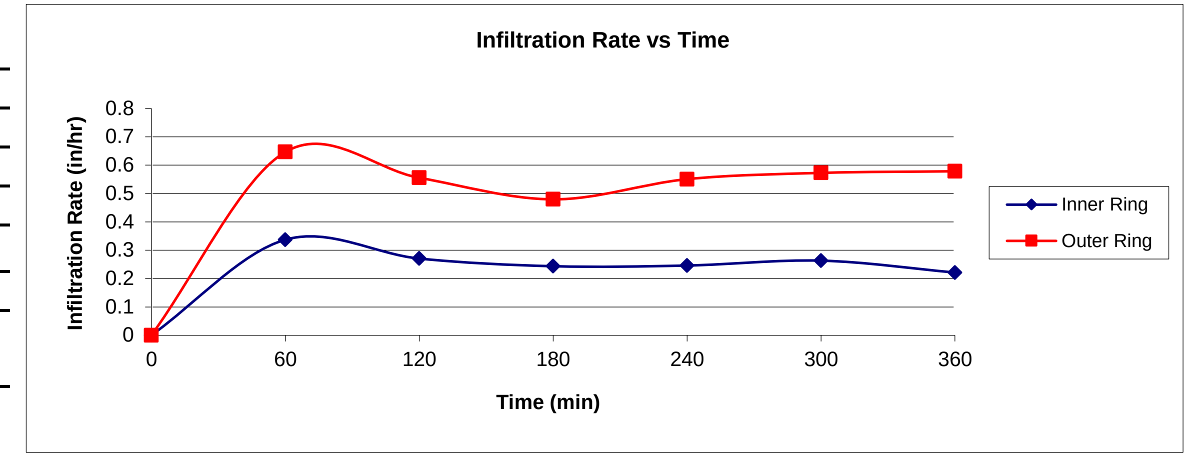


TEST PERIOD

TRIAL NO.	INNER TIME		INNER TIME INTERVAL (minutes)	INNER TOTAL ELASPED TIME (minutes)	ANNULAR SPACE TIME	ANNULAR SPACE TIME INTERVAL (minutes)	ANNULAR SPACE TOTAL ELASPED TIME (minutes)	WATER USED (lbs.) inner	WATER USED (lbs.) annular space	WATER USED (gal) inner	WATER USED (gal) annular space	INFILTRATION RATE (gal/sf.day) inner	INFILTRATION RATE (gal/sf.day) annular space	INFILTRATION RATE (in/hr) inner	INFILTRATION RATE (in/hr) annular space	LIQUID TEMP (°F)	REMARKS
1	S	9:24	60	60	9:24	60	60	2.17	10.61	0.261	1.274	8.0	13.0	0.5	0.9	68	
	E	10:24			10:24											68	
2	S	10:24	60	120	10:24	60	120	1.51	9.96	0.181	1.196	5.5	12.2	0.4	0.8	68	
	E	11:24			11:24											68	
3	S	11:24	60	180	11:24	60	180	1.43	9.27	0.172	1.113	5.2	11.3	0.4	0.8	68	
	E	12:24			12:24											69	
4	S	12:24	60	240	12:24	60	240	1.65	11.84	0.198	1.421	6.1	14.5	0.4	1.0	69	
	E	13:24			13:24											69	
5	S	13:27	60	300	13:27	60	300	1.55	10.52	0.186	1.263	5.7	12.8	0.4	0.9	69	refilled outer
	E	14:27			14:27											70	
6	S	14:27	60	360	14:27	60	360	1.58	10.40	0.190	1.248	5.8	12.7	0.4	0.9	70	
	E	15:27			15:27											70	

DOUBLE RING INFILTROMETER TEST DATA

Project:	Beaumont Village	**Client:**	Santiago Holdings, LLC
Project No.:	13627.11	**Test Date:**	March 2, 2022
Soil Classification:	(SM) Silty sand	**Test Hole No.:**	DRI-2
Depth of Test Hole:	12.5 ft.	**Test Hole Diameter:**	12 in. inner, 24 in. annular
Liquid Used:	Tap Water	**Date Excavated:**	March 1, 2022
Area of Rings:	Inner = 0.785 ft^2 , Annular 2.36 ft^2	**pH:**	7.8
Tested By:	A.L.	**Depth of Water in Rings:**	3.5 in.
Liquid Level Maintained Using:	Vacuum Seal	**Ring Penetration:**	3.5 in.
Depth to Water Table:	300+ ft		



TEST PERIOD

TRIAL NO.	INNER				ANNULAR SPACE			WATER USED (lbs.)		WATER USED (gal)		INFILTRATION RATE (gal/sf.day)		INFILTRATION RATE (in/hr)		LIQUID TEMP (°F)	REMARKS
	TIME		TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	TIME	TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	inner	annular space	inner	annular space	inner	annular space	inner	annular space		
1	S	9:40	60	60	9:40	60	60	1.37	7.90	0.164	0.948	5.0	9.6	0.3	0.6	68	
	E	10:40			10:40											68	
2	S	10:40	60	120	10:40	60	120	1.10	6.79	0.132	0.815	4.0	8.3	0.3	0.6	68	
	E	11:40			11:40											68	
3	S	11:40	60	180	11:40	60	180	0.99	5.86	0.119	0.703	3.6	7.2	0.2	0.5	68	
	E	12:40			12:40											69	
4	S	12:40	60	240	12:40	60	240	1.00	6.73	0.120	0.808	3.7	8.2	0.2	0.6	69	
	E	13:40			13:40											69	
5	S	13:40	60	300	13:40	60	300	1.07	7.00	0.128	0.840	3.9	8.5	0.3	0.6	69	
	E	14:40			14:40											70	
6	S	14:40	60	360	14:40	60	360	0.90	7.07	0.108	0.849	3.3	8.6	0.2	0.6	70	
	E	15:40			15:40											70	

PRELIMINARY GEOTECHNICAL AND INFILTRATION FEASIBILITY INVESTIGATION PROPOSED RETAIL DEVELOPMENT APN's 404-190-001& -003 NORTHWEST CORNER OF BEAUMONT AVENUE AND OAK VALLEY PARKWAY BEAUMONT, CALIFORNIA

PROJECT NO. 13627.1
APRIL 7, 2020

Prepared For:

Santiago Holdings, LLC
c/o Thatcher Engineering & Associates
1461 Ford Street, Suite 105
Redlands, California 92373

Attention: Ms. Kristin Tissot

April 7, 2020

Santiago Holdings, LLC
c/o Thatcher Engineering & Associates, Inc.
1461 Ford Street, Suite 105
Redlands, California 92373

Project No. 13627.1

Attention: Ms. Kristin Tissot

Subject: Preliminary Geotechnical and Infiltration Feasibility Investigation, Proposed Retail Development, APN's 404-190-001 and -003, Northwest Corner of Beaumont Avenue and Oak Valley Parkway, Beaumont, California.

LOR Geotechnical Group, Inc., is pleased to present this report summarizing our geotechnical investigation for the above referenced project. In summary, it is our opinion that the proposed development is feasible from a geotechnical perspective, provided the recommendations presented in the attached report are incorporated into design and construction.

To provide adequate support for the proposed structures, we recommend that a compacted fill mat be constructed beneath footings and slabs. The compacted fill mat will provide a dense, high-strength soil layer to uniformly distribute the anticipated foundation loads over the underlying soils. All fill/topsoil material and any loose alluvial materials should be removed from structural areas and areas to receive engineered compacted fill. The data developed during this investigation indicates that removals on the order of 3 to 5 feet from existing grades will be required to encounter competent native materials within the majority of the proposed development portion of the site and that removals on the order of 10 to 14 feet from existing grades will be required to encounter competent native materials within areas of the previous fault trenching that had been conducted by others. The given removal depths are preliminary. The actual depths of the removals should be determined during the grading operations by observation and/or in-place density testing.

Very low expansive soils and poor R-value quality soils were encountered on the site. A negligible sulfate content was found for the soils tested. Near completion and/or at the completion of site grading, additional foundation and subgrade soils should be tested to further evaluate their expansion potential, soluble sulfate content, and R-value quality.

Variable infiltration rates were obtained for the soils tested.

LOR Geotechnical Group, Inc.

Table of Contents

Page No.

Table of Contents

Page No.

Table of Contents

Page No.

INTRODUCTION

During March and April of 2020, a Preliminary Geotechnical and Infiltration Feasibility Investigation was performed by LOR Geotechnical Group, Inc. for proposed retail development of APN's 404-190-001 and -003 in the City of Beaumont, California. The purpose of this investigation was to conduct a technical evaluation of the geologic setting of the site and to provide geotechnical design recommendations for the proposed improvements. The scope of our services included:

- Review of available geotechnical literature, reports, maps, and agency information pertinent to the study area;
- Interpretation of aerial photographs of the site and surrounding region dated 1966 through 2018;
- Geologic field reconnaissance mapping to verify the areal distribution of earth units and significance of surficial features as compiled from the reviewed documents, literature, and reports;
- A subsurface field investigation to determine the physical soil conditions pertinent to the proposed development;
- Infiltration testing via the double ring infiltrometer method.
- Laboratory testing of selected soil samples obtained during the field investigation;
- Development of geotechnical recommendations for site grading and foundation design; and
- Preparation of this report summarizing our findings and providing conclusions and recommendations for site development.

The approximate location of the site is shown on the attached Index Map, Enclosure A-1, within Appendix A.

To orient our investigation at the site, you provided us with a Site Plan, prepared by Thatcher Engineering & Associates, Inc., dated February 18, 2020, that showed the proposed development. As noted on that map, the site will be developed with seven retail structures, including a gas station, and the associated improvements. The Site Plan was utilized as a base map for our field investigation and is presented as Enclosure A-2, within Appendix A.

PROJECT CONSIDERATIONS

The proposed structures are anticipated to be one-story in height and are anticipated to be of wood or steel frame construction with an exterior plaster veneer or of concrete construction. Light to moderate foundation loads are anticipated with such structures. Cuts up to 6± feet and fills up to 10± feet are proposed for the project (Thatcher, 2020).

EXISTING SITE CONDITIONS

The subject site consists of approximately 10± acres of vacant land with an irregular outline, located along the west side of Beaumont Avenue and the north side of Oak Valley Parkway. The topography of the proposed development area of the site is relatively planar and consists of a gentle slope to the west. However, within the southwest portion of the site, a small topographic high is present. Within the northern and western portion of the property, where no current development is proposed, the area consists of a natural drainage (Marshall Creek) with near vertical slopes up to approximately 20 feet in height, locally. This active, incised channel area contains a light growth of shrubs. The remainder of the site contains a light growth of weeds with large trees along the eastern and southeastern boundaries. A small concrete slab was present in the southeast corner of the site. Cross fencing was present in the northeast portion of the site.

The site is bound on the north and west by vacant land, similar to the site. A shopping center lies east of the site, across Beaumont Avenue, a partially improved roadway. Across Oak Valley Parkway, a partially improved roadway to the south, are large lot single family residences.

AERIAL PHOTOGRAPH ANALYSIS

The aerial photographs reviewed consisted of vertical aerial photographs of varying scales. We reviewed imagery available from Google Earth (2020) and from Historic Aerials (2020).

In summary, the site contained two residences with small outbuildings in the northeast and southeast corners in 1966, the earliest photograph available. The structures in the southeast corner were gone by the time of the 1972 photograph and the structures in the northeast corner were gone by the time of the 2003 photograph.

PREVIOUS GEOLOGIC REPORT

A previous geologic investigation was conducted for the site by Earth Systems Southwest in 2016. At that time, the proposed development of the site was a shopping center, similar to that which is currently proposed. Their report was conducted to address potential fault-rupture hazard at the site. In brief summary, their work consisted of reviewing previous geologic work conducted for the site and excavating 7 trenches to depths of approximately 10 to 12 feet. Trenches ranged in length from approximately 58 to 284 feet for a total of approximately 920 feet. The trenches were T-shaped and approximately 19 feet wide at the top, with 7.5 foot wide benches on either side of the deepest 4 foot wide portion of the trench. The report also states that Salem performed a 630 foot long fault trench in 2007. The depth of this trench was approximately 10 to 14 feet. Based on their investigation, Earth Systems Southwest recommended structural setbacks for habitable structures of approximately 25 to 50 feet beyond each side of the two mapped active fault zones, mapping of the fault zone locations during mass grading to confirm the fault zones presented, and removal and replacement of the backfill for both Salem's and Earth Systems Southwest's fault trenches. The location of Earth Systems Southwest's fault trenches and subsequent structural setback zones were surveyed by Tuttle Engineering. Salem's fault trench location was reportedly recorded based on hand held gps data.

FIELD EXPLORATION PROGRAM

Our subsurface field exploration program was conducted on March 12th and March 24th, 2020 and consisted of drilling 9 exploratory borings with a truck-mounted Mobile B-61 drill rig and a track mounted drill rig, both equipped with 8-inch diameter hollow stem augers. The borings were drilled to depths of approximately 16.5 to 51.5 feet below the existing ground surface. The approximate locations of our exploratory borings are presented on the attached Site Plan, Enclosure A-2 within Appendix A.

The subsurface conditions encountered in the exploratory borings were logged by a geologist from this firm. Relatively undisturbed and bulk samples were obtained at a maximum depth interval of 5 feet and returned to our geotechnical laboratory in sealed containers for further testing and evaluation. A detailed description of the field exploration program and the boring logs are presented in Appendix B.

LABORATORY TESTING PROGRAM

Selected soil samples obtained during the field investigation were subjected to laboratory testing to evaluate their physical and engineering properties. Laboratory testing included in-place moisture content and dry density, laboratory compaction characteristics, direct shear, sieve analysis, sand equivalent, R-value, expansion index consolidation, and soluble sulfate content. A detailed description of the laboratory testing program and the test results are presented in Appendix C.

GEOLOGIC CONDITIONS

Regional Geologic Setting

The subject site is located within the City of Beaumont, which in turn is situated along the junction of two major geomorphic provinces of southern California, or at the end of the Peninsular Ranges geomorphic province where it meets the Transverse Ranges geomorphic province. The Peninsular Ranges include a series of small northwestern trending mountains, separated by wide flat valleys, that extend from the Los Angeles region southeastward into Baja California. The northern margin of this province butts up against a series of mountain ranges that lie in a transverse direction to this normal northwestern trend, or extend east and west. These mountains include the Santa Monica Mountains, the San Gabriel Mountains, and the San Bernardino Mountains. In the Beaumont locality these two major provinces are termed the Peninsular Ranges Block to the south and the San Bernardino Mountains Block to the north and are separated by a series of complex faults known collectively as the San Andreas fault zone. In this tectonically complex area the Peninsular Ranges Block is generally sliding to the northwest, while partially being thrust underneath the San Bernardino Mountains Block. Therefore, the resulting faults end up with a complex mix of strike slip and thrust faults. The Banning and San Andreas faults, located to the north and northeast of the site, as well as the San Jacinto fault to the southwest, are all strike slip faults with right lateral offsets. However, the San Gorgonio Pass fault zone, which lies to the east of the site, is a result of compressional thrust faulting. In addition, differential movement along these faults has even led to the formation of the Beaumont Plains fault zone which is a series of tension, or pull apart, faults which traverse the site (Earth Systems, 2016). Therefore, the topography of the land in this region has been drastically altered by differing tectonic forces. The subject site itself is located along the central portion of a relatively broad fan-like surface known as the Beaumont Plain which extends from Calimesa southeast to Banning. This plain, along with the Badlands to the west, is the result of erosion of the mountains onto a valley like setting, then uplifting and offsetting of the region by interactions along and between the San Andreas and San Jacinto faults, then continued offsetting of the region along the San Andreas fault, and finally incising by drainages flowing from the northeast to the southwest.

In the vicinity of the subject site, along the southern edge of the Beaumont valley, the basement rocks in this region are considered to be igneous and metamorphic crystalline rocks, none of which are exposed at the subject site. These rocks have been covered with a relatively thick sequence of sedimentary rocks of the San Timoteo Formation, that outcrop along the flanks of the San Gorgonio Mountains to the south, and older alluvial sediments deposited from streams flowing to the north and northwest from the mountains to the south.

The geology of the site and immediate surrounding region as mapped by Dibblee (2003) is shown on Enclosure A-3, within Appendix A.

<u>Site Geologic Conditions</u>

<u>Fill/Topsoil:</u> As encountered within our exploratory borings placed at the site, fill/topsoil materials to a depth of 1 foot are present. These materials mainly consist of silty sand. The fill/topsoil materials are a result of past and current weed abatement practices (discing). Deeper fill materials are present, mainly associated with the previous fault trenching by others, and in the general areas of the previously noted residences and outbuildings.

<u>Older Alluvium:</u> Underlying the fill/topsoil materials within the currently proposed development portion of the site, older alluvial materials were encountered underlying the fill/topsoil materials noted above within our exploratory borings. These units primarily consist of silty sand with lessor units of well graded sand, sandy silt, poorly graded sand with silt, well graded sand with silt, and lean clay with sand to clayey sand. The older alluvial materials were in a relatively medium dense state upon first encounter becoming dense to very dense quickly with depth based on our equivalent Standard Penetration Test (SPT) data and in-place density testing. Consolidation testing indicated normal consolidation characteristics.

A detailed description of the subsurface soil conditions as encountered within our exploratory borings is presented on the Boring Logs within Appendix B.

Groundwater Hydrology

Groundwater was not encountered within our exploratory borings advanced to a maximum depth of approximately 50 feet below the existing ground surface.

Records for nearby wells which were readily available from the State of California Department of Water Resources online database (CDWR, 2020) were reviewed as a part of this investigation. This database indicates that the nearest state water wells are numbers 02S01W33R001S and -002S which are located approximately 0.6 kilometers (0.3 miles) to the west. These wells lie at elevations of approximately 2,602 and 2,622 feet above mean sea level (m.s.l.), respectively. Only one recorded groundwater measurement was available for well number -001S. The record indicates that groundwater in this well lied at a depth of 363 feet in October of 1982. Records for well number -002S were available from April of 2005 to October of 2010. Groundwater is noted to be getting sightly deeper over that time from a depth of approximately 384 feet in 2005 to a depth of approximately 414 feet in 2010.

As illustrated on Enclosure A-2, the lowest elevation at the site is approximately 2,614 feet above m.s.l. in the northwest portion of the currently proposed development area. Based on the information above, groundwater is anticipated to be at a depth of approximately 375 feet.

Surface Runoff

Current surface runoff of precipitation waters across the site is generally as sheet flow to the on-site drainage (Marshall Creek) which in turn flows to the southwest.

Mass Movement

The majority of the site lies on a relatively flat surface. The occurrence of mass movement failures such as landslides, rockfalls, or debris flows within such areas is generally not considered common and no evidence of mass movement was observed on the site. However, the over steepened slopes adjacent to the existing Marshal Creek in the northeast portion of the site were noted to exhibit some local surficial mass movement in the form of wedge failures resulting from undercutting of the steep banks.

Faulting

Based on the study by Earth Systems Southwest, known active faults exist at the site (2016). Recommendations were provided by Earth Systems Southwest which included set back zones for habitable structures from the two active faults identified.

As previously noted, the subject site lies near the middle of a large wedge shaped area in between the San Jacinto fault, located approximately 10 kilometers (6.2 miles) to the southwest, and the San Andreas fault which lies approximately 11.5 kilometers (7 miles) to the northeast. Both of these faults are considered to be major active faults which move in a right lateral strike-slip fashion with relative movement of the fault such that the southwest side moves northwest and the northeast side moves southeast during earthquakes. The San Andreas fault is considered to be the major tectonic feature of California, separating the Pacific plate and the North American plate. While estimates vary, the San Andreas fault is generally thought to have an average slip range on the order of 24 mm/yr and capable of generating large magnitude events on the order of 7.5 or greater.

The San Jacinto fault zone is a sub-parallel branch of the San Andreas fault zone, extending from the northwestern San Bernardino area, southward into the El Centro region. It is believed that the San Jacinto fault zone has an average slip rate of about 12 mm/year and is capable of producing an earthquake magnitude on the order of 6.5 or greater.

Lying in between these two faults are numerous smaller faults with varying types of motion. Perhaps the largest of these, based on length and estimated amounts of past displacement in the region around the site, is the Banning fault. Based on mapping conducted by the U.S.G.S., the Banning fault bifurcates off of the San Andreas fault just north of Indio, then extends through the Banning-Beaumont pass area and into the Calimesa area. Some authors refer to this portion of this fault across the Beaumont region as the San Gorgonio Pass fault system (Matti et al, 1992). These faults generally extend along the base of the hills north of Beaumont, approximately 3 to 5 kilometers (2 to 3 miles) north of the site.

Differential movement along the faults discussed above has resulted in the extension of the Beaumont Plain. This has created a series of northwest trending en-echelon fault scarps, referred to as normal faults, in which the center block drops downward along an irregular fault line. These have collectively been named the Beaumont Plain fault zone, which may have some thrusting motion along the northern portions. The motions and activities of these faults are poorly understood. However, the study by Earth Systems

Southwest, (2016) indicates that two of these faults are active and that they traverse the site.

Current standards of practice have included a discussion of all potential earthquake sources within a 100 kilometer (62 mile) radius. However, while there are other large earthquake faults within a 100 kilometer (62 mile) radius of the site, none of these are considered as relevant to the site as the faults described above, due to their greater distance and smaller anticipated magnitudes.

Historical Seismicity

In order to obtain a general perspective of the historical seismicity of the site and surrounding region a search was conducted for seismic events at and around the area within various radii. This search was conducted utilizing the historical seismic search website of the U.S.G.S. (2020). This website conducts a search of a user selected cataloged seismic events database, within a specified radius and selected magnitudes, and then plots the events onto a map. At the time of our search, the database contained data from January 1, 1932 through April 2, 2020.

In our first search, the general seismicity of the region was analyzed by selecting an epicenter map listing all events of magnitude 4.0 and greater, recorded since 1932, within a 100 kilometer (62 mile)radius of the site, in accordance with guidelines of the California Division of Mines and Geology. This map illustrates the regional seismic history of moderate to large events. As depicted on Enclosure A-4, within Appendix A, the site lies within a relatively active region with the San Jacinto and the San Andreas faults trending southeast to northwest.

In the second search, the micro seismicity of the area lying within a 10 kilometer (6.2 mile) radius of the site was examined by selecting an epicenter map listing events on the order of 2.0 and greater since 1978. In addition, only the “A” events, or most accurate events were selected. Caltech indicates the accuracy of the “A” events to be approximately 1 km. The results of this search is a map that presents the seismic history around the area of the site with much greater detail, not permitted on the larger map. The reason for limiting the events to the last 40± years on the detail map is to enhance the accuracy of the map. Events recorded prior the mid 1970's are generally considered to be less accurate due to advancements in technology. As depicted on this map, Enclosure A-5, the subject site lies within an area underlain by very numerous small events in the general area. No specific trend of the events is noted. In contrast, these events are scattered across the entire region with the closest event, perhaps, occurring under the site. This would be the anticipated result of numerous earthquake faults with dipping fault planes. This factor allows the earthquake focus to spread out across a wide area.

In summary, the historical seismicity of the site entails numerous small to medium magnitude earthquake events occurring around the subject site, predominately associated with the presence of the faults described within. Any future developments at the subject site should anticipate that moderate to large seismic events could occur very near the site.

Secondary Seismic Hazards

Other secondary seismic hazards generally associated with severe ground shaking during an earthquake include liquefaction, seiches and tsunamis, earthquake induced flooding, landsliding and rockfalls, and seismic-induced settlement.

Liquefaction: The potential for liquefaction generally occurs during strong ground shaking within loose granular sediments where the depth to groundwater is usually less than 50 feet. As groundwater is thought to be in excess of 50 feet beneath the site and the site is underlain by relatively dense to very dense older alluvium, the possibility of liquefaction within these units is considered nil.

Seiches/Tsunamis: The potential for the site to be affected by a seiche or tsunami (earthquake generated wave) is considered nil due to the absence of any large bodies of water near the site.

Flooding (Water Storage Facility Failure): There are no large water storage facilities located on or upstream near the site which could possibly rupture during an earthquake and affect the site by flooding.

Seismically-Induced Landsliding: As previously mentioned, evidence for past surficial mass movement of the incised bank of the on-site Marshall Creek was noted to be present locally. However, due to the relatively low relief of the site and adjacent surrounding region, the potential for deep seated landslides to occur at the site is considered nil.

Rockfalls: No large, exposed, loose or unrooted boulders that could affect the integrity of the site are present upon or above the site.

Seismically-Induced Settlement: Settlement generally occurs within areas of loose, granular soils with relatively low density. Since the site is underlain by dense to very dense materials, the potential for settlement is considered low. In addition, the earthwork operations recommended to be conducted during the development of the site will mitigate any near surface loose soil conditions.

SOILS AND SEISMIC DESIGN CRITERIA (California Building Code 2019)

Design requirements for structures can be found within Chapter 16 of the 2019 California Building Code (CBC) based on building type, use and/or occupancy. The classification of use and occupancy of all proposed structures at the site, and thus the design requirements, shall be the responsibility of the structural engineer and the building official. For structures at the site to be designed in accordance with the provisions of Chapter 16, the subject site specific criteria is provided below:

Site Classification

Chapter 20 of the ASCE 7-16 defines six possible site classes for earth materials that underlie any given site. Bedrock is assigned one of three of these six site classes and these are: A, B, or C. Per ASCE 7-16, Site Class A and Site Class B shall be measured on-site or estimated by a geotechnical engineer, engineering geologist or seismologist for competent rock with moderate fracturing and weathering. Site Class A and Site Class B shall not be used if more than 10 feet of soil is between the rock surface and bottom of the spread footing or mat foundation. Site Class C can be used for very dense soil and soft rock with values greater than 50 blows per foot. Site Class D can be used for stiff soil with values ranging from 15 to 50 blows per foot. Site Class E is for soft clay soils with values less than 15 blows per foot. Our Standard Penetration Test (SPT) data indicate that the materials beneath the site are considered Site Class D soils.

CBC Earthquake Design Summary

As determined in the previous section, earthquake design criteria have been formulated for the site. However, these values should be reviewed and the final design should be performed by a qualified structural engineer familiar with the region. Our design values are provided in Appendix E.

INFILTRATION TESTING AND TEST RESULTS

Eight double ring infiltration tests were conducted at the general locations and depths requested. The locations are illustrated on Enclosure A-2. Test pits were excavated to depths ranging from approximately 6 to 14 feet below the existing ground surface and a 12-inch diameter casing was installed within the center of the test locations with a 24-inch diameter casing centered around it. Each 20-inch tall casing was imbedded to a depth of approximately 3.5-inches. The test locations were tested immediately after the casings were installed by filling both the inside and outside casings and maintaining a water level to depths ranging from approximately 3 to 5.5 inches.

The testing procedure was as follows:

Both the inside and outside areas of the casings were filled with water to a level of approximately 3 to 5.5 inches above the ground surface. Water was then metered to maintain this water level within both rings. The volume of water use in a given time period was recorded at various time intervals to establish the infiltration rate of the water within the inner ring.

The infiltration rate is measured as the drop in water level compared to the permeability of the bottom surface area soils in the bottom of the test hole. If casing is not used, the water column in the test hole is allowed to seep into both the bottom and sidewalls of the hole, for which the drop in water level must be corrected and reduced for the volume of water seeping into the sidewall and for the diameter of the test hole. As described above, the tests described herein were conducted using a 12-inch diameter inner casing and 24-inch diameter outer casing.

The test holes were found to have the following measured clear water infiltration rates:

Test No.	Depth (ft)*	Clear Water Infiltration Rate** in/hr
DRI-1	6	3.1
DRI-2	10	1.5
DRI-3	12	0.9
DRI-4	12	0.4
DRI-5	12	0.3
DRI-6	11	0.3
DRI-7	11	8.9
DRI-8	14	4.0
* depth measured below existing ground surface ** final reading		

The results of our infiltration testing are attached as Enclosures D-1 through D-8.

CONCLUSIONS

General

This investigation provides a broad overview of the geotechnical and geologic factors which are expected to influence future site planning and development. On the basis of our field investigation and testing program, it is the opinion of LOR Geotechnical Group, Inc., that the proposed development is feasible from a geotechnical standpoint, provided the recommendations presented in this report are incorporated into design and implemented during grading and construction.

The subsurface conditions encountered in our exploratory borings are indicative of the locations explored. The subsurface conditions presented here are not to be construed as being present the same everywhere on the site.

If conditions are encountered during the construction of the project which differ significantly from those presented in this report, this firm should be notified immediately so we may assess the impact to the recommendations provided.

Foundation Support

Based upon the field investigation and test data, it is our opinion that the existing fill/topsoil and fill soils will not, in their present condition, provide uniform and/or adequate support for the proposed improvements. Left as is, this condition could cause unacceptable differential and/or overall settlements upon application of the anticipated foundation loads.

To provide adequate support for the proposed structural improvements, we recommend that a compacted fill mat be constructed beneath footings and slabs. This compacted fill mat will provide a dense, high-strength soil layer to uniformly distribute the anticipated foundation loads over the underlying soils. Conventional foundation systems, using either individual spread footings and/or continuous wall footings, will provide adequate support for the anticipated downward and lateral loads when utilized in conjunction with the recommended fill mat.

Soil Expansiveness

Our laboratory testing found that the soils tested have a very low expansion potential. Therefore, conventional design and construction should be applicable for the project.

Careful evaluation of on-site soils and any import fill for their expansion potential should be conducted during the grading operation.

Sulfate Protection

The results of the soluble sulfate tests conducted on selected subgrade soils expected to be encountered at foundation levels indicate that there is a negligible sulfate exposure to concrete elements in contact with the on site soils per the 2019 CBC. Therefore, no specific recommendations are given for concrete elements to be in contact with the onsite soils.

Geologic Mitigations

Marshall Creek is presented as a partially incised natural drainage along the north and western portion of the site. This has resulted in near vertical slopes up to approximately 20 feet high. The taller portion of these over steepened slopes were noted to exhibit some failure as soil fall. While the active portion of the drainage is not currently directed towards these, during heavy rainfall and/or flooding events, continued erosion may occur.

Seismicity

Seismic ground rupture is generally considered most likely to occur along pre-existing active faults. Since no known faults are known to exist at, or project into the site, the probability of ground surface rupture occurring at the site is considered nil.

Due to the site's close proximity to the faults described above, it is reasonable to expect a strong ground motion seismic event to occur during the lifetime of the proposed development on the site. Large earthquakes could occur on other faults in the general area, but because of their lesser anticipated magnitude and/or greater distance, they are considered less significant than the faults described above from a ground motion standpoint.

The effects of ground shaking anticipated at the subject site should be mitigated by the seismic design requirements and procedures outlined in Chapter 16 of the California Building Code. However, it should be noted that the current building code requires the minimum design to allow a structure to remain standing after a seismic event, in order to allow for safe evacuation. A structure built to code may still sustain damage which might ultimately result in the demolishing of the structure (Larson and Slosson, 1992).

RECOMMENDATIONS

Geologic Recommendations

Provisions should be made to protect the area of the site adjacent to the existing southern side of the on-site Marshall Creek. Such measures may include: channelization of the creek and/or slope protection to mitigate any future erosion. Based on our review of the Site Plan provided, currently proposed structures appear to set back a significant distance from the existing over steepened slope. Should the orientation of the structures change, this firm should be provided plans so that we may access any potential impacts.

The Restricted Use Zone, for habitable structures previously established by Earth Systems Southwest (2016) should be incorporated into the project.

During site rough grading, all removals and over-excavation bottom areas should be observed by the project engineering geologist in order to evaluate the geologic conditions exposed. Although not anticipated, widening of, or additions to, the established Restricted Use Zones is a possibility should evidence for active faulting near the limits or outside of the zone be encountered.

General Site Grading

It is imperative that no clearing and/or grading operations be performed without the presence of a qualified geotechnical engineer. An on-site, pre-job meeting with the owner, the developer, the contractor, and geotechnical engineer should occur prior to all grading related operations. Operations undertaken at the site without the geotechnical engineer present may result in exclusions of affected areas from the final compaction report for the project.

Grading of the subject site should be performed in accordance with the following recommendations as well as applicable portions of the California Building Code, and/or applicable local ordinances.

All areas to be graded should be stripped of significant vegetation and other deleterious materials.

It is our recommendation that any existing fills under any proposed flatwork and/or paved areas be removed and replaced with engineered compacted fill. If this is not done, premature structural distress (settlement) of the flatwork and pavement may occur. Any undocumented fills encountered during grading should be completely removed and cleaned of significant deleterious materials. These may then be reused as compacted fill.

Cavities created by removal of undocumented fill soils and/or subsurface obstructions should be thoroughly cleaned of loose soil, organic matter and other deleterious materials, shaped to provide access for construction equipment, and backfilled as recommended in the following Engineered Compacted Fill section of this report.

Initial Site Preparation

Any and all existing uncontrolled fill/topsoil, fault trench backfill, and loose/soft native alluvial soils should be removed from structural areas and areas to receive structural fills. The data developed during this investigation indicates that within the majority of the site, removals on the order of 3 to 5 feet from existing grades will be required to encounter competent native materials. However, deeper removals on the order of 10 to 14 feet will be required within the areas of fault trenches excavated by others (Earth Systems Southwest, 2016). Removals should extend horizontally at a distance equal to the depth of the removals plus proposed fill and at least a minimum of 5 feet. The actual depths of removals should be determined during the grading operation by observation and/or by in-place density testing.

As previously discussed, all removal and over-excavation bottom areas should be observed by the project engineering geologist prior to processing and/or fill placement.

Preparation of Fill Areas

After completion of the removals described above and prior to placing fill, the surfaces of all areas to receive fill should be scarified to a depth of at least 6 inches. The scarified soil should be brought to near optimum moisture content and compacted to a relative compaction of at least 90 percent (ASTM D 1557).

Preparation of Shallow Foundation Areas

All footings should rest upon a minimum of 24 inches of properly compacted fill material placed over competent natural alluvial soils. In areas where the required fill thickness is not accomplished by the removal of unsuitable soils, the footing areas should be further subexcavated to a depth of at least 24 inches below the proposed footing base grade, with the subexcavation extending at least 5 feet beyond the footing lines. The bottom of this excavation should then be scarified to a depth of at least 6 inches, brought to between 2 to 4 percent optimum moisture content, and recompacted to at least 90 percent relative compaction (ASTM D 1557) prior to refilling the excavation to grade as properly compacted fill. Fill areas should not be constructed so as to place structures across any area where the maximum depth of fill to minimum depth of fill is greater than a 3:1 ratio.

To provide adequate support, concrete slabs-on-grade should bear on a minimum of 24 inches of compacted soil. The remedial grading recommended above is anticipated to accomplish the minimum 24 inches of compacted fill. The final pad surfaces should be rolled to provide smooth, dense surfaces upon which to place the concrete.

No structure should be placed across any areas where the ratio of the maximum depth of fill to minimum depth of fill is greater than a 3 to 1 ratio as measured from the bottom of the footing. For example, if one edge of the building pad of a cut-to-fill transition lot requires 10 feet of fill, then the cut portion of the lot should be over-excavated to a minimum of 3 feet below the footing elevations.

Engineered Compacted Fill

Unless approved by the geotechnical engineer, rock or similar irreducible material with a maximum dimension greater than 6 inches should not be buried or placed in fills.

Import fill, if required, should be inorganic, non-expansive granular soils free from rocks or lumps greater than 6 inches in maximum dimension. Sources for import fill should be approved by the geotechnical engineer prior to their use.

Fill should be spread in maximum 8-inch uniform, loose lifts, with each lift brought to at or near optimum moisture content prior to, during and/or after placement, and compacted to a relative compaction of at least 90 percent in accordance with ASTM D 1557.

Based upon the relative compaction of the near surface soils determined during this investigation and the relative compaction anticipated for compacted fill soil, we estimate a compaction shrinkage factor of approximately 10 to 15 percent. Therefore, 1.10 to 1.15 cubic yards of in-place materials would be necessary to yield one cubic yard of properly compacted fill material. Subsidence is anticipated to be 0.10 feet. These values are for estimating purposes only, and are exclusive of losses due to stripping or the removal of subsurface obstructions.

These values may vary due to differing conditions within the project boundaries and the limitations of this investigation. Shrinkage should be monitored during construction. If percentages vary, provisions should be made to revise final grades or adjust quantities of borrow or export.

Short-Term Excavations

Following the California Occupational and Safety Health Act (CAL-OSHA) requirements, excavations 5 feet deep and greater should be sloped or shored. All excavations and shoring should conform to CAL-OSHA requirements.

Short-term excavations 5-feet deep and greater shall conform to Title 8 of the California Code of Regulations, Construction Safety Orders, Section 1504 and 1539 through 1547.

Based on our exploratory borings, it appears that Type C soil is the predominant type of soil on the project and all short-term excavations should be based on this type of soil. Deviation from the standard short-term slopes are permitted using Option 4, Design by a Registered Professional Engineer (Section 1541.1).

Short-term slope construction and maintenance are the responsibility of the contractor, and should be a consideration of his methods of operation and the actual soil conditions encountered.

Slope Construction

Preliminary data indicates that cut and fill slopes should be constructed no steeper than two horizontal to one vertical. Fill slopes should be overfilled during construction and then cut back to expose fully compacted soil. A suitable alternative would be to compact the slopes during construction, then roll the final slopes to provide dense, erosion-resistant surfaces.

Where fills are to be placed against existing slopes steeper than five horizontal to one vertical, the existing slopes should be properly keyed and benched into competent native materials. The key, constructed across the toe of the slope, should be a minimum of 12 to 15 feet wide, a minimum of 2 feet deep at the toe, and sloped back to 2 percent. Benches should be constructed at approximately 2 to 4 foot vertical intervals.

Slope Protection

Since the site soils are susceptible to erosion by running water, measures should be provided to prevent surface water from flowing over slope faces. Slopes at the project should be planted with a deep rooted ground cover as soon as possible after completion. The use of succulent ground covers such as iceplant or sedum is not recommended. If watering is necessary to sustain plant growth on slopes, the watering system should be monitored to assure proper operation and to prevent over watering.

Shallow Foundation Design

If the site is prepared as recommended, the proposed structures may be safely founded on conventional shallow foundations, either individual spread footings and/or continuous wall footings, bearing on a minimum of 24 inches of engineered compacted fill or entirely upon competent older alluvium. All foundations should have a minimum width of 12 inches and be established a minimum of 12 inches below lowest adjacent grade.

For the minimum width and depth, spread foundations may be designed using an allowable bearing pressure of 2,000 pounds per square foot (psf). This bearing pressure may be increased by 100 psf for each additional foot of width, and by 400 psf for each additional foot of depth, up to a maximum of 6,000 psf.

The above values are net pressures; therefore, the weight of the foundations and the backfill over the foundations may be neglected when computing dead loads. The values apply to the maximum edge pressure for foundations subjected to eccentric loads or overturning. The recommended pressures apply for the total of dead plus frequently applied live loads, and incorporate a factor of safety of at least 3.0. The allowable bearing pressures may be increased by one-third for temporary wind or seismic loading. The resultant of the combined vertical and lateral seismic loads should act within the middle one-third of the footing width. The maximum calculated edge pressure under the toe of foundations subjected to eccentric loads or over turning should not exceed the increased allowable pressure. Buildings should be setback from slopes in accordance with the California Building Code.

Resistance to lateral loads will be provided by passive earth pressure and base friction. For footings bearing against compacted fill, passive earth pressure may be considered to be developed at a rate of 200 pounds per square foot per foot of depth. Base friction may be computed at 0.25 times the normal load. Base friction and passive earth pressure may be combined without reduction. These values are for dead load plus live load and may be increased by one-third for wind or seismic loading.

Settlement

Total settlement of individual foundations will vary depending on the width of the foundation and the actual load supported. Maximum settlement of shallow foundations designed and constructed in accordance with the preceding recommendations are estimated to be on the order of 0.5 inch. Differential settlements between adjacent footings should be about one-half of the total settlement. Settlement of all foundations is expected to occur rapidly, primarily as a result of elastic compression of supporting soils as the loads are applied, and should be essentially completed shortly after initial application of the loads.

Building Area Slab-On-Grade

Concrete floor slabs should bear on a minimum of 24 inches of engineered fill compacted to at least 90 percent (ASTM D 1557). This is anticipated to be achieved during the remedial grading recommended above. The final pad surfaces should be rolled to provide smooth, dense surfaces upon which to place the concrete.

Slabs to receive moisture-sensitive coverings should be provided with a moisture vapor barrier. This barrier may consist of an impermeable membrane. Two inches of sand over the membrane will reduce punctures and aid in obtaining a satisfactory concrete cure. The sand should be moistened just prior to placing of concrete.

The slabs should be protected from rapid and excessive moisture loss which could result in slab curling. Careful attention should be given to slab curing procedures, as the site area is subject to large temperature extremes, humidity, and strong winds.

Exterior Flatwork

To provide adequate support, exterior flatwork improvements should rest on a minimum of 12 inches of soil compacted to at least 90 percent (ASTM D 1557).

Flatwork surface should be sloped a minimum of 1 percent away from buildings and slopes, to approved drainage structures.

Wall Pressures

The design of footings for retaining structures should be performed in accordance with the recommendations described earlier under Preparation of Foundation Areas and Foundation Design. For design of retaining wall footings, the resultant of the applied loads should act in the middle one-third of the footing, and the maximum edge pressure should not exceed the basic allowable value without increase.

For design of retaining walls unrestrained against movement at the top, we recommend an active pressure of 51 pounds per square foot (psf) be used. This assumes level backfill consisting of recompacted, non-expansive, soils placed against the structures and with the backcut slope extending upward from the base of the stem at 35 degrees from the vertical or flatter.

To avoid overstressing or excessive tilting during placement of backfill behind walls, heavy compaction equipment should not be allowed within the zone delineated by a 45 degree line extending from the base of the wall to the fill surface.

The backfill directly behind the walls should be compacted using light equipment such as hand operated vibrating plates and rollers. No material larger than 3-inches in diameter should be placed in direct contact with the wall.

Wall pressures should be verified prior to construction, when the actual backfill materials and conditions have been determined. Recommended pressures are applicable only to level, non-expansive, properly drained backfill (with no additional surcharge loadings).

If inclined backfills are proposed, this firm should be contacted to develop appropriate active earth pressure parameters. Toe bearing pressure for non-structural walls on soils, not prepared as described earlier under Preparation of Foundation Areas, should not exceed California Building Code values.

Sulfate Protection

The results of the soluble sulfate tests conducted on selected subgrade soils expected to be encountered at foundation levels are presented on Enclosure C.

Based on the test results it appears that there is a negligible sulfate exposure to concrete elements in contact with on site soils. The CBC, therefore, does not recommend special design criteria for concrete elements in conduct with such materials.

Preliminary Pavement Design

Testing and design for preliminary on-site pavement was conducted in accordance with the California Highway Design Manual. Based upon our preliminary sampling and testing, and upon Traffic Indices typical for such projects, it appears that the structural section tabulated below should provide satisfactory pavement for the subject pavement improvements:

AREA	T.I.*	DESIGN R-VALUE	PRELIMINARY SECTION
Parking and Drive Areas (light vehicular traffic and occasional truck traffic)	6.0	10	0.25' AC/1.05' AB
Industrial Collector Secondary Major - Off-site	8.0	10	0.40' AC/1.35'AB
AC - Asphalt Concrete AB - Class 2 Aggregate Base *Actual Traffic Index should be determined by others			

The above structural section is predicated upon 90 percent relative compaction (ASTM D 1557) of all utility trench backfills and 95 percent relative compaction (ASTM D 1557) of the upper 12 inches of pavement subgrade soils and of any aggregate base utilized. In addition, the aggregate base should meet Caltrans specifications for Class 2 Aggregate Base.

In areas of the pavement which will receive high abrasion loads due to start-ups and stops, or where trucks will move on a tight turning radius, consideration should be given to installing concrete pads. Such pads should be a minimum of 0.5-foot thick concrete, with a 0.35-foot thick aggregate base. Concrete pads are also recommended in areas adjacent to trash storage areas where heavier loads will occur due to operation of trucks lifting trash dumpsters. The recommended 0.5 feet thick portland cement concrete (PCC) pavement section should have a minimum modulus of rupture (MR) of 550 pounds per square inch (psi).

It should be noted that all of the above pavement design was based upon the results of preliminary sampling and testing, and should be verified by additional sampling and testing during construction when the actual subgrade soils are exposed.

Infiltration

Based upon our field investigation and infiltration test data, a clear water absorption rate of approximately 0.3 to 8.9 inches per hour was obtained. It is our opinion that the design clear water rate is the clear water rate obtained during this investigation at each of the planned infiltration in the areas and depths tested.

A factor of safety should be applied as indicated by the Design Handbook for Low Impact Development Best Management Practices (RCFCWCD, 2011). The design infiltration rate should be adjusted using a factor of safety 3.0.

To ensure continued infiltration capability of the infiltration area, a program to maintain the facility should be considered. This program should include periodic removal of accumulated materials, which can slow the infiltration considerably and decrease the water quality. Materials to be removed from the catch basin areas typically consist of litter, dead plant matter, and soil fines (silts and clays). Proper maintenance of the system is critical. A maintenance program should be prepared and properly executed. At a minimum, the program should be as outlined in the Design Handbook for Low Impact Development Best Management Practices (RCFCWCD, 2011).

The program should also incorporate the recommendations contained within this report and any other jurisdictional agency requirements.

- Systems should be set back at least 10 feet from foundations or as required by the design engineer.

- Any geotextile filter fabric utilized should consist of such that it prevents soil piping but has greater permeability than the existing soil.

- During site development, care should be taken to not disturb the area(s) proposed for infiltration as changes in the soil structure could occur resulting in a change of the soil infiltration characteristics.

Construction Monitoring

Post investigative services are an important and necessary continuation of this investigation. Project plans and specifications should be reviewed by the project geotechnical consultant prior to construction to confirm that the intent of the recommendations presented herein have been incorporated into the design. Additional expansion index, R-value, and soluble sulfate testing may be required during site rough grading.

During construction, sufficient and timely geotechnical observation and testing should be provided to correlate the findings of this investigation with the actual subsurface conditions exposed during construction. Items requiring observation and testing include, but are not necessarily limited to, the following:

1. Site preparation-stripping and removals.

2. Excavations, including approval of the bottom of excavation prior to processing and/or filling.

3. Mapping of the fault zone locations during mass grading by the project engineering geologist to confirm the fault zones presented by Earth Systems Southwest (2016).

4. Processing and compaction of removal and/or over-excavation of bottom soils prior to fill placement.

5. Subgrade preparation for pavements and slabs-on-grade.

6. Placement of engineered compacted fill and backfill, including approval of fill materials and the performance of sufficient density tests to evaluate the degree of compaction being achieved.

7. Foundation excavations.

LIMITATIONS

This report contains geotechnical conclusions and recommendations developed solely for use by Santiago Holdings, LLC c/o Thatcher Engineering & Associates, Inc., and their design consultants, for the purposes described earlier. It may not contain sufficient information for other uses or the purposes of other parties. The contents should not be extrapolated to other areas or used for other facilities without consulting LOR Geotechnical Group, Inc.

The recommendations are based on interpretations of the subsurface conditions concluded from information gained from subsurface explorations and a surficial site reconnaissance.

The interpretations may differ from actual subsurface conditions, which can vary horizontally and vertically across the site. If conditions are encountered during the construction of the project which differ significantly from those presented in this report, this firm should be notified immediately in order that we may assess the impact to the recommendations provided.

Due to possible subsurface variations, all aspects of field construction addressed in this report should be observed and tested by the project geotechnical consultant.

If parties other than LOR Geotechnical Group, Inc., provide construction monitoring services, they must be notified that they will be required to assume responsibility for the geotechnical phase of the project being completed by concurring with the recommendations provided in this report or by providing alternative recommendations.

The report was prepared using generally accepted geotechnical engineering practices under the direction of a state licensed geotechnical engineer. No warranty, expressed or implied, is made as to conclusions and professional advice included in this report. Any persons using this report for bidding or construction purposes should perform such independent investigations as deemed necessary to satisfy themselves as to the surface and subsurface conditions to be encountered and the procedures to be used in the performance of work on this project.

TIME LIMITATIONS

The findings of this report are valid as of this date. Changes in the condition of a property can, however, occur with the passage of time, whether they be due to natural processes or the work of man on this or adjacent properties. In addition, changes in the Standards-of-Practice and/or Governmental Codes may occur. Due to such changes, the findings of this report may be invalidated wholly or in part by changes beyond our control. Therefore, this report should not be relied upon after a significant amount of time without a review by LOR Geotechnical Group, Inc., verifying the suitability of the conclusions and recommendations.

CLOSURE

It has been a pleasure to assist you with this project. We look forward to being of further assistance to you as construction begins. Should conditions be encountered during construction that appear to be different than as indicated by this report, please contact this office immediately in order that we might evaluate these conditions.

Should you have any questions regarding this report, please do not hesitate to contact our office at your convenience.

Respectfully submitted,
LOR Geotechnical Group, Inc.

Andrew A. Tardie
Staff Geologist

Robert M. Markoff, CEG
Engineering Geologist

John P. Leuer, GE 2030
President

REGISTERED PROFESSIONAL ENGINEER
JOHN P. LEUER
NO. 2030
GEOTECHNICAL
STATE OF CALIFORNIA

PROFESSIONAL GEOLOGIST
ROBERT M. MARKOFF
NO. 2073
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

AAT:RMM:JPL:ss

Distribution: Addressee (4) and PDF via email kristint@thatchereingineering.com

REFERENCES

American Society of Civil Engineers, 2016, Minimum Design Load for Buildings and other Structures, ASCE 7-16.

California Building Standards Commission, 2019, California Building Code.

California Department of Water Resources, 2020, http://www.water.ca.gov/waterdatalibrary/.

County of Riverside, Transportation and Land Management Agency, 2020, Geographic Information System, http://www3.tlma.co.riverside.ca.us.

Dibble, T.W., 2003, Geologic Map of the Beaumont Quadrangle, Riverside County, California, Dibblee Geological Foundation Map DF-114.

Earth Systems Southwest, 2016, Design-Level Geologic Fault-Rupture Hazard Evaluation, APN's 404-190-001 & 003, Northwest Corner of Beaumont Avenue & Oak Valley Parkway, Beaumont, Riverside County, California.

Google Earth, 2020, Imagery from various years, www.google.com/earth.

Hart, E.W. and W.A. Bryant, 1997, revised 2003, Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps: California Dept. of Conservation Division of Mines and Geology Special Publication 42, Revised Edition with Supplements 1, 2 and 3.

Historic Aerials, 2020, Imagery from various years, www.historicaerials.com.

Larson, R., and Slosson, J., 1992, The Role of Seismic Hazard Evaluation in Engineering Reports, in Engineering Geology Practice in Southern California, AEG Special Publication Number 4, pp 191-194.

OSPHD, 2020 ,US Seismic Design Maps, https://seismicmaps.org.

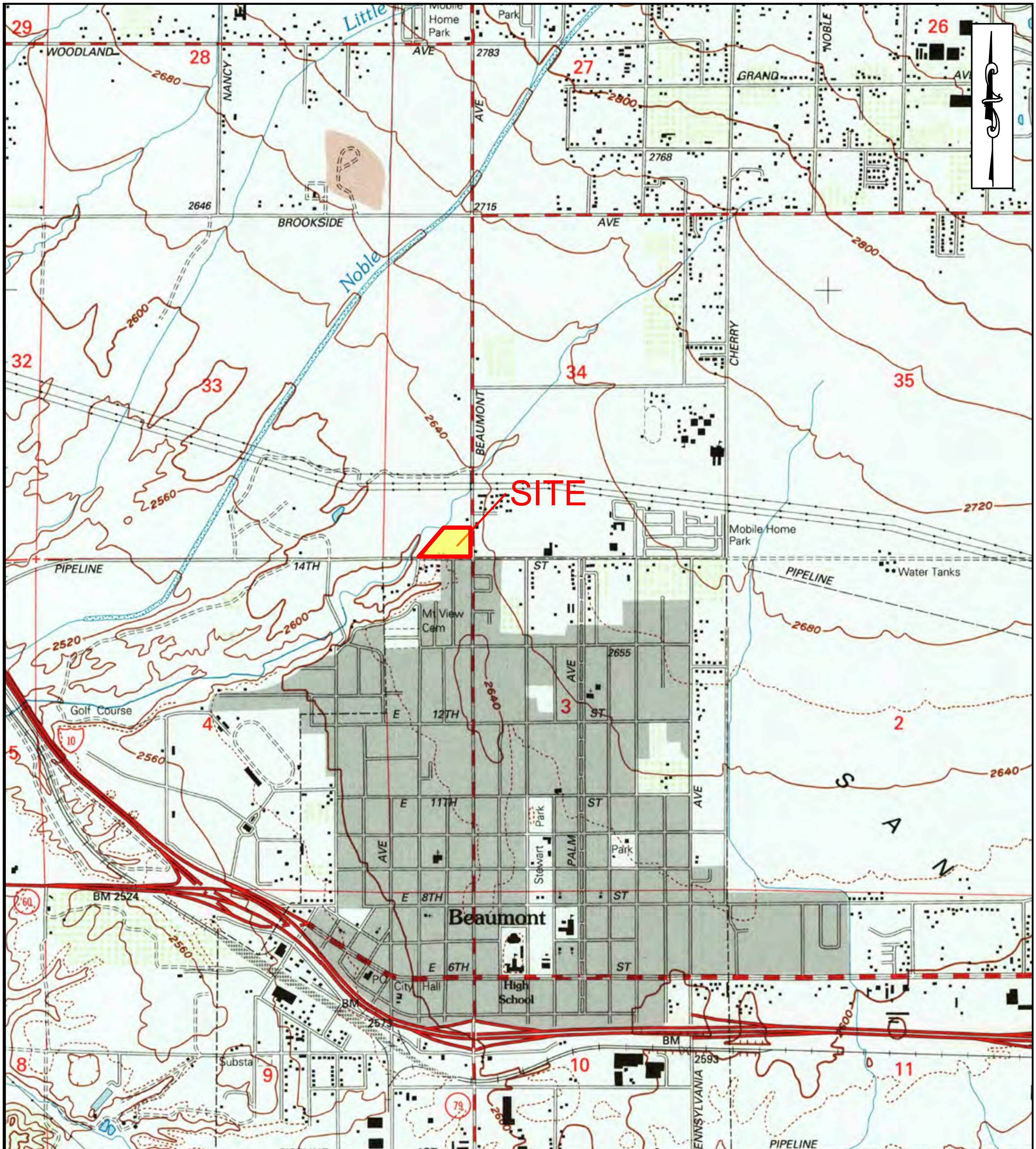
Riverside County Flood Control and Water Conservation District, 2011, Design Handbook for Low Impact Development Best Management Practices, dated September 2011.

Thatcher Engineering & Associates, Inc., Site Plan, Proposed Retail and Restaurant, APN 404-190-001 & 003, Northwest Corner of Beaumont Avenue & Oak Valley Parkway, Beaumont, California.

U.S.G.S., 2020, https://earthquake.usgs.gov/earthquakes/search/.

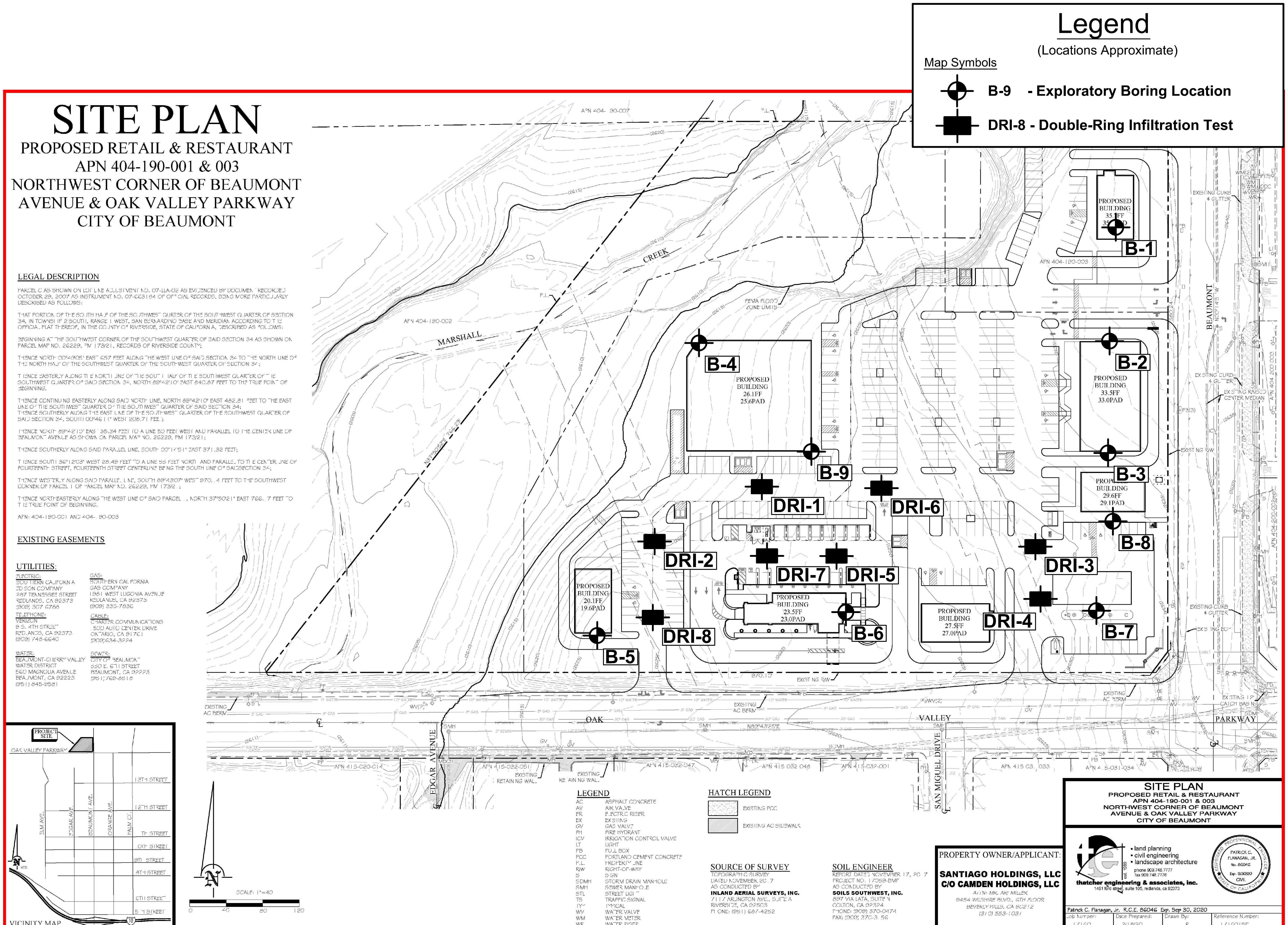
APPENDIX A

Index Map, Site Plan,
Regional Geologic Map,
and
Historical Seismicity Maps



INDEX MAP

PROJECT:	APN'S 404-190-001 & -003, BEAUMONT, CALIFORNIA	**PROJECT NO:**	13627.1
CLIENT:	SANTIAGO HOLDINGS, LLC, C/O THATCHER ENGINEERING & ASSOCIATES, INC.	**ENCLOSURE:**	A-1
LOR Geotechnical Group, Inc.		**DATE:**	APRIL 2020
		SCALE:	1" ≈ 2000'



SITE PLAN

PROJECT NO: 13627.1

ENCLOSURE: A-2

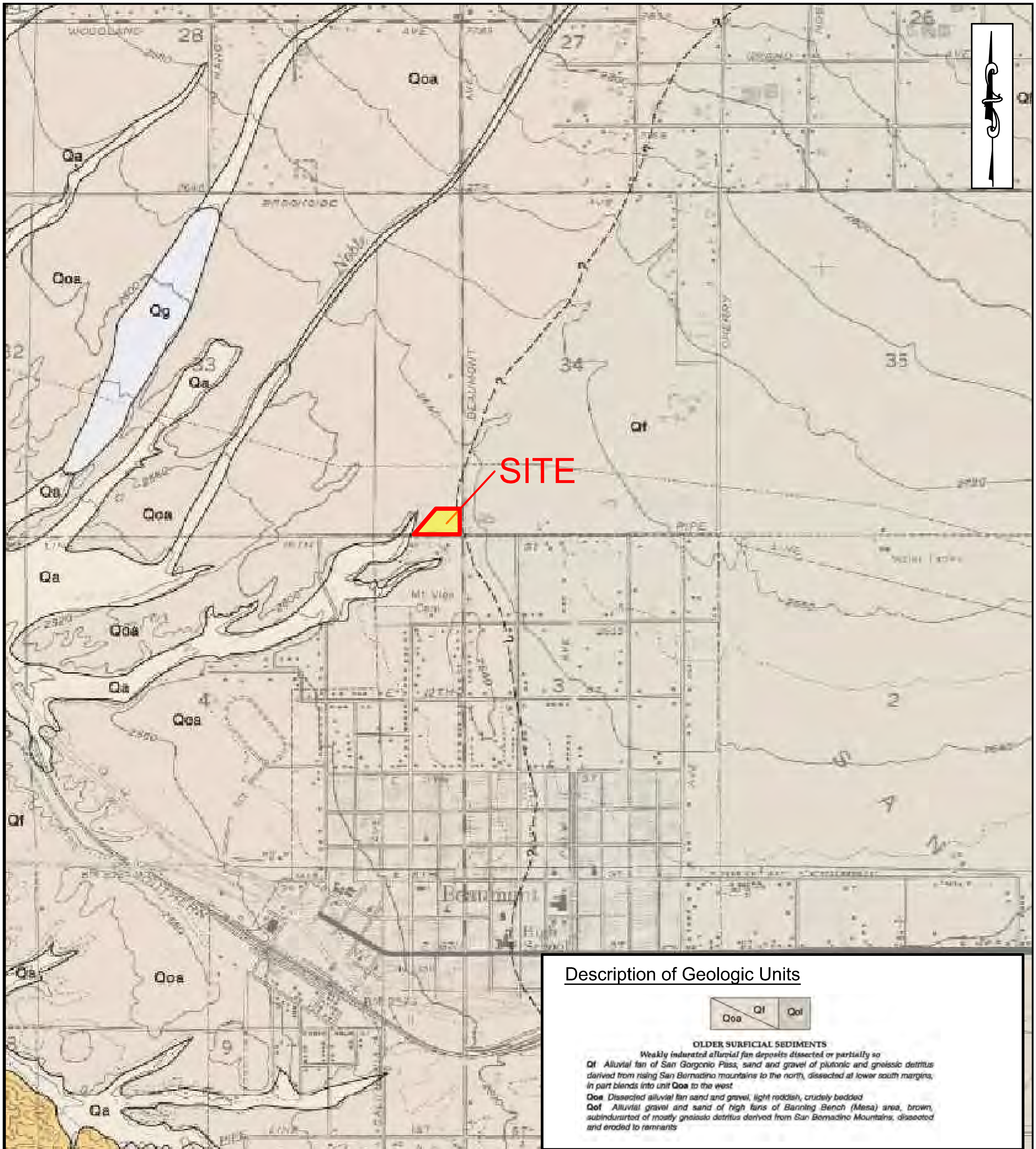
DATE: APRIL 2020

SCALE: 1" ≈ 100'

PROJECT: APN'S 404-190-001 & -003, BEAUMONT, CALIFORNIA

CLIENT: SANTIAGO HOLDINGS, LLC, C/O THATCHER ENGINEERING & ASSOCIATES, INC.

LOR Geotechnical Group, Inc.



Description of Geologic Units

OLDER SURFICIAL SEDIMENTS

Weakly indurated alluvial fan deposits dissected or partially so

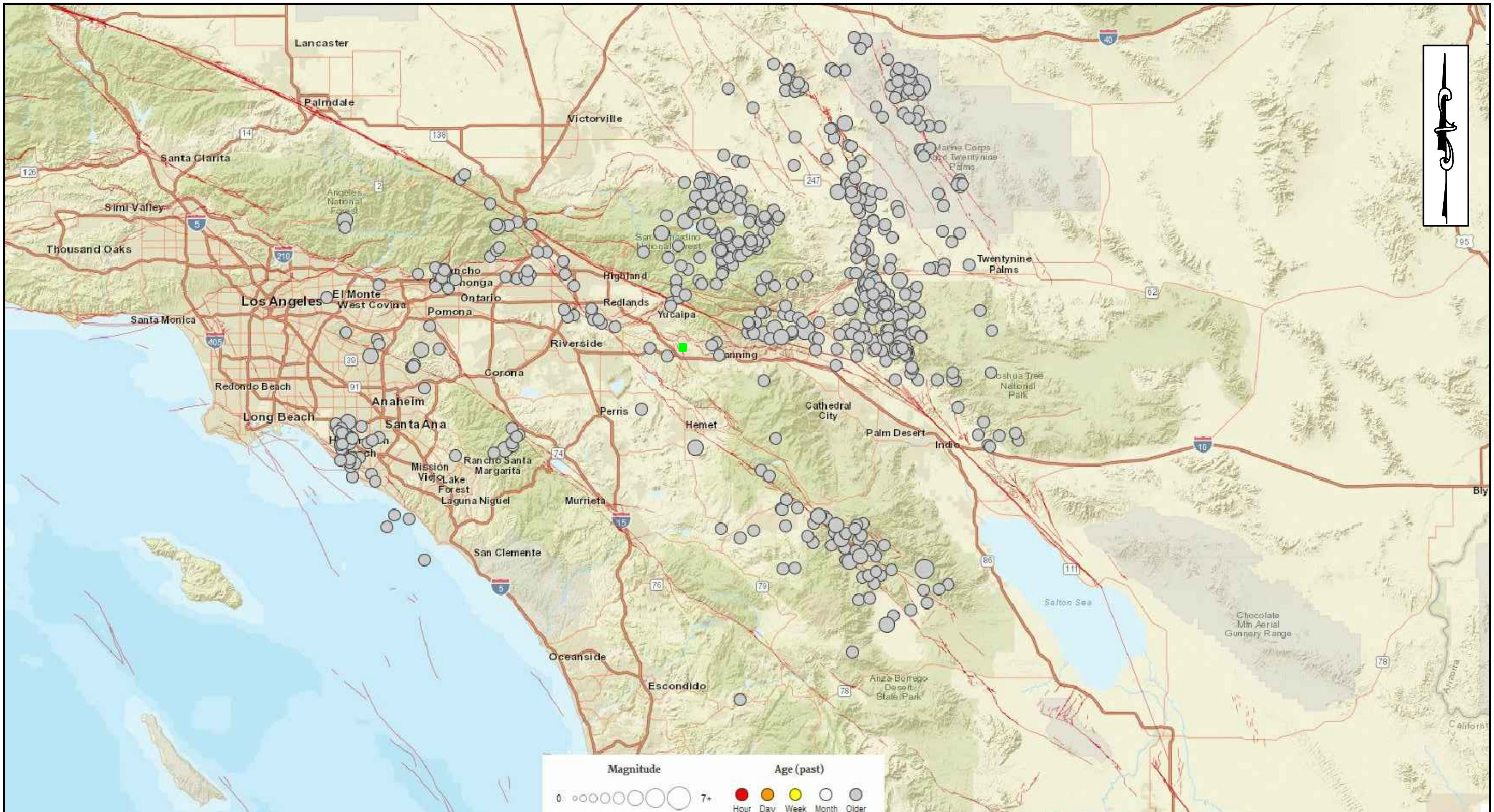
Qf Alluvial fan of San Gorgonio Pass, sand and gravel of plutonic and gneissic detritus derived from rising San Bernadino mountains to the north, dissected at lower south margins, in part blends into unit **Qoa** to the west

Qoa Dissected alluvial fan sand and gravel, light reddish, crudely bedded

Qof Alluvial gravel and sand of high fans of Banning Bench (Mesa) area, brown, subindurarted of mostly gneissic detritus derived from San Bernadino Mountains, dissected and eroded to remnants

REGIONAL GEOLOGIC MAP

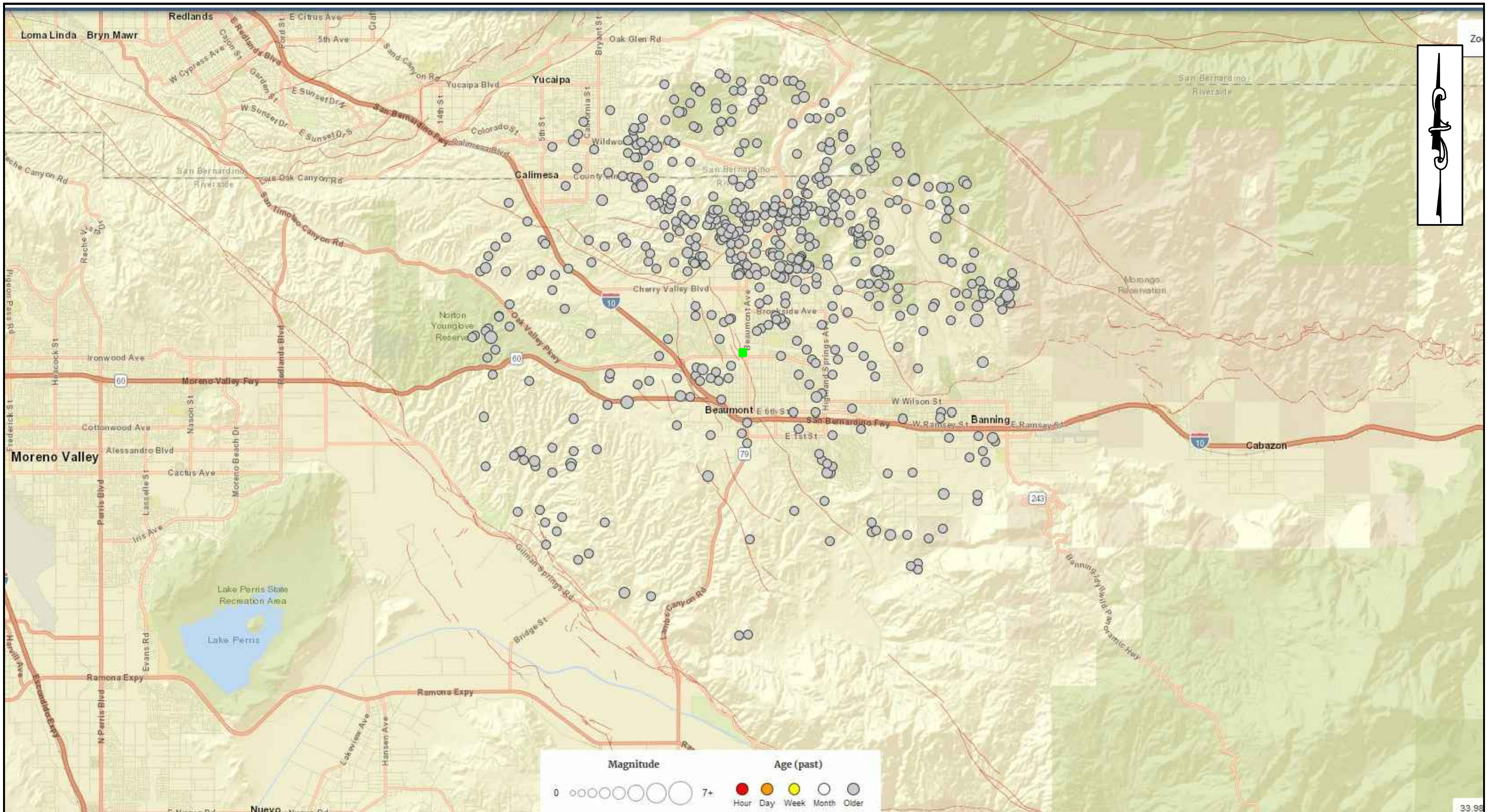
PROJECT:	APN'S 404-190-001 & -003, BEAUMONT, CALIFORNIA	**PROJECT NO:**	13627.1
CLIENT:	SANTIAGO HOLDINGS, LLC, C/O THATCHER ENGINEERING & ASSOCIATES, INC.	**ENCLOSURE:**	A-3
LOR Geotechnical Group, Inc.		**DATE:**	FEBRUARY 2020
		SCALE:	1" ≈ 2000'



U.S. Geologic Survey (2020) real-time earthquake epicenter map. Plotted are 544 epicenters of instrument-recored events from 1932 to present (04/02/20) of local magnitude greater than M4.0 within a radius of ~62 miles (100 kilometers) of the site. Location accuracy varies. The site is indicated by the green square. The selected magnitude corresponds to a threshold intensity value where very light damage potential begins. These evens are also generally widely felt by persons. Red lines mark the surface traces of known Quaternary-age faults.

HISTORICAL SEISMICITY MAP - 100km Radius

PROJECT:	APN'S 404-190-001 & -003, BEAUMONT, CALIFORNIA	**PROJECT NO:**	13627.1
CLIENT:	SANTIAGO HOLDINGS, LLC, C/O THATCHER ENGINEERING & ASSOCIATES, INC.	**ENCLOSURE:**	A-4
LOR Geotechnical Group, Inc.		**DATE:**	APRIL 2020
		SCALE:	1" ≈ 40km



U.S. Geologic Survey (2020) real-time earthquake epicenter map. Plotted are 551 epicenters of instrument-recored events from 1978 to present (04/02/20) of local magnitude greater than M2.0 within a radius of ~6.2 miles (10 kilometers) of the site. Location accuracy varies. The site is indicated by the green square. Red lines mark the surface traces of known Quaternary-age faults.

HISTORICAL SEISMICITY MAP - 10km Radius

PROJECT:	APN'S 404-190-001 & -003, BEAUMONT, CALIFORNIA	**PROJECT NO:**	13627.1
CLIENT:	SANTIAGO HOLDINGS, LLC, C/O THATCHER ENGINEERING & ASSOCIATES, INC.	**ENCLOSURE:**	A-5
LOR Geotechnical Group, Inc.		**DATE:**	APRIL 2020
		SCALE:	1" ≈ 4km

APPENDIX B

Field Investigation Program and Boring Logs

APPENDIX B
FIELD INVESTIGATION

Subsurface Exploration

The site was investigated on March 12th and March 24th 2020 and consisted of advancing 9 exploratory borings to depths from approximately 16.5 feet and 51.5 feet below the existing ground surface. The approximate locations of the borings are shown on Enclosures A-2 through A-4, within Appendix A.

The drilling exploration was conducted using a truck-mounted Mobile B-61 drill rig and a track mounted drill rig both equipped with 8-inch diameter hollow stem augers. The soils were continuously logged by our geologist who inspected the site, created detailed logs of the borings, obtained undisturbed, as well as disturbed, soil samples for evaluation and testing, and classified the soils by visual examination in accordance with the Unified Soil Classification System.

Relatively undisturbed samples of the subsoils were obtained at a maximum interval of 5 feet. The samples were recovered by using a California split barrel sampler of 2.50 inch inside diameter and 3.25 inch outside diameter or a Standard Penetration Sampler (SPT) from the ground surface to the total depth explored. The samplers were driven by a 140 pound automatic trip hammer dropped from a height of 30 inches. The number of hammer blows required to drive the sampler into the ground the final 12 inches were recorded and further converted to an equivalent SPT N-value. Factors such as efficiency of the automatic trip hammer used during this investigation (80%), borehole diameter (8"), and rod length at the test depth were considered for further computing of equivalent SPT N-values corrected for field procedures (N60) which are included in the boring logs, Enclosures B-1 through B-9.

The undisturbed soil samples were retained in brass sample rings of 2.42 inches in diameter and 1.00 inch in height, and placed in sealed containers. Disturbed soil samples were obtained at selected levels within the borings and placed in sealed containers for transport to the laboratory.

All samples obtained were taken to our geotechnical laboratory for storage and testing. Detailed logs of the borings are presented on the enclosed Boring Logs, Enclosures B-1 through B-9. A Boring Log Legend and Soil Classification Chart are presented on Enclosures B-i and B-ii, respectively.

CONSISTENCY OF SOIL

SANDS

SPT BLOWS	CONSISTENCY
0-4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
Over 50	Very Dense

COHESIVE SOILS

SPT BLOWS	CONSISTENCY
0-2	Very Soft
2-4	Soft
4-8	Medium
8-15	Stiff
15-30	Very Stiff
30-60	Hard
Over 60	Very Hard

SAMPLE KEY

Symbol	Description
■	INDICATES CALIFORNIA SPLIT SPOON SOIL SAMPLE
	INDICATES BULK SAMPLE
	INDICATES SAND CONE OR NUCLEAR DENSITY TEST
	INDICATES STANDARD PENETRATION TEST (SPT) SOIL SAMPLE

TYPES OF LABORATORY TESTS

1	Atterberg Limits
2	Consolidation
3	Direct Shear (undisturbed or remolded)
4	Expansion Index
5	Hydrometer
6	Organic Content
7	Proctor (4", 6", or Cal216)
8	R-value
9	Sand Equivalent
10	Sieve Analysis
11	Soluble Sulfate Content
12	Swell
13	Wash 200 Sieve

BORING LOG LEGEND

PROJECT:	PROPOSED RETAIL DEVELOPMENT, BEAUMONT, CALIFORNIA	PROJECT NO.:	13627.1
CLIENT:	SANTIAGO HOLDINGS, LLC. C/O THATCHER ENGINEERING & ASSOCIATES	ENCLOSURE:	B-i
LOR Geotechnical Group, Inc.		DATE:	APRIL 2020

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

PARTICLE SIZE LIMITS

BOULDERS	COBBLES	GRAVEL		SAND			SILT OR CLAY
		COARSE	FINE	COARSE	MEDIUM	FINE	

12" 3" 3/4" No. 4 No. 10 No. 40 200

(U.S. STANDARD SIEVE SIZE)

SOIL CLASSIFICATION CHART

PROJECT	PROPOSED RETAIL DEVELOPMENT, BEAUMONT, CALIFORNIA	PROJECT NO.	13627.1
CLIENT:	SANTIAGO HOLDINGS, LLC. C/O THATCHER ENGINEERING & ASSOCIATES	ENCLOSURE:	B-ii
LOR Geotechnical Group, Inc.		DATE:	APRIL 2020

LOG OF BORING B-1

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0	61	3, 4, 7, 9, 10, 11	7.4		122.7			SM	@ 0 feet, FILL/TOPSOIL: SILTY SAND, trace gravel to 1/2", approximately 15% coarse gained sand, 20% medium grained sand, 30% fine grained sand, 35% silty fines with trace clay, dark brown, wet (due to recent rain).
								ML	@ 1 foot, OLDER ALLUVIUM: SANDY SILT, trace gravel to 3/4", approximately 5% coarse grained sand, 15% medium grained sand, 20% fine grained sand, 60% silty fines with trace clay, light red brown, damp.
5	42		6.3		113.7			SM	@ 5 feet, SILTY SAND, approximately 10% coarse grained sand, 20% medium grained sand, 30% fine grained sand, 40% silty fines, light red brown, damp, some pinhole porosity.
10	73		2.5		114.5			SW SM	@ 10 feet, WELL GRADED SAND with GRAVEL and SILT, approximately 15% gravel to 1", 25% coarse grained sand, 25% medium grained sand, 25% fine grained sand, 10% silty fines, red brown, dry.
15	33		13.5		92.2			SP SM	@ 15 feet, POORLY GRADED SAND with SILT, approximately 5% coarse grained sand, 15% medium grained sand, 70% fine grained sand, 10% silty fines, yellow brown, damp.
20	73		2.2		120.0			SW	@ 20 feet, WELL GRADED SAND with GRAVEL, approximately 20% gravel to 1", 25% coarse grained sand, 25% medium grained sand, 25% fine grained sand, 5% silty fines, red brown, dry.
25	92		2.0		110.8				
									END OF BORING @ 26.33' Fill/topsoil to 1' No groundwater No bedrock
30									

PROJECT:	Proposed Retail Development	PROJECT NUMBER:	13627.1
CLIENT:	Thatcher Engineering	ELEVATION:	2637
		DATE DRILLED:	March 12, 2020
		EQUIPMENT:	Mobile B-61
		HOLE DIA.: 8"	ENCLOSURE: B-1

LOR GEOTECHNICAL GROUP INC.

LOG OF BORING B-2

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY *(PCF)*	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0	43		8.8		120.3			SM	@ 0 feet, FILL/TOPSOIL: **SILTY SAND, trace gravel to 3/4", approximately 15% coarse grained sand, 25% medium grained sand, 30% fine grained sand, 30% silty fines with trace clay, brown, wet (due to recent rain).** @ 1 foot, OLDER ALLUVIUM: **SILTY SAND, approximately 15% coarse grained sand, 20% medium grained sand, 25% fine grained sand, 40% silty fines with trace clay, red brown, damp, some pinhole porosity.**
5	34		9.4		119.4			SC CL	**@ 5 feet, SANDY CLAY/LEAN CLAY with SAND, approximately 15% coarse grained sand, 15% medium grained sand, 20% fine grained sand, 50% clayey fines of low plasticity, red brown, damp.**
10	57		3.5		122.5			SM	**@ 10 feet, SILTY SAND, approximately 5% gravel to 1/2", 20% coarse grained sand, 25% medium grained sand, 35% fine grained sand, 15% silty fines, yellow brown, dry.**
15	34		3.1		106.8				**@ 15 feet, SILTY SAND, approximately 15% coarse grained sand, 25% medium grained sand, 40% fine grained sand, 20% silty fines, yellow brown, dry.**
20	56		5.5		97.0				**@ 20 feet, SILTY SAND, approximately 5% coarse grained sand, 10% medium grained sand, 70% fine grained sand, 15% silty fines, yellow brown, dry.** **END OF BORING @ 21.5'** **Fill/topsoil to 1'** **No groundwater** **No bedrock**
25									

PROJECT:	**Proposed Retail Development**	PROJECT NUMBER:	**13627.1**
CLIENT:	**Thatcher Engineering**	ELEVATION:	**2637**
		DATE DRILLED:	**March 12, 2020**
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	**Mobile B-61**
		HOLE DIA.: **8"**	ENCLOSURE: **B-2**

LOG OF BORING B-3

TEST DATA

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY *(PCF)*	SAMPLE TYPE	LITHOLOGY	U.S.C.S.
0								SM
	22		6.8		119.8			
5	29		10.8		120.3			
10	26		4.7		113.0			
15	33		2.3		112.3			
20	68		5.2		112.2			
25	59		4.4		112.3			
30	98		4.8		116.9			ML SM
35								

DESCRIPTION

@ 0 feet, FILL/TOPSOIL: **SILTY SAND, approximately 15% coarse grained sand, 20% medium grained sand, 25% fine grained sand, 35% silty fines with trace clay, brown, wet (due to recent rain).**

@ 1 foot, OLDER ALLUVIUM: **SILTY SAND, approximately 5% gravel to 1/2", 15% coarse grained sand, 15% medium grained sand, 20% fine grained sand, 45% silty fines with trace clay, red brown, dry to damp.**

@ 5 feet, SILTY SAND, approximately 20% coarse grained sand, 25% medium grained sand, 30% fine grained sand, 25% silty fines with trace clay, red brown, damp, some pinhole porosity.

@ 10 feet, SILTY SAND, trace gravel to 1/2", approximately 15% coarse grained sand, 25% medium grained sand, 35% fine grained sand, 15% silty fines, light red brown, damp.

@ 15 feet, becomes yellow brown, dry.

@ 25 feet, SILTY SAND, approximately 10% coarse grained sand, 25% medium grained sand, 35% fine grained sand, 30% silty fines, yellow brown, dry.

@ 30 feet, SILTY SAND/SANDY SILT, trace gravel to 1/2", approximately 10% coarse grained sand, 15% medium grained sand, 25% fine grained sand, 50% silty fines, yellow brown, dry.

END OF BORING @ 30.42'

Fill/topsoil to 1'
No groundwater
No bedrock

PROJECT:	**Proposed Retail Development**	PROJECT NUMBER:	**13627.1**
CLIENT:	**Thatcher Engineering**	ELEVATION:	**2635**
LOR GEOTECHNICAL GROUP INC.		DATE DRILLED:	**March 12, 2020**
		EQUIPMENT:	**Mobile B-61**
		HOLE DIA.: **8"**	ENCLOSURE: **B-3**

LOG OF BORING B-4

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0	15	7, 9, 10, 11	3.9		109.0			SM	@ 0 feet, FILL/TOPSOIL: **SILTY SAND, trace gravel to1/2", approximately 5% coarse grained sand, 25% medium grained sand, 40% fine grained sand, 30% silty fines, dark brown, moist, loose.** **@ 1 foot,** OLDER ALLUVIUM: **SILTY SAND, approximately 5% coarse grained sand, 15% medium grained sand, 35% fine grained sand, 45% silty fines, light yellow brown, dry, some roothairs, trace pinhole porosity.**
5	31		9.5		116.4				**@ 5 feet, SILTY SAND, approximately 10% coarse grained sand, 20% medium grained sand, 40% fine grained sand, 30% silty fines with trace clay, light red brown, damp, some pinhole porosity.**
10	48		9.1		113.0				**@ 10 feet, SILTY SAND, approximately 20% medium grained sand, 60% fine grained sand, 20% silty fines, light red brown, damp.**
15	48		6.7		133.0				**@ 15 feet, trace gravel to 1/2".**
20	68		3.3		112.6			SW	**@ 20 feet, WELL GRADED SAND, approximately 5% gravel to 1/2", 25% coarse grained sand, 30% medium grained sand, 35% fine grained sand, 5% silty fines, tan, dry.**
25	76		2.7						
30	54		3.5						**@ 30 feet, becomes slightly finer grained.**
35	46		7.7					SM	**@ 35 feet, SILTY SAND, approximately 5% gravel to 1/2", 15% coarse grained sand, 25% medium grained sand, 40% fine grained sand, 20% silty fines, red brown, damp.**
40	46		7.6					SP SM	**@ 40 feet, POORLY GRADED SAND with SILT, approximately 90% fine grained sand, 10% silty fines, light red brown, dry to damp.**
45	35		16.4						**@ 45 feet, increase in moisture, moist.**
50	58		6.2						**@ 50 feet, decrease in moisture, damp.**
55									**END OF BORING @ 51.5'** Fill/topsoil to 1' No groundwater No bedrock

PROJECT:	**Proposed Retail Development**	PROJECT NUMBER:	**13627.1**
CLIENT:	**Thatcher Engineering**	ELEVATION:	**2616**
LOR GEOTECHNICAL GROUP INC.		DATE DRILLED:	**March 24, 2020**
		EQUIPMENT:	**Track Rig**
		HOLE DIA.: **8"**	ENCLOSURE: **B-4**

LOG OF BORING B-5

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0								SM	@ 0 feet, FILL/TOPSOIL: **SILTY SAND, approximately 5% coarse grained sand, 20% medium grained sand, 45% fine grained sand, 30% silty fines, dark brown, moist, loose.**
	13		11.6		116.3				**@ 1 foot,** OLDER ALLUVIUM: **SILTY SAND, approximately 5% gravel to 1/2", 15% coarse grained sand, 20% medium grained sand, 20% fine grained sand, 40% silty fines with trace clay, red brown, damp.**
5	10		6.6		107.6				**@ 5 feet, SILTY SAND, approximately 15% coarse grained sand, 30% medium grained sand, 30% fine grained sand, 25% silty fines, light yellow brown, damp.**
	10		6.7		100.1				**@ 7 feet, becomes dry, light red brown.**
10	24		4.6		119.3				**@ 10 feet, SILTY SAND, approximately 5% gravel to 1/2", 20% coarse grained sand, 25% medium grained sand, 35% fine grained sand, 20% silty fines, yellow brown, dry.**
15	80		4.6		123.4				**@ 15 feet, SILTY SAND with GRAVEL, approximately 15% gravel to 1", 20% coarse grained sand, 25% medium grained sand, 25% fine grained sand, 15% silty fines, yellow brown, dry.**
20	59		4.3		112.6				**@ 20 feet, SILTY SAND, approximately 5% coarse grained sand, 15% medium grained sand, 60% fine grained sand, 20% silty fines, red brown, dry.**
25	66		5.6		138.0				
									END OF BORING @ 26.5' **Fill/topsoil to 1'** **No groundwater** **No bedrock**
30									

PROJECT:	**Proposed Retail Development**	PROJECT NUMBER:	**13627.1**
CLIENT:	**Thatcher Engineering**	ELEVATION:	**2626**
		DATE DRILLED:	**March 24, 2020**
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	**Track Rig**
		HOLE DIA.: **8"**	ENCLOSURE: **B-5**

LOG OF BORING B-6

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY *(PCF)*	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0								SM	@ 0 feet, FILL/TOPSOIL: **SILTY SAND, approximately 5% coarse grained sand, 25% medium grained sand, 35% fine grained sand, 35% silty fines, dark brown, moist, loose.** @ 1 foot, OLDER ALLUVIUM: **SILTY SAND, trace coarse grained sand, approximately 15% medium grained sand, 50% fine grained sand, 35% silty fines with trace clay, red brown, damp, some pinhole porosity.**
	22		**8.7**		**111.8**				
5	**27**		**13.6**		**113.4**				**@ 5 feet, trace pinhole porosity.**
10	**21**		**11.0**		**105.7**				**@ 10 feet, SILTY SAND, approximately 5% coarse grained sand, 15% medium grained sand, 55% fine grained sand, 25% silty fines, yellow brown, damp.**
15	**29**		**20.2**		**99.3**			ML	**@ 15 feet, SANDY SILT, approximatley 20% fine grained sand, 80% silty fines, yellow brown, damp.**
20	**60**		**3.7**		**111.6**			SW	**@ 20 feet, WELL GRADED SAND, approximately 5% gravel to 1/2", 25% coarse grained sand, 30% medium grained sand, 35% fine grained sand, 5% silty fines, yellow brown, dry.**
									END OF BORING @ 21.5'
									Fill/topsoil to 1' **No groundwater** **No bedrock**
25									

PROJECT:	**Proposed Retail Development**	PROJECT NUMBER:	**13627.1**
CLIENT:	**Thatcher Engineering**	ELEVATION:	**2623**
LOR GEOTECHNICAL GROUP INC.		DATE DRILLED:	**March 24, 2020**
		EQUIPMENT:	**Track Rig**
		HOLE DIA.: **8"**	ENCLOSURE: **B-6**

LOG OF BORING B-7

TEST DATA

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0		8, 9, 10, 11						SM	@ 0 feet, FILL/TOPSOIL: **SILTY SAND, approximately 5% coarse grained sand, 25% medium grained sand, 35% fine grained sand, 35% silty fines, dark brown, moist, loose.**
	32		10.4		114.0			ML	@ 1 foot, OLDER ALLUVIUM: **SANDY SILT, trace fine gravel, approximately 5% coarse grained sand, 15% medium grained sand, 20% fine grained sand, 60% silty fines with trace clay, red brown, damp, trace pinhole porosity.**
5	50		11.3		120.3				
10	34		6.3		107.5			SM	@ 10 feet, **SILTY SAND, approximately 10% coarse grained sand, 35% medium grained sand, 40% fine grained sand, 15% silty fines, light yellow brown, damp.**
15	37		5.4		109.4				@ 15 feet, **SILTY SAND, approximately 35% medium grained sand, 50% fine grained sand, 15% silty fines, yellow brown, dry.**
20	69		2.1		113.7			SW	@ 20 feet, **WELL GRADED SAND, approximately 10% gravel to 1/2", 25% coarse grained sand, 30% medium grained sand, 30% fine grained sand, 5% silty fines, yellow brown, dry.**
25	85		2.0		115.8				
30									

END OF BORING @ 26.42'

Fill/topsoil to 1'
No groundwater
No bedrock

PROJECT:	**Proposed Retail Development**	PROJECT NUMBER:	**13627.1**
CLIENT:	**Thatcher Engineering**	ELEVATION:	**2632**
		DATE DRILLED:	**March 24, 2020**
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	**Track Rig**
		HOLE DIA.: **8"**	ENCLOSURE: **B-7**

LOG OF BORING B-8

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0								SM	**@ 0 feet, FILL/TOPSOIL: SILTY SAND, approximately 5% coarse grained sand, 20% medium grained sand, 45% fine grained sand, 30% silty fines, dark brown, moist, loose.** **@ 1 foot, OLDER ALLUVIUM: SILTY SAND, approximately 10% coarse grained sand, 30% medium grained sand, 30% fine grained sand, 30% silty fines with trace clay, red brown, damp, trace pinhole porosity.**
	29		9.5		117.6				
5	23		12.9		117.7				
10	38		11.8		117.1				
15	43		3.7		114.6				**@ 15 feet, SILTY SAND, approximately 25% medium grained sand, 60% fine grained sand, 15% silty fines, yellow brown, dry.**
									END OF BORING @ 16.5' **Fill/topsoil to 1'** **No groundwater** **No bedrock**
20									

PROJECT:	**Proposed Retail Development**	PROJECT NUMBER:	**13627.1**
CLIENT:	**Thatcher Engineering**	ELEVATION:	**2632**
		DATE DRILLED:	**March 24, 2020**
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	**Track Rig**
		HOLE DIA.: **8"**	ENCLOSURE: **B-8**

LOG OF BORING B-9

DEPTH IN FEET	SPT BLOW COUNTS	LABORATORY TESTS	MOISTURE CONTENT (%)		DRY DENSITY (PCF)	SAMPLE TYPE	LITHOLOGY	U.S.C.S.	DESCRIPTION
0								SM	@ 0 feet, FILL/TOPSOIL: **SILTY SAND, approximately 5% coarse grained sand, 25% medium grained sand, 40% fine grained sand, 30% silty fines, dark brown, moist, loose.**
	29		8.9		108.2				@ 1 foot, OLDER ALLUVIUM: **SILTY SAND, approximately 10% coarse grained sand, 25% medium grained sand, 35% fine grained sand, 30% silty fines with trace clay, red brown, damp, some roothairs, trace pinhole porosity.**
5	19		9.3		116.6				**@ 5 feet, contains trace gravel to 1/2", no visible porosity, yellow brown.**
10	12	2	10.6		99.9				**@ 10 feet, SILTY SAND, approximately 70% fine grained sand, 30% silty fines, red brown, damp.**
15	32		10.9		112.2				
20	36		13.0		111.2				
									END OF BORING @ 21.5' **Fill/topsoil to 1'** **No groundwater** **No bedrock**
25									

PROJECT:	**Proposed Retail Development**	PROJECT NUMBER:	**13627.1**
CLIENT:	**Thatcher Engineering**	ELEVATION:	**2623**
		DATE DRILLED:	**March 24, 2020**
LOR GEOTECHNICAL GROUP INC.		EQUIPMENT:	**Track Rig**
		HOLE DIA.: **8"**	ENCLOSURE: **B-9**

APPENDIX C

Laboratory Testing Program and Test Results

APPENDIX C
LABORATORY TESTING

General

Selected soil samples obtained from our borings were tested in our geotechnical laboratory to evaluate the physical properties of the soils affecting foundation design and construction procedures. The laboratory testing program performed in conjunction with our investigation included in-place moisture content and dry density, laboratory compaction characteristics, direct shear, sieve analysis, sand equivalent, R-value, expansion index, consolidation,, and soluble sulfate content. Descriptions of the laboratory tests are presented in the following paragraphs:

Moisture Density Tests

The moisture content and dry density information provides an indirect measure of soil consistency for each stratum, and can also provide a correlation between soils on this site. The dry unit weight and field moisture content were determined for selected undisturbed samples, in accordance with ASTM D 2922 and ASTM D 2216, respectively, and the results are shown on the Boring Logs, Enclosures B-1 through B-9 for convenient correlation with the soil profile.

Laboratory Compaction

Selected soil samples were tested in the laboratory to determine compaction characteristics using the ASTM D 1557 compaction test method. The results are presented in the following table:

LABORATORY COMPACTION				
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.G.S.)**	**Maximum Dry Density (pcf)**	**Optimum Moisture Content (percent)**
B-1	0-3	(ML) Sandy Silt	127.5	10.0
B-4	0-3	(SM) Silty Sand	130.0	9.5

Direct Shear Tests

Shear tests are performed with a direct shear machine in general accordance with ASTM D 3080 at a constant rate-of-strain (usually 0.04 inches/minute). The machine is designed to test a sample partially extruded from a sample ring in single shear. Samples are tested at varying normal loads in order to evaluate the shear strength parameters, angle of internal friction and cohesion. Samples are tested in a remolded condition (90 percent relative compaction per ASTM D 1557) and soaked, to represent the worst case conditions expected in the field.

The results of the shear tests are presented in the following table:

DIRECT SHEAR TESTS				
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.G.S.)**	**Angle of Internal Friction (degrees)**	**Apparent Cohesion (psf)**
B-1	0-3	(ML) Sandy Silt	25	350

Sieve Analysis

A quantitative determination of the grain size distribution was performed for selected samples in accordance with the ASTM D 422 laboratory test procedure. The determination is performed by passing the soil through a series of sieves, and recording the weights of retained particles on each screen. The results of the sieve analyses are presented graphically on Enclosure C-1.

Sand Equivalent

The sand equivalent of selected soils were evaluated using the California Sand Equivalent Test Method, Caltrans Number 217. The results of the sand equivalent tests are presented with the grain size distribution analyses on Enclosure C-1.

R-Value Test

Soil samples were obtained at probable pavement subgrade level and was tested to determine its R-value using the California R-Value Test Method, Caltrans Number 301. The results of the R-value test is presented on Enclosure C-1.

Expansion Index Tests

Remolded samples are tested to determine their expansion potential in accordance with the Expansion Index (EI) test. The test is performed in accordance with the Uniform Building Code Standard 18-2. The test results are presented in the following table:

EXPANSION INDEX TESTS				
Boring Number	**Sample Depth (feet)**	**Soil Description (U.S.C.S.)**	**Expansion Index (EI)**	**Expansion Potential**
B-1	0-4	(ML) Sandy Silt	12	Very Low

Expansion Index:	0-20	21-50	51-90	91-130
Expansion Potential:	Very low	Low	Medium	High

Consolidation Tests

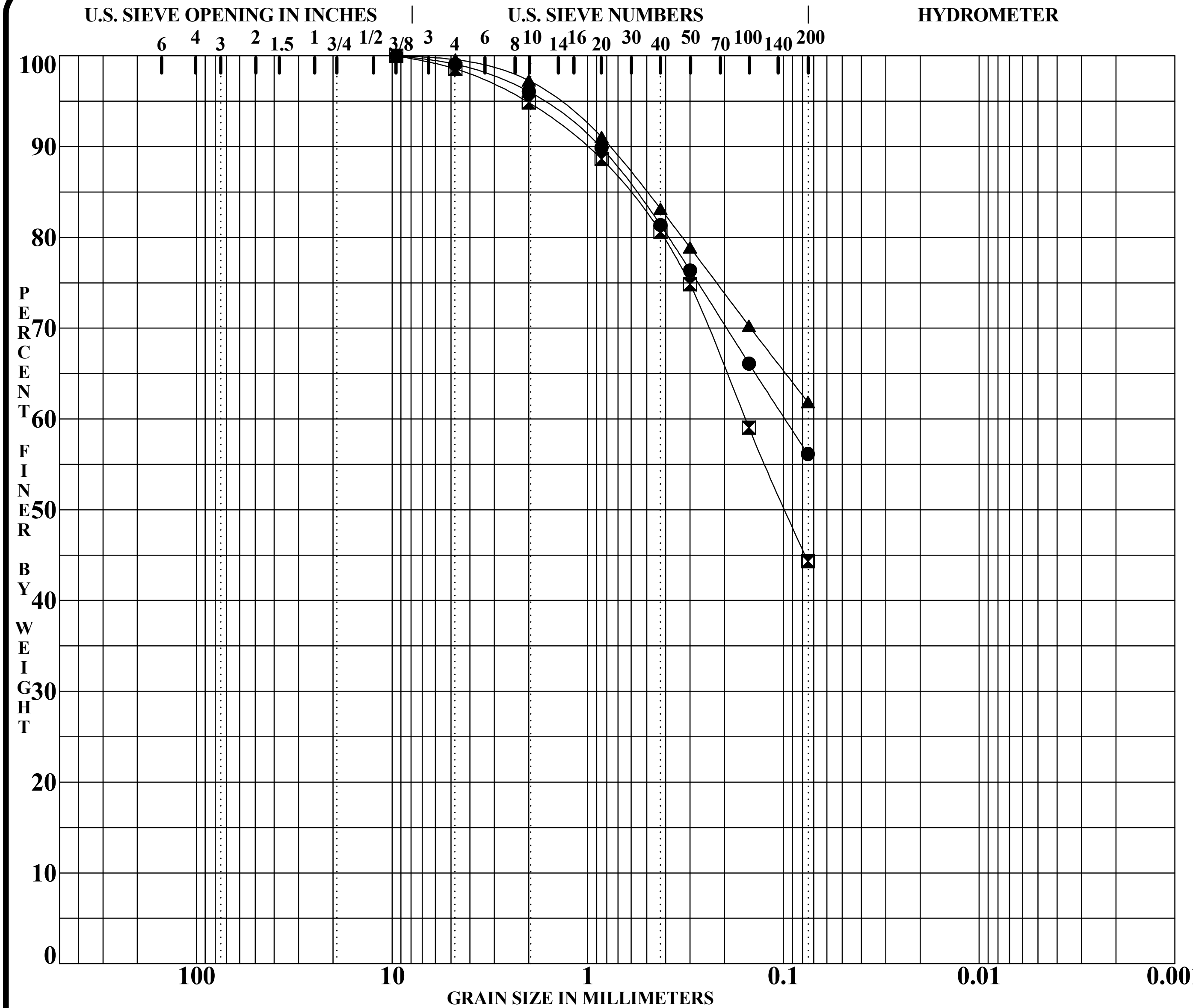
The apparatus used for the consolidation tests (odometer) is designed to test a one-inch high portion of the undisturbed soil sample as contained in a sample ring. Porous stones and filler paper are placed in contact with the top and bottom of the specimen to permit the addition or release of water. Loads are applied to the test specimen in specified increments, and the resulting axial deformations are recorded. The results are plotted as log of axial pressure versus consolidation or compression, expressed as strain or sample height.

Samples are tested at field and greater-than field moisture contents. The results are shown on Enclosure C-2.

Soluble Sulfate Content Tests

The soluble sulfate content of selected subgrade soils was evaluated and the concentration of soluble sulfates in the soils was determined by measuring the optical density of a barium sulfate precipitate. The precipitate results from a reaction of barium chloride with water extractions from the soil samples. The measured optical density is correlated with readings on precipitates of known sulfate concentrations. The test results are presented on the following table:

SOLUBLE SULFATE CONTENT TESTS			
Boring Number	Sample Depth (feet)	Soil Description (U.S.G.S.)	Sulfate Content (percent by weight)
B-1	0-3	(ML) Sandy Silt	< 0.005
B-4	0-3	(SM) Silty Sand	< 0.005
B-7	0-3	(ML) Sandy Silt	< 0.005



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Soil Classification	SE	RV	PL	PI	Cc	Cu
●	*B-1*	*@ 0-3 ft*	*(ML) Sandy Silt*	*10*	*--*				
⧗	*B-4*	*@ 0-3 ft*	*(SM) Silty Sand*	*14*	*--*				
▲	*B-7*	*@ 0-3 ft*	*(ML) Sandy Silt*	*8*	*12*				

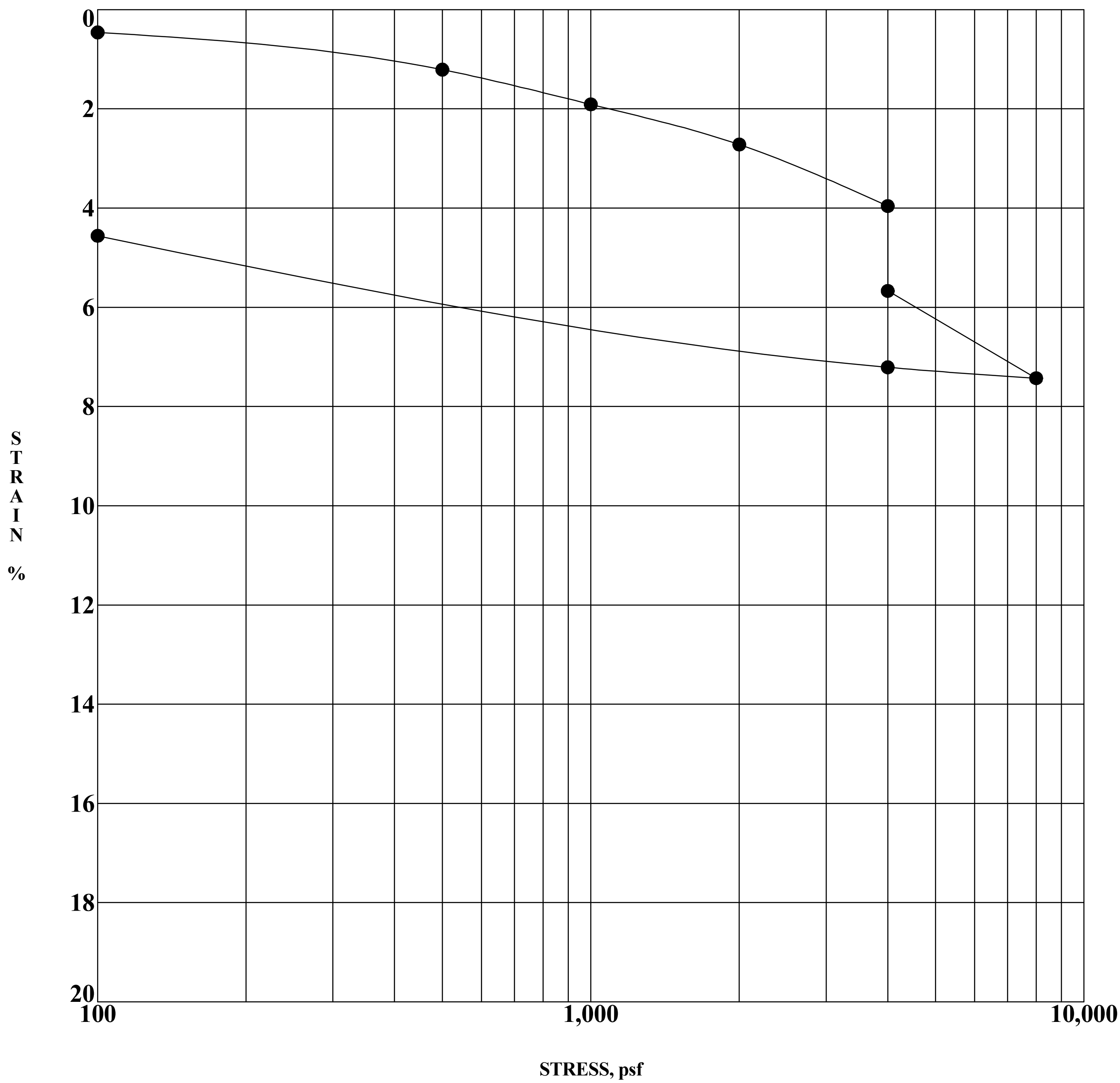
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	*B-1*	*@ 0-3 ft*	*9.50*	*0.10*			*0.9*	*42.9*	*56.1*	
⧗	*B-4*	*@ 0-3 ft*	*9.50*	*0.16*			*1.4*	*54.2*	*44.3*	
▲	*B-7*	*@ 0-3 ft*	*9.50*				*0.4*	*37.7*	*61.9*	

PROJECT *Proposed Retail Development*

PROJECT NO. *13627.1*
DATE *4/3/20*

GRADATION CURVES
LOR Geotechnical Group, Inc.

ENCLOSURE C-1



	Specimen I.D.		Classification	DD	MC%
●	B-9	@ 10 ft	**(SM) Silty Sand**	*100*	*11*

PROJECT *Proposed Retail Development*

PROJECT NO. *13627.1*

DATE *4/3/20*

CONSOLIDATION TEST
LOR Geotechnical Group, Inc.

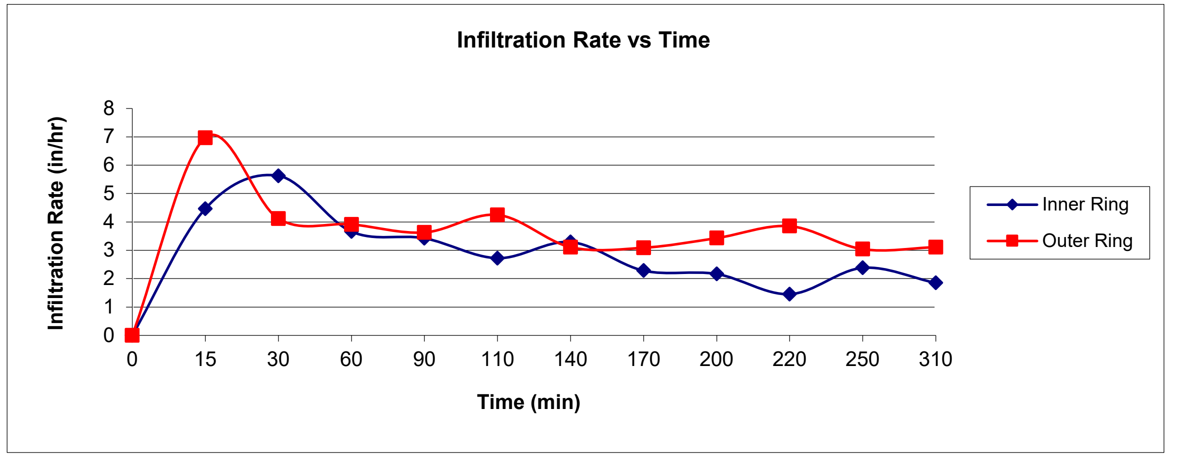
ENCLOSURE C-2

APPENDIX D

Infiltration Test Results

DOUBLE RING INFILTROMETER TEST DATA

Project:	NEC Beaumont Ave & Oak Valley	**Client:**	Santiago Holdings, LLC
Project No.:	13627.1	**Test Date:**	March 9, 2020
Soil Classification:	(SM) Silty Sand	**Test Hole No.:**	DRI-1
Depth of Test Hole:	6 ft	**Test Hole Diameter:**	12 in. inner, 24 in. annular
Liquid Used:	Tap Water	**Date Excavated:**	March 9, 2020
Area of Rings:	Inner = 0.785 ft^2 , Annular 2.36 ft^2	**pH:**	7.8
Tested By:	A.L. & C.P.	**Depth of Water in Rings:**	5.5 in
Liquid Level Maintained Using:	Vacuum Seal	**Ring Penetration:**	2 in
Depth to Water Table:	300+ ft		

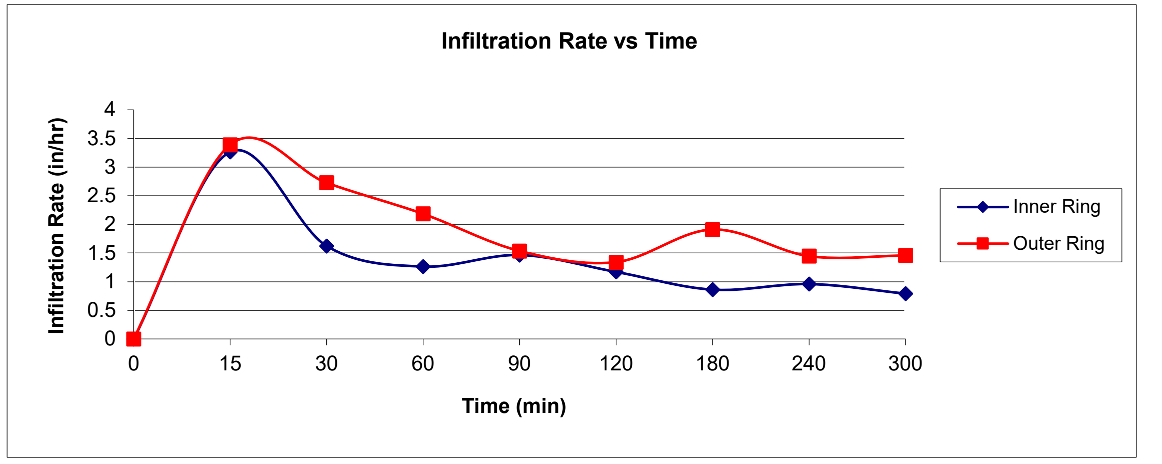


TEST PERIOD

TRIAL NO.	INNER TIME		INNER TIME INTERVAL (minutes)	INNER TOTAL ELASPED TIME (minutes)	ANNULAR SPACE TIME	ANNULAR SPACE TIME INTERVAL (minutes)	ANNULAR SPACE TOTAL ELASPED TIME (minutes)	WATER USED (lbs.) inner	WATER USED (lbs.) annular space	WATER USED (gal) inner	WATER USED (gal) annular space	INFILTRATION RATE (gal/sf.day) inner	INFILTRATION RATE (gal/sf.day) annular space	INFILTRATION RATE (in/hr) inner	INFILTRATION RATE (in/hr) annular space	LIQUID TEMP (°F)	REMARKS
1	S	9:08	15	15	9:08	15	15	4.54	21.30	0.545	2.557	66.7	104.0	4.5	7.0	58	outer ring leak
	E	9:23			9:23											58	
2	S	9:23	15	30	9:23	15	30	5.72	12.58	0.687	1.510	84.0	61.4	5.6	4.1	58	outer emptied
	E	9:38			9:38											58	
3	S	9:45	30	60	9:45	30	60	7.44	23.93	0.893	2.873	54.6	58.4	3.7	3.9	59	outer refill
	E	10:15			10:15											59	
4	S	10:19	30	90	10:19	30	90	6.96	22.18	0.836	2.663	51.1	54.2	3.4	3.6	59	outer refill
	E	10:49			10:49											59	
5	S	10:49	20	110	10:49	20	110	3.69	17.31	0.443	2.078	40.6	63.4	2.7	4.2	59	outer emptied
	E	11:09			11:09											59	
6	S	11:13	30	140	11:13	30	140	6.69	19.01	0.803	2.282	49.1	46.4	3.3	3.1	60	outer refill
	E	11:43			11:43											60	
7	S	11:45	30	170	11:45	30	170	4.64	18.88	0.557	2.267	34.1	46.1	2.3	3.1	60	inner refill (outer emptied)
	E	12:15			12:15											60	
8	S	12:18	30	200	12:18	30	200	4.40	20.96	0.528	2.516	32.3	51.2	2.2	3.4	60	outer refill
	E	12:48			12:48											60	
9	S	12:48	20	220	12:48	20	220	1.97	15.69	0.236	1.884	21.7	57.5	1.5	3.9	60	outer emptied
	E	13:08			13:08											60	
10	S	13:13	30	250	13:13	30	250	4.84	18.57	0.581	2.229	35.5	45.3	2.4	3.0	60	outer refill
	E	13:43			13:43											60	
11	S	13:52	60	310	13:52	60	310	7.51	38.03	0.902	4.565	27.6	46.4	1.8	3.1	61	
	E	14:52			14:52											61	

DOUBLE RING INFILTROMETER TEST DATA

Project:	NEC Beaumont Ave & Oak Valley	**Client:**	Santiago Holdings, LLC
Project No.:	13627.1	**Test Date:**	March 9, 2020
Soil Classification:	(SM) - Silty Sand	**Test Hole No.:**	DRI-2
Depth of Test Hole:	10 ft	**Test Hole Diameter:**	12 in. inner, 24 in. annular
Liquid Used:	Tap Water	**Date Excavated:**	March 9, 2020
Area of Rings:	Inner = 0.785 ft^2 , Annular 2.36 ft^2	**pH:**	7.8
Tested By:	A.L. & C.P.	**Depth of Water in Rings:**	5 in
Liquid Level Maintained Using:	Vacuum Seal	**Ring Penetration:**	3.5 in
Depth to Water Table:	300+ ft		

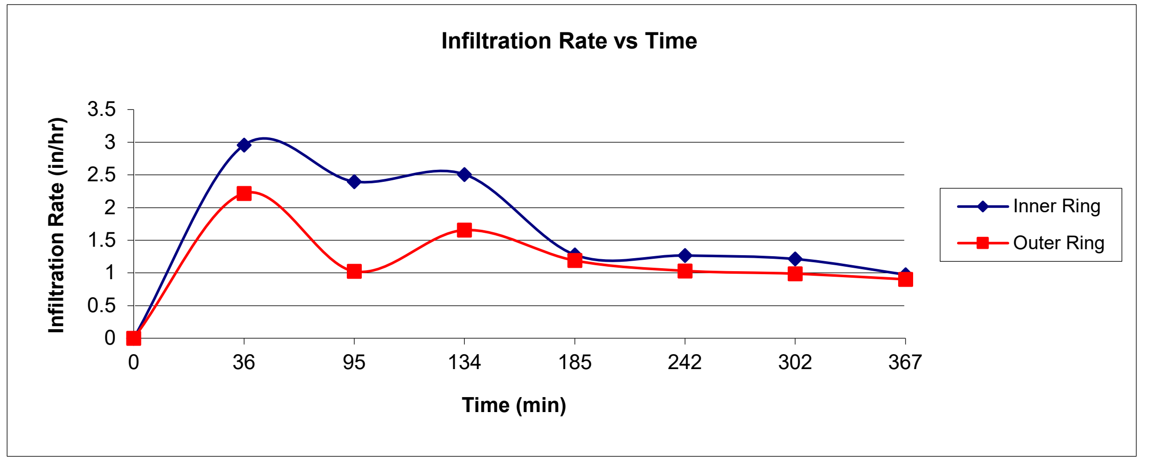


TEST PERIOD

TRIAL NO.		INNER			ANNULAR SPACE			WATER USED (lbs.)		WATER USED (gal)		INFILTRATION RATE (gal/sf.day)		INFILTRATION RATE (in/hr)		LIQUID TEMP (°F)	REMARKS
		TIME	TIME INTERVAL (minutes)	TOTAL ELAPSED TIME (minutes)	TIME	TIME INTERVAL (minutes)	TOTAL ELAPSED TIME (minutes)	inner	annular space	inner	annular space	inner	annular space	inner	annular space		
1	S	9:40	15	15	9:40	15	15	3.32	10.36	0.399	1.244	48.7	50.6	3.3	3.4	58	
	E	9:55			9:55											58	
2	S	9:55	15	30	9:55	15	30	1.65	8.33	0.198	1.000	24.2	40.7	1.6	2.7	58	
	E	10:10			10:10											58	
3	S	10:10	30	60	10:10	30	60	2.57	13.35	0.309	1.603	18.9	32.6	1.3	2.2	59	
	E	10:40			10:40											59	
4	S	10:45	30	90	10:45	30	90	2.98	9.39	0.358	1.127	21.9	22.9	1.5	1.5	59	
	E	11:15			11:15											59	
5	S	11:15	30	120	11:15	30	120	2.38	8.20	0.286	0.984	17.5	20.0	1.2	1.3	59	
	E	11:45			11:45											59	
6	S	11:45	30	150	11:45	30	150	1.86	9.88	0.223	1.186	13.7	24.1	0.9	1.6	60	
	E	12:15			12:15											60	
7	S	12:15	30	180	12:15	30	180	1.75	11.68	0.210	1.402	12.8	28.5	0.9	1.9	60	inner bottle leak
	E	12:45			12:45											60	
8	S	12:49	60	240	12:49	60	240	3.90	17.68	0.468	2.122	14.3	21.6	1.0	1.4	60	outer refill
	E	13:49			13:49											60	
9	S	13:49	60	300	13:49	60	300	3.22	17.81	0.387	2.138	11.8	21.7	0.8	1.5	60	
	E	14:49			14:49											61	

DOUBLE RING INFILTROMETER TEST DATA

Project:	NEC Beaumont Ave & Oak Valley	**Client:**	Santiago Holdings, LLC
Project No.:	13627.1	**Test Date:**	March 11, 2020
Soil Classification:	(SM) Silty Sand	**Test Hole No.:**	DRI-3
Depth of Test Hole:	12 ft	**Test Hole Diameter:**	12 in. inner, 24 in. annular
Liquid Used:	Tap Water	**Date Excavated:**	March 9, 2020
Area of Rings:	Inner = 0.785 ft^2 , Annular 2.36 ft^2	**pH:**	7.8
Tested By:	B.M.	**Depth of Water in Rings:**	4 in
Liquid Level Maintained Using:	Vacuum Seal	**Ring Penetration:**	3 in
Depth to Water Table:	300+ ft		

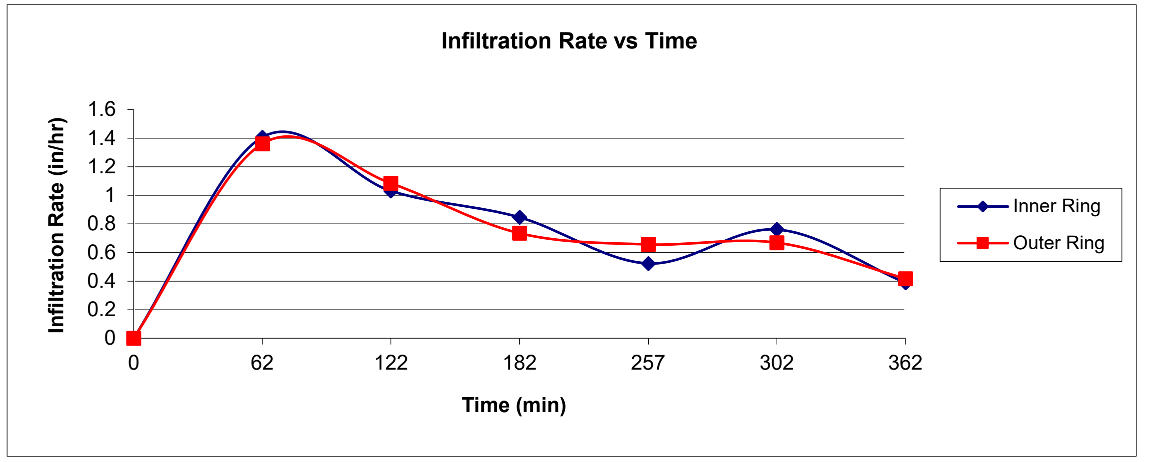


TEST PERIOD

TRIAL NO.	INNER				ANNULAR SPACE			WATER USED (lbs.)		WATER USED (gal)		INFILTRATION RATE (gal/sf.day)		INFILTRATION RATE (in/hr)		LIQUID TEMP (°F)	REMARKS
	TIME		TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	TIME	TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	inner	annular space	inner	annular space	inner	annular space	inner	annular space		
1	S	8:39	36	36	8:39	36	36	7.21	16.27	0.866	1.953	44.1	33.1	3.0	2.2	55	
	E	9:15			9:15											55	
2	S	9:15	59	95	9:15	59	95	9.59	12.31	1.151	1.478	35.8	15.3	2.4	1.0	55	
	E	10:14			10:14											55	
3	S	10:14	39	134	10:14	39	134	6.63	13.15	0.796	1.579	37.4	24.7	2.5	1.7	55	
	E	10:53			10:53											56	
4	S	10:53	51	185	10:53	51	185	4.42	12.36	0.531	1.484	19.1	17.8	1.3	1.2	56	
	E	11:44			11:44											56	
5	S	11:48	57	242	11:48	57	242	4.89	11.98	0.587	1.438	18.9	15.4	1.3	1.0	56	
	E	12:45			12:45											56	
6	S	12:45	60	302	12:45	60	302	4.93	12.08	0.592	1.450	18.1	14.7	1.2	1.0	57	
	E	13:45			13:45											57	
7	S	13:45	65	367	13:45	65	367	4.29	11.94	0.515	1.433	14.5	13.5	1.0	0.9	57	
	E	14:50			14:50											57	

DOUBLE RING INFILTROMETER TEST DATA

Project:	NEC Beaumont Ave & Oak Valley	**Client:**	Santiago Holdings, LLC
Project No.:	13627.1	**Test Date:**	March 11, 2020
Soil Classification:	(SM) Silty Sand	**Test Hole No.:**	DRI-4
Depth of Test Hole:	12 ft	**Test Hole Diameter:**	12 in. inner, 24 in. annular
Liquid Used:	Tap Water	**Date Excavated:**	March 9, 2020
Area of Rings:	Inner = 0.785 ft^2 , Annular 2.36 ft^2	**pH:**	7.8
Tested By:	B.M.	**Depth of Water in Rings:**	3 in
Liquid Level Maintained Using:	Vacuum Seal	**Ring Penetration:**	3 in
Depth to Water Table:	300+ ft		

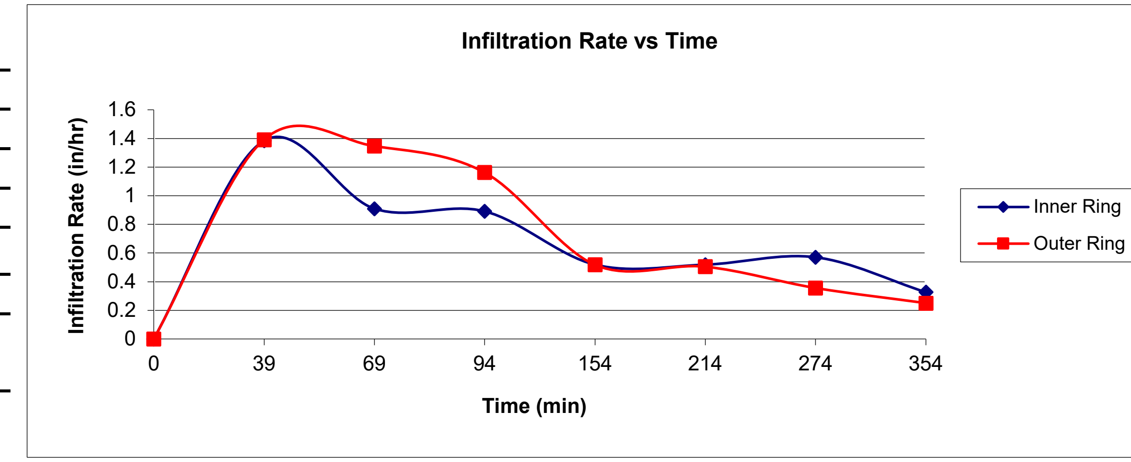


TEST PERIOD

TRIAL NO.	INNER				ANNULAR SPACE			WATER USED (lbs.)		WATER USED (gal)		INFILTRATION RATE (gal/sf.day)		INFILTRATION RATE (in/hr)		LIQUID TEMP (°F)	REMARKS
	TIME		TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	TIME	TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	inner	annular space	inner	annular space	inner	annular space	inner	annular space		
1	S	8:58	62	62	8:58	62	62	5.91	17.19	0.709	2.064	21.0	20.3	1.4	1.4	56	
	E	10:00			10:00											56	
2	S	10:00	60	122	10:00	60	122	4.19	13.25	0.503	1.591	15.4	16.2	1.0	1.1	56	
	E	11:00			11:00											56	
3	S	11:00	60	182	11:00	60	182	3.44	8.98	0.413	1.078	12.6	11.0	0.8	0.7	57	
	E	12:00			12:00											57	
4	S	12:00	75	257	12:00	75	257	2.66	10.03	0.319	1.204	7.8	9.8	0.5	0.7	57	
	E	13:15			13:15											58	
5	S	13:15	45	302	13:15	45	302	2.32	6.13	0.279	0.736	11.4	10.0	0.8	0.7	58	
	E	14:00			14:00											58	
6	S	14:00	60	362	14:00	60	362	1.58	5.10	0.190	0.612	5.8	6.2	0.4	0.4	59	
	E	15:00			15:00											59	

DOUBLE RING INFILTROMETER TEST DATA

Project:	NEC Beaumont Ave & Oak Valley	**Client:**	Santiago Holdings, LLC
Project No.:	13627.1	**Test Date:**	March 11, 2020
Soil Classification:	(SM) Silty Sand	**Test Hole No.:**	DRI-5
Depth of Test Hole:	12 ft	**Test Hole Diameter:**	12 in. inner, 24 in. annular
Liquid Used:	Tap Water	**Date Excavated:**	March 9, 2020
Area of Rings:	Inner = 0.785 ft^2 , Annular 2.36 ft^2	**pH:**	7.8
Tested By:	J.S.	**Depth of Water in Rings:**	3.5 in
Liquid Level Maintained Using:	Vacuum Seal	**Ring Penetration:**	3 in
Depth to Water Table:	300+ ft		

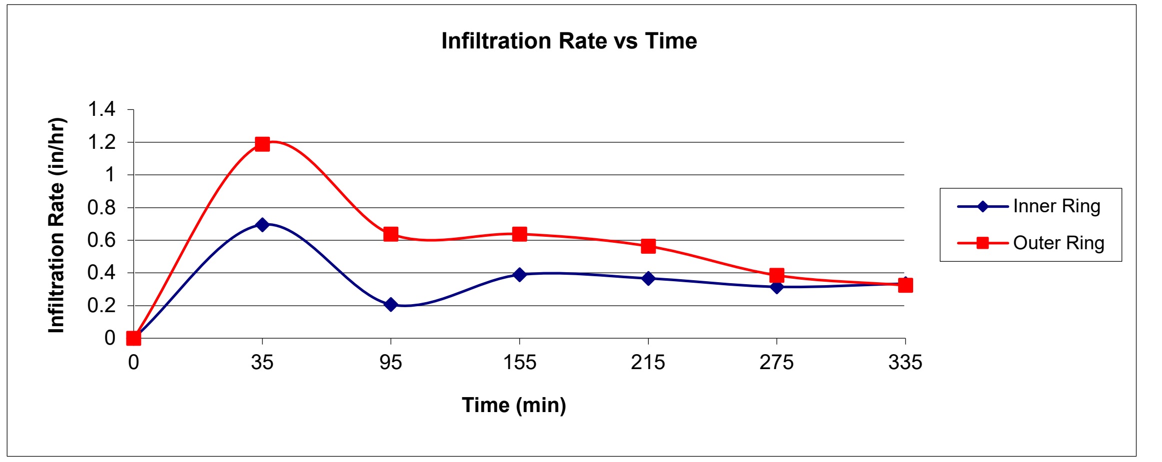


TEST PERIOD

TRIAL NO.	INNER TIME		INNER TIME INTERVAL (minutes)	INNER TOTAL ELAPSED TIME (minutes)	ANNULAR SPACE TIME	ANNULAR SPACE TIME INTERVAL (minutes)	ANNULAR SPACE TOTAL ELAPSED TIME (minutes)	WATER USED (lbs.) inner	WATER USED (lbs.) annular space	WATER USED (gal) inner	WATER USED (gal) annular space	INFILTRATION RATE (gal/sf.day) inner	INFILTRATION RATE (gal/sf.day) annular space	INFILTRATION RATE (in/hr) inner	INFILTRATION RATE (in/hr) annular space	LIQUID TEMP (°F)	REMARKS
1	S	9:31	39	39	9:31	39	39	3.66	11.06	0.439	1.328	20.7	20.8	1.4	1.4	55	
	E	10:10			10:10											55	
2	S	10:10	30	69	10:10	30	69	1.85	8.23	0.222	0.988	13.6	20.1	0.9	1.3	55	
	E	10:40			10:40											56	
3	S	10:40	25	94	10:40	25	94	1.51	5.92	0.181	0.711	13.3	17.3	0.9	1.2	56	
	E	11:05			11:05											56	
4	S	11:05	60	154	11:05	60	154	2.11	6.33	0.253	0.760	7.7	7.7	0.5	0.5	56	
	E	12:05			12:05											56	
5	S	12:10	60	214	12:10	60	214	2.11	6.17	0.253	0.741	7.7	7.5	0.5	0.5	56	
	E	13:10			13:10											57	
6	S	13:10	60	274	13:10	60	274	2.32	4.35	0.279	0.522	8.5	5.3	0.6	0.4	57	
	E	14:10			14:10											57	
7	S	14:10	80	354	14:10	80	354	1.77	4.08	0.212	0.490	4.9	3.7	0.3	0.3	57	
	E	15:30			15:30											57	

DOUBLE RING INFILTROMETER TEST DATA

Project:	NEC Beaumont Ave & Oak Valley	**Client:**	Santiago Holdings, LLC
Project No.:	13627.1	**Test Date:**	March 11, 2020
Soil Classification:	(SM) Silty Sand	**Test Hole No.:**	DRI-6
Depth of Test Hole:	11 ft	**Test Hole Diameter:**	12 in. inner, 24 in. annular
Liquid Used:	Tap Water	**Date Excavated:**	March 9, 2020
Area of Rings:	Inner = 0.785 ft^2 , Annular 2.36 ft^2	**pH:**	7.8
Tested By:	J.S.	**Depth of Water in Rings:**	3 in
Liquid Level Maintained Using:	Vacuum Seal	**Ring Penetration:**	3 in
Depth to Water Table:	300+ ft		

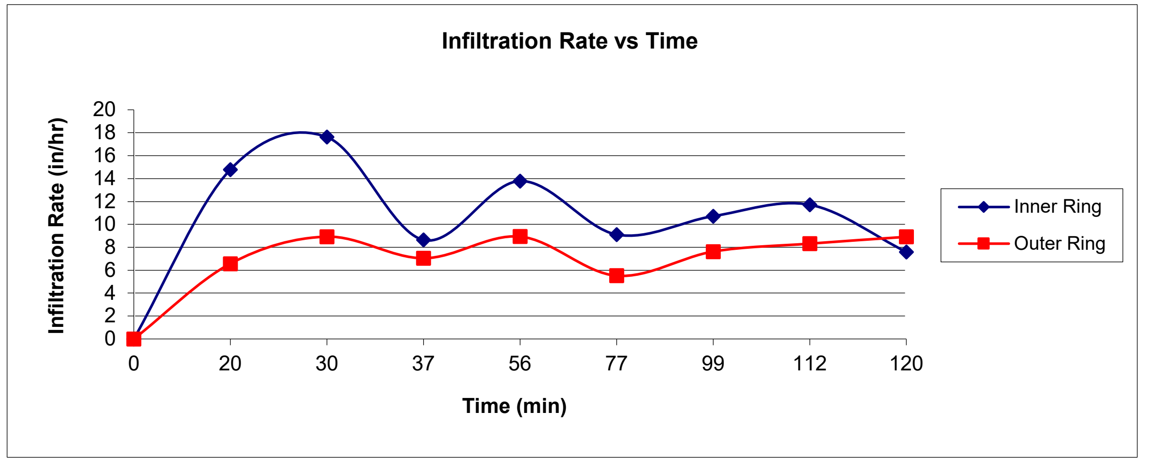


TEST PERIOD

TRIAL NO.	INNER				ANNULAR SPACE			WATER USED (lbs.)		WATER USED (gal)		INFILTRATION RATE (gal/sf.day)		INFILTRATION RATE (in/hr)		LIQUID TEMP (°F)	REMARKS
	TIME		TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	TIME	TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	inner	annular space	inner	annular space	inner	annular space	inner	annular space		
1	S	9:55	35	35	9:55	35	35	1.65	8.48	0.198	1.018	10.4	17.7	0.7	1.2	55	
	E	10:30			10:30											55	
2	S	10:30	60	95	10:30	60	95	0.84	7.80	0.101	0.936	3.1	9.5	0.2	0.6	55	
	E	11:30			11:30											55	
3	S	11:30	60	155	11:30	60	155	1.58	7.80	0.190	0.936	5.8	9.5	0.4	0.6	55	
	E	12:30			12:30											56	
4	S	12:30	60	215	12:30	60	215	1.49	6.89	0.179	0.827	5.5	8.4	0.4	0.6	56	
	E	13:30			13:30											56	
5	S	13:30	60	275	13:30	60	275	1.28	4.71	0.154	0.565	4.7	5.8	0.3	0.4	56	
	E	14:30			14:30											56	
6	S	14:30	60	335	14:30	60	335	1.36	3.96	0.163	0.475	5.0	4.8	0.3	0.3	57	
	E	15:30			15:30											57	

DOUBLE RING INFILTROMETER TEST DATA

Project:	NEC Beaumont Ave & Oak Valley	**Client:**	Santiago Holdings, LLC
Project No.:	13627.1	**Test Date:**	March 12, 2020
Soil Classification:	(SW) Well Graded Sand	**Test Hole No.:**	DRI-7
Depth of Test Hole:	11 ft	**Test Hole Diameter:**	12 in. inner, 24 in. annular
Liquid Used:	Tap Water	**Date Excavated:**	March 9, 2020
Area of Rings:	Inner = 0.785 ft^2 , Annular 2.36 ft^2	**pH:**	7.8
Tested By:	F.J.	**Depth of Water in Rings:**	3 in
Liquid Level Maintained Using:	Vacuum Seal	**Ring Penetration:**	4 in
Depth to Water Table:	300+ ft		

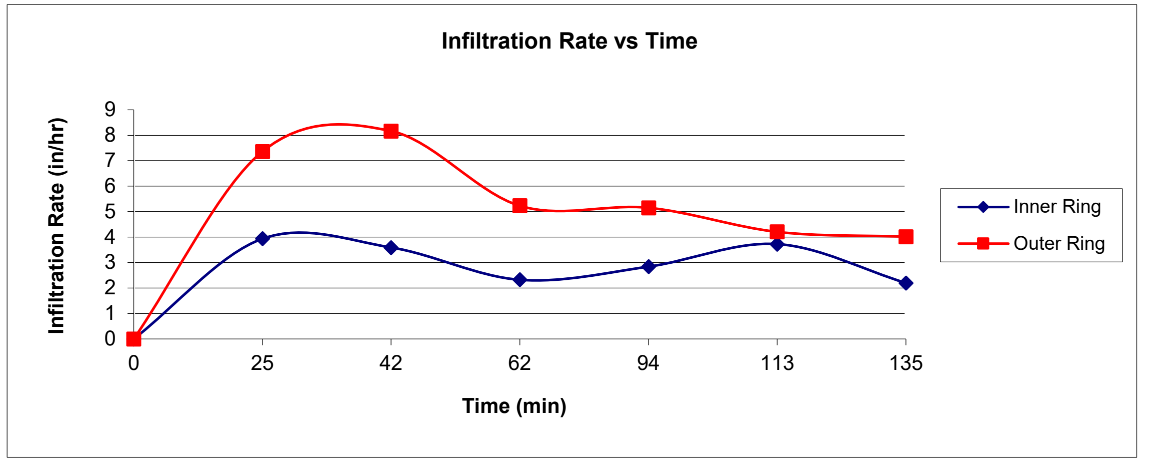


TEST PERIOD

TRIAL NO.	INNER TIME		INNER TIME INTERVAL (minutes)	INNER TOTAL ELAPSED TIME (minutes)	ANNULAR SPACE TIME	ANNULAR SPACE TIME INTERVAL (minutes)	ANNULAR SPACE TOTAL ELAPSED TIME (minutes)	WATER USED (lbs.) inner	WATER USED (lbs.) annular space	WATER USED (gal) inner	WATER USED (gal) annular space	INFILTRATION RATE (gal/sf.day) inner	INFILTRATION RATE (gal/sf.day) annular space	INFILTRATION RATE (in/hr) inner	INFILTRATION RATE (in/hr) annular space	LIQUID TEMP (°F)	REMARKS
1	S	9:45	20	20	9:45	20	20	20.05	26.79	2.407	3.216	220.8	98.1	14.8	6.6	55	
	E	10:05			10:05											55	
2	S	10:05	10	30	10:05	10	30	11.94	18.19	1.433	2.184	262.9	133.2	17.6	8.9	55	
	E	10:15			10:15											55	
3	S	10:15	7	37	10:15	7	37	4.10	10.05	0.492	1.206	129.0	105.2	8.6	7.0	55	
	E	10:22			10:22											56	
4	S	10:35	19	56	10:35	19	56	17.75	34.59	2.131	4.152	205.7	133.4	13.8	8.9	56	both refill
	E	10:54			10:54											56	
5	S	11:04	21	77	11:04	21	77	12.97	23.62	1.557	2.836	136.0	82.4	9.1	5.5	56	outer refill
	E	11:25			11:25											56	
6	S	11:44	22	99	11:44	22	99	15.98	34.20	1.918	4.106	160.0	113.9	10.7	7.6	57	outer refill
	E	12:06			12:06											57	
7	S	12:15	13	112	12:15	13	112	10.32	22.04	1.239	2.646	174.8	124.2	11.7	8.3	57	outer refill
	E	12:28			12:28											57	
8	S	12:37	8	120	12:37	8	120	4.12	14.53	0.495	1.744	113.4	133.0	7.6	8.9	57	
	E	12:45			12:45											57	

DOUBLE RING INFILTROMETER TEST DATA

Project:	NEC Beaumont Ave & Oak Valley	**Client:**	Santiago Holdings, LLC
Project No.:	13627.1	**Test Date:**	March 12, 2020
Soil Classification:	(SW-SM) Well Graded Sand w/ Silt	**Test Hole No.:**	DRI-8
Depth of Test Hole:	14 ft	**Test Hole Diameter:**	12 in. inner, 24 in. annular
Liquid Used:	Tap Water	**Date Excavated:**	March 9, 2020
Area of Rings:	Inner = 0.785 ft^2 , Annular 2.36 ft^2	**pH:**	7.8
Tested By:	F.J.	**Depth of Water in Rings:**	3.5 in
Liquid Level Maintained Using:	Vacuum Seal	**Ring Penetration:**	3 in
Depth to Water Table:	300+ ft		



TEST PERIOD

TRIAL NO.	INNER				ANNULAR SPACE			WATER USED (lbs.)		WATER USED (gal)		INFILTRATION RATE (gal/sf.day)		INFILTRATION RATE (in/hr)		LIQUID TEMP (°F)	REMARKS
	TIME		TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	TIME	TIME INTERVAL (minutes)	TOTAL ELASPED TIME (minutes)	inner	annular space	inner	annular space	inner	annular space	inner	annular space		
1	S	9:55	25	25	9:55	25	25	6.67	37.50	0.801	4.502	58.8	109.9	3.9	7.4	55	outer refill
	E	10:20			10:20											55	
2	S	10:23	17	42	10:23	17	42	4.14	28.28	0.497	3.395	53.6	121.9	3.6	8.2	55	outer refill
	E	10:40			10:40											55	
3	S	10:52	20	62	10:52	20	62	3.15	21.31	0.378	2.558	34.7	78.1	2.3	5.2	56	outer refill
	E	11:12			11:12											56	
4	S	11:19	32	94	11:19	32	94	6.16	33.60	0.739	4.034	42.4	76.9	2.8	5.2	56	outer refill
	E	11:51			11:51											56	
5	S	12:00	19	113	12:00	19	113	4.80	16.28	0.576	1.954	55.6	62.8	3.7	4.2	57	
	E	12:19			12:19											57	
6	S	12:19	22	135	12:19	22	135	3.28	18.01	0.394	2.162	32.8	60.0	2.2	4.0	57	
	E	12:41			12:41											57	

APPENDIX E

Seismic Design Spectrum

Project: APN's 404-190-001 & -003
Project Number: 13627.1
Client: Santigo Holdings, LLC, c/o Thatcher Engineering & Associates
Site Lat/Long: 33.9478/-116.9786
Controlling Seismic Source: Southern San Andreas

REFERENCE	NOTATION	VALUE
Site Class	A, B, C, D, E, or F	D measured
Site Class D - Table 11.4-1	F_a	1.0
Site Class D - 21.2.3.(ii)	F_v	2.5
$0.2*(S_{D1}/S_{DS})$	T_0	0.116
S_{D1}/S_{DS}	T_S	0.582
Fundamental Period (12.8.2)	T	Period
Seismic Design Maps or Fig 22-14	T_L	8
Equation 11.4-4 - $2/3*S_{M1}$	S_{D1}	0.773
Equation 11.4-2 - F_V*S_1	S_{M1}	1.159

REFERENCE	NOTATION	VALUE
F_v (Table 11.4-2)[Used for General Spectrum]	F_v	1.7
Design Maps	S_s	1.993
Design Maps	S_1	0.682
Equation 11.4-1 - F_A*S_S	S_{MS}	1.993
Equation 11.4-3 - $2/3*S_{MS}$	S_{DS}	1.329
Design Maps	PGA	0.812
Table 11.8-1	F_{PGA}	1.1
Equation 11.8-1 - F_{PGA}*PGA	PGA_M	0.893
Section 21.5.3	80% of PGA_M	0.715
Design Maps	C_{RS}	0.919
Design Maps	C_{R1}	0.893

RISK COEFFICIENT

Cr - At Perods <=0.2, Cr=Crs	C_{RS}	0.919
Cr - At Periods >=1.0, Cr=Cr1	C_{R1}	0.893

Cr - At Periods between 0.2 and 1.0 use trendline formula to complete

Period	Cr
0.200	0.919
0.300	0.916
0.400	0.913
0.500	0.909
0.600	0.906
0.680	0.903
1.000	0.893

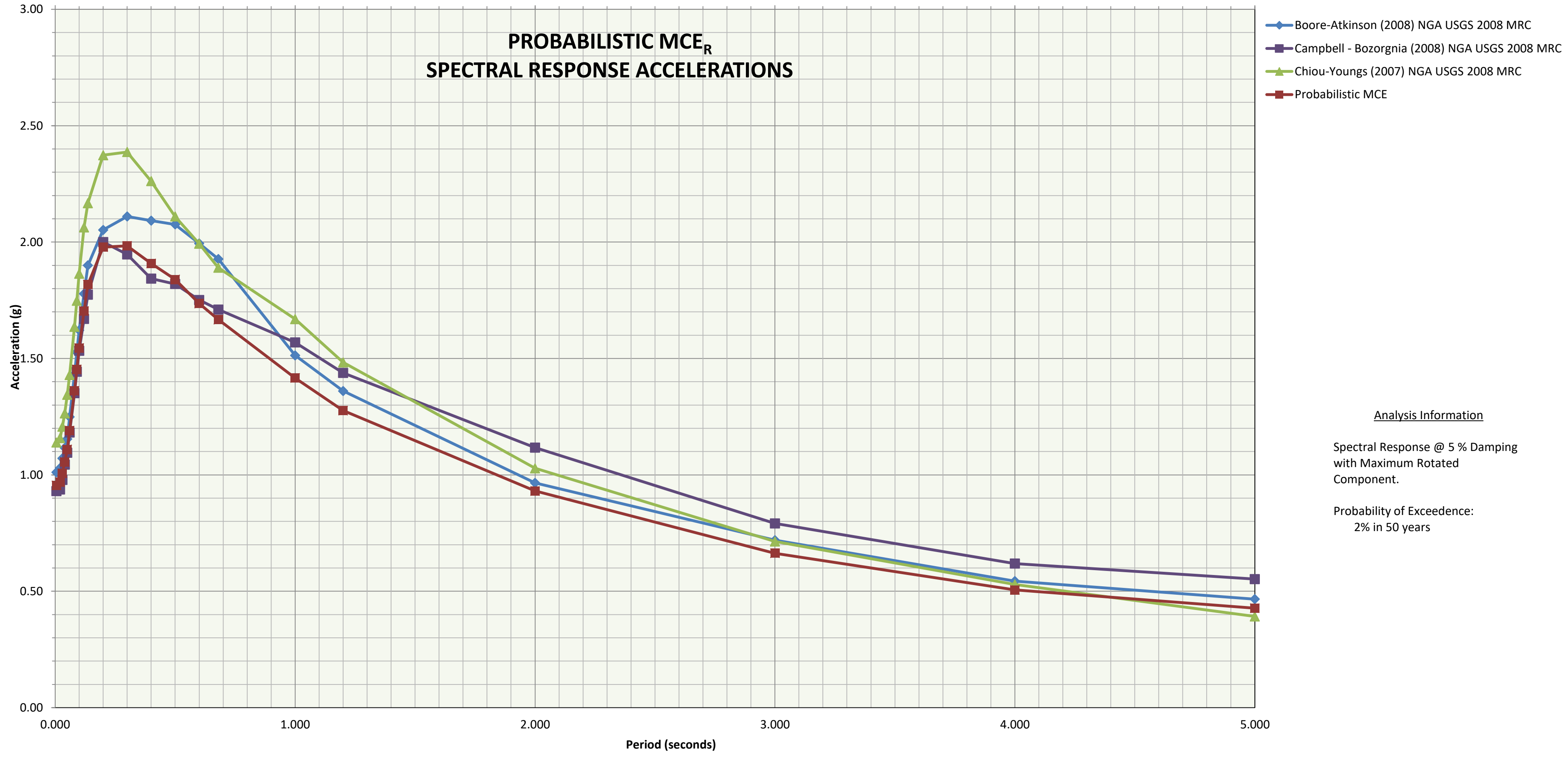
PROBABILISTIC SPECTRA
2% in 50 year Exceedence

Period	B - A	C - B	C - Y	Mean	Risk Coefficient (C_R)	Probabilistic MCE
0.005	1.01	0.93	1.14	1.04	0.919	0.955
0.020	1.03	0.94	1.16	1.05	0.919	0.969
0.030	1.07	0.98	1.21	1.10	0.919	1.007
0.040	1.12	1.04	1.26	1.15	0.919	1.056
0.050	1.15	1.10	1.34	1.21	0.919	1.109
0.060	1.25	1.18	1.43	1.30	0.919	1.190
0.080	1.43	1.35	1.64	1.48	0.919	1.361
0.090	1.53	1.44	1.75	1.58	0.919	1.453
0.100	1.62	1.53	1.86	1.68	0.919	1.545
0.120	1.78	1.67	2.06	1.85	0.919	1.704
0.136	1.90	1.77	2.17	1.98	0.919	1.818
0.200	2.05	2.00	2.37	2.15	0.919	1.979
0.300	2.11	1.95	2.39	2.17	0.916	1.984
0.400	2.09	1.84	2.26	2.09	0.913	1.908
0.500	2.08	1.82	2.11	2.02	0.909	1.839
0.600	1.99	1.75	1.99	1.92	0.906	1.736
0.680	1.93	1.71	1.89	1.85	0.903	1.667
1.000	1.51	1.57	1.67	1.59	0.893	1.416
1.200	1.36	1.44	1.48	1.43	0.893	1.276
2.000	0.97	1.12	1.03	1.04	0.893	0.931
3.000	0.72	0.79	0.71	0.74	0.893	0.663
4.000	0.54	0.62	0.53	0.57	0.893	0.506
5.000	0.47	0.55	0.39	0.48	0.893	0.427

B-A - Boore-Atkinson (2008) NGA USGS 2008 MRC
C-B - Campbell-Bozorgnia (2008) NGA USGS 2008 MRC
C-Y - Chiou-Youngs (2007) NGA USGS 2008 MRC

Probabilistic PGA: 0.955
Is $Sa_{(max)}<1.2F_a$? NO

Project No: 13627.1



Analysis Information

Spectral Response @ 5 % Damping with Maximum Rotated Component.

Probability of Exceedence: 2% in 50 years

Project No: 13627.1

LOR GEOTECHNICAL GROUP, INC.

DETERMINISTIC SPECTRUM AND LOWER LIMIT

Largest Amplitudes of Ground Motions Considering All Sources Calculated using Weighted Mean of Attenuation Equations*.

Controlling Source: Southern San Andreas

Period	DETERMINISTIC (RAW)	DETERMINISTIC MCE 84 FRACTILE
0.005	0.665	0.665
0.020	0.679	0.679
0.030	0.711	0.711
0.040	0.748	0.748
0.050	0.784	0.784
0.060	0.838	0.838
0.080	0.944	0.944
0.090	0.998	0.998
0.100	1.049	1.049
0.120	1.140	1.140
0.136	1.203	1.203
0.200	1.290	1.290
0.300	1.353	1.353
0.400	1.350	1.350
0.500	1.371	1.371
0.600	1.357	1.357
0.680	1.346	1.346
1.000	1.240	1.240
1.200	1.156	1.156
2.000	0.883	0.883
3.000	0.685	0.685
4.000	0.531	0.531
5.000	0.414	0.414

Is Sa(max)<1.2Fa? NO

Deterministic PGA: 0.665

*Attenuation Equations

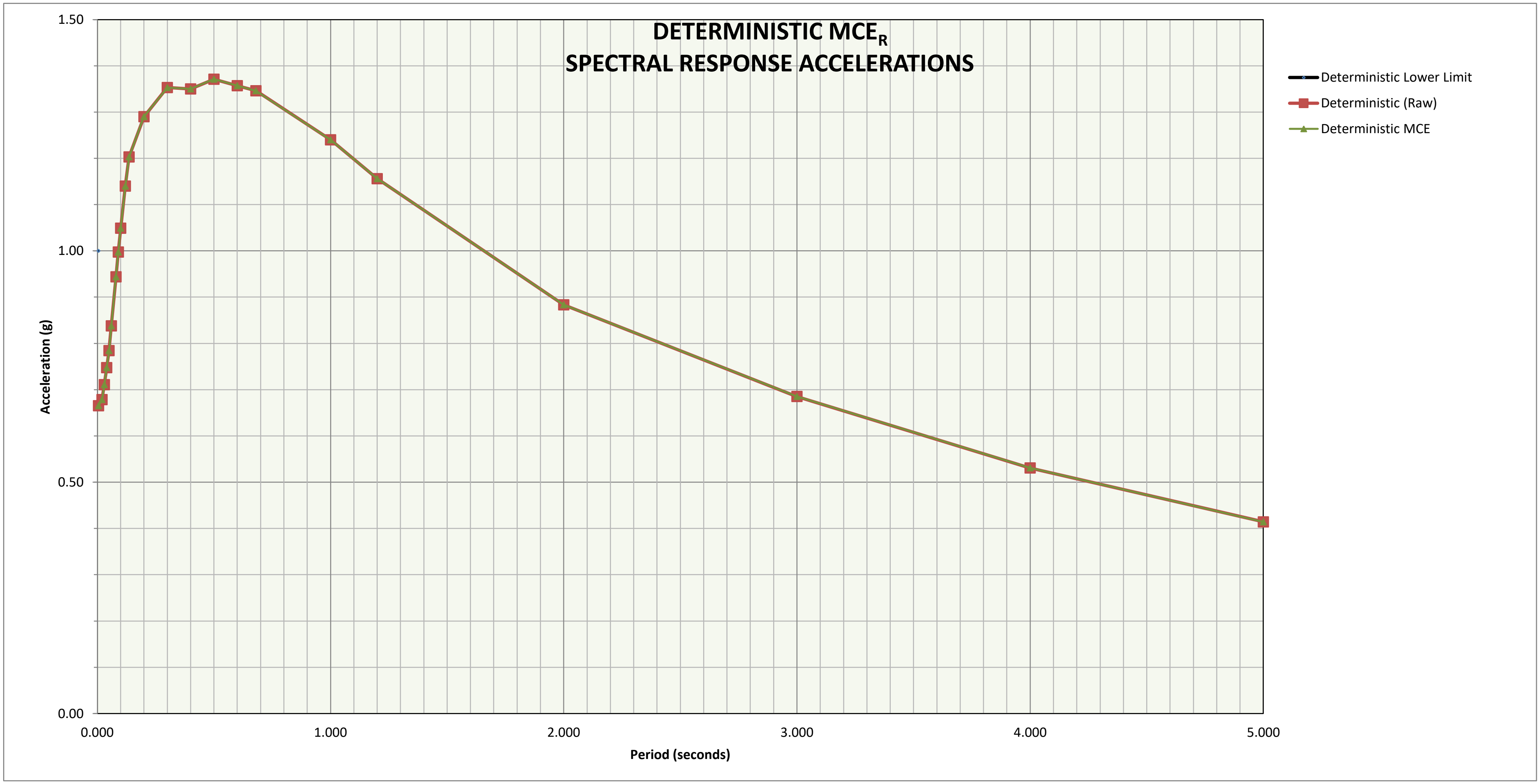
Boore - Atkinson (2008) NGA USGS 2008 MRC

Campbell - Bozorgnia (2008) NGA USGS 2008 MRC

Chiou - Youngs (2007) NGA USGS 2008 MRC

Project No: 13627.1

LOR GEOTECHNICAL GROUP, INC.



Project No: 13627.1

LOR GEOTECHNICAL GROUP, INC.

SITE SPECIFIC SPECTRA

Period	Probabilistic MCE	Deterministic MCE	Site-Specific MCE	Design Response Spectrum (Sa)
0.005	0.955	0.665	0.665	0.453
0.020	0.969	0.679	0.679	0.480
0.030	1.007	0.711	0.711	0.590
0.040	1.056	0.748	0.748	0.644
0.050	1.109	0.784	0.784	0.699
0.060	1.190	0.838	0.838	0.754
0.080	1.361	0.944	0.944	0.864
0.090	1.453	0.998	0.998	0.919
0.100	1.545	1.049	1.049	0.973
0.120	1.704	1.140	1.140	1.063
0.136	1.818	1.203	1.203	1.063
0.200	1.979	1.290	1.290	1.063
0.300	1.984	1.353	1.353	1.063
0.400	1.908	1.350	1.350	1.063
0.500	1.839	1.371	1.371	1.063
0.600	1.736	1.357	1.357	1.063
0.680	1.667	1.346	1.346	0.909
1.000	1.416	1.240	1.240	0.827
1.200	1.276	1.156	1.156	0.771
2.000	0.931	0.883	0.883	0.589
3.000	0.663	0.685	0.663	0.442
4.000	0.506	0.531	0.506	0.337
5.000	0.427	0.414	0.414	0.276

Period	ASCE 7 SECTION 11.4.6 General Spectrum	80% General Response Spectrum
0.005	0.566	0.453
0.010	0.600	0.480
0.030	0.737	0.590
0.040	0.806	0.644
0.050	0.874	0.699
0.060	0.943	0.754
0.080	1.080	0.864
0.090	1.148	0.919
0.100	1.217	0.973
0.110	1.285	1.028
0.120	1.329	1.063
0.136	1.329	1.063
0.150	1.329	1.063
0.160	1.329	1.063
0.170	1.329	1.063
0.180	1.329	1.063
0.190	1.329	1.063
0.200	1.329	1.063
0.300	1.329	1.063
0.400	1.329	1.063
0.500	1.329	1.063
0.580	1.329	1.063
0.640	1.208	0.966
0.680	1.137	0.909
0.850	0.909	0.727
0.900	0.859	0.687
0.950	0.814	0.651
1.000	0.773	0.618
1.200	0.644	0.515
2.000	0.386	0.309
3.000	0.258	0.206
4.000	0.193	0.155
5.000	0.155	0.124

ASCE 7-16: Section 21.4

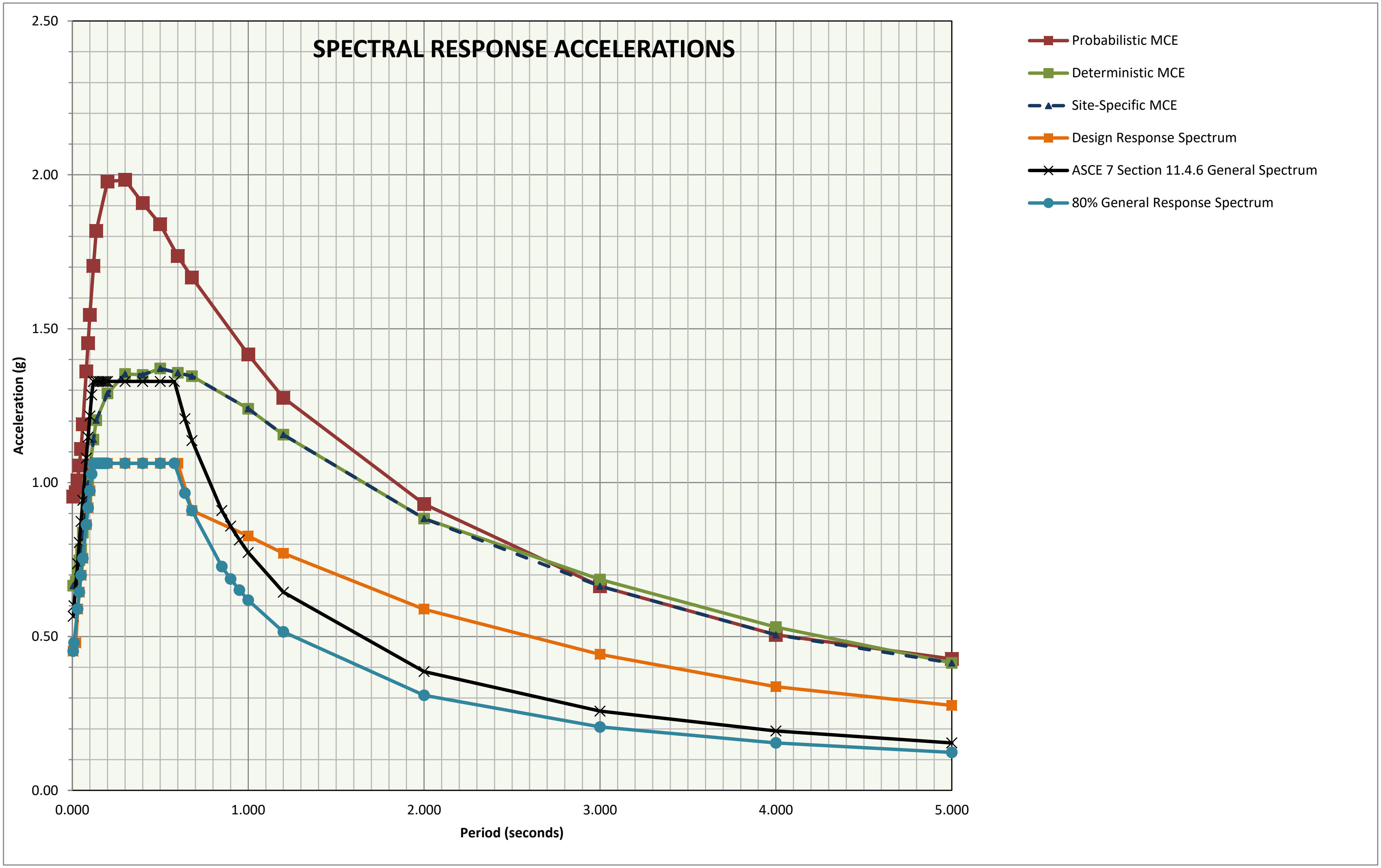
	Calculated Value	**Design Value**
SDS:	~~0.957~~	1.063
SD1:	1.381	1.381
SMS:	~~1.435~~	1.594
SM1:	2.071	2.071
Site Specific PGAm:	~~0.665~~	0.715
Site Class:	D measured	

Seismic Design Category - Short*	D
Seismic Design Category - 1s*	D

* Risk Categories I, II, or III

Project No: 13627.1

LOR GEOTECHNICAL GROUP, INC.



Project No: 13627.1

LOR GEOTECHNICAL GROUP, INC.

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

From: Robert Vestal <rvestal@beaumontca.gov>
Sent: Wednesday, July 26, 2023 4:51 PM
To: Robert Lane; Jeff Hart
Cc: Anthony M. Mistretta; Patrick Flanagan; Michael Gentile
Subject: RE: Beaumont Village Project - PWQMP Review, Project #: 226816-0000894.47 - Above vs. Underground Infiltration Basins Issue

Robert,

Jeff and I are ok with the method below. Please proceed with a resubmittal.

From: Robert Lane <Rlane@cascinc.com>
Sent: Wednesday, July 26, 2023 2:30 PM
To: Robert Vestal <rvestal@beaumontca.gov>; Jeff Hart <jhart@beaumontca.gov>
Cc: Anthony M. Mistretta <amistretta@cascinc.com>; Patrick Flanagan <pflanagan@cascinc.com>; Michael Gentile <mgentile@cascinc.com>
Subject: RE: Beaumont Village Project - PWQMP Review, Project #: 226816-0000894.47 - Above vs. Underground Infiltration Basins Issue

Good afternoon Robert and Jeff,

Just following up on the e-mail below.
Let us know if you have any questions.

Thanks,

CELEBRATING 30 YEARS
CASC
Engineering and Consulting

Rob Lane, E.I.T.
Design Engineer II

Casc Engineering & Consulting
1470 E. Cooley Drive
Colton, CA 92324
Phone: 909.783.0101 x3400
rlane@cascinc.com

From: Robert Lane
Sent: Monday, July 24, 2023 7:29 AM
To: 'Robert Vestal' <rvestal@beaumontca.gov>; Jeff Hart <jhart@beaumontca.gov>

Cc: Anthony M. Mistretta <amistretta@cascinc.com>; Patrick Flanagan <pflanagan@cascinc.com>; Michael Gentile <mgentile@cascinc.com>
Subject: Beaumont Village Project - PWQMP Review, Project #: 226816-0000894.47 - Above vs. Underground Infiltration Basins Issue

Good morning Robert and Jeff,

Please see attached exhibit illustrating the revision to the site we discussed on our call a couple weeks ago on the 11th. As discussed, we maximized the proposed above ground basins/landscape depressions utilizing 2:1 side slopes, and confirmed the basins will draw down within the allowable 72 hours.
Unfortunately we are still not able to provide 100% of the required DCV in the above ground basins. See breakdown below.
Flows from DA C and DA D are directed to the above ground basins first, then will overflow to the underground basin in Parcel 6 (SW corner). Emergency overflow is provided via under sidewalk drain.
We are not able to get the entirety of DA B to drain to an above ground basin first before overflowing to the below ground basin due to the layout, however we are able to provide approximately 94% of the DCV in above ground basins.
We removed the underground basins from DA C and DA D, and the lone proposed underground basin located near the southwest corner is oversized to mitigate for increased flow rates caused by the development. Each row of chambers includes multiple inspection ports for maintenance purposes as the City requested.

DA B - DCV: 11,165 - 10,540 (cumulative above ground basin volume) = 625 CF (6%) DCV to below ground basin
DA C - DCV: 1,787 - 1,430 (above ground basin volume) = 357 CF (20%) DCV to below ground basin
DA D - DCV: 1,614 - 1,240 (above ground basin volume) = 374 CF (23%) DCV to below ground basin

Let us know if you have questions or would like to discuss. Upon City approval, we will move forward with updating the Land Use Entitlement work products.

Thanks,

CELEBRATING 30 YEARS CASC Engineering and Consulting

Rob Lane, E.I.T.
Design Engineer II

Casc Engineering & Consulting
1470 E. Cooley Drive
Colton, CA 92324
Phone: 909.783.0101 x3400
rlane@cascinc.com

From: Suzanne Foxworth <SFoxworth@beaumontca.gov>
Sent: Thursday, May 06, 2021 11:08 AM
To: Kristin Tissot <kristint@thatcherengineering.com>
Cc: Patrick Flanagan <patrickf@thatcherengineering.com>; Vicky Valenzuela <vickyv@thatcherengineering.com>; Jennifer Graham <jgraham@beaumontca.gov>
Subject: RE: Suzanne Foxworth shared "PW2021-0659 BEAUMONT VILLAGE PWQMP" with you 171601

Good morning,

Please see the plan checkers responses in red. Let me know if you have any further questions.

Thanks, Sue. have listed my questions below. I I think it might be easiest to discuss this once the reviewer has reviewed my questions. I trust that they have access to your dropbox to re-review the comments / document as needed. My cell is the best way to reach me. (909) 633-1185.

1. Section D – Concern with infiltration rates needing a factor of safety of 3 being below the threshold of 0.81"/hr & concerns with varying rates
    a. Table D.1 is asking if in-situ rates are less than 1.6"/hr. This does not require the consideration of a safety factor. Per the guidance copied and pasted below, the 1.6" / hr rate already considers a safety factor. This is based on a 5' depth. As shown, the average rate is 2.43"/hr.
    b. Further, we have shown on the informational sheet behind the soils report that each basin will draw down within 72 hours even after applying a safety factor of 3 to the rate closest to each basin. We have based the depth of each basin on those specific rates to insure drawdown within the 72 hour time frame.

Guidance says:
"To avoid creation of nuisance or vector conditions in accordance with MS4 Permit Provision XII.K.1,

a maximum Drawdown Time of 72 hours has been established. To ensure that over the life of the BMP the actual Drawdown Time does not exceed 72 hours, and based on the typical infiltration basin depth of 5 feet, the minimum long-term post-development infiltration rate must be at least 0.83 inches per hour (5ft * 12 / 72 hours = 0.83 inches/hour). As discussed above however, the long-term post-development infiltration rates can be much lower than the initial (pre development) infiltration rates that are measured for feasibility testing. As such, infiltration testing requirements have incorporated a minimum safety factor of 2 for LID Infiltration BMPs. Incorporating the established minimum factor of safety, the tested pre-development infiltration rates must be greater than 1.6 inches per hour to be assured that, over the life of the BMP, nuisance or vector conditions will not be created. This will also ensure that the BMP will be adequately drained in the event of back-to-back storms. Accordingly the following feasibility criteria have been developed to ensure that the most effective BMPs are deployed: • If the average 'in-situ' tested infiltration rate for the site is less than 1.6 inches per hour, LID Infiltration BMPs (infiltration basins, infiltration trenches, etc.) shall not be used. Infiltration testing needs to be performed using approved methodologies, such as those identified in the LID BMP Design Handbook. The analysis used to determine the threshold infiltration rates was based on factors of safety used in the adopted Orange County WQMP/Technical Guidance Document, standard engineering practices, and best professional judgment. Appendix VII ("Infiltration Rate Evaluation Protocol and Factor of Safety Recommendations") of the "Orange County Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans" was consulted." – Clarification accepted provided 72 hours drawdown time is established for all the infiltration BMPs.

2. Request to show roof drains on exhibit
    a. Roof drain locations are not known at this time. Can this be added during final engineering / final WQMP preparation? – Acceptable to show roof down drains in FWQMP.
3. Concern with gas station fueling area runoff entering storm drain / pretreatment of gas station and car wash
    a. Pretreatment can be provided at the inlet to the underground basin for each of these areas. We typically specify a bioclean drop in filter. We will reflect this on the next submittal. Does this satisfy the pretreatment concern? – Acceptable. Please provide appropriate specs for the 'bioclean drop' in the WQMP exhibit.
    b. There is a holding tank shown at the fuel station area. Any fuel leaks from under the canopy would be directed to this holding tank, which will be emptied as needed and disposed of offsite. Runoff from the roof / surrounding areas would be directed to the underground basin (and pretreatment first). Please confirm that this is satisfactory. – Acceptable . Please identify holding tank on the WQMP exhibit clearly.
4. Request to show pollutants of concern in Table E.1
    a. Per the previous page, since LID BMPs have been incorporated into the site to fully address the drainage management areas, this Section E does not need to be completed. Please confirm nothing further is required. –Accepted.

Thanks!

SUE FOXWORTH
Solid Waste & Recycling Manager

City of Beaumont
550 E. 6th Street, Beaumont, Ca 92223
Desk (951) 769-8520 | Fax (951) 769-8526
BeaumontCa.gov
Facebook | Twitter | Instagram | YouTube

BEAUMONT
CALIFORNIA

#ACITYELEVATED

As of May 15, 2019, Building & Safety same day permits will no longer be available.

From: Kristin Tissot <kristint@thatcherengineering.com>
Sent: Tuesday, May 04, 2021 11:11 AM
To: Suzanne Foxworth <SFoxworth@beaumontca.gov>
Cc: Patrick Flanagan <patrickf@thatcherengineering.com>; Vicky Valenzuela <vickyv@thatcherengineering.com>
Subject: RE: Suzanne Foxworth shared "PW2021-0659 BEAUMONT VILLAGE PWQMP" with you 171601

Sue, just following up on the below. Can you please advise?

Thank you,

kristin tissot, r.l.a. , a.s.l.a.
landscape architect

thatcher engineering & associates, inc.
1461 ford street, suite 105. Redlands, ca 92373
phone: 909.748.7777 fax: 909.748.7776
hours: monday – thursday 8a-12p,1p-5p
www.thatcherengineering.com

From: Kristin Tissot
Sent: Wednesday, April 28, 2021 9:59 AM

To: Suzanne Foxworth <SFoxworth@beaumontca.gov>
Cc: Patrick Flanagan <patrickf@thatcherengineering.com>; Vicky Valenzuela <vickyv@thatcherengineering.com>
Subject: RE: Suzanne Foxworth shared "PW2021-0659 BEAUMONT VILLAGE PWQMP" with you 171601

Thanks, Sue. have listed my questions below. I I think it might be easiest to discuss this once the reviewer has reviewed my questions. I trust that they have access to your dropbox to re-review the comments / document as needed. My cell is the best way to reach me. (909) 633-1185.

1. Section D – Concern with infiltration rates needing a factor of safety of 3 being below the threshold of 0.81"/hr & concerns with varying rates
    a. Table D.1 is asking if in-situ rates are less than 1.6"/hr. This does not require the consideration of a safety factor. Per the guidance copied and pasted below, the 1.6" / hr rate already considers a safety factor. This is based on a 5' depth. As shown, the average rate is 2.43"/hr.
    b. Further, we have shown on the informational sheet behind the soils report that each basin will draw down within 72 hours even after applying a safety factor of 3 to the rate closest to each basin. We have based the depth of each basin on those specific rates to insure drawdown within the 72 hour time frame.

Guidance says:
"To avoid creation of nuisance or vector conditions in accordance with MS4 Permit Provision XII.K.1, a maximum Drawdown Time of 72 hours has been established. To ensure that over the life of the BMP the actual Drawdown Time does not exceed 72 hours, and based on the typical infiltration basin depth of 5 feet, the minimum long-term post-development infiltration rate must be at least 0.83 inches per hour (5ft * 12 / 72 hours = 0.83 inches/hour). As discussed above however, the long-term post-development infiltration rates can be much lower than the initial (pre development) infiltration rates that are measured for feasibility testing. As such, infiltration testing requirements have incorporated a minimum safety factor of 2 for LID Infiltration BMPs. Incorporating the established minimum factor of safety, the tested pre-development infiltration rates must be greater than 1.6 inches per hour to be assured that, over the life of the BMP, nuisance or vector conditions will not be created. This will also ensure that the BMP will be adequately drained in the event of back-to-back storms. Accordingly the following feasibility criteria have been developed to ensure that the most effective BMPs are deployed: • If the average 'in-situ' tested infiltration rate for the site is less than 1.6 inches per hour, LID Infiltration BMPs (infiltration basins, infiltration trenches, etc.) shall not be used. Infiltration testing needs to be performed using approved methodologies, such as those identified in the LID BMP Design Handbook. The analysis used to determine the threshold infiltration rates was based on factors of safety used in the adopted Orange County WQMP/Technical Guidance Document, standard engineering practices, and best professional judgment. Appendix VII ("Infiltration Rate Evaluation Protocol and Factor of Safety Recommendations") of the "Orange County Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans" was consulted."

2. Request to show roof drains on exhibit
    a. Roof drain locations are not known at this time. Can this be added during final

engineering / final WQMP preparation?

3. Concern with gas station fueling area runoff entering storm drain / pretreatment of gas station and car wash
    a. Pretreatment can be provided at the inlet to the underground basin for each of these areas. We typically specify a bioclean drop in filter. We will reflect this on the next submittal. Does this satisfy the pretreatment concern?
    b. There is a holding tank shown at the fuel station area. Any fuel leaks from under the canopy would be directed to this holding tank, which will be emptied as needed and disposed of offsite. Runoff from the roof / surrounding areas would be directed to the underground basin (and pretreatment first). Please confirm that this is satisfactory.
4. Request to show pollutants of concern in Table E.1
    a. Per the previous page, since LID BMPs have been incorporated into the site to fully address the drainage management areas, this Section E does not need to be completed. Please confirm nothing further is required.

Thank you,

kristin tissot, r.l.a. , a.s.l.a.

landscape architect

thatcher engineering & associates, inc.
1461 ford street, suite 105. Redlands, ca 92373
phone: 909.748.7777 fax: 909.748.7776
hours: monday – thursday 8a-12p,1p-5p
www.thatcherengineering.com

From: Suzanne Foxworth <SFoxworth@beaumontca.gov>
Sent: Tuesday, April 27, 2021 12:02 PM
To: Kristin Tissot <kristint@thatcherengineering.com>
Subject: RE: Suzanne Foxworth shared "PW2021-0659 BEAUMONT VILLAGE PWQMP" with you 171601

Good afternoon,

If you could, please put your questions in an email and I can forward to the plan checker who reviewed the plans.

Thank you!

SUE FOXWORTH
Solid Waste & Recycling Manager

City of Beaumont
550 E. 6th Street, Beaumont, Ca 92223
Desk (951) 769-8520 | Fax (951) 769-8526
BeaumontCa.gov
Facebook | Twitter | Instagram | YouTube

BEAUMONT
CALIFORNIA

#ACITYELEVATED

As of May 15, 2019, Building & Safety same day permits will no longer be available.

From: Kristin Tissot <kristint@thatcherengineering.com>
Sent: Tuesday, April 27, 2021 9:17 AM
To: Suzanne Foxworth <SFoxworth@beaumontca.gov>
Subject: FW: Suzanne Foxworth shared "PW2021-0659 BEAUMONT VILLAGE PWQMP" with you
171601

Hello, Sue, I have some questions regarding the review comments. Could we please schedule a brief phone call?

Thank you,

kristin tissot, r.l.a. , a.s.l.a.
landscape architect

thatcher engineering & associates, inc.
1461 ford street, suite 105. Redlands, ca 92373
phone: 909.748.7777 fax: 909.748.7776
hours: monday – thursday 8a-12p,1p-5p
www.thatcherengineering.com

From: Suzanne Foxworth (via Dropbox) <no-reply@dropbox.com>
Sent: Monday, April 19, 2021 11:37 AM
To: Vicky Valenzuela <vickyv@thatcherengineering.com>

Subject: Suzanne Foxworth shared "PW2021-0659 BEAUMONT VILLAGE PWQMP" with you

Hi Vicky,

Suzanne Foxworth (sfoxworth@beaumontca.gov) invited you to edit the folder "**PW2021-0659 BEAUMONT VILLAGE PWQMP**" on Dropbox.

Go to folder

Enjoy!
The Dropbox team

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 CASC | Date 8/30/2023

Designed by KJ | Case No

Company Project Number/Name Beaumont Village

BMP Identification

BMP NAME / ID B

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}= 0.85 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)*
B	*15,770*	*Roofs*	*1*	*0.89*	*14066.8*			
B	*124,824*	*Concrete or Asphalt*	*1*	*0.89*	*111343*			
B	*41,329*	*Ornamental Landscaping*	*0.1*	*0.11*	*4565.1*			
	181923	***Total***			**129974.9**	**0.85**	***9206.6***	***27,305***

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: CASC
Date: 8/30/2023
Designed by: KJ
Case No:
Company Project Number/Name: Beaumont Village

BMP Identification

BMP NAME / ID: B-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}= 0.85 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)*
B1	*11,061*	*Concrete or Asphalt*	*1*	*0.89*	*9866.4*			
B1	*1,361*	*Ornamental Landscaping*	*0.1*	*0.11*	*150.3*			
	12422	***Total***			**10016.7**	**0.85**	**709.5**	**60**

Proposed Volume must be greater than the Design Capture Volume

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: CASC
Date: 8/30/2023
Designed by: KJ
Case No:
Company Project Number/Name: Beaumont Village

BMP Identification

BMP NAME / ID: B-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}= 0.85 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)*
B2	*1,096*	*Concrete or Asphalt*	*1*	*0.89*	*977.6*			
B2	*121*	*Ornamental Landscaping*	*0.1*	*0.11*	*13.4*			
	1217	***Total***			**991**	**0.85**	**70.2**	**35**

Proposed Volume must be greater than the Design Capture Volume

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 CASC | Date 8/30/2023
Designed by KJ | Case No
Company Project Number/Name Beaumont Village

BMP Identification

BMP NAME / ID B-3

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}= 0.85 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)*
B3	*1,494*	*Concrete or Asphalt*	*1*	*0.89*	*1332.6*			
B3	*249*	*Ornamental Landscaping*	*0.1*	*0.11*	*27.5*			
	1743	***Total***			**1360.1**	**0.85**	***96.3***	***100***

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 CASC
Date 8/30/2023
Designed by KJ
Case No
Company Project Number/Name Beaumont Village

BMP Identification

BMP NAME / ID B-4

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}= 0.85 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 Impervious 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)*
B4	*2,139*	*Concrete or Asphalt*	*1*	*0.89*	*1908*			
B4	*249*	*Ornamental Landscaping*	*0.1*	*0.11*	*27.5*			
	2388	***Total***			**1935.5**	**0.85**	***137.1***	**100**

Proposed Volume must be greater than the Design Capture Volume

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 CASC — Date 8/30/2023

Designed by KJ — Case No

Company Project Number/Name — Beaumont Village

BMP Identification

BMP NAME / ID B-5

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}= 0.85 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)*
B5	*1,781*	*Concrete or Asphalt*	*1*	*0.89*	*1588.7*			
B5	*1,491*	*Ornamental Landscaping*	*0.1*	*0.11*	*164.7*			
	3272	***Total***			**1753.4**	**0.85**	**124.2**	**290**

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 CASC

Date 8/30/2023

Designed by KJ

Case No

Company Project Number/Name Beaumont Village

BMP Identification

BMP NAME / ID B-6

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}= 0.85 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 Impervious 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)*
B6	*4,990*	*Concrete or Asphalt*	*1*	*0.89*	*4451.1*			
B6	*498*	*Ornamental Landscaping*	*0.1*	*0.11*	*55*			
	5488	***Total***			**4506.1**	**0.85**	**319.2**	**155**

Proposed Volume must be greater than the Design Capture Volume

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 CASC | Date 8/30/2023

Designed by KJ | Case No

Company Project Number/Name Beaumont Village

BMP Identification

BMP NAME / ID B-7

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}= 0.85 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 Impervious 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)*
B7	*4,242*	*Concrete or Asphalt*	*1*	*0.89*	*3783.9*			
B7	*435*	*Ornamental Landscaping*	*0.1*	*0.11*	*48*			
	4677	***Total***			**3831.9**	**0.85**	***271.4***	**155**

Proposed Volume must be greater than the Design Capture Volume

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 CASC
Date 8/30/2023
Designed by KJ
Case No
Company Project Number/Name Beaumont Village

BMP Identification

BMP NAME / ID B-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}= 0.85 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 Impervious 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)*
B8	*1,906*	*Concrete or Asphalt*	*1*	*0.89*	*1700.2*			
B8	*534*	*Ornamental Landscaping*	*0.1*	*0.11*	*59*			
	2440	**Total**			**1759.2**	**0.85**	**124.6**	**155**

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: CASC — Date: 8/30/2023

Designed by: KJ — Case No:

Company Project Number/Name: Beaumont Village

BMP Identification

BMP NAME / ID: B-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}= 0.85 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)*
B9	*1,096*	*Roofs*	*1*	*0.89*	*977.6*			
B9	*7,054*	*Concrete or Asphalt*	*1*	*0.89*	*6292.2*			
B9	*1,794*	*Ornamental Landscaping*	*0.1*	*0.11*	*198.2*			
	9944	***Total***			**7468**	**0.85**	***529***	**425**

Proposed Volume must be greater than the Design Capture Volume

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 CASC | Date 8/30/2023
Designed by KJ | Case No
Company Project Number/Name Beaumont Village

BMP Identification

BMP NAME / ID C

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}= 0.85 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)*
C	*3,605*	*Roofs*	*1*	*0.89*	*3215.7*			
C	*25,445*	*Concrete or Asphalt*	*1*	*0.89*	*22696.9*			
C	*7,909*	*Ornamental Landscaping*	*0.1*	*0.11*	*873.6*			
	36959	***Total***			**26786.2**	**0.85**	***1897.4***	**1,430**

Proposed Volume must be greater than the Design Capture Volume

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: CASC | Date: 8/30/2023

Designed by: KJ | Case No:

Company Project Number/Name: Beaumont Village

BMP Identification

BMP NAME / ID: D

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}= 0.85 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 Impervious 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)*
D	*3,130*	*Roofs*	*1*	*0.89*	*2792*			
D	*20,864*	*Concrete or Asphalt*	*1*	*0.89*	*18610.7*			
D	*6,831*	*Ornamental Landscaping*	*0.1*	*0.11*	*754.5*			
	30825	**Total**			**22157.2**	**0.85**	**1569.5**	**1,240**

Proposed Volume must be greater than the Design Capture Volume

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{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 | Date

Designed by | Case No

Company Project Number/Name

BMP Identification

BMP NAME / ID

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

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 (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
D	*3130*	*Roofs*	*1*	*0.89*	*2792*			
D	*20864*	*Concrete or Asphalt*	*1*	*0.892*	*18610.7*			
D	*6831*	*Ornamental Landscaping*	*0.1*	*0.110458*	*754.5*			
	30825	***Total***			**22157.2**	**0.20**	***0.1***	

DMAs

Proposed Volume must be greater than the Design Capture Volume

Notes:

CALIFORNIA CERTIFIED FULL TRASH CAPTURE

Aqua-Swirl® Sizing Chart

Aqua-Swirl® Model	Swirl Chamber Diameter	Maximum Stub-Out Pipe Nominal Diameter		Water Quality Treatment Flow[2]	Trash/Debris Storage Capacity	Sediment Storage Capacity	Oil Storage Capacity
	(ft.)	(in.)		(cfs)	(ft^3)	(ft3)	(gal)
		On/Offline	BYP[1]				
AS-2s	2.50	8	15	1.1	1.0	10	37
AS-3s	3.50	10	21	2.1	2.1	20	110
AS-4s	4.50	12	27	3.5	3.4	32	190
AS-5s	5.00	12	30	4.4	4.3	45	270
AS-6s	6.00	15	36	6.3	6.3	65	390
AS-7s	7.00	18	42	8.6	8.6	90	540
AS-8s	8.00	18	48	11.2	11.4	115	710
AS-9s	9.00	21	54	14.2	14.5	145	910
AS-10s	10.0	24	60	17.5	17.9	180	1130
AS-11s	11.0	24	60*	21.2	21.8	222	1422
AS-12s	12.0	24	60*	25.2	26.0	270	1698
AS-13s	13.0	27	60*	29.6	30.6	310	1986
AS-XX	Custom	--	--	>29.6**	>30.6	> 310	>1986

*** See AquaShield representative for more information on pipe sizes available.**

**** Higher water quality treatment flow rates can be designed with multiple swirls.**

1) *The **Aqua-Swirl® Internal Bypass (BYP)** provides full treatment of the "first flush," specifically the 1-year, 1-hour storm event while the peak storm is diverted and bypassed through the main conveyance pipe.*

2) *In accordance with the Trash Amendments, all trash treatment control devices installed after December 2, 2015 shall meet the Full Capture System definition and be certified by the State Water Resources Control Board (State Water Board) Executive Director, or designee, prior to installation. **The Aqua-Swirl device meets the Full Capture System definition and is certified for installation by the State Water Board Executive Director designee**. For more info: https://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/trash_implementation/a1_certified_fcd.pdf*

The design and orientation of the Aqua-Swirl® generally entails some degree of customization. For assistance in design and specific layouts, please refer to an AquaShield™ representative or visit our website at www.AquaShieldinc.com. CAD details and specifications are available upon request.

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

SiteAssist™
FOR STORMTECH INSTALLATION INSTRUCTIONS VISIT OUR APP

BEAUMONT VILLAGE AREA B

BEAUMONT, CA, USA

MC-7200 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-7200.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-7200 CHAMBER SYSTEM

1. STORMTECH MC-7200 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-7200 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-7200 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

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

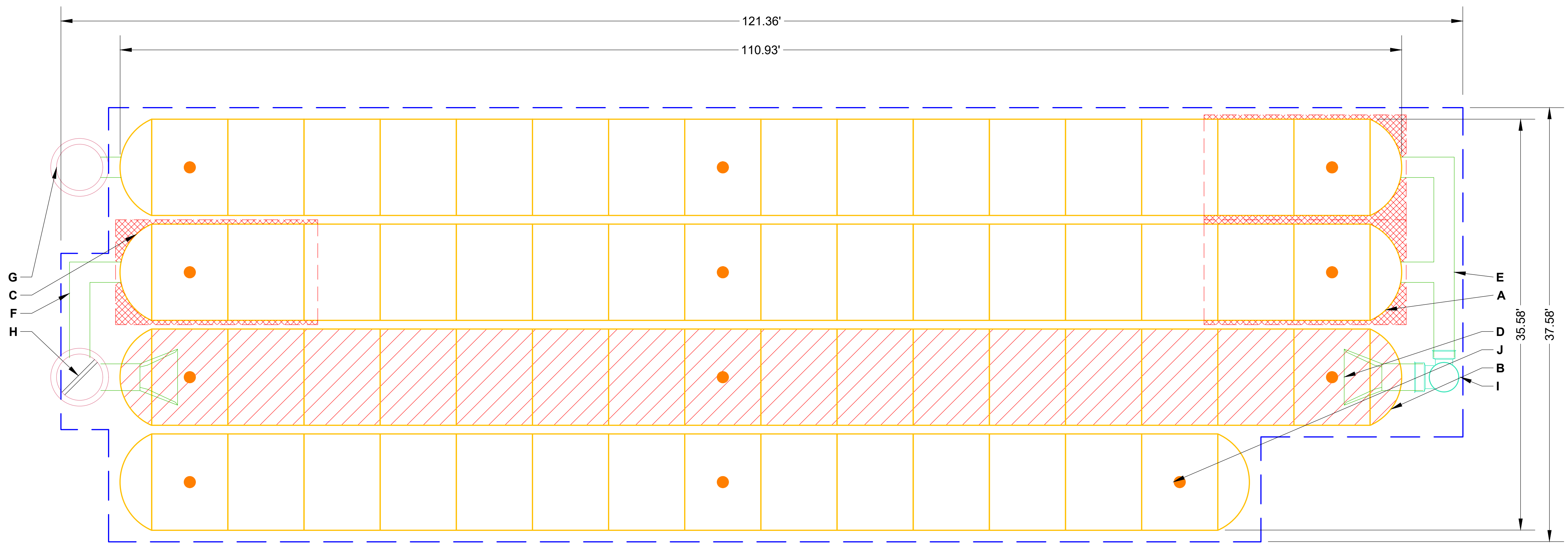
CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT	
62	STORMTECH MC-7200 CHAMBERS
8	STORMTECH MC-7200 END CAPS
12	STONE ABOVE (in)
9	STONE BELOW (in)
40	STONE VOID
18371	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
4310	SYSTEM AREA (SF)
317.9	SYSTEM PERIMETER (ft)

PROPOSED ELEVATIONS:	
MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	21.40
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	16.90
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	16.40
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	16.40
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	16.40
TOP OF STONE:	15.40
TOP OF MC-7200 CHAMBER:	14.40
18" x 18" TOP MANIFOLD INVERT:	11.85
24" ISOLATOR ROW PLUS INVERT:	9.59
24" ISOLATOR ROW PLUS INVERT:	9.59
18" x 18" BOTTOM MANIFOLD INVERT:	9.56
18" BOTTOM CONNECTION INVERT:	9.56
BOTTOM OF MC-7200 CHAMBER:	9.40
BOTTOM OF STONE:	8.65

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	18" TOP PARTIAL CUT END CAP, PART#: MC7200IEPP18T / TYP OF ALL 18" TOP CONNECTIONS	29.36"	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
PREFABRICATED END CAP	C	18" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.97"	
FLAMP	D	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP (TYP 2 PLACES)		
MANIFOLD	E	18" x 18" TOP MANIFOLD, ADS N-12	29.36"	
MANIFOLD	F	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.97"	
CONCRETE STRUCTURE	G	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		4.0 CFS OUT
CONCRETE STRUCTURE W/WEIR	H	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		5.5 CFS IN
NYLOPLAST (INLET W/ ISO PLUS ROW)	I	30" DIAMETER (24.00" SUMP MIN)		11.0 CFS IN
INSPECTION PORT	J	4" SEE DETAIL (TYP 12 PLACES)		



ISOLATOR ROW PLUS
(SEE DETAIL)

PLACE MINIMUM 17.50' OF ADSPLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

BEAUMONT VILLAGE AREA 1 & 2
BEAUMONT, CA, USA

DATE:
DRAWN: RU
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

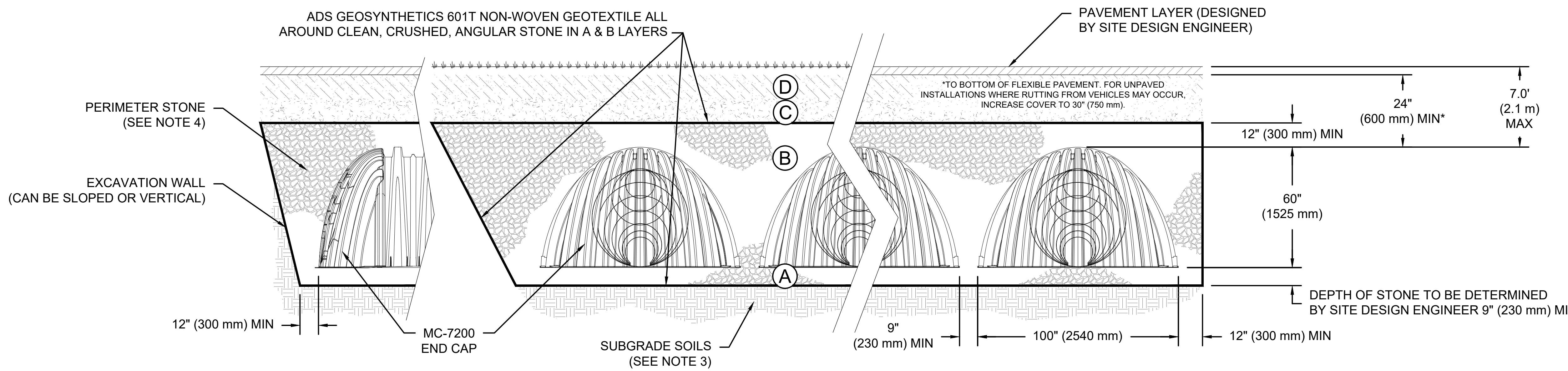
StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

ACCEPTABLE FILL MATERIALS: STORMTECH MC-7200 CHAMBER SYSTEMS

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

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

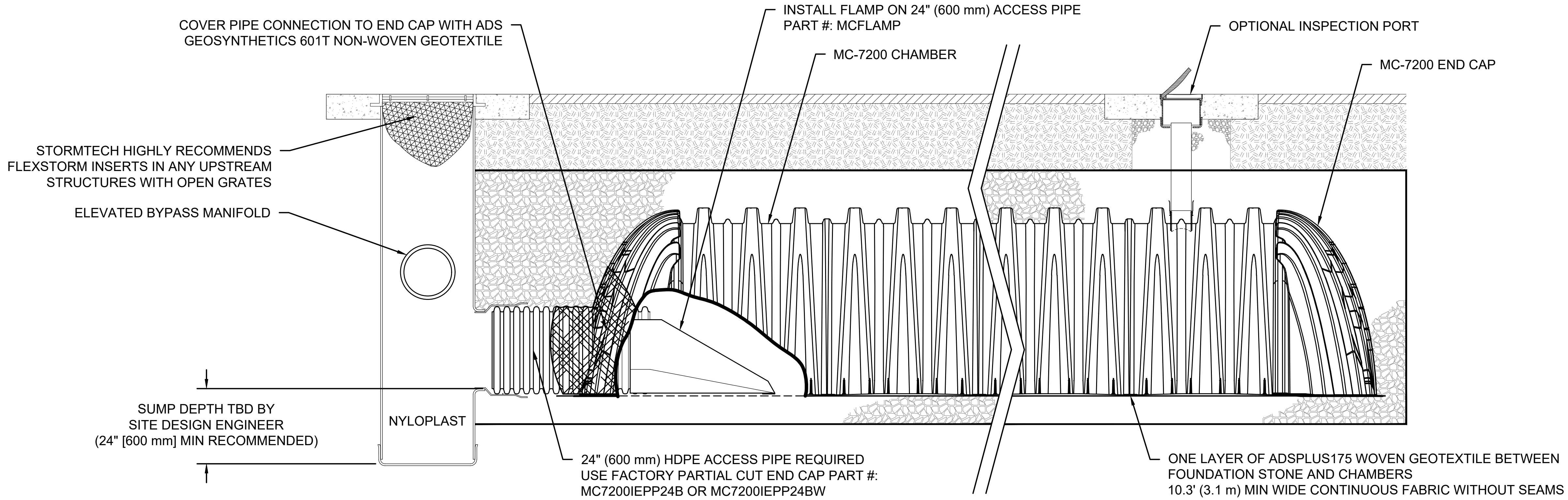
1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-7200 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

BEAUMONT VILLAGE AREA 1 & 2
BEAUMONT, CA, USA
DATE:
DRAWN: RU
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473



MC-7200 ISOLATOR ROW PLUS DETAIL

NTS

INSPECTION & MAINTENANCE

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

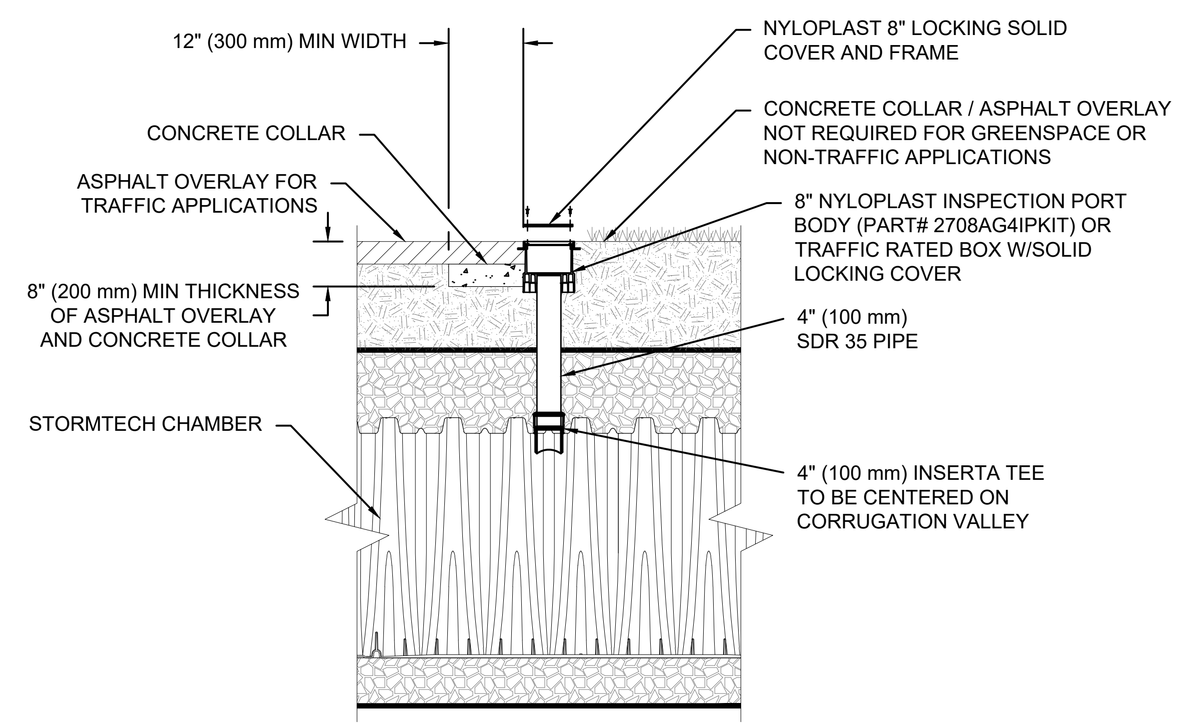
STEP 2) CLEAN OUT ISOLATOR ROW PLUS USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

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

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

NOTES

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



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION VALLEY.

4" PVC INSPECTION PORT DETAIL (MC SERIES CHAMBER)

NTS

BEAUMONT VILLAGE AREA 1 & 2
BEAUMONT, CA, USA

DATE: | DRAWN: RU
PROJECT #: | CHECKED: N/A

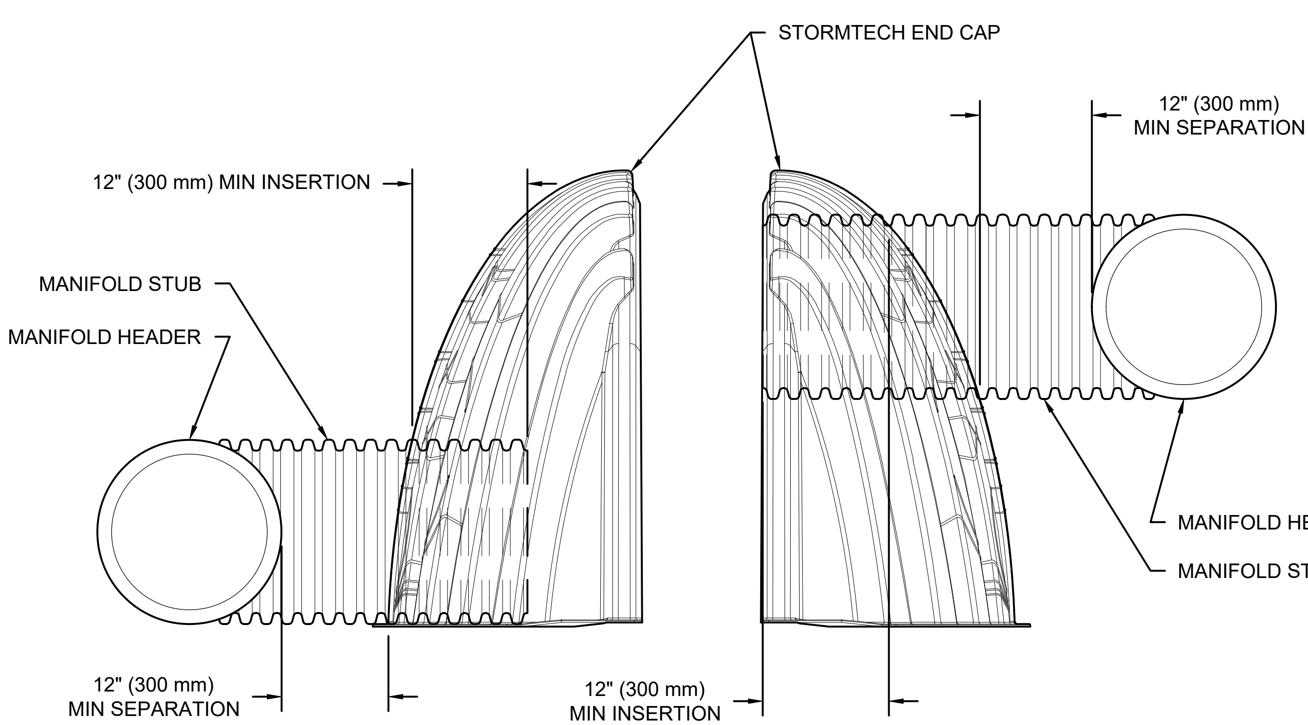
DATE | DRW | CHK | DESCRIPTION

StormTech® Chamber System
888-892-2694 | WWW.STORMTECH.COM

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

MC-SERIES END CAP INSERTION DETAIL

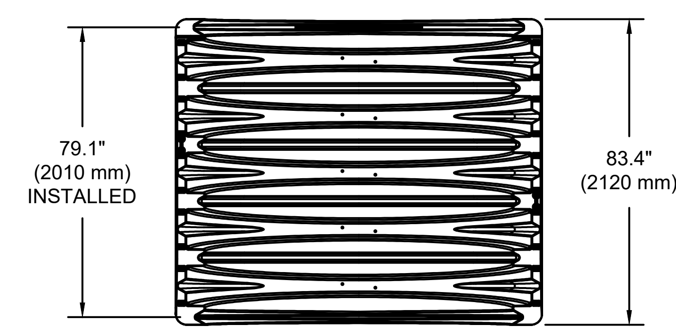
NTS

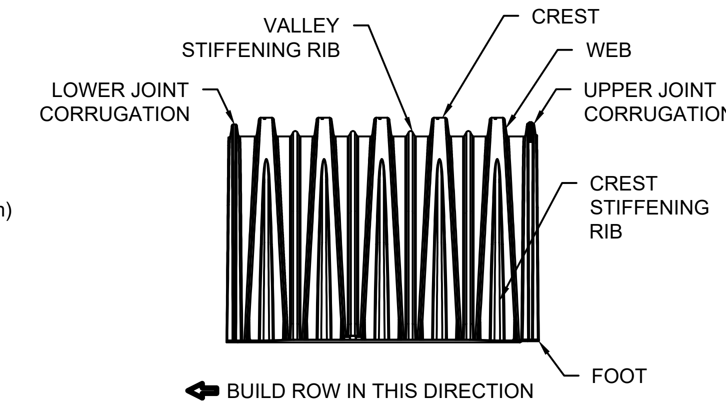


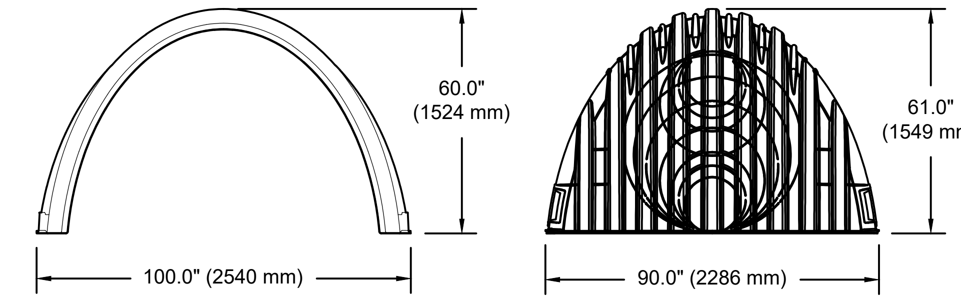
NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

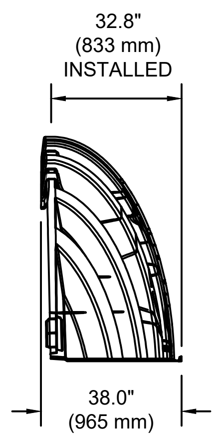
MC-7200 TECHNICAL SPECIFICATION

NTS









NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 79.1"	(2540 mm X 1524 mm X 2010 mm)
CHAMBER STORAGE	175.9 CUBIC FEET	(4.98 m³)
MINIMUM INSTALLED STORAGE*	267.3 CUBIC FEET	(7.56 m³)
WEIGHT (NOMINAL)	205 lbs.	(92.9 kg)

NOMINAL END CAP SPECIFICATIONS

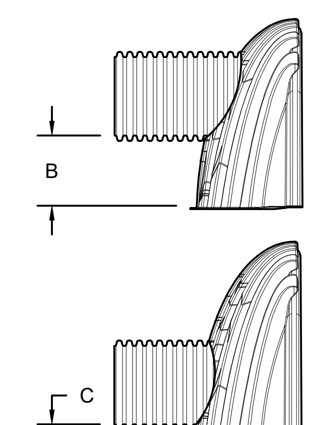
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

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

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC7200IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC7200IEPP06B		---	0.86" (22 mm)
MC7200IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC7200IEPP08B		---	1.01" (26 mm)
MC7200IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC7200IEPP10B		---	1.33" (34 mm)
MC7200IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC7200IEPP12B		---	1.55" (39 mm)
MC7200IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC7200IEPP15B		---	1.70" (43 mm)
MC7200IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC7200IEPP18TW			
MC7200IEPP18B		---	1.97" (50 mm)
MC7200IEPP18BW			
MC7200IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC7200IEPP24TW			
MC7200IEPP24B		---	2.26" (57 mm)
MC7200IEPP24BW			
MC7200IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC7200IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC7200IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PREFABRICATED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-7200 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

BEAUMONT VILLAGE AREA 1 & 2

BEAUMONT, CA, USA

DATE:

DRAWN: RU

PROJECT #:

CHECKED: N/A

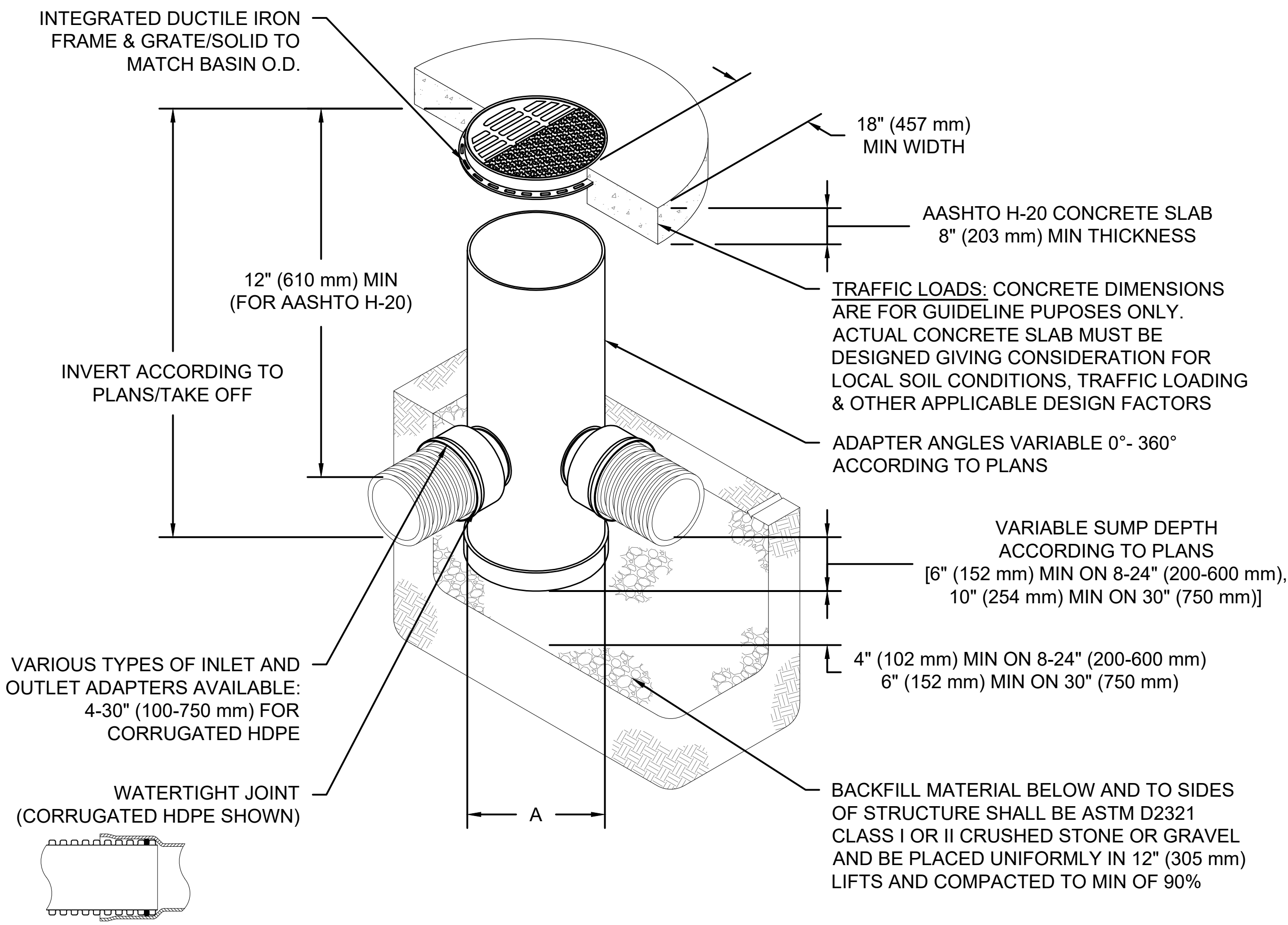
DATE	DRW	CHK	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

NYLOPLAST DRAIN BASIN

NTS



NOTES

1. 8-30" (200-750 mm) GRATES/SOLID COVERS SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
2. 12-30" (300-750 mm) FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
3. DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS
4. DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS & HANCOR DUAL WALL) & SDR 35 PVC
5. FOR COMPLETE DESIGN AND PRODUCT INFORMATION: **WWW.NYLOPLAST-US.COM**
6. TO ORDER CALL: **800-821-6710**

A	PART #	GRATE/SOLID COVER OPTIONS		
8" (200 mm)	2808AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
10" (250 mm)	2810AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
12" (300 mm)	2812AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
15" (375 mm)	2815AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
18" (450 mm)	2818AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
24" (600 mm)	2824AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
30" (750 mm)	2830AG	PEDESTRIAN AASHTO H-20	STANDARD AASHTO H-20	SOLID AASHTO H-20

BEAUMONT VILLAGE AREA 1 & 2

BEAUMONT, CA, USA

DATE:

DRAWN: RU

PROJECT #:

CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

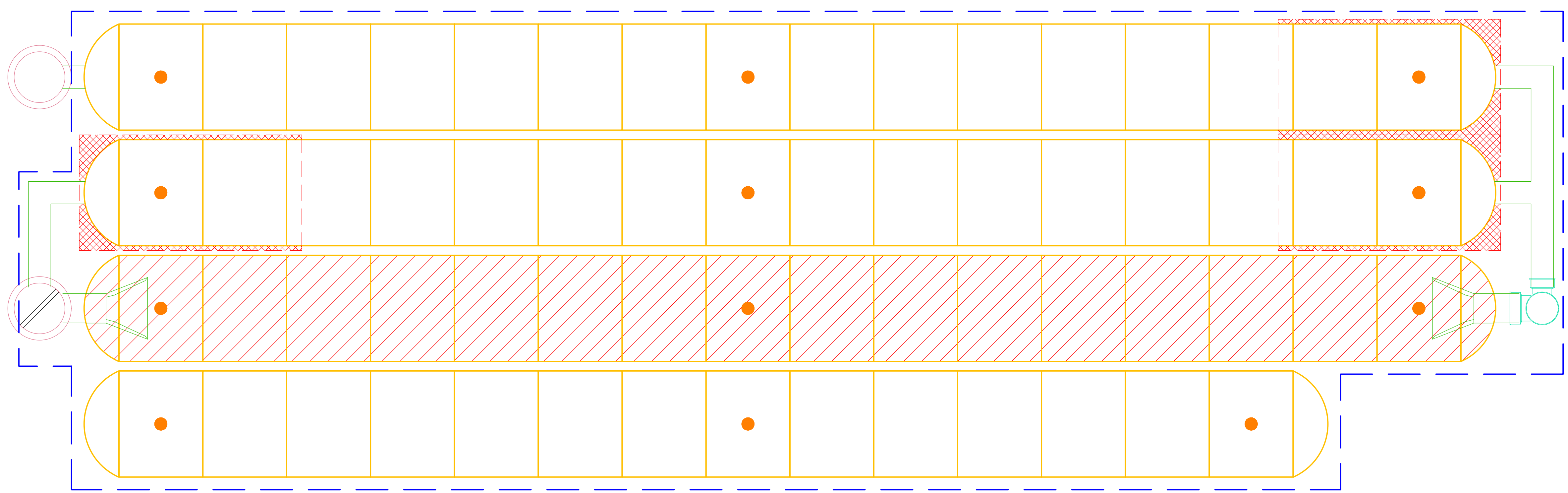
THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO ADS UNDER THE DIRECTION OF THE SITE DESIGN ENGINEER OR OTHER PROJECT REPRESENTATIVE. THE SITE DESIGN ENGINEER SHALL REVIEW THIS DRAWING PRIOR TO CONSTRUCTION. IT IS THE ULTIMATE RESPONSIBILITY OF THE SITE DESIGN ENGINEER TO ENSURE THAT THE PRODUCT(S) DEPICTED AND ALL ASSOCIATED DETAILS MEET ALL APPLICABLE LAWS, REGULATIONS, AND PROJECT REQUIREMENTS.

Nyloplast®

770-932-2443 | WWW.NYLOPLAST-US.COM

ADS

4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473



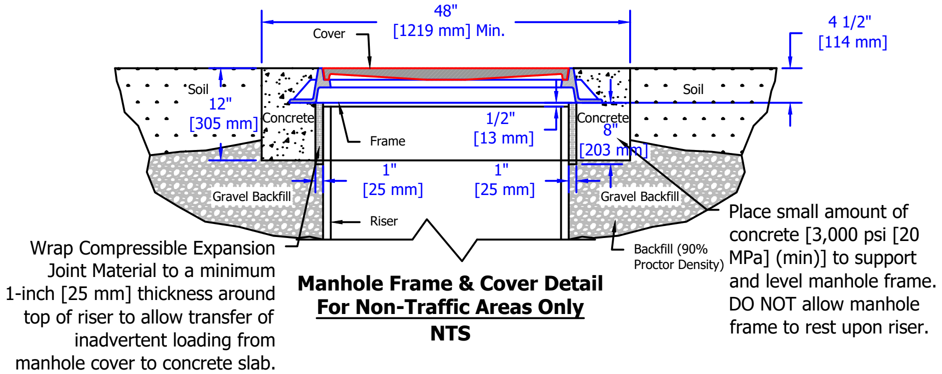
Aqua-Swirl Polymer Coated Steel (PCS) Stormwater Treatment System

If traffic loading (HS-25) is required or anticipated, a 4-foot [1.22 m] diameter, 14-inch [356 mm] thick reinforced concrete pad must be placed over the Stormwater Treatment System Riser to support and level the manhole frame, as shown. The top of riser pipe must be wrapped with compressible expansion joint material to a minimum 1-inch [25 mm] thickness to allow transfer of wheel loads from manhole cover to concrete slab. Manhole cover shall bear on concrete slab and not on riser pipe. The concrete slab shall have a minimum strength of 3,000 psi [20 MPa] and be reinforced with #4 [13 mm] reinforcing steel as shown. Minimum cover over reinforcing steel shall be 1-inch [25 mm]. Top of manhole cover and concrete slab shall be level with finish grade.

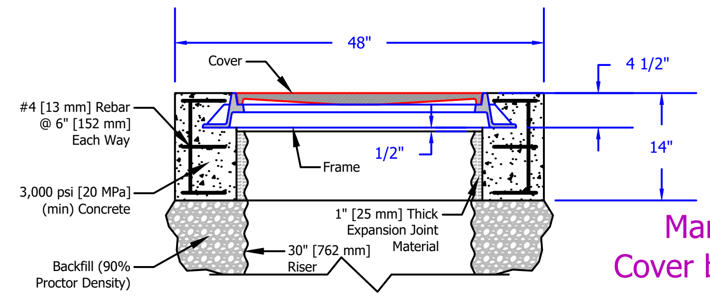
Note: As an alternative, 42-inch OD, HS-25 rated precast concrete rings may be substituted. 14-inch thickness must be maintained.

*** Please see accompanied Aqua-Swirl specification notes.**
*** See Site Plan for actual system orientation.**
**** Orientation may vary from 90°, 180°, or custom angles to meet site conditions.**

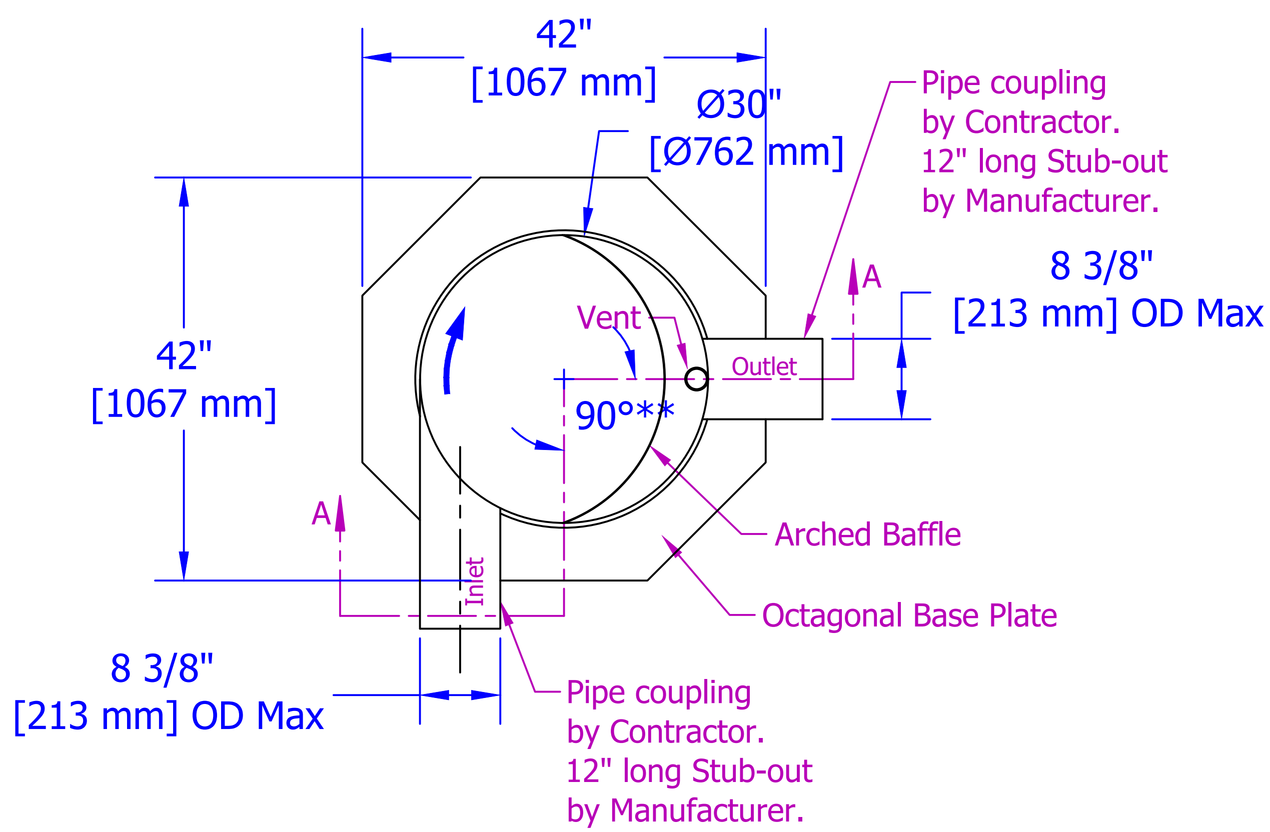
Unless other traffic barriers are present, bollards shall be placed around access riser(s) in non-traffic areas to prevent inadvertent loading by maintenance vehicles.



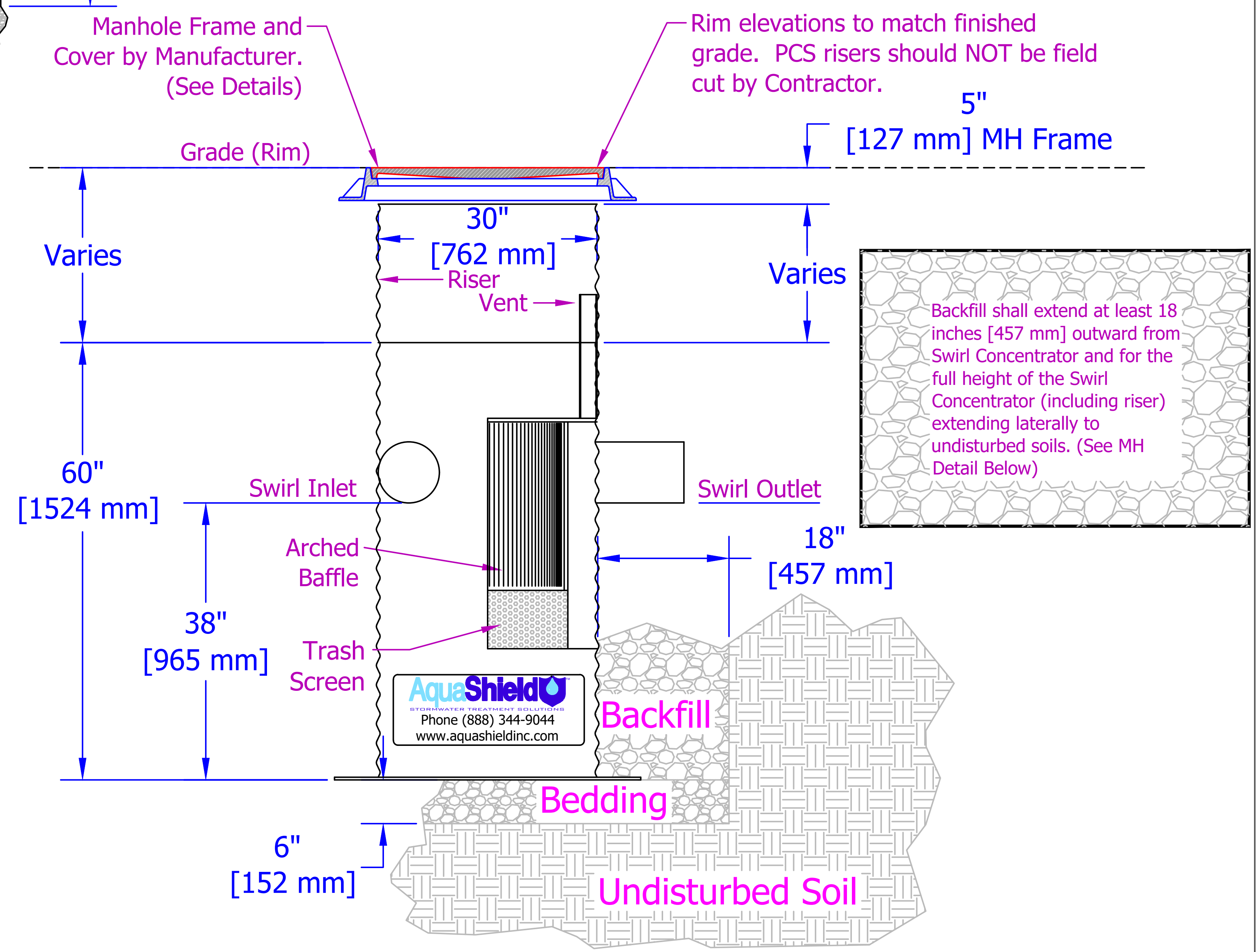
Manhole Frame & Cover Detail
For Non-Traffic Areas Only
NTS



Manhole Frame & Cover Detail
For Traffic Loading Areas
NTS



Plan View



Section A-A

AquaShield
STORMWATER TREATMENT SOLUTIONS
2733 Kanasita Drive, Suite 111, Chattanooga, TN 37343
Phone (888) 344-9044 Fax (423) 826-2112
www.aquashieldinc.com

Document:	AS-2 PCS STD
Drawn By:	JCW
Scale:	NTS
Date:	02/05/15

U.S. Patent No. 6524473 and other Patent Pending

Aqua-Swirl Concentrator Model AS-2s PCS Standard Detail

Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

HCOC Applicability Map

Hydromodification Susceptibility Documentation Report and Mapping
Riverside County Flood Control and Water Conservation District

Map 2

PRELIMINARY DRAINAGE ANALYSIS

FOR

APN 404-190-001 & 003

BEAUMONT VILLAGE – PROPOSED COMMERCIAL RETAIL CENTER

CITY OF BEAUMONT

RIVERSIDE COUNTY, CALIFORNIA

Prepared for:

SANTIAGO HOLDINGS, LLC
C/O: CAMDEN HOLDINGS, LLC
Attn: Mr. Ari Miller
9454 Wilshire Boulevard 6th Floor
Beverly Hills, CA 90212

Contact: Mr. Ari Miller
Tel: (310) 553-31031

Prepared by:

CASC Engineering and Consulting

1470 East Cooley Drive
Colton, CA 92324
(909) 783-0101 • Fax (909) 783-0108

REVISED AUGUST 31, 2023

This report has been prepared by or under the direction of the following registered civil engineer who attests to the technical information contained herein.

Patrick C. Flanagan Jr., P.E. Registered Civil Engineer	Date	Seal

TABLE OF CONTENTS

APPENDICES

EXHIBITS

I. PURPOSE AND SCOPE

The purpose of this study is to analyze the flows to and through the site, both pre-development and post-development. Further, the mitigation measures proposed will be discussed to demonstrate that the additional flows from the development will not have a negative impact on the downstream properties.

To achieve the desired goal the following steps will be taken:

1. Determine the 10 and 100 year pre-development flows. Note the pre-development flows currently drain west towards Marshall Creek.
2. Determine the 10 and 100 year post-development flows. Post development flows will be directed southeasterly to one of several proposed infiltration basins. The site has been broken up into 4 areas for the purpose of the analysis.
3. Identify the proposed mitigation and discuss the potential impacts the development of the site would have on the downstream properties. The methodology used in this report to mitigate for increased flow rates caused by the development will be to provide a retention volume equal to or exceeding the difference between the runoff volume produced by the post-development 10-year, 24-hour storm event and the pre-development 10-year, 24 hour storm event. Basin routing calculations will be provided during final engineering. See Appendix C and D for the unit hydrograph analysis.

II. PROJECT DESCRIPTION

The project proposes to develop the currently vacant subject site. The development of the commercial retail center includes the construction of drive-thru restaurants, retail/office buildings, a car wash, a convenience store, and a fuel station. The proposed drive-thru restaurants range in size from approximately 2,304 to 2,800 square feet. An approximate 3,130 square foot convenience store is proposed with a fuel station canopy (approximately 3,096 square feet). The development also includes the construction of parking lots, asphalt paving, and perimeter landscaping and improvements. A total of four driveways are proposed to provide access to the site: two driveways on Oak Valley Parkway and two on Beaumont Avenue. The project site is adjacent to a FEMA regulatory floodway, but the site is located in Zone X, "Area of minimal flood hazard" per Flood Insurance Rate Map Community Pannel Number 06065C0803G, dated August 28, 2008. See page 8 for FIRMette map.

The existing project site is approximately 10.39 net acres in size and consists of two parcels: APN 404-190-001 & 003. The project is located at the northwest corner of Oak Valley Parkway and Beaumont Avenue in the City of Beaumont. Tentative Parcel Map 37440 is being processed concurrently to remove the existing property line, dedicate R/W to Beaumont Avenue, and create seven proposed parcels for the project, totaling 6.70 net acres. These parcels are referred to in this study as Parcel 1, Parcel 2, Parcel 3, etc. No development is proposed on the westerly portion of the site (Lot A), which is 3.62 net acres.

It will remain undisturbed and will continue to drain west toward Marshall Creek as it does historically. The site is currently vacant and poorly covered with native vegetation. The project site currently drains westerly as sheet flow, entering Marshall Creek, which flows southerly.

The site is bordered on the north side by APN 404-190-008. The site's easterly boundary is adjacent to Beaumont Avenue right-of-way. The site's westerly boundary is APN 404-190-002. The site's southerly boundary is adjacent to Oak Valley Parkway right-of-way.

APN 404-190-008 to the north drains west and does not contribute any flows to the subject site.

APN 404-190-002 to the west drains to Marshall Creek and does not contribute any flows to the subject site.

Beaumont Avenue is currently improved with a paved roadway and asphalt sidewalk. It drains south, then west on Oak Valley Parkway to an existing catch basin located on the bridge over Marshall Creek that directs flows to Marshall Creek. The development proposes to improve Beaumont Avenue project frontage by dedicating an additional 5 feet of right of way, and constructing new PCC curb, gutter, and sidewalk, along with the construction of two new PCC driveway approaches.

Lot A of TPM 37440 will remain natural and unimproved and will continue to flow westerly to Marshall Creek as it has historically.

Oak Valley Parkway is currently improved with a paved roadway, asphalt berm, and asphalt sidewalk. It drains west to an existing catch basin located on the bridge over Marshall Creek that directs flows to Marshall Creek. The development proposes to improve Oak Valley Parkway project frontage by constructing new PCC curb, gutter, raised center median, sidewalk, and bus turn-out along with the construction of two new PCC driveway approaches.

The proposed development of the site includes three drive-thru restaurants, a retail building, a car wash, a multi-tenant retail/restaurant/medical office building, convenience store, and a fuel station with related parking, paved access, and landscaping. Flows from the site will be directed southwesterly to one of several proposed infiltration basins. The northerly portion Area 1 includes several depressed landscape areas that will intercept sheet flows and be utilized for water quality. Flows on the southerly portion of Area 1 will be directed to a proposed infiltration basin located on the southerly portion of Parcel 4. In the event the basin reaches capacity, it will overflow via inlet riser and storm drain to the proposed underground infiltration basin located in the parking lot of Parcel 6. Emergency overflow is provided via under sidewalk drain to Oak Valley Pkwy in the event the overflow inlet fails. Flows from area 2 will be directed via sheet flow and ribbon gutter to a proposed drop inlet located near the southeast corner of Parcel 6. The drop inlet will direct flows to the aforementioned underground infiltration basin. In the event the underground basin reaches capacity, it will overflow to a proposed above ground infiltration basin located at the southwest corner of the development. In the event the basin reaches capacity, it will overflow via under sidewalk drain to Oak Valley Pkwy. Flows generated by Area 3 (Parcel 5) will be directed via sheet flow, ribbon gutter and curb and gutter to a proposed infiltration basin located along the south side of Parcel 5. In the event the basin reaches capacity, it will overflow via inlet riser and storm drain to the underground basin. Emergency overflow is provided to Oak Valley Pkwy. Flows from Area 4 (Parcel 3) will be directed via sheet flow and ribbon gutter to a proposed drop inlet near the south side of Parcel 3. Flows will pass through a pretreatment unit for water quality before entering a proposed infiltration basin. In the event the basin reaches capacity, flows will overflow via inlet riser and storm drain to the underground basin. Emergency overflow is provided via under sidewalk drain to Oak Valley Pkwy.

III. DRAINAGE AREA OVERVIEW

Existing Condition
Pre-development: The entire site currently drains westerly towards Marshall Creek.

Proposed Condition
Post-development: The proposed depressed landscape areas and the proposed above ground infiltration basin located in Area 1 provide a cumulative retention volume of approximately 1,605 cubic feet.

Post-development: The total volume provided by Area 2, which includes the proposed underground basin and the above ground basin near the southwest corner, is approximately 27,306 cubic feet.

Post-development: Area 3 (Parcel 5) includes an above ground basin that provides a retention volume of approximately 1,430 cubic feet.

Post-development: Area 4 (Parcel 3) includes an above ground basin that provides a retention volume of approximately 1,240 cubic feet.

The total retention volume provided by the site is approximately 31,581 cubic feet.

IV. HYDROLOGY

The Riverside County Hydrology Manual (RCFC&WCD) was used to develop the hydrologic parameters for the hydrology analysis. In addition, Hydrologic Soil Groups (HSG) were determined using the Natural Resources Conservation Service Web Soil Survey. The study area consists of soil type "C" (see Appendix G).

The Rational Method was used to determine the peak flow rates and times of concentration under the existing and proposed conditions. Computations were performed using the RSBC computer program developed by Civil Cadd/Civil Design Engineering Software.

V. RESULTS

60 minute Rainfall Values (inches) for unit hydrograph analysis (per reference NOAA Atlas 14 Precipitation Frequency, Appendix F): Y2 = 0.601, Y100 = 1.91

Standard intensity-duration curve data is per Plate D-4.1 of the hydrology manual.

See unit hydrograph analysis and rational method analysis results below:

Unit Hydrograph			
Condition	Drainage Area (acre)	Q_{10} (cfs)	V_{10} (ac-ft)
Existing	6.70	3.29	1.34

Table 5-1: Existing Condition Unit Hydrograph Method Hydrology Results (10-year, 24-hour)

Unit Hydrograph			
Condition	Drainage Area (acre)	Q_{10} (cfs)	V_{10} (ac-ft)
Proposed Area 1&2	5.15	2.79	1.60
Proposed Area 3	0.85	0.46	0.26
Proposed Area 4	0.71	0.39	0.22
Total Proposed	6.71	-	2.08

Table 5-2: Proposed Condition Unit Hydrograph Method Hydrology Results (10-year, 24-hour)

Rational Method			
Condition	Drainage Area (acre)	Q_{10} (cfs)	Q_{100} (cfs)
Existing	6.70	9.73	15.71
Proposed	6.71	15.08	22.64

Table 5-3: Existing & Proposed Condition Rational Method Hydrology Results (10 and 100-year)

VI. STUDY FINDINGS/ANALYSIS

As seen above in Table 5-1, the runoff volume for the entire site during the 10-year, 24-hour storm event for the existing condition is 1.34 acre-feet (ac-ft). As seen in Table 5-2, the total runoff volume for the entire site during the 10-year, 24-hour storm event for the proposed condition is 2.08 ac-ft. The tables also include peak flow rates for the existing and proposed conditions. The proposed infiltration basins onsite will be utilized to mitigate for increased runoff . For preliminary purposes, the total proposed basin volume is based on the difference in runoff between the existing and propose condition 10-year, 24-hour unit hydrograph analysis. The difference is 0.74 ac-ft (32,235 cubic feet), and the proposed total retention volume provided by the above ground and below ground basins is 32,937 cubic feet. Basin routing calculations will be provided during final engineering per the Riverside County Hydrology Manual.

VII. CONCLUSION

The increased post-development flows from the development area will be mitigated by the proposed infiltration basins onsite. All of the proposed infiltration basins will have an overflow condition in the event they reach full capacity, so the site will not flood. Onsite flows will overflow to a proposed under sidewalk drain to Oak Valley Parkway located near the southwest corner of the site. Flows will be directed to Marshall Creek where the site drains historically.

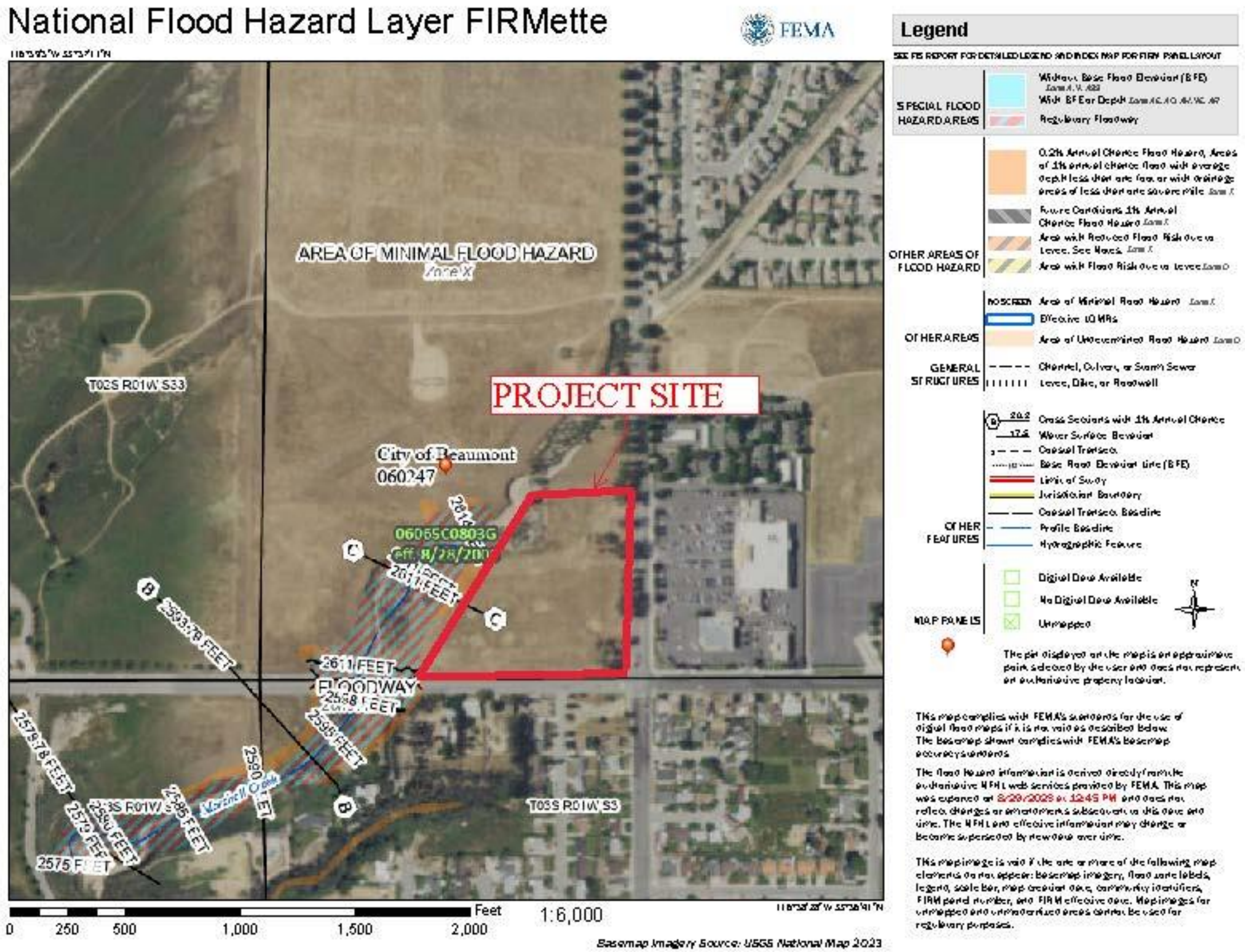
REFERENCES

1. Riverside County; *Riverside County Flood Control & Water Conservation District Hydrology Manual*, April 1978.
2. National Resources Conservation Service; Web Soil Survey. September 13, 2021.
3. NOAA’s National Weather Service; NOAA Atlas 14, Volume 6, Version 2. February 9, 2022

FIGURE 1: REGIONAL VICINITY MAP

FIGURE 2: LOCAL VICINITY MAP

FIGURE 3: FEMA FLOODPLAIN MAP



APPENDIX A

PRE-DEVELOPMENT FLOW CALCULATIONS (RATIONAL METHOD)

APPENDIX A.1

10-YEAR HYDROLOGY CALCULATIONS (PRE-DEVELOPMENT)

```
            Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2018 Version 9.0
     Rational Hydrology Study        Date: 05/25/23  File:10.out
------------------------------------------------------------------------
1512-0001 BEAUMONT VILLAGE
PRE-DEVELOPMENT
10-YEAR STORM EVENT

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

 English (in-lb) Units used in input data file

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


Program License Serial Number 6522

------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =   10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [ Beaumont ] area used.
10 year storm 10 minute intensity =  2.300(In/Hr)
10 year storm 60 minute intensity =  0.890(In/Hr)
100 year storm 10 minute intensity =  3.410(In/Hr)
100 year storm 60 minute intensity =  1.320(In/Hr)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.890(In/Hr)
Slope of intensity duration curve = 0.5300




+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   826.000(Ft.)
Top (of initial area) elevation =    38.000(Ft.)
Bottom (of initial area) elevation =    13.700(Ft.)
Difference in elevation =    24.300(Ft.)
Slope =    0.02942  s(percent)=       2.94
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.752 min.
```

```
Rainfall intensity =      1.808(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.804
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  86.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      9.734(CFS)
Total initial stream area =        6.700(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =           6.70 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  86.0
```

APPENDIX A.2

100-YEAR HYDROLOGY CALCULATIONS (PRE-DEVELOPMENT)

```
           Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2018 Version 9.0
     Rational Hydrology Study       Date: 05/25/23  File:100.out
------------------------------------------------------------------------
1512-0001 BEAUMONT VILLAGE
PRE-DEVELOPMENT
100-YEAR STORM EVENT

------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

 English (in-lb) Units used in input data file

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


Program License Serial Number 6522

------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) =  100.00 Antecedent Moisture Condition = 3

Standard intensity-duration curves data (Plate D-4.1)
For the [ Beaumont ] area used.
10 year storm 10 minute intensity =  2.300(In/Hr)
10 year storm 60 minute intensity =  0.890(In/Hr)
100 year storm 10 minute intensity =  3.410(In/Hr)
100 year storm 60 minute intensity =  1.320(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.320(In/Hr)
Slope of intensity duration curve = 0.5300





++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       1.000 to Point/Station       2.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   826.000(Ft.)
Top (of initial area) elevation =    38.000(Ft.)
Bottom (of initial area) elevation =    13.700(Ft.)
Difference in elevation =    24.300(Ft.)
Slope =    0.02942  s(percent)=       2.94
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.752 min.
```

```
Rainfall intensity =      2.682(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  94.40
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     15.707(CFS)
Total initial stream area =        6.700(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =            6.70 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  86.0
```

APPENDIX B

POST-DEVELOPMENT FLOW CALCULATIONS (RATIONAL METHOD)

APPENDIX B.1

10-YEAR HYDROLOGY CALCULATIONS (POST-DEVELOPMENT)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2018 Version 9.0
Rational Hydrology Study Date: 08/31/23 File:10.out

1512-0001 BEAUMONT VILLAGE
POST-DEVELOPMENT
10-YEAR STORM EVENT

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6522

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Beaumont] area used.
10 year storm 10 minute intensity = 2.300(In/Hr)
10 year storm 60 minute intensity = 0.890(In/Hr)
100 year storm 10 minute intensity = 3.410(In/Hr)
100 year storm 60 minute intensity = 1.320(In/Hr)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.890(In/Hr)
Slope of intensity duration curve = 0.5300

Area 1

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

Initial area flow distance = 603.000(Ft.)
Top (of initial area) elevation = 40.300(Ft.)
Bottom (of initial area) elevation = 24.200(Ft.)
Difference in elevation = 16.100(Ft.)
Slope = 0.02670 s(percent)= 2.67
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.016 min.

```
Rainfall intensity =      2.587(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.812(CFS)
Total initial stream area =        3.420(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       2.000 to Point/Station       3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    19.200(Ft.)
Downstream point/station elevation =    15.400(Ft.)
Pipe length  =   249.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.812(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.812(CFS)
Normal flow depth in pipe =   12.02(In.)
Flow top width inside pipe =   11.96(In.)
Critical Depth =   13.27(In.)
Pipe flow velocity =      7.41(Ft/s)
Travel time through pipe =    0.56 min.
Time of concentration (TC) =     8.58 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       3.000 to Point/Station       3.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.420(Ac.)
Runoff from this stream =      7.812(CFS)
Time of concentration =    8.58 min.
Rainfall intensity =     2.496(In/Hr)
Program is now starting with Main Stream No. 2
```

Area 2

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       4.000 to Point/Station       5.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   383.000(Ft.)
Top (of initial area) elevation =    25.400(Ft.)
Bottom (of initial area) elevation =    18.600(Ft.)
Difference in elevation =     6.800(Ft.)
Slope =    0.01775  s(percent)=       1.78
```

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.253 min.
Rainfall intensity =      2.727(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.170(CFS)
Total initial stream area =        1.730(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       5.000 to Point/Station       3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    15.600(Ft.)
Downstream point/station elevation =    15.400(Ft.)
Pipe length  =    21.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.170(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.170(CFS)
Normal flow depth in pipe =    8.91(In.)
Flow top width inside pipe =   14.73(In.)
Critical Depth =    9.93(In.)
Pipe flow velocity =      5.49(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     7.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       3.000 to Point/Station       3.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.730(Ac.)
Runoff from this stream =      4.170(CFS)
Time of concentration =    7.32 min.
Rainfall intensity =     2.715(In/Hr)
Program is now starting with Main Stream No. 3
```

Area 3

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       6.000 to Point/Station       7.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   407.000(Ft.)
Top (of initial area) elevation =    23.400(Ft.)
Bottom (of initial area) elevation =    20.900(Ft.)
```

```
Difference in elevation =     2.500(Ft.)
Slope =    0.00614  s(percent)=      0.61
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.189 min.
Rainfall intensity =      2.406(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.804(CFS)
Total initial stream area =        0.850(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       7.000 to Point/Station       3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    15.700(Ft.)
Downstream point/station elevation =    15.400(Ft.)
Pipe length  =    66.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.804(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.804(CFS)
Normal flow depth in pipe =    7.76(In.)
Flow top width inside pipe =   11.47(In.)
Critical Depth =    6.85(In.)
Pipe flow velocity =      3.36(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     9.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       3.000 to Point/Station       3.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      0.850(Ac.)
Runoff from this stream =      1.804(CFS)
Time of concentration =    9.52 min.
Rainfall intensity =     2.362(In/Hr)
Program is now starting with Main Stream No. 4
```

Area 4

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        9.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   240.000(Ft.)
Top (of initial area) elevation =    29.600(Ft.)
Bottom (of initial area) elevation =    26.800(Ft.)
Difference in elevation =     2.800(Ft.)
Slope =    0.01167  s(percent)=       1.17
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.544 min.
Rainfall intensity =      2.880(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.809(CFS)
Total initial stream area =        0.710(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    22.000(Ft.)
Downstream point/station elevation =    15.400(Ft.)
Pipe length  =   585.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.809(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.809(CFS)
Normal flow depth in pipe =    5.84(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    6.87(In.)
Pipe flow velocity =      4.76(Ft/s)
Travel time through pipe =    2.05 min.
Time of concentration (TC) =     8.59 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      0.710(Ac.)
Runoff from this stream =      1.809(CFS)
Time of concentration =    8.59 min.
Rainfall intensity =     2.493(In/Hr)
```

```
Summary of stream data:

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


1        7.812      8.58              2.496
2        4.170      7.32              2.715
3        1.804      9.52              2.362
4        1.809      8.59              2.493
Largest stream flow has longer or shorter time of concentration
Qp =      7.812 + sum of
       Qb          Ia/Ib
        4.170 *    0.919 =      3.833
       Qa           Tb/Ta
        1.804 *    0.901 =      1.625
       Qa           Tb/Ta
        1.809 *    0.998 =      1.806
Qp =     15.076

Total of 4 main streams to confluence:
Flow rates before confluence point:
       7.812       4.170       1.804       1.809
Area of streams before confluence:
        3.420        1.730        0.850        0.710


Results of confluence:
Total flow rate =     15.076(CFS)
Time of concentration =     8.576 min.
Effective stream area after confluence  =      6.710(Ac.)
End of computations, total study area =            6.71 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  69.0
```

APPENDIX B.2

100-YEAR HYDROLOGY CALCULATIONS (POST-DEVELOPMENT)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2018 Version 9.0
Rational Hydrology Study Date: 09/05/23 File:100.out

1512-0001 BEAUMONT VILLAGE
POST-DEVELOPMENT
100-YEAR STORM EVENT

********* Hydrology Study Control Information **********

English (in-lb) Units used in input data file

Program License Serial Number 6522

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 3

Standard intensity-duration curves data (Plate D-4.1)
For the [Beaumont] area used.
10 year storm 10 minute intensity = 2.300(In/Hr)
10 year storm 60 minute intensity = 0.890(In/Hr)
100 year storm 10 minute intensity = 3.410(In/Hr)
100 year storm 60 minute intensity = 1.320(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.320(In/Hr)
Slope of intensity duration curve = 0.5300

Area 1

++

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

Initial area flow distance = 603.000(Ft.)
Top (of initial area) elevation = 40.300(Ft.)
Bottom (of initial area) elevation = 24.200(Ft.)
Difference in elevation = 16.100(Ft.)
Slope = 0.02670 s(percent)= 2.67
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 8.016 min.

```
Rainfall intensity =      3.836(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.895
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  84.40
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     11.737(CFS)
Total initial stream area =        3.420(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        2.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    19.200(Ft.)
Downstream point/station elevation =    15.400(Ft.)
Pipe length  =   249.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.737(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    11.737(CFS)
Normal flow depth in pipe =   13.41(In.)
Flow top width inside pipe =   15.70(In.)
Critical Depth =   15.64(In.)
Pipe flow velocity =      8.32(Ft/s)
Travel time through pipe =    0.50 min.
Time of concentration (TC) =     8.51 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.420(Ac.)
Runoff from this stream =     11.737(CFS)
Time of concentration =    8.51 min.
Rainfall intensity =     3.715(In/Hr)
Program is now starting with Main Stream No. 2
```

Area 2

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   383.000(Ft.)
Top (of initial area) elevation =    25.400(Ft.)
Bottom (of initial area) elevation =    18.600(Ft.)
Difference in elevation =     6.800(Ft.)
Slope =    0.01775  s(percent)=       1.78
```

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.253 min.
Rainfall intensity =      4.045(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.895
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  84.40
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      6.262(CFS)
Total initial stream area =        1.730(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       5.000 to Point/Station       3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    15.600(Ft.)
Downstream point/station elevation =    15.400(Ft.)
Pipe length  =    21.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.262(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.262(CFS)
Normal flow depth in pipe =   12.21(In.)
Flow top width inside pipe =   11.67(In.)
Critical Depth =   12.12(In.)
Pipe flow velocity =      5.86(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     7.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       3.000 to Point/Station       3.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.730(Ac.)
Runoff from this stream =      6.262(CFS)
Time of concentration =    7.31 min.
Rainfall intensity =     4.027(In/Hr)
Program is now starting with Main Stream No. 3
```

Area 3

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       6.000 to Point/Station       7.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   407.000(Ft.)
Top (of initial area) elevation =    23.400(Ft.)
Bottom (of initial area) elevation =    20.900(Ft.)
```

```
Difference in elevation =     2.500(Ft.)
Slope =    0.00614  s(percent)=      0.61
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.189 min.
Rainfall intensity =      3.568(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.894
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  84.40
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.712(CFS)
Total initial stream area =        0.850(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       7.000 to Point/Station       3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    15.700(Ft.)
Downstream point/station elevation =    15.400(Ft.)
Pipe length  =    66.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.712(CFS)
Nearest computed pipe diameter  =    15.00(In.)
Calculated individual pipe flow  =    2.712(CFS)
Normal flow depth in pipe =    8.57(In.)
Flow top width inside pipe =   14.85(In.)
Critical Depth =    7.93(In.)
Pipe flow velocity =      3.74(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =     9.48 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       3.000 to Point/Station       3.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      0.850(Ac.)
Runoff from this stream =      2.712(CFS)
Time of concentration =    9.48 min.
Rainfall intensity =     3.509(In/Hr)
Program is now starting with Main Stream No. 4
```

Area 4

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       8.000 to Point/Station       9.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________
Initial area flow distance =   240.000(Ft.)
```

```
Top (of initial area) elevation =    29.600(Ft.)
Bottom (of initial area) elevation =    26.800(Ft.)
Difference in elevation =     2.800(Ft.)
Slope =    0.01167  s(percent)=      1.17
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.544 min.
Rainfall intensity =      4.272(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.895
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  84.40
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.715(CFS)
Total initial stream area =        0.710(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station        3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________
Upstream point/station elevation =    22.000(Ft.)
Downstream point/station elevation =    15.400(Ft.)
Pipe length  =   585.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.715(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.715(CFS)
Normal flow depth in pipe =    7.52(In.)
Flow top width inside pipe =   11.61(In.)
Critical Depth =    8.48(In.)
Pipe flow velocity =      5.24(Ft/s)
Travel time through pipe =    1.86 min.
Time of concentration (TC) =     8.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        3.000 to Point/Station        3.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =      0.710(Ac.)
Runoff from this stream =      2.715(CFS)
Time of concentration =    8.40 min.
Rainfall intensity =     3.741(In/Hr)
Summary of stream data:

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

```
1       11.737      8.51             3.715
2        6.262      7.31             4.027
3        2.712      9.48             3.509
4        2.715      8.40             3.741
Largest stream flow has longer or shorter time of concentration
Qp =     11.737 + sum of
       Qb         Ia/Ib
        6.262 *    0.923 =      5.777
       Qa          Tb/Ta
        2.712 *    0.898 =      2.435
       Qb         Ia/Ib
        2.715 *    0.993 =      2.696
Qp =     22.644

Total of 4 main streams to confluence:
Flow rates before confluence point:
      11.737       6.262       2.712       2.715
Area of streams before confluence:
        3.420        1.730        0.850        0.710


Results of confluence:
Total flow rate =     22.644(CFS)
Time of concentration =     8.515 min.
Effective stream area after confluence  =      6.710(Ac.)
End of computations, total study area =           6.71 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  69.0
```

APPENDIX C

PRE-DEVELOPMENT FLOW CALCULATIONS (UNIT HYDROGRAPH)

APPENDIX C.1

10-YEAR HYDROLOGY CALCULATIONS (PRE-DEVELOPMENT)

```
     U n i t   H y d r o g r a p h   A n a l y s i s

     Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2018, Version 9.0
           Study date  05/30/23 File: 102410.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978


Program License Serial Number 6522

---------------------------------------------------------------------
 English (in-lb) Input Units Used
 English Rainfall Data (Inches) Input Values Used

 English Units used in output format



---------------------------------------------------------------------
1512-0001 BEAUMONT VILLAGE
EXISTING CONDITION
10-YEAR, 24-HOUR STORM EVENT

--------------------------------------------------------------------
Drainage Area =       6.70(Ac.)  =      0.010 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =       6.70(Ac.)  =      0.010
Sq. Mi.
USER Entry of lag time in hours
Lag time =    0.158 Hr.
Lag time =     9.45 Min.
25% of lag time =     2.36 Min.
40% of lag time =     3.78 Min.
Unit time =     5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow =     0.00(CFS)

2 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        6.70             2.79                 18.69

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        6.70             6.77                 45.36

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    2.790(In)
Area Averaged 100-Year Rainfall =    6.770(In)

Point rain (area averaged) =    4.427(In)
Areal adjustment factor =  100.00 %
```

Adjusted average point rain = 4.427(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
6.700	91.00	0.000

Total Area Entered = 6.70(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
91.0	91.0	0.117	0.000	0.117	1.000	0.117
					Sum (F) =	0.117

Area averaged mean soil loss (F) (In/Hr) = 0.117
Minimum soil loss rate ((In/Hr)) = 0.059
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period	(hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	52.910	6.691	0.452
2	0.167	105.820	28.574	1.929
3	0.250	158.730	28.446	1.921
4	0.333	211.640	11.992	0.810
5	0.417	264.550	6.549	0.442
6	0.500	317.460	4.550	0.307
7	0.583	370.370	3.271	0.221
8	0.667	423.280	2.427	0.164
9	0.750	476.190	1.780	0.120
10	0.833	529.101	1.537	0.104
11	0.917	582.011	1.168	0.079
12	1.000	634.921	0.923	0.062
13	1.083	687.831	0.699	0.047
14	1.167	740.741	0.538	0.036
15	1.250	793.651	0.529	0.036
16	1.333	846.561	0.328	0.022
			Sum = 100.000	Sum= 6.752

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.035	(0.207)	0.032	0.004
2	0.17	0.07	0.035	(0.207)	0.032	0.004
3	0.25	0.07	0.035	(0.206)	0.032	0.004
4	0.33	0.10	0.053	(0.205)	0.048	0.005
5	0.42	0.10	0.053	(0.204)	0.048	0.005
6	0.50	0.10	0.053	(0.203)	0.048	0.005
7	0.58	0.10	0.053	(0.203)	0.048	0.005
8	0.67	0.10	0.053	(0.202)	0.048	0.005
9	0.75	0.10	0.053	(0.201)	0.048	0.005

10	0.83	0.13	0.071	(0.200)	0.064	0.007
11	0.92	0.13	0.071	(0.199)	0.064	0.007
12	1.00	0.13	0.071	(0.199)	0.064	0.007
13	1.08	0.10	0.053	(0.198)	0.048	0.005
14	1.17	0.10	0.053	(0.197)	0.048	0.005
15	1.25	0.10	0.053	(0.196)	0.048	0.005
16	1.33	0.10	0.053	(0.196)	0.048	0.005
17	1.42	0.10	0.053	(0.195)	0.048	0.005
18	1.50	0.10	0.053	(0.194)	0.048	0.005
19	1.58	0.10	0.053	(0.193)	0.048	0.005
20	1.67	0.10	0.053	(0.192)	0.048	0.005
21	1.75	0.10	0.053	(0.192)	0.048	0.005
22	1.83	0.13	0.071	(0.191)	0.064	0.007
23	1.92	0.13	0.071	(0.190)	0.064	0.007
24	2.00	0.13	0.071	(0.189)	0.064	0.007
25	2.08	0.13	0.071	(0.189)	0.064	0.007
26	2.17	0.13	0.071	(0.188)	0.064	0.007
27	2.25	0.13	0.071	(0.187)	0.064	0.007
28	2.33	0.13	0.071	(0.186)	0.064	0.007
29	2.42	0.13	0.071	(0.186)	0.064	0.007
30	2.50	0.13	0.071	(0.185)	0.064	0.007
31	2.58	0.17	0.089	(0.184)	0.080	0.009
32	2.67	0.17	0.089	(0.183)	0.080	0.009
33	2.75	0.17	0.089	(0.183)	0.080	0.009
34	2.83	0.17	0.089	(0.182)	0.080	0.009
35	2.92	0.17	0.089	(0.181)	0.080	0.009
36	3.00	0.17	0.089	(0.180)	0.080	0.009
37	3.08	0.17	0.089	(0.180)	0.080	0.009
38	3.17	0.17	0.089	(0.179)	0.080	0.009
39	3.25	0.17	0.089	(0.178)	0.080	0.009
40	3.33	0.17	0.089	(0.177)	0.080	0.009
41	3.42	0.17	0.089	(0.177)	0.080	0.009
42	3.50	0.17	0.089	(0.176)	0.080	0.009
43	3.58	0.17	0.089	(0.175)	0.080	0.009
44	3.67	0.17	0.089	(0.174)	0.080	0.009
45	3.75	0.17	0.089	(0.174)	0.080	0.009
46	3.83	0.20	0.106	(0.173)	0.096	0.011
47	3.92	0.20	0.106	(0.172)	0.096	0.011
48	4.00	0.20	0.106	(0.171)	0.096	0.011
49	4.08	0.20	0.106	(0.171)	0.096	0.011
50	4.17	0.20	0.106	(0.170)	0.096	0.011
51	4.25	0.20	0.106	(0.169)	0.096	0.011
52	4.33	0.23	0.124	(0.169)	0.112	0.012
53	4.42	0.23	0.124	(0.168)	0.112	0.012
54	4.50	0.23	0.124	(0.167)	0.112	0.012
55	4.58	0.23	0.124	(0.166)	0.112	0.012
56	4.67	0.23	0.124	(0.166)	0.112	0.012
57	4.75	0.23	0.124	(0.165)	0.112	0.012
58	4.83	0.27	0.142	(0.164)	0.128	0.014
59	4.92	0.27	0.142	(0.164)	0.128	0.014
60	5.00	0.27	0.142	(0.163)	0.128	0.014
61	5.08	0.20	0.106	(0.162)	0.096	0.011
62	5.17	0.20	0.106	(0.161)	0.096	0.011
63	5.25	0.20	0.106	(0.161)	0.096	0.011
64	5.33	0.23	0.124	(0.160)	0.112	0.012
65	5.42	0.23	0.124	(0.159)	0.112	0.012
66	5.50	0.23	0.124	(0.159)	0.112	0.012
67	5.58	0.27	0.142	(0.158)	0.128	0.014
68	5.67	0.27	0.142	(0.157)	0.128	0.014
69	5.75	0.27	0.142	(0.157)	0.128	0.014

70	5.83	0.27	0.142	(0.156)	0.128	0.014
71	5.92	0.27	0.142	(0.155)	0.128	0.014
72	6.00	0.27	0.142	(0.154)	0.128	0.014
73	6.08	0.30	0.159	(0.154)	0.143	0.016
74	6.17	0.30	0.159	(0.153)	0.143	0.016
75	6.25	0.30	0.159	(0.152)	0.143	0.016
76	6.33	0.30	0.159	(0.152)	0.143	0.016
77	6.42	0.30	0.159	(0.151)	0.143	0.016
78	6.50	0.30	0.159	(0.150)	0.143	0.016
79	6.58	0.33	0.177	0.150	(0.159)	0.027
80	6.67	0.33	0.177	0.149	(0.159)	0.028
81	6.75	0.33	0.177	0.148	(0.159)	0.029
82	6.83	0.33	0.177	0.148	(0.159)	0.029
83	6.92	0.33	0.177	0.147	(0.159)	0.030
84	7.00	0.33	0.177	0.146	(0.159)	0.031
85	7.08	0.33	0.177	0.146	(0.159)	0.031
86	7.17	0.33	0.177	0.145	(0.159)	0.032
87	7.25	0.33	0.177	0.144	(0.159)	0.033
88	7.33	0.37	0.195	0.144	(0.175)	0.051
89	7.42	0.37	0.195	0.143	(0.175)	0.052
90	7.50	0.37	0.195	0.142	(0.175)	0.052
91	7.58	0.40	0.213	0.142	(0.191)	0.071
92	7.67	0.40	0.213	0.141	(0.191)	0.071
93	7.75	0.40	0.213	0.140	(0.191)	0.072
94	7.83	0.43	0.230	0.140	(0.207)	0.090
95	7.92	0.43	0.230	0.139	(0.207)	0.091
96	8.00	0.43	0.230	0.138	(0.207)	0.092
97	8.08	0.50	0.266	0.138	(0.239)	0.128
98	8.17	0.50	0.266	0.137	(0.239)	0.128
99	8.25	0.50	0.266	0.137	(0.239)	0.129
100	8.33	0.50	0.266	0.136	(0.239)	0.130
101	8.42	0.50	0.266	0.135	(0.239)	0.130
102	8.50	0.50	0.266	0.135	(0.239)	0.131
103	8.58	0.53	0.283	0.134	(0.255)	0.149
104	8.67	0.53	0.283	0.133	(0.255)	0.150
105	8.75	0.53	0.283	0.133	(0.255)	0.151
106	8.83	0.57	0.301	0.132	(0.271)	0.169
107	8.92	0.57	0.301	0.131	(0.271)	0.170
108	9.00	0.57	0.301	0.131	(0.271)	0.170
109	9.08	0.63	0.336	0.130	(0.303)	0.206
110	9.17	0.63	0.336	0.130	(0.303)	0.207
111	9.25	0.63	0.336	0.129	(0.303)	0.207
112	9.33	0.67	0.354	0.128	(0.319)	0.226
113	9.42	0.67	0.354	0.128	(0.319)	0.226
114	9.50	0.67	0.354	0.127	(0.319)	0.227
115	9.58	0.70	0.372	0.127	(0.335)	0.245
116	9.67	0.70	0.372	0.126	(0.335)	0.246
117	9.75	0.70	0.372	0.125	(0.335)	0.247
118	9.83	0.73	0.390	0.125	(0.351)	0.265
119	9.92	0.73	0.390	0.124	(0.351)	0.265
120	10.00	0.73	0.390	0.124	(0.351)	0.266
121	10.08	0.50	0.266	0.123	(0.239)	0.143
122	10.17	0.50	0.266	0.122	(0.239)	0.143
123	10.25	0.50	0.266	0.122	(0.239)	0.144
124	10.33	0.50	0.266	0.121	(0.239)	0.144
125	10.42	0.50	0.266	0.121	(0.239)	0.145
126	10.50	0.50	0.266	0.120	(0.239)	0.146
127	10.58	0.67	0.354	0.119	(0.319)	0.235
128	10.67	0.67	0.354	0.119	(0.319)	0.235
129	10.75	0.67	0.354	0.118	(0.319)	0.236

130	10.83	0.67	0.354	0.118	(0.319)	0.237
131	10.92	0.67	0.354	0.117	(0.319)	0.237
132	11.00	0.67	0.354	0.117	(0.319)	0.238
133	11.08	0.63	0.336	0.116	(0.303)	0.221
134	11.17	0.63	0.336	0.115	(0.303)	0.221
135	11.25	0.63	0.336	0.115	(0.303)	0.222
136	11.33	0.63	0.336	0.114	(0.303)	0.222
137	11.42	0.63	0.336	0.114	(0.303)	0.223
138	11.50	0.63	0.336	0.113	(0.303)	0.223
139	11.58	0.57	0.301	0.113	(0.271)	0.189
140	11.67	0.57	0.301	0.112	(0.271)	0.189
141	11.75	0.57	0.301	0.111	(0.271)	0.190
142	11.83	0.60	0.319	0.111	(0.287)	0.208
143	11.92	0.60	0.319	0.110	(0.287)	0.208
144	12.00	0.60	0.319	0.110	(0.287)	0.209
145	12.08	0.83	0.443	0.109	(0.398)	0.334
146	12.17	0.83	0.443	0.109	(0.398)	0.334
147	12.25	0.83	0.443	0.108	(0.398)	0.335
148	12.33	0.87	0.460	0.108	(0.414)	0.353
149	12.42	0.87	0.460	0.107	(0.414)	0.353
150	12.50	0.87	0.460	0.107	(0.414)	0.354
151	12.58	0.93	0.496	0.106	(0.446)	0.390
152	12.67	0.93	0.496	0.105	(0.446)	0.390
153	12.75	0.93	0.496	0.105	(0.446)	0.391
154	12.83	0.97	0.514	0.104	(0.462)	0.409
155	12.92	0.97	0.514	0.104	(0.462)	0.410
156	13.00	0.97	0.514	0.103	(0.462)	0.410
157	13.08	1.13	0.602	0.103	(0.542)	0.499
158	13.17	1.13	0.602	0.102	(0.542)	0.500
159	13.25	1.13	0.602	0.102	(0.542)	0.500
160	13.33	1.13	0.602	0.101	(0.542)	0.501
161	13.42	1.13	0.602	0.101	(0.542)	0.501
162	13.50	1.13	0.602	0.100	(0.542)	0.502
163	13.58	0.77	0.407	0.100	(0.367)	0.308
164	13.67	0.77	0.407	0.099	(0.367)	0.308
165	13.75	0.77	0.407	0.099	(0.367)	0.309
166	13.83	0.77	0.407	0.098	(0.367)	0.309
167	13.92	0.77	0.407	0.098	(0.367)	0.310
168	14.00	0.77	0.407	0.097	(0.367)	0.310
169	14.08	0.90	0.478	0.097	(0.430)	0.381
170	14.17	0.90	0.478	0.096	(0.430)	0.382
171	14.25	0.90	0.478	0.096	(0.430)	0.382
172	14.33	0.87	0.460	0.095	(0.414)	0.365
173	14.42	0.87	0.460	0.095	(0.414)	0.366
174	14.50	0.87	0.460	0.094	(0.414)	0.366
175	14.58	0.87	0.460	0.094	(0.414)	0.367
176	14.67	0.87	0.460	0.093	(0.414)	0.367
177	14.75	0.87	0.460	0.093	(0.414)	0.368
178	14.83	0.83	0.443	0.092	(0.398)	0.350
179	14.92	0.83	0.443	0.092	(0.398)	0.351
180	15.00	0.83	0.443	0.091	(0.398)	0.351
181	15.08	0.80	0.425	0.091	(0.383)	0.334
182	15.17	0.80	0.425	0.090	(0.383)	0.335
183	15.25	0.80	0.425	0.090	(0.383)	0.335
184	15.33	0.77	0.407	0.090	(0.367)	0.318
185	15.42	0.77	0.407	0.089	(0.367)	0.318
186	15.50	0.77	0.407	0.089	(0.367)	0.319
187	15.58	0.63	0.336	0.088	(0.303)	0.248
188	15.67	0.63	0.336	0.088	(0.303)	0.249
189	15.75	0.63	0.336	0.087	(0.303)	0.249

190	15.83	0.63	0.336	0.087	(0.303)	0.250
191	15.92	0.63	0.336	0.086	(0.303)	0.250
192	16.00	0.63	0.336	0.086	(0.303)	0.251
193	16.08	0.13	0.071	(0.085)	0.064	0.007
194	16.17	0.13	0.071	(0.085)	0.064	0.007
195	16.25	0.13	0.071	(0.085)	0.064	0.007
196	16.33	0.13	0.071	(0.084)	0.064	0.007
197	16.42	0.13	0.071	(0.084)	0.064	0.007
198	16.50	0.13	0.071	(0.083)	0.064	0.007
199	16.58	0.10	0.053	(0.083)	0.048	0.005
200	16.67	0.10	0.053	(0.082)	0.048	0.005
201	16.75	0.10	0.053	(0.082)	0.048	0.005
202	16.83	0.10	0.053	(0.082)	0.048	0.005
203	16.92	0.10	0.053	(0.081)	0.048	0.005
204	17.00	0.10	0.053	(0.081)	0.048	0.005
205	17.08	0.17	0.089	(0.080)	0.080	0.009
206	17.17	0.17	0.089	(0.080)	0.080	0.009
207	17.25	0.17	0.089	0.080	(0.080)	0.009
208	17.33	0.17	0.089	0.079	(0.080)	0.009
209	17.42	0.17	0.089	0.079	(0.080)	0.010
210	17.50	0.17	0.089	0.078	(0.080)	0.010
211	17.58	0.17	0.089	0.078	(0.080)	0.011
212	17.67	0.17	0.089	0.078	(0.080)	0.011
213	17.75	0.17	0.089	0.077	(0.080)	0.011
214	17.83	0.13	0.071	(0.077)	0.064	0.007
215	17.92	0.13	0.071	(0.076)	0.064	0.007
216	18.00	0.13	0.071	(0.076)	0.064	0.007
217	18.08	0.13	0.071	(0.076)	0.064	0.007
218	18.17	0.13	0.071	(0.075)	0.064	0.007
219	18.25	0.13	0.071	(0.075)	0.064	0.007
220	18.33	0.13	0.071	(0.075)	0.064	0.007
221	18.42	0.13	0.071	(0.074)	0.064	0.007
222	18.50	0.13	0.071	(0.074)	0.064	0.007
223	18.58	0.10	0.053	(0.074)	0.048	0.005
224	18.67	0.10	0.053	(0.073)	0.048	0.005
225	18.75	0.10	0.053	(0.073)	0.048	0.005
226	18.83	0.07	0.035	(0.072)	0.032	0.004
227	18.92	0.07	0.035	(0.072)	0.032	0.004
228	19.00	0.07	0.035	(0.072)	0.032	0.004
229	19.08	0.10	0.053	(0.071)	0.048	0.005
230	19.17	0.10	0.053	(0.071)	0.048	0.005
231	19.25	0.10	0.053	(0.071)	0.048	0.005
232	19.33	0.13	0.071	(0.070)	0.064	0.007
233	19.42	0.13	0.071	(0.070)	0.064	0.007
234	19.50	0.13	0.071	(0.070)	0.064	0.007
235	19.58	0.10	0.053	(0.069)	0.048	0.005
236	19.67	0.10	0.053	(0.069)	0.048	0.005
237	19.75	0.10	0.053	(0.069)	0.048	0.005
238	19.83	0.07	0.035	(0.069)	0.032	0.004
239	19.92	0.07	0.035	(0.068)	0.032	0.004
240	20.00	0.07	0.035	(0.068)	0.032	0.004
241	20.08	0.10	0.053	(0.068)	0.048	0.005
242	20.17	0.10	0.053	(0.067)	0.048	0.005
243	20.25	0.10	0.053	(0.067)	0.048	0.005
244	20.33	0.10	0.053	(0.067)	0.048	0.005
245	20.42	0.10	0.053	(0.066)	0.048	0.005
246	20.50	0.10	0.053	(0.066)	0.048	0.005
247	20.58	0.10	0.053	(0.066)	0.048	0.005
248	20.67	0.10	0.053	(0.066)	0.048	0.005
249	20.75	0.10	0.053	(0.065)	0.048	0.005

250	20.83	0.07	0.035	(0.065)	0.032	0.004
251	20.92	0.07	0.035	(0.065)	0.032	0.004
252	21.00	0.07	0.035	(0.065)	0.032	0.004
253	21.08	0.10	0.053	(0.064)	0.048	0.005
254	21.17	0.10	0.053	(0.064)	0.048	0.005
255	21.25	0.10	0.053	(0.064)	0.048	0.005
256	21.33	0.07	0.035	(0.064)	0.032	0.004
257	21.42	0.07	0.035	(0.063)	0.032	0.004
258	21.50	0.07	0.035	(0.063)	0.032	0.004
259	21.58	0.10	0.053	(0.063)	0.048	0.005
260	21.67	0.10	0.053	(0.063)	0.048	0.005
261	21.75	0.10	0.053	(0.062)	0.048	0.005
262	21.83	0.07	0.035	(0.062)	0.032	0.004
263	21.92	0.07	0.035	(0.062)	0.032	0.004
264	22.00	0.07	0.035	(0.062)	0.032	0.004
265	22.08	0.10	0.053	(0.062)	0.048	0.005
266	22.17	0.10	0.053	(0.061)	0.048	0.005
267	22.25	0.10	0.053	(0.061)	0.048	0.005
268	22.33	0.07	0.035	(0.061)	0.032	0.004
269	22.42	0.07	0.035	(0.061)	0.032	0.004
270	22.50	0.07	0.035	(0.061)	0.032	0.004
271	22.58	0.07	0.035	(0.060)	0.032	0.004
272	22.67	0.07	0.035	(0.060)	0.032	0.004
273	22.75	0.07	0.035	(0.060)	0.032	0.004
274	22.83	0.07	0.035	(0.060)	0.032	0.004
275	22.92	0.07	0.035	(0.060)	0.032	0.004
276	23.00	0.07	0.035	(0.060)	0.032	0.004
277	23.08	0.07	0.035	(0.060)	0.032	0.004
278	23.17	0.07	0.035	(0.059)	0.032	0.004
279	23.25	0.07	0.035	(0.059)	0.032	0.004
280	23.33	0.07	0.035	(0.059)	0.032	0.004
281	23.42	0.07	0.035	(0.059)	0.032	0.004
282	23.50	0.07	0.035	(0.059)	0.032	0.004
283	23.58	0.07	0.035	(0.059)	0.032	0.004
284	23.67	0.07	0.035	(0.059)	0.032	0.004
285	23.75	0.07	0.035	(0.059)	0.032	0.004
286	23.83	0.07	0.035	(0.059)	0.032	0.004
287	23.92	0.07	0.035	(0.059)	0.032	0.004
288	24.00	0.07	0.035	(0.059)	0.032	0.004

(Loss Rate Not Used)

Sum = 100.0 Sum = 28.7

Flood volume = Effective rainfall 2.39(In)
times area 6.7(Ac.)/[(In)/(Ft.)] = 1.3(Ac.Ft)
Total soil loss = 2.03(In)
Total soil loss = 1.136(Ac.Ft)
Total rainfall = 4.43(In)
Flood volume = 58206.8 Cubic Feet
Total soil loss = 49470.7 Cubic Feet

Peak flow rate of this hydrograph = 3.290(CFS)

++

24 - H O U R S T O R M

R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m) Volume Ac.Ft Q(CFS) 0 2.5 5.0 7.5 10.0

0+ 5	0.0000	0.00	Q
0+10	0.0001	0.01	Q
0+15	0.0002	0.02	Q
0+20	0.0003	0.02	Q
0+25	0.0005	0.02	Q
0+30	0.0007	0.03	Q
0+35	0.0009	0.03	Q
0+40	0.0011	0.03	Q
0+45	0.0013	0.03	Q
0+50	0.0016	0.03	Q
0+55	0.0018	0.04	Q
1+ 0	0.0021	0.04	Q
1+ 5	0.0024	0.04	Q
1+10	0.0027	0.04	Q
1+15	0.0030	0.04	Q
1+20	0.0032	0.04	Q
1+25	0.0035	0.04	Q
1+30	0.0037	0.04	Q
1+35	0.0040	0.04	Q
1+40	0.0042	0.04	Q
1+45	0.0045	0.04	Q
1+50	0.0047	0.04	Q
1+55	0.0050	0.04	Q
2+ 0	0.0053	0.04	Q
2+ 5	0.0056	0.05	Q
2+10	0.0059	0.05	Q
2+15	0.0063	0.05	Q
2+20	0.0066	0.05	Q
2+25	0.0069	0.05	Q
2+30	0.0072	0.05	Q
2+35	0.0076	0.05	Q
2+40	0.0079	0.05	Q
2+45	0.0083	0.06	Q
2+50	0.0087	0.06	Q
2+55	0.0091	0.06	Q
3+ 0	0.0095	0.06	Q
3+ 5	0.0099	0.06	Q
3+10	0.0103	0.06	Q
3+15	0.0107	0.06	Q
3+20	0.0111	0.06	Q
3+25	0.0115	0.06	Q
3+30	0.0119	0.06	Q
3+35	0.0123	0.06	Q
3+40	0.0128	0.06	Q
3+45	0.0132	0.06	Q
3+50	0.0136	0.06	Q
3+55	0.0140	0.06	Q
4+ 0	0.0145	0.07	Q
4+ 5	0.0150	0.07	Q
4+10	0.0154	0.07	Q
4+15	0.0159	0.07	Q
4+20	0.0164	0.07	Q
4+25	0.0169	0.08	Q
4+30	0.0175	0.08	Q
4+35	0.0180	0.08	Q
4+40	0.0186	0.08	Q
4+45	0.0192	0.08	Q
4+50	0.0197	0.08	Q
4+55	0.0203	0.09	Q
5+ 0	0.0209	0.09	Q

```
 5+ 5       0.0216      0.09  Q         |         |         |         |
 5+10       0.0222      0.08  Q         |         |         |         |
 5+15       0.0227      0.08  Q         |         |         |         |
 5+20       0.0232      0.08  Q         |         |         |         |
 5+25       0.0238      0.08  Q         |         |         |         |
 5+30       0.0243      0.08  Q         |         |         |         |
 5+35       0.0249      0.08  Q         |         |         |         |
 5+40       0.0255      0.09  Q         |         |         |         |
 5+45       0.0261      0.09  Q         |         |         |         |
 5+50       0.0268      0.09  Q         |         |         |         |
 5+55       0.0274      0.09  Q         |         |         |         |
 6+ 0       0.0281      0.09  Q         |         |         |         |
 6+ 5       0.0287      0.10  Q         |         |         |         |
 6+10       0.0294      0.10  Q         |         |         |         |
 6+15       0.0301      0.10  Q         |         |         |         |
 6+20       0.0308      0.10  Q         |         |         |         |
 6+25       0.0316      0.11  Q         |         |         |         |
 6+30       0.0323      0.11  Q         |         |         |         |
 6+35       0.0330      0.11  Q         |         |         |         |
 6+40       0.0340      0.13  QV        |         |         |         |
 6+45       0.0351      0.16  QV        |         |         |         |
 6+50       0.0362      0.17  QV        |         |         |         |
 6+55       0.0375      0.18  QV        |         |         |         |
 7+ 0       0.0388      0.19  QV        |         |         |         |
 7+ 5       0.0401      0.19  QV        |         |         |         |
 7+10       0.0415      0.20  QV        |         |         |         |
 7+15       0.0429      0.20  QV        |         |         |         |
 7+20       0.0444      0.22  QV        |         |         |         |
 7+25       0.0462      0.26  |Q        |         |         |         |
 7+30       0.0482      0.30  |Q        |         |         |         |
 7+35       0.0504      0.32  |Q        |         |         |         |
 7+40       0.0530      0.37  |Q        |         |         |         |
 7+45       0.0558      0.42  |Q        |         |         |         |
 7+50       0.0589      0.45  |Q        |         |         |         |
 7+55       0.0623      0.50  |Q        |         |         |         |
 8+ 0       0.0661      0.54  |VQ       |         |         |         |
 8+ 5       0.0701      0.58  | Q       |         |         |         |
 8+10       0.0747      0.67  | Q       |         |         |         |
 8+15       0.0798      0.75  | Q       |         |         |         |
 8+20       0.0852      0.79  | VQ      |         |         |         |
 8+25       0.0908      0.81  | VQ      |         |         |         |
 8+30       0.0965      0.83  | VQ      |         |         |         |
 8+35       0.1024      0.85  |  Q      |         |         |         |
 8+40       0.1086      0.90  |  Q      |         |         |         |
 8+45       0.1151      0.95  |  Q      |         |         |         |
 8+50       0.1219      0.98  |  Q      |         |         |         |
 8+55       0.1289      1.03  |  VQ     |         |         |         |
 9+ 0       0.1363      1.07  |   Q     |         |         |         |
 9+ 5       0.1440      1.11  |   Q     |         |         |         |
 9+10       0.1523      1.20  |   Q     |         |         |         |
 9+15       0.1611      1.28  |   VQ    |         |         |         |
 9+20       0.1702      1.33  |    Q    |         |         |         |
 9+25       0.1797      1.39  |    Q    |         |         |         |
 9+30       0.1896      1.44  |    Q    |         |         |         |
 9+35       0.1998      1.47  |    Q    |         |         |         |
 9+40       0.2103      1.53  |     Q   |         |         |         |
 9+45       0.2212      1.58  |     Q   |         |         |         |
 9+50       0.2323      1.61  |     Q   |         |         |         |
 9+55       0.2438      1.67  |     QV  |         |         |         |
10+ 0       0.2556      1.71  |     QV  |         |         |         |
```

```
10+ 5       0.2672      1.68  |     QV  |         |         |         |
10+10       0.2773      1.46  |    Q  V |         |         |         |
10+15       0.2858      1.24  |   Q   V |         |         |         |
10+20       0.2937      1.15  |   Q   V |         |         |         |
10+25       0.3013      1.10  |   Q    V|         |         |         |
10+30       0.3087      1.07  |   Q    V|         |         |         |
10+35       0.3162      1.09  |   Q    V|         |         |         |
10+40       0.3248      1.25  |   Q    V|         |         |         |
10+45       0.3346      1.41  |    Q    V         |         |         |
10+50       0.3447      1.47  |    Q    V         |         |         |
10+55       0.3551      1.51  |     Q   V         |         |         |
11+ 0       0.3657      1.53  |     Q   V         |         |         |
11+ 5       0.3763      1.54  |     Q   |V        |         |         |
11+10       0.3868      1.52  |     Q   |V        |         |         |
11+15       0.3971      1.50  |    Q    |V        |         |         |
11+20       0.4074      1.49  |    Q    | V       |         |         |
11+25       0.4177      1.50  |    Q    | V       |         |         |
11+30       0.4280      1.50  |     Q   | V       |         |         |
11+35       0.4383      1.49  |    Q    |  V      |         |         |
11+40       0.4481      1.43  |    Q    |  V      |         |         |
11+45       0.4575      1.36  |    Q    |  V      |         |         |
11+50       0.4668      1.35  |    Q    |  V      |         |         |
11+55       0.4762      1.37  |    Q    |   V     |         |         |
12+ 0       0.4857      1.39  |    Q    |   V     |         |         |
12+ 5       0.4958      1.46  |    Q    |   V     |         |         |
12+10       0.5075      1.70  |     Q   |    V    |         |         |
12+15       0.5209      1.94  |      Q  |    V    |         |         |
12+20       0.5351      2.06  |       Q |     V   |         |         |
12+25       0.5499      2.15  |       Q |     V   |         |         |
12+30       0.5652      2.22  |       Q |     V   |         |         |
12+35       0.5809      2.29  |        Q|      V  |         |         |
12+40       0.5974      2.39  |        Q|      V  |         |         |
12+45       0.6144      2.48  |        Q|       V |         |         |
12+50       0.6319      2.54  |         Q       V |         |         |
12+55       0.6498      2.60  |         Q        V|         |         |
13+ 0       0.6682      2.66  |         Q         V         |         |
13+ 5       0.6870      2.74  |         Q         V         |         |
13+10       0.7072      2.93  |         |Q        |V        |         |
13+15       0.7287      3.12  |         | Q       |V        |         |
13+20       0.7507      3.20  |         | Q       | V       |         |
13+25       0.7731      3.25  |         |  Q      |  V      |         |
13+30       0.7958      3.29  |         |  Q      |  V      |         |
13+35       0.8180      3.23  |         | Q       |   V     |         |
13+40       0.8378      2.87  |         |Q        |    V    |         |
13+45       0.8551      2.52  |         Q         |    V    |         |
13+50       0.8715      2.37  |        Q|         |     V   |         |
13+55       0.8873      2.30  |        Q|         |     V   |         |
14+ 0       0.9028      2.25  |       Q |         |      V  |         |
14+ 5       0.9182      2.24  |       Q |         |      V  |         |
14+10       0.9344      2.35  |        Q|         |      V  |         |
14+15       0.9515      2.47  |        Q|         |       V |         |
14+20       0.9687      2.51  |         Q         |       V |         |
14+25       0.9859      2.49  |        Q|         |        V|         |
14+30       1.0029      2.47  |        Q|         |         V         |
14+35       1.0199      2.47  |        Q|         |         V         |
14+40       1.0369      2.47  |        Q|         |         |V        |
14+45       1.0539      2.47  |        Q|         |         |V        |
14+50       1.0709      2.46  |        Q|         |         | V       |
14+55       1.0876      2.43  |        Q|         |         | V       |
15+ 0       1.1042      2.40  |        Q|         |         |  V      |
```

```
15+ 5       1.1206      2.39  |        Q|         |         |  V      |
15+10       1.1368      2.35  |        Q|         |         |   V     |
15+15       1.1528      2.31  |        Q|         |         |   V     |
15+20       1.1685      2.29  |        Q|         |         |   V     |
15+25       1.1840      2.25  |       Q |         |         |    V    |
15+30       1.1993      2.21  |       Q |         |         |    V    |
15+35       1.2141      2.16  |       Q |         |         |     V   |
15+40       1.2280      2.02  |       Q |         |         |     V   |
15+45       1.2409      1.87  |      Q  |         |         |      V  |
15+50       1.2534      1.81  |      Q  |         |         |      V  |
15+55       1.2657      1.78  |      Q  |         |         |      V  |
16+ 0       1.2778      1.76  |      Q  |         |         |       V |
16+ 5       1.2890      1.63  |     Q   |         |         |       V |
16+10       1.2969      1.15  |   Q     |         |         |       V |
16+15       1.3016      0.67  | Q       |         |         |       V |
16+20       1.3048      0.47  |Q        |         |         |        V|
16+25       1.3072      0.35  |Q        |         |         |        V|
16+30       1.3091      0.27  |Q        |         |         |        V|
16+35       1.3106      0.22  Q         |         |         |        V|
16+40       1.3118      0.17  Q         |         |         |        V|
16+45       1.3127      0.14  Q         |         |         |        V|
16+50       1.3134      0.11  Q         |         |         |        V|
16+55       1.3140      0.09  Q         |         |         |        V|
17+ 0       1.3145      0.07  Q         |         |         |        V|
17+ 5       1.3150      0.06  Q         |         |         |        V|
17+10       1.3154      0.06  Q         |         |         |        V|
17+15       1.3158      0.06  Q         |         |         |        V|
17+20       1.3161      0.05  Q         |         |         |        V|
17+25       1.3165      0.06  Q         |         |         |        V|
17+30       1.3170      0.06  Q         |         |         |        V|
17+35       1.3174      0.06  Q         |         |         |        V|
17+40       1.3178      0.07  Q         |         |         |        V|
17+45       1.3183      0.07  Q         |         |         |        V|
17+50       1.3188      0.07  Q         |         |         |        V|
17+55       1.3192      0.06  Q         |         |         |        V|
18+ 0       1.3196      0.06  Q         |         |         |        V|
18+ 5       1.3200      0.05  Q         |         |         |        V|
18+10       1.3203      0.05  Q         |         |         |        V|
18+15       1.3207      0.05  Q         |         |         |        V|
18+20       1.3210      0.05  Q         |         |         |        V|
18+25       1.3214      0.05  Q         |         |         |        V|
18+30       1.3217      0.05  Q         |         |         |        V|
18+35       1.3220      0.05  Q         |         |         |        V|
18+40       1.3223      0.04  Q         |         |         |        V|
18+45       1.3226      0.04  Q         |         |         |        V|
18+50       1.3229      0.04  Q         |         |         |        V|
18+55       1.3231      0.03  Q         |         |         |        V|
19+ 0       1.3233      0.03  Q         |         |         |        V|
19+ 5       1.3235      0.03  Q         |         |         |        V|
19+10       1.3237      0.03  Q         |         |         |        V|
19+15       1.3240      0.03  Q         |         |         |        V|
19+20       1.3242      0.04  Q         |         |         |        V|
19+25       1.3245      0.04  Q         |         |         |        V|
19+30       1.3248      0.04  Q         |         |         |        V|
19+35       1.3251      0.04  Q         |         |         |        V|
19+40       1.3254      0.04  Q         |         |         |        V|
19+45       1.3256      0.04  Q         |         |         |        V|
19+50       1.3259      0.04  Q         |         |         |        V|
19+55       1.3261      0.03  Q         |         |         |        V|
20+ 0       1.3263      0.03  Q         |         |         |        V|
```

20+ 5	1.3265	0.03	Q	|	|	|	V|
20+10	1.3267	0.03	Q	|	|	|	V|
20+15	1.3269	0.03	Q	|	|	|	V|
20+20	1.3272	0.03	Q	|	|	|	V|
20+25	1.3274	0.03	Q	|	|	|	V|
20+30	1.3276	0.04	Q	|	|	|	V|
20+35	1.3279	0.04	Q	|	|	|	V|
20+40	1.3281	0.04	Q	|	|	|	V|
20+45	1.3284	0.04	Q	|	|	|	V|
20+50	1.3286	0.03	Q	|	|	|	V|
20+55	1.3288	0.03	Q	|	|	|	V|
21+ 0	1.3290	0.03	Q	|	|	|	V|
21+ 5	1.3292	0.03	Q	|	|	|	V|
21+10	1.3294	0.03	Q	|	|	|	V|
21+15	1.3297	0.03	Q	|	|	|	V|
21+20	1.3299	0.03	Q	|	|	|	V|
21+25	1.3301	0.03	Q	|	|	|	V|
21+30	1.3303	0.03	Q	|	|	|	V|
21+35	1.3305	0.03	Q	|	|	|	V|
21+40	1.3307	0.03	Q	|	|	|	V|
21+45	1.3309	0.03	Q	|	|	|	V|
21+50	1.3311	0.03	Q	|	|	|	V|
21+55	1.3313	0.03	Q	|	|	|	V|
22+ 0	1.3315	0.03	Q	|	|	|	V|
22+ 5	1.3317	0.03	Q	|	|	|	V|
22+10	1.3319	0.03	Q	|	|	|	V|
22+15	1.3321	0.03	Q	|	|	|	V|
22+20	1.3324	0.03	Q	|	|	|	V|
22+25	1.3326	0.03	Q	|	|	|	V|
22+30	1.3328	0.03	Q	|	|	|	V|
22+35	1.3329	0.03	Q	|	|	|	V|
22+40	1.3331	0.03	Q	|	|	|	V|
22+45	1.3333	0.03	Q	|	|	|	V|
22+50	1.3335	0.02	Q	|	|	|	V|
22+55	1.3336	0.02	Q	|	|	|	V|
23+ 0	1.3338	0.02	Q	|	|	|	V|
23+ 5	1.3340	0.02	Q	|	|	|	V|
23+10	1.3341	0.02	Q	|	|	|	V|
23+15	1.3343	0.02	Q	|	|	|	V|
23+20	1.3345	0.02	Q	|	|	|	V|
23+25	1.3346	0.02	Q	|	|	|	V|
23+30	1.3348	0.02	Q	|	|	|	V|
23+35	1.3350	0.02	Q	|	|	|	V|
23+40	1.3351	0.02	Q	|	|	|	V|
23+45	1.3353	0.02	Q	|	|	|	V|
23+50	1.3354	0.02	Q	|	|	|	V|
23+55	1.3356	0.02	Q	|	|	|	V|
24+ 0	1.3358	0.02	Q	|	|	|	V|
24+ 5	1.3359	0.02	Q	|	|	|	V|
24+10	1.3360	0.02	Q	|	|	|	V|
24+15	1.3361	0.01	Q	|	|	|	V|
24+20	1.3361	0.01	Q	|	|	|	V|
24+25	1.3362	0.00	Q	|	|	|	V|
24+30	1.3362	0.00	Q	|	|	|	V|
24+35	1.3362	0.00	Q	|	|	|	V|
24+40	1.3362	0.00	Q	|	|	|	V|
24+45	1.3362	0.00	Q	|	|	|	V|
24+50	1.3362	0.00	Q	|	|	|	V|
24+55	1.3362	0.00	Q	|	|	|	V|
25+ 0	1.3362	0.00	Q	|	|	|	V|

```
   25+ 5       1.3362      0.00  Q         |         |         |        V|
   25+10       1.3362      0.00  Q         |         |         |        V|
   25+15       1.3362      0.00  Q         |         |         |         V
-----------------------------------------------------------------------
```

APPENDIX D

POST-DEVELOPMENT FLOW CALCULATIONS (UNIT HYDROGRAPH)

APPENDIX D.1

10-YEAR HYDROLOGY CALCULATIONS (POST-DEVELOPMENT)

U n i t   H y d r o g r a p h   A n a l y s i s

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2018, Version 9.0
Study date 05/30/23 File: 102410.out

++

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6522

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

1512-0001 BEAUMONT VILLAGE
PROPOSED CONDITION
10-YEAR, 24-HOUR STORM EVENT
AREA 1 & 2

Drainage Area = 5.15(Ac.) = 0.008 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 5.15(Ac.) = 0.008 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.086 Hr.
Lag time = 5.15 Min.
25% of lag time = 1.29 Min.
40% of lag time = 2.06 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
5.15	2.79	14.37

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
5.15	6.77	34.87

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 2.790(In)
Area Averaged 100-Year Rainfall = 6.770(In)

Point rain (area averaged) = 4.427(In)
Areal adjustment factor = 100.00 %

Adjusted average point rain = 4.427(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
5.150	69.00	0.900

Total Area Entered = 5.15(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
69.0	69.0	0.373	0.900	0.071	1.000	0.071
					Sum (F) =	0.071

Area averaged mean soil loss (F) (In/Hr) = 0.071
Minimum soil loss rate ((In/Hr)) = 0.035
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	97.125	18.319	0.951
2	0.167	194.250	48.142	2.499
3	0.250	291.375	16.091	0.835
4	0.333	388.500	7.218	0.375
5	0.417	485.625	4.095	0.213
6	0.500	582.751	2.657	0.138
7	0.583	679.876	1.692	0.088
8	0.667	777.001	1.071	0.056
9	0.750	874.126	0.716	0.037
			Sum = 100.000	Sum= 5.190

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Loss rate(In./Hr) Low	Effective (In/Hr)
1	0.08	0.07	0.035	(0.126)	0.006	0.029
2	0.17	0.07	0.035	(0.125)	0.006	0.029
3	0.25	0.07	0.035	(0.125)	0.006	0.029
4	0.33	0.10	0.053	(0.124)	0.010	0.044
5	0.42	0.10	0.053	(0.124)	0.010	0.044
6	0.50	0.10	0.053	(0.123)	0.010	0.044
7	0.58	0.10	0.053	(0.123)	0.010	0.044
8	0.67	0.10	0.053	(0.122)	0.010	0.044
9	0.75	0.10	0.053	(0.122)	0.010	0.044
10	0.83	0.13	0.071	(0.121)	0.013	0.058
11	0.92	0.13	0.071	(0.121)	0.013	0.058
12	1.00	0.13	0.071	(0.120)	0.013	0.058
13	1.08	0.10	0.053	(0.120)	0.010	0.044
14	1.17	0.10	0.053	(0.119)	0.010	0.044
15	1.25	0.10	0.053	(0.119)	0.010	0.044
16	1.33	0.10	0.053	(0.118)	0.010	0.044

17	1.42	0.10	0.053	(0.118)	0.010	0.044
18	1.50	0.10	0.053	(0.117)	0.010	0.044
19	1.58	0.10	0.053	(0.117)	0.010	0.044
20	1.67	0.10	0.053	(0.117)	0.010	0.044
21	1.75	0.10	0.053	(0.116)	0.010	0.044
22	1.83	0.13	0.071	(0.116)	0.013	0.058
23	1.92	0.13	0.071	(0.115)	0.013	0.058
24	2.00	0.13	0.071	(0.115)	0.013	0.058
25	2.08	0.13	0.071	(0.114)	0.013	0.058
26	2.17	0.13	0.071	(0.114)	0.013	0.058
27	2.25	0.13	0.071	(0.113)	0.013	0.058
28	2.33	0.13	0.071	(0.113)	0.013	0.058
29	2.42	0.13	0.071	(0.112)	0.013	0.058
30	2.50	0.13	0.071	(0.112)	0.013	0.058
31	2.58	0.17	0.089	(0.111)	0.016	0.073
32	2.67	0.17	0.089	(0.111)	0.016	0.073
33	2.75	0.17	0.089	(0.110)	0.016	0.073
34	2.83	0.17	0.089	(0.110)	0.016	0.073
35	2.92	0.17	0.089	(0.110)	0.016	0.073
36	3.00	0.17	0.089	(0.109)	0.016	0.073
37	3.08	0.17	0.089	(0.109)	0.016	0.073
38	3.17	0.17	0.089	(0.108)	0.016	0.073
39	3.25	0.17	0.089	(0.108)	0.016	0.073
40	3.33	0.17	0.089	(0.107)	0.016	0.073
41	3.42	0.17	0.089	(0.107)	0.016	0.073
42	3.50	0.17	0.089	(0.106)	0.016	0.073
43	3.58	0.17	0.089	(0.106)	0.016	0.073
44	3.67	0.17	0.089	(0.106)	0.016	0.073
45	3.75	0.17	0.089	(0.105)	0.016	0.073
46	3.83	0.20	0.106	(0.105)	0.019	0.087
47	3.92	0.20	0.106	(0.104)	0.019	0.087
48	4.00	0.20	0.106	(0.104)	0.019	0.087
49	4.08	0.20	0.106	(0.103)	0.019	0.087
50	4.17	0.20	0.106	(0.103)	0.019	0.087
51	4.25	0.20	0.106	(0.102)	0.019	0.087
52	4.33	0.23	0.124	(0.102)	0.022	0.102
53	4.42	0.23	0.124	(0.102)	0.022	0.102
54	4.50	0.23	0.124	(0.101)	0.022	0.102
55	4.58	0.23	0.124	(0.101)	0.022	0.102
56	4.67	0.23	0.124	(0.100)	0.022	0.102
57	4.75	0.23	0.124	(0.100)	0.022	0.102
58	4.83	0.27	0.142	(0.099)	0.026	0.116
59	4.92	0.27	0.142	(0.099)	0.026	0.116
60	5.00	0.27	0.142	(0.099)	0.026	0.116
61	5.08	0.20	0.106	(0.098)	0.019	0.087
62	5.17	0.20	0.106	(0.098)	0.019	0.087
63	5.25	0.20	0.106	(0.097)	0.019	0.087
64	5.33	0.23	0.124	(0.097)	0.022	0.102
65	5.42	0.23	0.124	(0.096)	0.022	0.102
66	5.50	0.23	0.124	(0.096)	0.022	0.102
67	5.58	0.27	0.142	(0.096)	0.026	0.116
68	5.67	0.27	0.142	(0.095)	0.026	0.116
69	5.75	0.27	0.142	(0.095)	0.026	0.116
70	5.83	0.27	0.142	(0.094)	0.026	0.116
71	5.92	0.27	0.142	(0.094)	0.026	0.116
72	6.00	0.27	0.142	(0.093)	0.026	0.116
73	6.08	0.30	0.159	(0.093)	0.029	0.131
74	6.17	0.30	0.159	(0.093)	0.029	0.131
75	6.25	0.30	0.159	(0.092)	0.029	0.131
76	6.33	0.30	0.159	(0.092)	0.029	0.131

77	6.42	0.30	0.159	(0.091)	0.029	0.131
78	6.50	0.30	0.159	(0.091)	0.029	0.131
79	6.58	0.33	0.177	(0.091)	0.032	0.145
80	6.67	0.33	0.177	(0.090)	0.032	0.145
81	6.75	0.33	0.177	(0.090)	0.032	0.145
82	6.83	0.33	0.177	(0.089)	0.032	0.145
83	6.92	0.33	0.177	(0.089)	0.032	0.145
84	7.00	0.33	0.177	(0.089)	0.032	0.145
85	7.08	0.33	0.177	(0.088)	0.032	0.145
86	7.17	0.33	0.177	(0.088)	0.032	0.145
87	7.25	0.33	0.177	(0.087)	0.032	0.145
88	7.33	0.37	0.195	(0.087)	0.035	0.160
89	7.42	0.37	0.195	(0.087)	0.035	0.160
90	7.50	0.37	0.195	(0.086)	0.035	0.160
91	7.58	0.40	0.213	(0.086)	0.038	0.174
92	7.67	0.40	0.213	(0.085)	0.038	0.174
93	7.75	0.40	0.213	(0.085)	0.038	0.174
94	7.83	0.43	0.230	(0.085)	0.041	0.189
95	7.92	0.43	0.230	(0.084)	0.041	0.189
96	8.00	0.43	0.230	(0.084)	0.041	0.189
97	8.08	0.50	0.266	(0.083)	0.048	0.218
98	8.17	0.50	0.266	(0.083)	0.048	0.218
99	8.25	0.50	0.266	(0.083)	0.048	0.218
100	8.33	0.50	0.266	(0.082)	0.048	0.218
101	8.42	0.50	0.266	(0.082)	0.048	0.218
102	8.50	0.50	0.266	(0.082)	0.048	0.218
103	8.58	0.53	0.283	(0.081)	0.051	0.232
104	8.67	0.53	0.283	(0.081)	0.051	0.232
105	8.75	0.53	0.283	(0.080)	0.051	0.232
106	8.83	0.57	0.301	(0.080)	0.054	0.247
107	8.92	0.57	0.301	(0.080)	0.054	0.247
108	9.00	0.57	0.301	(0.079)	0.054	0.247
109	9.08	0.63	0.336	(0.079)	0.061	0.276
110	9.17	0.63	0.336	(0.078)	0.061	0.276
111	9.25	0.63	0.336	(0.078)	0.061	0.276
112	9.33	0.67	0.354	(0.078)	0.064	0.290
113	9.42	0.67	0.354	(0.077)	0.064	0.290
114	9.50	0.67	0.354	(0.077)	0.064	0.290
115	9.58	0.70	0.372	(0.077)	0.067	0.305
116	9.67	0.70	0.372	(0.076)	0.067	0.305
117	9.75	0.70	0.372	(0.076)	0.067	0.305
118	9.83	0.73	0.390	(0.076)	0.070	0.319
119	9.92	0.73	0.390	(0.075)	0.070	0.319
120	10.00	0.73	0.390	(0.075)	0.070	0.319
121	10.08	0.50	0.266	(0.074)	0.048	0.218
122	10.17	0.50	0.266	(0.074)	0.048	0.218
123	10.25	0.50	0.266	(0.074)	0.048	0.218
124	10.33	0.50	0.266	(0.073)	0.048	0.218
125	10.42	0.50	0.266	(0.073)	0.048	0.218
126	10.50	0.50	0.266	(0.073)	0.048	0.218
127	10.58	0.67	0.354	(0.072)	0.064	0.290
128	10.67	0.67	0.354	(0.072)	0.064	0.290
129	10.75	0.67	0.354	(0.072)	0.064	0.290
130	10.83	0.67	0.354	(0.071)	0.064	0.290
131	10.92	0.67	0.354	(0.071)	0.064	0.290
132	11.00	0.67	0.354	(0.071)	0.064	0.290
133	11.08	0.63	0.336	(0.070)	0.061	0.276
134	11.17	0.63	0.336	(0.070)	0.061	0.276
135	11.25	0.63	0.336	(0.069)	0.061	0.276
136	11.33	0.63	0.336	(0.069)	0.061	0.276

137	11.42	0.63	0.336	(0.069)	0.061	0.276
138	11.50	0.63	0.336	(0.068)	0.061	0.276
139	11.58	0.57	0.301	(0.068)	0.054	0.247
140	11.67	0.57	0.301	(0.068)	0.054	0.247
141	11.75	0.57	0.301	(0.067)	0.054	0.247
142	11.83	0.60	0.319	(0.067)	0.057	0.261
143	11.92	0.60	0.319	(0.067)	0.057	0.261
144	12.00	0.60	0.319	(0.066)	0.057	0.261
145	12.08	0.83	0.443	0.066	(0.080)	0.377
146	12.17	0.83	0.443	0.066	(0.080)	0.377
147	12.25	0.83	0.443	0.065	(0.080)	0.377
148	12.33	0.87	0.460	0.065	(0.083)	0.395
149	12.42	0.87	0.460	0.065	(0.083)	0.396
150	12.50	0.87	0.460	0.064	(0.083)	0.396
151	12.58	0.93	0.496	0.064	(0.089)	0.432
152	12.67	0.93	0.496	0.064	(0.089)	0.432
153	12.75	0.93	0.496	0.064	(0.089)	0.432
154	12.83	0.97	0.514	0.063	(0.092)	0.450
155	12.92	0.97	0.514	0.063	(0.092)	0.451
156	13.00	0.97	0.514	0.063	(0.092)	0.451
157	13.08	1.13	0.602	0.062	(0.108)	0.540
158	13.17	1.13	0.602	0.062	(0.108)	0.540
159	13.25	1.13	0.602	0.062	(0.108)	0.541
160	13.33	1.13	0.602	0.061	(0.108)	0.541
161	13.42	1.13	0.602	0.061	(0.108)	0.541
162	13.50	1.13	0.602	0.061	(0.108)	0.541
163	13.58	0.77	0.407	0.060	(0.073)	0.347
164	13.67	0.77	0.407	0.060	(0.073)	0.347
165	13.75	0.77	0.407	0.060	(0.073)	0.348
166	13.83	0.77	0.407	0.059	(0.073)	0.348
167	13.92	0.77	0.407	0.059	(0.073)	0.348
168	14.00	0.77	0.407	0.059	(0.073)	0.348
169	14.08	0.90	0.478	0.059	(0.086)	0.420
170	14.17	0.90	0.478	0.058	(0.086)	0.420
171	14.25	0.90	0.478	0.058	(0.086)	0.420
172	14.33	0.87	0.460	0.058	(0.083)	0.403
173	14.42	0.87	0.460	0.057	(0.083)	0.403
174	14.50	0.87	0.460	0.057	(0.083)	0.403
175	14.58	0.87	0.460	0.057	(0.083)	0.404
176	14.67	0.87	0.460	0.056	(0.083)	0.404
177	14.75	0.87	0.460	0.056	(0.083)	0.404
178	14.83	0.83	0.443	0.056	(0.080)	0.387
179	14.92	0.83	0.443	0.056	(0.080)	0.387
180	15.00	0.83	0.443	0.055	(0.080)	0.387
181	15.08	0.80	0.425	0.055	(0.077)	0.370
182	15.17	0.80	0.425	0.055	(0.077)	0.370
183	15.25	0.80	0.425	0.054	(0.077)	0.371
184	15.33	0.77	0.407	0.054	(0.073)	0.353
185	15.42	0.77	0.407	0.054	(0.073)	0.353
186	15.50	0.77	0.407	0.054	(0.073)	0.354
187	15.58	0.63	0.336	0.053	(0.061)	0.283
188	15.67	0.63	0.336	0.053	(0.061)	0.283
189	15.75	0.63	0.336	0.053	(0.061)	0.284
190	15.83	0.63	0.336	0.053	(0.061)	0.284
191	15.92	0.63	0.336	0.052	(0.061)	0.284
192	16.00	0.63	0.336	0.052	(0.061)	0.284
193	16.08	0.13	0.071	(0.052)	0.013	0.058
194	16.17	0.13	0.071	(0.051)	0.013	0.058
195	16.25	0.13	0.071	(0.051)	0.013	0.058
196	16.33	0.13	0.071	(0.051)	0.013	0.058

197	16.42	0.13	0.071	(0.051)	0.013	0.058
198	16.50	0.13	0.071	(0.050)	0.013	0.058
199	16.58	0.10	0.053	(0.050)	0.010	0.044
200	16.67	0.10	0.053	(0.050)	0.010	0.044
201	16.75	0.10	0.053	(0.050)	0.010	0.044
202	16.83	0.10	0.053	(0.049)	0.010	0.044
203	16.92	0.10	0.053	(0.049)	0.010	0.044
204	17.00	0.10	0.053	(0.049)	0.010	0.044
205	17.08	0.17	0.089	(0.049)	0.016	0.073
206	17.17	0.17	0.089	(0.048)	0.016	0.073
207	17.25	0.17	0.089	(0.048)	0.016	0.073
208	17.33	0.17	0.089	(0.048)	0.016	0.073
209	17.42	0.17	0.089	(0.048)	0.016	0.073
210	17.50	0.17	0.089	(0.047)	0.016	0.073
211	17.58	0.17	0.089	(0.047)	0.016	0.073
212	17.67	0.17	0.089	(0.047)	0.016	0.073
213	17.75	0.17	0.089	(0.047)	0.016	0.073
214	17.83	0.13	0.071	(0.047)	0.013	0.058
215	17.92	0.13	0.071	(0.046)	0.013	0.058
216	18.00	0.13	0.071	(0.046)	0.013	0.058
217	18.08	0.13	0.071	(0.046)	0.013	0.058
218	18.17	0.13	0.071	(0.046)	0.013	0.058
219	18.25	0.13	0.071	(0.045)	0.013	0.058
220	18.33	0.13	0.071	(0.045)	0.013	0.058
221	18.42	0.13	0.071	(0.045)	0.013	0.058
222	18.50	0.13	0.071	(0.045)	0.013	0.058
223	18.58	0.10	0.053	(0.045)	0.010	0.044
224	18.67	0.10	0.053	(0.044)	0.010	0.044
225	18.75	0.10	0.053	(0.044)	0.010	0.044
226	18.83	0.07	0.035	(0.044)	0.006	0.029
227	18.92	0.07	0.035	(0.044)	0.006	0.029
228	19.00	0.07	0.035	(0.043)	0.006	0.029
229	19.08	0.10	0.053	(0.043)	0.010	0.044
230	19.17	0.10	0.053	(0.043)	0.010	0.044
231	19.25	0.10	0.053	(0.043)	0.010	0.044
232	19.33	0.13	0.071	(0.043)	0.013	0.058
233	19.42	0.13	0.071	(0.042)	0.013	0.058
234	19.50	0.13	0.071	(0.042)	0.013	0.058
235	19.58	0.10	0.053	(0.042)	0.010	0.044
236	19.67	0.10	0.053	(0.042)	0.010	0.044
237	19.75	0.10	0.053	(0.042)	0.010	0.044
238	19.83	0.07	0.035	(0.041)	0.006	0.029
239	19.92	0.07	0.035	(0.041)	0.006	0.029
240	20.00	0.07	0.035	(0.041)	0.006	0.029
241	20.08	0.10	0.053	(0.041)	0.010	0.044
242	20.17	0.10	0.053	(0.041)	0.010	0.044
243	20.25	0.10	0.053	(0.041)	0.010	0.044
244	20.33	0.10	0.053	(0.040)	0.010	0.044
245	20.42	0.10	0.053	(0.040)	0.010	0.044
246	20.50	0.10	0.053	(0.040)	0.010	0.044
247	20.58	0.10	0.053	(0.040)	0.010	0.044
248	20.67	0.10	0.053	(0.040)	0.010	0.044
249	20.75	0.10	0.053	(0.040)	0.010	0.044
250	20.83	0.07	0.035	(0.039)	0.006	0.029
251	20.92	0.07	0.035	(0.039)	0.006	0.029
252	21.00	0.07	0.035	(0.039)	0.006	0.029
253	21.08	0.10	0.053	(0.039)	0.010	0.044
254	21.17	0.10	0.053	(0.039)	0.010	0.044
255	21.25	0.10	0.053	(0.039)	0.010	0.044
256	21.33	0.07	0.035	(0.038)	0.006	0.029

257	21.42	0.07	0.035	(0.038)	0.006	0.029
258	21.50	0.07	0.035	(0.038)	0.006	0.029
259	21.58	0.10	0.053	(0.038)	0.010	0.044
260	21.67	0.10	0.053	(0.038)	0.010	0.044
261	21.75	0.10	0.053	(0.038)	0.010	0.044
262	21.83	0.07	0.035	(0.038)	0.006	0.029
263	21.92	0.07	0.035	(0.038)	0.006	0.029
264	22.00	0.07	0.035	(0.037)	0.006	0.029
265	22.08	0.10	0.053	(0.037)	0.010	0.044
266	22.17	0.10	0.053	(0.037)	0.010	0.044
267	22.25	0.10	0.053	(0.037)	0.010	0.044
268	22.33	0.07	0.035	(0.037)	0.006	0.029
269	22.42	0.07	0.035	(0.037)	0.006	0.029
270	22.50	0.07	0.035	(0.037)	0.006	0.029
271	22.58	0.07	0.035	(0.037)	0.006	0.029
272	22.67	0.07	0.035	(0.036)	0.006	0.029
273	22.75	0.07	0.035	(0.036)	0.006	0.029
274	22.83	0.07	0.035	(0.036)	0.006	0.029
275	22.92	0.07	0.035	(0.036)	0.006	0.029
276	23.00	0.07	0.035	(0.036)	0.006	0.029
277	23.08	0.07	0.035	(0.036)	0.006	0.029
278	23.17	0.07	0.035	(0.036)	0.006	0.029
279	23.25	0.07	0.035	(0.036)	0.006	0.029
280	23.33	0.07	0.035	(0.036)	0.006	0.029
281	23.42	0.07	0.035	(0.036)	0.006	0.029
282	23.50	0.07	0.035	(0.036)	0.006	0.029
283	23.58	0.07	0.035	(0.036)	0.006	0.029
284	23.67	0.07	0.035	(0.036)	0.006	0.029
285	23.75	0.07	0.035	(0.036)	0.006	0.029
286	23.83	0.07	0.035	(0.035)	0.006	0.029
287	23.92	0.07	0.035	(0.035)	0.006	0.029
288	24.00	0.07	0.035	(0.035)	0.006	0.029

(Loss Rate Not Used)

Sum = 100.0 Sum = 44.7

Flood volume = Effective rainfall 3.72(In)
times area 5.2(Ac.)/[(In)/(Ft.)] = 1.6(Ac.Ft)
Total soil loss = 0.70(In)
Total soil loss = 0.302(Ac.Ft)
Total rainfall = 4.43(In)
Flood volume = 69593.9 Cubic Feet
Total soil loss = 13173.3 Cubic Feet

Peak flow rate of this hydrograph = 2.793(CFS)

++

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0002	0.03	Q				
0+10	0.0009	0.10	Q				
0+15	0.0017	0.12	Q				
0+20	0.0028	0.15	Q				
0+25	0.0041	0.19	Q				
0+30	0.0055	0.21	Q				
0+35	0.0070	0.22	Q				

```
 0+40       0.0085       0.22  Q           |           |           |           |
 0+45       0.0101       0.22  Q           |           |           |           |
 0+50       0.0117       0.24  Q           |           |           |           |
 0+55       0.0136       0.28  VQ          |           |           |           |
 1+ 0       0.0156       0.29  VQ          |           |           |           |
 1+ 5       0.0175       0.28  VQ          |           |           |           |
 1+10       0.0192       0.25  Q           |           |           |           |
 1+15       0.0209       0.24  Q           |           |           |           |
 1+20       0.0225       0.23  Q           |           |           |           |
 1+25       0.0240       0.23  Q           |           |           |           |
 1+30       0.0256       0.23  Q           |           |           |           |
 1+35       0.0272       0.23  Q           |           |           |           |
 1+40       0.0287       0.23  Q           |           |           |           |
 1+45       0.0303       0.23  Q           |           |           |           |
 1+50       0.0320       0.24  Q           |           |           |           |
 1+55       0.0339       0.28  VQ          |           |           |           |
 2+ 0       0.0358       0.29  VQ          |           |           |           |
 2+ 5       0.0379       0.29  VQ          |           |           |           |
 2+10       0.0399       0.30  VQ          |           |           |           |
 2+15       0.0420       0.30  |Q          |           |           |           |
 2+20       0.0440       0.30  |Q          |           |           |           |
 2+25       0.0461       0.30  |Q          |           |           |           |
 2+30       0.0482       0.30  |Q          |           |           |           |
 2+35       0.0504       0.32  |Q          |           |           |           |
 2+40       0.0528       0.35  |Q          |           |           |           |
 2+45       0.0553       0.36  |Q          |           |           |           |
 2+50       0.0578       0.37  |Q          |           |           |           |
 2+55       0.0604       0.37  |Q          |           |           |           |
 3+ 0       0.0630       0.37  |Q          |           |           |           |
 3+ 5       0.0656       0.38  |Q          |           |           |           |
 3+10       0.0682       0.38  |Q          |           |           |           |
 3+15       0.0708       0.38  |Q          |           |           |           |
 3+20       0.0734       0.38  |Q          |           |           |           |
 3+25       0.0760       0.38  |Q          |           |           |           |
 3+30       0.0786       0.38  |Q          |           |           |           |
 3+35       0.0811       0.38  |QV         |           |           |           |
 3+40       0.0837       0.38  |QV         |           |           |           |
 3+45       0.0863       0.38  |QV         |           |           |           |
 3+50       0.0890       0.39  |QV         |           |           |           |
 3+55       0.0920       0.43  |QV         |           |           |           |
 4+ 0       0.0950       0.44  |QV         |           |           |           |
 4+ 5       0.0981       0.44  |QV         |           |           |           |
 4+10       0.1011       0.45  |QV         |           |           |           |
 4+15       0.1042       0.45  |QV         |           |           |           |
 4+20       0.1074       0.46  |QV         |           |           |           |
 4+25       0.1109       0.50  | Q         |           |           |           |
 4+30       0.1145       0.51  | Q         |           |           |           |
 4+35       0.1180       0.52  | Q         |           |           |           |
 4+40       0.1216       0.52  | QV        |           |           |           |
 4+45       0.1253       0.53  | QV        |           |           |           |
 4+50       0.1290       0.54  | QV        |           |           |           |
 4+55       0.1330       0.58  | QV        |           |           |           |
 5+ 0       0.1370       0.59  | QV        |           |           |           |
 5+ 5       0.1409       0.57  | QV        |           |           |           |
 5+10       0.1444       0.50  |Q V        |           |           |           |
 5+15       0.1476       0.48  |Q V        |           |           |           |
 5+20       0.1509       0.48  |Q V        |           |           |           |
 5+25       0.1545       0.51  | QV        |           |           |           |
 5+30       0.1581       0.52  | QV        |           |           |           |
 5+35       0.1617       0.54  | Q V       |           |           |           |
```

```
 5+40       0.1657      0.57  | Q V     |         |         |         |
 5+45       0.1697      0.59  | Q V     |         |         |         |
 5+50       0.1738      0.59  | Q V     |         |         |         |
 5+55       0.1780      0.60  | Q V     |         |         |         |
 6+ 0       0.1821      0.60  | Q V     |         |         |         |
 6+ 5       0.1863      0.62  | Q V     |         |         |         |
 6+10       0.1908      0.65  | Q V     |         |         |         |
 6+15       0.1954      0.67  | Q V     |         |         |         |
 6+20       0.2000      0.67  | Q  V    |         |         |         |
 6+25       0.2047      0.67  | Q  V    |         |         |         |
 6+30       0.2093      0.68  | Q  V    |         |         |         |
 6+35       0.2141      0.69  | Q  V    |         |         |         |
 6+40       0.2191      0.73  | Q  V    |         |         |         |
 6+45       0.2242      0.74  | Q  V    |         |         |         |
 6+50       0.2294      0.75  | Q  V    |         |         |         |
 6+55       0.2345      0.75  | Q  V    |         |         |         |
 7+ 0       0.2397      0.75  |  Q  V   |         |         |         |
 7+ 5       0.2449      0.75  |  Q  V   |         |         |         |
 7+10       0.2501      0.75  |  Q  V   |         |         |         |
 7+15       0.2553      0.75  |  Q  V   |         |         |         |
 7+20       0.2606      0.77  |  Q  V   |         |         |         |
 7+25       0.2661      0.80  |  Q  V   |         |         |         |
 7+30       0.2717      0.82  |  Q  V   |         |         |         |
 7+35       0.2775      0.84  |  Q  V   |         |         |         |
 7+40       0.2835      0.88  |  Q   V  |         |         |         |
 7+45       0.2896      0.89  |  Q   V  |         |         |         |
 7+50       0.2959      0.91  |  Q   V  |         |         |         |
 7+55       0.3024      0.95  |  Q   V  |         |         |         |
 8+ 0       0.3091      0.96  |  Q   V  |         |         |         |
 8+ 5       0.3159      1.00  |  Q   V  |         |         |         |
 8+10       0.3234      1.08  |   Q   V |         |         |         |
 8+15       0.3309      1.10  |   Q   V |         |         |         |
 8+20       0.3386      1.11  |   Q   V |         |         |         |
 8+25       0.3463      1.12  |   Q   V |         |         |         |
 8+30       0.3541      1.13  |   Q   V |         |         |         |
 8+35       0.3620      1.14  |   Q    V|         |         |         |
 8+40       0.3701      1.18  |   Q    V|         |         |         |
 8+45       0.3783      1.19  |   Q    V|         |         |         |
 8+50       0.3867      1.21  |   Q    V|         |         |         |
 8+55       0.3953      1.25  |    Q   V|         |         |         |
 9+ 0       0.4040      1.27  |    Q    V         |         |         |
 9+ 5       0.4130      1.30  |    Q    V         |         |         |
 9+10       0.4224      1.38  |    Q    V         |         |         |
 9+15       0.4321      1.40  |    Q    V         |         |         |
 9+20       0.4420      1.43  |    Q    |V        |         |         |
 9+25       0.4521      1.47  |    Q    |V        |         |         |
 9+30       0.4624      1.49  |    Q    |V        |         |         |
 9+35       0.4728      1.51  |     Q   |V        |         |         |
 9+40       0.4835      1.55  |     Q   | V       |         |         |
 9+45       0.4943      1.57  |     Q   | V       |         |         |
 9+50       0.5052      1.59  |     Q   | V       |         |         |
 9+55       0.5164      1.63  |     Q   | V       |         |         |
10+ 0       0.5277      1.64  |     Q   |  V      |         |         |
10+ 5       0.5384      1.55  |     Q   |  V      |         |         |
10+10       0.5474      1.30  |    Q    |  V      |         |         |
10+15       0.5558      1.22  |   Q     |  V      |         |         |
10+20       0.5640      1.18  |   Q     |   V     |         |         |
10+25       0.5720      1.16  |   Q     |   V     |         |         |
10+30       0.5799      1.15  |   Q     |   V     |         |         |
10+35       0.5882      1.21  |   Q     |   V     |         |         |
```

```
10+40       0.5978      1.39  |    Q    |   V     |         |         |
10+45       0.6077      1.44  |    Q    |    V    |         |         |
10+50       0.6178      1.47  |    Q    |    V    |         |         |
10+55       0.6281      1.49  |    Q    |    V    |         |         |
11+ 0       0.6383      1.50  |    Q    |    V    |         |         |
11+ 5       0.6486      1.49  |    Q    |     V   |         |         |
11+10       0.6586      1.46  |    Q    |     V   |         |         |
11+15       0.6686      1.45  |    Q    |     V   |         |         |
11+20       0.6785      1.44  |    Q    |     V   |         |         |
11+25       0.6884      1.44  |    Q    |      V  |         |         |
11+30       0.6983      1.44  |    Q    |      V  |         |         |
11+35       0.7080      1.41  |    Q    |      V  |         |         |
11+40       0.7172      1.33  |    Q    |      V  |         |         |
11+45       0.7262      1.31  |    Q    |       V |         |         |
11+50       0.7352      1.31  |    Q    |       V |         |         |
11+55       0.7444      1.34  |    Q    |       V |         |         |
12+ 0       0.7537      1.35  |    Q    |       V |         |         |
12+ 5       0.7638      1.46  |    Q    |        V|         |         |
12+10       0.7759      1.75  |      Q  |        V|         |         |
12+15       0.7886      1.85  |      Q  |        V|         |         |
12+20       0.8018      1.91  |      Q  |         V         |         |
12+25       0.8154      1.98  |      Q  |         V         |         |
12+30       0.8293      2.02  |       Q |         V         |         |
12+35       0.8436      2.07  |       Q |         |V        |         |
12+40       0.8585      2.17  |       Q |         |V        |         |
12+45       0.8737      2.21  |       Q |         |V        |         |
12+50       0.8891      2.24  |       Q |         | V       |         |
12+55       0.9050      2.30  |        Q|         | V       |         |
13+ 0       0.9209      2.32  |        Q|         |  V      |         |
13+ 5       0.9375      2.41  |        Q|         |  V      |         |
13+10       0.9557      2.64  |         Q         |  V      |         |
13+15       0.9745      2.72  |         Q         |   V     |         |
13+20       0.9935      2.76  |         |Q        |   V     |         |
13+25       1.0126      2.78  |         |Q        |    V    |         |
13+30       1.0318      2.79  |         |Q        |    V    |         |
13+35       1.0499      2.62  |         Q         |     V   |         |
13+40       1.0646      2.14  |       Q |         |     V   |         |
13+45       1.0782      1.98  |      Q  |         |     V   |         |
13+50       1.0913      1.91  |      Q  |         |      V  |         |
13+55       1.1042      1.87  |      Q  |         |      V  |         |
14+ 0       1.1169      1.84  |      Q  |         |      V  |         |
14+ 5       1.1299      1.89  |      Q  |         |       V |         |
14+10       1.1441      2.06  |       Q |         |       V |         |
14+15       1.1587      2.12  |       Q |         |        V|         |
14+20       1.1733      2.13  |       Q |         |        V|         |
14+25       1.1878      2.10  |       Q |         |        V|         |
14+30       1.2022      2.10  |       Q |         |         V         |
14+35       1.2167      2.10  |       Q |         |         V         |
14+40       1.2311      2.10  |       Q |         |         V         |
14+45       1.2456      2.10  |       Q |         |         |V        |
14+50       1.2599      2.08  |       Q |         |         |V        |
14+55       1.2740      2.04  |       Q |         |         |V        |
15+ 0       1.2879      2.03  |       Q |         |         | V       |
15+ 5       1.3017      2.00  |       Q |         |         | V       |
15+10       1.3152      1.96  |      Q  |         |         | V       |
15+15       1.3286      1.94  |      Q  |         |         |  V      |
15+20       1.3418      1.92  |      Q  |         |         |  V      |
15+25       1.3547      1.87  |      Q  |         |         |  V      |
15+30       1.3674      1.85  |      Q  |         |         |   V     |
15+35       1.3797      1.78  |      Q  |         |         |   V     |
```

```
15+40       1.3907      1.60  |     Q   |         |         |   V     |
15+45       1.4013      1.54  |     Q   |         |         |    V    |
15+50       1.4117      1.51  |     Q   |         |         |    V    |
15+55       1.4220      1.50  |    Q    |         |         |    V    |
16+ 0       1.4323      1.49  |    Q    |         |         |    V    |
16+ 5       1.4410      1.27  |    Q    |         |         |     V   |
16+10       1.4458      0.70  | Q       |         |         |     V   |
16+15       1.4493      0.51  | Q       |         |         |     V   |
16+20       1.4522      0.42  |Q        |         |         |     V   |
16+25       1.4548      0.37  |Q        |         |         |     V   |
16+30       1.4571      0.34  |Q        |         |         |     V   |
16+35       1.4593      0.31  |Q        |         |         |     V   |
16+40       1.4610      0.26  |Q        |         |         |     V   |
16+45       1.4627      0.24  Q         |         |         |     V   |
16+50       1.4643      0.23  Q         |         |         |     V   |
16+55       1.4659      0.23  Q         |         |         |     V   |
17+ 0       1.4675      0.23  Q         |         |         |     V   |
17+ 5       1.4692      0.26  |Q        |         |         |     V   |
17+10       1.4715      0.33  |Q        |         |         |     V   |
17+15       1.4739      0.35  |Q        |         |         |     V   |
17+20       1.4764      0.36  |Q        |         |         |     V   |
17+25       1.4789      0.37  |Q        |         |         |      V  |
17+30       1.4815      0.37  |Q        |         |         |      V  |
17+35       1.4841      0.37  |Q        |         |         |      V  |
17+40       1.4866      0.38  |Q        |         |         |      V  |
17+45       1.4892      0.38  |Q        |         |         |      V  |
17+50       1.4917      0.36  |Q        |         |         |      V  |
17+55       1.4940      0.33  |Q        |         |         |      V  |
18+ 0       1.4962      0.31  |Q        |         |         |      V  |
18+ 5       1.4983      0.31  |Q        |         |         |      V  |
18+10       1.5004      0.31  |Q        |         |         |      V  |
18+15       1.5025      0.30  |Q        |         |         |      V  |
18+20       1.5046      0.30  |Q        |         |         |      V  |
18+25       1.5067      0.30  |Q        |         |         |      V  |
18+30       1.5087      0.30  |Q        |         |         |      V  |
18+35       1.5107      0.29  |Q        |         |         |      V  |
18+40       1.5125      0.25  |Q        |         |         |      V  |
18+45       1.5141      0.24  Q         |         |         |      V  |
18+50       1.5156      0.22  Q         |         |         |      V  |
18+55       1.5169      0.18  Q         |         |         |      V  |
19+ 0       1.5180      0.17  Q         |         |         |       V |
19+ 5       1.5192      0.17  Q         |         |         |       V |
19+10       1.5206      0.21  Q         |         |         |       V |
19+15       1.5221      0.22  Q         |         |         |       V |
19+20       1.5237      0.23  Q         |         |         |       V |
19+25       1.5256      0.27  |Q        |         |         |       V |
19+30       1.5276      0.29  |Q        |         |         |       V |
19+35       1.5295      0.28  |Q        |         |         |       V |
19+40       1.5312      0.25  Q         |         |         |       V |
19+45       1.5328      0.24  Q         |         |         |       V |
19+50       1.5343      0.22  Q         |         |         |       V |
19+55       1.5356      0.18  Q         |         |         |       V |
20+ 0       1.5367      0.17  Q         |         |         |       V |
20+ 5       1.5379      0.17  Q         |         |         |       V |
20+10       1.5393      0.21  Q         |         |         |       V |
20+15       1.5408      0.22  Q         |         |         |       V |
20+20       1.5423      0.22  Q         |         |         |       V |
20+25       1.5439      0.22  Q         |         |         |       V |
20+30       1.5454      0.22  Q         |         |         |       V |
20+35       1.5469      0.22  Q         |         |         |       V |
```

20+40	1.5485	0.23	Q	|	|	|	V |
20+45	1.5501	0.23	Q	|	|	|	V |
20+50	1.5515	0.21	Q	|	|	|	V |
20+55	1.5527	0.18	Q	|	|	|	V |
21+ 0	1.5539	0.16	Q	|	|	|	V |
21+ 5	1.5550	0.17	Q	|	|	|	V |
21+10	1.5565	0.21	Q	|	|	|	V |
21+15	1.5580	0.22	Q	|	|	|	V|
21+20	1.5594	0.21	Q	|	|	|	V|
21+25	1.5606	0.17	Q	|	|	|	V|
21+30	1.5617	0.16	Q	|	|	|	V|
21+35	1.5628	0.17	Q	|	|	|	V|
21+40	1.5643	0.21	Q	|	|	|	V|
21+45	1.5657	0.22	Q	|	|	|	V|
21+50	1.5672	0.21	Q	|	|	|	V|
21+55	1.5683	0.17	Q	|	|	|	V|
22+ 0	1.5695	0.16	Q	|	|	|	V|
22+ 5	1.5706	0.17	Q	|	|	|	V|
22+10	1.5720	0.21	Q	|	|	|	V|
22+15	1.5735	0.22	Q	|	|	|	V|
22+20	1.5750	0.21	Q	|	|	|	V|
22+25	1.5761	0.17	Q	|	|	|	V|
22+30	1.5772	0.16	Q	|	|	|	V|
22+35	1.5783	0.16	Q	|	|	|	V|
22+40	1.5794	0.15	Q	|	|	|	V|
22+45	1.5805	0.15	Q	|	|	|	V|
22+50	1.5815	0.15	Q	|	|	|	V|
22+55	1.5825	0.15	Q	|	|	|	V|
23+ 0	1.5836	0.15	Q	|	|	|	V|
23+ 5	1.5846	0.15	Q	|	|	|	V|
23+10	1.5857	0.15	Q	|	|	|	V|
23+15	1.5867	0.15	Q	|	|	|	V|
23+20	1.5877	0.15	Q	|	|	|	V|
23+25	1.5888	0.15	Q	|	|	|	V|
23+30	1.5898	0.15	Q	|	|	|	V|
23+35	1.5909	0.15	Q	|	|	|	V|
23+40	1.5919	0.15	Q	|	|	|	V|
23+45	1.5929	0.15	Q	|	|	|	V|
23+50	1.5940	0.15	Q	|	|	|	V|
23+55	1.5950	0.15	Q	|	|	|	V|
24+ 0	1.5960	0.15	Q	|	|	|	V|
24+ 5	1.5969	0.12	Q	|	|	|	V|
24+10	1.5972	0.05	Q	|	|	|	V|
24+15	1.5974	0.03	Q	|	|	|	V|
24+20	1.5975	0.02	Q	|	|	|	V|
24+25	1.5976	0.01	Q	|	|	|	V|
24+30	1.5976	0.01	Q	|	|	|	V|
24+35	1.5976	0.00	Q	|	|	|	V|
24+40	1.5977	0.00	Q	|	|	|	V

U n i t   H y d r o g r a p h   A n a l y s i s

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2018, Version 9.0
Study date 05/30/23 File: 102410.out

++

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6522

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

1512-0001 BEAUMONT VILLAGE
PROPOSED CONDITION
10-YEAR, 24-HOUR STORM EVENT
AREA 3

Drainage Area = 0.85(Ac.) = 0.001 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 0.85(Ac.) = 0.001 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.092 Hr.
Lag time = 5.51 Min.
25% of lag time = 1.38 Min.
40% of lag time = 2.21 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
0.85	2.79	2.37

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
0.85	6.77	5.75

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 2.790(In)
Area Averaged 100-Year Rainfall = 6.770(In)

Point rain (area averaged) = 4.427(In)
Areal adjustment factor = 100.00 %

Adjusted average point rain = 4.427(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
0.850	69.00	0.900

Total Area Entered = 0.85(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
69.0	69.0	0.373	0.900	0.071	1.000	0.071
					Sum (F) =	0.071

Area averaged mean soil loss (F) (In/Hr) = 0.071
Minimum soil loss rate ((In/Hr)) = 0.035
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %		Unit Hydrograph (CFS)
1	0.083	90.678	16.379		0.140
2	0.167	181.357	47.215		0.404
3	0.250	272.035	17.280		0.148
4	0.333	362.713	7.602		0.065
5	0.417	453.391	4.390		0.038
6	0.500	544.070	2.811		0.024
7	0.583	634.748	1.906		0.016
8	0.667	725.426	1.214		0.010
9	0.750	816.104	1.204		0.010
			Sum = 100.000	Sum=	0.857

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Loss rate(In./Hr) Low	Effective (In/Hr)
1	0.08	0.07	0.035	(0.126)	0.006	0.029
2	0.17	0.07	0.035	(0.125)	0.006	0.029
3	0.25	0.07	0.035	(0.125)	0.006	0.029
4	0.33	0.10	0.053	(0.124)	0.010	0.044
5	0.42	0.10	0.053	(0.124)	0.010	0.044
6	0.50	0.10	0.053	(0.123)	0.010	0.044
7	0.58	0.10	0.053	(0.123)	0.010	0.044
8	0.67	0.10	0.053	(0.122)	0.010	0.044
9	0.75	0.10	0.053	(0.122)	0.010	0.044
10	0.83	0.13	0.071	(0.121)	0.013	0.058
11	0.92	0.13	0.071	(0.121)	0.013	0.058
12	1.00	0.13	0.071	(0.120)	0.013	0.058
13	1.08	0.10	0.053	(0.120)	0.010	0.044
14	1.17	0.10	0.053	(0.119)	0.010	0.044
15	1.25	0.10	0.053	(0.119)	0.010	0.044
16	1.33	0.10	0.053	(0.118)	0.010	0.044

17	1.42	0.10	0.053	(0.118)	0.010	0.044
18	1.50	0.10	0.053	(0.117)	0.010	0.044
19	1.58	0.10	0.053	(0.117)	0.010	0.044
20	1.67	0.10	0.053	(0.117)	0.010	0.044
21	1.75	0.10	0.053	(0.116)	0.010	0.044
22	1.83	0.13	0.071	(0.116)	0.013	0.058
23	1.92	0.13	0.071	(0.115)	0.013	0.058
24	2.00	0.13	0.071	(0.115)	0.013	0.058
25	2.08	0.13	0.071	(0.114)	0.013	0.058
26	2.17	0.13	0.071	(0.114)	0.013	0.058
27	2.25	0.13	0.071	(0.113)	0.013	0.058
28	2.33	0.13	0.071	(0.113)	0.013	0.058
29	2.42	0.13	0.071	(0.112)	0.013	0.058
30	2.50	0.13	0.071	(0.112)	0.013	0.058
31	2.58	0.17	0.089	(0.111)	0.016	0.073
32	2.67	0.17	0.089	(0.111)	0.016	0.073
33	2.75	0.17	0.089	(0.110)	0.016	0.073
34	2.83	0.17	0.089	(0.110)	0.016	0.073
35	2.92	0.17	0.089	(0.110)	0.016	0.073
36	3.00	0.17	0.089	(0.109)	0.016	0.073
37	3.08	0.17	0.089	(0.109)	0.016	0.073
38	3.17	0.17	0.089	(0.108)	0.016	0.073
39	3.25	0.17	0.089	(0.108)	0.016	0.073
40	3.33	0.17	0.089	(0.107)	0.016	0.073
41	3.42	0.17	0.089	(0.107)	0.016	0.073
42	3.50	0.17	0.089	(0.106)	0.016	0.073
43	3.58	0.17	0.089	(0.106)	0.016	0.073
44	3.67	0.17	0.089	(0.106)	0.016	0.073
45	3.75	0.17	0.089	(0.105)	0.016	0.073
46	3.83	0.20	0.106	(0.105)	0.019	0.087
47	3.92	0.20	0.106	(0.104)	0.019	0.087
48	4.00	0.20	0.106	(0.104)	0.019	0.087
49	4.08	0.20	0.106	(0.103)	0.019	0.087
50	4.17	0.20	0.106	(0.103)	0.019	0.087
51	4.25	0.20	0.106	(0.102)	0.019	0.087
52	4.33	0.23	0.124	(0.102)	0.022	0.102
53	4.42	0.23	0.124	(0.102)	0.022	0.102
54	4.50	0.23	0.124	(0.101)	0.022	0.102
55	4.58	0.23	0.124	(0.101)	0.022	0.102
56	4.67	0.23	0.124	(0.100)	0.022	0.102
57	4.75	0.23	0.124	(0.100)	0.022	0.102
58	4.83	0.27	0.142	(0.099)	0.026	0.116
59	4.92	0.27	0.142	(0.099)	0.026	0.116
60	5.00	0.27	0.142	(0.099)	0.026	0.116
61	5.08	0.20	0.106	(0.098)	0.019	0.087
62	5.17	0.20	0.106	(0.098)	0.019	0.087
63	5.25	0.20	0.106	(0.097)	0.019	0.087
64	5.33	0.23	0.124	(0.097)	0.022	0.102
65	5.42	0.23	0.124	(0.096)	0.022	0.102
66	5.50	0.23	0.124	(0.096)	0.022	0.102
67	5.58	0.27	0.142	(0.096)	0.026	0.116
68	5.67	0.27	0.142	(0.095)	0.026	0.116
69	5.75	0.27	0.142	(0.095)	0.026	0.116
70	5.83	0.27	0.142	(0.094)	0.026	0.116
71	5.92	0.27	0.142	(0.094)	0.026	0.116
72	6.00	0.27	0.142	(0.093)	0.026	0.116
73	6.08	0.30	0.159	(0.093)	0.029	0.131
74	6.17	0.30	0.159	(0.093)	0.029	0.131
75	6.25	0.30	0.159	(0.092)	0.029	0.131
76	6.33	0.30	0.159	(0.092)	0.029	0.131

77	6.42	0.30	0.159	(0.091)	0.029	0.131
78	6.50	0.30	0.159	(0.091)	0.029	0.131
79	6.58	0.33	0.177	(0.091)	0.032	0.145
80	6.67	0.33	0.177	(0.090)	0.032	0.145
81	6.75	0.33	0.177	(0.090)	0.032	0.145
82	6.83	0.33	0.177	(0.089)	0.032	0.145
83	6.92	0.33	0.177	(0.089)	0.032	0.145
84	7.00	0.33	0.177	(0.089)	0.032	0.145
85	7.08	0.33	0.177	(0.088)	0.032	0.145
86	7.17	0.33	0.177	(0.088)	0.032	0.145
87	7.25	0.33	0.177	(0.087)	0.032	0.145
88	7.33	0.37	0.195	(0.087)	0.035	0.160
89	7.42	0.37	0.195	(0.087)	0.035	0.160
90	7.50	0.37	0.195	(0.086)	0.035	0.160
91	7.58	0.40	0.213	(0.086)	0.038	0.174
92	7.67	0.40	0.213	(0.085)	0.038	0.174
93	7.75	0.40	0.213	(0.085)	0.038	0.174
94	7.83	0.43	0.230	(0.085)	0.041	0.189
95	7.92	0.43	0.230	(0.084)	0.041	0.189
96	8.00	0.43	0.230	(0.084)	0.041	0.189
97	8.08	0.50	0.266	(0.083)	0.048	0.218
98	8.17	0.50	0.266	(0.083)	0.048	0.218
99	8.25	0.50	0.266	(0.083)	0.048	0.218
100	8.33	0.50	0.266	(0.082)	0.048	0.218
101	8.42	0.50	0.266	(0.082)	0.048	0.218
102	8.50	0.50	0.266	(0.082)	0.048	0.218
103	8.58	0.53	0.283	(0.081)	0.051	0.232
104	8.67	0.53	0.283	(0.081)	0.051	0.232
105	8.75	0.53	0.283	(0.080)	0.051	0.232
106	8.83	0.57	0.301	(0.080)	0.054	0.247
107	8.92	0.57	0.301	(0.080)	0.054	0.247
108	9.00	0.57	0.301	(0.079)	0.054	0.247
109	9.08	0.63	0.336	(0.079)	0.061	0.276
110	9.17	0.63	0.336	(0.078)	0.061	0.276
111	9.25	0.63	0.336	(0.078)	0.061	0.276
112	9.33	0.67	0.354	(0.078)	0.064	0.290
113	9.42	0.67	0.354	(0.077)	0.064	0.290
114	9.50	0.67	0.354	(0.077)	0.064	0.290
115	9.58	0.70	0.372	(0.077)	0.067	0.305
116	9.67	0.70	0.372	(0.076)	0.067	0.305
117	9.75	0.70	0.372	(0.076)	0.067	0.305
118	9.83	0.73	0.390	(0.076)	0.070	0.319
119	9.92	0.73	0.390	(0.075)	0.070	0.319
120	10.00	0.73	0.390	(0.075)	0.070	0.319
121	10.08	0.50	0.266	(0.074)	0.048	0.218
122	10.17	0.50	0.266	(0.074)	0.048	0.218
123	10.25	0.50	0.266	(0.074)	0.048	0.218
124	10.33	0.50	0.266	(0.073)	0.048	0.218
125	10.42	0.50	0.266	(0.073)	0.048	0.218
126	10.50	0.50	0.266	(0.073)	0.048	0.218
127	10.58	0.67	0.354	(0.072)	0.064	0.290
128	10.67	0.67	0.354	(0.072)	0.064	0.290
129	10.75	0.67	0.354	(0.072)	0.064	0.290
130	10.83	0.67	0.354	(0.071)	0.064	0.290
131	10.92	0.67	0.354	(0.071)	0.064	0.290
132	11.00	0.67	0.354	(0.071)	0.064	0.290
133	11.08	0.63	0.336	(0.070)	0.061	0.276
134	11.17	0.63	0.336	(0.070)	0.061	0.276
135	11.25	0.63	0.336	(0.069)	0.061	0.276
136	11.33	0.63	0.336	(0.069)	0.061	0.276

137	11.42	0.63	0.336	(0.069)	0.061	0.276
138	11.50	0.63	0.336	(0.068)	0.061	0.276
139	11.58	0.57	0.301	(0.068)	0.054	0.247
140	11.67	0.57	0.301	(0.068)	0.054	0.247
141	11.75	0.57	0.301	(0.067)	0.054	0.247
142	11.83	0.60	0.319	(0.067)	0.057	0.261
143	11.92	0.60	0.319	(0.067)	0.057	0.261
144	12.00	0.60	0.319	(0.066)	0.057	0.261
145	12.08	0.83	0.443	0.066	(0.080)	0.377
146	12.17	0.83	0.443	0.066	(0.080)	0.377
147	12.25	0.83	0.443	0.065	(0.080)	0.377
148	12.33	0.87	0.460	0.065	(0.083)	0.395
149	12.42	0.87	0.460	0.065	(0.083)	0.396
150	12.50	0.87	0.460	0.064	(0.083)	0.396
151	12.58	0.93	0.496	0.064	(0.089)	0.432
152	12.67	0.93	0.496	0.064	(0.089)	0.432
153	12.75	0.93	0.496	0.064	(0.089)	0.432
154	12.83	0.97	0.514	0.063	(0.092)	0.450
155	12.92	0.97	0.514	0.063	(0.092)	0.451
156	13.00	0.97	0.514	0.063	(0.092)	0.451
157	13.08	1.13	0.602	0.062	(0.108)	0.540
158	13.17	1.13	0.602	0.062	(0.108)	0.540
159	13.25	1.13	0.602	0.062	(0.108)	0.541
160	13.33	1.13	0.602	0.061	(0.108)	0.541
161	13.42	1.13	0.602	0.061	(0.108)	0.541
162	13.50	1.13	0.602	0.061	(0.108)	0.541
163	13.58	0.77	0.407	0.060	(0.073)	0.347
164	13.67	0.77	0.407	0.060	(0.073)	0.347
165	13.75	0.77	0.407	0.060	(0.073)	0.348
166	13.83	0.77	0.407	0.059	(0.073)	0.348
167	13.92	0.77	0.407	0.059	(0.073)	0.348
168	14.00	0.77	0.407	0.059	(0.073)	0.348
169	14.08	0.90	0.478	0.059	(0.086)	0.420
170	14.17	0.90	0.478	0.058	(0.086)	0.420
171	14.25	0.90	0.478	0.058	(0.086)	0.420
172	14.33	0.87	0.460	0.058	(0.083)	0.403
173	14.42	0.87	0.460	0.057	(0.083)	0.403
174	14.50	0.87	0.460	0.057	(0.083)	0.403
175	14.58	0.87	0.460	0.057	(0.083)	0.404
176	14.67	0.87	0.460	0.056	(0.083)	0.404
177	14.75	0.87	0.460	0.056	(0.083)	0.404
178	14.83	0.83	0.443	0.056	(0.080)	0.387
179	14.92	0.83	0.443	0.056	(0.080)	0.387
180	15.00	0.83	0.443	0.055	(0.080)	0.387
181	15.08	0.80	0.425	0.055	(0.077)	0.370
182	15.17	0.80	0.425	0.055	(0.077)	0.370
183	15.25	0.80	0.425	0.054	(0.077)	0.371
184	15.33	0.77	0.407	0.054	(0.073)	0.353
185	15.42	0.77	0.407	0.054	(0.073)	0.353
186	15.50	0.77	0.407	0.054	(0.073)	0.354
187	15.58	0.63	0.336	0.053	(0.061)	0.283
188	15.67	0.63	0.336	0.053	(0.061)	0.283
189	15.75	0.63	0.336	0.053	(0.061)	0.284
190	15.83	0.63	0.336	0.053	(0.061)	0.284
191	15.92	0.63	0.336	0.052	(0.061)	0.284
192	16.00	0.63	0.336	0.052	(0.061)	0.284
193	16.08	0.13	0.071	(0.052)	0.013	0.058
194	16.17	0.13	0.071	(0.051)	0.013	0.058
195	16.25	0.13	0.071	(0.051)	0.013	0.058
196	16.33	0.13	0.071	(0.051)	0.013	0.058

197	16.42	0.13	0.071	(0.051)	0.013	0.058
198	16.50	0.13	0.071	(0.050)	0.013	0.058
199	16.58	0.10	0.053	(0.050)	0.010	0.044
200	16.67	0.10	0.053	(0.050)	0.010	0.044
201	16.75	0.10	0.053	(0.050)	0.010	0.044
202	16.83	0.10	0.053	(0.049)	0.010	0.044
203	16.92	0.10	0.053	(0.049)	0.010	0.044
204	17.00	0.10	0.053	(0.049)	0.010	0.044
205	17.08	0.17	0.089	(0.049)	0.016	0.073
206	17.17	0.17	0.089	(0.048)	0.016	0.073
207	17.25	0.17	0.089	(0.048)	0.016	0.073
208	17.33	0.17	0.089	(0.048)	0.016	0.073
209	17.42	0.17	0.089	(0.048)	0.016	0.073
210	17.50	0.17	0.089	(0.047)	0.016	0.073
211	17.58	0.17	0.089	(0.047)	0.016	0.073
212	17.67	0.17	0.089	(0.047)	0.016	0.073
213	17.75	0.17	0.089	(0.047)	0.016	0.073
214	17.83	0.13	0.071	(0.047)	0.013	0.058
215	17.92	0.13	0.071	(0.046)	0.013	0.058
216	18.00	0.13	0.071	(0.046)	0.013	0.058
217	18.08	0.13	0.071	(0.046)	0.013	0.058
218	18.17	0.13	0.071	(0.046)	0.013	0.058
219	18.25	0.13	0.071	(0.045)	0.013	0.058
220	18.33	0.13	0.071	(0.045)	0.013	0.058
221	18.42	0.13	0.071	(0.045)	0.013	0.058
222	18.50	0.13	0.071	(0.045)	0.013	0.058
223	18.58	0.10	0.053	(0.045)	0.010	0.044
224	18.67	0.10	0.053	(0.044)	0.010	0.044
225	18.75	0.10	0.053	(0.044)	0.010	0.044
226	18.83	0.07	0.035	(0.044)	0.006	0.029
227	18.92	0.07	0.035	(0.044)	0.006	0.029
228	19.00	0.07	0.035	(0.043)	0.006	0.029
229	19.08	0.10	0.053	(0.043)	0.010	0.044
230	19.17	0.10	0.053	(0.043)	0.010	0.044
231	19.25	0.10	0.053	(0.043)	0.010	0.044
232	19.33	0.13	0.071	(0.043)	0.013	0.058
233	19.42	0.13	0.071	(0.042)	0.013	0.058
234	19.50	0.13	0.071	(0.042)	0.013	0.058
235	19.58	0.10	0.053	(0.042)	0.010	0.044
236	19.67	0.10	0.053	(0.042)	0.010	0.044
237	19.75	0.10	0.053	(0.042)	0.010	0.044
238	19.83	0.07	0.035	(0.041)	0.006	0.029
239	19.92	0.07	0.035	(0.041)	0.006	0.029
240	20.00	0.07	0.035	(0.041)	0.006	0.029
241	20.08	0.10	0.053	(0.041)	0.010	0.044
242	20.17	0.10	0.053	(0.041)	0.010	0.044
243	20.25	0.10	0.053	(0.041)	0.010	0.044
244	20.33	0.10	0.053	(0.040)	0.010	0.044
245	20.42	0.10	0.053	(0.040)	0.010	0.044
246	20.50	0.10	0.053	(0.040)	0.010	0.044
247	20.58	0.10	0.053	(0.040)	0.010	0.044
248	20.67	0.10	0.053	(0.040)	0.010	0.044
249	20.75	0.10	0.053	(0.040)	0.010	0.044
250	20.83	0.07	0.035	(0.039)	0.006	0.029
251	20.92	0.07	0.035	(0.039)	0.006	0.029
252	21.00	0.07	0.035	(0.039)	0.006	0.029
253	21.08	0.10	0.053	(0.039)	0.010	0.044
254	21.17	0.10	0.053	(0.039)	0.010	0.044
255	21.25	0.10	0.053	(0.039)	0.010	0.044
256	21.33	0.07	0.035	(0.038)	0.006	0.029

257	21.42	0.07	0.035	(0.038)	0.006	0.029
258	21.50	0.07	0.035	(0.038)	0.006	0.029
259	21.58	0.10	0.053	(0.038)	0.010	0.044
260	21.67	0.10	0.053	(0.038)	0.010	0.044
261	21.75	0.10	0.053	(0.038)	0.010	0.044
262	21.83	0.07	0.035	(0.038)	0.006	0.029
263	21.92	0.07	0.035	(0.038)	0.006	0.029
264	22.00	0.07	0.035	(0.037)	0.006	0.029
265	22.08	0.10	0.053	(0.037)	0.010	0.044
266	22.17	0.10	0.053	(0.037)	0.010	0.044
267	22.25	0.10	0.053	(0.037)	0.010	0.044
268	22.33	0.07	0.035	(0.037)	0.006	0.029
269	22.42	0.07	0.035	(0.037)	0.006	0.029
270	22.50	0.07	0.035	(0.037)	0.006	0.029
271	22.58	0.07	0.035	(0.037)	0.006	0.029
272	22.67	0.07	0.035	(0.036)	0.006	0.029
273	22.75	0.07	0.035	(0.036)	0.006	0.029
274	22.83	0.07	0.035	(0.036)	0.006	0.029
275	22.92	0.07	0.035	(0.036)	0.006	0.029
276	23.00	0.07	0.035	(0.036)	0.006	0.029
277	23.08	0.07	0.035	(0.036)	0.006	0.029
278	23.17	0.07	0.035	(0.036)	0.006	0.029
279	23.25	0.07	0.035	(0.036)	0.006	0.029
280	23.33	0.07	0.035	(0.036)	0.006	0.029
281	23.42	0.07	0.035	(0.036)	0.006	0.029
282	23.50	0.07	0.035	(0.036)	0.006	0.029
283	23.58	0.07	0.035	(0.036)	0.006	0.029
284	23.67	0.07	0.035	(0.036)	0.006	0.029
285	23.75	0.07	0.035	(0.036)	0.006	0.029
286	23.83	0.07	0.035	(0.035)	0.006	0.029
287	23.92	0.07	0.035	(0.035)	0.006	0.029
288	24.00	0.07	0.035	(0.035)	0.006	0.029

(Loss Rate Not Used)

Sum = 100.0 Sum = 44.7

Flood volume = Effective rainfall 3.72(In)
times area 0.8(Ac.)/[(In)/(Ft.)] = 0.3(Ac.Ft)
Total soil loss = 0.70(In)
Total soil loss = 0.050(Ac.Ft)
Total rainfall = 4.43(In)
Flood volume = 11486.5 Cubic Feet
Total soil loss = 2174.3 Cubic Feet

Peak flow rate of this hydrograph = 0.460(CFS)

+++

24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0000	0.00	Q	|	|	|	|
0+10	0.0001	0.02	Q	|	|	|	|
0+15	0.0003	0.02	Q	|	|	|	|
0+20	0.0004	0.02	Q	|	|	|	|
0+25	0.0007	0.03	Q	|	|	|	|
0+30	0.0009	0.03	Q	|	|	|	|
0+35	0.0011	0.04	Q	|	|	|	|

```
 0+40        0.0014      0.04  Q         |         |         |         |
 0+45        0.0016      0.04  Q         |         |         |         |
 0+50        0.0019      0.04  Q         |         |         |         |
 0+55        0.0022      0.05  Q         |         |         |         |
 1+ 0        0.0025      0.05  Q         |         |         |         |
 1+ 5        0.0029      0.05  Q         |         |         |         |
 1+10        0.0031      0.04  Q         |         |         |         |
 1+15        0.0034      0.04  Q         |         |         |         |
 1+20        0.0037      0.04  Q         |         |         |         |
 1+25        0.0039      0.04  Q         |         |         |         |
 1+30        0.0042      0.04  Q         |         |         |         |
 1+35        0.0045      0.04  Q         |         |         |         |
 1+40        0.0047      0.04  Q         |         |         |         |
 1+45        0.0050      0.04  Q         |         |         |         |
 1+50        0.0052      0.04  Q         |         |         |         |
 1+55        0.0056      0.05  Q         |         |         |         |
 2+ 0        0.0059      0.05  Q         |         |         |         |
 2+ 5        0.0062      0.05  Q         |         |         |         |
 2+10        0.0066      0.05  Q         |         |         |         |
 2+15        0.0069      0.05  QV        |         |         |         |
 2+20        0.0072      0.05  QV        |         |         |         |
 2+25        0.0076      0.05  QV        |         |         |         |
 2+30        0.0079      0.05  QV        |         |         |         |
 2+35        0.0083      0.05  QV        |         |         |         |
 2+40        0.0087      0.06  QV        |         |         |         |
 2+45        0.0091      0.06  QV        |         |         |         |
 2+50        0.0095      0.06  QV        |         |         |         |
 2+55        0.0099      0.06  QV        |         |         |         |
 3+ 0        0.0104      0.06  QV        |         |         |         |
 3+ 5        0.0108      0.06  QV        |         |         |         |
 3+10        0.0112      0.06  QV        |         |         |         |
 3+15        0.0116      0.06  QV        |         |         |         |
 3+20        0.0121      0.06  QV        |         |         |         |
 3+25        0.0125      0.06  QV        |         |         |         |
 3+30        0.0129      0.06  QV        |         |         |         |
 3+35        0.0133      0.06  Q V       |         |         |         |
 3+40        0.0138      0.06  Q V       |         |         |         |
 3+45        0.0142      0.06  Q V       |         |         |         |
 3+50        0.0146      0.06  Q V       |         |         |         |
 3+55        0.0151      0.07  Q V       |         |         |         |
 4+ 0        0.0156      0.07  Q V       |         |         |         |
 4+ 5        0.0161      0.07  Q V       |         |         |         |
 4+10        0.0166      0.07  Q V       |         |         |         |
 4+15        0.0172      0.07  Q V       |         |         |         |
 4+20        0.0177      0.08  Q V       |         |         |         |
 4+25        0.0182      0.08  Q V       |         |         |         |
 4+30        0.0188      0.08  Q V       |         |         |         |
 4+35        0.0194      0.09  Q V       |         |         |         |
 4+40        0.0200      0.09  Q  V      |         |         |         |
 4+45        0.0206      0.09  Q  V      |         |         |         |
 4+50        0.0212      0.09  Q  V      |         |         |         |
 4+55        0.0219      0.09  Q  V      |         |         |         |
 5+ 0        0.0225      0.10  Q  V      |         |         |         |
 5+ 5        0.0232      0.09  Q  V      |         |         |         |
 5+10        0.0238      0.08  Q  V      |         |         |         |
 5+15        0.0243      0.08  Q  V      |         |         |         |
 5+20        0.0249      0.08  Q  V      |         |         |         |
 5+25        0.0254      0.08  Q  V      |         |         |         |
 5+30        0.0260      0.09  Q  V      |         |         |         |
 5+35        0.0266      0.09  Q   V     |         |         |         |
```

```
 5+40       0.0273      0.09  Q   V     |         |         |         |
 5+45       0.0279      0.10  Q   V     |         |         |         |
 5+50       0.0286      0.10  Q   V     |         |         |         |
 5+55       0.0293      0.10  Q   V     |         |         |         |
 6+ 0       0.0300      0.10  Q   V     |         |         |         |
 6+ 5       0.0307      0.10  Q   V     |         |         |         |
 6+10       0.0314      0.11  Q   V     |         |         |         |
 6+15       0.0322      0.11  Q   V     |         |         |         |
 6+20       0.0329      0.11  Q   V     |         |         |         |
 6+25       0.0337      0.11  Q    V    |         |         |         |
 6+30       0.0345      0.11  Q    V    |         |         |         |
 6+35       0.0353      0.11  Q    V    |         |         |         |
 6+40       0.0361      0.12  Q    V    |         |         |         |
 6+45       0.0369      0.12  Q    V    |         |         |         |
 6+50       0.0378      0.12  Q    V    |         |         |         |
 6+55       0.0386      0.12  Q    V    |         |         |         |
 7+ 0       0.0395      0.12  Q    V    |         |         |         |
 7+ 5       0.0403      0.12  Q     V   |         |         |         |
 7+10       0.0412      0.12  Q     V   |         |         |         |
 7+15       0.0420      0.12  Q     V   |         |         |         |
 7+20       0.0429      0.13  Q     V   |         |         |         |
 7+25       0.0438      0.13  Q     V   |         |         |         |
 7+30       0.0447      0.13  Q     V   |         |         |         |
 7+35       0.0457      0.14  Q     V   |         |         |         |
 7+40       0.0467      0.14  Q      V  |         |         |         |
 7+45       0.0477      0.15  Q      V  |         |         |         |
 7+50       0.0487      0.15  Q      V  |         |         |         |
 7+55       0.0498      0.16  Q      V  |         |         |         |
 8+ 0       0.0509      0.16  Q      V  |         |         |         |
 8+ 5       0.0520      0.16  Q      V  |         |         |         |
 8+10       0.0532      0.18  Q       V |         |         |         |
 8+15       0.0545      0.18  Q       V |         |         |         |
 8+20       0.0558      0.18  Q       V |         |         |         |
 8+25       0.0570      0.18  Q       V |         |         |         |
 8+30       0.0583      0.19  Q       V |         |         |         |
 8+35       0.0596      0.19  Q        V|         |         |         |
 8+40       0.0609      0.19  Q        V|         |         |         |
 8+45       0.0623      0.20  Q        V|         |         |         |
 8+50       0.0637      0.20  Q        V|         |         |         |
 8+55       0.0651      0.21  Q        V|         |         |         |
 9+ 0       0.0665      0.21  Q         V         |         |         |
 9+ 5       0.0680      0.21  Q         V         |         |         |
 9+10       0.0696      0.23  Q         V         |         |         |
 9+15       0.0712      0.23  Q         V         |         |         |
 9+20       0.0728      0.24  Q         |V        |         |         |
 9+25       0.0744      0.24  Q         |V        |         |         |
 9+30       0.0761      0.25  Q         |V        |         |         |
 9+35       0.0778      0.25  Q         |V        |         |         |
 9+40       0.0796      0.26  |Q        | V       |         |         |
 9+45       0.0814      0.26  |Q        | V       |         |         |
 9+50       0.0832      0.26  |Q        | V       |         |         |
 9+55       0.0850      0.27  |Q        | V       |         |         |
10+ 0       0.0869      0.27  |Q        |  V      |         |         |
10+ 5       0.0887      0.26  |Q        |  V      |         |         |
10+10       0.0902      0.22  Q         |  V      |         |         |
10+15       0.0916      0.20  Q         |  V      |         |         |
10+20       0.0929      0.20  Q         |   V     |         |         |
10+25       0.0943      0.19  Q         |   V     |         |         |
10+30       0.0956      0.19  Q         |   V     |         |         |
10+35       0.0969      0.20  Q         |   V     |         |         |
```

```
10+40       0.0985      0.23  Q         |   V     |         |         |
10+45       0.1001      0.24  Q         |    V    |         |         |
10+50       0.1018      0.24  Q         |    V    |         |         |
10+55       0.1035      0.24  Q         |    V    |         |         |
11+ 0       0.1052      0.25  Q         |    V    |         |         |
11+ 5       0.1069      0.25  Q         |     V   |         |         |
11+10       0.1085      0.24  Q         |     V   |         |         |
11+15       0.1102      0.24  Q         |     V   |         |         |
11+20       0.1118      0.24  Q         |     V   |         |         |
11+25       0.1134      0.24  Q         |      V  |         |         |
11+30       0.1151      0.24  Q         |      V  |         |         |
11+35       0.1167      0.23  Q         |      V  |         |         |
11+40       0.1182      0.22  Q         |      V  |         |         |
11+45       0.1197      0.22  Q         |       V |         |         |
11+50       0.1212      0.22  Q         |       V |         |         |
11+55       0.1227      0.22  Q         |       V |         |         |
12+ 0       0.1242      0.22  Q         |       V |         |         |
12+ 5       0.1259      0.24  Q         |        V|         |         |
12+10       0.1279      0.29  |Q        |        V|         |         |
12+15       0.1299      0.30  |Q        |        V|         |         |
12+20       0.1321      0.31  |Q        |         V         |         |
12+25       0.1344      0.33  |Q        |         V         |         |
12+30       0.1366      0.33  |Q        |         V         |         |
12+35       0.1390      0.34  |Q        |         |V        |         |
12+40       0.1414      0.36  |Q        |         |V        |         |
12+45       0.1439      0.36  |Q        |         |V        |         |
12+50       0.1465      0.37  |Q        |         | V       |         |
12+55       0.1491      0.38  |Q        |         | V       |         |
13+ 0       0.1517      0.38  |Q        |         |  V      |         |
13+ 5       0.1544      0.40  |Q        |         |  V      |         |
13+10       0.1574      0.43  |Q        |         |  V      |         |
13+15       0.1605      0.45  |Q        |         |   V     |         |
13+20       0.1636      0.45  |Q        |         |   V     |         |
13+25       0.1668      0.46  |Q        |         |    V    |         |
13+30       0.1700      0.46  |Q        |         |    V    |         |
13+35       0.1730      0.43  |Q        |         |     V   |         |
13+40       0.1754      0.36  |Q        |         |     V   |         |
13+45       0.1777      0.33  |Q        |         |     V   |         |
13+50       0.1799      0.32  |Q        |         |      V  |         |
13+55       0.1820      0.31  |Q        |         |      V  |         |
14+ 0       0.1841      0.31  |Q        |         |      V  |         |
14+ 5       0.1863      0.31  |Q        |         |       V |         |
14+10       0.1886      0.34  |Q        |         |       V |         |
14+15       0.1910      0.35  |Q        |         |       V |         |
14+20       0.1934      0.35  |Q        |         |        V|         |
14+25       0.1958      0.35  |Q        |         |        V|         |
14+30       0.1982      0.35  |Q        |         |         V         |
14+35       0.2006      0.35  |Q        |         |         V         |
14+40       0.2029      0.35  |Q        |         |         V         |
14+45       0.2053      0.35  |Q        |         |         |V        |
14+50       0.2077      0.34  |Q        |         |         |V        |
14+55       0.2100      0.34  |Q        |         |         |V        |
15+ 0       0.2123      0.33  |Q        |         |         | V       |
15+ 5       0.2146      0.33  |Q        |         |         | V       |
15+10       0.2168      0.32  |Q        |         |         | V       |
15+15       0.2190      0.32  |Q        |         |         |  V      |
15+20       0.2212      0.32  |Q        |         |         |  V      |
15+25       0.2234      0.31  |Q        |         |         |  V      |
15+30       0.2255      0.31  |Q        |         |         |   V     |
15+35       0.2275      0.30  |Q        |         |         |   V     |
```

```
15+40       0.2293      0.27  |Q        |         |         |   V     |
15+45       0.2311      0.26  |Q        |         |         |    V    |
15+50       0.2328      0.25  |Q        |         |         |    V    |
15+55       0.2345      0.25  Q         |         |         |    V    |
16+ 0       0.2362      0.25  Q         |         |         |    V    |
16+ 5       0.2377      0.21  Q         |         |         |     V   |
16+10       0.2385      0.12  Q         |         |         |     V   |
16+15       0.2391      0.09  Q         |         |         |     V   |
16+20       0.2396      0.07  Q         |         |         |     V   |
16+25       0.2400      0.06  Q         |         |         |     V   |
16+30       0.2404      0.06  Q         |         |         |     V   |
16+35       0.2408      0.05  Q         |         |         |     V   |
16+40       0.2411      0.04  Q         |         |         |     V   |
16+45       0.2414      0.04  Q         |         |         |     V   |
16+50       0.2417      0.04  Q         |         |         |     V   |
16+55       0.2419      0.04  Q         |         |         |     V   |
17+ 0       0.2422      0.04  Q         |         |         |     V   |
17+ 5       0.2425      0.04  Q         |         |         |     V   |
17+10       0.2428      0.05  Q         |         |         |     V   |
17+15       0.2432      0.06  Q         |         |         |     V   |
17+20       0.2436      0.06  Q         |         |         |     V   |
17+25       0.2441      0.06  Q         |         |         |      V  |
17+30       0.2445      0.06  Q         |         |         |      V  |
17+35       0.2449      0.06  Q         |         |         |      V  |
17+40       0.2453      0.06  Q         |         |         |      V  |
17+45       0.2458      0.06  Q         |         |         |      V  |
17+50       0.2462      0.06  Q         |         |         |      V  |
17+55       0.2465      0.05  Q         |         |         |      V  |
18+ 0       0.2469      0.05  Q         |         |         |      V  |
18+ 5       0.2473      0.05  Q         |         |         |      V  |
18+10       0.2476      0.05  Q         |         |         |      V  |
18+15       0.2479      0.05  Q         |         |         |      V  |
18+20       0.2483      0.05  Q         |         |         |      V  |
18+25       0.2486      0.05  Q         |         |         |      V  |
18+30       0.2490      0.05  Q         |         |         |      V  |
18+35       0.2493      0.05  Q         |         |         |      V  |
18+40       0.2496      0.04  Q         |         |         |      V  |
18+45       0.2499      0.04  Q         |         |         |      V  |
18+50       0.2501      0.04  Q         |         |         |      V  |
18+55       0.2503      0.03  Q         |         |         |      V  |
19+ 0       0.2505      0.03  Q         |         |         |       V |
19+ 5       0.2507      0.03  Q         |         |         |       V |
19+10       0.2510      0.03  Q         |         |         |       V |
19+15       0.2512      0.04  Q         |         |         |       V |
19+20       0.2515      0.04  Q         |         |         |       V |
19+25       0.2518      0.04  Q         |         |         |       V |
19+30       0.2521      0.05  Q         |         |         |       V |
19+35       0.2524      0.05  Q         |         |         |       V |
19+40       0.2527      0.04  Q         |         |         |       V |
19+45       0.2530      0.04  Q         |         |         |       V |
19+50       0.2532      0.04  Q         |         |         |       V |
19+55       0.2534      0.03  Q         |         |         |       V |
20+ 0       0.2536      0.03  Q         |         |         |       V |
20+ 5       0.2538      0.03  Q         |         |         |       V |
20+10       0.2540      0.03  Q         |         |         |       V |
20+15       0.2543      0.04  Q         |         |         |       V |
20+20       0.2545      0.04  Q         |         |         |       V |
20+25       0.2548      0.04  Q         |         |         |       V |
20+30       0.2550      0.04  Q         |         |         |       V |
20+35       0.2553      0.04  Q         |         |         |       V |
```

20+40	0.2556	0.04	Q	|	|	|	V |
20+45	0.2558	0.04	Q	|	|	|	V |
20+50	0.2561	0.04	Q	|	|	|	V |
20+55	0.2563	0.03	Q	|	|	|	V |
21+ 0	0.2564	0.03	Q	|	|	|	V |
21+ 5	0.2566	0.03	Q	|	|	|	V |
21+10	0.2569	0.03	Q	|	|	|	V |
21+15	0.2571	0.04	Q	|	|	|	V|
21+20	0.2574	0.03	Q	|	|	|	V|
21+25	0.2575	0.03	Q	|	|	|	V|
21+30	0.2577	0.03	Q	|	|	|	V|
21+35	0.2579	0.03	Q	|	|	|	V|
21+40	0.2582	0.03	Q	|	|	|	V|
21+45	0.2584	0.04	Q	|	|	|	V|
21+50	0.2586	0.03	Q	|	|	|	V|
21+55	0.2588	0.03	Q	|	|	|	V|
22+ 0	0.2590	0.03	Q	|	|	|	V|
22+ 5	0.2592	0.03	Q	|	|	|	V|
22+10	0.2594	0.03	Q	|	|	|	V|
22+15	0.2597	0.04	Q	|	|	|	V|
22+20	0.2599	0.03	Q	|	|	|	V|
22+25	0.2601	0.03	Q	|	|	|	V|
22+30	0.2603	0.03	Q	|	|	|	V|
22+35	0.2605	0.03	Q	|	|	|	V|
22+40	0.2607	0.03	Q	|	|	|	V|
22+45	0.2608	0.03	Q	|	|	|	V|
22+50	0.2610	0.03	Q	|	|	|	V|
22+55	0.2612	0.03	Q	|	|	|	V|
23+ 0	0.2614	0.02	Q	|	|	|	V|
23+ 5	0.2615	0.02	Q	|	|	|	V|
23+10	0.2617	0.02	Q	|	|	|	V|
23+15	0.2619	0.02	Q	|	|	|	V|
23+20	0.2620	0.02	Q	|	|	|	V|
23+25	0.2622	0.02	Q	|	|	|	V|
23+30	0.2624	0.02	Q	|	|	|	V|
23+35	0.2626	0.02	Q	|	|	|	V|
23+40	0.2627	0.02	Q	|	|	|	V|
23+45	0.2629	0.02	Q	|	|	|	V|
23+50	0.2631	0.02	Q	|	|	|	V|
23+55	0.2632	0.02	Q	|	|	|	V|
24+ 0	0.2634	0.02	Q	|	|	|	V|
24+ 5	0.2636	0.02	Q	|	|	|	V|
24+10	0.2636	0.01	Q	|	|	|	V|
24+15	0.2636	0.00	Q	|	|	|	V|
24+20	0.2637	0.00	Q	|	|	|	V|
24+25	0.2637	0.00	Q	|	|	|	V|
24+30	0.2637	0.00	Q	|	|	|	V|
24+35	0.2637	0.00	Q	|	|	|	V|
24+40	0.2637	0.00	Q	|	|	|	V

U n i t   H y d r o g r a p h   A n a l y s i s

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2018, Version 9.0
Study date 05/30/23 File: 102410.out

++

Riverside County Synthetic Unit Hydrology Method
RCFC & WCD Manual date - April 1978

Program License Serial Number 6522

English (in-lb) Input Units Used
English Rainfall Data (Inches) Input Values Used

English Units used in output format

1512-0001 BEAUMONT VILLAGE
PROPOSED CONDITION
10-YEAR, 24-HOUR STORM EVENT
AREA 4

Drainage Area = 0.71(Ac.) = 0.001 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 0.71(Ac.) = 0.001 Sq. Mi.
USER Entry of lag time in hours
Lag time = 0.065 Hr.
Lag time = 3.92 Min.
25% of lag time = 0.98 Min.
40% of lag time = 1.57 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
0.71	2.79	1.98

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
0.71	6.77	4.81

STORM EVENT (YEAR) = 10.00
Area Averaged 2-Year Rainfall = 2.790(In)
Area Averaged 100-Year Rainfall = 6.770(In)

Point rain (area averaged) = 4.427(In)
Areal adjustment factor = 100.00 %

Adjusted average point rain = 4.427(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
0.710	69.00	0.900

Total Area Entered = 0.71(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
69.0	69.0	0.373	0.900	0.071	1.000	0.071
					Sum (F) =	0.071

Area averaged mean soil loss (F) (In/Hr) = 0.071
Minimum soil loss rate ((In/Hr)) = 0.035
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period	(hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	127.421	27.309	0.195
2	0.167	254.842	48.420	0.346
3	0.250	382.263	12.697	0.091
4	0.333	509.684	5.699	0.041
5	0.417	637.105	3.149	0.023
6	0.500	764.526	1.732	0.012
7	0.583	891.947	0.994	0.007
			Sum = 100.000	Sum= 0.716

The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.035	(0.126)	0.006	0.029
2	0.17	0.07	0.035	(0.125)	0.006	0.029
3	0.25	0.07	0.035	(0.125)	0.006	0.029
4	0.33	0.10	0.053	(0.124)	0.010	0.044
5	0.42	0.10	0.053	(0.124)	0.010	0.044
6	0.50	0.10	0.053	(0.123)	0.010	0.044
7	0.58	0.10	0.053	(0.123)	0.010	0.044
8	0.67	0.10	0.053	(0.122)	0.010	0.044
9	0.75	0.10	0.053	(0.122)	0.010	0.044
10	0.83	0.13	0.071	(0.121)	0.013	0.058
11	0.92	0.13	0.071	(0.121)	0.013	0.058
12	1.00	0.13	0.071	(0.120)	0.013	0.058
13	1.08	0.10	0.053	(0.120)	0.010	0.044
14	1.17	0.10	0.053	(0.119)	0.010	0.044
15	1.25	0.10	0.053	(0.119)	0.010	0.044
16	1.33	0.10	0.053	(0.118)	0.010	0.044
17	1.42	0.10	0.053	(0.118)	0.010	0.044
18	1.50	0.10	0.053	(0.117)	0.010	0.044

19	1.58	0.10	0.053	(0.117)	0.010	0.044
20	1.67	0.10	0.053	(0.117)	0.010	0.044
21	1.75	0.10	0.053	(0.116)	0.010	0.044
22	1.83	0.13	0.071	(0.116)	0.013	0.058
23	1.92	0.13	0.071	(0.115)	0.013	0.058
24	2.00	0.13	0.071	(0.115)	0.013	0.058
25	2.08	0.13	0.071	(0.114)	0.013	0.058
26	2.17	0.13	0.071	(0.114)	0.013	0.058
27	2.25	0.13	0.071	(0.113)	0.013	0.058
28	2.33	0.13	0.071	(0.113)	0.013	0.058
29	2.42	0.13	0.071	(0.112)	0.013	0.058
30	2.50	0.13	0.071	(0.112)	0.013	0.058
31	2.58	0.17	0.089	(0.111)	0.016	0.073
32	2.67	0.17	0.089	(0.111)	0.016	0.073
33	2.75	0.17	0.089	(0.110)	0.016	0.073
34	2.83	0.17	0.089	(0.110)	0.016	0.073
35	2.92	0.17	0.089	(0.110)	0.016	0.073
36	3.00	0.17	0.089	(0.109)	0.016	0.073
37	3.08	0.17	0.089	(0.109)	0.016	0.073
38	3.17	0.17	0.089	(0.108)	0.016	0.073
39	3.25	0.17	0.089	(0.108)	0.016	0.073
40	3.33	0.17	0.089	(0.107)	0.016	0.073
41	3.42	0.17	0.089	(0.107)	0.016	0.073
42	3.50	0.17	0.089	(0.106)	0.016	0.073
43	3.58	0.17	0.089	(0.106)	0.016	0.073
44	3.67	0.17	0.089	(0.106)	0.016	0.073
45	3.75	0.17	0.089	(0.105)	0.016	0.073
46	3.83	0.20	0.106	(0.105)	0.019	0.087
47	3.92	0.20	0.106	(0.104)	0.019	0.087
48	4.00	0.20	0.106	(0.104)	0.019	0.087
49	4.08	0.20	0.106	(0.103)	0.019	0.087
50	4.17	0.20	0.106	(0.103)	0.019	0.087
51	4.25	0.20	0.106	(0.102)	0.019	0.087
52	4.33	0.23	0.124	(0.102)	0.022	0.102
53	4.42	0.23	0.124	(0.102)	0.022	0.102
54	4.50	0.23	0.124	(0.101)	0.022	0.102
55	4.58	0.23	0.124	(0.101)	0.022	0.102
56	4.67	0.23	0.124	(0.100)	0.022	0.102
57	4.75	0.23	0.124	(0.100)	0.022	0.102
58	4.83	0.27	0.142	(0.099)	0.026	0.116
59	4.92	0.27	0.142	(0.099)	0.026	0.116
60	5.00	0.27	0.142	(0.099)	0.026	0.116
61	5.08	0.20	0.106	(0.098)	0.019	0.087
62	5.17	0.20	0.106	(0.098)	0.019	0.087
63	5.25	0.20	0.106	(0.097)	0.019	0.087
64	5.33	0.23	0.124	(0.097)	0.022	0.102
65	5.42	0.23	0.124	(0.096)	0.022	0.102
66	5.50	0.23	0.124	(0.096)	0.022	0.102
67	5.58	0.27	0.142	(0.096)	0.026	0.116
68	5.67	0.27	0.142	(0.095)	0.026	0.116
69	5.75	0.27	0.142	(0.095)	0.026	0.116
70	5.83	0.27	0.142	(0.094)	0.026	0.116
71	5.92	0.27	0.142	(0.094)	0.026	0.116
72	6.00	0.27	0.142	(0.093)	0.026	0.116
73	6.08	0.30	0.159	(0.093)	0.029	0.131
74	6.17	0.30	0.159	(0.093)	0.029	0.131
75	6.25	0.30	0.159	(0.092)	0.029	0.131
76	6.33	0.30	0.159	(0.092)	0.029	0.131
77	6.42	0.30	0.159	(0.091)	0.029	0.131
78	6.50	0.30	0.159	(0.091)	0.029	0.131

79	6.58	0.33	0.177	(0.091)	0.032	0.145
80	6.67	0.33	0.177	(0.090)	0.032	0.145
81	6.75	0.33	0.177	(0.090)	0.032	0.145
82	6.83	0.33	0.177	(0.089)	0.032	0.145
83	6.92	0.33	0.177	(0.089)	0.032	0.145
84	7.00	0.33	0.177	(0.089)	0.032	0.145
85	7.08	0.33	0.177	(0.088)	0.032	0.145
86	7.17	0.33	0.177	(0.088)	0.032	0.145
87	7.25	0.33	0.177	(0.087)	0.032	0.145
88	7.33	0.37	0.195	(0.087)	0.035	0.160
89	7.42	0.37	0.195	(0.087)	0.035	0.160
90	7.50	0.37	0.195	(0.086)	0.035	0.160
91	7.58	0.40	0.213	(0.086)	0.038	0.174
92	7.67	0.40	0.213	(0.085)	0.038	0.174
93	7.75	0.40	0.213	(0.085)	0.038	0.174
94	7.83	0.43	0.230	(0.085)	0.041	0.189
95	7.92	0.43	0.230	(0.084)	0.041	0.189
96	8.00	0.43	0.230	(0.084)	0.041	0.189
97	8.08	0.50	0.266	(0.083)	0.048	0.218
98	8.17	0.50	0.266	(0.083)	0.048	0.218
99	8.25	0.50	0.266	(0.083)	0.048	0.218
100	8.33	0.50	0.266	(0.082)	0.048	0.218
101	8.42	0.50	0.266	(0.082)	0.048	0.218
102	8.50	0.50	0.266	(0.082)	0.048	0.218
103	8.58	0.53	0.283	(0.081)	0.051	0.232
104	8.67	0.53	0.283	(0.081)	0.051	0.232
105	8.75	0.53	0.283	(0.080)	0.051	0.232
106	8.83	0.57	0.301	(0.080)	0.054	0.247
107	8.92	0.57	0.301	(0.080)	0.054	0.247
108	9.00	0.57	0.301	(0.079)	0.054	0.247
109	9.08	0.63	0.336	(0.079)	0.061	0.276
110	9.17	0.63	0.336	(0.078)	0.061	0.276
111	9.25	0.63	0.336	(0.078)	0.061	0.276
112	9.33	0.67	0.354	(0.078)	0.064	0.290
113	9.42	0.67	0.354	(0.077)	0.064	0.290
114	9.50	0.67	0.354	(0.077)	0.064	0.290
115	9.58	0.70	0.372	(0.077)	0.067	0.305
116	9.67	0.70	0.372	(0.076)	0.067	0.305
117	9.75	0.70	0.372	(0.076)	0.067	0.305
118	9.83	0.73	0.390	(0.076)	0.070	0.319
119	9.92	0.73	0.390	(0.075)	0.070	0.319
120	10.00	0.73	0.390	(0.075)	0.070	0.319
121	10.08	0.50	0.266	(0.074)	0.048	0.218
122	10.17	0.50	0.266	(0.074)	0.048	0.218
123	10.25	0.50	0.266	(0.074)	0.048	0.218
124	10.33	0.50	0.266	(0.073)	0.048	0.218
125	10.42	0.50	0.266	(0.073)	0.048	0.218
126	10.50	0.50	0.266	(0.073)	0.048	0.218
127	10.58	0.67	0.354	(0.072)	0.064	0.290
128	10.67	0.67	0.354	(0.072)	0.064	0.290
129	10.75	0.67	0.354	(0.072)	0.064	0.290
130	10.83	0.67	0.354	(0.071)	0.064	0.290
131	10.92	0.67	0.354	(0.071)	0.064	0.290
132	11.00	0.67	0.354	(0.071)	0.064	0.290
133	11.08	0.63	0.336	(0.070)	0.061	0.276
134	11.17	0.63	0.336	(0.070)	0.061	0.276
135	11.25	0.63	0.336	(0.069)	0.061	0.276
136	11.33	0.63	0.336	(0.069)	0.061	0.276
137	11.42	0.63	0.336	(0.069)	0.061	0.276
138	11.50	0.63	0.336	(0.068)	0.061	0.276

139	11.58	0.57	0.301	(0.068)	0.054	0.247
140	11.67	0.57	0.301	(0.068)	0.054	0.247
141	11.75	0.57	0.301	(0.067)	0.054	0.247
142	11.83	0.60	0.319	(0.067)	0.057	0.261
143	11.92	0.60	0.319	(0.067)	0.057	0.261
144	12.00	0.60	0.319	(0.066)	0.057	0.261
145	12.08	0.83	0.443	0.066	(0.080)	0.377
146	12.17	0.83	0.443	0.066	(0.080)	0.377
147	12.25	0.83	0.443	0.065	(0.080)	0.377
148	12.33	0.87	0.460	0.065	(0.083)	0.395
149	12.42	0.87	0.460	0.065	(0.083)	0.396
150	12.50	0.87	0.460	0.064	(0.083)	0.396
151	12.58	0.93	0.496	0.064	(0.089)	0.432
152	12.67	0.93	0.496	0.064	(0.089)	0.432
153	12.75	0.93	0.496	0.064	(0.089)	0.432
154	12.83	0.97	0.514	0.063	(0.092)	0.450
155	12.92	0.97	0.514	0.063	(0.092)	0.451
156	13.00	0.97	0.514	0.063	(0.092)	0.451
157	13.08	1.13	0.602	0.062	(0.108)	0.540
158	13.17	1.13	0.602	0.062	(0.108)	0.540
159	13.25	1.13	0.602	0.062	(0.108)	0.541
160	13.33	1.13	0.602	0.061	(0.108)	0.541
161	13.42	1.13	0.602	0.061	(0.108)	0.541
162	13.50	1.13	0.602	0.061	(0.108)	0.541
163	13.58	0.77	0.407	0.060	(0.073)	0.347
164	13.67	0.77	0.407	0.060	(0.073)	0.347
165	13.75	0.77	0.407	0.060	(0.073)	0.348
166	13.83	0.77	0.407	0.059	(0.073)	0.348
167	13.92	0.77	0.407	0.059	(0.073)	0.348
168	14.00	0.77	0.407	0.059	(0.073)	0.348
169	14.08	0.90	0.478	0.059	(0.086)	0.420
170	14.17	0.90	0.478	0.058	(0.086)	0.420
171	14.25	0.90	0.478	0.058	(0.086)	0.420
172	14.33	0.87	0.460	0.058	(0.083)	0.403
173	14.42	0.87	0.460	0.057	(0.083)	0.403
174	14.50	0.87	0.460	0.057	(0.083)	0.403
175	14.58	0.87	0.460	0.057	(0.083)	0.404
176	14.67	0.87	0.460	0.056	(0.083)	0.404
177	14.75	0.87	0.460	0.056	(0.083)	0.404
178	14.83	0.83	0.443	0.056	(0.080)	0.387
179	14.92	0.83	0.443	0.056	(0.080)	0.387
180	15.00	0.83	0.443	0.055	(0.080)	0.387
181	15.08	0.80	0.425	0.055	(0.077)	0.370
182	15.17	0.80	0.425	0.055	(0.077)	0.370
183	15.25	0.80	0.425	0.054	(0.077)	0.371
184	15.33	0.77	0.407	0.054	(0.073)	0.353
185	15.42	0.77	0.407	0.054	(0.073)	0.353
186	15.50	0.77	0.407	0.054	(0.073)	0.354
187	15.58	0.63	0.336	0.053	(0.061)	0.283
188	15.67	0.63	0.336	0.053	(0.061)	0.283
189	15.75	0.63	0.336	0.053	(0.061)	0.284
190	15.83	0.63	0.336	0.053	(0.061)	0.284
191	15.92	0.63	0.336	0.052	(0.061)	0.284
192	16.00	0.63	0.336	0.052	(0.061)	0.284
193	16.08	0.13	0.071	(0.052)	0.013	0.058
194	16.17	0.13	0.071	(0.051)	0.013	0.058
195	16.25	0.13	0.071	(0.051)	0.013	0.058
196	16.33	0.13	0.071	(0.051)	0.013	0.058
197	16.42	0.13	0.071	(0.051)	0.013	0.058
198	16.50	0.13	0.071	(0.050)	0.013	0.058

199	16.58	0.10	0.053	(0.050)	0.010	0.044
200	16.67	0.10	0.053	(0.050)	0.010	0.044
201	16.75	0.10	0.053	(0.050)	0.010	0.044
202	16.83	0.10	0.053	(0.049)	0.010	0.044
203	16.92	0.10	0.053	(0.049)	0.010	0.044
204	17.00	0.10	0.053	(0.049)	0.010	0.044
205	17.08	0.17	0.089	(0.049)	0.016	0.073
206	17.17	0.17	0.089	(0.048)	0.016	0.073
207	17.25	0.17	0.089	(0.048)	0.016	0.073
208	17.33	0.17	0.089	(0.048)	0.016	0.073
209	17.42	0.17	0.089	(0.048)	0.016	0.073
210	17.50	0.17	0.089	(0.047)	0.016	0.073
211	17.58	0.17	0.089	(0.047)	0.016	0.073
212	17.67	0.17	0.089	(0.047)	0.016	0.073
213	17.75	0.17	0.089	(0.047)	0.016	0.073
214	17.83	0.13	0.071	(0.047)	0.013	0.058
215	17.92	0.13	0.071	(0.046)	0.013	0.058
216	18.00	0.13	0.071	(0.046)	0.013	0.058
217	18.08	0.13	0.071	(0.046)	0.013	0.058
218	18.17	0.13	0.071	(0.046)	0.013	0.058
219	18.25	0.13	0.071	(0.045)	0.013	0.058
220	18.33	0.13	0.071	(0.045)	0.013	0.058
221	18.42	0.13	0.071	(0.045)	0.013	0.058
222	18.50	0.13	0.071	(0.045)	0.013	0.058
223	18.58	0.10	0.053	(0.045)	0.010	0.044
224	18.67	0.10	0.053	(0.044)	0.010	0.044
225	18.75	0.10	0.053	(0.044)	0.010	0.044
226	18.83	0.07	0.035	(0.044)	0.006	0.029
227	18.92	0.07	0.035	(0.044)	0.006	0.029
228	19.00	0.07	0.035	(0.043)	0.006	0.029
229	19.08	0.10	0.053	(0.043)	0.010	0.044
230	19.17	0.10	0.053	(0.043)	0.010	0.044
231	19.25	0.10	0.053	(0.043)	0.010	0.044
232	19.33	0.13	0.071	(0.043)	0.013	0.058
233	19.42	0.13	0.071	(0.042)	0.013	0.058
234	19.50	0.13	0.071	(0.042)	0.013	0.058
235	19.58	0.10	0.053	(0.042)	0.010	0.044
236	19.67	0.10	0.053	(0.042)	0.010	0.044
237	19.75	0.10	0.053	(0.042)	0.010	0.044
238	19.83	0.07	0.035	(0.041)	0.006	0.029
239	19.92	0.07	0.035	(0.041)	0.006	0.029
240	20.00	0.07	0.035	(0.041)	0.006	0.029
241	20.08	0.10	0.053	(0.041)	0.010	0.044
242	20.17	0.10	0.053	(0.041)	0.010	0.044
243	20.25	0.10	0.053	(0.041)	0.010	0.044
244	20.33	0.10	0.053	(0.040)	0.010	0.044
245	20.42	0.10	0.053	(0.040)	0.010	0.044
246	20.50	0.10	0.053	(0.040)	0.010	0.044
247	20.58	0.10	0.053	(0.040)	0.010	0.044
248	20.67	0.10	0.053	(0.040)	0.010	0.044
249	20.75	0.10	0.053	(0.040)	0.010	0.044
250	20.83	0.07	0.035	(0.039)	0.006	0.029
251	20.92	0.07	0.035	(0.039)	0.006	0.029
252	21.00	0.07	0.035	(0.039)	0.006	0.029
253	21.08	0.10	0.053	(0.039)	0.010	0.044
254	21.17	0.10	0.053	(0.039)	0.010	0.044
255	21.25	0.10	0.053	(0.039)	0.010	0.044
256	21.33	0.07	0.035	(0.038)	0.006	0.029
257	21.42	0.07	0.035	(0.038)	0.006	0.029
258	21.50	0.07	0.035	(0.038)	0.006	0.029

259	21.58	0.10	0.053	(0.038)	0.010	0.044
260	21.67	0.10	0.053	(0.038)	0.010	0.044
261	21.75	0.10	0.053	(0.038)	0.010	0.044
262	21.83	0.07	0.035	(0.038)	0.006	0.029
263	21.92	0.07	0.035	(0.038)	0.006	0.029
264	22.00	0.07	0.035	(0.037)	0.006	0.029
265	22.08	0.10	0.053	(0.037)	0.010	0.044
266	22.17	0.10	0.053	(0.037)	0.010	0.044
267	22.25	0.10	0.053	(0.037)	0.010	0.044
268	22.33	0.07	0.035	(0.037)	0.006	0.029
269	22.42	0.07	0.035	(0.037)	0.006	0.029
270	22.50	0.07	0.035	(0.037)	0.006	0.029
271	22.58	0.07	0.035	(0.037)	0.006	0.029
272	22.67	0.07	0.035	(0.036)	0.006	0.029
273	22.75	0.07	0.035	(0.036)	0.006	0.029
274	22.83	0.07	0.035	(0.036)	0.006	0.029
275	22.92	0.07	0.035	(0.036)	0.006	0.029
276	23.00	0.07	0.035	(0.036)	0.006	0.029
277	23.08	0.07	0.035	(0.036)	0.006	0.029
278	23.17	0.07	0.035	(0.036)	0.006	0.029
279	23.25	0.07	0.035	(0.036)	0.006	0.029
280	23.33	0.07	0.035	(0.036)	0.006	0.029
281	23.42	0.07	0.035	(0.036)	0.006	0.029
282	23.50	0.07	0.035	(0.036)	0.006	0.029
283	23.58	0.07	0.035	(0.036)	0.006	0.029
284	23.67	0.07	0.035	(0.036)	0.006	0.029
285	23.75	0.07	0.035	(0.036)	0.006	0.029
286	23.83	0.07	0.035	(0.035)	0.006	0.029
287	23.92	0.07	0.035	(0.035)	0.006	0.029
288	24.00	0.07	0.035	(0.035)	0.006	0.029

```
          (Loss Rate Not Used)
    Sum =     100.0                                   Sum =    44.7
     Flood volume = Effective rainfall      3.72(In)
      times area       0.7(Ac.)/[(In)/(Ft.)] =       0.2(Ac.Ft)
     Total soil loss =      0.70(In)
     Total soil loss =     0.042(Ac.Ft)
     Total rainfall =      4.43(In)
     Flood volume =        9594.6 Cubic Feet
     Total soil loss =        1816.1 Cubic Feet
     --------------------------------------------------------------------
      Peak flow rate of this hydrograph =      0.387(CFS)
     --------------------------------------------------------------------
     ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                         24 - H O U R   S T O R M
                    R u n o f f     H y d r o g r a p h
     --------------------------------------------------------------------
                 Hydrograph in   5   Minute intervals ((CFS))

     --------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5        5.0        7.5      10.0
 -----------------------------------------------------------------------
   0+ 5       0.0000      0.01  Q         |         |          |         |
   0+10       0.0001      0.02  Q         |         |          |         |
   0+15       0.0003      0.02  Q         |         |          |         |
   0+20       0.0004      0.02  Q         |         |          |         |
   0+25       0.0006      0.03  Q         |         |          |         |
   0+30       0.0008      0.03  Q         |         |          |         |
   0+35       0.0010      0.03  Q         |         |          |         |
   0+40       0.0013      0.03  Q         |         |          |         |
   0+45       0.0015      0.03  Q         |         |          |         |
```

```
0+50       0.0017      0.03  Q         |          |          |          |
0+55       0.0020      0.04  Q         |          |          |          |
1+ 0       0.0022      0.04  Q         |          |          |          |
1+ 5       0.0025      0.04  Q         |          |          |          |
1+10       0.0027      0.03  Q         |          |          |          |
1+15       0.0030      0.03  Q         |          |          |          |
1+20       0.0032      0.03  Q         |          |          |          |
1+25       0.0034      0.03  Q         |          |          |          |
1+30       0.0036      0.03  Q         |          |          |          |
1+35       0.0038      0.03  Q         |          |          |          |
1+40       0.0040      0.03  Q         |          |          |          |
1+45       0.0043      0.03  Q         |          |          |          |
1+50       0.0045      0.03  Q         |          |          |          |
1+55       0.0048      0.04  Q         |          |          |          |
2+ 0       0.0050      0.04  Q         |          |          |          |
2+ 5       0.0053      0.04  Q         |          |          |          |
2+10       0.0056      0.04  QV        |          |          |          |
2+15       0.0059      0.04  QV        |          |          |          |
2+20       0.0062      0.04  QV        |          |          |          |
2+25       0.0065      0.04  QV        |          |          |          |
2+30       0.0068      0.04  QV        |          |          |          |
2+35       0.0071      0.04  QV        |          |          |          |
2+40       0.0074      0.05  QV        |          |          |          |
2+45       0.0077      0.05  QV        |          |          |          |
2+50       0.0081      0.05  QV        |          |          |          |
2+55       0.0085      0.05  QV        |          |          |          |
3+ 0       0.0088      0.05  QV        |          |          |          |
3+ 5       0.0092      0.05  QV        |          |          |          |
3+10       0.0095      0.05  QV        |          |          |          |
3+15       0.0099      0.05  QV        |          |          |          |
3+20       0.0102      0.05  QV        |          |          |          |
3+25       0.0106      0.05  QV        |          |          |          |
3+30       0.0110      0.05  QV        |          |          |          |
3+35       0.0113      0.05  Q V       |          |          |          |
3+40       0.0117      0.05  Q V       |          |          |          |
3+45       0.0120      0.05  Q V       |          |          |          |
3+50       0.0124      0.05  Q V       |          |          |          |
3+55       0.0128      0.06  Q V       |          |          |          |
4+ 0       0.0132      0.06  Q V       |          |          |          |
4+ 5       0.0137      0.06  Q V       |          |          |          |
4+10       0.0141      0.06  Q V       |          |          |          |
4+15       0.0145      0.06  Q V       |          |          |          |
4+20       0.0150      0.07  Q V       |          |          |          |
4+25       0.0155      0.07  Q V       |          |          |          |
4+30       0.0160      0.07  Q V       |          |          |          |
4+35       0.0165      0.07  Q V       |          |          |          |
4+40       0.0170      0.07  Q  V      |          |          |          |
4+45       0.0175      0.07  Q  V      |          |          |          |
4+50       0.0180      0.08  Q  V      |          |          |          |
4+55       0.0185      0.08  Q  V      |          |          |          |
5+ 0       0.0191      0.08  Q  V      |          |          |          |
5+ 5       0.0196      0.08  Q  V      |          |          |          |
5+10       0.0201      0.07  Q  V      |          |          |          |
5+15       0.0205      0.06  Q  V      |          |          |          |
5+20       0.0210      0.07  Q  V      |          |          |          |
5+25       0.0215      0.07  Q  V      |          |          |          |
5+30       0.0220      0.07  Q  V      |          |          |          |
5+35       0.0225      0.08  Q   V     |          |          |          |
5+40       0.0230      0.08  Q   V     |          |          |          |
5+45       0.0236      0.08  Q   V     |          |          |          |
```

```
 5+50       0.0242      0.08  Q   V     |         |         |         |
 5+55       0.0247      0.08  Q   V     |         |         |         |
 6+ 0       0.0253      0.08  Q   V     |         |         |         |
 6+ 5       0.0259      0.09  Q   V     |         |         |         |
 6+10       0.0265      0.09  Q   V     |         |         |         |
 6+15       0.0272      0.09  Q   V     |         |         |         |
 6+20       0.0278      0.09  Q    V    |         |         |         |
 6+25       0.0285      0.09  Q    V    |         |         |         |
 6+30       0.0291      0.09  Q    V    |         |         |         |
 6+35       0.0298      0.10  Q    V    |         |         |         |
 6+40       0.0305      0.10  Q    V    |         |         |         |
 6+45       0.0312      0.10  Q    V    |         |         |         |
 6+50       0.0319      0.10  Q    V    |         |         |         |
 6+55       0.0326      0.10  Q    V    |         |         |         |
 7+ 0       0.0333      0.10  Q     V   |         |         |         |
 7+ 5       0.0340      0.10  Q     V   |         |         |         |
 7+10       0.0347      0.10  Q     V   |         |         |         |
 7+15       0.0355      0.10  Q     V   |         |         |         |
 7+20       0.0362      0.11  Q     V   |         |         |         |
 7+25       0.0370      0.11  Q     V   |         |         |         |
 7+30       0.0377      0.11  Q     V   |         |         |         |
 7+35       0.0385      0.12  Q     V   |         |         |         |
 7+40       0.0394      0.12  Q      V  |         |         |         |
 7+45       0.0402      0.12  Q      V  |         |         |         |
 7+50       0.0411      0.13  Q      V  |         |         |         |
 7+55       0.0420      0.13  Q      V  |         |         |         |
 8+ 0       0.0429      0.13  Q      V  |         |         |         |
 8+ 5       0.0439      0.14  Q      V  |         |         |         |
 8+10       0.0449      0.15  Q       V |         |         |         |
 8+15       0.0460      0.15  Q       V |         |         |         |
 8+20       0.0471      0.15  Q       V |         |         |         |
 8+25       0.0481      0.16  Q       V |         |         |         |
 8+30       0.0492      0.16  Q       V |         |         |         |
 8+35       0.0503      0.16  Q        V|         |         |         |
 8+40       0.0514      0.16  Q        V|         |         |         |
 8+45       0.0526      0.17  Q        V|         |         |         |
 8+50       0.0537      0.17  Q        V|         |         |         |
 8+55       0.0549      0.17  Q        V|         |         |         |
 9+ 0       0.0561      0.18  Q         V         |         |         |
 9+ 5       0.0574      0.18  Q         V         |         |         |
 9+10       0.0587      0.19  Q         V         |         |         |
 9+15       0.0601      0.20  Q         V         |         |         |
 9+20       0.0614      0.20  Q         |V        |         |         |
 9+25       0.0628      0.20  Q         |V        |         |         |
 9+30       0.0643      0.21  Q         |V        |         |         |
 9+35       0.0657      0.21  Q         |V        |         |         |
 9+40       0.0672      0.22  Q         | V       |         |         |
 9+45       0.0687      0.22  Q         | V       |         |         |
 9+50       0.0702      0.22  Q         | V       |         |         |
 9+55       0.0718      0.23  Q         |  V      |         |         |
10+ 0       0.0733      0.23  Q         |  V      |         |         |
10+ 5       0.0748      0.21  Q         |  V      |         |         |
10+10       0.0760      0.17  Q         |  V      |         |         |
10+15       0.0771      0.16  Q         |  V      |         |         |
10+20       0.0782      0.16  Q         |   V     |         |         |
10+25       0.0793      0.16  Q         |   V     |         |         |
10+30       0.0804      0.16  Q         |   V     |         |         |
10+35       0.0815      0.17  Q         |   V     |         |         |
10+40       0.0829      0.20  Q         |    V    |         |         |
10+45       0.0843      0.20  Q         |    V    |         |         |
```

```
10+50       0.0857      0.20  Q         |    V    |         |         |
10+55       0.0871      0.21  Q         |    V    |         |         |
11+ 0       0.0885      0.21  Q         |     V   |         |         |
11+ 5       0.0899      0.21  Q         |     V   |         |         |
11+10       0.0913      0.20  Q         |     V   |         |         |
11+15       0.0927      0.20  Q         |     V   |         |         |
11+20       0.0940      0.20  Q         |      V  |         |         |
11+25       0.0954      0.20  Q         |      V  |         |         |
11+30       0.0968      0.20  Q         |      V  |         |         |
11+35       0.0981      0.19  Q         |      V  |         |         |
11+40       0.0993      0.18  Q         |       V |         |         |
11+45       0.1006      0.18  Q         |       V |         |         |
11+50       0.1018      0.18  Q         |       V |         |         |
11+55       0.1031      0.19  Q         |       V |         |         |
12+ 0       0.1044      0.19  Q         |       V |         |         |
12+ 5       0.1058      0.21  Q         |        V|         |         |
12+10       0.1075      0.25  Q         |        V|         |         |
12+15       0.1093      0.26  |Q        |        V|         |         |
12+20       0.1112      0.27  |Q        |         V         |         |
12+25       0.1131      0.28  |Q        |         V         |         |
12+30       0.1150      0.28  |Q        |         V         |         |
12+35       0.1170      0.29  |Q        |         |V        |         |
12+40       0.1191      0.30  |Q        |         |V        |         |
12+45       0.1212      0.31  |Q        |         | V       |         |
12+50       0.1234      0.31  |Q        |         | V       |         |
12+55       0.1256      0.32  |Q        |         | V       |         |
13+ 0       0.1278      0.32  |Q        |         |  V      |         |
13+ 5       0.1301      0.34  |Q        |         |  V      |         |
13+10       0.1327      0.37  |Q        |         |   V     |         |
13+15       0.1353      0.38  |Q        |         |   V     |         |
13+20       0.1379      0.38  |Q        |         |    V    |         |
13+25       0.1406      0.39  |Q        |         |    V    |         |
13+30       0.1432      0.39  |Q        |         |     V   |         |
13+35       0.1456      0.35  |Q        |         |     V   |         |
13+40       0.1476      0.28  |Q        |         |     V   |         |
13+45       0.1494      0.26  |Q        |         |      V  |         |
13+50       0.1512      0.26  |Q        |         |      V  |         |
13+55       0.1529      0.25  |Q        |         |      V  |         |
14+ 0       0.1546      0.25  |Q        |         |       V |         |
14+ 5       0.1564      0.26  |Q        |         |       V |         |
14+10       0.1584      0.29  |Q        |         |       V |         |
14+15       0.1605      0.29  |Q        |         |        V|         |
14+20       0.1625      0.29  |Q        |         |        V|         |
14+25       0.1645      0.29  |Q        |         |        V|         |
14+30       0.1665      0.29  |Q        |         |         V         |
14+35       0.1685      0.29  |Q        |         |         V         |
14+40       0.1705      0.29  |Q        |         |         V         |
14+45       0.1725      0.29  |Q        |         |         |V        |
14+50       0.1744      0.29  |Q        |         |         |V        |
14+55       0.1764      0.28  |Q        |         |         | V       |
15+ 0       0.1783      0.28  |Q        |         |         | V       |
15+ 5       0.1802      0.27  |Q        |         |         | V       |
15+10       0.1820      0.27  |Q        |         |         |  V      |
15+15       0.1839      0.27  |Q        |         |         |  V      |
15+20       0.1857      0.26  |Q        |         |         |  V      |
15+25       0.1874      0.26  |Q        |         |         |   V     |
15+30       0.1892      0.25  |Q        |         |         |   V     |
15+35       0.1908      0.24  Q         |         |         |   V     |
15+40       0.1923      0.22  Q         |         |         |   V     |
15+45       0.1938      0.21  Q         |         |         |    V    |
```

```
15+50       0.1952      0.21  Q         |         |         |    V    |
15+55       0.1966      0.20  Q         |         |         |    V    |
16+ 0       0.1980      0.20  Q         |         |         |    V    |
16+ 5       0.1991      0.16  Q         |         |         |     V   |
16+10       0.1996      0.08  Q         |         |         |     V   |
16+15       0.2001      0.06  Q         |         |         |     V   |
16+20       0.2004      0.05  Q         |         |         |     V   |
16+25       0.2007      0.05  Q         |         |         |     V   |
16+30       0.2010      0.04  Q         |         |         |     V   |
16+35       0.2013      0.04  Q         |         |         |     V   |
16+40       0.2015      0.03  Q         |         |         |     V   |
16+45       0.2017      0.03  Q         |         |         |     V   |
16+50       0.2020      0.03  Q         |         |         |     V   |
16+55       0.2022      0.03  Q         |         |         |     V   |
17+ 0       0.2024      0.03  Q         |         |         |     V   |
17+ 5       0.2026      0.04  Q         |         |         |     V   |
17+10       0.2030      0.05  Q         |         |         |     V   |
17+15       0.2033      0.05  Q         |         |         |     V   |
17+20       0.2037      0.05  Q         |         |         |     V   |
17+25       0.2040      0.05  Q         |         |         |      V  |
17+30       0.2044      0.05  Q         |         |         |      V  |
17+35       0.2047      0.05  Q         |         |         |      V  |
17+40       0.2051      0.05  Q         |         |         |      V  |
17+45       0.2054      0.05  Q         |         |         |      V  |
17+50       0.2058      0.05  Q         |         |         |      V  |
17+55       0.2061      0.04  Q         |         |         |      V  |
18+ 0       0.2064      0.04  Q         |         |         |      V  |
18+ 5       0.2067      0.04  Q         |         |         |      V  |
18+10       0.2070      0.04  Q         |         |         |      V  |
18+15       0.2072      0.04  Q         |         |         |      V  |
18+20       0.2075      0.04  Q         |         |         |      V  |
18+25       0.2078      0.04  Q         |         |         |      V  |
18+30       0.2081      0.04  Q         |         |         |      V  |
18+35       0.2084      0.04  Q         |         |         |      V  |
18+40       0.2086      0.03  Q         |         |         |      V  |
18+45       0.2088      0.03  Q         |         |         |      V  |
18+50       0.2090      0.03  Q         |         |         |      V  |
18+55       0.2092      0.02  Q         |         |         |      V  |
19+ 0       0.2093      0.02  Q         |         |         |       V |
19+ 5       0.2095      0.02  Q         |         |         |       V |
19+10       0.2097      0.03  Q         |         |         |       V |
19+15       0.2099      0.03  Q         |         |         |       V |
19+20       0.2101      0.03  Q         |         |         |       V |
19+25       0.2104      0.04  Q         |         |         |       V |
19+30       0.2107      0.04  Q         |         |         |       V |
19+35       0.2110      0.04  Q         |         |         |       V |
19+40       0.2112      0.03  Q         |         |         |       V |
19+45       0.2114      0.03  Q         |         |         |       V |
19+50       0.2116      0.03  Q         |         |         |       V |
19+55       0.2118      0.02  Q         |         |         |       V |
20+ 0       0.2119      0.02  Q         |         |         |       V |
20+ 5       0.2121      0.02  Q         |         |         |       V |
20+10       0.2123      0.03  Q         |         |         |       V |
20+15       0.2125      0.03  Q         |         |         |       V |
20+20       0.2127      0.03  Q         |         |         |       V |
20+25       0.2129      0.03  Q         |         |         |       V |
20+30       0.2131      0.03  Q         |         |         |       V |
20+35       0.2133      0.03  Q         |         |         |       V |
20+40       0.2136      0.03  Q         |         |         |       V |
20+45       0.2138      0.03  Q         |         |         |       V |
```

```
  20+50       0.2140      0.03  Q         |         |         |       V |
  20+55       0.2141      0.02  Q         |         |         |       V |
  21+ 0       0.2143      0.02  Q         |         |         |       V |
  21+ 5       0.2145      0.02  Q         |         |         |       V |
  21+10       0.2147      0.03  Q         |         |         |       V |
  21+15       0.2149      0.03  Q         |         |         |        V|
  21+20       0.2151      0.03  Q         |         |         |        V|
  21+25       0.2152      0.02  Q         |         |         |        V|
  21+30       0.2154      0.02  Q         |         |         |        V|
  21+35       0.2155      0.02  Q         |         |         |        V|
  21+40       0.2157      0.03  Q         |         |         |        V|
  21+45       0.2159      0.03  Q         |         |         |        V|
  21+50       0.2161      0.03  Q         |         |         |        V|
  21+55       0.2163      0.02  Q         |         |         |        V|
  22+ 0       0.2164      0.02  Q         |         |         |        V|
  22+ 5       0.2166      0.02  Q         |         |         |        V|
  22+10       0.2168      0.03  Q         |         |         |        V|
  22+15       0.2170      0.03  Q         |         |         |        V|
  22+20       0.2172      0.03  Q         |         |         |        V|
  22+25       0.2174      0.02  Q         |         |         |        V|
  22+30       0.2175      0.02  Q         |         |         |        V|
  22+35       0.2177      0.02  Q         |         |         |        V|
  22+40       0.2178      0.02  Q         |         |         |        V|
  22+45       0.2179      0.02  Q         |         |         |        V|
  22+50       0.2181      0.02  Q         |         |         |        V|
  22+55       0.2182      0.02  Q         |         |         |        V|
  23+ 0       0.2184      0.02  Q         |         |         |        V|
  23+ 5       0.2185      0.02  Q         |         |         |        V|
  23+10       0.2187      0.02  Q         |         |         |        V|
  23+15       0.2188      0.02  Q         |         |         |        V|
  23+20       0.2189      0.02  Q         |         |         |        V|
  23+25       0.2191      0.02  Q         |         |         |        V|
  23+30       0.2192      0.02  Q         |         |         |        V|
  23+35       0.2194      0.02  Q         |         |         |        V|
  23+40       0.2195      0.02  Q         |         |         |        V|
  23+45       0.2197      0.02  Q         |         |         |        V|
  23+50       0.2198      0.02  Q         |         |         |        V|
  23+55       0.2199      0.02  Q         |         |         |        V|
  24+ 0       0.2201      0.02  Q         |         |         |        V|
  24+ 5       0.2202      0.02  Q         |         |         |        V|
  24+10       0.2202      0.01  Q         |         |         |        V|
  24+15       0.2202      0.00  Q         |         |         |        V|
  24+20       0.2203      0.00  Q         |         |         |        V|
  24+25       0.2203      0.00  Q         |         |         |        V|
  24+30       0.2203      0.00  Q         |         |         |        V|
-----------------------------------------------------------------------
```

APPENDIX E

STORMTECH CUT SHEETS

PROJECT INFORMATION	
ENGINEERED PRODUCT MANAGER	
ADS SALES REP	
PROJECT NO.	

Advanced Drainage Systems, Inc.

SiteAssist™
FOR STORMTECH
INSTALLATION INSTRUCTIONS
VISIT OUR APP

BEAUMONT VILLAGE AREA 1 & 2

BEAUMONT, CA, USA

MC-7200 STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-7200.
2. CHAMBERS SHALL BE ARCH-SHAPED AND SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORTS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS". LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. UPON REQUEST BY THE SITE DESIGN ENGINEER OR OWNER, THE CHAMBER MANUFACTURER SHALL SUBMIT A STRUCTURAL EVALUATION FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE AS FOLLOWS:
   - THE STRUCTURAL EVALUATION SHALL BE SEALED BY A REGISTERED PROFESSIONAL ENGINEER.
   - THE STRUCTURAL EVALUATION SHALL DEMONSTRATE THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY SECTIONS 3 AND 12.12 OF THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS FOR THERMOPLASTIC PIPE.
   - THE TEST DERIVED CREEP MODULUS AS SPECIFIED IN ASTM F2418 SHALL BE USED FOR PERMANENT DEAD LOAD DESIGN EXCEPT THAT IT SHALL BE THE 75-YEAR MODULUS USED FOR DESIGN.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-7200 CHAMBER SYSTEM

1. STORMTECH MC-7200 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
12. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-7200 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-7200 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-7200 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-7200 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

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

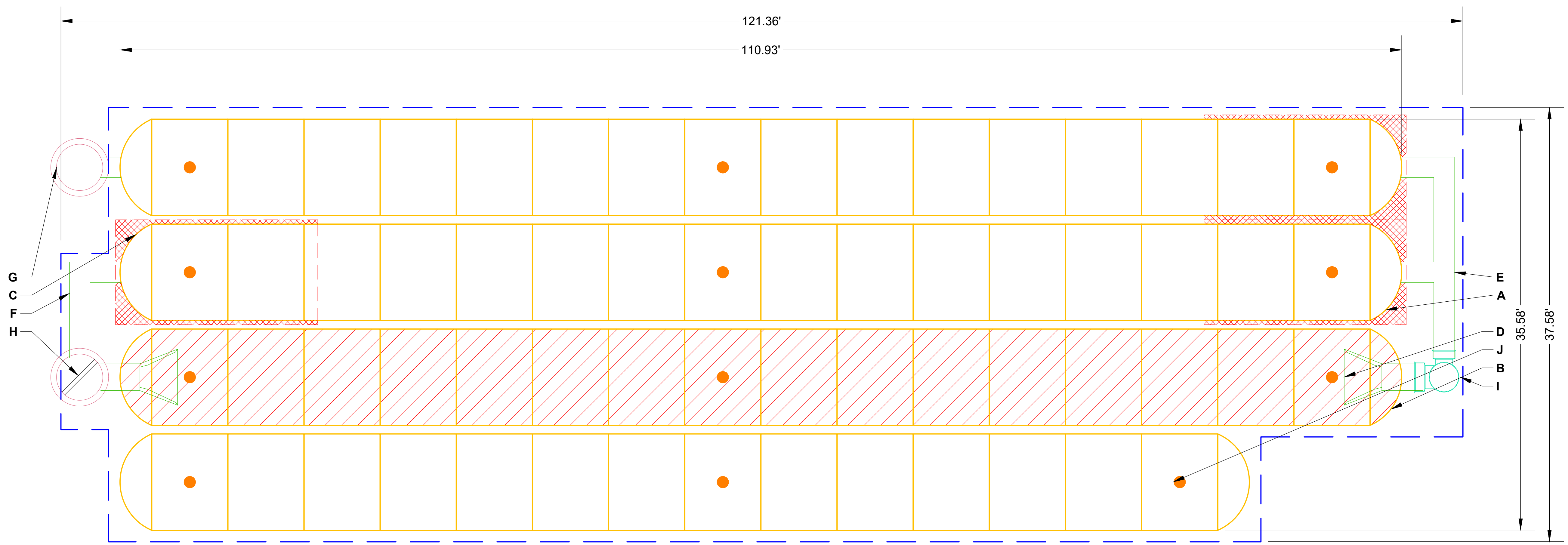
CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

PROPOSED LAYOUT	
62	STORMTECH MC-7200 CHAMBERS
8	STORMTECH MC-7200 END CAPS
12	STONE ABOVE (in)
9	STONE BELOW (in)
40	STONE VOID
18371	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)
4310	SYSTEM AREA (SF)
317.9	SYSTEM PERIMETER (ft)

PROPOSED ELEVATIONS:	
MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	21.40
MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	16.90
MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	16.40
MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	16.40
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	16.40
TOP OF STONE:	15.40
TOP OF MC-7200 CHAMBER:	14.40
18" x 18" TOP MANIFOLD INVERT:	11.85
24" ISOLATOR ROW PLUS INVERT:	9.59
24" ISOLATOR ROW PLUS INVERT:	9.59
18" x 18" BOTTOM MANIFOLD INVERT:	9.56
18" BOTTOM CONNECTION INVERT:	9.56
BOTTOM OF MC-7200 CHAMBER:	9.40
BOTTOM OF STONE:	8.65

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	18" TOP PARTIAL CUT END CAP, PART#: MC7200IEPP18T / TYP OF ALL 18" TOP CONNECTIONS	29.36"	
PREFABRICATED END CAP	B	24" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP24B / TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR PLUS ROWS	2.26"	
PREFABRICATED END CAP	C	18" BOTTOM PARTIAL CUT END CAP, PART#: MC7200IEPP18B / TYP OF ALL 18" BOTTOM CONNECTIONS	1.97"	
FLAMP	D	INSTALL FLAMP ON 24" ACCESS PIPE / PART#: MCFLAMP (TYP 2 PLACES)		
MANIFOLD	E	18" x 18" TOP MANIFOLD, ADS N-12	29.36"	
MANIFOLD	F	18" x 18" BOTTOM MANIFOLD, ADS N-12	1.97"	
CONCRETE STRUCTURE	G	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		4.0 CFS OUT
CONCRETE STRUCTURE W/WEIR	H	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		5.5 CFS IN
NYLOPLAST (INLET W/ ISO PLUS ROW)	I	30" DIAMETER (24.00" SUMP MIN)		11.0 CFS IN
INSPECTION PORT	J	4" SEE DETAIL (TYP 12 PLACES)		



ISOLATOR ROW PLUS (SEE DETAIL)

PLACE MINIMUM 17.50' OF ADSPLUS175 WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH NOTE #6.32 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- **NOT FOR CONSTRUCTION:** THIS LAYOUT IS FOR DIMENSIONAL PURPOSES ONLY TO PROVE CONCEPT & THE REQUIRED STORAGE VOLUME CAN BE ACHIEVED ON SITE.

BEAUMONT VILLAGE AREA 1 & 2
BEAUMONT, CA, USA

DATE:
DRAWN: RU
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

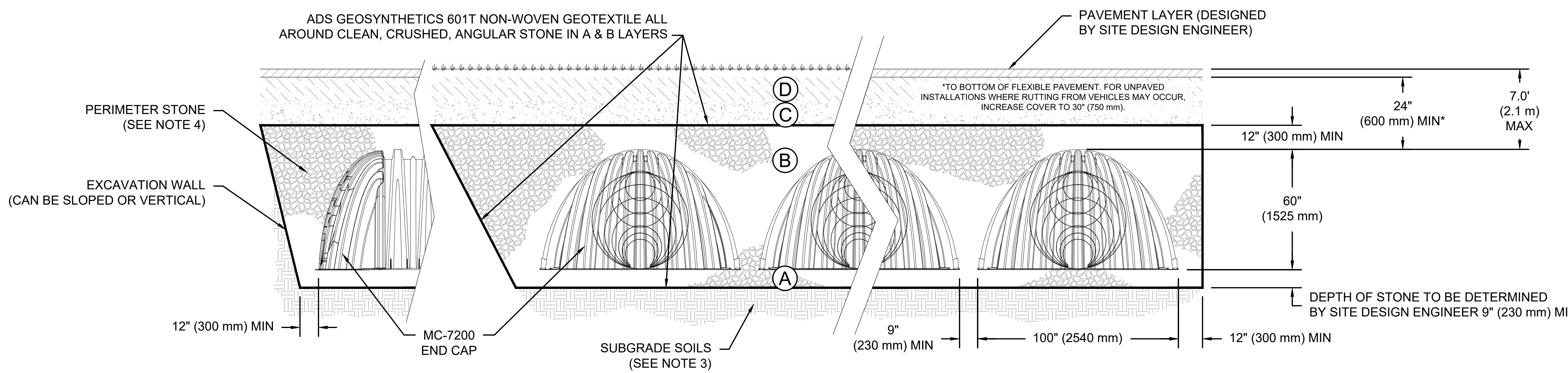
ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

0 10 20

ACCEPTABLE FILL MATERIALS: STORMTECH MC-7200 CHAMBER SYSTEMS

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

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-7200 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT SHALL BE GREATER THAN OR EQUAL TO 450 LBS/FT/%. THE ASC IS DEFINED IN SECTION 6.2.8 OF ASTM F2418. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

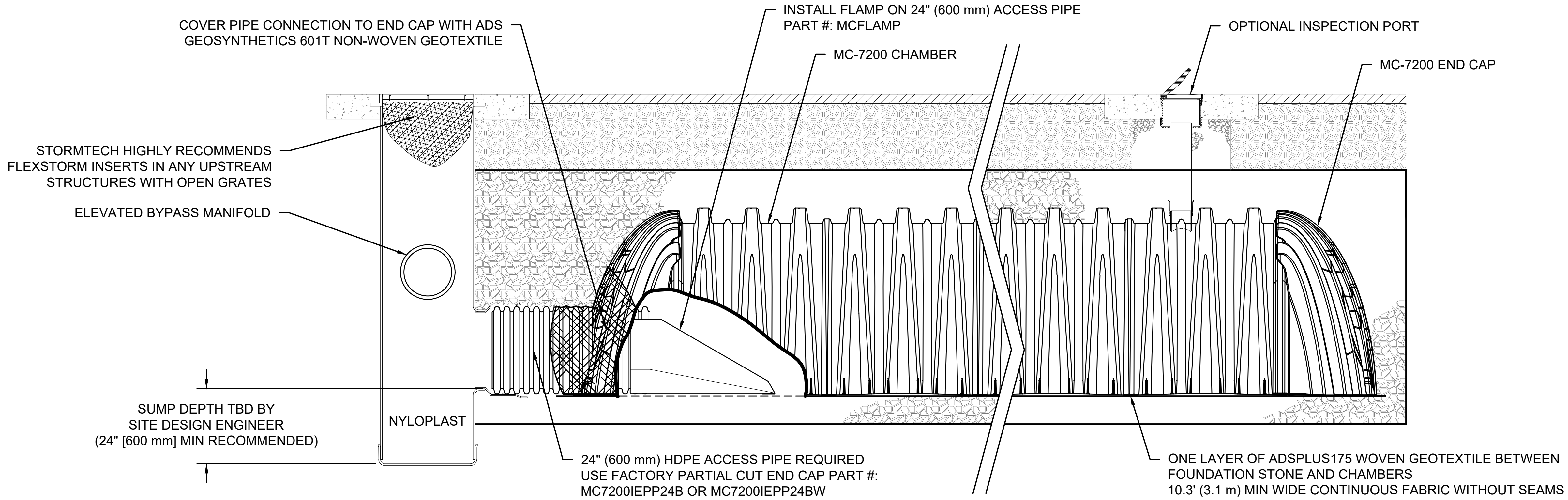
BEAUMONT VILLAGE AREA 1 & 2
BEAUMONT, CA, USA

DATE:
DRAWN: RU
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473



MC-7200 ISOLATOR ROW PLUS DETAIL

NTS

INSPECTION & MAINTENANCE

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

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

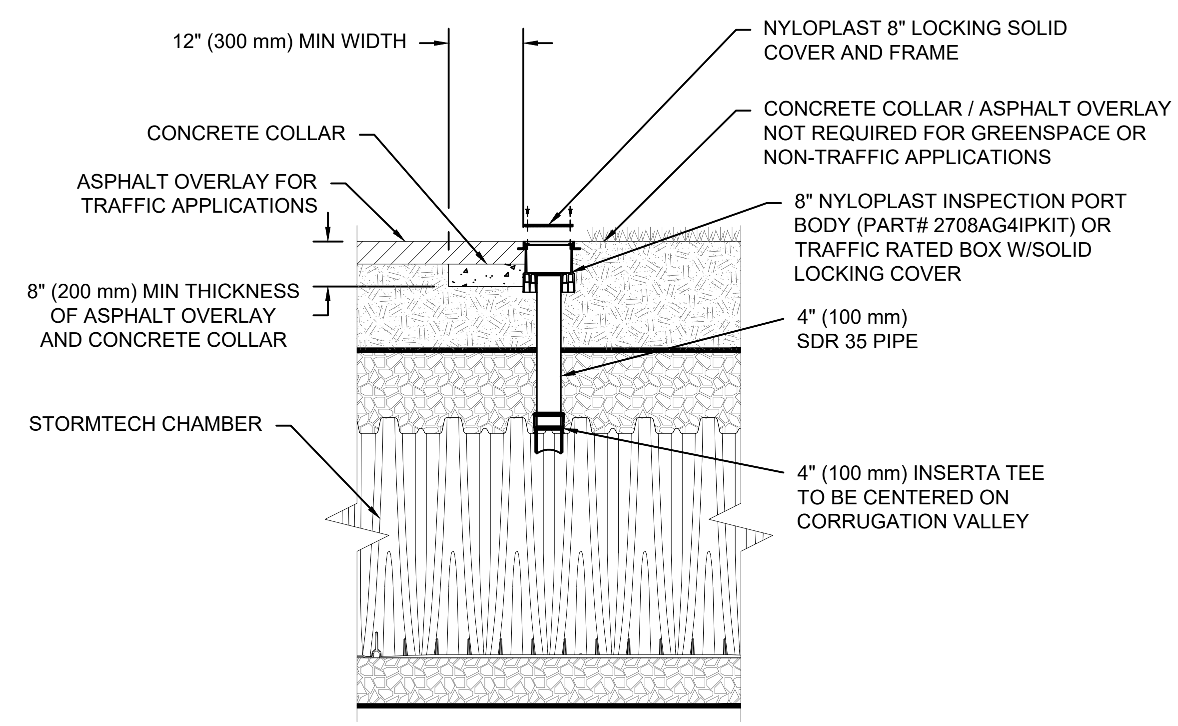
STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

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

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



NOTE:
INSPECTION PORTS MAY BE CONNECTED THROUGH ANY CHAMBER CORRUGATION VALLEY.

4" PVC INSPECTION PORT DETAIL
(MC SERIES CHAMBER)

NTS

BEAUMONT VILLAGE AREA 1 & 2
BEAUMONT, CA, USA

DATE:
DRAWN: RU
PROJECT #:
CHECKED: N/A

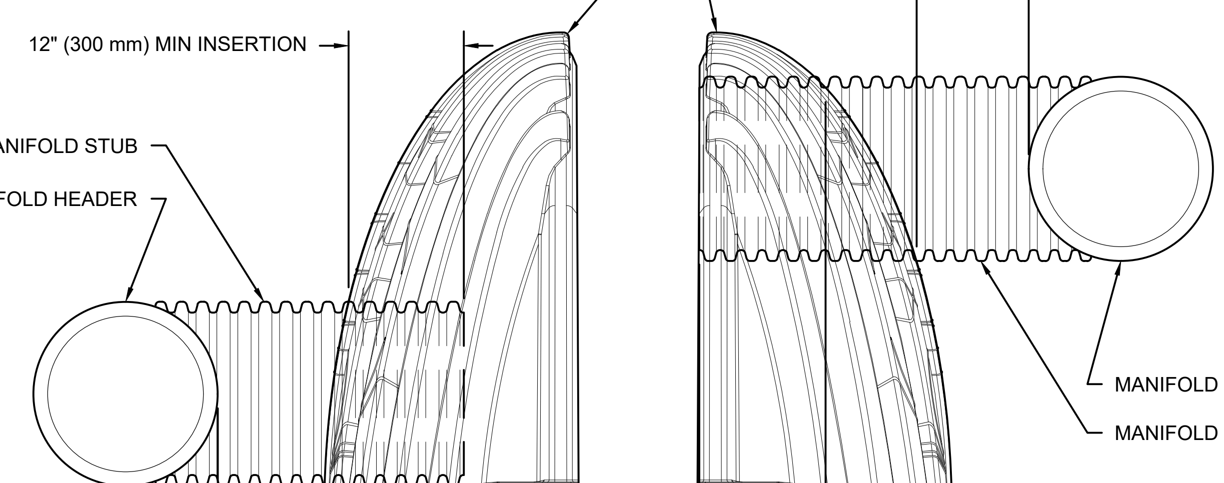
DATE	DRW	CHK	DESCRIPTION

StormTech®
Chamber System
888-892-2694 | WWW.STORMTECH.COM

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

MC-SERIES END CAP INSERTION DETAIL

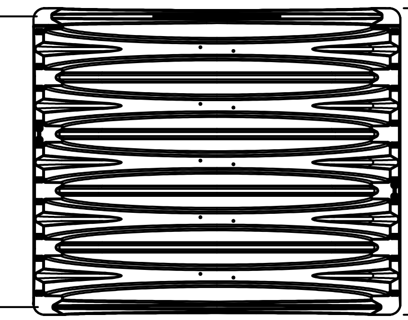
NTS

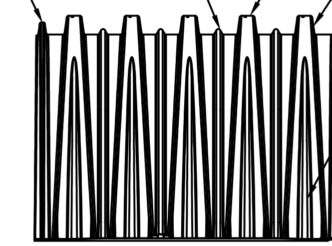


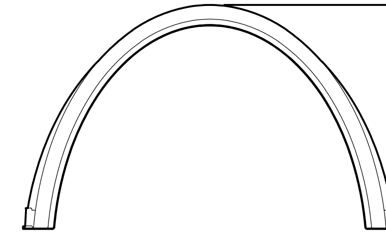
NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

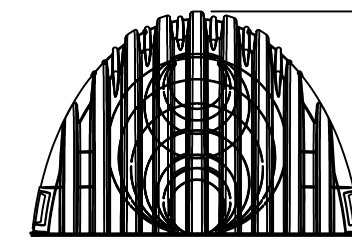
MC-7200 TECHNICAL SPECIFICATION

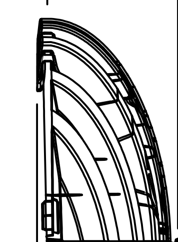
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 79.1"	(2540 mm X 1524 mm X 2010 mm)
CHAMBER STORAGE	175.9 CUBIC FEET	(4.98 m³)
MINIMUM INSTALLED STORAGE*	267.3 CUBIC FEET	(7.56 m³)
WEIGHT (NOMINAL)	205 lbs.	(92.9 kg)

NOMINAL END CAP SPECIFICATIONS

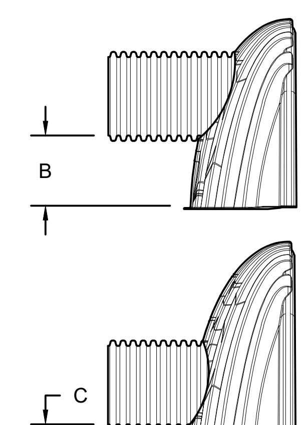
SIZE (W X H X INSTALLED LENGTH)	90.0" X 61.0" X 32.8"	(2286 mm X 1549 mm X 833 mm)
END CAP STORAGE	39.5 CUBIC FEET	(1.12 m³)
MINIMUM INSTALLED STORAGE*	115.3 CUBIC FEET	(3.26 m³)
WEIGHT (NOMINAL)	90 lbs.	(40.8 kg)

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

PARTIAL CUT HOLES AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
PARTIAL CUT HOLES AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC7200IEPP06T	6" (150 mm)	42.54" (1081 mm)	---
MC7200IEPP06B		---	0.86" (22 mm)
MC7200IEPP08T	8" (200 mm)	40.50" (1029 mm)	---
MC7200IEPP08B		---	1.01" (26 mm)
MC7200IEPP10T	10" (250 mm)	38.37" (975 mm)	---
MC7200IEPP10B		---	1.33" (34 mm)
MC7200IEPP12T	12" (300 mm)	35.69" (907 mm)	---
MC7200IEPP12B		---	1.55" (39 mm)
MC7200IEPP15T	15" (375 mm)	32.72" (831 mm)	---
MC7200IEPP15B		---	1.70" (43 mm)
MC7200IEPP18T	18" (450 mm)	29.36" (746 mm)	---
MC7200IEPP18TW			
MC7200IEPP18B		---	1.97" (50 mm)
MC7200IEPP18BW			
MC7200IEPP24T	24" (600 mm)	23.05" (585 mm)	---
MC7200IEPP24TW			
MC7200IEPP24B		---	2.26" (57 mm)
MC7200IEPP24BW			
MC7200IEPP30BW	30" (750 mm)	---	2.95" (75 mm)
MC7200IEPP36BW	36" (900 mm)	---	3.25" (83 mm)
MC7200IEPP42BW	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL



CUSTOM PREFABRICATED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-7200 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

BEAUMONT VILLAGE AREA 1 & 2
BEAUMONT, CA, USA

DATE:	DRAWN: RU
PROJECT #:	CHECKED: N/A

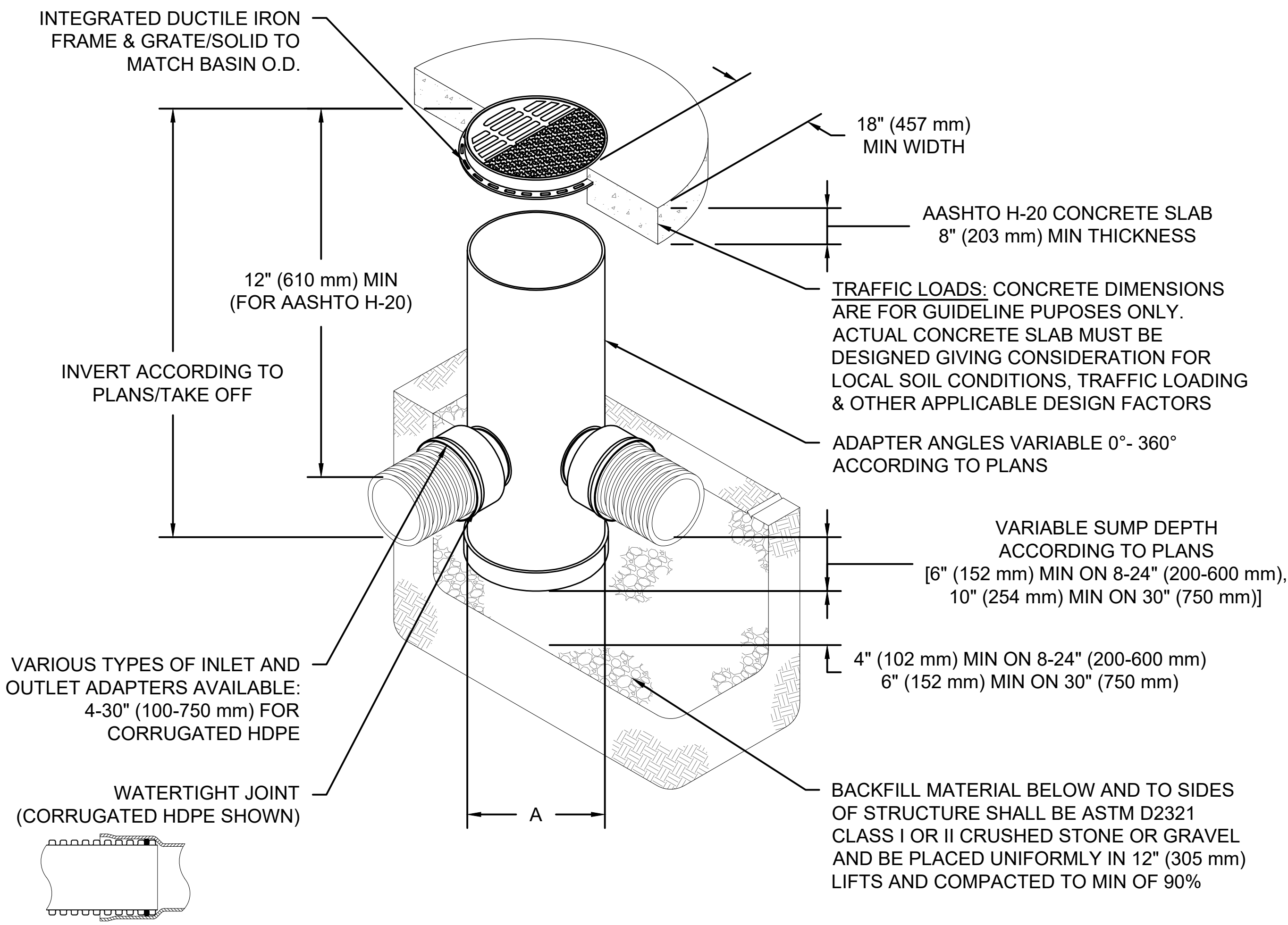
DATE	DRW	CHK	DESCRIPTION

StormTech® Chamber System
888-892-2694 | WWW.STORMTECH.COM

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

NYLOPLAST DRAIN BASIN

NTS



NOTES

1. 8-30" (200-750 mm) GRATES/SOLID COVERS SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
2. 12-30" (300-750 mm) FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
3. DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS
4. DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS & HANCOR DUAL WALL) & SDR 35 PVC
5. FOR COMPLETE DESIGN AND PRODUCT INFORMATION: **WWW.NYLOPLAST-US.COM**
6. TO ORDER CALL: **800-821-6710**

A	PART #	GRATE/SOLID COVER OPTIONS		
8" (200 mm)	2808AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
10" (250 mm)	2810AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
12" (300 mm)	2812AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
15" (375 mm)	2815AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
18" (450 mm)	2818AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
24" (600 mm)	2824AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
30" (750 mm)	2830AG	PEDESTRIAN AASHTO H-20	STANDARD AASHTO H-20	SOLID AASHTO H-20

BEAUMONT VILLAGE AREA 1 & 2
BEAUMONT, CA, USA

DATE:
DRAWN: RU
PROJECT #:
CHECKED: N/A

DATE	DRW	CHK	DESCRIPTION

Nyloplast®
770-932-2443 | WWW.NYLOPLAST-US.COM

ADS
4640 TRUEMAN BLVD
HILLIARD, OH 43026
1-800-733-7473

APPENDIX F

NOAA ATLAS 14, VOLUME 6, VERSION 2 POINT PRECIPITATION

NOAA Atlas 14, Volume 6, Version 2
Location name: Beaumont, California, USA*
Latitude: 33.9478°, Longitude: -116.9783°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.126 (0.105-0.152)	0.162 (0.135-0.197)	0.218 (0.181-0.266)	0.271 (0.223-0.333)	0.354 (0.281-0.450)	0.429 (0.334-0.556)	0.515 (0.391-0.686)	0.618 (0.455-0.846)	0.780 (0.551-1.12)	0.928 (0.633-1.38)
10-min	0.180 (0.150-0.218)	0.233 (0.194-0.283)	0.313 (0.260-0.381)	0.388 (0.319-0.477)	0.507 (0.403-0.645)	0.614 (0.478-0.798)	0.739 (0.561-0.983)	0.885 (0.653-1.21)	1.12 (0.790-1.60)	1.33 (0.907-1.97)
15-min	0.218 (0.181-0.264)	0.282 (0.234-0.342)	0.379 (0.314-0.461)	0.469 (0.386-0.576)	0.614 (0.488-0.780)	0.743 (0.578-0.965)	0.893 (0.678-1.19)	1.07 (0.789-1.47)	1.35 (0.956-1.93)	1.61 (1.10-2.38)
30-min	0.316 (0.264-0.384)	0.409 (0.340-0.497)	0.550 (0.457-0.670)	0.682 (0.561-0.838)	0.892 (0.709-1.13)	1.08 (0.840-1.40)	1.30 (0.985-1.73)	1.56 (1.15-2.13)	1.97 (1.39-2.81)	2.34 (1.60-3.46)
60-min	0.465 (0.387-0.563)	0.601 (0.500-0.729)	0.808 (0.670-0.983)	1.00 (0.824-1.23)	1.31 (1.04-1.66)	1.59 (1.23-2.06)	1.91 (1.45-2.54)	2.28 (1.68-3.13)	2.89 (2.04-4.13)	3.43 (2.34-5.08)
2-hr	0.664 (0.553-0.805)	0.824 (0.686-1.00)	1.06 (0.882-1.29)	1.28 (1.06-1.57)	1.62 (1.29-2.06)	1.92 (1.49-2.49)	2.26 (1.71-3.00)	2.65 (1.95-3.62)	3.25 (2.29-4.64)	3.78 (2.58-5.60)
3-hr	0.813 (0.677-0.985)	0.997 (0.830-1.21)	1.27 (1.05-1.54)	1.51 (1.24-1.86)	1.88 (1.50-2.39)	2.20 (1.71-2.86)	2.56 (1.94-3.41)	2.97 (2.19-4.07)	3.59 (2.53-5.13)	4.13 (2.81-6.11)
6-hr	1.18 (0.985-1.43)	1.44 (1.20-1.75)	1.81 (1.50-2.21)	2.14 (1.76-2.62)	2.62 (2.08-3.32)	3.02 (2.35-3.91)	3.45 (2.62-4.59)	3.93 (2.90-5.39)	4.64 (3.28-6.64)	5.24 (3.57-7.76)
12-hr	1.62 (1.35-1.96)	2.02 (1.68-2.45)	2.57 (2.13-3.12)	3.03 (2.49-3.72)	3.68 (2.92-4.67)	4.20 (3.27-5.45)	4.74 (3.60-6.31)	5.32 (3.92-7.29)	6.14 (4.34-8.77)	6.79 (4.63-10.1)
24-hr	2.15 (1.91-2.48)	2.79 (2.47-3.22)	3.64 (3.21-4.21)	4.33 (3.79-5.05)	5.28 (4.47-6.36)	6.02 (5.00-7.40)	6.77 (5.49-8.53)	7.56 (5.96-9.78)	8.63 (6.54-11.6)	9.47 (6.94-13.2)
2-day	2.63 (2.33-3.03)	3.49 (3.08-4.03)	4.67 (4.11-5.40)	5.66 (4.95-6.60)	7.07 (5.99-8.52)	8.20 (6.81-10.1)	9.39 (7.61-11.8)	10.7 (8.41-13.8)	12.5 (9.43-16.8)	13.9 (10.2-19.4)
3-day	2.86 (2.53-3.30)	3.84 (3.40-4.43)	5.22 (4.60-6.04)	6.41 (5.61-7.48)	8.15 (6.91-9.82)	9.59 (7.96-11.8)	11.1 (9.03-14.0)	12.8 (10.1-16.6)	15.3 (11.6-20.6)	17.4 (12.7-24.2)
4-day	3.12 (2.76-3.59)	4.20 (3.72-4.85)	5.74 (5.06-6.65)	7.09 (6.20-8.27)	9.07 (7.68-10.9)	10.7 (8.89-13.2)	12.5 (10.1-15.7)	14.5 (11.4-18.7)	17.3 (13.1-23.3)	19.7 (14.4-27.5)
7-day	3.61 (3.20-4.17)	4.86 (4.30-5.61)	6.62 (5.84-7.66)	8.14 (7.12-9.49)	10.4 (8.77-12.5)	12.2 (10.1-15.0)	14.1 (11.5-17.8)	16.3 (12.8-21.1)	19.4 (14.7-26.1)	22.0 (16.1-30.6)
10-day	3.98 (3.52-4.59)	5.35 (4.73-6.18)	7.26 (6.40-8.40)	8.90 (7.79-10.4)	11.3 (9.55-13.6)	13.2 (11.0-16.2)	15.3 (12.4-19.2)	17.5 (13.8-22.7)	20.7 (15.7-27.9)	23.4 (17.1-32.6)
20-day	4.96 (4.39-5.71)	6.73 (5.95-7.77)	9.15 (8.07-10.6)	11.2 (9.79-13.1)	14.1 (11.9-17.0)	16.4 (13.6-20.1)	18.8 (15.2-23.7)	21.4 (16.9-27.7)	25.0 (18.9-33.7)	28.0 (20.5-39.0)
30-day	5.81 (5.15-6.70)	7.95 (7.03-9.17)	10.8 (9.53-12.5)	13.2 (11.5-15.4)	16.5 (14.0-19.9)	19.1 (15.9-23.5)	21.9 (17.7-27.5)	24.7 (19.5-32.0)	28.7 (21.7-38.7)	31.9 (23.4-44.4)
45-day	7.00 (6.19-8.06)	9.59 (8.48-11.1)	13.0 (11.5-15.1)	15.8 (13.8-18.5)	19.7 (16.7-23.7)	22.7 (18.8-27.9)	25.8 (20.9-32.5)	29.0 (22.9-37.5)	33.4 (25.3-45.0)	36.9 (27.0-51.4)
60-day	8.18 (7.24-9.43)	11.2 (9.90-12.9)	15.1 (13.3-17.5)	18.3 (16.0-21.4)	22.7 (19.2-27.3)	26.0 (21.6-32.0)	29.4 (23.8-37.0)	32.9 (26.0-42.6)	37.7 (28.5-50.8)	41.4 (30.3-57.7)

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

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

Please refer to NOAA Atlas 14 document for more information.

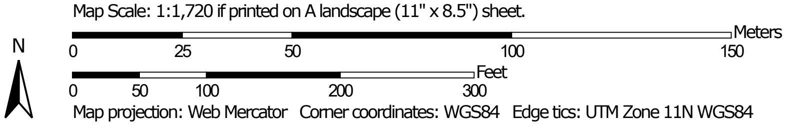
Back to Top

PF graphical

APPENDIX G

HYDROLOGIC SOIL GROUP

Map Scale: 1:1,720 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 14, Sep 13, 2021

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

Date(s) aerial images were photographed: Nov 15, 2020—Nov 19, 2020

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
RaB2	Ramona sandy loam, 2 to 5 percent slopes, eroded	C	0.9	8.4%
RaC2	Ramona sandy loam, 5 to 8 percent slopes, eroded	C	6.3	57.7%
RaE3	Ramona sandy loam, 15 to 25 percent slopes, severely eroded	C	1.9	17.8%
TvC	Tujunga loamy sand, channeled, 0 to 8 percent slopes	A	1.8	16.2%
Totals for Area of Interest			**10.9**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

EXHIBIT A

EXISTING CONDITION HYDROLOGY MAP (RATIONAL METHOD)

TRIBUTARY AREA MAP

PRE-DEVELOPMENT
BEAUMONT VILLAGE - PROPOSED COMMERCIAL RETAIL CENTER
APN 404-190-001 & 003
NORTHWEST CORNER OF BEAUMONT AVENUE & OAK VALLEY PARKWAY
CITY OF BEAUMONT

LEGAL DESCRIPTION

PARCEL C AS SHOWN ON LOT LINE ADJUSTMENT NO. 07-LLA-02 AS EVIDENCED BY DOCUMENT RECORDED OCTOBER 29, 2007 AS INSTRUMENT NO. 07-663184 OF OFFICIAL RECORDS, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

THAT PORTION OF THE SOUTH HALF OF THE SOUTHWEST QURTER OF THE SOUTHWEST QUARTER OF SECTION 34, IN TOWNSHIP 2 SOUTH, RANGE 1 WEST, SAN BERNARDINO BASE AND MERIDIAN ACCORDING TO THE OFFICIAL PLAT THEREOF, IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF THE SOUTHWEST QUARTER OF SAID SECTION 34 AS SHOWN ON PARCEL MAP NO. 26229, PM 173/21, RECORDS OF RIVERSIDE COUNTY;

THENCE NORTH 00°49'05" EAST 657 FEET ALONG THE WEST LINE OF SAID SECTION 34 TO THE NORTH LINE OF THE NORTH HALF OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 34;

THENCE EASTERLY ALONG THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 34, NORTH 89°42'10" EAST 840.87 FEET TO THE TRUE POINT OF BEGINNING.

THENCE CONTINUING EASTERLY ALONG SAID NORTH LINE, NORTH 89°42'10" EAST 482.81 FEET TO THE EAST LINE OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 34;
THENCE SOUTHERLY ALONG THE EAST LINE OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 34, SOUTH 00°46'11" WEST 208.71 FEET;

THENCE NORTH 89°42'10" EAST 35.34 FEET TO A LINE 50 FEET WEST AND PARALLEL TO THE CENTER LINE OF BEAUMONT AVENUE AS SHOWN ON PARCEL MAP NO. 26229, PM 173/21;

THENCE SOUTHERLY ALONG SAID PARALLEL LINE, SOUTH 00°14'51" EAST 371.32 FEET;

THENCE SOUTH 36°12'03" WEST 28.49 FEET TO A LINE 55 FEET NORTH AND PARALLEL TO THE CENTER LINE OF FOURTEENTH STREET, FOURTEENTH STREET CENTERLINE BEING THE SOUTH LINE OF SAID SECTION 34;

THENCE WESTERLY ALONG SAID PARALLEL LINE, SOUTH 89°43'07" WEST 970.14 FEET TO THE SOUTHWEST CORNER OF PARCEL 1 OF PARCEL MAP NO. 26229, PM 173/21;

THENCE NORTHEASTERLY ALONG THE WEST LINE OF SAID PARCEL 1, NORTH 37°50'21" EAST 766.17 FEET TO THE TRUE POINT OF BEGINNING.

EXISTING EASEMENTS

NO KNOWN EASEMENTS PER TITLE REPORT DATED 08/29/2019 BY NORTH AMERICAN TITLE COMPANY.

UTILITIES:

ELECTRIC:
SOUTHERN CALIFORNIA EDISON COMPANY
287 TENNESSEE STREET
REDLANDS, CA 92373
(909) 307-6788

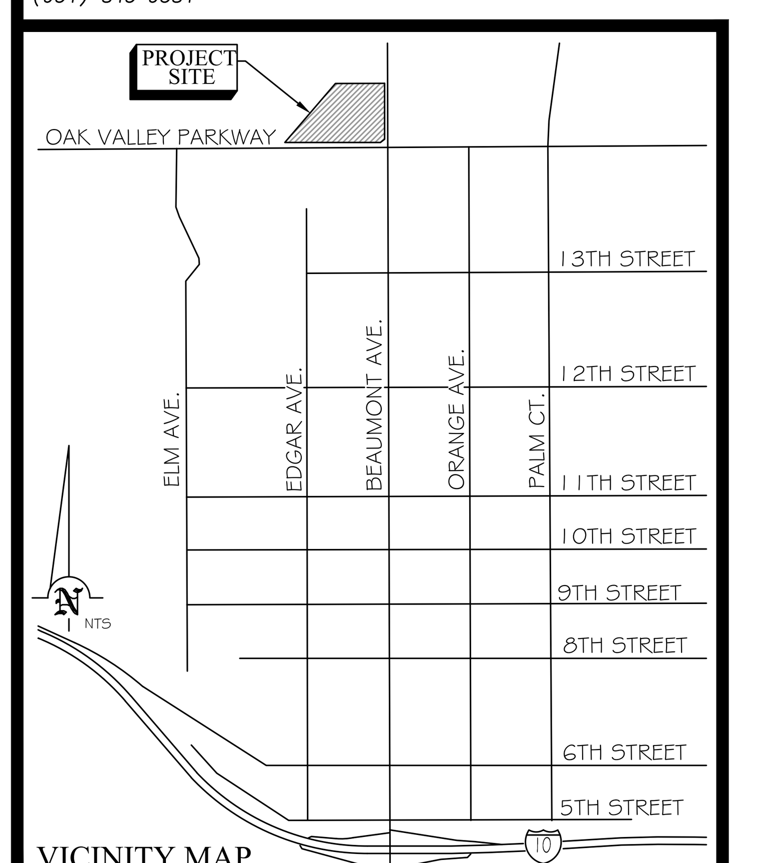
TELEPHONE:
VERIZON
9 S. 4TH STREET
REDLANDS, CA 92373
(909) 748-6640

WATER:
BEAUMONT-CHERRY VALLEY WATER DISTRICT
560 MAGNOLIA AVENUE
BEAUMONT, CA 92223
(951) 845-9581

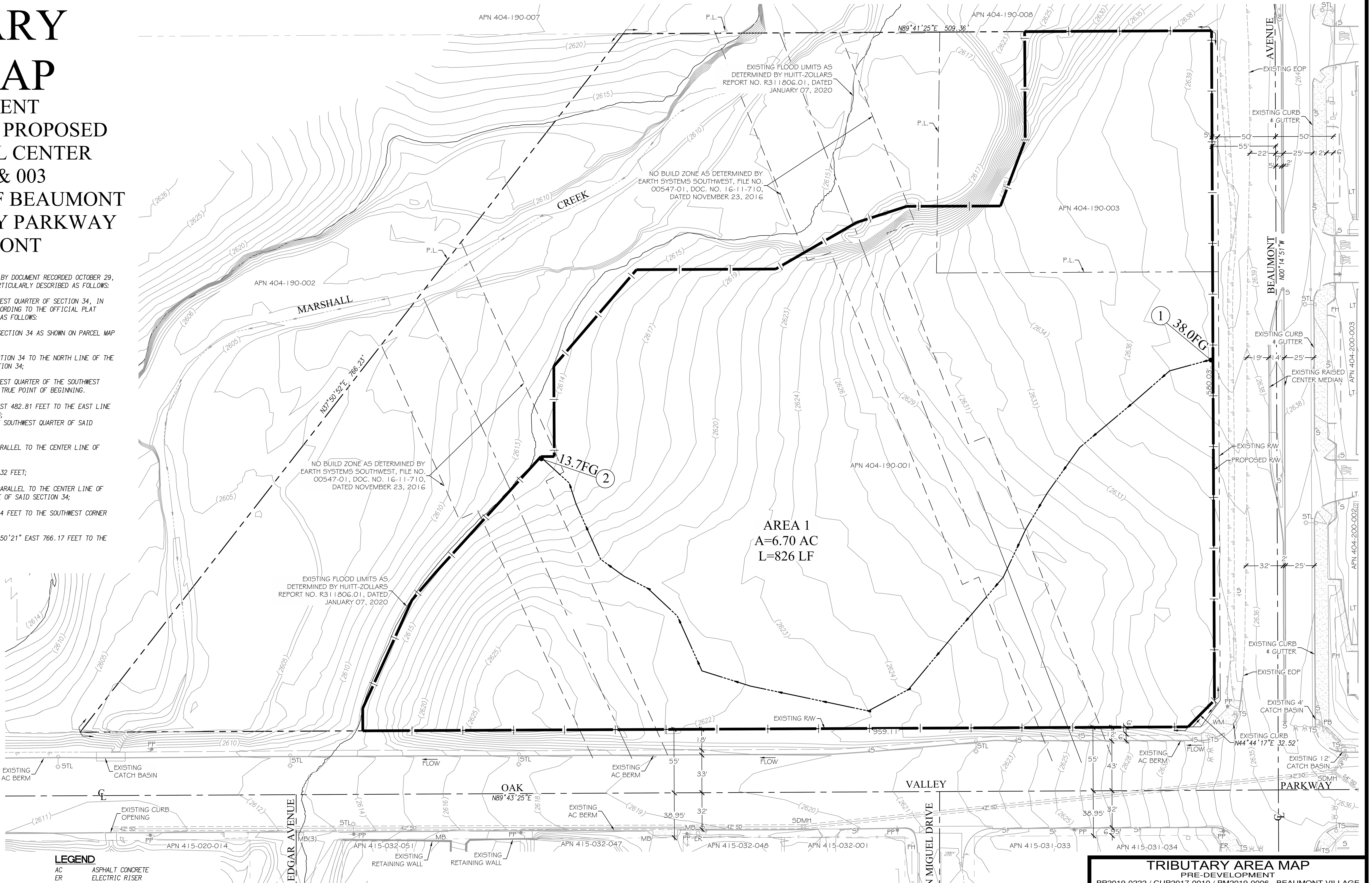
GAS:
SOUTHERN CALIFORNIA GAS COMPANY
1981 WEST LUGONIA AVENUE
REDLANDS, CA 92373
(909) 335-7836

CABLE:
CHARTER COMMUNICATIONS
1500 AUTO CENTER DRIVE
ONTARIO, CA 91761
(909) 634-3224

SEWER:
CITY OF BEAUMONT
550 E. 6TH STREET
BEAUMONT, CA 92223
(951) 769-8518



VICINITY MAP



LEGEND

AC	ASPHALT CONCRETE
ER	ELECTRIC RISER
EX	EXISTING
FH	FIRE HYDRANT
LT	LIGHT
PB	PULL BOX
PCC	PORTLAND CEMENT CONCRETE
P.L.	PROPERTY LINE
R/W	RIGHT-OF-WAY
S	SIGN
SDMH	STORM DRAIN MANHOLE
STL	STREET LIGHT
TS	TRAFFIC SIGNAL
TYP	TYPICAL
	EXISTING PCC

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

LEGEND

1 ELEV.	NODE # & ELEV.
L=165'	FLOWLINE LENGTH
A=1.44 AC	SUB AREA
	FLOWLINE
	TRIBUTARY BOUNDARY
	OVERFLOW

SOURCE OF SURVEY

TOPOGRAPHIC SURVEY
DATED NOVEMBER 2017
AS CONDUCTED BY
INLAND AERIAL SURVEYS, INC.
7117 ARLINGTON AVE., SUITE A
RIVERSIDE, CA 92503
PHONE: (951) 687-4252

SOIL ENGINEER

REPORT DATED APRIL 7, 2020
PROJECT NO. 13627-1
AS CONDUCTED BY
LOR GEOTECHNICAL GROUP, INC.
6121 QUAIL VALLEY COURT
RIVERSIDE, CA 92507
PHONE: (951) 653-1760
FAX: (951) 653-1741

SOURCE OF FLOOD LIMITS

REPORT DATED JANUARY 7, 2020
PROJECT NO. R311806.01
AS CONDUCTED BY
HUITT-ZOLLARS, INC.
2603 MAIN STREET, SUITE 400
IRVINE, CA 92614
PHONE: (949) 988-5815
FAX: (949) 988-5820

SOURCE OF NO BUILD ZONE

REPORT DATED NOVEMBER 23, 2016
FILE NO. 00547-01, DOC. NO. 16-11-710
AS CONDUCTED BY
EARTH SYSTEMS SOUTHWEST
1680 ILLINOIS AVE, SUITE 20
PERRIS, CA 92571
PHONE: (951) 928-9799
FAX: (951) 928-9948

EXHIBIT 'A'

PROPERTY OWNER/APPLICANT:

SANTIAGO HOLDINGS, LLC
C/O CAMDEN HOLDINGS, LLC
ATTN: MR. ARI MILLER
9454 WILSHIRE BLVD., 6TH FLOOR
BEVERLY HILLS, CA 90212
(310) 553-1031

TRIBUTARY AREA MAP

PRE-DEVELOPMENT
PP2019-0222 / CUP2017-0010 / PM2019-0006 - BEAUMONT VILLAGE
PROPOSED COMMERCIAL RETAIL CENTER
APN 404-190-001 & 003
NORTHWEST CORNER OF BEAUMONT
AVENUE & OAK VALLEY PARKWAY
CITY OF BEAUMONT

CASC
Engineering and Consulting
1470 EAST COOLEY DRIVE
COLTON, CA 92324
PH. (909) 783-0101 FAX (909) 783-0108

REGISTERED PROFESSIONAL ENGINEER
PATRICK C. FLANAGAN JR.
NO. C 086046
CIVIL
STATE OF CALIFORNIA

Patrick C. Flanagan, Jr. R.C.E. 86046 Exp. Sep 30, 2024

Job Number:	Date Prepared:	Drawn By:	Reference Number:
1512-0001	9/5/23	RL	1512-0001 HYDROLOGY

EXHIBIT B

PROPOSED CONDITION HYDROLOGY MAP (RATIONAL METHOD)

TRIBUTARY AREA MAP

POST-DEVELOPMENT
BEAUMONT VILLAGE - PROPOSED COMMERCIAL RETAIL CENTER
APN 404-190-001 & 003
NORTHWEST CORNER OF BEAUMONT AVENUE & OAK VALLEY PARKWAY
CITY OF BEAUMONT

LEGAL DESCRIPTION

PARCEL C AS SHOWN ON LOT LINE ADJUSTMENT NO. 07-LLA-02 AS EVIDENCED BY DOCUMENT RECORDED OCTOBER 29, 2007 AS INSTRUMENT NO. 07-663184 OF OFFICIAL RECORDS, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

THAT PORTION OF THE SOUTH HALF OF THE SOUTHWEST QURTER OF THE SOUTHWEST QUARTER OF SECTION 34, IN TOWNSHIP 2 SOUTH, RANGE 1 WEST, SAN BERNARDINO BASE AND MERIDIAN ACCORDING TO THE OFFICIAL PLAT THEREOF, IN THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

BEGINNING AT THE SOUTHWEST CORNER OF THE SOUTHWEST QUARTER OF SAID SECTION 34 AS SHOWN ON PARCEL MAP NO. 26229, PM 173/21, RECORDS OF RIVERSIDE COUNTY;

THENCE NORTH 00°49'05" EAST 657 FEET ALONG THE WEST LINE OF SAID SECTION 34 TO THE NORTH LINE OF THE NORTH HALF OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SECTION 34;

THENCE EASTERLY ALONG THE NORTH LINE OF THE SOUTH HALF OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 34, NORTH 89°42'10" EAST 840.87 FEET TO THE TRUE POINT OF BEGINNING.

THENCE CONTINUING EASTERLY ALONG SAID NORTH LINE, NORTH 89°42'10" EAST 482.81 FEET TO THE EAST LINE OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 34;
THENCE SOUTHERLY ALONG THE EAST LINE OF THE SOUTHWEST QUARTER OF THE SOUTHWEST QUARTER OF SAID SECTION 34, SOUTH 00°46'11" WEST 208.71 FEET;

THENCE NORTH 89°42'10" EAST 35.34 FEET TO A LINE 50 FEET WEST AND PARALLEL TO THE CENTER LINE OF BEAUMONT AVENUE AS SHOWN ON PARCEL MAP NO. 26229, PM 173/21;

THENCE SOUTHERLY ALONG SAID PARALLEL LINE, SOUTH 00°14'51" EAST 371.32 FEET;

THENCE SOUTH 36°12'03" WEST 28.49 FEET TO A LINE 55 FEET NORTH AND PARALLEL TO THE CENTER LINE OF FOURTEENTH STREET, FOURTEENTH STREET CENTERLINE BEING THE SOUTH LINE OF SAID SECTION 34;

THENCE WESTERLY ALONG SAID PARALLEL LINE, SOUTH 89°43'07" WEST 970.14 FEET TO THE SOUTHWEST CORNER OF PARCEL 1 OF PARCEL MAP NO. 26229, PM 173/21;

THENCE NORTHEASTERLY ALONG THE WEST LINE OF SAID PARCEL 1, NORTH 37°50'21" EAST 766.17 FEET TO THE TRUE POINT OF BEGINNING.

EXISTING EASEMENTS

NO KNOWN EASEMENTS PER TITLE REPORT DATED 08/29/2019 BY NORTH AMERICAN TITLE COMPANY.

UTILITIES:

ELECTRIC:
SOUTHERN CALIFORNIA EDISON COMPANY
287 TENNESSEE STREET
REDLANDS, CA 92373
(909) 307-6788

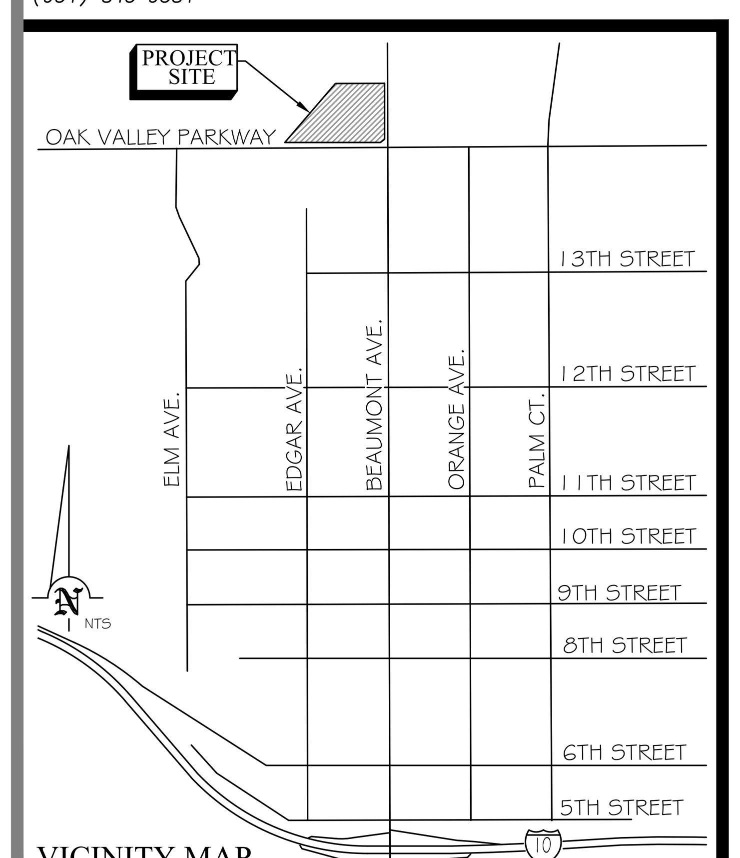
TELEPHONE:
VERIZON
9 S. 4TH STREET
REDLANDS, CA 92373
(909) 748-6640

WATER:
BEAUMONT-CHERRY VALLEY WATER DISTRICT
560 MAGNOLIA AVENUE
BEAUMONT, CA 92223
(951) 845-9581

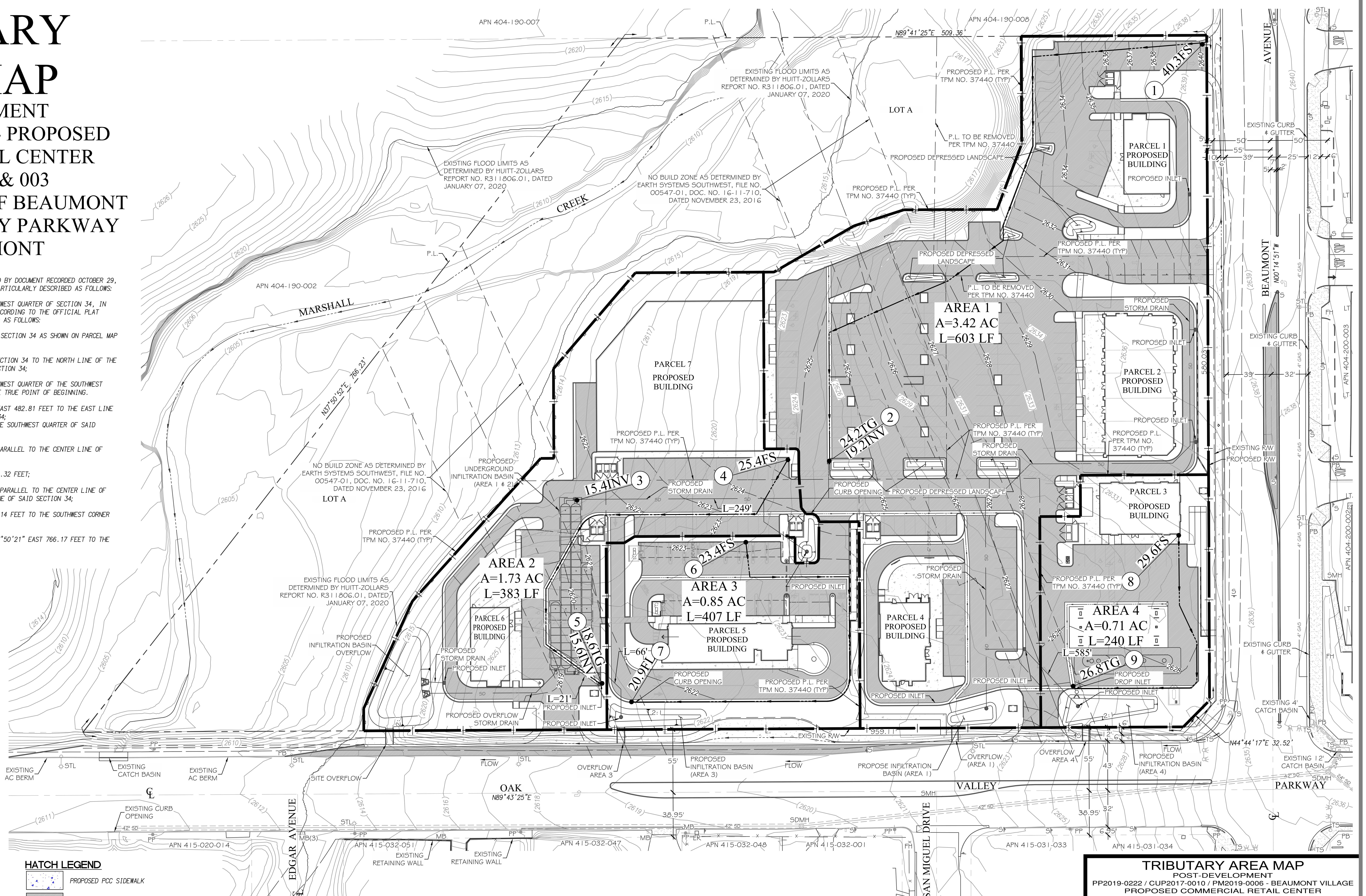
GAS:
SOUTHERN CALIFORNIA GAS COMPANY
1981 WEST LUGONIA AVENUE
REDLANDS, CA 92373
(909) 335-7836

CABLE:
CHARTER COMMUNICATIONS
1500 AUTO CENTER DRIVE
ONTARIO, CA 91761
(909) 634-3224

SEWER:
CITY OF BEAUMONT
550 E. 6TH STREET
BEAUMONT, CA 92223
(951) 769-8518



VICINITY MAP



HATCH LEGEND

PROPOSED PCC SIDEWALK
PROPOSED AC
EXISTING PCC PAVING

LEGEND

AC	ASPHALT CONCRETE
ER	ELECTRIC RISER
EX	EXISTING
FH	FIRE HYDRANT
LT	LIGHT
PB	PULL BOX
PCC	PORTLAND CEMENT CONCRETE
P.L.	PROPERTY LINE
R/W	RIGHT-OF-WAY
S	SIGN
SDMH	STORM DRAIN MANHOLE
STL	STREET LIGHT
TS	TRAFFIC SIGNAL
TYP	TYPICAL

GRAPHIC SCALE
40 0 20 40 80
1" = 40'

LEGEND

1 ELEV.	NODE # & ELEV.
L=165'	FLOWLINE LENGTH
A=1.44 AC	SUB AREA
	FLOWLINE
	TRIBUTARY BOUNDARY
	OVERFLOW

SOURCE OF SURVEY

TOPOGRAPHIC SURVEY
DATED NOVEMBER 2017
AS CONDUCTED BY
INLAND AERIAL SURVEYS, INC.
7117 ARLINGTON AVE., SUITE A
RIVERSIDE, CA 92503
PHONE: (951) 687-4252

SOIL ENGINEER

REPORT DATED APRIL 7, 2020
PROJECT NO. 13627-1
AS CONDUCTED BY
LOR GEOTECHNICAL GROUP, INC.
6121 QUAIL VALLEY COURT
RIVERSIDE, CA 92507
PHONE: (951) 653-1760
FAX: (951) 653-1741

SOURCE OF FLOOD LIMITS

REPORT DATED JANUARY 7, 2020
PROJECT NO. R311806.01
AS CONDUCTED BY
HUITT-ZOLLARS, INC.
2603 MAIN STREET, SUITE 400
IRVINE, CA 92614
PHONE: (949) 988-5815
FAX: (949) 988-5820

SOURCE OF NO BUILD ZONE

REPORT DATED NOVEMBER 23, 2016
FILE NO. 00547-01, DOC. NO. 16-11-710
AS CONDUCTED BY
EARTH SYSTEMS SOUTHWEST
1680 ILLINOIS AVE, SUITE 20
PERRIS, CA 92571
PHONE: (951) 928-9799
FAX: (951) 928-9948

FIGURE 5.2

PROPERTY OWNER/APPLICANT:

SANTIAGO HOLDINGS, LLC
C/O CAMDEN HOLDINGS, LLC
ATTN: MR. ARI MILLER
9454 WILSHIRE BLVD., 6TH FLOOR
BEVERLY HILLS, CA 90212
(310) 553-1031

TRIBUTARY AREA MAP

POST-DEVELOPMENT
PP2019-0222 / CUP2017-0010 / PM2019-0006 - BEAUMONT VILLAGE
PROPOSED COMMERCIAL RETAIL CENTER
APN 404-190-001 & 003
NORTHWEST CORNER OF BEAUMONT AVENUE & OAK VALLEY PARKWAY
CITY OF BEAUMONT

CASC
Engineering and Consulting
1470 EAST COOLEY DRIVE
COLTON, CA 92324
PH. (909) 783-0101 FAX (909) 783-0108

REGISTERED PROFESSIONAL ENGINEER
PATRICK C. FLANAGAN JR.
NO. C 086046
CIVIL
STATE OF CALIFORNIA

Patrick C. Flanagan, Jr. R.C.E. 86046 Exp. Sep 30, 2024

Job Number:	Date Prepared:	Drawn By:	Reference Number:
1512-0001	5/3/22	RL	1512-0001 HYDROLOGY

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section G of the WQMP Template):

1. Review Column 1 and identify which of these potential sources of stormwater pollutants apply to your site. Check each box that applies.
2. Review Column 2 and incorporate all of the corresponding applicable BMPs in your WQMP Exhibit.
3. Review Columns 3 and 4 and incorporate all of the corresponding applicable permanent controls and operational BMPs in your WQMP. Use the format shown in Table G.1on page 23 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ A. **On-site storm drain inlets**	❑ **Locations of 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 site owners, lessees, or operators.** ❑ **See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** ❑ **Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."**
❑ B. **Interior floor drains and elevator shaft sump pumps**		❑ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.**	❑ **Inspect and maintain drains to prevent blockages and overflow.**
❑ C. **Interior parking garages**		❑ **State that parking garage floor drains will be plumbed to the sanitary sewer.**	❑ **Inspect and maintain drains to prevent blockages and overflow.**

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☐ D1. **Need for future indoor & structural pest control**		☐ **Note building design features that discourage entry of pests.**	☐ **Provide Integrated Pest Management information to owners, lessees, and operators.**
☒ D2. **Landscape/ Outdoor Pesticide Use**	☐ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.** ☐ **Show self-retaining landscape areas, if any.** ☐ **Show stormwater treatment and hydrograph modification management BMPs. (See instructions in Chapter 3, Step 5 and guidance in Chapter 5.)**	**State that final landscape plans will accomplish all of the following.** ☐ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.** ☐ **Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to 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 insure 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"** at http://rcflood.org/stormwater/**Error! Hyperlink reference not valid.** ☐ **Provide IPM information to new owners, lessees and operators.**

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ E. **Pools, spas, ponds, decorative fountains, and other water features.**	❑ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)**	**If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.**	❑ **See applicable operational BMPs in** "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/
☒ F. **Food service**	❑ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.** ❑ **On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.**	❑ **Describe the location and features of the designated cleaning area.** ❑ **Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.**	❑ **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**	❑ **Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas.** ❑ **If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area.** ❑ **Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.**	❑ **State how site refuse will be handled and provide supporting detail to what is shown on plans.** ❑ **State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.**	❑ **State how the following will be implemented:** **Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ H. **Industrial processes.**	❑ **Show process area.**	❑ **If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."**	❑ **See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)**	❑ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.** ❑ **Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults.** ❑ **Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.**	**Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains.** **Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:** ▪ **Hazardous Waste Generation** ▪ **Hazardous Materials Release Response and Inventory** ▪ **California Accidental Release (CalARP)** ▪ **Aboveground Storage Tank** ▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991** ▪ **Underground Storage Tank** **www.cchealth.org/groups/hazmat/**	❑ **See the Fact Sheets SC-31, “Outdoor Liquid Container Storage” and SC-33, “Outdoor Storage of Raw Materials ” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ J. **Vehicle and Equipment Cleaning**	❑ **Show on drawings as appropriate:** **(1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses.** **(2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use).** **(3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer.** **(4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.**	❑ **If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.**	**Describe operational measures to implement the following (if applicable):** ❑ **Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system.** 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/ ❑**Car dealerships and similar may rinse cars with water only.**

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ K. **Vehicle/Equipment Repair and Maintenance**	❑ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.** ❑ **Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas.** ❑ **Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.**	❑ **State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area.** ❑ **State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.** ❑ **State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.**	**In the Stormwater Control Plan, note that all of the following restrictions apply to use the site:** ❑ **No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains.** ❑ **No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately.** ❑ **No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment.** Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations". Brochure can be found at http://rcflood.org/stormwater/ 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/

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ L. **Fuel Dispensing Areas**	❑ **Fueling areas[6] 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. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.**		❑ **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**

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

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
❑ M. **Loading Docks**	❑ **Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer.** ❑ **Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation.** ❑ **Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.**		❑ **Move loaded and unloaded items indoors as soon as possible.** ❑ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☐ N. **Fire Sprinkler Test Water**		☐ **Provide a means to drain fire sprinkler test water to the sanitary sewer.**	☐ **See the note in Fact Sheet SC-41, “Building and Grounds Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**
O. **Miscellaneous Drain or Wash Water or Other Sources** ☐ **Boiler drain lines** ☒ **Condensate drain lines** ☐ **Rooftop equipment** ☐ **Drainage sumps** ☒ **Roofing, gutters, and trim.** ☐ **Other sources**		☐ **Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system.** ☒ **Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system.** ☐ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.** ☐ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.** ☒ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.** ☐ **Include controls for other sources as specified by local reviewer.**	

STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 Potential Sources of Runoff Pollutants	2 Permanent Controls—Show on WQMP Drawings	3 Permanent Controls—List in WQMP Table and Narrative	4 Operational BMPs—Include in WQMP Table and Narrative
☒ P. **Plazas, sidewalks, and parking lots.**			☐ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.**

Appendix 9: O&M

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

To be completed in Final WQMP.

Appendix 10: Educational Materials

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

For Information:

For more information on the General Industrial Storm Water Permit contact:

State Water Resources Control Board (SWRCB)
(916) 657-1146 or www.swrcb.ca.gov/ or, at your Regional Water Quality Control Board (RWQCB).

Santa Ana Region (8)
California Tower
3737 Main Street, Ste. 500
Riverside, CA 92501-3339
(909) 782-4130

San Diego Region (9)
9771 Clairemont Mesa Blvd., Ste. A
San Diego, CA 92124
(619) 467-2952

Colorado River Basin Region (7)
73-720 Fred Waring Dr., Ste. 100
Palm Desert, CA 92260
(760) 346-7491

SPILL RESPONSE AGENCY:

HAZ-MAT:	(909) 358-5055
HAZARDOUS WASTE DISPOSAL:	(909) 358-5055
RECYCLING INFORMATION:	1-800-366-SAVE
TO REPORT ILLEGAL DUMPING OR A CLOGGED STORM DRAIN:	1-800-506-2555

To order additional brochures or to obtain information on other pollution prevention activities, call:
(909) 955-1111.

StormWater CleanWater
PROTECTION PROGRAM

Riverside County gratefully acknowledges the State Water Quality Control Board and the American Public Works Association, Storm Water Quality Task Force for the information provided in this brochure.

DID YOU KNOW . . .

YOUR FACILITY MAY NEED A STORM WATER PERMIT?

Many industrial facilities and manufacturing operations must obtain coverage under the Industrial Activities Storm Water General Permit

FIND OUT
IF YOUR FACILITY MUST OBTAIN A PERMIT

StormWater Pollution . . . What you should know

Riverside County has two drainage systems - sanitary sewers and storm drains. The storm drain system is designed to help prevent flooding by carrying excess rainwater away from streets. Since the storm drain system does not provide for water treatment, it also serves the *unintended* function of transporting pollutants directly to our waterways.

Unlike sanitary sewers, storm drains are not connected to a treatment plant - they flow directly to our local streams, rivers and lakes.

In recent years, awareness of the need to protect water quality has increased. As a result, federal, state, and local programs have been established to reduce polluted stormwater discharges to our waterways. The emphasis of these programs is to prevent stormwater pollution since it's much easier, and less costly, than cleaning up "after the fact."

National Pollutant Discharge Elimination System (NPDES)

In 1987, the Federal Clean Water Act was amended to establish a framework for regulating industrial stormwater discharges under the NPDES permit program. In California, NPDES permits are issued by the State Water Resources Control Board (SWRCB) and the nine (9) Regional Water Quality Control Boards (RWQCB). In general, certain industrial facilities and manufacturing operations must obtain coverage under the Industrial Activities Storm Water General Permit if the type of facilities or operations falls into one of the several categories described in this brochure.

How Do I Know If I Need A Permit?

Following are ***general descriptions*** of the industry categories types that are regulated by the Industrial Activities Storm Water General Permit. Contact your local Region Water Quality Control Board to determine if your facility/operation requires coverage under the Permit.

➜ Facilities such as cement manufacturing; feedlots; fertilizer manufacturing; petroleum refining; phosphate manufacturing; steam electric power generation; coal mining; mineral mining and processing; ore mining and dressing; and asphalt emulsion;

➜ Facilities classified as lumber and wood products (except wood kitchen cabinets); pulp, paper, and paperboard mills; chemical producers (except some pharmaceutical and biological products); petroleum and coal products; leather production and products; stone, clay and glass products; primary metal industries; fabricated structural metal; ship and boat building and repairing;

➜ Active or inactive mining operations and oil and gas exploration, production, processing, or treatment operations;

➜ Hazardous waste treatment, storage, or disposal facilities;

➜ Landfills, land application sites and open dumps that receive or have received any industrial waste; unless there is a new overlying land use such as a golf course, park, etc., and there is no discharge associated with the landfill;

➜ Facilities involved in the recycling of materials, including metal scrap yards, battery reclaimers, salvage yards, and automobile junkyards;

➜ Steam electric power generating facilities, facilities that generate steam for electric power by combustion;

➜ Transportation facilities that have vehicle maintenance shops, fueling facilities, equipment cleaning operations, or airport deicing operations. This includes school bus maintenance facilities operated by a school district;

➜ Sewage treatment facilities;

➜ Facilities that have areas where material handling equipment or activities, raw materials, intermediate products, final products, waste materials, by-products, or industrial machinery are exposed to storm water.

How do I obtain coverage under the Industrial Activities Storm Water General Permit?

Obtain a permit application package from your local Regional Water Quality Control Board listed on the back of this brochure or the State Water Resources Control Board (SWRCB). Submit a completed Notice of Intent (NOI) form, site map and the appropriate fee ($250 or $500) to the SWRCB. Facilities must submit an NOI thirty (30) days prior to beginning operation. Once you submit the NOI, the State Board will send you a letter acknowledging receipt of your NOI and will assign your facility a waste discharge identification number (WDID No.). You will also receive an annual fee billing. These billings should roughly coincide with the date the State Board processed your original NOI submittal.

What are the requirements of the Industrial Activities Storm Water General Permit?

The basic requirements of the Permit are:

1. The facility must eliminate any non-stormwater discharges or obtain a separate permit for such discharges.

2. The facility must develop and implement a Storm Water Pollution Prevention Plan (SWPPP). The SWPPP must identify sources of pollutants that may be exposed to stormwater. Once the sources of pollutants have been identified, the facility operator must develop and implement Best Management Practices (BMPs) to minimize or prevent polluted runoff.

   Guidance in preparing a SWPPP is available from a document prepared by the California Storm Water Quality Task Force called the California Storm Water Best Management Practice Handbook.

3. The facility must develop and implement a Monitoring Program that includes conducting visual observations and collecting samples of the facility's storm water discharges associated with industrial activity. The General Permit requires that the analysis be conducted by a laboratory that is certified by the State of California.

4. The facility must submit to the Regional Board, every July 1, an annual report that includes the results of its monitoring program.

A Non-Storm Water Discharge is... *any discharge to a storm drain system that is not composed entirely of storm water. The following non-storm water discharges are authorized by the General Permit: fire hydrant flushing; potable water sources, including potable water related to the operation, maintenance, or testing of potable water systems; drinking fountain water; atmospheric condensates including refrigeration, air conditioning, and compressor condensate; irrigation drainage; landscape watering; springs; non-contaminated ground water; foundation or footing drainage; and sea water infiltration where the sea waters are discharged back into the sea water source.*

A BMP is . . . *a technique, process, activity, or structure used to reduce the pollutant content of a storm water discharge. BMPs may include simple, non-structural methods such as good housekeeping, staff training and preventive maintenance. Additionally, BMPs may include structural modifications such as the installation of berms, canopies or treatment control (e.g. setting basins, oil/water separators, etc.)*

WARNING*: There are significant penalties for non-compliance: a minimum fine of $5,000 for failing to obtain permit coverage, and, up to $10,000 per day, per violation plus $10 per gallon of discharge in excess of 1,000 gallons.*

Riverside County Stormwater Program Members

City of Banning
(951) 922-3105

City of Beaumont
(951) 769-8520

City of Calimesa
(909) 795-9801

City of Canyon Lake
(951) 244-2955

City of Cathedral City
(760) 770-0340

City of Coachella
(760) 398-3502

City of Corona
(951) 736-2447

City of Desert Hot Springs
(760) 329-6411

City of Eastvale
(951) 361-0900

City of Hemet
(951) 765-2300

City of Indian Wells
(760) 346-2489

City of Indio
(760) 391-4000

City of Jurupa Valley
(951) 332-6464

City of Lake Elsinore
(951) 674-3124

City of La Quinta
(760) 777-7000

City of Menifee
(951) 672-6777

City of Moreno Valley
(951) 413-3000

City of Murrieta
(951) 304-2489

City of Norco
(951) 270-5607

City of Palm Desert
(760) 346-0611

City of Palm Springs
(760) 323-8299

City of Perris
(951) 943-6100

City of Rancho Mirage
(760) 324-4511

City of Riverside
(951) 826-5311

City of San Jacinto
(951) 487-7330

City of Temecula
(951) 694-6444

City of Wildomar
(951) 677-7751

Coachella Valley Water District
(760) 398-2651

County of Riverside
(951) 955-1000

Riverside County Flood Control District
(951) 955-1200

Stormwater Pollution

What you should know for...

Industrial & Commercial Facilities

Best Management Practices (BMPS) for:

- Industrial Facilities
- Commercial Facilities

YOU can prevent Stormwater Pollution following these practices...

Industrial and Commercial Facilities

The Riverside County Stormwater Program has identified a number of Best Management Practices (BMPs) for Industrial and Commercial Facilities. These BMPs control and reduce stormwater pollutants from reaching our storm drain system and ultimately our local water bodies. City and County ordinances require businesses to use these BMPs to protect our water quality. Local cities and the County are required to verify implementation of these BMPs by performing regular facility inspections.

Prohibited Discharges

Discontinue all non-stormwater discharges to the storm drain system. It is *prohibited* to discharge any chemicals, paints, debris, wastes or wastewater into the gutter, street or storm drain.

Outdoor Storage BMPs

- Install covers and secondary containment areas for all hazardous materials and wastes stored outdoors in accordance with County and/or City standards.
- Keep all temporary waste containers covered, at all times when not in use.
- Sweep outdoor areas instead of using a hose or pressure washer.
- Move all process operations including vehicle/equipment maintenance inside of the building or under a covered and contained area.
- Wash equipment and vehicles in a contained and covered wash bay which is closed-loop or connected to a clarifier sized to local standards and discharged to a sanitary sewer or take them to a commercial car wash.

Spills and Clean Up BMPs

- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep up the area.
- Clean up spills immediately when they occur, using dry clean up methods such as absorbent materials or sweep followed by proper disposal of materials.
- Always have a spill kit available near chemical loading dock doors and vehicle maintenance and fueling areas.
- Follow your Business Emergency Plan, as filed with the local Fire Department.
- Report all prohibited discharges and non-implementation of BMPs to your local Stormwater Coordinator as listed on the back of this pamphlet.
- Report hazardous materials spills to 951-358-5055 or call after hours to 951-782-2973 or, if an emergency, call the Fire Department's Haz Mat Team at 911.

Plastic Manufacturing Facilities BMPs

AB 258 requires plastic product manufacturers to use BMPs, such as safe storage and clean-up procedures to prevent plastic pellets (nurdles) from entering the waterway. The plastic pellets are released into the environment during transporting, packaging and processing and migrate to waterways through the storm drain system. AB 258 will help protect fish and wildlife from the hazards of plastic pollution.

Training BMPs

As prescribed by your City and County Stormwater Ordinance(s), train employees in spill procedures and prohibit non-stormwater discharges to the storm drain system. Applicable BMP examples can be found at www.cabmphandbooks.com.

Permitting

Stormwater discharges associated with specific categories for industrial facilities are regulated by the State Water Resources Control Board through an Industrial Stormwater General Permit. A copy of this General Permit and application forms are available at: www.waterboards.ca.gov, select stormwater then the industrial quick link.

To report illegal dumping or for more information on stormwater pollution prevention call: 1-800-506-2555 or e-mail us at: fcnpdes@rcflood.org.

Helpful telephone numbers and links:

Riverside County Stormwater Protection Partners

Flood Control District	(951) 955-1200
County of Riverside	(951) 955-1000
City of Banning	(951) 922-3105
City of Beaumont	(951) 769-8520
City of Calimesa	(909) 795-9801
City of Canyon Lake	(951) 244-2955
Cathedral City	(760) 770-0327
City of Coachella	(760) 398-4978
City of Corona	(951) 736-2447
City of Desert Hot Springs	(760) 329-6411
City of Eastvale	(951) 361-0900
City of Hemet	(951) 765-2300
City of Indian Wells	(760) 346-2489
City of Indio	(760) 391-4000
City of Lake Elsinore	(951) 674-3124
City of La Quinta	(760) 777-7000
City of Menifee	(951) 672-6777
City of Moreno Valley	(951) 413-3000
City of Murrieta	(951) 304-2489
City of Norco	(951) 270-5607
City of Palm Desert	(760) 346-0611
City of Palm Springs	(760) 323-8299
City of Perris	(951) 943-6100
City of Rancho Mirage	(760) 324-4511
City of Riverside	(951) 361-0900
City of San Jacinto	(951) 654-7337
City of Temecula	(951) 694-6444
City of Wildomar	(951) 677-7751

REPORT ILLEGAL STORM DRAIN DISPOSAL
1-800-506-2555 or e-mail us at
fcnpdes@rcflood.org

- Riverside County Flood Control and Water Conservation District
  www.rcflood.org

Online resources include:

- California Storm Water Quality Association
  www.casqa.org
- State Water Resources Control Board
  www.waterboards.ca.gov
- Power Washers of North America
  www.thepwna.org

Stormwater Pollution

What you should know for...

Outdoor Cleaning Activities and Professional Mobile Service Providers

Storm drain pollution prevention information for:

- Car Washing / Mobile Detailers
- Window and Carpet Cleaners
- Power Washers
- Waterproofers / Street Sweepers
- Equipment cleaners or degreasers and all mobile service providers

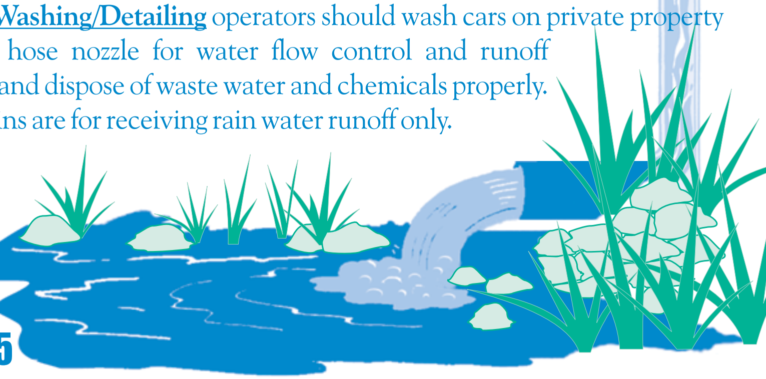
Do you know where street flows actually go?

Storm drains are NOT connected to sanitary sewer systems and treatment plants!

The primary purpose of storm drains is to carry *rain* water away from developed areas to prevent flooding. Pollutants discharged to storm drains are transported directly into rivers, lakes and streams. Soaps, degreasers, automotive fluids, litter and a host of materials are washed off buildings, sidewalks, plazas and parking areas. Vehicles and equipment must be properly managed to prevent the pollution of local waterways.

Unintentional spills by mobile service operators can flow into storm drains and pollute our waterways. **Avoid mishaps.** *Always* have a **Spill Response Kit** on hand to clean up unintentional spills. Only emergency **Mechanical** repairs should be done in City streets, using drip pans for spills. **Plumbing** should be done on private property. Always store chemicals in a leak-proof container and keep covered when not in use. **Window/Power Washing** waste water shouldn't be released into the streets, but should be disposed of in a sanitary sewer, landscaped area or in the soil. Soiled **Carpet Cleaning** wash water should be filtered before being discharged into the sanitary sewer. Dispose of all filter debris properly. **Car Washing/Detailing** operators should wash cars on private property and use a regulated hose nozzle for water flow control and runoff prevention. Capture and dispose of waste water and chemicals properly. Remember, storm drains are for receiving rain water runoff only.

REPORT ILLEGAL STORM DRAIN DISPOSAL 1-800-506-2555



Help Protect Our Waterways!

Use these guidelines for Outdoor Cleaning Activities and Wash Water Disposal

Did you know that disposing of pollutants into the street, gutter, storm drain or body of water is *PROHIBITED* by law and can result in stiff penalties?

Best Management Practices

Waste wash water from Mechanics, Plumbers, Window/Power Washers, Carpet Cleaners, Car Washing and Mobile Detailing activities may contain significant quantities of motor oil, grease, chemicals, dirt, detergents, brake pad dust, litter and other materials.

Best Management Practices, or BMPs as they are known, are guides to prevent pollutants from entering the storm drains. ***Each of us*** can do our part to keep stormwater clean by using the suggested BMPs below:

Simple solutions for both light and heavy duty jobs:

Do...consider dry cleaning methods first such as a mop, broom, rag or wire brush. Always keep a spill response kit on site.

Do...prepare the work area before power cleaning by using sand bags, rubber mats, vacuum booms, containment pads or temporary berms to keep wash water away from the gutters and storm drains.

Do...use vacuums or other machines to remove and collect loose debris or litter before applying water.

Do...obtain the property owner's permission to dispose of ***small amounts*** of power washing waste water on to landscaped, gravel or unpaved surfaces.

Do...check your local sanitary sewer agency's policies on wash water disposal regulations before disposing of wash water into the sewer. (See list on reverse side)

Do...be aware that if discharging to landscape areas, soapy wash water may damage landscaping. Residual wash water may remain on paved surfaces to evaporate. Sweep up solid residuals and dispose of properly. Vacuum booms are another option for capturing and collecting wash water.

Do...check to see if local ordinances prevent certain activities.

Do not let...wash or waste water from sidewalk, plaza or building cleaning go into a street or storm drain.

Report illegal storm drain disposal
Call Toll Free
1-800-506-2555

Using Cleaning Agents

Try using biodegradable/phosphate-free products. They are easier on the environment, but don't confuse them with being toxic free. Soapy water entering the storm drain system can impact the delicate aquatic environment.

When cleaning surfaces with a ***high-pressure washer*** or ***steam cleaner***, additional precautions should be taken to prevent the discharge of pollutants into the storm drain system. These two methods of surface cleaning can loosen additional material that can contaminate local waterways.

Think Water Conservation

Minimize water use by using high pressure, low volume nozzles. Be sure to check all hoses for leaks. Water is a precious resource, don't let it flow freely and be sure to shut it off in between uses.

Screening Wash Water

Conduct thorough dry cleanup before washing exterior surfaces, such as buildings and decks ***with loose paint***, sidewalks or plaza areas. Keep debris from entering the storm drain after cleaning by first passing the wash water through a "20 mesh" or finer screen to catch the solid materials, then dispose of the mesh in a refuse container. Do not let the remaining wash water enter a street, gutter or storm drain.

Drain Inlet Protection & Collection of Wash Water

- Prior to any washing, block all storm drains with an impervious barrier such as sandbags or berms, or seal the storm drain with plugs or other appropriate materials.
- Create a containment area with berms and traps or take advantage of a low spot to keep wash water contained.
- Wash vehicles and equipment on grassy or gravel areas so that the wash water can seep into the ground.
- Pump or vacuum up all wash water in the contained area.

Concrete/Coring/Saw Cutting and Drilling Projects

Protect any down-gradient inlets by using dry activity techniques whenever possible. If water is used, minimize the amount of water used during the coring/drilling or saw cutting process. Place a barrier of sandbags and/or absorbent berms to protect the storm drain inlet or watercourse. Use a shovel or wet vacuum to remove the residue from the pavement. Do not wash residue or particulate matter into a storm drain inlet or watercourse.

After the Storm

A Citizen's Guide to Understanding Stormwater

WHEN IT RAINS IT DRAINS

For more information contact:

or visit

www.epa.gov/npdes/stormwater

www.epa.gov/nps

EPA United States Environmental Protection Agency

EPA 833-B-03-002

January 2003

Internet Address (URL) • HTTP://www.epa.gov
Recycled/Recyclable • Printed With Vegetable Oil Based Inks on 100% Postconsumer, Process Chlorine Free Recycled Paper

THE YEAR OF CLEAN WATER Celebration & Commitment

What is stormwater runoff?

Stormwater runoff occurs when precipitation from rain or snowmelt flows over the ground. Impervious surfaces like driveways, sidewalks, and streets prevent stormwater from naturally soaking into the ground.

Why is stormwater runoff a problem?

Stormwater can pick up debris, chemicals, dirt, and other pollutants and flow into a storm sewer system or directly to a lake, stream, river, wetland, or coastal water. Anything that enters a storm sewer system is discharged untreated into the waterbodies we use for swimming, fishing, and providing drinking water.

The effects of pollution

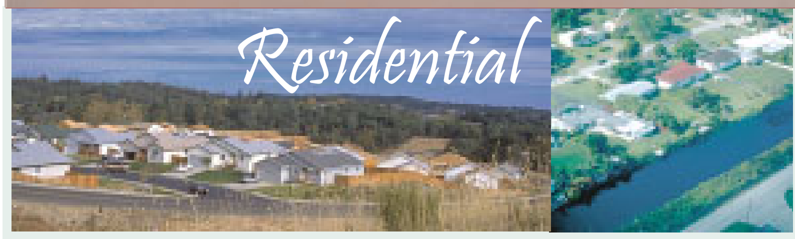
Polluted stormwater runoff can have many adverse effects on plants, fish, animals, and people.

- Sediment can cloud the water and make it difficult or impossible for aquatic plants to grow. Sediment also can destroy aquatic habitats.
- Excess nutrients can cause algae blooms. When algae die, they sink to the bottom and decompose in a process that removes oxygen from the water. Fish and other aquatic organisms can't exist in water with low dissolved oxygen levels.
- Bacteria and other pathogens can wash into swimming areas and create health hazards, often making beach closures necessary.
- Debris—plastic bags, six-pack rings, bottles, and cigarette butts—washed into waterbodies can choke, suffocate, or disable aquatic life like ducks, fish, turtles, and birds.
- Household hazardous wastes like insecticides, pesticides, paint, solvents, used motor oil, and other auto fluids can poison aquatic life. Land animals and people can become sick or die from eating diseased fish and shellfish or ingesting polluted water.

- Polluted stormwater often affects drinking water sources. This, in turn, can affect human health and increase drinking water treatment costs.

Stormwater Pollution Solutions

Education is essential to changing people's behavior. Signs and markers near storm drains warn residents that pollutants entering the drains will be carried untreated into a local waterbody.



Residential

Recycle or properly dispose of household products that contain chemicals, such as insecticides, pesticides, paint, solvents, and used motor oil and other auto fluids. Don't pour them onto the ground or into storm drains.

Lawn care

Excess fertilizers and pesticides applied to lawns and gardens wash off and pollute streams. In addition, yard clippings and leaves can wash into storm drains and contribute nutrients and organic matter to streams.

- Don't overwater your lawn. Consider using a soaker hose instead of a sprinkler.
- Use pesticides and fertilizers sparingly. When use is necessary, use these chemicals in the recommended amounts. Use organic mulch or safer pest control methods whenever possible.
- Compost or mulch yard waste. Don't leave it in the street or sweep it into storm drains or streams.
- Cover piles of dirt or mulch being used in landscaping projects.

Auto care

Washing your car and degreasing auto parts at home can send detergents and other contaminants through the storm sewer system. Dumping automotive fluids into storm drains has the same result as dumping the materials directly into a waterbody.

- Use a commercial car wash that treats or recycles its wastewater, or wash your car on your yard so the water infiltrates into the ground.
- Repair leaks and dispose of used auto fluids and batteries at designated drop-off or recycling locations.

Septic systems

Leaking and poorly maintained septic systems release nutrients and pathogens (bacteria and viruses) that can be picked up by stormwater and discharged into nearby waterbodies. Pathogens can cause public health problems and environmental concerns.

- Inspect your system every 3 years and pump your tank as necessary (every 3 to 5 years).
- Don't dispose of household hazardous waste in sinks or toilets.

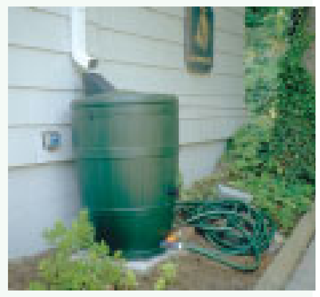
Pet waste

Pet waste can be a major source of bacteria and excess nutrients in local waters.

- When walking your pet, remember to pick up the waste and dispose of it properly. Flushing pet waste is the best disposal method. Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into local waterbodies.

Residential landscaping

Permeable Pavement—Traditional concrete and asphalt don't allow water to soak into the ground. Instead these surfaces rely on storm drains to divert unwanted water. Permeable pavement systems allow rain and snowmelt to soak through, decreasing stormwater runoff.



Rain Barrels—You can collect rainwater from rooftops in mosquito-proof containers. The water can be used later on lawn or garden areas.

Rain Gardens and Grassy Swales—Specially designed areas planted with native plants can provide natural places for rainwater to collect and soak into the ground. Rain from rooftop areas or paved areas can be diverted into these areas rather than into storm drains.

Vegetated Filter Strips—Filter strips are areas of native grass or plants created along roadways or streams. They trap the pollutants stormwater picks up as it flows across driveways and streets.

Commercial

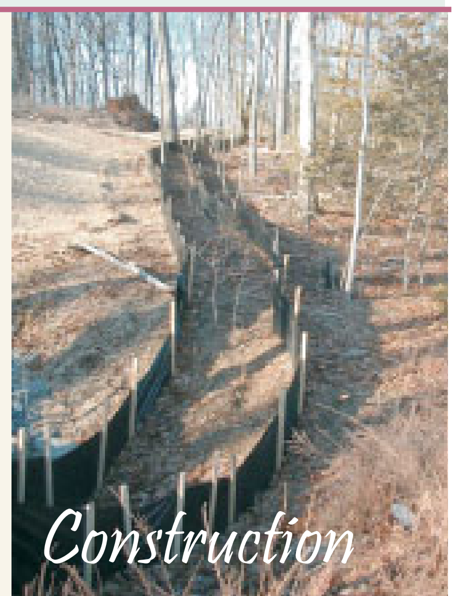
Dirt, oil, and debris that collect in parking lots and paved areas can be washed into the storm sewer system and eventually enter local waterbodies.

- Sweep up litter and debris from sidewalks, driveways and parking lots, especially around storm drains.
- Cover grease storage and dumpsters and keep them clean to avoid leaks.
- Report any chemical spill to the local hazardous waste cleanup team. They'll know the best way to keep spills from harming the environment.

Construction

Erosion controls that aren't maintained can cause excessive amounts of sediment and debris to be carried into the stormwater system. Construction vehicles can leak fuel, oil, and other harmful fluids that can be picked up by stormwater and deposited into local waterbodies.

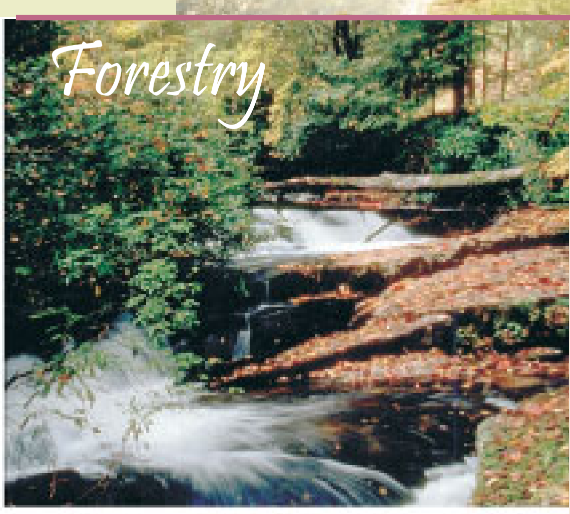
- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install silt fences, vehicle mud removal areas, vegetative cover, and other sediment and erosion controls and properly maintain them, especially after rainstorms.
- Prevent soil erosion by minimizing disturbed areas during construction projects, and seed and mulch bare areas as soon as possible.



Agriculture

Lack of vegetation on streambanks can lead to erosion. Overgrazed pastures can also contribute excessive amounts of sediment to local waterbodies. Excess fertilizers and pesticides can poison aquatic animals and lead to destructive algae blooms. Livestock in streams can contaminate waterways with bacteria, making them unsafe for human contact.

- Keep livestock away from streambanks and provide them a water source away from waterbodies.
- Store and apply manure away from waterbodies and in accordance with a nutrient management plan.
- Vegetate riparian areas along waterways.
- Rotate animal grazing to prevent soil erosion in fields.
- Apply fertilizers and pesticides according to label instructions to save money and minimize pollution.

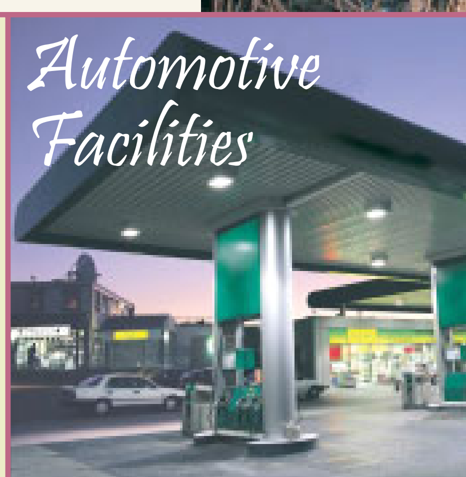


Forestry

Improperly managed logging operations can result in erosion and sedimentation.

- Conduct preharvest planning to prevent erosion and lower costs.
- Use logging methods and equipment that minimize soil disturbance.
- Plan and design skid trails, yard areas, and truck access roads to minimize stream crossings and avoid disturbing the forest floor.
- Construct stream crossings so that they minimize erosion and physical changes to streams.
- Expedite revegetation of cleared areas.

Automotive Facilities



Uncovered fueling stations allow spills to be washed into storm drains. Cars waiting to be repaired can leak fuel, oil, and other harmful fluids that can be picked up by stormwater.

- Clean up spills immediately and properly dispose of cleanup materials.
- Provide cover over fueling stations and design or retrofit facilities for spill containment.
- Properly maintain fleet vehicles to prevent oil, gas, and other discharges from being washed into local waterbodies.
- Install and maintain oil/water separators.

IRRIGATION RUNOFF

STORMWATER FACT SHEET

RIVERSIDE COUNTY
WATERSHED PROTECTION

Report Irrigation Runoff or Stormwater Pollution:
800.506.2555

OVERWATERING

Overwatering causes irrigation runoff that may contain pollutants such as pesticides, herbicides, fertilizers, pet waste, yard waste, and sediments which can be hazardous to residents and harmful to our environment. Runoff can also serve as a transport mechanism for other pollutants already on the ground or in the curb gutter. Irrigation runoff entering the storm drain system is an illicit discharge.

BEST PRACTICES

Urban runoff begins when yards and landscaped areas are over-irrigated. Irrigation systems require regular maintenance and visual inspection of the system should be performed to prevent over-spray, leaks, and other problems that result in runoff to storm drains, curbs and gutters.

You can **prevent pollution** by conserving water on your property. Water during cooler times of the day (before 10am and after 6pm).

- Adjust sprinklers to stop overspray and runoff.
- Make needed repairs immediately.
- Use drip irrigation, soaker hoses, or micro-spray systems.
- Use an irrigation timer to pre-set watering times.
- Use a control nozzle or similar mechanism when watering by hand.
- Switch to a water-wise landscape - native plants need less fertilizers, herbicides, pesticides and water.

PROTECT OUR WATERSHED

Many people think that when water flows into a storm drain it is treated, but the storm drain system and the sanitary sewer system are not connected. Everything that enters storm drains flows untreated directly into our creeks, rivers, lakes, beaches and ultimately the ocean. Storm water often contains pollutants, including chemicals, trash, and automobile fluids, all of which pollute our watershed and harm fish and wildlife.

Whether at home or work, you can help reduce pollution and improve water quality by using the above Best Management Practices (BMP's) as part of your daily clean up and maintenance routine.

Fueling Areas

SD-30

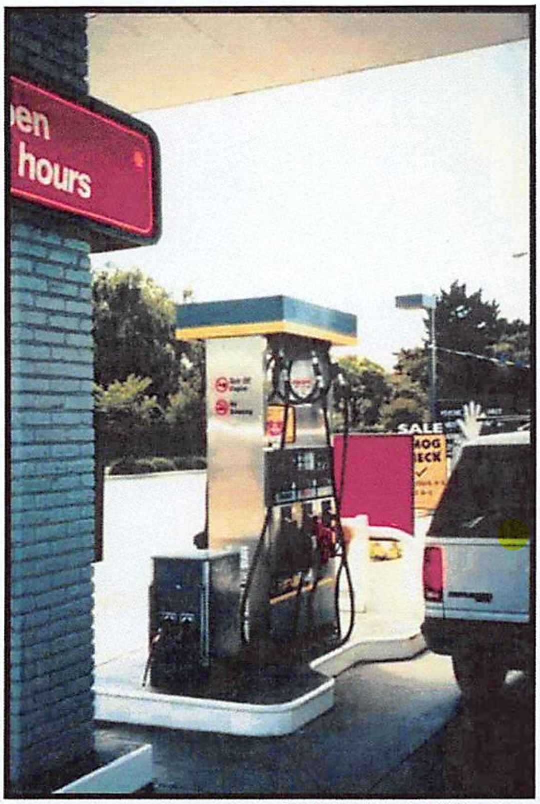


Photo Credit: Geoff Brosseau

Design Objectives

- ☐ Maximize Infiltration
- ☐ Provide Retention
- ☐ Slow Runoff
- ☐ Minimize Impervious Land Coverage
- ☐ Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- ☑ Collect and Convey

Description

Fueling areas have the potential to contribute oil and grease, solvents, car battery acid, coolant and gasoline to the stormwater conveyance system. Spills at vehicle and equipment fueling areas can be a significant source of pollution because fuels contain toxic materials and heavy metals that are not easily removed by stormwater treatment devices.

Approach

Project plans must be developed for cleaning near fuel dispensers, emergency spill cleanup, containment, and leak prevention.

Suitable Applications

Appropriate applications include commercial, industrial, and any other areas planned to have fuel dispensing equipment, including retail gasoline outlets, automotive repair shops, and major non-retail dispensing areas.

Design Considerations

Design requirements for fueling areas are governed by Building and Fire Codes and by current local agency ordinances and zoning requirements. Design requirements described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements.

Designing New Installations

Covering

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

Fuel dispensing areas should provide an overhanging roof structure or canopy. The cover's minimum dimensions must be equal to or greater than the area within the grade break. The cover must not drain onto the fuel dispensing area and the downspouts must be routed to prevent drainage across the fueling area. The fueling area should drain to the project's treatment control BMP(s) prior to discharging to the stormwater conveyance system. Note - If fueling large equipment or vehicles that would prohibit the use of covers or roofs, the fueling island should be designed to sufficiently accommodate the larger vehicles and equipment and to prevent stormwater run-on and runoff. Grade to direct stormwater to a dead-end sump.

Surfacing

Fuel dispensing areas should be paved with Portland cement concrete (or equivalent smooth impervious surface). The use of asphalt concrete should be prohibited. Use asphalt sealant to protect asphalt paved areas surrounding the fueling area. This provision may be made to sites that have pre-existing asphalt surfaces.

The concrete fuel dispensing area should be extended a minimum of 6.5 ft from the corner of each fuel dispenser, or the length at which the hose and nozzle assembly may be operated plus 1 ft, whichever is less.

Grading/Contouring

Dispensing areas should have an appropriate slope to prevent ponding, and be separated from the rest of the site by a grade break that prevents run-on of urban runoff. (Slope is required to be 2 to 4% in some jurisdictions' stormwater management and mitigation plans.)

Fueling areas should be graded to drain toward a dead-end sump. Runoff from downspouts/roofs should be directed away from fueling areas. Do not locate storm drains in the immediate vicinity of the fueling area.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

- In the case of an emergency, provide storm drain seals, such as isolation valves, drain plugs, or drain covers, to prevent spills or contaminated stormwater from entering the stormwater conveyance system.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Alternative Building Materials SD-21

Design Objectives

☑ Maximize Infiltration

☑ Provide Retention

☑ Source Control

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

Contain Pollutant

Collect and Convey

Description

Alternative building materials are selected instead of conventional materials for new construction and renovation. These materials reduce potential sources of pollutants in stormwater runoff by eliminating compounds that can leach into runoff, reducing the need for pesticide application, reducing the need for painting and other maintenance, or by reducing the volume of runoff.

Approach

Alternative building materials are available for use as lumber for decking, roofing materials, home siding, and paving for driveways, decks, and sidewalks.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Decking

One of the most common materials for construction of decks and other outdoor construction has traditionally been pressure treated wood, which is now being phased out. The standard treatment is called CCA, for chromated copper arsenate. The key ingredients are arsenic (which kills termites, carpenter ants and other insects), copper (which kills the fungi that cause wood to rot) and chromium (which reacts with the other ingredients to bind them to the wood). The amount of arsenic is far from trivial. A deck just 8 feet x 10 feet contains more than 1 1/3 pounds of this highly potent poison. Replacement materials include a new type of pressure treated wood, plastic and composite lumber.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

There are currently over 20 products in the market consisting of plastic or plastic-wood composites. Plastic lumber is made from 100% recycled plastic, # 2 HDPE and polyethylene plastic milk jugs and soap bottles. Plastic-wood composites are a combination of plastic and wood fibers or sawdust. These materials are a long lasting exterior weather, insect, and chemical resistant wood lumber replacement for non structural applications. Use it for decks, docks, raised garden beds and planter boxes, pallets, hand railings, outdoor furniture, animal pens, boat decks, etc.

New pressure treated wood uses a much safer recipe, ACQ, which stands for ammoniacal copper quartenary. It contains no arsenic and no chromium. Yet the American Wood Preservers Association has found it to be just as effective as the standard formula. ACQ is common in Japan and Europe.

Roofing

Several studies have indicated that metal used as roofing material, flashing, or gutters can leach metals into the environment. The leaching occurs because rainfall is slightly acidic and slowly dissolved the exposed metals. Common traditional applications include copper sheathing and galvanized (zinc) gutters.

Coated metal products are available for both roofing and gutter applications. These products eliminate contact of bare metal with rainfall, eliminating one source of metals in runoff. There are also roofing materials made of recycled rubber and plastic that resemble traditional materials.

A less traditional approach is the use of green roofs. These roofs are not just green, they're alive. Planted with grasses and succulents, low- profile green roofs reduce the urban heat island effect, stormwater runoff, and cooling costs, while providing wildlife habitat and a connection to nature for building occupants. These roofs are widely used on industrial facilities in Europe and have been established as experimental installations in several locations in the US, including Portland, Oregon. Their feasibility is questionable in areas of California with prolonged, dry, hot weather.

Paved Areas

Traditionally, concrete is used for construction of patios, sidewalks, and driveways. Although it is non-toxic, these paved areas reduce stormwater infiltration and increase the volume and rate of runoff. This increase in the amount of runoff is the leading cause of stream channel degradation in urban areas.

There are a number of alternative materials that can be used in these applications, including porous concrete and asphalt, modular blocks, and crushed granite. These materials, especially modular paving blocks, are widely available and a well established method to reduce stormwater runoff.

Building Siding

Wood siding is commonly used on the exterior of residential construction. This material weathers fairly rapidly and requires repeated painting to prevent rotting. Alternative "new" products for this application include cement-fiber and vinyl. Cement-fiber siding is a masonry product made from Portland cement, sand, and cellulose and will not burn, cup, swell, or shrink.

Pesticide Reduction
A common use of powerful pesticides is for the control of termites. Chlordane was used for many years for this purpose and is now found in urban streams and lakes nationwide. There are a number of physical barriers that can be installed during construction to help reduce the use of pesticides.

Sand barriers for subterranean termites are a physical deterrent because the termites cannot tunnel through it. Sand barriers can be applied in crawl spaces under pier and beam foundations, under slab foundations, and between the foundation and concrete porches, terraces, patios and steps. Other possible locations include under fence posts, underground electrical cables, water and gas lines, telephone and electrical poles, inside hollow tile cells and against retaining walls.

Metal termite shields are physical barriers to termites which prevent them from building invisible tunnels. In reality, metal shields function as a helpful termite detection device, forcing them to build tunnels on the outside of the shields which are easily seen. Metal termite shields also help prevent dampness from wicking to adjoining wood members which can result in rot, thus making the material more attractive to termites and other pests. Metal flashing and metal plates can also be used as a barrier between piers and beams of structures such as decks, which are particularly vulnerable to termite attack.

Redeveloping Existing Installations
Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of "redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources
There are no good, independent, comprehensive sources of information on alternative building materials for use in minimizing the impacts of stormwater runoff. Most websites or other references to "green" or "alternative" building materials focus on indoor applications, such as formaldehyde free plywood and low VOC paints, carpets, and pads. Some supplemental information on alternative materials is available from the manufacturers.

Fires are a source of concern in many areas of California. Information on the flammability of alternative decking materials is available from the University of California Forest Product Laboratory (UCFPL) website at: http://www.ucfpl.ucop.edu/WDDeckIntro.htm

Storm Drain Signage

SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Roof Runoff Controls

Rain Garden

Design Objectives

☑ Maximize Infiltration

☑ Provide Retention

☑ Slow Runoff

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

☑ Contain Pollutants

Collect and Convey

Description

Various roof runoff controls are available to address stormwater that drains off rooftops. The objective is to reduce the total volume and rate of runoff from individual lots, and retain the pollutants on site that may be picked up from roofing materials and atmospheric deposition. Roof runoff controls consist of directing the roof runoff away from paved areas and mitigating flow to the storm drain system through one of several general approaches: cisterns or rain barrels; dry wells or infiltration trenches; pop-up emitters, and foundation planting. The first three approaches require the roof runoff to be contained in a gutter and downspout system. Foundation planting provides a vegetated strip under the drip line of the roof.

Approach

Design of individual lots for single-family homes as well as lots for higher density residential and commercial structures should consider site design provisions for containing and infiltrating roof runoff or directing roof runoff to vegetative swales or buffer areas. Retained water can be reused for watering gardens, lawns, and trees. Benefits to the environment include reduced demand for potable water used for irrigation, improved stormwater quality, increased groundwater recharge, decreased runoff volume and peak flows, and decreased flooding potential.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Designing New Installations

Cisterns or Rain Barrels

One method of addressing roof runoff is to direct roof downspouts to cisterns or rain barrels. A cistern is an above ground storage vessel with either a manually operated valve or a permanently open outlet. Roof runoff is temporarily stored and then released for irrigation or infiltration between storms. The number of rain

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

barrels needed is a function of the rooftop area. Some low impact developers recommend that every house have at least 2 rain barrels, with a minimum storage capacity of 1000 liters. Roof barrels serve several purposes including mitigating the first flush from the roof which has a high volume, amount of contaminants, and thermal load. Several types of rain barrels are commercially available. Consideration must be given to selecting rain barrels that are vector proof and childproof. In addition, some barrels are designed with a bypass valve that filters out grit and other contaminants and routes overflow to a soak-away pit or rain garden.

If the cistern has an operable valve, the valve can be closed to store stormwater for irrigation or infiltration between storms. This system requires continual monitoring by the resident or grounds crews, but provides greater flexibility in water storage and metering. If a cistern is provided with an operable valve and water is stored inside for long periods, the cistern must be covered to prevent mosquitoes from breeding.

A cistern system with a permanently open outlet can also provide for metering stormwater runoff. If the cistern outlet is significantly smaller than the size of the downspout inlet (say ¼ to ½ inch diameter), runoff will build up inside the cistern during storms, and will empty out slowly after peak intensities subside. This is a feasible way to mitigate the peak flow increases caused by rooftop impervious land coverage, especially for the frequent, small storms.

Dry wells and Infiltration Trenches

Roof downspouts can be directed to dry wells or infiltration trenches. A dry well is constructed by excavating a hole in the ground and filling it with an open graded aggregate, and allowing the water to fill the dry well and infiltrate after the storm event. An underground connection from the downspout conveys water into the dry well, allowing it to be stored in the voids. To minimize sedimentation from lateral soil movement, the sides and top of the stone storage matrix can be wrapped in a permeable filter fabric, though the bottom may remain open. A perforated observation pipe can be inserted vertically into the dry well to allow for inspection and maintenance.

In practice, dry wells receiving runoff from single roof downspouts have been successful over long periods because they contain very little sediment. They must be sized according to the amount of rooftop runoff received, but are typically 4 to 5 feet square, and 2 to 3 feet deep, with a minimum of 1-foot soil cover over the top (maximum depth of 10 feet).

To protect the foundation, dry wells must be set away from the building at least 10 feet. They must be installed in solids that accommodate infiltration. In poorly drained soils, dry wells have very limited feasibility.

Infiltration trenches function in a similar manner and would be particularly effective for larger roof areas. An infiltration trench is a long, narrow, rock-filled trench with no outlet that receives stormwater runoff. These are described under Treatment Controls.

Pop-up Drainage Emitter

Roof downspouts can be directed to an underground pipe that daylights some distance from the building foundation, releasing the roof runoff through a pop-up emitter. Similar to a pop-up irrigation head, the emitter only opens when there is flow from the roof. The emitter remains flush to the ground during dry periods, for ease of lawn or landscape maintenance.

Foundation Planting

Landscape planting can be provided around the base to allow increased opportunities for stormwater infiltration and protect the soil from erosion caused by concentrated sheet flow coming off the roof. Foundation plantings can reduce the physical impact of water on the soil and provide a subsurface matrix of roots that encourage infiltration. These plantings must be sturdy enough to tolerate the heavy runoff sheet flows, and periodic soil saturation.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Supplemental Information

Examples

- City of Ottawa's Water Links Surface –Water Quality Protection Program
- City of Toronto Downspout Disconnection Program
- City of Boston, MA, Rain Barrel Demonstration Program

Other Resources

Hager, Marty Catherine, Stormwater, "Low-Impact Development", January/February 2003. www.stormh2o.com

Low Impact Urban Design Tools, Low Impact Development Design Center, Beltsville, MD. www.lid-stormwater.net

Start at the Source, Bay Area Stormwater Management Agencies Association, 1999 Edition

Building & Grounds Maintenance SC-41

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	
Organics	

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

CASQA
California Stormwater Quality Association

- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.

- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Use mulch or other erosion control measures when soils are exposed.

- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.

- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.

- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.

- Do not use pesticides if rain is expected.

- Do not mix or prepare pesticides for application near storm drains.

- Use the minimum amount needed for the job.

- Calibrate fertilizer distributors to avoid excessive application.

- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.

- Apply pesticides only when wind speeds are low.

- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.

- Irrigate slowly to prevent runoff and then only as much as is needed.

- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.

- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.
- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.
- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.
- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.
- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

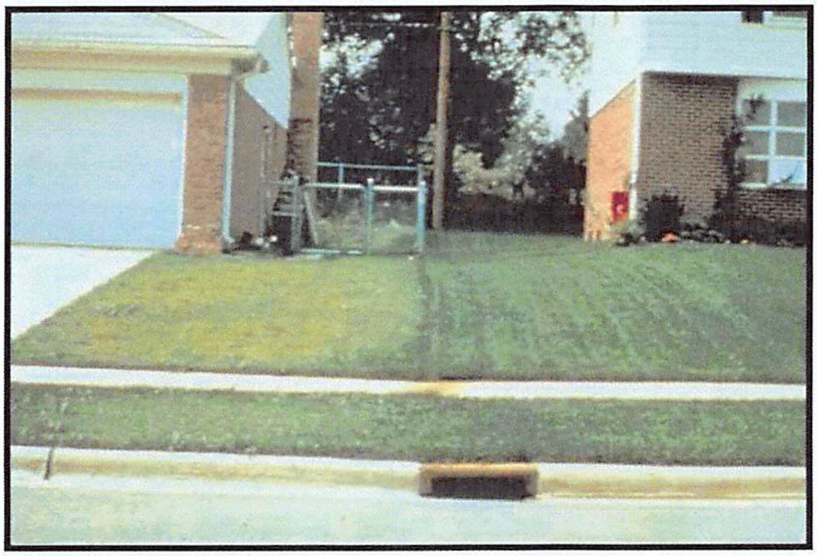
Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Efficient Irrigation SD-12



Design Objectives

☑ Maximize Infiltration

☑ Provide Retention

☑ Slow Runoff

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

Contain Pollutants

Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.

- Design irrigation systems to each landscape area's specific water requirements.

- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.

- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

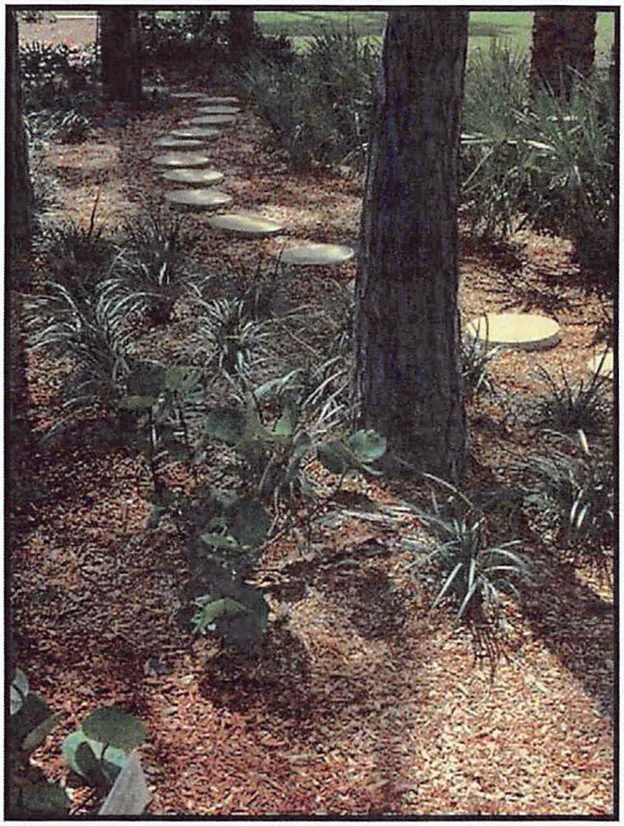
Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.



Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- ☑ Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Each project site possesses unique topographic, hydrologic, and vegetative features, some of which are more suitable for development than others. Integrating and incorporating appropriate landscape planning methodologies into the project design is the most effective action that can be done to minimize surface and groundwater contamination from stormwater.

Approach

Landscape planning should couple consideration of land suitability for urban uses with consideration of community goals and projected growth. Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for site design and landscapes planning should conform to applicable standards and specifications of agencies with jurisdiction and be consistent with applicable General Plan and Local Area Plan policies.

Designing New Installations

Begin the development of a plan for the landscape unit with attention to the following general principles:

- Formulate the plan on the basis of clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

- Map and assess land suitability for urban uses. Include the following landscape features in the assessment: wooded land, open unwooded land, steep slopes, erosion-prone soils, foundation suitability, soil suitability for waste disposal, aquifers, aquifer recharge areas, wetlands, floodplains, surface waters, agricultural lands, and various categories of urban land use. When appropriate, the assessment can highlight outstanding local or regional resources that the community determines should be protected (e.g., a scenic area, recreational area, threatened species habitat, farmland, fish run). Mapping and assessment should recognize not only these resources but also additional areas needed for their sustenance.

Project plan designs should conserve natural areas to the extent possible, maximize natural water storage and infiltration opportunities, and protect slopes and channels.

Conserve Natural Areas during Landscape Planning

If applicable, the following items are required and must be implemented in the site layout during the subdivision design and approval process, consistent with applicable General Plan and Local Area Plan policies:

- Cluster development on least-sensitive portions of a site while leaving the remaining land in a natural undisturbed condition.

- Limit clearing and grading of native vegetation at a site to the minimum amount needed to build lots, allow access, and provide fire protection.

- Maximize trees and other vegetation at each site by planting additional vegetation, clustering tree areas, and promoting the use of native and/or drought tolerant plants.

- Promote natural vegetation by using parking lot islands and other landscaped areas.

- Preserve riparian areas and wetlands.

Maximize Natural Water Storage and Infiltration Opportunities Within the Landscape Unit

- Promote the conservation of forest cover. Building on land that is already deforested affects basin hydrology to a lesser extent than converting forested land. Loss of forest cover reduces interception storage, detention in the organic forest floor layer, and water losses by evapotranspiration, resulting in large peak runoff increases and either their negative effects or the expense of countering them with structural solutions.

- Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Develop and implement policies and regulations to discourage the clearing, filling, and channelization of these features. Utilize them in drainage networks in preference to pipes, culverts, and engineered ditches.

- Evaluating infiltration opportunities by referring to the stormwater management manual for the jurisdiction and pay particular attention to the selection criteria for avoiding groundwater contamination, poor soils, and hydrogeological conditions that cause these facilities to fail. If necessary, locate developments with large amounts of impervious surfaces or a potential to produce relatively contaminated runoff away from groundwater recharge areas.

Protection of Slopes and Channels during Landscape Design

- Convey runoff safely from the tops of slopes.
- Avoid disturbing steep or unstable slopes.
- Avoid disturbing natural channels.
- Stabilize disturbed slopes as quickly as possible.
- Vegetate slopes with native or drought tolerant vegetation.
- Control and treat flows in landscaping and/or other controls prior to reaching existing natural drainage systems.
- Stabilize temporary and permanent channel crossings as quickly as possible, and ensure that increases in run-off velocity and frequency caused by the project do not erode the channel.
- Install energy dissipaters, such as riprap, at the outlets of new storm drains, culverts, conduits, or channels that enter unlined channels in accordance with applicable specifications to minimize erosion. Energy dissipaters shall be installed in such a way as to minimize impacts to receiving waters.
- Line on-site conveyance channels where appropriate, to reduce erosion caused by increased flow velocity due to increases in tributary impervious area. The first choice for linings should be grass or some other vegetative surface, since these materials not only reduce runoff velocities, but also provide water quality benefits from filtration and infiltration. If velocities in the channel are high enough to erode grass or other vegetative linings, riprap, concrete, soil cement, or geo-grid stabilization are other alternatives.
- Consider other design principles that are comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Redevelopment may present significant opportunity to add features which had not previously been implemented. Examples include incorporation of depressions, areas of permeable soils, and swales in newly redeveloped areas. While some site constraints may exist due to the status of already existing infrastructure, opportunities should not be missed to maximize infiltration, slow runoff, reduce impervious areas, disconnect directly connected impervious areas.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Stormwater Management Manual for Western Washington, Washington State Department of Ecology, August 2001.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Drainage System Maintenance SC-44

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	✓
Oil and Grease	
Organics	

CASQA California Stormwater Quality Association

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:

  - Immediate repair of any deterioration threatening structural integrity.

  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.

  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.

- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.

- Keep accurate logs of the number of catch basins cleaned.

- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.

- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System
- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.

- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations
- Clean all storm drain pump stations prior to the wet season to remove silt and trash.

- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.

- Conduct routine maintenance at each pump station.

- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel
- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.

- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges
- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:

  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?
- Record locations of apparent illegal discharges/illicit connections?
- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- Eliminate the discharge once the origin of flow is established.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Allow only properly trained individuals to handle hazardous materials/wastes.
- Have staff involved in detection and removal of illicit connections trained in the following:
  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).

- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.

- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.

- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.

- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.

- Regulations may include adoption of substantial penalties for illegal dumping and disposal.

- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.

- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:

  - Purchase and installation of signs.

  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.

  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.

  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm

Parking/Storage Area Maintenance SC-43

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

The goal of this program is to ensure stormwater pollution prevention practices are considered when conducting activities on or around parking areas and storage areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook)

- Keep accurate maintenance logs to evaluate BMP implementation.

CASQA California Stormwater Quality Association

Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel, and dispose of litter in the trash.

Surface Cleaning

- Use dry cleaning methods (e.g., sweeping, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- Follow the procedures below if water is used to clean surfaces:
  - Block the storm drain or contain runoff.
  - Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- Follow the procedures below when cleaning heavy oily deposits:
  - Clean oily spots with absorbent materials.
  - Use a screen or filter fabric over inlet, then wash surfaces.

- Do not allow discharges to the storm drain.
- Vacuum/pump discharges to a tank or discharge to sanitary sewer.
- Appropriately dispose of spilled materials and absorbents.

Surface Repair

- Preheat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.
- Cover and seal nearby storm drain inlets where applicable (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.
- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.
- Clean up fluid spills immediately with absorbent rags or material.
- Dispose of spilled material and absorbents properly.

Other Considerations

Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

Requirements

Costs

Cleaning/sweeping costs can be quite large. Construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot regularly to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities regularly to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Only use only as much water as is necessary for dust control to avoid runoff.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/