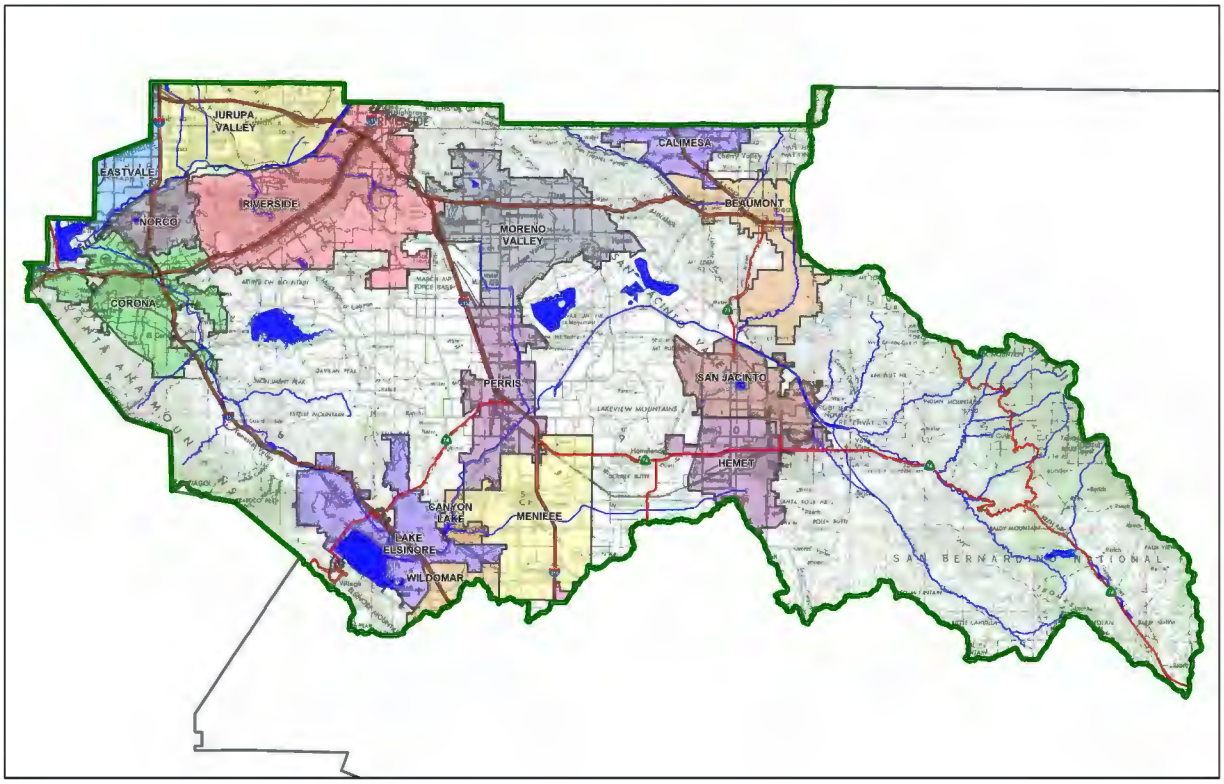
Project Specific Water Quality Management Plan

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

Project Title: SOLDAT OFFICE BUILDING PROJECT

Development No:

Design Review/Case No: PPT230008



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Prepared for Compliance with
Regional Board Order No. **R8-2010-0033**

OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for John Soldat by Carlos Pineda, P.E. for the Soldat Office Building project.

This WQMP is intended to comply with the requirements of the County of Riverside Ordinance No. 754 and 754.1 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 754 and 754.1 (Municipal Code Section 14.12.315).

"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
Carlos A. Pineda Preparer's Printed Name	Civil Engineer Preparer's Title/Position

Preparer's Licensure: R.C.E. No. C38639



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Section A: Project and Site Information

The Soldat Office Building Project Site consists of approximately 1.1 Acres. The proposed Soldat Office Building project will consist of a building with 4 stories, a 1st story parking garage and 3 stories of offices with a total gross conditioned space of 24,712 SF. The project provides a total of 96 parking spaces, 43 in the upper parking area and 53 in the lower parking area.

PROJECT INFORMATION		
Type of Project:	Office Building/Commercial	
Ward Area:	Temescal Valley	
Community Name:		
Development Name:	Soldat Office Building	
PROJECT LOCATION		
Latitude & Longitude (DMS): 33.80494 N, -117.50516 W		
Project Watershed and Sub-Watershed: Santa Ana; Santa Ana River, Reach ¾		
Gross Acreage: 1.07 Acres		
APN(s): 282-121-011-4		
Map Book and Page No.: 282-12		
PROJECT CHARACTERISTICS		
Proposed or Potential Land Use(s)	Office Building	
Proposed or Potential SIC Code(s)	1542	
Area of Impervious Project Footprint (SF)	43497.6	
Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement	43497.6	
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	
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)	B	
What is the Water Quality Design Storm Depth for the project?	0.85	

A.1 Maps and Site Plans

Appendix 1 includes a map of the local vicinity and existing site. In addition, WQMP Site Plan, located in Appendix 1, includes 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
- BMP Locations (Lat/Long)

A.2 Receiving Waters

In order of upstream to downstream, the receiving waters that the project site is tributary to are as follows. A map of the receiving waters is included in Appendix 1.

Table A.1 Identification of Receiving Waters

Receiving Waters	Hydrologic Unit	EPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Temescal Creek	4801.25	Metals, Pesticides, Nuisance	REC2	N/A
Santa Ana River, reach 3	801.21	Pathogens	AGR, GWR, RCE1, REC2, WARM, WILD, RARE, SPWN	N/A
Santa Ana River, reach 4	801.21	Pathogens	GWR, RCE1, REC2, WARM, WILD	N/A

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

Table A.2 Other Applicable Permits

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

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.

Does the project identify and preserve existing drainage patterns? If so, how? If not, why?

Yes, drainage patterns have been preserved by the existing drainage patterns towards the existing headwall located at the northeast corner of the project site. We have also accepted the tributary offsite discharges coming from the east of the project.

Does the project identify and protect existing vegetation? If so, how? If not, why?

No existing vegetation to protect.

Does the project identify and preserve natural infiltration capacity? If so, how? If not, why?

Yes, underground storage/infiltration pipes are being proposed to mitigate water quality impacts

Does the project identify and minimize impervious area? If so, how? If not, why?

To the greatest extent possible for the proposed office building use and required parking. Some landscape areas have been added to the site.

Does the project identify and disperse runoff to adjacent pervious areas? If so, how? If not, why?

Yes, stormwater runoff is directed to a pretreatment CDS unit and then discharge to underground storage /infiltration units where the DCV is treated and infiltrated, the overflows will be discharged to Temescal Canyon Road Storm Drain Line C-1

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)	Area (Sq. Ft.)	DMA Type
A/1	Landscape	1,076	Self-Treating
D/1	Roof	13,164	Drains to BMP
D/2	Concrete	30,826	Drains to BMP
D/3	Landscape	2,968	Drains to BMP

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

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
A/1	1,076	Landscape	Drip

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]
N/A						

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

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]
N/A							

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

DMA Name or ID	BMP Name or ID
D/1	Underground Storage/Infiltration
D/2	Underground Storage/Infiltration
D/3	Underground Storage/Infiltration

Section D: Implement LID BMPs

D.1 Infiltration Applicability

Is there an approved downstream 'Highest and Best Use' for stormwater runoff (ref: Chapter 2.4.4 of the WQMP Guidance Document)? ☐ 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 is required by the City of Riverside to confirm present and past site characteristics that may affect the use of Infiltration BMPs, see Appendix 3.

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

Infiltration Feasibility

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

Table D.1 Infiltration Feasibility

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

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs should not be used for those DMAs.

D.2 Harvest and Use Assessment

The following conditions apply*:*

☐ 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 (verified with the City of Riverside).

☒ The Design Capture Volume will be addressed using Infiltration Only BMPs. (Harvest and Use BMPs are still encouraged but are not required as the Design Capture Volume will be infiltrated or evapotranspiration).

☐ None of the above.

Harvest and Use BMPs need not be assessed for the site. If none 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), otherwise omit the following sections.

Irrigation Use Feasibility

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

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

Total Area of Irrigated Landscape: Insert Area (Acres)

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

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

Total Area of Impervious Surfaces: Insert Area (Acres)

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

The project EIATIA factor: 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: Insert Area (Acres)

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

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

Toilet Use Feasibility

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

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

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

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

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

Total Area of Impervious Surfaces: Insert Area (Acres)

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

The project TUTIA factor: 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: Required number of toilet users

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

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

Other Non-Potable Use Feasibility

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

Insert narrative description here.

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

Average Daily Demand: Projected Average Daily Use (gpd)

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

Total Area of Impervious Surfaces: Insert Area (Acres)

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

The project factor: Enter Value 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: Minimum use required (gpd)

Step 5: Determine if harvesting stormwater runoff for other non-potable use is feasible for the project by comparing the Average Daily non-potable demand (Step 1) to the minimum required non-potable use (Step 4).

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

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

D.3 Bioretention and Biotreatment Assessment

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

For the project, the following applies:

☐ 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 City of Riverside to discuss this option. If you checked this box, then proceed to Section E to document your alternative compliance measures.

☐ None of the above.

D.4 Feasibility Assessment Summaries

In concurrence with the Infiltration, Harvest and Use, Bioretention and Biotreatment Sections above, Table D.2 below summarizes 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	
D/1	☒	☐	☐	☐	☐
D/2	☒	☐	☐	☐	☐
D/3	☒	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐

For those DMAs where LID BMPs are not feasible, provide a brief narrative below summarizing why they are not feasible, with technical infeasibility criteria included in Appendix 5, and Alternative Compliance measures for those DMAs documented in Section E.

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 City of Riverside. Utilize the worksheets found in the LID BMP Design Handbook or consult with the City of Riverside 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 **SEE WORKSHEET FROM THE LID DESIGN MANUAL**

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]			
D/1	*13,164*	*ROOF*	*1*	*0.89*	*11,742.3*	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
D/2	*30,826*	*CONCRETE*	*1*	*0.89*	*2,7496.8*			
D/3	*2,968*	*LANDSCAPE*	*0.1*	*0.11*	*327.8*			
	46,958				39,566.9	0.85	2,802.7	[G]

[B], [C] are obtained from Section 2.3.1 of the WQMP Guidance Document

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

[G] is obtained from LID BMP design procedure sheet, placed in Appendix 6

Section E: Alternative Compliance (LID Waiver Program)

LID BMPs are expected to be feasible on virtually all projects. Where LID BMPs have been demonstrated to be infeasible as documented in Section D, other Treatment Control BMPs must be used (subject to confirmation of LID waiver approval by the Regional Board). For the project, the following applies:

☐ 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 Regional Board 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 alternative compliance measures on the following pages are being implemented to ensure that any pollutant loads expected to be discharged by not incorporating LID BMPs, are fully mitigated.

E.1 Pollutants of Concern

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

Table E.1 Potential Pollutants by Land Use Type

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

P = Potential

N = Not Potential

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

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

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

(4) Specifically petroleum hydrocarbons

(5) Specifically solvents

(6) Bacterial indicators are routinely detected in pavement runoff

E.2 Stormwater Credits

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

Table E.2 Water Quality Credits

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

[1]Cannot Exceed 50%

[2]Obtain corresponding data from Table 3-8 in the WQMP Guidance Document

E.3 Sizing Criteria

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

Table E.3 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Area x Runoff Factor		*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]				
N/A						*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 = Σ[A]				Σ= [D]	[E]	$[F] = \frac{[D]x[E]}{[G]}$	[F] X (1-[H])	[I]

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

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

[G] is for Flow-Based Treatment Control BMPs [G] = 43,560, for Volume-Based Control Treatment BMPs, [G] = 12

[H] is from the Total Credit Percentage as Calculated from Table E.2 above

[I] as obtained from a design procedure sheet from the BMP manufacturer and should be included in Appendix 6

E.4 Treatment Control BMP Selection

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

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

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

Table E.4 Treatment Control BMP Selection

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

[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 Referenced from Table E.1 above.
[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.

The project does not create a Hydrologic Condition of Concern, meeting the criteria for HCOC Exemption as shown below:

HCOC EXEMPTION 1: The Priority Development Project disturbs less than one acre. The Co-permittee 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

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 City of Riverside

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

Results included in Table F.1 below and hydrologic analysis included in Appendix 7.

Table F.1 Hydrologic Conditions of Concern Summary

	2 year – 24 hour		
	Pre-condition	**Post-condition**	**% Difference**
Time of Concentration	18.25	6.28	-65
Flow (CFS)	0.53	0.88	66
Volume (Cubic Feet) By triangular method for small areas	99 ½xQx(2 Tc)	340 ½xQx(2 Tc)	2.4 We will mitigate the difference by oversizing the BMP

[1] Time of concentration is defined as the time after the beginning of thTe 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 (Prado Dam, Santa Ana River) 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

The Project discharges to a county facility that has been engineered and is regularly maintained to ensue design flow capacity. See Appendix F for County report. The SD-line along Temescal Rd. discharges to an open field before it discharges to Temescal Creek.

F.2 HCOC Mitigation

As an alternative to the HCOC Exemption Criteria above, HCOC criteria is considered mitigated if the project meets one of the following conditions, as indicated:

☐ 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.

THE FINAL DESIGN INCLUDING THE INFILTRATION WILL LIMIT THE OUTFLOWS TO MIMICK THE PREDEVELOPMENT HYDROGRAPH.BMP HAS BEEN OVERSIZED AND WILL BE ADJUSTED DURING FINAL DESIGN TO LIMIT THE OUTFLOW Q.

☐ d. None of the above.

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

NOTE: The subject site is HCOC exempt per the HCOC Applicability Map located in the Watershed Action Plan

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. Co-permittee 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.

The following table identifies the potential sources of runoff pollutants for this project and specifies how they are addressed through permanent controls and operational BMPs:

Table G.1 Permanent and Operational Source Control Measures

Potential Sources of Runoff pollutants	Permanent Structural Source Control BMPs	Operational Source Control BMPs
On-site Storm Drain Inlets	Mark all inlets with the words "only rain down the storm drain"	Maintain and periodically repaint or replace inlet markings. Provide stormwater pollution prevention information to new site owners, lessees, or operators.
Landscape/Outdoor-Pesticide Use	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	Maintain landscaping using minimum or no pesticides. Provide IPM information to new owners, lessees and operators. -

	pollution. Consider using pest-resistant plants, especially adjacent to hardscape. To ensure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency and plant interactions.	
Rooftop Equipment	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. Avoid roofing, gutters and trim made of copper or other unprotected metals that may leach into runoff	

Section H: Construction Plan Checklist

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

Table H.1 Construction Plan Cross-reference

BMP No. or ID	BMP Identifier and Description	Plan Sheet Number(s)	Latitude / Longitude
		To be Included in the Final WQMP	

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

As required by the City of Riverside, the following Operation, Maintenance and Funding details are provided as summarized:

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.
3. An outline of general maintenance requirements for the Stormwater BMPs 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.
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.

See Appendix 9 for a detailed Stormwater BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the Stormwater BMPs built on site, and an agreement assigning responsibility for maintenance and providing for inspections and certification.

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: **To be included in the Final WQMP**

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

☒ Y ☐ N

Operation and Maintenance Plan and Maintenance Mechanism is included in Appendix 9. Educational materials for those personnel that will be maintaining the proposed BMPs within this Project-Specific WQMP are included in Appendix 10.

Appendix 1: Maps and Site Plans

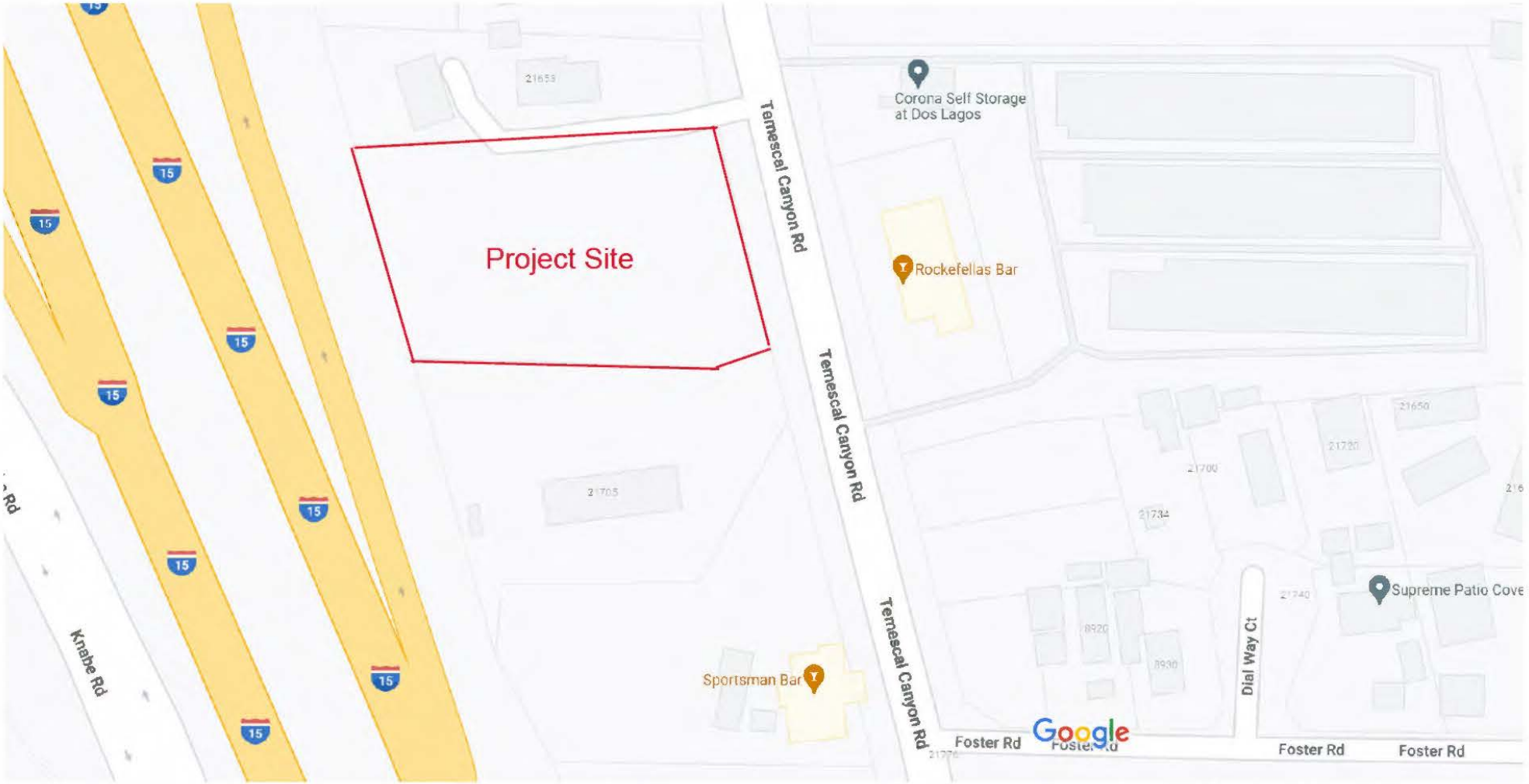
Location Map, WQMP Site Plan and Receiving Waters Map

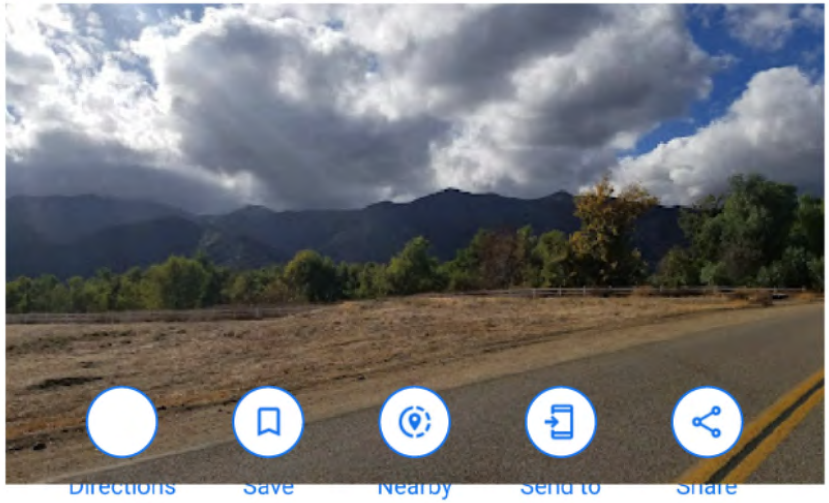

SOLDAT OFFICE BUILDING
LOCATION MAP
I-15
Project Site
Temescal
Canyon Rod
Google Earth
300 ft

Google Maps

Temescal Canyon Rd

PROPERTY IN QUESTION





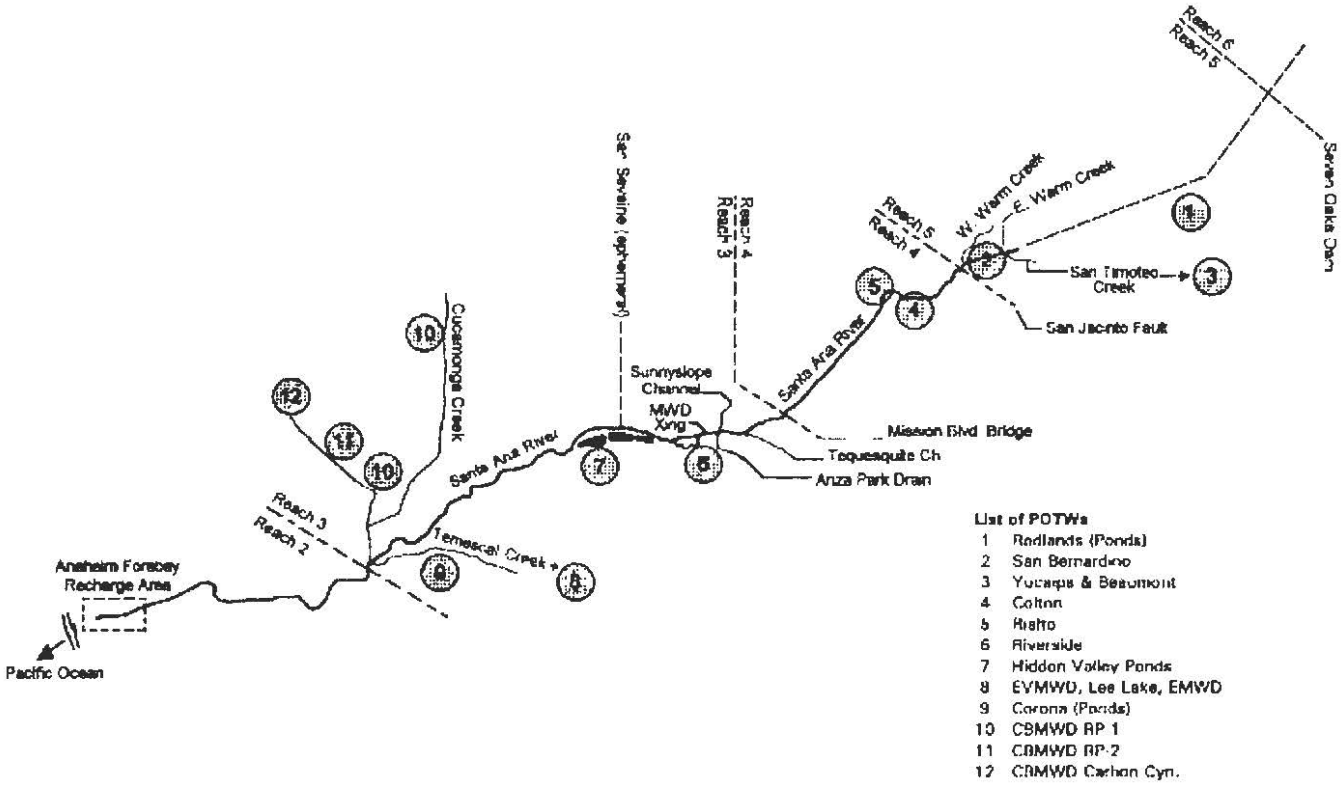
Corona, CA

Photos

Photos

FIX DRAFTING OF SITE PHOTOS

FIGURE 1-2
SANTA ANA RIVER AND TRIBUTARIES



FROM SANTA ANA BASIN PLAN

NPDES MUNICIPAL PERMIT
SANTA ANA RIVER WATERSHED
EXHIBIT SA-1
(EASTVALE, JURUPA VALLEY, RIVERSIDE, CORONA, NORCO AREAS)

- CITY MS4 FACILITIES
- COUNTY MS4 FACILITIES
- RCFC&WCD MS4 FACILITIES
- OTHER FACILITIES
- MAJOR OUTFALL SITES
- SAR CORE MONITORING STATIONS
- SANTA ANA RIVER WATERSHED BOUNDARY
- LANDFILL SITES
- SEWAGE TREATMENT PLANTS
- SANTA ANA RIVER/SAN JACINTO RIVER
- BLUE LINE STREAMS
- RIVERSIDE COUNTY BOUNDARY
- INCORPORATED AREAS
- FREEWAYS/HIGHWAYS
- PRIMARY STREETS

N

0 0.5 1 1.5 2 MILES

UPDATED NOVEMBER 2017

JURUPA VALLEY

EASTVALE

NORCO

RIVERSIDE

CORONA

MORENO VALLEY

SAN BERNARDINO COUNTY
RIVERSIDE COUNTY

RIVERSIDE COUNTY
ORANGE COUNTY

EASTVALE MASTER DRAINAGE PLAN - LINE A

EASTVALE MASTER DRAINAGE PLAN - LINE E

SAN SEVAINE CHANNEL - EASTVALE MASTER DRAINAGE PLAN - LINE J

BLY CHANNEL - MISSION SD

JURUPA CHANNEL

RUBIDOUX CHANNEL

JAMESTOWN STORM DRAIN

HIGHGROVE - CENTER STREET STORM DRAIN

SPRING STREET CHANNEL

UNIVERSITY WASH - SPRUCE STREET STORM DRAIN

BOX SPRINGS STORM DRAIN

MAGNOLIA CENTER STORM DRAIN

PHOENIX AVENUE STORM DRAIN

MAGNOLIA CENTER STORM DRAIN - CENTRAL AVENUE LATERAL

MAGNOLIA CENTER STORM DRAIN - PIGEON PASS LATERAL

NORTH NORCO CHANNEL - LINE N-1

NORTH NORCO CHANNEL - LINE A

LA SIERRA CHANNEL - LA SIERRA AVENUE STORM DRAIN

ARLANZA CHANNEL

MONROE MOF - PENNSYLVANIA LATERAL

CORONA DRAIN LINE 48

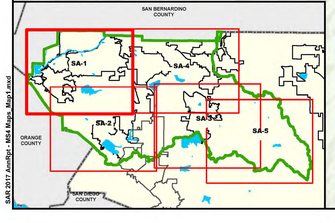
HOMER CREEK - TEMESCAL CANYON ROAD STORM DRAIN

TEMESCAL CREEK

PROJECT SITE

MORENO VALLEY - PERRIS - LINE L AND S-1

Service Layer Credits: Sources: Esri, HERE, DeLorme, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community



The graphical and tabular information shown on this document may be derived from a variety of public agency and/or private commercial sources such as Riverside County Transportation and Land Management Agency, Thomas Brothers Mapping, the Stephen P. Teale Data Center, GIS Technology Center, State of California, the United States Geologic Survey and the United States National Atlas. These sources may possess varying levels of accuracy and precision and this product is meant only as a guide to the relative position and scale of the depicted features. This GIS document is in no case to be interpreted as fundamental or decisive for purposes of land surveying, field engineering, plan drafting, code enforcement, land boundary determination and/or land acquisition.

SAR 2017 ArcMap - MS4 Maps_Map1.mxd



DRAINAGE MANAGEMENT AREA (DMA's):

Table C.1 DMA Classifications

DMA Name or ID	Surface Type(s)	Area (Sq. Ft.)	DMA Type
A/1	Landscape	1,076	Self-Treating
D/1	Roof	13,164	Drains to BMP
D/2	Concrete	30,826	Drains to BMP
D/3	Landscape	2,968	Drains to BMP

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

DMA Name or ID	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)
A/1		Landscape	Drip

SOURCE CONTROL BMPS	
BMP ID	BMP DESCRIPTION
S1	STORM DRAIN STENCILING AND SIGNAGE → ALL SD GRATED INLETS, CURB CUTS (TYP.)
S3	REFUSE / TRASH COLLECTION AREAS
S4	LANDSCAPE / OUTDOOR PESTICIDE USE
N1	EDUCATION FOR PROPERTY OWNERS, TENANTS, AND OCCUPANTS (ENTIRE SITE)
N3	COMMON AREA LANDSCAPE MANAGEMENT
N4	BMP MAINTENANCE
☐	
N10	UNIFORM FIRE CODE IMPLEMENTATION (ENTIRE SITE)
N11	COMMON AREA LITTER CONTROL (ENTIRE SITE)
N12	EMPLOYEE TRAINING (ENTIRE SITE)
N14	COMMON AREA CATCH BASIN INSPECTION
N15	STREET SWEEPING PRIVATE STREETS AND PARKING LOTS

LEGEND:

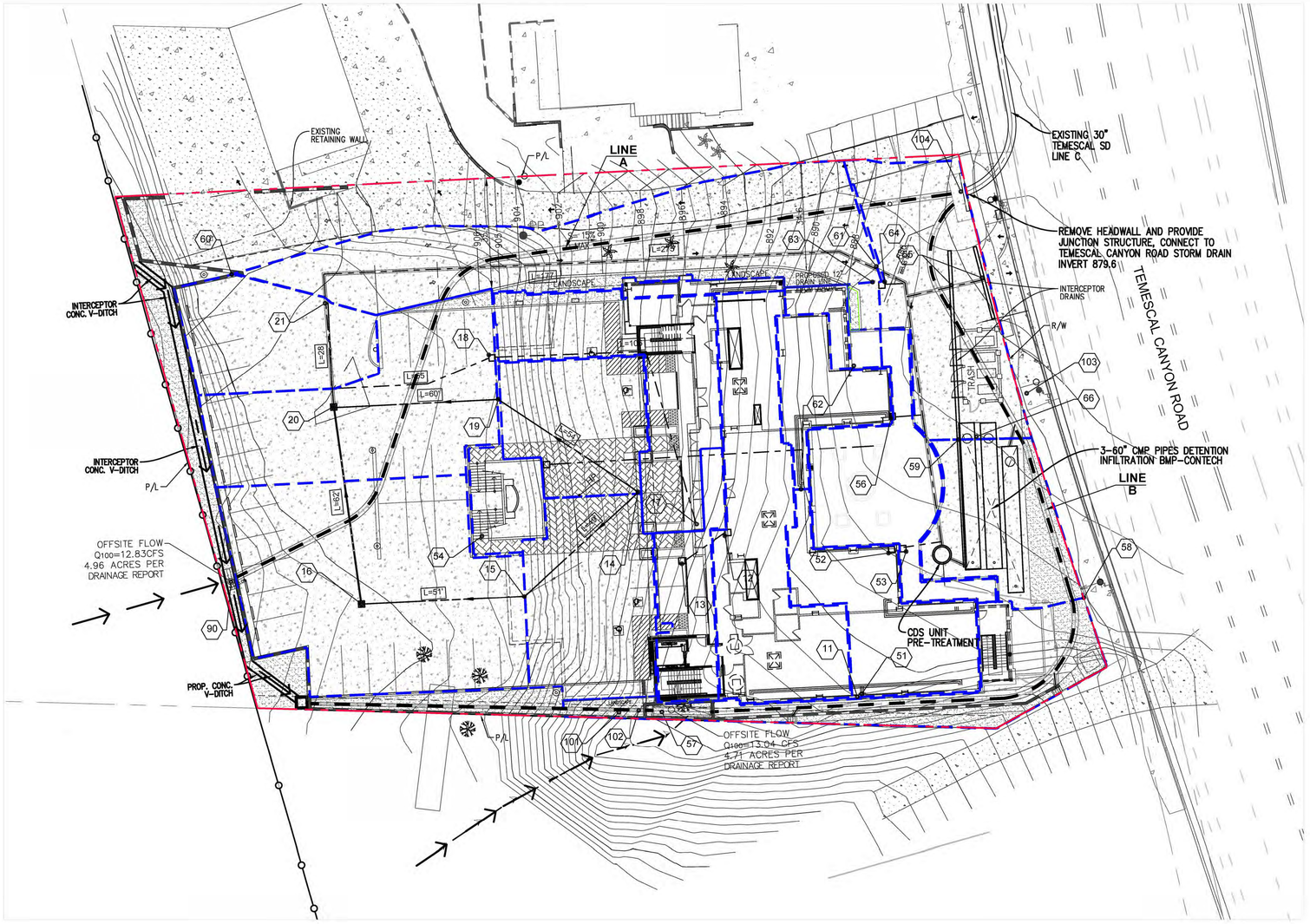
- INDICATES STORM DRAIN
- INDICATES CONCRETE SURFACE - DRAINS TO BMP
- INDICATES ROOF - DRAINS TO BMP
- INDICATES LANDSCAPE SURFACE - SELF TREATING
- INDICATES LANDSCAPE SURFACE - DRAINS TO EXIST SD

NORTH
SCALE: 1"= 20'

20' 0' 20' 40' 60'
GRAPHIC SCALE: 1" = 20'

DRAINAGE AREA MAP
WATER QUALITY MANAGEMENT PLAN
SOLDAT COMMERCIAL BUILDING
TEMESCAL CANYON ROAD
RIVERSIDE, CA

Plot Date: 01-05-2026



Summary Hydrology Drainage Sub-areas for Proposed Condition – Rational Method 100-year storm (see below for calculation):

Drainage Area	Area in Acre	Q_{100} sub-area in cfs	Notes
Node 16	0.4	1.5	Upper Parking Lot
Node 21	0.6	2.27	Upper Parking Lot
Node 61	0.7	2.66	Lower Parking Area
Node 59	0.2	0.77	Lower Parking Area
Node 65	0.9	3.08	Lower Parking Area
Node 66	1.1	3.80	Project Q. Area 1.1 Acres
Node 103	7.7	21.02	Confluence with Line B
Node 104	12.6	33.40	Confluence with Line A

LEGEND:

- (MAIN) TRIBUTARY AREA BOUNDARY
- FLOWLINES
- 0.124 Ac — TRIBUTARY AREA, Ac
- 100 — NODE NUMBERS
- L=900' — FLOW LENGTH FROM NODE TO NODE WITHIN SUB-AREA
- DIRECTION OF FLOW
- PROP. STORM DRAIN
- EXIST. STORM DRAIN

20' 0' 20' 40' 60'
GRAPHIC SCALE: 1" = 20'

FIGURE 2b:

PRELIMINARY HYDROLOGY MAP

PROPOSED CONDITION

SOLDAT COMMERCIAL BUILDING
TEMESCAL CANYON ROAD
RIVERSIDE, CA

Plot Date: 11-08-2025

Appendix 2: Construction Plans

Grading and Drainage Plans

TO BE INCLUDED IN THE FINAL WQMP

PRELIMINARY GRADING PLAN

POR. SE ¼, SEC. 21, T.4S., R.6 W., SBBM.
21699 TEMESCAL CANYON ROAD
RIVERSIDE COUNTY, CA
APN: 282-121-011
PPT 230008

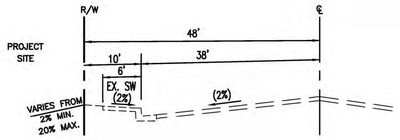
RAW EARTHWORK

	CUT (CY)	FILL (CY)
RAW	11,000	11,000
OVEREXCAVATION	–	–
SHRINKAGE (10% OF FILL)	–	–
TOTAL	11,000	11,000
IMPORT		–

THE ABOVE QUANTITIES DO NOT REFLECT OR ANY SPECIAL CONDITIONS THAT MAY BE SPECIFIED IN THE PRELIMINARY SOILS REPORT AND ARE FOR REFERENCE AND FEE PURPOSES ONLY. SINCE THE ENGINEER CANNOT CONTROL THE EXACT METHOD OR MEANS USED BY THE CONTRACTOR DURING GRADING OPERATION, NOR CAN THE ENGINEER GUARANTEE THE EXACT SOIL CONDITION OVER THE ENTIRE SITE. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR FINAL EARTHWORK QUANTITIES FOR BIDDING, CONTRACT, AND CONSTRUCTION PURPOSES. IF IT APPEARS THERE WILL BE AN EXCESS OR SHORTAGE OF MATERIAL, THE CONTRACTOR MAY NOTIFY THE ENGINEER TO DETERMINE IF POSSIBLE GRADE ADJUSTMENTS CAN BE MADE TO ALLEVIATE SAID MATERIAL EXCESS OR SHORTAGE.

EARTHWORK NOTES:

- *EARTHWORK SHOWN IS BASED UPON:*
  - *A PROPOSED BUILDING PAD IS 8" BELOW PROPOSED FINISHED FLOOR ELEVATION.*
  - *THE PAD WAS PREVIOUS COMPACTED. CONTRACTOR TO VERIFY AGAINST SOIL'S REPORT TO ENSURE MEETS CURRENT CODE PRIOR TO CONSTRUCTION OF BUILDING SLAB AND FOOTING.*
- *CONTRACTOR IS RESPONSIBLE FOR OBTAINING THEIR OWN EARTHWORK NUMBERS FOR PRICING/CONTRACT PURPOSES.*
- *EARTHWORK VALUES DO NOT ACCOUNT FOR POTENTIAL SCARIFYING AND REMOVALS OF EXISTING ON-SITE IMPROVEMENTS/ORGANIC MATERIALS.*
- *DOES NOT INCLUDE SPOILS.*



TYPICAL TEMESCAL CANYON ROAD SECTION
NOT TO SCALE

APRON NOTE:

(A) DRIVEWAY APRON PER RIVERSIDE COUNTY STANDARD NO. 207 COMMERCIAL APRON

(D) 5' SIDEWALK AT R/W ADJACENT AND PROVIDE SIDEWALK TRANSITION PER STD 207A, PAGE 1

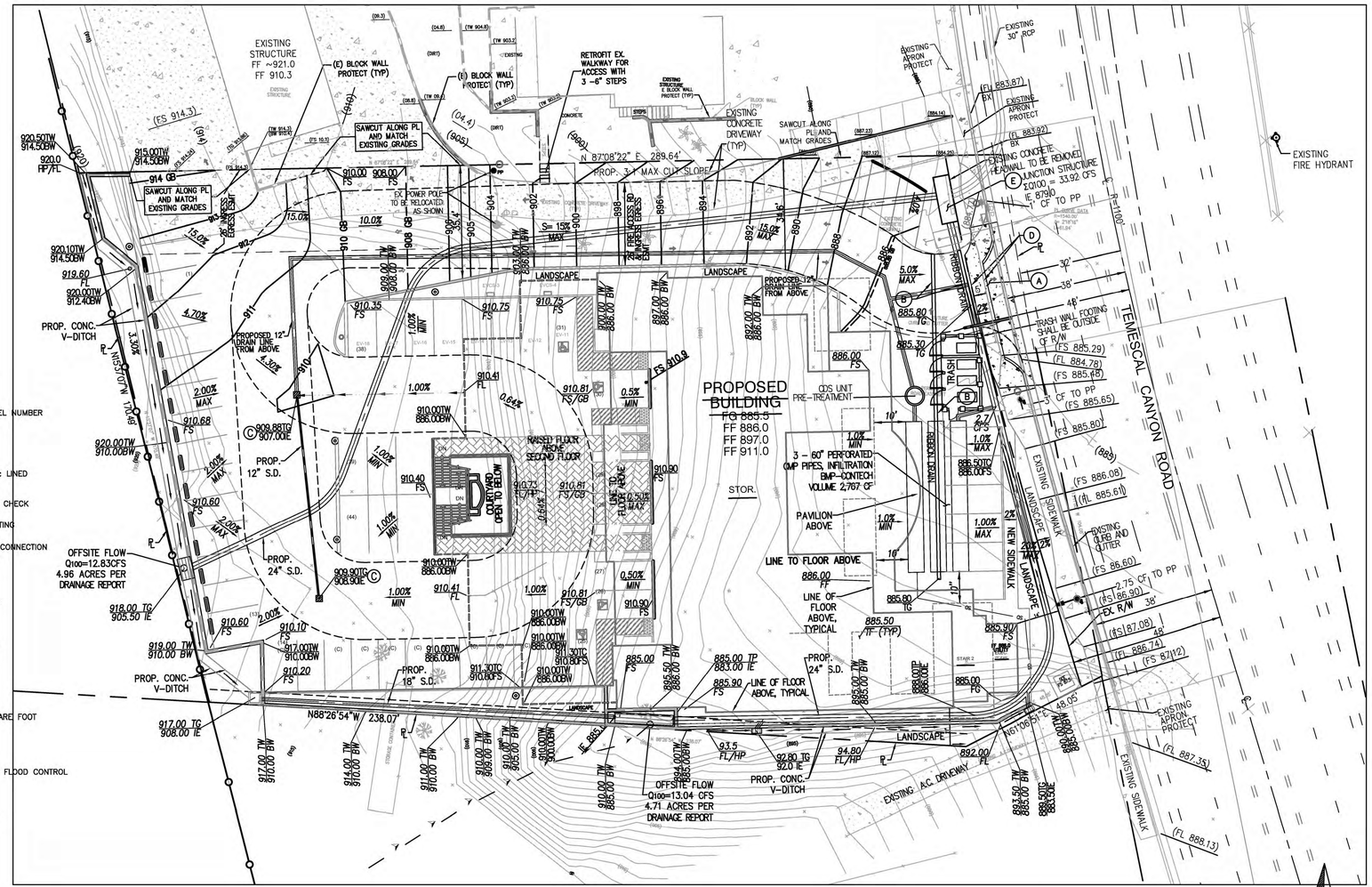
DRAINAGE NOTE:

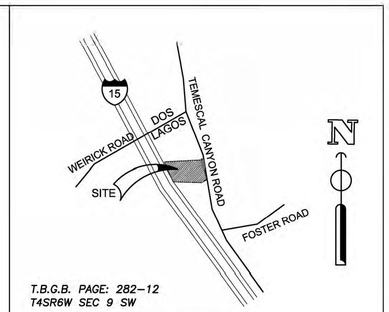
(B) USE NDS DRAIN DURA SLOPE OR PRO SERIES CHANNEL OR EQUAL

(C) PROVIDE 24"X24" CATCH BASIN NDS MODEL #2415 OR EQUAL

ALL INLETS ARE TRAFFIC RATED

(E) CONSTRUCT MANHOLE No. 1, RCFC&WCD STD. DWG. No. M-251 SD STA. 084+05.15 IE 879.50 SD INFO PER DRAINAGE PLAN BY EDWARD NG WO 05-0066 DATED 6-26-16





T.B.G.B. PAGE: 282-12
T4SR6W SEC 9 SW

VICINITY MAP
NOT TO SCALE

PROJECT LOCATION

21690 TEMESCAL CANYON RD.,
RIVERSIDE COUNTY, CA

SITE OWNER

JOHN SOLDAT
1902 FULLERTON AVE.
CORONA, CA 92881
TELE: (951) 737-7047
EMAIL: JOHN@SOLDATCPA.ONMICROSOFT.COM

TOPOGRAPHY

CIVIL CONSULTING
2621 GREEN RIVER RD #105-209
CORONA, CA 92882
PHONE: 714-392-1219
DATED: DATED 8-10-19, 8-20-22 & 10-6-22

SOIL ENGINEER

EARTH STRATA GEOTECHINCAL SERVICES INC
42184 REMINGTON AVE,
TEMECULA, CA 92590
PHONE: (951) 387-3179
CONTACT: MR. STEPHEN M. POOLE
EMAIL: INFO@EARTH-STRATA.COM

CIVIL ENGINEER

PEARL CITY ENGINEERING
14726 RAMONA AVE., OFFICE #446
CHINO, CA 91710
PHONE: (949) 727-9560
CONTACT: MR. YANG M. HU
EMAIL: INFO@PEARLCITYINC.COM

LEGAL DESCRIPTION

PARCEL A, AS SHOWN ON LOT LINE ADJUSTMENT NO. 2928, AS EVIDENCED BY DOCUMENT RECORDED JANUARY 26, 1990 AS INSTRUMENT NO. 1990-32933 OF OFFICIAL RECORDS, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS: THAT PORTION OF GOVERNMENT LOT 9 IN SECTION 21, TOWNSHIP 4 SOUTH, RANGE 6 WEST, SAN BERNARDINO BASE AND MERIDIAN, ACCORDING TO UNITED STATES GOVERNMENT SURVEY THEREOF, DESCRIBED AS FOLLOWS: COMMENCING AT A POINT ON THE SOUTHERLY LINE OF PARCEL 2 AS SHOWN BY MAP ON RECORD OF SURVEY ON FILE IN BOOK 42, PAGE(S) 68 THEREOF, OF RECORDS OF SURVEY, RECORDS OF RIVERSIDE COUNTY, CALIFORNIA, SAID POINT IS NORTH 87° 35' 10" WEST; ALONG SAID SOUTHERLY LINE, A DISTANCE OF 113.91 FEET FROM THE SOUTHEAST CORNER OF PARCEL 1 OF SAID RECORD OF SURVEY, SAID POINT BEING THE NORTHEAST CORNER OF THE LAND DESCRIBED AS PARCEL 40 IN FINAL ORDER OF CONDEMNATION, SUPERIOR CASE NO. 84056 RECORDED SEPTEMBER 23, 1965 AS INSTRUMENT NO. 109366 OF OFFICIAL RECORDS OF RIVERSIDE COUNTY, CALIFORNIA; THENCE SOUTH 15° 37' 07" EAST, ALONG THE EASTERLY LINE OF SAID PARCEL 40, A DISTANCE OF 100.00 FEET TO THE SOUTHEAST CORNER OF THE PARCEL LAND AS DESCRIBED IN DEED TO DOYLE V. HILL AND ELIZABETH L. HILL, RECORDED AUGUST 20, 1969 AS INSTRUMENT NO. 85326 OF OFFICIAL RECORDS OF RIVERSIDE COUNTY, CALIFORNIA, SAID SOUTHWEST CORNER BEING THE TRUE POINT OF BEGINNING OF THE PARCEL TO BE DESCRIBED; THENCE CONTINUING SOUTH 15° 37' 07" EAST, ALONG SAID EASTERLY LINE OF PARCEL 40, A DISTANCE OF 170.49 FEET (FORMERLY RECORDED 170.52 FEET), TO THE SOUTHERLY LINE OF THE PARCEL OF LAND AS DESCRIBED IN DEED TO EULA G. CROSBIE, RECORDED JANUARY 29, 1942, IN BOOK 531, PAGE(S) 224 THEREOF, OF OFFICIAL RECORDS OF RIVERSIDE COUNTY, CALIFORNIA; THENCE SOUTH 88° 26' 54" EAST, ALONG SAID SOUTHERLY LINE, A DISTANCE OF 238.07 FEET TO A POINT THAT BEARS NORTH 88° 26' 54" WEST, ALONG SAID SOUTHERLY LINE, A DISTANCE OF 59.42 FEET FROM THE SOUTHEAST CORNER OF SAID PARCEL OF LAND DESCRIBED IN DEED TO EULA G. CROSBIE; THENCE NORTH 61° 06' 51" EAST, A DISTANCE OF 48.05 FEET TO THE WESTERLY LINE OF STATE HIGHWAY NUMBER 71, 80.00 FEET IN WIDTH, AS DESCRIBED IN DEED TO THE COUNTY OF RIVERSIDE, RECORDED JULY 22, 1930 IN BOOK 867, PAGE(S) 45 THEREOF, OF DEEDS, RECORDS OF RIVERSIDE COUNTY, CALIFORNIA; THENCE NORTH 13° 11' 55" WEST ALONG SAID WESTERLY LINE, A DISTANCE OF 104.06 FEET; THENCE NORTHWESTERLY ALONG SAID WESTERLY LINE ON A CURVE CONCAVE, HAVING A RADIUS OF 1540.00 FEET THROUGH AN ANGLE OF 02° 18' 16", AN ARC LENGTH OF 61.94 FEET TO THE SOUTHEAST CORNER OF SAID PARCEL OF LAND DESCRIBED IN DEED TO DOYLE V. HILL AND ELIZABETH L. HILL; THENCE SOUTH 87° 08' 22" WEST, ALONG THE SOUTHERLY LINE OF SAID PARCEL OF LAND, DESCRIBED IN DEED TO DOYLE V. HILL AND ELIZABETH L. HILL, A DISTANCE OF 289.64 FEET TO THE TRUE POINT OF BEGINNING.

APN: 282-121-011

LOT SIZE
47,592 SF NET & GROSS
1.09 ACRE NET & GROSS

PLANNING
ZONING CR
LAND USE C-P-S, CZ 5845
NOT IN SPECIFIC PLAN

GEOLOGIC HAZARDS
VERY LOW LIQUEFACTION POTENTAIL
SUSCEPTIBLE TO SUBSIDENCE
NOT IN FAULT ZONE
PER COUNTY GIS SHEET

FEMA
ZONE X

LEGEND

- BOUNDARY LINE/RIGHT OF WAY
- EXISTING LOT LINES
- CENTERLINE
- EASEMENT LINE
- CURB AND GUTTER
- (E) EXISTING ELECTRICAL LINE
- (G) EXISTING GAS LINE
- VZN EXISTING VERIZON LINE
- ATT EXISTING AT&T LINE
- (W) EXISTING WATER LINE
- (SS) EXISTING STORM DRAIN
- EXISTING SEWER
- PROPOSED STORM DRAIN
- RW PROPOSED RECLAIMED WATER LINE
- RETAINING WALL/ DEEPENED FOOTING/STEM WALL
- 1% PROPOSED RATE OF GRADE
- 8.50 FS PROPOSED ELEVATIONS
- (8.50) FS EXISTING ELEVATIONS
- R PROPOSED RIDGE LINE
- FH EXISTING FIRE HYDRANT
- EXISTING TREE
- EXISTING STREET LIGHT
- TRENCHING/BACKFILL

ABBREVIATIONS:

AC. – ACRES
A.P.N. – ASSESSOR'S PARCEL NUMBER
BP – BOTTOM OF PIPE
BW – BACK OF WALK
CB – CATCH BASIN
CF – CURB FACE
CL – CENTERLINE
CML&C – CEMENT MORTAR & LINED
CO – SEWER CLEANOUT
DW – DOMESTIC WATER
DDC – DOUBLE DETECTOR CHECK
DI – DRAINAGE INLET
EDF – EXTRA DEPTH FOOTING
EX./EXIST. – EXISTING
FDC – FIRE DEPARTMENT CONNECTION
FG – FINISHED GROUND
FH – FIRE HYDRANT
FF – FINISHED FLOOR
FL – FLOWLINE
FS – FINISHED SURFACE
FW – FIRE WATER
GB – GRADE BREAK
HP – HIGH POINT
INV – INVERT ELEVATION
LA – LANDSCAPE AREA
LL – LATERAL LOAD
MH – MANHOLE
PB – PULLBOX
R – PROPERTY LINE
PP – POWER POLE
PSF – POUNDS PER SQUARE FOOT
PROP. – PROPOSED
R – RIDGE
R/W – RIGHT OF WAY
RCW – RECYCLED WATER
RCFC – RIVERSIDE COUNTY FLOOD CONTROL
RD – ROOF DRAIN
SD – STORM DRAIN
SS – SEWER
SSCO – SEWER CLEANOUT
SWMH, SMH – SEWER MANHOLE
TC – TOP OF CURB
TG – TOP OF GRATE
TP – TOP OF PIPE
TYP. – TYPICAL
VC – VERTICAL CURVE
WA – WATER
WM – WATER METER
WMWD – WESTERN MUNICIPAL WATER DISTRICT
WV – WATER VALVE

20' 0' 20' 40' 60'
GRAPHIC SCALE: 1"=20'

BMP _____
BGR _____

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NOTE:
WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR A GRADING PERMIT HAS BEEN ISSUED.

The private engineer signing these plans is responsible for assuring the accuracy and acceptability of the design herein. In the event of discrepancies arising after county approval or during construction, the private engineer shall be responsible for determining an acceptable solution and revising the plans for approval by the county.

MARK	BY	DATE	REVISIONS	APPR	DATE
				ENGINEER	COUNTY

SEAL-ENGINEER
REGISTERED PROFESSIONAL ENGINEER
YANG MING HU
No. 81754
EXP. 3/31/26
CIVIL
STATE OF CALIFORNIA

ENGINEERING COMPANY
PEARL CITY ENGINEERING
14726 RAMONA AVE., OFFICE #446
CHINO, CA 91710
(949) 727-9560

PEARL CITY ENGINEERING
Planning by Imagination. Building by Experience

PREPARED BY: YANG MING HU
R.C.E. NO. 81754
DATE 2026-01-07

BENCHMARK:
THE BENCH MARK FOR THIS PROJECT BASED TEMPORARY BENCH MARK, TBM, NORTHEASTERLY MOST CORNER OF SUBJECT PROPERTY A 1" I.P. UP 7'.
ELEVATION: 1462.22' (INTERPOLATED)

SCALE: H:_____ V:_____

COUNTY OF RIVERSIDE
SOLDAT OFFICE BLDG.
APN: 282-122-011
PRELIMINARY PRECISE GRADING

SHEET NO. 1 OF 1 SHTS

FOR: | W.O. | COUNTY FILE NO.

Appendix 3: Soils Information

Geotechnical Study and Other Infiltration Testing Data

TO BE INCLUDED IN THE FINAL WQMP

REPORT OF

GEOTECHNICAL INVESTIGATION

PROPOSED 3-STORY OFFICE BUILDING OVER ONE LEVEL PARKING

TEMESCAL CANYON ROAD

APN: 2821-210-011-4

CORONA, CALIFORNIA

FOR

MR. JOHN SOLDAT

PROJECT NO. 22-449

MARCH 4, 2023

GTC, Inc.

GeoTech Consultants, Inc.
1545 N. Verdugo Road No. 7
Glendale, California 91208
Tel: (310) 945-7288 Behnamgeotech@gmail.com

March 4, 2023 22-449

John Soldat
1902 Fullerton Ave.,
Corona, CA 92881

Subject: Geotechnical Investigation
Proposed 3-Story Office Building over One Level of Parking
Temescal Canyon Road,
APN: 282-121-011-04
Corona, CA

INTRODUCTION

Dear Mr. Soldat;

Pursuant to your request, a Limited Geotechnical Investigation has been performed at the proposed site of new construction in Glendale, California. During the course of this investigation, the engineering properties of the subsurface materials were evaluated in order to provide recommendations for development of the site, including earthwork, seismic design, retaining walls, excavations, shoring, and foundation design. The investigation included subsurface exploration, soil sampling, laboratory testing, engineering evaluation and analysis, consultation and preparation of this report. During the course of this investigation, the project plans provided by the client were used as reference. The plans were electronically submitted to our office.

GeoTech Consultants, Inc. (GTC) has prepared this soils investigation report for the proposed project by drilling 4 deep borings at 52, 17, 17, and 12 feet, conducting laboratory tests and engineering analysis and calculations independent of all previous work. All of the presented engineering values and analysis in this report are based on our samples derived from the borings and laboratory tests conducted in our soils lab.

Engineering for the proposed project should not begin until approval of the geotechnical investigation is granted by the local building official.

LIST OF ATTACHMENTS TO THIS REPORT

The attached Appendix I, describes the method of field exploration. Appendix II describes the laboratory testing procedures.

Plate No. 1 shows the Site Location.

The enclosed site plan, drawings No. 1, shows the approximate location of the exploratory borings and off-site properties in relation to the site boundaries and the proposed building.

Figure Nos. I-1 and I-2 presents summaries of the materials encountered at the location of our borings. Figure Nos. I-3 presents summaries of the materials encountered at the location of our boring drilled for the purpose of percolation test. Figure No. I-4 presents the Uniform Soil Classification System Chart; a guide to the Log of Exploratory Borings.

Figure Nos. II-1 and II-2 present the results of direct shear and consolidation tests performed on selected undisturbed soil samples.

Figure No.1 presents the soil bearing capacity.

ASCE Design Maps Summary Report & Seismic Parameters.

Table 1: Unrestrained and Restrained Drained Retaining walls, represents the result of active, at-rest,and seismic lateral pressure calculations on restrained and cantilever walls.

Table 3: Shoring Design, is the result of the computer printout calculations that follow the tables.

Following the Tables 1 & 2 are computer printouts, the result of our lateral pressure calculations on the shoring system.

Liquefaction and Dynamic Settlements Evaluation

It should be noted that the presented recommendations in this report are based on our understanding of the depth of excavation, structural setback and assumed loading data. This office should be notified if the actual loading and excavation depths are different from those used during this investigation.

PROJECT CONSIDERATIONS

It is our understanding that the proposed project will consist of construction of a new office building. The building will be a 4-story structure, approximately 60 feet in height, at same approximate elevation as Temescal Canyon Road (no subterranean levels are proposed). The approximate location of the proposed building is shown on the enclosed Site Plan; Drawing No. 1.

Structural loading data was not available during the course of preparation of this report. For the purpose of this report, it is assumed that concentrated loads will be on the order of 450 kips, combined dead plus frequently applied live loads. Perimeter and interior wall footings of the structure are expected to exert loads of on the order of 3 kips per lineal foot.

SITE CONDITIONS

SURFACE CONDITIONS

The site of the proposed project covers one vacant lot and is located along the west side of Temescal Canyon Road that have been assigned as APN 282-121-011-04. The site is irregular in shape, covering an area of about 50,000 square feet. See the enclosed Site Plan; Drawing No. 1.

There is an elevation difference of approximately 23 feet between the Temescal Canyon Road (East side) and West side of the property (with higher elevation).

PURPOSE AND SCOPE OF SERVICES

The purpose of this geotechnical investigation was to evaluate subsurface soil conditions at the site of the proposed improvements; and to provide geotechnical recommendations pertaining to earthwork and foundation aspects of the project. The scope of services performed for this geotechnical investigation consisted of subsurface exploration, laboratory testing, engineering analysis of field and laboratory data, and preparation of this report.

Environmental services such as evaluation and chemical analysis of the soil and groundwater for hazardous material were not included in our scope of services.

SUBSURFACE INVESTIGATION

The site was explored on December 7, 2022 by drilling four exploratory borings. The borings were extended to a maximum depth of 52 feet below existing grades with the aid of a truck-mounted drilling machine using 8-inchdiameter hollow-stem augers. The

approximate locations of the borings are shown on the enclosed Drawing No.1. Continuous logs of the subsurface conditions, as encountered in the excavated borings, were recorded in the field and are presented on the Log of Exploratory borings.

LABORATORY TESTING

The laboratory tests were conducted on representative samples in order to determine certain physical properties of the subsurface materials. Field moisture content, in-situ density, shear strength, consolidation were determined from these tests.

- ASTM D422
  Standard Test Method for Particle-Size Analysis of Soils;
- ASTM D2216
  Standard Test Method for Determination of Water (Moisture) Content of Soil by Microwave Oven Heating;
- ASTM D3080
  Standard Test Method for Direct Shear Test of Soils under Consolidated Drained Conditions;
- ASTM D2435
  Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading;

The laboratory test results are presented on Figure Nos. II-1 and II-2, within Appendix II.

ENGINEERING ANALYSIS

The results of our field and laboratory investigations were evaluated. Based on the results of the laboratory testing, engineering analyses were performed in order to formulate recommendations for design and construction of foundations.

SUBSURFACE CONDITIONS

SOIL PROFILE

Correlation of the subsoil between the borings was considered to be good. Generally, the site, to the depths explored, was found to be covered with surficial fill underlain by natural alluvium deposites of silty sand in slightly moist, and dense condition. Thickness of the surficial fill was found to be about three feet (3) at the location of our borings. The existing surficial fill were found to be generally porous in-place and compressible. At their present state, such soils are considered to be inadequate for foundations and grade slabs support. The materials found below the planned foundation levels were found to be generally very dense, silty sand and sandy soils.

GROUNDWATER

During the course of our investigation, no groundwater was encountered in our exploratory borings drilled to maximum depth of 52 feet below existing ground surface. According to the Riverside Western Municipal Water District office, groundwater records from nearby wells indicate that the groundwater level is more than 100 feet below the ground surface.

SEISMIC CONSIDERATIONS

EVALUATION OF LIQUEFACTION POTENTIAL

Liquefaction is a phenomenon in which saturated silty to cohesionless soils below the groundwater table are subject to a temporary loss of strength due to the buildup of excess pore pressure during cyclic loading conditions such as those induced by an earthquake. Liquefaction related effects include loss of bearing strength, amplified ground oscillations, lateral spreading, and flow failures.

The project site has not yet been mapped for earthquake-induced hazard zones under the Seismic Hazards Mapping Act by CGS.

Groundwater was not encountered during exploration, which were excavated to a maximum depth of 52 feet below the existing site grade. According to the Riverside Western Municipal Water District office, groundwater records from nearby wells indicate that the groundwater level is more than 100 feet below the ground surface.

Based on the dense nature of the underlying soils, and the depth to the groundwater level, the potential for liquefaction occurring at the site is considered to be remote.

The site is located within a State of California Liquefaction Seismic Hazard Zone. During the course of our investigation, no groundwater was found in our boring No.1 drilled to depth of 52 feet below existing ground surface.

Seismically-induced settlement or compaction of dry or moist, cohesionless soils can be an effect related to earthquake ground motion. Such settlements are typically most damaging when the settlements are differential in nature across the length of structures.

Some seismically-induced settlement of the proposed structures should be expected as a result of strong ground-shaking, however, due to the uniform nature of the underlying geologic materials, excessive differential settlements are not expected to occur.

Seismically-induced settlement calculations were performed using the SPT blowcounts collected from the exploratory borings, and the method by Tokimatsu and Seed (1987). The results indicate that seismically induced dry settlement on the site, subsequent to the recommended grading, will be on the order of 0.24 inches. This is considered to be negligible and well within the tolerance of a well-designed structure.

LANDSLIDING

The subject site is not mapped within an Earthquake Induced Landslide Zone by the State of California or City. No reported occurrences of landslides are known to have recently affected the site. Therefore, the potential for landslides is consider to be very low at the site.

TSUNAMIS

The subject site is not located within a Tsunami Hazard Zone delineated by the State of California. Due to the distance from the Pacific Ocean of (25) miles, and the elevation of the site at approximately (900) feet above sea level, the potential for tsunami inundation is very low.

SEISMIC PARAMETERS

Seismic design parameters based on the new code have been provided. In accordance with the ASCE 7-16, corresponding to CBC 2020, the project site can be classified as site “D”. The mapped spectral accelerations of S_s= 2.289 and S_1= 0.911 can be used for this project. These parameters correspond to site coefficient values of F_a=1.0 and F_v= N/A respectively (see the seismic design parameters and note below).

$S_{MS}= F_a(S_s)= 1.0\ (2.289) = 2.289$	$S_{M1}= F_V(S_1)=$ N/A (see note below)
$S_{DS}= ⅔(S_{MS})= ⅔\ (2.289) = 1.526$	$S_{D1}= ⅔(S_{M1})=$ N/A (see note below)

Note: Since the seismic factor, S_1 is greater than 0.2 site-specific ground-motion hazard analysis may be required. The project structural engineer shall determine if an exemption can be applied in accordance with ASCE 7-16 Section 11.4.8. If an exemption applies, a long period coefficient (F_v) of 1.7 may be utilized for calculation of seismic parameters. A copy of the detailed ASCE out-put is included with this report.

EVALUATION AND RECOMMENDATIONS

GENERAL

Based on the geotechnical engineering data derived from this investigation, the site is considered to be suitable for the proposed development. Our findings conclude that the site of the proposed work will be safe against hazards from landslide, settlement or slippage. The proposed work will have no effect on the geotechnical stability of the area outside of the proposed work. The opinions, conclusions and recommendations presented herein are based on our field and office studies, the properties of the soils encountered in our borings, and the results of our laboratory testing program.

Geotechnical recommendations for temporary excavations, foundations, lateral design, grade slabs, subsurface walls, and observations during construction are presented in the remaining portions of this report.

EXPANSIVE POTENTIAL

Based on depth of the proposed subterranean levels, the proposed structure would not be prone to the effect of expansive soils.

SLOPE STABILITY

The property has less than 25 feet of overall elevation change at a gradient of approximately 11:1 or gentler (H:V) gradient. A slope stability analysis is not required for the property per Riverside County Department of Building and Safety.

TEMPORARY EXCAVATION

Unsupported/open Cuts: Where space limitations permit, unshored temporary excavation slopes could be used. Based upon the engineering characteristics of the site upper soils, it is our opinion that temporary excavation slopes in accordance with the following table should be used:

Maximum Depth of Cut (Ft)	Maximum Slope Ratio (Horizontal:Vertical)
0-4	Vertical
>4	1:1

In order to retard the chances of erosion, open cut slopes should be covered with plastic sheeting during the rainy periods. All temporary cuts should be stabilized within 4 week from the initial date of excavation.

Water should not be allowed to flow over the top of the excavation in an uncontrolled manner. No surcharge should be allowed within a 45-degree line drawn from the bottom of the excavation. Excavation surfaces should be kept moist but not saturated to retard raveling and sloughing during construction.

SITE PREPARATION

Debris from demolition and underground utility lines to be abandoned should be removed from the building area. All excavations resulting from removal of existing obstructions should be backfilled with soil compacted to at least 90 percent of the maximum density as determined by ASTM: D-1557. If any cesspools or seepage pits are encountered during shoring, they should be backfilled with vibrated gravel or slurry mix to 5 feet below finish grade. The upper 5 feet should be backfilled with soil compacted by mechanical means.

FILL PLACEMENT

Fill soils, if any, should be cleaned of deleterious debris, placed in 6 to 8 inch lifts, brought to about optimum moisture content and compacted to at least 90 percent of the maximum density for granular soils. The placement of the fill should be performed under our observation and testing.

GENERAL GUIDELINES FOR SITE GRADING

Site grading for the proposed project is expected to include excavation in order to create the finish grades, and backfilling behind the retaining walls. All grading operations should be performed in compliance with all applicable codes and the minimum specifications outlined below. Observation and testing will be necessary during these phases of the project to allow our office to provide certification of finished project.

SITE PREPARATION AND EXCAVATION

- Any existing structures designated for removal are to include the existing foundation system. All construction debris are to be stripped and wasted from the site.

- Any trees or shrubs designated for removal should be cut down and all stumps and roots should be removed. All major vegetation, organic soil and debris material are to be stripped and wasted from the site.
- The approximate horizontal and vertical extent of these excavations are to be verified by the project geotechnical consultant in the field.

FILL PLACEMENT

It is recommended that all fill be placed under engineering observation and in accordance with the following guidelines.

1. Compacted fill is to be placed over horizontal benches excavated into dense competent existing material.
2. Compacted fill may be placed to design grades using onsite inorganic soils or approved import.
3. Soil proposed for use as structural fill should be inorganic, free from deleterious materials, and contain no more than 15 percent by weight of rocks larger than four (4) inches (largest dimension).
4. We expect that materials excavated onsite will be suitable for use as compacted fill provided they do not contain appreciable quantities of organic debris.
5. Where in-place moisture content exceeds optimum values, the materials may need to be spread and dried, or mixed with dryer material. Final determination will be provided in the field by the project geotechnical consultants at the time the excavations take place.
6. Excavated material containing excessive organic debris will not be suitable for use in the compacted fill. Materials deemed unsuitable should be wasted offsite or as designated by the project architect or geotechnical consultant.
7. The approved material should be placed in layers, each not exceeding eight (8) inches in thickness (before compaction), water conditions to about two percent above optimum moisture content and compacted to a minimum 90 percent relative compaction based on ASTM Test D1557.
8. Fill compaction tests should be performed during placement of the future fills to verify acceptable compaction and moisture content. At a minimum, one test

should be performed within each 12 to 24 inches (vertical depth) or 500 cubic yards of fill (whichever is less). More frequent testing may be required by the geotechnical consultant.

9. If construction takes place during the winter months or unseasonable rainy periods, additional winterizing and erosion-control recommendations may be necessary.

FOUNDATIONS DESIGN

CONVENTIONAL

Conventional spread footing foundation systems properly compacted fill soils or competent native soils are expected to provide adequate support for the proposed building. Continuous foundation may be designed for a bearing capacity 2,400 pounds per square foot, and should be a minimum of 18 inches in width, 24 inches in depth below the lowest adjacent final grades. Column foundation may be designed for a bearing capacity of 2,600 pounds per square foot, and should be a minimum of 24 inches in width, 24 inches in depth below the lowest adjacent final grades. The bearing capacity may be may be increased at a rate of 150 pounds per square foot for each additional foot of footing depth and width, to a maximum value of 3,600 pounds per square foot.

The above given values are for the total of dead, plus frequently applied live loads. For short duration transient loading, such as wind or seismic forces, the given values may be increased by one-third.

EXPECTED SETTLEMENTS

Under the allowable maximum soil pressure, footings carrying the assumed maximum concentrated loads of 450 kips are expected to settle on the order of 3/4 of an inch. Continuous footings, with loads of about 3 kips per lineal foot are expected to settle on the order of 1/2 of an inch. Maximum differential settlements are expected to be on the order of 1/4 of an inch. The major portion of the settlements is expected to occur during construction.

LATERAL DESIGN

Lateral resistance at the base of footings in contact with native soils or properly compacted fill soils may be assumed to be the product of the dead load forces and a coefficient of friction of 0.30. Passive pressure on the face of footings may also be used

to resist lateral forces. A passive pressure of zero at the ground surface and increasing at a rate of 300 pounds per square foot per foot of depth to a maximum value of 3,000 pounds per square foot may be used for footings poured against native and/or properly compacted fill soils.

RETAINING WALL DESIGN

CANTILEVER RETAINING WALLS

Retaining walls supporting a level back-slope may be designed utilizing a triangular distribution of pressure. Cantilever retaining walls may be designed for 37 pound per cubic foot for walls retaining up to 15 feet of earth for drained condition.

Retaining walls exceeding 6 feet in height shall be designed to resist the additional earth pressure caused by seismic ground shaking. An inverse triangular pressure distribution should be utilized for the additional seismic loads (13 pcf) as illustrated in the attachments to this report.

RETAINING WALL DRAINAGE

Proper subdrain should be installed behind the retaining walls. Subdrain for retaining walls normally consists of four-inch diameter perforated pipes, placed with perforation facing down. The pipe shall be encased in at least one-foot of gravel around the pipe. The gravel may consist of three-quarter inch to one inch crushed rocks.

RETAINING WALL BACKFILL

Where adequate space is available, granular fill should be placed and mechanically compacted in layers not more than 8 inches thick, behind the retaining walls (after the subdrain is installed) to a relative compaction of at least 90 percent. At least one field density tests should be taken for each 2 feet of the backfill. The degree of compaction of the wall backfill should be verified by the Soil Engineer.

Where space is limited, free-draining gravel should be placed behind the retaining walls. The gravel should then be capped with at least 18 inch thick site soils also compacted to a relative compaction of at least 90 percent. It should be noted that the backfill placed behind the retaining walls should be made after the concrete decking is cast. All grading surrounding the building should be such to ensure that water drains freely from the site and does not pond.

PAVEMENT RECOMMENDATION

In order to provide uniform support beneath the proposed pavement area, it is recommended that a minimum of 24 inches of the exposed subgrade beneath the pavement section be properly removed and recompacted to 90 percent of maximum density as determined by most recent version of ASTM D 1557. Subsequent to the recommended removal, the excavated subgrade shall be scarified to a minimum depth of 12 inches and recompacted to a minimum of 95 percent relative compaction prior to placement of compacted fill. The following pavement sections are recommended:

Pavement Area	Assumed Traffic Index	Asphalt Thickness (in)	Aggregate Base Thickness (in)
Parking / Driveways	5	3.0	5.0
Truck Access/Fire Lanes	7	4.0	8.0

A subgrade modulus of 120 pound per cubic inch may be assumed for design of concrete Paving. Concrete paving for passenger cars and moderate truck traffic shall be assumed be a minimum of 6 inches in thickness, and shall be underlain by 4 inches of aggregate base. Concrete paving for heavy truck traffic shall be a minimum 7½ inches in thickness, and shall be underlain by 6 inches of aggregate base. Concrete pavement should be reinforced with minimum of #3 steel bar on 24 inch centers each way.

DRAINAGE

Adequate site drainage is absolutely essential at the site and it should be provided. Roof drainage should be connected to an appropriate drainage system and carried away from the building and to the street. Yard drainage should be kept adequate to prevent ponding of water and saturation of the soils. Water should be directed to the street in an approved manner. Future performance of the building and appurtenances will be significantly influenced by the site drainage conditions. Planters and lawns adjacent to the building should be avoided. If planters are planned adjacent to the building, they should have the bottom and walls waterproofed and a drain installed to carry irrigation water away from the footing areas. Site drainage should be provided to divert roof and surface waters from the property through non-erodible drainage devices to the street. In no case should the surface waters be allowed to pond adjacent to

building or behind the retaining walls. A minimum slope of two and five percent are recommended for paved and unpaved areas, respectively.

FLOOR SLAB ON GRADE

The slabs-on-grade thickness and reinforcement should reflect the anticipated use of the slab and should be designed by the Structural Engineer. The floor slabs-on- grade should be a minimum of 5 inches thick with minimum reinforcement consisting of #4 bars spaced maximum at 16 inches each way (#4 @ maximum 16" o.c. each way) placed slightly above the slab mid-height. Cracking of reinforced concrete is a relatively common occurrence. Some cracking of reinforced concrete, including slabs, can be anticipated. Irregularities in new slabs are also common. If cracking of slabs cannot be tolerated, heavily reinforced structural slabs are an option.

MOISTURE-SENSITIVE SPECIAL CONSIDERATIONS

GTC does not practice in the field of moisture vapor transmission evaluation and mitigation. Therefore it is recommended that a qualified consultant be engaged to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. The qualified consultant should provide recommendations for mitigation of potential adverse impacts of moisture vapor transmission on various components of the structure.

Where dampness would be objectionable, it is recommended that the floor slabs should be waterproofed. A qualified waterproofing consultant should be retained in order to recommend a product or method which would provide protection for concrete slabs-on-grade. All concrete slabs-on-grade should be supported on vapor retarder. The design of the slab and the installation of the vapor retarder should comply with the most recent revisions of ASTM E 1643 and ASTM E 1745.

Where a vapor retarder is used, a low-slump concrete should be used to minimize possible curling of the slabs. The barrier can be covered with a layer of trimmable, compactible, granular fill, where it is thought to be beneficial. See ACI 302.2R-32, Chapter 7 for information on the placement of vapor retarders and the use of a fill layer.

PERCOLATION TEST (SURFACE WATER INFILTRATION)

In order to establish a percolation rate for the site soils, we drilled additional boring No.5 for percolation test. The boring was drilled to depth of 15 feet. Casing (4-inches diameter perforated pipe) was placed within the boring to test the area from 10 to 15 feet and below of the existing grade. As per our borings No.1, 2, 3, and 4 the soils materials continue to be similar below 5 feet. After pre-soak, the boring was refilled with water and the absorption of the soils was measured. The result of the percolation test is attached in Percolation Test, Figure No. I.

The laboratory tests were conducted on representative samples in order to determine certain physical properties of the subsurface materials. Field moisture content, in-situ density, and sieve analysis were determined from these tests. The laboratory test results are presented on Figure Nos. I-1.

As per our test results, the site soil below the depths of 10-15 feet (where water infiltration would be allowed) has a percolation rates, on the order of 2.7 inches per hour. According to the Riverside County LID BMP Design Handbook, a safety factor of 3 should be applied to obtain the design infiltration rate.

It is the opinion of this firm that shallow infiltration basins and/or deep “dry well” type infiltration systems may be utilized for stormwater infiltration. The proposed infiltration systems shall maintain a minimum horizontal distance of 10 feet from any structures or foundations, or setback beyond a 1:1 (H:V) plane projected upward from the bottom of any subterranean structures, whichever is greater.

All infiltration devices should be provided with overflow protection. Once the device is full of water, additional water flowing to the device should be diverted to another acceptable disposal area, or disposed offsite in an acceptable manner.

All connections associated with stormwater infiltration devices should be sealed and water-tight. Water leaking into the subgrade soils can lead to loss of strength, piping, erosion, settlement and/or expansion of the effected earth materials.

Based on results of the site explorations, the onsite soils are primarily granular in nature. The soils are in the very low to low expansion range. The onsite soils should allow stormwater to percolate generally in a vertical manner. Therefore, the potential of

creating a perched water condition is negligible. In addition, laboratory testing indicates that the onsite soils are not susceptible to significant hydroconsolidation.

Excavations proposed for the installation of stormwater facilities should comply with the "Temporary Excavations" sections of this (the referenced) reports well as CalOSHA Regulations where applicable.

PLAN REVIEW

Formal plans ready for submittal to the building department should be reviewed by GeoTech Consultants. Any changes in scope of the project may require additional work.

GEOTECHNICAL OBSERVATION

The building department requires that the geotechnical engineer of the record provides site observation during construction. Foundation excavations should be observed and approved by the geotechnical engineer prior to placing steel, forms, or concrete. The engineer should observe bottoms for fill, compaction of fill, temporary excavations, soldier piles, raker deadmen, the installation and stress testing of tieback anchors, and subdrains. All fill that is placed should be approved by the geotechnical engineer and the building department prior to use for support of structural footings and floor slabs.

The building department stamped plans, the permits, and the geotechnical reports should be at the site and available to our representative. The project consultant will perform the observation and post a notice (field memo) at the job site with the findings. This notice should be given to the agency inspector.

WORKMAN SAFETY-EXCAVATIONS

It is necessary for the contractor to provide adequate shoring and safety equipment as required by the State or Federal OSHA regulations. All regulations of the State or Federal OSHA should be followed before allowing workmen in a trench or other excavation. If excavations are to be made during the rainy season, particular care should be given to insure that berms or other devices will prevent surface water from flowing over the top of the excavations or ponding at the top of the excavations.

CLOSURE

The findings and recommendations presented in this report were based on the results of our field and laboratory investigations combined with professional engineering experience and judgment. The report was prepared in accordance with generally accepted engineering principles and practice. We make no other warranty, either express or implied.

It is noted that the conclusions and recommendations presented are based on exploration "window" borings and excavations which is in conformance with accepted engineering practice. Some variations of subsurface conditions are common between "windows" and major variations are possible.

-o0o-

The following Figures and Appendices are attached and complete this report:

Appendix I-Method of Field Exploration
Appendix II-Methods of Laboratory Testing
Site Location Map Plate No. 1
Seismic Hazard Zone Map Plate No. 2
Historically Highest Groundwater Contour Map Plate No. 3
Seismic Hazard Map (Alluvium Condition) Plate No. 4
Site Plan Drawing No.1
Figure Nos. I-1 through I-2 Log of Borings & I-3 Guide to the log of borings
Figure Nos. II-1 and II-2 Direct Shear and Swell – Consolidation Tests
Summary of Calculations Fig. No. 1, Bearing Capacity Calculations
ASCE Design Maps Summary Report & Seismic Parameters.
Liquefaction Analysis.
Percolation Test Results

Respectfully Submitted

GeoTech Consultants, Inc.

Reviewed By:



_____
Behnam Mahmoudkhani, M.Sc., P.E.
Civil Engineer
CE 88488

APPENDIX I

METHOD OF FIELD EXPLORATION

In order to define the subsurface conditions, four borings were made on the site. The approximate location of the drilled borings are shown on the enclosed Site Plan. Borings were extended to maximum depth of about 52 feet below the existing grades. Borings were drilled with an auger.

Continuous logs of the subsurface conditions, as encountered in the test borings, were recorded during the field work and are presented on Figure Nos. I-1 and I-2 within this Appendix. These figures also show the number and approximate depths of each of the recovered soil samples.

The drilling of the borings was supervised by our field engineer who logged the materials brought up from the borings. Undisturbed and bulk samples were collected at depths appropriate to the investigation. The undisturbed sampler utilized in our investigation included our 2.50 inch I.D. drive barrel lined with 1 inch brass rings. The sampler used in the exploratory borings was driven to a depth of 12 inches with a 140-pound hammer falling through a height of 30 inches. The number of blows to drive the sampler 12 inches is shown on the attached Logs of Borings.

APPENDIX II

LABORATORY TESTING PROCEDURES

Moisture Density

The moisture-density information provides a summary of soil consistency for each stratum and can also provide a correlation between soils found on this site and other nearby sites. The dry unit weight and field moisture content were determined for each undisturbed sample, and the results are shown on the log of exploratory borings.

Shear Tests

Shear tests were made with a direct shear machine at a constant rate of strain. The machine is designed to test the soil without completely removing the samples from the brass rings. A range of normal stresses were applied vertically, and the shear strength was progressively determined at each load in order to determine the internal angle of friction and the cohesion. The results of direct shear tests are presented on Figure No. II-1 within this Appendix.

Consolidation

The apparatus used for the consolidation tests is designed to receive the undisturbed brass ring of soil as it comes from the field. Loads were applied to the test specimen in several increments, and the resulting deformations were recorded at selected time intervals. Porous stones were placed in contact with the top and bottom of the specimen to permit the ready addition or release of water.

Undisturbed specimens were tested at the field and added water conditions. The test results are shown on Figure No. II-2 within this Appendix.



SITE LOCATION

JOB NAME : Temescal Canyon Rd (APN: 2821-210-11), Corona, CA

JOB No. 22-449

GeoTech Consultants, Inc.

PLATE No. 1





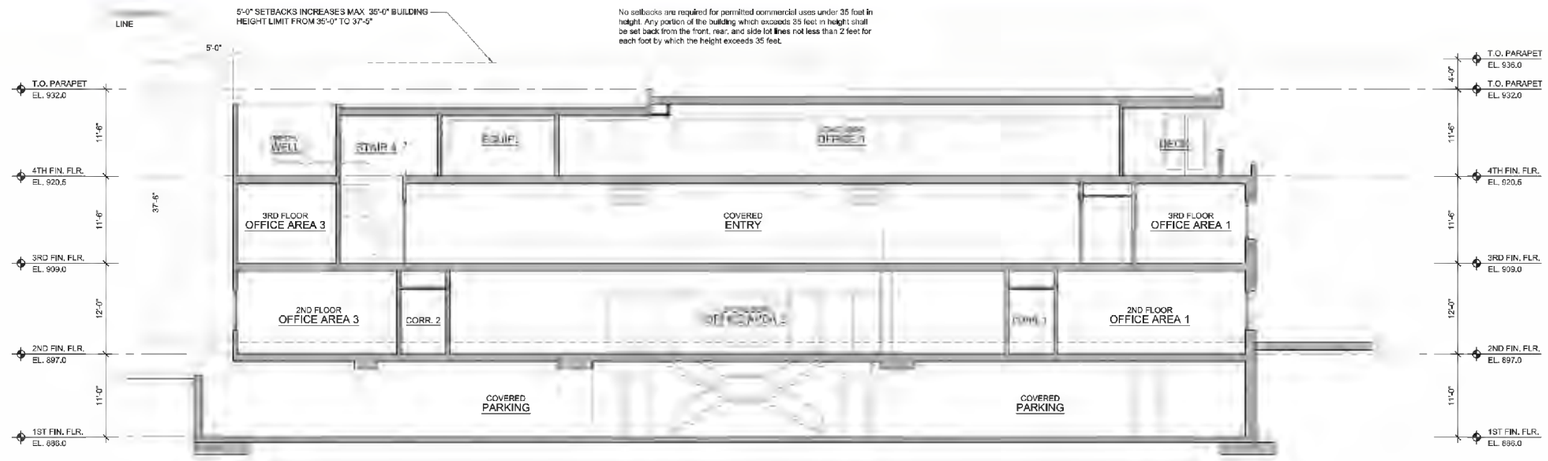
Scale: 1" = 30'

SITE PLAN

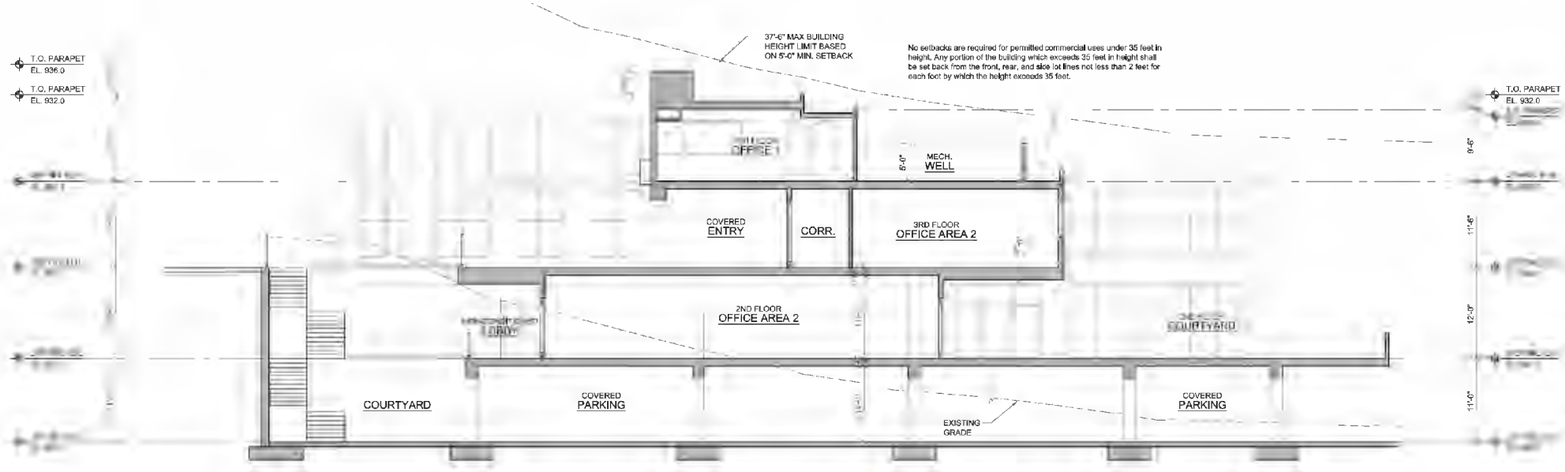
Proposed New 3-Story Office Building
Over Covered Parking on Vacant Land

Temescal Canyon Road. Corona, CA (APN: 2821-210-11)

FOR. Mr. John Soldat	DATE December 2022	PROJECT No. 22-449
GeoTech Consultants, Inc.		DRAWING No. 1



BUILDING SECTION - 2



BUILDING SECTION - 1

Scale: 1" = 20' (V=H)

CROSS SECTIONS

Proposed New 3-Story Office Building
Over Covered Parking on Vacant Land

Temescal Canyon Road. Corona, CA (APN: 2821-210-11)

FOR.	DATE	PROJECT No.
Mr. John Soldat	February 2023	22-449
GeoTech Consultants, Inc.		DRAWING No. 2

GTC
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Glendale, CA 91202
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Email: Behnamgeotech@gmail.com

BORING NUMBER 1

CLIENT

PROJECT NUMBER 22-449 **PROJECT LOCATION** Temescal Canyon Road, Corona (APN 2821-210-11)

DATE 12/7/22 **GROUND ELEVATION** 895 ft **HOLE SIZE** 8 Inches

DRILLING CONTRACTOR Choice Drilling **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem Flight Auger **AT TIME OF DRILLING** --- No Water

LOGGED BY Haybert Mahmoudi **AT END OF DRILLING** --- No Water

CHECKED BY Behnam Mahmoudkhani **NOTES**

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0	GB			Fill		SILTY SAND, (SM) dark brown, fine grained, dry to slightly moist, dense, with fine grained gravel, some roots, no odor — 894.0
1.0						
				SM		SILTY SAND, (SM)
5						890.0
5.0	SPT	11-18-24 (42)	MC = 7% DD = 125 pcf Fines = 31%	SM		SILTY SAND, (SM) light brown, fine grained, moist, very dense, few coarse sand, few fine grained gravel, no odor
10						885.0
10.0	SPT	10-20-31 (51)	MC = 12% DD = 109 pcf Fines = 71%	ML		CLAYEY SILT, (ML) brownish orange, moist, very stiff, with very fine grained sand, no odor
15						880.0
15.0	SPT	35-50/3"	MC = 8% DD = 118 pcf Fines = 42%	SM		SILTY SAND, (SM) light tannish brown, fine grained, moist, very dense, few fine grained gravel, with clay, no odor
20						875.0
20.0	SPT	14-38-46 (84)	MC = 11% DD = 120 pcf Fines = 39%	SM		SILTY SAND, (SM) dark brown, fine to coarse grained, moist, very dense, few fine grained gravel, no odor
25						870.0
25.0	SPT	29-50/4"	MC = 12% DD = 116 pcf Fines = 46%	SM		SILTY SAND, (SM) light brown, very fine to fine grained, moist, very dense, with clay, no odor

(Continued Next Page)

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BORING NUMBER 1

CLIENT _____

PROJECT NUMBER 22-449 **PROJECT LOCATION** Temescal Canyon Road, Corona (APN 2821-210-11)

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
30				SM		SILTY SAND, (SM) light brown, very fine to fine grained, moist, very dense, with clay, no odor *(continued)*
						30.0 865.0
	SPT	21-38-50/5"	MC = 13% DD = 105 pcf Fines = 82%	ML		CLAYEY SILT, (ML) greenish brown, moist, very stiff, with very fine grained sand, no odor
35						35.0 860.0
	SPT	33-50/5"	MC = 10% DD = 104 pcf Fines = 85%	ML		CLAYEY SILT, (ML) brownish green, moist, very stiff, with very fine grained sand, no odor
40						40.0 855.0
	SPT	28-34-40 (74)	MC = 13% DD = 104 pcf Fines = 86%	ML		CLAYEY SILT, (ML) No Change
45						45.0 850.0
	SPT	30-32-50/5"	MC = 10% DD = 105 pcf Fines = 80%	ML		CLAYEY SILT, (ML) No Change
50						50.0 845.0
	SPT	24-50/5"	MC = 12% DD = 103 pcf Fines = 79%	ML		CLAYEY SILT, (ML) No Change
						52.0 843.0

Bottom of borehole at 52.0 feet.

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BORING NUMBER 2

CLIENT

PROJECT NUMBER 22-449 **PROJECT LOCATION** Temescal Canyon Road, Corona (APN 2821-210-11)

DATE 12/7/22 **GROUND ELEVATION** 885 ft **HOLE SIZE** 8 Inches

DRILLING CONTRACTOR Choice Drilling **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem Flight Auger **AT TIME OF DRILLING** --- No Water

LOGGED BY Haybert Mahmoudi **AT END OF DRILLING** --- No Water

CHECKED BY Behnam Mahmoudkhani **NOTES**

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0	GB			Fill		SILTY SAND, (SM) dark brown, fine grained, dry to slightly moist, dense, with fine grained gravel, some roots, no odor
						2.0 — 883.0
2.5				ML		SANDY CLAYEY SILT, (ML)
5.0						5.0 — 880.0
	MC	8-10-14 (24)	MC = 10% DD = 114 pcf			SANDY CLAYEY SILT, (ML) dark brown, fine grained, moist, stiff, few coarse sand, few fine grained gravel, no odor
7.5				ML		
10.0						10.0 — 875.0
	MC	29-50/5"	MC = 8% DD = 123 pcf			SILTY SAND, (SM) brownish orange, fine grained, moist, very dense, few fine grained gravel, no odor
12.5				SM		
15.0						15.0 — 870.0
	MC	25-40-50/4"	MC = 8% DD = 118 pcf	SM		SILTY SAND, (SM) brown, fine grained, moist, very dense, with clay, few fine grained gravel, no odor
						17.0 — 868.0

Bottom of borehole at 17.0 feet.

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BORING NUMBER 3

CLIENT

PROJECT NUMBER 22-449 **PROJECT LOCATION** Temescal Canyon Road, Corona (APN 2821-210-11)

DATE 12/7/22 **GROUND ELEVATION** 915 ft **HOLE SIZE** 8 Inches

DRILLING CONTRACTOR Choice Drilling **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem Flight Auger **AT TIME OF DRILLING** --- No Water

LOGGED BY Haybert Mahmoudi **AT END OF DRILLING** --- No Water

CHECKED BY Behnam Mahmoudkhani **NOTES**

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0	GB			Fill		SILTY SAND, (SM) dark brown, fine grained, dry to slightly moist, dense, with fine grained gravel, some roots, no odor
2.5						
						3.0 912.0
				SM		SILTY SAND, (SM)
5.0						5.0 910.0
	MC	18-50/5"	MC = 5% DD = 115 pcf	SM		SILTY SAND, (SM) light brown, fine to coarse grained, slightly moist, very dense, with fine grained gravel, no odor
7.5						
10.0						10.0 905.0
	MC	34-50/5"	MC = 10% DD = 103 pcf	ML		CLAYEY SILT, (ML) light tannish brown, moist, very stiff, trace very fine grained sand, no odor
12.5						
15.0						15.0 900.0
	MC	27-50/5"	MC = 12% DD = 108 pcf	ML		SANDY CLAYEY SILT, (ML) light brown, very fine grained, moist, very stiff, no odor
						17.0 898.0

Bottom of borehole at 17.0 feet.

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BORING NUMBER 4

CLIENT

PROJECT NUMBER 22-449 **PROJECT LOCATION** Temescal Canyon Road, Corona (APN 2821-210-11)

DATE 12/7/22 **GROUND ELEVATION** 916 ft **HOLE SIZE** 8 Inches

DRILLING CONTRACTOR Choice Drilling **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem Flight Auger **AT TIME OF DRILLING** --- No Water

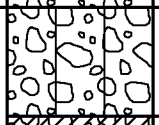
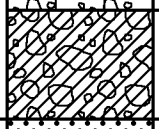
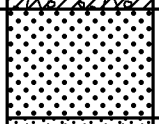
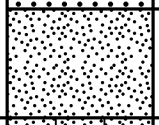
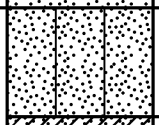
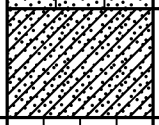
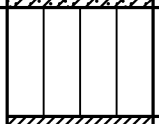
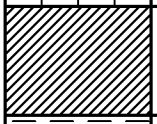
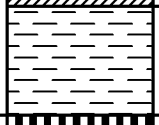
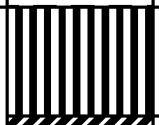
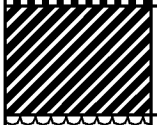
LOGGED BY Haybert Mahmoudi **AT END OF DRILLING** --- No Water

CHECKED BY Behnam Mahmoudkhani **NOTES**

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0	GB			Fill		SILTY SAND, (SM) dark brown, fine grained, dry to slightly moist, dense, with fine grained gravel, some roots, no odor
2.5						
						3.0 913.0
				SM		SILTY SAND, (SM)
5.0						5.0 911.0
	MC	24-31-50/5"	MC = 9% DD = 116 pcf	SM		SILTY SAND, (SM) brown, fine grained, moist, very dense, with fine grained gravel, no odor
7.5						
10.0						10.0 906.0
	MC	37-50/5"	MC = 11% DD = 109 pcf	ML		CLAYEY SILT, (ML) light brown, moist, very stiff, trace very fine grained sand, no odor
						12.0 904.0

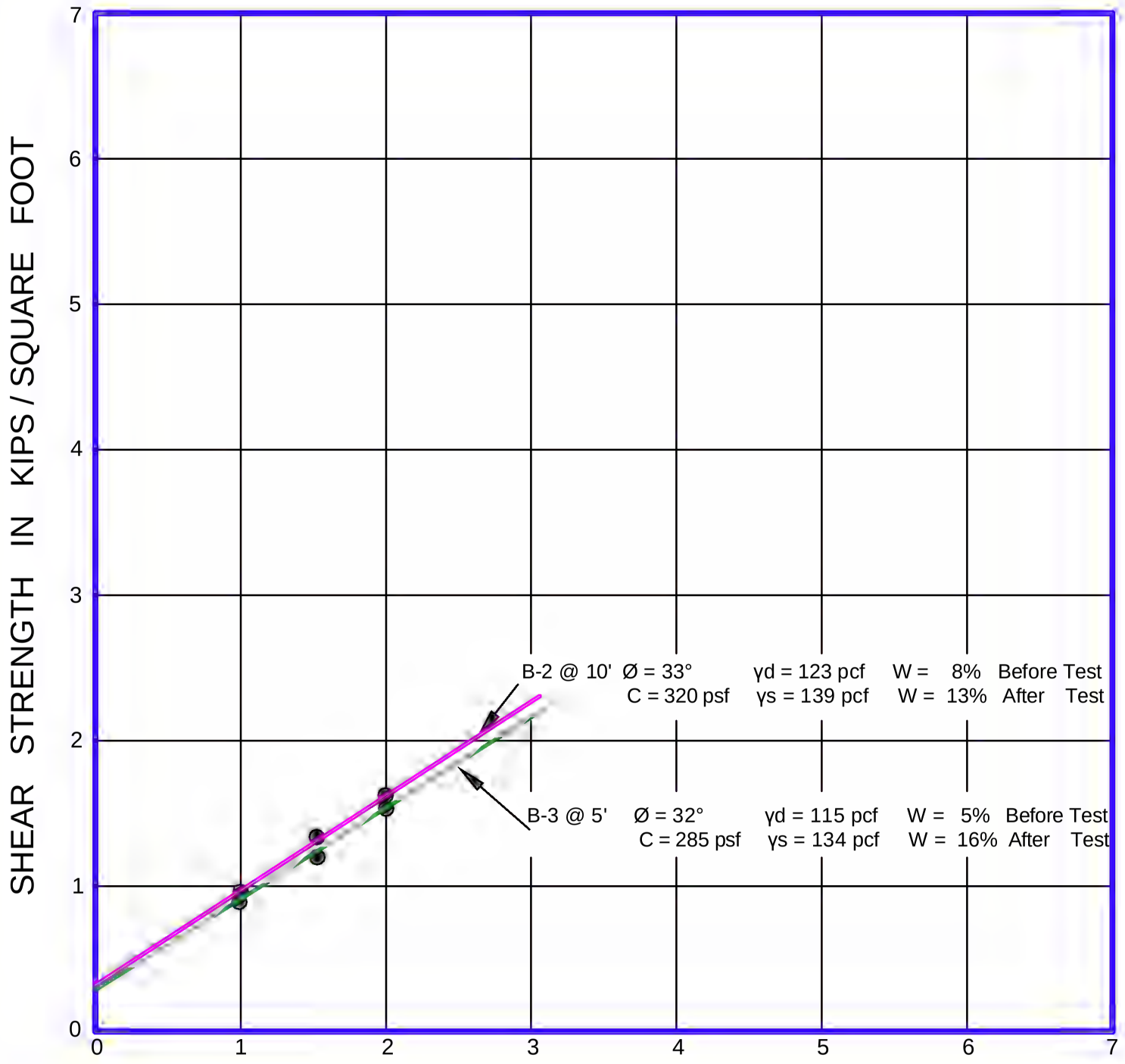
Bottom of borehole at 12.0 feet.

SOIL CLASSIFICATION CHART

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

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

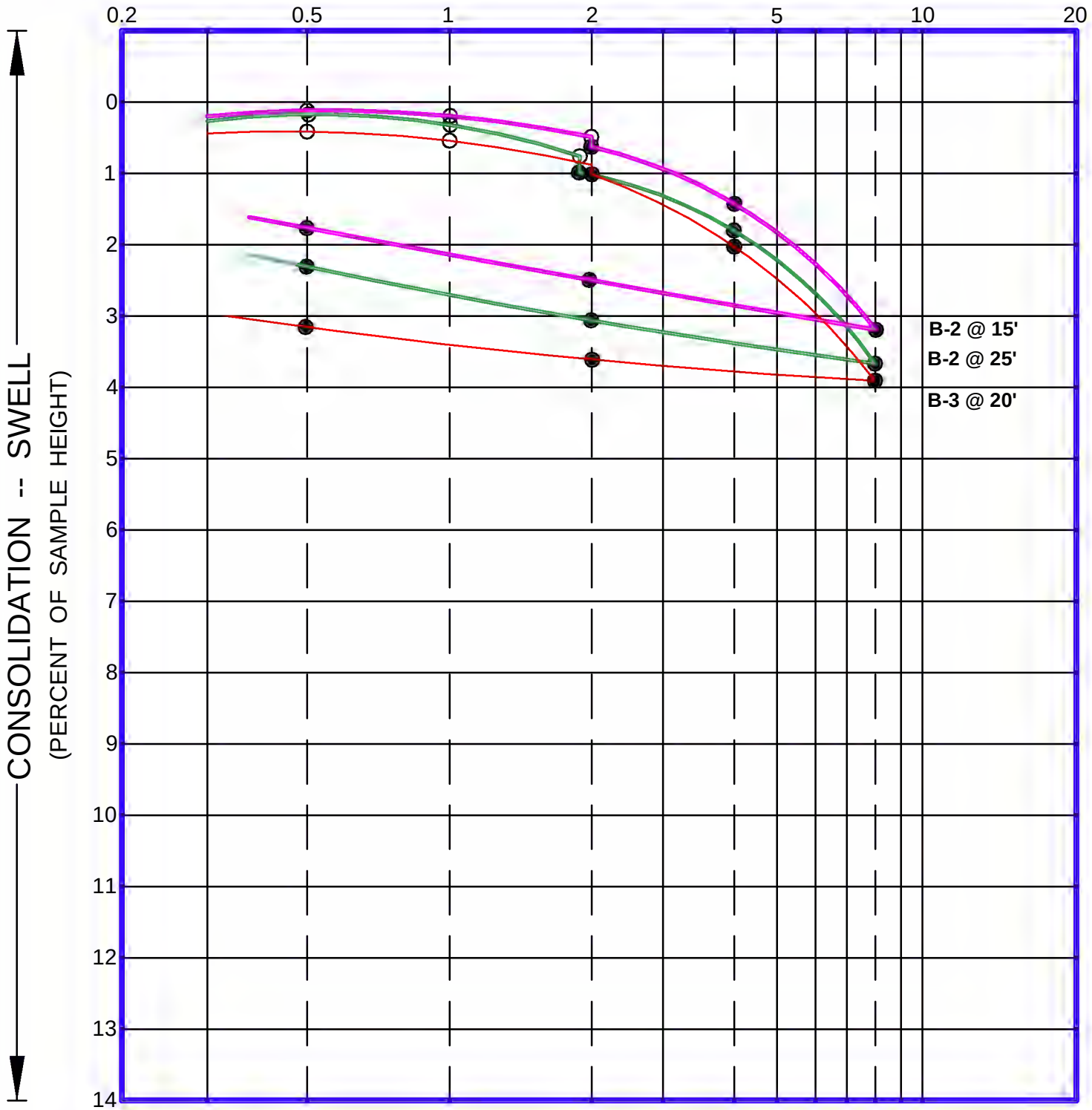
NORMAL STRESS IN KIPS / SQUARE FOOT



DIRECT SHEAR TESTS

JOB NAME Temescal Canyon Road. Corona, CA (APN: 2821-210-11)	JOB No. 22-449
GeoTech Consultants, Inc.	FIGURE No. II - 1

PRESSURE IN KIPS PER SQUARE FOOT



○ FIELD MOISTURE ● WATER ADDED

SWELL - CONSOLIDATION TESTS

JOB NAME Temescal Canyon Road. Corona, CA (APN: 2821-210-11)

JOB No. 22-449

GeoTech Consultants, Inc.

FIGURE No. II - 2

Summary of Calculation
Bearing Capacity Calculations

Input

Soil Density	(γ)	121	pcf
Friction Angle	(φ)	32	
Cohesion	(c)	285	psf
Footing Width	(B)	1	ft
Footing Depth	(D)	2	ft
Effective Unit weight	(γ')		pcf
Factor of Safety	(FS)	4	

Continuous Footing

$q_{ult} = cNc+\gamma DNq+\gamma BN\gamma/2$

$q_{allow} = q_{ult}/FS$

q_{allow} = 2400 psf

Square Footing

$q_{ult} = 1.3cNc+\gamma DNq+0.4\gamma BN\gamma$

$q_{allow} = q_{ult}/FS$

q_{allow} = 2600 psf

Increase per foot of Depth and Width

$q_{increase,\ depth}$ = 200 psf

Increase per foot of Width

$q_{increase,\ width}$ = 200 psf

$q_{max\,allow}$ = 3800 psf

Job Name:	Temescal Canyon Road, Corona, CA.	Job No.	22-449
G.T.C		FIGURE No.	1

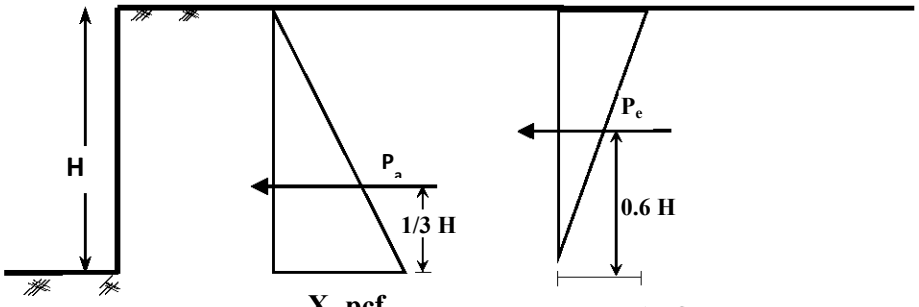
Table 1: NONRESTRAINED AND RESTRAINED DRAINED RETAINING WALLS

Wall Design Recommendations				
Retained Height & Back-slope Gradient (maximum)	Active Pressure Fluid Weight (pcf)	At-Rest Pressure Fluid Weight (pcf)	Restrained Design Earth Pressure (psf)*[1]	Seismically Induced Earth Pressure - Fluid Weight (pcf) *[2]
Up to 25 (ft.) Height & Level Back-Slope	$X_1 = 37$	-	$X_2 = 48 \times \mathbf{H}$	Y= 13

*[1] -Where H is the height of retained soil

*[2] - The seismically induced earth pressure should be applied as an inverted triangular pressure

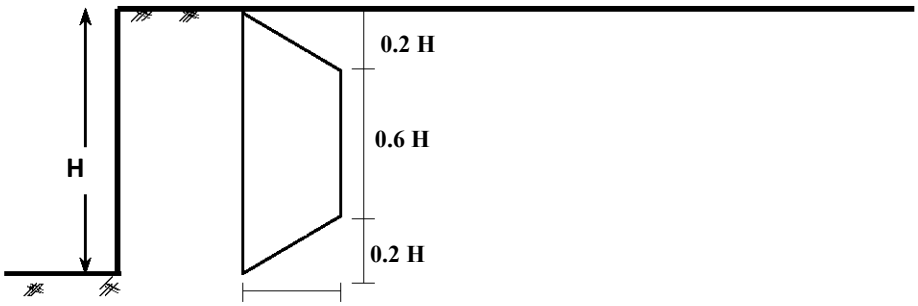
2. Cantilever Wall Design Based on Active Earth Pressure



X_1 pcf
Triangular Distribution of Active Earth Pressure

Y H (psf)
Triangular Inverse Distribution of Earth Pressure (Seismic)

1. Restrained Wall Design Based on At Rest Earth Pressure



X_2 H (psf)
Trapezoidal Distribution of Earth pressure

1. **Restrained Subterranean walls**, "walls for which horizontal movement is restricted at the top", shall be designed for an At-Rest lateral earth pressure (equivalent fluid weight) as illustrated in the above diagram of **Trapezoidal Distribution of Earth Pressure, X_2.H(psf). Our analysis of restrained and cantilevered retaining walls indicate that load combination of seismic plus static active is lower than the at-reat forces. Therefore, no additional loading due to seismic is required for restrained walls.**

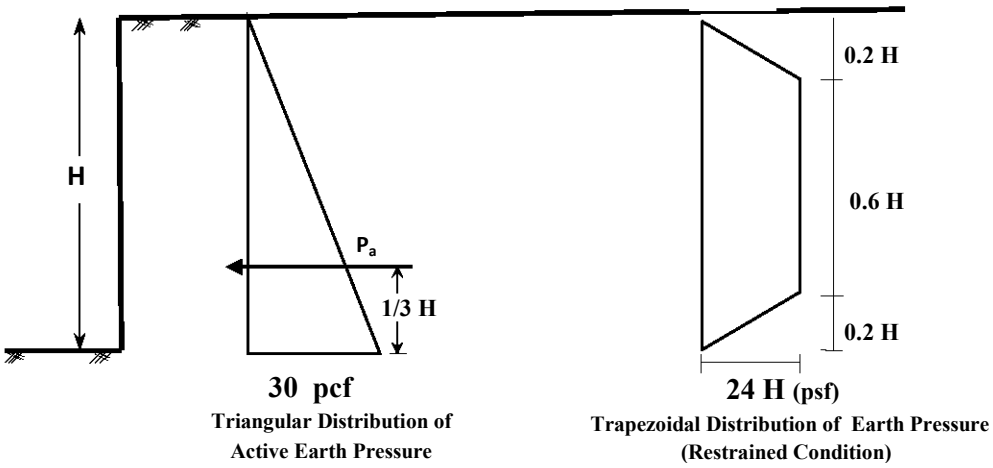
2. **Cantilevered retaining walls** higher than 6 feet shall be designed with the addition of seismic surcharge as illustrated on the above diagrams of Triangular Distribution of Active Earth Pressure and Triangular Inverse distribution of seismic pressure.

Table 2: Shoring Design

Shoring Lateral Pressures Recommendations		
Surface Slope of Retained Material Horizontal to Vertical	Static Equivalent Fluid Weight (pcf)	Restrained Condition Design Earth Pressure (psf)*
Level up to 25 ft.	X = 30	24

* -Where H is the retained height of the excavation soil

Shoring Design Based on Active Earth Pressure



Cantilevered soldier pile should be designed to resist an active earth pressure. The active earth pressure condition assumes that a triangular pressure distribution is utilized in the shoring design. If the soldier piles are not allowed to deflect, they shall be designed for the Restrained Condition. Soldier piles designed for the restrained condition should utilize a trapezoidal pressure distribution.

Earth pressure on structure analysis

Input data

Project

Task : Lateral Earth Pressure Permanent Condition (At-Rest) Up to 25 ft. Back-Slope
Descript. : Temescal Canyon Road
Author : Behnam M. Khani
Date : 2/27/2023

Settings

USA - Safety factor-GeoTech (Parameters Reduce) (2)

Excavations

Active earth pressure calculation : Mazindrani (Rankin)
Passive earth pressure calculation : Mazindrani (Rankin)
Earthquake analysis : Mononobe-Okabe
Shape of earth wedge : Calculate as skew
Verification methodology : Limit states (LSD)

Reduction coeff. of soil parameters Permanent design situation			
Reduction coeff. of internal friction :	$\gamma_{m\varphi}$ =	1.50	[–]
Reduction coeff. of cohesion :	γ_{mc} =	1.50	[–]
Reduction coeff. of Poisson's ratio :	$\gamma_{m\nu}$ =	1.00	[–]
Coefficient of unit weight behind construction :	$\gamma_{m\gamma}$ =	1.00	[–]
Coefficient of unit weight in front of constr. :	$\gamma_{m\gamma}$ =	1.00	[–]

Basic soil parameters

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [psf]	γ [pcf]	γ_{su} [pcf]	δ [°]
1	Silty Sand		32.00	285.0	121.00	71.50	0.00

All soils are considered as cohesionless for at rest pressure analysis.

Soil parameters

Silty Sand
Unit weight : γ = 121.0 pcf
Stress-state : effective
Angle of internal friction : φ_{ef} = 32.00 °
Cohesion of soil : c_{ef} = 285.0 psf
Angle of friction struc.-soil : δ = 0.00 °
Soil : cohesionless
Saturated unit weight : γ_{sat} = 134.0 pcf

Geological profile and assigned soils

No.	Layer [ft]	Assigned soil	Pattern
1	30.00	Silty Sand	

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No.	Layer [ft]	Assigned soil	Pattern
2	-	Silty Sand	

Terrain profile

Terrain behind the structure is flat.

Water influence

Ground water table is located below the structure.

Settings of the stage of construction

Design situation : permanent

Analysis No. 1

Pressure at rest behind the structure - partial results

Layer No.	Thickness [ft]	α [°]	φ_d [°]	c_d [psf]	γ [pcf]	K_r	Comment
1	25.00	0.00	21.33	190.0	121.00	0.636	

Pressure at rest distribution behind the structure (without surcharge)

Layer No.	Start [ft] End [ft]	σ_Z [psf]	σ_W [psf]	Pressure [psf]	Hor. comp. [psf]	Vert. comp. [psf]
1	0.00	0.0	0.0	0.0	0.0	0.0
	25.00	3025.0	0.0	1924.5	1924.5	0.0

Overall pressure acting on the structure

Point No.	Depth [ft]	Hor. comp. [psf]	Vert. comp. [psf]
1	0.00	0.0	0.0
2	25.00	1924.5	0.0

Resultant forces

Total horizontal pressure acting on construction = 24056.57 lbf/ft
Application point of horiz. comp. lies in depth = 16.67 ft
Total vertical pressure acting on construction = 0.00 lbf/ft
Dist. of vertical comp. from top of constr. = 0.00 ft

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Earth pressure on structure analysis

Input data

Project

Task : Lateral Earth Pressure Permanent Condition (Seismic) Up to 25 ft. Back-Slope
Descript. : Temescal Canyon Road
Author : Behnam M. Khani
Date : 2/27/2023

Settings

USA - Safety factor-GeoTech (Parameters Reduce) (2)

Excavations

Active earth pressure calculation : Mazindrani (Rankin)
Passive earth pressure calculation : Mazindrani (Rankin)
Earthquake analysis : Mononobe-Okabe
Shape of earth wedge : Calculate as skew
Verification methodology : Limit states (LSD)

Reduction coeff. of soil parameters Seismic design situation			
Reduction coeff. of internal friction :	$\gamma_{m\varphi}$ =	1.00	[–]
Reduction coeff. of cohesion :	γ_{mc} =	1.00	[–]
Reduction coeff. of Poisson's ratio :	$\gamma_{m\nu}$ =	1.00	[–]
Coefficient of unit weight behind construction :	$\gamma_{m\gamma}$ =	1.00	[–]
Coefficient of unit weight in front of constr. :	$\gamma_{m\gamma}$ =	1.00	[–]

Basic soil parameters

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [psf]	γ [pcf]	γ_{su} [pcf]	δ [°]
1	Silty Sand		32.00	285.0	121.00	71.50	0.00

All soils are considered as cohesionless for at rest pressure analysis.

Soil parameters

Silty Sand
Unit weight : γ = 121.0 pcf
Stress-state : effective
Angle of internal friction : φ_{ef} = 32.00 °
Cohesion of soil : c_{ef} = 285.0 psf
Angle of friction struc.-soil : δ = 0.00 °
Soil : cohesionless
Saturated unit weight : γ_{sat} = 134.0 pcf

Geological profile and assigned soils

No.	Layer [ft]	Assigned soil	Pattern
1	30.00	Silty Sand	

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No.	Layer [ft]	Assigned soil	Pattern
2	-	Silty Sand	

Terrain profile

Terrain behind the structure is flat.

Water influence

Ground water table is located below the structure.

Earthquake

Horizontal seismic coefficient k_h = 0.3500
Vertical seismic coefficient k_v = 0.0000
Coeff. to compute point of application k.H = 0.60
Water below the GWT is restricted.

Settings of the stage of construction

Design situation : seismic

Analysis No. 1

Active pressure behind the structure - partial results

Layer No.	Thickness [ft]	α [°]	φ_d [°]	c_d [psf]	γ [pcf]	δ_d [°]	K_a	Comment
1	8.50	0.00	32.00	285.0	121.00	0.00	0.000	
2	16.50	0.00	32.00	285.0	121.00	0.00	0.203	

Active pressure distribution behind the structure (without surcharge)

Layer No.	Start [ft] End [ft]	σ_Z [psf]	σ_W [psf]	Pressure [psf]	Hor. comp. [psf]	Vert. comp. [psf]
1	0.00	0.0	0.0	0.0	0.0	0.0
	8.50	1028.3	0.0	0.0	0.0	0.0
2	8.50	1028.3	0.0	0.0	0.0	0.0
	25.00	3025.0	0.0	613.5	613.5	0.0

Earthquake effects (active earth pressure) - partial results

Layer No.	Thickness [ft]	φ_d [°]	β [°]	ψ [°]	K_a	K_{ae}	K_{ae}-K_a	Comment
1	8.50	32.00	0.00	19.29	0.307	0.585	0.278	
2	16.50	32.00	0.00	19.29	0.307	0.585	0.278	

Earthquake effects (active earth pressure)

Layer No.	Start [ft] End [ft]	σ_Z [psf]	σ_D [psf]	Pressure [psf]	Hor. comp. [psf]	Vertical comp. [psf]
1	0.00	0.0	3025.0	839.7	839.7	0.0
	8.50	1028.3	1996.7	554.2	554.2	0.0
2	8.50	1028.3	1996.7	554.2	554.2	0.0
	25.00	3025.0	0.0	0.0	0.0	0.0

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Overall pressure acting on the structure

Point No.	Depth [ft]	Hor. comp. [psf]	Vert. comp. [psf]
1	0.00	671.7	0.0
2	8.50	500.5	0.0
3	25.00	781.4	0.0

Resultant forces

Total horizontal pressure acting on construction = 15557.56 lbf/ft
Application point of horiz. comp. lies in depth = 13.09 ft
Total vertical pressure acting on construction = 0.00 lbf/ft
Dist. of vertical comp. from top of constr. = 0.00 ft

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Earth pressure on structure analysis

Input data

Project

Task : Lateral Earth Pressure Permanent Condition (Active) Up to 25 ft. Back-Slope
Descript. : Temescal Canyon Road
Author : Behnam M. Khani
Date : 2/27/2023

Settings

USA - Safety factor-GeoTech (Parameters Reduce) (2)

Excavations

Active earth pressure calculation : Mazindrani (Rankin)
Passive earth pressure calculation : Mazindrani (Rankin)
Earthquake analysis : Mononobe-Okabe
Shape of earth wedge : Calculate as skew
Verification methodology : Limit states (LSD)

Reduction coeff. of soil parameters Permanent design situation			
Reduction coeff. of internal friction :	$\gamma_{m\varphi}$ =	1.50	[–]
Reduction coeff. of cohesion :	γ_{mc} =	1.50	[–]
Reduction coeff. of Poisson's ratio :	$\gamma_{m\nu}$ =	1.00	[–]
Coefficient of unit weight behind construction :	$\gamma_{m\gamma}$ =	1.00	[–]
Coefficient of unit weight in front of constr. :	$\gamma_{m\gamma}$ =	1.00	[–]

Basic soil parameters

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [psf]	γ [pcf]	γ_{su} [pcf]	δ [°]
1	Silty Sand		32.00	285.0	121.00	71.50	0.00

All soils are considered as cohesionless for at rest pressure analysis.

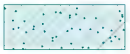
Soil parameters

Silty Sand
Unit weight : γ = 121.0 pcf
Stress-state : effective
Angle of internal friction : φ_{ef} = 32.00 °
Cohesion of soil : c_{ef} = 285.0 psf
Angle of friction struc.-soil : δ = 0.00 °
Soil : cohesionless
Saturated unit weight : γ_{sat} = 134.0 pcf

Geological profile and assigned soils

No.	Layer [ft]	Assigned soil	Pattern
1	30.00	Silty Sand	

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No.	Layer [ft]	Assigned soil	Pattern
2	-	Silty Sand	

Terrain profile

Terrain behind the structure is flat.

Water influence

Ground water table is located below the structure.

Settings of the stage of construction

Design situation : permanent

Analysis No. 1

Active pressure behind the structure - partial results

Layer No.	Thickness [ft]	α [°]	φ_d [°]	c_d [psf]	γ [pcf]	δ_d [°]	K_a	Comment
1	4.60	0.00	21.33	190.0	121.00	0.00	0.000	
2	20.40	0.00	21.33	190.0	121.00	0.00	0.381	

Active pressure distribution behind the structure (without surcharge)

Layer No.	Start [ft] End [ft]	σ_Z [psf]	σ_W [psf]	Pressure [psf]	Hor. comp. [psf]	Vert. comp. [psf]
1	0.00	0.0	0.0	0.0	0.0	0.0
	4.60	556.4	0.0	0.0	0.0	0.0
2	4.60	556.4	0.0	0.0	0.0	0.0
	25.00	3025.0	0.0	1151.6	1151.6	0.0

Overall pressure acting on the structure

Point No.	Depth [ft]	Hor. comp. [psf]	Vert. comp. [psf]
1	0.00	0.0	0.0
2	4.60	0.0	0.0
3	25.00	1151.6	0.0

Resultant forces

Total horizontal pressure acting on construction = 11747.59 lbf/ft
Application point of horiz. comp. lies in depth = 18.20 ft
Total vertical pressure acting on construction = 0.00 lbf/ft
Dist. of vertical comp. from top of constr. = 0.00 ft

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Earth pressure on structure analysis

Input data

Project

Task : Lateral Earth Pressure Temporary Condition (Active) Up to 25 ft. Back-Slope
Descript. : Temescal Canyon Road
Author : Behnam M. Khani
Date : 2/27/2023

Settings

USA - Safety factor-GeoTech (Parameters Reduce) (2)

Excavations

Active earth pressure calculation : Mazindrani (Rankin)
Passive earth pressure calculation : Mazindrani (Rankin)
Earthquake analysis : Mononobe-Okabe
Shape of earth wedge : Calculate as skew
Verification methodology : Limit states (LSD)

Reduction coeff. of soil parameters Transient design situation			
Reduction coeff. of internal friction :	$\gamma_{m\varphi}$ =	1.25	[–]
Reduction coeff. of cohesion :	γ_{mc} =	1.25	[–]
Reduction coeff. of Poisson's ratio :	$\gamma_{m\nu}$ =	1.00	[–]
Coefficient of unit weight behind construction :	$\gamma_{m\gamma}$ =	1.00	[–]
Coefficient of unit weight in front of constr. :	$\gamma_{m\gamma}$ =	1.00	[–]

Basic soil parameters

No.	Name	Pattern	φ_{ef} [°]	c_{ef} [psf]	γ [pcf]	γ_{su} [pcf]	δ [°]
1	Silty Sand		32.00	285.0	121.00	71.50	0.00

All soils are considered as cohesionless for at rest pressure analysis.

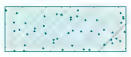
Soil parameters

Silty Sand
Unit weight : γ = 121.0 pcf
Stress-state : effective
Angle of internal friction : φ_{ef} = 32.00 °
Cohesion of soil : c_{ef} = 285.0 psf
Angle of friction struc.-soil : δ = 0.00 °
Soil : cohesionless
Saturated unit weight : γ_{sat} = 134.0 pcf

Geological profile and assigned soils

No.	Layer [ft]	Assigned soil	Pattern
1	30.00	Silty Sand	

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No.	Layer [ft]	Assigned soil	Pattern
2	-	Silty Sand	

Terrain profile

Terrain behind the structure is flat.

Water influence

Ground water table is located below the structure.

Settings of the stage of construction

Design situation : transient

Analysis No. 1

Active pressure behind the structure - partial results

Layer No.	Thickness [ft]	α [°]	φ_d [°]	c_d [psf]	γ [pcf]	δ_d [°]	K_a	Comment
1	5.98	0.00	25.60	228.0	121.00	0.00	0.000	
2	19.02	0.00	25.60	228.0	121.00	0.00	0.302	

Active pressure distribution behind the structure (without surcharge)

Layer No.	Start [ft] End [ft]	σ_z [psf]	σ_w [psf]	Pressure [psf]	Hor. comp. [psf]	Vert. comp. [psf]
1	0.00	0.0	0.0	0.0	0.0	0.0
	5.98	724.1	0.0	0.0	0.0	0.0
2	5.98	724.1	0.0	0.0	0.0	0.0
	25.00	3025.0	0.0	912.4	912.4	0.0

Overall pressure acting on the structure

Point No.	Depth [ft]	Hor. comp. [psf]	Vert. comp. [psf]
1	0.00	0.0	0.0
2	5.98	0.0	0.0
3	25.00	912.4	0.0

Resultant forces

Total horizontal pressure acting on construction = 8675.37 lbf/ft
Application point of horiz. comp. lies in depth = 18.66 ft
Total vertical pressure acting on construction = 0.00 lbf/ft
Dist. of vertical comp. from top of constr. = 0.00 ft

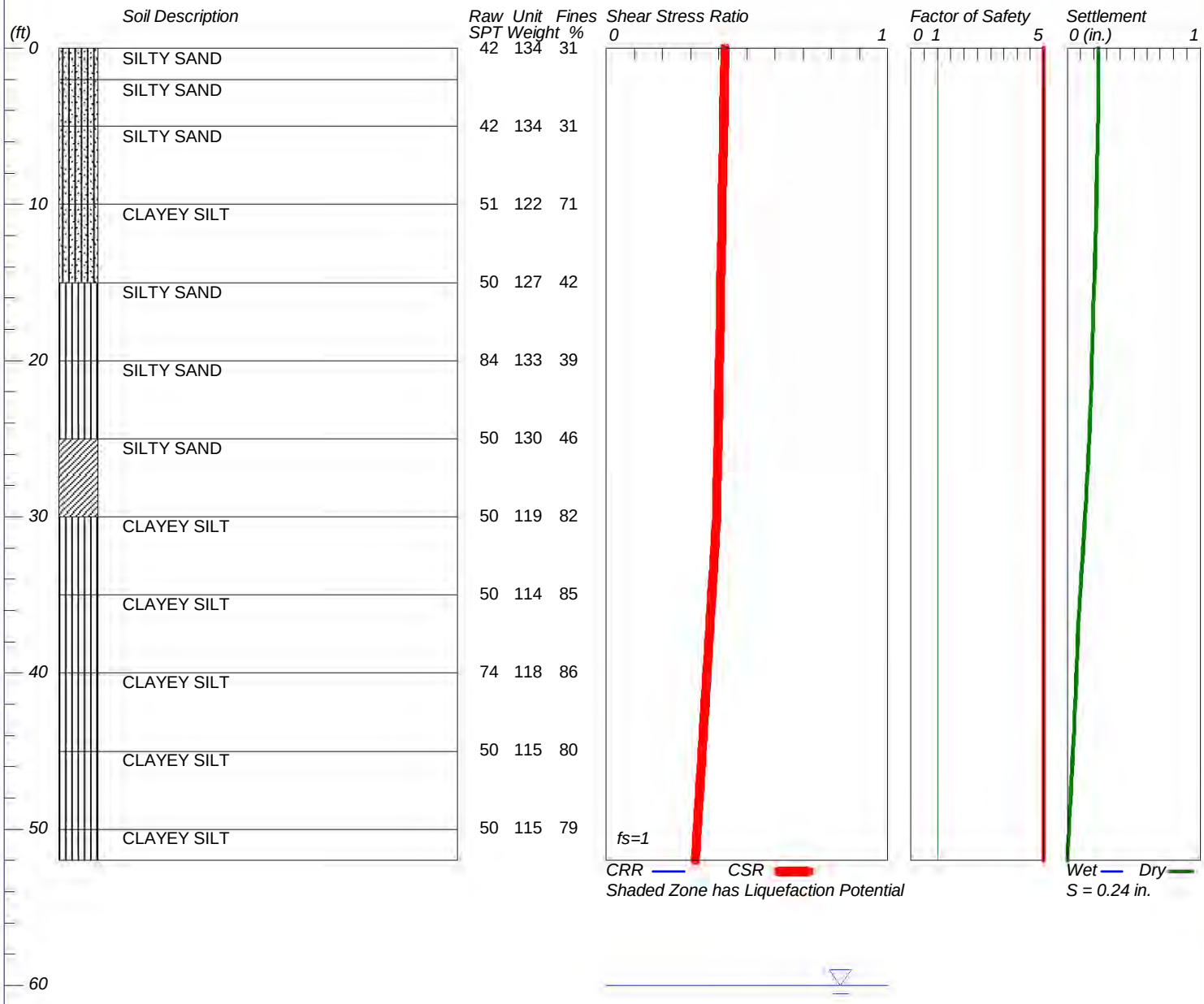
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LIQUEFACTION EVALUATION

Temescal Canyon Rd. Los Angeles

Hole No.=B-1 Water Depth=60 ft Surface Elev.=895

Magnitude=6.7
Acceleration=0.65g



LiquefyPro CivilTech Software USA www.civiltech.com

****

LIQUEFACTION ANALYSIS CALCULATION SHEET

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Input File Name: \\MYCLOUD-GPS9AC\Public\BEHNAM\2022\Temescal Canyon Rd (APN 2821-210-11)\PDF\New folder\Temescal Canyon Road.liq

Title: Temescal Canyon Rd. Los Angeles

Subtitle: GeoTech Consultants (Method Tokimatsu/Seed)

Input Data:

Surface Elev.=895

Hole No.=B-1

Depth of Hole=52.0 ft

Water Table during Earthquake= 60.0 ft

Water Table during In-Situ Testing= 60.0 ft

Max. Acceleration=0.65 g

Earthquake Magnitude=6.7

Earthquake Magnitude=6.7

2. Settlement Analysis Method: Tokimatsu / Seed

3. Fines Correction for Liquefaction: Idriss/Seed (SPT only)

4. Fine Correction for Settlement: During Liquefaction*

5. Settlement Calculation in: All zones*

6. Hammer Energy Ratio, Ce=1.2

7. Borehole Diameter, Cb=1

8. Sampeling Method, Cs=1

fs=1, Plot one CSR (fs=1)

10. Use Curve Smoothing: Yes*

* Recommended Options

In-Situ Test Data:

Depth ft	SPT	Gamma pcf	Fines %
0.0	42.0	134.0	31.0
5.0	42.0	134.0	31.0
10.0	51.0	122.0	71.0
15.0	50.0	127.0	42.0
20.0	84.0	133.0	39.0
25.0	50.0	130.0	46.0
30.0	50.0	119.0	82.0

35.0	50.0	114.0	85.0
40.0	74.0	118.0	86.0
45.0	50.0	115.0	80.0
50.0	50.0	115.0	79.0

Output Results:

Calculation segment, dz=0.050 ft

User defined Print Interval, dp=5.00 ft

CSR Calculation:

Depth ft	gamma pcf	sigma tsf	gamma' pcf	sigma' tsf	rd	CSR	fs (user)	CSRfs w/fs
0.00	134.0	0.000	134.0	0.000	1.00	0.42	1.0	0.42
5.00	134.0	0.335	134.0	0.335	0.99	0.42	1.0	0.42
10.00	122.0	0.655	122.0	0.655	0.98	0.41	1.0	0.41
15.00	127.0	0.966	127.0	0.966	0.97	0.41	1.0	0.41
20.00	133.0	1.291	133.0	1.291	0.95	0.40	1.0	0.40
25.00	130.0	1.620	130.0	1.620	0.94	0.40	1.0	0.40
30.00	119.0	1.931	119.0	1.931	0.93	0.39	1.0	0.39
35.00	114.0	2.223	114.0	2.223	0.89	0.38	1.0	0.38
40.00	118.0	2.513	118.0	2.513	0.85	0.36	1.0	0.36
45.00	115.0	2.804	115.0	2.804	0.81	0.34	1.0	0.34
50.00	115.0	3.092	115.0	3.092	0.77	0.32	1.0	0.32

CSR is based on water table at 60.0 during earthquake

CRR Calculation from SPT or BPT data:

Depth ft	SPT	Cebs	Cr	sigma' tsf	Cn	(N1)60	Fines %	d(N1)60	(N1)60f	CRR7.5
0.00	42.00	1.20	0.75	0.000	1.70	64.26	31.00	15.22	79.48	2.00
5.00	42.00	1.20	0.75	0.335	1.70	64.26	31.00	15.22	79.48	2.00
10.00	51.00	1.20	0.85	0.655	1.24	64.27	71.00	17.85	82.12	2.00
15.00	50.00	1.20	0.95	0.966	1.02	57.98	42.00	16.60	74.58	2.00
20.00	84.00	1.20	0.95	1.291	0.88	84.27	39.00	21.85	106.12	2.00
25.00	50.00	1.20	0.95	1.620	0.79	44.78	46.00	13.96	58.74	2.00
30.00	50.00	1.20	1.00	1.931	0.72	43.17	82.00	13.63	56.81	2.00
35.00	50.00	1.20	1.00	2.223	0.67	40.24	85.00	13.05	53.29	2.00
40.00	74.00	1.20	1.00	2.513	0.63	56.02	86.00	16.20	72.22	2.00
45.00	50.00	1.20	1.00	2.804	0.60	35.83	80.00	12.17	48.00	2.00
50.00	50.00	1.20	1.00	3.092	0.57	34.12	79.00	11.82	45.95	2.00

CRR is based on water table at 60.0 during In-Situ Testing

Factor of Safety, - Earthquake Magnitude= 6.7:

Depth ft	sigC' tsf	CRR7.5 tsf	Ksigma	CRRv	MSF	CRRm	CSRfs w/fs	F.S. CRRm/CSRfs
0.00	0.00	2.00	1.00	2.00	1.33	2.67	0.42	5.00
5.00	0.22	2.00	1.00	2.00	1.33	2.67	0.42	5.00
10.00	0.43	2.00	1.00	2.00	1.33	2.67	0.41	5.00
15.00	0.63	2.00	1.00	2.00	1.33	2.67	0.41	5.00
20.00	0.84	2.00	1.00	2.00	1.33	2.67	0.40	5.00
25.00	1.05	2.00	1.00	2.00	1.33	2.66	0.40	5.00
30.00	1.26	2.00	0.97	1.93	1.33	2.58	0.39	5.00
35.00	1.44	2.00	0.94	1.88	1.33	2.51	0.38	5.00
40.00	1.63	2.00	0.92	1.83	1.33	2.44	0.36	5.00
45.00	1.82	2.00	0.89	1.78	1.33	2.38	0.34	5.00
50.00	2.01	2.00	0.87	1.74	1.33	2.32	0.32	5.00

* F.S.<1: Liquefaction Potential Zone. (If above water table: F.S.=5)
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

CPT convert to SPT for Settlement Analysis:
Fines Correction for Settlement Analysis:

Depth ft	Ic	qc/N60	qc1 tsf	(N1)60	Fines %	d(N1)60	(N1)60s
0.00	-	-	-	79.48	31.0	0.00	79.48
5.00	-	-	-	79.48	31.0	0.00	79.48
10.00	-	-	-	82.12	71.0	0.00	82.12
15.00	-	-	-	74.58	42.0	0.00	74.58
20.00	-	-	-	100.00	39.0	0.00	100.00
25.00	-	-	-	58.74	46.0	0.00	58.74
30.00	-	-	-	56.81	82.0	0.00	56.81
35.00	-	-	-	53.29	85.0	0.00	53.29
40.00	-	-	-	72.22	86.0	0.00	72.22
45.00	-	-	-	48.00	80.0	0.00	48.00
50.00	-	-	-	45.95	79.0	0.00	45.95

(N1)60s has been fines corrected in liquefaction analysis, therefore d(N1)60=0.
Fines=NoLiq means the soils are not liquefiable.

Settlement of Saturated Sands:
Settlement Analysis Method: Tokimatsu / Seed

Depth ft	CSRfs w/fs	F.S.	Fines %	(N1)60s	Dr %	ec %	dsz in.	dsp in.	S in.

Settlement of Saturated Sands=0.000 in.
qc1 and (N1)60 is after fines correction in liquefaction analysis
dsz is per each segment, dz=0.05 ft
dsp is per each print interval, dp=5.00 ft
S is cumulated settlement at this depth

Settlement of Dry Sands:

Depth ft	sigma' tsf	sigC' tsf	(N1)60s	CSRfs w/fs	Gmax tsf	g*Ge/Gm	g_eff	ec7.5 %	Cec	ec %	dsz in.	dsp in.	S in.
51.95	3.20	2.08	45.23	0.32	2296.4	4.4E-4	0.0972	0.0307	0.84	0.0258	3.09E-4	0.000	0.000
50.00	3.09	2.01	45.95	0.32	2267.8	4.4E-4	0.0967	0.0306	0.84	0.0256	3.08E-4	0.012	0.012
45.00	2.80	1.82	48.00	0.34	2191.3	4.4E-4	0.0943	0.0298	0.84	0.0250	3.00E-4	0.030	0.043
40.00	2.51	1.63	72.22	0.36	2376.7	3.8E-4	0.0706	0.0223	0.84	0.0187	2.25E-4	0.026	0.069
35.00	2.22	1.44	53.29	0.38	2020.2	4.1E-4	0.1228	0.0388	0.84	0.0326	3.91E-4	0.028	0.096
30.00	1.93	1.26	56.81	0.39	1923.7	3.9E-4	0.1086	0.0343	0.84	0.0288	3.45E-4	0.037	0.133
25.00	1.62	1.05	58.74	0.40	1781.5	3.6E-4	0.0876	0.0277	0.84	0.0232	2.79E-4	0.031	0.165
20.00	1.29	0.84	100.00	0.40	1898.8	2.7E-4	0.0486	0.0154	0.84	0.0129	1.55E-4	0.020	0.185
15.00	0.97	0.63	74.58	0.41	1489.8	2.6E-4	0.0606	0.0192	0.84	0.0161	1.93E-4	0.018	0.202
10.00	0.66	0.43	82.12	0.41	1266.7	2.1E-4	0.0373	0.0118	0.84	0.0099	1.19E-4	0.016	0.218
5.00	0.34	0.22	79.48	0.42	895.9	1.6E-4	0.0279	0.0088	0.84	0.0074	8.89E-5	0.011	0.229
0.00	0.00	0.00	79.48	0.42	4.9	8.6E-7	0.0010	0.0003	0.84	0.0003	3.23E-6	0.006	0.235

Settlement of Dry Sands=0.235 in.
dsz is per each segment, dz=0.05 ft
dsp is per each print interval, dp=5.00 ft
S is cumulated settlement at this depth

Total Settlement of Saturated and Dry Sands=0.235 in.
Differential Settlement=0.118 to 0.155 in.

Units Depth = ft, Stress or Pressure = tsf (atm), Unit Weight = pcf, Settlement = in.

SPT	Field data from Standard Penetration Test (SPT)
BPT	Field data from Becker Penetration Test (BPT)
qc	Field data from Cone Penetration Test (CPT)
fc	Friction from CPT testing
gamma	Total unit weight of soil
gamma'	Effective unit weight of soil
Fines	Fines content [%]
D50	Mean grain size

Dr	Relative Density
sigma	Total vertical stress [tsf]
sigma'	Effective vertical stress [tsf]
sigC'	Effective confining pressure [tsf]
rd	Stress reduction coefficient
CSR	Cyclic stress ratio induced by earthquake
fs	User request factor of safety, apply to CSR
w/fs	With user request factor of safety inside
CSRfs	CSR with User request factor of safety
CRR7.5	Cyclic resistance ratio (M=7.5)
Ksigma	Overburden stress correction factor for CRR7.5
CRRv	CRR after overburden stress correction, CRRv=CRR7.5 * Ksigma
MSF	Magnitude scaling factor for CRR (M=7.5)
CRRm	After magnitude scaling correction CRRm=CRRv * MSF
F.S.	Factor of Safety against liquefaction F.S.=CRRm/CSRfs
F.S*	User inputed Factor of Safety
Cebs	Energy Ratio, Borehole Dia., and Sample Method Corrections
Cr	Rod Length Corrections
Cn	Overburden Pressure Correction
(N1)60	SPT after corrections, (N1)60=SPT * Cr * Cn * Cebs
d(N1)60	Fines correction of SPT
(N1)60f	(N1)60 after fines corrections, (N1)60f=(N1)60 + d(N1)60
Cq	Overburden stress correction factor
qc1	CPT after Overburden stress correction
dqc1	Fines correction of CPT
qc1f	CPT after Fines and Overburden correction, qc1f=qc1 + dqc1
qc1n	CPT after normalization in Robertson's method
Kc	Fine correction factor in Robertson's Method
qc1f	CPT after Fines correction in Robertson's Method
Ic	Soil type index in Suzuki's and Robertson's Methods
(N1)60s	(N1)60 after seattlement fines corrections
ec	Volumetric strain for saturated sands
dz	Calculation segment, dz=0.050 ft
dsz	Settlement in each segment, dz
dp	User defined print interval
dsp	Settlement in each print interval, dp
Gmax	Shear Modulus at low strain
g_eff	gamma_eff, Effective shear Strain
g*Ge/Gm	gamma_eff * G_eff/G_max, Strain-modulus ratio
ec7.5	Volumetric Strain for magnitude=7.5
Cec	Magnitude correction factor for any magnitude
ec	Volumetric strain for dry sands, ec=Cec * ec7.5
NoLiq	No-Liquefy Soils

References:

NCEER Workshop on Evaluation of Liquefaction Resistance of Soils. Youd, T.L., and Idriss, I.M., eds., Technical Report NCEER 97-0022.

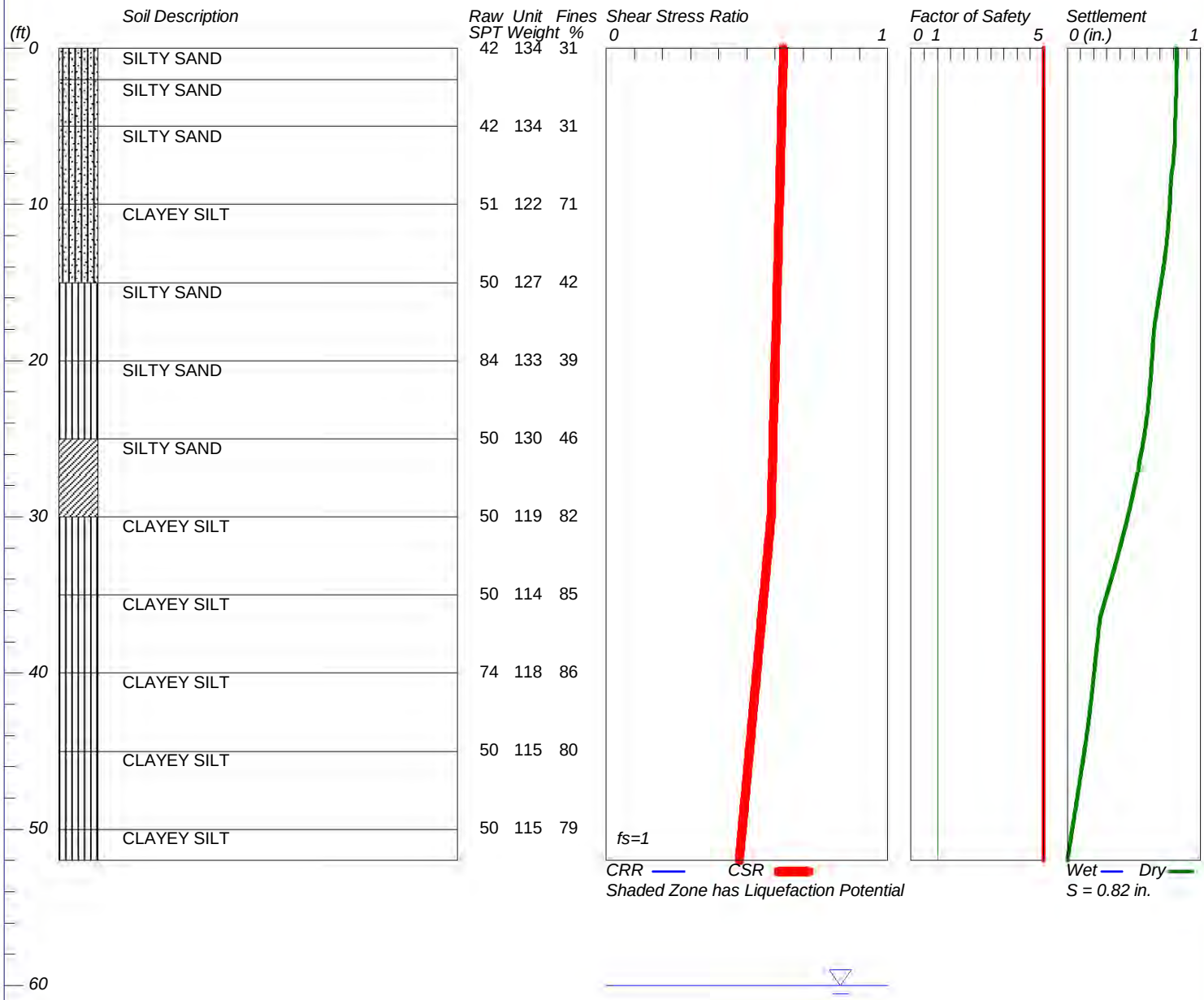
SP117. Southern California Earthquake Center. Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for
Analyzing and Mitigating Liquefaction in California. University of Southern California. March 1999.

LIQUEFACTION EVALUATION

Temescal Canyon Rd. Los Angeles

Hole No.=B-1 Water Depth=60 ft Surface Elev.=895

Magnitude=6.9
Acceleration=0.97g



LiquefyPro CivilTech Software USA www.civiltech.com

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LIQUEFACTION ANALYSIS CALCULATION SHEET

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Input File Name: \\MYCLOUD-GPS9AC\Public\BEHNAM\2022\Temescal Canyon Rd (APN 2821-210-11)\PDF\New folder\Temescal Canyon Road.liq

Title: Temescal Canyon Rd. Los Angeles

Subtitle: GeoTech Consultants (Method Tokimatsu/Seed)

Input Data:

Surface Elev.=895

Hole No.=B-1

Depth of Hole=52.0 ft

Water Table during Earthquake= 60.0 ft

Water Table during In-Situ Testing= 60.0 ft

Max. Acceleration=0.97 g

Earthquake Magnitude=6.9

Earthquake Magnitude=6.9

2. Settlement Analysis Method: Tokimatsu / Seed

3. Fines Correction for Liquefaction: Idriss/Seed (SPT only)

4. Fine Correction for Settlement: During Liquefaction*

5. Settlement Calculation in: All zones*

6. Hammer Energy Ratio, Ce=1.2

7. Borehole Diameter, Cb=1

8. Sampeling Method, Cs=1

fs=1, Plot one CSR (fs=1)

10. Use Curve Smoothing: Yes*

* Recommended Options

In-Situ Test Data:

Depth ft	SPT	Gamma pcf	Fines %
0.0	42.0	134.0	31.0
5.0	42.0	134.0	31.0
10.0	51.0	122.0	71.0
15.0	50.0	127.0	42.0
20.0	84.0	133.0	39.0
25.0	50.0	130.0	46.0
30.0	50.0	119.0	82.0

35.0	50.0	114.0	85.0
40.0	74.0	118.0	86.0
45.0	50.0	115.0	80.0
50.0	50.0	115.0	79.0

Output Results:

Calculation segment, dz=0.050 ft

User defined Print Interval, dp=5.00 ft

CSR Calculation:

Depth ft	gamma pcf	sigma tsf	gamma' pcf	sigma' tsf	rd	CSR	fs (user)	CSRfs w/fs
0.00	134.0	0.000	134.0	0.000	1.00	0.63	1.0	0.63
5.00	134.0	0.335	134.0	0.335	0.99	0.62	1.0	0.62
10.00	122.0	0.655	122.0	0.655	0.98	0.62	1.0	0.62
15.00	127.0	0.966	127.0	0.966	0.97	0.61	1.0	0.61
20.00	133.0	1.291	133.0	1.291	0.95	0.60	1.0	0.60
25.00	130.0	1.620	130.0	1.620	0.94	0.59	1.0	0.59
30.00	119.0	1.931	119.0	1.931	0.93	0.59	1.0	0.59
35.00	114.0	2.223	114.0	2.223	0.89	0.56	1.0	0.56
40.00	118.0	2.513	118.0	2.513	0.85	0.53	1.0	0.53
45.00	115.0	2.804	115.0	2.804	0.81	0.51	1.0	0.51
50.00	115.0	3.092	115.0	3.092	0.77	0.48	1.0	0.48

CSR is based on water table at 60.0 during earthquake

CRR Calculation from SPT or BPT data:

Depth ft	SPT	Cebs	Cr	sigma' tsf	Cn	(N1)60	Fines %	d(N1)60	(N1)60f	CRR7.5
0.00	42.00	1.20	0.75	0.000	1.70	64.26	31.00	15.22	79.48	2.00
5.00	42.00	1.20	0.75	0.335	1.70	64.26	31.00	15.22	79.48	2.00
10.00	51.00	1.20	0.85	0.655	1.24	64.27	71.00	17.85	82.12	2.00
15.00	50.00	1.20	0.95	0.966	1.02	57.98	42.00	16.60	74.58	2.00
20.00	84.00	1.20	0.95	1.291	0.88	84.27	39.00	21.85	106.12	2.00
25.00	50.00	1.20	0.95	1.620	0.79	44.78	46.00	13.96	58.74	2.00
30.00	50.00	1.20	1.00	1.931	0.72	43.17	82.00	13.63	56.81	2.00
35.00	50.00	1.20	1.00	2.223	0.67	40.24	85.00	13.05	53.29	2.00
40.00	74.00	1.20	1.00	2.513	0.63	56.02	86.00	16.20	72.22	2.00
45.00	50.00	1.20	1.00	2.804	0.60	35.83	80.00	12.17	48.00	2.00
50.00	50.00	1.20	1.00	3.092	0.57	34.12	79.00	11.82	45.95	2.00

CRR is based on water table at 60.0 during In-Situ Testing

Factor of Safety, - Earthquake Magnitude= 6.9:

Depth ft	sigC' tsf	CRR7.5 tsf	Ksigma	CRRv	MSF	CRRm	CSRfs w/fs	F.S. CRRm/CSRfs
0.00	0.00	2.00	1.00	2.00	1.24	2.48	0.63	5.00
5.00	0.22	2.00	1.00	2.00	1.24	2.48	0.62	5.00
10.00	0.43	2.00	1.00	2.00	1.24	2.48	0.62	5.00
15.00	0.63	2.00	1.00	2.00	1.24	2.48	0.61	5.00
20.00	0.84	2.00	1.00	2.00	1.24	2.48	0.60	5.00
25.00	1.05	2.00	1.00	2.00	1.24	2.47	0.59	5.00
30.00	1.26	2.00	0.97	1.93	1.24	2.39	0.59	5.00
35.00	1.44	2.00	0.94	1.88	1.24	2.33	0.56	5.00
40.00	1.63	2.00	0.92	1.83	1.24	2.27	0.53	5.00
45.00	1.82	2.00	0.89	1.78	1.24	2.21	0.51	5.00
50.00	2.01	2.00	0.87	1.74	1.24	2.15	0.48	5.00

* F.S.<1: Liquefaction Potential Zone. (If above water table: F.S.=5)
(F.S. is limited to 5, CRR is limited to 2, CSR is limited to 2)

CPT convert to SPT for Settlement Analysis:
Fines Correction for Settlement Analysis:

Depth ft	Ic	qc/N60	qc1 tsf	(N1)60	Fines %	d(N1)60	(N1)60s
0.00	-	-	-	79.48	31.0	0.00	79.48
5.00	-	-	-	79.48	31.0	0.00	79.48
10.00	-	-	-	82.12	71.0	0.00	82.12
15.00	-	-	-	74.58	42.0	0.00	74.58
20.00	-	-	-	100.00	39.0	0.00	100.00
25.00	-	-	-	58.74	46.0	0.00	58.74
30.00	-	-	-	56.81	82.0	0.00	56.81
35.00	-	-	-	53.29	85.0	0.00	53.29
40.00	-	-	-	72.22	86.0	0.00	72.22
45.00	-	-	-	48.00	80.0	0.00	48.00
50.00	-	-	-	45.95	79.0	0.00	45.95

(N1)60s has been fines corrected in liquefaction analysis, therefore d(N1)60=0.
Fines=NoLiq means the soils are not liquefiable.

Settlement of Saturated Sands:
Settlement Analysis Method: Tokimatsu / Seed

Depth ft	CSRfs w/fs	F.S.	Fines %	(N1)60s	Dr %	ec %	dsz in.	dsp in.	S in.

Settlement of Saturated Sands=0.000 in.
qc1 and (N1)60 is after fines correction in liquefaction analysis
dsz is per each segment, dz=0.05 ft
dsp is per each print interval, dp=5.00 ft
S is cumulated settlement at this depth

Settlement of Dry Sands:

Depth ft	sigma' tsf	sigC' tsf	(N1)60s	CSRfs w/fs	Gmax tsf	g*Ge/Gm	g_eff	ec7.5 %	Cec	ec %	dsz in.	dsp in.	S in.
51.95	3.20	2.08	45.23	0.47	2296.4	6.6E-4	0.2733	0.0864	0.90	0.0778	9.33E-4	0.001	0.001
50.00	3.09	2.01	45.95	0.48	2267.8	6.6E-4	0.2715	0.0859	0.90	0.0773	9.27E-4	0.036	0.037
45.00	2.80	1.82	48.00	0.51	2191.3	6.5E-4	0.2622	0.0829	0.90	0.0746	8.95E-4	0.091	0.129
40.00	2.51	1.63	72.22	0.53	2376.7	5.7E-4	0.1755	0.0555	0.90	0.0499	5.99E-4	0.073	0.201
35.00	2.22	1.44	53.29	0.56	2020.2	6.2E-4	0.5159	0.1632	0.90	0.1468	1.76E-3	0.095	0.296
30.00	1.93	1.26	56.81	0.59	1923.7	5.9E-4	0.4156	0.1314	0.90	0.1182	1.42E-3	0.159	0.455
25.00	1.62	1.05	58.74	0.59	1781.5	5.4E-4	0.2902	0.0918	0.90	0.0826	9.91E-4	0.120	0.575
20.00	1.29	0.84	100.00	0.60	1898.8	4.1E-4	0.1192	0.0377	0.90	0.0339	4.07E-4	0.061	0.637
15.00	0.97	0.63	74.58	0.61	1489.8	3.9E-4	0.2636	0.0833	0.90	0.0750	9.00E-4	0.069	0.706
10.00	0.66	0.43	82.12	0.62	1266.7	3.2E-4	0.1075	0.0340	0.90	0.0306	3.67E-4	0.065	0.770
5.00	0.34	0.22	79.48	0.62	895.9	2.3E-4	0.0553	0.0175	0.90	0.0157	1.89E-4	0.041	0.812
0.00	0.00	0.00	79.48	0.63	4.9	1.3E-6	0.0010	0.0003	0.90	0.0003	3.47E-6	0.011	0.823

Settlement of Dry Sands=0.823 in.
dsz is per each segment, dz=0.05 ft
dsp is per each print interval, dp=5.00 ft
S is cumulated settlement at this depth

Total Settlement of Saturated and Dry Sands=0.823 in.
Differential Settlement=0.411 to 0.543 in.

Units Depth = ft, Stress or Pressure = tsf (atm), Unit Weight = pcf, Settlement = in.

SPT	Field data from Standard Penetration Test (SPT)
BPT	Field data from Becker Penetration Test (BPT)
qc	Field data from Cone Penetration Test (CPT)
fc	Friction from CPT testing
gamma	Total unit weight of soil
gamma'	Effective unit weight of soil
Fines	Fines content [%]
D50	Mean grain size

Dr	Relative Density
sigma	Total vertical stress [tsf]
sigma'	Effective vertical stress [tsf]
sigC'	Effective confining pressure [tsf]
rd	Stress reduction coefficient
CSR	Cyclic stress ratio induced by earthquake
fs	User request factor of safety, apply to CSR
w/fs	With user request factor of safety inside
CSRfs	CSR with User request factor of safety
CRR7.5	Cyclic resistance ratio (M=7.5)
Ksigma	Overburden stress correction factor for CRR7.5
CRRv	CRR after overburden stress correction, CRRv=CRR7.5 * Ksigma
MSF	Magnitude scaling factor for CRR (M=7.5)
CRRm	After magnitude scaling correction CRRm=CRRv * MSF
F.S.	Factor of Safety against liquefaction F.S.=CRRm/CSRfs
F.S*	User inputed Factor of Safety
Cebs	Energy Ratio, Borehole Dia., and Sample Method Corrections
Cr	Rod Length Corrections
Cn	Overburden Pressure Correction
(N1)60	SPT after corrections, (N1)60=SPT * Cr * Cn * Cebs
d(N1)60	Fines correction of SPT
(N1)60f	(N1)60 after fines corrections, (N1)60f=(N1)60 + d(N1)60
Cq	Overburden stress correction factor
qc1	CPT after Overburden stress correction
dqc1	Fines correction of CPT
qc1f	CPT after Fines and Overburden correction, qc1f=qc1 + dqc1
qc1n	CPT after normalization in Robertson's method
Kc	Fine correction factor in Robertson's Method
qc1f	CPT after Fines correction in Robertson's Method
Ic	Soil type index in Suzuki's and Robertson's Methods
(N1)60s	(N1)60 after seattlement fines corrections
ec	Volumetric strain for saturated sands
dz	Calculation segment, dz=0.050 ft
dsz	Settlement in each segment, dz
dp	User defined print interval
dsp	Settlement in each print interval, dp
Gmax	Shear Modulus at low strain
g_eff	gamma_eff, Effective shear Strain
g*Ge/Gm	gamma_eff * G_eff/G_max, Strain-modulus ratio
ec7.5	Volumetric Strain for magnitude=7.5
Cec	Magnitude correction factor for any magnitude
ec	Volumetric strain for dry sands, ec=Cec * ec7.5
NoLiq	No-Liquefy Soils

References:

NCEER Workshop on Evaluation of Liquefaction Resistance of Soils. Youd, T.L., and Idriss, I.M., eds., Technical Report NCEER 97-0022.

SP117. Southern California Earthquake Center. Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for
Analyzing and Mitigating Liquefaction in California. University of Southern California. March 1999.

GeoTech Services

Percolation Test

1. General Percolation Test Information

Diameter: 8 in

Date prepared and soaked: 1/23/2023

Is pre-soak required* ? YES

soak start time: 8:0000 AM

soak end time: 11:00 AM

2. Percolation Test Data

Test hole: **#5**

Starting time: 11:30:00 AM

Date reading taken: 1/23/2023

Soil texture description

Depth (ft)	Soil Texture
5	Sandy Clayey Silt
10	Silty Sand
15	Silty Sand

Reading	Start time	End Time	Start	End	Perc rate	%	Pass
1	11:00:00	11:10:00	100	99.4	16.67	N/A	N/A
2	11:10:00	11:20:00	99.4	98.82	17.24	N/A	N/A
3	11:20:00	11:30:00	98.82	98.31	19.61	15.0	NO
4	11:30:00	11:50:00	98.31	97.39	21.74	20.7	NO
7	11:50:00	12:10:00	97.39	96.5	22.22	0.0	YES

Percolation Rate for Test Hole #1: 22.2 mpi (min/in)

2.7 (in/hr)

JOB NAME : Temescal Canyon Road, Corona, CA **JOB NO.** 22-449

GeoTech Consultants, Inc. **FIGURE NO.** I

Porchet Method - Conversion of Percolation Rate to Infiltration Rate	Perc Test No. SP-1	Legend:	Required Entries / Calculated Cells

Company Name: Earth Strata Geotechnical — Date: 12/22/2025

Designed by: GADALLA GADALLA — County/City Case No:

Percolation Conversion to Infiltration Rate

The conversion equation is used:

$$I_t\,(in/hr) = \frac{\Delta H(in) \times 60\ (min/hr) \times r(in)}{\Delta t(min) \times [r(in) + 2H_{avg}(in)]}$$

If test hole is round - Enter radius here →	$r =$	4.00	inches
If test hole is square - Enter average side width below			
$w =$ inches	$r_{eq} =$	0.00	inches
Time interval	$\Delta t =$	30.0	minutes
Initial height of water during selected time interval	$H_o =$	105.00	inches
Final height of water during selected time interval	$H_f =$	55.00	inches
Change in height of water during selected time interval	$\Delta H =$	50.00	inches
Average head height over the selected time interval	$H_{avg} =$	80.00	inches
Converted infiltration rate per test data	$I_t =$	2.44	inches/hour

Comments

Porchet Method - Conversion of Percolation Rate to Infiltration Rate	Perc Test No. SP-2	**Legend:**	Required Entries / Calculated Cells

Company Name: Earth Strata Geotechnical — Date: 12/22/2025

Designed by: GADALLA GADALLA — County/City Case No:

Percolation Conversion to Infiltration Rate

The conversion equation is used:

$$I_t\,(in/hr) = \frac{\Delta H(in) \times 60\ (min/hr) \times r(in)}{\Delta t(min) \times [r(in) + 2H_{avg}(in)]}$$

If test hole is round - Enter radius here →	$r =$	4.00	inches
If test hole is square - Enter average side width below			
$w =$ inches	$r_{eq} =$	0.00	inches
Time interval	$\Delta t =$	30.0	minutes
Initial height of water during selected time interval	$H_o =$	168.00	inches
Final height of water during selected time interval	$H_f =$	96.00	inches
Change in height of water during selected time interval	$\Delta H =$	72.00	inches
Average head height over the selected time interval	$H_{avg} =$	132.00	inches
Converted infiltration rate per test data	$I_t =$	2.15	inches/hour

Comments

Porchet Method - Conversion of Percolation Rate to Infiltration Rate	Perc Test No. SP-3	**Legend:**	Required Entries / Calculated Cells

Company Name: Earth Strata Geotechnical — Date: 12/22/2025

Designed by: GADALLA GADALLA — County/City Case No:

Percolation Conversion to Infiltration Rate

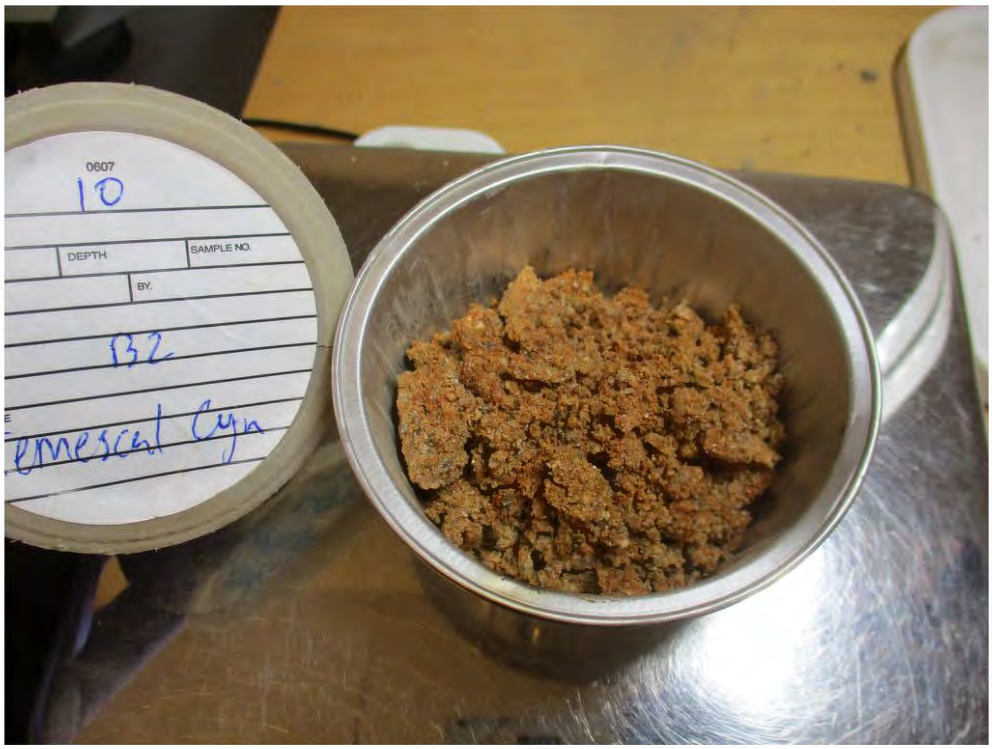
The conversion equation is used:

$$I_t\,(in/hr) = \frac{\Delta H(in) \times 60\ (min/hr) \times r(in)}{\Delta t(min) \times [r(in) + 2H_{avg}(in)]}$$

If test hole is round - Enter radius here ⟶	$r =$	4.00	inches
If test hole is square - Enter average side width below			
$w =$ inches	$r_{eq} =$	0.00	inches
Time interval	$\Delta t =$	30.0	minutes
Initial height of water during selected time interval	$H_o =$	105.00	inches
Final height of water during selected time interval	$H_f =$	72.00	inches
Change in height of water during selected time interval	$\Delta H =$	33.00	inches
Average head height over the selected time interval	$H_{avg} =$	88.50	inches
Converted infiltration rate per test data	$I_t =$	1.46	inches/hour

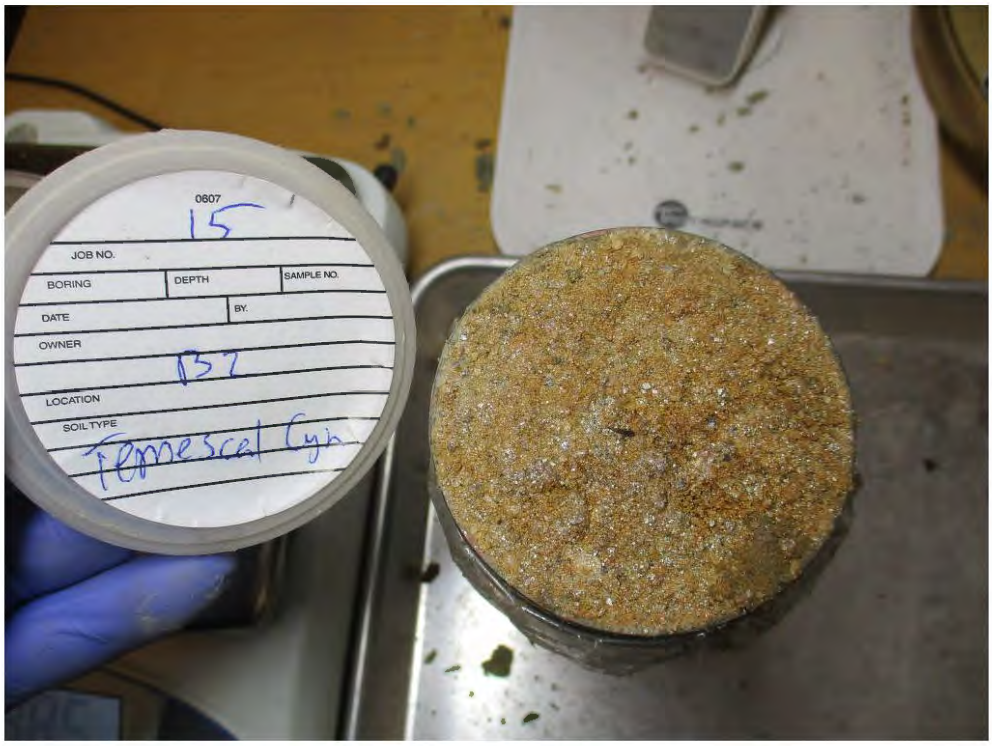
Comments





JOB NAME: Temescal Canyon Road, Corona, CA **Job No.** 22-449

GeoTech Consultants, Inc.





JOB NAME: Temescal Canyon Road, Corona, CA **Job No.** 22-449

GeoTech Consultants, Inc.

Appendix 4: Historical Site Conditions

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

NOT AVAILABLE

Appendix 5: LID Infeasibility

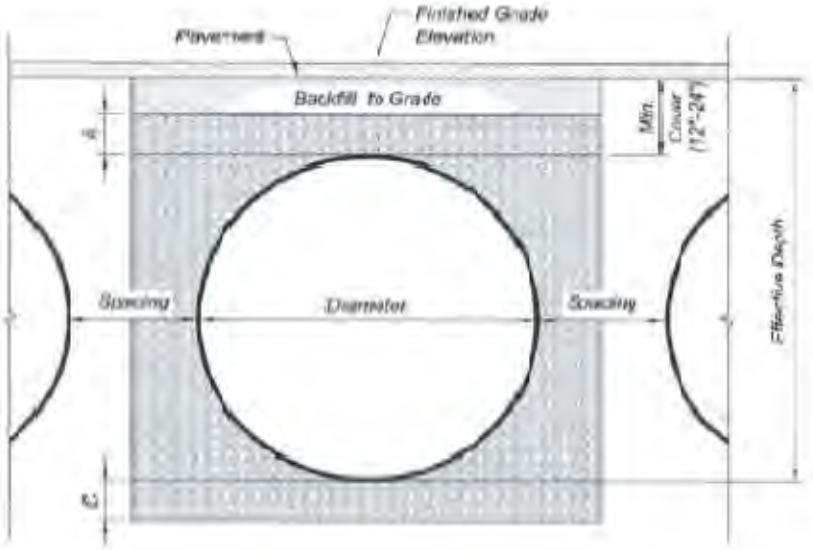
LID Technical Infeasibility Analysis

NOT APPLICABLE

Appendix 6: BMP Design Details

BMP Sizing, Design Details, and other Supporting Documentation





CMP DETENTION SYSTEMS

BMP-2 STORAGE VOLUME

Perforated CMP System (by Contech)

Pipe Diameter (60”CMP)	5 ft.
Cross Sectional Area	19.63 sf.
No. of Rows	3
Row Length	47 ft.
No. of Headers	1
Header Length	18 ft.
Total Pipe Length(3x47’+18’)	159 ft

Pipe Storage (19.63 SF.X 159 FT)	**3,121 cu ft.**

Gravel Pit Length (47'+5+2(.75'))	53.5 ft.
Gravel Pith Width (15'+2(1.5) +2(.75))	19.5 ft.
Spacing between Barrels (ft):	1.50
Stone width around Perimeter of System (ft):	0.75
Depth A: Porous Stone above Pipe (in):	0
Depth C: Porous Stone Below Pipe (in):	4
Gravel Pit Depth	5.34 ft.
Gravel Void Ratio	0.4

Gravel Pit Storage: ((53.5'X19.5'X5.35') – 3,121cu ft) X 0.40 = 980.0 cu ft.

Gravel Pit Storage	**980.0 cu ft.**

Storage Volume BMP -2: **3,121 + 980.0 = 4,101 cu ft.**

Provided Storage: 4,100 cu ft. > DCV=2,802.7+ 240.0 = 3,042 cu ft.

(INCLUDING MITIGATION VOLUME SEE TABLE F-1 HYDROMODIFICATION)

INFILTRATION RATE

Measured Infiltration (I)	**2.44 in/hr.**
Factor of Safety	**3.00**
Design Infiltration	**0.813 in/hr.**
I (design)	**0.0677 ft/hr.**

BMP DRAWDOWN TIME

Inf. Surface Area, SA (inf) (53.5'x19.5')	**1,043.2 sf.**
Equivalent Depth, d(eq) (4100 cu ft./1043.2sf.)	**3.93 ft**
Drawdown Time (T) (3.93/.0677)	**57.9 hr.**

T (BMP) Less than 72 hr.? **YES**

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: CAP Engineering — Date: 12/10/2025

Designed by: Carlos Pineda — Case No:

Company Project Number/Name:

BMP Identification

BMP NAME / ID: BMP -2 UNDERGROUND DETENTION/INFILTRATION STORAGE PIPES

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)
D/1	13164	Roofs	1	0.89	11742.3			
D/2	30826	Concrete or Asphalt	1	0.89	27496.8			
D/3	2968	Natural (B Soil)	0.1	0.11	327.8			
	46958	Total			39566.9	0.85	2802.7	3142

Notes:

OPERATIONS AND MAINTENANCE GUIDELINES

CDS Stormwater Treatment Unit

INTRODUCTION

The CDS unit is an important and effective component of your storm water management program and proper operation and maintenance of the unit are essential to demonstrate your compliance with local, state and federal water pollution control requirements.

The CDS technology features a patented non-blocking, indirect screening technique developed in Australia to treat water runoff. The unit is highly effective in the capture of suspended solids, fine sands and larger particles. Because of its non-blocking screening capacity, the CDS unit is un-matched in its ability to capture and retain gross pollutants such as trash and debris. In short, CDS units capture a very wide range of organic and in-organic solids and pollutants that typically result in tons of captured solids each year such as: Total suspended solids (TSS) and other sedimentitious materials, oil and greases, trash, and other debris (including floatables, neutrally buoyant, and negatively buoyant debris). These pollutants will be captured even under very high flow rate conditions.

CDS units are equipped with conventional oil baffles to capture and retain oil and grease. Laboratory evaluations show that the CDS units are capable of capturing up to 70% of the free oil and grease from storm water. CDS units can also accommodate the addition of oil sorbents within their separation chambers. The addition of the oil sorbents can ensure the permanent removal of 80% to 90% of the free oil and grease from the storm water runoff.

OPERATIONS

The CDS unit is a non-mechanical self-operating system and will function any time there is flow in the storm drainage system. The unit will continue to effectively capture pollutants in flows up to the design capacity even during extreme rainfall events when the design capacity may be exceeded. Pollutants captured in the CDS unit's separation chamber and sump will be retained even when the units design capacity is exceeded.

CDS UNIT INSPECTION

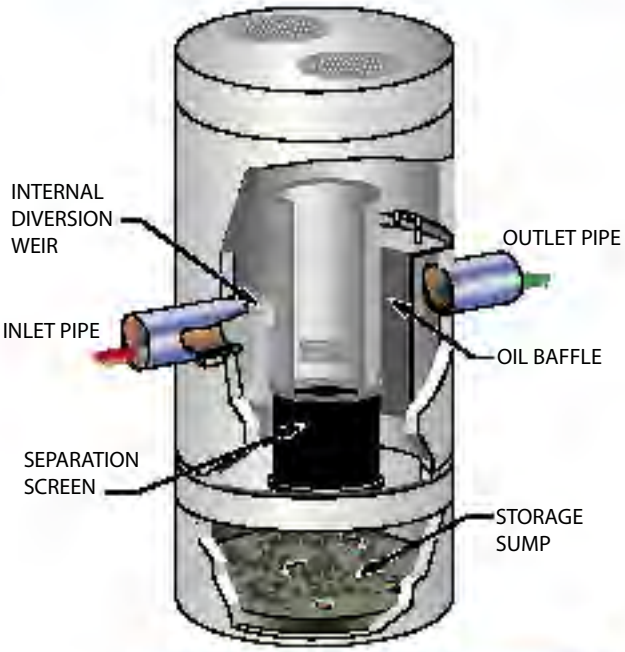
Access to the CDS unit is typically achieved through two manhole access covers – one allows inspection (and cleanout) of the separation chamber (screen/cylinder) & sump and another allows inspection (and cleanout) of sediment captured and retained behind the screen.

The unit should be periodically inspected to determine the amount of accumulated pollutants and to ensure that the cleanout frequency is adequate to handle the predicted pollutant load being processed by the CDS unit. The unit should be periodically inspected for indications of vector infestation, as well. The recommended cleanout of

CDS®

Patented continuous deflection separation (CDS) technology

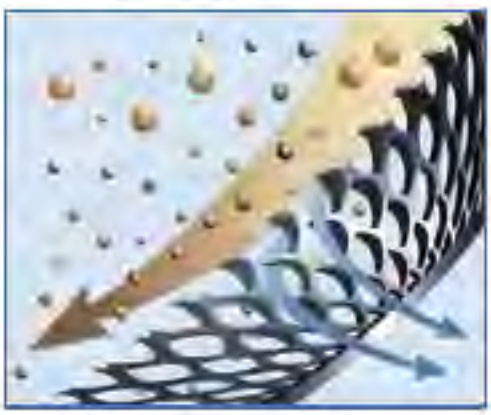
Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Available precast or cast-in-place, offline units can treat flows from 1 to 300 cfs. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs. The pollutant removal capability of the CDS system has been proven in the lab and field.



How does it work?

Stormwater enters the CDS unit's diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed. All flows up to the system's treatment design capacity enter the separation chamber.

Swirl concentration and screen deflection forces floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.



Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During flow events exceeding the design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants will not wash out.



CDS

- Removes sediment, trash, and free oil and grease
- Patented screening technology captures and retains 100% of floatables, including neutrally buoyant and all other material greater than the screen aperture
- Operation independent of flow
- Performance verified through lab and field testing
- Unobstructed maintenance access
- Customizable/flexible design and multiple configurations available
- Separates and confines pollutants from outlet flow
- Grate inlet available
- Multiple screen aperture sizes available

Available Models

Refer to the following tables for our standard models, sizes, and treatment capacities. Drawings and specifications are available at contechstormwater.com.

We encourage you to contact your local stormwater consultant for site-specific design assistance. In many cases our products can be customized to fit your particular project's needs.

Local regulations may impact design requirements.

	CDS Model	Structure Diameter[1]		Typical Depth Below Invert		Water Quality Flow[2] 125 μm		Screen Diameter/Height		Sump Storage	
		ft	m	ft	m	cfs	L/s	ft	m	yd^3	m^3
Inline	PMIU20_15	4	1.2	3.7	1.1	0.7	19.8	2.0/1.5	0.6/0.5	0.5	0.4
	PMIU20_15_4	4	1.2	3.5	1.1	0.7	19.8	2.0/1.5	0.6/0.5	0.5	0.4
	PMSU20_15	5	1.5	4.4	1.3	0.7	19.8	2.0/1.5	0.6/0.5	1.1	0.8
	PMSU20_20	5	1.5	5.0	1.5	1.1	31.1	2.0/2.0	0.6/0.6	1.1	0.8
	PMSU20_25	5	1.5	5.3	1.6	1.6	45.3	2.0/2.5	0.6/0.8	1.1	0.8
	PMSU30_20	6	1.8	5.5	1.7	2.0	56.6	3.0/2.0	0.9/0.6	2.1	1.6
	PMSU30_30	6	1.8	6.5	2.0	3.0	85.0	3.0/3.0	0.9/0.9	2.1	1.6
	PMSU40_30	8	2.4	7.8	2.4	4.5	127.4	4.0/3.0	1.2/0.9	5.6	4.3
	PMSU40_40	8	2.4	8.8	2.7	6.0	169.9	4.0/4.0	1.2/1.2	5.6	4.3
Offline	PSWC30_20	6	1.8	5.3	1.6	2.0	56.6	3.0/2.0	0.9/0.6	1.9	1.5
	PSW30_30	varies	varies	6.3	1.9	3.0	85.0	3.0/3.0	0.9/0.9	5.8	4.4
	PSWC30_30	6	1.8	6.3	1.9	3.0	85.0	3.0/3.0	0.9/0.9	2.1	1.6
	PSWC40_30	7	2.1	7.7	2.3	4.5	127.4	4.0/3.0	1.2/0.9	1.9	1.5
	PSWC40_40	7	2.1	8.8	2.7	6.0	169.9	4.0/4.0	1.2/1.2	1.9	1.5
	PSW50_42	varies	varies	8.8	2.7	9.0	254.9	5.0/4.2	1.5/1.3	1.9	1.5
	PSWC56_40	8	2.4	8.8	2.7	9.0	254.9	5.6/4.0	1.7/1.2	1.9	1.5
	PSW50_50	varies	varies	9.5	2.9	11.0	311.5	5.0/5.0	1.5/1.5	1.9	1.5
	PSWC56_53	8	2.4	10.1	3.1	14.0	396.4	5.6/5.3	1.7/1.6	1.9	1.5
	PSWC56_68	8	2.4	11.8	3.6	19.0	538.0	5.6/6.8	1.7/2.1	1.9	1.5
	PSWC56_78	8	2.4	12.8	3.9	25.0	707.9	5.6/7.8	1.7/2.4	1.9	1.5
	PSW70_70	varies	varies	13.0	4.0	26.0	736.2	7.0/7.0	2.1/2.1	3.9	3.0
	PSW100_60	varies	varies	11.0	3.4	30.0	849.5	10.0/6.0	3.0/1.8	6.9	5.3
	PSW100_80	varies	varies	13.0	4.0	50.0	1415.8	10.0/8.0	3.0/2.4	6.9	5.3
	PSW100_100	varies	varies	15.0	4.6	64.0	1812.3	10.0/10.0	3.0/3.0	6.9	5.3

1. Structure diameter represents the standard inside dimension of the concrete structure. Offline systems will require additional concrete diversion components.
2. Water Quality Flow is based on 80% removal of a particle size distribution with an average particle size of 125 microns. This flow also represents the maximum flow prior to which bypass occurs. Test results are based on use of a 2400 micron screen.

Cast-in-place system are available to treat higher flows. Check with your local representatives for specifications.

Notes:

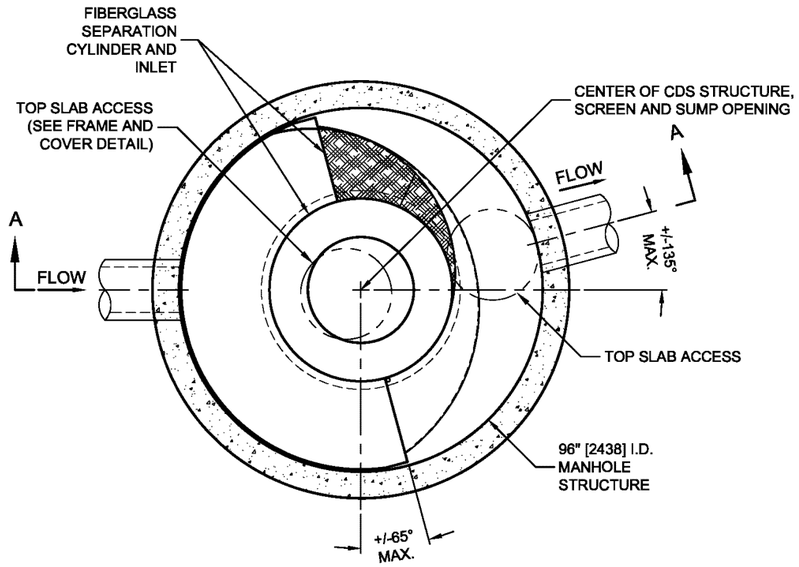
Systems can be sized based on a water quality flow (e.g. 1 inch storm) or on a net annual basis depending on the local regulatory requirement.

When sizing based on a water quality storm, the required flow to be treated should be equal to or less than the listed water quality flow for the selected system. Systems sized based on a water quality storm are generally more conservatively sized.

Additional particle size distributions are available for sizing purposes upon request.

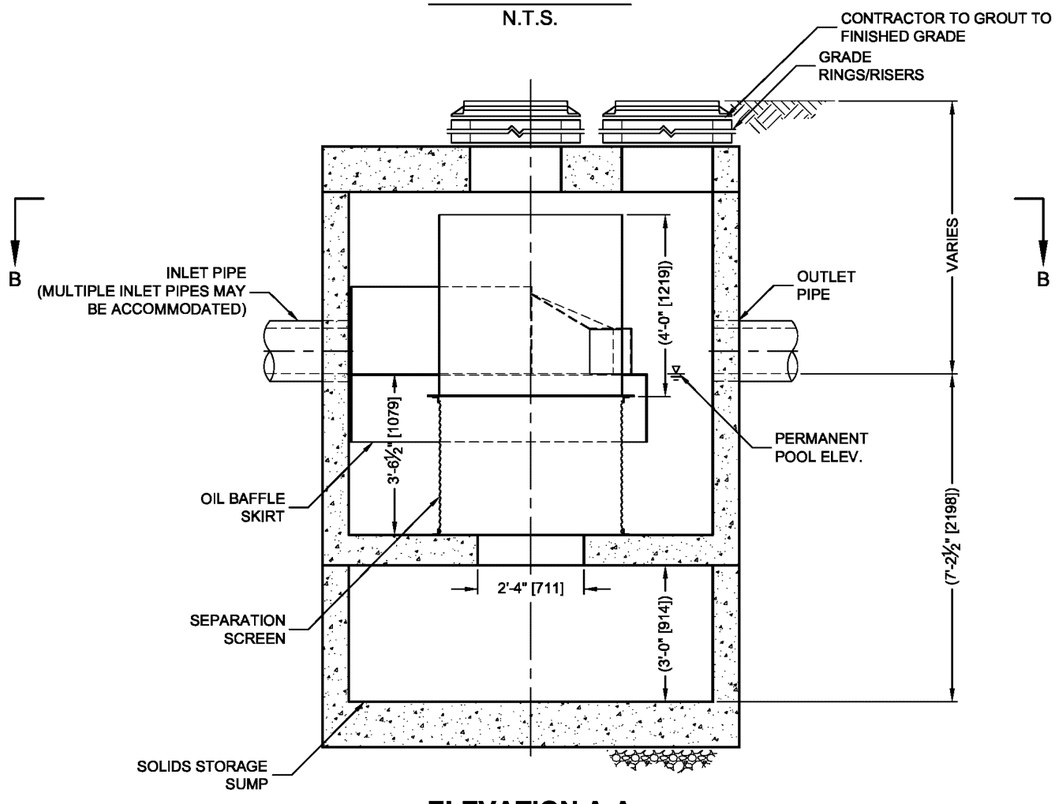
Depth below invert is measured to the inside bottom of the system. This depth can be adjusted to meet specific storage or maintenance requirements.

Contact our support staff for the most cost effective sizing for your area.



PLAN VIEW B-B

N.T.S.



ELEVATION A-A

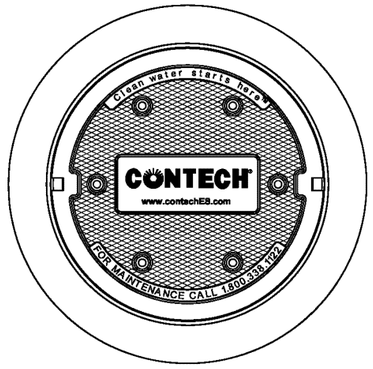
N.T.S.

THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 5,759,415; 5,941,720; 5,971,009; 6,061,768; RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

CDS4030-8-C DESIGN NOTES

THE STANDARD CDS4030-8-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES
SEPARATE OIL BAFFLE (SINGLE INLET PIPE REQUIRED FOR THIS CONFIGURATION)
SEDIMENT WEIR FOR NJDEP / NJCAT CONFORMING UNITS



FRAME AND COVER

(DIAMETER VARIES)

N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECHENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.contechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET HS20 (AASHTO M 306) LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS, AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH® ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS4030-8-C
INLINE CDS
STANDARD DETAIL

C:\USERS\SCHLACHTERH\DESKTOP\CDS DETAILS 180 MICRON SIZING\ACAD\CDS4030-8-C-DTL.DWG 5/19/2014 5:34 PM

CONTECH®
ENGINEERED SOLUTIONS

CMP Detention and Infiltration Installation Guide



CMP Detention and Infiltration Installation Guide

Proper installation of a flexible corrugated metal pipe (CMP) underground detention system will ensure long-term performance. The configuration of these systems often requires special construction practices that differ from conventional flexible pipe construction. Contech recommends scheduling a preconstruction meeting with your local Contech Representative to determine if additional measures, not covered in this guide, are appropriate for your site.

Preconstruction Meeting

It is a best practice to have a pre-construction meeting with the installation contractor and Contech personnel. Included at the end of this guide is a preconstruction checklist to review prior to installation.

Proper Pipe Unloading, Handling and Placement

The pipe should be unloaded off the flatbed trailer with a fork lift, excavator, crane or other piece of construction equipment. The pipe should never be dropped or rolled off the flatbed trailer. Nylon slings or lifting lugs should be used to lift the pipe into place.

Normally the header row pipe section is placed on the downstream end. For detention systems with a single header row on one end and pipe with bulkheads on the other end; it is a best practice to start pipe placement on the header row end.



Lifting CMP off the flatbed with a front end loader and forks.



Lifting ALT2 CMP with nylon slings.



Lowering the header pipe section into place first.



Lifting polymer-coated CMP into place with nylon slings.

Foundation and Pipe Bedding

Construct a foundation that can support the design loading applied by the pipe and adjacent backfill weight as well as maintain its integrity during construction. If soft or unsuitable soils are encountered, remove the poor soils to a suitable depth and then replace with a competent granular material to the appropriate elevation. The granular material gradation should not allow the migration of fines, which can cause settlement of the detention system or pavement above. If the structural fill material is not compatible with the underlying soils a geotextile fabric should be used as a separator.

Grade the foundation subgrade to a uniform or slightly sloping grade. If the subgrade is clay or relatively non-porous and the construction sequence will last for an extended period of time, it is best to slope the grade to one end of the system. This will allow excess water to drain quickly, preventing saturation of the subgrade.

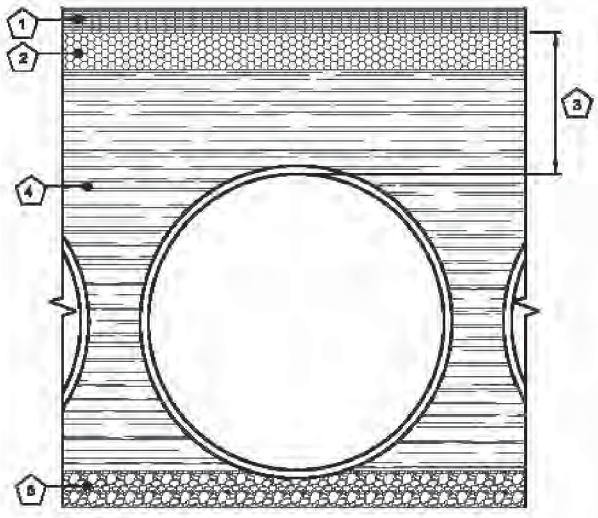
A 4"- 6" thick, well-graded granular material is preferred pipe bedding. If the existing foundation is made up of a course sand or other suitable granular material, imported bedding material will not be required.





Site conditions may require 4" – 6" of imported granular material as pipe bedding.

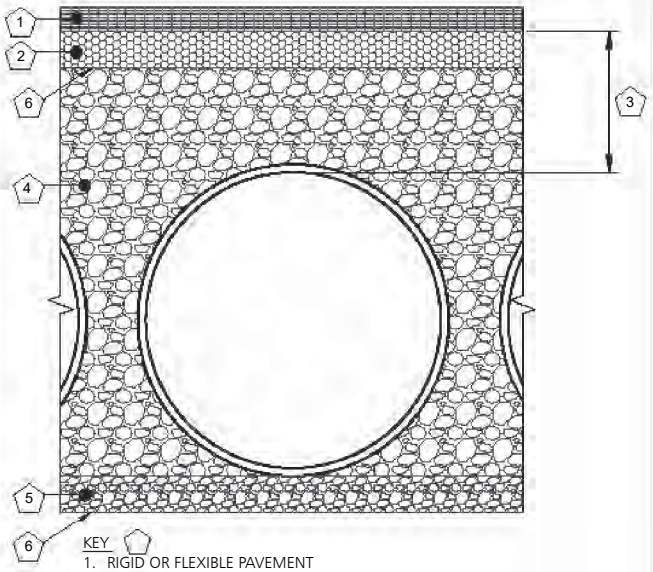
SOLIDWALL BACKFILL DETAIL



KEY

1. RIGID OR FLEXIBLE PAVEMENT
2. GRANULAR ROAD BASE
3. 12" MIN. FOR DIAMETERS THROUGH 96"
   18" MIN. FOR DIAMETERS FROM 102" AND LARGER MEASURED TO TOP OF RIGID OR BOTTOM OF FLEXIBLE PAVEMENT.
4. SELECT GRANULAR FILL PER AASHTO M145 A1, A2 OR A3 OR APPROVED EQUAL. PLACED IN 8" LIFTS (COMPACTED TO MIN. 90% STANDARD DENSITY PER AASHTO T99)
5. GRANULAR BEDDING, ROUGHLY SHAPED TO FIT THE BOTTOM OF PIPE, 4" TO 6" IN DEPTH.

PERFORATED BACKFILL DETAIL



KEY

1. RIGID OR FLEXIBLE PAVEMENT
2. GRANULAR ROAD BASE
3. 12" MIN. FOR DIAMETERS THROUGH 96"
   18" MIN. FOR DIAMETERS FROM 102" AND LARGER MEASURED TO TOP OF RIGID OR BOTTOM OF FLEXIBLE PAVEMENT.
4. FREE DRAINING ANGULAR WASHED STONE 3/4" - 2" MIN. PARTICLE SIZE.
5. GRANULAR BEDDING, ROUGHLY SHAPED TO FIT THE BOTTOM OF PIPE, 4" TO 6" IN DEPTH.
6. NON WOVEN GEOTEXTILE (IF REQUIRED), WRAPPING TRENCH ONLY. CONSULT GEOTECHNICAL EOR FOR PROJECT SPECIFIC BACKFILL REQUIREMENTS.

Connecting Bands

There are various types of connecting bands for connecting CMP. Hugger and corrugated bands are the most common. Flat gaskets or O-ring gaskets can also be used in conjunction with connecting bands to reduce leakage in the joints.



Installing a Hugger band on a perforated pipe.



Tightening bolts on a corrugated band.





Installation of band with flat neoprene gasket.







Some jobs may require special bands, such as rod and lug connection, flat bands, or dimple bands.

Geomembrane Barrier

When indicated on the Contech contract drawings or the project plans, an HDPE membrane liner will be placed on the crown of each pipe to help protect the system from environmental changes that may adversely affect the system over time. The liner should extend beyond the 8 and 4 o'clock positions (crown) of the pipe. Please refer to Contech's CMP Detention Design Guide or Contech contract drawings for additional technical details.





An HDPE liner is rolled out over the crown of the pipe prior to backfilling around the pipe.





For large diameter pipes, the liner is shipped in rolls that are folded in half. The liner is rolled out over the crown of the pipe, unfolded, and covered over the pipe from the eight and four o'clock positions.

In-Situ Trench Wall

If excavation is required, the trench wall needs to be capable of supporting the load that the pipe sheds as the system is loaded. If soils are not capable of supporting these loads, the pipe can deflect. Perform a simple soil pressure check using the applied loads to determine the limits of excavation beyond the spring line of the outer most pipes.

In most cases, the requirements for a safe work environment and proper backfill placement and compaction take care of the concern. The contractor is responsible for the safety of his/her employees and agents.

Safe practices on construction work as outlined in the latest edition of the "Manual of Accident Prevention in Construction," published by the Associated General Contractors, shall be used as a guide and observed. The contractor shall comply with all applicable city, state, and federal safety codes in effect in the area where work is being performed. This conformance shall include the provisions of the current issue of the "OSHA Safety and Health Standards (29 CFR 1926/1910)" as published by the U.S. Department of Labor.

Backfill Material

Corrugated Steel Pipe is a flexible pipe. All buried flexible pipes are dependent on a quality backfill material for structural support. AASHTO refers to these pipe systems as, "Soil-Corrugated Metal Structure Interaction Systems". The best backfill material is an angular, well-graded, granular fill meeting the requirements of AASHTO A-1, A-2, or A-3. Aggregate materials that are free draining and compact easily such as crushed aggregate, crushed aggregate with fines, gravely sand, and coarse sand make good backfill. The aggregate particle size shall not exceed 3" in diameter.

For solid pipe, well graded or open graded granular material can be used as backfill. Infiltration pipe systems have a pipe perforation sized of 3/8" diameter. An open graded stone, with a particle size of ½" – 2 ½" diameter is recommended for backfill around perforated pipe.

Backfill using controlled low-strength material (CLSM, "flash fill", or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.

EXAMPLES OF ACCEPTABLE BACKFILL MATERIAL



Course Sand



Crushed Limestone



Crushed Granite



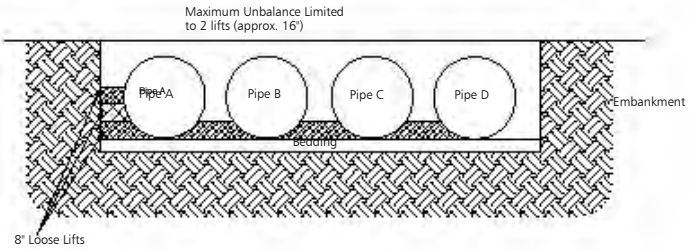
Crushed River Gravel

Backfill Placement

The backfill shall be placed in 8" +/- loose lifts and compacted to 90% AASHTO T99 standard proctor density. Material shall be worked into the pipe haunches by means of shovel-slicing, rodding, vibratory packer, or other effective methods. If AASHTO T99 procedures are determined infeasible by the geotechnical engineer of record, compaction is considered adequate when no further yielding of the material is observed under the compactor, or under foot, and the geotechnical engineer of record (or representative thereof) is satisfied with the level of compaction.

For large systems, conveyor systems, backhoes with long reaches may be used to place backfill. Once minimum cover for the construction loading across the entire width of the system is reached, advance the equipment to the end of the recently placed fill, and begin the sequence again until the system is completely backfilled. This type of construction sequence provides room for stockpiled backfill directly behind the backhoe, as well as the movement of construction traffic.

It is important to keep the elevation of backfill between pipes and side embankment evenly. As a rule of thumb, do not allow for backfill to exceed the elevation of one side of pipe to another pipe or one side of pipe to the outside trench/embankment by more than 24".



Material stockpiles on top of the backfilled detention system should be limited to 9' +/- high and must provide balanced loading across all barrels. To determine the proper minimum cover over the pipes to allow the movement of construction equipment, contact your local Contech Sales Engineer.

If CLSM or "flowable fill" is used as backfill, pipe flotation needs to be prevented. Typically, small lifts are placed between the pipes and then allowed to set-up prior to the placement of the next lift. The allowable thickness of the CLSM lift is a function of a proper balance between the uplift force of the CLSM, the opposing weight of the pipe, and the effect of other restraining measures. Your local Sales Engineer can help determine an appropriate lift thickness.



Placing backfill with a conveyor.



Compaction with vibratory equipment.

Final Cover Placement and Construction Loading

The minimum cover specified for a project normally assumes H-20 highway live loading. Backfill must be placed and fully compacted to the minimum cover level over the structure before the pipe is subjected to design loads. The minimum cover for AASHTO H-20 Live Loading per design section 12, is span of the pipe divided by eight plus asphalt pavement.

Construction loads often exceed design highway loading. During construction, keep heavy construction equipment that exceeds legal highway loads off the pipe. Light construction equipment on tracks such as a D-3 dozer (or lighter weight) may cross over the pipe when a minimum of 12" of compacted backfill is over pipe. Since construction equipment varies from job to job, it is best to address equipment specific minimum cover requirements with your local Contech Sales Engineer during your pre-construction meeting.

Minimum Height of Cover Requirements for Tracked Equipment
HEL-COR® Corrugated Steel Pipe[1]

Diameter (inches)	Minimum Cover (Ft)	Track Width (inches) Maximum Track Pressure at Surface (psi)			
		12	18	24	30
12 – 42	1.0	29	22	18	17
	1.5	58	41	34	30
	2.0	95	65	51	44
	2.5	138	91	70	59
	3.0	189	120	91	75
	4.0	321	195	143	115
48 – 66	1.0	10.6	8	6.9	6.2
	1.5	24	17	14	12.2
	2.0	39	26	21	18
	2.5	56	37	28	24
	3.0	77	49	37	30
	4.0	132	80	59	47
72 – 102	1.0	3.2	2.5	2.1	1.9
	1.5	8.8	6.2	5	4.4
	2.0	16	11.1	8.8	7.5
	2.5	24	15	12	10.1
	3.0	32	20	15	12.9
	4.0	56	34	25	20
108 – 120	1.0	2.8	2.1	1.7	1.6
	1.5	6.9	4.9	3.9	3.4
	2.0	14.8	10.1	8	6.7
	2.5	21	14.2	10.9	9.1
	3.0	29	18	14.1	11.6
	4.0	51	31	22	18
126 – 144	1.0	2.8	2.1	1.7	1.5
	1.5	6	4.3	3.5	3
	2.0	12	8	6.4	5.4
	2.5	21	14	10.6	8.9
	3.0	29	18	13.9	11.4
	4.0	50	30	22	18

1 *The values in this table represent the maximum ground pressure permitted when performing reasonable work over the pipes, using the manufacture's published equipment specifications. (Ground pressure for track equipment is the vehicle operating weight divided by the total ground contact area for both tracks.) This table is to be used as a guide. Talk to your Contech representative if you have questions about the equipment you plan on operating over the pipes. Care should be taken to maintain adequate cover depth during construction activities.*



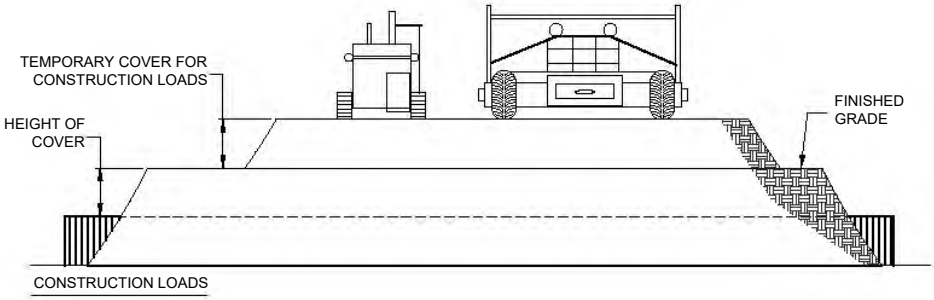


Examples of light, tracked, construction equipment used to place final cover over the pipe system.





Examples of heavy construction equipment that may require additional minimal cover. Contech can help evaluate minimum cover for the installation contractor for all the equipment on the site.



FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

Minimum Height of Cover Requirements for Rubber-Tired Equipment Over HEL-COR® CSP

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

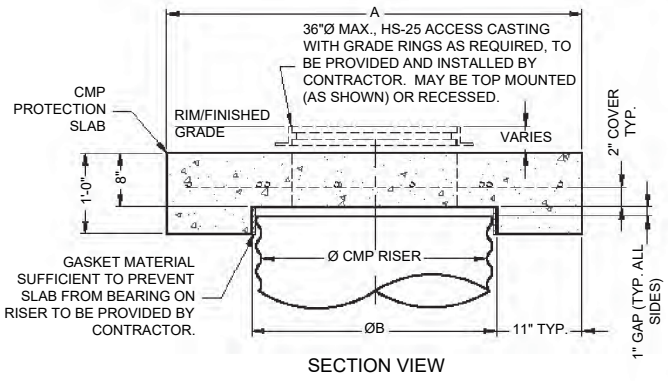
CMP Manhole Risers

CMP manhole risers allow easy access for future maintenance of the system. If the system is installed under a parking lot or road way subject to live loads, care must be taken to ensure loads are not applied directly to the riser structure. A pre-cast or cast-in-place slab should be installed above the riser. The manhole lid and frame should not rest directly on the CMP riser.









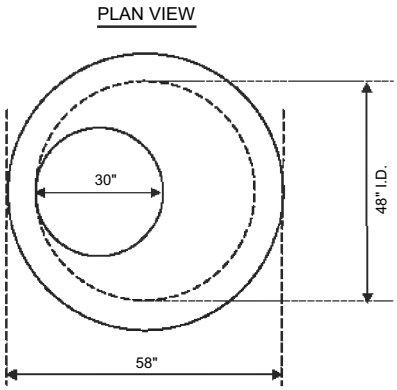
SECTION VIEW

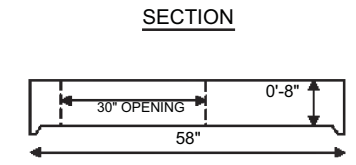
Reinforcing Table				
Ø CMP Riser	A	ØB	Reinforcing	Bearing Pressure** (psf)
24	4′Ø 4′ x 4′	26″	#5 @ 10″ OCEW #5 @ 10″ OCEW	2,540 1,900
30″	4′-6″Ø 4′-6″ x 4′-6″	32″	#5 @ 10″ OCEW #5 @ 9″ OCEW	2,260 1,670
36″	5′Ø 5′ x 5′	38″	#5 @ 9″ OCEW #5 @ 8″ OCEW	2,060 1,500
42″	5′-6″Ø 5′-6″ x 5′-6″	44″	#5 @ 8″ OCEW #5 @ 8″ OCEW	1,490 1,370
48″	6′Ø 6′ x 6′	50″	#5 @ 7″ OCEW #5 @ 7″ OCEW	1,210 1,270

*** Assumed soil bearing capacity.*

Precast Option for Manhole Riser Caps







NOTES:

A.) 4000 P.S.I. CONCRETE

B.) GRADE 60 REINFORCING PER ASTM A-615

C.) BUTYL SEALANT IN JOINTS

Additional Considerations

Because most systems are constructed below-grade, rainfall can rapidly fill the excavation; potentially causing floatation and movement of the previously placed pipes. To help mitigate potential problems, it is best to start the installation at the downstream end with the outlet already constructed to allow a route for the water to escape. Temporary diversion measures may be required for high flows due to the restricted nature of the outlet pipe.

CMP Preconstruction Checklist

Contech Field Contact and Phone: _____

Contech Plant Contact and Phone: _____

Contractor Contact and Phone: _____

Project Name: _____

Site Address: _____

Pre-con Attendees: _____

Topics to Review:

- ☐ Truck access and pipe storage availability/expectation
- ☐ Pipe unloading and handling safety, equipment and procedures
- ☐ System layout and shop drawing review
- ☐ Shipping schedule and installation sequence
- ☐ Joint configuration and assembly
- ☐ Connection with unlike storm sewer materials
- ☐ Backfill material selection and placement strategy
- ☐ Backfill sequence, lift thickness and balanced loading
- ☐ Compaction requirement (90%) and equipment
- ☐ Additional cover requirements for heavy construction loads
- ☐ CMP riser concrete cap installation

Notes: _____



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ENGINEERED SOLUTIONS

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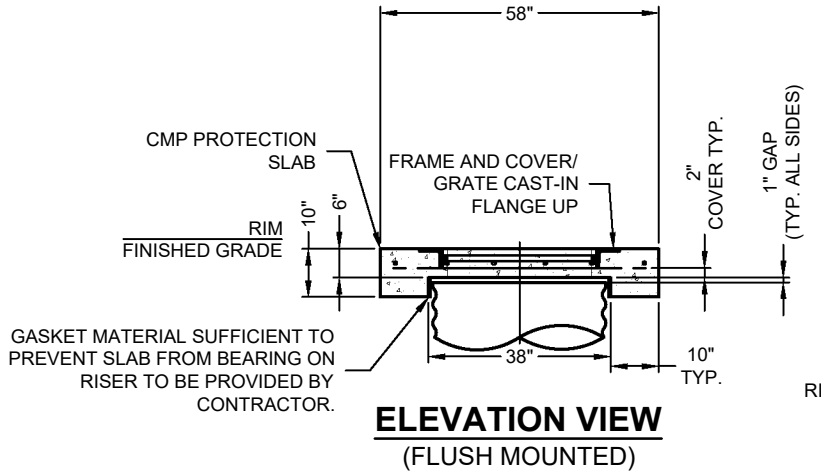
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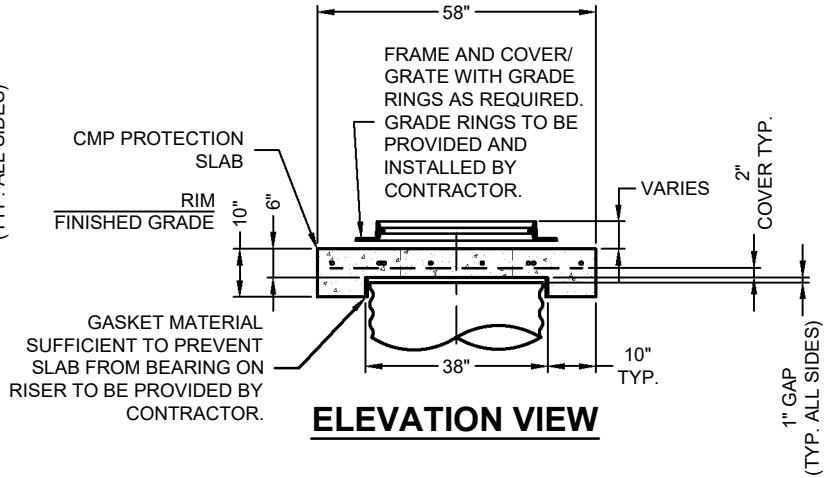
SUPPORT

DRAWINGS AND SPECIFICATIONS ARE AVAILABLE AT WWW.CONTECHES.COM

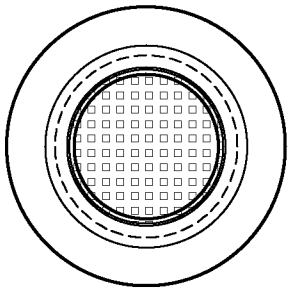
CMP Detention Install Guide 03/24



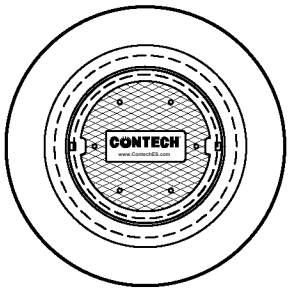
ELEVATION VIEW
(FLUSH MOUNTED)



ELEVATION VIEW



PLAN VIEW
(GRATED CASTING)
30"Ø HS20 LOAD RATED



PLAN VIEW
(SOLID CASTING)
30"Ø HS25 LOAD RATED
24"Ø HS20 LOAD RATED

CHECK ONE:

- ☐ CAST-IN COVER
- ☐ SEPARATE COVER

CHECK ONE:

- ☐ 30"Ø COVER
- ☐ 24"Ø COVER
- ☐ 30"Ø GRATE

FABRICATION NOTES:

1. CONCRETE STRENGTH = 4,000 PSI
2. REINFORCING STEEL - ASTM A615, GRADE 60, OR EQUIVALENT WELDED WIRE FABRIC.
3. NICE LIGHT BROOM FINISH FOR UNITS W/ CAST-IN FRAME AND COVER
4. LIFTERS IN SIDE FOR UNITS W/ CAST-IN FRAME AND COVER AND LIFTERS IN TOP SLAB FOR UNITS W/ SEPARATE COVER

GENERAL NOTES:

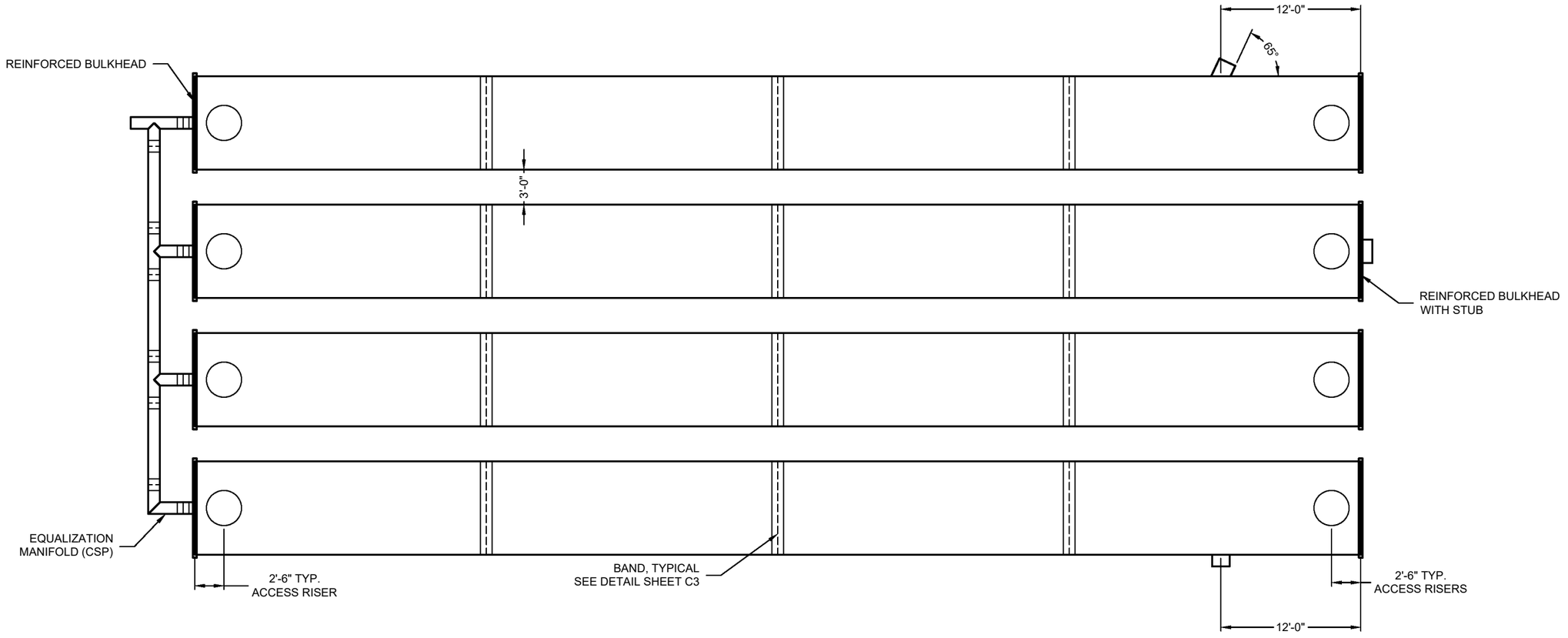
1. DESIGN LOAD HS20/HS25
2. EARTH COVER = 1' MAX
3. RISER CAP MUST BE ADEQUATELY SUPPORTED WITH PROPER BEDDING AS TO NOT TRANSFER LOADS ONTO RISER.
4. HEAVY PICK WEIGHT = 1,900 LBS

CONTECH® ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

58" OD CMP RISER CAP
UP TO 36" RISERS
PRECASTER: SEALY, TX

CONTECH® CMP DETENTION SYSTEMS

DATE: 04/07/2021	SCALE: NONE	PROJECT No.:	SEQUENCE No.:	DRAWN: TJS	CHECKED: KMR



ASSEMBLY

SCALE: 1" = 10'

THE UNDERSIGNED HEREBY APPROVES THE ATTACHED (6) PAGES INCLUDING THE FOLLOWING:

- **MAINLINE PIPE GAGE = 18, 16, 14, 12, 10, 8**
- **WALL TYPE = SOLID OR PERF**
- **DIAMETER = 12 - 144"**
- **FINISH = ALT2, POLY, GALV, ALUM**
- **CORRUGATION = 2 2/3x1/2, 3x1, 5x1**

CUSTOMER _____ DATE _____

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE.
- ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD (EOR) PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE AS REQUIRED, BY CONTRACTOR.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- ALL ACCESS CASTINGS ARE THE RESPONSIBILITY OF THE CONTRACTOR AND ARE NOT SUPPLIED BY CONTECH.

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MARK	DATE	REVISION DESCRIPTION	BY

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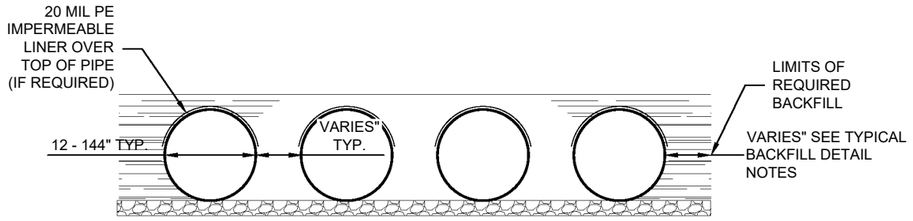
CONTECH CMP DETENTION SYSTEMS

CONTECH CONTRACT DRAWING

12 - 144"Ø SOLID OR PERFORATED UNDERGROUND SYSTEM
SAMPLE PROJECT
ANYTOWN, USA
SITE DESIGNATION: SAMPLE TANK

PROJECT No.:	SEQ. No.:	DATE:
----	----	1/10/2019
DESIGNED: xxx	DRAWN: DAH	
CHECKED: xxx	APPROVED: xxx	
SHEET NO.: C1 OF 6		

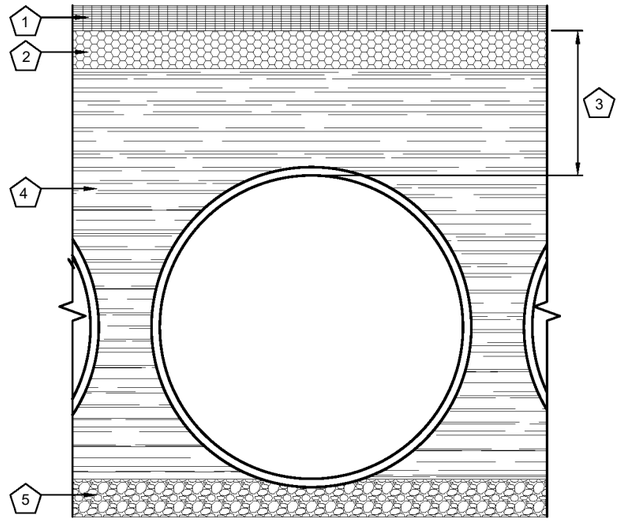
C:\USERS\DHOPKINS\DESKTOP\000000-001-CMP SAMPLE SOLID - PERF.DWG, 3/7/2019 5:49 PM



TYPICAL SECTION VIEW

NOT TO SCALE

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.



KEY

1. RIGID OR FLEXIBLE PAVEMENT
2. GRANULAR ROAD BASE
3. 12" MIN. FOR DIAMETERS THROUGH 96"
   18" MIN. FOR DIAMETERS FROM 102"
   AND LARGER MEASURED TO TOP OF RIGID
   OR BOTTOM OF FLEXIBLE PAVEMENT.
4. SELECT GRANULAR FILL PER AASHTO M145
   A1, A2 OR A3, OR APPROVED EQUAL.
   PLACED IN 8" LIFTS (COMPACTED TO MIN.
   90% STANDARD DENSITY PER AASHTO T99.)
5. GRANULAR BEDDING, ROUGHLY SHAPED TO
   FIT THE BOTTOM OF PIPE, 4" TO 6" IN DEPTH

FOUNDATION/BEDDING PREPARATION

PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER. ONCE THE FOUNDATION PREPARATION IS COMPLETE, 4" - 6" OF A WELL-GRADED GRANULAR MATERIAL SHALL BE PLACED AS THE BEDDING.

BACKFILL

THE BACKFILL SHALL BE AN A1, A2 OR A3 GRANULAR FILL PER AASHTO M145, OR A WELL-GRADED GRANULAR FILL AS APPROVED BY THE SITE ENGINEER (SEE INSTALLATION GUIDELINES). THE MATERIAL SHALL BE PLACED IN 8" LOOSE LIFTS AND COMPACTED TO 90% AASHTO T99 STANDARD PROCTOR DENSITY. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.

BACKFILL DETAIL

NOT TO SCALE

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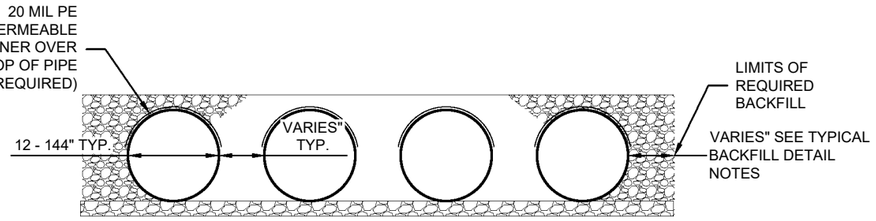
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CONTECH® CMP DETENTION SYSTEMS
CONTECH CONTRACT DRAWING

12 - 144"Ø SOLID OR PERFORATED UNDERGROUND SYSTEM - ---------
SAMPLE PROJECT
ANYTOWN, USA
SITE DESIGNATION: SAMPLE TANK

PROJECT No.:	SEQ. No.:	DATE:
----	----	1/10/2019
DESIGNED:	DRAWN:	
xxx	DAH	
CHECKED:	APPROVED:	
xxx	xxx	
SHEET NO.:		
C2 (2) OF 6		

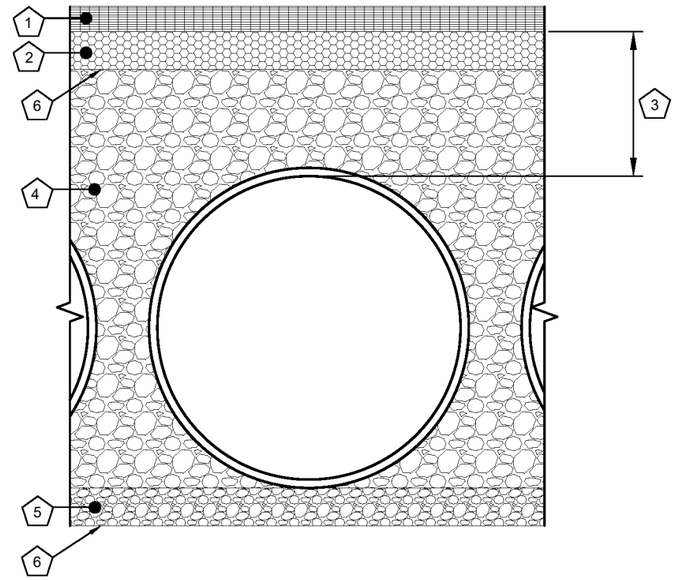
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TYPICAL SECTION VIEW

NOT TO SCALE

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.



KEY

1.) RIGID OR FLEXIBLE PAVEMENT

2.) GRANULAR ROAD BASE

3.) 12" MIN. FOR DIAMETERS THROUGH 96"
18" MIN. FOR DIAMETERS FROM 102"
AND LARGER MEASURED TO TOP OF
RIGID OR BOTTOM OF FLEXIBLE
PAVEMENT.

4.) FREE DRAINING ANGULAR WASHED
STONE 3/4" - 2" MIN. PARTICLE SIZE.

5.) GRANULAR BEDDING, ROUGHLY
SHAPED TO FIT THE BOTTOM OF PIPE,
4"- 6" IN DEPTH.

6.) CONTECH C-40 OR C-45
NON-WOVEN GEOTEXTILE
REQUIRED, WRAPPING TRENCH
ONLY.

FOUNDATION/BEDDING PREPARATION

PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER. ONCE THE FOUNDATION PREPARATION IS COMPLETE, THE 4 INCHES OF A WELL-GRADED GRANULAR MATERIAL SHALL BE PLACED AS THE BEDDING.

BACKFILL

THE BACKFILL MATERIAL SHALL BE FREE-DRAINING ANGULAR WASHED STONE 3/4" - 2" PARTICLE SIZE. MATERIAL SHALL BE PLACED IN 8"-10" MAXIMUM LIFTS. MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR-TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE PROJECT ENGINEER OR HIS REPRESENTATIVE IS SATISFIED WITH THE LEVEL OF COMPACTION. INADEQUATE COMPACTION CAN LEAD TO EXCESSIVE DEFLECTIONS WITHIN THE SYSTEM AND SETTLEMENT OF THE SOILS OVER THE SYSTEM. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO-LIFT DIFFERENTIAL BETWEEN THE SIDES OF ANY PIPE IN THE SYSTEM AT ALL TIMES DURING THE BACKFILL PROCESS. BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON ANY PIPES IN THE SYSTEM.

EQUIPMENT USED TO PLACE AND COMPACT THE BACKFILL SHALL BE OF A SIZE AND TYPE SO AS NOT TO DISTORT, DAMAGE, OR DISPLACE THE PIPE. ATTENTION MUST BE GIVEN TO PROVIDING ADEQUATE MINIMUM COVER FOR SUCH EQUIPMENT, AND MAINTAINING BALANCED LOADING ON ALL PIPES IN THE SYSTEM, DURING ALL SUCH OPERATIONS.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS. REFER TO TYPICAL BACKFILL DETAIL FOR MATERIAL REQUIRED.

1 / C3 BACKFILL DETAIL

SCALE: N.T.S.

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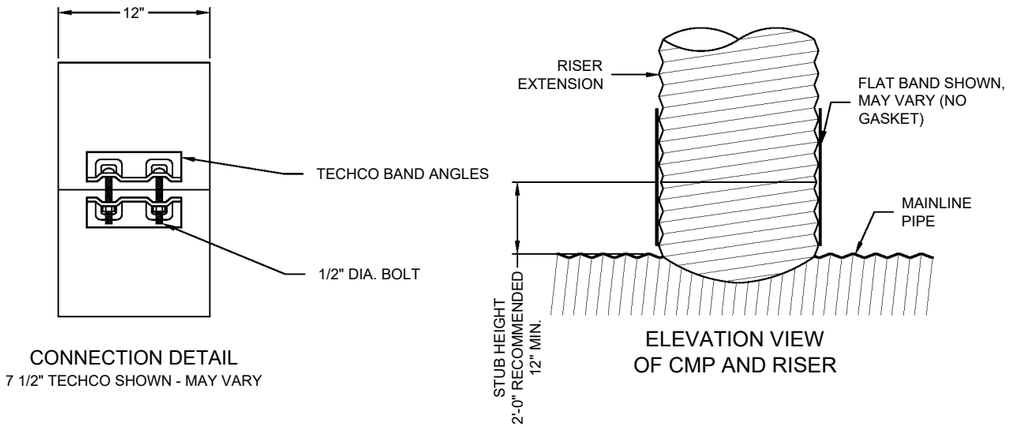
CONTECH® CMP DETENTION SYSTEMS

CONTECH **CONTRACT** DRAWING

12 - 144"Ø SOLID OR PERFORATED UNDERGROUND SYSTEM - ---------
SAMPLE PROJECT
ANYTOWN, USA
SITE DESIGNATION: SAMPLE TANK

PROJECT No.:	SEQ. No.:	DATE:
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DESIGNED:	DRAWN:	
xxx	DAH	
CHECKED:	APPROVED:	
xxx	xxx	
SHEET NO.:		
C2 OF 6		

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CONNECTION DETAIL
7 1/2" TECHCO SHOWN - MAY VARY

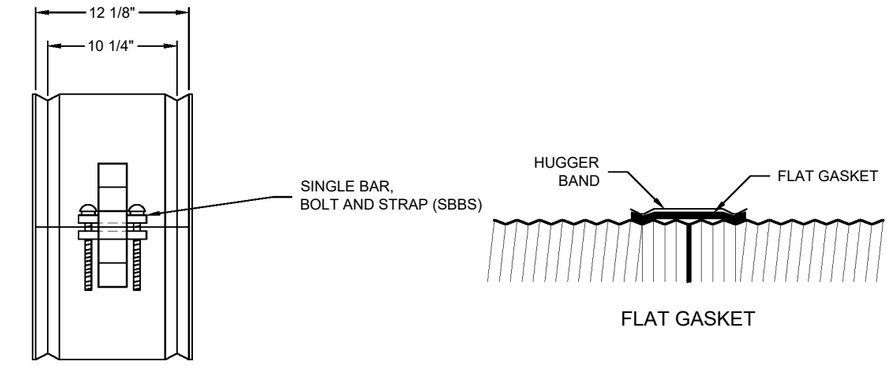
ELEVATION VIEW OF CMP AND RISER

PLAIN END CMP RISER PIPE

GENERAL NOTES:

1. **DELIVERED BAND STYLE AND FASTENER TYPE MAY VARY BY FABRICATION PLANT.**
2. JOINT IS TO BE ASSEMBLED PER AASHTO BRIDGE CONSTRUCTION SPECIFICATION SEC 26.4.2.4.
3. BAND MATERIAL AND GAGE TO BE SAME AS RISER MATERIAL.
4. IF RISER HAS A HEIGHT OF COVER OF 10' OR MORE, USE A SLIP JOINT.
5. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   - 12" THRU 48" 1-PIECE
   - 54" 2-PIECES
6. ALL RISER JOINT COMPONENTS WILL BE FIELD ASSEMBLED.
7. MANHOLE RISERS IN APPLICATIONS WHERE TRAFFIC LOADS ARE IMPOSED REQUIRE SPECIAL DESIGN CONSIDERATIONS.
8. DIMENSIONS SUBJECT TO MANUFACTURING TOLERANCES.

12" RISER BAND DETAIL
NOT TO SCALE



CONNECTION DETAIL
(SBBS)

2 2/3"x1/2" RE-ROLLED END HEL-COR PIPE

GENERAL NOTES:

1. JOINT IS TO BE ASSEMBLED PER AASHTO BRIDGE CONSTRUCTION SPECIFICATION SEC 26.4.2.4.
2. BAND MATERIALS AND/OR COATING CAN VARY BY LOCATION. CONTACT YOUR CONTECH REPRESENTATIVE FOR AVAILABILITY.
3. BANDS ARE SHAPED TO MATCH THE PIPE-ARCH WHEN APPLICABLE.
4. BANDS ARE NORMALLY FURNISHED AS FOLLOWS:
   - 12" THRU 48" 1-PIECE
   - 54" THRU 96" 2-PIECES
   - 102" THRU 144" 3-PIECES
5. BAND FASTENERS ARE ATTACHED WITH SPOT WELDS, RIVETS OR HAND WELDS.
6. ALL CMP IS REROLLED TO HAVE ANNULAR END CORRUGATIONS OF 2 2/3"x1/2"
7. DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
8. ORDER SHALL DESIGNATE GASKET OPTION, IF REQUIRED (SEE DETAILS ABOVE).

H-12 HUGGER BAND DETAIL
NOT TO SCALE

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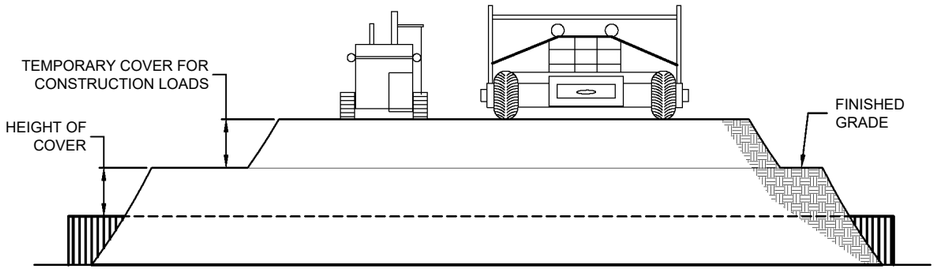
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CONTECH® CMP DETENTION SYSTEMS
CONTECH **CONTRACT** DRAWING

12 - 144"Ø SOLID OR PERFORATED UNDERGROUND SYSTEM - ---------
SAMPLE PROJECT
ANYTOWN, USA
SITE DESIGNATION: SAMPLE TANK

PROJECT No.:	SEQ. No.:	DATE:
----	----	1/10/2019
DESIGNED:		DRAWN:
xxx		DAH
CHECKED:		APPROVED:
xxx		xxx
SHEET NO.:		
C3 OF 6		



CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

NOT TO SCALE

SPECIFICATION FOR CORRUGATED STEEL PIPE-ALUMINIZED TYPE 2 STEEL

SCOPE

THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE CORRUGATED STEEL PIPE (CSP) DETAILED IN THE PROJECT PLANS.

MATERIAL

THE ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M274 OR ASTM A929.

PIPE

THE CSP SHALL BE MANUFACTURED IN ACCORDANCE WITH THE APPLICABLE REQUIREMENTS OF AASHTO M36 OR ASTM A760. THE PIPE SIZES, GAGES AND CORRUGATIONS SHALL BE AS SHOWN ON THE PROJECT PLANS.

ALL FABRICATION OF THE PRODUCT SHALL OCCUR WITHIN THE UNITED STATES.

HANDLING AND ASSEMBLY

SHALL BE IN ACCORDANCE WITH RECOMMENDATIONS OF THE NATIONAL CORRUGATED STEEL PIPE ASSOCIATION (NCSPA)

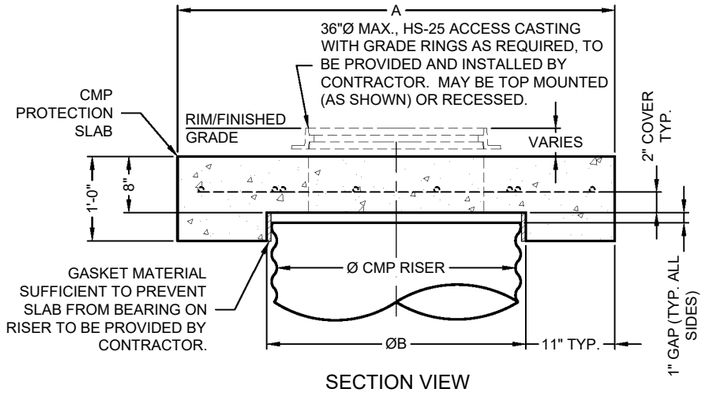
INSTALLATION

SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II OR ASTM A798 AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

MATERIAL SPECIFICATION

NOT TO SCALE

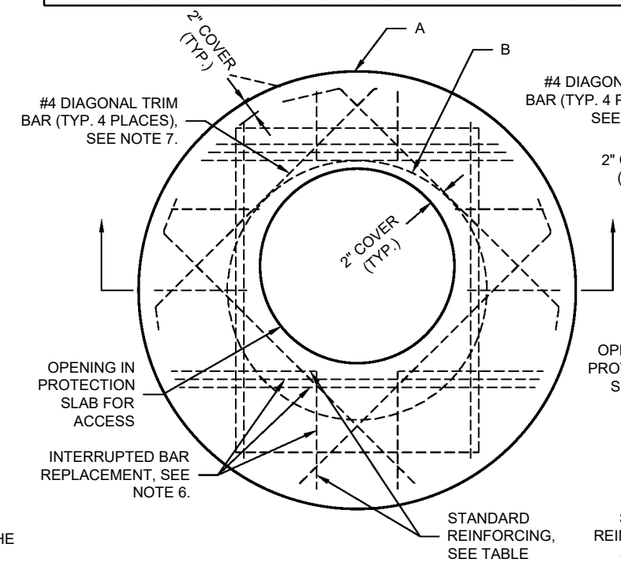


SECTION VIEW

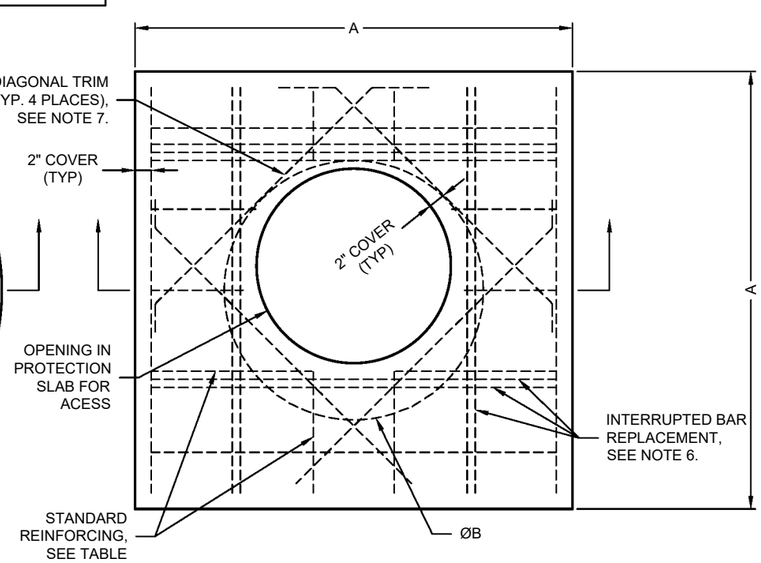
REINFORCING TABLE				
Ø CMP RISER	A	B Ø	REINFORCING	**BEARING PRESSURE (PSF)
24"	4'Ø 4'x4'	26"	#5 @ 10" OCEW #5 @ 10" OCEW	2,540 1,900
30"	4'-6"Ø 4'-6" x 4'-6"	32"	#5 @ 10" OCEW #5 @ 9" OCEW	2,260 1,670
36"	5'Ø 5' x 5'	38"	#5 @ 9" OCEW #5 @ 8" OCEW	2,060 1,500
42"	5'-6"Ø 5'-6" x 5'-6"	44"	#5 @ 8" OCEW #5 @ 8" OCEW	1,490 1,370
48"	6'Ø 6' x 6'	50"	#5 @ 7" OCEW #5 @ 7" OCEW	1,210 1,270

** ASSUMED SOIL BEARING CAPACITY

ACCESS CASTING NOT SUPPLIED BY CONTECH



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION AND ACI 350.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 4,000 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERS, ARCHITECTS AND LAND SURVEYORS, ENDWELL, NY.

MANHOLE CAP DETAIL

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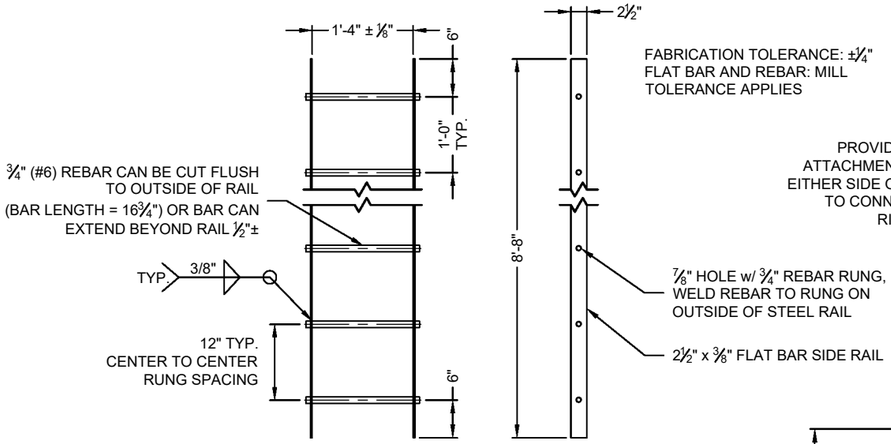
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CONTECH CONTRACT DRAWING

12 - 144"Ø SOLID OR PERFORATED UNDERGROUND SYSTEM - ---------
SAMPLE PROJECT
ANYTOWN, USA
SITE DESIGNATION: SAMPLE TANK

PROJECT No.:	SEQ. No.:	DATE:
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DESIGNED: xxx	DRAWN: DAH	
CHECKED: xxx	APPROVED: xxx	
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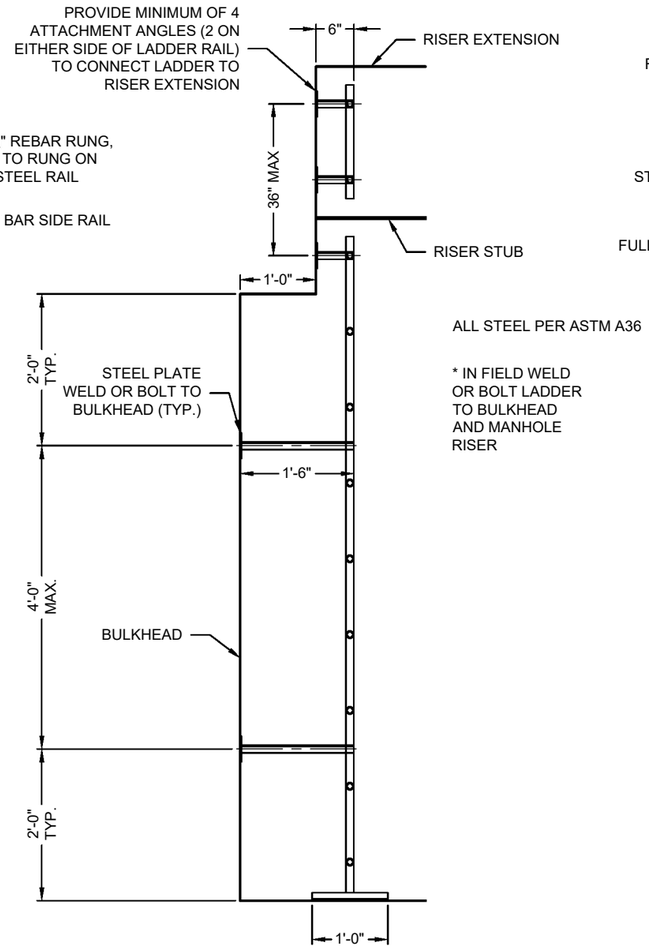
ELEVATION SIDE

NOTES:
1. LADDERS CAN BE MADE IN STANDARD LENGTHS AND CUT TO FIT
2. ALL MATERIAL TO MEET ASTM A36
3. LADDER TO BE HOT DIPPED GALVANIZED PER ASTM A-123 AFTER FABRICATION IS COMPLETE

STANDARD LADDER DETAIL

NOT TO SCALE

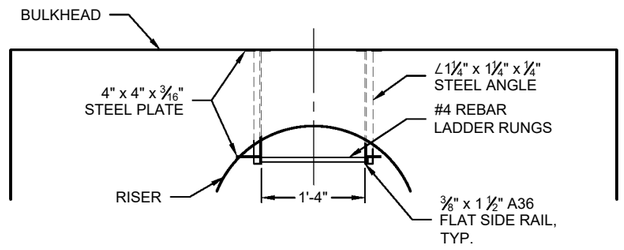
PART No. HALAGVL16



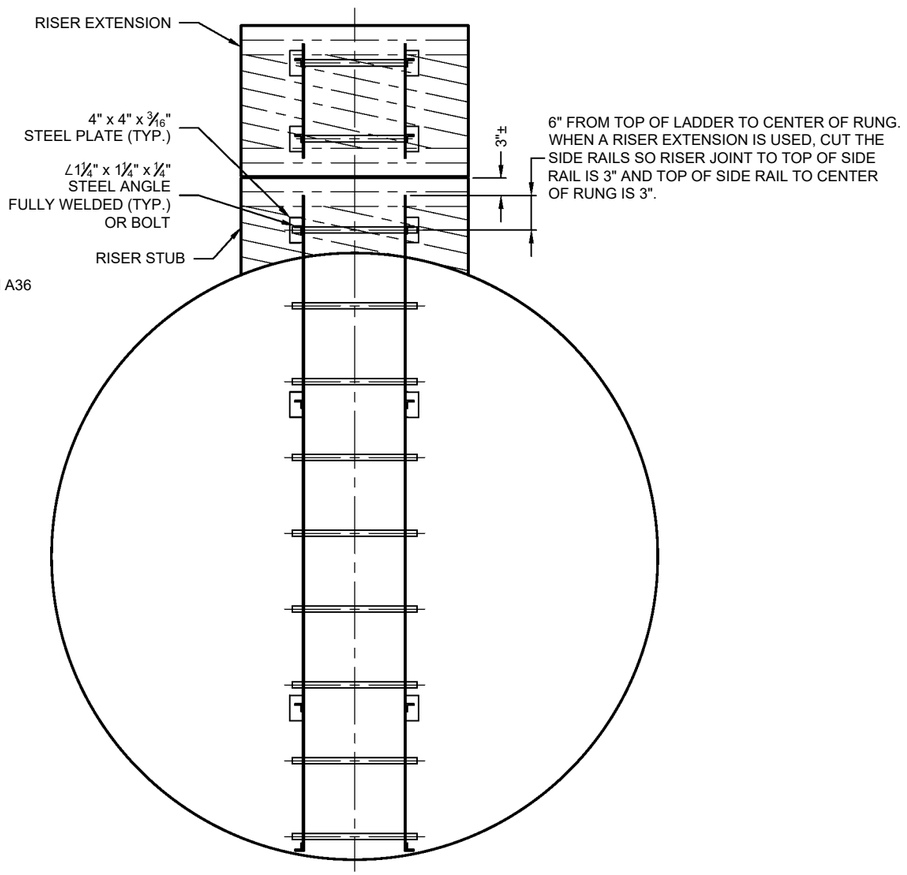
SIDE

ALL STEEL PER ASTM A36

* IN FIELD WELD OR BOLT LADDER TO BULKHEAD AND MANHOLE RISER



PLAN



ELEVATION

NOTE:
THIS DRAWING IS INTENDED TO APPLY TO LADDERS INSTALLED IN RISERS HAVING A DIAMETER OF 36" OR LARGER AND LOCATED ONE FOOT FROM THE BULKHEAD ONLY

RISER LADDER DETAIL

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CONTECH CONTRACT DRAWING

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SAMPLE PROJECT
ANYTOWN, USA
SITE DESIGNATION: SAMPLE TANK

PROJECT No.:	SEQ. No.:	DATE:
----	----	1/10/2019
DESIGNED: xxx	DRAWN: DAH	
CHECKED: xxx	APPROVED: xxx	
SHEET NO.: C5 OF 6		

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Appendix 7: Hydromodification

Supporting Detail Relating to Hydrologic Conditions of Concern

NOAA Atlas 14, Volume 6, Version 2
Location name: California, USA*
Latitude: 33.2805°, Longitude: -117.5052°
Elevation: ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.45 (1.22-1.74)	1.85 (1.55-2.22)	2.39 (2.00-2.88)	2.86 (2.38-3.47)	3.53 (2.82-4.44)	4.07 (3.18-5.24)	4.64 (3.54-6.14)	5.26 (3.89-7.16)	6.13 (4.34-8.75)	6.84 (4.67-10.1)
10-min	1.04 (0.876-1.25)	1.32 (1.11-1.59)	1.72 (1.43-2.06)	2.05 (1.70-2.49)	2.53 (2.02-3.19)	2.91 (2.28-3.76)	3.32 (2.54-4.40)	3.77 (2.79-5.14)	4.39 (3.11-6.27)	4.90 (3.35-7.26)
15-min	0.840 (0.708-1.01)	1.07 (0.896-1.28)	1.38 (1.16-1.66)	1.65 (1.37-2.01)	2.04 (1.63-2.57)	2.35 (1.84-3.03)	2.68 (2.04-3.55)	3.04 (2.25-4.14)	3.54 (2.51-5.05)	3.95 (2.70-5.85)
30-min	0.608 (0.512-0.730)	0.772 (0.650-0.928)	1.00 (0.838-1.21)	1.20 (0.994-1.45)	1.48 (1.18-1.86)	1.70 (1.33-2.19)	1.94 (1.48-2.57)	2.20 (1.63-3.00)	2.57 (1.82-3.66)	2.87 (1.96-4.24)
60-min	0.415 (0.350-0.499)	0.528 (0.444-0.634)	0.684 (0.573-0.824)	0.816 (0.678-0.993)	1.01 (0.807-1.27)	1.16 (0.910-1.50)	1.33 (1.01-1.76)	1.50 (1.11-2.05)	1.75 (1.24-2.50)	1.96 (1.34-2.90)
2-hr	0.283 (0.238-0.340)	0.356 (0.299-0.428)	0.456 (0.382-0.550)	0.541 (0.450-0.659)	0.664 (0.532-0.837)	0.762 (0.597-0.983)	0.867 (0.661-1.15)	0.978 (0.724-1.34)	1.14 (0.804-1.62)	1.26 (0.862-1.87)
3-hr	0.221 (0.186-0.266)	0.278 (0.234-0.334)	0.355 (0.298-0.429)	0.421 (0.350-0.513)	0.515 (0.413-0.650)	0.591 (0.463-0.762)	0.670 (0.511-0.888)	0.755 (0.559-1.03)	0.874 (0.619-1.25)	0.970 (0.662-1.44)
6-hr	0.145 (0.122-0.175)	0.183 (0.154-0.220)	0.234 (0.196-0.283)	0.278 (0.231-0.338)	0.339 (0.271-0.427)	0.387 (0.303-0.499)	0.437 (0.333-0.579)	0.490 (0.363-0.669)	0.564 (0.399-0.805)	0.623 (0.425-0.922)
12-hr	0.093 (0.078-0.112)	0.119 (0.100-0.143)	0.154 (0.129-0.186)	0.183 (0.152-0.222)	0.223 (0.178-0.281)	0.254 (0.199-0.328)	0.286 (0.218-0.379)	0.320 (0.237-0.436)	0.366 (0.259-0.522)	0.401 (0.274-0.594)
24-hr	0.057 (0.051-0.066)	0.075 (0.066-0.087)	0.098 (0.086-0.114)	0.117 (0.102-0.137)	0.143 (0.121-0.173)	0.163 (0.135-0.201)	0.184 (0.149-0.232)	0.205 (0.162-0.266)	0.234 (0.177-0.315)	0.257 (0.188-0.357)
2-day	0.034 (0.030-0.040)	0.046 (0.040-0.053)	0.061 (0.053-0.071)	0.073 (0.064-0.086)	0.090 (0.076-0.109)	0.103 (0.086-0.127)	0.117 (0.095-0.147)	0.131 (0.103-0.169)	0.150 (0.114-0.202)	0.165 (0.121-0.230)
3-day	0.025 (0.022-0.029)	0.034 (0.030-0.039)	0.045 (0.040-0.053)	0.055 (0.048-0.064)	0.068 (0.058-0.082)	0.078 (0.065-0.097)	0.089 (0.072-0.112)	0.100 (0.079-0.130)	0.116 (0.088-0.156)	0.128 (0.094-0.179)
4-day	0.020 (0.018-0.023)	0.027 (0.024-0.032)	0.037 (0.032-0.043)	0.045 (0.039-0.052)	0.056 (0.047-0.067)	0.064 (0.053-0.079)	0.073 (0.059-0.093)	0.083 (0.065-0.107)	0.096 (0.073-0.130)	0.107 (0.078-0.149)
7-day	0.013 (0.012-0.015)	0.018 (0.016-0.021)	0.025 (0.021-0.029)	0.030 (0.026-0.035)	0.038 (0.032-0.046)	0.044 (0.036-0.054)	0.050 (0.040-0.063)	0.057 (0.045-0.074)	0.066 (0.050-0.089)	0.073 (0.054-0.102)
10-day	0.010 (0.009-0.012)	0.014 (0.012-0.016)	0.019 (0.017-0.022)	0.023 (0.020-0.027)	0.030 (0.025-0.036)	0.034 (0.028-0.042)	0.040 (0.032-0.050)	0.045 (0.035-0.058)	0.053 (0.040-0.071)	0.059 (0.043-0.082)
20-day	0.006 (0.005-0.007)	0.008 (0.007-0.010)	0.012 (0.010-0.014)	0.014 (0.013-0.017)	0.019 (0.016-0.022)	0.022 (0.018-0.027)	0.025 (0.020-0.032)	0.029 (0.023-0.038)	0.034 (0.026-0.046)	0.039 (0.028-0.054)
30-day	0.004 (0.004-0.005)	0.006 (0.006-0.007)	0.009 (0.008-0.011)	0.011 (0.010-0.013)	0.015 (0.012-0.018)	0.018 (0.015-0.022)	0.021 (0.017-0.026)	0.024 (0.019-0.031)	0.028 (0.021-0.038)	0.032 (0.023-0.045)
45-day	0.003 (0.003-0.004)	0.005 (0.004-0.006)	0.007 (0.006-0.008)	0.009 (0.008-0.011)	0.012 (0.010-0.014)	0.014 (0.012-0.017)	0.016 (0.013-0.021)	0.019 (0.015-0.025)	0.023 (0.017-0.031)	0.026 (0.019-0.037)
60-day	0.003 (0.002-0.003)	0.004 (0.004-0.005)	0.006 (0.005-0.007)	0.008 (0.007-0.009)	0.010 (0.008-0.012)	0.012 (0.010-0.015)	0.014 (0.011-0.018)	0.017 (0.013-0.022)	0.020 (0.015-0.027)	0.023 (0.017-0.032)

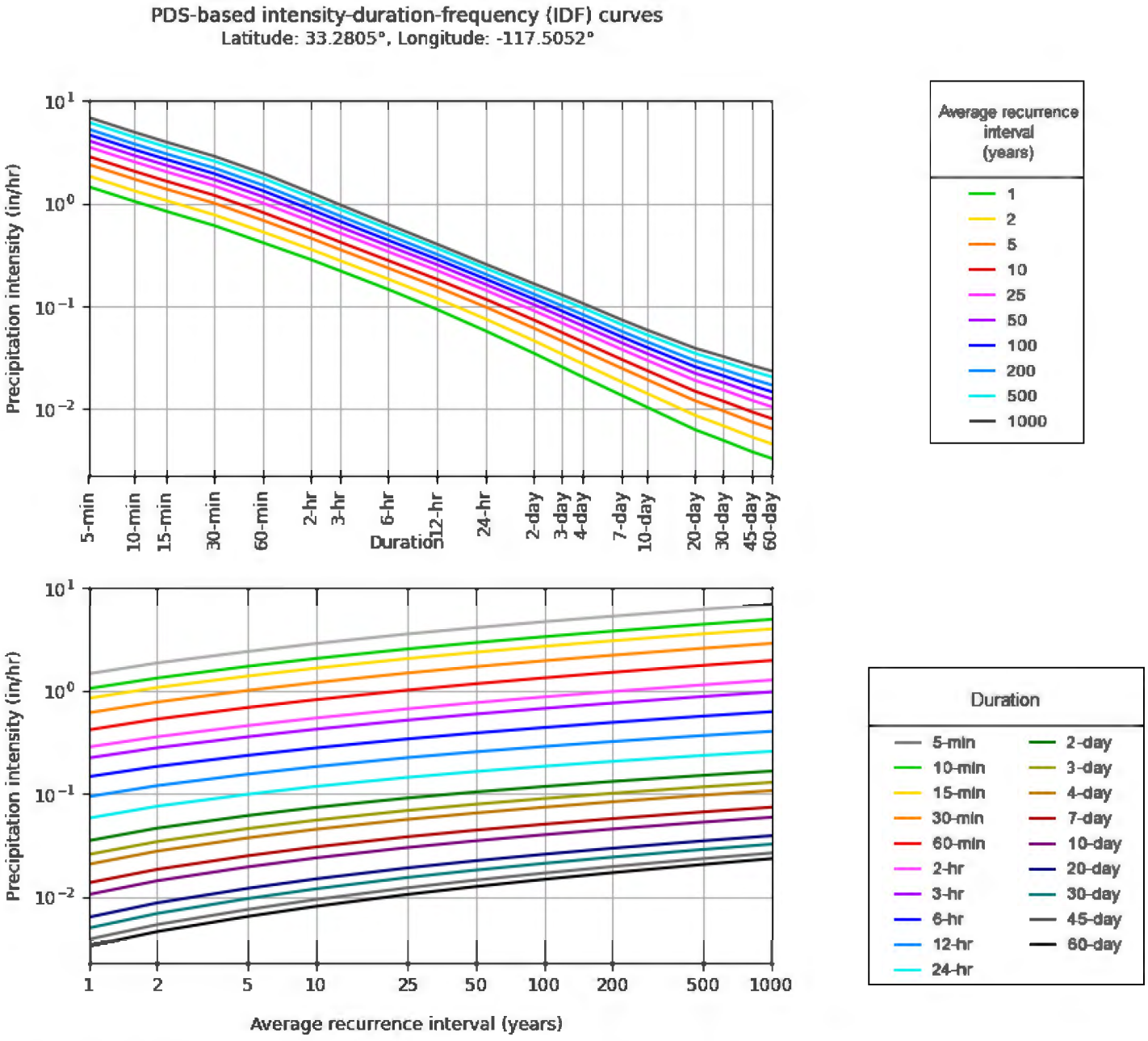
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

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.

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PF graphical



NOAA Atlas 14, Volume 6, Version 2

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Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
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Silver Spring, MD 20910
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Disclaimer

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************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1542

                              Analysis prepared by:
                          TRANSTECH ENGINEERS, INC.

 ************************** DESCRIPTION OF STUDY **************************
* SOLDAT BUILDING                                                        *
* TEMESCAL CANYON ROAD, CORONA, CALIFORNIA                               *
* 2-YEAR STORM, UNDEVELOPED CONDITION ANALYSIS                           *
 ************************************************************************

  FILE NAME: SLDTE.DAT
  TIME/DATE OF STUDY: 10:43 11/10/2025
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.85
  2-YEAR, 1-HOUR PRECIPITATION(INCH) =  0.516
  100-YEAR, 1-HOUR PRECIPITATION(INCH) =  1.490
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) =   0.516
  SLOPE OF INTENSITY DURATION CURVE = 0.4500
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)   (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

************************************************************************
  FLOW PROCESS FROM NODE     10.00 TO NODE     17.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   325.00
  UPSTREAM ELEVATION(FEET) =    919.00
  DOWNSTREAM ELEVATION(FEET) =    885.00
```

```
  ELEVATION DIFFERENCE(FEET) =     34.00
  TC = 0.533*[(  325.00**3)/(    34.00)]**.2 =    8.457
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.246
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6634
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.07
  TOTAL AREA(ACRES) =      0.09   TOTAL RUNOFF(CFS) =      0.07

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     17.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     16.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  1007.00
  UPSTREAM ELEVATION(FEET) =    919.00
  DOWNSTREAM ELEVATION(FEET) =    891.00
  ELEVATION DIFFERENCE(FEET) =     28.00
  TC = 0.533*[( 1007.00**3)/(    28.00)]**.2 =   17.330
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.902
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6030
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.11
  TOTAL AREA(ACRES) =      0.21   TOTAL RUNOFF(CFS) =      0.11

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     17.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    891.00  DOWNSTREAM(FEET) =    885.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    96.00   CHANNEL SLOPE =  0.0625
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.11
  FLOW VELOCITY(FEET/SEC) =   3.75 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.43   Tc(MIN.) =   17.76
  LONGEST FLOWPATH FROM NODE     13.00 TO NODE     17.00 =    1103.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     17.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  0.893
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6008
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.47   SUBAREA RUNOFF(CFS) =    0.25
  TOTAL AREA(ACRES) =        0.7   TOTAL RUNOFF(CFS) =       0.37
  TC(MIN.) =   17.76
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     17.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc       INTENSITY     AREA
  NUMBER      (CFS)     (MIN.)    (INCH/HOUR)   (ACRE)
      1        0.37    17.76        0.893        0.68
  LONGEST FLOWPATH FROM NODE     13.00 TO NODE     17.00 =    1103.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc       INTENSITY     AREA
  NUMBER      (CFS)     (MIN.)    (INCH/HOUR)   (ACRE)
      1        0.07     8.46        1.246        0.09
  LONGEST FLOWPATH FROM NODE     10.00 TO NODE     17.00 =     325.00 FEET.

 **********************************WARNING***********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc       INTENSITY
  NUMBER     (CFS)      (MIN.)    (INCH/HOUR)
      1       0.25       8.46        1.246
      2       0.42      17.76        0.893

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.42   Tc(MIN.) =   17.76
  TOTAL AREA(ACRES) =        0.8

****************************************************************************
  FLOW PROCESS FROM NODE     17.00 TO NODE     22.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    885.00  DOWNSTREAM(FEET) =    884.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =    58.00   CHANNEL SLOPE =  0.0172
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.42
  FLOW VELOCITY(FEET/SEC) =   1.97 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.49   Tc(MIN.) =   18.25
  LONGEST FLOWPATH FROM NODE     13.00 TO NODE     22.00 =    1161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     18.00 TO NODE     21.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
```

```
        ASSUMED INITIAL SUBAREA UNIFORM
        DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   141.00
  UPSTREAM ELEVATION(FEET) =    921.00
  DOWNSTREAM ELEVATION(FEET) =    905.00
  ELEVATION DIFFERENCE(FEET) =     16.00
  TC = 0.533*[(  141.00**3)/(    16.00)]**.2 =    5.958
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.459
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6898
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.13
  TOTAL AREA(ACRES) =      0.13   TOTAL RUNOFF(CFS) =      0.13

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     22.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    905.00  DOWNSTREAM(FEET) =    884.00
  CHANNEL LENGTH THRU SUBAREA(FEET) =   156.00   CHANNEL SLOPE =  0.1346
  NOTE: CHANNEL FLOW OF 1. CFS WAS ASSUMED IN VELOCITY ESTIMATION
  NOTE: CHANNEL SLOPE OF .1 WAS ASSUMED IN VELOCITY ESTIMATION
  CHANNEL FLOW THRU SUBAREA(CFS) =       0.13
  FLOW VELOCITY(FEET/SEC) =   4.74 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.55   Tc(MIN.) =    6.51
  LONGEST FLOWPATH FROM NODE     18.00 TO NODE     22.00 =     297.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.402
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6834
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.13   SUBAREA RUNOFF(CFS) =    0.12
  TOTAL AREA(ACRES) =       0.3   TOTAL RUNOFF(CFS) =       0.26
  TC(MIN.) =    6.51

****************************************************************************
  FLOW PROCESS FROM NODE     22.00 TO NODE     22.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1         0.26     6.51       1.402        0.26
  LONGEST FLOWPATH FROM NODE     18.00 TO NODE     22.00 =     297.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1         0.42    18.25       0.882        0.77
  LONGEST FLOWPATH FROM NODE     13.00 TO NODE     22.00 =    1161.00 FEET.
```

```
 **********************************WARNING**********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ***************************************************************************

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       0.41       6.51        1.402
      2       0.58      18.25        0.882

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.58   Tc(MIN.) =   18.25
  TOTAL AREA(ACRES) =        1.0
===========================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        1.0  TC(MIN.) =     18.25
  PEAK FLOW RATE(CFS)   =       0.58
===========================================================================
===========================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
           RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1542

                              Analysis prepared by:
                                      ER

 ************************* DESCRIPTION OF STUDY *************************
* SOLDAT BUILDING, TEMESCAL CANYON ROAD                                  *
* CORONA, CALIFORNIA                                                     *
* 2-YEAR STORM ANALYSIS, DEVELOPED CONDITION, NODE 61                    *
 ************************************************************************

  FILE NAME: S61.DAT
  TIME/DATE OF STUDY: 22:13 11/10/2025
------------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
------------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.060
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.889
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.440
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.490
          (SOURCE: NOAA ATLAS 14, VOL. 6, VER. 2)
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4690160
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4669684
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) =   0.469
  SLOPE OF INTENSITY DURATION CURVE = 0.4690
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

**************************************************************************
  FLOW PROCESS FROM NODE     11.00 TO NODE     12.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
========================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
```

```
        DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    67.00
  UPSTREAM ELEVATION(FEET) =    920.50
  DOWNSTREAM ELEVATION(FEET) =    920.00
  ELEVATION DIFFERENCE(FEET) =      0.50
  TC = 0.303*[(   67.00**3)/(     0.50)]**.2 =    4.339
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.504
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8795
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.10
  TOTAL AREA(ACRES) =      0.08   TOTAL RUNOFF(CFS) =      0.10

****************************************************************************
  FLOW PROCESS FROM NODE     12.00 TO NODE     13.00 IS CODE =  31
----------------------------------------------------------------------------
  ** WARNING: Computed Flowrate is less than 0.1 cfs,
               Routing Algorithm is UNAVAILABLE.

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     13.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.504
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8795
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.03   SUBAREA RUNOFF(CFS) =    0.04
  TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.14
  TC(MIN.) =    5.00

****************************************************************************
  FLOW PROCESS FROM NODE     13.00 TO NODE     16.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   917.80  DOWNSTREAM(FEET) =   903.60
  FLOW LENGTH(FEET) =   119.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   0.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.08
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.14
  PIPE TRAVEL TIME(MIN.) =   0.39    Tc(MIN.) =    5.39
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE     16.00 =     186.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     16.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.452
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8789
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.12   SUBAREA RUNOFF(CFS) =    0.16
  TOTAL AREA(ACRES) =        0.2   TOTAL RUNOFF(CFS) =       0.30
  TC(MIN.) =    5.39
```

```
****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     16.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     15.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    49.00
  UPSTREAM ELEVATION(FEET) =    908.30
  DOWNSTREAM ELEVATION(FEET) =    907.50
  ELEVATION DIFFERENCE(FEET) =      0.80
  TC = 0.303*[(   49.00**3)/(     0.80)]**.2 =    3.274
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.504
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8795
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.08
  TOTAL AREA(ACRES) =      0.06   TOTAL RUNOFF(CFS) =      0.08

****************************************************************************
  FLOW PROCESS FROM NODE     15.00 TO NODE     16.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.08     5.00       1.504        0.06
  LONGEST FLOWPATH FROM NODE     14.00 TO NODE     16.00 =      49.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.30     5.39       1.452        0.23
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE     16.00 =     186.00 FEET.

 ****************************************WARNING*************************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF      Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       0.35       5.00        1.504
      2       0.37       5.39        1.452

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.37   Tc(MIN.) =    5.39
```

```
  TOTAL AREA(ACRES) =        0.3

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     16.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     16.00 TO NODE     20.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   903.60  DOWNSTREAM(FEET) =   903.00
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.64
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.37
  PIPE TRAVEL TIME(MIN.) =   0.14    Tc(MIN.) =    5.53
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE     20.00 =     216.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     14.00 TO NODE     19.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    54.00
  UPSTREAM ELEVATION(FEET) =    908.30
  DOWNSTREAM ELEVATION(FEET) =    907.50
  ELEVATION DIFFERENCE(FEET) =      0.80
  TC = 0.303*[(   54.00**3)/(     0.80)]**.2 =    3.471
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.504
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8795
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.06
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.06

****************************************************************************
  FLOW PROCESS FROM NODE     19.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.504
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8795
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.10
```

```
 TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.16
 TC(MIN.) =    5.00

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        0.16     5.00       1.504        0.12
 LONGEST FLOWPATH FROM NODE     14.00 TO NODE     20.00 =      54.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
 STREAM     RUNOFF      Tc      INTENSITY     AREA
 NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
     1        0.37     5.53       1.435        0.28
 LONGEST FLOWPATH FROM NODE     11.00 TO NODE     20.00 =     216.00 FEET.

****************************WARNING*********************************
 IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
 ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
 WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
********************************************************************

 ** PEAK FLOW RATE TABLE **
 STREAM    RUNOFF       Tc      INTENSITY
 NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
     1       0.49       5.00        1.504
     2       0.52       5.53        1.435

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       0.52   Tc(MIN.) =    5.53
 TOTAL AREA(ACRES) =        0.4

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     20.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
    2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.435
 COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8787
 SOIL CLASSIFICATION IS "D"
 SUBAREA AREA(ACRES) =    0.00   SUBAREA RUNOFF(CFS) =    0.00
 TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       0.52
 TC(MIN.) =    5.53

****************************************************************************
 FLOW PROCESS FROM NODE     20.00 TO NODE     21.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   903.00  DOWNSTREAM(FEET) =   902.50
 FLOW LENGTH(FEET) =    28.00   MANNING'S N =  0.013
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   2.8 INCHES
```

```
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.83
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.52
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    5.65
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE     21.00 =     244.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     21.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.420
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8785
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.03   SUBAREA RUNOFF(CFS) =    0.04
  TOTAL AREA(ACRES) =        0.4   TOTAL RUNOFF(CFS) =       0.56
  TC(MIN.) =    5.65

****************************************************************************
  FLOW PROCESS FROM NODE     21.00 TO NODE     61.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   902.50  DOWNSTREAM(FEET) =   883.00
  FLOW LENGTH(FEET) =   177.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   1.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.46
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.56
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =    6.05
  LONGEST FLOWPATH FROM NODE     11.00 TO NODE     61.00 =     421.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      6.05
  PEAK FLOW RATE(CFS)   =       0.56
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**********************************************************************
           RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
        RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
                    (RCFC&WCD)  1978 HYDROLOGY MANUAL
          (c) Copyright 1982-2016 Advanced Engineering Software (aes)
                    (Rational Tabling Version 23.0)
                Release Date: 07/01/2016  License ID 1542

                              Analysis prepared by:
                                      ER

 ************************* DESCRIPTION OF STUDY *************************
* SOLDAT BUILDING, TEMESCAL CANYON ROAD                                *
* CORONA, CALIFORNIA                                                   *
* 2 YEAR STORM ANALYSIS, DEVELOPED CONDITION, NODE 66                  *
 **********************************************************************

  FILE NAME: SLDTP.DAT
  TIME/DATE OF STUDY: 22:37 11/10/2025
----------------------------------------------------------------------
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
----------------------------------------------------------------------
  USER SPECIFIED STORM EVENT(YEAR) =    2.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.90
  10-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  2.060
  10-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  0.889
  100-YEAR STORM 10-MINUTE INTENSITY(INCH/HOUR) =  3.440
  100-YEAR STORM 60-MINUTE INTENSITY(INCH/HOUR) =  1.490
          (SOURCE: NOAA ATLAS 14, VOL. 6, VER. 2)
  SLOPE OF 10-YEAR INTENSITY-DURATION CURVE =  0.4690160
  SLOPE OF 100-YEAR INTENSITY-DURATION CURVE =  0.4669684
  COMPUTED RAINFALL INTENSITY DATA:
  STORM EVENT =    2.00   1-HOUR INTENSITY(INCH/HOUR) =   0.469
  SLOPE OF INTENSITY DURATION CURVE = 0.4690
  RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD
  NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
        AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES
  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

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

**********************************************************************
  FLOW PROCESS FROM NODE     51.00 TO NODE     52.00 IS CODE =  21
----------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
======================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
```

```
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    48.00
  UPSTREAM ELEVATION(FEET) =    920.50
  DOWNSTREAM ELEVATION(FEET) =    920.00
  ELEVATION DIFFERENCE(FEET) =      0.50
  TC = 0.303*[(   48.00**3)/(     0.50)]**.2 =    3.553
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.504
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8795
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.06
  TOTAL AREA(ACRES) =      0.05   TOTAL RUNOFF(CFS) =      0.06

****************************************************************************
  FLOW PROCESS FROM NODE     52.00 TO NODE     53.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.504
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8795
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.02   SUBAREA RUNOFF(CFS) =    0.03
  TOTAL AREA(ACRES) =       0.1   TOTAL RUNOFF(CFS) =       0.09
  TC(MIN.) =    5.00

****************************************************************************
  FLOW PROCESS FROM NODE     53.00 TO NODE     59.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     54.00 TO NODE     55.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    30.00
  UPSTREAM ELEVATION(FEET) =    886.30
  DOWNSTREAM ELEVATION(FEET) =    886.00
  ELEVATION DIFFERENCE(FEET) =      0.30
  TC = 0.303*[(   30.00**3)/(     0.30)]**.2 =    2.968
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.504
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8795
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.03
  TOTAL AREA(ACRES) =      0.02   TOTAL RUNOFF(CFS) =      0.03

****************************************************************************
  FLOW PROCESS FROM NODE     55.00 TO NODE     56.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.504
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8795
```

```
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.02   SUBAREA RUNOFF(CFS) =    0.03
  TOTAL AREA(ACRES) =        0.0   TOTAL RUNOFF(CFS) =       0.06
  TC(MIN.) =    5.00

****************************************************************************
  FLOW PROCESS FROM NODE     56.00 TO NODE     59.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.06     5.00       1.504        0.04
  LONGEST FLOWPATH FROM NODE     54.00 TO NODE     59.00 =      30.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.09     5.00       1.504        0.07
  LONGEST FLOWPATH FROM NODE     51.00 TO NODE     59.00 =      48.00 FEET.

 **********************************WARNING***********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF      Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       0.15       5.00        1.504
      2       0.15       5.00        1.504

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.15   Tc(MIN.) =    5.00
  TOTAL AREA(ACRES) =        0.1

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     59.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     59.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     57.00 TO NODE     58.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
          ASSUMED INITIAL SUBAREA UNIFORM
          DEVELOPMENT IS: UNDEVELOPED WITH POOR COVER
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
```

```
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   155.00
  UPSTREAM ELEVATION(FEET) =    888.00
  DOWNSTREAM ELEVATION(FEET) =    886.50
  ELEVATION DIFFERENCE(FEET) =      1.50
  TC = 0.533*[(  155.00**3)/(     1.50)]**.2 =   10.125
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.080
  UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6377
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.02
  TOTAL AREA(ACRES) =      0.03   TOTAL RUNOFF(CFS) =      0.02

****************************************************************************
  FLOW PROCESS FROM NODE     58.00 TO NODE     59.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.080
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8738
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.06   SUBAREA RUNOFF(CFS) =    0.06
  TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.08
  TC(MIN.) =   10.12

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     59.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1         0.08    10.12       1.080        0.09
  LONGEST FLOWPATH FROM NODE     57.00 TO NODE     59.00 =     155.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1         0.15     5.00       1.504        0.11
  LONGEST FLOWPATH FROM NODE     51.00 TO NODE     59.00 =      48.00 FEET.

 ****************************WARNING*************************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ************************************************************************

  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
      1        0.19       5.00        1.504
      2        0.18      10.12        1.080

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.19   Tc(MIN.) =    5.00
  TOTAL AREA(ACRES) =        0.2

****************************************************************************
  FLOW PROCESS FROM NODE     59.00 TO NODE     66.00 IS CODE =  31
```

```
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   883.00  DOWNSTREAM(FEET) =   882.50
  FLOW LENGTH(FEET) =     6.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   1.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.89
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.19
  PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    5.02
  LONGEST FLOWPATH FROM NODE     57.00 TO NODE     66.00 =     161.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     66.00 TO NODE     66.00 IS CODE =  12
----------------------------------------------------------------------------
  >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     66.00 TO NODE     66.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     61.00 IS CODE =   7
----------------------------------------------------------------------------
  >>>>>USER SPECIFIED HYDROLOGY INFORMATION AT NODE<<<<<
============================================================================
  USER-SPECIFIED VALUES ARE AS FOLLOWS:
  TC(MIN) =   6.05   RAIN INTENSITY(INCH/HOUR) =  1.38
  TOTAL AREA(ACRES) =     0.40   TOTAL RUNOFF(CFS) =      0.56

****************************************************************************
  FLOW PROCESS FROM NODE     61.00 TO NODE     65.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   883.00  DOWNSTREAM(FEET) =   882.75
  FLOW LENGTH(FEET) =    22.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.2 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.34
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.56
  PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    6.16
  LONGEST FLOWPATH FROM NODE     57.00 TO NODE     65.00 =     183.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     65.00 IS CODE =  10
----------------------------------------------------------------------------
  >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
  FLOW PROCESS FROM NODE     62.00 TO NODE     63.00 IS CODE =  21
```

```
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
============================================================================
         ASSUMED INITIAL SUBAREA UNIFORM
         DEVELOPMENT IS COMMERCIAL
  TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    72.00
  UPSTREAM ELEVATION(FEET) =    920.50
  DOWNSTREAM ELEVATION(FEET) =    920.00
  ELEVATION DIFFERENCE(FEET) =      0.50
  TC = 0.303*[(   72.00**3)/(     0.50)]**.2 =    4.531
  COMPUTED TIME OF CONCENTRATION INCREASED TO 5 MIN.
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.504
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8795
  SOIL CLASSIFICATION IS "D"
  SUBAREA RUNOFF(CFS) =      0.06
  TOTAL AREA(ACRES) =      0.04   TOTAL RUNOFF(CFS) =      0.06

****************************************************************************
  FLOW PROCESS FROM NODE     63.00 TO NODE     65.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
     2 YEAR RAINFALL INTENSITY(INCH/HOUR) =  1.504
  COMMERCIAL DEVELOPMENT RUNOFF COEFFICIENT = .8795
  SOIL CLASSIFICATION IS "D"
  SUBAREA AREA(ACRES) =    0.08   SUBAREA RUNOFF(CFS) =    0.11
  TOTAL AREA(ACRES) =        0.1   TOTAL RUNOFF(CFS) =       0.17
  TC(MIN.) =    5.00

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     65.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1         0.17     5.00       1.504        0.13
  LONGEST FLOWPATH FROM NODE     62.00 TO NODE     65.00 =      72.00 FEET.

  ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER       (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1         0.56     6.16       1.364        0.40
  LONGEST FLOWPATH FROM NODE     57.00 TO NODE     65.00 =     183.00 FEET.

 ****************************WARNING*************************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ****************************************************************************
  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER      (CFS)     (MIN.)   (INCH/HOUR)
      1        0.62       5.00        1.504
      2        0.71       6.16        1.364
```

```
  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.71   Tc(MIN.) =    6.16
  TOTAL AREA(ACRES) =        0.5

****************************************************************************
  FLOW PROCESS FROM NODE     65.00 TO NODE     66.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   882.75  DOWNSTREAM(FEET) =   882.50
  FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.013
  ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   3.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   3.40
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       0.71
  PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    6.28
  LONGEST FLOWPATH FROM NODE     57.00 TO NODE     66.00 =     208.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE     66.00 TO NODE     66.00 IS CODE =  11
----------------------------------------------------------------------------
  >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================
  ** MAIN STREAM CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.71     6.28       1.351        0.53
  LONGEST FLOWPATH FROM NODE     57.00 TO NODE     66.00 =     208.00 FEET.

  ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM     RUNOFF      Tc      INTENSITY     AREA
  NUMBER      (CFS)    (MIN.)   (INCH/HOUR)   (ACRE)
      1        0.19     5.02       1.501        0.20
  LONGEST FLOWPATH FROM NODE     57.00 TO NODE     66.00 =     161.00 FEET.

 **********************************WARNING**********************************
  IN THIS COMPUTER PROGRAM, THE CONFLUENCE VALUE USED IS BASED
  ON THE RCFC&WCD FORMULA OF PLATE D-1 AS DEFAULT VALUE. THIS FORMULA
  WILL NOT NECESSARILY RESULT IN THE MAXIMUM VALUE OF PEAK FLOW.
 ***************************************************************************
  ** PEAK FLOW RATE TABLE **
  STREAM    RUNOFF       Tc      INTENSITY
  NUMBER     (CFS)     (MIN.)   (INCH/HOUR)
      1       0.75       5.02        1.501
      2       0.88       6.28        1.351

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       0.88   Tc(MIN.) =    6.28
  TOTAL AREA(ACRES) =        0.7
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.7  TC(MIN.) =      6.28
  PEAK FLOW RATE(CFS)   =       0.88
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

The drainage inlet on Soldat property (referenced as APN 282-121-008) is located at Node 34 on the hydrology map (PDF page 65) with Q100 of 33.92 cfs entering Lateral C-1 (PDF page 70).

TEMESCAL CANYON ROAD WIDENING PROJECT

LEROY ROAD TO DOS LAGOS DRIVE

WORK ORDER C6-0066

DRAINAGE REPORT

June 27, 2017

INFORMATION ONLY

NOT FOR PUBLIC RELEASE

Prepared for:

Riverside County Transportation Department

Submitted by:

NCM Engineering
4740 Green River Road, Suite 218
Corona, CA 92880

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APPENDIX C – DRAINAGE INLET CALCULATIONS
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APPENDIX E – MAPS AND EXHIBITS

1. INTRODUCTION

The Temescal Canyon Road Widening Project (C6-0066) is located in an unincorporated area in the County of Riverside. The project work limit begins from Leroy Road to Dos Lagos Drive. This project will add additional travel lanes and modify curves to enhance traffic flow and safety.



Figure 1 - Vicinity Map

The purpose of this drainage report is to verify the existing drainage conditions and provide hydraulic calculations for the proposed drainage pipe systems and inlets. The calculations developed in this report conform to Riverside County Flood Control and Water Conservation District (RCFC&WCD) design criteria and standards. Offsite drainage improvement or mitigation are not part of the project and shall be addressed separately.

Hydrologic modeling was based on a single 100-yr storm event.

Hydraulic computations were performed to determine drainage inlet sizes and storm drain conveyance capacity to assure proper street flow interception and flood width so that one travel lane would remain open in each direction during the design storm event.

2. TOPOGRAPHY AND LAND USE

The project site is located east of the I-15 freeway and is situated at the foothill of Bedford Peak. The project's upstream watersheds generally have gradients of 8% to 16% and the surface runoff flows northeasterly toward I-15 freeway. The runoff discharges to Temescal Creek.

For drainage area delineation purposes, the following topographic maps were used for drainage analysis:

- The project 1-ft topography which focuses on the detailed site features along the road widening project corridor.

- RCFC&WCD's 4-ft topography which gives a refined relief detail beyond the project topography limit.

- The 2015 USGS 7.5-minute topography maps with 40-ft contours which covers very large area and shows mountainous flow pattern.

The zonings (see Appendix E) along Temescal Canyon Road are primarily Commercial Retail and Commercial Office. For the upstream tributary areas located west of I-15, the land use comprises of Commercial Office, Light Industrial, Conservation Habitat and Rural Community (Estate Density) Residential.

3. METHODOLOGY

Precipitation

The 2-yr and 100-yr precipitation data for the project drainage area were obtained from the Isohyetal Maps in the RCFC&WCD Hydrology Manual (Plate D-4.3 & 4.4). The project location reads 0.6 inch and 1.4 inch for 2-yr 1-hr and 100-yr 1-hr precipitation. The precipitation maps are included in Appendix A.

An intensity-duration curve slope of 0.45 was used for the calculations in accordance with RCFC&WCD Plate D-4.6. Intensity-duration curves were determined based on the slope and the 100-yr 1-hr precipitation to define the relationship of rainfall intensities against duration less than 60 minutes.

Soil Groups

According to the Hydrologic Soils Group Map (Plate C-1.27 Corona South), the project upstream watershed consists of soil types D or C, which are soils with lower infiltration rate and higher runoff potential. Copies of the Hydrologic Soils Group Maps for the project site are included in Appendix A.

Runoff Calculation

The rational method from Section D of RCFC&WCD Hydrology Manual (1978) was used to determine the runoff generated by the subareas. The CivilDesign Hydrology Package, Riverside County module was used to facilitate the hydrologic calculations and the Temescal Canyon Land Use Map (2015) was used to determine watershed land use (See Appendix E).

The hydrologic calculations for drainage areas were established using the rational method and AMC value of 3 in the 100-year storm event analysis, in accordance with Section C in RCFC&WCD Hydrology Manual

Time of concentration (t_c) for initial subareas areas is based on the RCFC&WCD's nomograph (Plate D-3). Hydrology calculations are included in Appendix B.

Hydrology maps for offsite and onsite conditions indicating drainage subareas, boundaries, area designation, acreage, and runoffs are included in Appendix E.

Pipe Hydraulics

CivilDesign's WSPGW (v14.08) was utilized to determine the water surface profile in a proposed storm drain system. Manning's coefficient of 0.013 was used for concrete pipe modeling. If the downstream water surface elevation is not known, the pipe soffit elevation will be assumed for hydraulic grade line modeling purposes. The pipe hydraulic analysis results can be found in Appendix D.

Inlet Capacity

Bentley Flowmaster was utilized for inlet capacity sizing. The inlet calculation modules in the program can simulate side-opening inlet, grate inlet, or combination of these inlets in both by-pass and sag conditions based on the FHWA Urban Drainage Manual HEC-22 methodology. The calculations have assumed that all inlets will be subject to 50% clogged and the results can be found in Appendix C.

4. EXISTING AND PROPOSED DRAINAGE FACILITES

Historically, the runoff from Bedford Peak drains northeasterly towards both I-15 and Temescal Canyon Road before discharging to Temescal Creek. After years of development, there are now eight major drainage facilities across the I-15 freeway located west of the project site that handle the terrain surface flow.

These facilities are illustrated in Figure 4.1 below to show the existing drainage conditions in the area. The project storm drain improvement plans are included in Appendix E for reference.

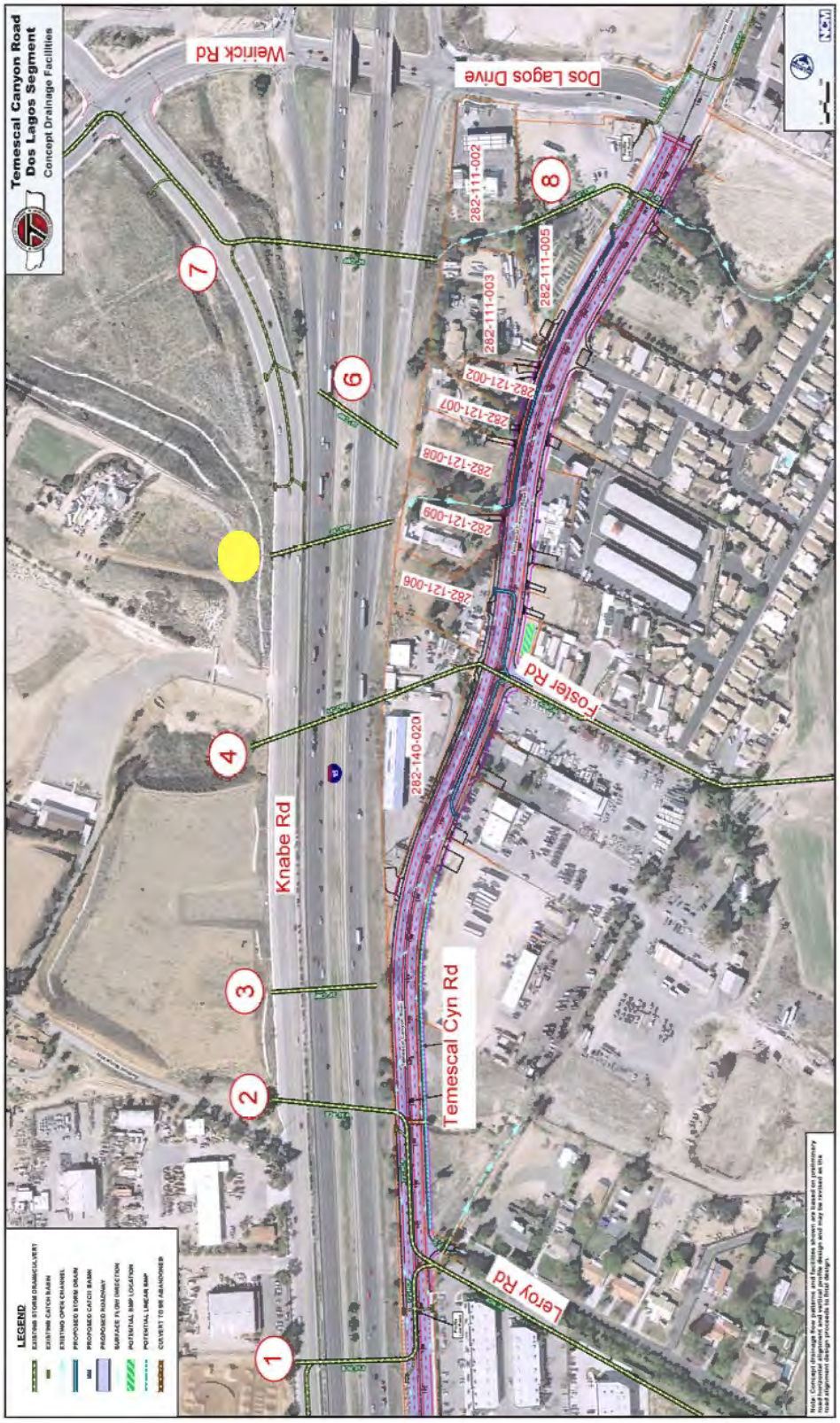


Figure 4.1 – Existing Offsite Drainage Facilities Map

System 1 – an existing 8'x5' RCB. This facility handles a large amount of the flow from the hillside tributary across I-15. It also intercepts surface runoff from Knabe Road, I-15 and Temescal Canyon Road. This facility transitions to an existing 72" RCP on Temescal Canyon Road and merges with System 2.

System 2 – an existing 8'x5' RCB. This facility also conveys the stormwater from the same watershed of System 1 as a parallel discharge system. System 1 and 2 merge at Leroy Road and become one at the 78" RCP along Leroy Road. This system discharges directly to Temescal Creek approximately 1800 feet east.

System 3 – an existing 24" CMP culvert. This facility conveys surface flow from a small tributary area west of I-15 and discharges at the west side of Temescal Canyon Road. The discharge flows northerly behind the existing curb to a pond located approximately 150 feet away from the culvert exit. If there is excessive flow from the culvert, the discharge may overflow onto Temescal Canyon Road and continue to drain northerly on the west side of the road.

The project will add an inlet to intercept this offsite flow and minimize run-on to the roadway.

System 4 – an existing 54" CMP. This facility carries a large amount of flow from a portion of the large drainage area within "The Retreat" community, which is located approximately 3000 feet to the west. This facility also intercepts a good portion of the runoff from APN 282-140-020 and some Temescal Canyon Road street flows. The conveyance system becomes a 60" RCP along Foster Road and discharges to Temescal Creek located approximately 1500 feet east.

The project will add catch basins along the street to enhance the roadway drainage capability. Two proposed drainage systems (Line B1 and B2) will connect to this system for discharge purposes.

System 5 – an existing 24" CMP. This system conveys surface flow from a small tributary area west of I-15 and discharges within Caltrans right-of-way. Downstream of the culvert exit, the discharge follows the natural drainage course within APN 282-121-009 and APN 282-121-008 before merging with the gutter flow on Temescal Canyon Road.

During a 100-year storm event, APN 282-121-009 and APN 282-121-008 may be subject to standing water due to the spreading ground effect and poor soil infiltration (Soil Group D). In-lot drainage improvement is not part of the project scope so no study was performed to further evaluate the drainage impact in these properties. The corresponding drainage improvement shall be property owner's responsibility.

However, the project has proposed a drainage inlet in front of these two properties to help intercept the surface flows. These properties may opt to tie to the new county

storm drain system for better drainage capability.

System 6 – an existing 24" CMP. This system intercepts I-15 surface flow and discharge within Caltrans right-of-way. Similar to System 5, the downstream of System 6 also follows the natural drainage course for a short distance and the surface flow will traverse across both APN 282-121-009 and APN 282-121-008. These two properties may also be subject to standing water during a 100-year storm event due to the spreading ground effect and poor soil infiltration (Soil Group D).

In-lot drainage improvement is not part of the project scope so no study was performed to further evaluate the drainage impact in these properties. The corresponding drainage improvement shall be property owner's responsibility.

The project has proposed a drainage inlet in front of these two properties to help intercept the discharge from both System 5 and System 6. These properties may opt to tie to the new county storm drain system for better drainage capability.

System 7 – an existing 54" CMP. This system conveys the offsite flows from the storm drain system on Weirick Rd and a portion of Knabe Road and outflows within Caltrans right-of-way. The downstream of System 7 follows the natural drainage course through APN 282-111-003 and APN 282-111-002, then discharges to System 8.

According to "The Retreat" drainage report (S.P. 317, Tract 17888), there would be approximately 292.8 cfs within System 7 during a 100-yr storm event, which may cause local flood concerns to both the properties around and the street intersection at Dos Lagos Dr and Temescal Canyon Road. It is recommended to improve the drainage condition at the downstream of System 7 by connecting both System 7 and System 8 to avoid the spreading effect in the area.

However, the properties mentioned above are private and the area in question is out of the project scope. Therefore, the said improvement can only be conditioned to the property owners when the properties are redeveloped.

System 8 – an existing 42" CMP. This system receives flows from System 7 and the neighboring properties, then discharges across Temescal Canyon Road on the east side. The discharge follows a natural stream course and merges with Temescal Creek located 850 feet east of Temescal Canyon Road.

5. RESULTS

The proposed road widening will not result in significant drainage impacts to the general drainage patterns in the area. New drainage systems will be installed on Temescal Canyon Road to handle the onsite area flows and offsite run-on. Catch basins will be located at the appropriate interval to minimize the street flood potential. Hydrology modeling results are listed below for sizing the proposed drainage improvements.

Node	Feature	Q_{100} (cfs)
20.0	Pipe (Line C)	349.5
34.0	Headwall (Line C1)	33.92
36.0	Pipe (Line C1)	42.3
36.3	Curb Inlet CB (Line C2)	8.4
57.5	Grate Inlet CB (Line B1)	21.26
58.3	Curb Inlet CB (Line B3)	5.84
58.3	Pipe (Line B1)	26.36
58.7	Curb Inlet CB (Line B2)	8.83
98.3	Curb Inlet CB (Line A)	4.69

According to the pipe hydraulic analysis results in Appendix D, Line C (existing 42” CMP, see System 8 in Fig 4.1) was found to be incapable of handling a 100-yr storm event. APN 282-111-002 and 282-111-005 could also be subject to flood hazard due to the insufficient capacity and backwater effect. Therefore, a 60” RCP was proposed to replace the existing 42" CMP and improve the culvert conveyance.

The proposed upgrade will be conducted within the current right-of-way and allow future upstream facility upgrade when the parcels are redeveloped.

Line A, B1, B2, C, C1 and C2 will be able to handle a 100-year storm event and the catch basin inlet calculation has been summarized below:

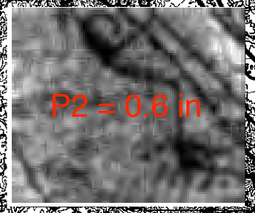
Line	Street STA	Q100 (cfs)	By-pass from u/s (cfs)	Prop. Width (ft)	Captured Flow (cfs)	By-pass flow to d/s (cfs)	By-pass to	Design Q (cfs)
A	143+33 38' LT	4.69	0	21	4.69	0	-	4.69
B2	156+75 38' LT	8.83	0	21	8.58	0.25	Dos Lagos / Temescal Int	8.83
B3	151+96 38' RT	5.84	0	21	5.84	0	-	5.84
C2	166+09 38' LT	8.4	0	21	8.08	0.32	Ex CB at 167+20 38’ LT	8.4

There are two proposed culvert headwalls and the following table summarizes the hydraulic conditions in a 100-year storm event:

Line	Street STA	Node	Q100 (cfs)	Allowable Head Water Elev (ft)	Calculated Head Water Elev (ft)
B1	148+85 58' LT	57.5	21.26	907.5	905.04
C1	160+27 49' LT	34.0	33.92	885.8	882.99



APPENDIX A
HYDROLOGIC MODELING DATA



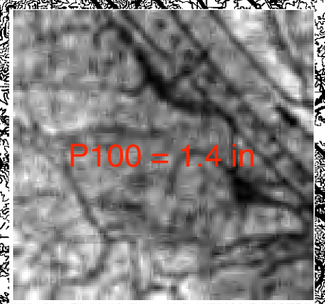
NOTES:
Isohyetals based on NOAA Atlas 2,
Volume XI - California, 1973

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

2-YEAR — 1-HOUR
PRECIPITATION

PLATE D-4.3



Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973

RCFC & WCD

HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

100-YEAR — 1-HOUR PRECIPITATION

APPROVED: CHIEF ENGINEER R.E. NO. 6822 DATE

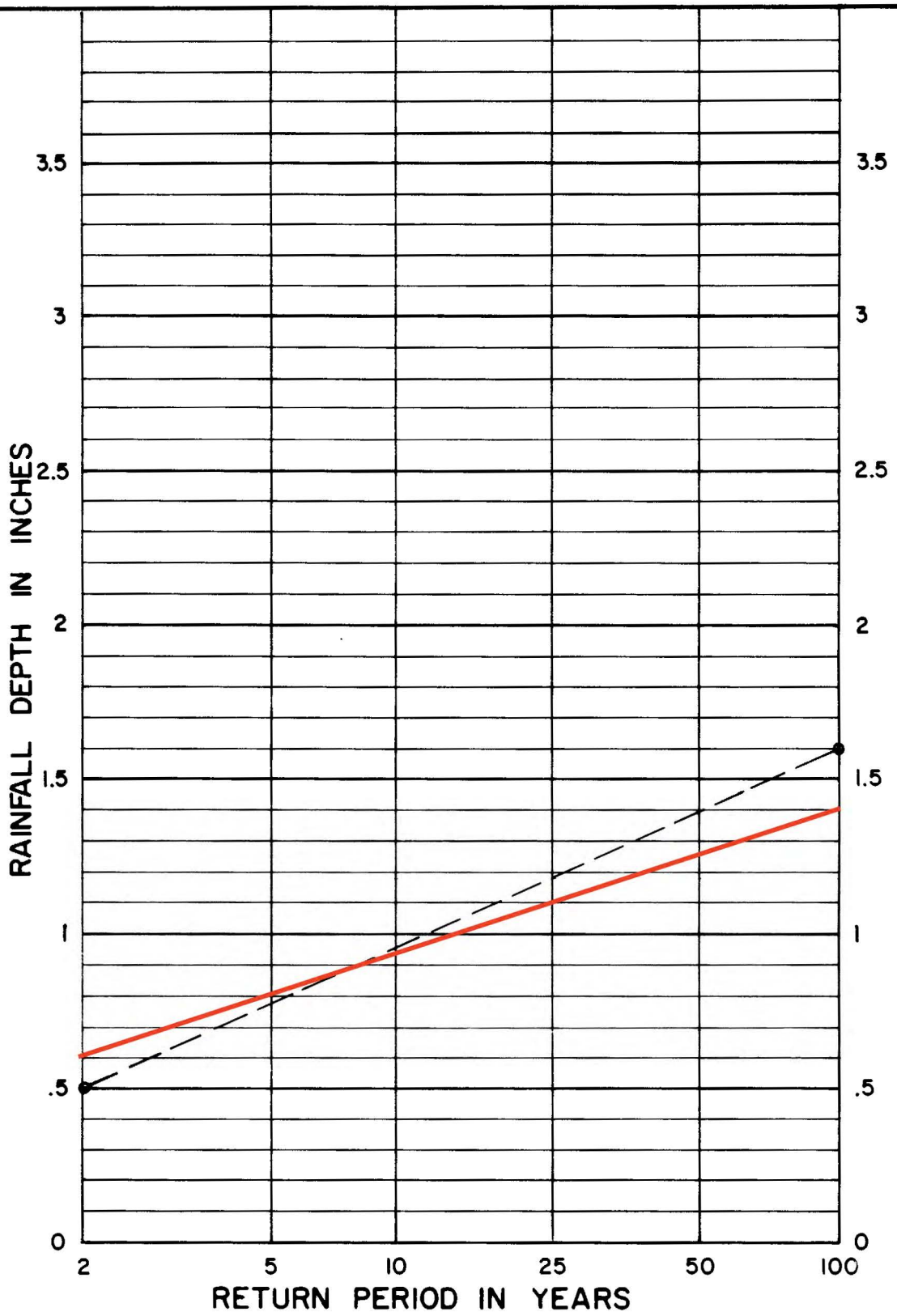
DRAWN BY: A.A.L.

PLATE D-4.4

SHEET NO

DR NO

REVISED



NOTE:

1. For intermediate return periods plot 2-year and 100-year one hour values from maps, then connect points and read value for desired return period. For example given 2-year one hour = .50" and 100-year one hour = 1.60", 25-year one hour = 1.18"

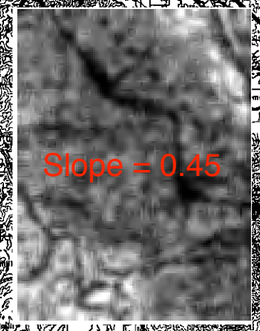
Reference: NOAA Atlas 2, Volume XI - California, 1973.

RCFC & WCD

HYDROLOGY MANUAL

RAINFALL DEPTH VERSUS RETURN PERIOD FOR PARTIAL DURATION SERIES

PLATE D-4.5



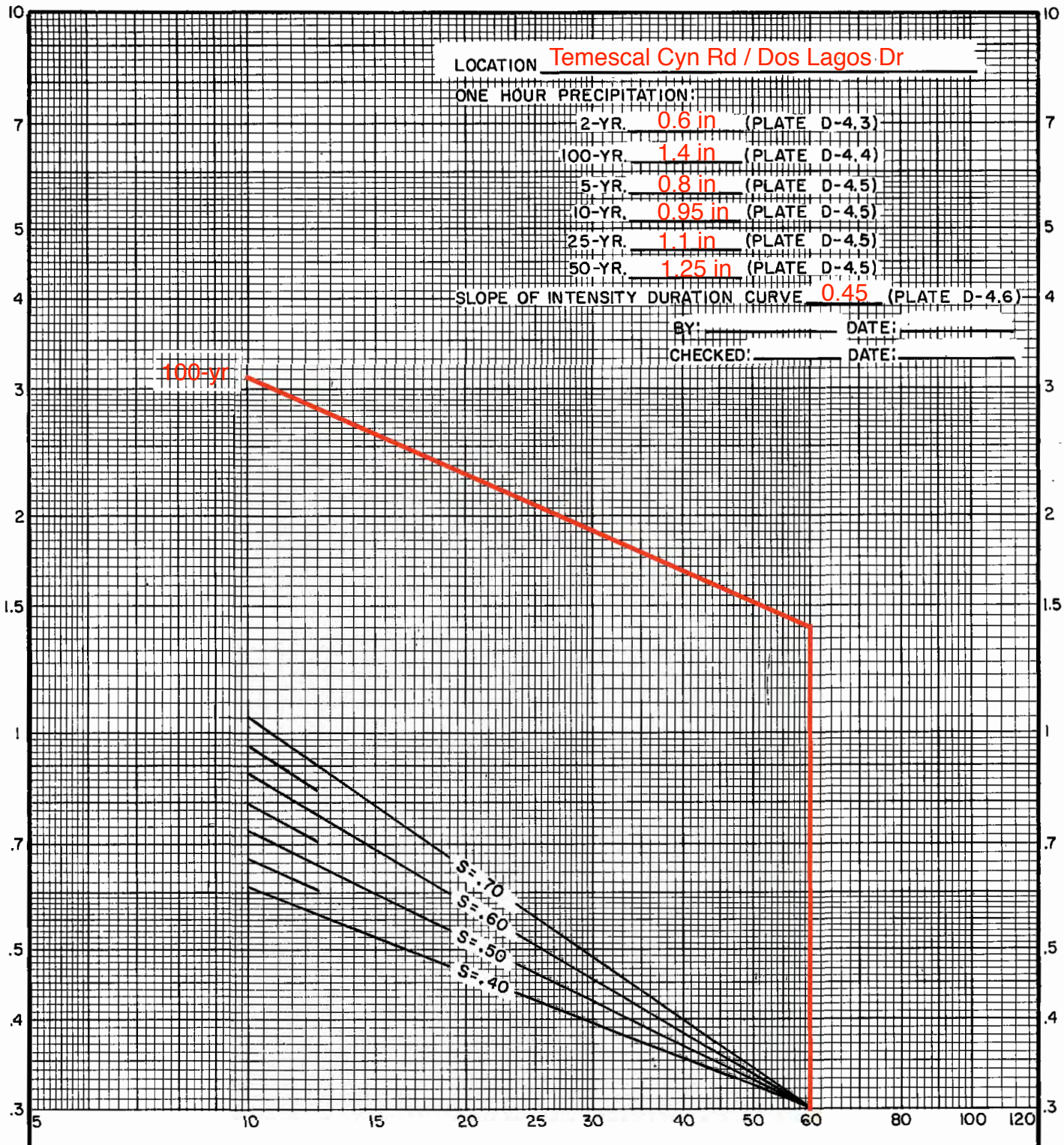
Notes
1. Slope of Intensity-Duration Curve based on District analysis of automatic recording rain gage records

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

SLOPE OF INTENSITY DURATION CURVE

APPROVED CHIEF ENGINEER R.E. NO. 8825	DRAWN BY E.A.S.	SHEET NO
DATE	PLATE D-4.6	DR. NO

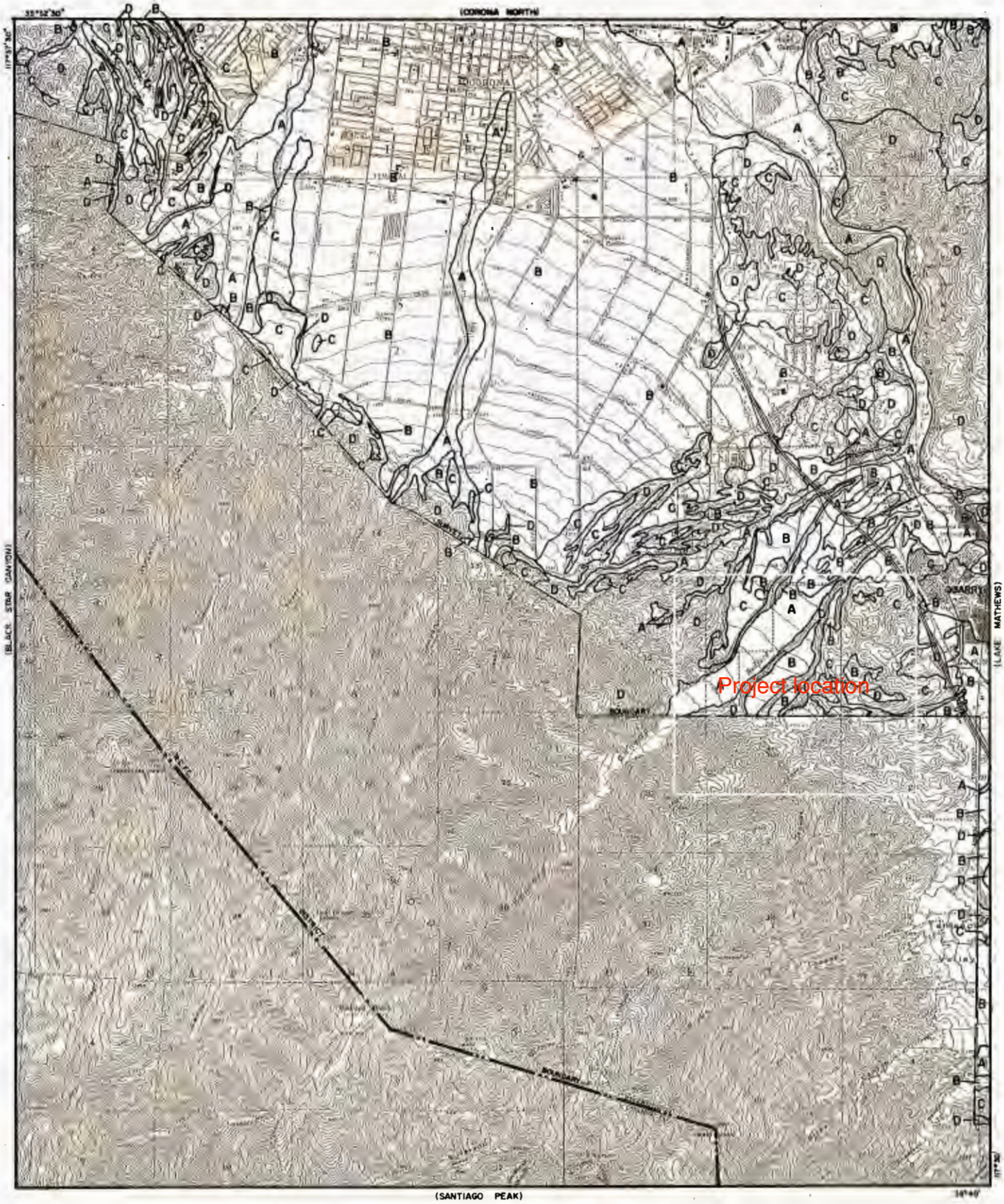


RCFC & WCD

HYDROLOGY MANUAL

INTENSITY – DURATION CURVES CALCULATION SHEET

PLATE D-4.7



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR CORONA-SOUTH

PLATE C-1.27

APPENDIX B
HYDROLOGY CALCULATIONS

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 06/12/17 File:C60066.out

Temescal Canyon Road Widening
Leroy Rd to Dos Largo Dr (W.O. C6-0066)
Proposed 100-yr condition

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

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

Program License Serial Number 6395

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

2 year, 1 hour precipitation = 0.600(In.)
100 year, 1 hour precipitation = 1.400(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.400(In/Hr)
Slope of intensity duration curve = 0.4500

++

Process from Point/Station 17.000 to Point/Station 17.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.612(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.848
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.900
RI index for soil(AMC 3) = 86.86
Pervious area fraction = 0.800; Impervious fraction = 0.200
User specified values are as follows:
TC = 15.00 min. Rain intensity = 2.61(In/Hr)
Total area = 106.50(Ac.) Total runoff = 292.80(CFS)

++

Process from Point/Station 17.000 to Point/Station 18.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****

Upstream point/station elevation = 908.000(Ft.)
Downstream point/station elevation = 888.000(Ft.)
Pipe length = 507.00(Ft.) Manning's N = 0.024
No. of pipes = 1 Required pipe flow = 292.800(CFS)
Given pipe size = 54.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
26.191(Ft.) at the headworks or inlet of the pipe(s)
Pipe friction loss = 38.296(Ft.)
Minor friction loss = 7.894(Ft.) K-factor = 1.50
Pipe flow velocity = 18.41(Ft/s)
Travel time through pipe = 0.46 min.
Time of concentration (TC) = 15.46 min.

++

Process from Point/Station 18.000 to Point/Station 19.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****

```
Top of natural channel elevation =    888.000(Ft.)
End of natural channel elevation =    883.000(Ft.)
Length of natural channel  =   194.000(Ft.)
Estimated mean flow rate at midpoint of channel =    301.763(CFS)

Natural mountain channel type used
L.A. County flood control district formula for channel velocity:
 Velocity = 5.48(q^.33)(slope^.492)
Velocity using mean channel flow =   5.96(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0258
Corrected/adjusted channel slope =  0.0258
Travel time =    0.54 min.      TC =   16.00  min.


 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.538(In/Hr) for a   100.0 year storm
Subarea runoff =     14.667(CFS) for      6.520(Ac.)
Total runoff =    307.467(CFS)  Total area =     113.020(Ac.)


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Process from Point/Station       19.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   876.000(Ft.)
Downstream point/station elevation =   865.580(Ft.)
Pipe length  =   403.00(Ft.)   Manning's N = 0.024
No. of pipes = 1  Required pipe flow =   307.467(CFS)
Given pipe size =     42.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
   141.605(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =    128.237(Ft.)
 Minor friction loss =     23.788(Ft.)  K-factor =   1.50
Pipe flow velocity =     31.96(Ft/s)
Travel time through pipe =    0.21 min.
Time of concentration (TC) =    16.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       20.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    16.21 min.
Rainfall intensity =      2.523(In/Hr) for a   100.0 year storm
Subarea runoff =      4.025(CFS) for      1.800(Ac.)
Total runoff =    311.492(CFS)  Total area =     114.820(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       19.000 to Point/Station       20.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    114.820(Ac.)
Runoff from this stream =    311.492(CFS)
Time of concentration =   16.21 min.
Rainfall intensity =     2.523(In/Hr)
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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   291.000(Ft.)
Top (of initial area) elevation =  1048.000(Ft.)
Bottom(of initial area) elevation =  1027.000(Ft.)
Difference in elevation =    21.000(Ft.)
Slope =    0.07216  s(percent)=       7.22
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.855 min.
Rainfall intensity =      3.495(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.853
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 =  0.800; Impervious fraction =  0.200
Initial subarea runoff =      2.533(CFS)
Total initial stream area =       0.850(Ac.)
Pervious area fraction = 0.800


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       33.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of natural channel elevation =  1027.000(Ft.)
End of natural channel elevation =   936.000(Ft.)
Length of natural channel  =   481.000(Ft.)
Estimated mean flow rate at midpoint of channel =      8.284(CFS)

Natural mountain channel type used
L.A. County flood control district formula for channel velocity:
 Velocity = 5.48(q^.33)(slope^.492)
Velocity using mean channel flow =   4.85(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.1892
Corrected/adjusted channel slope =  0.1892
Travel time =    1.65 min.     TC =    9.51  min.


 Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.849
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 =  0.800; Impervious fraction =  0.200
Rainfall intensity =      3.208(In/Hr) for a   100.0 year storm
Subarea runoff =     10.507(CFS) for      3.860(Ac.)
Total runoff =     13.040(CFS)  Total area =       4.710(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       33.000 to Point/Station       33.500
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   929.000(Ft.)
Downstream point/station elevation =   923.900(Ft.)
Pipe length  =   305.00(Ft.)   Manning's N = 0.024
No. of pipes = 1  Required pipe flow =    13.040(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    13.040(CFS)
Normal flow depth in pipe =   16.59(In.)
Flow top width inside pipe =   22.17(In.)
Critical Depth =   15.58(In.)
Pipe flow velocity =      5.63(Ft/s)
Travel time through pipe =    0.90 min.
Time of concentration (TC) =   10.41 min.
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24" PIPE UNDER FREEWAY

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Process from Point/Station       33.500 to Point/Station       34.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
Top of natural channel elevation =    923.900(Ft.)
End of natural channel elevation =    883.510(Ft.)
Length of natural channel  =   381.000(Ft.)
Estimated mean flow rate at midpoint of channel =     17.346(CFS)

Natural mountain channel type used
L.A. County flood control district formula for channel velocity:
 Velocity = 5.48(q^.33)(slope^.492)
Velocity using mean channel flow =   4.66(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.1060
Corrected/adjusted channel slope =  0.1060
Travel time =    1.36 min.      TC =   11.77  min.


 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.913(In/Hr) for a   100.0 year storm
Subarea runoff =      8.046(CFS) for       3.110(Ac.)
Total runoff =     21.086(CFS)  Total area =       7.820(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       33.500 to Point/Station       34.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =   11.77 min.
Rainfall intensity =      2.913(In/Hr) for a   100.0 year storm
Subarea runoff =     12.832(CFS) for       4.960(Ac.)
Total runoff =     33.918(CFS)  Total area =      12.780(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       36.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
----------------------------------------------------------------------------
Upstream point/station elevation =   879.000(Ft.)
Downstream point/station elevation =   870.940(Ft.)
Pipe length  =   610.60(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    33.918(CFS)
Given pipe size =     24.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     8.376(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     13.721(Ft.)
 Minor friction loss =      2.715(Ft.)  K-factor =   1.50
Pipe flow velocity =     10.80(Ft/s)
Travel time through pipe =    0.94 min.
Time of concentration (TC) =    12.71 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       34.000 to Point/Station       36.000
**** SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------------
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
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Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    12.71 min.
Rainfall intensity =      2.814(In/Hr) for a   100.0 year storm
Subarea runoff =      8.368(CFS) for      3.350(Ac.)
Total runoff =     42.286(CFS)  Total area =      16.130(Ac.)


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Process from Point/Station       36.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =   870.940(Ft.)
Downstream point/station elevation =   866.780(Ft.)
Pipe length  =    84.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow =    42.286(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow  =    42.286(CFS)
Normal flow depth in pipe =   16.85(In.)
Flow top width inside pipe =   21.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.96(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    12.79 min.


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Process from Point/Station       36.000 to Point/Station       20.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     16.130(Ac.)
Runoff from this stream =     42.286(CFS)
Time of concentration =   12.79 min.
Rainfall intensity =     2.806(In/Hr)
Summary of stream data:

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


1      311.492     16.21                 2.523
2       42.286     12.79                 2.806
Largest stream flow has longer time of concentration
Qp =    311.492 + sum of
          Qb          Ia/Ib
          42.286 *    0.899 =     38.011
Qp =    349.503

Total of 2 streams to confluence:
Flow rates before confluence point:
     311.492      42.286
Area of streams before confluence:
      114.820       16.130
Results of confluence:
Total flow rate =    349.503(CFS)
Time of concentration =    16.212 min.
Effective stream area after confluence =    130.950(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       57.100 to Point/Station       57.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   166.000(Ft.)
Top (of initial area) elevation =   996.000(Ft.)
Bottom (of initial area) elevation =   978.000(Ft.)
Difference in elevation =    18.000(Ft.)
Slope =    0.10843  s(percent)=      10.84
TC = k(0.480)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.784 min.
Rainfall intensity =      4.011(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.858
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
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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 =  0.800; Impervious fraction =  0.200
Initial subarea runoff =      0.930(CFS)
Total initial stream area =        0.270(Ac.)
Pervious area fraction = 0.800


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       57.200 to Point/Station       57.300
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =    978.000(Ft.)
End of natural channel elevation =    928.000(Ft.)
Length of natural channel  =   621.000(Ft.)
Estimated mean flow rate at midpoint of channel =     10.312(CFS)

Natural mountain channel type used
L.A. County flood control district formula for channel velocity:
 Velocity = 5.48(q^.33)(slope^.492)
Velocity using mean channel flow =   3.43(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0805
Corrected/adjusted channel slope =  0.0805
Travel time =    3.02 min.     TC =    8.80  min.


 Adding area flow to channel
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.850
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 =  0.800; Impervious fraction =  0.200
Rainfall intensity =      3.320(In/Hr) for a   100.0 year storm
Subarea runoff =     15.386(CFS) for      5.450(Ac.)
Total runoff =     16.315(CFS)  Total area =       5.720(Ac.)


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Process from Point/Station       57.300 to Point/Station       57.400
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   922.000(Ft.)
Downstream point/station elevation =   915.000(Ft.)
Pipe length  =   277.00(Ft.)   Manning's N = 0.024
No. of pipes = 1  Required pipe flow =    16.315(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =    16.315(CFS)
Normal flow depth in pipe =   16.80(In.)
Flow top width inside pipe =   21.99(In.)
Critical Depth =   17.48(In.)
Pipe flow velocity =      6.94(Ft/s)
Travel time through pipe =    0.66 min.
Time of concentration (TC) =     9.47 min.


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Process from Point/Station       57.300 to Point/Station       57.400
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.889
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     9.47 min.
Rainfall intensity =      3.213(In/Hr) for a   100.0 year storm
Subarea runoff =      2.114(CFS) for      0.740(Ac.)
Total runoff =     18.429(CFS)  Total area =       6.460(Ac.)
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Process from Point/Station       57.400 to Point/Station       57.500
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =    915.000(Ft.)
End of natural channel elevation =    907.500(Ft.)
Length of natural channel  =   223.000(Ft.)
Estimated mean flow rate at midpoint of channel =     19.941(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   5.49(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0336
Corrected/adjusted channel slope =  0.0336
Travel time =    0.68 min.      TC =   10.15  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.858
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.115(In/Hr) for a   100.0 year storm
Subarea runoff =      2.834(CFS) for       1.060(Ac.)
Total runoff =     21.263(CFS)  Total area =       7.520(Ac.)


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Process from Point/Station       57.500 to Point/Station       58.300
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   892.350(Ft.)
Downstream point/station elevation =   891.000(Ft.)
Pipe length  =   368.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow =    21.263(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow =    21.263(CFS)
Normal flow depth in pipe =   21.38(In.)
Flow top width inside pipe =   27.16(In.)
Critical Depth =   18.82(In.)
Pipe flow velocity =      5.69(Ft/s)
Travel time through pipe =    1.08 min.
Time of concentration (TC) =    11.22 min.


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Process from Point/Station       57.500 to Point/Station       58.300
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      7.520(Ac.)
Runoff from this stream =     21.263(CFS)
Time of concentration =   11.22 min.
Rainfall intensity =     2.977(In/Hr)


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Process from Point/Station       58.100 to Point/Station       58.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   195.000(Ft.)
Top (of initial area) elevation =   912.000(Ft.)
Bottom (of initial area) elevation =   911.000(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00513  s(percent)=       0.51
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.098 min.
Rainfall intensity =      3.658(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
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Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.619(CFS)
Total initial stream area =        0.190(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       58.200 to Point/Station       58.300
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =   911.000(Ft.)
End of street segment elevation =   896.500(Ft.)
Length of street segment  =   948.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  38.000(Ft.)
Distance from crown to crossfall grade break  =  36.000(Ft.)
Slope from gutter to grade break (v/hz)  =   0.080
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.020
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  0.160(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.258(CFS)
Depth of flow =   0.194(Ft.), Average velocity =   2.743(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.020(Ft.)
Flow velocity =   2.74(Ft/s)
Travel time =    5.76 min.     TC =   12.86  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.800(In/Hr) for a   100.0 year storm
Subarea runoff =      5.219(CFS) for      2.100(Ac.)
Total runoff =      5.837(CFS)  Total area =       2.290(Ac.)
Street flow at end of street =      5.837(CFS)
Half street flow at end of street =      5.837(CFS)
Depth of flow =   0.246(Ft.), Average velocity =   3.179(Ft/s)
Flow width (from curb towards crown)=  13.650(Ft.)


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Process from Point/Station       58.200 to Point/Station       58.300
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.290(Ac.)
Runoff from this stream =      5.837(CFS)
Time of concentration =   12.86 min.
Rainfall intensity =     2.800(In/Hr)
Summary of stream data:

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


1       21.263     11.22                  2.977
2        5.837     12.86                  2.800
Largest stream flow has longer or shorter time of concentration
Qp =     21.263 + sum of
          Qa           Tb/Ta
           5.837 *     0.873 =      5.096
Qp =     26.359

Total of 2 streams to confluence:
```

```
Flow rates before confluence point:
      21.263       5.837
Area of streams before confluence:
       7.520       2.290
Results of confluence:
Total flow rate =     26.359(CFS)
Time of concentration =    11.225 min.
Effective stream area after confluence =      9.810(Ac.)


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Process from Point/Station       58.300 to Point/Station       58.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   891.000(Ft.)
Downstream point/station elevation =   878.500(Ft.)
Pipe length =   289.60(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow =    26.359(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow =    26.359(CFS)
Normal flow depth in pipe =   11.45(In.)
Flow top width inside pipe =   29.15(In.)
Critical Depth =   21.00(In.)
Pipe flow velocity =     15.30(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    11.54 min.


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Process from Point/Station       58.300 to Point/Station       58.700
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   501.000(Ft.)
Top (of initial area) elevation =   896.500(Ft.)
Bottom (of initial area) elevation =   891.500(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00998  s(percent)=       1.00
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.062 min.
Rainfall intensity =      3.277(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.889
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      8.830(CFS)
Total initial stream area =       3.030(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       58.700 to Point/Station       58.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   886.320(Ft.)
Downstream point/station elevation =   878.500(Ft.)
Pipe length =   261.50(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow =     8.830(CFS)
Given pipe size =     24.00(In.)
Calculated individual pipe flow =     8.830(CFS)
Normal flow depth in pipe =    7.75(In.)
Flow top width inside pipe =   22.45(In.)
Critical Depth =   12.73(In.)
Pipe flow velocity =     10.06(Ft/s)
Travel time through pipe =    0.43 min.
Time of concentration (TC) =     9.50 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       98.100 to Point/Station       98.300
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   485.000(Ft.)
Top (of initial area) elevation =   922.000(Ft.)
Bottom (of initial area) elevation =   912.800(Ft.)
Difference in elevation =     9.200(Ft.)
```

```
Slope =    0.01897  s(percent)=       1.90
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.867 min.
Rainfall intensity =      3.493(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.896
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 3)  =  88.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.692(CFS)
Total initial stream area =       1.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       98.300 to Point/Station       98.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =   900.810(Ft.)
Downstream point/station elevation =   898.460(Ft.)
Pipe length  =    27.40(Ft.)    Manning's N = 0.013
No. of pipes = 1  Required pipe flow =     4.692(CFS)
Given pipe size =     42.00(In.)
Calculated individual pipe flow =     4.692(CFS)
Normal flow depth in pipe =    3.69(In.)
Flow top width inside pipe =   23.78(In.)
Critical Depth =    7.78(In.)
Pipe flow velocity =     11.32(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     7.91 min.
End of computations, total study area =          145.29 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.670
Area averaged RI index number =  69.8
```

APPENDIX C
DRAINAGE INLET CALCULATIONS

Curb Inlet CB @ 143+33 38' LT (Line A)

Project Description

Solve For	Efficiency

Input Data

Discharge	4.69	ft³/s
Slope	0.00400	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	21.00	ft
Local Depression	4.00	in
Local Depression Width	4.00	ft

Results

Efficiency	100.00	%
Intercepted Flow	4.69	ft³/s
Bypass Flow	0.00	ft³/s
Spread	14.22	ft
Depth	0.40	ft
Flow Area	2.14	ft²
Gutter Depression	0.12	ft
Total Depression	0.45	ft
Velocity	2.19	ft/s
Equivalent Cross Slope	0.06696	ft/ft
Length Factor	1.52	
Total Interception Length	13.79	ft

Culvert Calculator Report
HW @ 148+85 58' LT (Line B1)

Solve For: Headwater Elevation

Culvert Summary					
Allowable HW Elevation	907.50	ft	Headwater Depth/Height	1.56	
Computed Headwater Elevation	905.04	ft	Discharge	21.26	cfs
Inlet Control HW Elev.	903.56	ft	Tailwater Elevation	893.56	ft
Outlet Control HW Elev.	905.04	ft	Control Type	Outlet Control	

Grades					
Upstream Invert	901.14	ft	Downstream Invert	891.06	ft
Length	359.98	ft	Constructed Slope	0.000000	ft/ft

Hydraulic Profile					
Profile	Pressure Profile		Depth, Downstream	2.50	ft
Slope Type	N/A		Normal Depth	N/A	ft
Flow Regime	N/A		Critical Depth	1.57	ft
Velocity Downstream	4.33	ft/s	Critical Slope	0.005216	ft/ft

Section					
Section Shape	Circular		Mannings Coefficient	0.013	
Section Material	Concrete		Span	2.50	ft
Section Size	30 inch		Rise	2.50	ft
Number Sections	1				

Outlet Control Properties					
Outlet Control HW Elev.	905.04	ft	Upstream Velocity Head	0.29	ft
Ke	0.50		Entrance Loss	0.15	ft

Inlet Control Properties					
Inlet Control HW Elev.	903.56	ft	Flow Control	Unsubmerged	
Inlet Type	Square edge w/headwall		Area Full	4.9	ft^2
K	0.00980		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	1	
C	0.03980		Equation Form	1	
Y	0.67000				

Curb Inlet CB @ 151+96 38' RT (Line B3)

Project Description

Solve For	Efficiency

Input Data

Discharge	5.84	ft³/s
Slope	0.00900	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	21.00	ft
Local Depression	4.00	in
Local Depression Width	4.00	ft

Results

Efficiency	100.00	%
Intercepted Flow	5.84	ft³/s
Bypass Flow	0.00	ft³/s
Spread	13.16	ft
Depth	0.38	ft
Flow Area	1.85	ft²
Gutter Depression	0.12	ft
Total Depression	0.45	ft
Velocity	3.15	ft/s
Equivalent Cross Slope	0.07060	ft/ft
Length Factor	1.12	
Total Interception Length	18.68	ft

Curb Inlet CB @ 156+75 38' LT (Line B2)

Project Description

Solve For	Efficiency

Input Data

Discharge	8.83	ft³/s
Slope	0.01000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	21.00	ft
Local Depression	4.00	in
Local Depression Width	4.00	ft

Results

Efficiency	97.15	%
Intercepted Flow	8.58	ft³/s
Bypass Flow	0.25	ft³/s
Spread	15.28	ft
Depth	0.43	ft
Flow Area	2.45	ft²
Gutter Depression	0.12	ft
Total Depression	0.45	ft
Velocity	3.60	ft/s
Equivalent Cross Slope	0.06377	ft/ft
Length Factor	0.86	
Total Interception Length	24.38	ft

Culvert Calculator Report
HW @ 160+27 49' LT (Line C1)

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	885.80 ft	Headwater Depth/Height	1.42
Computed Headwater Elevation	882.99 ft	Discharge	33.92 cfs
Inlet Control HW Elev.	882.99 ft	Tailwater Elevation	872.68 ft
Outlet Control HW Elev.	882.95 ft	Control Type	Inlet Control

Grades			
Upstream Invert	879.43 ft	Downstream Invert	870.18 ft
Length	616.77 ft	Constructed Slope	0.014997 ft/ft

Hydraulic Profile			
Profile	CompositeS1S2	Depth, Downstream	1.51 ft
Slope Type	Steep	Normal Depth	1.51 ft
Flow Regime	N/A	Critical Depth	1.98 ft
Velocity Downstream	10.99 ft/s	Critical Slope	0.007299 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	2.50 ft
Section Size	30 inch	Rise	2.50 ft
Number Sections	1		

Outlet Control Properties			
Outlet Control HW Elev.	882.95 ft	Upstream Velocity Head	1.03 ft
Ke	0.50	Entrance Loss	0.51 ft

Inlet Control Properties			
Inlet Control HW Elev.	882.99 ft	Flow Control	Submerged
Inlet Type	Square edge w/headwall	Area Full	4.9 ft²
K	0.00980	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	1
C	0.03980	Equation Form	1
Y	0.67000		

Curb Inlet CB @ 166+09 38' LT (Line C2)

Project Description

Solve For	Efficiency

Input Data

Discharge	8.40	ft³/s
Slope	0.01300	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.08	ft/ft
Road Cross Slope	0.02	ft/ft
Roughness Coefficient	0.015	
Curb Opening Length	21.00	ft
Local Depression	4.00	in
Local Depression Width	4.00	ft

Results

Efficiency	96.23	%
Intercepted Flow	8.08	ft³/s
Bypass Flow	0.32	ft³/s
Spread	14.18	ft
Depth	0.40	ft
Flow Area	2.13	ft²
Gutter Depression	0.12	ft
Total Depression	0.45	ft
Velocity	3.94	ft/s
Equivalent Cross Slope	0.06708	ft/ft
Length Factor	0.84	
Total Interception Length	25.06	ft

APPENDIX D
PIPE HYDRAULIC CALCULATIONS

```
T1 Temescal Canyon Road Widening Project                                    0
T2 Leroy Rd to Dos Lagos Dr (C6-0066)
T3 Line A 100-yr HGL analysis
SO    103.630 898.460  1                          901.960
R     118.000 899.870  1      .013                              .000    .000 0
R     127.510 900.810  1      .013                              .000    .000 0
SH    127.510 900.810  1                          900.810
CD   1  4   1    .000   3.500     .000  .000  .000   .00
Q             4.690   .0
```

Program Package Serial Number: 1794

WATER SURFACE PROFILE LISTING Date: 6-13-2017 Time: 9:50:28

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line A 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
103.630	898.460	3.500	901.960	4.69	.49	.00	901.96	.00	.65	.00	3.500	.000	.00	1 .0
.000	.0981					.0000	.00	3.50	.00	.30	.013	.00	.00	PIPE
103.630	898.460	3.500	901.960	4.69	.49	.00	901.96	.00	.65	.00	3.500	.000	.00	1 .0
3.293	.0981					.0000	.00	3.50	.00	.30	.013	.00	.00	PIPE
106.923	898.783	3.176	901.959	4.69	.51	.00	901.96	.00	.65	2.03	3.500	.000	.00	1 .0
1.917	.0981					.0000	.00	3.18	.04	.30	.013	.00	.00	PIPE
108.840	898.971	2.987	901.958	4.69	.54	.00	901.96	.00	.65	2.48	3.500	.000	.00	1 .0
1.580	.0981					.0000	.00	2.99	.05	.30	.013	.00	.00	PIPE
110.420	899.126	2.832	901.958	4.69	.56	.00	901.96	.00	.65	2.75	3.500	.000	.00	1 .0
1.382	.0981					.0000	.00	2.83	.06	.30	.013	.00	.00	PIPE
111.802	899.262	2.696	901.957	4.69	.59	.01	901.96	.00	.65	2.95	3.500	.000	.00	1 .0
1.244	.0981					.0000	.00	2.70	.06	.30	.013	.00	.00	PIPE
113.047	899.384	2.573	901.957	4.69	.62	.01	901.96	.00	.65	3.09	3.500	.000	.00	1 .0
1.138	.0981					.0000	.00	2.57	.07	.30	.013	.00	.00	PIPE
114.184	899.495	2.461	901.956	4.69	.65	.01	901.96	.00	.65	3.20	3.500	.000	.00	1 .0
1.051	.0981					.0000	.00	2.46	.08	.30	.013	.00	.00	PIPE
115.235	899.599	2.357	901.956	4.69	.68	.01	901.96	.00	.65	3.28	3.500	.000	.00	1 .0
.979	.0981					.0000	.00	2.36	.08	.30	.013	.00	.00	PIPE

Program Package Serial Number: 7141

WATER SURFACE PROFILE LISTING Date: 6-13-2017 Time: 9:50:28

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line A 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch

116.213	899.695	2.260	901.955	4.69	.71	.01	901.96	.00	.65	3.35	3.500	.000	.00	1	.0
.917	.0981					.0000	.00	2.26	.09	.30	.013	.00	.00	PIPE	
117.130	899.785	2.170	901.954	4.69	.75	.01	901.96	.00	.65	3.40	3.500	.000	.00	1	.0
.861	.0981					.0000	.00	2.17	.10	.30	.013	.00	.00	PIPE	
118.000	899.870	2.084	901.954	4.69	.79	.01	901.96	.00	.65	3.44	3.500	.000	.00	1	.0
.806	.0988					.0001	.00	2.08	.11	.30	.013	.00	.00	PIPE	
118.806	899.950	2.003	901.953	4.69	.82	.01	901.96	.00	.65	3.46	3.500	.000	.00	1	.0
.762	.0988					.0001	.00	2.00	.11	.30	.013	.00	.00	PIPE	
119.567	900.025	1.927	901.952	4.69	.86	.01	901.96	.00	.65	3.48	3.500	.000	.00	1	.0
.721	.0988					.0001	.00	1.93	.12	.30	.013	.00	.00	PIPE	
120.288	900.096	1.854	901.951	4.69	.91	.01	901.96	.00	.65	3.49	3.500	.000	.00	1	.0
.685	.0988					.0001	.00	1.85	.13	.30	.013	.00	.00	PIPE	
120.973	900.164	1.785	901.949	4.69	.95	.01	901.96	.00	.65	3.50	3.500	.000	.00	1	.0
.650	.0988					.0001	.00	1.79	.14	.30	.013	.00	.00	PIPE	
121.623	900.228	1.720	901.948	4.69	1.00	.02	901.96	.00	.65	3.50	3.500	.000	.00	1	.0
.618	.0988					.0001	.00	1.72	.15	.30	.013	.00	.00	PIPE	
122.242	900.289	1.657	901.947	4.69	1.05	.02	901.96	.00	.65	3.50	3.500	.000	.00	1	.0
.588	.0988					.0001	.00	1.66	.16	.30	.013	.00	.00	PIPE	

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
122.830	900.347	1.597	901.945	4.69	1.10	.02	901.96	.00	.65	3.49	3.500	.000	.00	1	.0
.561	.0988					.0001	.00	1.60	.17	.30	.013	.00	.00	PIPE	
123.391	900.403	1.540	901.943	4.69	1.15	.02	901.96	.00	.65	3.47	3.500	.000	.00	1	.0
.533	.0988					.0001	.00	1.54	.19	.30	.013	.00	.00	PIPE	
123.924	900.456	1.486	901.941	4.69	1.21	.02	901.96	.00	.65	3.46	3.500	.000	.00	1	.0
.509	.0988					.0002	.00	1.49	.20	.30	.013	.00	.00	PIPE	
124.433	900.506	1.433	901.939	4.69	1.27	.02	901.96	.00	.65	3.44	3.500	.000	.00	1	.0

.484	.0988					.0002	.00	1.43	.21	.30	.013	.00	.00	PIPE			
124.917	900.554	1.383	901.937	4.69	1.33	.03	901.96	.00	.65	3.42	3.500	.000	.00	1	.0		
.462	.0988					.0002	.00	1.38	.23	.30	.013	.00	.00	PIPE			
125.379	900.599	1.335	901.934	4.69	1.39	.03	901.96	.00	.65	3.40	3.500	.000	.00	1	.0		
.439	.0988					.0002	.00	1.33	.25	.30	.013	.00	.00	PIPE			
125.818	900.643	1.288	901.931	4.69	1.46	.03	901.96	.00	.65	3.38	3.500	.000	.00	1	.0		
.417	.0988					.0003	.00	1.29	.26	.30	.013	.00	.00	PIPE			
126.235	900.684	1.244	901.928	4.69	1.53	.04	901.96	.00	.65	3.35	3.500	.000	.00	1	.0		
.396	.0988					.0003	.00	1.24	.28	.30	.013	.00	.00	PIPE			
126.631	900.723	1.201	901.924	4.69	1.61	.04	901.96	.00	.65	3.32	3.500	.000	.00	1	.0		
.377	.0988					.0004	.00	1.20	.30	.30	.013	.00	.00	PIPE			

Program Package Serial Number: 7141

WATER SURFACE PROFILE LISTING Date: 6-13-2017 Time: 9:50:28

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line A 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
127.008	900.760	1.160	901.920	4.69	1.68	.04	901.96	.00	.65	3.30	3.500	.000	.00	1 .0
.357	.0988					.0004	.00	1.16	.32	.30	.013	.00	.00	PIPE
127.365	900.796	1.121	901.916	4.69	1.77	.05	901.96	.00	.65	3.27	3.500	.000	.00	1 .0
.145	.0988					.0005	.00	1.12	.35	.30	.013	.00	.00	PIPE
127.510	900.810	1.104	901.915	4.69	1.80	.05	901.96	.00	.65	3.25	3.500	.000	.00	1 .0

```
T1 Temescal Canyon Road Widening Project                                    0
T2 Leroy Rd to Dos Lagos Dr (C6-0066)
T3 Line B1 100-yr HGL analysis
SO    100.000 878.500  1                          881.500
R     106.480 879.796  1      .013                              .000    .000 0
R     127.340 883.968  1      .013                           -53.120    .000 0
R     150.640 888.630  1      .013                              .000    .000 0
R     252.360 889.647  1      .013                              .000    .000 0
R     385.610 890.980  1      .013                              .000    .000 0
JX    390.110 891.060  1  3   .015    5.100          891.000       -45.0         .000
R     500.410 894.148  2      .013                              .000    .000 0
R     626.930 897.691  2      .013                             7.811    .000 0
R     670.360 898.907  2      .013                            55.297    .000 0
R     750.090 901.140  2      .013                              .000    .000 0
SH    750.090 901.140  2                          901.140
CD   1  4   1    .000   3.000     .000  .000  .000   .00
CD   2  4   1    .000   2.500     .000  .000  .000   .00
CD   3  4   1    .000   2.000     .000  .000  .000   .00
Q            21.260   .0
```

Program Package Serial Number: 1794

WATER SURFACE PROFILE LISTING Date: 6-19-2017 Time: 1:48:31

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line B1 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
100.000	878.500	.665	879.165	26.36	22.60	7.93	887.10	.00	1.66	2.49	3.000	.000	.00	1 .0
6.480	.2000					.1290	.84	.67	5.82	.60	.013	.00	.00	PIPE
106.480	879.796	.679	880.475	26.36	21.95	7.48	887.96	1.67	1.66	2.51	3.000	.000	.00	1 .0
4.129	.2000					.1200	.50	2.35	5.59	.60	.013	.00	.00	PIPE
110.609	880.622	.690	881.311	26.36	21.48	7.17	888.48	1.61	1.66	2.52	3.000	.000	.00	1 .0
6.905	.2000					.1090	.75	2.30	5.43	.60	.013	.00	.00	PIPE
117.514	882.003	.713	882.716	26.36	20.48	6.52	889.23	1.48	1.66	2.55	3.000	.000	.00	1 .0
5.426	.2000					.0953	.52	2.19	5.09	.60	.013	.00	.00	PIPE
122.940	883.088	.738	883.826	26.36	19.53	5.92	889.75	1.36	1.66	2.58	3.000	.000	.00	1 .0
4.400	.2000					.0834	.37	2.10	4.76	.60	.013	.00	.00	PIPE
127.340	883.968	.763	884.731	26.36	18.62	5.38	890.12	.00	1.66	2.61	3.000	.000	.00	1 .0
2.107	.2001					.0750	.16	.76	4.46	.60	.013	.00	.00	PIPE
129.447	884.390	.777	885.167	26.36	18.14	5.11	890.28	.00	1.66	2.63	3.000	.000	.00	1 .0
3.306	.2001					.0677	.22	.78	4.30	.60	.013	.00	.00	PIPE
132.753	885.051	.804	885.855	26.36	17.29	4.64	890.50	.00	1.66	2.66	3.000	.000	.00	1 .0
2.801	.2001					.0593	.17	.80	4.02	.60	.013	.00	.00	PIPE
135.554	885.612	.832	886.443	26.36	16.49	4.22	890.67	.00	1.66	2.69	3.000	.000	.00	1 .0
2.394	.2001					.0519	.12	.83	3.77	.60	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date: 6-19-2017 Time: 1:48:31

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line B1 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch

137.948	886.091	.861	886.951	26.36	15.72	3.84	890.79	.00	1.66	2.71	3.000	.000	.00	1	.0
2.062	.2001					.0454	.09	.86	3.53	.60	.013	.00	.00	PIPE	
140.010	886.503	.891	887.394	26.36	14.99	3.49	890.88	.00	1.66	2.74	3.000	.000	.00	1	.0
1.784	.2001					.0397	.07	.89	3.30	.60	.013	.00	.00	PIPE	
141.794	886.860	.922	887.782	26.36	14.29	3.17	890.95	.00	1.66	2.77	3.000	.000	.00	1	.0
1.549	.2001					.0348	.05	.92	3.09	.60	.013	.00	.00	PIPE	
143.343	887.170	.954	888.124	26.36	13.63	2.88	891.01	.00	1.66	2.79	3.000	.000	.00	1	.0
1.347	.2001					.0305	.04	.95	2.89	.60	.013	.00	.00	PIPE	
144.690	887.439	.988	888.427	26.36	12.99	2.62	891.05	.00	1.66	2.82	3.000	.000	.00	1	.0
1.173	.2001					.0267	.03	.99	2.70	.60	.013	.00	.00	PIPE	
145.863	887.674	1.023	888.697	26.36	12.39	2.38	891.08	.00	1.66	2.84	3.000	.000	.00	1	.0
1.020	.2001					.0234	.02	1.02	2.52	.60	.013	.00	.00	PIPE	
146.883	887.878	1.059	888.938	26.36	11.81	2.17	891.10	.00	1.66	2.87	3.000	.000	.00	1	.0
.886	.2001					.0205	.02	1.06	2.36	.60	.013	.00	.00	PIPE	
147.769	888.056	1.097	889.153	26.36	11.26	1.97	891.12	.00	1.66	2.89	3.000	.000	.00	1	.0
.767	.2001					.0180	.01	1.10	2.21	.60	.013	.00	.00	PIPE	
148.536	888.209	1.137	889.346	26.36	10.74	1.79	891.14	.00	1.66	2.91	3.000	.000	.00	1	.0
.661	.2001					.0158	.01	1.14	2.06	.60	.013	.00	.00	PIPE	

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
149.197	888.341	1.178	889.519	26.36	10.24	1.63	891.15	.00	1.66	2.93	3.000	.000	.00	1	.0
.565	.2001					.0138	.01	1.18	1.92	.60	.013	.00	.00	PIPE	
149.762	888.454	1.220	889.675	26.36	9.76	1.48	891.15	.00	1.66	2.95	3.000	.000	.00	1	.0
.479	.2001					.0121	.01	1.22	1.80	.60	.013	.00	.00	PIPE	
150.240	888.550	1.265	889.815	26.36	9.31	1.35	891.16	.00	1.66	2.96	3.000	.000	.00	1	.0
.400	.2001					.0107	.00	1.26	1.68	.60	.013	.00	.00	PIPE	
150.640	888.630	1.311	889.941	26.36	8.87	1.22	891.16	.00	1.66	2.98	3.000	.000	.00	1	.0

101.720	.0100					.0099	1.01	1.31	1.57	1.31	.013	.00	.00	PIPE			
252.360	889.647	1.318	890.965	26.36	8.81	1.21	892.17	.00	1.66	2.98	3.000	.000	.00	1	.0		
63.832	.0100					.0095	.60	1.32	1.55	1.31	.013	.00	.00	PIPE			
316.192	890.286	1.345	891.630	26.36	8.59	1.15	892.78	.00	1.66	2.98	3.000	.000	.00	1	.0		
37.997	.0100					.0086	.33	1.34	1.49	1.31	.013	.00	.00	PIPE			
354.189	890.666	1.395	892.060	26.36	8.19	1.04	893.10	.00	1.66	2.99	3.000	.000	.00	1	.0		
17.212	.0100					.0075	.13	1.39	1.39	1.31	.013	.00	.00	PIPE			
371.401	890.838	1.447	892.285	26.36	7.81	.95	893.23	.00	1.66	3.00	3.000	.000	.00	1	.0		
9.244	.0100					.0066	.06	1.45	1.30	1.31	.013	.00	.00	PIPE			
380.645	890.930	1.502	892.432	26.36	7.45	.86	893.29	.00	1.66	3.00	3.000	.000	.00	1	.0		
4.965	.0100					.0058	.03	1.50	1.21	1.31	.013	.00	.00	PIPE			

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Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line B1 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
385.610	890.980	1.560	892.540	26.36	7.10	.78	893.32	.00	1.66	3.00	3.000	.000	.00	1 .0
JUNCT STR	.0178					.0177	.08	1.56	1.12		.015	.00	.00	PIPE
390.110	891.060	.955	892.015	21.26	12.33	2.36	894.38	.00	1.57	2.43	2.500	.000	.00	1 .0
25.306	.0280					.0280	.71	.96	2.58	.96	.013	.00	.00	PIPE
415.416	891.768	.955	892.724	21.26	12.33	2.36	895.08	.00	1.57	2.43	2.500	.000	.00	1 .0
84.994	.0280					.0280	2.38	.96	2.58	.96	.013	.00	.00	PIPE
500.410	894.148	.955	895.103	21.26	12.33	2.36	897.46	.01	1.57	2.43	2.500	.000	.00	1 .0
21.861	.0280					.0280	.61	.97	2.58	.96	.013	.00	.00	PIPE
522.271	894.760	.955	895.715	21.26	12.33	2.36	898.08	.01	1.57	2.43	2.500	.000	.00	1 .0
104.659	.0280					.0271	2.83	.97	2.58	.96	.013	.00	.00	PIPE
626.930	897.691	.973	898.664	21.26	12.02	2.25	900.91	.24	1.57	2.44	2.500	.000	.00	1 .0
43.430	.0280					.0248	1.08	1.22	2.49	.96	.013	.00	.00	PIPE
670.360	898.907	1.001	899.908	21.26	11.57	2.08	901.99	.00	1.57	2.45	2.500	.000	.00	1 .0

23.774	.0280				.0223	.53	1.00	2.36	.96	.013	.00	.00	PIPE	
694.134	899.573	1.033	900.606	21.26	11.10	1.91	902.52	.00	1.57	2.46	2.500	.000	.00	1 .0
16.378	.0280				.0197	.32	1.03	2.22	.96	.013	.00	.00	PIPE	
710.513	900.031	1.071	901.103	21.26	10.58	1.74	902.84	.00	1.57	2.47	2.500	.000	.00	1 .0
11.082	.0280				.0173	.19	1.07	2.07	.96	.013	.00	.00	PIPE	

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
721.595	900.342	1.111	901.453	21.26	10.09	1.58	903.03	.00	1.57	2.48	2.500	.000	.00	1 .0
7.994	.0280				.0152	.12	1.11	1.93	.96	.013	.00	.00	PIPE	
729.589	900.566	1.152	901.718	21.26	9.62	1.44	903.15	.00	1.57	2.49	2.500	.000	.00	1 .0
5.976	.0280				.0134	.08	1.15	1.80	.96	.013	.00	.00	PIPE	
735.565	900.733	1.195	901.929	21.26	9.17	1.31	903.23	.00	1.57	2.50	2.500	.000	.00	1 .0
4.523	.0280				.0118	.05	1.20	1.68	.96	.013	.00	.00	PIPE	
740.088	900.860	1.241	902.101	21.26	8.74	1.19	903.29	.00	1.57	2.50	2.500	.000	.00	1 .0
3.432	.0280				.0104	.04	1.24	1.56	.96	.013	.00	.00	PIPE	
743.520	900.956	1.288	902.244	21.26	8.34	1.08	903.32	.00	1.57	2.50	2.500	.000	.00	1 .0
2.556	.0280				.0091	.02	1.29	1.45	.96	.013	.00	.00	PIPE	
746.076	901.028	1.338	902.366	21.26	7.95	.98	903.35	.00	1.57	2.49	2.500	.000	.00	1 .0
1.845	.0280				.0081	.01	1.34	1.35	.96	.013	.00	.00	PIPE	
747.921	901.079	1.390	902.470	21.26	7.58	.89	903.36	.00	1.57	2.48	2.500	.000	.00	1 .0
1.235	.0280				.0071	.01	1.39	1.26	.96	.013	.00	.00	PIPE	
749.156	901.114	1.446	902.560	21.26	7.23	.81	903.37	.00	1.57	2.47	2.500	.000	.00	1 .0
.706	.0280				.0063	.00	1.45	1.17	.96	.013	.00	.00	PIPE	
749.862	901.134	1.504	902.638	21.26	6.89	.74	903.38	.00	1.57	2.45	2.500	.000	.00	1 .0
.228	.0280				.0056	.00	1.50	1.08	.96	.013	.00	.00	PIPE	

Leroy Rd to Dos Lagos Dr (C6-0066)
Line B1 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
750.090	901.140	1.567	902.707	21.26	6.57	.67	903.38	.00	1.57	2.42	2.500	.000	.00	1 .0

B2.WSW

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T1 Temescal Canyon Road Widening Project                                    0
T2 Leroy Rd to Dos Lagos Dr (C6-0066)
T3 Line B2 100-yr HGL analysis
SO    100.703 878.500  1                          880.500
R     103.408 878.510  1      .013                              .000    .000 0
R     120.022 882.510  1      .013                              .000    .000 0
R     133.372 885.180  1      .013                            33.995    .000 0
R     277.981 885.900  1      .013                            -7.418    .000 0
R     313.668 886.080  1      .013                           -90.876    .000 0
R     361.540 886.320  1      .013                              .000    .000 0
SH    361.540 886.320  1                          886.320
CD   1  4   1    .000   2.000     .000  .000  .000   .00
Q             8.830   .0
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Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line B2 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
100.703	878.500	.436	878.936	8.83	17.44	4.72	883.66	.00	1.06	1.65	2.000	.000	.00	1 .0
2.705	.0037					.1488	.40	.44	5.55	1.16	.013	.00	.00	PIPE
103.408	878.510	.424	878.934	8.83	18.19	5.14	884.07	.00	1.06	1.63	2.000	.000	.00	1 .0
2.314	.2408					.1535	.36	.42	5.88	.38	.013	.00	.00	PIPE
105.722	879.067	.429	879.496	8.83	17.85	4.94	884.44	.00	1.06	1.64	2.000	.000	.00	1 .0
4.313	.2408					.1399	.60	.43	5.73	.38	.013	.00	.00	PIPE
110.034	880.105	.444	880.549	8.83	17.01	4.50	885.04	.00	1.06	1.66	2.000	.000	.00	1 .0
3.322	.2408					.1223	.41	.44	5.37	.38	.013	.00	.00	PIPE
113.357	880.905	.459	881.364	8.83	16.22	4.09	885.45	.00	1.06	1.68	2.000	.000	.00	1 .0
2.658	.2408					.1069	.28	.46	5.03	.38	.013	.00	.00	PIPE
116.015	881.545	.475	882.020	8.83	15.47	3.72	885.74	.00	1.06	1.70	2.000	.000	.00	1 .0
2.183	.2408					.0935	.20	.47	4.71	.38	.013	.00	.00	PIPE
118.197	882.071	.491	882.562	8.83	14.75	3.38	885.94	.00	1.06	1.72	2.000	.000	.00	1 .0
1.825	.2408					.0818	.15	.49	4.41	.38	.013	.00	.00	PIPE
120.022	882.510	.508	883.018	8.83	14.06	3.07	886.09	.48	1.06	1.74	2.000	.000	.00	1 .0
1.589	.2000					.0726	.12	.98	4.13	.40	.013	.00	.00	PIPE
121.611	882.828	.521	883.349	8.83	13.56	2.85	886.20	.45	1.06	1.76	2.000	.000	.00	1 .0
1.783	.2000					.0646	.12	.97	3.92	.40	.013	.00	.00	PIPE

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WATER SURFACE PROFILE LISTING Date: 6-13-2017 Time: 9:59:37

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line B2 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch

123.395	883.185	.539	883.724	8.83	12.93	2.60	886.32	.41	1.06	1.78	2.000	.000	.00	1	.0
1.514	.2000					.0565	.09	.95	3.67	.40	.013	.00	.00	PIPE	
124.909	883.487	.558	884.045	8.83	12.33	2.36	886.40	.38	1.06	1.79	2.000	.000	.00	1	.0
1.296	.2000					.0494	.06	.93	3.44	.40	.013	.00	.00	PIPE	
126.205	883.747	.577	884.324	8.83	11.75	2.14	886.47	.35	1.06	1.81	2.000	.000	.00	1	.0
1.115	.2000					.0433	.05	.92	3.22	.40	.013	.00	.00	PIPE	
127.320	883.970	.597	884.567	8.83	11.21	1.95	886.52	.32	1.06	1.83	2.000	.000	.00	1	.0
.965	.2000					.0379	.04	.91	3.01	.40	.013	.00	.00	PIPE	
128.285	884.163	.618	884.781	8.83	10.68	1.77	886.55	.29	1.06	1.85	2.000	.000	.00	1	.0
.836	.2000					.0332	.03	.91	2.82	.40	.013	.00	.00	PIPE	
129.121	884.330	.640	884.970	8.83	10.19	1.61	886.58	.27	1.06	1.87	2.000	.000	.00	1	.0
.725	.2000					.0291	.02	.91	2.63	.40	.013	.00	.00	PIPE	
129.846	884.475	.663	885.137	8.83	9.71	1.47	886.60	.25	1.06	1.88	2.000	.000	.00	1	.0
.629	.2000					.0255	.02	.91	2.46	.40	.013	.00	.00	PIPE	
130.475	884.600	.686	885.286	8.83	9.26	1.33	886.62	.22	1.06	1.90	2.000	.000	.00	1	.0
.544	.2000					.0223	.01	.91	2.30	.40	.013	.00	.00	PIPE	
131.019	884.709	.710	885.420	8.83	8.83	1.21	886.63	.21	1.06	1.91	2.000	.000	.00	1	.0
.469	.2000					.0196	.01	.92	2.15	.40	.013	.00	.00	PIPE	

Program Package Serial Number: 7141

WATER SURFACE PROFILE LISTING Date: 6-13-2017 Time: 9:59:37

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line B2 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
131.488	884.803	.736	885.539	8.83	8.42	1.10	886.64	.19	1.06	1.93	2.000	.000	.00	1	.0
.402	.2000					.0171	.01	.92	2.01	.40	.013	.00	.00	PIPE	
131.890	884.884	.762	885.646	8.83	8.03	1.00	886.65	.17	1.06	1.94	2.000	.000	.00	1	.0
.343	.2000					.0150	.01	.94	1.88	.40	.013	.00	.00	PIPE	
132.233	884.952	.790	885.742	8.83	7.65	.91	886.65	.16	1.06	1.96	2.000	.000	.00	1	.0
.289	.2000					.0132	.00	.95	1.76	.40	.013	.00	.00	PIPE	
132.522	885.010	.819	885.828	8.83	7.30	.83	886.66	.14	1.06	1.97	2.000	.000	.00	1	.0

.240	.2000					.0116	.00	.96	1.64	.40	.013	.00	.00	PIPE			
132.762	885.058	.849	885.906	8.83	6.96	.75	886.66	.13	1.06	1.98	2.000	.000	.00	1	.0		
.196	.2000					.0102	.00	.98	1.53	.40	.013	.00	.00	PIPE			
132.958	885.097	.880	885.977	8.83	6.63	.68	886.66	.12	1.06	1.99	2.000	.000	.00	1	.0		
.154	.2000					.0089	.00	1.00	1.43	.40	.013	.00	.00	PIPE			
133.112	885.128	.912	886.040	8.83	6.33	.62	886.66	.11	1.06	1.99	2.000	.000	.00	1	.0		
.116	.2000					.0079	.00	1.02	1.33	.40	.013	.00	.00	PIPE			
133.228	885.151	.947	886.098	8.83	6.03	.56	886.66	.10	1.06	2.00	2.000	.000	.00	1	.0		
.081	.2000					.0069	.00	1.05	1.24	.40	.013	.00	.00	PIPE			
133.309	885.167	.982	886.150	8.83	5.75	.51	886.66	.09	1.06	2.00	2.000	.000	.00	1	.0		
.047	.2000					.0061	.00	1.07	1.16	.40	.013	.00	.00	PIPE			

Program Package Serial Number: 7141

WATER SURFACE PROFILE LISTING Date: 6-13-2017 Time: 9:59:37

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line B2 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
133.356	885.177	1.020	886.197	8.83	5.48	.47	886.66	.08	1.06	2.00	2.000	.000	.00	1 .0
.016	.2000					.0054	.00	1.10	1.08	.40	.013	.00	.00	PIPE
133.372	885.180	1.060	886.240	8.83	5.22	.42	886.66	.00	1.06	2.00	2.000	.000	.00	1 .0
1.782	.0050					.0050	.01	1.06	1.00	1.06	.013	.00	.00	PIPE
135.154	885.189	1.062	886.251	8.83	5.21	.42	886.67	.00	1.06	2.00	2.000	.000	.00	1 .0
142.827	.0050					.0049	.71	1.06	1.00	1.06	.013	.00	.00	PIPE
277.981	885.900	1.062	886.962	8.83	5.21	.42	887.38	.07	1.06	2.00	2.000	.000	.00	1 .0
.015	.0050					.0050	.00	1.14	1.00	1.06	.013	.00	.00	PIPE
277.996	885.900	1.060	886.960	8.83	5.22	.42	887.38	.08	1.06	2.00	2.000	.000	.00	1 .0
HYDRAULIC JUMP														
277.996	885.900	1.058	886.958	8.83	5.23	.43	887.38	.08	1.06	2.00	2.000	.000	.00	1 .0
35.194	.0050					.0050	.18	1.13	1.00	1.06	.013	.00	.00	PIPE
313.189	886.078	1.058	887.136	8.83	5.23	.43	887.56	.08	1.06	2.00	2.000	.000	.00	1 .0

	.479	.0050					.0050	.00	1.13	1.00	1.06	.013	.00	.00	PIPE				
313.668	886.080	1.060	887.140	8.83	5.22	.42	887.56	.00	1.06	2.00	2.000	.000	.00	1	.0				
	47.670	.0050					.0050	.24	1.06	1.00	1.06	.013	.00	.00	PIPE				
361.338	886.319	1.060	887.379	8.83	5.22	.42	887.80	.00	1.06	2.00	2.000	.000	.00	1	.0				
	.202	.0050					.0050	.00	1.06	1.00	1.06	.013	.00	.00	PIPE				

Program Package Serial Number: 7141

WATER SURFACE PROFILE LISTING Date: 6-13-2017 Time: 9:59:37

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line B2 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
361.540	886.320	1.060	887.380	8.83	5.22	.42	887.80	.00	1.06	2.00	2.000	.000	.00	1	.0

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T1 Temescal Canyon Road Widening Project                                    0
T2 Leroy Rd to Dos Lagos Dr (C6-0066)
T3 Line B3 100-yr HGL analysis
SO    103.180 891.000  1                          893.000
R     109.190 891.090  1      .013                              .000    .000 0
SH    109.190 891.090  1                          891.090
CD   1  4   1    .000   2.000     .000  .000  .000   .00
Q             5.840   .0
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Program Package Serial Number: 1794
WATER SURFACE PROFILE LISTING Date: 6-27-2017 Time: 9:38:19
Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line B3 100-yr HGL analysis

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
103.180	891.000	2.000	893.000	5.84	1.86	.05	893.05	.00	.85	.00	2.000	.000	.00	1 .0
.000	.0150					.0007	.00	2.00	.00	.62	.013	.00	.00	PIPE
103.180	891.000	2.000	893.000	5.84	1.86	.05	893.05	.00	.85	.00	2.000	.000	.00	1 .0
6.010	.0150					.0006	.00	2.00	.00	.62	.013	.00	.00	PIPE
109.190	891.090	1.911	893.001	5.84	1.89	.06	893.06	.00	.85	.82	2.000	.000	.00	1 .0

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C.WSW

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T1 Temescal Canyon Road Widening Project                                    0
T2 Leroy Rd to Dos Lagos Dr (C6-0066)
T3 Line C 100-yr HGL analysis
SO    100.000 863.790  1                          867.290
R     108.850 864.010  1      .013                              .000    .000 0
R     170.650 865.580  1      .013                              .000    .000 0
JX    170.660 865.580  1  2   .000   38.011          866.780        -63.1         .000
R     188.000 865.990  1      .013                              .000    .000 0
SH    188.000 865.990  1                          865.990
CD   1  4   1    .000   5.000     .000  .000  .000   .00
CD   2  4   1    .000   1.500     .000  .000  .000   .00
Q           311.492   .0
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Program Package Serial Number: 1794

WATER SURFACE PROFILE LISTING Date: 6-27-2017 Time: 9:37: 2

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line C 100-yr HGL analysis

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/Dia.-FT or I.D. / X-Fall	Base Wt / ZR	ZL	No Wth Prs/Pip / Type Ch
100.000	863.790	4.114	867.904	349.50	20.22	6.35	874.25	.00	4.81	3.82	5.000	.000	.00	1 .0
8.850	.0249					.0178	.16	4.11	1.67	3.54	.013	.00	.00	PIPE
108.850	864.010	4.150	868.160	349.50	20.06	6.25	874.41	.00	4.81	3.76	5.000	.000	.00	1 .0
11.179	.0254					.0174	.19	4.15	1.64	3.52	.013	.00	.00	PIPE
120.029	864.294	4.204	868.498	349.50	19.83	6.11	874.61	.00	4.81	3.66	5.000	.000	.00	1 .0
34.382	.0254					.0166	.57	4.20	1.59	3.52	.013	.00	.00	PIPE
154.411	865.167	4.457	869.625	349.50	18.91	5.55	875.18	.00	4.81	3.11	5.000	.000	.00	1 .0
16.239	.0254					.0158	.26	4.46	1.37	3.52	.013	.00	.00	PIPE
170.650	865.580	4.808	870.388	349.50	18.03	5.05	875.43	.00	4.81	1.92	5.000	.000	.00	1 .0
JUNCT STR	.0000					.0174	.00	4.81	1.00		.014	.00	.00	PIPE
170.660	865.580	6.383	871.963	311.49	15.86	3.91	875.87	.00	4.71	.00	5.000	.000	.00	1 .0
17.340	.0236					.0143	.25	6.38	.00	3.31	.013	.00	.00	PIPE
188.000	865.990	6.221	872.211	311.49	15.86	3.91	876.12	.00	4.71	.00	5.000	.000	.00	1 .0

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C1.WSW

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T1 Temescal Canyon Road Widening Project                                    0
T2 Leroy Rd to Dos Lagos Dr (C6-0066)
T3 Line C1 100-yr HGL analysis
SO    102.010 866.000  1                          868.500
R     133.530 867.576  1      .013                              .000    .000 0
R     145.630 868.181  1      .013                              .000    .000 0
R     184.380 870.120  1      .013                              .000    .000 0
JX    188.380 870.180  1  2   .015    8.400          871.380     45.0         .000
R     296.110 871.796  1      .013                              .000  -2.145 0
R     404.440 873.421  1      .013                              .000  -3.831 0
R     462.820 874.297  1      .013                              .000  -5.436 0
R     593.470 876.256  1      .013                              .000    .000 0
R     610.140 876.506  1      .013                            42.458    .000 0
R     620.060 876.655  1      .013                              .000    .000 0
R     637.030 876.910  1      .013                           -43.209    .000 0
R     773.540 878.957  1      .013                            -6.921    .000 0
R     805.150 879.432  1      .013                            80.498    .000 0
SH    805.150 879.432  1                          879.432
CD   1  4   1    .000   2.500     .000  .000  .000   .00
CD   2  4   1    .000   1.500     .000  .000  .000   .00
Q            33.920   .0
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Program Package Serial Number: 1794

WATER SURFACE PROFILE LISTING Date: 6-19-2017 Time: 2:30: 1

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line C1 100-yr HGL analysis

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch
102.010	866.000	1.302	867.302	42.32	16.37	4.16	871.46	.00	2.18	2.50	2.500	.000	.00	1 .0
14.229	.0500					.0357	.51	1.30	2.84	1.19	.013	.00	.00	PIPE
116.239	866.711	1.333	868.044	42.32	15.91	3.93	871.97	.00	2.18	2.49	2.500	.000	.00	1 .0
17.291	.0500					.0324	.56	1.33	2.71	1.19	.013	.00	.00	PIPE
133.530	867.576	1.385	868.961	42.32	15.17	3.57	872.53	.00	2.18	2.49	2.500	.000	.00	1 .0
12.100	.0500					.0286	.35	1.38	2.52	1.19	.013	.00	.00	PIPE
145.630	868.181	1.437	869.618	42.32	14.49	3.26	872.88	.00	2.18	2.47	2.500	.000	.00	1 .0
2.551	.0500					.0266	.07	1.44	2.35	1.19	.013	.00	.00	PIPE
148.181	868.309	1.450	869.759	42.32	14.33	3.19	872.95	.00	2.18	2.47	2.500	.000	.00	1 .0
9.117	.0500					.0247	.22	1.45	2.31	1.19	.013	.00	.00	PIPE
157.298	868.765	1.509	870.274	42.32	13.66	2.90	873.17	.00	2.18	2.45	2.500	.000	.00	1 .0
7.140	.0500					.0218	.16	1.51	2.14	1.19	.013	.00	.00	PIPE
164.438	869.122	1.571	870.693	42.32	13.03	2.64	873.33	.00	2.18	2.42	2.500	.000	.00	1 .0
5.653	.0500					.0194	.11	1.57	1.98	1.19	.013	.00	.00	PIPE
170.091	869.405	1.637	871.042	42.32	12.42	2.40	873.44	.00	2.18	2.38	2.500	.000	.00	1 .0
4.484	.0500					.0172	.08	1.64	1.83	1.19	.013	.00	.00	PIPE
174.575	869.629	1.708	871.337	42.32	11.84	2.18	873.52	.00	2.18	2.33	2.500	.000	.00	1 .0
3.512	.0500					.0153	.05	1.71	1.68	1.19	.013	.00	.00	PIPE

Program Package Serial Number: 7141

WATER SURFACE PROFILE LISTING Date: 6-19-2017 Time: 2:30: 1

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line C1 100-yr HGL analysis

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head / SF Ave	Energy Grd.El. / HF	Super Elev / SE Dpth	Critical Depth / Froude N	Flow Top Width / Norm Dp	Height/ Dia.-FT / "N"	Base Wt or I.D. / X-Fall	ZL / ZR	No Wth Prs/Pip / Type Ch

178.087	869.805	1.784	871.589	42.32	11.29	1.98	873.57	.00	2.18	2.26	2.500	.000	.00	1	.0
2.686	.0500					.0137	.04	1.78	1.55	1.19	.013	.00	.00	PIPE	
180.773	869.939	1.866	871.806	42.32	10.77	1.80	873.61	.00	2.18	2.17	2.500	.000	.00	1	.0
1.938	.0500					.0123	.02	1.87	1.41	1.19	.013	.00	.00	PIPE	
182.711	870.036	1.957	871.993	42.32	10.27	1.64	873.63	.00	2.18	2.06	2.500	.000	.00	1	.0
1.222	.0500					.0111	.01	1.96	1.28	1.19	.013	.00	.00	PIPE	
183.933	870.098	2.058	872.156	42.32	9.79	1.49	873.64	.00	2.18	1.91	2.500	.000	.00	1	.0
.447	.0500					.0101	.00	2.06	1.15	1.19	.013	.00	.00	PIPE	
184.380	870.120	2.177	872.297	42.32	9.33	1.35	873.65	.00	2.18	1.68	2.500	.000	.00	1	.0
JUNCT STR	.0150					.0110	.04	2.18	1.00		.015	.00	.00	PIPE	
188.380	870.180	3.030	873.210	33.92	6.91	.74	873.95	.00	1.98	.00	2.500	.000	.00	1	.0
61.311	.0150					.0068	.42	3.03	.00	1.50	.013	.00	.00	PIPE	
249.691	871.100	2.532	873.632	33.92	6.91	.74	874.37	.00	1.98	.00	2.500	.000	.00	1	.0
HYDRAULIC JUMP															
249.691	871.100	1.505	872.604	33.92	10.99	1.87	874.48	.00	1.98	2.45	2.500	.000	.00	1	.0
46.419	.0150					.0150	.70	1.50	1.72	1.50	.013	.00	.00	PIPE	
296.110	871.796	1.505	873.301	33.92	10.99	1.87	875.18	.00	1.98	2.45	2.500	.000	.00	1	.0
108.330	.0150					.0150	1.63	1.50	1.72	1.50	.013	.00	.00	PIPE	

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
404.440	873.421	1.505	874.926	33.92	10.99	1.87	876.80	.00	1.98	2.45	2.500	.000	.00	1 .0
58.380	.0150					.0150	.88	1.50	1.72	1.50	.013	.00	.00	PIPE
462.820	874.297	1.505	875.802	33.92	10.99	1.87	877.68	.00	1.98	2.45	2.500	.000	.00	1 .0
1.232	.0150					.0150	.02	1.51	1.72	1.51	.013	.00	.00	PIPE
464.052	874.315	1.505	875.821	33.92	10.99	1.87	877.69	.00	1.98	2.45	2.500	.000	.00	1 .0
129.418	.0150					.0149	1.93	1.51	1.72	1.51	.013	.00	.00	PIPE
593.470	876.256	1.510	877.766	33.92	10.94	1.86	879.63	.40	1.98	2.45	2.500	.000	.00	1 .0

16.670	.0150					.0148	.25	1.91	1.71	1.51	.013	.00	.00	PIPE			
610.140	876.506	1.511	878.017	33.92	10.93	1.86	879.87	.00	1.98	2.44	2.500	.000	.00	1	.0		
9.920	.0150					.0148	.15	1.51	1.71	1.50	.013	.00	.00	PIPE			
620.060	876.655	1.512	878.167	33.92	10.93	1.85	880.02	.40	1.98	2.44	2.500	.000	.00	1	.0		
16.970	.0150					.0148	.25	1.91	1.71	1.50	.013	.00	.00	PIPE			
637.030	876.910	1.514	878.424	33.92	10.91	1.85	880.27	.01	1.98	2.44	2.500	.000	.00	1	.0		
19.510	.0150					.0147	.29	1.52	1.70	1.51	.013	.00	.00	PIPE			
656.540	877.203	1.518	878.720	33.92	10.88	1.84	880.56	.01	1.98	2.44	2.500	.000	.00	1	.0		
86.272	.0150					.0138	1.19	1.53	1.70	1.51	.013	.00	.00	PIPE			
742.812	878.496	1.580	880.077	33.92	10.37	1.67	881.75	.01	1.98	2.41	2.500	.000	.00	1	.0		
30.728	.0150					.0122	.38	1.59	1.57	1.51	.013	.00	.00	PIPE			

Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line C1 100-yr HGL analysis

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
773.540	878.957	1.647	880.604	33.92	9.89	1.52	882.12	.32	1.98	2.37	2.500	.000	.00	1 .0
1.796	.0150					.0114	.02	1.97	1.45	1.50	.013	.00	.00	PIPE
775.336	878.984	1.653	880.637	33.92	9.85	1.51	882.14	.32	1.98	2.37	2.500	.000	.00	1 .0
15.261	.0150					.0108	.16	1.97	1.44	1.50	.013	.00	.00	PIPE
790.597	879.213	1.725	880.938	33.92	9.39	1.37	882.31	.28	1.98	2.31	2.500	.000	.00	1 .0
8.659	.0150					.0096	.08	2.01	1.32	1.50	.013	.00	.00	PIPE
799.256	879.343	1.802	881.146	33.92	8.95	1.24	882.39	.25	1.98	2.24	2.500	.000	.00	1 .0
4.505	.0150					.0086	.04	2.05	1.21	1.50	.013	.00	.00	PIPE
803.761	879.411	1.886	881.297	33.92	8.54	1.13	882.43	.22	1.98	2.15	2.500	.000	.00	1 .0
1.389	.0150					.0077	.01	2.10	1.11	1.50	.013	.00	.00	PIPE
805.150	879.432	1.980	881.412	33.92	8.14	1.03	882.44	.19	1.98	2.03	2.500	.000	.00	1 .0

C2.WSW

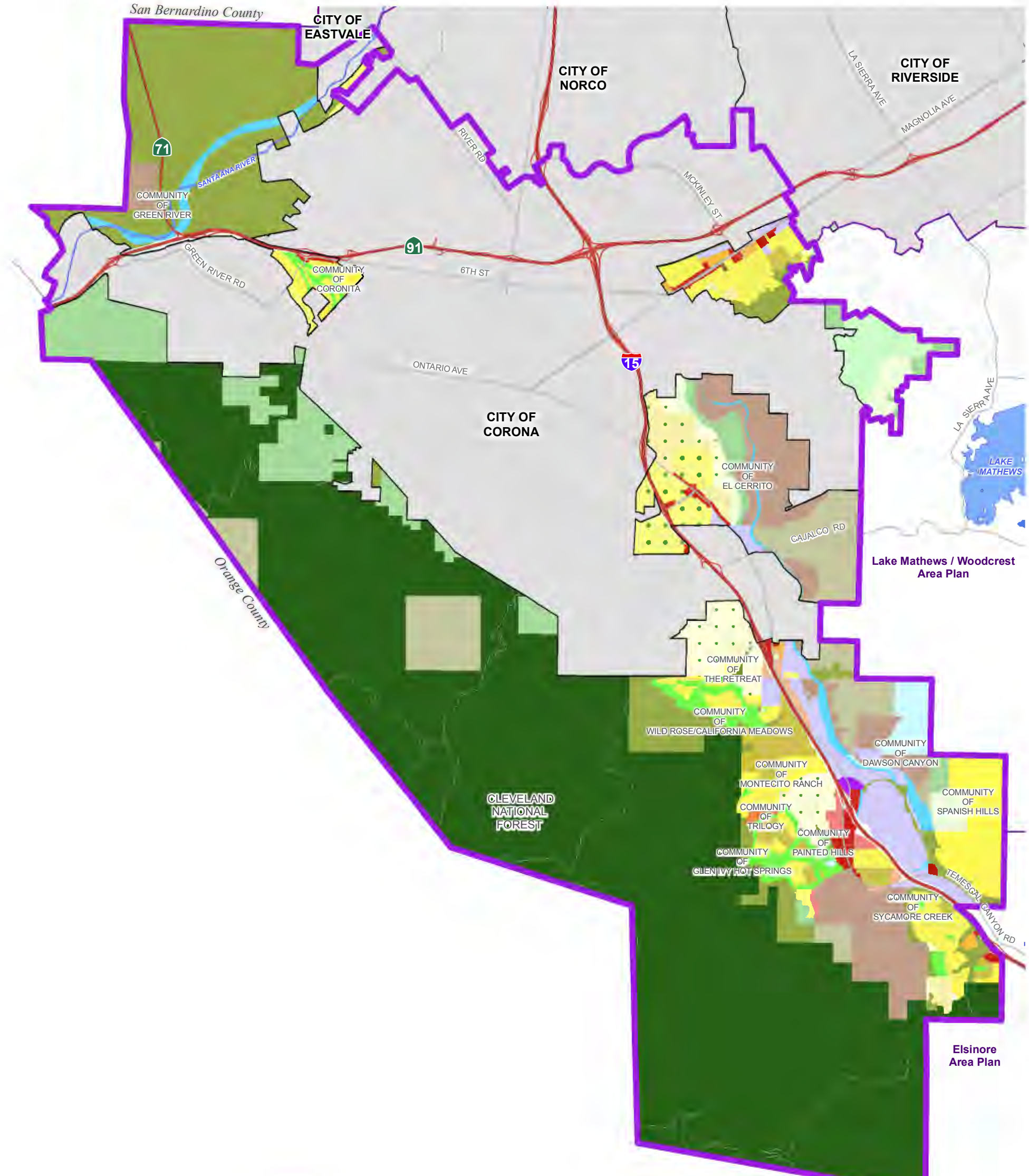
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T1 Temescal Canyon Road Widening Project                                    0
T2 Leroy Rd to Dos Lagos Dr (C6-0066)
T3 Line C2 100-yr HGL analysis
SO    100.000 871.380  1                          872.880
R     109.750 871.480  1      .013                              .000    .000 0
SH    109.750 871.480  1                          871.480
CD   1  4   1    .000   1.500     .000  .000  .000   .00
Q             8.400   .0
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Program Package Serial Number: 1794
WATER SURFACE PROFILE LISTING Date: 6-19-2017 Time: 2:31: 7
Temescal Canyon Road Widening Project
Leroy Rd to Dos Lagos Dr (C6-0066)
Line C2 100-yr HGL analysis

Station / L/Elem	Invert Elev / Ch Slope	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS) / SF Ave	Vel Head / HF	Energy Grd.El. / SE Dpth	Super Elev / Froude N	Critical Depth / Norm Dp	Flow Top Width / "N"	Height/Dia.-FT / X-Fall	Base Wt or I.D. / ZR	ZL	No Wth Prs/Pip / Type Ch
100.000	871.380	1.500	872.880	8.40	4.75	.35	873.23	.00	1.12	.00	1.500	.000	.00	1 .0
.000	.0103				.0063	.00	1.50	.00	1.01	.013	.00	.00	PIPE	
100.000	871.380	1.500	872.880	8.40	4.75	.35	873.23	.00	1.12	.00	1.500	.000	.00	1 .0
9.750	.0103				.0059	.06	1.50	.00	1.01	.013	.00	.00	PIPE	
109.750	871.480	1.450	872.930	8.40	4.80	.36	873.29	.00	1.12	.54	1.500	.000	.00	1 .0

♀

APPENDIX E
MAPS AND EXHIBITS



COMMUNITY DEVELOPMENT

- Estate Density Residential
- Very Low Density Residential
- Low Density Residential
- Medium Density Residential
- Medium High Density Residential
- High Density Residential
- Very High Density Residential
- Highest Density Residential
- Commercial Retail
- Commercial Tourist
- Commercial Office
- Light Industrial
- Business Park
- Public Facilities
- Community Center

RURAL COMMUNITY

- Rural Community - Estate Density Residential
- Rural Community - Very Low Density Residential
- Rural Community - Low Density Residential

RURAL

- Rural Residential
- Rural Mountainous

AGRICULTURE

- Agriculture

OPEN SPACE

- Conservation
- Conservation Habitat
- Open Space Recreation
- Open Space Rural
- Mineral Resources
- Water

- Highways
- Area Plan Boundary
- City Boundary
- Waterbodies

Data Source: Riverside County Planning

Figure 3

December 8, 2015

0 1 2 Miles

Disclaimer: Maps and data are to be used for reference purposes only. Map features are approximate, and are not necessarily accurate to surveying or engineering standards. The County of Riverside makes no warranty or guarantee as to the content (the source is often third party), accuracy, timeliness, or completeness of any of the data provided, and assumes no legal responsibility for the information contained on this map. Any use of this product with respect to accuracy and precision shall be the sole responsibility of the user.

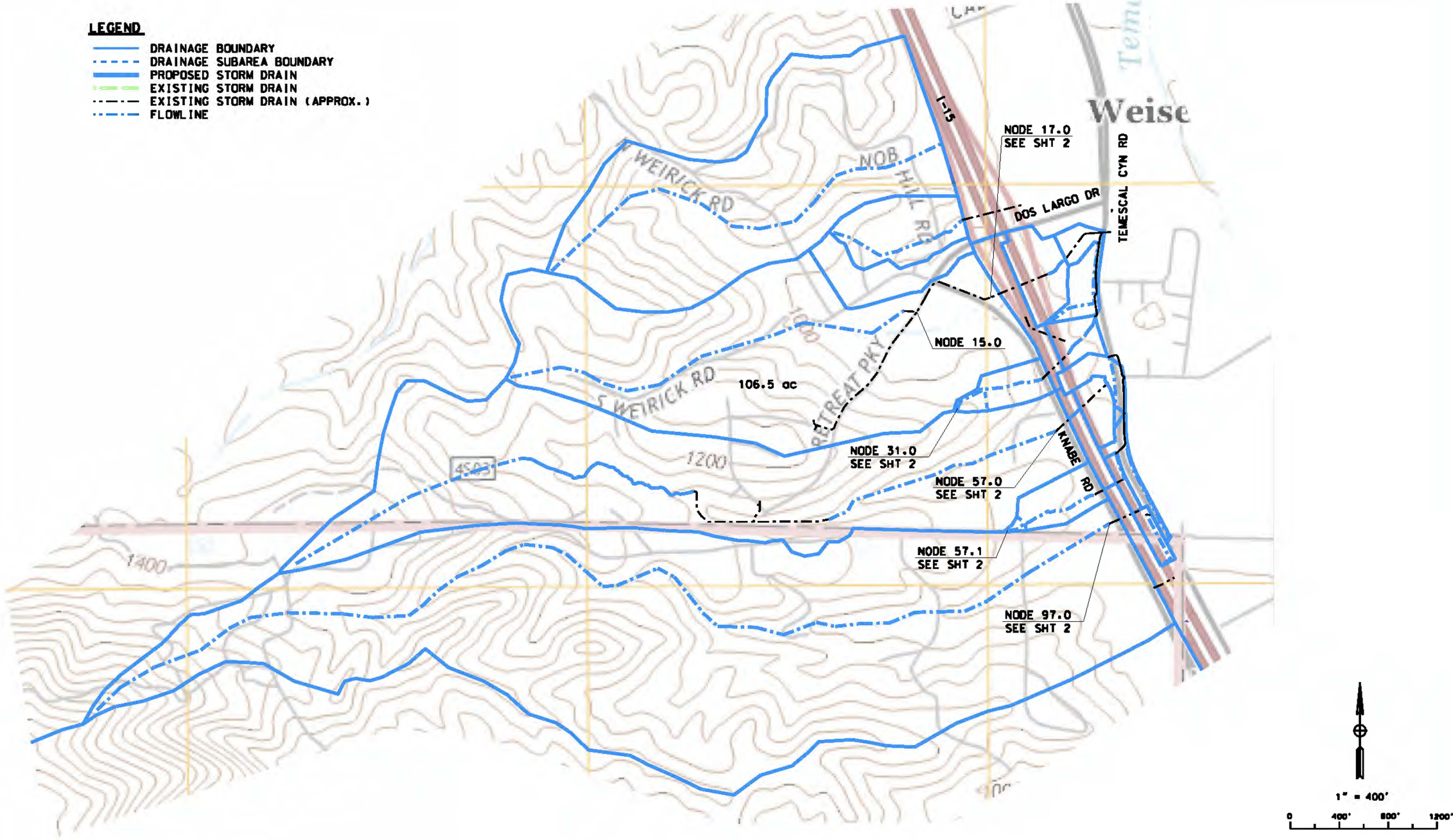
RIVERSIDE COUNTY PLANNING DEPARTMENT

TEMESCAL CANYON AREA PLAN LAND USE PLAN

Path: \\agency\Imagis\Projects\Planning\GPA960_GPAs2010_2015\TCAP-landuse.mxd

LEGEND

- DRAINAGE BOUNDARY
- DRAINAGE SUBAREA BOUNDARY
- PROPOSED STORM DRAIN
- EXISTING STORM DRAIN
- EXISTING STORM DRAIN (APPROX.)
- FLOWLINE



PREPARED BY

PREPARED UNDER THE SUPERVISION OF:

EDWARD NG
No. 45767
Exp. 6/30/15
REGISTERED PROFESSIONAL ENGINEER
CIVIL
STATE OF CALIFORNIA

EDWARD NG DATE
PROJECT MANAGER
NCM ENGINEERING INC
4740 GREEN RIVER RD, STE 218
CORONA, CA 92880

TEMESCAL CANYON RD WIDENING
DOS LAGOS DR TO LEROY RD
OFFSITE CONDITION

SHEET No.
SHEET 1 of 2

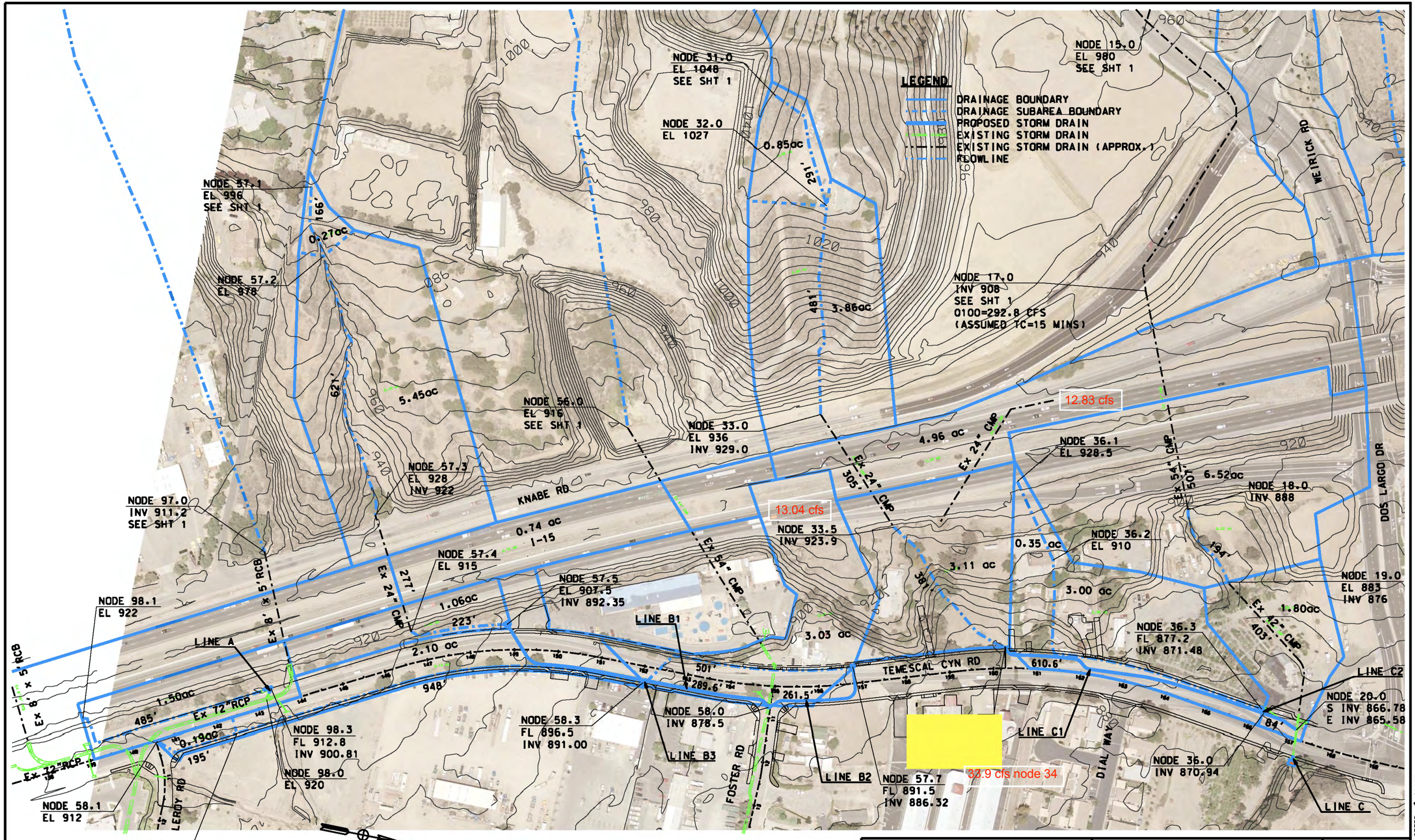
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USERNAME → $USER
DGN FILE → $REQUEST

WO C6-0066

COUNTY
FILE No.

LAST REVISION $DATE $TIME
DATE PLOTTED
TIME PLOTTED
00-00-00



PREPARED BY

PREPARED UNDER THE SUPERVISION OF:

REGISTERED PROFESSIONAL ENGINEER — EDWARD NG — No. 46767 — Exp. 6/30/19 — CIVIL — STATE OF CALIFORNIA

EDWARD NG DATE
PROJECT MANAGER
NCM ENGINEERING
4740 GREEN RIVER RD. STE 218
CORONA, CA 92880

TEMESCAL CANYON RD WIDENING
DOS LAGOS DR TO LEROY RD
ONSITE CONDITION

SHEET No.
SHEET 2 OF 2

BORDER LAST REVISED 07/21/2015

USERNAME → $USER
DGN FILE → $REQUEST

WO C6-0066

COUNTY FILE No.

LAST REVISION 00-00-00 DATE PLOTTED $DATE TIME PLOTTED $TIME

COUNTY OF RIVERSIDE

TRANSPORTATION DEPARTMENT

TEMESCAL CANYON ROAD WIDENING PROJECT
LEROY RD TO DOS LAGOS DR (C6-0066)

REALIGNMENT WIDENING PROJECT

IN THE TEMESCAL VALLEY AREA

WO NO. C6-0066

FEDERAL AID No. XXXX (XXX) (IF APPLICABLE)

BASIS OF BEARING

THE BASIS OF BEARINGS FOR THIS SURVEY IS THE CALIFORNIA STATE PLANE COORDINATE SYSTEM, CCS83, ZONE 6, BASED LOCALLY ON CONTROL STATIONS:

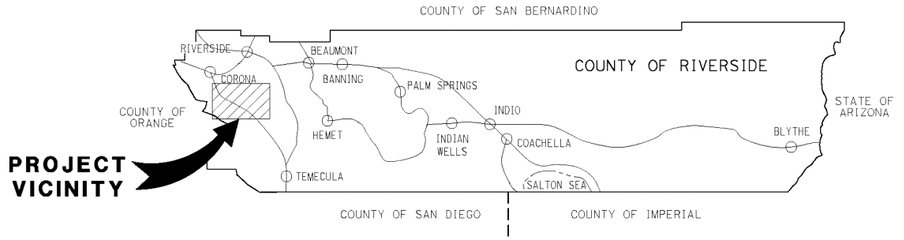
NGS PID: "AF9684", CSRC SITE CODE: "BILL"
NGS PID: "DH7055", CSRC SITE CODE: "CNPP"
NGS PID: N/A, CSRC SITE CODE: "MAT2"
NGS PID: N/A, CSRC SITE CODE: "MJPK"

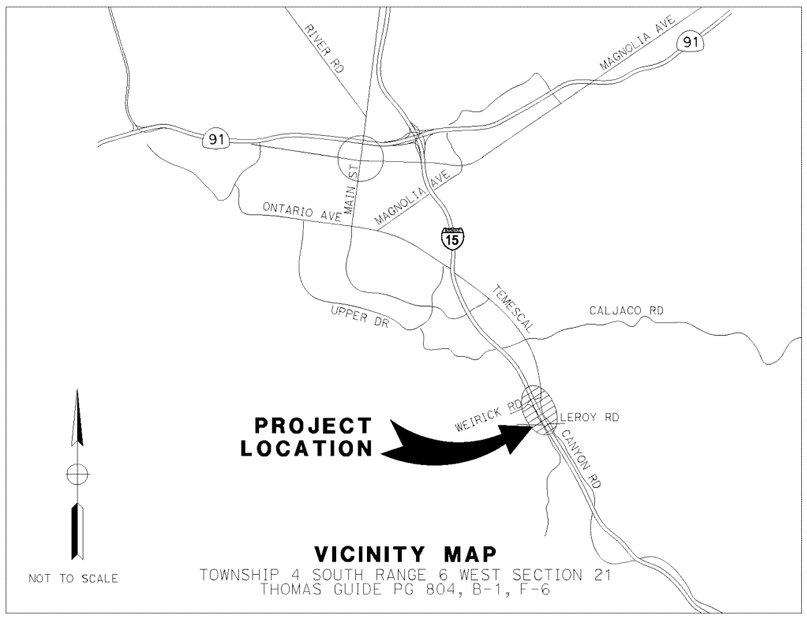
NAD 83 (NSRS 2011) AS SHOWN HEREON. ALL BEARINGS AND DISTANCES SHOWN ON THIS MAP ARE GRID. QUOTED BEARINGS AND DISTANCES FROM REFERENCE MAPS OR DEEDS ARE AS SHOWN PER THAT RECORD REFERENCE. ALL DISTANCES SHOWN ARE GROUND DISTANCES UNLESS SPECIFIED OTHERWISE. GRID DISTANCES, MAY BE OBTAINED BY MULTIPLYING THE GROUND DISTANCE BY A COMBINATION FACTOR OF: 1.000052527. CALCULATIONS ARE MADE AT; TRAV PT. 357 WITH COORDINATES OF: N: 2235826.326, E: 6181734.747, USING AN ELEVATION OF 930.70. COVERGENCE ANGLE: -0°41'13.95138"

BENCH MARK

THE BECHMARK USED FOR THIS SURVEY IS: "Z16246"
DATUM: NAVD88
ELEVATION: 1079.97'

FOUND 1/2" REBAR WITH RCFC PLASTIC CAP, FLUSH, 20' NLY TOP BANK, 75' ELY OF RW FENCE I-15, PER RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT DATA SHEET, DATED 05/01/2015.





VICINITY MAP
TOWNSHIP 4 SOUTH RANGE 6 WEST SECTION 21
THOMAS GUIDE PG 804, B-1, F-6

ABBREVIATIONS

NOTE: SEE CALTRANS STD A3A THRU A3C FOR ADDITIONAL ABBREVIATIONS

AP	ANGLE POINT
BL	BIKE LANE
CB	CATCH BASIN
CI	CURB INLET
℄	CENTER LINE
E'LY	EASTERLY
EVMWD	ELSINORE VALLEY MUNICIPAL WATER DISTRICT
GB	GRADE BREAK
GCP	GRATED CONCRETE PIPE
IMP	IMPROVEMENTS
N'LY	NORTHERLY
RCFC	RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
SAWPA	SANTA ANA WATERSHED PROJECT AUTHORITY
SCE	SOUTHERN CALIFORNIA EDISON
SCG	SOUTHERN CALIFORNIA GAS
S'LY	SOUTHERLY
TC	TOP OF CURB
TPC	TRANS PACIFIC CORP
TWLTL	TWO-WAY LEFT TURN LANE
W'LY	WESTERLY

INDEX OF SHEETS

SHEET No.	DESCRIPTION
1	TITLE
2	KEY MAP & NOTES
3 - 5	TYPICAL CROSS SECTIONS
6	SURVEY CONTROL
7 -12	LAYOUT
13-14	CONSTRUCTION DETAILS
15-18	DRAINAGE PLAN AND PROFILE
19-22	UTILITY
23-25	RETAINING WALL
26-28	SIGNING
29-31	STRIPING

REVIEWS OF PROJECT PLANS AND SPECIFICATIONS BY THE COUNTY OF RIVERSIDE IS CONFINED TO A REVIEW ONLY AND DOES NOT RELIEVE THE ENGINEER IN RESPONSIBLE CHARGE (AS DEFINED BY SECTION 6703 OF THE BUSINESS AND PROFESSIONAL CODE) OF THEIR RESPONSIBILITIES TO COMPLY WITH APPLICABLE STANDARDS FOR THE PROJECT DESIGN.

THE CONTRACTOR SHALL NOTIFY UNDERGROUND SERVICE ALERT, (800) 227-2600, AND ALL CONCERNED UTILITY COMPANIES AT LEAST TWO WORKING DAYS IN ADVANCE OF EXCAVATION

COUNTY APPROVAL	PREPARED BY	TITLE SHEET	SHEET No.
PATRICIA ROMO DATE DIRECTOR OF TRANSPORTATION COUNTY OF RIVERSIDE	REGISTERED PROFESSIONAL ENGINEER EDWARD NG No. 46767 Exp. 6/30/19 CIVIL STATE OF CALIFORNIA PREPARED UNDER THE SUPERVISION OF: EDWARD NG DATE PROJECT MANAGER NCM ENGINEERING 4740 GREEN RIVER RD, STE 218 CORONA, CA 92880	TEMESCAL CANYON RD LEROY RD TO DOS LAGOS RD (C6-0066) REALIGNMENT WIDENING PROJECT	T-1 SHEET 01 OF XX

TEMESCAL CANYON RD WIDENING PROJECT (C6-0066)

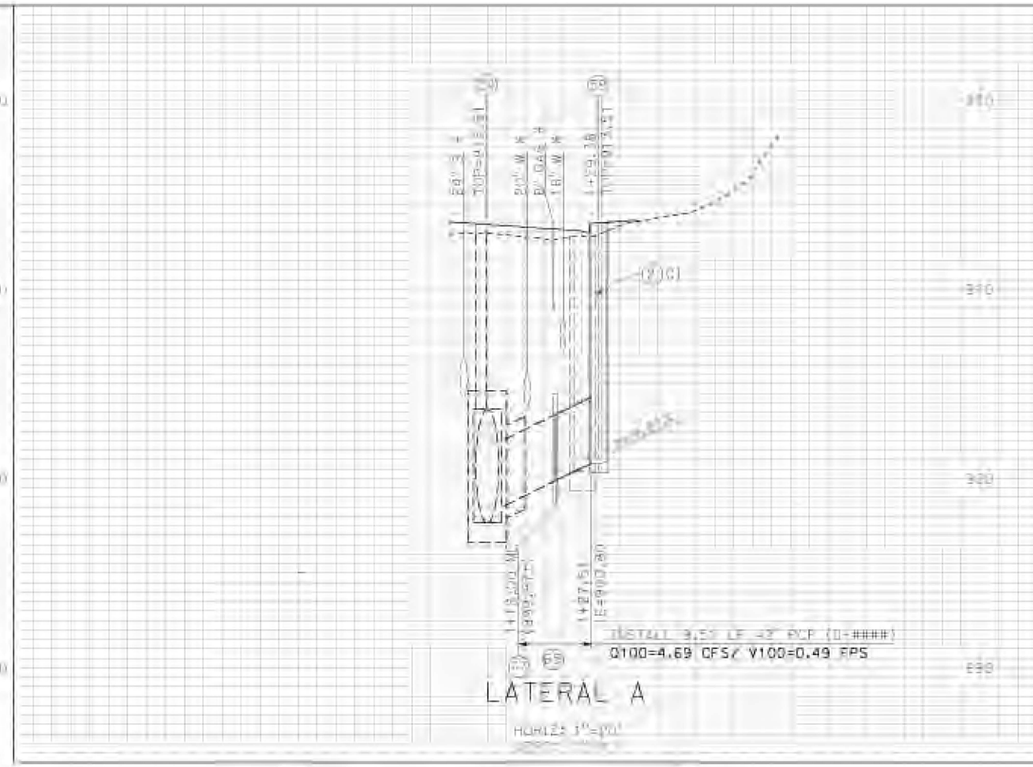
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WO C6-0066

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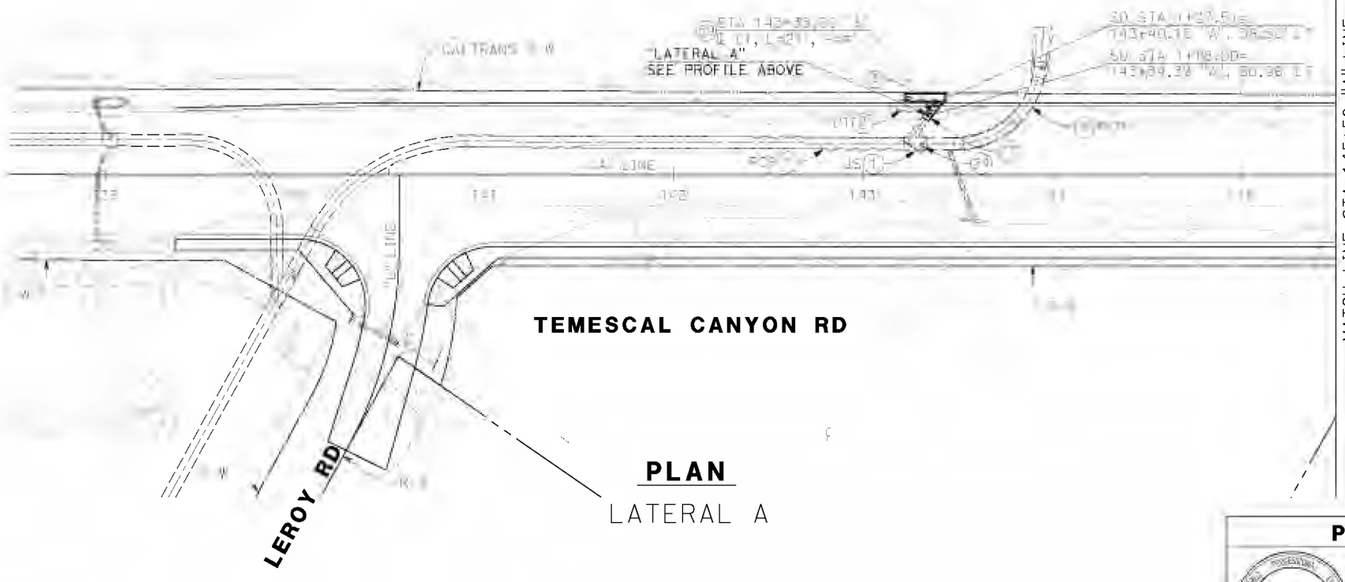


LATERAL A

HORIZ: 1"=20'

PROFILE

HORIZ: AS SHOWN
VERT: AS SHOWN



PLAN

LATERAL A

SCALE: 1" = 80'

CONSTRUCTION NOTES:

1. PROTECT IN PLACE
2. REMOVE
3. ADJUST MANHOLE TO GRADE
4. CONSTRUCT CURB INLET WITH GRATE PER RCTD STD. NO. 300, WITH CONNECTOR PIPE TRASH SCREEN
5. INSTALL 42" RCP (D-####)
6. CONSTRUCT CONCRETE COLLAR PER DETAIL ON SHEET XX

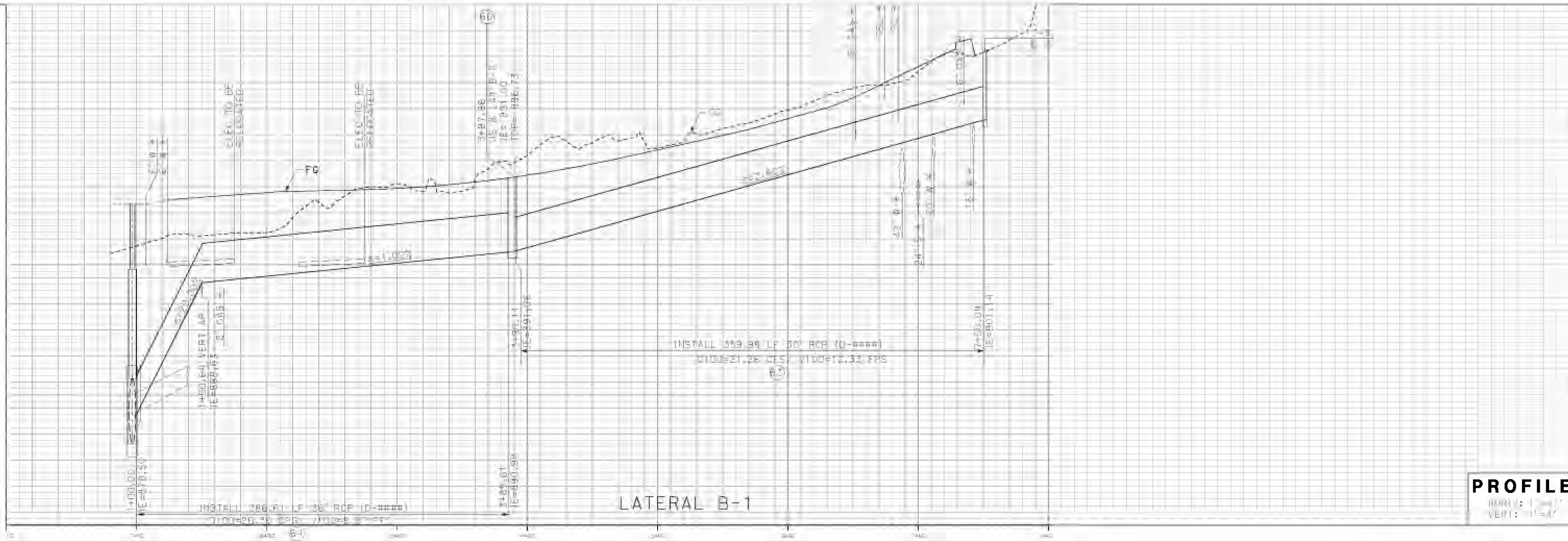
STORM DRAIN CURVE/LINE DATA

NO.	BEARING/DELTA	RADIUS	LENGTH	TANGENT
(A)	N81°07'02"W	----	27.51'	----

PREPARED BY	DRAINAGE PLAN & PROFILE	SHEET No.
PREPARED UNDER THE SUPERVISION OF: EDWARD NG DATE PROJECT MANAGER NCM ENGINEERING 3740 GREEN RIVER RD, STE E-8 CORONA, CA 92880	**TEMESCAL CANYON RD** LEROY RD TO DOS LAGOS DR "A" LINE STA 138+50 TO 145+50	**D-1** 15 OF XX

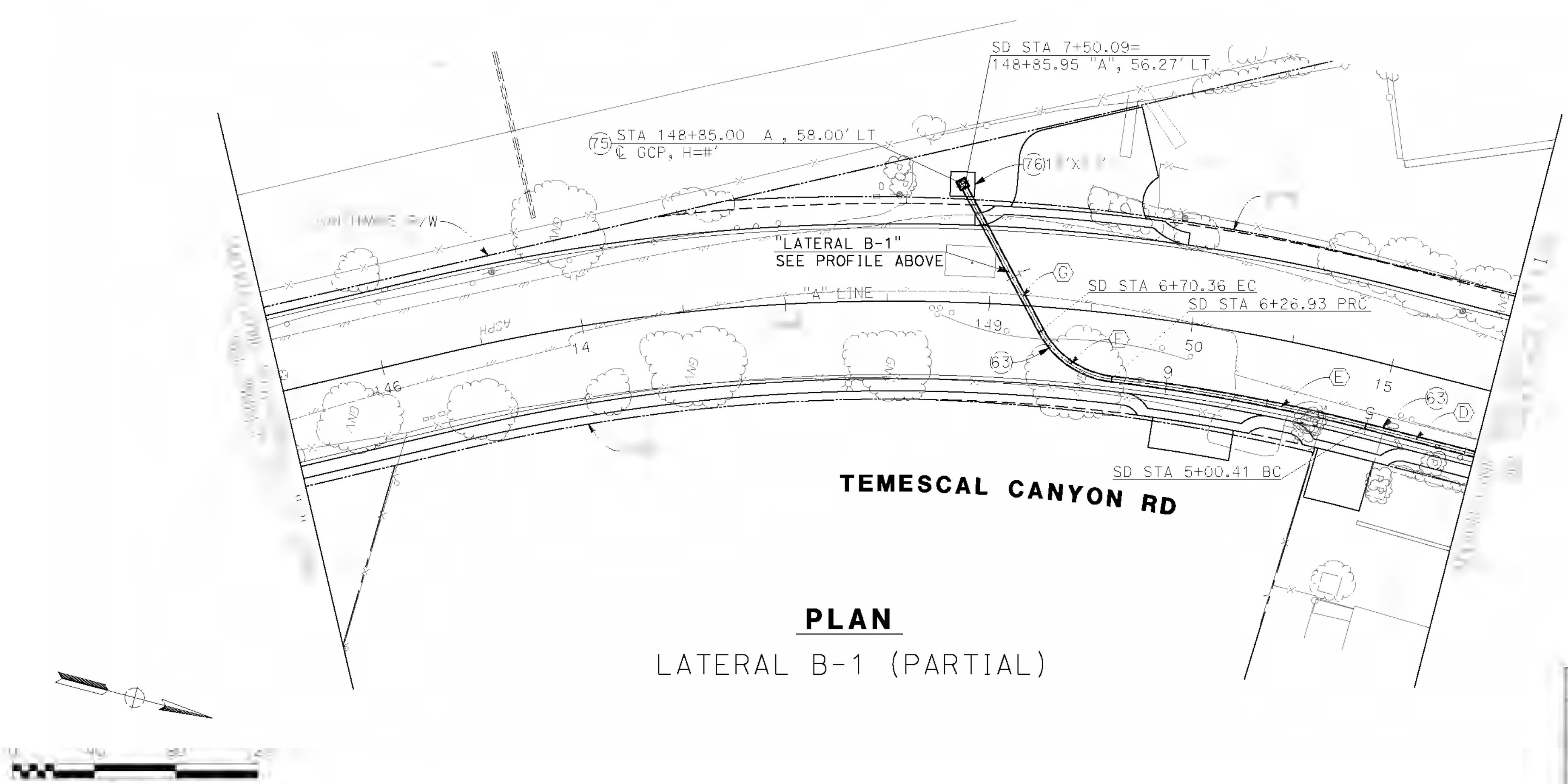
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PROFILE

HORIZ: 1"=40'
VERT: 1"=4'



PLAN

LATERAL B-1 (PARTIAL)

CONSTRUCTION NOTES:

(63) INSTALL 30" RCP (D-####)
(64) INSTALL 36" RCP (D-####)
(75) CONSTRUCT GRATED CONCRETE PIPE INLET PER CALTRANS STD PLAN D75B WITH CONNECTOR PIPE TRASH SCREEN
(76) CONSTRUCT CONCRETE APRON PER DETAIL ON SHEET XX

STORM DRAIN CURVE/LINE DATA

NO.	BEARING/DELTA	RADIUS	LENGTH	TANGENT
D	60°13'32"E	----	248.05'	----
E	7°43'42"	938.00'	126.52'	63.36
F	55°17'35"	45.00'	43.43'	23.57'
G	[illegible]22"W	----	90.72'	----

PREPARED BY

PREPARED UNDER THE SUPERVISION OF:

EDWARD NG
PROJECT MANAGER
NCM ENGINEERING
3740 GREEN RIVER RD, STE 218
CORONA, CA 92880

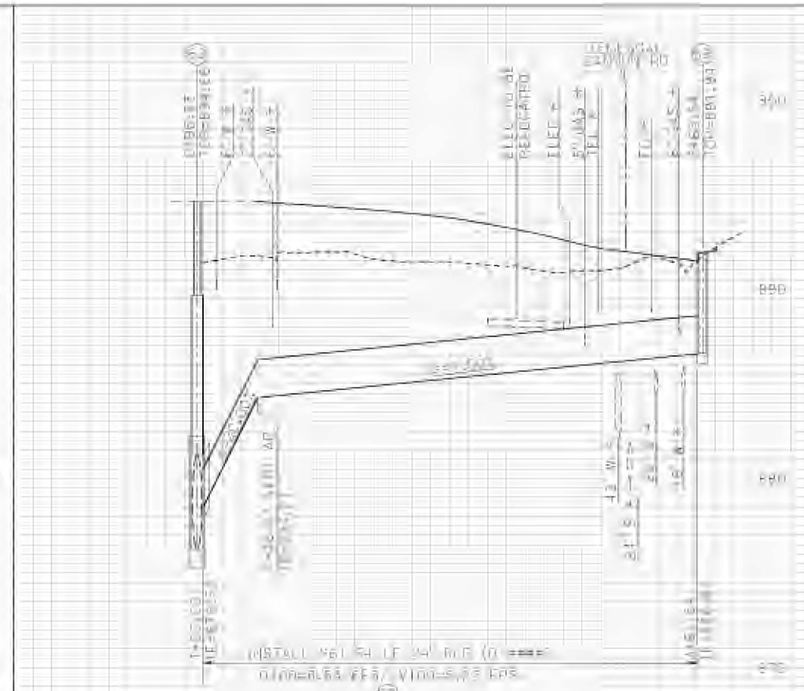
DATE

DRAINAGE PLAN & PROFILE
TEMESCAL CANYON RD
LEROY RD TO DOS LAGOS DR
"A" LINE STA 145+50 TO 151+50

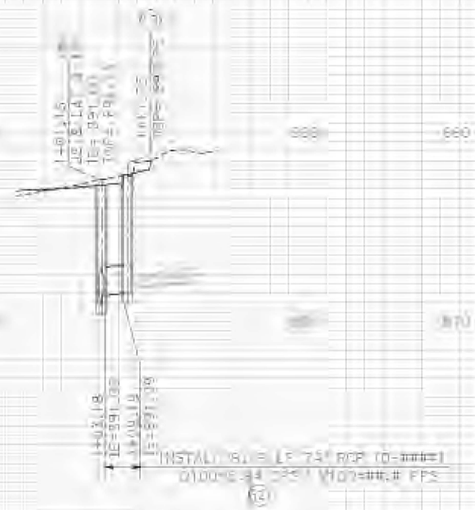
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16 OF XX

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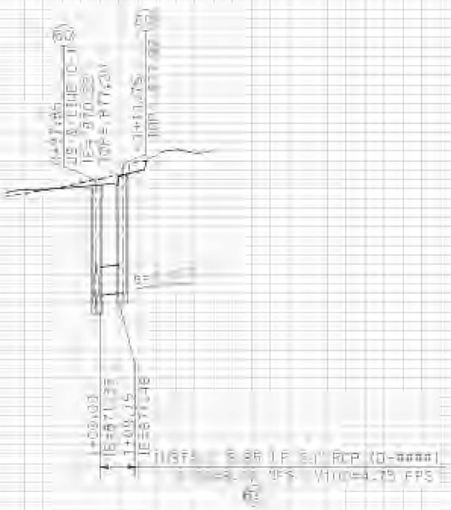
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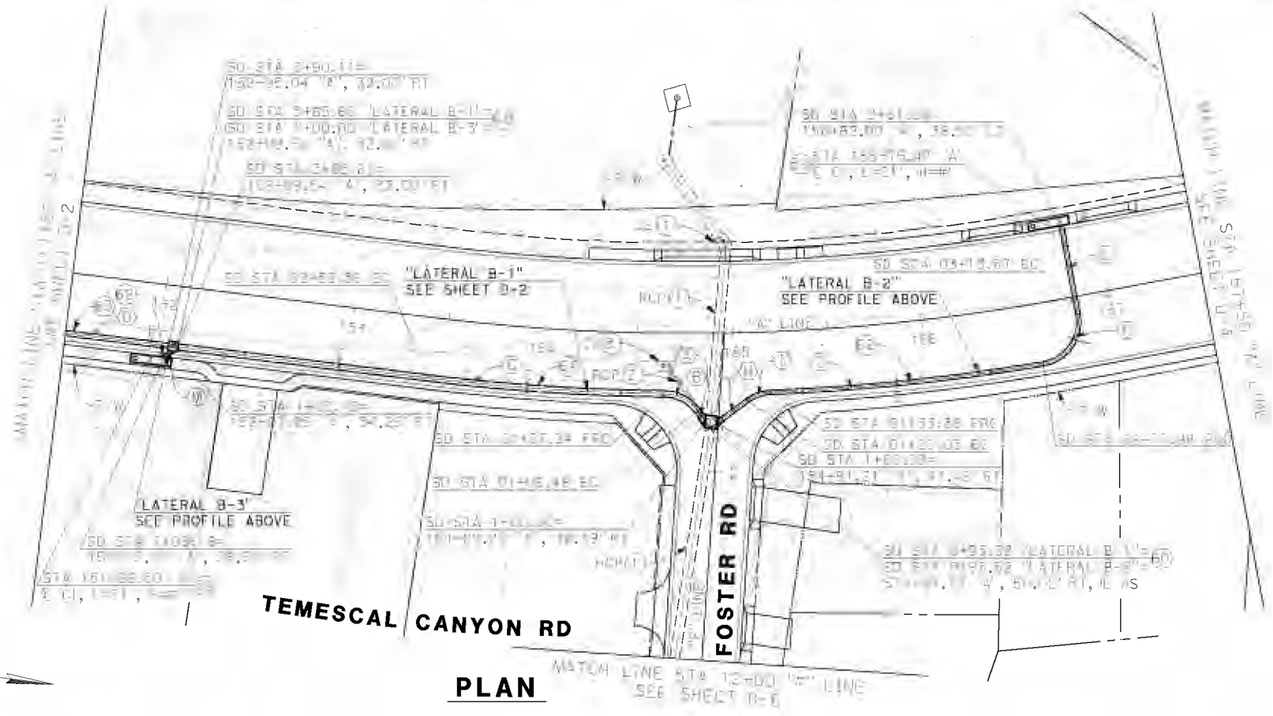
LATERAL B-2



LATERAL B-3



LATERAL C-2



PLAN

SCALE 1" = 80'

- (A) PROJECT BOUNDARY
- (B) REMOVE
- (C) CONSTRUCT CURB INLET
- (D) CONNECTION (MIN. PIPE SIZE)
- (E) CONSTRUCT JUNCTION
- (F) INSTALL ##" RCP (D-####)
- (G) INSTALL ##" RCP (D-####)
- (H) INSTALL ##" RCP (D-####)

(A)	S46°27'41"W	----	10.96'	----
(B)	S4°06'06"E	82.58'	20.45'	11.6±
(C)	06°24'47"	1117.00'	185.03'	58
(D)	S00°17'39"E	----	245.04'	----
(E)	SEE SHEET D-3 FOR DATA			
(F)	SEE SHEET D-2 FOR DATA			
(G)	SEE SHEET D-3 FOR DATA			
(H)	43°36'12"W	----	44.50'	----
(I)	33°53'58"	32.50'	13.35'	6.8±
(J)	07°22'10"	1117.00'	144.61'	72.4±
(K)	90°00'00"	82.58'	35.69'	52.8±
(L)	S7°06'06"E	----	47.97'	----
(M)	S43°41'58"E	----	3.19'	----

PREPARED UNDER THE SUPERVISION OF:

EDWARD, RCE 57567, EXP. 6-30-18

EDWARD, PE
PROJECT MANAGER
HDR ENGINEERING
3790 GREEN RIVER
CORONA, CA 92880

DATE

PLOT SET REVISED 07/1/2018

USERNAME = SCE
DGN FILE = C:\Projects\...\D-1.dgn

WO # ...

CONSTRUCTION NOTES:

(1) PROTECT IN PLACE
(2) REMOVE
(3) CONSTRUCT P.C.C. CULVERT HEADWALL, STANDARD, SINGLE LINE PER CALTRANS STD PLAN D89
(4) CONSTRUCT CURB INLET PER COUNTY STD NO. 300, WITH
(5) CONSTRUCT JUNCTION STRUCTURE PER CALTRANS STD PLAN D94
(6) INSTALL 18" RCP (D=####)
(7) INSTALL 30" RCP (D=####)
(8) INSTALL 42" RCP (.XXX" THICK)
(9) INSTALL RIP RAP SLOPE PROTECTION 1 1/2 TON, METHOD B
(10) CONSTRUCT METAL HAND RAILING PER CALTRANS STD PLAN B77-1

CURVE/LINE DATA

NO.	BEARING/DELTA	RADIUS	LENGTH	TANGENT
L1	S46°31'49"W	----	10.13'	----
L2	S41°31'49"W	11.25'	13.25'	7.03'
L3	S3°27'03"E	----	6.57'	----
L4	S0°04'47"W	----	177.33'	----
L5	S0°55'05"W	----	100.33'	----
L6	S0°55'05"W	----	55.67'	----
L7	S0°55'05"W	----	131.85'	6.63'
L8	S0°06'14"W	----	16.67'	----
L9	S0°39'57"E	35.50'	4.47'	3.00'
L10	S3°39'57"E	----	12.47'	6.23'
L11	42°37'37"	28.50'	130.51'	68.56'
L12	S46°12'33"E	1130.00'	31.61'	15.80'
L13	42°12'17"	28.50'	13.09'	----
L14	DF 55°17'	----	----	----
L15	80°29'55"	----	----	----
L16	S5°00'47"W	----	----	----

PROFILE

HORIZ: 1"=40'
VERT: 1"=4'

LINE C

PLAN

LINE C

TEMESCAL CANYON RD

SCALE: 1" = 40'

PREPARED BY

PREPARED UNDER THE SUPERVISION OF:

DATE

EDWARD TIC
PROJECT MANAGER
RICK ENGINEERING
3750 CREEK VIEW RD., STE E-8
CORONA, CA 92880

USERNAME = TIC
LAST PLOTTED = 05-10-13 @ 14:00:00

DRAINAGE PLAN & PROFILE

TEMESCAL CANYON RD
LEROY RD TO DOS LAGOS DR
"A" LINE STA 157+50 TO 164+50

SHE

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.

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.

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/

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❑ 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

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❑ **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.**

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❑ **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/

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❑ **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.

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❑ 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

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☐ **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.	

	pollution. Consider using pest-resistant plants, especially adjacent to hardscape. To ensure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency and plant interactions.	
Rooftop Equipment	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. Avoid roofing, gutters and trim made of copper or other unprotected metals that may leach into runoff	

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☐ **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 INCLUDED IN THE FINAL WQMP

Appendix 10: Educational Materials

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

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