Thienes Engineering, Inc.
CIVIL ENGINEERING ● LAND SURVEYING

# PROJECT SPECIFIC PRELIMINARY WATER QUALITY MANAGEMENT PLAN (P-WQMP)

FOR:
**RUBIDOUX COMMERCE CENTER**
26TH STREET
JURUPA VALLEY, CA 92509
APNs: 178-030-001, 178-030-002, 178-030-003, 178-030-006, 178-030-008, 178-030-009, 178-030-010; 178-070-001, 178-070-002, 178-070-003; 178-080-009

PREPARED FOR:
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CONTACT: JEFF TRENTON

| SINGLE-BUILDING SCHEME | MULTI-BUILDING SCHEME |
|---|---|
| JANUARY 8, 2019 | SEPTEMBER 26, 2022 |
| AUGUST 8, 2019 | JUNE 28, 2023 |
| OCTOBER 7, 2020 | |
| FEBRUARY 1, 2021 | |

JOB NO. 3384b

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# PROJECT SPECIFIC PRELIMINARY WATER QUALITY MANAGEMENT PLAN
# (P-WQMP)

## FOR

# "RUBIDOUX COMMERCE CENTER"

REGISTERED PROFESSIONAL ENGINEER
REINHARD STENZEL
R.C.E. NO. 56155
Exp. 12-31-24
CIVIL
STATE OF CALIFORNIA

PREPARED BY LUIS PRADO
UNDER THE SUPERVISION OF:

6/28/2023

REINHARD STENZEL DATE
R.C.E. 56155
EXP. 12/31/2024

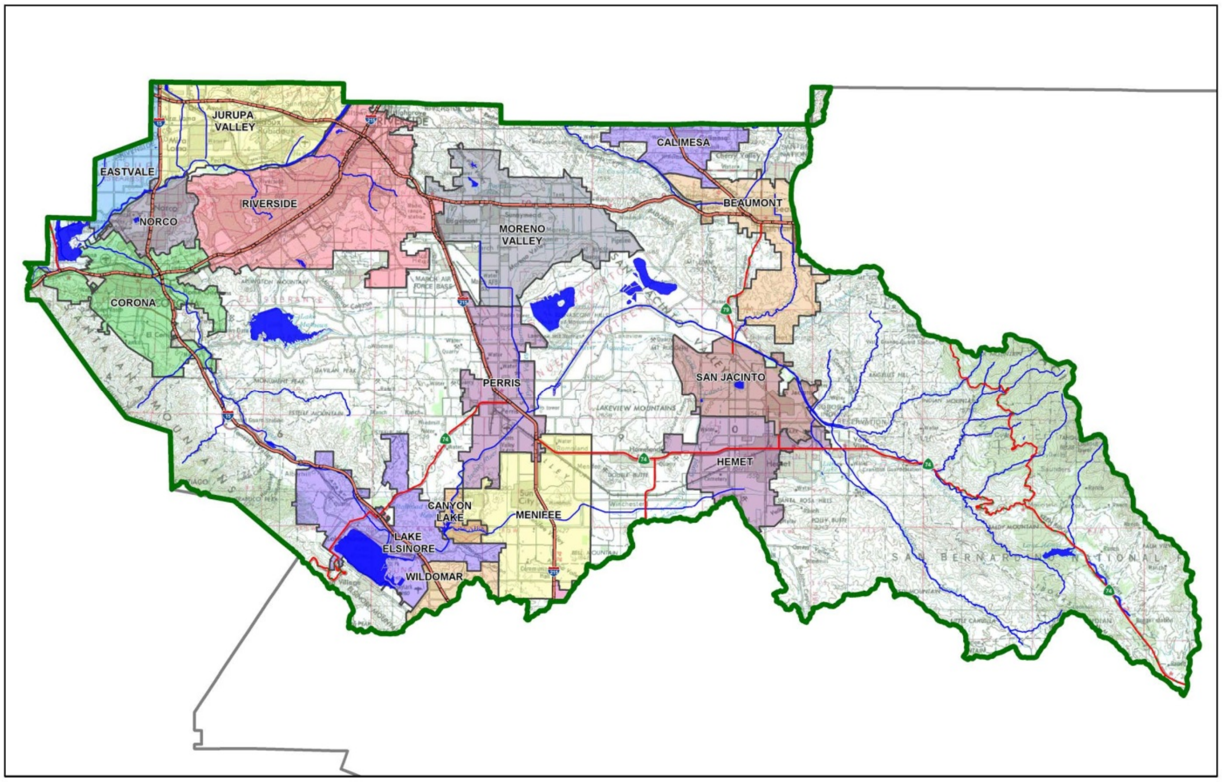
# Project Specific Water Quality Management Plan

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

**Project Title:** Rubidoux Commerce Center

**Development No:** APNs 178-030-001, 178-030-002, 178-030-003, 178-030-006, 178-030-008, 178-030-009, 178-030-010; 178-070-001, 178-070-002, 178-070-003; 178-080-009

**Design Review/Case No:** GP 23-XXX



☒ **Preliminary**
☐ **Final**

**Original Date Prepared**: January 8, 2019
**Revision Date(s)**: August 8, 2019 (single-building scheme)
October 7, 2020 (single-building scheme)
February 1, 2021 (single-building scheme)
September 26, 2022 (multi-building scheme)
June 28, 2023 (multi-building scheme)

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

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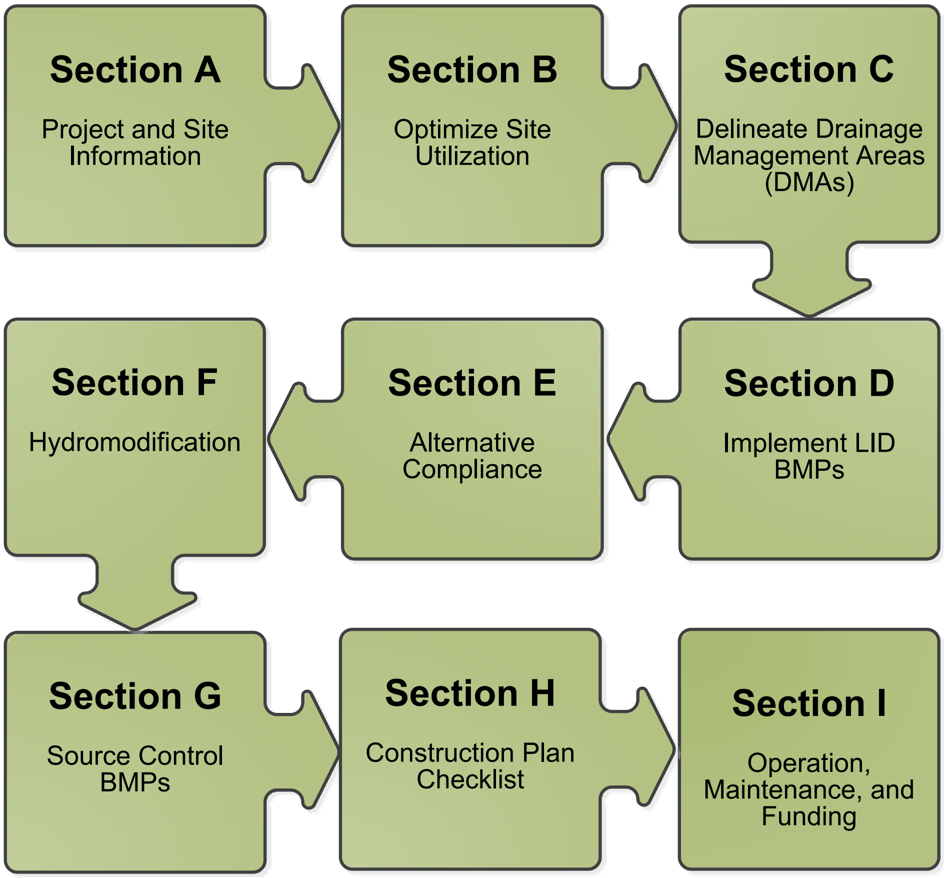
Job No. 3384b

## A Brief Introduction

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



# OWNER'S CERTIFICATION

This Project-Specific Water Quality Management Plan (WQMP) has been prepared for **Proficiency Rubidoux, LLC** by **Thienes Engineering, Inc.** for the **Rubidoux Commerce Center** project.

This WQMP is intended to comply with the requirements of the **City of Jurupa Valley** for **Ordinance No. 2012-07** 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 **City of Jurupa Valley** Water Quality Ordinance (Municipal Code Section **2012-07**).

"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

Jeff Trenton
Owner's Printed Name

President
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

6/28/2023
Date

Reinhard Stenzel
Preparer's Printed Name

Director of Engineering
Preparer's Title/Position

Preparer's Licensure:

REGISTERED PROFESSIONAL ENGINEER
REINHARD STENZEL
R.C.E. NO. 56155
Exp. 12-31-24
CIVIL
STATE OF CALIFORNIA

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# Section A: Project and Site Information

## PROJECT INFORMATION

Type of Project: Light Industrial
Planning Area: Industrial/Business Park
Community Name: N/A
Development Name: Rubidoux Commerce Center

## PROJECT LOCATION

Latitude & Longitude (DMS): 34.014939, -117.399195
Project Watershed and Sub-Watershed: Santa Ana River
APN(s): 178-030-001, 178-030-002, 178-030-003, 178-030-006, 178-030-008, 178-030-009, 178-030-010; 178-070-001, 178-070-002, 178-070-003; 178-080-009
Map Book and Page No.: Assessor's Map BK.178 PG.03, PG.07 and PG.08

## PROJECT CHARACTERISTICS

| | |
|---|---|
| Proposed or Potential Land Use(s) | Light Industrial |
| Proposed or Potential SIC Code(s) | 4225 |
| Area of Impervious Project Footprint (SF) | 2,532,578 (58.14 acres) |
| Total Area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement | 2,532,578 (58.14 acres) |
| 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) | 50,792 (1.17 acres) |
| 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) | Soil/Infiltration Report Available |
| What is the Water Quality Design Storm Depth for the project? | 0.66 |

## PROJECT DESCRIPTION

The project site consists of 5 buildings over three distinct areas. Buildings 1-3 are located between 25th Street and 28th Street on the northwesterly side of the prolongation of 26th Street and the proposed extension of Van Dell Road. Building 4 is located on the southeasterly side of the extension of Van Dell Road and 26th Street. The West Riverside Canal is located on the southerly sides of Buildings 1, 2, and 4. Finally, Building 5 is located at the southwesterly corner of 26th Street and Avalon Street.

The project site comprised of Buildings 1-4 consists of 74.30 acres while the Building 5 site consists of 2.49 acres. Each building has truck yards and vehicle parking lots. There will be two infiltration basins; one located east of Buildings 1, 2 and the other one located southeast of Building 4. Underground chambers will be located west of Building 5. A storm drain system will be built near the westerly property line to intercept runoff from the westerly adjacent hills and horse stables. The said storm drain system will convey flows southwest (onsite) and then southeast in 28th Street before connecting to the existing 72-inch storm drain in 28th Street (near the West Riverside Canal intersection).

**Existing Conditions**

The site is currently an undeveloped dirt lot. Runoff from the site generally surface drains south-easterly to a dirt channel and then to the 72-inch storm drain in 28th Street. The offsite hillside area and horse stables northwest of the project site are also tributary to the site.

**Proposed Conditions**

The onsite northwesterly landscape areas, offsite northerly hills and existing horse stables will drain southerly to a proposed storm drain. Runoff is then conveyed southerly to the existing 72-inch Storm Drain Line "D" in 28th Street.
Generally, runoff from the Building 3 portion of the project site is collected in catch basins located in the truck yard and

parking areas. A proposed private storm drain will convey these flows easterly through the Building 4 site. Runoff from Building 4 is also tributary to the storm drain system. The storm drain continues easterly, discharging into Infiltration Basin-B located on the southeasterly side of the Building 4. Overflows from Infiltration Basin-B are then conveyed southwesterly to the proposed storm drain in 28th Street.

Runoff from Buildings 1 and 2 are generally collected in catch basins located in the truck yards and vehicle parking lots. Proposed storm drain systems convey flows southeasterly into Infiltration Basin-A located on the easterly side of Buildings 1 and 2. Overflows from Infiltration Basin-A are then conveyed southwesterly to the proposed storm drain in 28th Street.

The southerly Building 5 site will maintain its existing drainage pattern. The site generally drains to a grate inlet at the southwesterly corner of the site. From here, overflows will discharge onto Avalon Street via a parkway culvert. Areas adjacent to the street also discharge to Avalon Street. Similar to existing conditions, runoff from the Building 5 site will be conveyed southwesterly in Avalon Street to the catch basin at the 28th Street/Avalon Street intersection, ultimately to the 72-inch storm drain in 28th Street. A sump pump will be utilized to pump stormwater out of the proposed truck well and onto the adjacent finish grade.

A total of 3.85 acres of landscape areas (DMA D) located along the street frontages from the buildings will drain offsite. These areas are considered self-treating areas.

Hydrologic conditions of concern (HCOC) will be mitigated via the proposed infiltration basins and the underground chambers. The difference in volumes between the existing and proposed 2-year, 24-hour storm event will be retained onsite. Refer to Appendix 7 for existing and proposed hydrographs.

## A.1 Maps and Site Plans

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

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

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

## A.2 Identify Receiving Waters

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

**Table A.1** Identification of Receiving Waters

| Receiving Waters | EPA Approved 303(d) List Impairments | Designated Beneficial Uses | Proximity to RARE Beneficial Use |
|---|---|---|---|
| Santa Ana River, Reach 3 | Copper, Indicator Bacteria and Lead | AGR, GWR, REC1, REC2, WARM, WILD, RARE | 4 miles |
| The Prado Basin Management Zone | pH | REC1, REC2, WARM, WILD, RARE | 13 miles |
| Santa Ana River, Reach 2 | None | AGR, GWR, REC1, REC2, WARM, WILD, RARE | 18 miles |
| Santa Ana River, Reach 1 | None | REC1, REC2, WARM, WILD | Not classified as a RARE waterbody. |
| Tidal Prism of Santa Ana River and Newport Slough | Indicator Bacteria and Toxicity | REC1, REC2, COMM, WILD, RARE, MAR | 44 miles |
| Pacific Ocean Near shore Zone | None | IND, NAV, REC1, REC2, COMM, WILD, RARE, SPWN, MAR, SHEL | 44 miles |
| Pacific Ocean Offshore Zone | None | IND, NAV, REC1, REC2, COMM, WILD, RARE, SPWN, MAR | 45 miles |

## 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)*<br>City of Jurupa Valley Grading Permit | ☒ Y | ☐ N |
| Other *(please list in the space below as required)*<br>City of Jurupa Valley Building Permit | ☒ Y | ☐ N |

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

# Section B: Optimize Site Utilization (LID Principles)

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

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

## Site Optimization

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

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

- *There are no creeks, wetlands, or riparian habitats nearby.*
- *In existing conditions, runoff from the site generally surface drains south-easterly to a dirt channel and then to the 72-inch storm drain in 28th Street. The offsite hillside area and horse stables northwest of the project site are also tributary to the site. Proposed condition drainage patterns mimic pre-development conditions.*

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

- *Not applicable, there are no existing vegetation.*
- *Not applicable, there are no sensitive areas.*

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

- *Stormwater BMPs are located in areas of permeable soil to promote infiltration (see Appendix 3 for infiltration report).*

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

- *Impervious area on the site has been minimized to City standards.*
- *Due to the nature of the project site (large trucks), substitution of pavement for landscaping is not feasible. The project does not propose overflow parking where substitution of pavement for landscaping would be optimal. Landscaping has been provided wherever applicable and to the maximum extent practicable.*

- *The entire Design Capture Volume (DCV) is handled by the proposed BMPs. Permeable pavement is not needed to meet the DCV.*

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

- *Roof runoff is directed to the proposed BMPs for treatment.*
- *All stormwater runoff will be piped or sheet flow into their respective BMPs.*

# Section C: Delineate Drainage Management Areas (DMAs)

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

**Table C.1** DMA Classifications

| DMA Name or ID | Surface Type(s)[1] | Area (Sq. Ft.) | Area (Acres) | DMA Type |
|---|---|---|---|---|
| A1 | Roofs/Conc/Asphalt | 1,513,710 | 34.75 | Type D |
| A2 | Ornamental Landscaping | 202,554 | 4.65 | Type D |
| A3 | Natural (A Soil) | 330,185 | 7.58 | Type D |
| B1 | Roofs/Conc/Asphalt | 933,055 | 21.42 | Type D |
| B2 | Ornamental Landscaping | 107,593 | 2.47 | Type D |
| C1 | Roofs/Conc/Asphalt | 85,813 | 1.97 | Type D |
| C2 | Ornamental Landscaping | 4,356 | 0.10 | Type D |
| D | Ornamental Landscaping | 167,706 | 3.85 | Type A |

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

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

| **DMA Name or ID** | **Area (Sq. Ft.)** | **Stabilization Type** | **Irrigation Type (if any)** |
|---|---|---|---|
| D | 167,706 | California Native Vegetation | Timed Sprinklers |

**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 | n/a | n/a | n/a | n/a | n/a | 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 | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

**Table C.5** Type ‘D’, Areas Draining to BMPs

| DMA Name or ID | BMP Name or ID |
|---|---|
| A1 | Infiltration Basin-A |
| A2 | Infiltration Basin-A |
| A3 | Infiltration Basin-A |
| B1 | Infiltration Basin-B |
| B2 | Infiltration Basin-B |
| C1 | Underground Chambers-C |
| C2 | Underground Chambers-C |

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

# Section D: Implement LID BMPs

## D.1 Infiltration Applicability

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

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

### Geotechnical Report

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

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

### Infiltration Feasibility

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

**Table D.1** Infiltration Feasibility

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

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

## D.2 Harvest and Use Assessment

Please check what applies*:*

☐ Reclaimed water will be used for the non-potable water demands for the project.

☐ Downstream water rights may be impacted by Harvest and Use as approved by the Regional Board (verify with the Copermittee).

☒ The Design Capture Volume will be addressed using Infiltration Only BMPs. In such a case, Harvest and Use BMPs are still encouraged, but it would not be required if the Design Capture Volume will be infiltrated or evapotranspired.

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

### Irrigation Use Feasibility

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

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

*Total Area of Irrigated Landscape*: N/A

*Type of Landscaping (Conservation Design or Active Turf)*: Conservation design

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:* N/A

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

*Enter your EIATIA factor*: N/A

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*: N/A

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)** |
|---|---|
| N/A | N/A |

## 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:* N/A

*Project Type:* N/A

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:* N/A

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

*Enter your TUTIA factor:* N/A

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:* N/A

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)** |
|---|---|
| N/A | N/A |

## 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.

N/A

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

*Average Daily Demand:* N/A

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:* N/A

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

*Enter the factor from Table 2-3:* N/A

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:* N/A

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

| **Minimum required non-potable use (Step 4)** | **Projected average daily use (Step 1)** |
|---|---|
| N/A | N/A |

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

## D.3 Bioretention and Biotreatment Assessment

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

*Select one of the following:*

☐ LID Bioretention/Biotreatment BMPs will be used for some or all DMAs of the project as noted below in Section D.4 (note the requirements of Section 3.4.2 in the WQMP Guidance Document).

☐ A site-specific analysis demonstrating the technical infeasibility of all LID BMPs has been performed and is included in Appendix 5. If you plan to submit an analysis demonstrating the technical infeasibility of LID BMPs, request a pre-submittal meeting with the Copermittee to discuss this option. Proceed to Section E to document your alternative compliance measures.

☒ Not applicable

## D.4 Feasibility Assessment Summaries

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

**Table D.2** LID Prioritization Summary Matrix

| DMA Name/ID | LID BMP Hierarchy | | | | Alternative Compliance |
|---|---|---|---|---|---|
| | 1. Infiltration | 2. Harvest and use | 3. Bioretention | 4. Biotreatment | |
| A1 | ☒ | ☐ | ☐ | ☐ | ☐ |
| A2 | ☒ | ☐ | ☐ | ☐ | ☐ |
| A3 | ☒ | ☐ | ☐ | ☐ | ☐ |
| B1 | ☒ | ☐ | ☐ | ☐ | ☐ |
| B2 | ☒ | ☐ | ☐ | ☐ | ☐ |
| C1 | ☒ | ☐ | ☐ | ☐ | ☐ |
| C2 | ☒ | ☐ | ☐ | ☐ | ☐ |

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

## D.5 LID BMP Sizing

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

**Table D.3** DCV Calculations for LID BMPs

| DMA Type/ID | DMA Area (square feet) | Post-Project Surface Type | Effective Impervious Fraction, $I_f$ | DMA Runoff Factor | DMA Areas x Runoff Factor | *Design Storm Depth (in)* | *Design Capture Volume,* $V_{BMP}$ *(cubic feet)* | *Proposed Volume on Plans (cubic feet)* |
|---|---|---|---|---|---|---|---|---|
| | [A] | | [B] | [C] | [A] x [C] | | | |
| A1 | 1,513,710 | Roofs/Conc/Asphalt | *1.00* | *0.89* | *1,350,229.3* | *0.66* | *74262.6* | *78,408* |
| A2 | 202,554 | Ornamental Landscaping | *0.10* | *0.11* | *22,373.7* | *0.66* | *1230.6* | |
| A3 | 330,185 | Natural (A Soil) | *0.03* | *0.06* | *20,650.1* | *0.66* | *1135.8* | |
| B1 | 933,055 | Roofs/Conc/Asphalt | *1.00* | *0.89* | *832,285.2* | *0.66* | *45775.7* | *48,308* |
| B2 | 107,593 | Ornamental Landscaping | *0.10* | *0.11* | *11,884.5* | *0.66* | *653.6* | |
| C1 | 85,813 | Roofs/Conc/Asphalt | *1.00* | *0.89* | *76,545.4* | *0.66* | *4210* | *4,596* |
| C2 | 4,356 | Ornamental Landscaping | *0.10* | *0.11* | *481.2* | *0.66* | *26.5* | |
| | *3,177,266* | | | | *2,314,449* | 0.66 | 127,294.8 | 131,312 |

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

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

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

# Section E: Alternative Compliance (LID Waiver Program)

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

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

- *Or* -

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

## E.1 Identify Pollutants of Concern

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

Table E.1 Potential Pollutants by Land Use Type

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

*P = Potential*
*N = Not Potential*
(1) *A potential Pollutant if non-native landscaping exists or is proposed onsite; otherwise not expected*
(2) *A potential Pollutant if the project includes uncovered parking areas; otherwise not expected*
(3) *A potential Pollutant is land use involving animal waste*
(4) *Specifically petroleum hydrocarbons*
(5) *Specifically solvents*
(6) *Bacterial indicators are routinely detected in pavement runoff*

## E.2 Stormwater Credits

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

Table E.2 Water Quality Credits

| Qualifying Project Categories | Credit Percentage[2] |
|---|---|
| N/A | |
| | |
| | |
| *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 Imp Fraction, $I_f$** | **DMA Runoff Factor** | **DMA Area x Runoff Factor** | *Design Storm Depth (in)* | *Minimum Design Capture Volume (cubic feet)* | *Total Storm Water Credit % Reduction* | *Proposed Volume or Flow on Plans (cubic feet or cfs)* |
|---|---|---|---|---|---|---|---|---|---|
| | [A] | | [B] | [C] | [A] x [C] | | | | |
| ***N/A*** | *N/A* | *N/A* | *N/A* | *N/A* | *N/A* | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

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

## E.4 Treatment Control BMP Selection

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

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

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

**Table E.4** Treatment Control BMP Selection

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

*[1] Treatment Control BMPs must not be constructed within Receiving Waters. In addition, a proposed Treatment Control BMP may be listed more than once if they possess more than one qualifying pollutant removal efficiency.*

*[2] Cross Reference Table E.1 above to populate this column.*

*[3] As documented in a Co-Permittee Approved Study and provided in Appendix 6.*

# Section F: Hydromodification

## F.1 Hydrologic Conditions of Concern (HCOC) Analysis

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

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

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

If Yes, HCOC criteria do not apply.

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

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

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

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

**Table F.1** Hydrologic Conditions of Concern Summary

| | 2 year – 24 hour | | |
|---|---|---|---|
| | **Pre-condition** | **Post-condition** | **% Difference** |
| **Time of Concentration (min)** | n/a | n/a | n/a |
| **Volume (Acre Feet)** | n/a | n/a | n/a |

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

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

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

If Yes, HCOC criteria do not apply and note below which adequate sump applies to this HCOC qualifier: See Appendix 7 for HCOC map (adequate sump is Prado Dam).

## F.2 HCOC Mitigation

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

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

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

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

**Hydrologic conditions of concern (HCOC) will be mitigated via the proposed infiltration basins and the underground chambers. The difference in volumes between the existing and proposed 2-year, 24-hour storm event will be retained onsite. Refer to Appendix 7 for existing and proposed hydrographs and provided volumes in the infiltration basins and underground chambers.**

All pertinent documentation used in analysis of the items a, b or c can be found in Appendix 7.

# Section G: Source Control BMPs

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

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

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

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

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

**Table G.1** Permanent and Operational Source Control Measures

| Potential Sources of Runoff pollutants | Permanent Structural Source Control BMPs | Operational Source Control BMPs |
|---|---|---|
| **A.** On-site storm drain inlets | • Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. | • Maintain and periodically repaint or replace inlet markings annually.<br>• Provide stormwater pollution prevention information to new site owners, lessees, or operators upon occupancy and annually thereafter.<br>• See CASQA fact sheet SC-44 for "Drainage System Maintenance," included in Appendix of this document.<br>• Include the following lease agreements: "Tenant shall not allow anyone to discharge anything to storm drain or to store or deposit materials so as to create a potential discharge to storm drains." |

| Potential Sources of Runoff pollutants | Permanent Structural Source Control BMPs | Operational Source Control BMPs |
|---|---|---|
| **B.** Interior floor drains and elevator shaft sump pumps | • Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer. | • Inspect and maintain drains semi-annually to prevent blockages and overflow. |
| **D2.** Landscape / Outdoor Pesticide Use | • Landscape plans will 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.<br>• Pest-resistant plans will be used adjacent to hardscape.<br>• The landscape plans will consider plants appropriate to the site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions. | • Maintain landscaping only using minimum pesticides, when needed.<br>• See Appendix 10 for “Landscape and Gardening” brochure by RCFlood.<br>• Provide Integrated Pest Management (IPM) information to new owners, lessees and operators upon occupancy and annually thereafter. IPM is an effective and environmentally sensitive approach to pest management. |
| **G.** Refuse Areas | • Site refuse will be handled by contractor on a weekly basis.<br>• Signs will be posted on or near dumpsters with the words “Do not dump hazardous materials here” or similar. | • A minimum of two receptacles will be provided and located indoors. Receptacles are to be inspected daily and repairs or replacements to leaky receptacles will be completed immediately. Receptacles are to remain covered when not in use. Dumping of liquid or hazardous wastes is prohibited. A “no hazardous materials” sign will be posted. Spills will be cleaned immediately upon discovery. Spill control materials will be available onsite. See Appendix 10 for CASQA fact sheet SC-34 for “Waste Handling and Disposal.” |
| **H.** Industrial processes | • All process activities to be performed indoors. No processes to drain to exterior or to storm drain system. | • See Appendix 10 for CASQA fact sheet SC-10 for “Non-Stormwater Discharges” |
| **M.** Loading Docks | • Spills will be cleaned up immediately and disposed of properly. | • Move loaded and unloaded items indoors as soon as possible.<br>• See Appendix 10 for CASQA fact sheet SC-30 for “Outdoor Loading and Unloading” |
| **P.** Plazas, sidewalks, and parking lots | | • Sweep plazas, sidewalks, and parking lots monthly 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. |

# Section H: Construction Plan Checklist

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

**Table H.1** Construction Plan Cross-reference

| BMP No. or ID | BMP Identifier and Description | Corresponding Plan Sheet(s) | Latitude | Longitude |
|---|---|---|---|---|
| A | On-site storm drain inlets | WQMP Site Map | --- | --- |
| B | Interior floor drains and elevator shaft sump pumps | N/A | --- | --- |
| D2 | Landscape / Outdoor Pesticide Use | On-site Landscape Improvement Plans | --- | --- |
| G | Refuse Areas | WQMP Site Map | --- | --- |
| H | Industrial processes | WQMP Site Map (indoors, if any) | --- | --- |
| M | Loading Docks | WQMP Site Map | --- | --- |
| P | Plazas, sidewalks, and parking lots | N/A | --- | --- |
| IF-A | Infiltration Basin-A | WQMP Site Map | 34.01306 | -117.39895 |
| IF-B | Infiltration Basin-B | WQMP Site Map | 34.01496 | -117.39548 |
| STC-C | Underground Chambers-C | WQMP Site Map | 34.01337 | -117.39658 |

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

# Section I: Operation, Maintenance and Funding

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

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

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

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

**Maintenance Mechanism:**

City of Jurupa Valley:
Water Quality Management Plan and Stormwater BMP Operation and Maintenance Agreement

The maintenance mechanism mentioned above will be executed by the owner and will be tied to the property. The maintenance mechanism will ensure that all structural BMPs and other control measures specified in this WQMP receive periodic and continuous maintenance as per the Operation and Maintenance Plan (O&M Plan) included in Appendix 9. Funding required to maintain the BMPs will be provided by the owner stated below.

**Proficiency Rubidoux, LLC**
5020 Campus Drive
Newport Beach, CA 92660
Phone: (949) 296-7006
Contact: Jeff Trenton

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

☒ Y ☐ N

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

# Appendix 1: Maps and Site Plans

*Location Map, WQMP Site Plan and Receiving Waters Map*

Last Update: 6/28/23
O:\3300-3399\3384\3384Vicinity_Map.dwg

# VICINITY MAP

FOR

# RUBIDOUX COMMERCE PARK

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

FLOW

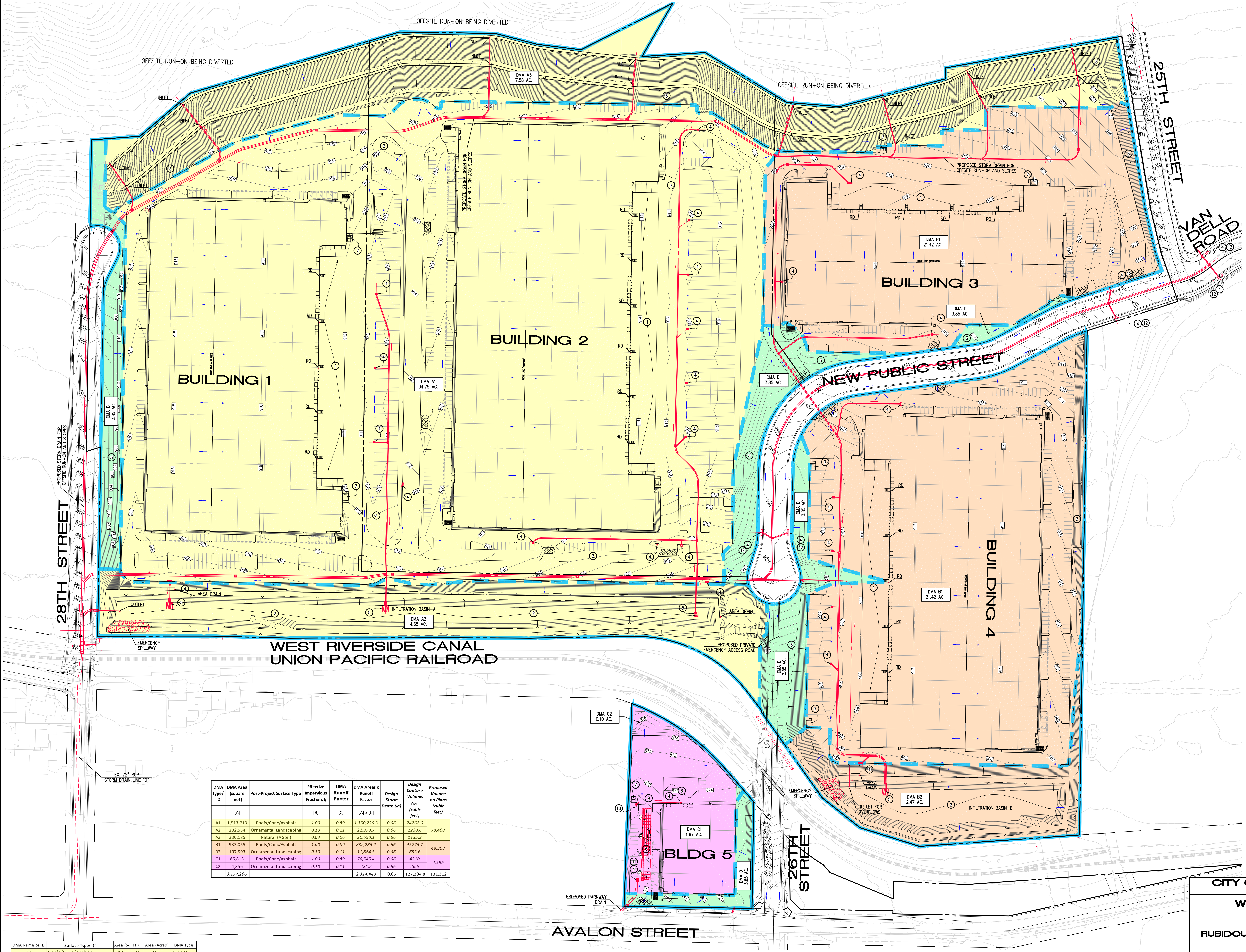
# RECEIVING WATERS MAP

FOR

# RUBIDOUX COMMERCE PARK

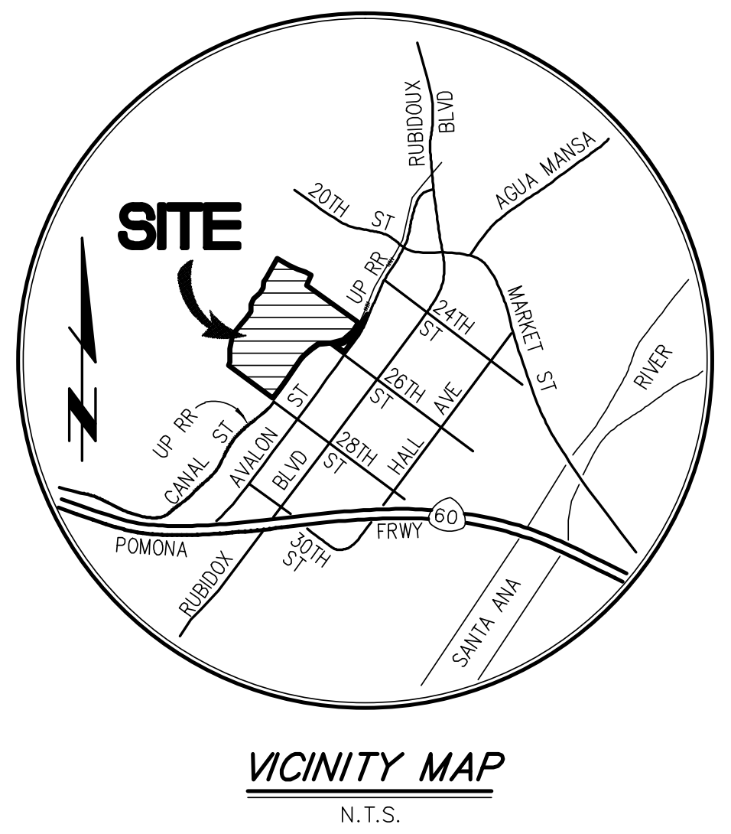
*Thienes Engineering, Inc.*
*CIVIL ENGINEERING • LAND SURVEYING*
*14349 FIRESTONE BOULEVARD*
*LA MIRADA, CALIFORNIA 90638*
*PH.(714)521-4811 FAX(714)521-4173*

Last Update: 6/28/23
O:\3300-3399\3384\3384Vicinity_Map.dwg



| DMA Type/ ID | DMA Area (square feet) | Post-Project Surface Type | Effective Impervious Fraction, $I_f$ | DMA Runoff Factor | DMA Areas x Runoff Factor | Design Storm Depth (in) | Design Capture Volume, $V_{BMP}$ (cubic feet) | Proposed Volume on Plans (cubic feet) |
|---|---|---|---|---|---|---|---|---|
| | [A] | | [B] | [C] | [A] x [C] | | | |
| A1 | 1,513,710 | Roofs/Conc/Asphalt | 1.00 | 0.89 | 1,350,229.3 | 0.66 | 74262.6 | 78,408 |
| A2 | 202,554 | Ornamental Landscaping | 0.10 | 0.11 | 22,373.7 | 0.66 | 1230.6 | |
| A3 | 330,185 | Natural (A Soil) | 0.03 | 0.06 | 20,650.1 | 0.66 | 1135.8 | |
| B1 | 933,055 | Roofs/Conc/Asphalt | 1.00 | 0.89 | 832,285.2 | 0.66 | 45775.7 | 48,308 |
| B2 | 107,593 | Ornamental Landscaping | 0.10 | 0.11 | 11,884.5 | 0.66 | 653.6 | |
| C1 | 85,813 | Roofs/Conc/Asphalt | 1.00 | 0.89 | 76,545.4 | 0.66 | 4210 | 4,596 |
| C2 | 4,356 | Ornamental Landscaping | 0.10 | 0.11 | 481.2 | 0.66 | 26.5 | |
| | 3,177,266 | | | | 2,314,449 | 0.66 | 127,294.8 | 131,312 |

| DMA Name or ID | Surface Type(s)[1] | Area (Sq. Ft.) | Area (Acres) | DMA Type |
|---|---|---|---|---|
| A1 | Roofs/Conc/Asphalt | 1,513,710 | 34.75 | Type D |
| A2 | Ornamental Landscaping | 202,554 | 4.65 | Type D |
| A3 | Natural (A Soil) | 330,185 | 7.58 | Type D |
| B1 | Roofs/Conc/Asphalt | 933,055 | 21.42 | Type D |
| B2 | Ornamental Landscaping | 107,593 | 2.47 | Type D |
| C1 | Roofs/Conc/Asphalt | 85,813 | 1.97 | Type D |
| C2 | Ornamental Landscaping | 4,356 | 0.10 | Type D |
| D | Ornamental Landscaping | 167,706 | 3.85 | Type A |



VICINITY MAP
N.T.S.

## LEGEND

① ABOVEGROUND LOADING DOCK
② INFILTRATION BASIN
③ LANDSCAPE/EFFICIENT IRRIGATION
④ STORM DRAIN SYSTEM SIGNS "ONLY RAIN DOWN THE STORM DRAIN"
⑤ FOREBAY
⑥ SC-740 STORMTECH CHAMBERS
⑦ TRASH ENCLOSURES
⑧ TRUCK WELL
⑨ SUMP PUMP
⑩ FORCE MAIN
⑪ DRAIN INSERTS
⑫ CONNECTOR PIPE SCREENS (CPS) / FULL CAPTURE

| | |
|---|---|
| RD | ROOF DRAIN |
| ▬ | BOUNDARY |
| ▬ ▬ | DRAINAGE AREAS |
| ← | SURFACE FLOW LINE |
| ← | SD FLOW LINE |

## BMP SD-13:

SAMPLE STENCIL TO BE USED NEAR GRATE AND CURB OPENING INLETS

SAMPLE CATCH BASIN STENCIL

0 40 80 160 240
SCALE: 1"=80'

Last Update: 6/27/23
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# CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

## WQMP SITE MAP

## RUBIDOUX COMMERCE CENTER
## 26TH STREET

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
PHONE: (949) 296-7006

**PREPARED BY:**

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

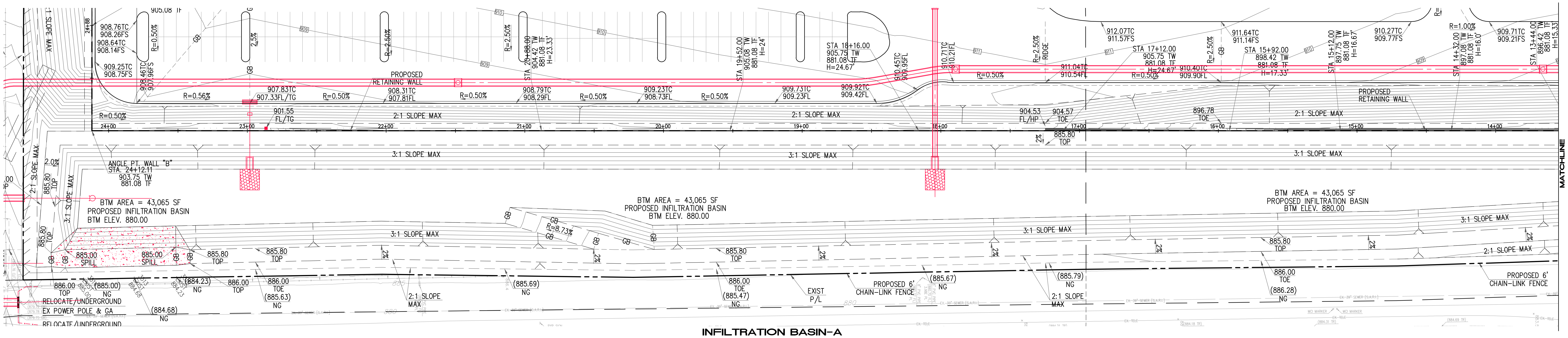
Designed by ______
Date ______
Checked by ______
Date ______
Designed by ______
Date ______
Checked by ______
Date ______

Approved by Date ______

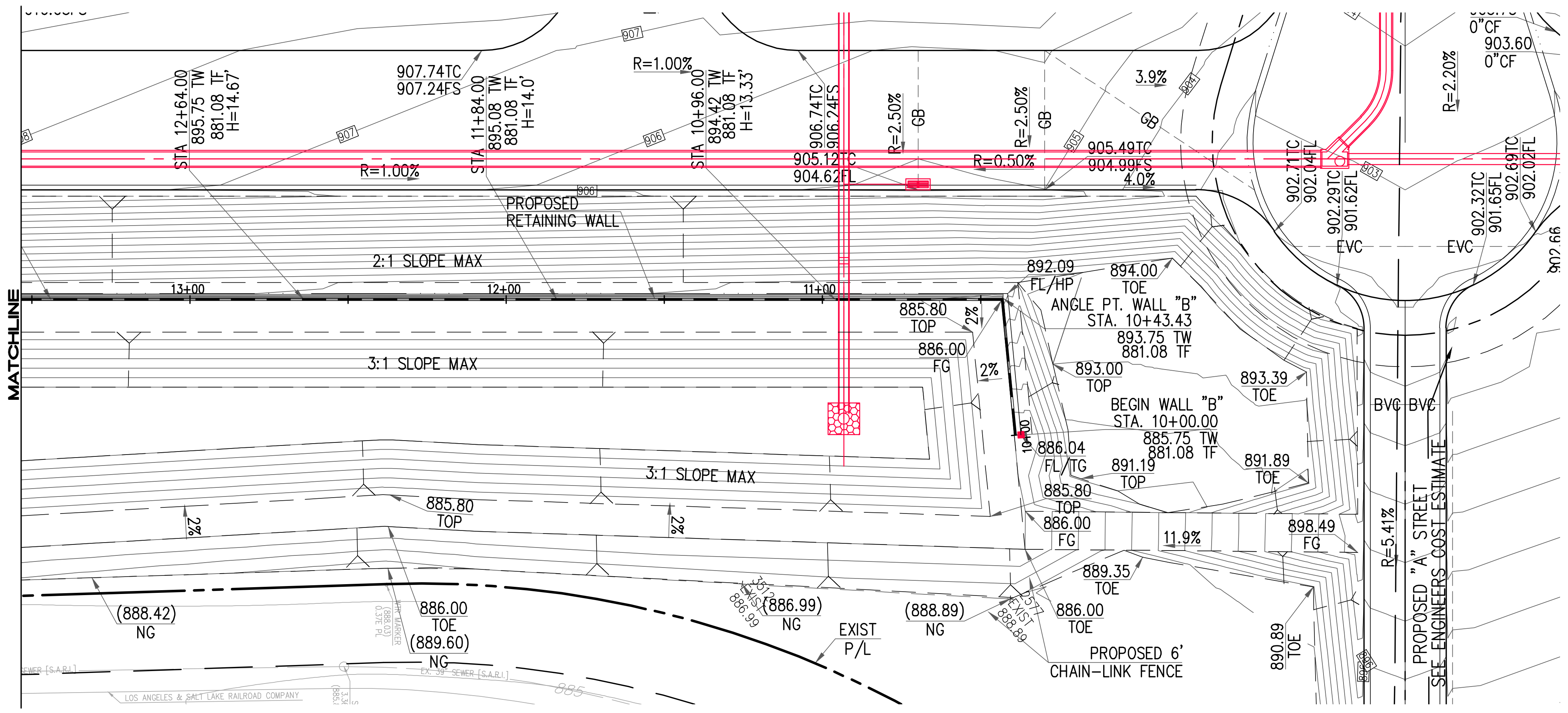
Public Works Director R.C.E. ______

Sheet 1 of 3 Sheets

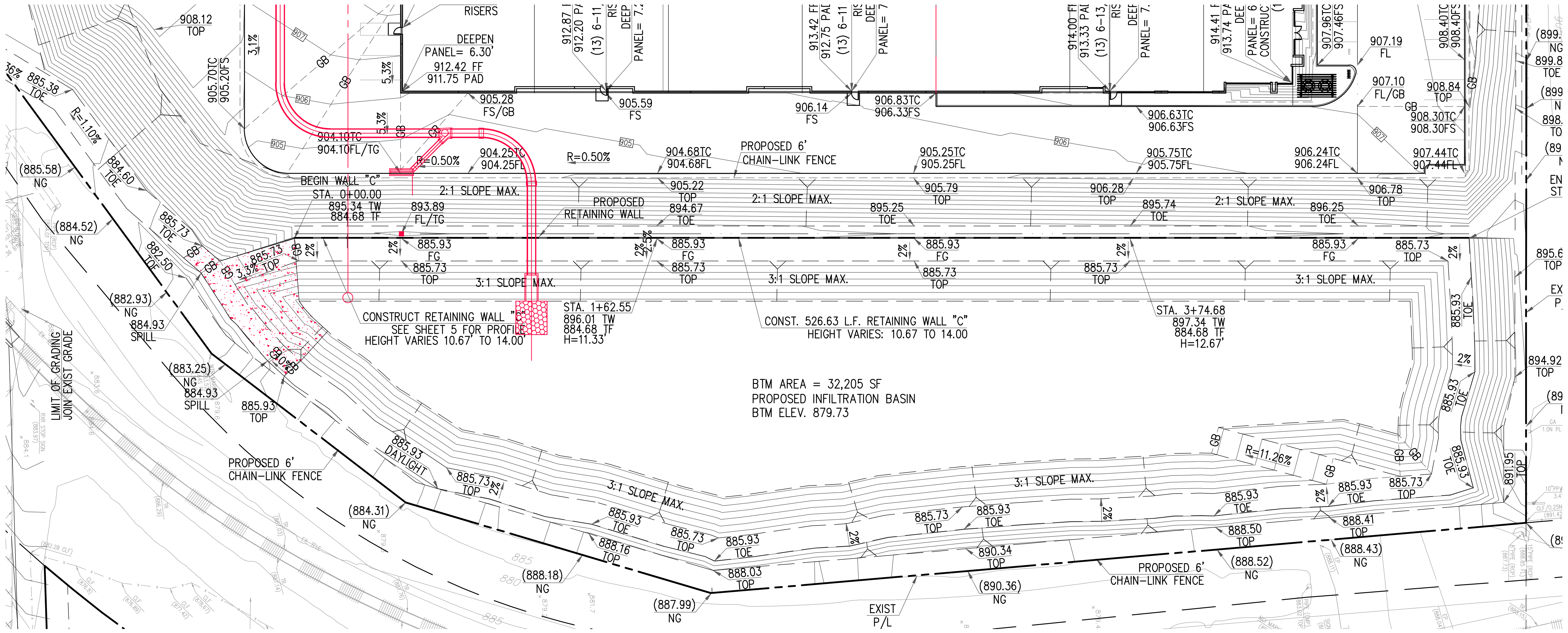
3384/1 OF 3 SHEETS



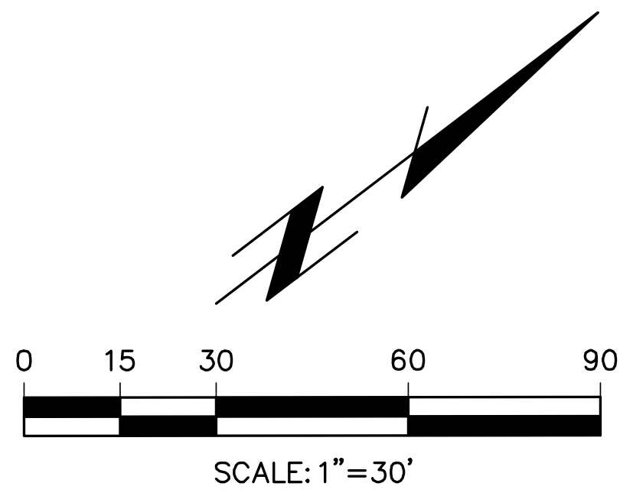
INFILTRATION BASIN-A



INFILTRATION BASIN-A



INFILTRATION BASIN-B



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# CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

# WQMP SITE MAP

## RUBIDOUX COMMERCE CENTER
## 26TH STREET

**PREPARED FOR:**

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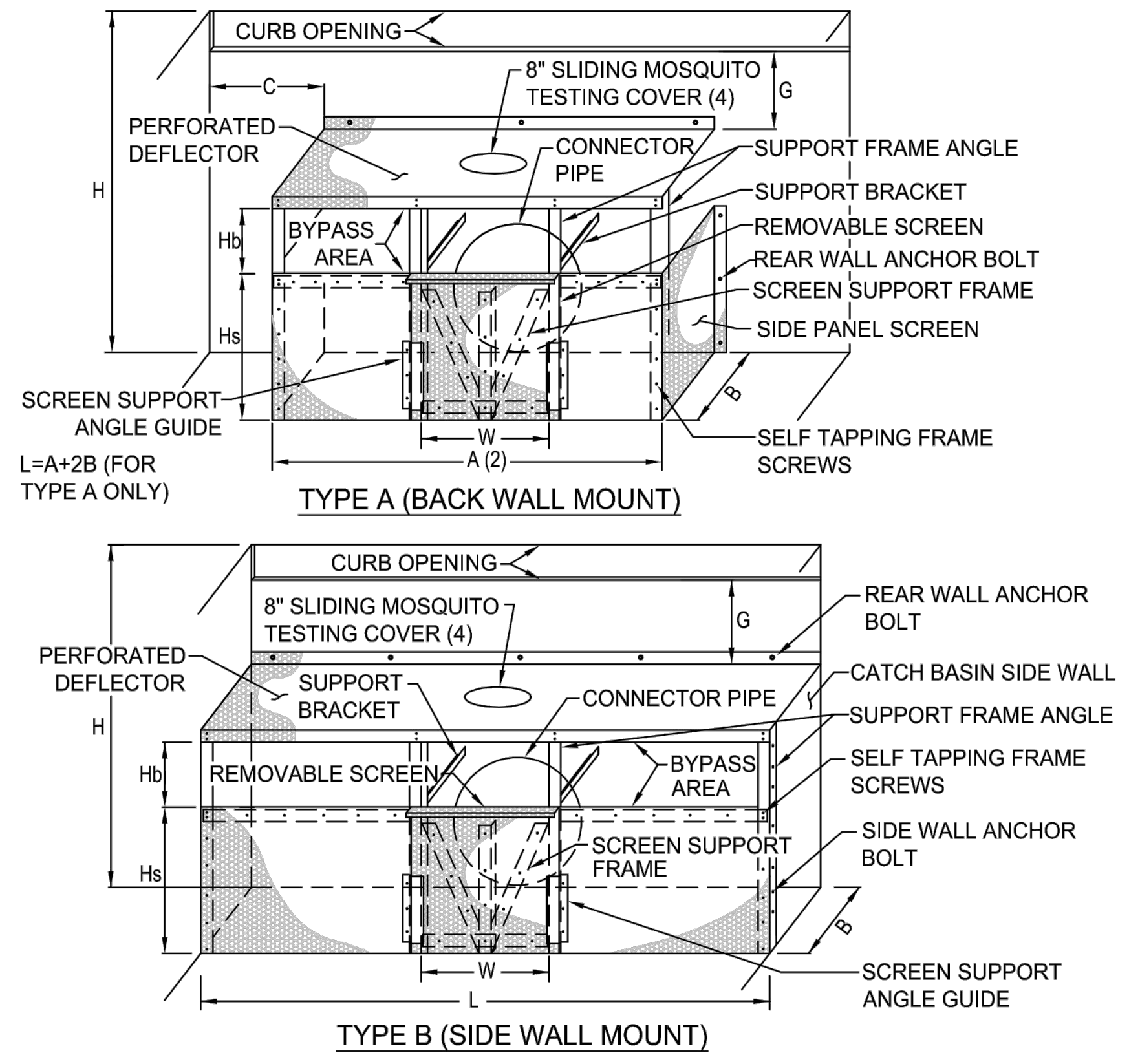
Designed by ______
Date ______
Checked by ______
Date ______
Designed by ______
Date ______
Checked by ______
Date ______

Approved by Date ______

Public Works Director R.C.E. ______

Sheet 2 of 3 Sheets

3384/2 OF 3 SHEETS



TYPE A (BACK WALL MOUNT)

TYPE B (SIDE WALL MOUNT)

DIMENSIONS:

| | |
|---|---|
| SCREEN LENGTH (1) | L |
| REMOVABLE SCREEN WIDTH (2) | W (24" TO 36") |
| SCREEN HEIGHT (1) | Hs |
| SCREEN BYPASS HEIGHT (1) | Hb |
| MINIMUM WALL CLEARANCE (2) | C=12" |
| MINIMUM INTERIOR SPACE (2) | B=10" |
| DISTANCE BELOW GUTTER FL (1) | G |
| CATCH BASIN HEIGHT (5) | H |

NOTES:

(1) SEE TABLES ON PAGES 10-13 FOR VALUES
(2) SEE FTCD GENERAL NOTES ON STD 313-3
(3) SEE FTCD SCREEN TYPE AND LOCATIONS WITHIN CATCH BASINS ON STD 313-4 TO -8
(4) MOSQUITO TESTING COVER REQUIRED ONLY FOR STD NOS. 301 AND 302 APPLICATIONS
(5) CB HEIGHT IS VERTICAL DISTANCE FROM TOP OF CURB TO OUTLET PIPE FLOW LINE

APPROVED BY:

DIRECTOR OF TRANSPORTATION DATE
PATRICIA ROMO, RCE 56064

| REVISIONS | | REV. | BY: | APR'D | DATE | REV. | BY: | APR'D | DATE |
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COUNTY OF RIVERSIDE

FULL TRASH CAPTURE DEVICE (FTCD) - CONNECTOR PIPE SCREEN (CPS)

STANDARD NO. 313 (1 of 14)

---

FCTD SPECIFICATIONS

1. FULL TRASH CAPTURE DEVICE (FTCD) SHALL BE A UNITED STORM WATER, INC. CONNECTOR PIPE SCREEN (CPS) OR EQUIVALENT. EQUIVALENT SYSTEMS OR ALTERNATIVE DESIGNS SHALL BE ON THE STATE OF CALIFORNIA APPROVED TRASH CAPTURE DEVICE LIST AND REQUIRE APPROVAL OF THE TRANSPORTATION DEPARTMENT.
2. FTCD SHALL HAVE STRUCTURAL FRAME FOR STIFFNESS AND TO ENABLE BOLTING TO CATCH BASIN FLOOR AND WALL. FRAME MEMBERS SHALL BE FABRICATED FROM PERFORATED 14 GAUGE GRADE 304 STAINLESS STEEL HAVING 5 MM DIAMETER HOLES.
3. FTCD SCREENS SHALL BE FABRICATED FROM PERFORATED 14 GAUGE GRADE 304 STAINLESS STEEL HAVING 5 mm DIAMETER HOLES.
4. FTCD SHALL HAVE A PERFORATED DEFLECTOR SCREEN COVERING THE TOP OF THE FTCD TO PROHIBIT DEBRIS FROM FALLING BEHIND THE FRONT AND SIDE SCREENS. THE DEFLECTOR SHALL BE ABLE TO WITHSTAND A VERTICAL LOAD OF 10 LBS PER SQUARE FOOT
5. FTCD FRAME AND SCREEN SHALL HAVE SUFFICIENT STRUCTURAL INTEGRITY TO WITHSTAND THE FORCE OF STANDING WATER IN THE CATCH BASIN ASSUMING THE SCREEN IS 100% CLOGGED.
6. FCTD SHALL BE FASTENED TO THE CATCH BASIN WALLS AND FLOOR WITH ANCHOR BOLTS. ANCHOR BOLTS SHALL BE SS-304, 3/8" DIAMETER AND 3" LENGTH, AND SHALL BE EPOXY SET INTO CATCH BASIN CONCRETE. IF REINFORCEMENT STEEL IS ENCOUNTERED DURING INSTALLATION, RELOCATE THE ANCHOR HOLE AND FILL VACANT HOLE WITH EPOXY. EPOXY SHALL BE ON THE CURRENT APPROVED LIST OF CHEMICAL ADHESIVES FOR USE IN CALTRANS CONTRACTS. ANCHOR BOLT SPACING TO BE 12" O.C. EXCEPT WHERE FRAME LENGTH WOULD RESULT IN LESS THAN 3 BOLTS PER FRAME MEMBER. IN THIS CASE FASTEN FRAME TO CATCH BASIN WALL USING 3 ANCHOR BOLTS.
7. THE SCREEN SHALL BE SECURED TO THE SUPPORT FRAME, BRACKETS AND SIDE PANEL USING #12 X 0.5" SELF TAPPING SS-304 TECH SCREWS .
8. THE FTCD SHALL BE FABRICATED ON SITE TO BE FLUSH WITH THE INTERIOR SURFACES OF THE CATCH BASIN. THE MAXIMUM ALLOWABLE GAP BETWEEN THE FTCD AND THE CATCH BASIN SURFACES IS 5MM (0.197 INCHES).
9. FOR SCREEN SPANS (DIMENSION "A" FOR TYPE A OR DIMENSION "L" FOR TYPE B PER STD. 313-1) GREATER THAN 36" PROVIDE ADDITIONAL SUPPORT BRACKETS AND SUPPORT FRAME ANGLES AT 36" ON CENTER OR LESS. SEE STD. 313-1 TYPE B FOR TYPICAL SUPPORT BRACKET AND SUPPORT FRAME ANGLE CONFIGURATION.

APPROVED BY:

DIRECTOR OF TRANSPORTATION DATE
PATRICIA ROMO, RCE 56064

| REVISIONS | | REV. | BY: | APR'D | DATE | REV. | BY: | APR'D | DATE |
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COUNTY OF RIVERSIDE

FTCD - CPS SPECIFICATIONS

STANDARD NO. 313 (2 of 14)

---

FTCD GENTERAL NOTES (NEW CONSTRUCTION)

1. FTCD SHALL CONFORM TO THE CONFIGURATIONS SHOWN IN STD. 313-4 THROUGH 313-8 AND SHALL BE SIZED ACCORDING TO THE SIZING TABLES SHOWN IN STD. 313-10 THROUGH 313-13.
2. THE REMOVABLE SCREEN WIDTH (W) SHALL EQUAL THE CONNECTOR PIPE DIAMETER OR 24", WHICHEVER IS GREATER, BUT SHALL NOT EXCEED 36". WHERE DIMENSION "A" PER STD. 313-1 TYPE A (BACK WALL MOUNT) IS LESS THAN OR EQUAL TO 36", THE REMOVABLE SCREEN MAY EXTEND THE FULL WIDTH OF THE FTCD (W = A). IN THIS CASE SUPPORT BRACKETS AND THE ASSOCIATED SUPPORT FRAME ANGLES WILL BE OMITTED.
3. IF THE FTCD CANNOT PROVIDE A SIDE WALL CLEARANCE (C) OF 12", PROVIDE A SIDE WALL MOUNT. AN L-SHAPED FTCD WILL HAVE ONE SIDE WALL AND ONE BACK WALL MOUNT.
4. THE INTERIOR SPACE DIMENSION "B" PER DRAWING 313-1 TYPE A, SHALL BE AT LEAST 10" UNLESS OTHERWISE AUTHORIZED BY THE TRANSPORTATION DEPARTMENT.
5. POSITIVE DRAINAGE TO THE OUTLET PIPE IS REQUIRED FOR THE ENTIRE CATCH BASIN FLOOR.
6. THE CATCH BASIN SHALL INCLUDE MAINTENANCE GAUGE STENCILING ON THE INTERIOR WALL OPPOSITE THE FTCD THAT IDENTIFIES THE ACCUMULATED DEBRIS ELEVATION AT 40% AND 100% OF THE FTCD HEIGHT. SEE STD. 313-9 FOR STENCILING REQUIREMENTS.
7. TRANSPORTATION DEPT. APPROVAL REQUIRED WHERE CONNECTOR PIPE SIZE > 42" DIA.
8. CATCH BASINS (NEW OR EXISTING) WITH FOSSIL FILTERS (PER STANDARD 300A OR EQUIVALENT) SHALL REQUIRE SPECIAL CONSIDERATION FOR INCORPORATION OF THE FTCD. A MODIFIED FTCD DESIGN SHALL BE SUBMITTED TO THE TRANSPORTATION DEPARTMENT FOR REVIEW AND APPROVAL PRIOR TO FABRICATION.
9. ENGINEER MAY PREPARE SITE SPECIFIC CPS DESIGN UTILIZING THE CPS FLOW CHART PER STD. 313-14 IN LIEU OF SIZING PER STD. 313-10 THROUGH 313-13.

FTCD RETROFIT NOTES

10. WHERE MANHOLE CONFIGURATIONS IN THE EXISTING CATCH BASIN DO NOT CONFORM WITH FTCD LOCATIONS SHOWN IN STD. 313-4 THROUGH 313-8, NEW MANHOLES OPENINGS SHALL BE INSTALLED TO CONFORM WITH THESE REQUIREMENTS. RETROFIT DESIGN DRAWINGS MUST BE APPROVED BY THE TRANSPORTATION DEPARTMENT.
11. IF ADEQUATE SPACE IS NOT AVAILABLE FOR RETROFIT OF EXISTING CATCH BASIN WITH FTCD, A MODIFIED FTCD DESIGN SHALL BE SUBMITTED TO THE TRANSPORTATION DEPARTMENT FOR REVIEW AND APPROVAL PRIOR TO FABRICATION.
12. CATCH BASINS THAT DO NOT DRAIN TOWARD THE CONNECTOR PIPE SHALL BE MODIFIED TO DRAIN PROPERLY UTILIZING A POLYESTER POLYMER CONCRETE OVERLAY PRODUCT APPROVED BY THE TRANSPORTATION DEPT. PRIOR TO INSTALLATION OF THE FTCD. THE BASIN FLOOR SHALL BE ROUGHENED TO THE SATISFACTION OF THE TRANSPORTATION DEPT. PRIOR TO APPLICATION OF THE OVERLAY. SURFACE PREPARATION MUST PROVIDE FOR MINIMUM OVERLAY THICKNESS PER OVERLAY PRODUCT MANUFACTURER'S SPECIFICATIONS. PROPER DRAINAGE OF BASIN FLOOR SHALL BE ACHIEVED TO THE SATISFACTION OF THE TRANSPORTATION DEPT.

APPROVED BY:

DIRECTOR OF TRANSPORTATION DATE
PATRICIA ROMO, RCE 56064

| REVISIONS | | REV. | BY: | APR'D | DATE | REV. | BY: | APR'D | DATE |
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COUNTY OF RIVERSIDE

FTCD - CPS GENERAL NOTES AND RETROFIT NOTES

STANDARD NO. 313 (3 of 14)

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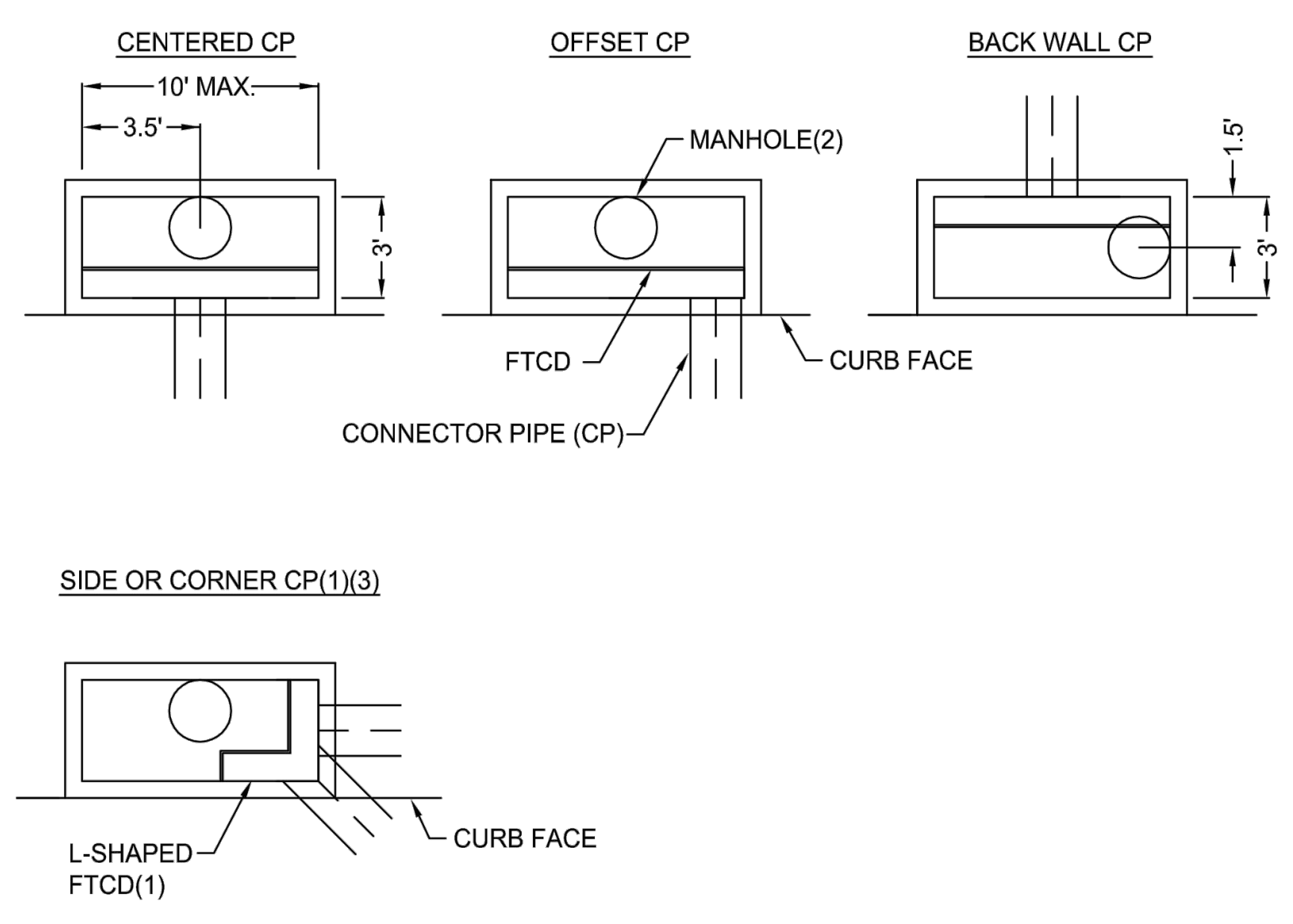

NOTES

(1) FOR CORNER AND SIDE CONNECTOR PIPE (CP) LOCATIONS THE FTCD SHALL BE L-SHAPED TO FULLY COVER THE PIPE OPENING. A SUPPORT FRAME ANGLE SHALL BE PROVIDED IN THE CPS CORNER.
(2) DETAIL VALID FOR CATCH BASIN WIDTHS LESS THAN OR EQUAL TO 10 FEET. MULTIPLE MANHOLES REQUIRED FOR CATCH BASIN WIDTHS GREATER THAN 10 FEET. SEE STANDARD NO. 313-5 AND 313-6.
(3) FOR SIDE OR CORNER CP LOCATIONS WHERE REQUIRED SCREEN LENGTH (L) CANNOT BE ACHIEVED SPECIAL DESIGN MUST BE SUBMITTED TO THE TRANSPORTATION DEPARTMENT FOR REVIEW AND APPROVAL.

APPROVED BY:

DIRECTOR OF TRANSPORTATION DATE
PATRICIA ROMO, RCE 56064

| REVISIONS | | REV. | BY: | APR'D | DATE | REV. | BY: | APR'D | DATE |
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COUNTY OF RIVERSIDE

FTCD - CPS SCREEN / MANHOLE LOCATIONS FOR 10' MAX. WIDTH STD. NO. 300 CURB INLET CATCH BASINS

STANDARD NO. 313 (4 OF 14)

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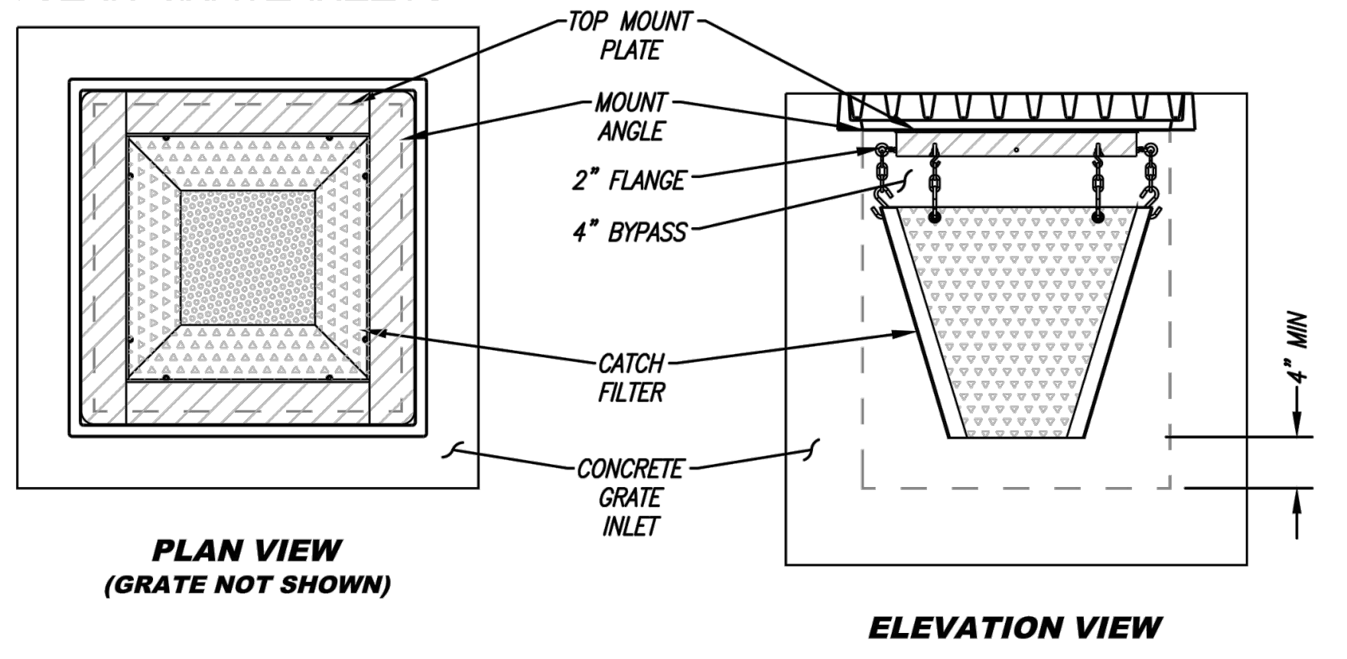
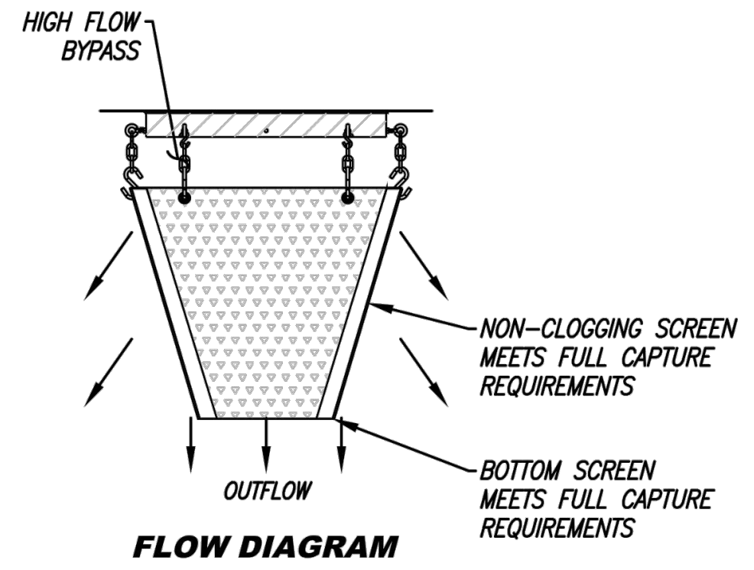
## BIO CLEAN FULL CAPTURE FILTER
## FOR USE IN GRATE INLETS



PLAN VIEW
(GRATE NOT SHOWN)

ELEVATION VIEW



FLOW DIAGRAM

| MODEL # | TREATMENT FLOW RATE (CFS) | BYPASS FLOW (CFS) | SOLIDS STORAGE CAPACITY (CF) |
|---|---|---|---|
| BIO-GRATE-FULL 12-12-12 | 1.04 | 1.24 | 0.15 |
| BIO-GRATE-FULL 18-18-12 | 1.78 | 2.79 | 0.33 |
| BIO-GRATE-FULL 24-24-12 | 2.70 | 4.96 | 0.59 |
| BIO-GRATE-FULL 24-40-12 | 3.70 | 6.35 | 0.88 |
| BIO-GRATE-FULL 24-24-24 | 7.31 | 4.96 | 1.22 |
| BIO-GRATE-FULL 24-40-24 | 9.53 | 6.35 | 1.82 |
| BIO-GRATE-FULL 36-36-24 | 11.93 | 7.74 | 2.73 |

INSTALLATION NOTES:

1. ALL HARDWARE, FLANGE, FRAME, SCREENS SHALL BE STAINLESS STEEL.
2. OPTIONAL HYDROCARBON BOOM SHALL BE 2" DIAMETER.
3. SEE PERFORMANCE REPORTS IN MANUFACTURES SPECIFICATIONS.
4. OTHER STANDARD AND CUSTOM MODEL SIZES AVAILABLE – CONTACT BIO CLEAN FOR MORE INFORMATION.
5. BASED ON 37% OPEN AREA.
6. CONSIDERS A SAFETY FACTOR OF 2.0.
7. CONSIDERS A LOCAL DEPRESSION PONDING DEPTH OF 6 INCHES.
8. STORAGE CAPACITY BASED ON THE BASKET HALF FULL.
9. CONCRETE STRUCTURES SOLD SEPARATELY.

NOT TO SCALE

9/23/22CSSCHIPPER

PROPRIETARY AND CONFIDENTIAL:

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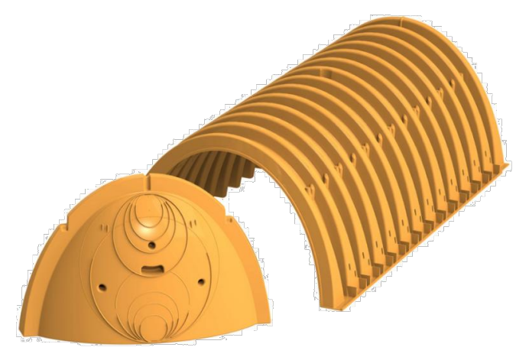
CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com

GRATE INLET FILTER
FULL CAPTURE
STANDARD DETAIL

---

# StormTech® SC-740 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.



**Nominal Chamber Specifications**
(not to scale)

**Size (L x W x H)**
85.4” x 51” x 30”
2,170 mm x 1,295 mm x 762 mm

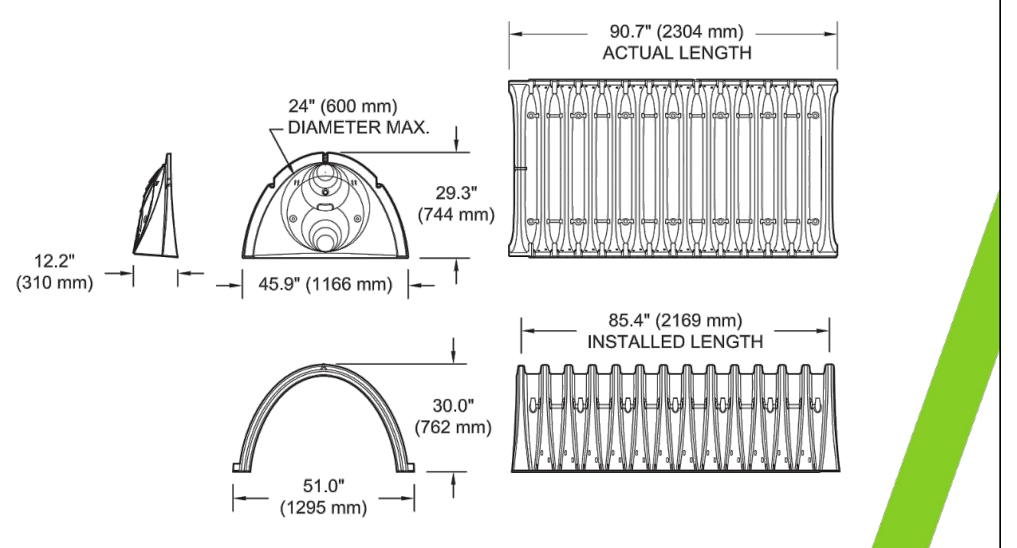
**Chamber Storage**
45.9 ft³ (1.30 m³)

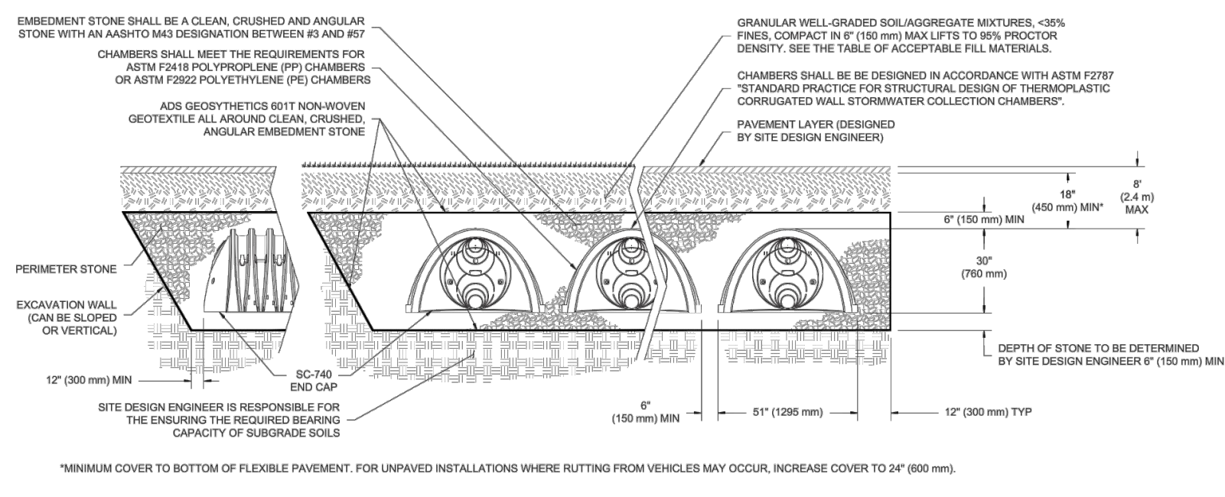
**Min. Installed Storage***
74.9 ft³ (2.12 m³)

**Weight**
74.0 lbs (33.6 kg)

**Shipping**
30 chambers/pallet
60 end caps/pallet
12 pallets/truck

*Assumes 6” (150 mm) stone above, below and between chambers and 40% stone porosity.





*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

ADS StormTech

---

## StormTech SC-740 Specifications

### Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 6” (150 mm) Stone Base Under Chambers.

| Depth of Water in System Inches (mm) | | Cumulative Chamber Storage ft³ (m³) | Total System Cumulative Storage ft³ (m³) |
|---|---|---|---|
| 42 (1067) | Stone Cover | 45.90 (1.300) | 74.90 (2.121) |
| 41 (1041) | | 45.90 (1.300) | 73.77 (2.089) |
| 40 (1016) | | 45.90 (1.300) | 72.64 (2.057) |
| 39 (991) | | 45.90 (1.300) | 71.52 (2.025) |
| 38 (965) | | 45.90 (1.300) | 70.39 (1.993) |
| 37 (940) | | 45.90 (1.300) | 69.26 (1.961) |
| 36 (914) | | 45.90 (1.300) | 68.14 (1.929) |
| 35 (889) | | 45.85 (1.298) | 66.98 (1.897) |
| 34 (864) | | 45.69 (1.294) | 65.75 (1.862) |
| 33 (838) | | 45.41 (1.286) | 64.46 (1.825) |
| 32 (813) | | 44.81 (1.269) | 62.97 (1.783) |
| 31 (787) | | 44.01 (1.246) | 61.36 (1.737) |
| 30 (762) | | 43.06 (1.219) | 59.66 (1.689) |
| 29 (737) | | 41.98 (1.189) | 57.89 (1.639) |
| 28 (711) | | 40.80 (1.155) | 56.05 (1.587) |
| 27 (686) | | 39.54 (1.120) | 54.17 (1.534) |
| 26 (660) | | 38.18 (1.081) | 52.23 (1.479) |
| 25 (635) | | 36.74 (1.040) | 50.23 (1.422) |
| 24 (610) | | 35.22 (0.977) | 48.19 (1.365) |
| 23 (584) | | 33.64 (0.953) | 46.11 (1.306) |
| 22 (559) | | 31.99 (0.906) | 44.00 (1.246) |
| 21 (533) | | 30.29 (0.858) | 1.85 (1.185) |
| 20 (508) | | 28.54 (0.808) | 39.67 (1.123) |
| 19 (483) | | 26.74 (0.757) | 37.47 (1.061) |
| 18 (457) | | 24.89 (0.705) | 35.23 (0.997) |
| 17 (432) | | 23.00 (0.651) | 32.96 (0.939) |
| 16 (406) | | 21.06 (0.596) | 30.68 (0.869) |
| 15 (381) | | 19.09 (0.541) | 28.36 (0.803) |
| 14 (356) | | 17.08 (0.484) | 26.03 (0.737) |
| 13 (330) | | 15.04 (0.426) | 23.68 (0.670) |
| 12 (305) | | 12.97 (0.367) | 21.31 (0.608) |
| 11 (279) | | 10.87 (0.309) | 18.92 (0.535) |
| 10 (254) | | 8.74 (0.247) | 16.51 (0.468) |
| 9 (229) | | 6.58 (0.186) | 14.09 (0.399) |
| 8 (203) | | 4.41 (0.125) | 11.66 (0.330) |
| 7 (178) | | 2.21 (0.063) | 9.21 (0.264) |
| 6 (152) | Stone Foundation | 0 (0) | 6.76 (0.191) |
| 5 (127) | | 0 (0) | 5.63 (0.160) |
| 4 (102) | | 0 (0) | 4.51 (0.128) |
| 3 (76) | | 0 (0) | 3.38 (0.096) |
| 2 (51) | | 0 (0) | 2.25 (0.064) |
| 1 (25) | | 0 (0) | 1.13 (0.032) |

**Note:** Add 1.13 ft³ (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

### Storage Volume Per Chamber ft³ (m³)

| | Bare Chamber Storage ft³ (m³) | Chamber and Stone Foundation Depth in. (mm) | | |
|---|---|---|---|---|
| | | 6 (150) | 12 (300) | 18 (450) |
| SC-740 Chamber | 45.9 (1.3) | 74.9 (2.1) | 81.7 (2.3) | 88.4 (2.5) |

**Note:** Assumes 6” (150 mm) stone above chambers, 6” (150 mm) row spacing and 40% stone porosity.

### Amount of Stone Per Chamber

| English Tons (yds³) | Stone Foundation Depth | | |
|---|---|---|---|
| | 6” | 12” | 16” |
| SC-740 | 3.8 (2.8) | 4.6 (3.3) | 5.5 (3.9) |
| Metric Kilograms (m³) | 150 mm | 300 mm | 450 mm |
| SC-740 | 3,450 (2.1) | 4,170 (2.5) | 4,490 (3.0) |

**Note:** Assumes 6” (150 mm) of stone above and between chambers.

### Volume Excavation Per Chamber yd³ (m³)

| | Stone Foundation Depth | | |
|---|---|---|---|
| | 6 (150) | 12 (300) | 18 (450) |
| SC-740 | 5.5 (4.2) | 6.2 (4.7) | 6.8 (5.2) |

**Note:** Assumes 6” (150 mm) of row separation and 18” (450 mm) of cover. The volume of excavation will vary as depth of cover increases.

ADS StormTech products, manufactured in accordance with ASTM F2418 or ASTMF2922, comply with all requirements in the Build America, Buy America (BABA) Act.

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# CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

## WQMP SITE MAP

## RUBIDOUX COMMERCE CENTER
## 26TH STREET

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
PHONE: (949) 296-7006

**PREPARED BY:**

Thienes Engineering, Inc.
CIVIL ENGINEERING •LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Designed by ____
Date ____
Checked by ____
Date ____
Designed by ____
Date ____
Checked by ____
Date ____

Approved by Date ____

Public Works Director R.C.E. ____

Sheet 3 of 3 Sheets

3384/2 OF 3 SHEETS

# Appendix 2: Construction Plans

*Grading and Drainage Plans (PROVIDED WITH F-WQMP)*

# GENERAL GRADING NOTES

1. APPROVAL OF THESE PLANS BY THE CITY ENGINEER DOES NOT AUTHORIZE ANY WORK TO BE PERFORMED UNTIL A PERMIT HAS BEEN ISSUED.
2. THE APPROVAL OF THIS PLAN OR ISSUANCE OF A PERMIT BY THE CITY DOES NOT AUTHORIZE THE SUBDIVIDER AND/OR OWNER TO VIOLATE ANY FEDERAL, STATE, COUNTY, OR CITY LAWS, ORDINANCES, REGULATIONS, OR POLICIES.
3. ALL GRADING SHALL CONFORM TO THE 2019 CALIFORNIA BUILDING CODE CHAPTER 17, 18, & APPENDIX J AS AMENDED BY THE CITY OF JURUPA VALLEYS ORDINANCE NUMBER 2019-18.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SURVEY MONUMENTS AND/OR VERTICAL CONTROL BENCHMARKS WHICH ARE DISTURBED OR DESTROYED BY CONSTRUCTION. A LAND SURVEYOR SHALL REPLACE SUCH MONUMENTS WITH APPROPRIATE MONUMENTS. A CORNER RECORD OR RECORD OF SURVEY, AS APPROPRIATE, SHALL BE FILED AS REQUIRED BY THE PROFESSIONAL LAND SURVEYORS ACT, SECTION 8771 OF THE BUSINESS AND PROFESSIONS CODE OF THE STATE OF CALIFORNIA. IF ANY VERTICAL CONTROL IS TO BE DISTURBED OR DESTROYED, THE CITY OF JURUPA VALLEY MUST BE NOTIFIED, IN WRITING, AT LEAST THREE (3) DAYS PRIOR TO THE CONSTRUCTION. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE COST OF REPLACING ANY VERTICAL CONTROL BENCHMARKS DESTROYED BY THE CONSTRUCTION.
5. ALL PROPERTY CORNERS, GRADING BOUNDARIES AND ALL CONSERVATION AREAS/LEAST SENSITIVE AREA (LSA) DETERMINED BY THE ENVIRONMENTAL PROGRAMS DEPARTMENT (EPD) SHALL BE CLEARLY DELINEATED AND STAKED IN THE FIELD PRIOR TO COMMENCEMENT OF ANY CONSTRUCTION/GRADING.
6. ALL WORK UNDER THIS PERMIT SHALL BE LIMITED TO WORK WITHIN THE PROPERTY LINES. ALL WORK WITHIN THE ROAD RIGHT-OF-WAY WILL REQUIRE SEPARATE PLANS AND A SEPARATE REVIEW-APPROVAL (PERMIT) FROM THE TRANSPORTATION DEPARTMENT.
7. ALL GRADING SHALL BE DONE UNDER THE SUPERVISION OF A SOILS ENGINEER IN CONFORMANCE WITH THE RECOMMENDATIONS OF THE GEOTECHNICAL INVESTIGATION REPORT PREPARED BY LANGAN ENGINEERING DATED OCTOBER 15, 2021.
8. COMPACTED FILL TO SUPPORT ANY STRUCTURES SHALL COMPLY WITH SECTION 1803.5.8. PROJECTS WITHOUT A PRELIMINARY SOILS REPORT SHALL INCLUDE DETAILED SPECIFICATIONS IN ACCORDANCE WITH SECTIONS 1803.2 AND 1803.5 PREPARED BY THE ENGINEER OF RECORD.
9. THE CONTRACTOR SHALL NOTIFY THE BUILDING AND SAFETY DEPARTMENT AT LEAST 24 HOURS IN ADVANCE TO REQUEST FINISH LOT GRADE AND DRAINAGE INSPECTION. THIS INSPECTION MUST BE APPROVED PRIOR TO BUILDING PERMIT FINAL INSPECTION FOR EACH LOT.
10. PER SECTION 4216 OF THE GOVERNMENT CODE, THE CONTRACTOR SHALL NOTIFY UNDERGROUND SERVICE ALERT, TWO (2) DAYS PRIOR TO DIGGING AT 1-800-422-4133.
11. PRIOR TO GRADING, A MEETING SHALL BE SCHEDULED WITH A RIVERSIDE COUNTY ENVIRONMENTAL COMPLIANCE INSPECTOR PRIOR TO COMMENCEMENT OF GRADING OPERATIONS.

# CUT/FILL

1. MAXIMUM CUT AND FILL SLOPE SHALL BE 2:1, HORIZONTAL TO VERTICAL.
2. NO FILL SHALL BE PLACED ON EXISTING GROUND UNTIL THE GROUND HAS BEEN CLEARED OF WEEDS, TOPSOIL AND OTHER DELETERIOUS MATERIAL. FILLS SHOULD BE PLACED IN THIN LIFTS ( 8-INCH MAX OR AS RECOMMENDED IN THE SOILS REPORT ), COMPACTED AND TESTED THROUGHOUT THE GRADING PROCESS UNTIL FINAL GRADES ARE ATTAINED. ALL FILLS ON SLOPES STEEPER THAN 5:1, HORIZONTAL TO VERTICAL, AND A HEIGHT GREATER THAN FIVE (5) FEET SHALL BE KEYED AND BENCHED INTO FIRM NATURAL SOIL FOR FULL SUPPORT. THE BENCH UNDER THE TOE MUST BE TEN (10) FEET WIDE MINIMUM.
3. THE SLOPE STABILITY FOR CUT AND FILL SLOPES OVER THIRTY (3) FEET IN VERTICAL HEIGHT, OR CUT SLOPES STEEPER THAN 2:1 HAVE BEEN VERIFIED WITH A FACTOR OF SAFETY OF AT LEAST 1.5.
4. NO ROCK OR SIMILAR IRREDUCIBLE MATERIAL WITH A MAXIMUM DIMENSION GREATER THAN TWELVE (12) INCHES SHALL BE BURIED OR PLACED IN FILLS CLOSER THAN TEN (10) FEET TO THE FINISHED GRADE.

# COMPLETION OF WORK NOTES

1. FOR ROUGH GRADING PLANS, A REGISTERED CIVIL ENGINEER SHALL PREPARE FINAL COMPACTION REPORT/GRADING REPORT AND IT SHALL BE SUBMITTED TO THE DEPARTMENT OF BUILDING AND SAFETY FOR REVIEW AND APPROVAL. THE REPORT SHALL INCLUDE BUILDING FOUNDATION DESIGN PARAMETERS, EXPANSION INDEX, DESIGN ALTERNATIVES (IF IE > 20), WATER SOLUBLE SULFATE CONTENT, CORROSIVITY AND REMEDIAL MEASURE IF NECESSARY.
2. FOR ROUGH GRADING PLANS, EXCEPT FOR NON-TRACT SINGLE RESIDENTIAL RO GRADING, THE COMPACTION REPORT SHALL INCLUDE THE SPECIAL INSPECTION VERIFICATIONS LISTED ON TABLE 1705.6 OF 2019 CALIFORNIA BUILDING CODE.
3. FOR ROUGH GRADING, IN ADDITION TO OBTAINING ALL REQUIRED INSPECTIONS AND APPROVAL OF ALL FINAL REPORTS, ALL SITES PERMITTED FOR ROUGH GRADE ONLY SHALL PROVIDE VEGETATIVE COVERAGE (100%) OR OTHER MEANS OF SITE STABILIZATION APPROVED BY ENVIRONMENTAL COMPLIANCE DIVISION, PRIOR TO RECEIVING A ROUGH GRADE PERMIT FINAL SIGNATURE.
4. FOR PRECISE GRADING, A REGISTERED CIVIL ENGINEER SHALL SUBMIT TO THE BUILDING AND SAFETY DEPARTMENT WRITTEN FINAL CERTIFICATION OF COMPLETION OF GRADING IN ACCORDANCE WITH THE APPROVED GRADING PLAN PRIOR TO THE REQUEST OF PRECISE GRADING INSPECTION.

# DRAINAGE, EROSION/DUST CONTROL

1. DRAINAGE ACROSS PROPERTY LINES SHALL NOT EXCEED THAT WHICH EXISTED PRIOR TO GRADING. EXCESS OR CONCENTRATED DRAINAGE SHALL BE CONTAINED ON SITE OR DIRECTED TO AN APPROVED DRAINAGE FACILITY. EROSION OF THE GROUND IN THE AREA OF DISCHARGE SHALL BE PREVENTED BY INSTALLATION OF NON-EROSIVE DOWN DRAINS OR OTHER DEVICES.
2. THE CONTRACTOR SHALL PROVIDE A PAVED SLOPE INTERCEPTOR DRAIN ALONG THE TOP OF CUT SLOPES WHERE THE DRAINAGE PATH IS GREATER THAN FORTY (40) FEET TOWARDS THE CUT SLOPE.
3. THE CONTRACTOR SHALL PROVIDE FIVE (5) FEET WIDE BY ONE (1) FOOT HIGH BERM ALONG THE TOP OF ALL FILL SLOPES STEEPER THAN 3:1, HORIZONTAL TO VERTICAL.
4. THE GROUND SURFACE IMMEDIATELY ADJACENT TO THE BUILDING FOUNDATION SHALL BE SLOPED AWAY FROM THE BUILDING AT A SLOPE OF NOT LESS THAN ONE UNIT VERTICAL IN 20 UNITS HORIZONTAL (5% SLOPE) FOR A MINIMUM DISTANCE OF TEN (10) FEET MEASURED PERPENDICULAR TO THE FACE OF THE FOUNDATION.
5. NO OBSTRUCTION OF NATURAL WATER COURSES SHALL BE PERMITTED.
6. DURING ROUGH GRADING OPERATIONS AND PRIOR TO CONSTRUCTION OF PERMANENT DRAINAGE STRUCTURES, TEMPORARY DRAINAGE CONTROL (BEST MANAGEMENT PRACTICES, BMPs) SHALL BE PROVIDED TO PREVENT PONDING WATER AND DRAINAGE TO ADJACENT PROPERTIES.
7. DUST CONTROL ShALL BE CONTROLLED BY WATERING OR OTHER APPROVED METHODS.
8. CONSTRUCTION SITES SUBJECT TO PM10 FUGITIVE DUST MITIGATION SHALL COMPLY WITH AQMD RULE 403.1.
9. ALL EXISTING DRAINAGE COURSES AND STORM DRAIN FACILITIES SHALL CONTINUE TO FUNCTION. PROTECTIVE MEASURES AND TEMPORARY DRAINAGE PROVISIONS MUST BE USED TO PROTECT ADJOINING PROPERTIES DURING GRADING OPERATIONS.
10. FOR ALL SLOPES EQUAL TO OR GREATER THAN THREE (3) FEET IN VERTICAL HEIGHT ARE REQUIRED TO BE PLANTED WITH AN APPROVED DROUGHT-TOLERANT GROUND COVER AT A MINIMUM SPACING OF 12" ON CENTER OR AS APPROVED BY THE ENGINEER OF RECORD OR THE REGISTERED LANDSCAPE ARCHITECT AND DROUGHT-TOLERANT SHRUBS SPACED AT NO MORE THAN 10' ON CENTER, OR TREES SPACED NOT TO EXCEED 20' ON CENTER, OR A COMBINATION OF SHRUBS AND TREES NOT TO EXCEED 15' IN ADDITION TO THE GRASS OR GROUND COVER. SLOPES THAT REQUIRE PLANTING SHALL BE PROVIDED WITH AN IN-GROUND IRRIGATION SYSTEM EQUIPPED WITH AN APPROPRIATE BACKFLOW DEVICE PER C.P.C. CHAPTER 6. THE SLOPE PLANTING AND IRRIGATION SYSTEM SHALL BE INSTALLED AS SOON AS POSSIBLE UPON COMPLETION OF ROUGH GRADING. ALL PERMANENT SLOPE PLANTING SHALL BE ESTABLISHED AND IN GOOD CONDITION PRIOR TO SCHEDULING PRECISE GRADE INSPECTION.

# HOLD HARMLESS INDEMNIFICATION CLAUSE:

THE CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THE PROJECT INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT, THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; AND THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY, AND HOLD THE CITY OF JURUPA VALLEY, THE OWNER, AND THE PRIVATE ENGINEERS HARMLESS FOR ANY AND ALL LIABILITY; REAL OR ALLEGED, IN CONNECTION WITH PERFORMANCE OF WORK ON THIS PROJECT, EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR ENGINEER.

# EXISTING UNDERGROUND STRUCTURES:

ALL UNDERGROUND UTILITIES OR STRUCTURE, REPORTED OR FOUND ON PUBLIC RECORDS, ARE INDICATED WITH THEIR APPROXIMATE LOCATION AND EXTENT. THE OWNER, BY ACCEPTING THESE PLANS OR PROCEEDING WITH THE IMPROVEMENTS HEREON, AGREES TO ASSUME LIABILITY AND TO HOLD THE ENGINEER HARMLESS FOR ANY DAMAGES RESULTING FROM THE EXISTENCE OF UNDERGROUND UTILITIES OR STRUCTURES NOT REPORTED OR INDICATED ON PUBLIC RECORDS, OR THOSE CONSTRUCTED AT VARIANCE WITH REPORTED OR RECORD LOCATIONS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES OR STRUCTURES SHOWN AND ANY OTHERS FOUND AT THE SITE. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNERS OF ALL UTILITIES STRUCTURES CONCERNED BEFORE STARTING WORK.

# NOTICE TO CONTRACTOR:

CONTRACTOR SHALL VERIFY ALL CONDITIONS AND DIMENSIONS AND SHALL REPORT DISCREPANCIES TO THE ENGINEER PRIOR TO THE COMMENCEMENT OF WORK.

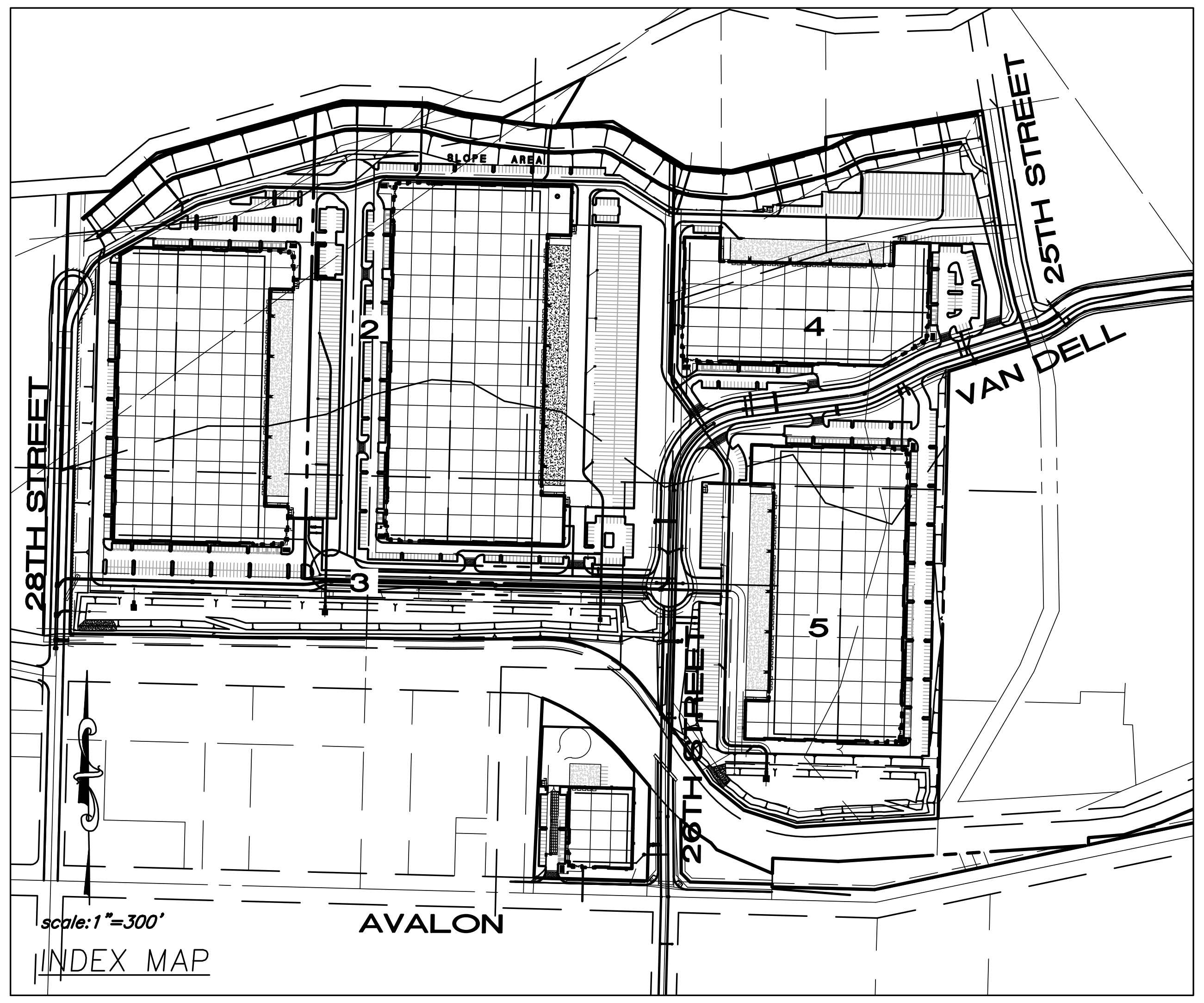
# DECLARATION OF ENGINEER OF RECORD

I HEREBY DECLARE THAT THE DESIGN OF THE IMPROVEMENTS AS SHOWN ON THESE PLANS COMPLIES WITH PROFESSIONAL ENGINEERING STANDARDS AND PRACTICES. AS THE ENGINEER IN RESPONSIBLE CHARGE OF DESIGN OF THESE IMPROVEMENTS, I ASSUME FULL RESPONSIBLE CHARGE FOR SUCH DESIGN.
I UNDERSTAND AND ACKNOWLEDGE THAT THE PLAN CHECK OF THESE PLANS BY THE CITY OF JURUPA VALLEY IS A REVIEW FOR THE LIMITED PURPOSE OF ENSURING THAT THE PLANS COMPLY WITH CITY PROCEDURES, APPLICABLE POLICIES AND ORDINANCES. THE PLAN CHECK IS NOT A DETERMINATION OF THE TECHNICAL ADEQUACY OF THE DESIGN OF THE IMPROVEMENTS. SUCH PLAN CHECK DOES NOT, THEREFORE, RELIEVE ME OF MY RESPONSIBILITY FOR THE DESIGN OF THESE IMPROVEMENTS. AS ENGINEER OF RECORD (EOR), I AGREE TO IDEMNIFY AND HOLD THE CITY OF JURUPA VALLEY, THE JURUPA VALLEY HOUSING AUTHORITY, AND THE JURUPA VALLEY COMMUNITY SERVICES DISTRICT (CSD), ITS OFFICERS, AGENTS AND EMPLOYEES HARMLESS FROM ANY AND ALL LIABILITY OF CLAIMS, DAMAGES OR INJURIES TO ANY PERSON OR PROPERTY WHICH MIGHT ARISE FROM THE NEGLIGENT ACTS, ERRORS OR MISSIONS OF THE ENGINEER OF RECORD. I HAVE READ AND INFORMED THE PROJECT APPLICANT/DEVELOPER THAT APPROVAL OF THESE PLANS DO NOT RELIEVE THEM FROM THE REQUIREMENTS OF THE CONDITIONS OF APPROVAL (ATTACHED HEREIN OR IN OTHER APPROVED IMPROVEMENT PLANS).

I ALSO HEREBY DECLARE THAT I HAVE COMPARED THESE PLANS WITH ALL APPLICABLE ADA TITLE II AND TITLE 24 REQUIREMENTS FOR DISABILITY ACCESS FOR THIS PROJECT, AND THESE PLANS ARE IN FULL COMPLIANCE WITH THOSE REQUIREMENTS.

REINHARD STENZEL R.C.E. #56155 (EXP. 12/31/2022)  DATE

# CITY OF JURUPA VALLEY
# CALIFORNIA
# PRECISE GRADING PLANS
# FOR
## RUBIDOUX COMMERCE PARK



INDEX MAP

UTILITY DISTRICTS:

ELECTRIC:
SOUTHERN CALIFORNIA EDISON-ONTARIO
1351 EAST FRANCIS
ONTARIO, CA 91761
PHONE: (909) 930-8539
FAX: (909) 930-8438
CONTACT: MIKE DITTA

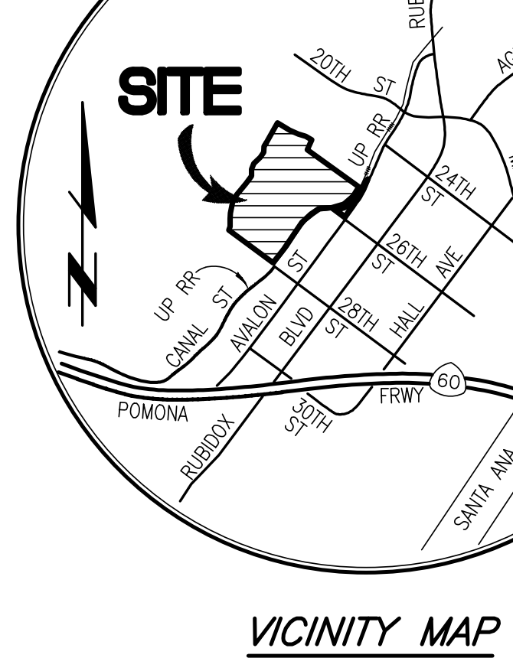
GAS:
SOUTHERN CALIFORNIA GAS
COMPANY-REDLANDS
1981 W. LUGONIA AVENUE, P.O. BOX 3003
REDLANDS, CA 92374-9720
PHONE: (909) 335-7725
FAX: (909) 335-7527
CONTACT: PAUL MULLINS

PHONE:
AT&T-ANAHEIM
1265 VAN BUREN STREET, SUITE 180
ANAHEIM, CA 92807
PHONE: (714) 666-5503
FAX: M43744@ATT.COM (W/S)

SEWER AND WATER:
JURUPA COMMUNITY SERVICES DISTRICT
11201 HARREL STREET
MIRA LOMA, CA 91752
PHONE: (951) 685-7434 X141
FAX: (951) 685-1153
CONTACT: NICKIE HAMIC

## SHEET INDEX

| SHT. No. | DESCRIPTION |
|---|---|
| 1 | TITLE SHEET |
| 2-6 | CONCEPTUAL GRADING PLAN |
| 7 | RETAINING WALL PROFILES |
| 8 | SITE SECTIONS |
| 9-11 | UTILITY PLAN |
| 12-13 | STORM DRAIN PLAN |
| 14-16 | STORM DRAIN PROFILES |



VICINITY MAP

N.T.S.

## LEGEND

| | |
|---|---|
| FH | EXIST. FIRE HYDRANT |
| WM | EXIST. WATER METER |
| WV | EXIST. WATER VALVE |
| GAS V. | EXIST. GAS VALVE |
| | GUY WIRE/DEADMAN |
| PP | EXIST. POWER POLE |
| | EXIST. TRAFFIC SIGNAL |
| | EXIST. CROSSWALK SIGNAL |
| SLB | EX. STREET LIGHTING BOX |
| | EXIST. STREET LIGHT |
| SDMH | EXIST. STORM DRAIN M.H. |
| SMH | EXIST. SEWER MANHOLE |
| VLT. | EXIST. VAULT |
| | EXIST. SIGN |
| | TREE |
| TSB | EXIST. TRAFFIC SIGNAL BOX |
| GM | EXIST. GAS METER |
| MB | EXIST. MAIL BOX |
| TMH | EXIST. TELEPHONE MANHOLE |
| X 1854.69 | EXIST. GRADE ELEVATION |
| CATV | EXIST. CABLE TV CONDUIT |
| | EXIST. EDGE OF A.C. PAVEMENT |
| | EXIST. CURB AND GUTTER |
| S 8" | EXIST. SANITARY SEWER |

| | |
|---|---|
| 24" SD | EXIST. STORM DRAIN |
| G 3" | EXIST. GAS LINE |
| T | EXIST. TELEPHONE CONDUIT |
| W 10" | EXIST. WATER LINE |
| (1800) | EXIST. CONTOUR |
| 55 | PROPOSED CONTOUR |
| | PROPERTY LINE |
| | PROP. R/W LINE |
| | PROP. EASEMENT |
| | PROPOSED EDGE OF PAVEMENT |
| | PROP. STORM DRAIN M.H. |
| | PROP. STORM DRAIN |
| | FUTURE CURB & GUTTER (FOR REFERENCE ONLY) |
| | SHEET MATCHLINE |
| | PROP. SEWER & MANHOLE |
| | PROP. SEWER & CLEANOUT |
| | PROPOSED WATER & METER SIZE PER PLAN |
| | PROP. FENCE PER ARCH. DETAILS |
| | PROPOSED FIRE HYDRANT |
| □ | PROPOSED WATER METER |
| ○ | PROPOSED SEWER CLEAN OUT |
| | PROP. DROP INLET CATCH BASIN |
| | PROP. ADA PATH OF TRAVEL |
| GB | PROP. GRADE BREAK |
| | PROP. BIKE RACK |
| | PROPOSED THRUST BLOCK |
| ⊗ | PROPOSED FIRE VALVE |
| ⊙ | PROPOSED FIRE PIV |
| | PROPOSED FIRE RISER |

## ABBREVIATIONS

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| C.L.F. | —CHAIN LINK FENCE | CONC. | —CONCRETE | TRANS PAD | —TRANSFORMER PAD | H.C. | —HANDICAP |
| ℄ | —PROPERTY LINE | ST.LT. | —STREET LIGHT | T.O.P. | —TOP OF PIPE | EXIST. | —EXISTING |
| R/W | —RIGHT OF WAY | G.B. | —GRADE BREAK | B.O.P. | —BOTTOM OF PIPE | BLDG | —BUILDING |
| ℄ | —CENTERLINE | H.P. | —HIGH POINT | R | —RATE OF GRADE | M.H. | —MANHOLE |
| T.C. | —TOP OF CURB | C.F. | —CURB FACE | T.F. | —TOP OF FOOTING | T.B. | —TOP OF BERM |
| F.L. | —FLOW LINE | B.W. | —BACK OF WALK | T.W. | —TOP OF WALL | W.S.E. | —WATER SURFACE ELEVATION |
| F.S. | —FINISH SURFACE | A.B. | —AGGREGATE BASE | C.M.B. | —CRUSHED MISC. BASE | | |
| T.S. | —TOP OF CONC. SLAB | P.V.C. | —POLYVINYLCHLORIDE | S.F. | —SQUARE FEET | | |
| H.P. | —HIGH POINT | C.I.P. | —CAST IRON PIPE | (0.00) | —EXISTING ELEVATION | | |
| F.F. | —FINISH FLOOR | F.H. | —FIRE HYDRANT | B.O.W. | —BOTTOM OF WALL | | |
| R.D. | —ROOF DRAIN | P.P. | —POWER POLE | T.G. | —TOP OF GRATE | | |
| R.C.P. | —REINF. CONC. PIPE | C.B. | —CATCH BASIN | N.G. | —NATURAL GRADE | | |
| INV. | —INVERT | R= | —RATE OF GRADE | TOP | —TOP OF SLOPE | | |
| S = | —SLOPE | B.C.R. | —BEGINNING OF CURVE | TOE | —TOE OF SLOPE | | |
| F.G. | —FINISH GRADE | E.C.R. | —END OF CURVE | E.P. | —EDGE OF PAVEMENT | | |
| S.D. | —STORM DRAIN | L.P. | —LOW POINT | A.C. | —ASPHALT CONCRETE | | |

# CIVIL ENGINEER CERTIFICATION

I HEREBY CERTIFY THAT AS THE ENGINEER IN RESPONSIBLE CHARGE OF WORK FOR THIS PROJECT, I HAVE SUPERVISED THE ENGINEERING WORK AS SHOWN ON THESE PLANS TO DETERMINE GENERAL COMPLIANCE WITH PLANS AND SPECIFICATIONS, AND THAT THE COMPLETED CONSTRUCTION IS IN CONFORMANCE WITH THESE PLANS.

I ALSO CERTIFY THAT ALL DESIGN CHANGES MADE DURING CONSTRUCTION, ALL INFORMATION AS REQUIRED BY THE CITY OF JURUPA VALLEY GRADING ORDINANCE, AND ALL RECOMMENDATIONS FROM THE SOILS ENGINEERING AND ENGINEERING GEOLOGY REPORTS PREPARED FOR THIS PROJECT HAVE BEEN INCORPORATED IN THESE PLANS.

REINHARD STENZEL R.C.E. #56155 (EXP. 12/31/2023)  DATE

# ENGINEER'S NOTICE TO CONTRACTORS

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY THE SEARCH OF AVAILABLE RECORDS. THESE LOCATIONS ARE APPROXIMATE AND SHALL BE CONFIRMED IN THE FIELD BY THE CONTRACTOR, SO THAT ANY NECESSARY ADJUSTMENT CAN BE MADE IN ALIGNMENT AND/OR GRADE OF THE PROPOSED IMPROVEMENT. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT ANY UTILITY FACILITIES SHOWN AND ANY OTHER FACILITIES NOT OF RECORD OR NOT SHOWN ON THESE PLANS.
THE CONTRACTOR SHALL POSSESS THE CLASS (OR CLASSES) OF LICENSE AS SPECIFIED IN THE "NOTICE INVITING BIDS" OF THE BID DOCUMENTS.

SOILS ENGINEER:

THIS PLAN HAS BEEN REVIEWED AND CONFORMS TO THE RECOMMENDATIONS OF THE SOILS REPORT, PREPARED BY NORCAL ENGINEERING PROJECT No. 12627-05, DATED NOVEMBER 30, 2005

NAME TITLE (SOILS ENGINEER)  DATE

*GEOTECHNICAL ENGINEER:*
*NORCAL ENGINEERING*
*10641 HUMBOLT STREET*
*LOS ALAMITOS, CA 90720*
*PH. (562) 799-9469*
*FAX (562) 799-9459*

NOTE: ALL WORK SHALL COMPLY WITH 2019 CALIFORNIA BUILDING CODE, 2019 CALIFORNIA PLUMBING CODE, JURUPA VALLEY, AND ALL APPLICABLE CODES.

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
(949) 296-7006

**PREPARED BY:**

*Thienes Engineering, Inc.*
*CIVIL ENGINEERING • LAND SURVEYING*
*14349 FIRESTONE BOULEVARD*
*LA MIRADA, CALIFORNIA 90638*
*PH.(714)521-4811 FAX(714)521-4173*

# CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

## TITLE SHEET

## RUBIDOUX COMMERCE PARK
## MA17132

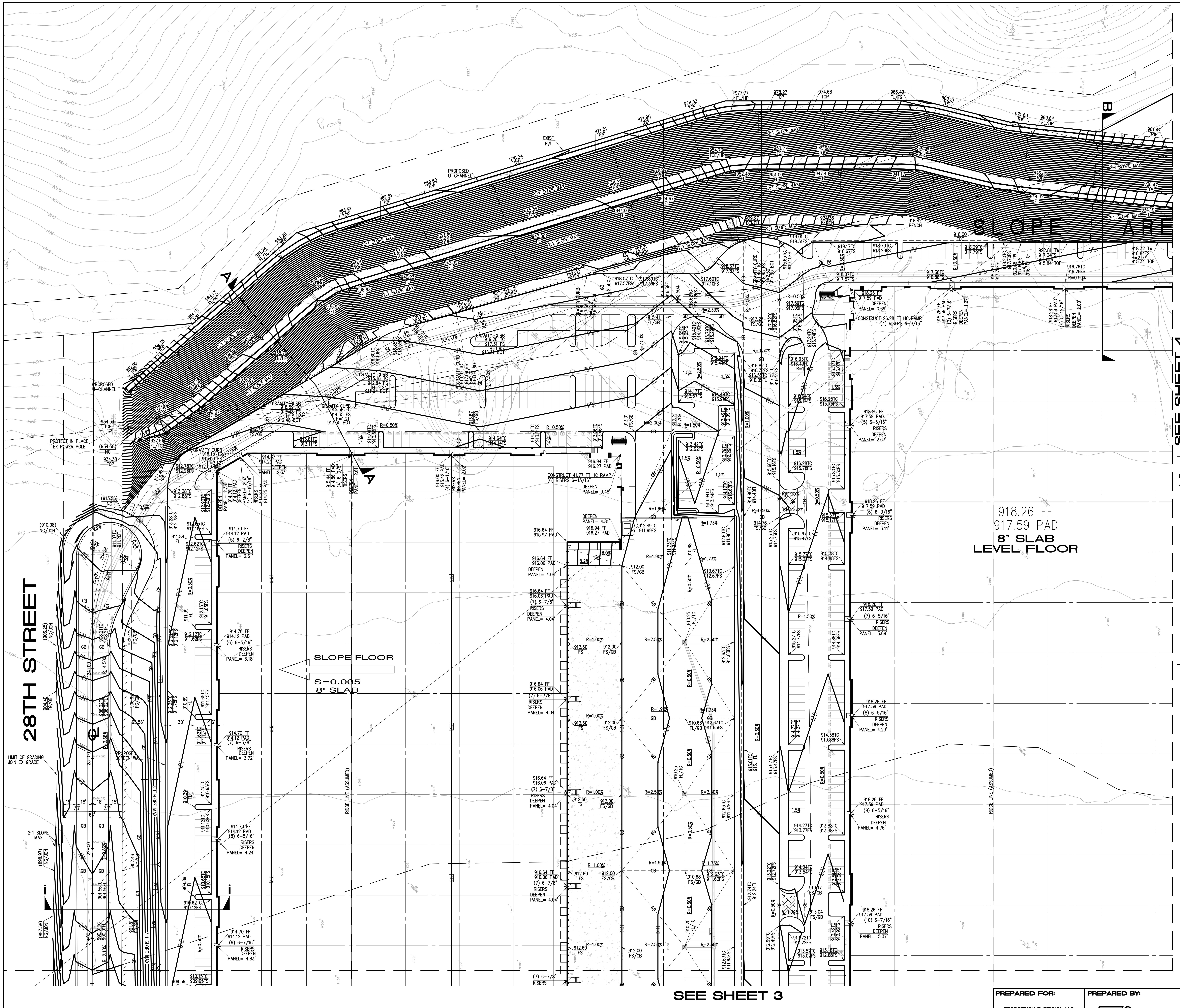
Designed by ______
Date ______
Checked by ______
Date ______
Designed by ______
Date ______
Checked by ______
Date ______

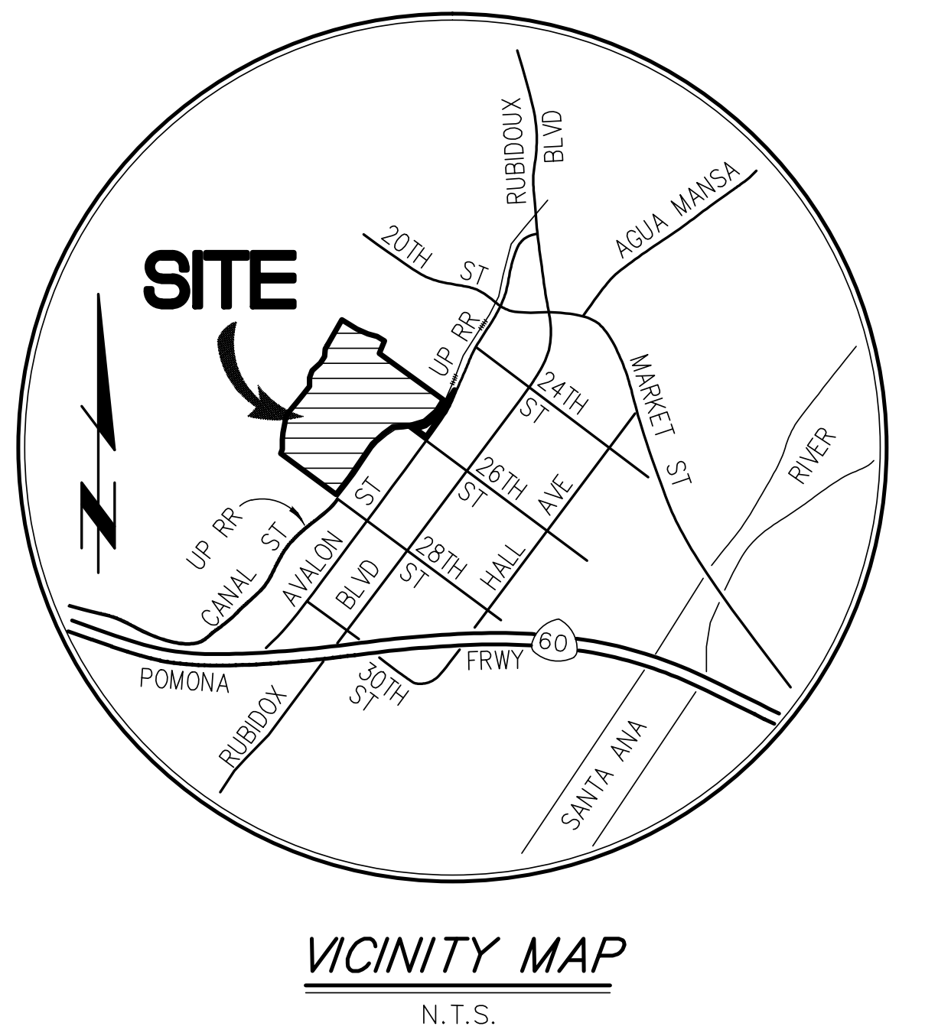
Approved by  Date ______

Public Works Director  R.C.E. ______

Sheet 1 of 16 Sheets

3384 / 1 OF 16 SHEETS





VICINITY MAP
N.T.S.

## LEGEND

| | |
|---|---|
| (1800) | EXIST. CONTOUR |
| 55 | PROPOSED CONTOUR |
| | PROPERTY LINE |
| | EASEMENT |
| | PROPOSED EDGE OF PAVEMENT |
| | SHEET MATCHLINE |
| | PROPOSED SEWER & MANHOLE SIZE PER PLAN |
| | PROPOSED WATER & METER SIZE PER PLAN |
| | EXISTING RIGHT OF WAY |
| | PROPOSED RIGHT OF WAY |
| | EXISTING P/L |
| | PROPOSED LOTLINE |
| | EXISTING LOT LINE |
| | PROPOSED FIRE HYDRANT |
| □ | PROPOSED WATER METER |
| ⊗ | PROPOSED WATER VALVE |
| ◁ | PROPOSED THRUST BLOCK |
| ○ | PROPOSED SEWER MANHOLE |
| ○ | PROPOSED SEWER CLEAN OUT |
| ▤ | PROPOSED CATCH BASIN |
| ▩ | TRUNCATED DOMES |

9/26/2022

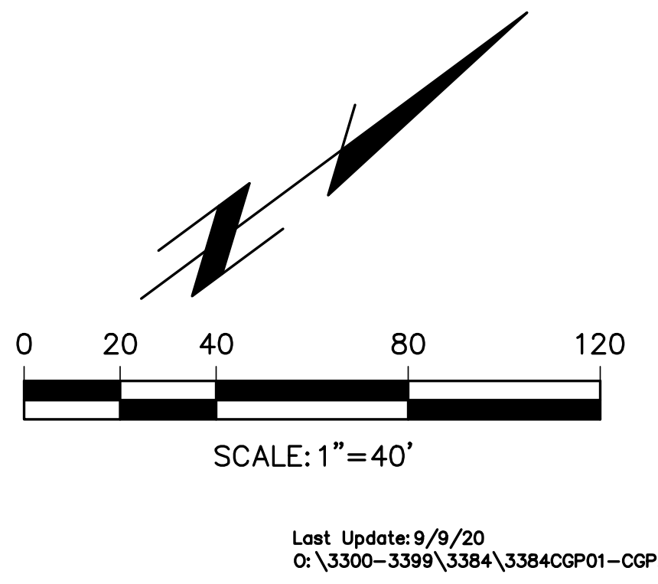
**EARTHWORK BALANCE CALCULATIONS**

PROJECT: RUBIDOUX COMMERCE PARK
JOB# 3384

| | | | |
|---|---|---|---|
| K. | SITE AREA: | 3,489,251 | SF |
| L. | SUBSIDENCE FACTOR: | 0.125 | |
| M. | SHRINKAGE FACTOR: | 10.0 | % |
| N. | OVEREXCAVATION: | 188,776 | CY |
| A. | CALCULATED CUT: | 927,021 | CY |
| **B.** | FOOTING AND UTILITY SPOILS | **12,000** | CY |
| **B1** | Underground Storage | - | |
| **C.** | **TOTAL CUT: (A+B)** | **939,021** | CY |
| D. | CALCULATED FILL: | 593,372 | CY |
| E. | LIGHT PAVING FILL: | - | CY |
| F. | SUBSIDENCE: (LxK)/27= | 16,154 | CY |
| G. | SHRINKAGE: (M/100)C= | 93,902 | CY |
| H. | OVEREXCAVATION SHRINKAGE | 18,878 | CY |
| **I.** | **TOTAL FILL: (D+E+F+G+H)=** | **722,306** | CY |
| **J.** | **TOTAL (IMPORT) OR EXPORT:** | **216,715** | CY |
| | SITE ADJUSTMENT | 1.68 | |

SHEET INDEX:

SHEET 1 TO 4– CONCEPTUAL GRADING PLAN
SHEET 5 – CONCEPTUAL RETAINING WALL PROFILES
SHEET 6 – CONCEPTUAL ONSITE CROSS SECTIONS AND STREET TYPICAL SECTION
SHEET 7 TO 8 – CONCEPTUAL UTILITY PLAN
SHEET 9 – CONCEPTUAL SEWER PROFILES
SHEET 10 TO 11 – CONCEPTUAL STORM DRAIN PLANS
SHEET 12 TO 15 – CONCEPTUAL STORM DRAIN PROFILES



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Last Update: 9/9/20
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# CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

# CONCEPTUAL GRADING PLAN

## RUBIDOUX COMMERCE PARK
## MA17132

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
(949) 296-7006

**PREPARED BY:**

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

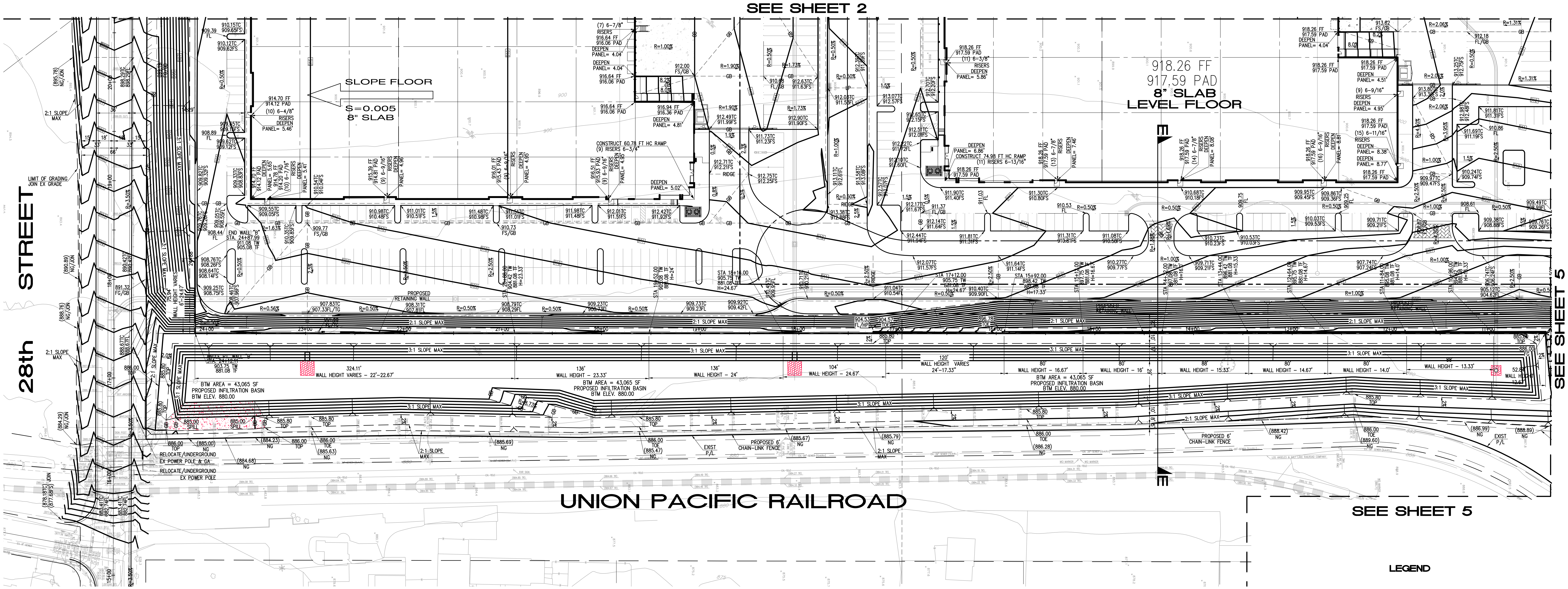
Designed by ______
Date ______
Checked by ______
Date ______
Designed by ______
Date ______
Checked by ______
Date ______

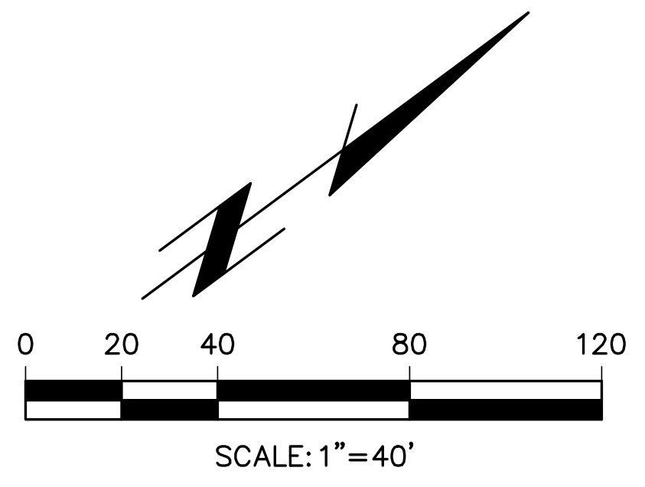
Approved by ______ Date ______

Public Works Director R.C.E. XXXXX

Sheet 2 of 16 Sheets

3384 / 2 OF 16 SHEETS





LEGEND

- EXIST. CONTOUR
- PROPOSED CONTOUR
- PROPERTY LINE
- EASEMENT
- PROPOSED EDGE OF PAVEMENT
- SHEET MATCHLINE
- PROPOSED SEWER & MANHOLE SIZE PER PLAN
- PROPOSED WATER & METER SIZE PER PLAN
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- EXISTING P/L
- PROPOSED LOTLINE
- EXISTING LOT LINE
- PROPOSED FIRE HYDRANT
- PROPOSED WATER METER
- PROPOSED WATER VALVE
- PROPOSED THRUST BLOCK
- PROPOSED SEWER MANHOLE
- PROPOSED SEWER CLEAN OUT
- PROPOSED CATCH BASIN
- TRUNCATED DOMES

Last Update: 9/9/20
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**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
(949) 296-7006

**PREPARED BY:**

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# CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

# CONCEPTUAL GRADING PLAN

## RUBIDOUX COMMERCE PARK
## MA17132

Designed by ________
Date ________
Checked by ________
Date ________
Designed by ________
Date ________
Checked by ________
Date ________

Approved by Date ________

Public Works Director R.C.E. XXXXX

Sheet 3 of 16 Sheets

3384 / 3 OF 16 SHEETS

Last Update: 9/9/20
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**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
(949) 296-7006

**PREPARED BY:**

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CIVIL ENGINEERING • LAND SURVEYING
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LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

# CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

# CONCEPTUAL GRADING PLAN

## RUBIDOUX COMMERCE PARK
## MA17132

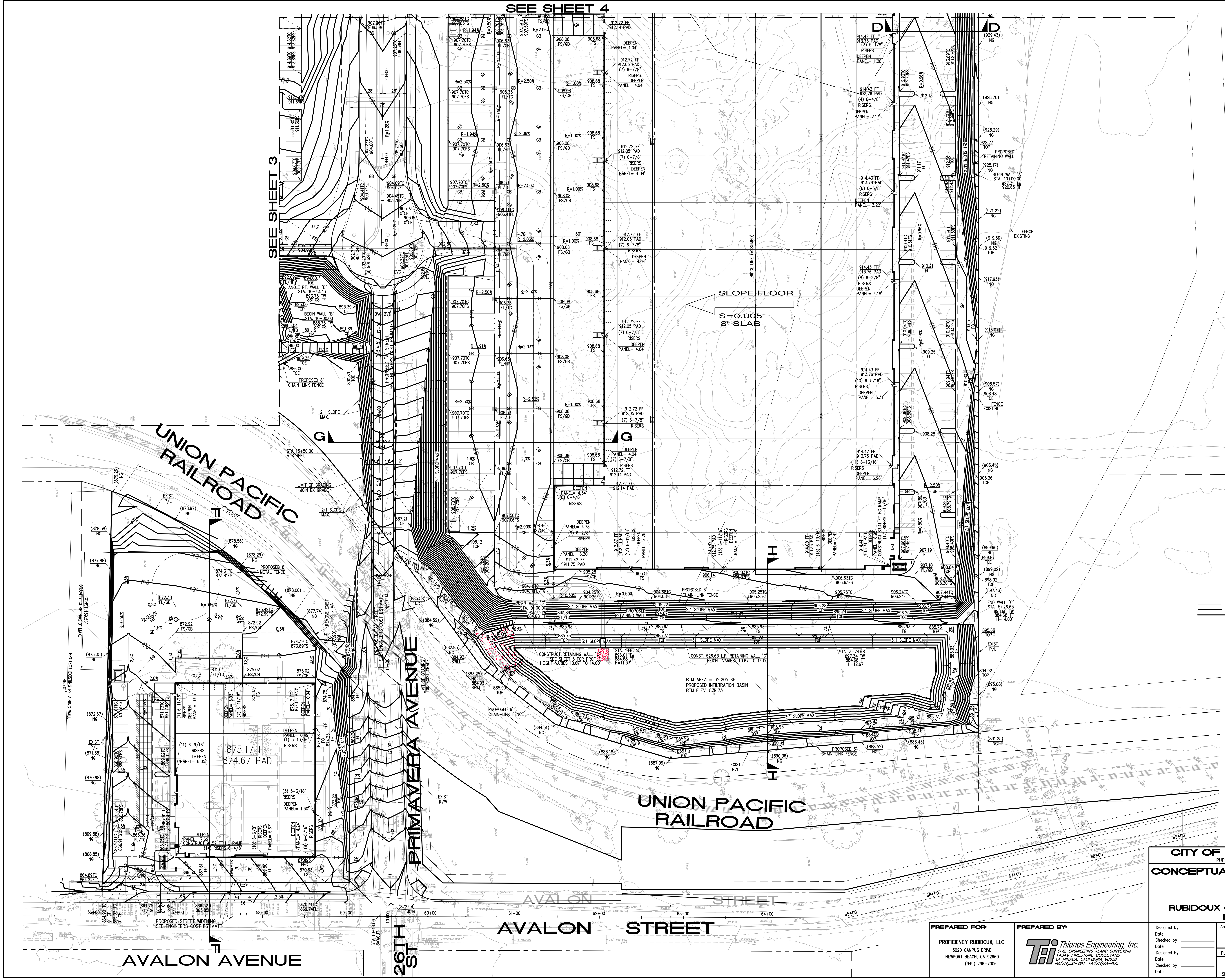
Designed by ______
Date ______
Checked by ______
Date ______
Designed by ______
Date ______
Checked by ______
Date ______

Approved by Date ______

Public Works Director R.C.E. XXXXX

Sheet 4 of 16 Sheets

3384 / 4 OF 16 SHEETS



## LEGEND

- EXIST. CONTOUR
- PROPOSED CONTOUR
- PROPERTY LINE
- EASEMENT
- PROPOSED EDGE OF PAVEMENT
- SHEET MATCHLINE
- PROPOSED SEWER & MANHOLE SIZE PER PLAN
- PROPOSED WATER & METER SIZE PER PLAN
- EXISTING RIGHT OF WAY
- PROPOSED RIGHT OF WAY
- EXISTING P/L
- PROPOSED LOTLINE
- EXISTING LOT LINE
- PROPOSED FIRE HYDRANT
- PROPOSED WATER METER
- PROPOSED WATER VALVE
- PROPOSED THRUST BLOCK
- PROPOSED SEWER MANHOLE
- PROPOSED SEWER CLEAN OUT
- PROPOSED CATCH BASIN
- TRUNCATED DOMES

0 20 40 80 120

SCALE: 1"=40'

Last Update: 9/9/20
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# CITY OF JURUPA VALLEY

PUBLIC WORKS DEPARTMENT

# CONCEPTUAL GRADING PLAN

## RUBIDOUX COMMERCE PARK
## MA17132

3384 / 5 OF 16 SHEETS

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
(949) 296-7006

**PREPARED BY:**

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
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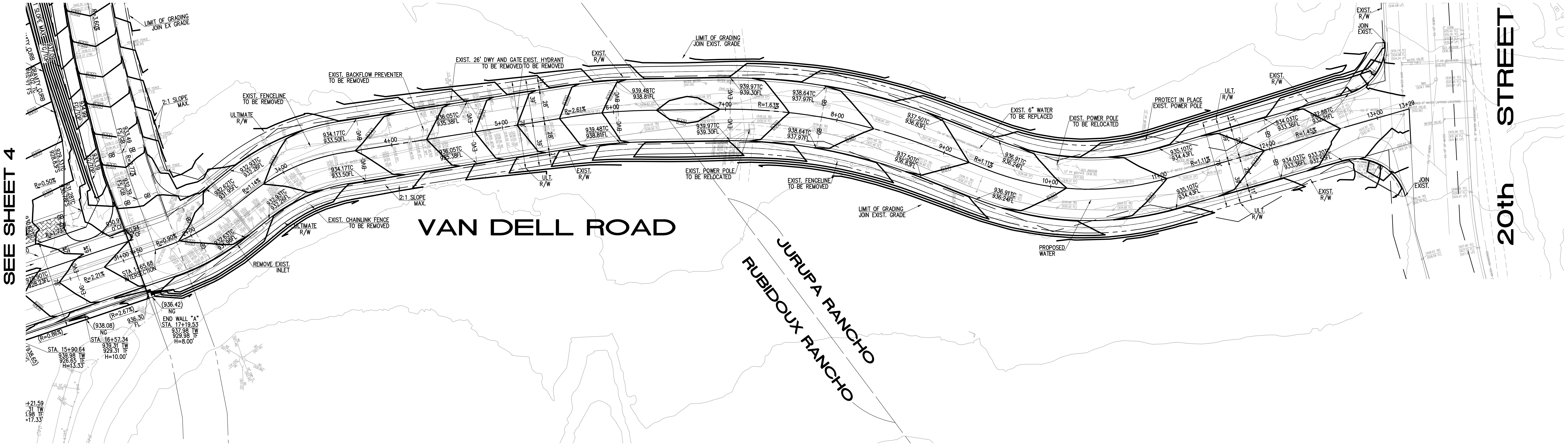
Date ______
Checked by ______
Date ______
Designed by ______
Date ______
Checked by ______
Date ______

Approved by Date ______

Public Works Director R.C.E. XXXXX

Sheet 5 of 16 Sheets



## LEGEND

- EXIST. CONTOUR
- PROPOSED CONTOUR
- PROPERTY LINE
- EASEMENT
- PROPOSED EDGE OF PAVEMENT
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- EXISTING LOT LINE
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- □ PROPOSED WATER METER
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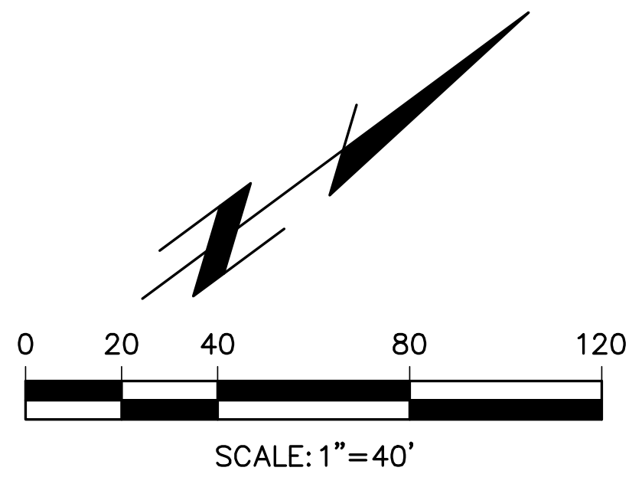
- ○ PROPOSED SEWER MANHOLE
- ○ PROPOSED SEWER CLEAN OUT
- ▤ PROPOSED CATCH BASIN
- ▨ TRUNCATED DOMES



Last Update: 9/9/20
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**PREPARED FOR:**

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# CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

# CONCEPTUAL GRADING PLAN

## RUBIDOUX COMMERCE PARK
## MA17132

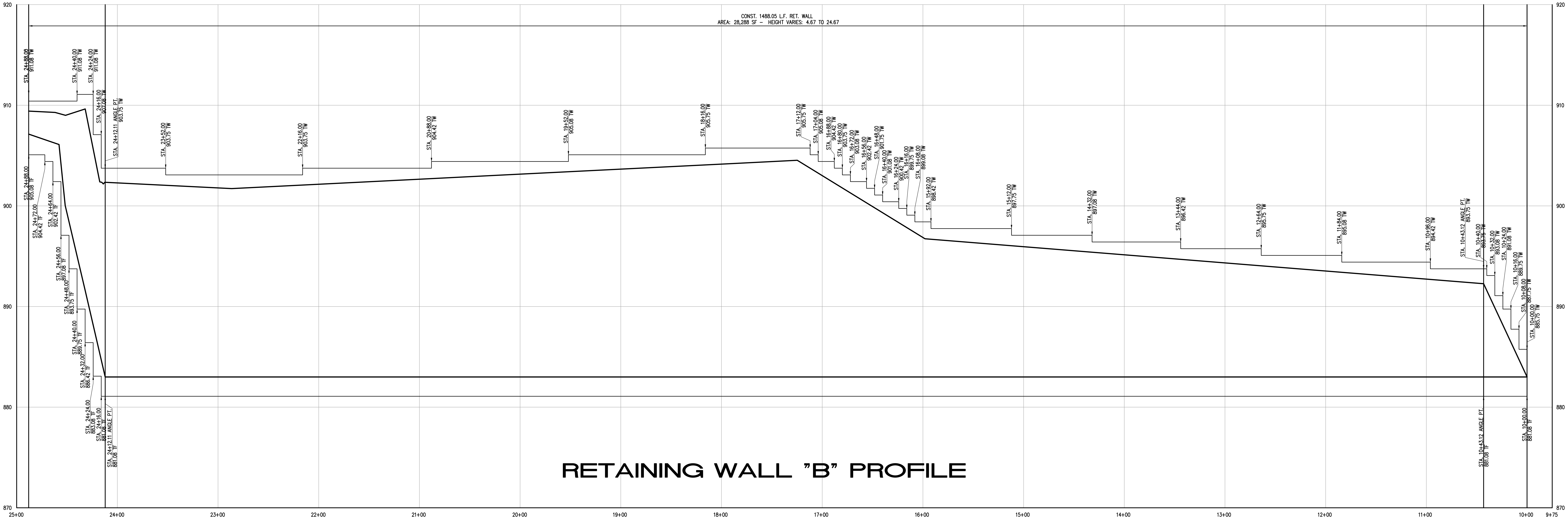
Designed by ____
Date ____
Checked by ____
Date ____
Designed by ____
Date ____
Checked by ____
Date ____

Approved by
Date ____

Public Works Director
R.C.E. XXXXX

Sheet 6 of 16 Sheets

3384 / 6 OF 16 SHEETS



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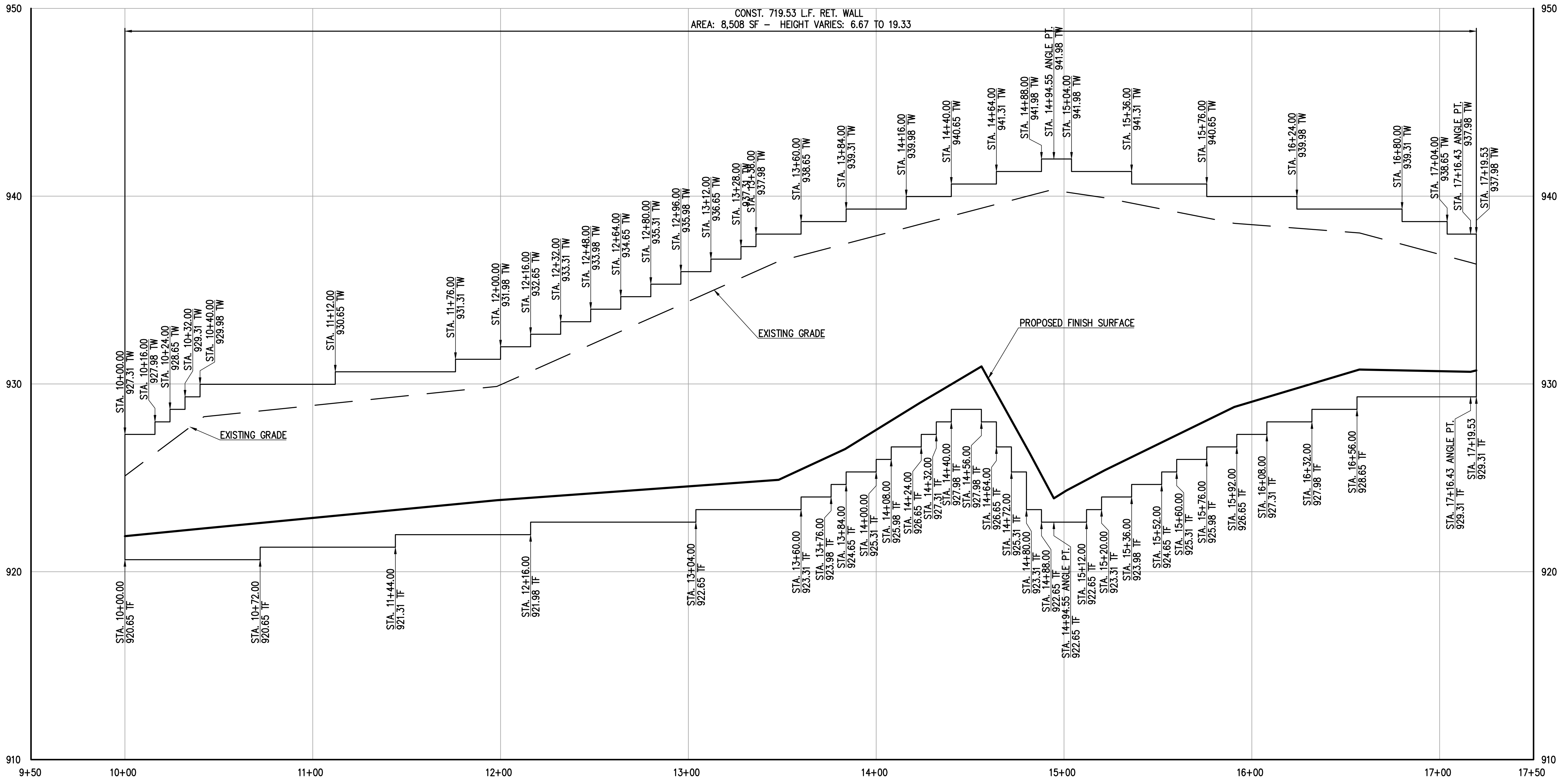

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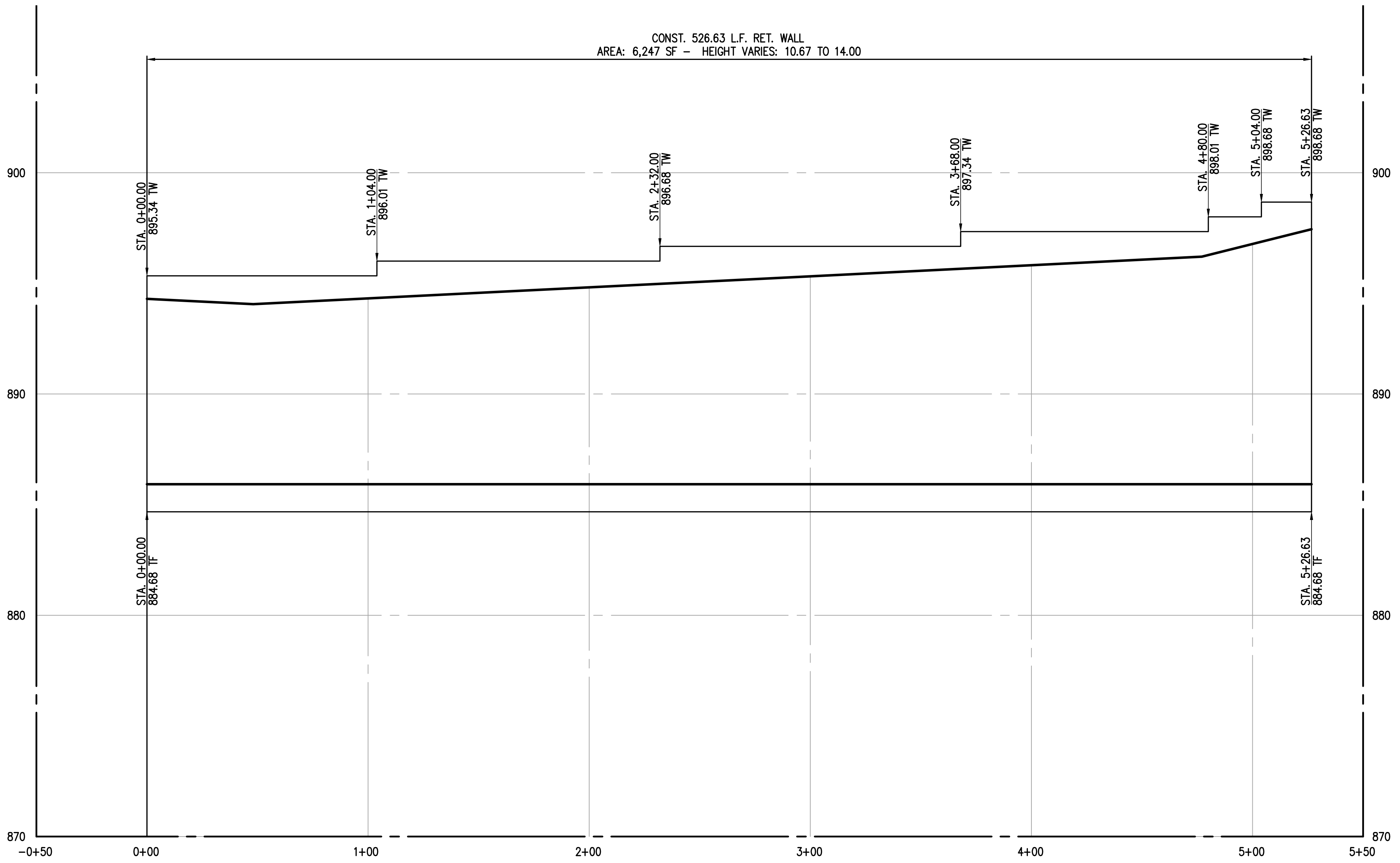

## RETAINING WALL "C" PROFILE

Last Update:7/24/19
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**CITY OF JURUPA VALLEY**
PUBLIC WORKS DEPARTMENT

**CONCEPTUAL**
**RETAINING WALL PROFILES**

**RUBIDOUX COMMERCE PARK**
**MA17132**

3384 / 7 OF 16 SHEETS

**PREPARED FOR:**
PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
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**PREPARED BY:**
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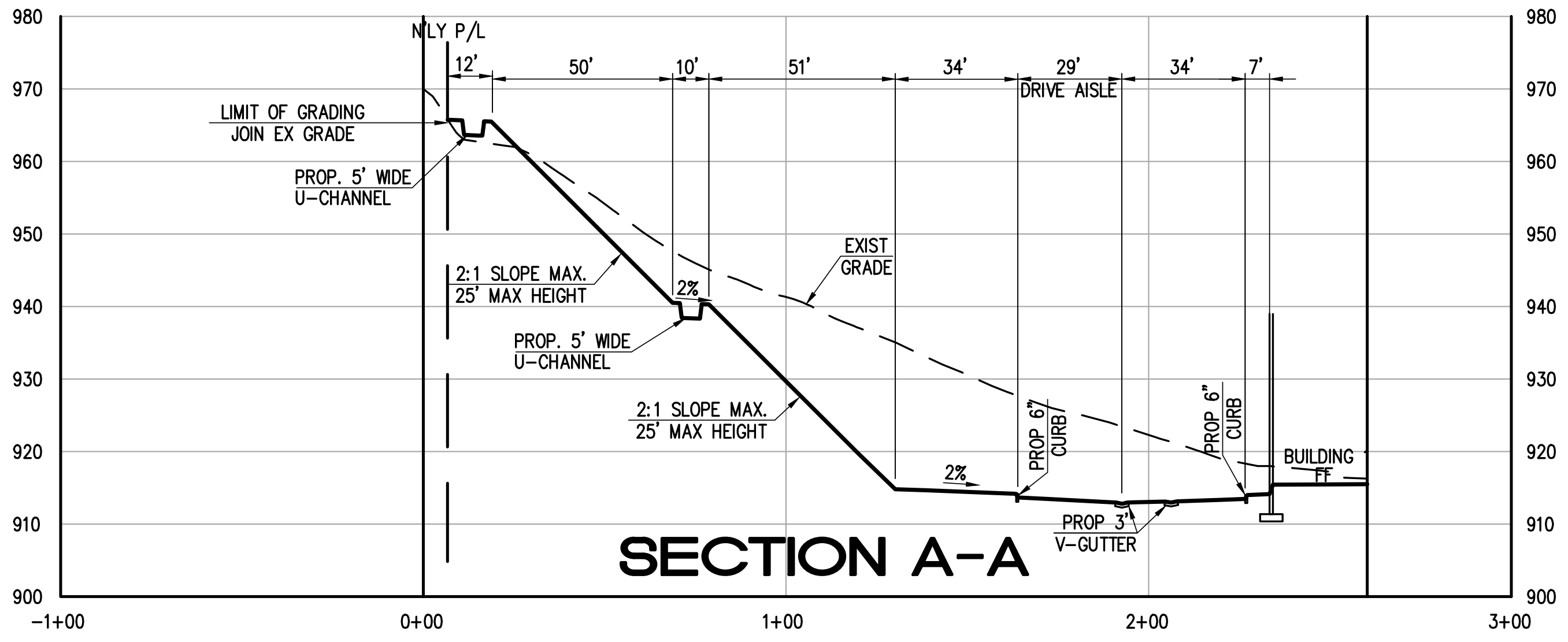
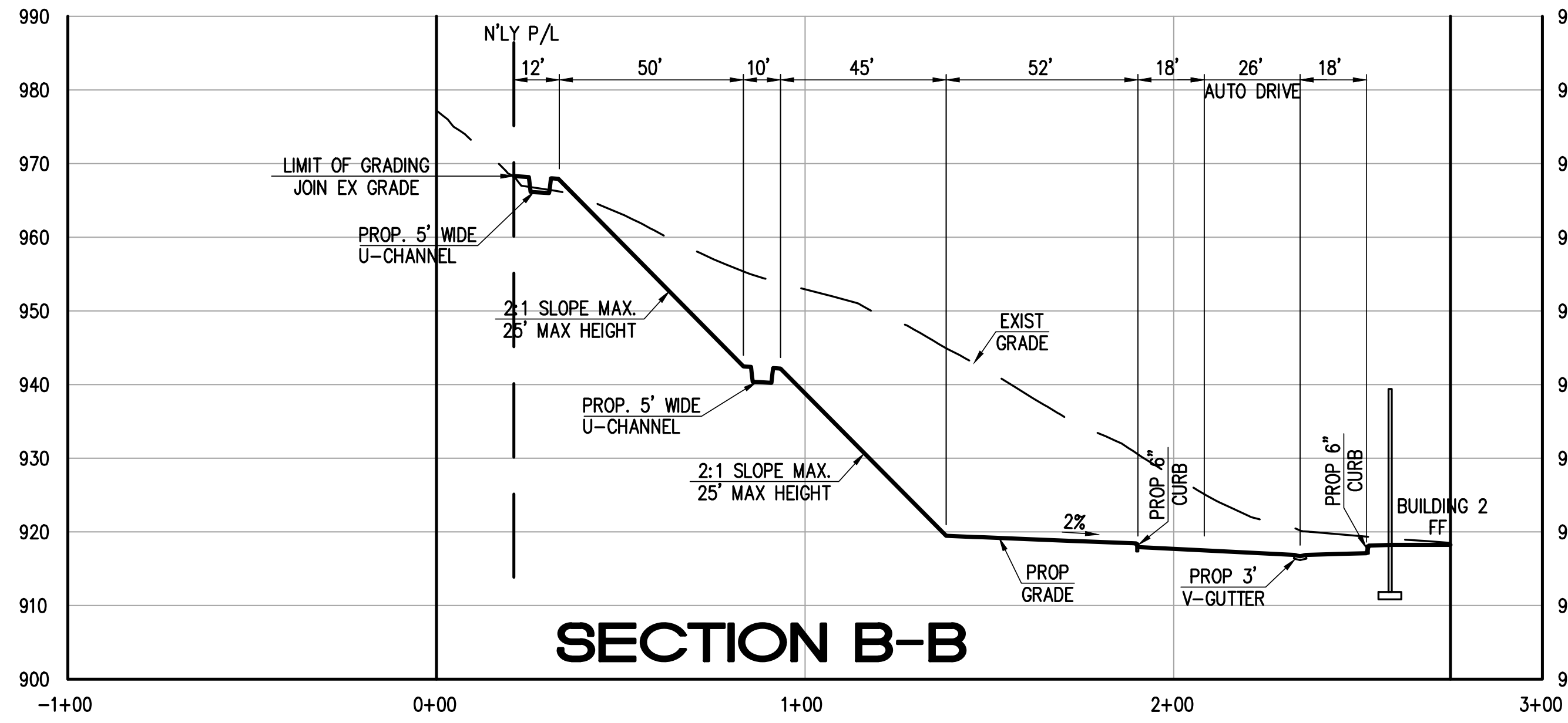
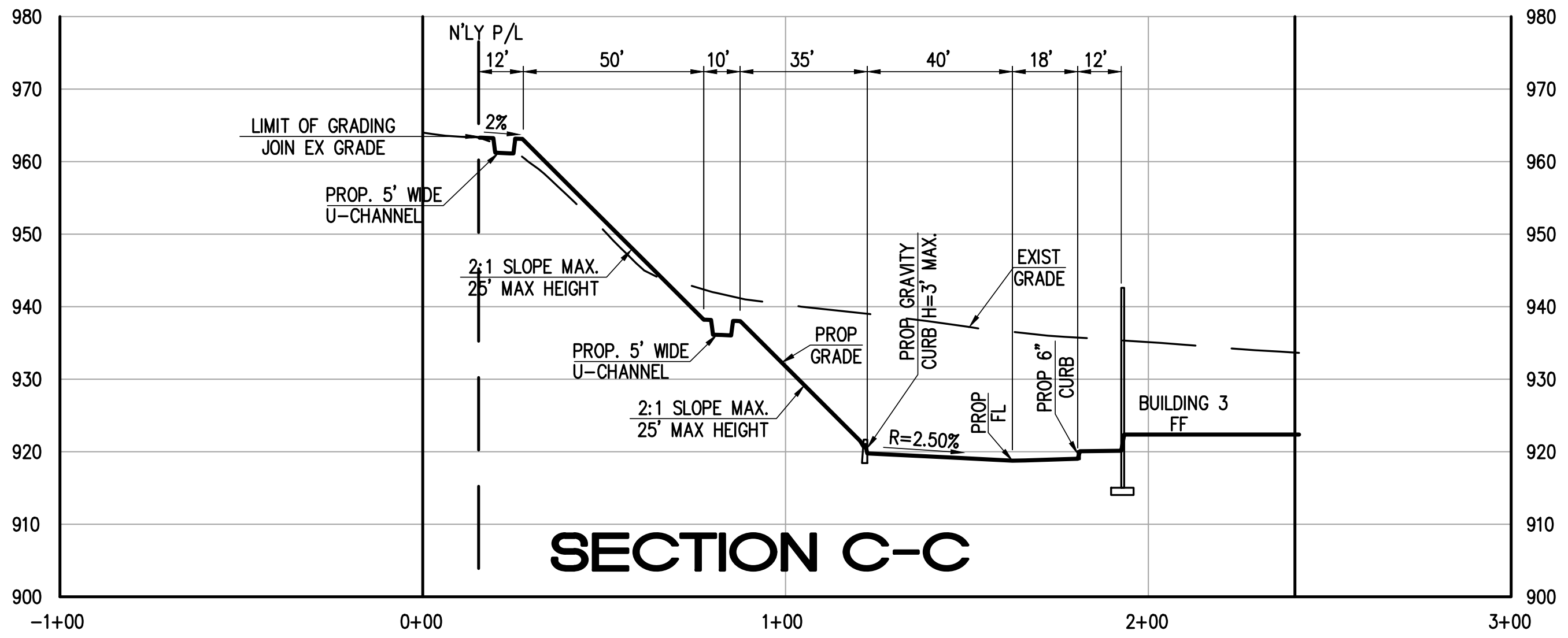
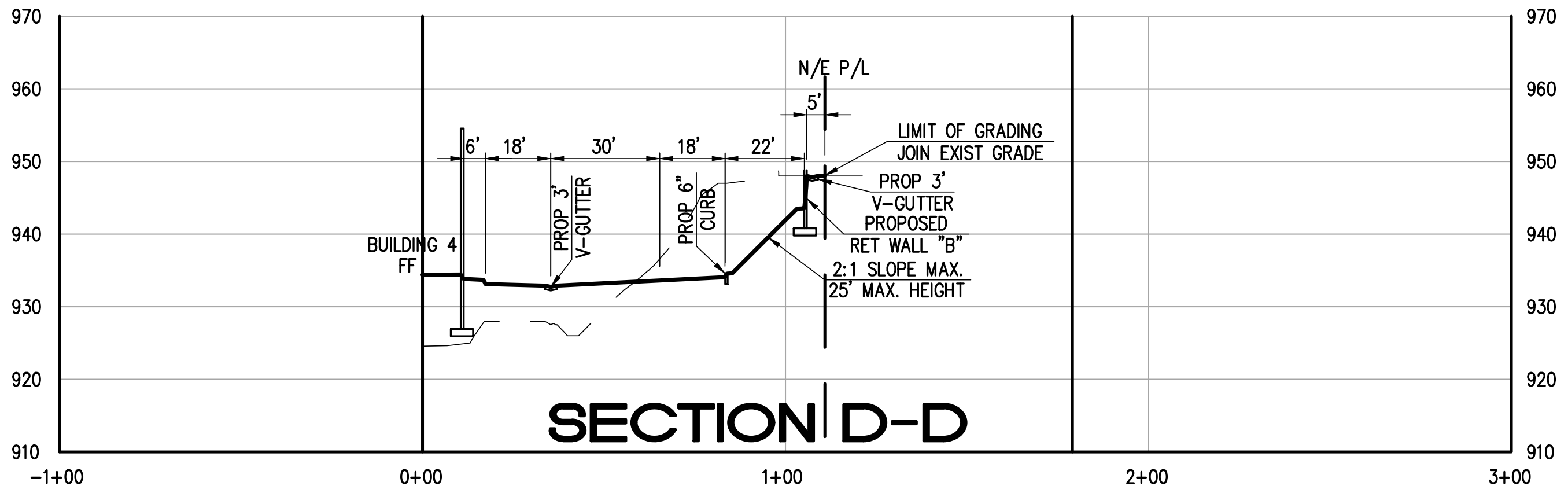
Designed by
Date
Checked by
Date
Designed by
Date
Checked by
Date

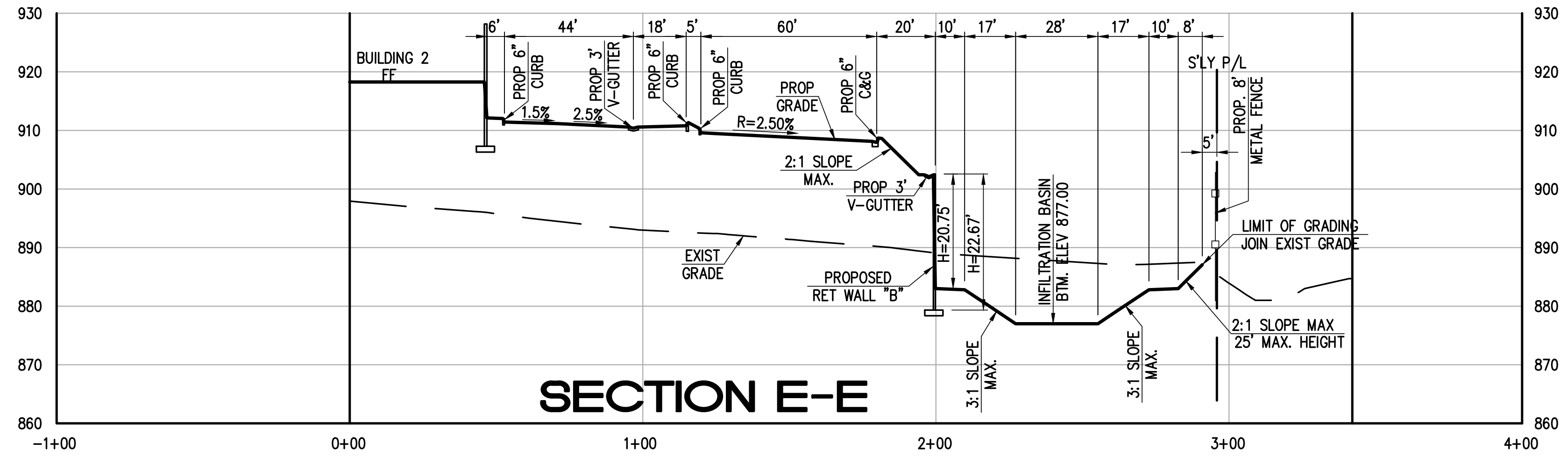
Approved by Date
Public Works Director R.C.E. XXXXX
Sheet 7 of 16 Sheets

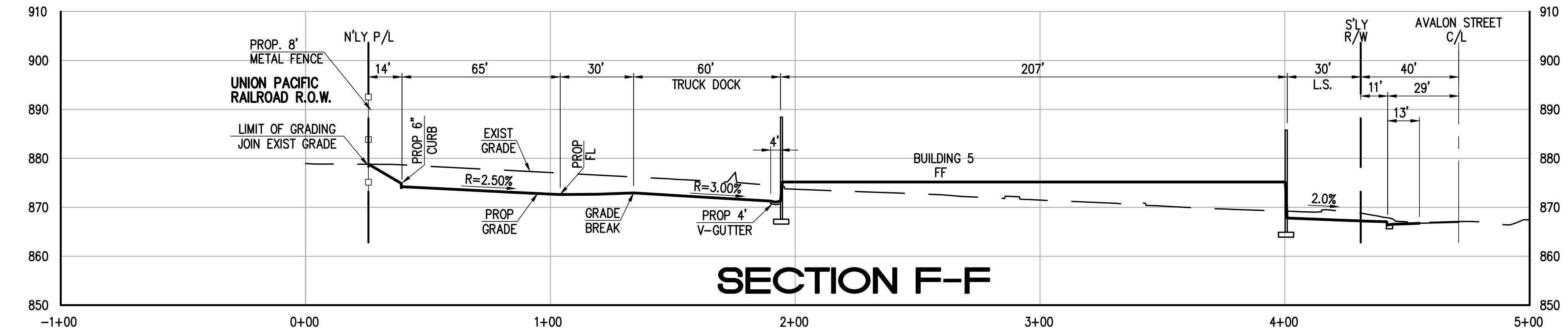


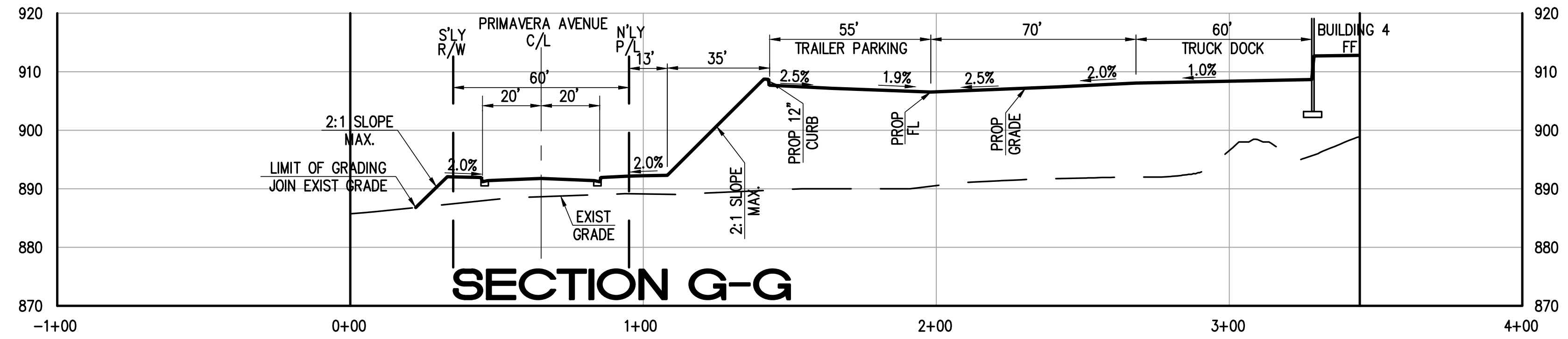


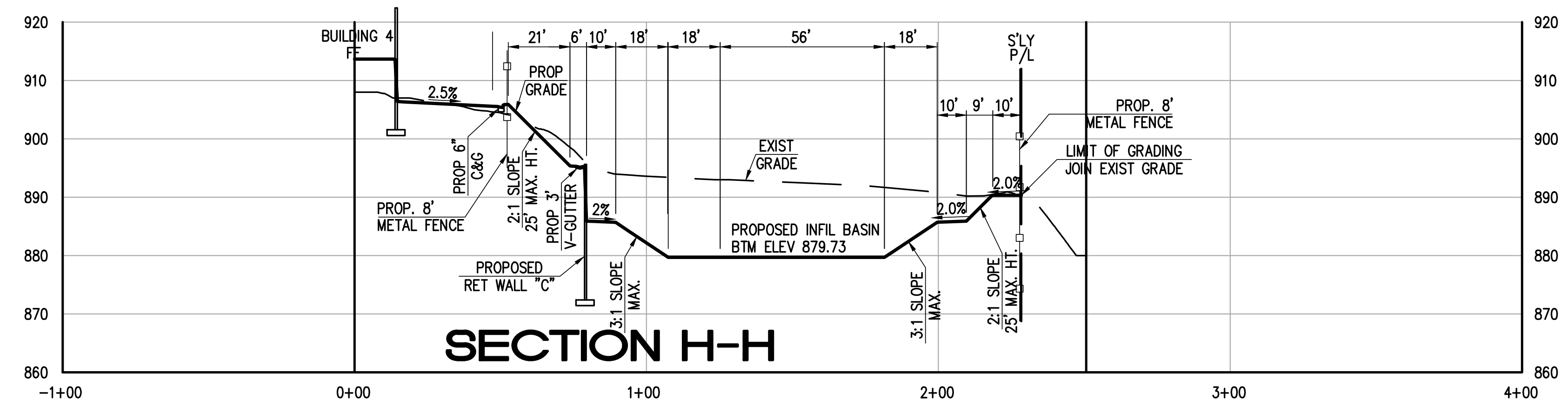


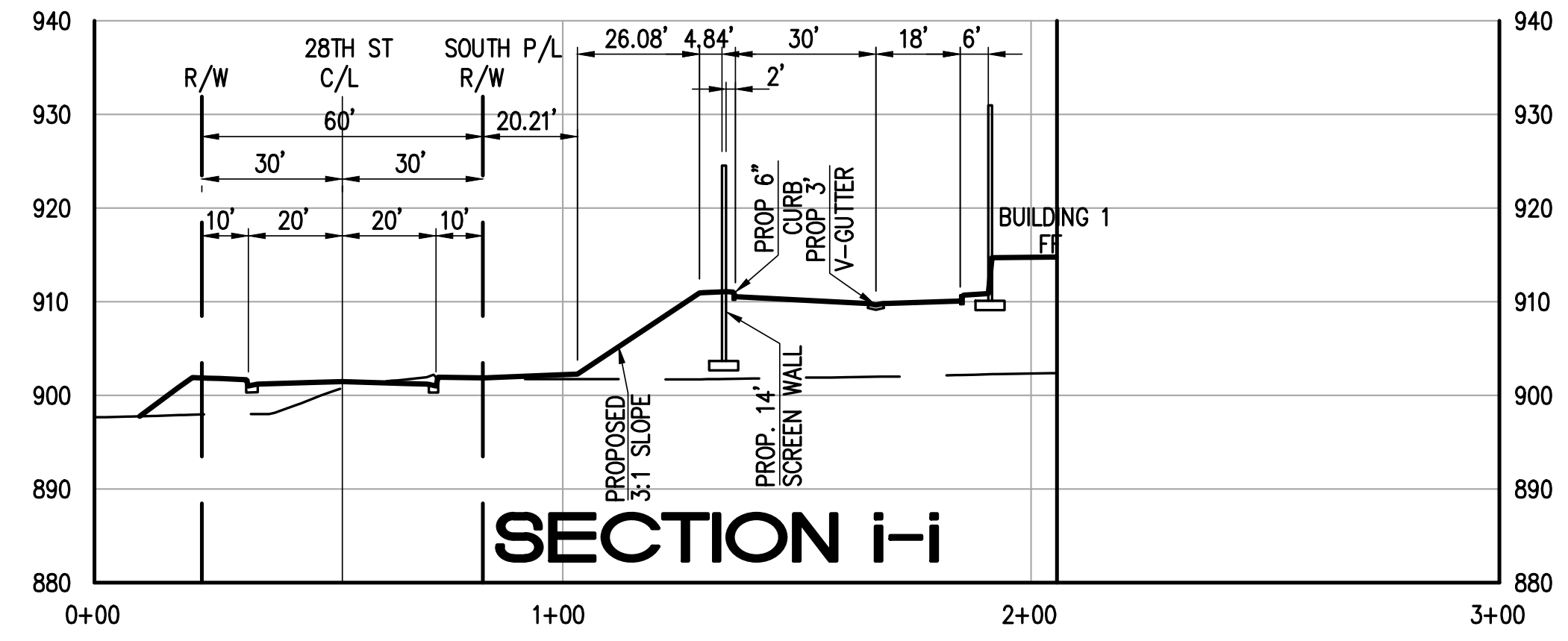


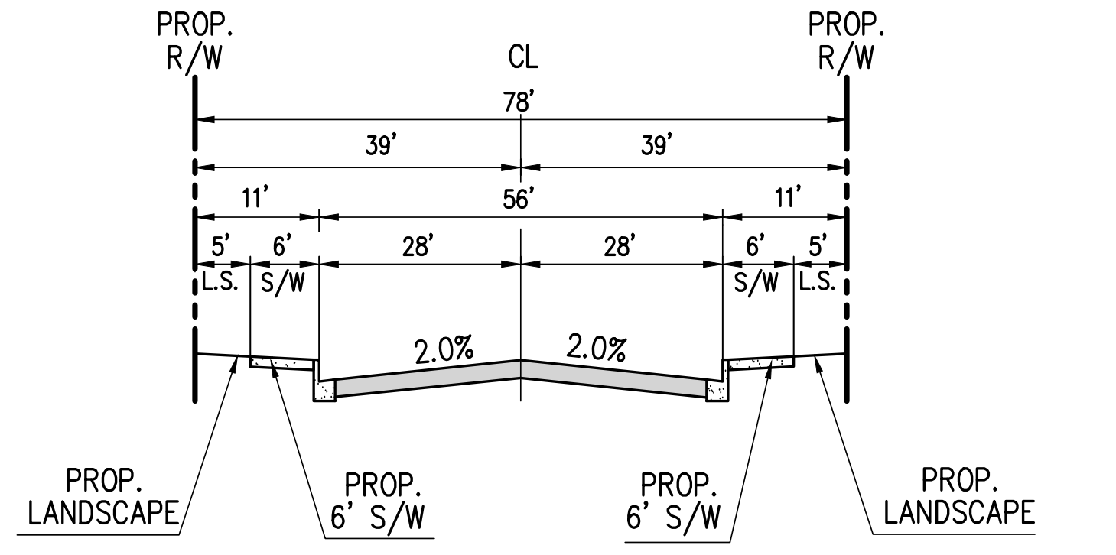












PRIMAVERA AVENUE

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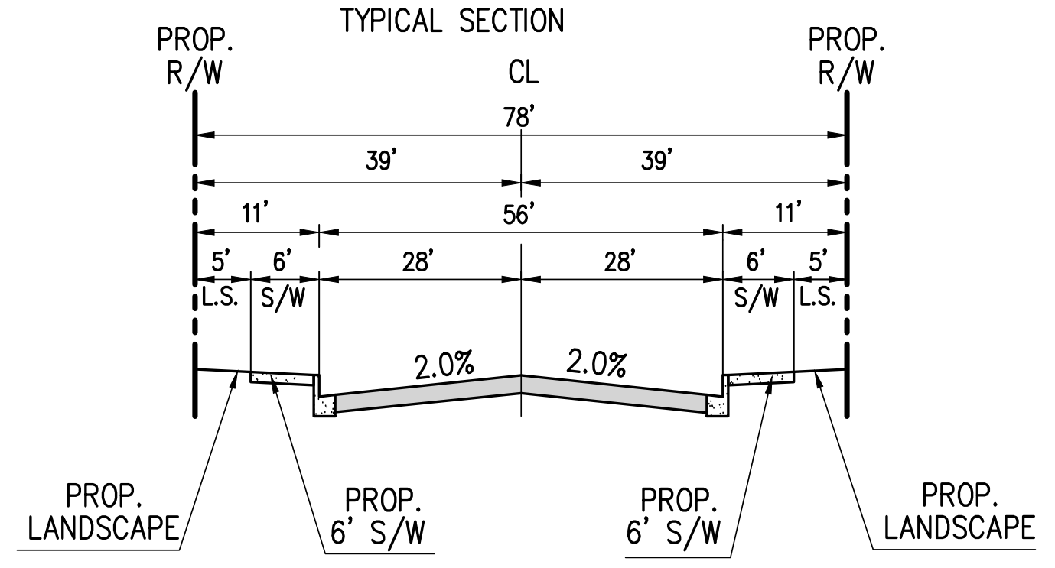

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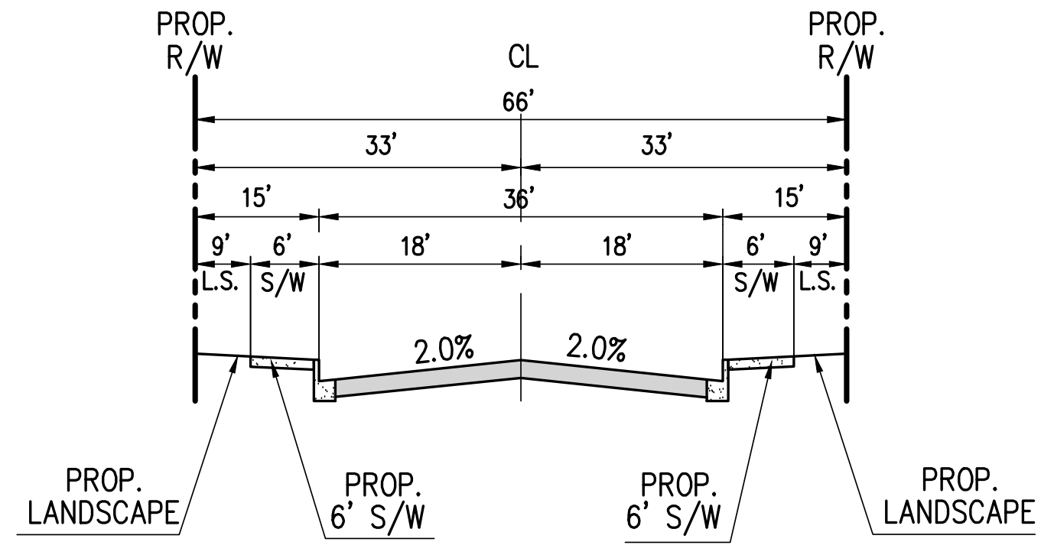
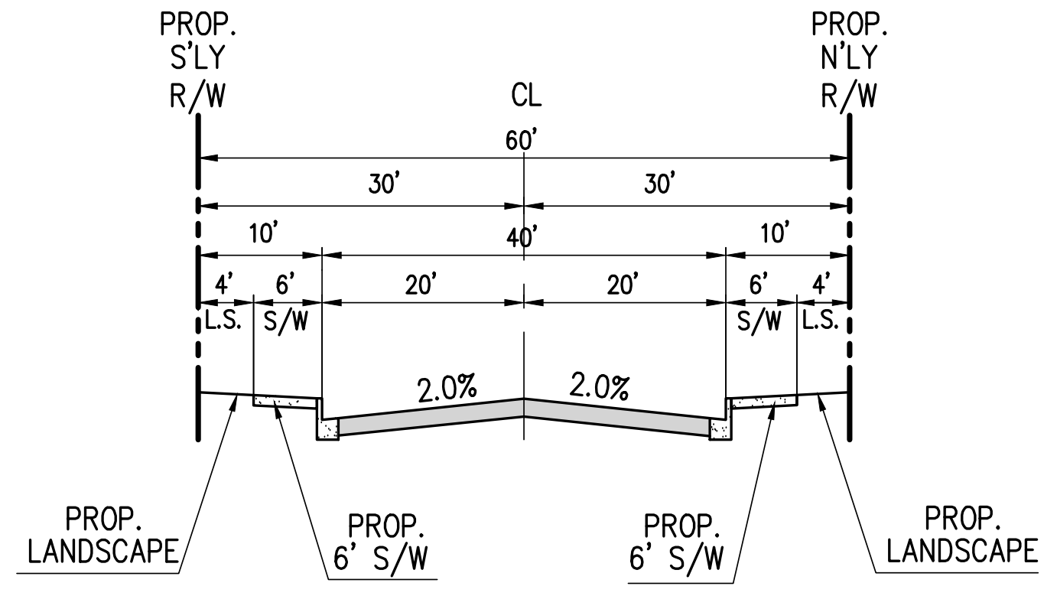
TYPICAL SECTION



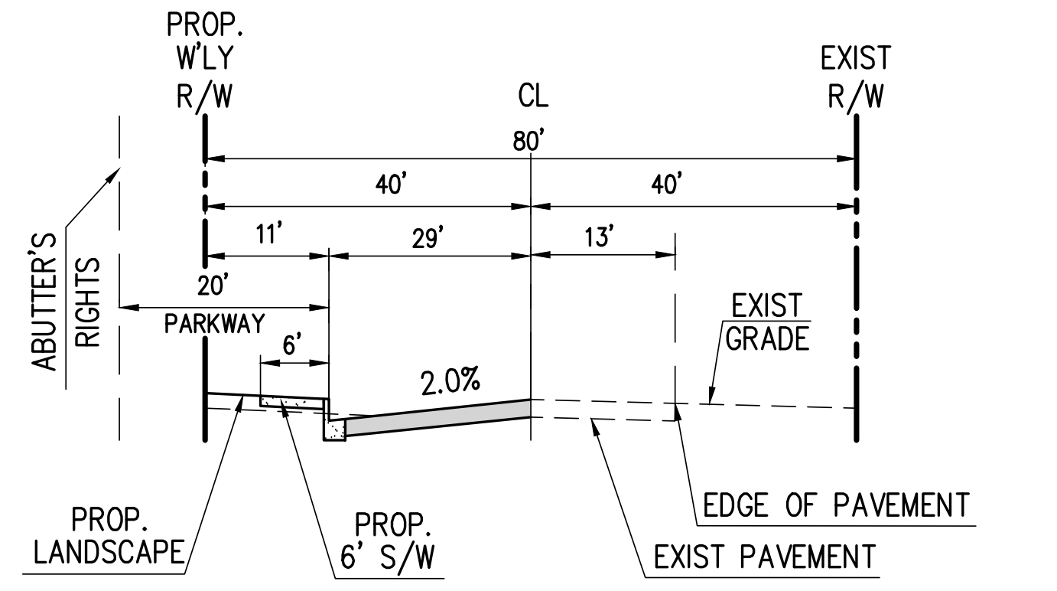
28TH STREET

TYPICAL SECTION



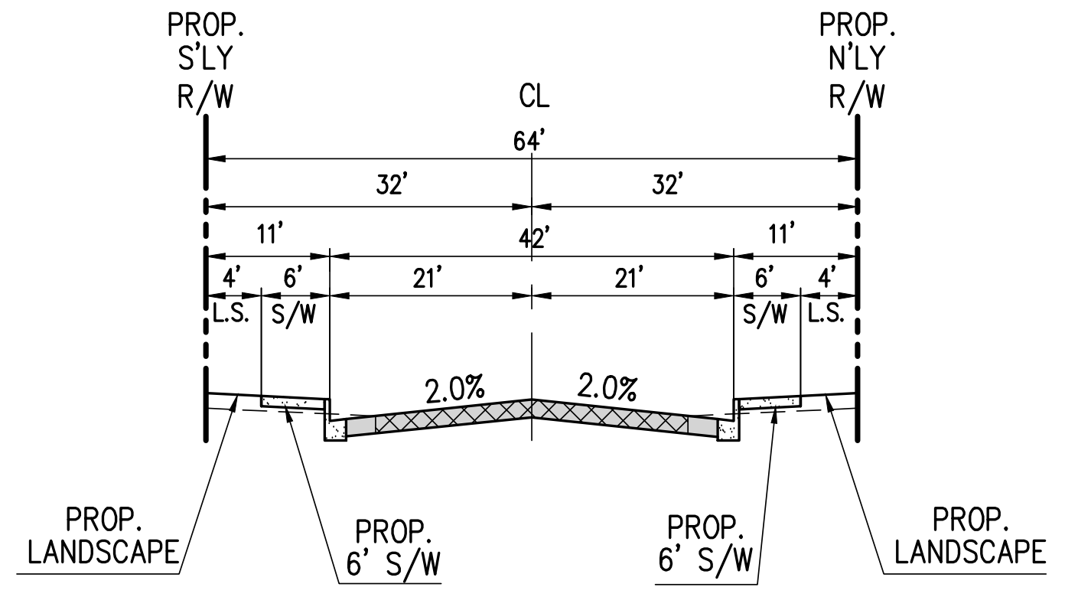
26TH STREET

TYPICAL SECTION



AVALON STREET

TYPICAL SECTION



25TH STREET

TYPICAL SECTION

Last Update: 2/23/22
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# CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

# CONCEPTUAL ONSITE CROSS SECTIONS AND STREET TYPICAL SECTIONS
## RUBIDOUX COMMERCE PARK
## MA17132

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
(949) 296-7006

**PREPARED BY:**

Thienes Engineering, Inc.
CIVIL ENGINEERING •LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Designed by ______
Date ______
Checked by ______
Date ______
Designed by ______
Date ______
Checked by ______
Date ______

Approved by Date ______

Public Works Director R.C.E. XXXXX

Sheet 8 of 16 Sheets

3384 / 8 OF 16 SHEETS

Last Update: 12/20/18
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**CITY OF JURUPA VALLEY**
PUBLIC WORKS DEPARTMENT

**CONCEPTUAL UTILITY PLAN**

**RUBIDOUX COMMERCE PARK**
**MA17132**

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
(949) 296-7006

**PREPARED BY:**

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Date ______
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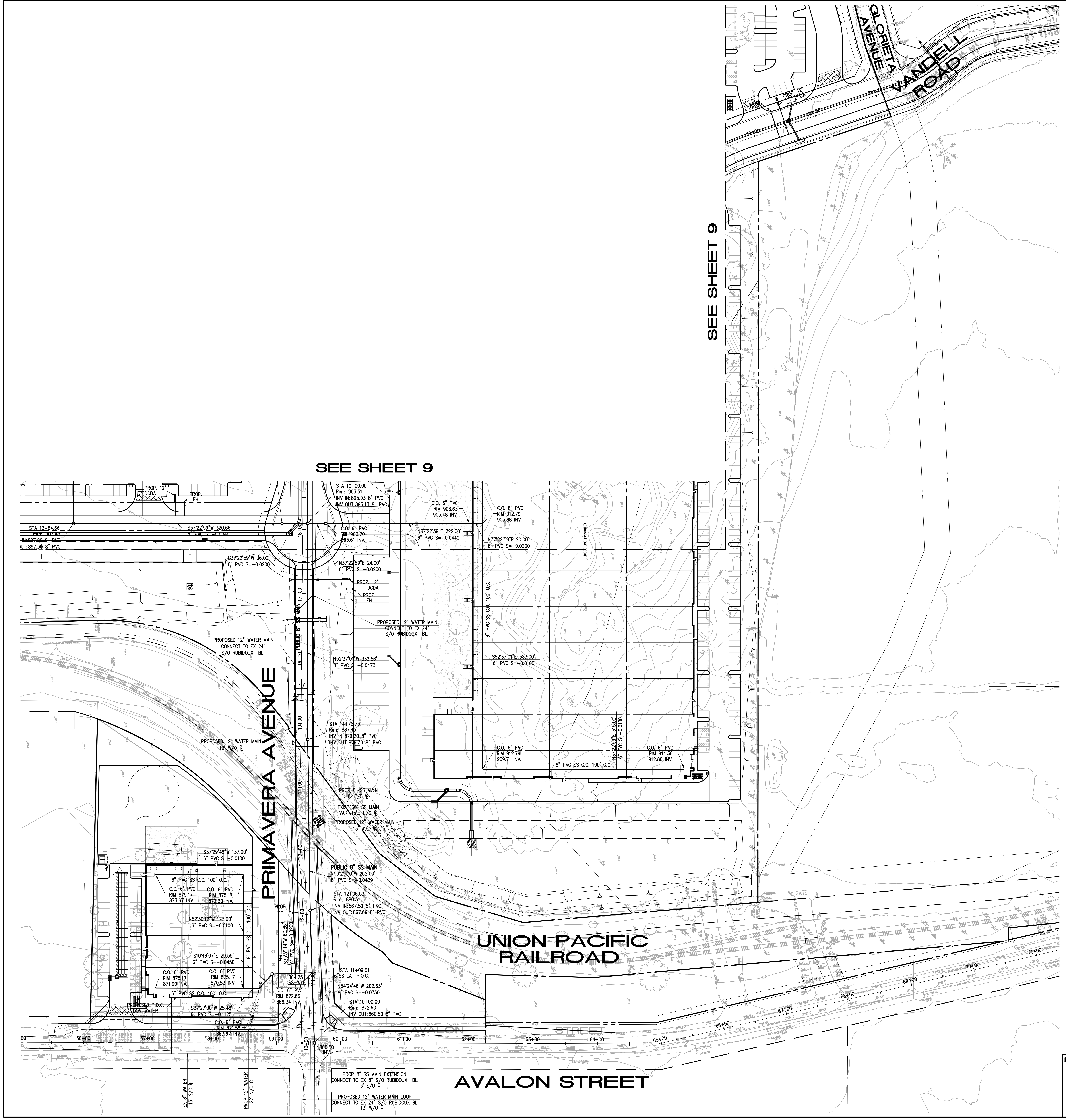
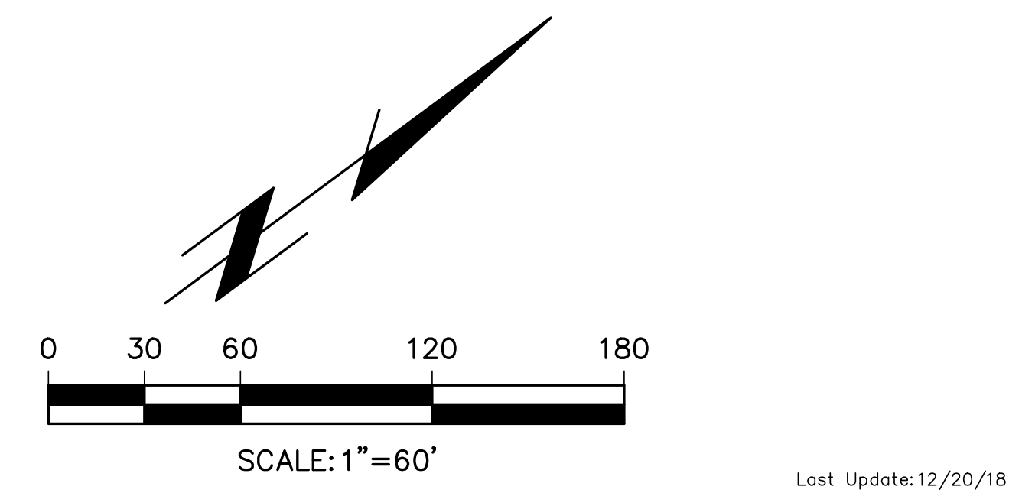
Public Works Director R.C.E. XXXXX

Sheet 9 of 16 Sheets

3384 / 9 OF 16 SHEETS





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Last Update: 12/20/18
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# CITY OF JURUPA VALLEY

PUBLIC WORKS DEPARTMENT

## CONCEPTUAL UTILITY PLAN

## RUBIDOUX COMMERCE PARK
MA17132

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
(949) 296-7006

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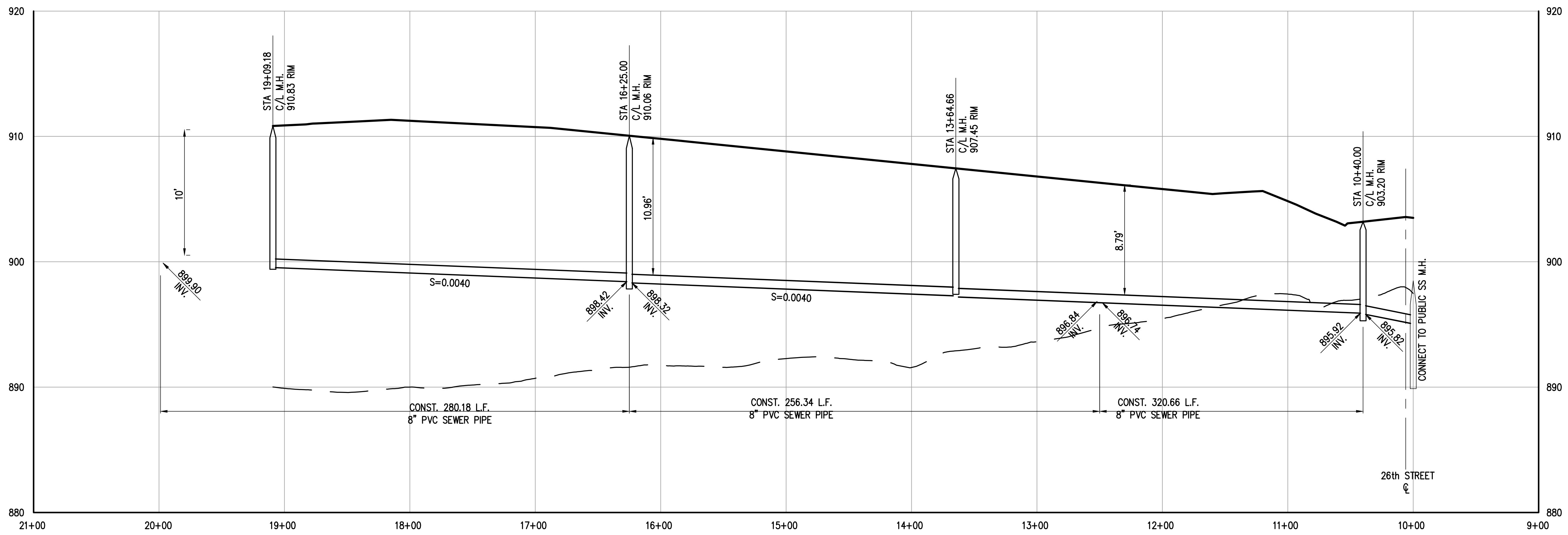
Designed by ____
Date ____
Checked by ____
Date ____
Designed by ____
Date ____
Checked by ____
Date ____

Approved by ____ Date ____

Public Works Director R.C.E. XXXXX

Sheet 10 of 16 Sheets

3384 /10 OF 16 SHEETS



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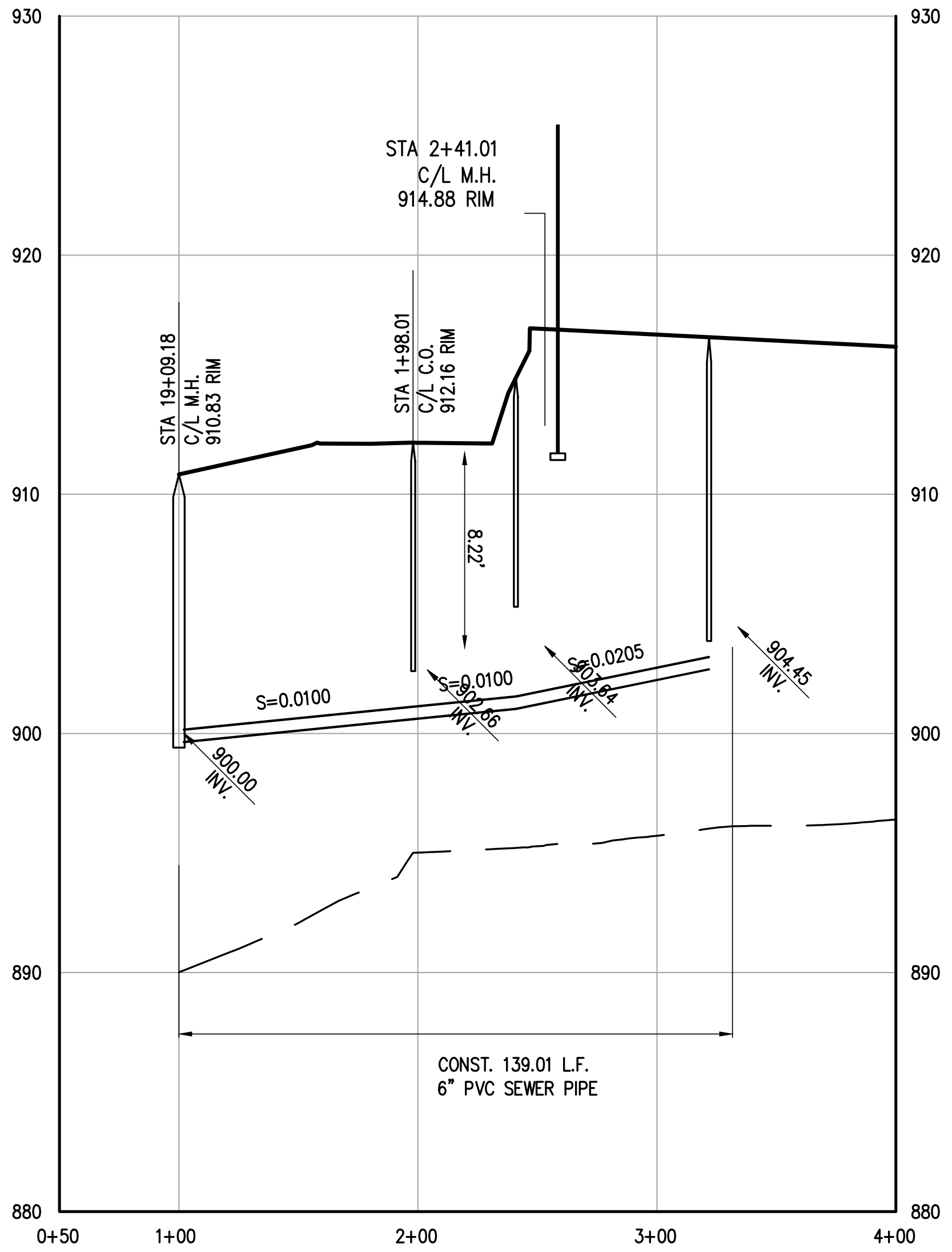

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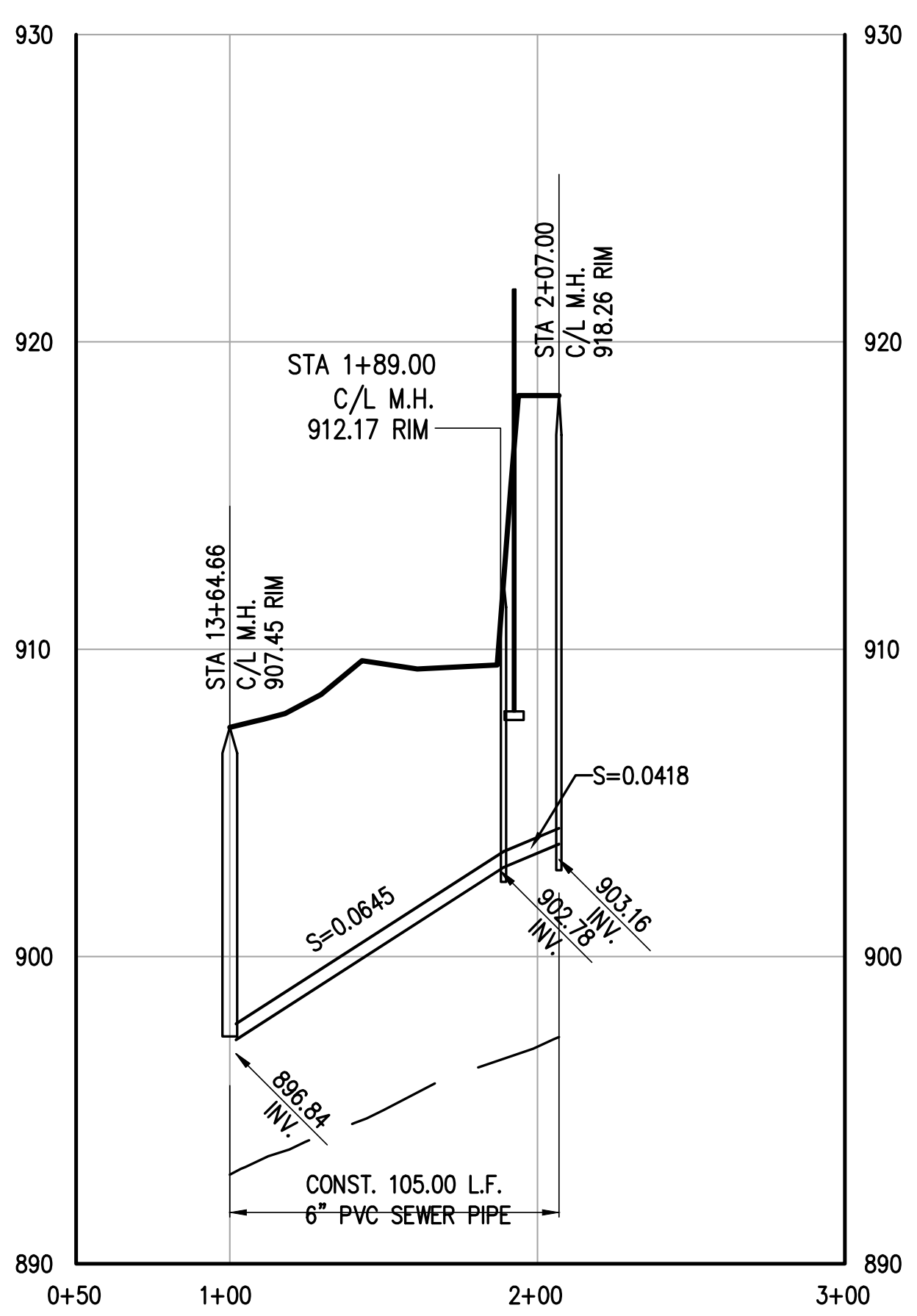

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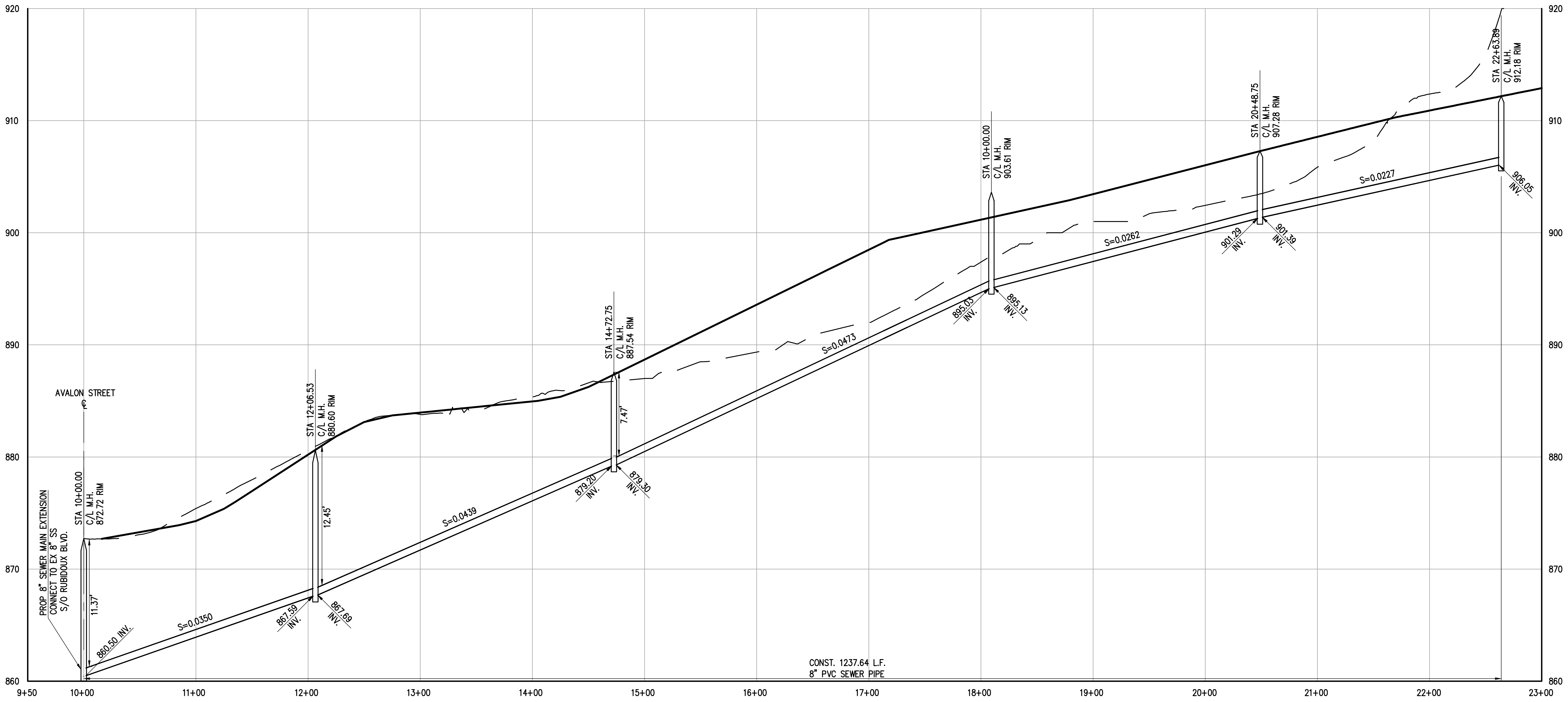

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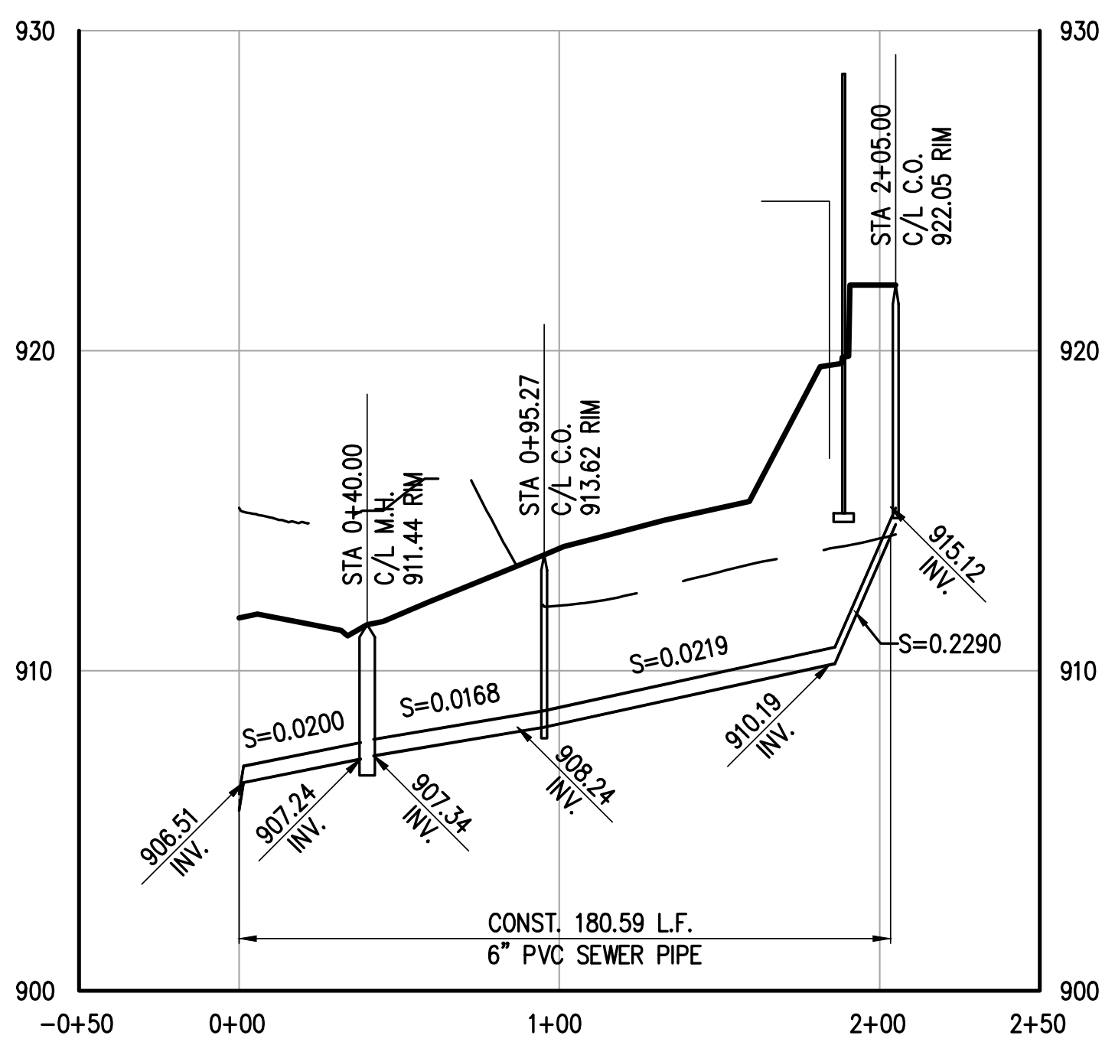

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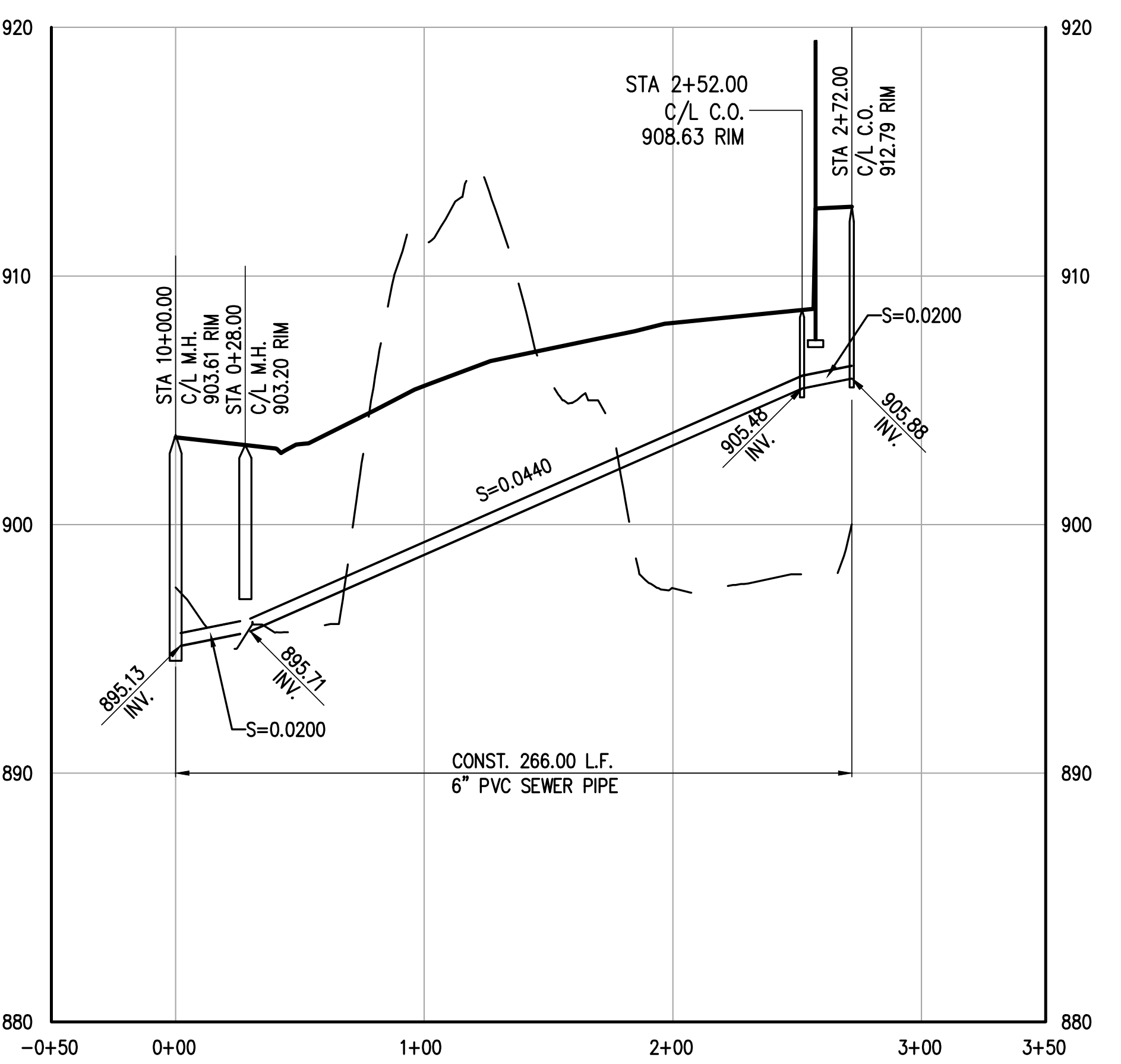

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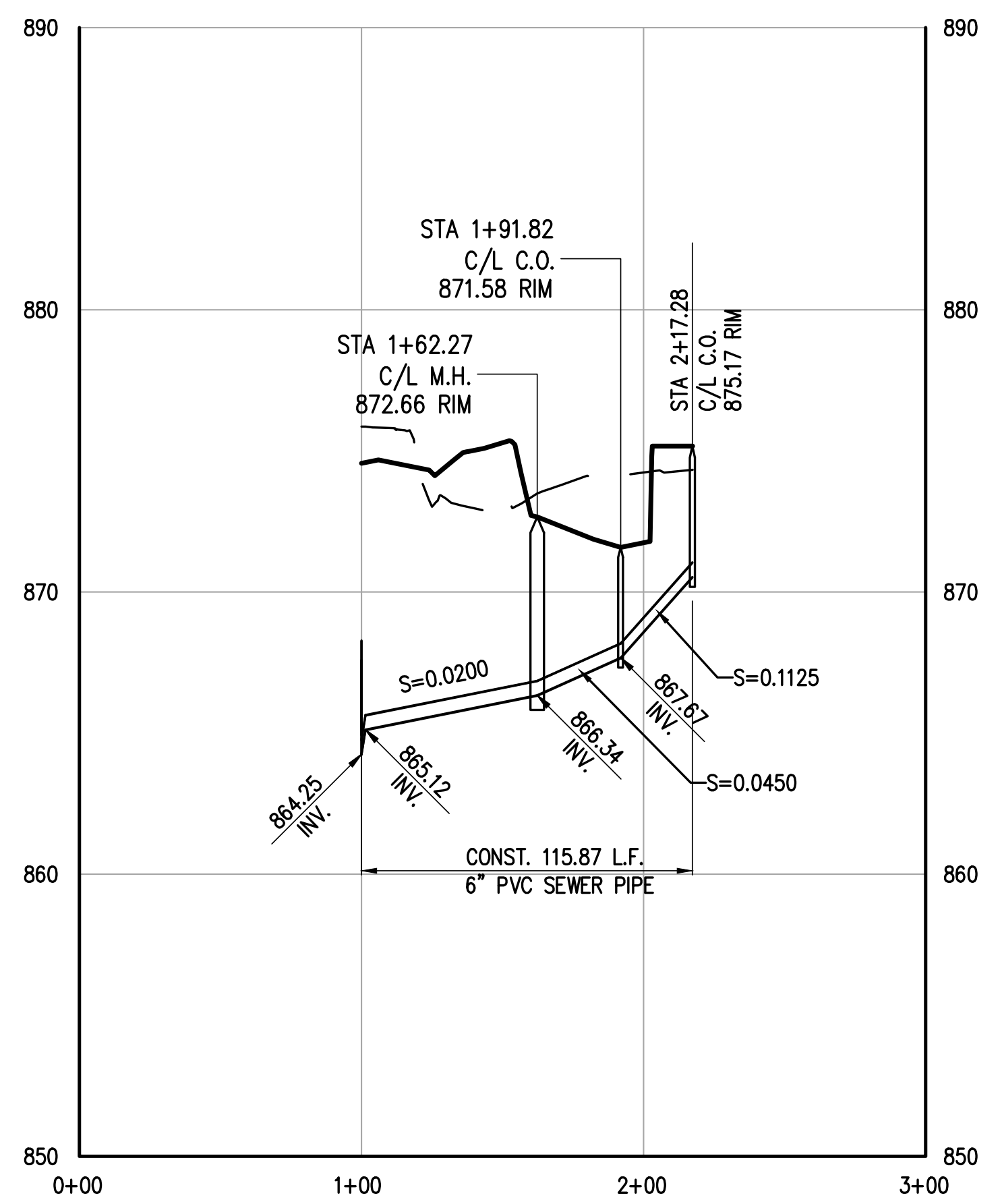

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Last Update: 7/26/19
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**CITY OF JURUPA VALLEY**
PUBLIC WORKS DEPARTMENT

**CONCEPTUAL UTILITY**
**SEWER PROFILES**

**RUBIDOUX COMMERCE PARK**
**MA17132**

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
(949) 296-7006

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Designed by ____________
Date ____________
Checked by ____________
Date ____________
Designed by ____________
Date ____________
Checked by ____________
Date ____________

Approved by Date ________

Public Works Director R.C.E. XXXXX

Sheet 11 of 16 Sheets

3384 /11 OF 16 SHEETS

Last Update: 6/21/23
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# CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

## CONCEPTUAL
## ONSITE STORM DRAIN PLAN

## RUBIDOUX COMMERCE PARK
## MA17132

**PREPARED FOR:**

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NEWPORT BEACH, CA 92660
(949) 296-7006

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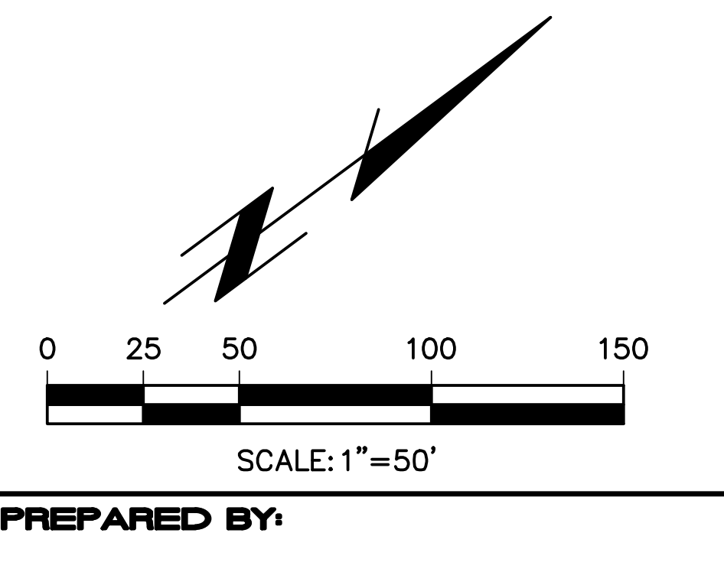
Date ______
Designed by ______
Date ______
Checked by ______
Date ______

Approved by ______ Date ______

Public Works Director R.C.E. XXXXX

Sheet 12 of 16 Sheets

3384 /12 OF 16 SHEETS



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Last Update: 5/10/23
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# CITY OF JURUPA VALLEY

PUBLIC WORKS DEPARTMENT

## CONCEPTUAL
## ONSITE STORM DRAIN PLAN

## RUBIDOUX COMMERCE PARK
## MA17132

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
(949) 296-7006

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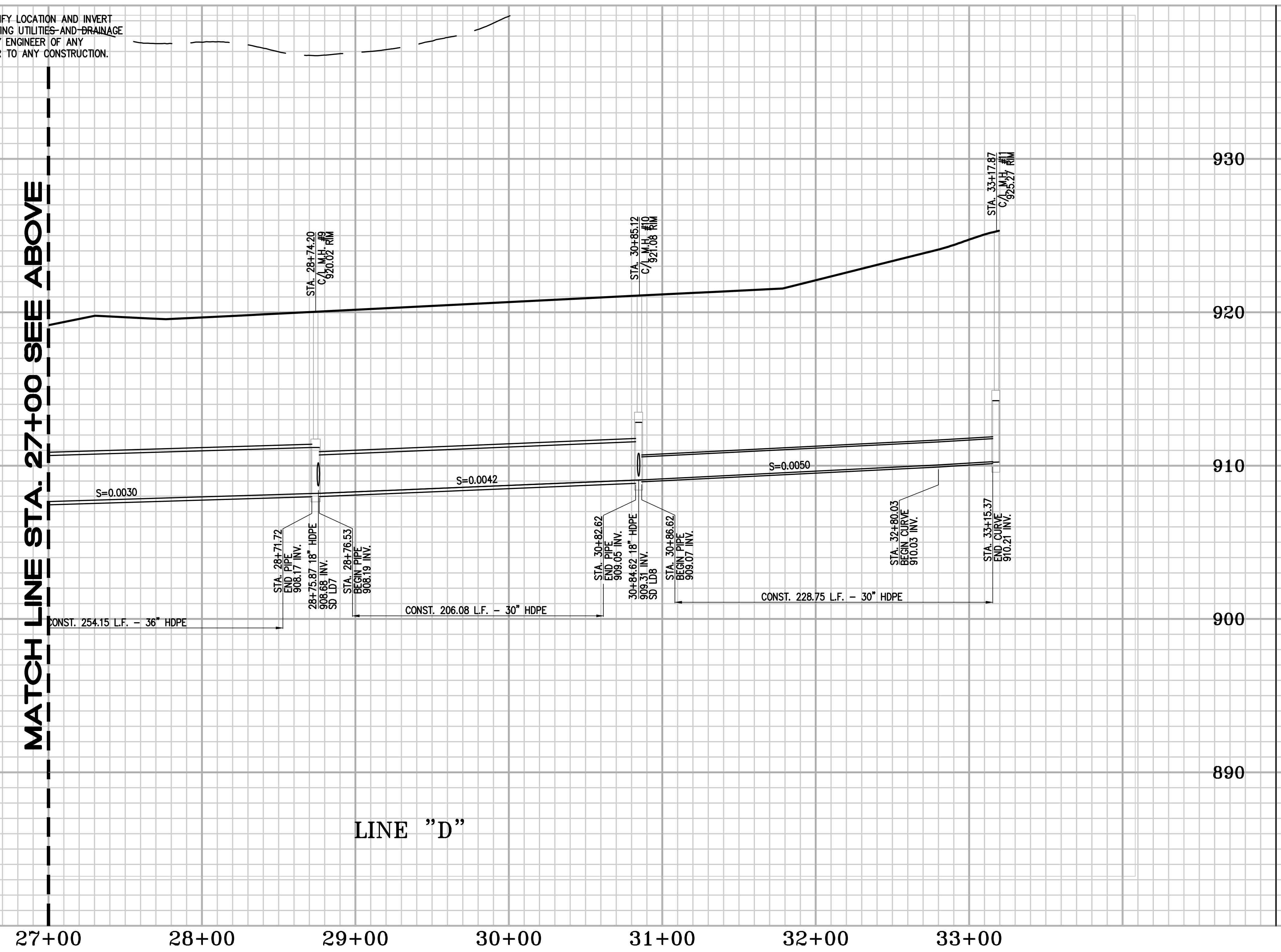
Public Works Director R.C.E. XXXXX

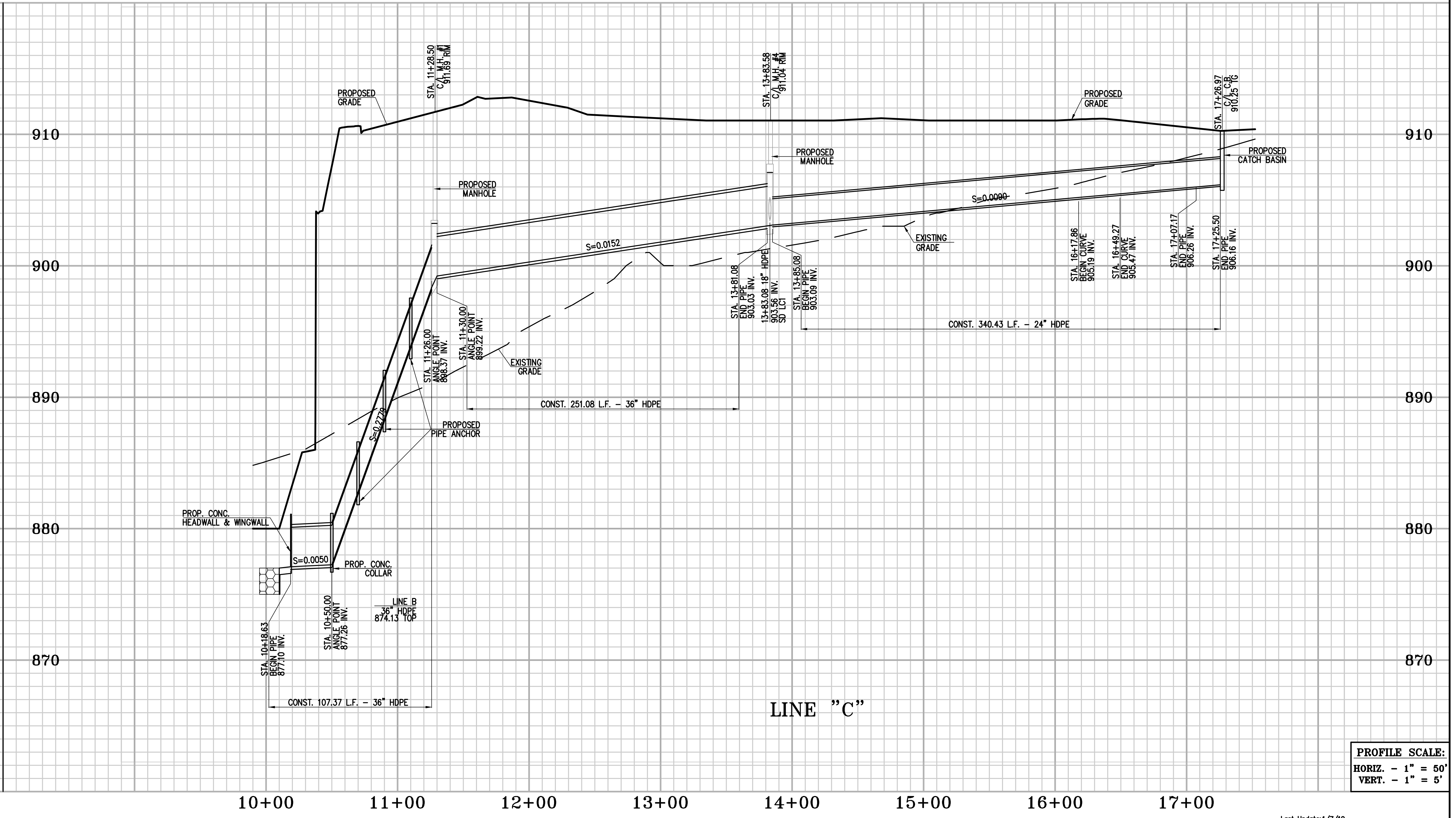
Sheet 13 of 16 Sheets

3384 /13 OF 16 SHEETS

*CONTRACTOR TO VERIFY LOCATION AND INVERT ELEVATIONS OF EXISTING UTILITIES AND DRAINAGE SYSTEMS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ANY CONSTRUCTION.

*CONTRACTOR TO VERIFY LOCATION AND INVERT ELEVATIONS OF EXISTING UTILITIES ~~AND DRAINAGE~~ SYSTEMS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ANY CONSTRUCTION.





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# CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

## CONCEPTUAL
## STORM DRAIN PROFILES

RUBIDOUX COMMERCE PARK
MA17132

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
(949) 296-7006

**PREPARED BY:**

Thienes Engineering, Inc.
CIVIL ENGINEERING •LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Designed by ______
Date ______
Checked by ______
Date ______
Designed by ______
Date ______
Checked by ______
Date ______

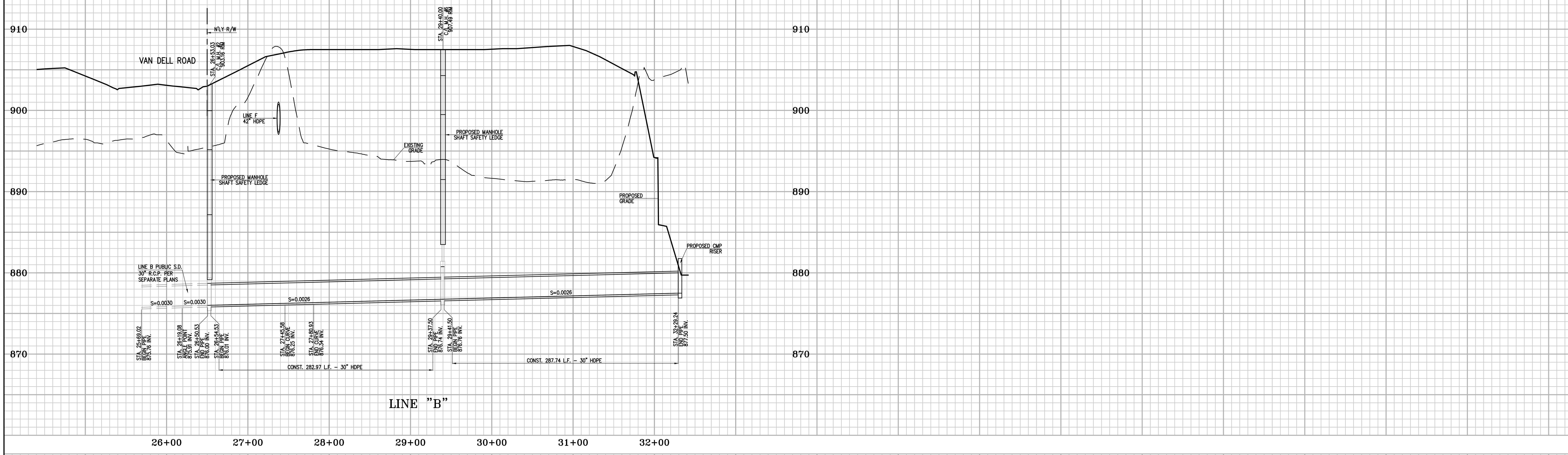
Approved by Date ______

Public Works Director R.C.E. XXXXX

Sheet 14 of 16 Sheets

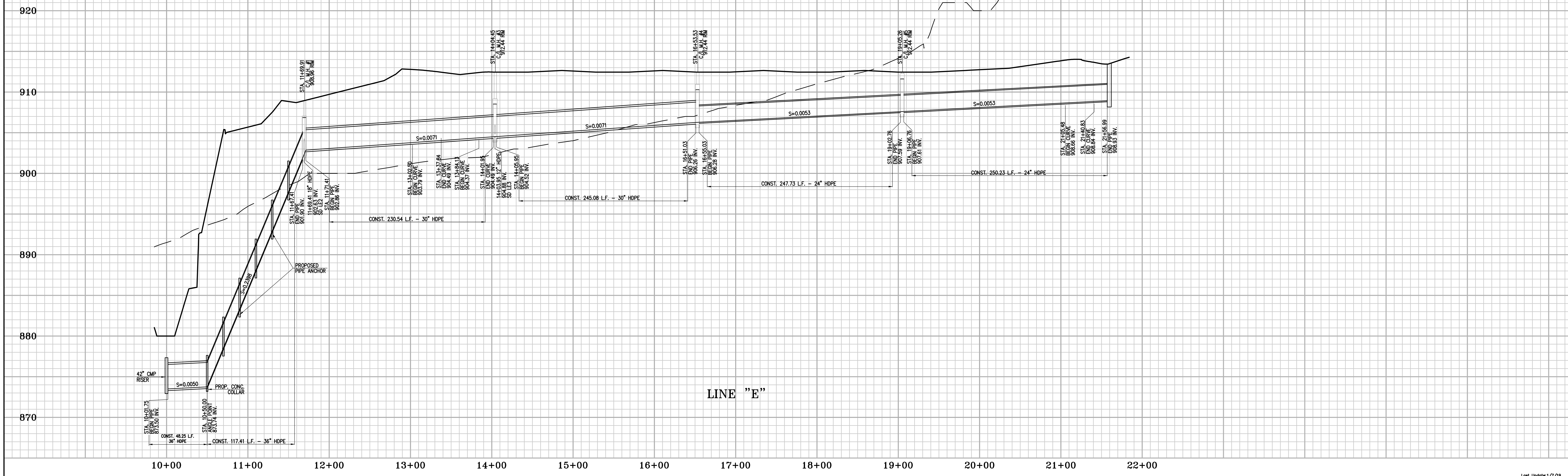
3384 /14 OF 16 SHEETS

*CONTRACTOR TO VERIFY LOCATION AND INVERT ELEVATIONS OF EXISTING UTILITIES AND DRAINAGE SYSTEMS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ANY CONSTRUCTION.



**PROFILE SCALE:**
HORIZ. – 1" = 50'
VERT. – 1" = 5'

*CONTRACTOR TO VERIFY LOCATION AND INVERT ELEVATIONS OF EXISTING UTILITIES AND DRAINAGE SYSTEMS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ANY CONSTRUCTION.



**PROFILE SCALE:**
HORIZ. – 1" = 50'
VERT. – 1" = 5'

Last Update:1/7/19
O:\3300-3399\3384\3384CGP13-SDC PROF.dwg

# CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

## CONCEPTUAL
## STORM DRAIN PROFILES

## RUBIDOUX COMMERCE PARK
## MA17132

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
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Designed by ________
Date ________
Checked by ________
Date ________
Designed by ________
Date ________
Checked by ________
Date ________

Approved by ________ Date ________

Public Works Director R.C.E. XXXXX

Sheet 15 of 16 Sheets

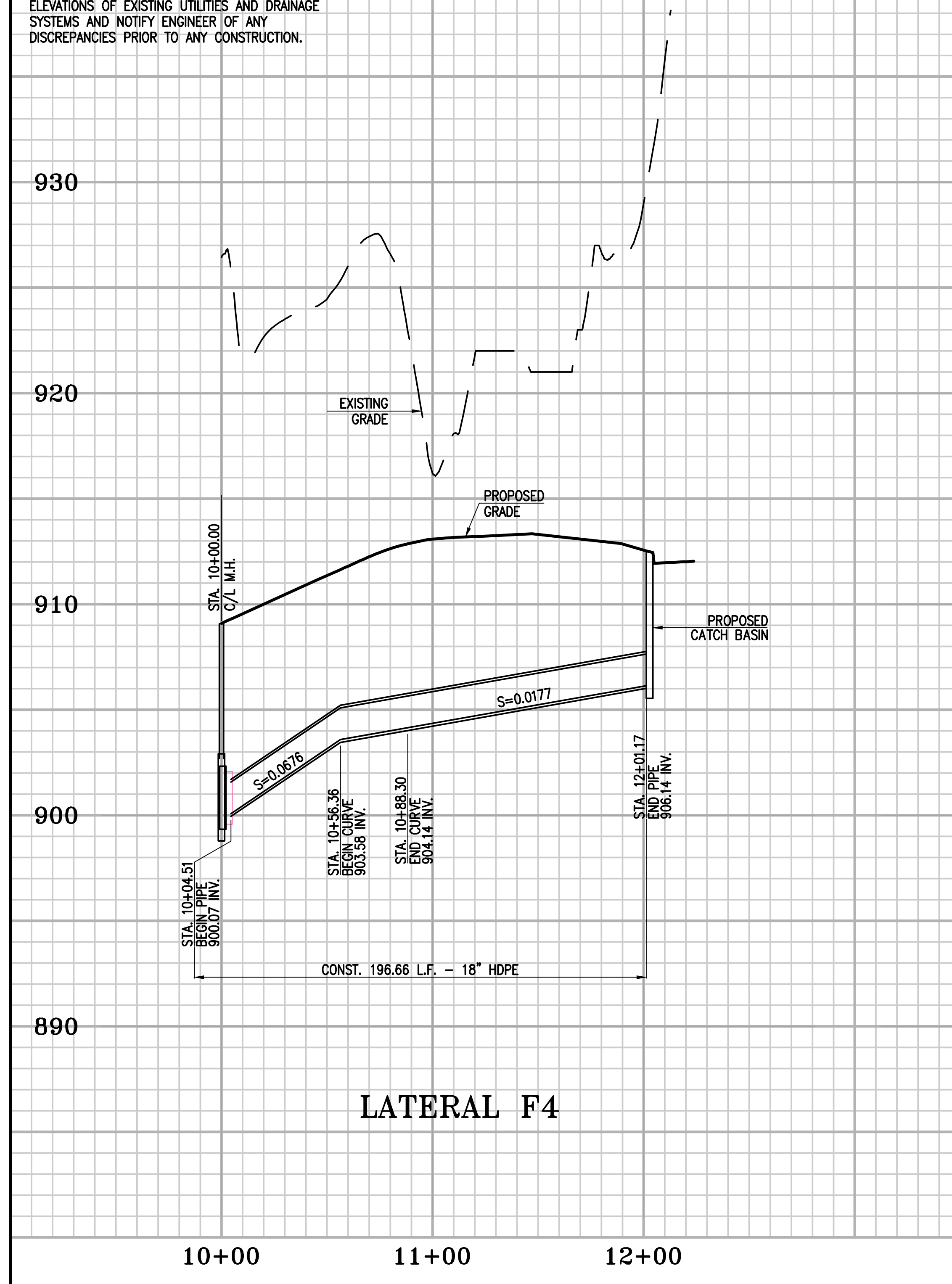
3384 / 15 OF 16 SHEETS

*CONTRACTOR TO VERIFY LOCATION AND INVERT ELEVATIONS OF EXISTING UTILITIES AND DRAINAGE SYSTEMS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ANY CONSTRUCTION.

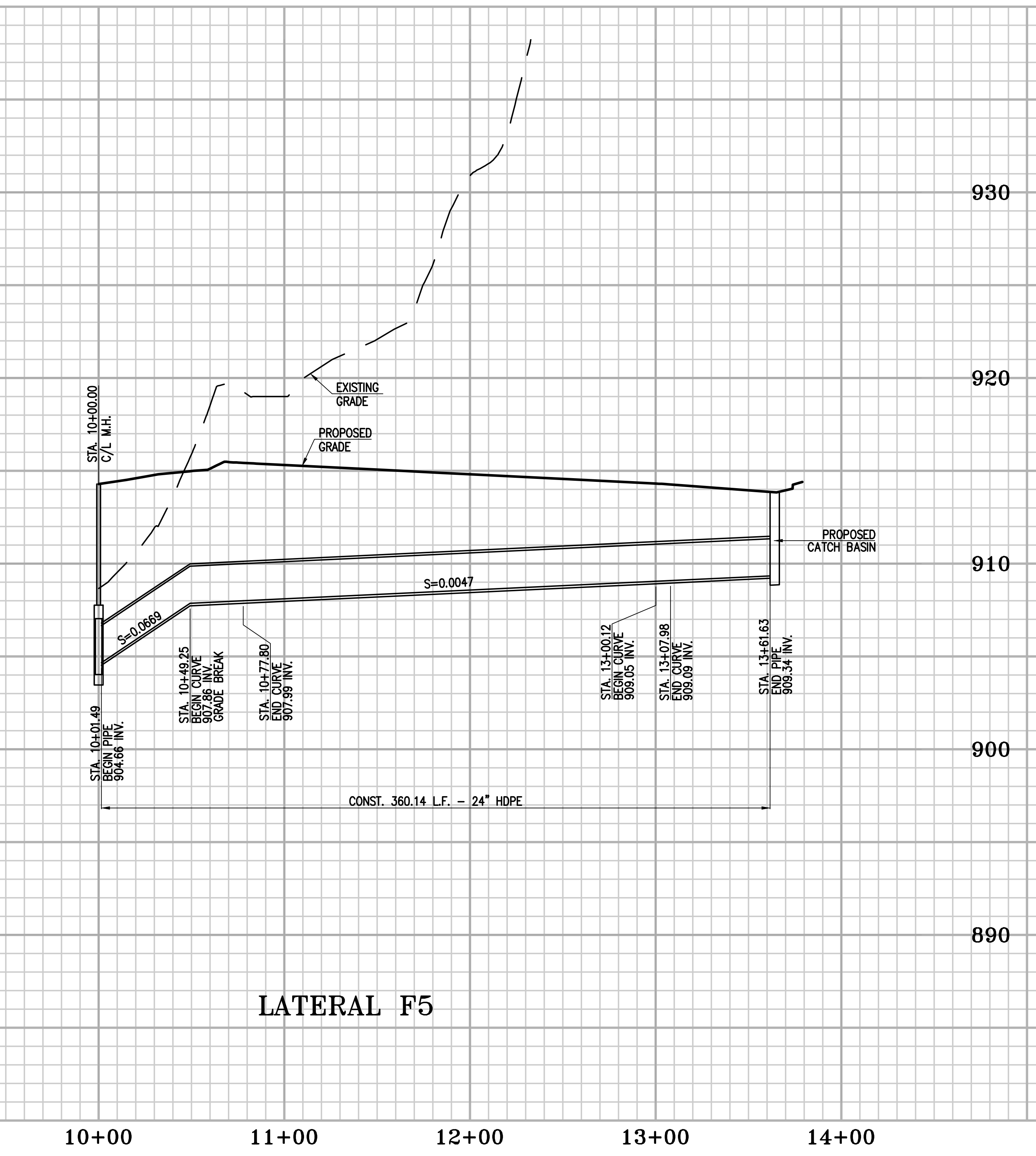
LINE "F"

LINE "F"

*CONTRACTOR TO VERIFY LOCATION AND INVERT ELEVATIONS OF EXISTING UTILITIES AND DRAINAGE SYSTEMS AND NOTIFY ENGINEER OF ANY DISCREPANCIES PRIOR TO ANY CONSTRUCTION.



LATERAL F4



LATERAL F5

**PROFILE SCALE:**
**HORIZ. – 1" = 50'**
**VERT. – 1" = 5'**

Last Update: 1/7/19
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## CITY OF JURUPA VALLEY
PUBLIC WORKS DEPARTMENT

## CONCEPTUAL
## STORM DRAIN PROFILES

## RUBIDOUX COMMERCE PARK
## MA17132

3384 /16 OF 16 SHEETS

**PREPARED FOR:**

PROFICIENCY RUBIDOUX, LLC
5020 CAMPUS DRIVE
NEWPORT BEACH, CA 92660
(949) 296-7006

**PREPARED BY:**

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Designed by ______
Date ______
Checked by ______
Date ______
Designed by ______
Date ______
Checked by ______
Date ______

Approved by ______ Date ______

Public Works Director R.C.E. XXXXX

Sheet 16 of 16 Sheets

# Appendix 3: Soils Information

*Geotechnical Study and Other Infiltration Testing Data*

**NorCal Engineering**
Soils and Geotechnical Consultants
10641 Humbolt Street Los Alamitos, CA 90720
(562) 799-9469 Fax (562) 799-9459

January 29, 2019

Project Number 12627-05

Proficiency Rubidoux LLC
11777 San Vicente Boulevard, Suite 780
Los Angeles, California 90049

Attn: Matt Englhard

RE: *SUPPLEMENTAL* **Soil Infiltration Study** - Proposed Office/Warehouse Development – Located Northwest of the Intersection of 26th Street and Avalon Street, in the City of Jurupa Valley, California

Dear Mr. Englhard:

Pursuant to your request, this firm has performed a *Supplemental* Soil Infiltration Study for the above referenced project. The information provided herein supplements that given in our previous report dated August 7, 2015. The purpose of this study is to further evaluate the feasibility of on-site drainage disposal systems on the subject property. The scope of current work included the following: 1) site reconnaissance; 2) subsurface geotechnical exploration; 3) double ring infiltration testing at three locations; 4) engineering analysis of field test data; and 5) preparation of this report.

It is proposed to install detention/infiltration basins/systems to dispose of on-site water runoff in conjunction with a new warehouse building development and associated parking. Locations and depths of supplemental tests were provided by Thienes Engineering on their map dated January 7, 2019.

## Site Description

The property is located northwesterly of Avalon Street, as shown on the attached Figure 1. A railroad easement extends along the easterly property line.

The property is largely vacant with some low vegetation except for a church building and concrete parking lot at the corner of 26th Street and Avalon Street. A former mining operation is located on the northerly parcel. Drainage of the site sheetflows toward Avalon Street.

**Field Exploration**

The infiltration testing was completed on January 28, 2019 and consisted of using the double ring infiltrometer at four locations to determine the infiltration rate of the proposed retention/infiltration system(s). The locations of the tests are shown on the attached Figure 1. The test locations were excavated by backhoe to depths of 8.1 to 14.1 feet below existing ground surface (bgs). No significant caving occurred to the depths of these test excavations. Detailed descriptions of the subsurface soils are given on the attached test excavations logs in Appendix B. Test excavations ST-3 and ST-4 were performed at different elevations within the same test pit. This was performed because one of the test locations designated by Thienes was situated in the middle of the concrete parking lot of the church facility. Based upon findings in test pits during our previous testing and test pits placed pursuant to the completion of our *Geotechnical Engineering Investigation* report dated November 30, 2005, it is with reasonable certainty that we can conclude soil conditions are similar in our ST-3 and ST-4 test locations as 100 feet south beneath concrete pavement.

The test areas were found to be underlain by 12 inches of disturbed topsoils/fill soils overlying native soils. The soils at test locations consisted of native silty SAND with some clay and gravel to sandy SILT. These soils were noted to be medium dense/stiff to dense/stiff and damp.

## Groundwater

Groundwater was not encountered in any of our recent excavations. Research of the *California Department of Water Resources website* http://www.water.ca.gov/waterdatalibrary/ showed a depth to groundwater of 80 feet or greater at a nearby monitoring well located one-half mile south of the site.

## Infiltration Test Procedure and Results

The infiltration test consisted of the double ring infiltration test per ASTM Method D 3385. The double ring infiltrometer method consists of driving two open cylinders, one inside the other, into the ground, partially filling the ring with water, and then maintaining the liquid at a constant level. The volume of liquid added to the inner ring, to maintain the liquid level constant is the measure of the volume of liquid that infiltrates into the soil.

The volume infiltrated during timed intervals is converted to an incremental infiltration velocity, usually expressed in centimeters per hour or inches per hour and plotted verses elapsed time. The maximum-steady state or average incremental infiltration velocity, depending on the purpose/application of the test is equivalent to the infiltration rate.

Water levels were maintained at a constant level in both the inner ring and annular space between rings throughout the test, to prevent flow of water from one ring to the other.

The volume of liquid used during each measured time interval was converted into an incremental infiltration velocity of both the inner ring in the annular space using the following equations:

For the inner ring calculated as follows:

$$Vir = \Delta Vir / (Air \Delta t)$$

where:

$Vir$ = inner ring incremental infiltration velocity, cm/hr

$\Delta Vir$ = volume of water used during time interval to maintain constant head in the inner ring, $cm^3$

$Air$ = internal area of the inner ting, $cm^2$

$\Delta t$ = time interval, hr

The last reading obtained was used for design purposes in each of the basin. The testing data sheets are attached in Appendix B and summarized in the *Discussion of Results* section below.

## Discussion of Results

The use of on-site disposal system by means of retention/infiltration basins appears to be geotechnically feasible for future development. The field infiltration rates given below may be utilized in the final basin design with a safety factor of 2.0 or greater.

| Test No. | Depth (feet bgs) | Soil Type | Infiltration Rate (cm/hr) | Infiltration Rate (in/hr) |
|---|---|---|---|---|
| ST-1 | 8.1 | sandy SILT | 5.7 | 2.3 |
| ST-2 | 9.9 | sandy SILT w/clay | 3.8 | 1.5 |
| ST-3 | 10.7 | sandy SILT w/clay | 3.8 | 1.5 |
| ST-4 | 14.1 | slightly silty SAND | 209 | 84 |

The use of stormwater infiltration is acceptable, provided the rates given above are used in design, without increasing the potential of settlement of proposed and existing structures or adversely affecting retaining/basement walls located either on or adjacent to the subject site. In addition, the potential for hydro-consolidation and the susceptibility for any ground settlements are considered low. All systems shall meet the California Regional Water Quality Control Board (CRWQCB) requirements.

## Closure

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase. This firm should have the opportunity to review the final plans to verify that all our recommendations are incorporated.

This report and all conclusions are subject to the review of the controlling authorities for the project. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

This infiltration study has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. All work was performed under the supervision of the Geotechnical Engineer. No other warranty, expressed or implied is made. No other warranty, expressed or implied is made.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

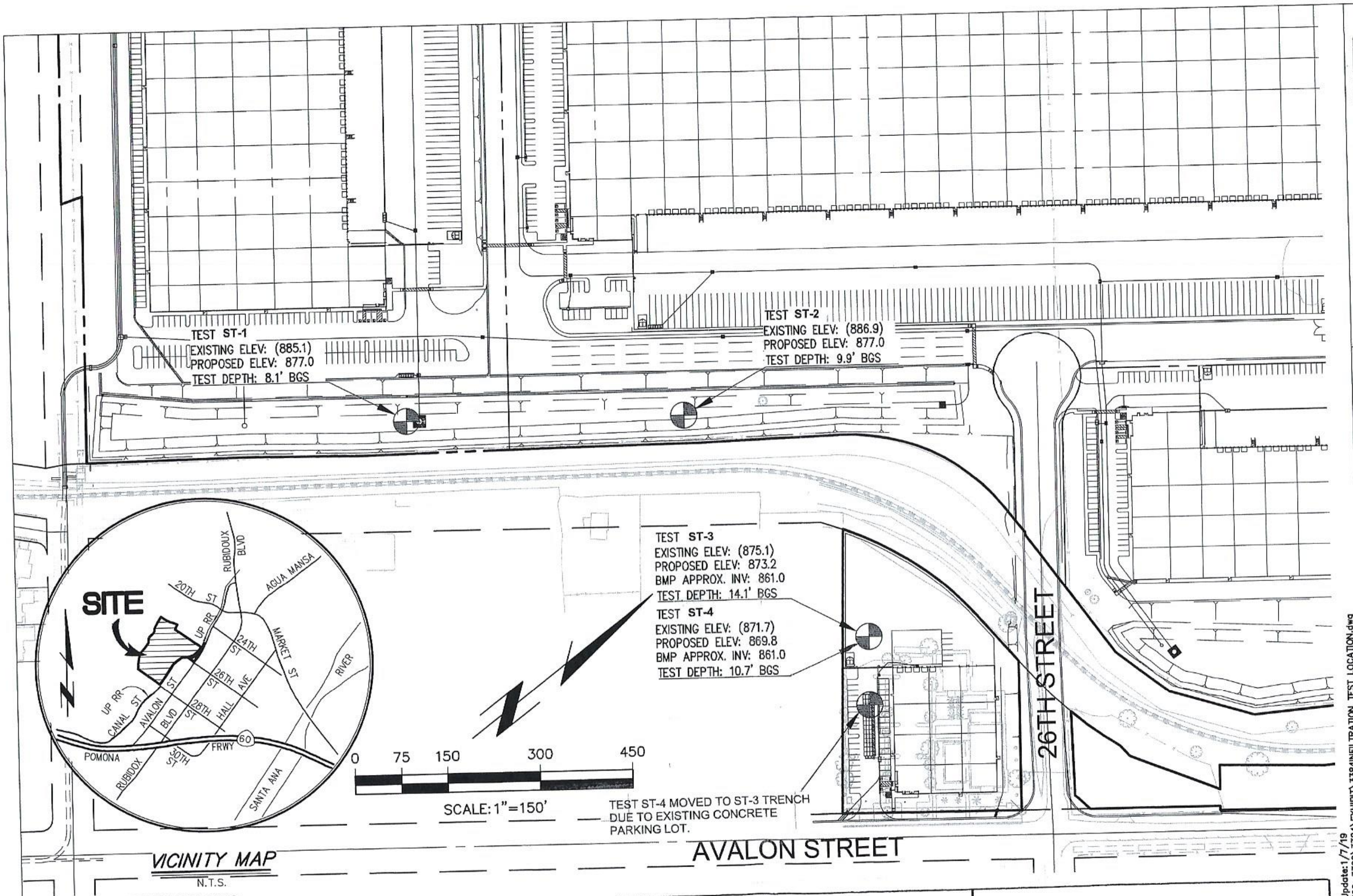
Respectfully submitted,
NORCAL ENGINEERING

Keith D Tucker

REGISTERED PROFESSIONAL ENGINEER
KEITH D. TUCKER
No. 841
Exp. 12/31/2020
GEOTECHNICAL
STATE OF CALIFORNIA

Keith D. Tucker
Project Engineer
R.G.E. 841

Mark A. Burkholder
Project Manager



TEST ST-1
EXISTING ELEV: (885.1)
PROPOSED ELEV: 877.0
TEST DEPTH: 8.1' BGS

TEST ST-2
EXISTING ELEV: (886.9)
PROPOSED ELEV: 877.0
TEST DEPTH: 9.9' BGS

TEST ST-3
EXISTING ELEV: (875.1)
PROPOSED ELEV: 873.2
BMP APPROX. INV: 861.0
TEST DEPTH: 14.1' BGS

TEST ST-4
EXISTING ELEV: (871.7)
PROPOSED ELEV: 869.8
BMP APPROX. INV: 861.0
TEST DEPTH: 10.7' BGS

TEST ST-4 MOVED TO ST-3 TRENCH DUE TO EXISTING CONCRETE PARKING LOT.

AVOID ALL EXISTING UTILITIES

◍ INFILTRATION TEST LOCATIONS

**NorCal Engineering**
SOILS AND GEOTECHNICAL CONSULTANTS

LOCATIONS OF TEST EXCAVATIONS

FIGURE 1

PROJECT 12627-05 | DATE 1/2019

Last Update:1/7/19
O:\3300-3399\3384\EXHIBIT\3384INFILTRATION TEST LOCATION.dwg

PREPARED FOR:

*PROFICIENCY RUBIDOUX, LLC*
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RUBIDOUX COMMERCE CENTER

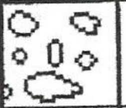
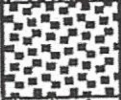
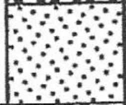
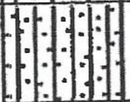
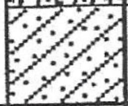
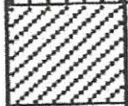
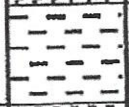
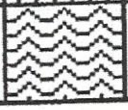
26TH STREET
JURUPA VALLEY, CA 92509

INFILTRATION TEST EXHIBIT
SHEET 1 OF 1

## List of Appendices
(in order of appearance)

### Appendix A

# Appendix A

| MAJOR DIVISION | | | GRAPHIC SYMBOL | LETTER SYMBOL | TYPICAL DESCRIPTIONS |
|---|---|---|---|---|---|
| COARSE GRAINED SOILS<br>MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | GRAVEL AND GRAVELLY SOILS<br>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<br>MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE | CLEAN SAND (LITTLE OR NO FINES) |  | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | |  | SP | POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES) |  | SM | SILTY SANDS, SAND-SILT MIXTURES |
| | | |  | SC | CLAYEY SANDS, SAND-CLAY MIXTURES |
| FINE GRAINED SOILS<br>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, FAT CLAYS |
| | | |  | 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

## UNIFIED SOIL CLASSIFICATION SYSTEM

NorCal Engineering

# KEY:

| | |
|---|---|
| ■ | Indicates 2.5-inch Inside Diameter. Ring Sample. |
| ☒ | Indicates 2-inch OD Split Spoon Sample (SPT). |
| ⧅ | Indicates Shelby Tube Sample. |
| ◫ | Indicates No Recovery. |
| ◧ | Indicates SPT with 140# Hammer 30 in. Drop. |
| 🖂 | Indicates Bulk Sample. |
| ◩ | Indicates Small Bag Sample. |
| ◨ | Indicates Non-Standard |
| ⌧ | Indicates Core Run. |

## COMPONENT PROPORTIONS

| DESCRIPTIVE TERMS | RANGE OF PROPORTION |
|---|---|
| Trace | 1 - 5% |
| Few | 5 - 10% |
| Little | 10 - 20% |
| Some | 20 - 35% |
| And | 35 - 50% |

## COMPONENT DEFINITIONS

| COMPONENT | SIZE RANGE |
|---|---|
| Boulders | Larger than 12 in |
| Cobbles | 3 in to 12 in |
| Gravel | 3 in to No 4 (4.5mm ) |
| Coarse gravel | 3 in to 3/4 in |
| Fine gravel | 3/4 in to No 4 ( 4.5mm ) |
| Sand | No. 4 ( 4.5mm ) to No. 200 ( 0.074mm ) |
| Coarse sand | No. 4 ( 4.5 mm ) to No. 10 ( 2.0 mm ) |
| Medium sand | No. 10 ( 2.0 mm ) to No. 40 ( 0.42 mm ) |
| Fine sand | No. 40 ( 0.42 mm ) to No. 200 ( 0.074 mm ) |
| Silt and Clay | Smaller than No. 200 ( 0.074 mm ) |

## MOISTURE CONTENT

| | |
|---|---|
| DRY | Absence of moisture, dusty, dry to the touch. |
| DAMP | Some perceptible moisture; below optimum |
| MOIST | No visible water; near optimum moisture content |
| WET | Visible free water, usually soil is below water table. |

## RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

| COHESIONLESS SOILS | | COHESIVE SOILS | | |
|---|---|---|---|---|
| Density | N ( blows/ft ) | Consistency | N (blows/ft ) | Approximate Undrained Shear Strength (psf) |
| Very Loose | 0 to 4 | Very Soft | 0 to 2 | < 250 |
| Loose | 4 to 10 | Soft | 2 to 4 | 250 - 500 |
| Medium Dense | 10 to 30 | Medium Stiff | 4 to 8 | 500 - 1000 |
| Dense | 30 to 50 | Stiff | 8 to 15 | 1000 - 2000 |
| Very Dense | over 50 | Very Stiff | 15 to 30 | 2000 - 4000 |
| | | Hard | over 30 | > 4000 |

## Proficiency Rubidoux, LLC
12627-05

## Log of Trench ST-1

**Boring Location:** 26th and Avalon, Jurupa Valley

**Date of Drilling:** 1/28/19

**Groundwater Depth:** None Encountered

**Drilling Method:** Backhoe

**Hammer Weight:**

**Drop:**

**Surface Elevation:** Not Measured

| Depth (feet) | Lith-ology | | Material Description | Samples: Type | Samples: Blow Counts | Laboratory: Moisture | Laboratory: Dry Density | Laboratory: Fines Content % |
|---|---|---|---|---|---|---|---|---|
| 0 | | GWT not encountered | FILL SOILS<br>Sandy SILT to Silty SAND with occasional gravel and rootlets<br>Brown, soft, moist | | | | | |
| | | | NATURAL SOILS<br>Sandy SILT<br>Brown, medium stiff, damp; with some clay 2 to 4 feet | | | | | |
| 5 | | | | | | | | |
| | | | Boring completed at depth of 8' | ☐ | | 3.7 | | |
| 10 | | | | | | | | |
| 15 | | | | | | | | |
| 20 | | | | | | | | |
| 25 | | | | | | | | |
| 30 | | | | | | | | |
| 35 | | | | | | | | |

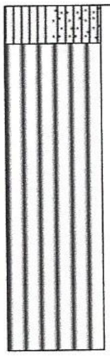
SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\1262705-2.log Date: 2/4/2019

**NorCal Engineering**

**Proficiency Rubidoux, LLC**
**12627-05**

# Log of Trench ST-2

| | |
|---|---|
| **Boring Location: 26th and Avalon, Jurupa Valley** | |
| **Date of Drilling: 1/28/19** | **Groundwater Depth: None Encountered** |
| **Drilling Method: Backhoe** | |
| **Hammer Weight:** | **Drop:** |
| **Surface Elevation: Not Measured** | |



| Depth (feet) | Lith- ology | Material Description | Samples: Type | Samples: Blow Counts | Laboratory: Moisture | Laboratory: Dry Density | Laboratory: Fines Content % |
|---|---|---|---|---|---|---|---|
| 0 | | FILL SOILS<br>Sandy SILT to Silty SAND with occasional gravel and rootlets<br>Brown, soft, moist | | | | | |
| | | NATURAL SOILS<br>Sandy SILT with clay<br>Brown, medium stiff, damp | | | | | |
| 5 | | | | | | | |
| | | Boring completed at depth of 9' | ☒ | | 5.5 | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

**Proficiency Rubidoux, LLC**
**12627-05**

# Log of Trench ST-3

**Boring Location:** 26th and Avalon, Jurupa Valley

**Date of Drilling:** 1/28/19

**Groundwater Depth:** None Encountered

**Drilling Method:** Backhoe

**Hammer Weight:**

**Drop:**

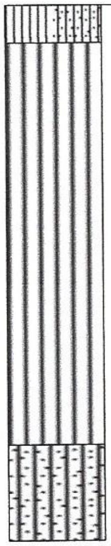
**Surface Elevation:** Not Measured

| Depth (feet) | Material Description | Samples: Type | Samples: Blow Counts | Laboratory: Moisture | Laboratory: Dry Density | Laboratory: Fines Content % |
|---|---|---|---|---|---|---|
| 0 | FILL SOILS<br>Sandy SILT to Silty SAND with occasional gravel and rootlets<br>Brown, soft, moist | | | | | |
| | NATURAL SOILS<br>Sandy SILT<br>Brown, medium stiff, damp to moist | | | | | |
| 5 | | | | | | |
| 10 | Boring completed at depth of 10' | ☒ | | 8.8 | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |

**Proficiency Rubidoux, LLC**
**12627-05**

## Log of Trench ST-4

| | |
|---|---|
| **Boring Location: 26th and Avalon, Jurupa Valley** | |
| **Date of Drilling: 1/28/19** | **Groundwater Depth: None Encountered** |
| **Drilling Method: Backhoe** | |
| **Hammer Weight:** | **Drop:** |
| **Surface Elevation: Not Measured** | |



GWT not encountered

| Depth (feet) | Lithology | Material Description | Samples: Type | Samples: Blow Counts | Laboratory: Moisture | Laboratory: Dry Density | Laboratory: Fines Content % |
|---|---|---|---|---|---|---|---|
| 0 | | FILL SOILS<br>Sandy SILT to Silty SAND with occasional gravel and rootlets<br>Brown, soft, moist | | | | | |
| 5<br>10 | | NATURAL SOILS<br>Sandy SILT<br>Brown, medium stiff, moist<br>Increase in density with depth | | | | | |
| | | Slightly silty SAND<br>Brown, medium dense, damp | | | | | |
| 15<br>20<br>25<br>30<br>35 | | Boring completed at depth of 14' | ☒ | | 2.0 | | |

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\1262705-2.log Date: 2/4/2019

NORCAL
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Project: Proficiency Rubidoux, LLC
Project No.: 12627-05
Date: 1/28/19
Test No. ST-1
Depth: 8'
Tested By: J.S.

| TIME (hr/min) | CHANGE TIME (min) | CUMULATIVE TIME (min) | INNER RING READING (cm) | INNER RING CHANGE | INNER RING FLOW (cc) | OUTER RING READING (cm) | OUTER RING CHANGE | OUTER RING FLOW (cc) | INNER RING INF RATE (cm/hr) | OUTER RING INF RATE (cm/hr) | INNER RING INF RATE (ft/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8:48 | | | 68.2 | | | 36.9 | | | | | |
| 8:58 | 10 | 10 | 70.4 | 2.2 | | 39.5 | 2.6 | | | | |
| 8:58 | | | 68.8 | | | 35.9 | | | | | |
| 9:08 | 10 | 20 | 70.2 | 1.4 | | 37.8 | 1.9 | | | | |
| 9:08 | | | 68.7 | | | 36.1 | | | | | |
| 9:18 | 10 | 30 | 70.0 | 1.3 | | 38.0 | 1.9 | | | | |
| 9:18 | | | 68.4 | | | 36.8 | | | | | |
| 9:28 | 10 | 40 | 69.5 | 1.1 | | 38.6 | 1.8 | | | | |
| 9:28 | | | 68.3 | | | 37.0 | | | | | |
| 9:38 | 10 | 50 | 69.5 | 1.2 | | 38.6 | 1.6 | | | | |
| 9:38 | | | 68.4 | | | 37.4 | | | | | |
| 9:48 | 10 | 60 | 69.3 | 0.9 | | 38.9 | 1.5 | | 5.4 | 9.0 | |
| 9:48 | | | 68.2 | | | 37.2 | | | | | |
| 9:58 | 10 | 70 | 69.3 | 1.1 | | 38.8 | 1.6 | | 6.6 | 9.6 | |
| 9:58 | | | 69.1 | | | 37.6 | | | | | |
| 10:08 | 10 | 80 | 70.0 | 0.9 | | 39.0 | 1.4 | | 5.4 | 8.4 | |
| 10:08 | | | 69.0 | | | 37.7 | | | | | |
| 10:18 | 10 | 90 | 69.9 | 0.9 | | 39.0 | 1.3 | | 5.4 | 7.8 | |
| 10:18 | | | 68.6 | | | 37.3 | | | | | |
| 10:28 | 10 | 100 | 69.6 | 1.0 | | 38.7 | 1.4 | | 6.0 | 8.4 | |
| 10:28 | | | 68.6 | | | 37.1 | | | | | |
| 10:38 | 10 | 110 | 69.5 | 0.9 | | 38.5 | 1.4 | | 5.4 | 8.4 | |
| 10:38 | | | 68.4 | | | 37.4 | | | | | |
| 10:48 | 10 | 120 | 69.3 | 0.9 | | 38.8 | 1.4 | | 5.4 | 8.4 | |

Average = 5.7 / 8.6 cm/hr

Project: Proficiency Rubidoux, LLC
Project No.: 12627-05
Date: 1/28/19
Test No. ST-2
Depth: 9’
Tested By: J.S.

| TIME (hr/min) | CHANGE TIME (min) | CUMULATIVE TIME (min) | INNER RING READING (cm) | INNER RING CHANGE | INNER RING FLOW (cc) | OUTER RING READING (cm) | OUTER RING CHANGE | OUTER RING FLOW (cc) | INNER RING INF RATE (cm/hr) | OUTER RING INF RATE (cm/hr) | INNER RING INF RATE (ft/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9:02 | | | 98.7 | | | 39.5 | | | | | |
| 9:12 | 10 | 10 | 99.5 | 0.8 | | 40.5 | 1.0 | | | | |
| 9:12 | | | 99.5 | | | 40.5 | | | | | |
| 9:22 | 10 | 20 | 100.4 | 0.9 | | 41.5 | 1.0 | | | | |
| 9:22 | | | 100.4 | | | 41.5 | | | | | |
| 9:32 | 10 | 30 | 100.9 | 0.5 | | 42.3 | 0.8 | | | | |
| 9:32 | | | 100.9 | | | 42.3 | | | | | |
| 9:42 | 10 | 40 | 101.5 | 0.6 | | 43.0 | 0.7 | | | | |
| 9:42 | | | 101.5 | | | 43.0 | | | | | |
| 9:52 | 10 | 50 | 102.2 | 0.7 | | 44.0 | 1.0 | | | | |
| 9:52 | | | 102.2 | | | 44.0 | | | | | |
| 10:02 | 10 | 60 | 102.9 | 0.7 | | 44.9 | 0.9 | | 4.2 | 5.4 | |
| 10:02 | | | 102.9 | | | 44.9 | | | | | |
| 10:12 | 10 | 70 | 103.6 | 0.7 | | 45.7 | 0.8 | | 4.2 | 4.8 | |
| 10:12 | | | 103.6 | | | 45.7 | | | | | |
| 10:22 | 10 | 80 | 104.3 | 0.7 | | 46.1 | 0.4 | | 4.2 | 2.4 | |
| 10:22 | | | 104.3 | | | 46.1 | | | | | |
| 10:32 | 10 | 90 | 104.9 | 0.6 | | 47.5 | 0.4 | | 3.6 | 2.4 | |
| 10:32 | | | 102.1 | | | 43.0 | | | | | |
| 10:42 | 10 | 100 | 102.5 | 0.4 | | 43.8 | 0.8 | | 2.4 | 4.8 | |
| 10:42 | | | 102.5 | | | 43.8 | | | | | |
| 10:52 | 10 | 110 | 103.2 | 0.7 | | 44.7 | 0.9 | | 4.2 | 5.4 | |
| 10:52 | | | 103.2 | | | 44.7 | | | | | |
| 11:02 | 10 | 120 | 103.8 | 0.6 | | 45.5 | 0.7 | | 3.6 | 4.2 | |

Average = 3.8 / 4.2 cm/hr

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Project: Proficiency Rubidoux, LLC
Project No.: 12627-05
Date: 1/28/19
Test No. ST-3
Depth: 10'
Tested By: J.S.

| TIME (hr/min) | CHANGE TIME (min) | CUMULATIVE TIME (min) | INNER RING READING (cm) | INNER RING CHANGE | INNER RING FLOW (cc) | OUTER RING READING (cm) | OUTER RING CHANGE | OUTER RING FLOW (cc) | INNER RING INF RATE (cm/hr) | OUTER RING INF RATE (cm/hr) | INNER RING INF RATE (ft/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11:15 | | | 71.0 | | | 39.9 | | | | | |
| 11:25 | 10 | 10 | 71.8 | 0.8 | | 40.3 | 0.4 | | | | |
| 11:25 | | | 71.8 | | | 40.3 | | | | | |
| 11:35 | 10 | 20 | 72.6 | 0.8 | | 41.1 | 0.8 | | | | |
| 11:35 | | | 72.6 | | | 41.1 | | | | | |
| 11:45 | 10 | 30 | 73.4 | 0.8 | | 41.8 | 0.7 | | | | |
| 11:45 | | | 73.4 | | | 41.8 | | | | | |
| 11:55 | 10 | 40 | 74.1 | 0.7 | | 42.3 | 0.5 | | | | |
| 11:55 | | | 74.1 | | | 42.3 | | | | | |
| 12:05 | 10 | 50 | 74.8 | 0.7 | | 42.8 | 0.5 | | | | |
| 12:05 | | | 74.8 | | | 42.8 | | | | | |
| 12:15 | 10 | 60 | 75.5 | 0.7 | | 43.4 | 0.6 | | 4.2 | 3.6 | |
| 12:15 | | | 75.5 | | | 43.4 | | | | | |
| 12:25 | 10 | 70 | 76.2 | 0.7 | | 44.0 | 0.6 | | 4.2 | 3.6 | |
| 12:25 | | | 76.2 | | | 44.0 | | | | | |
| 12:35 | 10 | 80 | 76.9 | 0.7 | | 44.5 | 0.5 | | 4.2 | 3.0 | |
| 12:35 | | | 76.9 | | | 44.5 | | | | | |
| 12:45 | 10 | 90 | 77.5 | 0.6 | | 45.0 | 0.5 | | 3.6 | 3.0 | |
| 12:45 | | | 77.5 | | | 45.0 | | | | | |
| 12:55 | 10 | 100 | 78.0 | 0.5 | | 45.6 | 0.6 | | 3.0 | 3.6 | |
| 12:55 | | | 78.0 | | | 45.6 | | | | | |
| 1:05 | 10 | 110 | 78.7 | 0.7 | | 46.1 | 0.7 | | 4.2 | 4.2 | |
| 1:05 | | | 78.7 | | | 46.1 | | | | | |
| 1:15 | 10 | 120 | 79.2 | 0.5 | | 46.6 | 0.5 | | 3.0 | 3.0 | |

Average = 3.8 / 3.4 cm/hr

NORCAL ENGINEERING
SOILS AND GEOTECHNICAL CONSULTANTS

| |
|---|
| Project: Proficiency Rubidoux, LLC |
| Project No.: 12627-05 |
| Date: 1/28/19 |
| Test No. ST-4 |
| Depth: 14’ |
| Tested By: J.S. |

| TIME (hr/min) | CHANGE TIME (min) | CUMULATIVE TIME (min) | INNER RING READING (cm) | INNER RING CHANGE | INNER RING FLOW (cc) | OUTER RING READING (cm) | OUTER RING CHANGE | OUTER RING FLOW (cc) | INNER RING INF RATE (cm/hr) | OUTER RING INF RATE (cm/hr) | INNER RING INF RATE (ft/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11:37 | | | 98.5 | | | 39.2 | | | | | |
| 11:39 | 2 | 2 | 106.3 | 7.8 | | 47.2 | 8.0 | | | | |
| 11:39 | | | 99.4 | | | 38.4 | | | | | |
| 11:41 | 2 | 4 | 106.5 | 7.1 | | 46.4 | 8.0 | | | | |
| 11:41 | | | 98.6 | | | 37.6 | | | | | |
| 11:43 | 2 | 6 | 106.1 | 7.5 | | 46.0 | 8.4 | | | | |
| 11:43 | | | 97.5 | | | 37.7 | | | | | |
| 11:45 | 2 | 8 | 105.0 | 7.5 | | 45.3 | 7.6 | | | | |
| 11:45 | | | 99.0 | | | 37.4 | | | | | |
| 11:47 | 2 | 10 | 106.2 | 7.2 | | 45.5 | 8.1 | | | | |
| 11:47 | | | 97.9 | | | 37.8 | | | | | |
| 11:49 | 2 | 12 | 104.6 | 6.7 | | 44.8 | 7.0 | | 201 | 210 | |
| 11:49 | | | 98.2 | | | 37.6 | | | | | |
| 11:51 | 2 | 14 | 105.3 | 7.1 | | 45.2 | 7.6 | | 213 | 228 | |
| 11:51 | | | 97.8 | | | 37.7 | | | | | |
| 11:53 | 2 | 16 | 104.5 | 6.7 | | 45.1 | 7.4 | | 201 | 222 | |
| 11:53 | | | 99.0 | | | 37.9 | | | | | |
| 11:55 | 2 | 18 | 105.8 | 6.8 | | 45.3 | 7.4 | | 204 | 222 | |
| 11:55 | | | 99.0 | | | 38.9 | | | | | |
| 11:57 | 2 | 20 | 106.3 | 7.2 | | 46.2 | 7.3 | | 216 | 219 | |
| 11:57 | | | 99.1 | | | 39.2 | | | | | |
| 11:59 | 2 | 22 | 106.2 | 7.1 | | 46.3 | 7.1 | | 213 | 213 | |
| 11:59 | | | 99.6 | | | 38.8 | | | | | |
| 12:01 | 2 | 24 | 106.7 | 7.1 | | 45.9 | 7.1 | | 213 | 213 | |

Average = 209 / 218 cm/hr

NorCal Engineering
Soils and Geotechnical Consultants
10641 Humbolt Street Los Alamitos, CA 90720
(562) 799-9469 Fax (562) 799-9459

August 7, 2015 Project Number 12627-05

Proficiency Rubidoux LLC
11777 San Vicente Boulevard, Suite 780
Los Angeles, California 90049

Attn: Matt Englhard

RE: **Soil Infiltration Study** - Proposed Office/Warehouse Development – Located Northwest of the Intersection of 26th Street and Avalon Street, in the City of Jurupa Valley, California

Dear Mr. Englhard:

Pursuant to your request, this firm has performed a Soil Infiltration Study for the above referenced project. The purpose of this study is to evaluate the feasibility of on-site drainage disposal systems on the subject property. The scope of current work included the following: 1) site reconnaissance; 2) subsurface geotechnical exploration; 3) double ring infiltration testing at three locations; 4) engineering analysis of field test data; and 5) preparation of this report.

It is proposed to install detention/infiltration basins/systems to dispose of on-site water runoff in conjunction with a new warehouse building development and associated parking. Locations and depths of tests were provided by Thienes Engineering on their map dated July 13, 2015 (attached as Figure 2).

## Site Description

The property is located northwesterly of Avalon Street, as shown on the attached Figure 1. A railroad easement extends along the easterly property line.

The property is currently vacant with some low vegetation. A former mining operation is located on the northerly parcel. Drainage of the site sheetflows toward Avalon Street.

## Field Exploration

The infiltration testing was completed on July 31, 2015 and consisted of using the double ring infiltrometer at four locations to determine the infiltration rate of the proposed retention/infiltration system(s). The locations of the tests are shown on the attached Figure 2. The test locations were excavated by backhoe to depths of 12.5 to 16.5 feet below existing ground surface (bgs). No significant caving occurred to the depths of these test excavations. Detailed descriptions of the subsurface soils are given on the attached test excavations logs in Appendix B.

The test areas were found to be underlain by 12 inches of disturbed topsoils/fill soils overlying native soils. The soils at test locations consisted of native silty SAND with some clay and gravel. These soils were noted to be medium dense to dense and damp.

## Groundwater

Groundwater was not encountered in any of our recent excavations. Research of the *California Department of Water Resources website* *http://www.water.ca.gov/waterdatalibrary/* showed a depth to groundwater of 80 feet or greater at a nearby monitoring well located one-half mile south of the site.

## Infiltration Test Procedure and Results

The infiltration test consisted of the double ring infiltration test per ASTM Method D 3385. The double ring infiltrometer method consists of driving two open cylinders, one inside the other, into the ground, partially filling the ring with water or other liquid, and then maintaining the liquid at a constant level. The volume of liquid added to the inner ring, to maintain the liquid level constant is the measure of the volume of liquid that infiltrates into the soil.

The volume infiltrated during timed intervals is converted to an incremental infiltration velocity, usually expressed in centimeters per hour or inches per hour and plotted verses elapsed time. The maximum-steady state or average incremental infiltration velocity, depending on the purpose/application of the test is equivalent to the infiltration rate.

Along the bottom of the infiltration test pits, dual infiltration rings were inserted 7 cm vertically into the soil by an impact-absorbing hammer. Guelph tubes, also referred to as bubblers were installed to maintain constant water level in each of the rings. Water levels were maintained at a constant level in both the inner ring and annular space between rings throughout the test, to prevent flow of water from one ring to the other.

The volume of liquid used during each measured time interval was converted into an incremental infiltration velocity of both the inner ring in the annular space using the following equations:

For the inner ring calculated as follows:

$Vir=\Delta Vir/(Air\Delta t)$

where:

$Vir$ = inner ring incremental infiltration velocity, cm/hr

$\Delta Vir$ = volume of water used during time interval to maintain constant head in the inner ring, $cm^3$

$Air$ = internal area of the inner ting, $cm^2$

$\Delta t$ = time interval, hr

The last reading obtained was used for design purposes in each of the basin. The testing data sheets are attached in Appendix B and summarized in the *Discussion of Results* section below.

## Discussion of Results

The following design rates should be used at the given depths for design of the two infiltration areas:

| Test No. | Depth (feet bgs) | Soil Type | Infiltration Rate (cm/hr) | Infiltration Rate (in/hr) |
|---|---|---|---|---|
| T-1 | 12.5 | silty SAND w/clay | 9.9 | 4.0 |
| T-2 | 16.5 | silty SAND w/clay | 2.3 | 0.9 |
| T-3 | 14.5 | silty SAND w/clay | 33.0 | 13.2 |
| T-4 | 13.0 | silty SAND w/clay | 6.0 | 2.4 |

The use of stormwater infiltration is acceptable, provided the rates given above are used in design, without increasing the potential of settlement of proposed and existing structures or adversely affecting retaining/basement walls located either on or adjacent to the subject site. In addition, the potential for hydro-consolidation and the susceptibility for any ground settlements are considered low. All systems shall meet the California Regional Water Quality Control Board (CRWQCB) requirements.

## Closure

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase. This firm should have the opportunity to review the final plans to verify that all our recommendations are incorporated.

This report and all conclusions are subject to the review of the controlling authorities for the project. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

This infiltration study has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. All work was performed under the supervision of the Geotechnical Engineer. No other warranty, expressed or implied is made. No other warranty, expressed or implied is made.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

Respectfully submitted,
NORCAL ENGINEERING

KEITH D. TUCKER
No. 841
Exp. 12/31/16

Keith D. Tucker
Project Engineer
R.G.E. 841

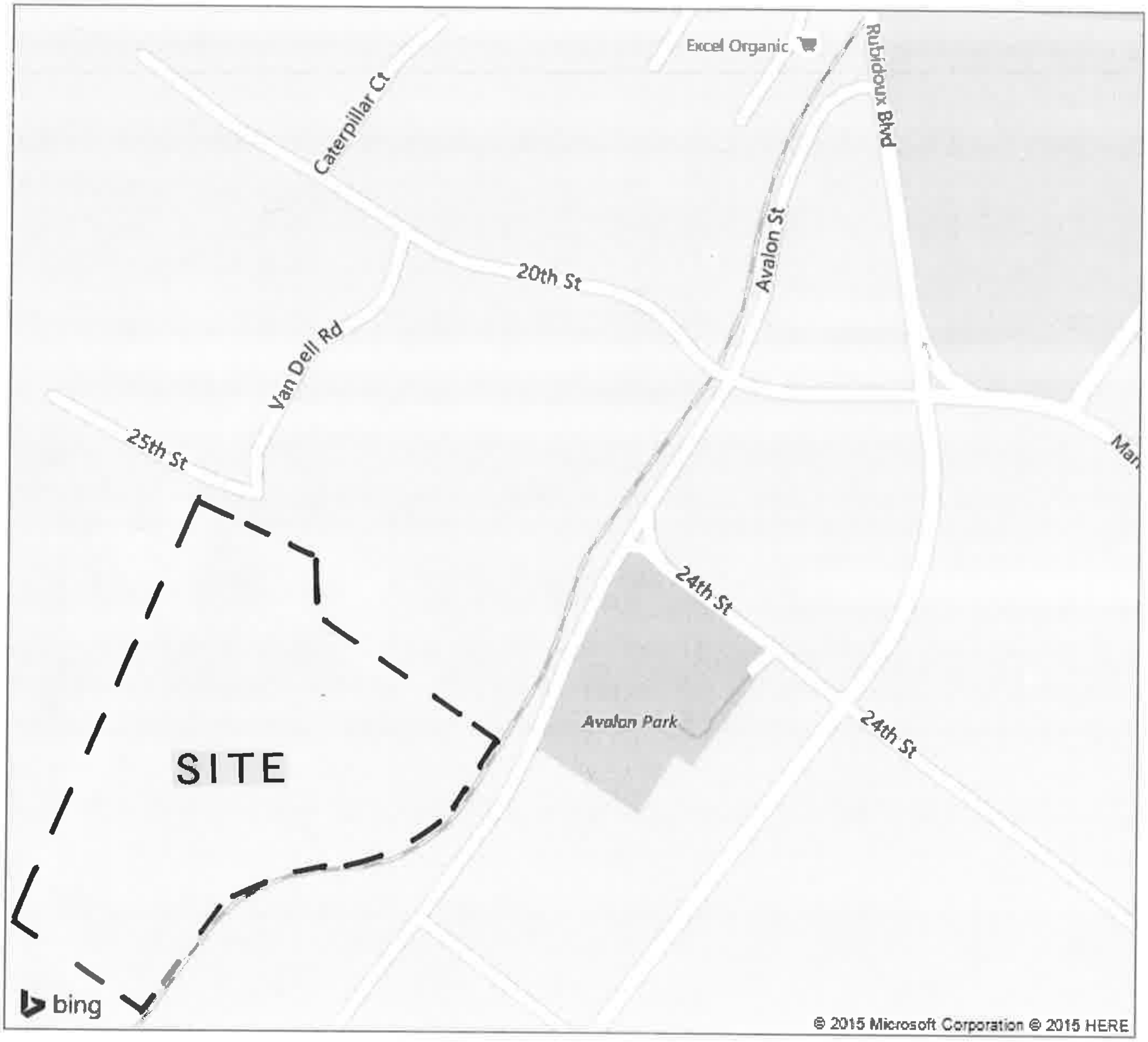
Mark A. Burkholder
Project Manager

## List of Appendices
## (in order of appearance)

### Appendix A

### Appendix B

# Appendix A



**NorCal Engineering**
SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 12627-05 | DATE 8/2015

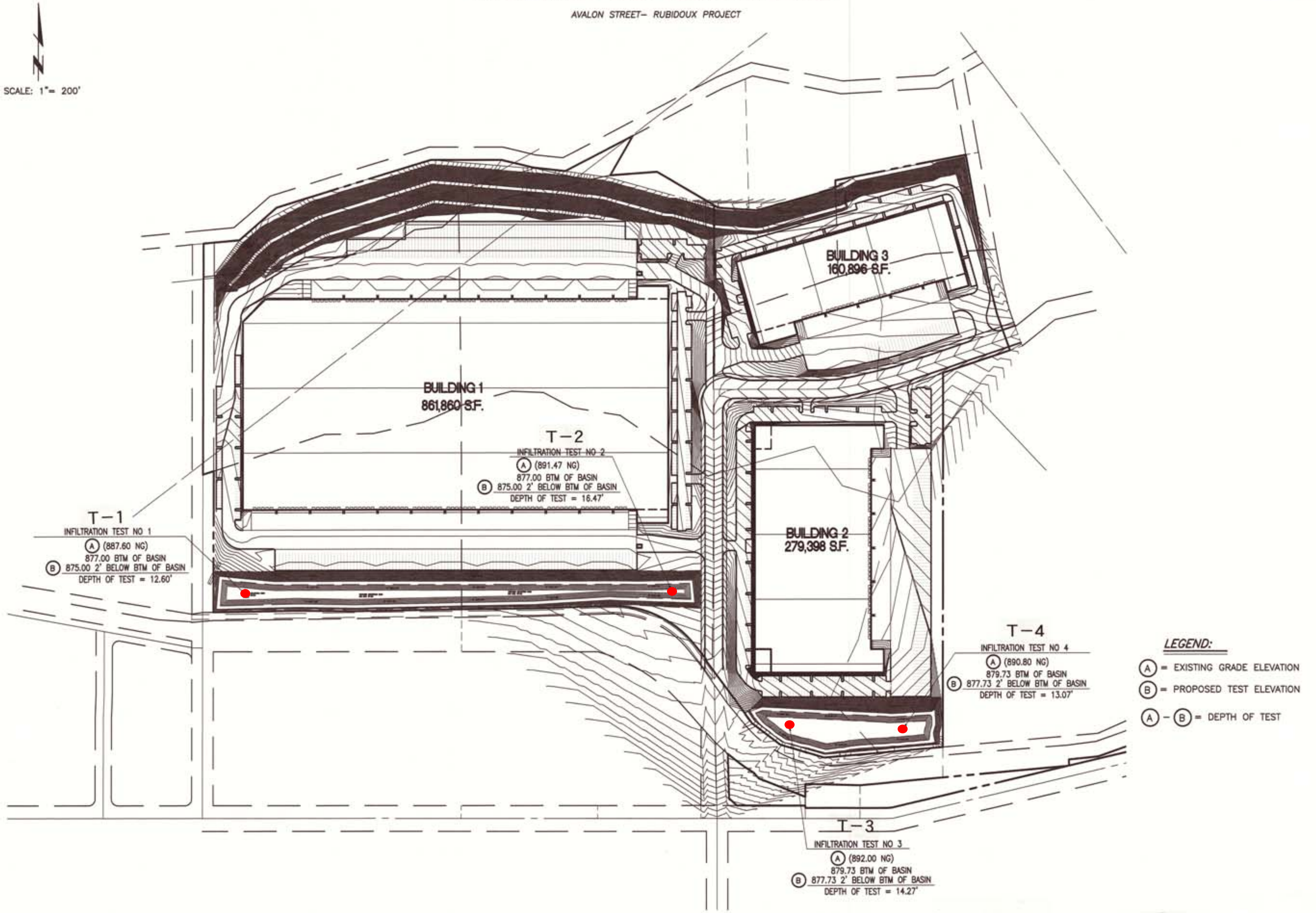
VICINITY MAP

FIGURE 1

# INFILTRATION TEST LOCATION EXHIBIT

AVALON STREET– RUBIDOUX PROJECT

SHEET 1 OF 1



Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
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LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Last Update: 7/13/15
O:\3300-3399\3384\INFILTRATION TEST LOCATION.dwg

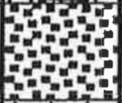
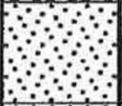
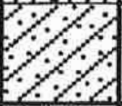
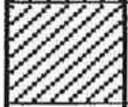
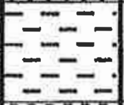
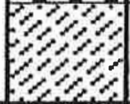
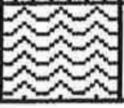
**NorCal Engineering**
SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 12627-05 DATE 8/2015

INFILTRATION TEST LOCATIONS

FIGURE 2

# Appendix B

| MAJOR DIVISION | | | GRAPHIC SYMBOL | LETTER SYMBOL | TYPICAL DESCRIPTIONS |
|---|---|---|---|---|---|
| COARSE GRAINED SOILS<br>MORE THAN 50% OF MATERIAL IS <u>LARGER</u> THAN NO. 200 SIEVE SIZE | GRAVEL AND GRAVELLY SOILS<br>MORE THAN 50% OF COARSE FRACTION <u>RETAINED</u> 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<br>MORE THAN 50% OF COARSE FRACTION <u>PASSING</u> ON NO. 4 SIEVE | CLEAN SAND (LITTLE OR NO FINES) |  | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | |  | SP | POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES) |  | SM | SILTY SANDS, SAND-SILT MIXTURES |
| | | |  | SC | CLAYEY SANDS, SAND-CLAY MIXTURES |
| FINE GRAINED SOILS<br>MORE THAN 50% OF MATERIAL IS <u>SMALLER</u> 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 <u>GREATER</u> THAN 50 |  | MH | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS |
| | | |  | CH | INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS |
| | | |  | 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

# UNIFIED SOIL CLASSIFICATION SYSTEM

**NorCal Engineering**

# KEY:

■ Indicates 2.5-inch Inside Diameter. Ring Sample.

☒ Indicates 2-inch OD Split Spoon Sample (SPT).

⧅ Indicates Shelby Tube Sample.

◫ Indicates No Recovery.

◧ Indicates SPT with 140# Hammer 30 in. Drop.

✉ Indicates Bulk Sample.

◩ Indicates Small Bag Sample.

◨ Indicates Non-Standard

⧗ Indicates Core Run.

## COMPONENT PROPORTIONS

| DESCRIPTIVE TERMS | RANGE OF PROPORTION |
|---|---|
| Trace | 1 - 5% |
| Few | 5 - 10% |
| Little | 10 - 20% |
| Some | 20 - 35% |
| And | 35 - 50% |

## COMPONENT DEFINITIONS

| COMPONENT | SIZE RANGE |
|---|---|
| Boulders | Larger than 12 in |
| Cobbles | 3 in to 12 in |
| Gravel | 3 in to No 4 (4.5mm ) |
| Coarse gravel | 3 in to 3/4 in |
| Fine gravel | 3/4 in to No 4 ( 4.5mm ) |
| Sand | No. 4 ( 4.5mm ) to No. 200 ( 0.074mm ) |
| Coarse sand | No. 4 ( 4.5 mm ) to No. 10 ( 2.0 mm ) |
| Medium sand | No. 10 ( 2.0 mm ) to No. 40 ( 0.42 mm ) |
| Fine sand | No. 40 ( 0.42 mm ) to No. 200 ( 0.074 mm ) |
| Silt and Clay | Smaller than No. 200 ( 0.074 mm ) |

## MOISTURE CONTENT

| | |
|---|---|
| DRY | Absence of moisture, dusty, dry to the touch. |
| DAMP | Some perceptible moisture; below optimum |
| MOIST | No visible water; near optimum moisture content |
| WET | Visible free water, usually soil is below water table. |

## RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

| COHESIONLESS SOILS | | COHESIVE SOILS | | |
|---|---|---|---|---|
| Density | N ( blows/ft ) | Consistency | N (blows/ft ) | Approximate Undrained Shear Strength (psf) |
| Very Loose | 0 to 4 | Very Soft | 0 to 2 | < 250 |
| Loose | 4 to 10 | Soft | 2 to 4 | 250 - 500 |
| Medium Dense | 10 to 30 | Medium Stiff | 4 to 8 | 500 - 1000 |
| Dense | 30 to 50 | Stiff | 8 to 15 | 1000 - 2000 |
| Very Dense | over 50 | Very Stiff | 15 to 30 | 2000 - 4000 |
| | | Hard | over 30 | > 4000 |

**Proficiency Rubidoux, LLC**
**12627-05**

# Log of Trench T-1

**Boring Location: 26th St & Avalon, Jurupa Valley**

**Date of Drilling: 7/31/15**

**Groundwater Depth: None Encountered**

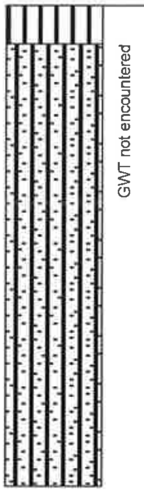
**Drilling Method: Backhoe**

**Hammer Weight:**

**Drop:**

**Surface Elevation: Not Measured**

| Depth (feet) | Lith-ology | Material Description | Samples: Type | Samples: Blow Counts | Laboratory: Moisture | Laboratory: Dry Density | Laboratory: % Passing 200 Sieve |
|---|---|---|---|---|---|---|---|
| 0 | | FILL SOILS<br>Sandy SILT with gravel, asphalt and rootlets<br>Brown, soft, dry | | | | | |
| | | NATURAL SOILS<br>Silty SAND with some clay with occasional gravel<br>Brown, medium dense to dense, damp | | | | | |
| | | Trench completed at depth of 12.5' | | | | | |

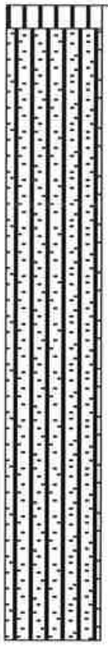


Depth scale: 0, 5, 10, 15, 20, 25, 30, 35

| **Proficiency Rubidoux, LLC**<br>**12627-05** | **Log of Trench T-2** |
|---|---|

| | |
|---|---|
| **Boring Location: 26th St & Avalon, Jurupa Valley** | |
| **Date of Drilling: 7/31/15** | **Groundwater Depth: None Encountered** |
| **Drilling Method: Backhoe** | |
| **Hammer Weight:** | **Drop:** |
| **Surface Elevation: Not Measured** | |

| Depth (feet) | Lith-ology | Material Description | Samples: Type | Samples: Blow Counts | Laboratory: Moisture | Laboratory: Dry Density | Laboratory: % Passing 200 Sieve |
|---|---|---|---|---|---|---|---|
| 0 | | DISTURBED TOP SOILS<br>Sandy SILT with occasional gravel and rootlets<br>Brown, soft, dry | | | | | |
| | | NATURAL SOILS<br>Silty SAND with some clay and occasional gravel<br>Brown, medium dense to dense, dry to damp | | | | | |
| 5 | | | | | | | |
| 10 | | | | | | | |
| | | Very dense below 13' | | | | | |
| 15 | | | | | | | |
| | | Trench completed at depth of 16.5' | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |



GWT not encountered

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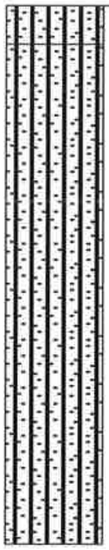
## Proficiency Rubidoux, LLC

12627-05

## Log of Trench T-3

|  |  |
|---|---|
| **Boring Location:** 26th St & Avalon, Jurupa Valley |  |
| **Date of Drilling:** 7/31/15 | **Groundwater Depth:** None Encountered |
| **Drilling Method:** Backhoe |  |
| **Hammer Weight:** | **Drop:** |
| **Surface Elevation:** Not Measured |  |

| Depth (feet) | Lith-ology | Material Description | Samples: Type | Samples: Blow Counts | Laboratory: Moisture | Laboratory: Dry Density | Laboratory: % Passing 200 Sieve |
|---|---|---|---|---|---|---|---|
| 0 |  | FILL SOILS<br>Silty SAND with gravel and roots<br>Brown, loose, dry |  |  |  |  |  |
|  |  | NATURAL SOILS<br>Silty SAND with some clay<br>Brown, dense, dry to damp |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |
| 15 |  | Trench completed at depth of 14' |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |
| 25 |  |  |  |  |  |  |  |
| 30 |  |  |  |  |  |  |  |
| 35 |  |  |  |  |  |  |  |

GWT not encountered

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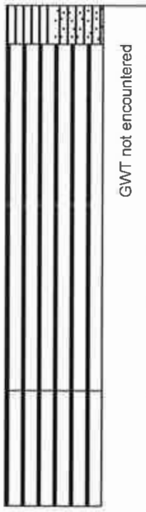
**Proficiency Rubidoux, LLC**
**12627-05**

# Log of Trench T-4

| | |
|---|---|
| **Boring Location: 26th St & Avalon, Jurupa Valley** | |
| **Date of Drilling: 7/31/15** | **Groundwater Depth: None Encountered** |
| **Drilling Method: Backhoe** | |
| **Hammer Weight:** | **Drop:** |
| **Surface Elevation: Not Measured** | |



| Depth (feet) | Material Description | Samples: Type | Samples: Blow Counts | Laboratory: Moisture | Laboratory: Dry Density | Laboratory: % Passing 200 Sieve |
|---|---|---|---|---|---|---|
| 0 | FILL SOILS<br>Sandy SILT to Silty SAND with occasional gravel, asphalt, rock and rootlets<br>Brown, soft, dry | | | | | |
| | NATURAL SOILS<br>Silty SAND with some clay, gravel<br>Brown, medium dense to dense, damp | | | | | |
| 10 | Sandy SILT<br>Brown, medium stiff, damp | | | | | |
| 13 | Trench completed at depth of 13' | | | | | |
| 15 | | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |

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SOILS AND GEOTECHNICAL CONSULTANTS

| | |
|---|---|
| **Project:** | **Proficiency Rubidoux, LLC** |
| **Project No:** | 12627-05 |
| **Date:** | 7/31/15 |
| **Test No.** | 1 |
| **Depth:** | 12.5' |
| **Tested By:** | D.R. |

| | TIME (hr/min) | CHANGE TIME (min) | CUMULATIVE TIME (min) | INNER RING READING (cm) | INNER RING FLOW (cc) | OUTER RING READING (cm) | OUTER RING CHANGE (cm) | OUTER RING FLOW (cc) | INNER RING INF RATE (cm/hr) | OUTER RING INF RATE (cm/hr) | INNER RING INF RATE (ft/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 3:05 | | | 99.3 | | | 44.5 | | | | |
| | 3:10 | 5 | 5 | 101.0 | 1.7 | | 46.0 | 1.5 | | | |
| **2** | 3:10 | | | 101.0 | | | 46.0 | | | | |
| | 3:15 | 5 | 10 | 102.0 | 1.0 | | 47.0 | 1.0 | | | |
| **3** | 3:15 | | | 102.0 | | | 47.0 | | | | |
| | 3:20 | 5 | 15 | 103.0 | 1.0 | | 48.0 | 1.0 | | | |
| **4** | 3:20 | | | 103.0 | | | 48.0 | | | | |
| | 3:25 | 5 | 20 | 104.0 | 1.0 | | 49.0 | 1.0 | | | |
| **5** | 3:25 | | | 104.0 | | | 49.0 | | | | |
| | 3:30 | 5 | 25 | 105.0 | 1.0 | | 50.0 | 1.0 | | | |
| **6** | 3:30 | | | 105.0 | | | 50.0 | | | | |
| | 3:35 | 5 | 30 | 106.0 | 1.0 | | 51.0 | 1.0 | 12.0 | 12.0 | |
| **7** | 3:35 | | | 106.0 | | | 51.0 | | | | |
| | 3:40 | 5 | 35 | 106.7 | 0.7 | | 51.7 | 0.7 | 8.4 | 8.4 | |
| **8** | 3:40 | | | 106.7 | | | 51.7 | | | | |
| | 3:45 | 5 | 40 | 107.6 | 0.9 | | 52.7 | 1.0 | 10.8 | 12.0 | |
| **9** | 3:45 | | | 100.7 | | | 46.6 | | | | |
| | 3:50 | 5 | 45 | 101.3 | 0.6 | | 47.6 | 1.0 | 7.2 | 12.0 | |
| **10** | 3:50 | | | 101.3 | | | 47.6 | | | | |
| | 3:55 | 5 | 50 | 102.4 | 1.1 | | 48.5 | 0.9 | 13.2 | 10.8 | |
| **11** | 3:55 | | | 102.4 | | | 48.5 | | | | |
| | 4:00 | 5 | 55 | 103.1 | 0.7 | | 49.1 | 0.6 | 8.4 | 7.2 | |
| **12** | 4:00 | | | 103.1 | | | 49.1 | | | | |
| | 4:05 | 5 | 60 | 103.9 | 0.8 | | 49.9 | 0.8 | 9.6 | 9.6 | |

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SOILS AND GEOTECHNICAL CONSULTANTS

| | |
|---|---|
| **Project:** | **Proficiency Rubidoux, LLC** |
| **Project No:** | 12627-05 |
| **Date:** | 7/31/15 |
| **Test No.** | 2 |
| **Depth:** | 16.5’ |
| **Tested By:** | D.R. |

| | TIME (hr/min) | CHANGE TIME (min) | CUMULATIVE TIME (min) | INNER RING READING (cm) | INNER RING FLOW (cc) | OUTER RING READING (cm) | OUTER RING CHANGE (cm) | OUTER RING FLOW (cc) | INNER RING INF RATE (cm/hr) | OUTER RING INF RATE (cm/hr) | INNER RING INF RATE (ft/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 1:20 | | | 107.3 | | | 51.2 | | | | |
| | 1:27 | 7 | 7 | 109.5 | 1.2 | | 52.5 | 1.3 | | | |
| **2** | 1:27 | | | 105.0 | | | 47.6 | | | | |
| | 1:34 | 7 | 14 | 106.0 | 1.0 | | 48.6 | 1.0 | | | |
| **3** | 1:34 | | | 106.0 | | | 48.6 | | | | |
| | 1:41 | 7 | 21 | 106.5 | 0.5 | | 49.4 | 0.8 | | | |
| **4** | 1:41 | | | 106.5 | | | 49.4 | | | | |
| | 1:48 | 7 | 28 | 107.0 | 0.5 | | 50.0 | 0.6 | | | |
| **5** | 1:48 | | | 107.0 | | | 50.0 | | | | |
| | 1:55 | 7 | 35 | 107.4 | 0.4 | | 50.5 | 0.5 | | | |
| **6** | 1:55 | | | 102.3 | | | 44.7 | | | | |
| | 2:02 | 7 | 42 | 102.6 | 0.3 | | 45.0 | 0.3 | 2.6 | 2.6 | |
| **7** | 2:02 | | | 102.6 | | | 45.0 | | | | |
| | 2:09 | 7 | 49 | 102.9 | 0.3 | | 45.3 | 0.3 | 2.6 | 2.6 | |
| **8** | 2:09 | | | 102.9 | | | 45.3 | | | | |
| | 2:16 | 7 | 56 | 103.2 | 0.3 | | 46.1 | 0.8 | 2.6 | 6.9 | |
| **9** | 2:16 | | | 103.2 | | | 46.1 | | | | |
| | 2:23 | 7 | 63 | 103.4 | 0.2 | | 46.4 | 0.3 | 1.7 | 2.6 | |
| **10** | 2:23 | | | 103.4 | | | 46.4 | | | | |
| | 2:30 | 7 | 70 | 103.6 | 0.2 | | 46.6 | 0.2 | 1.7 | 1.7 | |
| **11** | 2:30 | | | 103.6 | | | 46.6 | | | | |
| | 2:37 | 7 | 77 | 103.9 | 0.3 | | 46.9 | 0.3 | 2.6 | 2.6 | |
| **12** | 2:37 | | | 103.9 | | | 46.9 | | | | |
| | 2:44 | 7 | 84 | 104.2 | 0.3 | | 47.2 | 0.3 | 2.6 | 2.6 | |

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SOILS AND GEOTECHNICAL CONSULTANTS

| | |
|---|---|
| **Project:** | **Proficiency Rubidoux, LLC** |
| **Project No:** | 12627-05 |
| **Date:** | 7/31/15 |
| **Test No.** | 3 |
| **Depth:** | 14.5′ |
| **Tested By:** | D.R. |

| | TIME (hr/min) | CHANGE TIME (min) | CUMULATIVE TIME (min) | INNER RING READING (cm) | INNER RING FLOW (cc) | OUTER RING READING (cm) | OUTER RING CHANGE (cm) | OUTER RING FLOW (cc) | INNER RING INF RATE (cm/hr) | OUTER RING INF RATE (cm/hr) | INNER RING INF RATE (ft/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 10:17 | | | 42.2 | | | 99.6 | | | | |
| | 10:27 | 10 | 10 | 50.2 | 8.0 | | 107.2 | 7.6 | | | |
| **2** | 10:27 | | | 44.1 | | | 100.8 | | | | |
| | 10:37 | 10 | 20 | 52.0 | 7.9 | | 108.0 | 7.2 | | | |
| **3** | 10:37 | | | 43.1 | | | 99.3 | | | | |
| | 10:47 | 10 | 30 | 50.0 | 6.9 | | 106.0 | 6.7 | | | |
| **4** | 10:47 | | | 42.7 | | | 99.0 | | | | |
| | 10:57 | 10 | 40 | 49.0 | 6.3 | | 105.4 | 6.4 | | | |
| **5** | 10:57 | | | 43.5 | | | 100.5 | | | | |
| | 11:07 | 10 | 50 | 49.7 | 6.2 | | 106.1 | 5.6 | | | |
| **6** | 11:07 | | | 43.9 | | | 100.1 | | | | |
| | 11:17 | 10 | 60 | 49.6 | 5.7 | | 105.9 | 5.8 | 34.2 | 34.8 | |
| **7** | 11:17 | | | 44.3 | | | 100.6 | | | | |
| | 11:27 | 10 | 70 | 49.8 | 5.5 | | 106.0 | 5.4 | 33.0 | 32.4 | |
| **8** | 11:27 | | | 44.5 | | | 100.7 | | | | |
| | 11:37 | 10 | 80 | 50.0 | 5.5 | | 106.0 | 5.3 | 33.0 | 31.8 | |
| **9** | 11:37 | | | 43.5 | | | 99.0 | | | | |
| | 11:47 | 10 | 90 | 49.5 | 6.0 | | 105.0 | 6.0 | 36.0 | 36.0 | |
| **10** | 11:47 | | | 44.5 | | | 100.5 | | | | |
| | 11:57 | 10 | 100 | 50.0 | 5.5 | | 106.2 | 5.7 | 33.0 | 34.2 | |
| **11** | 11:57 | | | 45.0 | | | 101.5 | | | | |
| | 12:07 | 10 | 110 | 50.0 | 5.0 | | 107.0 | 5.5 | 30.0 | 33.0 | |
| **12** | 12:07 | | | 45.0 | | | 101.5 | | | | |
| | 12:17 | 10 | 120 | 50.5 | 5.5 | | 106.5 | 5.0 | 33.0 | 30.0 | |

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SOILS AND GEOTECHNICAL CONSULTANTS

| | |
|---|---|
| **Project:** | **Proficiency Rubidoux, LLC** |
| **Project No:** | 12627-05 |
| **Date:** | 7/31/15 |
| **Test No.** | 4 |
| **Depth:** | 13’ |
| **Tested By:** | D.R. |

| | TIME (hr/min) | CHANGE TIME (min) | CUMULATIVE TIME (min) | INNER RING READING (cm) | INNER RING FLOW (cc) | OUTER RING READING (cm) | OUTER RING CHANGE (cm) | OUTER RING FLOW (cc) | INNER RING INF RATE (cm/hr) | OUTER RING INF RATE (cm/hr) | INNER RING INF RATE (ft/hr) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 7:48 | | | 99.6 | | | 44.0 | | | | |
| | 7:58 | 10 | 10 | 102.0 | 2.4 | | 47.5 | 3.5 | | | |
| **2** | 7:58 | | | 102.0 | | | 47.5 | | | | |
| | 8:08 | 10 | 20 | 103.5 | 1.5 | | 49.9 | 2.4 | | | |
| **3** | 8:08 | | | 99.0 | | | 44.0 | | | | |
| | 8:18 | 10 | 30 | 100.3 | 1.3 | | 46.2 | 2.2 | | | |
| **4** | 8:18 | | | 100.3 | | | 46.2 | | | | |
| | 8:28 | 10 | 40 | 101.7 | 1.4 | | 48.7 | 2.5 | | | |
| **5** | 8:28 | | | 99.5 | | | 43.5 | | | | |
| | 8:38 | 10 | 50 | 100.4 | 0.9 | | 45.5 | 2.0 | | | |
| **6** | 8:38 | | | 100.4 | | | 45.5 | | | | |
| | 8:48 | 10 | 60 | 101.6 | 1.2 | | 47.4 | 1.9 | 7.2 | 11.4 | |
| **7** | 8:48 | | | 98.1 | | | 41.7 | | | | |
| | 8:58 | 10 | 70 | 99.1 | 1.0 | | 43.7 | 2.0 | 6.0 | 12.0 | |
| **8** | 8:58 | | | 99.1 | | | 43.7 | | | | |
| | 9:08 | 10 | 80 | 100.0 | 0.9 | | 45.5 | 1.8 | 5.4 | 10.8 | |
| **9** | 9:08 | | | 100.0 | | | 45.5 | | | | |
| | 9:18 | 10 | 90 | 101.0 | 1.0 | | 47.5 | 2.0 | 6.0 | 12.0 | |
| **10** | 9:18 | | | 101.0 | | | 47.5 | | | | |
| | 9:28 | 10 | 100 | 102.0 | 1.0 | | 49.4 | 1.9 | 6.0 | 11.4 | |
| **11** | 9:28 | | | 97.3 | | | 40.3 | | | | |
| | 9:38 | 10 | 110 | 98.2 | 0.9 | | 42.2 | 1.9 | 5.4 | 11.4 | |
| **12** | 9:38 | | | 98.2 | | | 42.2 | | | | |
| | 9:48 | 10 | 120 | 99.2 | 1.0 | | 44.1 | 1.9 | 6.0 | 11.4 | |

# GEOTECHNICAL ENGINEERING INVESTIGATION
Proposed Mixed Use Development
26th Street and Avalon Street
Rubidoux, County of Riverside, California

Prepared For:

Proficiency Rubidoux, LLC
11777 San Vicente Boulevard, Suite 780
Los Angeles, California 90049

Project Number 12627-05
November 30, 2005

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**NorCal Engineering**

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**NorCal Engineering**
SOILS AND GEOTECHNICAL CONSULTANTS
10641 HUMBOLT STREET LOS ALAMITOS, CA 90720
(562)799-9469 FAX (562)799-9459

November 30, 2005 Project Number 12627-05

Proficiency Rubidoux, LLC
11777 San Vicente Boulevard, Suite 780
Los Angeles, California 90049

Attn: Jeffrey Trenton

RE: **GEOTECHNICAL ENGINEERING INVESTIGATION** – Proposed Mixed Use Development – Located Northerly and Southerly of the Intersection of 26th Street and Avalon Street, Rubidoux, in the County of Riverside, California

Dear Mr. Trenton:

Pursuant to your request, this firm has performed a Geotechnical Engineering Investigation for the above referenced project. The purpose of this investigation is to evaluate the geotechnical conditions of the subject site and to provide recommendations for the proposed development. This geotechnical engineering report presents the findings of our study along with conclusions and recommendations for development.

## 1.0 STRUCTURAL CONSIDERATIONS

### 1.1 Proposed Development

The purpose of the investigation was to explore the subsurface conditions and to provide preliminary geotechnical engineering design parameters for evaluation of the site with respect to future development. Although no specific development plans have been provided to this firm at this date, it is anticipated that the site will be developed with small industrial buildings or residential or retail/commercial structures. It is assumed that the proposed grading for the development will generally include minor cut and fill procedures, although some terracing of the east facing hillside on the site may occur as will the excavation of the granite knob in the northerly portion of the property.

Final building plans shall be reviewed by this firm prior to submittal for city approval to determine the need for any additional study and revised recommendations pertinent to the proposed development, if necessary.

## 2.0 SITE DESCRIPTION

2.1 **Location:** The property consists of approximately 87 acres of land situated westerly of the Union Pacific Railroad and easterly of Jurupa Mountains in the Rubidoux area of the County of Riverside. The site extends from just north of 26th Street southerly to 28th Street as shown on the attached Vicinity Map, Figure 1 and Aerial Photograph, Figure 2.

2.2 **Existing Improvements:** The site is vacant of permanent structures. Some modular units, vehicles, storage bins and other equipment are located on the northerly portion of the site in the area of an on-going mining operation which is reducing and crushing materials from an existing granite knob on site.

The majority of the site south of the knob appears to have been excavated to its current grades during past soil export operations. According to available maps, it appears that up to approximately 20 to 30 feet of soil has been removed from along the westerly portion of the site with decreasing removals further to the east.

2.3 **Vegetation:**

The site is covered in most areas by moderate to heavy growth of weeds and grasses.

2.4 **Drainage/Topography:** Drainage of the relatively level site appears to generally sheetflow in an easterly direction. Site topography is generally flat in the southern portion of the site but slopes upward along the west property line into the Jurupa Mountains. The northern area of the mining operations slopes generally east with some terraces around the granite knob.

## 3.0 FIELD INVESTIGATION

### 3.1 Site Exploration

The purpose of the geotechnical investigation was to explore the subsurface conditions and to provide preliminary geotechnical engineering design parameters for evaluation of the site with respect to future development.

The investigation consisted of the placement of twenty-five subsurface exploratory excavations by backhoe and hand auger to a maximum depth of 15 feet below current ground elevations. The excavations were placed at accessible locations throughout the site. Access was somewhat limited around the current mining operations on the northerly portion of the site.

The explorations were visually classified and logged by a field engineer with locations of the subsurface explorations shown on the attached Figures 3 and 4. The excavations revealed the existing earth materials to consist of fill/disturbed topsoil and natural soil/bedrock zones. A detailed description of the subsurface conditions are listed on the excavation logs in Appendix A. It should be noted that the transition from one soil type to another as shown on the boring logs is approximate and may in fact be a gradual transition. The soils encountered are described as follows:

**Fill/Disturbed Top Soils:** Fill and disturbed top soils generally classifying as silty SANDS with some gravel, organics and minor debris were encountered across the site to depths ranging from 6 to 18 inches. These soils were noted to be dry to damp and loose in most cases.

**Natural:** Native, undisturbed soils classifying as silty SAND with some clay and gravel were encountered beneath the upper low-density soils in the southerly portion of the site. The native soils as encountered were generally observed to be medium dense and damp. Silt, sand and clay content varied slightly with depth of excavations.

Bedrock materials classifying as a massive GRANITE were encountered in excavations in the northerly portion of the site. These materials were noted to be slightly weathered and dense to hard. It should be noted that although difficult to excavate with a backhoe, the mining operations continue without any blasting of the rock using large excavators and other equipment to excavate and crush the rock. Some large boulders were noted in the mining area and more builders can be anticipated to be encountered during the site grading.

### 3.2 Groundwater

Groundwater was not encountered in any of the test excavations.

## 4.0 LABORATORY TESTS

Relatively undisturbed samples of the subsurface soils were obtained to perform laboratory testing and analysis for direct shear, consolidation tests, and to determine in-place moisture/densities. These relatively undisturbed ring samples were obtained by driving a thin-walled steel sampler lined with one-inch long brass rings with an inside diameter of 2.42 inches into the undisturbed soils a total of 6 inches.

Bulk bag samples were obtained in the upper soils for expansion index tests and maximum density tests. Preliminary wall loadings on the order of 4,000 lbs./lin.ft. and maximum compression loads on the order of 100 kips were utilized for testing and design purposes. All test results are included in Appendix B, unless otherwise noted.

4.1 **Field moisture content** (ASTM:D 2216) and the dry density of the ring samples were determined in the laboratory. This data is listed on the logs of explorations.

4.2 **Maximum density tests** (ASTM: D-1557-91) were performed on typical samples of the upper soils. Results of these tests are shown on Table I.

4.3 **Expansion index tests** in accordance with the Uniform Building Code Standard No. 29-2 were performed on remolded samples of the upper soils to determine the expansive characteristics and to provide any necessary recommendations for reinforcement of the slabs-on-grade and the foundations. Results of these tests are provided on Table II and are discussed later in this report.

4.4 **Direct shear tests** (ASTM: D-3080) were performed on undisturbed and disturbed samples of the subsurface soils. These tests were performed to determine parameters for the calculation of the safe bearing capacity. The test is performed under saturated conditions at loads of 1,000 lbs./sq.ft., 2,000 lbs./sq.ft., and 3,000 lbs./sq.ft. with results shown on Plates A - G.

4.5 **Consolidation tests** (ASTM: D-2435) were performed on undisturbed samples to determine the differential and total settlement which may be anticipated based upon the proposed loads. Water was added to the samples at a surcharge of one KSF and the settlement curves are plotted on Plates H - M.

4.6 **Soluble sulfate, pH, Resistivity and Chloride tests** to determine potential corrosive effects of soils on concrete and metal structures were performed in the laboratory. Test results are given in Tables III-VI.

4.7 **Resistance 'R' Value testing per test method CA 301** was conducted on a representative soil sample to determine preliminary pavement section design for the proposed on-site pavement areas. Test results are provided in Appendix B and recommended pavement sections are provided later within the text of this report.

## 5.0 SEISMICITY EVALUATION

The proposed development lies outside of any Alquist Priolo Special Studies Zone and the potential for damage due to direct fault rupture is considered unlikely.

The following site seismic information may be used for design considerations.

**Seismic Design Criteria**

| | San Jacinto Fault |
|---|---|
| Seismic Zone (UBC Figure 16-2) | Zone 4 |
| Seismic Zone Factor Z (UBC Table 16-I) | .40 |
| Seismic Source Type (UBC Table 16-U | B |
| Soil Profile Type (UBC Table 16-J) | $S_D$ |
| Seismic Coefficient Ca (UBC Table 16-Q) | 0.44Na |
| Seismic Coefficient Cv (UBC Table 16-R) | 0.64Nv |
| Near-Source Factor Na (UBC Table 16-S) | 1.00 |
| Near-Source Factor Nv (UBC Table 16-T) | 1.04 |
| Distance from Fault | 9 km |
| Maximum Magnitude | 6.9 |
| Maximum Horiz. Ground Acceleration | .42g |

Ground shaking originating from earthquakes along other active faults in the region is expected to induce lower horizontal accelerations due to smaller anticipated earthquakes and/or greater distances to other faults.

## 6.0 SEISMIC REFRACTION STUDY

A seismic refraction study was performed on the site to determine the ripability of the underlying dense soils and/or bedrock materials. This study was performed by Goffman, McCormick and Urban (GMU) under contract with NorCal Engineering. Five seismic lines were performed on the site in order to determine the expected excavation effort for the layers of soil/bedrock. All five lines revealed that the upper 3 to 10 feet of grading could be accomplished with easy processing. The next layer extended from 3 to at least 85 feet and these materials may be classified as requiring moderate and some difficult ripping. No blasting is anticipated on the site. A report is being compiled by GMU at this date and will be forwarded to client upon completion.

It is likely that some large boulders will be encountered during excavation in the granitic rock. Special rock breaking equipment may be required in order to reduce the boulders.

## 7.0 SLOPE STABILITY

Stability of any slopes on site will be evaluated upon receipt of grading plans for the project. No adverse bedrock or other conditions were encountered in the field which would adversely impact stability of current slopes at the site.

## 8.0 LIQUEFACTION EVALUATION

Due to the depth of groundwater in the area (>50 feet), the liquefaction potential at the subject site is deemed low. In addition, U.S. Geological Survey Professional Paper 1360 details the area as having a very low to low potential for liquefaction. No special design recommendations for the proposed structures due to liquefaction potential will be necessary for the development.

## 9.0 CONCLUSIONS AND RECOMMENDATIONS

Based upon our evaluations, development of the site is acceptable from a geotechnical engineering standpoint. By following the recommendations and guidelines set forth in our report, the structures will be safe from excessive settlements under the anticipated design loadings and conditions. The proposed development shall meet all requirements of the City Building Ordinance and will not impose any adverse effect on existing adjacent structures.

The following recommendations are based upon soil conditions encountered in our field investigation; these near-surface soil conditions could vary across the site. Variations in the soil conditions may not become evident until the commencement of grading operations for the proposed development and revised recommendations from the soils engineer may be necessary based upon the conditions encountered.

### 9.1 Site Grading Recommendations

It is recommended that site inspections be performed by a representative of this firm during all grading and construction of the development to verify the findings and recommendations documented in this report. Any unusual conditions which may be encountered in the course of the project development may require the need for additional study and revised recommendations.

Any vegetation shall be removed and hauled from proposed grading areas prior to the start of grading operations. Existing vegetation shall not be mixed or disced into the soils. Any removed soils may be reutilized as compacted fill once any deleterious material or oversized materials (in excess of eight inches) is removed. Grading operations shall be performed in accordance with the attached *Specifications for Placement of Compacted Fill.*

### 9.1.1 **Removal and Recompaction Recommendations**

All upper disturbed and fill soils (6 to 18 inches) shall be removed to competent native material, the exposed surface scarified to a depth of 12 inches, brought to within 2% of optimum moisture content and compacted to a minimum of 90% of the laboratory standard (ASTM: D-1557) prior to placement of any additional compacted fill soils and pavement. Soils in the upper 12 inches beneath slabs-on-grade shall be compacted to a minimum of 95% relative compaction. Grading shall extend a minimum of 5 horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

Care should be taken to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the grading operations and construction phase. Adequate drainage away from the structures, pavement and slopes should be provided at all times.

It is likely that isolated areas of undiscovered fill not described in this report are present on site. If found, these areas should be treated as discussed earlier. A diligent search shall also be conducted during grading operations in an effort to uncover any underground structures, irrigation or utility lines. If encountered, these structures and lines shall be either removed or properly abandoned prior to the proposed construction.

If placement of slabs-on-grade and pavement is not completed immediately upon completion of grading operations, additional testing and grading of the areas may be necessary prior to continuation of construction operations. Likewise, if adverse weather conditions occur which may damage the subgrade soils, additional assessment by the soils engineer as to the suitability of the supporting soils may be needed.

### 9.1.2 **Fill Blanket Recommendations**

Due to the medium density of the native soils and the potential for differential settlement of structures supported on both native/bedrock and compacted fill materials, it is recommended that all foundations be underlain by a uniform compacted fill blanket at least 3 feet in thickness. This fill blanket shall extend a minimum of 5 horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

### 9.2 **Shrinkage and Subsidence**

Results of our in-place density tests reveal that the soil shrinkage of the upper topsoils will be on the order of 12 to 18% due to excavation and recompaction, based upon the assumption that the fill is compacted to 93% of the maximum dry density per ASTM standards. Subsidence of these materials should be 0.2 feet due to earthwork operations. Some bulking of the decomposed granite may occur and should be between 3 and 7%. The volume changes do not include any allowance for vegetation or organic stripping, removal of subsurface improvements or topographic approximations. Although these values are only approximate, they represent our best estimate of lost yardage which will likely occur during grading. If more accurate shrinkage and subsidence factors are needed, it is recommended that field testing using the actual equipment and grading techniques should be conducted.

### 9.3 Temporary Excavations

Temporary unsurcharged excavations less than 4 feet in height may be made at vertical inclinations. Excavations between 4 and 10 feet in height in the existing site materials should be trimmed at a 1 to 1 (horizontal to vertical) gradient. In areas where soils with little or no binder are encountered, where adverse geological conditions are exposed, or where excavations are adjacent to existing structures, shoring, slot-cutting, or flatter excavations may be required.

The temporary cut slope gradients given above do not preclude local raveling and sloughing. All excavations shall be made in accordance with the requirements of the soils engineer, CAL-OSHA and other public agencies having jurisdiction.

### 9.4 Foundation Design

All foundation excavations may be designed utilizing the following allowable soil bearing capacities for an embedded depth of 18 into dense compacted fill materials with the corresponding widths:

**Allowable Soil Bearing Capacity (psf)**

| Width (ft) | Continuous Foundation | Isolated Foundation |
|---|---|---|
| 1.5 | 2000 | 2500 |
| 2.0 | 2075 | 2575 |
| 3.0 | 2375 | 2875 |
| 4.0 | 2675 | 3175 |

A substantial decrease in the above bearing capacities will be necessary if the required compacted fill blanket is not provided beneath and outside of foundations. Any property line wall foundations where footings are embedded into native materials may utilize an allowable soil bearing capacity of 1,500 psf provided the entire length of the wall is embedded into the medium dense native soils. Footings embedded into granitic bedrock may utilize an allowable soil bearing capacity of 3,000 psf however all foundations for any structure or wall cannot transition from bedrock to fill soils.

A one-third increase may be used when considering short term loading from wind and seismic forces. *Additional reinforcement of foundations may be necessary based upon soil expansion or building loads and the design should be reviewed further by the project structural engineer.* A representative of this firm shall observe all foundation excavations prior to pouring concrete.

### 9.5 **Settlement Analysis**

Resultant pressure curves for the consolidation tests are shown on Plates H-M. Computations utilizing these curves and the recommended allowable soil bearing capacities reveal that the foundations will experience settlements on the order of 3/4 inch and differential settlements of less than 1/4 inch.

## 9.6 **Lateral Resistance**

The following values may be utilized in resisting lateral loads imposed on the structure. Requirements of the Uniform Building Code should be adhered to when the coefficient of friction and passive pressures are combined.

Coefficient of Friction - 0.40
Equivalent Passive Fluid Pressure = 250 lbs./cu.ft.
Maximum Passive Pressure = 2,500 lbs./cu.ft.

The passive pressure recommendations are valid only for approved compacted fill soils.

## 9.7 **Retaining Wall Design Parameters**

Active earth pressures against retaining walls will be equal to the pressures developed by the following fluid densities. These values are for **granular backfill material** placed behind the walls at various ground slopes above the walls.

| Surface Slope of Retained Materials (Horizontal to Vertical) | Equivalent Fluid Density (lb./cu.ft.) |
|---|---|
| Level | 30 |
| 5 to 1 | 35 |
| 4 to 1 | 38 |
| 3 to 1 | 40 |
| 2 to 1 | 45 |

Any applicable short-term construction surcharges and seismic forces should be added to the above lateral pressure values. A backfill zone of free draining material shall consist of a wedge beginning a minimum of one horizontal foot from the base of the wall extending upward at an inclination of no less than 3/4 to 1 (horizontal to vertical). All walls shall be waterproofed as needed and protected from hydrostatic pressure by a reliable permanent subdrain system.

### 9.8 Slab Design

Concrete floor slabs-on-grade may be placed upon fill soils compacted to a minimum of 95% relative compaction in the upper 12 inches. Additional reinforcement requirements and recommendations regarding thickness of the slabs-on-grade may be necessary based upon soils expansion potential and proposed loading conditions in the structures and should be evaluated further by the project engineers and/or architect.

A vapor retarder should be utilized in areas which would be sensitive to the infiltration of moisture. This retarder shall meet requirements of ASTM E 96, *Water Vapor Transmission of Materials* and ASTM E 1745, *Standard Specification for Water Vapor Retarders used in Contact with Soil or Granular Fill Under Concrete Slabs.* The vapor retarder shall be installed in accordance with procedures stated in ASTM E 1643, *Standard practice for Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slabs.*

The moisture retarder may be placed directly upon compacted subgrade, although 1 to 2 inches of sand beneath the membrane is desirable. The subgrade upon which the retarder is placed shall be smooth and free of rocks, gravel or other protrusions which may damage the retarder. Use of sand above the retarder is under the purview of the structural engineer; if sand is used over the retarder, it should be placed in a dry condition.

Subgrade soils shall be maintained at or near optimum moisture levels prior to pouring of concrete. All concrete slab areas to receive floor coverings should be moisture tested to meet all manufacturer requirements prior to placement.

### 9.9 **Pavement Section Design**

The tables below provide a preliminary pavement design based upon an R-Value of 47 for the proposed pavement areas. Final pavement design should be based on R-Value testing of the subgrade soils near the conclusion of rough grading to assure that these soils are consistent with those used in this preliminary design.

**On-Site Flexible (Asphaltic) Pavement Section Design**

| Type of Traffic | Traffic Index | Inches Asphalt | Inches Base |
|---|---|---|---|
| Auto Parking/Circulation | 4.0/5.0 | 3.0 | 3.0 |
| Truck | 7.0 | 3.5 | 7.0 |

Subgrade soils to receive base material shall be compacted to a minimum of 90% relative compaction; base material shall be compacted to at least 95%. Any concrete slab-on-grade in delivery truck areas shall be a minimum of 6 inches in thickness and may be placed on subgrade soils compacted to at least 95% in the upper 12 inches.

*The above recommendations are based upon estimated traffic loadings. Client should submit anticipated traffic loadings for the pavement areas to the soils engineer, when available, so that pavement sections may be reviewed to determine adequacy to support the proposed loadings. Significant repetitions of heavy trucks at the property could significantly increase the above pavement sections.*

### 9.10 Utility Trench and Excavation Backfill

Trenches from installation of utility lines and other excavations may be backfilled with on-site soils or approved imported soils compacted to a minimum of 90% relative compaction. All utility lines shall be properly bedded with clean sand having a sand equivalency rating of 30 or more. This bedding material shall be thoroughly water jetted around the pipe structure prior to placement of compacted backfill soils.

### 9.11 Corrosion Design Criteria

Representative samples of the surficial soils revealed negligible sulfate concentrations; therefore all concrete in contact with on-site soils may be designed in accordance with Table 19A-A-4 of the 1997 Uniform Building Code. It is recommended that additional sulfate tests be performed at the completion of rough grading to assure that the as graded conditions are consistent with the recommendations stated in this design. Sulfate test results may be found on the attached Table III.

Tests were also conducted on a random representative sample of soils to determine the potential corrosive effects on buried metallic structures. Tests for pH, resistivity and chloride are included on Tables III – VI. Soil pH indicates a slightly alkaline condition. Resistivity is indicative of a condition which may be considered mildly corrosive to metallic structures. Chloride content revealed low concentrations.

### 9.12 **Expansive Soil**

The upper soils at the site are very low in expansion potential. Sites with expansive on site soils require special attention during project design and maintenance. The attached *Expansive Soil Guidelines* should be reviewed by the engineers, architects, owner, maintenance personnel and other interested parties and considered during the design of the project and future property maintenance.

## 10.0 CLOSURE

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase. It is the responsibility of the owner to ensure that all information within this report is submitted to the Architect and appropriate Engineers for the project.

This firm should have the opportunity to review the final plans (72 hours required) to verify that all our recommendations are incorporated. This report and all conclusions are subject to the review of the controlling authorities for the project.

A preconstruction conference should be held between the developer, general contractor, grading contractor, city inspector, architect, and soil engineer to clarify any questions relating to the grading operations and subsequent construction. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

This geotechnical investigation has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. No other warranty, expressed or implied is made.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

Respectfully submitted,
NORCAL ENGINEERING

Keith D. Tucker
No. 841
Exp. 12/31/08

Keith D. Tucker
Project Engineer
R.G.E. 841

Mark A. Burkholder
Project Manager

# SPECIFICATIONS FOR PLACEMENT OF COMPACTED FILL

**Excavation**

Any existing low density soils and/or saturated soils shall be removed to competent natural soil under the inspection of the Soils Engineering Firm. After the exposed surface has been cleansed of debris and/or vegetation, it shall be scarified until it is uniform in consistency, brought to the proper moisture content and compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557).

In any area where a transition between fill and native soil or between bedrock and soil are encountered, additional excavation beneath foundations and slabs will be necessary in order to provide uniform support and avoid differential settlement of the structure.

**Material For Fill**

The on-site soils or approved import soils may be utilized for the compacted fill provided they are free of any deleterious materials and shall not contain any rocks, brick, asphaltic concrete, concrete or other hard materials greater than eight inches in maximum dimensions. Any import soil must be approved by the Soils Engineering firm a minimum of 72 hours prior to importation of site.

**Placement of Compacted Fill Soils**

The approved fill soils shall be placed in layers not excess of six inches in thickness. Each lift shall be uniform in thickness and thoroughly blended. The fill soils shall be brought to within 2% of the optimum moisture content, unless otherwise specified by the Soils Engineering firm. Each lift shall be compacted to a minimum of 90% relative compaction (in accordance with ASTM: D-1557) or as recommended and approved prior to the placement of the next layer of soil. Compaction tests shall be obtained at the discretion of the Soils Engineering firm but to a minimum of one test for every 500 cubic yards placed and/or for every 2 feet of compacted fill placed.

The minimum relative compaction shall be obtained in accordance with accepted methods in the construction industry. The final grade of the structural areas shall be in a dense and smooth condition prior to placement of slabs-on-grade or pavement areas. No fill soils shall be placed, spread or compacted during unfavorable weather conditions. When the grading is interrupted by heavy rains, compaction operations shall not be resumed until approved by the Soils Engineering firm.

**Grading Observations**

The controlling governmental agencies should be notified prior to commencement of any grading operations. This firm recommends that the grading operations be conducted under the observation of a Soils Engineering firm as deemed necessary. A 24-hour notice must be provided to this firm prior to the time of our initial inspection.

Observation shall include the clearing and grubbing operations to assure that all unsuitable materials have been properly removed; approve the exposed subgrade in areas to receive fill and in areas where excavation has resulted in the desired finished grade and designate areas of overexcavation; and perform field compaction tests to determine relative compaction achieved during fill placement. In addition, all foundation excavations shall be observed by the Soils Engineering firm to confirm that appropriate bearing materials are present at the design grades and recommend any modifications to construct footings.

## EXPANSIVE SOIL GUIDELINES

The following expansive soil guidelines are provided for your project. The intent of these guidelines is to inform you, the client, of the importance of proper design and maintenance of projects supported on expansive soils. ***You, as the owner or other interested party, should be warned that you have a duty to provide the information contained in the soil report including these guidelines to your design engineers, architects, landscapers and other design parties in order to enable them to provide a design that takes into consideration expansive soils.***

*In addition, you should provide the soil report with these guidelines to any property manager, lessee, property purchaser or other interested party that will have or assume the responsibility of maintaining the development in the future.*

Expansive soils are fine-grained silts and clays which are subject to swelling and contracting. The amount of this swelling and contracting is subject to the amount of fine-grained clay materials present in the soils and the amount of moisture either introduced or extracted from the soils. Expansive soils are divided into five categories ranging from "very low" to "very high". Expansion indices are assigned to each classification and are included in the laboratory testing section of this report. *If the expansion index of the soils on your site, as stated in this report, is 21 or higher, you have expansive soils.* The classifications of expansive soils are as follows:

**Classification of Expansive Soil***

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

*From Table 18A-I-B of California Building Code (1988)

When expansive soils are compacted during site grading operations, care is taken to place the materials at or slightly above optimum moisture levels and perform proper compaction operations. Any subsequent excessive wetting and/or drying of expansive soils will cause the soil materials to expand and/or contract. These actions are likely to cause distress of foundations, structures, slabs-on-grade, sidewalks and pavement over the life of the structure. ***It is therefore imperative that even after construction of improvements, the moisture contents are maintained at relatively constant levels, allowing neither excessive wetting or drying of soils.***

Evidence of excessive wetting of expansive soils may be seen in concrete slabs, both interior and exterior. Slabs may lift at construction joints producing a trip hazard or may crack from the pressure of soil expansion. Wet clays in foundation areas may result in lifting of the structure causing difficulty in the opening and closing of doors and windows, as well as cracking in exterior and interior wall surfaces. In extreme wetting of soils to depth, settlement of the structure may eventually result. Excessive wetting of soils in landscape areas adjacent to concrete or asphaltic pavement areas may also result in expansion of soils beneath pavement and resultant distress to the pavement surface.

Excessive drying of expansive soils is initially evidenced by cracking in the surface of the soils due to contraction. Settlement of structures and on-grade slabs may also eventually result along with problems in the operation of doors and windows.

*Projects located in areas of expansive clay soils will be subject to more movement and "hairline" cracking of walls and slabs than similar projects situated on non-expansive sandy soils.* There are, however, measures that developers and property owners may take to reduce the amount of movement over the life the development. The following guidelines are provided to assist you in both design and maintenance of projects on expansive soils:

- Drainage away from structures and pavement is essential to prevent excessive wetting of expansive soils. Grades of at least 3% should be designed and maintained to allow flow of irrigation and rain water to approved drainage devices or to the street. Any "ponding" of water adjacent to buildings, slabs and pavement after rains is evidence of poor drainage; the installation of drainage devices or regrading of the area may be required to assure proper drainage. Installation of rain gutters is also recommended to control the introduction of moisture next to buildings. Gutters should discharge into a drainage device or onto pavement which drains to roadways.

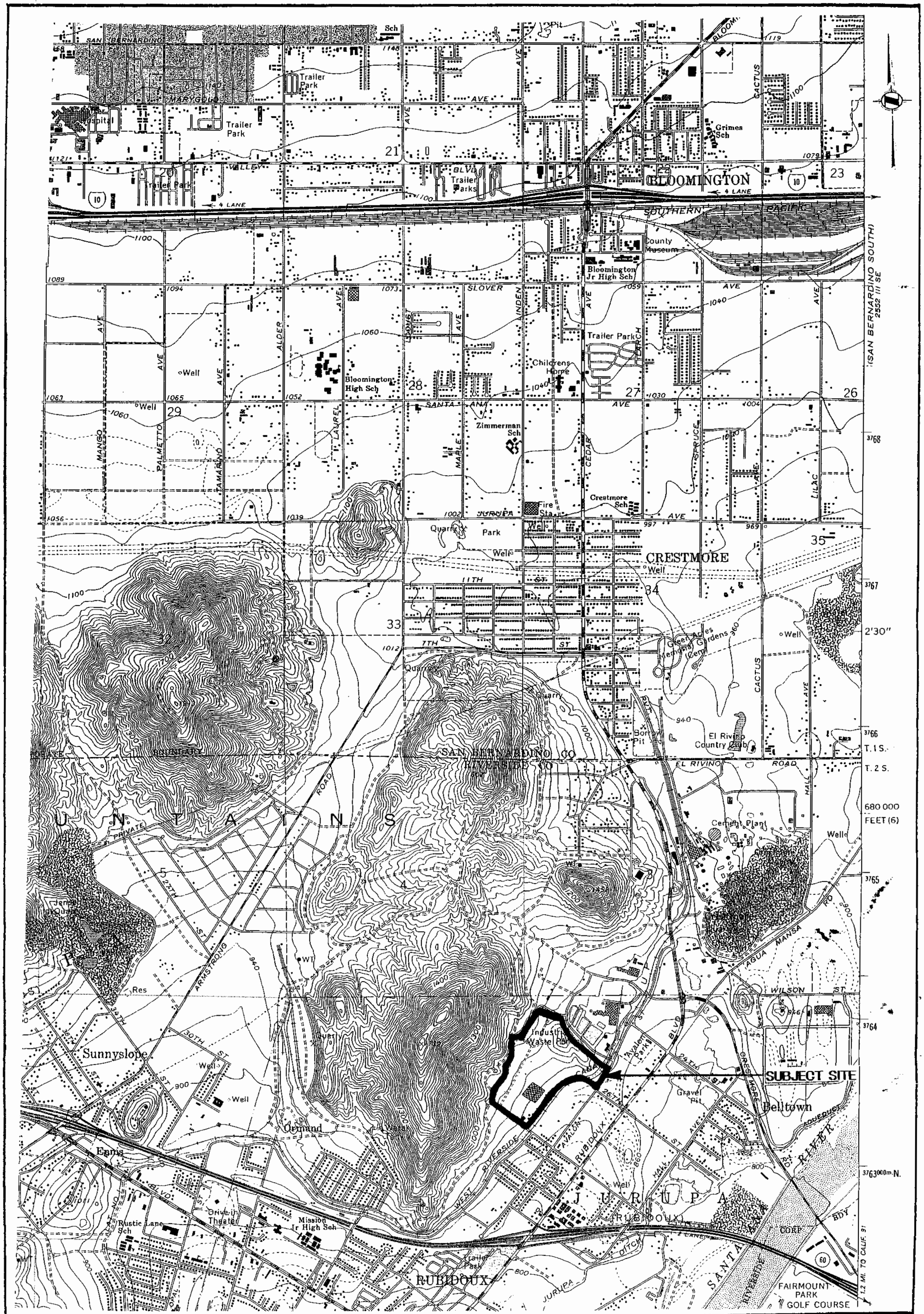
- Irrigation should be strictly controlled around building foundations, slabs and pavement and may need to be adjusted depending upon season. This control is essential to maintain a relatively uniform moisture content in the expansive soils and to prevent swelling and contracting. Over-watering adjacent to improvements may result in damage to those improvements. NorCal Engineering makes no specific recommendations regarding landscape irrigation schedules.

- Planting schemes for landscaping around structures and pavement should be analyzed carefully. Plants (including sod) requiring high amounts of water may result in excessive wetting of soils. Trees and large shrubs may actually extract moisture from the expansive soils, thus causing contraction of the fine-grained soils.

- Thickened edges on exterior slabs will assist in keeping excessive moisture from entering directly beneath the concrete. A six-inch thick or greater deepened edge on slabs may be considered. Underlying interior and exterior slabs with 6 to 12 inches or more of non-expansive soils and providing presaturation of the underlying clayey soils as recommended in the soil report will improve the overall performance of on-grade slabs.

- Increase the amount of steel reinforcing in concrete slabs, foundations and other structures to resist the forces of expansive soils. The precise amount of reinforcing should be determined by the appropriate design engineers and/or architects.

- Recommendations of the soil report should always be followed in the development of the project. Any recommendations regarding presaturation of the upper subgrade soils in slab areas should be performed in the field and verified by the Soil Engineer.



**NorCal Engineering**

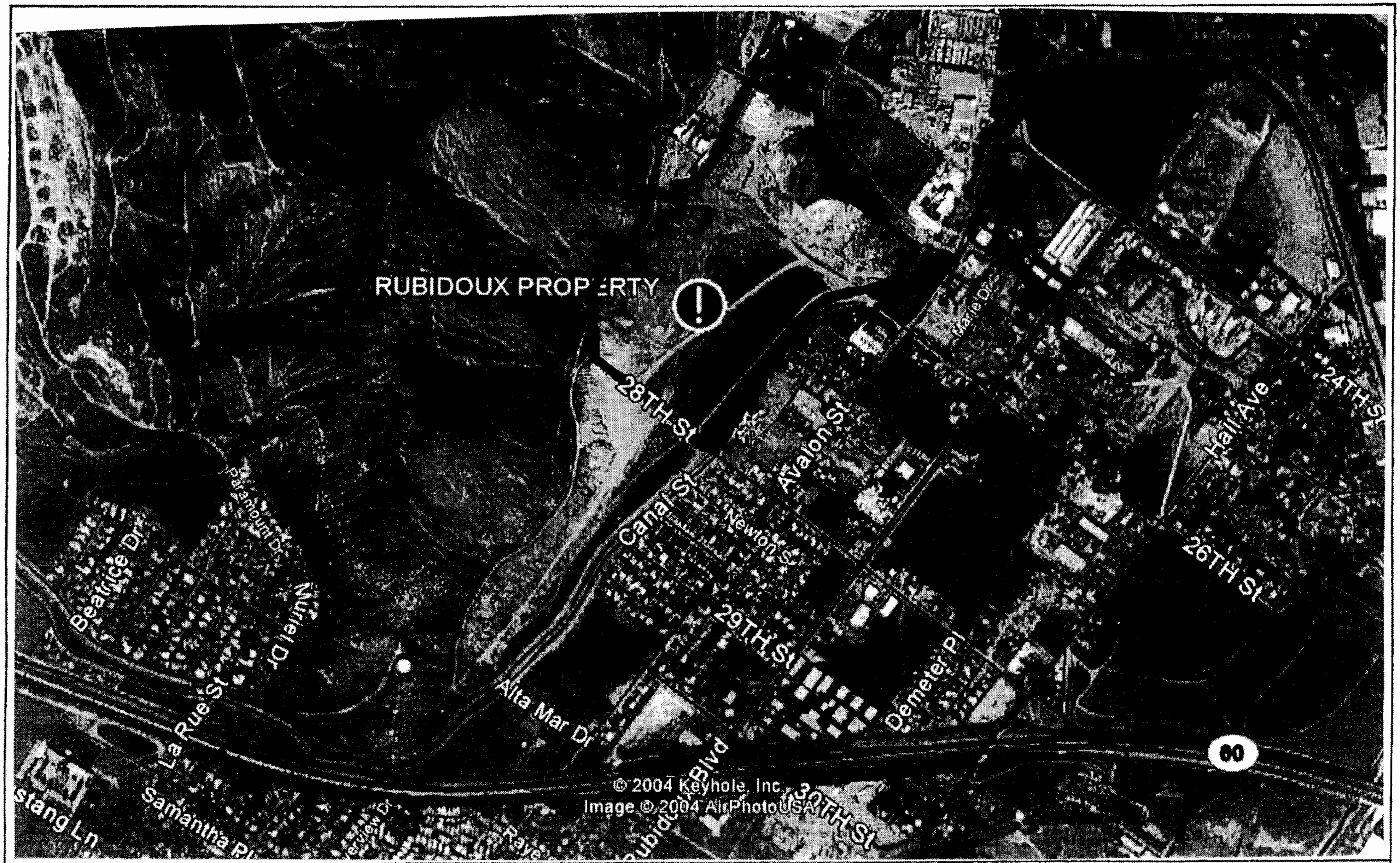
SOILS AND GEOTECHNICAL CONSULTANTS

**PROFICIENCY RUBIDOUX, LLC**

PROJECT 12627-05 DATE NOVEMBER 2005

## VICINITY MAP

FIGURE 1



**NorCal Engineering**

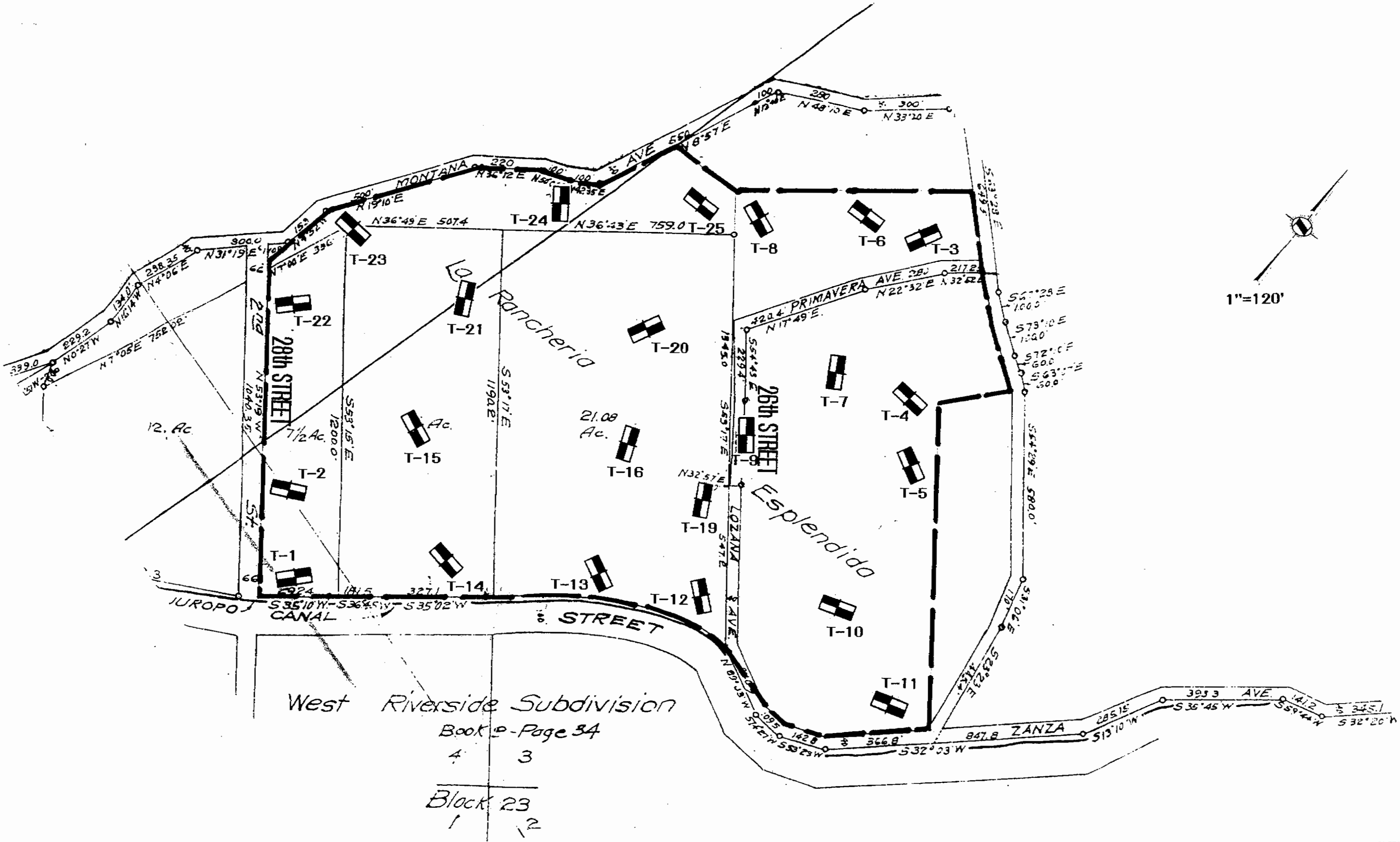
SOILS AND GEOTECHNICAL CONSULTANTS

PROFICIENCY RUBIDOUX, LLC

| PROJECT 12627-05 | DATE NOVEMBER 2005 |
|---|---|

# AERIAL PHOTOGRAPH

FIGURE 2



**NorCal Engineering**

SOILS AND GEOTECHNICAL CONSULTANTS

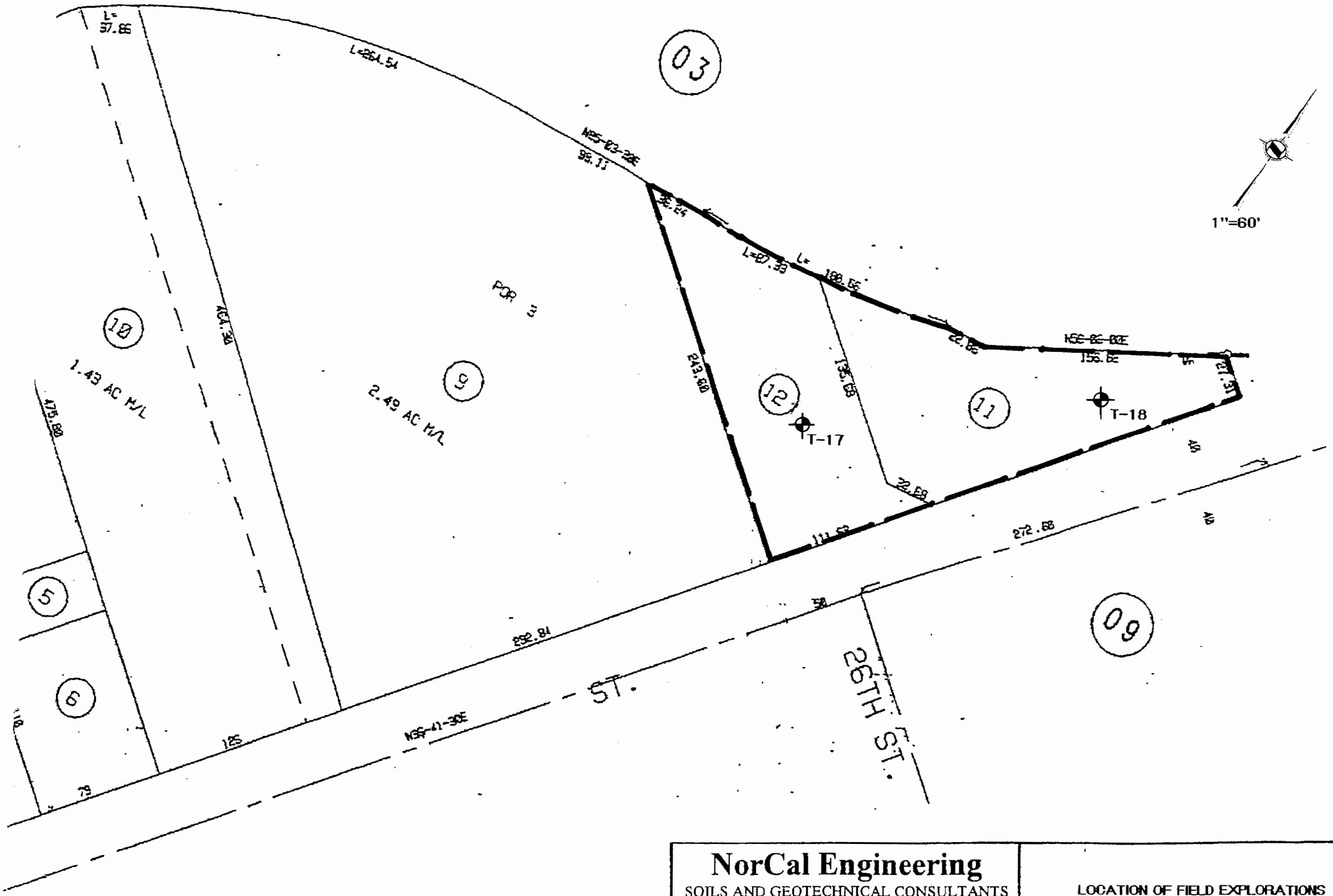
PROFICIENCY RUBIDOUX, LLC

PROJECT 12627-05

DATE NOVEMBER 2005

LOCATION OF FIELD EXPLORATIONS

FIGURE 3



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PROFICIENCY RUBIDOUX, LLC
PROJECT 12627-05
DATE NOVEMBER 2005

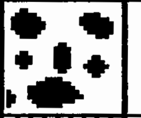
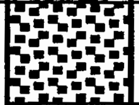
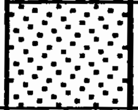
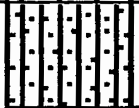
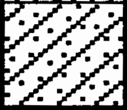
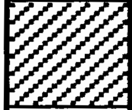
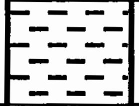
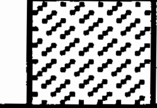
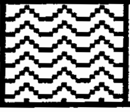
LOCATION OF FIELD EXPLORATIONS

FIGURE 4

# APPENDICES

(In order of appearance)

# APPENDIX A

| MAJOR DIVISION | | | GRAPHIC SYMBOL | LETTER SYMBOL | TYPICAL DESCRIPTIONS |
|---|---|---|---|---|---|
| COARSE GRAINED SOILS<br>MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | GRAVEL AND GRAVELLY SOILS<br>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<br>MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE | CLEAN SAND (LITTLE OR NO FINES) |  | SW | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | |  | SP | POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES |
| | | SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES) |  | SM | SILTY SANDS, SAND-SILT MIXTURES |
| | | |  | SC | CLAYEY SANDS, SAND-CLAY MIXTURES |
| FINE GRAINED SOILS<br>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, FAT CLAYS |
| | | |  | 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

# UNIFIED SOIL CLASSIFICATION SYSTEM

# KEY:

| | |
|---|---|
| ■ | Indicates 2.5-inch Inside Diameter. Ring Sample. |
| ☒ | Indicates 2-inch OD Split Spoon Sample (SPT). |
| ⧅ | Indicates Shelby Tube Sample. |
| ◫ | Indicates No Recovery. |
| ◧ | Indicates SPT with 140# Hammer 30 in. Drop. |
| ✉ | Indicates Bulk Sample. |
| ◩ | Indicates Small Bag Sample. |
| ◨ | Indicates Non-Standard |
| ⊠ | Indicates Core Run. |

## COMPONENT PROPORTIONS

| DESCRIPTIVE TERMS | RANGE OF PROPORTION |
|---|---|
| Trace | 1 - 5% |
| Few | 5 - 10% |
| Little | 10 - 20% |
| Some | 20 - 35% |
| And | 35 - 50% |

## COMPONENT DEFINITIONS

| COMPONENT | SIZE RANGE |
|---|---|
| Boulders | Larger than 12 in |
| Cobbles | 3 in to 12 in |
| Gravel | 3 in to No 4 (4.5mm ) |
| Coarse gravel | 3 in to 3/4 in |
| Fine gravel | 3/4 in to No 4 ( 4.5mm ) |
| Sand | No. 4 ( 4.5mm ) to No. 200 ( 0.074mm ) |
| Coarse sand | No. 4 ( 4.5 mm ) to No. 10 ( 2.0 mm ) |
| Medium sand | No. 10 ( 2.0 mm ) to No. 40 ( 0.42 mm ) |
| Fine sand | No. 40 ( 0.42 mm ) to No. 200 ( 0.074 mm ) |
| Silt and Clay | Smaller than No. 200 ( 0.074 mm ) |

## MOISTURE CONTENT

| | |
|---|---|
| DRY | Absence of moisture, dusty, dry to the touch. |
| DAMP | Some perceptible moisture; below optimum |
| MOIST | No visible water; near optimum moisture content |
| WET | Visible free water, usually soil is below water table. |

## RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

| COHESIONLESS SOILS | | COHESIVE SOILS | | |
|---|---|---|---|---|
| Density | N ( blows/ft ) | Consistency | N (blows/ft ) | Approximate Undrained Shear Strength (psf) |
| Very Loose | 0 to 4 | Very Soft | 0 to 2 | < 250 |
| Loose | 4 to 10 | Soft | 2 to 4 | 250 - 500 |
| Medium Dense | 10 to 30 | Medium Stiff | 4 to 8 | 500 - 1000 |
| Dense | 30 to 50 | Stiff | 8 to 15 | 1000 - 2000 |
| Very Dense | over 50 | Very Stiff | 15 to 30 | 2000 - 4000 |
| | | Hard | over 30 | > 4000 |

# Log of Trench T-1

**Project** Proficiency Capital/Rubidoux

**Date of Drilling:** 11/17/05

**Groundwater Depth:** None Encountered

**Drilling Method:** Backhoe

**Hammer Weight:**

**Drop:**

Surface Elevation Not Measured

| Depth (feet) | Geotechnical Description | Lithology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | DISTURBED TOP/FILL SOILS<br>Silty SAND with occasional gravel<br>Reddish-brown, loose, dry | | ☐ | | | | |
| | NATURAL SOILS<br>Silty SAND with occasional gravel<br>Reddish-brown, medium dense, damp<br>Increase in density with depth | | ■ | | 5.6 | 104.7 | |
| 5 | | | | | | | |
| | | | ■ | | 4.4 | 116.2 | |
| 10 | | | ■ | | 7.7 | 106.5 | |
| | | | ■ | | 6.9 | 113.2 | |
| 15 | Boring completed at depth of 15' | | ■ | | 7.1 | 110.4 | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-2

**Project** **Proficiency Capital/Rubidoux**

**Date of Drilling: 11/17/05**

**Groundwater Depth: None Encountered**

**Drilling Method: Backhoe**

**Hammer Weight:**

**Drop:**

**Surface Elevation Not Measured**

| Depth (feet) | Geotechnical Description | Lithology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | DISTURBED TOP/FILL SOILS<br>Silty SAND with occasional gravel<br>Reddish-brown, loose, dry | ▨ | ■ | | 5.6 | 109.8 | |
| | NATURAL SOILS<br>Silty SAND with occasional gravel<br>Reddish-brown, medium dense, damp | ▨ | | | | | |
| 5 | | ▨ | | | | | |
| | Boring completed at depth of 7' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-3

**Project** **Proficiency Capital/Rubidoux**

**Date of Drilling: 11/17/05**

**Groundwater Depth: None Encountered**

**Drilling Method: Backhoe**

**Hammer Weight:**

**Drop:**

**Surface Elevation Not Measured**

| Depth (feet) | Geotechnical Description | Lithology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | SURFICIAL FILL SOILS<br>Silty SAND with gravel<br>Grey, medium dense, dry to damp | ▨ | ■ | | 6.1 | 109.9 | |
| | NATURAL SOILS<br>Slightly fine grained silty SAND with gravel<br>Reddish-brown, dense to very dense, damp<br>Increase in density with depth | ▨ | ■ | | 4.2 | 120.7 | |
| 5 | | ▨ | ■ | | 8.0 | 112.7 | |
| | Silty SAND<br>Reddish-brown, hard, damp<br>Cemented | ▨ | ■ | | 7.2 | 118.3 | |
| | | ▨ | ☐ | | 10.1 | | |
| | Boring completed at depth of 7.5' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

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# Log of Trench T-4

| | |
|---|---|
| **Project** **Proficiency Capital/Rubidoux** | |
| **Date of Drilling: 11/17/05** | **Groundwater Depth: None Encountered** |
| **Drilling Method: Backhoe** | |
| **Hammer Weight:** | **Drop:** |

| **Depth (feet)** | **Geotechnical Description**<br>**Surface Elevation Not Measured** | **Lith-ology** | **Samples**<br>**Type** | **Samples**<br>**Blow counts** | **Laboratory**<br>**Moisture (%)** | **Laboratory**<br>**Dry Density (pcf)** | **Laboratory**<br>**Fines (%)** |
|---|---|---|---|---|---|---|---|
| 0 | SURFICIAL FILL SOILS<br>Silty SAND with gravel<br>Brown, loose, damp | ▨ | ☒ | | | | |
| | Decomposed Granite<br>BEDROCK<br>Grey, dense to hard, damp<br>Difficult to excavate | ▨ | | | | | |
| 5 | Boring completed at depth of 3' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-5

| | |
|---|---|
| **Project** Proficiency Capital/Rubidoux | |
| **Date of Drilling:** 11/17/05 | **Groundwater Depth:** None Encountered |
| **Drilling Method:** Backhoe | |
| **Hammer Weight:** | **Drop:** |

| Depth (feet) | Geotechnical Description | Lith-ology | Samples | | Laboratory | | |
|---|---|---|---|---|---|---|---|
| | Surface Elevation Not Measured | | Type | Blow counts | Moisture (%) | Dry Density (pcf) | Fines (%) |
| 0 | FILL SOILS<br>Silty SAND with gravel<br>Grey-brown, loose, damp | | ■ | | 4.1 | 119.3 | |
| | Decomposed Granite<br>BEDROCK<br>Grey, dense to hard, damp<br>Increase in density with depth | | | | | | |
| 5 | | | | | | | |
| | Boring completed at depth of 6' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-6

**Project** Proficiency Capital/Rubidoux

**Date of Drilling:** 11/17/05

**Groundwater Depth:** None Encountered

**Drilling Method:** Backhoe

**Hammer Weight:**

**Drop:**

Surface Elevation Not Measured

| Depth (feet) | Geotechnical Description | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|
| 0 | SURFICIAL FILL SOILS<br>Silty SAND with gravel<br>Grey, loose, dry | | | | | |
| | NATURAL SOILS<br>Silty SAND with occasional gravel<br>Brown, medium dense, damp<br>Slight increase in density below 10' | | | | | |
| 5 | | ■ | | 4.5 | 107.7 | |
| | | ■ | | 4.8 | 109.5 | |
| 10 | | ■ | | 4.7 | 113.5 | |
| | | ■ | | 4.7 | 111.4 | |
| 15 | Boring completed at depth of 15' | | | | | |
| 20 | | | | | | |
| 25 | | | | | | |
| 30 | | | | | | |
| 35 | | | | | | |

# Log of Trench T-7

**Project** **Proficiency Capital/Rubidoux**

**Date of Drilling: 11/17/05**

**Groundwater Depth: None Encountered**

**Drilling Method: Backhoe**

**Hammer Weight:**

**Drop:**

| Depth (feet) | Geotechnical Description | Lith-ology | Samples | | Laboratory | | |
|---|---|---|---|---|---|---|---|
| | | | Type | Blow counts | Moisture (%) | Dry Density (pcf) | Fines (%) |
| | Surface Elevation Not Measured | | | | | | |
| 0 | FILL SOILS<br>Silty SAND with gravel<br>Brown, loose, dry | ▤ | | | | | |
| | Decomposed Granite<br>BEDROCK<br>Grey, dense to hard, damp<br>Increase in density with depth | ▨ | ☑ | | 2.5 | | |
| 5 | Boring completed at depth of 4.5' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-8

| | |
|---|---|
| **Project** Proficiency Capital/Rubidoux | |
| **Date of Drilling:** 11/17/05 | **Groundwater Depth:** None Encountered |
| **Drilling Method:** Backhoe | |
| **Hammer Weight:** | **Drop:** |

Surface Elevation Not Measured

| Depth (feet) | Geotechnical Description | Lithology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | FILL SOILS<br>Silty SAND with gravel<br>Grey-brown, loose, dry | ▨ | | | | | |
| | NATURAL SOILS<br>Silty SAND with some clay<br>Reddish-brown, dense, damp<br>Hard @ 3.5' (cemented) | ▨ | ☒ | | 7.4 | | |
| 5 | Boring completed at depth of 5' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

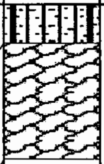
# Log of Trench T-9

**Project** **Proficiency Capital/Rubidoux**

**Date of Drilling: 11/17/05** **Groundwater Depth: None Encountered**

**Drilling Method: Backhoe**

**Hammer Weight:** **Drop:**

| Depth (feet) | Geotechnical Description<br>Surface Elevation Not Measured | Lith-ology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | FILL SOILS<br>Slightly silty SAND with gravel<br>Grey-brown, loose, dry |  | ☐ | | 1.4 | | |
| | NATURAL SOILS<br>Decomposed Granite<br>BEDROCK | | | | | | |
| 5 | Grey, dense, damp | | | | | | |
| | Boring completed at depth of 4' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

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# Log of Trench T-10

| | |
|---|---|
| **Project** Proficiency Capital/Rubidoux | |
| **Date of Drilling:** 11/17/05 | **Groundwater Depth:** None Encountered |
| **Drilling Method:** Backhoe | |
| **Hammer Weight:** | **Drop:** |

| Depth (feet) | Geotechnical Description | Lith-ology | Samples | | Laboratory | | |
|---|---|---|---|---|---|---|---|
| | Surface Elevation Not Measured | | Type | Blow counts | Moisture (%) | Dry Density (pcf) | Fines (%) |
| 0 | NATURAL SOILS<br>Silty SAND with clay, gravel<br>Reddish-brown, medium dense, damp | ▥ | | | | | |
| | Decomposed Granite<br>BEDROCK<br>Grey-brown, dense to hard, damp<br>Increase in density with depth | ▨ | ■ | | 1.7 | 137.3 | |
| 5 | Boring completed at depth of 5' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-11

**Project** Proficiency Capital/Rubidoux

**Date of Drilling:** 11/17/05

**Groundwater Depth:** None Encountered

**Drilling Method:** Backhoe

**Hammer Weight:**

**Drop:**

| Depth (feet) | Geotechnical Description | Lith-ology | Samples | | Laboratory | | |
|---|---|---|---|---|---|---|---|
| | | | Type | Blow counts | Moisture (%) | Dry Density (pcf) | Fines (%) |
| | Surface Elevation Not Measured | | | | | | |
| 0 | SURFICIAL FILL SOILS<br>Silty SAND with occasional gravel<br>Grey-brown, loose, dry | | | | | | |
| | NATURAL SOILS<br>Silty SAND with some clay and occasional gravel<br>Reddish-brown, dense, damp | | | | | | |
| 5 | Grading to Sandy SILT with depth | | ■ | | 5.2 | 106.2 | |
| | | | ■ | | 3.9 | 103.5 | |
| 10 | | | ☒ | | 3.0 | | |
| | Boring completed at depth of 12' | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-12

**Project** **Proficiency Capital/Rubidoux**

**Date of Drilling: 11/17/05** | **Groundwater Depth: None Encountered**

**Drilling Method: Backhoe**

**Hammer Weight:** | **Drop:**

| Depth (feet) | Geotechnical Description<br>Surface Elevation Not Measured | Lith-ology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | SURFICIAL FILL SOILS<br>Silty SAND with organics<br>Grey-brown, loose, damp | ▨ | | | | | |
| | NATURAL SOILS<br>Fine grained silty SAND with occasional gravel<br>Reddish-brown, medium dense, damp | ▨ | | | | | |
| 5 | | ▨ | ■ | | 5.7 | 105.1 | |
| 10 | | ▨ | ■ | | 6.9 | 111.4 | |
| | Boring completed at depth of 12' | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

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# Log of Trench T-13

| | |
|---|---|
| **Project** Proficiency Capital/Rubidoux | |
| **Date of Drilling:** 11/17/05 | **Groundwater Depth:** None Encountered |
| **Drilling Method:** Backhoe | |
| **Hammer Weight:** | **Drop:** |

**Surface Elevation Not Measured**

| Depth (feet) | Geotechnical Description | Lith-ology | Samples | | Laboratory | | |
|---|---|---|---|---|---|---|---|
| | | | Type | Blow counts | Moisture (%) | Dry Density (pcf) | Fines (%) |
| 0 | DISTURBED TOP SOILS<br>Loose, dry with roots<br>NATURAL SOILS<br>Fine grained silty SAND with occasional gravel<br>Reddish-brown, medium dense, damp | | | | | | |
| 5 | Boring completed at depth of 5' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-14

**Project** **Proficiency Capital/Rubidoux**

**Date of Drilling: 11/17/05** **Groundwater Depth: None Encountered**

**Drilling Method: Backhoe**

**Hammer Weight:** **Drop:**

| Depth (feet) | Geotechnical Description | Lith-ology | Samples | | Laboratory | | |
|---|---|---|---|---|---|---|---|
| | | | Type | Blow counts | Moisture (%) | Dry Density (pcf) | Fines (%) |
| | Surface Elevation Not Measured | | | | | | |
| 0 | DISTURBED TOP SOILS<br>Loose, dry with roots | ▨ | | | | | |
| | NATURAL SOILS<br>Fine grained silty SAND with occasional gravel<br>Reddish-brown, medium dense, damp | ▨ | | | | | |
| 5 | | ▨ | | | | | |
| | Boring completed at depth of 8' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

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# Log of Trench T-15

**Project** Proficiency Capital/Rubidoux

**Date of Drilling:** 11/17/05 **Groundwater Depth:** None Encountered

**Drilling Method:** Backhoe

**Hammer Weight:** **Drop:**

Surface Elevation Not Measured

| Depth (feet) | Geotechnical Description | Lithology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | DISTURBED TOP SOILS<br>Loose, dry with roots | ▨ | | | | | |
| | NATURAL SOILS<br>Fine grained silty SAND with some clay<br>Reddish-brown, medium dense, damp | ▨ | | | | | |
| 5 | | ▨ | | | | | |
| | Boring completed at depth of 6.5' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-16

**Project** Proficiency Capital/Rubidoux

**Date of Drilling:** 11/17/05

**Groundwater Depth:** None Encountered

**Drilling Method:** Backhoe

**Hammer Weight:**

**Drop:**

| Depth (feet) | Geotechnical Description | Lithology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| | Surface Elevation Not Measured | | | | | | |
| 0 | DISTURBED TOP SOILS<br>Loose, dry with roots | | | | | | |
| | NATURAL SOILS<br>Fine grained silty SAND with some clay<br>Reddish-brown, medium dense, damp | | ■ | | 4.6 | 113.8 | |
| 5 | | | | | | | |
| | | | ■ | | 5.9 | 110.8 | |
| 10 | Boring completed at depth of 10' | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-17

**Project** **Proficiency Capital/Rubidoux**

**Date of Drilling: 11/17/05**

**Groundwater Depth: None Encountered**

**Drilling Method: Hand Auger**

**Hammer Weight:**

**Drop:**

**Surface Elevation Not Measured**

| Depth (feet) | Geotechnical Description | Lithology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | FILL SOILS<br>Silty SAND with gravel, rock<br>Grey-brown, medium dense, dry to damp | | | | | | |
| | NATURAL SOILS<br>Sandy SILT with some clay<br>Reddish-brown, firm, moist | | ■ | | 11.7 | 106.4 | |
| 5 | | | | | | | |
| | | | ■ | | 12.4 | 108.3 | |
| 10 | | | | | | | |
| | | | ■ | | 11.1 | 112.4 | |
| 15 | Boring completed at depth of 15' | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

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# Log of Trench T-18

| | |
|---|---|
| **Project** | **Proficiency Capital/Rubidoux** |
| **Date of Drilling: 11/17/05** | **Groundwater Depth: None Encountered** |
| **Drilling Method: Hand Auger** | |
| **Hammer Weight:** | **Drop:** |

| Depth (feet) | Geotechnical Description<br>Surface Elevation Not Measured | Lith-ology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | SURFICIAL FILL SOILS<br>Silty SAND with gravel, organics<br>Brown, loose, dry | | | | | | |
| | NATURAL SOILS<br>Fine grained silty SAND with some clay<br>Reddish-brown, medium dense, damp to moist | | | | | | |
| 5 | | | | | | | |
| | Boring completed at depth of 8' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

SuperLog v2.2 CivilTech Software www.civiltech.com

*NorCal Engineering*

**Project No. 12627-05**

# Log of Trench T-19

**Project** Proficiency Capital/Rubidoux

**Date of Drilling:** 11/17/05 | **Groundwater Depth:** None Encountered

**Drilling Method:** Backhoe

**Hammer Weight:** | **Drop:**

| Depth (feet) | Geotechnical Description | Lith-ology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| | Surface Elevation Not Measured | | | | | | |
| 0 | SURFICIAL FILL SOILS<br>Silty SAND with gravel<br>Reddish-brown, loose, dry | ▨ | | | | | |
| | NATURAL SOILS<br>Fine grained silty SAND with occasional gravel<br>Reddish-brown, medium dense, damp | ▨ | | | | | |
| 5 | | | | | | | |
| | Boring completed at depth of 6' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

***NorCal Engineering***

**Project No.**
**12627-05**

# Log of Trench T-20

**Project** Proficiency Capital/Rubidoux

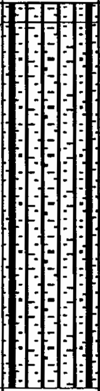
**Date of Drilling:** 11/17/05

**Groundwater Depth:** None Encountered

**Drilling Method:** Backhoe

**Hammer Weight:**

**Drop:**

| Depth (feet) | Geotechnical Description | Lith-ology | Samples | | Laboratory | | |
|---|---|---|---|---|---|---|---|
| | Surface Elevation Not Measured | | Type | Blow counts | Moisture (%) | Dry Density (pcf) | Fines (%) |
| 0 | DISTURBED TOP SOILS<br>Loose, dry with roots |  | | | | | |
| | NATURAL SOILS<br>Fine grained silty SAND with occasional gravel | | ■ | | 4.4 | 112.1 | |
| | Reddish-brown, dense, damp<br>Increase gravel, rock @ 3' | | ■ | | 4.0 | 118.5 | |
| 5 | Increase sand content with depth | | | | | | |
| | | | ■ | | 6.1 | 115.4 | |
| 10 | Boring completed at depth of 10' | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

**NorCal Engineering**

Project No.
12627-05

# Log of Trench T-21

**Project** Proficiency Capital/Rubidoux

**Date of Drilling:** 11/17/05

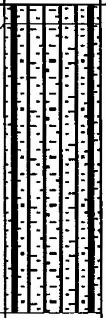
**Groundwater Depth:** None Encountered

**Drilling Method:** Backhoe

**Hammer Weight:**

**Drop:**

Surface Elevation Not Measured

| Depth (feet) | Geotechnical Description | Lith-ology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | DISTURBED TOP SOILS<br>Loose, dry with roots |  | | | | | |
| | NATURAL SOILS<br>Fine grained silty SAND with gravel, rock<br>Reddish-brown, medium dense, damp<br>Dense to very dense @ 6' | | ■ | | 4.0 | 122.1 | |
| 5 | | | ■ | | 5.3 | 113.9 | |
| | Boring completed at depth of 8' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-22

**Project** **Proficiency Capital/Rubidoux**

**Date of Drilling: 11/17/05**

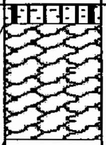
**Groundwater Depth: None Encountered**

**Drilling Method: Backhoe**

**Hammer Weight:**

**Drop:**

**Surface Elevation Not Measured**

| Depth (feet) | Geotechnical Description | Lith-ology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | SURFICIAL FILL SOILS<br>Gravelly SAND with gravel<br>Grey-brown, loose, dry<br>NATURAL SOILS<br>Decomposed Granite<br>BEDROCK |  | | | | | |
| 5 | Grey dense, damp<br>Boring completed at depth of 3.5' | | | | | | |
| 10 | | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-23

| | |
|---|---|
| **Project** | **Proficiency Capital/Rubidoux** |
| **Date of Drilling: 11/17/05** | **Groundwater Depth: None Encountered** |
| **Drilling Method: Backhoe** | |
| **Hammer Weight:** | **Drop:** |

| Depth (feet) | Geotechnical Description | Lith-ology | Samples | | Laboratory | | |
|---|---|---|---|---|---|---|---|
| | Surface Elevation Not Measured | | Type | Blow counts | Moisture (%) | Dry Density (pcf) | Fines (%) |
| 0 | DISTURBED TOP SOILS<br>Loose, dry with roots | ▨ | | | | | |
| | NATURAL SOILS<br>Silty SAND with occasional gravel<br>Reddish brown, medium dense, damp | ▨ | | | | | |
| 5 | | ▨ | ■ | | 2.6 | 120.2 | |
| 10 | Boring completed at depth of 10' | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

***NorCal Engineering***

**Project No.**
**12627-05**

# Log of Trench T-24

|  |  |
|---|---|
| **Project** Proficiency Capital/Rubidoux | |
| **Date of Drilling:** 11/17/05 | **Groundwater Depth:** None Encountered |
| **Drilling Method:** Backhoe | |
| **Hammer Weight:** | **Drop:** |

**Surface Elevation Not Measured**

| Depth (feet) | Geotechnical Description | Lith-ology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | DISTURBED TOP SOILS<br>Loose, dry with roots | | | | | | |
| | NATURAL SOILS<br>Silty SAND with occasional gravel<br>Reddish-brown, medium dense, damp<br>Some rock @ 8'<br>Increase in density @ 8' | | | | | | |
| 5 | | | | | | | |
| 10 | Boring completed at depth of 10' | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# Log of Trench T-25

**Project** **Proficiency Capital/Rubidoux**

**Date of Drilling: 11/17/05**

**Groundwater Depth: None Encountered**

**Drilling Method: Backhoe**

**Hammer Weight:**

**Drop:**

**Surface Elevation Not Measured**

| Depth (feet) | Geotechnical Description | Lith-ology | Samples: Type | Samples: Blow counts | Laboratory: Moisture (%) | Laboratory: Dry Density (pcf) | Laboratory: Fines (%) |
|---|---|---|---|---|---|---|---|
| 0 | DISTURBED TOP SOILS<br>Loose, dry | | | | | | |
| | NATURAL SOILS<br>Silty SAND with occasional gravel<br>Reddish-brown, medium dense, damp<br>Some rock @ 6' | | ■ | | 7.8 | 117.9 | |
| 5 | | | | | | | |
| 10 | Boring completed at depth of 10' | | | | | | |
| 15 | | | | | | | |
| 20 | | | | | | | |
| 25 | | | | | | | |
| 30 | | | | | | | |
| 35 | | | | | | | |

# APPENDIX B

## TABLE I
## MAXIMUM DENSITY TESTS
## (ASTM: D-1557)

| Sample | Classification | Optimum Moisture | Maximum Dry Density (lbs./cu.ft.) |
|---|---|---|---|
| T-1 @ 1-2' | silty SAND | 9.5 | 126.0 |
| T-4 @ 0.5-1' | decomposed GRANITE | 8.5 | 133.0 |

## TABLE II
## EXPANSION INDEX TESTS
## (UBC 18-2)

| Sample | Classification | Expansion Index |
|---|---|---|
| T-1 @ 1-2' | silty SAND | 04 |

## TABLE III
## SOLUBLE SULFATE TESTS
## (CT 417)

| Sample | Sulfate Concentration (%) |
|---|---|
| T-1 @ 1-2' | .0061 |
| T-4 @ 0.5-1' | .0062 |

## TABLE IV
## pH TESTS

| Sample | pH |
|---|---|
| T-1 @ 1-2' | 7.9 |
| T-4 @ 0.5-1' | 7.5 |

## TABLE V
## RESISTIVITY TESTS
## (CT 643)

| Sample | Resistivity (ohm-cm) |
|---|---|
| T-1 @ 1-2' | 9,030 |
| T-4 @ 0.5-1' | 10,670 |

## TABLE VI
## CHLORIDE TESTS
## (CT 422))

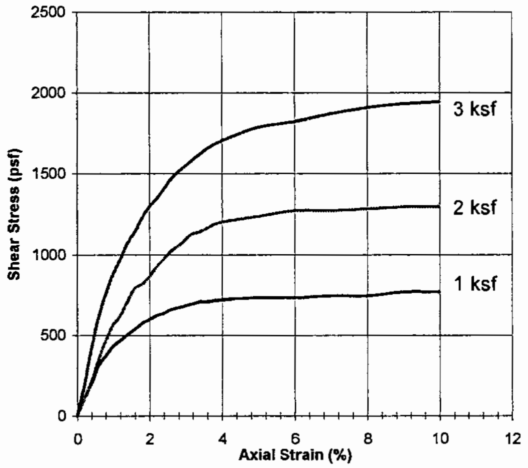
| Sample | Concentration (ppm) |
|---|---|
| T-1 @ 1-2' | 32 |
| T-4 @ 0.5-1' | 21 |

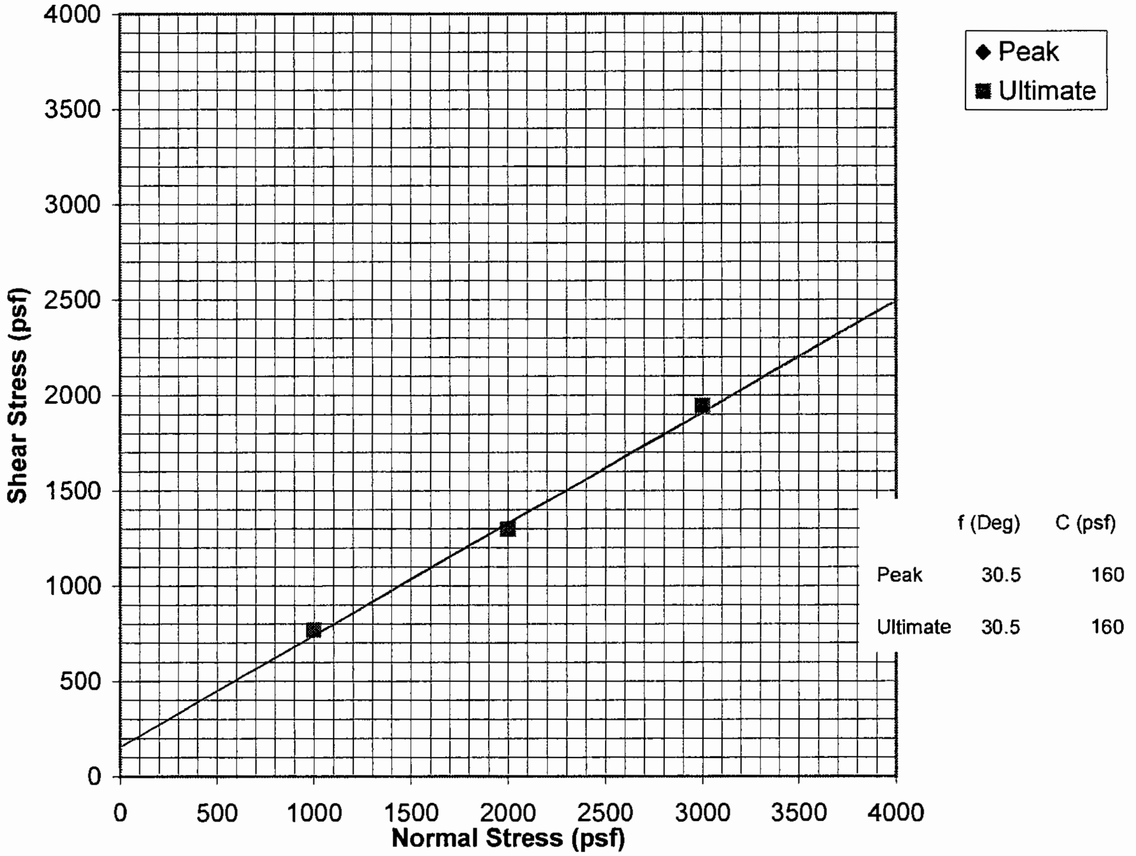
# TABLE VII
# RESISTANCE 'R' VALUE TESTS
# (CA 301))

| Sample | R-Value |
|---|---|
| B2 @ 1-3' | 47 |

| | |
|---|---|
| Sample No. | T1@1-2' |
| Sample Type: | Renolded-Saturated |
| Soil Description: | F-M Silty Sand |

| | 1 | 2 | 3 |
|---|---|---|---|
| Normal Stress, psf | 1000 | 2000 | 3000 |
| Peak Stress, psf | 768 | 1296 | 1944 |
| Displacement, in. | 0.225 | 0.225 | 0.250 |
| Ultimate Stress, psf | 768 | 1296 | 1944 |
| Displacement, in. | 0.250 | 0.250 | 0.250 |
| Initial Dry Density, pcf | 117.5 | 117.5 | 117.5 |
| Initial Water Content, % | 9.5 | 9.5 | 9.5 |
| Strain Rate, in/min. | 0.020 | 0.020 | 0.020 |





| | f (Deg) | C (psf) |
|---|---|---|
| Peak | 30.5 | 160 |
| Ultimate | 30.5 | 160 |

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Proficiency Capitol - 26th & Avalon - Rubidoux

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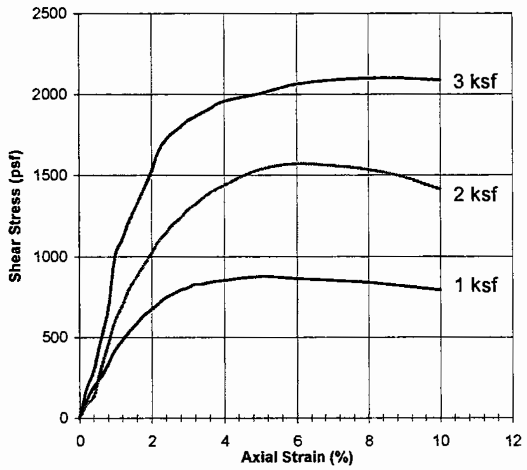
**DIRECT SHEAR TEST**
**Plate A**

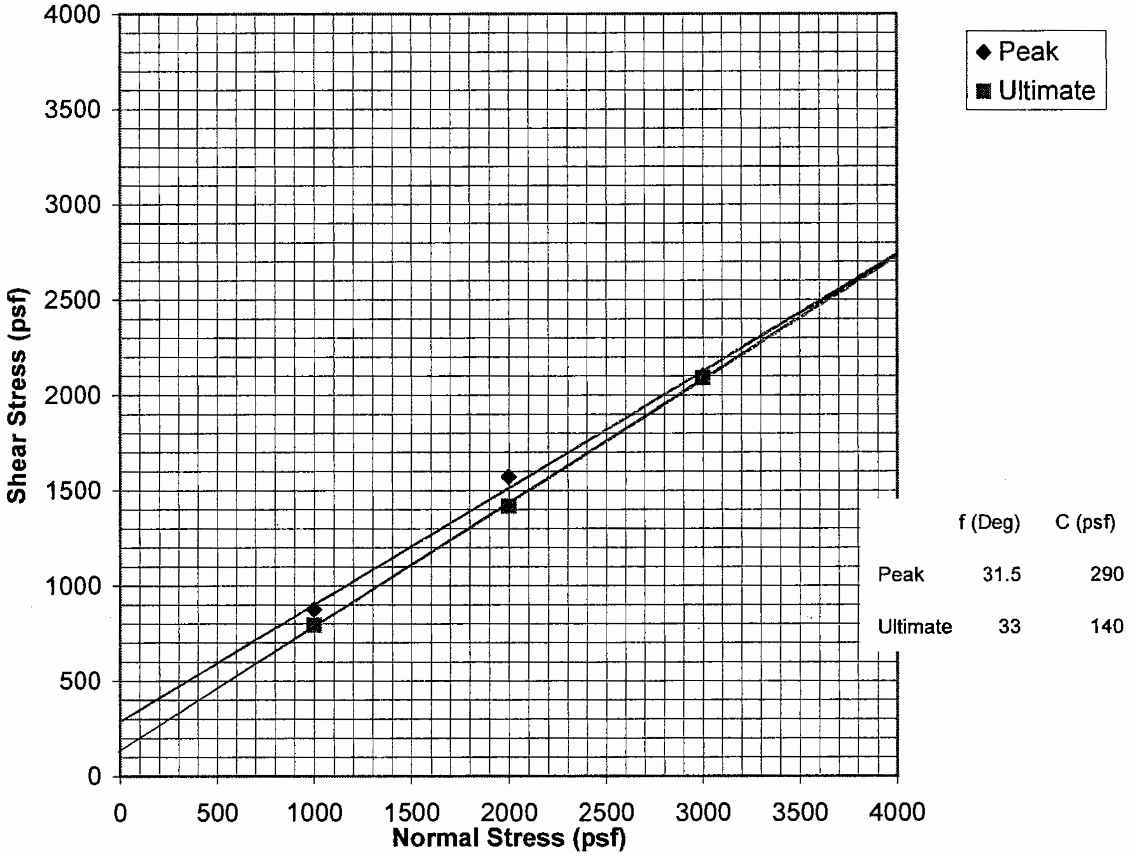
Sample No. T4@0.5-1'

Sample Type: Remolded-Saturated

Soil Description: F-C Silty Sand

| | 1 | 2 | 3 |
|---|---|---|---|
| Normal Stress, psf | 1000 | 2000 | 3000 |
| Peak Stress, psf | 876 | 1572 | 2100 |
| Displacement, in. | 0.125 | 0.150 | 0.200 |
| Ultimate Stress, psf | 792 | 1416 | 2088 |
| Displacement, in. | 0.250 | 0.250 | 0.250 |
| Initial Dry Density, pcf | 113.4 | 113.4 | 113.4 |
| Initial Water Content, % | 10.0 | 10.0 | 10.0 |
| Strain Rate, in/min. | 0.020 | 0.020 | 0.020 |





| | f (Deg) | C (psf) |
|---|---|---|
| Peak | 31.5 | 290 |
| Ultimate | 33 | 140 |

**NorCal Engineering**

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Proficiency Capitol - 26th & Avalon - Rubidoux

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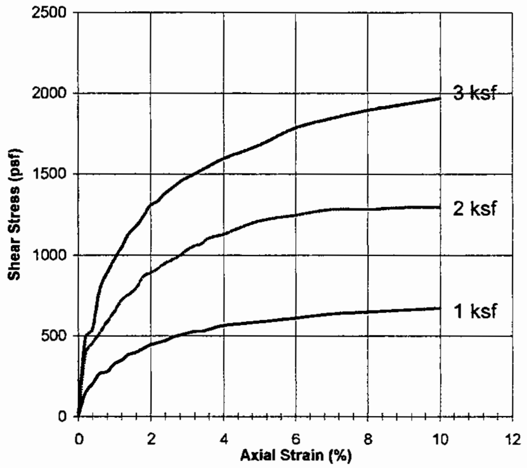
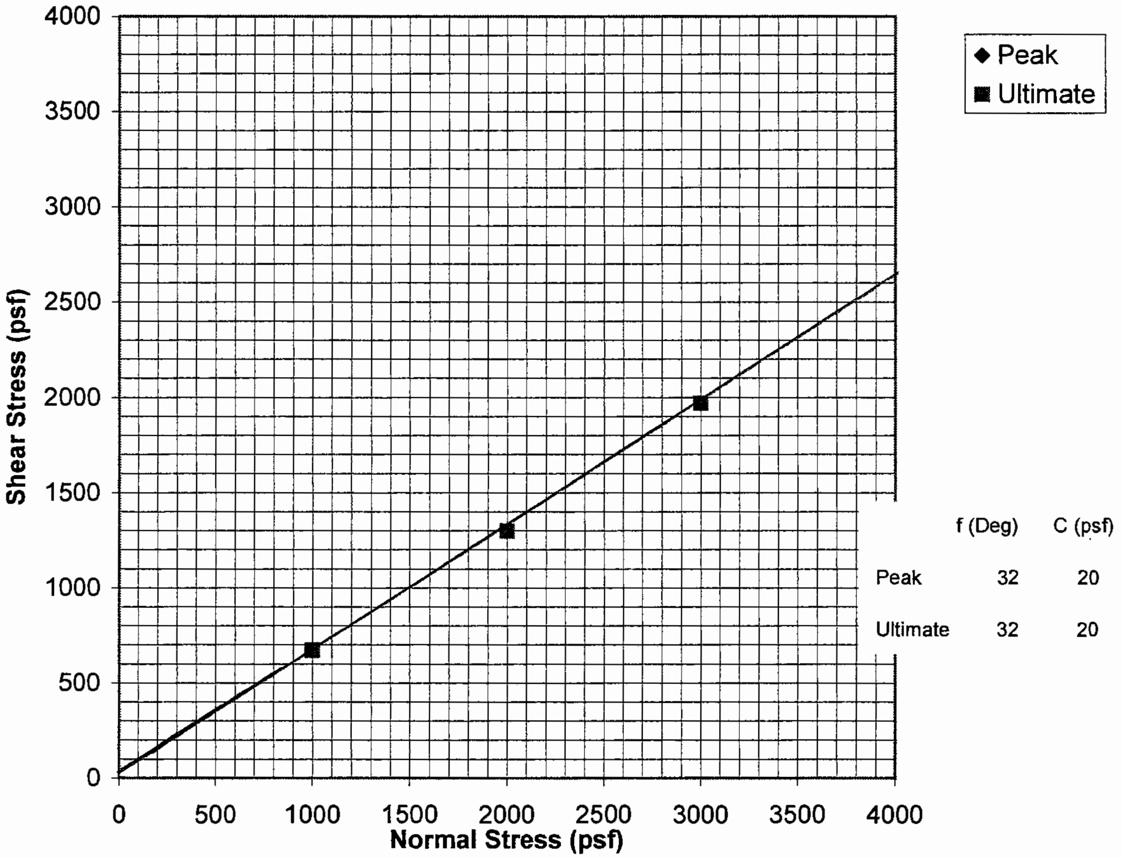
**DIRECT SHEAR TEST**

**Plate B**

Sample No. T1@3.5'
Sample Type: Undisturbed-Saturated
Soil Description: F-M Silty Sand

| | 1 | 2 | 3 |
|---|---|---|---|
| Normal Stress, psf | 1000 | 2000 | 3000 |
| Peak Stress, psf | 672 | 1296 | 1968 |
| Displacement, in. | 0.250 | 0.225 | 0.250 |
| Ultimate Stress, psf | 672 | 1296 | 1968 |
| Displacement, in. | 0.250 | 0.250 | 0.250 |
| Initial Dry Density, pcf | 104.7 | 104.7 | 104.7 |
| Initial Water Content, % | 5.6 | 5.6 | 5.6 |
| Strain Rate, in/min. | 0.020 | 0.020 | 0.020 |





| | f (Deg) | C (psf) |
|---|---|---|
| Peak | 32 | 20 |
| Ultimate | 32 | 20 |

# NorCal Engineering
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Proficiency Capitol - 26th & Avalon - Rubidoux
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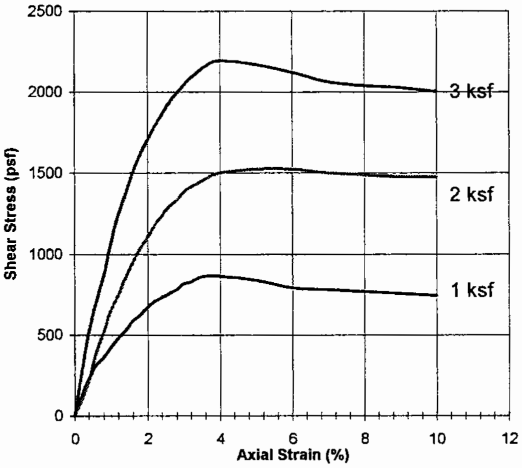
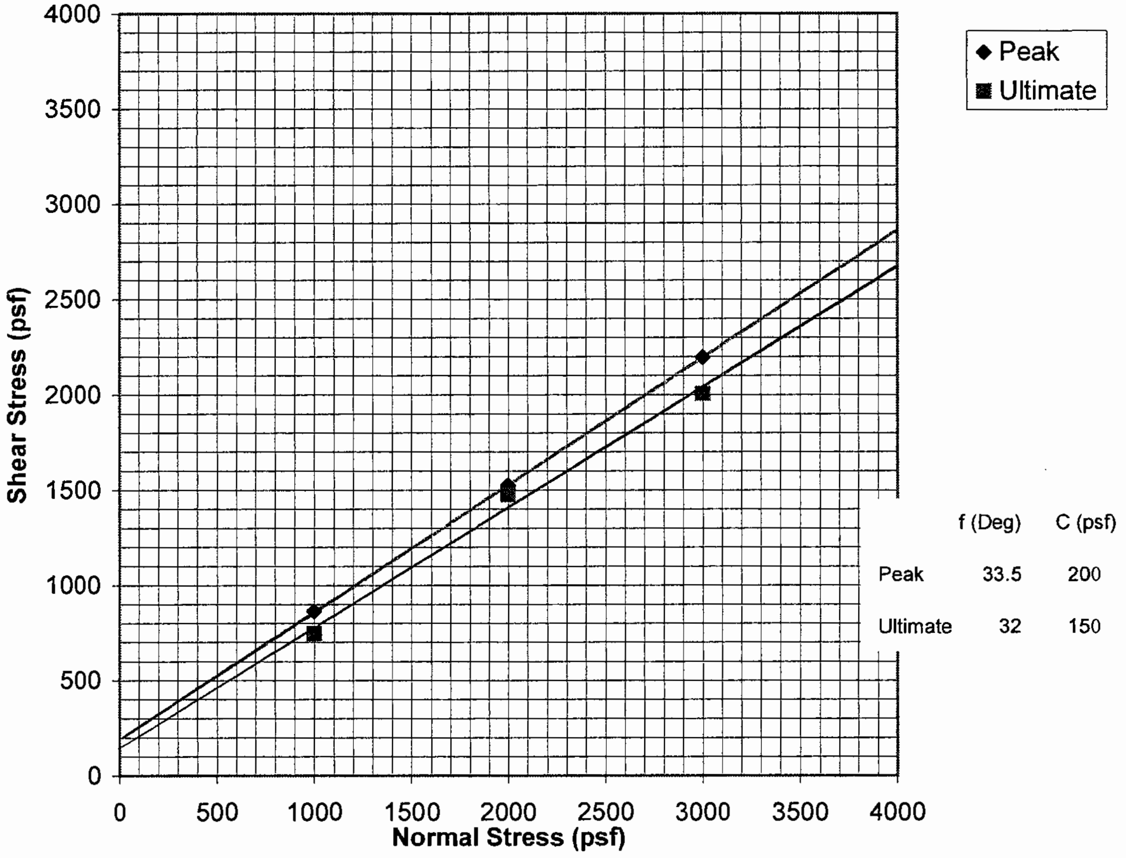
**DIRECT SHEAR TEST**
**Plate C**

| | |
|---|---|
| Sample No. | T1@7' |
| Sample Type: | Undisturbed-Saturated |
| Soil Description: | F Silty Sand |

| | 1 | 2 | 3 |
|---|---|---|---|
| Normal Stress, psf | 1000 | 2000 | 3000 |
| Peak Stress, psf | 864 | 1524 | 2196 |
| Displacement, in. | 0.090 | 0.125 | 0.100 |
| Ultimate Stress, psf | 744 | 1476 | 2004 |
| Displacement, in. | 0.250 | 0.250 | 0.250 |
| Initial Dry Density, pcf | 116.2 | 116.2 | 116.2 |
| Initial Water Content, % | 4.4 | 4.4 | 4.4 |
| Strain Rate, in/min. | 0.020 | 0.020 | 0.020 |





| | f (Deg) | C (psf) |
|---|---|---|
| Peak | 33.5 | 200 |
| Ultimate | 32 | 150 |

# NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

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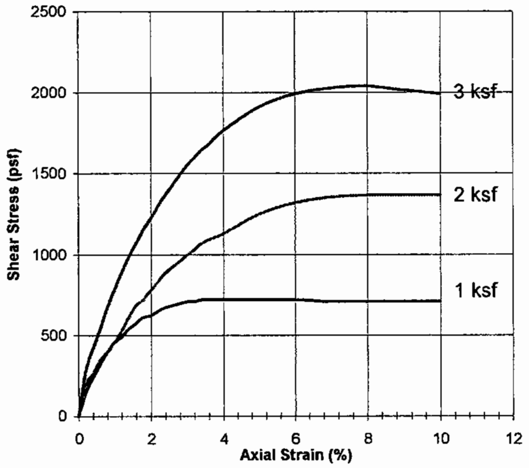
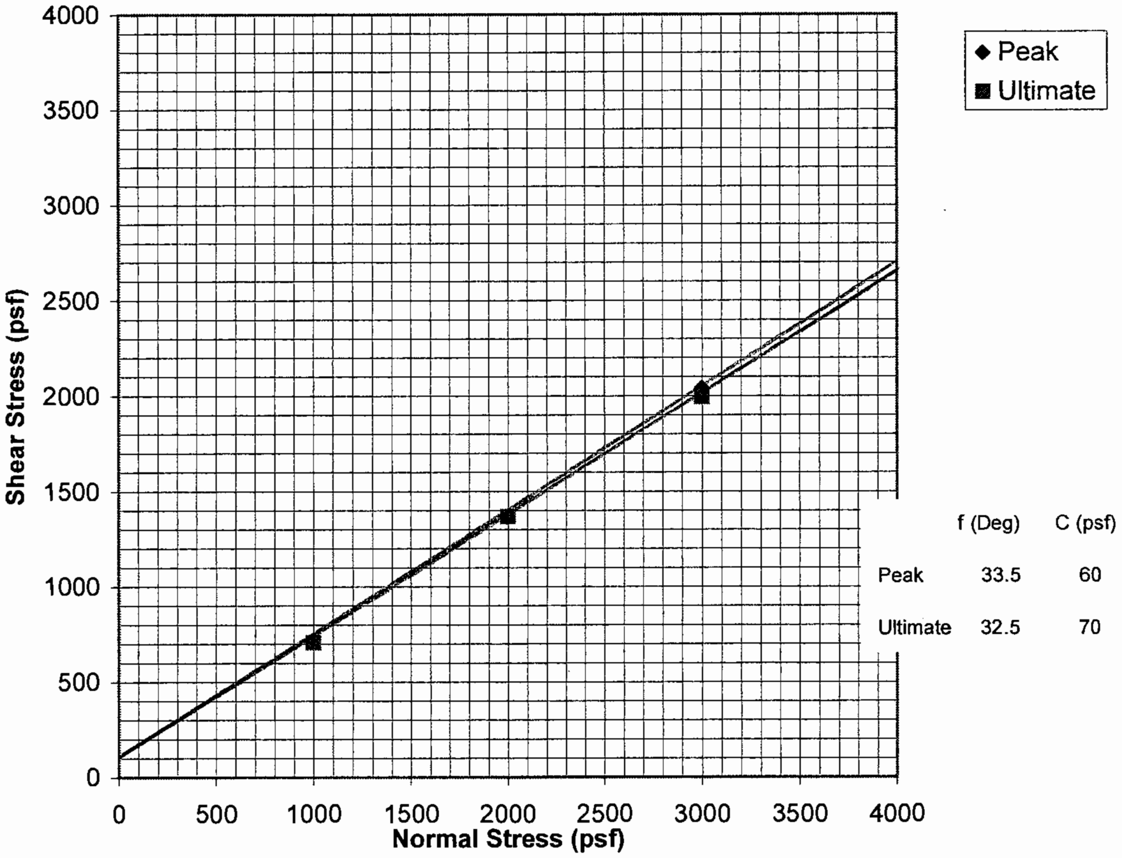
PROJECT: 12627-05 DATE: 11/28/2005

**DIRECT SHEAR TEST**
**Plate D**

Sample No. T3@5'
Sample Type: Undisturbed-Saturated
Soil Description: F Silty Sand w/Clay

| | 1 | 2 | 3 |
|---|---|---|---|
| Normal Stress, psf | 1000 | 2000 | 3000 |
| Peak Stress, psf | 720 | 1368 | 2040 |
| Displacement, in. | 0.085 | 0.200 | 0.200 |
| Ultimate Stress, psf | 708 | 1368 | 1992 |
| Displacement, in. | 0.250 | 0.250 | 0.250 |
| Initial Dry Density, pcf | 112.7 | 112.7 | 112.7 |
| Initial Water Content, % | 8.0 | 8.0 | 8.0 |
| Strain Rate, in/min. | 0.020 | 0.020 | 0.020 |





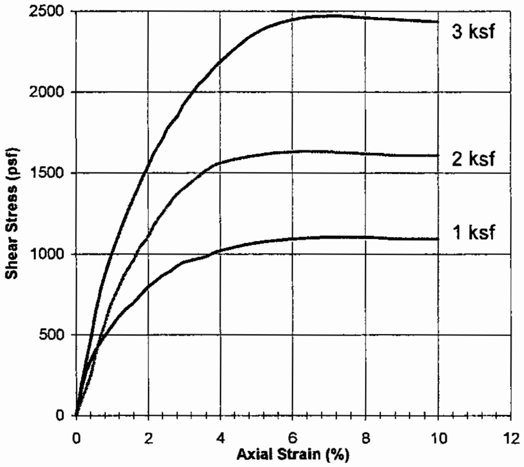
| | f (Deg) | C (psf) |
|---|---|---|
| Peak | 33.5 | 60 |
| Ultimate | 32.5 | 70 |

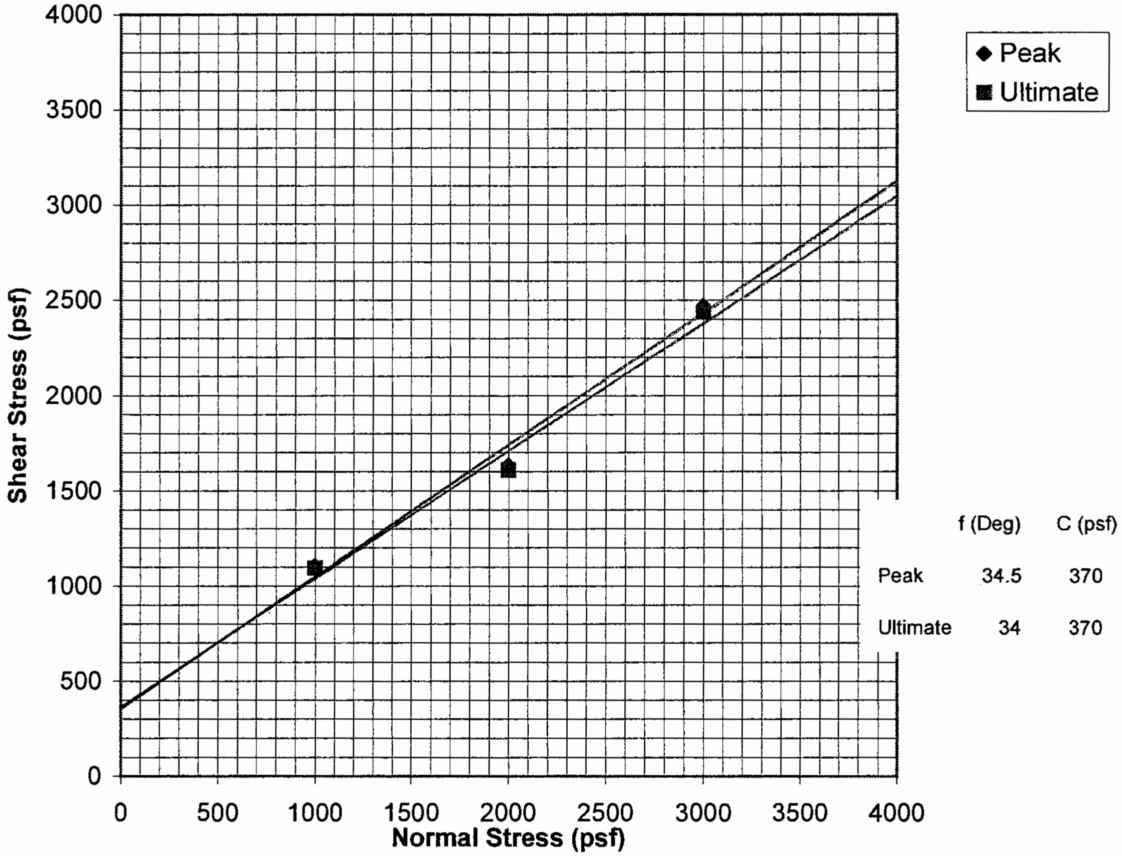
# NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS
Proficiency Capitol - 26th & Avalon - Rubidoux
PROJECT: 12627-05
DATE: 11/28/2005

**DIRECT SHEAR TEST**
**Plate E**

| | |
|---|---|
| Sample No. | T20@2' |
| Sample Type: | Undisturbed-Saturated |
| Soil Description: | F-M Silty Sand |

| | 1 | 2 | 3 |
|---|---|---|---|
| Normal Stress, psf | 1000 | 2000 | 3000 |
| Peak Stress, psf | 1104 | 1632 | 2472 |
| Displacement, in. | 0.175 | 0.150 | 0.175 |
| Ultimate Stress, psf | 1092 | 1608 | 2436 |
| Displacement, in. | 0.250 | 0.250 | 0.250 |
| Initial Dry Density, pcf | 112.1 | 112.1 | 112.1 |
| Initial Water Content, % | 4.4 | 4.4 | 4.4 |
| Strain Rate, in/min. | 0.020 | 0.020 | 0.020 |





| | f (Deg) | C (psf) |
|---|---|---|
| Peak | 34.5 | 370 |
| Ultimate | 34 | 370 |

# NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capitol - 26th & Avalon - Rubidoux

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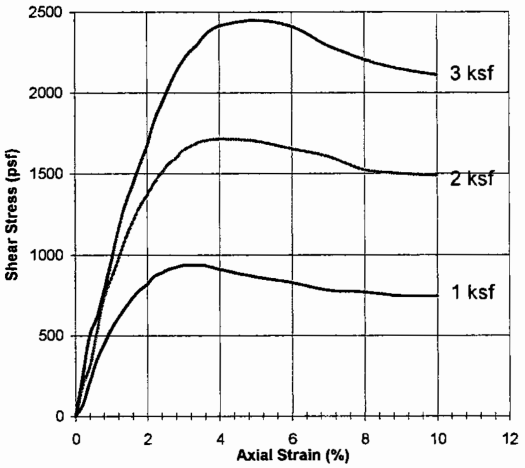
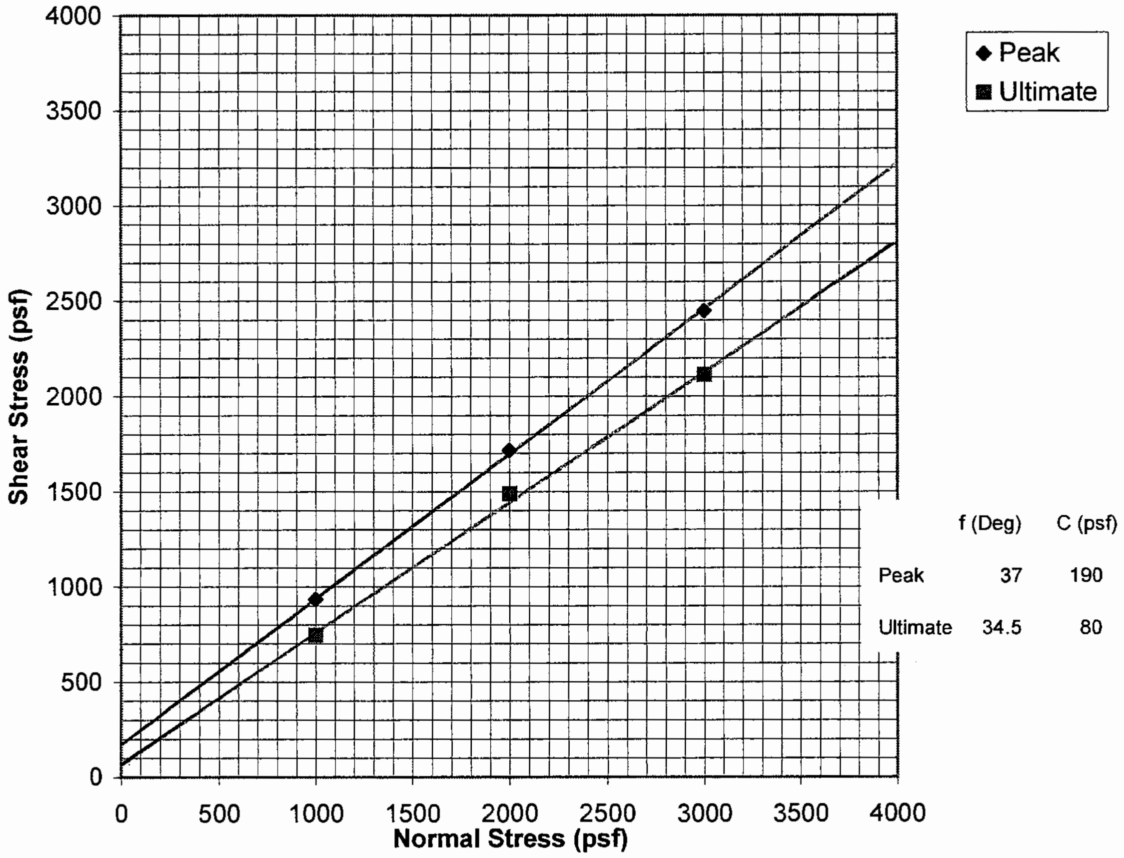
**DIRECT SHEAR TEST**

**Plate F**

|  |  |
|---|---|
| Sample No. | T20@4' |
| Sample Type: | Undisturbed-Saturated |
| Soil Description: | F-C Silty Sand w/Tr F Gravel |

|  | 1 | 2 | 3 |
|---|---|---|---|
| Normal Stress, psf | 1000 | 2000 | 3000 |
| Peak Stress, psf | 936 | 1716 | 2448 |
| Displacement, in. | 0.075 | 0.100 | 0.125 |
| Ultimate Stress, psf | 744 | 1488 | 2112 |
| Displacement, in. | 0.250 | 0.250 | 0.250 |
| Initial Dry Density, pcf | 118.5 | 118.5 | 118.5 |
| Initial Water Content, % | 4.0 | 4.0 | 4.0 |
| Strain Rate, in/min. | 0.020 | 0.020 | 0.020 |





|  | f (Deg) | C (psf) |
|---|---|---|
| Peak | 37 | 190 |
| Ultimate | 34.5 | 80 |

# NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capitol - 26th & Avalon - Rubidoux

PROJECT: 12627-05 DATE: 11/28/2005

**DIRECT SHEAR TEST**

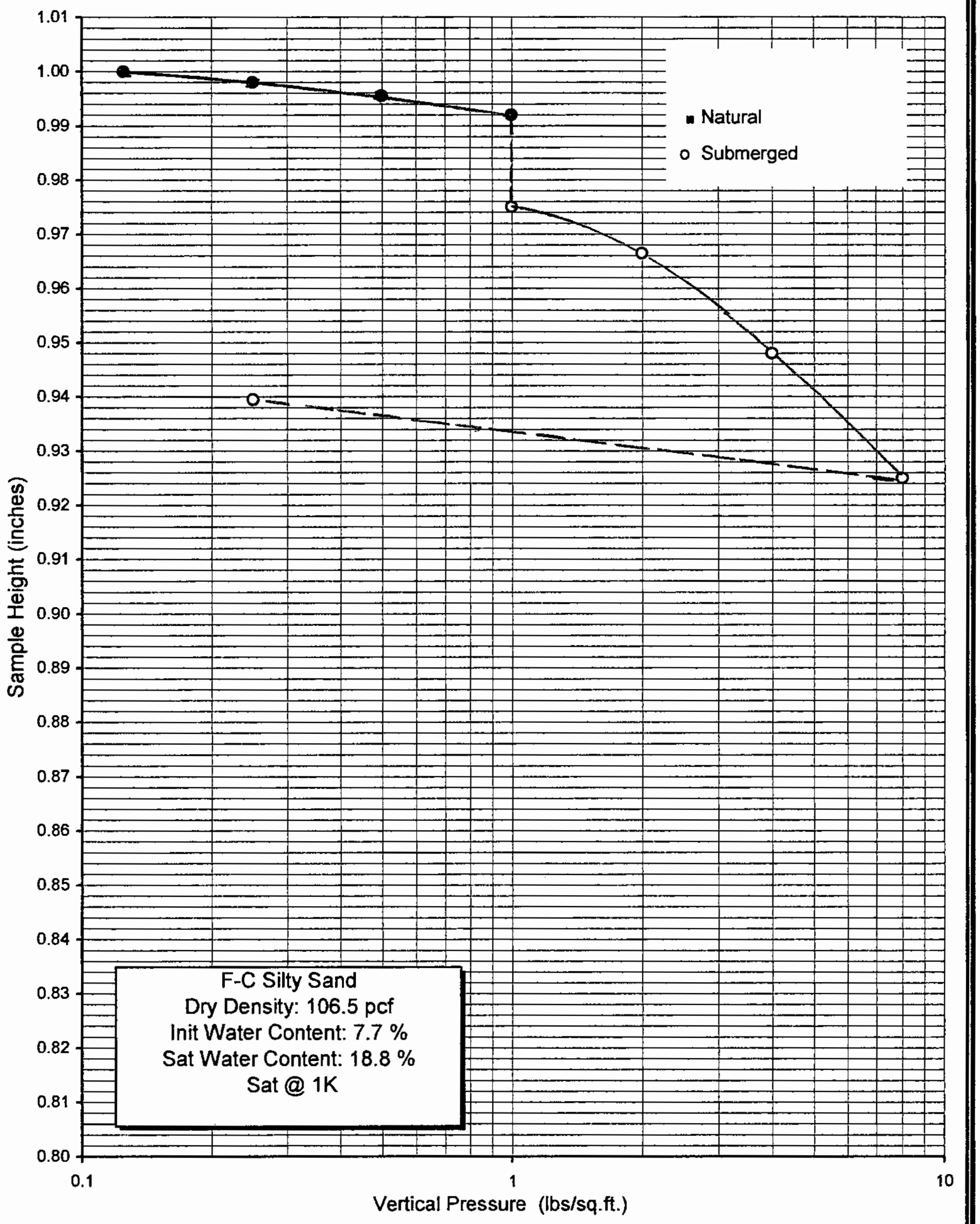
**Plate G**

| | | |
|---|---|---|
| Sample No. T1 | Depth 10' | Date 11-21-05 |

1

| Vertical Pressure (kips/sq.ft.) | Sample Height (inches) | Consol-idation (percent) | Saturated |
|---|---|---|---|
| 0.125 | **1.0000** | **0.0** | |
| 0.25 | **0.9980** | **0.2** | |
| 0.5 | **0.9955** | **0.4** | |
| 1 | **0.9920** | **0.8** | |
| 1 | **0.9750** | **2.5** | S |
| 2 | **0.9665** | **3.4** | |
| 4 | **0.9480** | **5.2** | |
| 8 | **0.9250** | **7.5** | |
| 0.25 | **0.9395** | **6.1** | |

| | |
|---|---|
| Tested: | **11/21/2005** |
| Sample No: | **T1** |
| Depth: | **10'** |



# NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital - 26th & Avalon - Rubidoux

PROJECT: 12627-05 DATE: 11/28/2005

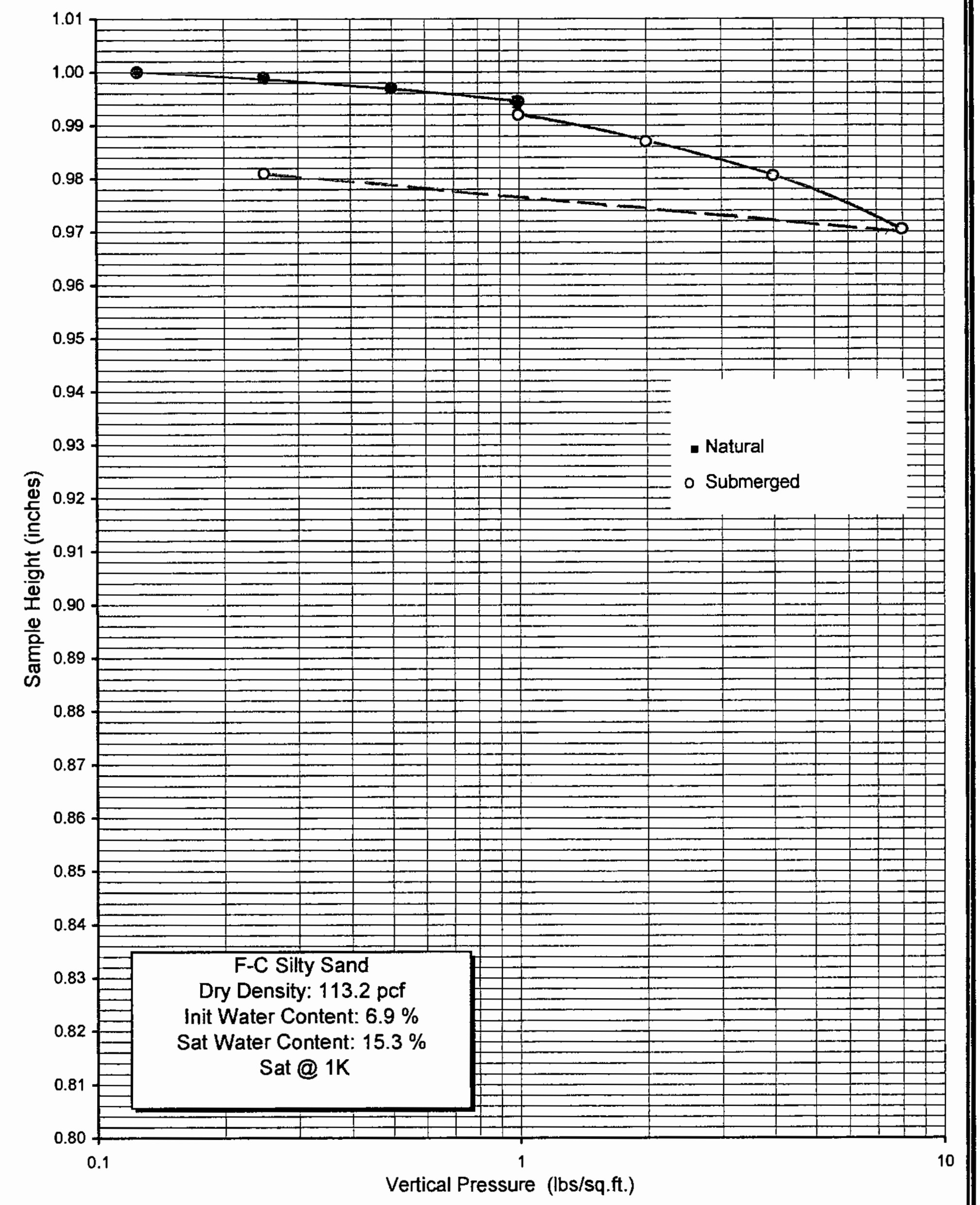
## CONSOLIDATION TEST

**Plate H**

| Sample No. | T1 | Depth | 12' | Date | 11-21-05 |
|---|---|---|---|---|---|

| Vertical Pressure (kips/sq.ft.) | Sample Height (inches) | Consol-idation (percent) | Saturated |
|---|---|---|---|
| | | 1 | |
| 0.125 | **1.0000** | **0.0** | |
| 0.25 | **0.9990** | **0.1** | |
| 0.5 | **0.9970** | **0.3** | |
| 1 | **0.9945** | **0.5** | |
| 1 | **0.9920** | **0.8** | S |
| 2 | **0.9870** | **1.3** | |
| 4 | **0.9805** | **2.0** | |
| 8 | **0.9705** | **3.0** | |
| 0.25 | **0.9810** | **1.9** | |

Tested: **11/21/2005**
Sample No: **T1**
Depth: **12'**



F-C Silty Sand
Dry Density: 113.2 pcf
Init Water Content: 6.9 %
Sat Water Content: 15.3 %
Sat @ 1K

# NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital - 26th & Avalon - Rubidoux

PROJECT: 12627-05 | DATE: 11/28/2005

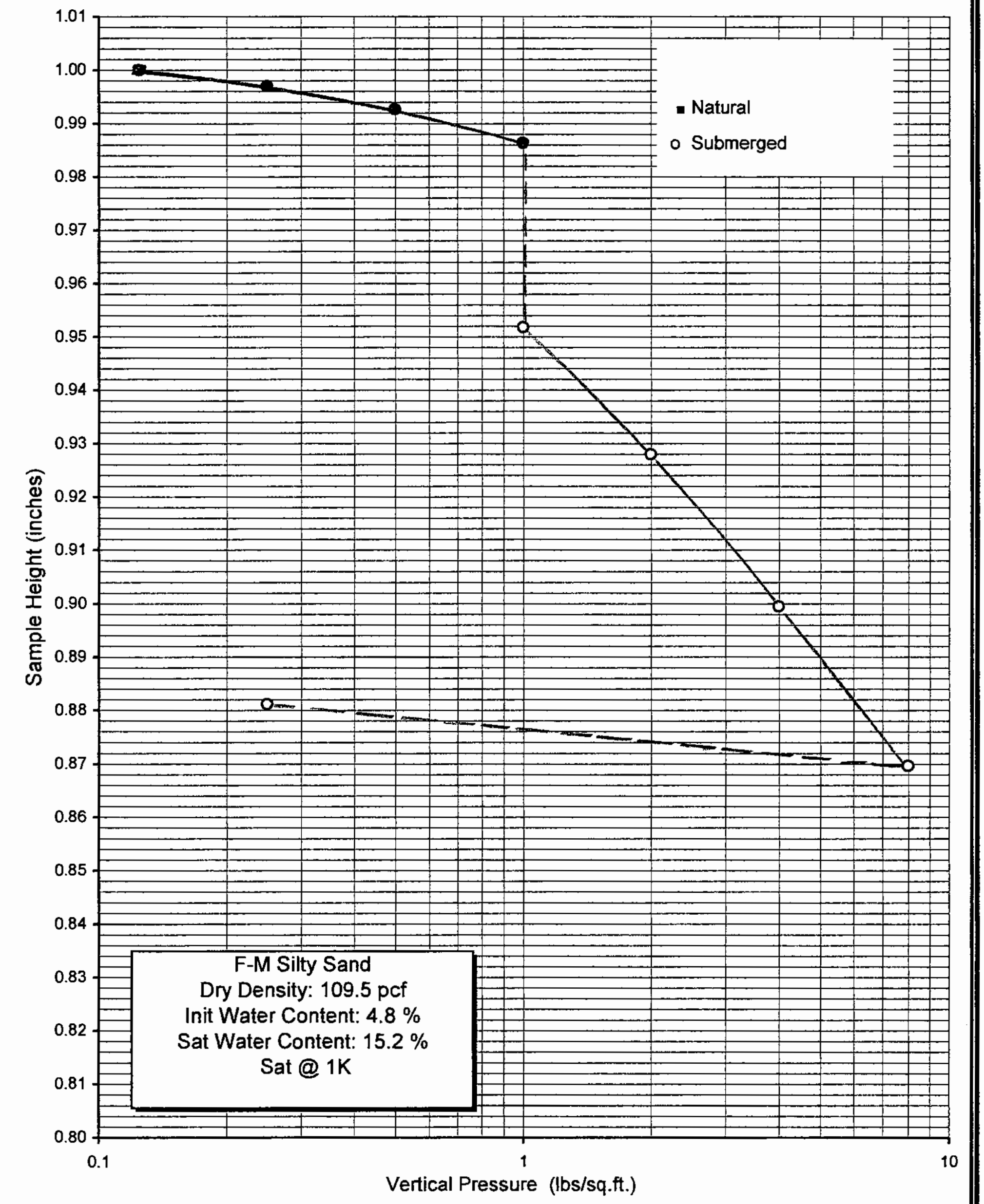
## CONSOLIDATION TEST

**Plate I**

| Vertical Pressure (kips/sq.ft.) | Sample Height (inches) | Consol-idation (percent) | | Sample No. | T6 | Depth | 6' | Date | 11-23-05 |
|---|---|---|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| | 1 | | |
| 0.125 | **1.0000** | **0.0** | Saturated |
| 0.25 | **0.9970** | **0.3** | |
| 0.5 | **0.9927** | **0.7** | |
| 1 | **0.9864** | **1.4** | |
| 1 | **0.9518** | **4.8** | S |
| 2 | **0.9280** | **7.2** | |
| 4 | **0.8995** | **10.1** | |
| 8 | **0.8697** | **13.0** | |
| 0.25 | **0.8812** | **11.9** | |

Tested: **11/23/2005**
Sample No: **T6**
Depth: **6'**



F-M Silty Sand
Dry Density: 109.5 pcf
Init Water Content: 4.8 %
Sat Water Content: 15.2 %
Sat @ 1K

# NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital - 26th & Avalon - Rubidoux

PROJECT: 12627-05 | DATE: 11/28/2005

## CONSOLIDATION TEST

**Plate J**

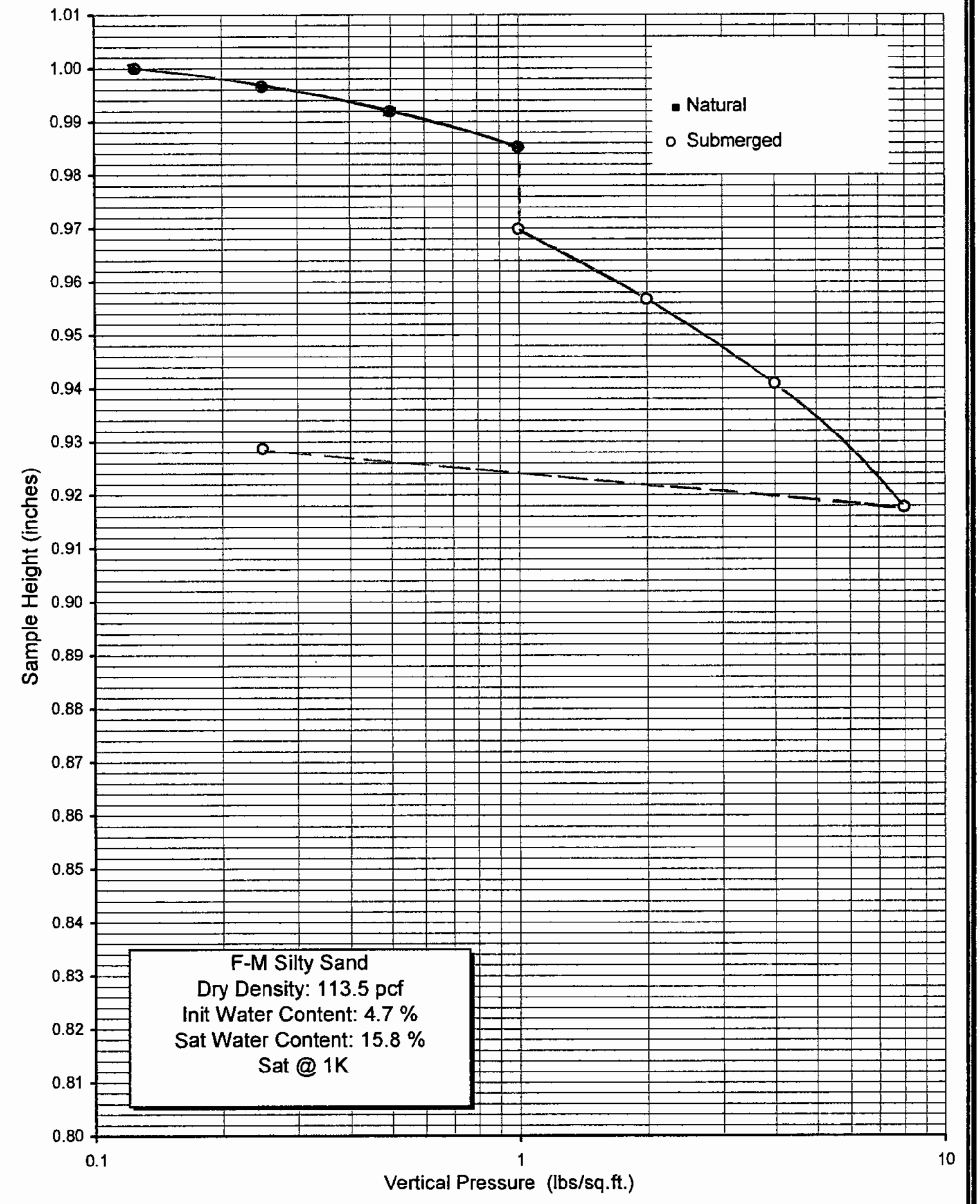
| Vertical Pressure (kips/sq.ft.) | Sample Height (inches) | Consol-idation (percent) | |
|---|---|---|---|
| | 1 | | |
| 0.125 | **1.0000** | **0.0** | Saturated |
| 0.25 | **0.9966** | **0.3** | |
| 0.5 | **0.9919** | **0.8** | |
| 1 | **0.9852** | **1.5** | |
| 1 | **0.9699** | **3.0** | S |
| 2 | **0.9567** | **4.3** | |
| 4 | **0.9409** | **5.9** | |
| 8 | **0.9177** | **8.2** | |
| 0.25 | **0.9287** | **7.1** | |

Sample No. T6

Depth 10'

Date 11-21-05

| | |
|---|---|
| Tested: | **11/21/2005** |
| Sample No: | **T6** |
| Depth: | **10'** |



# NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital - 26th & Avalon - Rubidoux

PROJECT: 12627-05

DATE: 11/28/2005

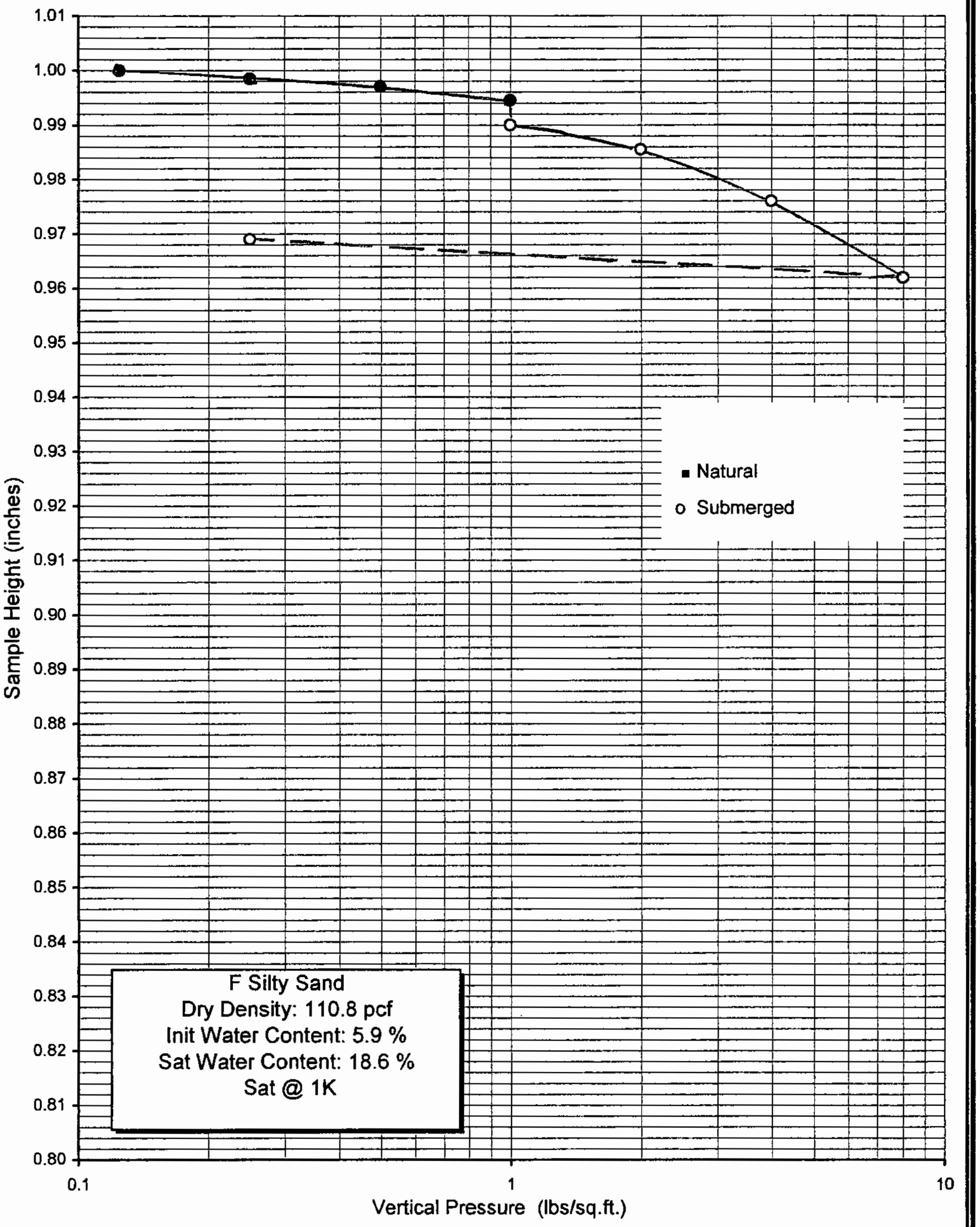
## CONSOLIDATION TEST

**Plate K**

| Vertical Pressure (kips/sq.ft.) | Sample Height (inches) | Consol-idation (percent) | | Sample No. T16 | Depth 8' | Date 11-23-05 |
|---|---|---|---|---|---|---|

| | | | |
|---|---|---|---|
| | 1 | | Saturated |
| 0.125 | **1.0000** | **0.0** | |
| 0.25 | **0.9985** | **0.1** | |
| 0.5 | **0.9970** | **0.3** | |
| 1 | **0.9945** | **0.5** | |
| 1 | **0.9900** | **1.0** | S |
| 2 | **0.9855** | **1.5** | |
| 4 | **0.9760** | **2.4** | |
| 8 | **0.9620** | **3.8** | |
| 0.25 | **0.9690** | **3.1** | |

Tested: **11/23/2005**
Sample No: **T16**
Depth: **8'**



F Silty Sand
Dry Density: 110.8 pcf
Init Water Content: 5.9 %
Sat Water Content: 18.6 %
Sat @ 1K

# NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital - 26th & Avalon - Rubidoux

PROJECT: 12627-05 DATE: 11/28/2005

**CONSOLIDATION TEST**

**Plate L**

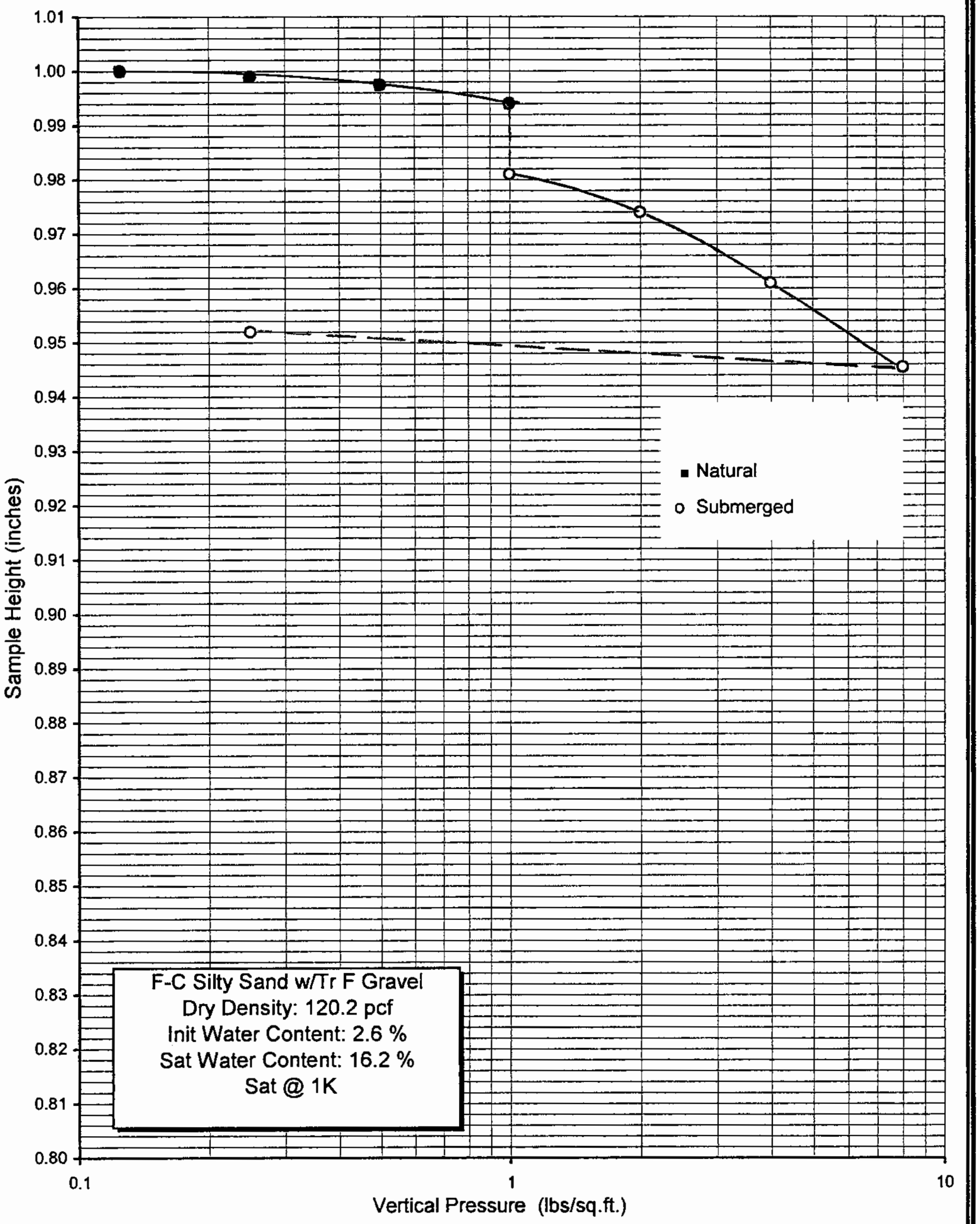
Sample No. T23

Depth 5.5'

Date 11-23-05

| Vertical Pressure (kips/sq.ft.) | Sample Height (inches) | Consol-idation (percent) | Saturated |
|---|---|---|---|
| | 1 | | |
| 0.125 | **1.0000** | **0.0** | |
| 0.25 | **0.9990** | **0.1** | |
| 0.5 | **0.9975** | **0.2** | |
| 1 | **0.9940** | **0.6** | |
| 1 | **0.9810** | **1.9** | S |
| 2 | **0.9740** | **2.6** | |
| 4 | **0.9610** | **3.9** | |
| 8 | **0.9455** | **5.5** | |
| 0.25 | **0.9520** | **4.8** | |

Tested: **11/23/2005**
Sample No: **T23**
Depth: **5.5'**



F-C Silty Sand w/Tr F Gravel
Dry Density: 120.2 pcf
Init Water Content: 2.6 %
Sat Water Content: 16.2 %
Sat @ 1K

# NorCal Engineering

SOILS AND GEOTECHNICAL CONSULTANTS

Proficiency Capital - 26th & Avalon - Rubidoux

PROJECT: 12627-05 DATE: 11/28/2005

**CONSOLIDATION TEST**

**Plate M**

# Appendix 4: Historical Site Conditions

*Phase I Environmental Site Assessment or Other Information on Past Site Use (NOT APPLICABLE)*

# Appendix 5: LID Infeasibility

*LID Technical Infeasibility Analysis (NOT APPLICABLE)*

# Appendix 6: BMP Design Details

*BMP Sizing, Design Details and other Supporting Documentation*

Base Maps
- ○ Topo Map
- ○ Street Map
- ● Aerial Photo
- ○ USGS Maps

Base Data

Stormwater Data
- ○ Hydromodification Susceptibility Mapping
- ○ 2010 - 303d/TMDL
- ☐ Hydromodification Exemption Areas
- ☐ District Facilities
- ☐ Permit Areas
- ☐ Hydrologic Unit Codes (HUC)
- ☐ Topographic Drainage Boundary
- ☐ Drainage Area Boundaries
- ☐ City Storm Drains
- ☑ WQMP 85% Design Isohyetal Map
  - ● Rain Gauges
  - Isoheyetal Minor Contours
  - Isoheyetal Major Contours
- ☐ CRP (Contol Release Point)
- ☐ FEMA Flood Plain
- ☐ Flood Plain - Other Special Studies
- ○ As-Built Plans

Groundwater Data

U.S. Fish and Wildlife Critical Habitat

WRMSHCP Potential Survey Areas

SKRHCP

CVMSHCP Survey Data and Conservation Areas

Identify Features

Click on map to view data.

06065C_956 (Fema Flood Zones)

| | |
|---|---|
| OBJECTID_1 | 640 |
| DFIRM_ID | 06065C |
| VERSION_ID | 1.1.1.0 |
| FLOOD ID | 06065C_956 |
| STUDY_TYP | NP |
| ZONE_SUBTY | AREA OF MINIMAL |
| AR_SUBTRV | |
| DUAL_ZONE | |
| FLOOD ZONE | UNSHADED X |
| RULEID | 10 |
| Shape.STArea() | 738650052.13399 |
| Shape.STLength() | 279865.23298 |

## **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 Thienes Engineering Inc.
Date 6/28/2023
Designed by Luis Prado
Case No
Company Project Number/Name 3384

### BMP Identification

BMP NAME / ID Infiltration Basin #A (IB-A)

*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

$D_{85}$= 0.66 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 Imprevious 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)* |
|---|---|---|---|---|---|---|---|---|
| *A1* | *1513710* | *Roofs* | *1* | *0.89* | *1350229.3* | | | |
| *A2* | *202554* | *Ornamental Landscaping* | *0.1* | *0.11* | *22373.7* | | | |
| *A3* | *330184.8* | *Natural (A Soil)* | *0.03* | *0.06* | *20650.1* | | | |
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| | **2046448.8** | ***Total*** | | | **1393253.1** | **0.66** | ***76628.9*** | ***78,408*** |

Notes:
Tributary area = 46.98 acres
Onsite impervious area = 34.75 acres
Onsite landscape = 4.65 acres
Slopes (Natural Soil A) = 7.58 acres
Additional volume is provided above the DCV to mitigate HCOCs.

| | | |
|---|---|---|
| Infiltration Basin - Design Procedure<br>(Rev. 03-2012) | BMP ID<br>IB-A | Legend: Required Entries<br>Calculated Cells |

Company Name: Thienes Engineering, Inc.
Date: 28-Jun
Designed by: Luis Prado
County/City Case No.:

## Design Volume

| | | | |
|---|---|---|---|
| a) Tributary area (BMP subarea) | $A_T$ = | 46.98 | acres |
| b) Enter $V_{BMP}$ determined from Section 2.1 of this Handbook | $V_{BMP}$= | 76,629 | $ft^3$ |

## Maximum Depth

| | | | |
|---|---|---|---|
| a) Infiltration rate | I = | 2.175 | in/hr |
| b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook) | FS = | 3 | |
| c) Calculate $D_1$ $\quad D_1 = \dfrac{I\text{ (in/hr) x 72 hrs}}{12\text{ (in/ft) x FS}}$ | $D_1$ = | 4.4 | ft |
| d) Enter the depth of freeboard (at least 1 ft) | | 1.26 | ft |
| e) Enter depth to historic high ground water (measured from **top** of basin) | | 50 | ft |
| f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin) | | 50 | ft |
| g) $D_2$ is the smaller of:<br>Depth to groundwater - (10 ft + freeboard) and<br>Depth to impermeable layer - (5 ft + freeboard) | $D_2$ = | 38.7 | ft |
| h) $D_{MAX}$ is the smaller value of $D_1$ and $D_2$ but shall not exceed 5 feet | $D_{MAX}$ = | 4.4 | ft |

## Basin Geometry

| | | | |
|---|---|---|---|
| a) Basin side slopes (no steeper than 4:1) Slope no steeper than 4:1 | z = | 3 | :1 |
| b) Proposed basin depth (excluding freeboard) | $d_B$ = | 1.8 | ft |
| c) Minimum bottom surface area of basin ($A_S$= $V_{BMP}/d_B$) | $A_S$ = | 42572 | $ft^2$ |
| d) Proposed Design Surface Area | $A_D$ = | 43065 | $ft^2$ |

## Forebay

| | | | |
|---|---|---|---|
| a) Forebay volume (minimum 0.5% $V_{BMP}$) | Volume = | 383 | $ft^3$ |
| b) Forebay depth (height of berm/splashwall. 1 foot min.) | Depth = | 1 | ft |
| c) Forebay surface area (minimum) | Area = | 383 | $ft^2$ |
| d) Full height notch-type weir | Width (W) = | 1.5 | in |

Notes: Average infiltration rate = (4 + 2.3 + 1.5 + 0.9)/4 = 2.175 in/hr

Volume Provided = 1.80 FT x 43,065 SF = 78,408 CF

# **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 Thienes Engineering Inc.
Date 6/28/2023
Designed by Luis Prado
Case No
Company Project Number/Name 3384

## BMP Identification

BMP NAME / ID Infiltration Basin #B (IB-B)

*Must match Name/ID used on BMP Design Calculation Sheet*

## Design Rainfall Depth

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

$D_{85}$= 0.66 inches

## Drainage Management Area Tabulation

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

| DMA Type/ID | DMA Area (square feet) | Post-Project Surface Type | Effective Imperivous Fraction, $I_f$ | DMA Runoff Factor | DMA Areas x Runoff Factor | *Design Storm Depth (in)* | *Design Capture Volume,* $V_{BMP}$ *(cubic feet)* | *Proposed Volume on Plans (cubic feet)* |
|---|---|---|---|---|---|---|---|---|
| *B1* | *933055.2* | *Roofs* | *1* | *0.89* | *832285.2* | | | |
| *B2* | *107593.2* | *Ornamental Landscaping* | *0.1* | *0.11* | *11884.5* | | | |
| | ***1040648.4*** | ***Total*** | | | **844169.7** | **0.66** | ***46429.3*** | ***48308*** |

Notes:
Tributary area = 23.89 acres
Onsite impervious area = 21.42 acres
Onsite landscape = 2.47 acres

Additional volume is provided above the DCV to mitigate HCOCs.

|  |  |  |  |
|---|---|---|---|
| Infiltration Basin - Design Procedure<br>(Rev. 03-2012) | BMP ID<br>IB-B | Legend: | Required Entries<br>Calculated Cells |

Company Name: Thienes Engineering, Inc.
Designed by: Luis Prado
Date: 28-Jun
County/City Case No.:

## Design Volume

|  |  |  |  |
|---|---|---|---|
| a) Tributary area (BMP subarea) | $A_T$ = | 23.89 | acres |
| b) Enter $V_{BMP}$ determined from Section 2.1 of this Handbook | $V_{BMP}$= | 46,429 | $ft^3$ |

## Maximum Depth

|  |  |  |  |
|---|---|---|---|
| a) Infiltration rate | I = | 2.4 | in/hr |
| b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook) | FS = | 3 |  |
| c) Calculate $D_1$ $\quad D_1 = \dfrac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$ | $D_1$ = | 4.8 | ft |
| d) Enter the depth of freeboard (at least 1 ft) |  | 1.5 | ft |
| e) Enter depth to historic high ground water (measured from **top** of basin) |  | 50 | ft |
| f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin) |  | 50 | ft |
| g) $D_2$ is the smaller of:<br>Depth to groundwater - (10 ft + freeboard) and<br>Depth to impermeable layer - (5 ft + freeboard) | $D_2$ = | 38.5 | ft |
| h) $D_{MAX}$ is the smaller value of $D_1$ and $D_2$ but shall not exceed 5 feet | $D_{MAX}$ = | 4.8 | ft |

## Basin Geometry

|  |  |  |  |
|---|---|---|---|
| a) Basin side slopes (no steeper than 4:1) Slope no steeper than 4:1 | z = | 3 | :1 |
| b) Proposed basin depth (excluding freeboard) | $d_B$ = | 1.5 | ft |
| c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$) | $A_S$ = | 30953 | $ft^2$ |
| d) Proposed Design Surface Area | $A_D$ = | 32205 | $ft^2$ |

## Forebay

|  |  |  |  |
|---|---|---|---|
| a) Forebay volume (minimum 0.5% $V_{BMP}$) | Volume = | 232 | $ft^3$ |
| b) Forebay depth (height of berm/splashwall. 1 foot min.) | Depth = | 1 | ft |
| c) Forebay surface area (minimum) | Area = | 232 | $ft^2$ |
| d) Full height notch-type weir | Width (W) = | 1.5 | in |

Notes: Volume Provided = 1.50 FT x 32,205 SF = 48,308 CF

## **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 | Thienes Engineering Inc. | Date | 6/28/2023 |
| Designed by | Luis Prado | Case No | |
| Company Project Number/Name | 3384 | | |

### BMP Identification

BMP NAME / ID Underground Chambers (STC-C)

*Must match Name/ID used on BMP Design Calculation Sheet*

### Design Rainfall Depth

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

$D_{85}$= 0.66 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)* |
|---|---|---|---|---|---|---|---|---|
| *C1* | *85813.2* | *Roofs* | *1* | *0.89* | *76545.4* | | | |
| *C2* | *4356* | *Ornamental Landscaping* | *0.1* | *0.11* | *481.2* | | | |
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| | | | | | | | | |
| | **90169.2** | ***Total*** | | | **77026.6** | **0.66** | **4236.5** | **4596** |

Notes:
Tributary area = 2.07 acres
Onsite impervious area = 1.97 acres
Onsite landscape = 0.10 acres
Additional volume is provided above the DCV to mitigate HCOCs.

## Infiltration Basin - Design Procedure

(Rev. 03-2012)

BMP ID: STC-C

Legend: Required Entries / Calculated Cells

Company Name: Thienes Engineering, Inc.

Designed by: Luis Prado

Date: 19-May

County/City Case No.:

### Design Volume

| | | | |
|---|---|---|---|
| a) Tributary area (BMP subarea) | $A_T$ = | 2.07 | acres |
| b) Enter $V_{BMP}$ determined from Section 2.1 of this Handbook | $V_{BMP}$= | 4,237 | $ft^3$ |

### Maximum Depth

| | | | |
|---|---|---|---|
| a) Infiltration rate | I = | 1.5 | in/hr |
| b) Factor of Safety (See Table 1, Appendix A: "Infiltration Testing" from this BMP Handbook) | FS = | 3 | |
| c) Calculate $D_1$ $\quad D_1 = \dfrac{I\ (in/hr) \times 72\ hrs}{12\ (in/ft) \times FS}$ | $D_1$ = | 3.0 | ft |
| d) Enter the depth of freeboard (at least 1 ft) | | 1 | ft |
| e) Enter depth to historic high ground water (measured from **top** of basin) | | 50 | ft |
| f) Enter depth to top of bedrock or impermeable layer (measured from **top** of basin) | | 50 | ft |
| g) $D_2$ is the smaller of:<br>Depth to groundwater - (10 ft + freeboard) and<br>Depth to impermeable layer - (5 ft + freeboard) | $D_2$ = | 39.0 | ft |
| h) $D_{MAX}$ is the smaller value of $D_1$ and $D_2$ but shall not exceed 5 feet | $D_{MAX}$ = | 3.0 | ft |

### Basin Geometry

| | | | |
|---|---|---|---|
| a) Basin side slopes (no steeper than 4:1) | z = | 4 | :1 |
| b) Proposed basin depth (excluding freeboard) | $d_B$ = | 1.87 | ft |
| c) Minimum bottom surface area of basin ($A_S = V_{BMP}/d_B$) | $A_S$ = | 2266 | $ft^2$ |
| d) Proposed Design Surface Area | $A_D$ = | 3360 | $ft^2$ |

### Forebay

| | | | |
|---|---|---|---|
| a) Forebay volume (minimum 0.5% $V_{BMP}$) | Volume = | 21 | $ft^3$ |
| b) Forebay depth (height of berm/splashwall. 1 foot min.) | Depth = | | ft |
| c) Forebay surface area (minimum) | Area = | | $ft^2$ |
| d) Full height notch-type weir | Width (W) = | | in |

Notes: Ponding Depth =1.87 feet = ((0.5') x 0.40) + 1.67' (chamber)

**Project:**

StormTech®
Detention • Retention • Water Quality
A division of ADS

Chamber Model - SC-740
Units - **Imperial** Click Here for Metric

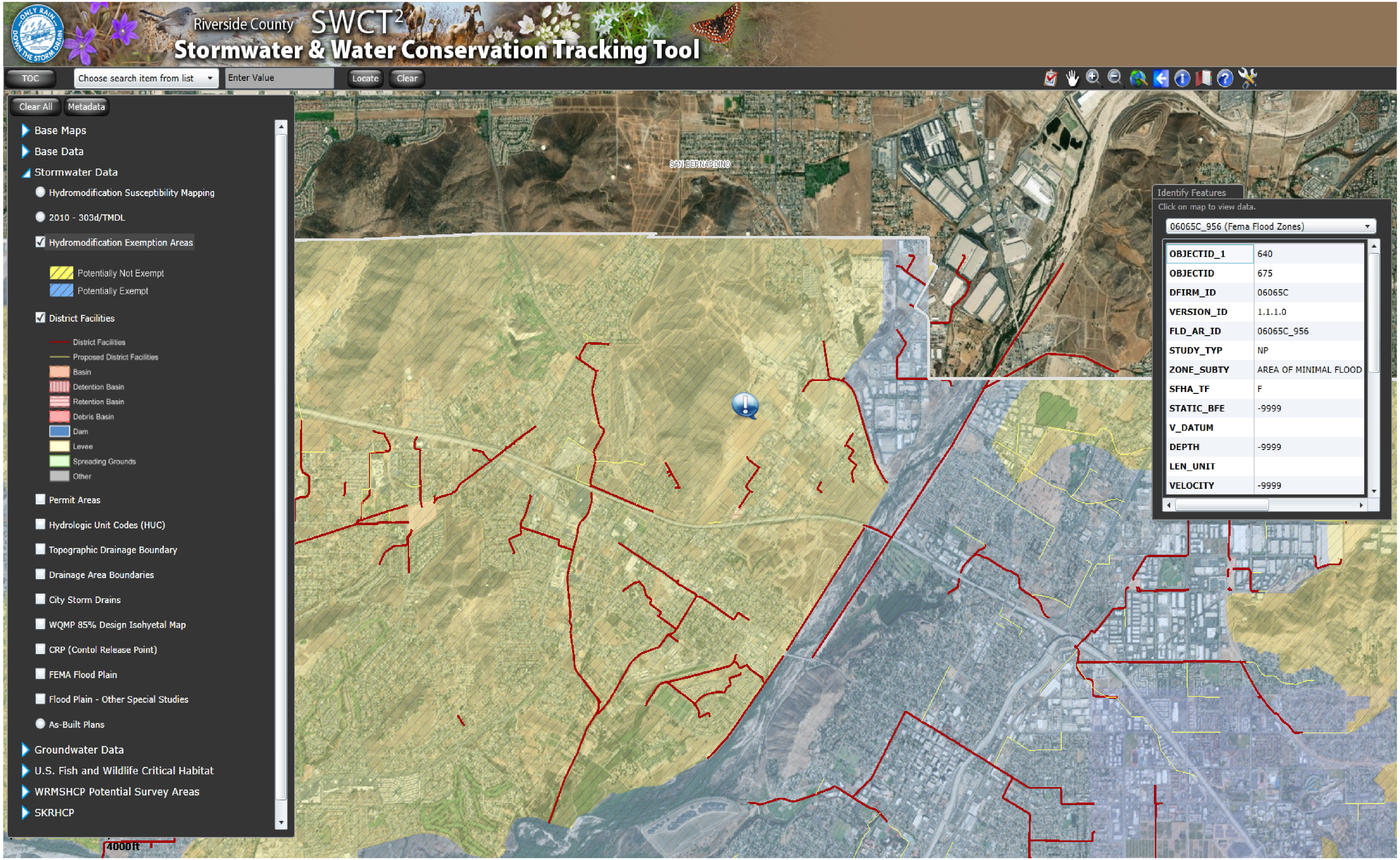
Number of chambers - 88
Voids in the stone (porosity) - 40 %
Base of Stone Elevation - 0.00 ft
Amount of Stone Above Chambers - 6 in
Amount of Stone Below Chambers - 6 in

☐ Include Perimeter Stone in Calculations

| Height of System *(inches)* | Incremental Single Chamber *(cubic feet)* | Incremental Total Chamber *(cubic feet)* | Incremental Stone *(cubic feet)* | Incremental Ch & St *(cubic feet)* | Cumulative Chamber *(cubic feet)* | Elevation *(feet)* |
|---|---|---|---|---|---|---|
| 42 | 0.00 | 0.00 | 99.16 | 99.16 | 6590.88 | 3.50 |
| 41 | 0.00 | 0.00 | 99.16 | 99.16 | 6491.72 | 3.42 |
| 40 | 0.00 | 0.00 | 99.16 | 99.16 | 6392.56 | 3.33 |
| 39 | 0.00 | 0.00 | 99.16 | 99.16 | 6293.40 | 3.25 |
| 38 | 0.00 | 0.00 | 99.16 | 99.16 | 6194.24 | 3.17 |
| 37 | 0.00 | 0.00 | 99.16 | 99.16 | 6095.08 | 3.08 |
| 36 | 0.05 | 4.84 | 97.22 | 102.06 | 5995.92 | 3.00 |
| 35 | 0.16 | 14.34 | 93.42 | 107.76 | 5893.86 | 2.92 |
| 34 | 0.28 | 24.81 | 89.23 | 114.05 | 5786.10 | 2.83 |
| 33 | 0.60 | 53.15 | 77.90 | 131.05 | 5672.06 | 2.75 |
| 32 | 0.80 | 70.55 | 70.94 | 141.49 | 5541.01 | 2.67 |
| 31 | 0.95 | 83.66 | 65.70 | 149.35 | 5399.52 | 2.58 |
| 30 | 1.07 | 94.56 | 61.34 | 155.89 | 5250.16 | 2.50 |
| 29 | 1.18 | 103.88 | 57.61 | 161.49 | 5094.27 | 2.42 |
| 28 | 1.27 | 111.38 | 54.61 | 165.99 | 4932.78 | 2.33 |
| 27 | 1.36 | 119.24 | 51.46 | 170.70 | 4766.80 | 2.25 |
| 26 | 1.45 | 127.96 | 47.97 | 175.94 | 4596.09 | 2.17 |
| 25 | 1.52 | 134.18 | 45.49 | 179.66 | 4420.16 | 2.08 |
| 24 | 1.58 | 139.24 | 43.46 | 182.71 | 4240.49 | 2.00 |
| 23 | 1.64 | 144.52 | 41.35 | 185.87 | 4057.79 | 1.92 |
| 22 | 1.70 | 149.56 | 39.34 | 188.89 | 3871.92 | 1.83 |
| 21 | 1.75 | 154.26 | 37.46 | 191.71 | 3683.02 | 1.75 |
| 20 | 1.80 | 158.65 | 35.70 | 194.35 | 3491.31 | 1.67 |
| 19 | 1.85 | 163.24 | 33.86 | 197.10 | 3296.96 | 1.58 |
| 18 | 1.89 | 166.59 | 32.52 | 199.11 | 3099.86 | 1.50 |
| 17 | 1.93 | 170.19 | 31.08 | 201.27 | 2900.74 | 1.42 |
| 16 | 1.97 | 173.80 | 29.64 | 203.44 | 2699.47 | 1.33 |
| 15 | 2.01 | 176.87 | 28.41 | 205.28 | 2496.03 | 1.25 |
| 14 | 2.04 | 179.96 | 27.18 | 207.13 | 2290.75 | 1.17 |
| 13 | 2.07 | 182.60 | 26.12 | 208.72 | 2083.61 | 1.08 |
| 12 | 2.10 | 185.23 | 25.07 | 210.30 | 1874.90 | 1.00 |
| 11 | 2.13 | 187.60 | 24.12 | 211.72 | 1664.60 | 0.92 |
| 10 | 2.15 | 189.54 | 23.34 | 212.88 | 1452.88 | 0.83 |
| 9 | 2.18 | 191.58 | 22.53 | 214.11 | 1240.00 | 0.75 |
| 8 | 2.20 | 193.46 | 21.78 | 215.23 | 1025.89 | 0.67 |
| 7 | 2.21 | 194.24 | 21.46 | 215.71 | 810.66 | 0.58 |
| 6 | 0.00 | 0.00 | 99.16 | 99.16 | 594.95 | 0.50 |
| 5 | 0.00 | 0.00 | 99.16 | 99.16 | 495.79 | 0.42 |
| 4 | 0.00 | 0.00 | 99.16 | 99.16 | 396.64 | 0.33 |
| 3 | 0.00 | 0.00 | 99.16 | 99.16 | 297.48 | 0.25 |
| 2 | 0.00 | 0.00 | 99.16 | 99.16 | 198.32 | 0.17 |
| 1 | 0.00 | 0.00 | 99.16 | 99.16 | 99.16 | 0.08 |

# Appendix 7: Hydromodification

*Supporting Detail Relating to Hydrologic Conditions of Concern*



- Base Maps
- Base Data
- Stormwater Data
  - ○ Hydromodification Susceptibility Mapping
  - ○ 2010 - 303d/TMDL
  - ☑ Hydromodification Exemption Areas
    - ▨ Potentially Not Exempt
    - ▨ Potentially Exempt
  - ☑ District Facilities
    - District Facilities
    - Proposed District Facilities
    - Basin
    - Detention Basin
    - Retention Basin
    - Debris Basin
    - Dam
    - Levee
    - Spreading Grounds
    - Other
  - ☐ Permit Areas
  - ☐ Hydrologic Unit Codes (HUC)
  - ☐ Topographic Drainage Boundary
  - ☐ Drainage Area Boundaries
  - ☐ City Storm Drains
  - ☐ WQMP 85% Design Isohyetal Map
  - ☐ CRP (Contol Release Point)
  - ☐ FEMA Flood Plain
  - ☐ Flood Plain - Other Special Studies
  - ○ As-Built Plans
- Groundwater Data
- U.S. Fish and Wildlife Critical Habitat
- WRMSHCP Potential Survey Areas
- SKRHCP

Identify Features

Click on map to view data.

06065C_956 (Fema Flood Zones)

| | |
|---|---|
| OBJECTID_1 | 640 |
| OBJECTID | 675 |
| DFIRM_ID | 06065C |
| VERSION_ID | 1.1.1.0 |
| FLD_AR_ID | 06065C_956 |
| STUDY_TYP | NP |
| ZONE_SUBTY | AREA OF MINIMAL FLOOD |
| SFHA_TF | F |
| STATIC_BFE | -9999 |
| V_DATUM | |
| DEPTH | -9999 |
| LEN_UNIT | |
| VELOCITY | -9999 |

# Existing Condition

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

                Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
                        Study date  09/23/22 File: 3384E012242.out


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

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


        Program License Serial Number 6400

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

         English Units used in output format



        ---------------------------------------------------------------------
        JURUPA VALLEY COMMERCE PARK
        BUILDINGS 1 & 2 - EXISTING CONDITION
        HYDROLOGIC ANALYSIS - 2-YEAR

        --------------------------------------------------------------------
        Drainage Area =      38.90(Ac.)  =      0.061 Sq. Mi.
        Drainage Area for Depth-Area Areal Adjustment =      38.90(Ac.)  =      0.061 Sq. Mi.
        USER Entry of lag time in hours
        Lag time =    0.000 Hr.
        Lag time =     0.00 Min.
        25% of lag time =     0.00 Min.
        40% of lag time =     0.00 Min.
        Unit time =     5.00 Min.
        Duration of storm = 24 Hour(s)
        User Entered Base Flow =     0.00(CFS)

        2 YEAR Area rainfall data:


        Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
               38.90            2.00                  77.80

        100 YEAR Area rainfall data:


        Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
               38.90            5.50                 213.95

        STORM EVENT (YEAR) =    2.00
        Area Averaged 2-Year Rainfall =    2.000(In)
        Area Averaged 100-Year Rainfall =    5.500(In)

        Point rain (area averaged) =    2.000(In)
        Areal adjustment factor =   99.99 %
        Adjusted average point rain =    2.000(In)

        Sub-Area Data:
        Area(Ac.)         Runoff Index   Impervious %
            21.200           62.00         0.000
            17.700           84.00         0.000
         Total Area Entered =     38.90(Ac.)


        RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
        AMC2 AMC-1     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
        62.0  42.0      0.650     0.000        0.650       0.545      0.354
        84.0  68.6      0.377     0.000        0.377       0.455      0.172
                                                          Sum (F) =   0.526
        Area averaged mean soil loss (F) (In/Hr) =  0.526
        Minimum soil loss rate ((In/Hr)) =  0.263
        (for 24 hour storm duration)
        Soil low loss rate (decimal) =   0.900
        ---------------------------------------------------------------------

                        U n i t  H y d r o g r a p h
                                VALLEY S-Curve
        --------------------------------------------------------------------
                        Unit Hydrograph Data
        ---------------------------------------------------------------------
        Unit time period   Time % of lag   Distribution   Unit Hydrograph
            (hrs)                           Graph %            (CFS)
        ---------------------------------------------------------------------
            1   0.083          1.#IO        100.000             39.204
                                      Sum = 100.000   Sum=      39.204
-----------------------------------------------------------------------
```

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

 Unit Time   Pattern   Storm Rain     Loss rate(In./Hr)     Effective
      (Hr.)  Percent   (In/Hr)         Max   |   Low       (In/Hr)
   1  0.08     0.07      0.016       (  0.933)      0.014        0.002
   2  0.17     0.07      0.016       (  0.929)      0.014        0.002
   3  0.25     0.07      0.016       (  0.925)      0.014        0.002
   4  0.33     0.10      0.024       (  0.922)      0.022        0.002
   5  0.42     0.10      0.024       (  0.918)      0.022        0.002
   6  0.50     0.10      0.024       (  0.915)      0.022        0.002
   7  0.58     0.10      0.024       (  0.911)      0.022        0.002
   8  0.67     0.10      0.024       (  0.907)      0.022        0.002
   9  0.75     0.10      0.024       (  0.904)      0.022        0.002
  10  0.83     0.13      0.032       (  0.900)      0.029        0.003
  11  0.92     0.13      0.032       (  0.897)      0.029        0.003
  12  1.00     0.13      0.032       (  0.893)      0.029        0.003
  13  1.08     0.10      0.024       (  0.890)      0.022        0.002
  14  1.17     0.10      0.024       (  0.886)      0.022        0.002
  15  1.25     0.10      0.024       (  0.883)      0.022        0.002
  16  1.33     0.10      0.024       (  0.879)      0.022        0.002
  17  1.42     0.10      0.024       (  0.876)      0.022        0.002
  18  1.50     0.10      0.024       (  0.872)      0.022        0.002
  19  1.58     0.10      0.024       (  0.869)      0.022        0.002
  20  1.67     0.10      0.024       (  0.865)      0.022        0.002
  21  1.75     0.10      0.024       (  0.862)      0.022        0.002
  22  1.83     0.13      0.032       (  0.858)      0.029        0.003
  23  1.92     0.13      0.032       (  0.855)      0.029        0.003
  24  2.00     0.13      0.032       (  0.851)      0.029        0.003
  25  2.08     0.13      0.032       (  0.848)      0.029        0.003
  26  2.17     0.13      0.032       (  0.844)      0.029        0.003
  27  2.25     0.13      0.032       (  0.841)      0.029        0.003
  28  2.33     0.13      0.032       (  0.838)      0.029        0.003
  29  2.42     0.13      0.032       (  0.834)      0.029        0.003
  30  2.50     0.13      0.032       (  0.831)      0.029        0.003
  31  2.58     0.17      0.040       (  0.827)      0.036        0.004
  32  2.67     0.17      0.040       (  0.824)      0.036        0.004
  33  2.75     0.17      0.040       (  0.821)      0.036        0.004
  34  2.83     0.17      0.040       (  0.817)      0.036        0.004
  35  2.92     0.17      0.040       (  0.814)      0.036        0.004
  36  3.00     0.17      0.040       (  0.811)      0.036        0.004
  37  3.08     0.17      0.040       (  0.807)      0.036        0.004
  38  3.17     0.17      0.040       (  0.804)      0.036        0.004
  39  3.25     0.17      0.040       (  0.800)      0.036        0.004
  40  3.33     0.17      0.040       (  0.797)      0.036        0.004
  41  3.42     0.17      0.040       (  0.794)      0.036        0.004
  42  3.50     0.17      0.040       (  0.790)      0.036        0.004
  43  3.58     0.17      0.040       (  0.787)      0.036        0.004
  44  3.67     0.17      0.040       (  0.784)      0.036        0.004
  45  3.75     0.17      0.040       (  0.781)      0.036        0.004
  46  3.83     0.20      0.048       (  0.777)      0.043        0.005
  47  3.92     0.20      0.048       (  0.774)      0.043        0.005
  48  4.00     0.20      0.048       (  0.771)      0.043        0.005
  49  4.08     0.20      0.048       (  0.767)      0.043        0.005
  50  4.17     0.20      0.048       (  0.764)      0.043        0.005
  51  4.25     0.20      0.048       (  0.761)      0.043        0.005
  52  4.33     0.23      0.056       (  0.758)      0.050        0.006
  53  4.42     0.23      0.056       (  0.754)      0.050        0.006
  54  4.50     0.23      0.056       (  0.751)      0.050        0.006
  55  4.58     0.23      0.056       (  0.748)      0.050        0.006
  56  4.67     0.23      0.056       (  0.745)      0.050        0.006
  57  4.75     0.23      0.056       (  0.742)      0.050        0.006
  58  4.83     0.27      0.064       (  0.738)      0.058        0.006
  59  4.92     0.27      0.064       (  0.735)      0.058        0.006
  60  5.00     0.27      0.064       (  0.732)      0.058        0.006
  61  5.08     0.20      0.048       (  0.729)      0.043        0.005
  62  5.17     0.20      0.048       (  0.726)      0.043        0.005
  63  5.25     0.20      0.048       (  0.722)      0.043        0.005
  64  5.33     0.23      0.056       (  0.719)      0.050        0.006
  65  5.42     0.23      0.056       (  0.716)      0.050        0.006
  66  5.50     0.23      0.056       (  0.713)      0.050        0.006
  67  5.58     0.27      0.064       (  0.710)      0.058        0.006
  68  5.67     0.27      0.064       (  0.707)      0.058        0.006
  69  5.75     0.27      0.064       (  0.704)      0.058        0.006
  70  5.83     0.27      0.064       (  0.701)      0.058        0.006
  71  5.92     0.27      0.064       (  0.697)      0.058        0.006
  72  6.00     0.27      0.064       (  0.694)      0.058        0.006
  73  6.08     0.30      0.072       (  0.691)      0.065        0.007
  74  6.17     0.30      0.072       (  0.688)      0.065        0.007
  75  6.25     0.30      0.072       (  0.685)      0.065        0.007
  76  6.33     0.30      0.072       (  0.682)      0.065        0.007
  77  6.42     0.30      0.072       (  0.679)      0.065        0.007
  78  6.50     0.30      0.072       (  0.676)      0.065        0.007
  79  6.58     0.33      0.080       (  0.673)      0.072        0.008
  80  6.67     0.33      0.080       (  0.670)      0.072        0.008
  81  6.75     0.33      0.080       (  0.667)      0.072        0.008
  82  6.83     0.33      0.080       (  0.664)      0.072        0.008
  83  6.92     0.33      0.080       (  0.661)      0.072        0.008
  84  7.00     0.33      0.080       (  0.658)      0.072        0.008
  85  7.08     0.33      0.080       (  0.655)      0.072        0.008
  86  7.17     0.33      0.080       (  0.652)      0.072        0.008
  87  7.25     0.33      0.080       (  0.649)      0.072        0.008
```

```
  88   7.33     0.37      0.088      (  0.646)      0.079        0.009
  89   7.42     0.37      0.088      (  0.643)      0.079        0.009
  90   7.50     0.37      0.088      (  0.640)      0.079        0.009
  91   7.58     0.40      0.096      (  0.637)      0.086        0.010
  92   7.67     0.40      0.096      (  0.634)      0.086        0.010
  93   7.75     0.40      0.096      (  0.631)      0.086        0.010
  94   7.83     0.43      0.104      (  0.628)      0.094        0.010
  95   7.92     0.43      0.104      (  0.625)      0.094        0.010
  96   8.00     0.43      0.104      (  0.623)      0.094        0.010
  97   8.08     0.50      0.120      (  0.620)      0.108        0.012
  98   8.17     0.50      0.120      (  0.617)      0.108        0.012
  99   8.25     0.50      0.120      (  0.614)      0.108        0.012
 100   8.33     0.50      0.120      (  0.611)      0.108        0.012
 101   8.42     0.50      0.120      (  0.608)      0.108        0.012
 102   8.50     0.50      0.120      (  0.605)      0.108        0.012
 103   8.58     0.53      0.128      (  0.603)      0.115        0.013
 104   8.67     0.53      0.128      (  0.600)      0.115        0.013
 105   8.75     0.53      0.128      (  0.597)      0.115        0.013
 106   8.83     0.57      0.136      (  0.594)      0.122        0.014
 107   8.92     0.57      0.136      (  0.591)      0.122        0.014
 108   9.00     0.57      0.136      (  0.588)      0.122        0.014
 109   9.08     0.63      0.152      (  0.586)      0.137        0.015
 110   9.17     0.63      0.152      (  0.583)      0.137        0.015
 111   9.25     0.63      0.152      (  0.580)      0.137        0.015
 112   9.33     0.67      0.160      (  0.577)      0.144        0.016
 113   9.42     0.67      0.160      (  0.575)      0.144        0.016
 114   9.50     0.67      0.160      (  0.572)      0.144        0.016
 115   9.58     0.70      0.168      (  0.569)      0.151        0.017
 116   9.67     0.70      0.168      (  0.566)      0.151        0.017
 117   9.75     0.70      0.168      (  0.564)      0.151        0.017
 118   9.83     0.73      0.176      (  0.561)      0.158        0.018
 119   9.92     0.73      0.176      (  0.558)      0.158        0.018
 120  10.00     0.73      0.176      (  0.556)      0.158        0.018
 121  10.08     0.50      0.120      (  0.553)      0.108        0.012
 122  10.17     0.50      0.120      (  0.550)      0.108        0.012
 123  10.25     0.50      0.120      (  0.547)      0.108        0.012
 124  10.33     0.50      0.120      (  0.545)      0.108        0.012
 125  10.42     0.50      0.120      (  0.542)      0.108        0.012
 126  10.50     0.50      0.120      (  0.540)      0.108        0.012
 127  10.58     0.67      0.160      (  0.537)      0.144        0.016
 128  10.67     0.67      0.160      (  0.534)      0.144        0.016
 129  10.75     0.67      0.160      (  0.532)      0.144        0.016
 130  10.83     0.67      0.160      (  0.529)      0.144        0.016
 131  10.92     0.67      0.160      (  0.526)      0.144        0.016
 132  11.00     0.67      0.160      (  0.524)      0.144        0.016
 133  11.08     0.63      0.152      (  0.521)      0.137        0.015
 134  11.17     0.63      0.152      (  0.519)      0.137        0.015
 135  11.25     0.63      0.152      (  0.516)      0.137        0.015
 136  11.33     0.63      0.152      (  0.514)      0.137        0.015
 137  11.42     0.63      0.152      (  0.511)      0.137        0.015
 138  11.50     0.63      0.152      (  0.509)      0.137        0.015
 139  11.58     0.57      0.136      (  0.506)      0.122        0.014
 140  11.67     0.57      0.136      (  0.503)      0.122        0.014
 141  11.75     0.57      0.136      (  0.501)      0.122        0.014
 142  11.83     0.60      0.144      (  0.498)      0.130        0.014
 143  11.92     0.60      0.144      (  0.496)      0.130        0.014
 144  12.00     0.60      0.144      (  0.494)      0.130        0.014
 145  12.08     0.83      0.200      (  0.491)      0.180        0.020
 146  12.17     0.83      0.200      (  0.489)      0.180        0.020
 147  12.25     0.83      0.200      (  0.486)      0.180        0.020
 148  12.33     0.87      0.208      (  0.484)      0.187        0.021
 149  12.42     0.87      0.208      (  0.481)      0.187        0.021
 150  12.50     0.87      0.208      (  0.479)      0.187        0.021
 151  12.58     0.93      0.224      (  0.476)      0.202        0.022
 152  12.67     0.93      0.224      (  0.474)      0.202        0.022
 153  12.75     0.93      0.224      (  0.472)      0.202        0.022
 154  12.83     0.97      0.232      (  0.469)      0.209        0.023
 155  12.92     0.97      0.232      (  0.467)      0.209        0.023
 156  13.00     0.97      0.232      (  0.465)      0.209        0.023
 157  13.08     1.13      0.272      (  0.462)      0.245        0.027
 158  13.17     1.13      0.272      (  0.460)      0.245        0.027
 159  13.25     1.13      0.272      (  0.458)      0.245        0.027
 160  13.33     1.13      0.272      (  0.455)      0.245        0.027
 161  13.42     1.13      0.272      (  0.453)      0.245        0.027
 162  13.50     1.13      0.272      (  0.451)      0.245        0.027
 163  13.58     0.77      0.184      (  0.448)      0.166        0.018
 164  13.67     0.77      0.184      (  0.446)      0.166        0.018
 165  13.75     0.77      0.184      (  0.444)      0.166        0.018
 166  13.83     0.77      0.184      (  0.441)      0.166        0.018
 167  13.92     0.77      0.184      (  0.439)      0.166        0.018
 168  14.00     0.77      0.184      (  0.437)      0.166        0.018
 169  14.08     0.90      0.216      (  0.435)      0.194        0.022
 170  14.17     0.90      0.216      (  0.433)      0.194        0.022
 171  14.25     0.90      0.216      (  0.430)      0.194        0.022
 172  14.33     0.87      0.208      (  0.428)      0.187        0.021
 173  14.42     0.87      0.208      (  0.426)      0.187        0.021
 174  14.50     0.87      0.208      (  0.424)      0.187        0.021
 175  14.58     0.87      0.208      (  0.422)      0.187        0.021
 176  14.67     0.87      0.208      (  0.419)      0.187        0.021
 177  14.75     0.87      0.208      (  0.417)      0.187        0.021
 178  14.83     0.83      0.200      (  0.415)      0.180        0.020
 179  14.92     0.83      0.200      (  0.413)      0.180        0.020
```

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180  15.00     0.83      0.200       (  0.411)      0.180        0.020
181  15.08     0.80      0.192       (  0.409)      0.173        0.019
182  15.17     0.80      0.192       (  0.407)      0.173        0.019
183  15.25     0.80      0.192       (  0.405)      0.173        0.019
184  15.33     0.77      0.184       (  0.403)      0.166        0.018
185  15.42     0.77      0.184       (  0.400)      0.166        0.018
186  15.50     0.77      0.184       (  0.398)      0.166        0.018
187  15.58     0.63      0.152       (  0.396)      0.137        0.015
188  15.67     0.63      0.152       (  0.394)      0.137        0.015
189  15.75     0.63      0.152       (  0.392)      0.137        0.015
190  15.83     0.63      0.152       (  0.390)      0.137        0.015
191  15.92     0.63      0.152       (  0.388)      0.137        0.015
192  16.00     0.63      0.152       (  0.386)      0.137        0.015
193  16.08     0.13      0.032       (  0.384)      0.029        0.003
194  16.17     0.13      0.032       (  0.382)      0.029        0.003
195  16.25     0.13      0.032       (  0.380)      0.029        0.003
196  16.33     0.13      0.032       (  0.378)      0.029        0.003
197  16.42     0.13      0.032       (  0.377)      0.029        0.003
198  16.50     0.13      0.032       (  0.375)      0.029        0.003
199  16.58     0.10      0.024       (  0.373)      0.022        0.002
200  16.67     0.10      0.024       (  0.371)      0.022        0.002
201  16.75     0.10      0.024       (  0.369)      0.022        0.002
202  16.83     0.10      0.024       (  0.367)      0.022        0.002
203  16.92     0.10      0.024       (  0.365)      0.022        0.002
204  17.00     0.10      0.024       (  0.363)      0.022        0.002
205  17.08     0.17      0.040       (  0.362)      0.036        0.004
206  17.17     0.17      0.040       (  0.360)      0.036        0.004
207  17.25     0.17      0.040       (  0.358)      0.036        0.004
208  17.33     0.17      0.040       (  0.356)      0.036        0.004
209  17.42     0.17      0.040       (  0.354)      0.036        0.004
210  17.50     0.17      0.040       (  0.353)      0.036        0.004
211  17.58     0.17      0.040       (  0.351)      0.036        0.004
212  17.67     0.17      0.040       (  0.349)      0.036        0.004
213  17.75     0.17      0.040       (  0.347)      0.036        0.004
214  17.83     0.13      0.032       (  0.346)      0.029        0.003
215  17.92     0.13      0.032       (  0.344)      0.029        0.003
216  18.00     0.13      0.032       (  0.342)      0.029        0.003
217  18.08     0.13      0.032       (  0.340)      0.029        0.003
218  18.17     0.13      0.032       (  0.339)      0.029        0.003
219  18.25     0.13      0.032       (  0.337)      0.029        0.003
220  18.33     0.13      0.032       (  0.336)      0.029        0.003
221  18.42     0.13      0.032       (  0.334)      0.029        0.003
222  18.50     0.13      0.032       (  0.332)      0.029        0.003
223  18.58     0.10      0.024       (  0.331)      0.022        0.002
224  18.67     0.10      0.024       (  0.329)      0.022        0.002
225  18.75     0.10      0.024       (  0.327)      0.022        0.002
226  18.83     0.07      0.016       (  0.326)      0.014        0.002
227  18.92     0.07      0.016       (  0.324)      0.014        0.002
228  19.00     0.07      0.016       (  0.323)      0.014        0.002
229  19.08     0.10      0.024       (  0.321)      0.022        0.002
230  19.17     0.10      0.024       (  0.320)      0.022        0.002
231  19.25     0.10      0.024       (  0.318)      0.022        0.002
232  19.33     0.13      0.032       (  0.317)      0.029        0.003
233  19.42     0.13      0.032       (  0.315)      0.029        0.003
234  19.50     0.13      0.032       (  0.314)      0.029        0.003
235  19.58     0.10      0.024       (  0.312)      0.022        0.002
236  19.67     0.10      0.024       (  0.311)      0.022        0.002
237  19.75     0.10      0.024       (  0.310)      0.022        0.002
238  19.83     0.07      0.016       (  0.308)      0.014        0.002
239  19.92     0.07      0.016       (  0.307)      0.014        0.002
240  20.00     0.07      0.016       (  0.305)      0.014        0.002
241  20.08     0.10      0.024       (  0.304)      0.022        0.002
242  20.17     0.10      0.024       (  0.303)      0.022        0.002
243  20.25     0.10      0.024       (  0.301)      0.022        0.002
244  20.33     0.10      0.024       (  0.300)      0.022        0.002
245  20.42     0.10      0.024       (  0.299)      0.022        0.002
246  20.50     0.10      0.024       (  0.298)      0.022        0.002
247  20.58     0.10      0.024       (  0.296)      0.022        0.002
248  20.67     0.10      0.024       (  0.295)      0.022        0.002
249  20.75     0.10      0.024       (  0.294)      0.022        0.002
250  20.83     0.07      0.016       (  0.293)      0.014        0.002
251  20.92     0.07      0.016       (  0.292)      0.014        0.002
252  21.00     0.07      0.016       (  0.290)      0.014        0.002
253  21.08     0.10      0.024       (  0.289)      0.022        0.002
254  21.17     0.10      0.024       (  0.288)      0.022        0.002
255  21.25     0.10      0.024       (  0.287)      0.022        0.002
256  21.33     0.07      0.016       (  0.286)      0.014        0.002
257  21.42     0.07      0.016       (  0.285)      0.014        0.002
258  21.50     0.07      0.016       (  0.284)      0.014        0.002
259  21.58     0.10      0.024       (  0.283)      0.022        0.002
260  21.67     0.10      0.024       (  0.282)      0.022        0.002
261  21.75     0.10      0.024       (  0.281)      0.022        0.002
262  21.83     0.07      0.016       (  0.280)      0.014        0.002
263  21.92     0.07      0.016       (  0.279)      0.014        0.002
264  22.00     0.07      0.016       (  0.278)      0.014        0.002
265  22.08     0.10      0.024       (  0.277)      0.022        0.002
266  22.17     0.10      0.024       (  0.276)      0.022        0.002
267  22.25     0.10      0.024       (  0.275)      0.022        0.002
268  22.33     0.07      0.016       (  0.274)      0.014        0.002
269  22.42     0.07      0.016       (  0.273)      0.014        0.002
270  22.50     0.07      0.016       (  0.273)      0.014        0.002
271  22.58     0.07      0.016       (  0.272)      0.014        0.002
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272  22.67     0.07      0.016       (  0.271)       0.014        0.002
273  22.75     0.07      0.016       (  0.270)       0.014        0.002
274  22.83     0.07      0.016       (  0.270)       0.014        0.002
275  22.92     0.07      0.016       (  0.269)       0.014        0.002
276  23.00     0.07      0.016       (  0.268)       0.014        0.002
277  23.08     0.07      0.016       (  0.268)       0.014        0.002
278  23.17     0.07      0.016       (  0.267)       0.014        0.002
279  23.25     0.07      0.016       (  0.266)       0.014        0.002
280  23.33     0.07      0.016       (  0.266)       0.014        0.002
281  23.42     0.07      0.016       (  0.265)       0.014        0.002
282  23.50     0.07      0.016       (  0.265)       0.014        0.002
283  23.58     0.07      0.016       (  0.264)       0.014        0.002
284  23.67     0.07      0.016       (  0.264)       0.014        0.002
285  23.75     0.07      0.016       (  0.264)       0.014        0.002
286  23.83     0.07      0.016       (  0.263)       0.014        0.002
287  23.92     0.07      0.016       (  0.263)       0.014        0.002
288  24.00     0.07      0.016       (  0.263)       0.014        0.002
                (Loss Rate Not Used)
    Sum =     100.0                                  Sum =     2.4
       Flood volume = Effective rainfall      0.20(In)
        times area      38.9(Ac.)/[(In)/(Ft.)] =       0.6(Ac.Ft)
       Total soil loss =      1.80(In)
       Total soil loss =     5.835(Ac.Ft)
       Total rainfall =      2.00(In)
       Flood volume =       28239.3 Cubic Feet
       Total soil loss =      254153.3 Cubic Feet
       --------------------------------------------------------------------
        Peak flow rate of this hydrograph =      1.067(CFS)
       --------------------------------------------------------------------
       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                           24 - H O U R    S T O R M
                      R u n o f f      H y d r o g r a p h
       --------------------------------------------------------------------
                   Hydrograph in   5   Minute intervals ((CFS))

       --------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
 -----------------------------------------------------------------------
   0+ 5       0.0004      0.06  Q         |         |         |         |
   0+10       0.0009      0.06  Q         |         |         |         |
   0+15       0.0013      0.06  Q         |         |         |         |
   0+20       0.0019      0.09  Q         |         |         |         |
   0+25       0.0026      0.09  Q         |         |         |         |
   0+30       0.0032      0.09  Q         |         |         |         |
   0+35       0.0039      0.09  Q         |         |         |         |
   0+40       0.0045      0.09  Q         |         |         |         |
   0+45       0.0052      0.09  Q         |         |         |         |
   0+50       0.0061      0.13  Q         |         |         |         |
   0+55       0.0069      0.13  Q         |         |         |         |
   1+ 0       0.0078      0.13  Q         |         |         |         |
   1+ 5       0.0084      0.09  Q         |         |         |         |
   1+10       0.0091      0.09  Q         |         |         |         |
   1+15       0.0097      0.09  Q         |         |         |         |
   1+20       0.0104      0.09  Q         |         |         |         |
   1+25       0.0110      0.09  Q         |         |         |         |
   1+30       0.0117      0.09  Q         |         |         |         |
   1+35       0.0123      0.09  Q         |         |         |         |
   1+40       0.0130      0.09  Q         |         |         |         |
   1+45       0.0136      0.09  Q         |         |         |         |
   1+50       0.0145      0.13  Q         |         |         |         |
   1+55       0.0153      0.13  Q         |         |         |         |
   2+ 0       0.0162      0.13  QV        |         |         |         |
   2+ 5       0.0171      0.13  QV        |         |         |         |
   2+10       0.0179      0.13  QV        |         |         |         |
   2+15       0.0188      0.13  QV        |         |         |         |
   2+20       0.0197      0.13  QV        |         |         |         |
   2+25       0.0205      0.13  QV        |         |         |         |
   2+30       0.0214      0.13  QV        |         |         |         |
   2+35       0.0225      0.16  QV        |         |         |         |
   2+40       0.0236      0.16  QV        |         |         |         |
   2+45       0.0246      0.16  QV        |         |         |         |
   2+50       0.0257      0.16  QV        |         |         |         |
   2+55       0.0268      0.16  QV        |         |         |         |
   3+ 0       0.0279      0.16  QV        |         |         |         |
   3+ 5       0.0290      0.16  QV        |         |         |         |
   3+10       0.0300      0.16  QV        |         |         |         |
   3+15       0.0311      0.16  QV        |         |         |         |
   3+20       0.0322      0.16  QV        |         |         |         |
   3+25       0.0333      0.16  Q V       |         |         |         |
   3+30       0.0344      0.16  Q V       |         |         |         |
   3+35       0.0354      0.16  Q V       |         |         |         |
   3+40       0.0365      0.16  Q V       |         |         |         |
   3+45       0.0376      0.16  Q V       |         |         |         |
   3+50       0.0389      0.19  Q V       |         |         |         |
   3+55       0.0402      0.19  Q V       |         |         |         |
   4+ 0       0.0415      0.19  Q V       |         |         |         |
   4+ 5       0.0428      0.19  Q V       |         |         |         |
   4+10       0.0441      0.19  Q V       |         |         |         |
   4+15       0.0454      0.19  Q V       |         |         |         |
   4+20       0.0469      0.22  Q V       |         |         |         |
   4+25       0.0484      0.22  Q V       |         |         |         |
   4+30       0.0499      0.22  Q  V      |         |         |         |
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 4+35       0.0514      0.22  Q  V      |         |         |         |
 4+40       0.0529      0.22  Q  V      |         |         |         |
 4+45       0.0545      0.22  Q  V      |         |         |         |
 4+50       0.0562      0.25  |Q V      |         |         |         |
 4+55       0.0579      0.25  |Q V      |         |         |         |
 5+ 0       0.0596      0.25  |Q V      |         |         |         |
 5+ 5       0.0609      0.19  Q  V      |         |         |         |
 5+10       0.0622      0.19  Q  V      |         |         |         |
 5+15       0.0635      0.19  Q  V      |         |         |         |
 5+20       0.0650      0.22  Q   V     |         |         |         |
 5+25       0.0666      0.22  Q   V     |         |         |         |
 5+30       0.0681      0.22  Q   V     |         |         |         |
 5+35       0.0698      0.25  |Q  V     |         |         |         |
 5+40       0.0715      0.25  |Q  V     |         |         |         |
 5+45       0.0733      0.25  |Q  V     |         |         |         |
 5+50       0.0750      0.25  |Q  V     |         |         |         |
 5+55       0.0767      0.25  |Q  V     |         |         |         |
 6+ 0       0.0784      0.25  |Q  V     |         |         |         |
 6+ 5       0.0804      0.28  |Q  V     |         |         |         |
 6+10       0.0823      0.28  |Q   V    |         |         |         |
 6+15       0.0843      0.28  |Q   V    |         |         |         |
 6+20       0.0862      0.28  |Q   V    |         |         |         |
 6+25       0.0882      0.28  |Q   V    |         |         |         |
 6+30       0.0901      0.28  |Q   V    |         |         |         |
 6+35       0.0923      0.31  |Q   V    |         |         |         |
 6+40       0.0944      0.31  |Q   V    |         |         |         |
 6+45       0.0966      0.31  |Q   V    |         |         |         |
 6+50       0.0988      0.31  |Q    V   |         |         |         |
 6+55       0.1009      0.31  |Q    V   |         |         |         |
 7+ 0       0.1031      0.31  |Q    V   |         |         |         |
 7+ 5       0.1052      0.31  |Q    V   |         |         |         |
 7+10       0.1074      0.31  |Q    V   |         |         |         |
 7+15       0.1096      0.31  |Q    V   |         |         |         |
 7+20       0.1119      0.35  |Q    V   |         |         |         |
 7+25       0.1143      0.35  |Q     V  |         |         |         |
 7+30       0.1167      0.35  |Q     V  |         |         |         |
 7+35       0.1193      0.38  |Q     V  |         |         |         |
 7+40       0.1219      0.38  |Q     V  |         |         |         |
 7+45       0.1245      0.38  |Q     V  |         |         |         |
 7+50       0.1273      0.41  |Q     V  |         |         |         |
 7+55       0.1301      0.41  |Q      V |         |         |         |
 8+ 0       0.1329      0.41  |Q      V |         |         |         |
 8+ 5       0.1361      0.47  |Q      V |         |         |         |
 8+10       0.1394      0.47  |Q      V |         |         |         |
 8+15       0.1426      0.47  |Q      V |         |         |         |
 8+20       0.1459      0.47  |Q       V|         |         |         |
 8+25       0.1491      0.47  |Q       V|         |         |         |
 8+30       0.1523      0.47  |Q       V|         |         |         |
 8+35       0.1558      0.50  | Q      V|         |         |         |
 8+40       0.1593      0.50  | Q      V|         |         |         |
 8+45       0.1627      0.50  | Q       V         |         |         |
 8+50       0.1664      0.53  | Q       V         |         |         |
 8+55       0.1701      0.53  | Q       V         |         |         |
 9+ 0       0.1737      0.53  | Q       V         |         |         |
 9+ 5       0.1778      0.60  | Q       V         |         |         |
 9+10       0.1820      0.60  | Q       |V        |         |         |
 9+15       0.1861      0.60  | Q       |V        |         |         |
 9+20       0.1904      0.63  | Q       |V        |         |         |
 9+25       0.1947      0.63  | Q       | V       |         |         |
 9+30       0.1990      0.63  | Q       | V       |         |         |
 9+35       0.2036      0.66  | Q       | V       |         |         |
 9+40       0.2081      0.66  | Q       | V       |         |         |
 9+45       0.2126      0.66  | Q       |  V      |         |         |
 9+50       0.2174      0.69  | Q       |  V      |         |         |
 9+55       0.2221      0.69  | Q       |  V      |         |         |
10+ 0       0.2269      0.69  | Q       |   V     |         |         |
10+ 5       0.2301      0.47  |Q        |   V     |         |         |
10+10       0.2334      0.47  |Q        |   V     |         |         |
10+15       0.2366      0.47  |Q        |   V     |         |         |
10+20       0.2399      0.47  |Q        |   V     |         |         |
10+25       0.2431      0.47  |Q        |    V    |         |         |
10+30       0.2463      0.47  |Q        |    V    |         |         |
10+35       0.2507      0.63  | Q       |    V    |         |         |
10+40       0.2550      0.63  | Q       |    V    |         |         |
10+45       0.2593      0.63  | Q       |     V   |         |         |
10+50       0.2636      0.63  | Q       |     V   |         |         |
10+55       0.2680      0.63  | Q       |     V   |         |         |
11+ 0       0.2723      0.63  | Q       |     V   |         |         |
11+ 5       0.2764      0.60  | Q       |      V  |         |         |
11+10       0.2805      0.60  | Q       |      V  |         |         |
11+15       0.2846      0.60  | Q       |      V  |         |         |
11+20       0.2887      0.60  | Q       |      V  |         |         |
11+25       0.2928      0.60  | Q       |       V |         |         |
11+30       0.2969      0.60  | Q       |       V |         |         |
11+35       0.3006      0.53  | Q       |       V |         |         |
11+40       0.3043      0.53  | Q       |       V |         |         |
11+45       0.3079      0.53  | Q       |        V|         |         |
11+50       0.3118      0.56  | Q       |        V|         |         |
11+55       0.3157      0.56  | Q       |        V|         |         |
12+ 0       0.3196      0.56  | Q       |        V|         |         |
12+ 5       0.3250      0.78  |  Q      |         V         |         |
12+10       0.3304      0.78  |  Q      |         V         |         |
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12+15       0.3358      0.78  |  Q      |         V         |         |
12+20       0.3414      0.82  |  Q      |         |V        |         |
12+25       0.3470      0.82  |  Q      |         |V        |         |
12+30       0.3527      0.82  |  Q      |         |V        |         |
12+35       0.3587      0.88  |  Q      |         | V       |         |
12+40       0.3648      0.88  |  Q      |         | V       |         |
12+45       0.3708      0.88  |  Q      |         | V       |         |
12+50       0.3771      0.91  |  Q      |         |  V      |         |
12+55       0.3834      0.91  |  Q      |         |  V      |         |
13+ 0       0.3896      0.91  |  Q      |         |   V     |         |
13+ 5       0.3970      1.07  |   Q     |         |   V     |         |
13+10       0.4043      1.07  |   Q     |         |   V     |         |
13+15       0.4117      1.07  |   Q     |         |    V    |         |
13+20       0.4190      1.07  |   Q     |         |    V    |         |
13+25       0.4264      1.07  |   Q     |         |     V   |         |
13+30       0.4337      1.07  |   Q     |         |     V   |         |
13+35       0.4387      0.72  | Q       |         |      V  |         |
13+40       0.4436      0.72  | Q       |         |      V  |         |
13+45       0.4486      0.72  | Q       |         |      V  |         |
13+50       0.4536      0.72  | Q       |         |      V  |         |
13+55       0.4586      0.72  | Q       |         |       V |         |
14+ 0       0.4635      0.72  | Q       |         |       V |         |
14+ 5       0.4694      0.85  |  Q      |         |       V |         |
14+10       0.4752      0.85  |  Q      |         |        V|         |
14+15       0.4810      0.85  |  Q      |         |        V|         |
14+20       0.4866      0.82  |  Q      |         |         V         |
14+25       0.4923      0.82  |  Q      |         |         V         |
14+30       0.4979      0.82  |  Q      |         |         V         |
14+35       0.5035      0.82  |  Q      |         |         |V        |
14+40       0.5091      0.82  |  Q      |         |         |V        |
14+45       0.5147      0.82  |  Q      |         |         |V        |
14+50       0.5201      0.78  |  Q      |         |         | V       |
14+55       0.5255      0.78  |  Q      |         |         | V       |
15+ 0       0.5309      0.78  |  Q      |         |         | V       |
15+ 5       0.5361      0.75  |  Q      |         |         |  V      |
15+10       0.5413      0.75  |  Q      |         |         |  V      |
15+15       0.5465      0.75  |  Q      |         |         |  V      |
15+20       0.5515      0.72  | Q       |         |         |   V     |
15+25       0.5564      0.72  | Q       |         |         |   V     |
15+30       0.5614      0.72  | Q       |         |         |   V     |
15+35       0.5655      0.60  | Q       |         |         |   V     |
15+40       0.5696      0.60  | Q       |         |         |    V    |
15+45       0.5737      0.60  | Q       |         |         |    V    |
15+50       0.5778      0.60  | Q       |         |         |    V    |
15+55       0.5819      0.60  | Q       |         |         |    V    |
16+ 0       0.5860      0.60  | Q       |         |         |     V   |
16+ 5       0.5869      0.13  Q         |         |         |     V   |
16+10       0.5878      0.13  Q         |         |         |     V   |
16+15       0.5886      0.13  Q         |         |         |     V   |
16+20       0.5895      0.13  Q         |         |         |     V   |
16+25       0.5904      0.13  Q         |         |         |     V   |
16+30       0.5912      0.13  Q         |         |         |     V   |
16+35       0.5919      0.09  Q         |         |         |     V   |
16+40       0.5925      0.09  Q         |         |         |     V   |
16+45       0.5932      0.09  Q         |         |         |     V   |
16+50       0.5938      0.09  Q         |         |         |     V   |
16+55       0.5945      0.09  Q         |         |         |     V   |
17+ 0       0.5951      0.09  Q         |         |         |     V   |
17+ 5       0.5962      0.16  Q         |         |         |     V   |
17+10       0.5973      0.16  Q         |         |         |     V   |
17+15       0.5984      0.16  Q         |         |         |     V   |
17+20       0.5994      0.16  Q         |         |         |     V   |
17+25       0.6005      0.16  Q         |         |         |      V  |
17+30       0.6016      0.16  Q         |         |         |      V  |
17+35       0.6027      0.16  Q         |         |         |      V  |
17+40       0.6038      0.16  Q         |         |         |      V  |
17+45       0.6048      0.16  Q         |         |         |      V  |
17+50       0.6057      0.13  Q         |         |         |      V  |
17+55       0.6066      0.13  Q         |         |         |      V  |
18+ 0       0.6074      0.13  Q         |         |         |      V  |
18+ 5       0.6083      0.13  Q         |         |         |      V  |
18+10       0.6092      0.13  Q         |         |         |      V  |
18+15       0.6100      0.13  Q         |         |         |      V  |
18+20       0.6109      0.13  Q         |         |         |      V  |
18+25       0.6118      0.13  Q         |         |         |      V  |
18+30       0.6126      0.13  Q         |         |         |      V  |
18+35       0.6133      0.09  Q         |         |         |      V  |
18+40       0.6139      0.09  Q         |         |         |      V  |
18+45       0.6146      0.09  Q         |         |         |      V  |
18+50       0.6150      0.06  Q         |         |         |      V  |
18+55       0.6154      0.06  Q         |         |         |      V  |
19+ 0       0.6159      0.06  Q         |         |         |       V |
19+ 5       0.6165      0.09  Q         |         |         |       V |
19+10       0.6172      0.09  Q         |         |         |       V |
19+15       0.6178      0.09  Q         |         |         |       V |
19+20       0.6187      0.13  Q         |         |         |       V |
19+25       0.6195      0.13  Q         |         |         |       V |
19+30       0.6204      0.13  Q         |         |         |       V |
19+35       0.6211      0.09  Q         |         |         |       V |
19+40       0.6217      0.09  Q         |         |         |       V |
19+45       0.6224      0.09  Q         |         |         |       V |
19+50       0.6228      0.06  Q         |         |         |       V |
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   19+55       0.6232      0.06  Q         |         |         |       V |
   20+ 0       0.6236      0.06  Q         |         |         |       V |
   20+ 5       0.6243      0.09  Q         |         |         |       V |
   20+10       0.6249      0.09  Q         |         |         |       V |
   20+15       0.6256      0.09  Q         |         |         |       V |
   20+20       0.6262      0.09  Q         |         |         |       V |
   20+25       0.6269      0.09  Q         |         |         |       V |
   20+30       0.6275      0.09  Q         |         |         |       V |
   20+35       0.6282      0.09  Q         |         |         |       V |
   20+40       0.6288      0.09  Q         |         |         |       V |
   20+45       0.6295      0.09  Q         |         |         |       V |
   20+50       0.6299      0.06  Q         |         |         |       V |
   20+55       0.6303      0.06  Q         |         |         |       V |
   21+ 0       0.6308      0.06  Q         |         |         |       V |
   21+ 5       0.6314      0.09  Q         |         |         |       V |
   21+10       0.6321      0.09  Q         |         |         |        V|
   21+15       0.6327      0.09  Q         |         |         |        V|
   21+20       0.6332      0.06  Q         |         |         |        V|
   21+25       0.6336      0.06  Q         |         |         |        V|
   21+30       0.6340      0.06  Q         |         |         |        V|
   21+35       0.6347      0.09  Q         |         |         |        V|
   21+40       0.6353      0.09  Q         |         |         |        V|
   21+45       0.6360      0.09  Q         |         |         |        V|
   21+50       0.6364      0.06  Q         |         |         |        V|
   21+55       0.6368      0.06  Q         |         |         |        V|
   22+ 0       0.6373      0.06  Q         |         |         |        V|
   22+ 5       0.6379      0.09  Q         |         |         |        V|
   22+10       0.6386      0.09  Q         |         |         |        V|
   22+15       0.6392      0.09  Q         |         |         |        V|
   22+20       0.6396      0.06  Q         |         |         |        V|
   22+25       0.6401      0.06  Q         |         |         |        V|
   22+30       0.6405      0.06  Q         |         |         |        V|
   22+35       0.6409      0.06  Q         |         |         |        V|
   22+40       0.6414      0.06  Q         |         |         |        V|
   22+45       0.6418      0.06  Q         |         |         |        V|
   22+50       0.6422      0.06  Q         |         |         |        V|
   22+55       0.6427      0.06  Q         |         |         |        V|
   23+ 0       0.6431      0.06  Q         |         |         |        V|
   23+ 5       0.6435      0.06  Q         |         |         |        V|
   23+10       0.6440      0.06  Q         |         |         |        V|
   23+15       0.6444      0.06  Q         |         |         |        V|
   23+20       0.6448      0.06  Q         |         |         |        V|
   23+25       0.6453      0.06  Q         |         |         |        V|
   23+30       0.6457      0.06  Q         |         |         |        V|
   23+35       0.6461      0.06  Q         |         |         |        V|
   23+40       0.6466      0.06  Q         |         |         |        V|
   23+45       0.6470      0.06  Q         |         |         |        V|
   23+50       0.6474      0.06  Q         |         |         |        V|
   23+55       0.6479      0.06  Q         |         |         |        V|
   24+ 0       0.6483      0.06  Q         |         |         |         V
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                U n i t   H y d r o g r a p h   A n a l y s i s

                Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
                        Study date  09/23/22 File: 3384E034242.out


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

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


        Program License Serial Number 6400

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

         English Units used in output format




        ---------------------------------------------------------------------
        JURUPA VALLEY COMMERCE PARK
        BUILDINGS 3 & 4 - EXISTING CONDITION
        HYDROLOGIC ANALYSIS - 2-YEAR

        ---------------------------------------------------------------------
        Drainage Area =      24.00(Ac.)  =      0.037 Sq. Mi.
        Drainage Area for Depth-Area Areal Adjustment =      24.00(Ac.)  =      0.037 Sq. Mi.
        USER Entry of lag time in hours
        Lag time =    0.000 Hr.
        Lag time =     0.00 Min.
        25% of lag time =     0.00 Min.
        40% of lag time =     0.00 Min.
        Unit time =     5.00 Min.
        Duration of storm = 24 Hour(s)
        User Entered Base Flow =     0.00(CFS)

        2 YEAR Area rainfall data:


        Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
               24.00            2.00                   48.00

        100 YEAR Area rainfall data:


        Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
               24.00            5.50                  132.00

        STORM EVENT (YEAR) =    2.00
        Area Averaged 2-Year Rainfall =    2.000(In)
        Area Averaged 100-Year Rainfall =    5.500(In)

        Point rain (area averaged) =    2.000(In)
        Areal adjustment factor =  100.00 %
        Adjusted average point rain =    2.000(In)

        Sub-Area Data:
        Area(Ac.)         Runoff Index   Impervious %
            16.400           62.00         0.000
             2.300           84.00         0.000
             5.300           88.00         0.000
         Total Area Entered =     24.00(Ac.)


        RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
        AMC2 AMC-1     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
        62.0  42.0      0.650     0.000        0.650       0.683      0.444
        84.0  68.6      0.377     0.000        0.377       0.096      0.036
        88.0  74.8      0.305     0.000        0.305       0.221      0.067
                                                          Sum (F) =   0.548
        Area averaged mean soil loss (F) (In/Hr) =  0.548
        Minimum soil loss rate ((In/Hr)) =  0.274
        (for 24 hour storm duration)
        Soil low loss rate (decimal) =   0.900
        ---------------------------------------------------------------------

                        U n i t  H y d r o g r a p h
                                VALLEY S-Curve
        --------------------------------------------------------------------
                        Unit Hydrograph Data
        ---------------------------------------------------------------------
        Unit time period   Time % of lag   Distribution   Unit Hydrograph
            (hrs)                           Graph %            (CFS)
        ---------------------------------------------------------------------
            1   0.083          1.#IO        100.000             24.188
                                      Sum = 100.000   Sum=      24.188
-----------------------------------------------------------------------
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The following loss rate calculations reflect use of the minimum calculated loss
rate subtracted from the Storm Rain to produce the maximum Effective Rain value

 Unit Time   Pattern   Storm Rain     Loss rate(In./Hr)     Effective
      (Hr.)  Percent   (In/Hr)         Max   |   Low        (In/Hr)
   1   0.08     0.07      0.016       (  0.971)      0.014        0.002
   2   0.17     0.07      0.016       (  0.968)      0.014        0.002
   3   0.25     0.07      0.016       (  0.964)      0.014        0.002
   4   0.33     0.10      0.024       (  0.960)      0.022        0.002
   5   0.42     0.10      0.024       (  0.956)      0.022        0.002
   6   0.50     0.10      0.024       (  0.953)      0.022        0.002
   7   0.58     0.10      0.024       (  0.949)      0.022        0.002
   8   0.67     0.10      0.024       (  0.945)      0.022        0.002
   9   0.75     0.10      0.024       (  0.942)      0.022        0.002
  10   0.83     0.13      0.032       (  0.938)      0.029        0.003
  11   0.92     0.13      0.032       (  0.934)      0.029        0.003
  12   1.00     0.13      0.032       (  0.931)      0.029        0.003
  13   1.08     0.10      0.024       (  0.927)      0.022        0.002
  14   1.17     0.10      0.024       (  0.923)      0.022        0.002
  15   1.25     0.10      0.024       (  0.920)      0.022        0.002
  16   1.33     0.10      0.024       (  0.916)      0.022        0.002
  17   1.42     0.10      0.024       (  0.912)      0.022        0.002
  18   1.50     0.10      0.024       (  0.909)      0.022        0.002
  19   1.58     0.10      0.024       (  0.905)      0.022        0.002
  20   1.67     0.10      0.024       (  0.901)      0.022        0.002
  21   1.75     0.10      0.024       (  0.898)      0.022        0.002
  22   1.83     0.13      0.032       (  0.894)      0.029        0.003
  23   1.92     0.13      0.032       (  0.891)      0.029        0.003
  24   2.00     0.13      0.032       (  0.887)      0.029        0.003
  25   2.08     0.13      0.032       (  0.883)      0.029        0.003
  26   2.17     0.13      0.032       (  0.880)      0.029        0.003
  27   2.25     0.13      0.032       (  0.876)      0.029        0.003
  28   2.33     0.13      0.032       (  0.873)      0.029        0.003
  29   2.42     0.13      0.032       (  0.869)      0.029        0.003
  30   2.50     0.13      0.032       (  0.866)      0.029        0.003
  31   2.58     0.17      0.040       (  0.862)      0.036        0.004
  32   2.67     0.17      0.040       (  0.858)      0.036        0.004
  33   2.75     0.17      0.040       (  0.855)      0.036        0.004
  34   2.83     0.17      0.040       (  0.851)      0.036        0.004
  35   2.92     0.17      0.040       (  0.848)      0.036        0.004
  36   3.00     0.17      0.040       (  0.844)      0.036        0.004
  37   3.08     0.17      0.040       (  0.841)      0.036        0.004
  38   3.17     0.17      0.040       (  0.837)      0.036        0.004
  39   3.25     0.17      0.040       (  0.834)      0.036        0.004
  40   3.33     0.17      0.040       (  0.830)      0.036        0.004
  41   3.42     0.17      0.040       (  0.827)      0.036        0.004
  42   3.50     0.17      0.040       (  0.823)      0.036        0.004
  43   3.58     0.17      0.040       (  0.820)      0.036        0.004
  44   3.67     0.17      0.040       (  0.817)      0.036        0.004
  45   3.75     0.17      0.040       (  0.813)      0.036        0.004
  46   3.83     0.20      0.048       (  0.810)      0.043        0.005
  47   3.92     0.20      0.048       (  0.806)      0.043        0.005
  48   4.00     0.20      0.048       (  0.803)      0.043        0.005
  49   4.08     0.20      0.048       (  0.799)      0.043        0.005
  50   4.17     0.20      0.048       (  0.796)      0.043        0.005
  51   4.25     0.20      0.048       (  0.793)      0.043        0.005
  52   4.33     0.23      0.056       (  0.789)      0.050        0.006
  53   4.42     0.23      0.056       (  0.786)      0.050        0.006
  54   4.50     0.23      0.056       (  0.783)      0.050        0.006
  55   4.58     0.23      0.056       (  0.779)      0.050        0.006
  56   4.67     0.23      0.056       (  0.776)      0.050        0.006
  57   4.75     0.23      0.056       (  0.773)      0.050        0.006
  58   4.83     0.27      0.064       (  0.769)      0.058        0.006
  59   4.92     0.27      0.064       (  0.766)      0.058        0.006
  60   5.00     0.27      0.064       (  0.763)      0.058        0.006
  61   5.08     0.20      0.048       (  0.759)      0.043        0.005
  62   5.17     0.20      0.048       (  0.756)      0.043        0.005
  63   5.25     0.20      0.048       (  0.753)      0.043        0.005
  64   5.33     0.23      0.056       (  0.749)      0.050        0.006
  65   5.42     0.23      0.056       (  0.746)      0.050        0.006
  66   5.50     0.23      0.056       (  0.743)      0.050        0.006
  67   5.58     0.27      0.064       (  0.740)      0.058        0.006
  68   5.67     0.27      0.064       (  0.736)      0.058        0.006
  69   5.75     0.27      0.064       (  0.733)      0.058        0.006
  70   5.83     0.27      0.064       (  0.730)      0.058        0.006
  71   5.92     0.27      0.064       (  0.727)      0.058        0.006
  72   6.00     0.27      0.064       (  0.723)      0.058        0.006
  73   6.08     0.30      0.072       (  0.720)      0.065        0.007
  74   6.17     0.30      0.072       (  0.717)      0.065        0.007
  75   6.25     0.30      0.072       (  0.714)      0.065        0.007
  76   6.33     0.30      0.072       (  0.711)      0.065        0.007
  77   6.42     0.30      0.072       (  0.707)      0.065        0.007
  78   6.50     0.30      0.072       (  0.704)      0.065        0.007
  79   6.58     0.33      0.080       (  0.701)      0.072        0.008
  80   6.67     0.33      0.080       (  0.698)      0.072        0.008
  81   6.75     0.33      0.080       (  0.695)      0.072        0.008
  82   6.83     0.33      0.080       (  0.692)      0.072        0.008
  83   6.92     0.33      0.080       (  0.688)      0.072        0.008
  84   7.00     0.33      0.080       (  0.685)      0.072        0.008
  85   7.08     0.33      0.080       (  0.682)      0.072        0.008
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  86   7.17     0.33      0.080       (  0.679)       0.072        0.008
  87   7.25     0.33      0.080       (  0.676)       0.072        0.008
  88   7.33     0.37      0.088       (  0.673)       0.079        0.009
  89   7.42     0.37      0.088       (  0.670)       0.079        0.009
  90   7.50     0.37      0.088       (  0.667)       0.079        0.009
  91   7.58     0.40      0.096       (  0.664)       0.086        0.010
  92   7.67     0.40      0.096       (  0.661)       0.086        0.010
  93   7.75     0.40      0.096       (  0.658)       0.086        0.010
  94   7.83     0.43      0.104       (  0.655)       0.094        0.010
  95   7.92     0.43      0.104       (  0.652)       0.094        0.010
  96   8.00     0.43      0.104       (  0.649)       0.094        0.010
  97   8.08     0.50      0.120       (  0.646)       0.108        0.012
  98   8.17     0.50      0.120       (  0.643)       0.108        0.012
  99   8.25     0.50      0.120       (  0.640)       0.108        0.012
 100   8.33     0.50      0.120       (  0.637)       0.108        0.012
 101   8.42     0.50      0.120       (  0.634)       0.108        0.012
 102   8.50     0.50      0.120       (  0.631)       0.108        0.012
 103   8.58     0.53      0.128       (  0.628)       0.115        0.013
 104   8.67     0.53      0.128       (  0.625)       0.115        0.013
 105   8.75     0.53      0.128       (  0.622)       0.115        0.013
 106   8.83     0.57      0.136       (  0.619)       0.122        0.014
 107   8.92     0.57      0.136       (  0.616)       0.122        0.014
 108   9.00     0.57      0.136       (  0.613)       0.122        0.014
 109   9.08     0.63      0.152       (  0.610)       0.137        0.015
 110   9.17     0.63      0.152       (  0.607)       0.137        0.015
 111   9.25     0.63      0.152       (  0.604)       0.137        0.015
 112   9.33     0.67      0.160       (  0.601)       0.144        0.016
 113   9.42     0.67      0.160       (  0.599)       0.144        0.016
 114   9.50     0.67      0.160       (  0.596)       0.144        0.016
 115   9.58     0.70      0.168       (  0.593)       0.151        0.017
 116   9.67     0.70      0.168       (  0.590)       0.151        0.017
 117   9.75     0.70      0.168       (  0.587)       0.151        0.017
 118   9.83     0.73      0.176       (  0.584)       0.158        0.018
 119   9.92     0.73      0.176       (  0.582)       0.158        0.018
 120  10.00     0.73      0.176       (  0.579)       0.158        0.018
 121  10.08     0.50      0.120       (  0.576)       0.108        0.012
 122  10.17     0.50      0.120       (  0.573)       0.108        0.012
 123  10.25     0.50      0.120       (  0.570)       0.108        0.012
 124  10.33     0.50      0.120       (  0.568)       0.108        0.012
 125  10.42     0.50      0.120       (  0.565)       0.108        0.012
 126  10.50     0.50      0.120       (  0.562)       0.108        0.012
 127  10.58     0.67      0.160       (  0.559)       0.144        0.016
 128  10.67     0.67      0.160       (  0.557)       0.144        0.016
 129  10.75     0.67      0.160       (  0.554)       0.144        0.016
 130  10.83     0.67      0.160       (  0.551)       0.144        0.016
 131  10.92     0.67      0.160       (  0.548)       0.144        0.016
 132  11.00     0.67      0.160       (  0.546)       0.144        0.016
 133  11.08     0.63      0.152       (  0.543)       0.137        0.015
 134  11.17     0.63      0.152       (  0.540)       0.137        0.015
 135  11.25     0.63      0.152       (  0.538)       0.137        0.015
 136  11.33     0.63      0.152       (  0.535)       0.137        0.015
 137  11.42     0.63      0.152       (  0.532)       0.137        0.015
 138  11.50     0.63      0.152       (  0.530)       0.137        0.015
 139  11.58     0.57      0.136       (  0.527)       0.122        0.014
 140  11.67     0.57      0.136       (  0.525)       0.122        0.014
 141  11.75     0.57      0.136       (  0.522)       0.122        0.014
 142  11.83     0.60      0.144       (  0.519)       0.130        0.014
 143  11.92     0.60      0.144       (  0.517)       0.130        0.014
 144  12.00     0.60      0.144       (  0.514)       0.130        0.014
 145  12.08     0.83      0.200       (  0.512)       0.180        0.020
 146  12.17     0.83      0.200       (  0.509)       0.180        0.020
 147  12.25     0.83      0.200       (  0.506)       0.180        0.020
 148  12.33     0.87      0.208       (  0.504)       0.187        0.021
 149  12.42     0.87      0.208       (  0.501)       0.187        0.021
 150  12.50     0.87      0.208       (  0.499)       0.187        0.021
 151  12.58     0.93      0.224       (  0.496)       0.202        0.022
 152  12.67     0.93      0.224       (  0.494)       0.202        0.022
 153  12.75     0.93      0.224       (  0.491)       0.202        0.022
 154  12.83     0.97      0.232       (  0.489)       0.209        0.023
 155  12.92     0.97      0.232       (  0.486)       0.209        0.023
 156  13.00     0.97      0.232       (  0.484)       0.209        0.023
 157  13.08     1.13      0.272       (  0.481)       0.245        0.027
 158  13.17     1.13      0.272       (  0.479)       0.245        0.027
 159  13.25     1.13      0.272       (  0.477)       0.245        0.027
 160  13.33     1.13      0.272       (  0.474)       0.245        0.027
 161  13.42     1.13      0.272       (  0.472)       0.245        0.027
 162  13.50     1.13      0.272       (  0.469)       0.245        0.027
 163  13.58     0.77      0.184       (  0.467)       0.166        0.018
 164  13.67     0.77      0.184       (  0.465)       0.166        0.018
 165  13.75     0.77      0.184       (  0.462)       0.166        0.018
 166  13.83     0.77      0.184       (  0.460)       0.166        0.018
 167  13.92     0.77      0.184       (  0.458)       0.166        0.018
 168  14.00     0.77      0.184       (  0.455)       0.166        0.018
 169  14.08     0.90      0.216       (  0.453)       0.194        0.022
 170  14.17     0.90      0.216       (  0.451)       0.194        0.022
 171  14.25     0.90      0.216       (  0.448)       0.194        0.022
 172  14.33     0.87      0.208       (  0.446)       0.187        0.021
 173  14.42     0.87      0.208       (  0.444)       0.187        0.021
 174  14.50     0.87      0.208       (  0.441)       0.187        0.021
 175  14.58     0.87      0.208       (  0.439)       0.187        0.021
 176  14.67     0.87      0.208       (  0.437)       0.187        0.021
 177  14.75     0.87      0.208       (  0.435)       0.187        0.021
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178  14.83     0.83      0.200       (  0.432)       0.180        0.020
179  14.92     0.83      0.200       (  0.430)       0.180        0.020
180  15.00     0.83      0.200       (  0.428)       0.180        0.020
181  15.08     0.80      0.192       (  0.426)       0.173        0.019
182  15.17     0.80      0.192       (  0.424)       0.173        0.019
183  15.25     0.80      0.192       (  0.421)       0.173        0.019
184  15.33     0.77      0.184       (  0.419)       0.166        0.018
185  15.42     0.77      0.184       (  0.417)       0.166        0.018
186  15.50     0.77      0.184       (  0.415)       0.166        0.018
187  15.58     0.63      0.152       (  0.413)       0.137        0.015
188  15.67     0.63      0.152       (  0.411)       0.137        0.015
189  15.75     0.63      0.152       (  0.409)       0.137        0.015
190  15.83     0.63      0.152       (  0.407)       0.137        0.015
191  15.92     0.63      0.152       (  0.405)       0.137        0.015
192  16.00     0.63      0.152       (  0.402)       0.137        0.015
193  16.08     0.13      0.032       (  0.400)       0.029        0.003
194  16.17     0.13      0.032       (  0.398)       0.029        0.003
195  16.25     0.13      0.032       (  0.396)       0.029        0.003
196  16.33     0.13      0.032       (  0.394)       0.029        0.003
197  16.42     0.13      0.032       (  0.392)       0.029        0.003
198  16.50     0.13      0.032       (  0.390)       0.029        0.003
199  16.58     0.10      0.024       (  0.388)       0.022        0.002
200  16.67     0.10      0.024       (  0.386)       0.022        0.002
201  16.75     0.10      0.024       (  0.384)       0.022        0.002
202  16.83     0.10      0.024       (  0.382)       0.022        0.002
203  16.92     0.10      0.024       (  0.380)       0.022        0.002
204  17.00     0.10      0.024       (  0.379)       0.022        0.002
205  17.08     0.17      0.040       (  0.377)       0.036        0.004
206  17.17     0.17      0.040       (  0.375)       0.036        0.004
207  17.25     0.17      0.040       (  0.373)       0.036        0.004
208  17.33     0.17      0.040       (  0.371)       0.036        0.004
209  17.42     0.17      0.040       (  0.369)       0.036        0.004
210  17.50     0.17      0.040       (  0.367)       0.036        0.004
211  17.58     0.17      0.040       (  0.365)       0.036        0.004
212  17.67     0.17      0.040       (  0.364)       0.036        0.004
213  17.75     0.17      0.040       (  0.362)       0.036        0.004
214  17.83     0.13      0.032       (  0.360)       0.029        0.003
215  17.92     0.13      0.032       (  0.358)       0.029        0.003
216  18.00     0.13      0.032       (  0.356)       0.029        0.003
217  18.08     0.13      0.032       (  0.355)       0.029        0.003
218  18.17     0.13      0.032       (  0.353)       0.029        0.003
219  18.25     0.13      0.032       (  0.351)       0.029        0.003
220  18.33     0.13      0.032       (  0.350)       0.029        0.003
221  18.42     0.13      0.032       (  0.348)       0.029        0.003
222  18.50     0.13      0.032       (  0.346)       0.029        0.003
223  18.58     0.10      0.024       (  0.344)       0.022        0.002
224  18.67     0.10      0.024       (  0.343)       0.022        0.002
225  18.75     0.10      0.024       (  0.341)       0.022        0.002
226  18.83     0.07      0.016       (  0.340)       0.014        0.002
227  18.92     0.07      0.016       (  0.338)       0.014        0.002
228  19.00     0.07      0.016       (  0.336)       0.014        0.002
229  19.08     0.10      0.024       (  0.335)       0.022        0.002
230  19.17     0.10      0.024       (  0.333)       0.022        0.002
231  19.25     0.10      0.024       (  0.332)       0.022        0.002
232  19.33     0.13      0.032       (  0.330)       0.029        0.003
233  19.42     0.13      0.032       (  0.328)       0.029        0.003
234  19.50     0.13      0.032       (  0.327)       0.029        0.003
235  19.58     0.10      0.024       (  0.325)       0.022        0.002
236  19.67     0.10      0.024       (  0.324)       0.022        0.002
237  19.75     0.10      0.024       (  0.323)       0.022        0.002
238  19.83     0.07      0.016       (  0.321)       0.014        0.002
239  19.92     0.07      0.016       (  0.320)       0.014        0.002
240  20.00     0.07      0.016       (  0.318)       0.014        0.002
241  20.08     0.10      0.024       (  0.317)       0.022        0.002
242  20.17     0.10      0.024       (  0.315)       0.022        0.002
243  20.25     0.10      0.024       (  0.314)       0.022        0.002
244  20.33     0.10      0.024       (  0.313)       0.022        0.002
245  20.42     0.10      0.024       (  0.311)       0.022        0.002
246  20.50     0.10      0.024       (  0.310)       0.022        0.002
247  20.58     0.10      0.024       (  0.309)       0.022        0.002
248  20.67     0.10      0.024       (  0.307)       0.022        0.002
249  20.75     0.10      0.024       (  0.306)       0.022        0.002
250  20.83     0.07      0.016       (  0.305)       0.014        0.002
251  20.92     0.07      0.016       (  0.304)       0.014        0.002
252  21.00     0.07      0.016       (  0.302)       0.014        0.002
253  21.08     0.10      0.024       (  0.301)       0.022        0.002
254  21.17     0.10      0.024       (  0.300)       0.022        0.002
255  21.25     0.10      0.024       (  0.299)       0.022        0.002
256  21.33     0.07      0.016       (  0.298)       0.014        0.002
257  21.42     0.07      0.016       (  0.297)       0.014        0.002
258  21.50     0.07      0.016       (  0.296)       0.014        0.002
259  21.58     0.10      0.024       (  0.294)       0.022        0.002
260  21.67     0.10      0.024       (  0.293)       0.022        0.002
261  21.75     0.10      0.024       (  0.292)       0.022        0.002
262  21.83     0.07      0.016       (  0.291)       0.014        0.002
263  21.92     0.07      0.016       (  0.290)       0.014        0.002
264  22.00     0.07      0.016       (  0.289)       0.014        0.002
265  22.08     0.10      0.024       (  0.288)       0.022        0.002
266  22.17     0.10      0.024       (  0.287)       0.022        0.002
267  22.25     0.10      0.024       (  0.287)       0.022        0.002
268  22.33     0.07      0.016       (  0.286)       0.014        0.002
269  22.42     0.07      0.016       (  0.285)       0.014        0.002
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270  22.50     0.07      0.016       (  0.284)       0.014        0.002
271  22.58     0.07      0.016       (  0.283)       0.014        0.002
272  22.67     0.07      0.016       (  0.282)       0.014        0.002
273  22.75     0.07      0.016       (  0.282)       0.014        0.002
274  22.83     0.07      0.016       (  0.281)       0.014        0.002
275  22.92     0.07      0.016       (  0.280)       0.014        0.002
276  23.00     0.07      0.016       (  0.279)       0.014        0.002
277  23.08     0.07      0.016       (  0.279)       0.014        0.002
278  23.17     0.07      0.016       (  0.278)       0.014        0.002
279  23.25     0.07      0.016       (  0.278)       0.014        0.002
280  23.33     0.07      0.016       (  0.277)       0.014        0.002
281  23.42     0.07      0.016       (  0.276)       0.014        0.002
282  23.50     0.07      0.016       (  0.276)       0.014        0.002
283  23.58     0.07      0.016       (  0.276)       0.014        0.002
284  23.67     0.07      0.016       (  0.275)       0.014        0.002
285  23.75     0.07      0.016       (  0.275)       0.014        0.002
286  23.83     0.07      0.016       (  0.274)       0.014        0.002
287  23.92     0.07      0.016       (  0.274)       0.014        0.002
288  24.00     0.07      0.016       (  0.274)       0.014        0.002
                (Loss Rate Not Used)
    Sum =     100.0                                Sum =     2.4
       Flood volume = Effective rainfall      0.20(In)
        times area      24.0(Ac.)/[(In)/(Ft.)] =       0.4(Ac.Ft)
       Total soil loss =      1.80(In)
       Total soil loss =     3.600(Ac.Ft)
       Total rainfall =      2.00(In)
       Flood volume =       17423.2 Cubic Feet
       Total soil loss =      156808.6 Cubic Feet
       --------------------------------------------------------------------
        Peak flow rate of this hydrograph =      0.658(CFS)
       --------------------------------------------------------------------
       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                           24 - H O U R   S T O R M
                      R u n o f f     H y d r o g r a p h
       --------------------------------------------------------------------
                   Hydrograph in   5   Minute intervals ((CFS))

       --------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
-----------------------------------------------------------------------
   0+ 5       0.0003      0.04  Q         |         |         |         |
   0+10       0.0005      0.04  Q         |         |         |         |
   0+15       0.0008      0.04  Q         |         |         |         |
   0+20       0.0012      0.06  Q         |         |         |         |
   0+25       0.0016      0.06  Q         |         |         |         |
   0+30       0.0020      0.06  Q         |         |         |         |
   0+35       0.0024      0.06  Q         |         |         |         |
   0+40       0.0028      0.06  Q         |         |         |         |
   0+45       0.0032      0.06  Q         |         |         |         |
   0+50       0.0037      0.08  Q         |         |         |         |
   0+55       0.0043      0.08  Q         |         |         |         |
   1+ 0       0.0048      0.08  Q         |         |         |         |
   1+ 5       0.0052      0.06  Q         |         |         |         |
   1+10       0.0056      0.06  Q         |         |         |         |
   1+15       0.0060      0.06  Q         |         |         |         |
   1+20       0.0064      0.06  Q         |         |         |         |
   1+25       0.0068      0.06  Q         |         |         |         |
   1+30       0.0072      0.06  Q         |         |         |         |
   1+35       0.0076      0.06  Q         |         |         |         |
   1+40       0.0080      0.06  Q         |         |         |         |
   1+45       0.0084      0.06  Q         |         |         |         |
   1+50       0.0089      0.08  Q         |         |         |         |
   1+55       0.0095      0.08  Q         |         |         |         |
   2+ 0       0.0100      0.08  QV        |         |         |         |
   2+ 5       0.0105      0.08  QV        |         |         |         |
   2+10       0.0111      0.08  QV        |         |         |         |
   2+15       0.0116      0.08  QV        |         |         |         |
   2+20       0.0121      0.08  QV        |         |         |         |
   2+25       0.0127      0.08  QV        |         |         |         |
   2+30       0.0132      0.08  QV        |         |         |         |
   2+35       0.0139      0.10  QV        |         |         |         |
   2+40       0.0145      0.10  QV        |         |         |         |
   2+45       0.0152      0.10  QV        |         |         |         |
   2+50       0.0159      0.10  QV        |         |         |         |
   2+55       0.0165      0.10  QV        |         |         |         |
   3+ 0       0.0172      0.10  QV        |         |         |         |
   3+ 5       0.0179      0.10  QV        |         |         |         |
   3+10       0.0185      0.10  QV        |         |         |         |
   3+15       0.0192      0.10  QV        |         |         |         |
   3+20       0.0199      0.10  QV        |         |         |         |
   3+25       0.0205      0.10  Q V       |         |         |         |
   3+30       0.0212      0.10  Q V       |         |         |         |
   3+35       0.0219      0.10  Q V       |         |         |         |
   3+40       0.0225      0.10  Q V       |         |         |         |
   3+45       0.0232      0.10  Q V       |         |         |         |
   3+50       0.0240      0.12  Q V       |         |         |         |
   3+55       0.0248      0.12  Q V       |         |         |         |
   4+ 0       0.0256      0.12  Q V       |         |         |         |
   4+ 5       0.0264      0.12  Q V       |         |         |         |
   4+10       0.0272      0.12  Q V       |         |         |         |
   4+15       0.0280      0.12  Q V       |         |         |         |
   4+20       0.0289      0.14  Q V       |         |         |         |
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 4+25       0.0299      0.14  Q V       |         |         |         |
 4+30       0.0308      0.14  Q  V      |         |         |         |
 4+35       0.0317      0.14  Q  V      |         |         |         |
 4+40       0.0327      0.14  Q  V      |         |         |         |
 4+45       0.0336      0.14  Q  V      |         |         |         |
 4+50       0.0347      0.15  Q  V      |         |         |         |
 4+55       0.0357      0.15  Q  V      |         |         |         |
 5+ 0       0.0368      0.15  Q  V      |         |         |         |
 5+ 5       0.0376      0.12  Q  V      |         |         |         |
 5+10       0.0384      0.12  Q  V      |         |         |         |
 5+15       0.0392      0.12  Q  V      |         |         |         |
 5+20       0.0401      0.14  Q   V     |         |         |         |
 5+25       0.0411      0.14  Q   V     |         |         |         |
 5+30       0.0420      0.14  Q   V     |         |         |         |
 5+35       0.0431      0.15  Q   V     |         |         |         |
 5+40       0.0441      0.15  Q   V     |         |         |         |
 5+45       0.0452      0.15  Q   V     |         |         |         |
 5+50       0.0463      0.15  Q   V     |         |         |         |
 5+55       0.0473      0.15  Q   V     |         |         |         |
 6+ 0       0.0484      0.15  Q   V     |         |         |         |
 6+ 5       0.0496      0.17  Q   V     |         |         |         |
 6+10       0.0508      0.17  Q    V    |         |         |         |
 6+15       0.0520      0.17  Q    V    |         |         |         |
 6+20       0.0532      0.17  Q    V    |         |         |         |
 6+25       0.0544      0.17  Q    V    |         |         |         |
 6+30       0.0556      0.17  Q    V    |         |         |         |
 6+35       0.0569      0.19  Q    V    |         |         |         |
 6+40       0.0583      0.19  Q    V    |         |         |         |
 6+45       0.0596      0.19  Q    V    |         |         |         |
 6+50       0.0609      0.19  Q     V   |         |         |         |
 6+55       0.0623      0.19  Q     V   |         |         |         |
 7+ 0       0.0636      0.19  Q     V   |         |         |         |
 7+ 5       0.0649      0.19  Q     V   |         |         |         |
 7+10       0.0663      0.19  Q     V   |         |         |         |
 7+15       0.0676      0.19  Q     V   |         |         |         |
 7+20       0.0691      0.21  Q     V   |         |         |         |
 7+25       0.0705      0.21  Q      V  |         |         |         |
 7+30       0.0720      0.21  Q      V  |         |         |         |
 7+35       0.0736      0.23  Q      V  |         |         |         |
 7+40       0.0752      0.23  Q      V  |         |         |         |
 7+45       0.0768      0.23  Q      V  |         |         |         |
 7+50       0.0785      0.25  |Q     V  |         |         |         |
 7+55       0.0803      0.25  |Q      V |         |         |         |
 8+ 0       0.0820      0.25  |Q      V |         |         |         |
 8+ 5       0.0840      0.29  |Q      V |         |         |         |
 8+10       0.0860      0.29  |Q      V |         |         |         |
 8+15       0.0880      0.29  |Q      V |         |         |         |
 8+20       0.0900      0.29  |Q       V|         |         |         |
 8+25       0.0920      0.29  |Q       V|         |         |         |
 8+30       0.0940      0.29  |Q       V|         |         |         |
 8+35       0.0961      0.31  |Q       V|         |         |         |
 8+40       0.0983      0.31  |Q       V|         |         |         |
 8+45       0.1004      0.31  |Q        V         |         |         |
 8+50       0.1027      0.33  |Q        V         |         |         |
 8+55       0.1049      0.33  |Q        V         |         |         |
 9+ 0       0.1072      0.33  |Q        V         |         |         |
 9+ 5       0.1097      0.37  |Q        V         |         |         |
 9+10       0.1123      0.37  |Q        |V        |         |         |
 9+15       0.1148      0.37  |Q        |V        |         |         |
 9+20       0.1175      0.39  |Q        |V        |         |         |
 9+25       0.1201      0.39  |Q        | V       |         |         |
 9+30       0.1228      0.39  |Q        | V       |         |         |
 9+35       0.1256      0.41  |Q        | V       |         |         |
 9+40       0.1284      0.41  |Q        | V       |         |         |
 9+45       0.1312      0.41  |Q        |  V      |         |         |
 9+50       0.1341      0.43  |Q        |  V      |         |         |
 9+55       0.1371      0.43  |Q        |  V      |         |         |
10+ 0       0.1400      0.43  |Q        |   V     |         |         |
10+ 5       0.1420      0.29  |Q        |   V     |         |         |
10+10       0.1440      0.29  |Q        |   V     |         |         |
10+15       0.1460      0.29  |Q        |   V     |         |         |
10+20       0.1480      0.29  |Q        |   V     |         |         |
10+25       0.1500      0.29  |Q        |   V     |         |         |
10+30       0.1520      0.29  |Q        |    V    |         |         |
10+35       0.1547      0.39  |Q        |    V    |         |         |
10+40       0.1573      0.39  |Q        |    V    |         |         |
10+45       0.1600      0.39  |Q        |    V    |         |         |
10+50       0.1627      0.39  |Q        |     V   |         |         |
10+55       0.1653      0.39  |Q        |     V   |         |         |
11+ 0       0.1680      0.39  |Q        |     V   |         |         |
11+ 5       0.1705      0.37  |Q        |      V  |         |         |
11+10       0.1731      0.37  |Q        |      V  |         |         |
11+15       0.1756      0.37  |Q        |      V  |         |         |
11+20       0.1781      0.37  |Q        |      V  |         |         |
11+25       0.1807      0.37  |Q        |       V |         |         |
11+30       0.1832      0.37  |Q        |       V |         |         |
11+35       0.1855      0.33  |Q        |       V |         |         |
11+40       0.1877      0.33  |Q        |       V |         |         |
11+45       0.1900      0.33  |Q        |       V |         |         |
11+50       0.1924      0.35  |Q        |        V|         |         |
11+55       0.1948      0.35  |Q        |        V|         |         |
12+ 0       0.1972      0.35  |Q        |        V|         |         |
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12+ 5       0.2005      0.48  |Q        |         V         |         |
12+10       0.2039      0.48  |Q        |         V         |         |
12+15       0.2072      0.48  |Q        |         V         |         |
12+20       0.2107      0.50  | Q       |         |V        |         |
12+25       0.2141      0.50  | Q       |         |V        |         |
12+30       0.2176      0.50  | Q       |         |V        |         |
12+35       0.2213      0.54  | Q       |         | V       |         |
12+40       0.2251      0.54  | Q       |         | V       |         |
12+45       0.2288      0.54  | Q       |         | V       |         |
12+50       0.2327      0.56  | Q       |         |  V      |         |
12+55       0.2365      0.56  | Q       |         |  V      |         |
13+ 0       0.2404      0.56  | Q       |         |   V     |         |
13+ 5       0.2449      0.66  | Q       |         |   V     |         |
13+10       0.2495      0.66  | Q       |         |   V     |         |
13+15       0.2540      0.66  | Q       |         |    V    |         |
13+20       0.2585      0.66  | Q       |         |    V    |         |
13+25       0.2631      0.66  | Q       |         |     V   |         |
13+30       0.2676      0.66  | Q       |         |     V   |         |
13+35       0.2707      0.45  |Q        |         |      V  |         |
13+40       0.2737      0.45  |Q        |         |      V  |         |
13+45       0.2768      0.45  |Q        |         |      V  |         |
13+50       0.2799      0.45  |Q        |         |      V  |         |
13+55       0.2829      0.45  |Q        |         |       V |         |
14+ 0       0.2860      0.45  |Q        |         |       V |         |
14+ 5       0.2896      0.52  | Q       |         |       V |         |
14+10       0.2932      0.52  | Q       |         |        V|         |
14+15       0.2968      0.52  | Q       |         |        V|         |
14+20       0.3003      0.50  | Q       |         |         V         |
14+25       0.3037      0.50  | Q       |         |         V         |
14+30       0.3072      0.50  | Q       |         |         V         |
14+35       0.3107      0.50  | Q       |         |         |V        |
14+40       0.3141      0.50  | Q       |         |         |V        |
14+45       0.3176      0.50  | Q       |         |         |V        |
14+50       0.3209      0.48  |Q        |         |         | V       |
14+55       0.3243      0.48  |Q        |         |         | V       |
15+ 0       0.3276      0.48  |Q        |         |         | V       |
15+ 5       0.3308      0.46  |Q        |         |         |  V      |
15+10       0.3340      0.46  |Q        |         |         |  V      |
15+15       0.3372      0.46  |Q        |         |         |  V      |
15+20       0.3403      0.45  |Q        |         |         |   V     |
15+25       0.3433      0.45  |Q        |         |         |   V     |
15+30       0.3464      0.45  |Q        |         |         |   V     |
15+35       0.3489      0.37  |Q        |         |         |   V     |
15+40       0.3515      0.37  |Q        |         |         |    V    |
15+45       0.3540      0.37  |Q        |         |         |    V    |
15+50       0.3565      0.37  |Q        |         |         |    V    |
15+55       0.3590      0.37  |Q        |         |         |    V    |
16+ 0       0.3616      0.37  |Q        |         |         |     V   |
16+ 5       0.3621      0.08  Q         |         |         |     V   |
16+10       0.3626      0.08  Q         |         |         |     V   |
16+15       0.3632      0.08  Q         |         |         |     V   |
16+20       0.3637      0.08  Q         |         |         |     V   |
16+25       0.3642      0.08  Q         |         |         |     V   |
16+30       0.3648      0.08  Q         |         |         |     V   |
16+35       0.3652      0.06  Q         |         |         |     V   |
16+40       0.3656      0.06  Q         |         |         |     V   |
16+45       0.3660      0.06  Q         |         |         |     V   |
16+50       0.3664      0.06  Q         |         |         |     V   |
16+55       0.3668      0.06  Q         |         |         |     V   |
17+ 0       0.3672      0.06  Q         |         |         |     V   |
17+ 5       0.3678      0.10  Q         |         |         |     V   |
17+10       0.3685      0.10  Q         |         |         |     V   |
17+15       0.3692      0.10  Q         |         |         |     V   |
17+20       0.3698      0.10  Q         |         |         |     V   |
17+25       0.3705      0.10  Q         |         |         |      V  |
17+30       0.3712      0.10  Q         |         |         |      V  |
17+35       0.3718      0.10  Q         |         |         |      V  |
17+40       0.3725      0.10  Q         |         |         |      V  |
17+45       0.3732      0.10  Q         |         |         |      V  |
17+50       0.3737      0.08  Q         |         |         |      V  |
17+55       0.3742      0.08  Q         |         |         |      V  |
18+ 0       0.3748      0.08  Q         |         |         |      V  |
18+ 5       0.3753      0.08  Q         |         |         |      V  |
18+10       0.3758      0.08  Q         |         |         |      V  |
18+15       0.3764      0.08  Q         |         |         |      V  |
18+20       0.3769      0.08  Q         |         |         |      V  |
18+25       0.3774      0.08  Q         |         |         |      V  |
18+30       0.3780      0.08  Q         |         |         |      V  |
18+35       0.3784      0.06  Q         |         |         |      V  |
18+40       0.3788      0.06  Q         |         |         |      V  |
18+45       0.3792      0.06  Q         |         |         |      V  |
18+50       0.3794      0.04  Q         |         |         |      V  |
18+55       0.3797      0.04  Q         |         |         |      V  |
19+ 0       0.3800      0.04  Q         |         |         |      V  |
19+ 5       0.3804      0.06  Q         |         |         |       V |
19+10       0.3808      0.06  Q         |         |         |       V |
19+15       0.3812      0.06  Q         |         |         |       V |
19+20       0.3817      0.08  Q         |         |         |       V |
19+25       0.3822      0.08  Q         |         |         |       V |
19+30       0.3828      0.08  Q         |         |         |       V |
19+35       0.3832      0.06  Q         |         |         |       V |
19+40       0.3836      0.06  Q         |         |         |       V |
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   19+45       0.3840      0.06  Q          |         |         |       V |
   19+50       0.3842      0.04  Q          |         |         |       V |
   19+55       0.3845      0.04  Q          |         |         |       V |
   20+ 0       0.3848      0.04  Q          |         |         |       V |
   20+ 5       0.3852      0.06  Q          |         |         |       V |
   20+10       0.3856      0.06  Q          |         |         |       V |
   20+15       0.3860      0.06  Q          |         |         |       V |
   20+20       0.3864      0.06  Q          |         |         |       V |
   20+25       0.3868      0.06  Q          |         |         |       V |
   20+30       0.3872      0.06  Q          |         |         |       V |
   20+35       0.3876      0.06  Q          |         |         |       V |
   20+40       0.3880      0.06  Q          |         |         |       V |
   20+45       0.3884      0.06  Q          |         |         |       V |
   20+50       0.3886      0.04  Q          |         |         |       V |
   20+55       0.3889      0.04  Q          |         |         |       V |
   21+ 0       0.3892      0.04  Q          |         |         |       V |
   21+ 5       0.3896      0.06  Q          |         |         |       V |
   21+10       0.3900      0.06  Q          |         |         |        V|
   21+15       0.3904      0.06  Q          |         |         |        V|
   21+20       0.3906      0.04  Q          |         |         |        V|
   21+25       0.3909      0.04  Q          |         |         |        V|
   21+30       0.3912      0.04  Q          |         |         |        V|
   21+35       0.3916      0.06  Q          |         |         |        V|
   21+40       0.3920      0.06  Q          |         |         |        V|
   21+45       0.3924      0.06  Q          |         |         |        V|
   21+50       0.3926      0.04  Q          |         |         |        V|
   21+55       0.3929      0.04  Q          |         |         |        V|
   22+ 0       0.3932      0.04  Q          |         |         |        V|
   22+ 5       0.3936      0.06  Q          |         |         |        V|
   22+10       0.3940      0.06  Q          |         |         |        V|
   22+15       0.3944      0.06  Q          |         |         |        V|
   22+20       0.3946      0.04  Q          |         |         |        V|
   22+25       0.3949      0.04  Q          |         |         |        V|
   22+30       0.3952      0.04  Q          |         |         |        V|
   22+35       0.3954      0.04  Q          |         |         |        V|
   22+40       0.3957      0.04  Q          |         |         |        V|
   22+45       0.3960      0.04  Q          |         |         |        V|
   22+50       0.3962      0.04  Q          |         |         |        V|
   22+55       0.3965      0.04  Q          |         |         |        V|
   23+ 0       0.3968      0.04  Q          |         |         |        V|
   23+ 5       0.3970      0.04  Q          |         |         |        V|
   23+10       0.3973      0.04  Q          |         |         |        V|
   23+15       0.3976      0.04  Q          |         |         |        V|
   23+20       0.3978      0.04  Q          |         |         |        V|
   23+25       0.3981      0.04  Q          |         |         |        V|
   23+30       0.3984      0.04  Q          |         |         |        V|
   23+35       0.3986      0.04  Q          |         |         |        V|
   23+40       0.3989      0.04  Q          |         |         |        V|
   23+45       0.3992      0.04  Q          |         |         |        V|
   23+50       0.3994      0.04  Q          |         |         |        V|
   23+55       0.3997      0.04  Q          |         |         |        V|
   24+ 0       0.4000      0.04  Q          |         |         |        V|
-----------------------------------------------------------------------
```

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

                Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
                        Study date  09/23/22 File: 3384E005242.out


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

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


        Program License Serial Number 6400

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

         English Units used in output format



        ---------------------------------------------------------------------
        JURUPA VALLEY COMMERCE PARK
        BUILDING 5 - EXISTING CONDITION
        HYDROLOGIC ANALYSIS - 2-YEAR

        --------------------------------------------------------------------
        Drainage Area =       2.50(Ac.)  =      0.004 Sq. Mi.
        Drainage Area for Depth-Area Areal Adjustment =       2.50(Ac.)  =      0.004 Sq. Mi.
        USER Entry of lag time in hours
        Lag time =    0.000 Hr.
        Lag time =     0.00 Min.
        25% of lag time =     0.00 Min.
        40% of lag time =     0.00 Min.
        Unit time =     5.00 Min.
        Duration of storm = 24 Hour(s)
        User Entered Base Flow =     0.00(CFS)

        2 YEAR Area rainfall data:


        Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
                2.50            2.00                    5.00

        100 YEAR Area rainfall data:


        Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
                2.50            5.50                   13.75

        STORM EVENT (YEAR) =    2.00
        Area Averaged 2-Year Rainfall =    2.000(In)
        Area Averaged 100-Year Rainfall =    5.500(In)

        Point rain (area averaged) =    2.000(In)
        Areal adjustment factor =  100.00 %
        Adjusted average point rain =    2.000(In)

        Sub-Area Data:
        Area(Ac.)         Runoff Index   Impervious %
             1.000           84.00         0.000
             1.500           69.00         0.900
         Total Area Entered =      2.50(Ac.)


        RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
        AMC2 AMC-1     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
        84.0  68.6      0.377     0.000        0.377       0.400      0.151
        69.0  49.8      0.574     0.900        0.109       0.600      0.065
                                                          Sum (F) =   0.216
        Area averaged mean soil loss (F) (In/Hr) =  0.216
        Minimum soil loss rate ((In/Hr)) =  0.108
        (for 24 hour storm duration)
        Soil low loss rate (decimal) =   0.470
        ---------------------------------------------------------------------

                        U n i t   H y d r o g r a p h
                                VALLEY S-Curve
        --------------------------------------------------------------------
                        Unit Hydrograph Data
        ---------------------------------------------------------------------
        Unit time period   Time % of lag   Distribution   Unit Hydrograph
            (hrs)                           Graph %            (CFS)
        ---------------------------------------------------------------------
            1   0.083          1.#IO        100.000              2.520
                                      Sum = 100.000   Sum=       2.520
-----------------------------------------------------------------------
```

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

 Unit Time   Pattern   Storm Rain     Loss rate(In./Hr)     Effective
      (Hr.)  Percent   (In/Hr)         Max   |   Low       (In/Hr)
   1  0.08     0.07      0.016       (  0.383)       0.008        0.008
   2  0.17     0.07      0.016       (  0.382)       0.008        0.008
   3  0.25     0.07      0.016       (  0.380)       0.008        0.008
   4  0.33     0.10      0.024       (  0.379)       0.011        0.013
   5  0.42     0.10      0.024       (  0.377)       0.011        0.013
   6  0.50     0.10      0.024       (  0.376)       0.011        0.013
   7  0.58     0.10      0.024       (  0.375)       0.011        0.013
   8  0.67     0.10      0.024       (  0.373)       0.011        0.013
   9  0.75     0.10      0.024       (  0.372)       0.011        0.013
  10  0.83     0.13      0.032       (  0.370)       0.015        0.017
  11  0.92     0.13      0.032       (  0.369)       0.015        0.017
  12  1.00     0.13      0.032       (  0.367)       0.015        0.017
  13  1.08     0.10      0.024       (  0.366)       0.011        0.013
  14  1.17     0.10      0.024       (  0.364)       0.011        0.013
  15  1.25     0.10      0.024       (  0.363)       0.011        0.013
  16  1.33     0.10      0.024       (  0.361)       0.011        0.013
  17  1.42     0.10      0.024       (  0.360)       0.011        0.013
  18  1.50     0.10      0.024       (  0.359)       0.011        0.013
  19  1.58     0.10      0.024       (  0.357)       0.011        0.013
  20  1.67     0.10      0.024       (  0.356)       0.011        0.013
  21  1.75     0.10      0.024       (  0.354)       0.011        0.013
  22  1.83     0.13      0.032       (  0.353)       0.015        0.017
  23  1.92     0.13      0.032       (  0.351)       0.015        0.017
  24  2.00     0.13      0.032       (  0.350)       0.015        0.017
  25  2.08     0.13      0.032       (  0.349)       0.015        0.017
  26  2.17     0.13      0.032       (  0.347)       0.015        0.017
  27  2.25     0.13      0.032       (  0.346)       0.015        0.017
  28  2.33     0.13      0.032       (  0.344)       0.015        0.017
  29  2.42     0.13      0.032       (  0.343)       0.015        0.017
  30  2.50     0.13      0.032       (  0.342)       0.015        0.017
  31  2.58     0.17      0.040       (  0.340)       0.019        0.021
  32  2.67     0.17      0.040       (  0.339)       0.019        0.021
  33  2.75     0.17      0.040       (  0.337)       0.019        0.021
  34  2.83     0.17      0.040       (  0.336)       0.019        0.021
  35  2.92     0.17      0.040       (  0.335)       0.019        0.021
  36  3.00     0.17      0.040       (  0.333)       0.019        0.021
  37  3.08     0.17      0.040       (  0.332)       0.019        0.021
  38  3.17     0.17      0.040       (  0.330)       0.019        0.021
  39  3.25     0.17      0.040       (  0.329)       0.019        0.021
  40  3.33     0.17      0.040       (  0.328)       0.019        0.021
  41  3.42     0.17      0.040       (  0.326)       0.019        0.021
  42  3.50     0.17      0.040       (  0.325)       0.019        0.021
  43  3.58     0.17      0.040       (  0.324)       0.019        0.021
  44  3.67     0.17      0.040       (  0.322)       0.019        0.021
  45  3.75     0.17      0.040       (  0.321)       0.019        0.021
  46  3.83     0.20      0.048       (  0.320)       0.023        0.025
  47  3.92     0.20      0.048       (  0.318)       0.023        0.025
  48  4.00     0.20      0.048       (  0.317)       0.023        0.025
  49  4.08     0.20      0.048       (  0.316)       0.023        0.025
  50  4.17     0.20      0.048       (  0.314)       0.023        0.025
  51  4.25     0.20      0.048       (  0.313)       0.023        0.025
  52  4.33     0.23      0.056       (  0.312)       0.026        0.030
  53  4.42     0.23      0.056       (  0.310)       0.026        0.030
  54  4.50     0.23      0.056       (  0.309)       0.026        0.030
  55  4.58     0.23      0.056       (  0.308)       0.026        0.030
  56  4.67     0.23      0.056       (  0.306)       0.026        0.030
  57  4.75     0.23      0.056       (  0.305)       0.026        0.030
  58  4.83     0.27      0.064       (  0.304)       0.030        0.034
  59  4.92     0.27      0.064       (  0.302)       0.030        0.034
  60  5.00     0.27      0.064       (  0.301)       0.030        0.034
  61  5.08     0.20      0.048       (  0.300)       0.023        0.025
  62  5.17     0.20      0.048       (  0.298)       0.023        0.025
  63  5.25     0.20      0.048       (  0.297)       0.023        0.025
  64  5.33     0.23      0.056       (  0.296)       0.026        0.030
  65  5.42     0.23      0.056       (  0.294)       0.026        0.030
  66  5.50     0.23      0.056       (  0.293)       0.026        0.030
  67  5.58     0.27      0.064       (  0.292)       0.030        0.034
  68  5.67     0.27      0.064       (  0.291)       0.030        0.034
  69  5.75     0.27      0.064       (  0.289)       0.030        0.034
  70  5.83     0.27      0.064       (  0.288)       0.030        0.034
  71  5.92     0.27      0.064       (  0.287)       0.030        0.034
  72  6.00     0.27      0.064       (  0.285)       0.030        0.034
  73  6.08     0.30      0.072       (  0.284)       0.034        0.038
  74  6.17     0.30      0.072       (  0.283)       0.034        0.038
  75  6.25     0.30      0.072       (  0.282)       0.034        0.038
  76  6.33     0.30      0.072       (  0.280)       0.034        0.038
  77  6.42     0.30      0.072       (  0.279)       0.034        0.038
  78  6.50     0.30      0.072       (  0.278)       0.034        0.038
  79  6.58     0.33      0.080       (  0.277)       0.038        0.042
  80  6.67     0.33      0.080       (  0.275)       0.038        0.042
  81  6.75     0.33      0.080       (  0.274)       0.038        0.042
  82  6.83     0.33      0.080       (  0.273)       0.038        0.042
  83  6.92     0.33      0.080       (  0.272)       0.038        0.042
  84  7.00     0.33      0.080       (  0.270)       0.038        0.042
  85  7.08     0.33      0.080       (  0.269)       0.038        0.042
  86  7.17     0.33      0.080       (  0.268)       0.038        0.042
  87  7.25     0.33      0.080       (  0.267)       0.038        0.042
```

```
  88   7.33     0.37      0.088       (  0.266)       0.041        0.047
  89   7.42     0.37      0.088       (  0.264)       0.041        0.047
  90   7.50     0.37      0.088       (  0.263)       0.041        0.047
  91   7.58     0.40      0.096       (  0.262)       0.045        0.051
  92   7.67     0.40      0.096       (  0.261)       0.045        0.051
  93   7.75     0.40      0.096       (  0.260)       0.045        0.051
  94   7.83     0.43      0.104       (  0.258)       0.049        0.055
  95   7.92     0.43      0.104       (  0.257)       0.049        0.055
  96   8.00     0.43      0.104       (  0.256)       0.049        0.055
  97   8.08     0.50      0.120       (  0.255)       0.056        0.064
  98   8.17     0.50      0.120       (  0.254)       0.056        0.064
  99   8.25     0.50      0.120       (  0.252)       0.056        0.064
 100   8.33     0.50      0.120       (  0.251)       0.056        0.064
 101   8.42     0.50      0.120       (  0.250)       0.056        0.064
 102   8.50     0.50      0.120       (  0.249)       0.056        0.064
 103   8.58     0.53      0.128       (  0.248)       0.060        0.068
 104   8.67     0.53      0.128       (  0.247)       0.060        0.068
 105   8.75     0.53      0.128       (  0.245)       0.060        0.068
 106   8.83     0.57      0.136       (  0.244)       0.064        0.072
 107   8.92     0.57      0.136       (  0.243)       0.064        0.072
 108   9.00     0.57      0.136       (  0.242)       0.064        0.072
 109   9.08     0.63      0.152       (  0.241)       0.071        0.081
 110   9.17     0.63      0.152       (  0.240)       0.071        0.081
 111   9.25     0.63      0.152       (  0.238)       0.071        0.081
 112   9.33     0.67      0.160       (  0.237)       0.075        0.085
 113   9.42     0.67      0.160       (  0.236)       0.075        0.085
 114   9.50     0.67      0.160       (  0.235)       0.075        0.085
 115   9.58     0.70      0.168       (  0.234)       0.079        0.089
 116   9.67     0.70      0.168       (  0.233)       0.079        0.089
 117   9.75     0.70      0.168       (  0.232)       0.079        0.089
 118   9.83     0.73      0.176       (  0.231)       0.083        0.093
 119   9.92     0.73      0.176       (  0.229)       0.083        0.093
 120  10.00     0.73      0.176       (  0.228)       0.083        0.093
 121  10.08     0.50      0.120       (  0.227)       0.056        0.064
 122  10.17     0.50      0.120       (  0.226)       0.056        0.064
 123  10.25     0.50      0.120       (  0.225)       0.056        0.064
 124  10.33     0.50      0.120       (  0.224)       0.056        0.064
 125  10.42     0.50      0.120       (  0.223)       0.056        0.064
 126  10.50     0.50      0.120       (  0.222)       0.056        0.064
 127  10.58     0.67      0.160       (  0.221)       0.075        0.085
 128  10.67     0.67      0.160       (  0.220)       0.075        0.085
 129  10.75     0.67      0.160       (  0.219)       0.075        0.085
 130  10.83     0.67      0.160       (  0.218)       0.075        0.085
 131  10.92     0.67      0.160       (  0.216)       0.075        0.085
 132  11.00     0.67      0.160       (  0.215)       0.075        0.085
 133  11.08     0.63      0.152       (  0.214)       0.071        0.081
 134  11.17     0.63      0.152       (  0.213)       0.071        0.081
 135  11.25     0.63      0.152       (  0.212)       0.071        0.081
 136  11.33     0.63      0.152       (  0.211)       0.071        0.081
 137  11.42     0.63      0.152       (  0.210)       0.071        0.081
 138  11.50     0.63      0.152       (  0.209)       0.071        0.081
 139  11.58     0.57      0.136       (  0.208)       0.064        0.072
 140  11.67     0.57      0.136       (  0.207)       0.064        0.072
 141  11.75     0.57      0.136       (  0.206)       0.064        0.072
 142  11.83     0.60      0.144       (  0.205)       0.068        0.076
 143  11.92     0.60      0.144       (  0.204)       0.068        0.076
 144  12.00     0.60      0.144       (  0.203)       0.068        0.076
 145  12.08     0.83      0.200       (  0.202)       0.094        0.106
 146  12.17     0.83      0.200       (  0.201)       0.094        0.106
 147  12.25     0.83      0.200       (  0.200)       0.094        0.106
 148  12.33     0.87      0.208       (  0.199)       0.098        0.110
 149  12.42     0.87      0.208       (  0.198)       0.098        0.110
 150  12.50     0.87      0.208       (  0.197)       0.098        0.110
 151  12.58     0.93      0.224       (  0.196)       0.105        0.119
 152  12.67     0.93      0.224       (  0.195)       0.105        0.119
 153  12.75     0.93      0.224       (  0.194)       0.105        0.119
 154  12.83     0.97      0.232       (  0.193)       0.109        0.123
 155  12.92     0.97      0.232       (  0.192)       0.109        0.123
 156  13.00     0.97      0.232       (  0.191)       0.109        0.123
 157  13.08     1.13      0.272       (  0.190)       0.128        0.144
 158  13.17     1.13      0.272       (  0.189)       0.128        0.144
 159  13.25     1.13      0.272       (  0.188)       0.128        0.144
 160  13.33     1.13      0.272       (  0.187)       0.128        0.144
 161  13.42     1.13      0.272       (  0.186)       0.128        0.144
 162  13.50     1.13      0.272       (  0.185)       0.128        0.144
 163  13.58     0.77      0.184       (  0.184)       0.086        0.098
 164  13.67     0.77      0.184       (  0.183)       0.086        0.098
 165  13.75     0.77      0.184       (  0.182)       0.086        0.098
 166  13.83     0.77      0.184       (  0.182)       0.086        0.098
 167  13.92     0.77      0.184       (  0.181)       0.086        0.098
 168  14.00     0.77      0.184       (  0.180)       0.086        0.098
 169  14.08     0.90      0.216       (  0.179)       0.102        0.114
 170  14.17     0.90      0.216       (  0.178)       0.102        0.114
 171  14.25     0.90      0.216       (  0.177)       0.102        0.114
 172  14.33     0.87      0.208       (  0.176)       0.098        0.110
 173  14.42     0.87      0.208       (  0.175)       0.098        0.110
 174  14.50     0.87      0.208       (  0.174)       0.098        0.110
 175  14.58     0.87      0.208       (  0.173)       0.098        0.110
 176  14.67     0.87      0.208       (  0.172)       0.098        0.110
 177  14.75     0.87      0.208       (  0.172)       0.098        0.110
 178  14.83     0.83      0.200       (  0.171)       0.094        0.106
 179  14.92     0.83      0.200       (  0.170)       0.094        0.106
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180  15.00     0.83      0.200       (  0.169)       0.094        0.106
181  15.08     0.80      0.192       (  0.168)       0.090        0.102
182  15.17     0.80      0.192       (  0.167)       0.090        0.102
183  15.25     0.80      0.192       (  0.166)       0.090        0.102
184  15.33     0.77      0.184       (  0.165)       0.086        0.098
185  15.42     0.77      0.184       (  0.165)       0.086        0.098
186  15.50     0.77      0.184       (  0.164)       0.086        0.098
187  15.58     0.63      0.152       (  0.163)       0.071        0.081
188  15.67     0.63      0.152       (  0.162)       0.071        0.081
189  15.75     0.63      0.152       (  0.161)       0.071        0.081
190  15.83     0.63      0.152       (  0.160)       0.071        0.081
191  15.92     0.63      0.152       (  0.160)       0.071        0.081
192  16.00     0.63      0.152       (  0.159)       0.071        0.081
193  16.08     0.13      0.032       (  0.158)       0.015        0.017
194  16.17     0.13      0.032       (  0.157)       0.015        0.017
195  16.25     0.13      0.032       (  0.156)       0.015        0.017
196  16.33     0.13      0.032       (  0.156)       0.015        0.017
197  16.42     0.13      0.032       (  0.155)       0.015        0.017
198  16.50     0.13      0.032       (  0.154)       0.015        0.017
199  16.58     0.10      0.024       (  0.153)       0.011        0.013
200  16.67     0.10      0.024       (  0.152)       0.011        0.013
201  16.75     0.10      0.024       (  0.152)       0.011        0.013
202  16.83     0.10      0.024       (  0.151)       0.011        0.013
203  16.92     0.10      0.024       (  0.150)       0.011        0.013
204  17.00     0.10      0.024       (  0.149)       0.011        0.013
205  17.08     0.17      0.040       (  0.149)       0.019        0.021
206  17.17     0.17      0.040       (  0.148)       0.019        0.021
207  17.25     0.17      0.040       (  0.147)       0.019        0.021
208  17.33     0.17      0.040       (  0.146)       0.019        0.021
209  17.42     0.17      0.040       (  0.146)       0.019        0.021
210  17.50     0.17      0.040       (  0.145)       0.019        0.021
211  17.58     0.17      0.040       (  0.144)       0.019        0.021
212  17.67     0.17      0.040       (  0.144)       0.019        0.021
213  17.75     0.17      0.040       (  0.143)       0.019        0.021
214  17.83     0.13      0.032       (  0.142)       0.015        0.017
215  17.92     0.13      0.032       (  0.141)       0.015        0.017
216  18.00     0.13      0.032       (  0.141)       0.015        0.017
217  18.08     0.13      0.032       (  0.140)       0.015        0.017
218  18.17     0.13      0.032       (  0.139)       0.015        0.017
219  18.25     0.13      0.032       (  0.139)       0.015        0.017
220  18.33     0.13      0.032       (  0.138)       0.015        0.017
221  18.42     0.13      0.032       (  0.137)       0.015        0.017
222  18.50     0.13      0.032       (  0.137)       0.015        0.017
223  18.58     0.10      0.024       (  0.136)       0.011        0.013
224  18.67     0.10      0.024       (  0.135)       0.011        0.013
225  18.75     0.10      0.024       (  0.135)       0.011        0.013
226  18.83     0.07      0.016       (  0.134)       0.008        0.008
227  18.92     0.07      0.016       (  0.133)       0.008        0.008
228  19.00     0.07      0.016       (  0.133)       0.008        0.008
229  19.08     0.10      0.024       (  0.132)       0.011        0.013
230  19.17     0.10      0.024       (  0.131)       0.011        0.013
231  19.25     0.10      0.024       (  0.131)       0.011        0.013
232  19.33     0.13      0.032       (  0.130)       0.015        0.017
233  19.42     0.13      0.032       (  0.130)       0.015        0.017
234  19.50     0.13      0.032       (  0.129)       0.015        0.017
235  19.58     0.10      0.024       (  0.128)       0.011        0.013
236  19.67     0.10      0.024       (  0.128)       0.011        0.013
237  19.75     0.10      0.024       (  0.127)       0.011        0.013
238  19.83     0.07      0.016       (  0.127)       0.008        0.008
239  19.92     0.07      0.016       (  0.126)       0.008        0.008
240  20.00     0.07      0.016       (  0.126)       0.008        0.008
241  20.08     0.10      0.024       (  0.125)       0.011        0.013
242  20.17     0.10      0.024       (  0.124)       0.011        0.013
243  20.25     0.10      0.024       (  0.124)       0.011        0.013
244  20.33     0.10      0.024       (  0.123)       0.011        0.013
245  20.42     0.10      0.024       (  0.123)       0.011        0.013
246  20.50     0.10      0.024       (  0.122)       0.011        0.013
247  20.58     0.10      0.024       (  0.122)       0.011        0.013
248  20.67     0.10      0.024       (  0.121)       0.011        0.013
249  20.75     0.10      0.024       (  0.121)       0.011        0.013
250  20.83     0.07      0.016       (  0.120)       0.008        0.008
251  20.92     0.07      0.016       (  0.120)       0.008        0.008
252  21.00     0.07      0.016       (  0.119)       0.008        0.008
253  21.08     0.10      0.024       (  0.119)       0.011        0.013
254  21.17     0.10      0.024       (  0.118)       0.011        0.013
255  21.25     0.10      0.024       (  0.118)       0.011        0.013
256  21.33     0.07      0.016       (  0.118)       0.008        0.008
257  21.42     0.07      0.016       (  0.117)       0.008        0.008
258  21.50     0.07      0.016       (  0.117)       0.008        0.008
259  21.58     0.10      0.024       (  0.116)       0.011        0.013
260  21.67     0.10      0.024       (  0.116)       0.011        0.013
261  21.75     0.10      0.024       (  0.115)       0.011        0.013
262  21.83     0.07      0.016       (  0.115)       0.008        0.008
263  21.92     0.07      0.016       (  0.115)       0.008        0.008
264  22.00     0.07      0.016       (  0.114)       0.008        0.008
265  22.08     0.10      0.024       (  0.114)       0.011        0.013
266  22.17     0.10      0.024       (  0.113)       0.011        0.013
267  22.25     0.10      0.024       (  0.113)       0.011        0.013
268  22.33     0.07      0.016       (  0.113)       0.008        0.008
269  22.42     0.07      0.016       (  0.112)       0.008        0.008
270  22.50     0.07      0.016       (  0.112)       0.008        0.008
271  22.58     0.07      0.016       (  0.112)       0.008        0.008
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272  22.67     0.07      0.016       (  0.111)       0.008        0.008
273  22.75     0.07      0.016       (  0.111)       0.008        0.008
274  22.83     0.07      0.016       (  0.111)       0.008        0.008
275  22.92     0.07      0.016       (  0.111)       0.008        0.008
276  23.00     0.07      0.016       (  0.110)       0.008        0.008
277  23.08     0.07      0.016       (  0.110)       0.008        0.008
278  23.17     0.07      0.016       (  0.110)       0.008        0.008
279  23.25     0.07      0.016       (  0.110)       0.008        0.008
280  23.33     0.07      0.016       (  0.109)       0.008        0.008
281  23.42     0.07      0.016       (  0.109)       0.008        0.008
282  23.50     0.07      0.016       (  0.109)       0.008        0.008
283  23.58     0.07      0.016       (  0.109)       0.008        0.008
284  23.67     0.07      0.016       (  0.109)       0.008        0.008
285  23.75     0.07      0.016       (  0.108)       0.008        0.008
286  23.83     0.07      0.016       (  0.108)       0.008        0.008
287  23.92     0.07      0.016       (  0.108)       0.008        0.008
288  24.00     0.07      0.016       (  0.108)       0.008        0.008
                (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    12.7
       Flood volume = Effective rainfall      1.06(In)
        times area       2.5(Ac.)/[(In)/(Ft.)] =       0.2(Ac.Ft)
       Total soil loss =      0.94(In)
       Total soil loss =     0.196(Ac.Ft)
       Total rainfall =      2.00(In)
       Flood volume =        9619.5 Cubic Feet
       Total soil loss =        8530.5 Cubic Feet
       --------------------------------------------------------------------
        Peak flow rate of this hydrograph =      0.363(CFS)
       --------------------------------------------------------------------
       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                           24 - H O U R   S T O R M
                      R u n o f f     H y d r o g r a p h
       --------------------------------------------------------------------
                   Hydrograph in   5   Minute intervals ((CFS))

       --------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
-----------------------------------------------------------------------
   0+ 5       0.0001      0.02  Q        |         |          |        |
   0+10       0.0003      0.02  Q        |         |          |        |
   0+15       0.0004      0.02  Q        |         |          |        |
   0+20       0.0007      0.03  Q        |         |          |        |
   0+25       0.0009      0.03  Q        |         |          |        |
   0+30       0.0011      0.03  Q        |         |          |        |
   0+35       0.0013      0.03  Q        |         |          |        |
   0+40       0.0015      0.03  Q        |         |          |        |
   0+45       0.0018      0.03  Q        |         |          |        |
   0+50       0.0021      0.04  Q        |         |          |        |
   0+55       0.0024      0.04  Q        |         |          |        |
   1+ 0       0.0026      0.04  Q        |         |          |        |
   1+ 5       0.0029      0.03  Q        |         |          |        |
   1+10       0.0031      0.03  Q        |         |          |        |
   1+15       0.0033      0.03  Q        |         |          |        |
   1+20       0.0035      0.03  Q        |         |          |        |
   1+25       0.0038      0.03  Q        |         |          |        |
   1+30       0.0040      0.03  Q        |         |          |        |
   1+35       0.0042      0.03  Q        |         |          |        |
   1+40       0.0044      0.03  Q        |         |          |        |
   1+45       0.0046      0.03  Q        |         |          |        |
   1+50       0.0049      0.04  Q        |         |          |        |
   1+55       0.0052      0.04  Q        |         |          |        |
   2+ 0       0.0055      0.04  Q        |         |          |        |
   2+ 5       0.0058      0.04  QV       |         |          |        |
   2+10       0.0061      0.04  QV       |         |          |        |
   2+15       0.0064      0.04  QV       |         |          |        |
   2+20       0.0067      0.04  QV       |         |          |        |
   2+25       0.0070      0.04  QV       |         |          |        |
   2+30       0.0073      0.04  QV       |         |          |        |
   2+35       0.0077      0.05  QV       |         |          |        |
   2+40       0.0080      0.05  QV       |         |          |        |
   2+45       0.0084      0.05  QV       |         |          |        |
   2+50       0.0088      0.05  QV       |         |          |        |
   2+55       0.0091      0.05  QV       |         |          |        |
   3+ 0       0.0095      0.05  QV       |         |          |        |
   3+ 5       0.0099      0.05  QV       |         |          |        |
   3+10       0.0102      0.05  QV       |         |          |        |
   3+15       0.0106      0.05  QV       |         |          |        |
   3+20       0.0110      0.05  QV       |         |          |        |
   3+25       0.0113      0.05  Q V      |         |          |        |
   3+30       0.0117      0.05  Q V      |         |          |        |
   3+35       0.0121      0.05  Q V      |         |          |        |
   3+40       0.0124      0.05  Q V      |         |          |        |
   3+45       0.0128      0.05  Q V      |         |          |        |
   3+50       0.0132      0.06  Q V      |         |          |        |
   3+55       0.0137      0.06  Q V      |         |          |        |
   4+ 0       0.0141      0.06  Q V      |         |          |        |
   4+ 5       0.0146      0.06  Q V      |         |          |        |
   4+10       0.0150      0.06  Q V      |         |          |        |
   4+15       0.0155      0.06  Q V      |         |          |        |
   4+20       0.0160      0.07  Q V      |         |          |        |
   4+25       0.0165      0.07  Q V      |         |          |        |
   4+30       0.0170      0.07  Q  V     |         |          |        |
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 4+35       0.0175      0.07  Q  V      |         |         |         |
 4+40       0.0180      0.07  Q  V      |         |         |         |
 4+45       0.0185      0.07  Q  V      |         |         |         |
 4+50       0.0191      0.09  Q  V      |         |         |         |
 4+55       0.0197      0.09  Q  V      |         |         |         |
 5+ 0       0.0203      0.09  Q  V      |         |         |         |
 5+ 5       0.0208      0.06  Q  V      |         |         |         |
 5+10       0.0212      0.06  Q  V      |         |         |         |
 5+15       0.0216      0.06  Q  V      |         |         |         |
 5+20       0.0222      0.07  Q   V     |         |         |         |
 5+25       0.0227      0.07  Q   V     |         |         |         |
 5+30       0.0232      0.07  Q   V     |         |         |         |
 5+35       0.0238      0.09  Q   V     |         |         |         |
 5+40       0.0244      0.09  Q   V     |         |         |         |
 5+45       0.0250      0.09  Q   V     |         |         |         |
 5+50       0.0255      0.09  Q   V     |         |         |         |
 5+55       0.0261      0.09  Q   V     |         |         |         |
 6+ 0       0.0267      0.09  Q   V     |         |         |         |
 6+ 5       0.0274      0.10  Q   V     |         |         |         |
 6+10       0.0280      0.10  Q    V    |         |         |         |
 6+15       0.0287      0.10  Q    V    |         |         |         |
 6+20       0.0294      0.10  Q    V    |         |         |         |
 6+25       0.0300      0.10  Q    V    |         |         |         |
 6+30       0.0307      0.10  Q    V    |         |         |         |
 6+35       0.0314      0.11  Q    V    |         |         |         |
 6+40       0.0322      0.11  Q    V    |         |         |         |
 6+45       0.0329      0.11  Q    V    |         |         |         |
 6+50       0.0336      0.11  Q     V   |         |         |         |
 6+55       0.0344      0.11  Q     V   |         |         |         |
 7+ 0       0.0351      0.11  Q     V   |         |         |         |
 7+ 5       0.0358      0.11  Q     V   |         |         |         |
 7+10       0.0366      0.11  Q     V   |         |         |         |
 7+15       0.0373      0.11  Q     V   |         |         |         |
 7+20       0.0381      0.12  Q     V   |         |         |         |
 7+25       0.0389      0.12  Q      V  |         |         |         |
 7+30       0.0397      0.12  Q      V  |         |         |         |
 7+35       0.0406      0.13  Q      V  |         |         |         |
 7+40       0.0415      0.13  Q      V  |         |         |         |
 7+45       0.0424      0.13  Q      V  |         |         |         |
 7+50       0.0434      0.14  Q      V  |         |         |         |
 7+55       0.0443      0.14  Q       V |         |         |         |
 8+ 0       0.0453      0.14  Q       V |         |         |         |
 8+ 5       0.0464      0.16  Q       V |         |         |         |
 8+10       0.0475      0.16  Q       V |         |         |         |
 8+15       0.0486      0.16  Q       V |         |         |         |
 8+20       0.0497      0.16  Q       V |         |         |         |
 8+25       0.0508      0.16  Q        V|         |         |         |
 8+30       0.0519      0.16  Q        V|         |         |         |
 8+35       0.0531      0.17  Q        V|         |         |         |
 8+40       0.0543      0.17  Q        V|         |         |         |
 8+45       0.0554      0.17  Q         V         |         |         |
 8+50       0.0567      0.18  Q         V         |         |         |
 8+55       0.0579      0.18  Q         V         |         |         |
 9+ 0       0.0592      0.18  Q         V         |         |         |
 9+ 5       0.0606      0.20  Q         V         |         |         |
 9+10       0.0620      0.20  Q         |V        |         |         |
 9+15       0.0634      0.20  Q         |V        |         |         |
 9+20       0.0649      0.21  Q         |V        |         |         |
 9+25       0.0663      0.21  Q         | V       |         |         |
 9+30       0.0678      0.21  Q         | V       |         |         |
 9+35       0.0693      0.22  Q         | V       |         |         |
 9+40       0.0709      0.22  Q         | V       |         |         |
 9+45       0.0724      0.22  Q         |  V      |         |         |
 9+50       0.0741      0.24  Q         |  V      |         |         |
 9+55       0.0757      0.24  Q         |  V      |         |         |
10+ 0       0.0773      0.24  Q         |  V      |         |         |
10+ 5       0.0784      0.16  Q         |   V     |         |         |
10+10       0.0795      0.16  Q         |   V     |         |         |
10+15       0.0806      0.16  Q         |   V     |         |         |
10+20       0.0817      0.16  Q         |   V     |         |         |
10+25       0.0828      0.16  Q         |   V     |         |         |
10+30       0.0839      0.16  Q         |    V    |         |         |
10+35       0.0854      0.21  Q         |    V    |         |         |
10+40       0.0869      0.21  Q         |    V    |         |         |
10+45       0.0883      0.21  Q         |    V    |         |         |
10+50       0.0898      0.21  Q         |     V   |         |         |
10+55       0.0913      0.21  Q         |     V   |         |         |
11+ 0       0.0927      0.21  Q         |     V   |         |         |
11+ 5       0.0941      0.20  Q         |      V  |         |         |
11+10       0.0955      0.20  Q         |      V  |         |         |
11+15       0.0969      0.20  Q         |      V  |         |         |
11+20       0.0983      0.20  Q         |      V  |         |         |
11+25       0.0997      0.20  Q         |       V |         |         |
11+30       0.1011      0.20  Q         |       V |         |         |
11+35       0.1024      0.18  Q         |       V |         |         |
11+40       0.1036      0.18  Q         |       V |         |         |
11+45       0.1049      0.18  Q         |       V |         |         |
11+50       0.1062      0.19  Q         |        V|         |         |
11+55       0.1075      0.19  Q         |        V|         |         |
12+ 0       0.1089      0.19  Q         |        V|         |         |
12+ 5       0.1107      0.27  |Q        |         V         |         |
12+10       0.1126      0.27  |Q        |         V         |         |
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12+15       0.1144      0.27  |Q        |         V         |         |
12+20       0.1163      0.28  |Q        |         |V        |         |
12+25       0.1182      0.28  |Q        |         |V        |         |
12+30       0.1201      0.28  |Q        |         |V        |         |
12+35       0.1222      0.30  |Q        |         | V       |         |
12+40       0.1243      0.30  |Q        |         | V       |         |
12+45       0.1263      0.30  |Q        |         | V       |         |
12+50       0.1285      0.31  |Q        |         |  V      |         |
12+55       0.1306      0.31  |Q        |         |  V      |         |
13+ 0       0.1327      0.31  |Q        |         |   V     |         |
13+ 5       0.1352      0.36  |Q        |         |   V     |         |
13+10       0.1377      0.36  |Q        |         |   V     |         |
13+15       0.1402      0.36  |Q        |         |    V    |         |
13+20       0.1427      0.36  |Q        |         |    V    |         |
13+25       0.1452      0.36  |Q        |         |     V   |         |
13+30       0.1477      0.36  |Q        |         |     V   |         |
13+35       0.1494      0.25  Q         |         |      V  |         |
13+40       0.1511      0.25  Q         |         |      V  |         |
13+45       0.1528      0.25  Q         |         |      V  |         |
13+50       0.1545      0.25  Q         |         |      V  |         |
13+55       0.1562      0.25  Q         |         |       V |         |
14+ 0       0.1579      0.25  Q         |         |       V |         |
14+ 5       0.1599      0.29  |Q        |         |       V |         |
14+10       0.1619      0.29  |Q        |         |        V|         |
14+15       0.1639      0.29  |Q        |         |        V|         |
14+20       0.1658      0.28  |Q        |         |         V         |
14+25       0.1677      0.28  |Q        |         |         V         |
14+30       0.1696      0.28  |Q        |         |         V         |
14+35       0.1715      0.28  |Q        |         |         |V        |
14+40       0.1734      0.28  |Q        |         |         |V        |
14+45       0.1753      0.28  |Q        |         |         |V        |
14+50       0.1772      0.27  |Q        |         |         | V       |
14+55       0.1790      0.27  |Q        |         |         | V       |
15+ 0       0.1809      0.27  |Q        |         |         | V       |
15+ 5       0.1826      0.26  |Q        |         |         |  V      |
15+10       0.1844      0.26  |Q        |         |         |  V      |
15+15       0.1862      0.26  |Q        |         |         |  V      |
15+20       0.1879      0.25  Q         |         |         |   V     |
15+25       0.1895      0.25  Q         |         |         |   V     |
15+30       0.1912      0.25  Q         |         |         |   V     |
15+35       0.1926      0.20  Q         |         |         |   V     |
15+40       0.1940      0.20  Q         |         |         |    V    |
15+45       0.1954      0.20  Q         |         |         |    V    |
15+50       0.1968      0.20  Q         |         |         |    V    |
15+55       0.1982      0.20  Q         |         |         |    V    |
16+ 0       0.1996      0.20  Q         |         |         |     V   |
16+ 5       0.1999      0.04  Q         |         |         |     V   |
16+10       0.2002      0.04  Q         |         |         |     V   |
16+15       0.2005      0.04  Q         |         |         |     V   |
16+20       0.2008      0.04  Q         |         |         |     V   |
16+25       0.2011      0.04  Q         |         |         |     V   |
16+30       0.2014      0.04  Q         |         |         |     V   |
16+35       0.2016      0.03  Q         |         |         |     V   |
16+40       0.2018      0.03  Q         |         |         |     V   |
16+45       0.2021      0.03  Q         |         |         |     V   |
16+50       0.2023      0.03  Q         |         |         |     V   |
16+55       0.2025      0.03  Q         |         |         |     V   |
17+ 0       0.2027      0.03  Q         |         |         |     V   |
17+ 5       0.2031      0.05  Q         |         |         |     V   |
17+10       0.2035      0.05  Q         |         |         |     V   |
17+15       0.2038      0.05  Q         |         |         |     V   |
17+20       0.2042      0.05  Q         |         |         |     V   |
17+25       0.2046      0.05  Q         |         |         |      V  |
17+30       0.2049      0.05  Q         |         |         |      V  |
17+35       0.2053      0.05  Q         |         |         |      V  |
17+40       0.2057      0.05  Q         |         |         |      V  |
17+45       0.2060      0.05  Q         |         |         |      V  |
17+50       0.2063      0.04  Q         |         |         |      V  |
17+55       0.2066      0.04  Q         |         |         |      V  |
18+ 0       0.2069      0.04  Q         |         |         |      V  |
18+ 5       0.2072      0.04  Q         |         |         |      V  |
18+10       0.2075      0.04  Q         |         |         |      V  |
18+15       0.2078      0.04  Q         |         |         |      V  |
18+20       0.2081      0.04  Q         |         |         |      V  |
18+25       0.2084      0.04  Q         |         |         |      V  |
18+30       0.2087      0.04  Q         |         |         |      V  |
18+35       0.2089      0.03  Q         |         |         |      V  |
18+40       0.2091      0.03  Q         |         |         |      V  |
18+45       0.2093      0.03  Q         |         |         |      V  |
18+50       0.2095      0.02  Q         |         |         |      V  |
18+55       0.2096      0.02  Q         |         |         |      V  |
19+ 0       0.2098      0.02  Q         |         |         |      V  |
19+ 5       0.2100      0.03  Q         |         |         |       V |
19+10       0.2102      0.03  Q         |         |         |       V |
19+15       0.2105      0.03  Q         |         |         |       V |
19+20       0.2107      0.04  Q         |         |         |       V |
19+25       0.2110      0.04  Q         |         |         |       V |
19+30       0.2113      0.04  Q         |         |         |       V |
19+35       0.2116      0.03  Q         |         |         |       V |
19+40       0.2118      0.03  Q         |         |         |       V |
19+45       0.2120      0.03  Q         |         |         |       V |
19+50       0.2121      0.02  Q         |         |         |       V |
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   19+55       0.2123      0.02  Q         |         |         |       V |
   20+ 0       0.2124      0.02  Q         |         |         |       V |
   20+ 5       0.2127      0.03  Q         |         |         |       V |
   20+10       0.2129      0.03  Q         |         |         |       V |
   20+15       0.2131      0.03  Q         |         |         |       V |
   20+20       0.2133      0.03  Q         |         |         |       V |
   20+25       0.2135      0.03  Q         |         |         |       V |
   20+30       0.2138      0.03  Q         |         |         |       V |
   20+35       0.2140      0.03  Q         |         |         |       V |
   20+40       0.2142      0.03  Q         |         |         |       V |
   20+45       0.2144      0.03  Q         |         |         |       V |
   20+50       0.2146      0.02  Q         |         |         |       V |
   20+55       0.2147      0.02  Q         |         |         |       V |
   21+ 0       0.2149      0.02  Q         |         |         |       V |
   21+ 5       0.2151      0.03  Q         |         |         |       V |
   21+10       0.2153      0.03  Q         |         |         |       V |
   21+15       0.2155      0.03  Q         |         |         |        V|
   21+20       0.2157      0.02  Q         |         |         |        V|
   21+25       0.2158      0.02  Q         |         |         |        V|
   21+30       0.2160      0.02  Q         |         |         |        V|
   21+35       0.2162      0.03  Q         |         |         |        V|
   21+40       0.2164      0.03  Q         |         |         |        V|
   21+45       0.2166      0.03  Q         |         |         |        V|
   21+50       0.2168      0.02  Q         |         |         |        V|
   21+55       0.2169      0.02  Q         |         |         |        V|
   22+ 0       0.2171      0.02  Q         |         |         |        V|
   22+ 5       0.2173      0.03  Q         |         |         |        V|
   22+10       0.2175      0.03  Q         |         |         |        V|
   22+15       0.2177      0.03  Q         |         |         |        V|
   22+20       0.2179      0.02  Q         |         |         |        V|
   22+25       0.2180      0.02  Q         |         |         |        V|
   22+30       0.2182      0.02  Q         |         |         |        V|
   22+35       0.2183      0.02  Q         |         |         |        V|
   22+40       0.2185      0.02  Q         |         |         |        V|
   22+45       0.2186      0.02  Q         |         |         |        V|
   22+50       0.2188      0.02  Q         |         |         |        V|
   22+55       0.2189      0.02  Q         |         |         |        V|
   23+ 0       0.2191      0.02  Q         |         |         |        V|
   23+ 5       0.2192      0.02  Q         |         |         |        V|
   23+10       0.2194      0.02  Q         |         |         |        V|
   23+15       0.2195      0.02  Q         |         |         |        V|
   23+20       0.2197      0.02  Q         |         |         |        V|
   23+25       0.2198      0.02  Q         |         |         |        V|
   23+30       0.2199      0.02  Q         |         |         |        V|
   23+35       0.2201      0.02  Q         |         |         |        V|
   23+40       0.2202      0.02  Q         |         |         |        V|
   23+45       0.2204      0.02  Q         |         |         |        V|
   23+50       0.2205      0.02  Q         |         |         |        V|
   23+55       0.2207      0.02  Q         |         |         |        V|
   24+ 0       0.2208      0.02  Q         |         |         |        V|
-----------------------------------------------------------------------
```

# Proposed Condition

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

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
                Study date  06/28/23 File: 3384PBA2242.out


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

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


Program License Serial Number 6400

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

 English Units used in output format




---------------------------------------------------------------------
JURUPA VALLEY COMMERCE PARK
PROPOSED CONDITION - BASIN A - NODES 300-353
HYDROLOGIC ANALYSIS - 2-YEAR

--------------------------------------------------------------------
Drainage Area =      39.40(Ac.)  =      0.062 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      39.40(Ac.)  =      0.062 Sq. Mi.
Length along longest watercourse =    1708.00(Ft.)
Length along longest watercourse measured to centroid =     854.00(Ft.)
Length along longest watercourse =      0.323 Mi.
Length along longest watercourse measured to centroid =      0.162 Mi.
Difference in elevation =      41.50(Ft.)
Slope along watercourse =    128.2904 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.047 Hr.
Lag time =     2.80 Min.
25% of lag time =     0.70 Min.
40% of lag time =     1.12 Min.
Unit time =     5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow =     0.00(CFS)

2 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       39.40            2.00                   78.80

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       39.40            5.50                  216.70

STORM EVENT (YEAR) =    2.00
Area Averaged 2-Year Rainfall =    2.000(In)
Area Averaged 100-Year Rainfall =    5.500(In)

Point rain (area averaged) =    2.000(In)
Areal adjustment factor =   99.99 %
Adjusted average point rain =    2.000(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
     2.640           77.00         0.000
    21.740           32.00         0.900
    14.920           69.00         0.900
     0.100           75.00         0.900
 Total Area Entered =     39.40(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-1     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
77.0  59.4      0.476     0.000        0.476       0.067      0.032
32.0  16.2      0.870     0.900        0.165       0.552      0.091
69.0  49.8      0.574     0.900        0.109       0.379      0.041
75.0  57.0      0.501     0.900        0.095       0.003      0.000
                                                  Sum (F) =   0.165
Area averaged mean soil loss (F) (In/Hr) =  0.165
Minimum soil loss rate ((In/Hr)) =  0.082
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.230
---------------------------------------------------------------------

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

```
                        Unit Hydrograph Data
        ---------------------------------------------------------------------
        Unit time period   Time % of lag   Distribution   Unit Hydrograph
            (hrs)                             Graph %            (CFS)
        ---------------------------------------------------------------------
            1   0.083        178.639         39.453             15.666
            2   0.167        357.277         44.884             17.823
            3   0.250        535.916          9.722              3.860
            4   0.333        714.555          3.999              1.588
            5   0.417        893.193          1.942              0.771
                                      Sum = 100.000   Sum=      39.708
-----------------------------------------------------------------------


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

  Unit Time   Pattern   Storm Rain     Loss rate(In./Hr)     Effective
       (Hr.)  Percent   (In/Hr)         Max   |   Low        (In/Hr)
   1   0.08     0.07      0.016       (  0.292)      0.004        0.012
   2   0.17     0.07      0.016       (  0.291)      0.004        0.012
   3   0.25     0.07      0.016       (  0.290)      0.004        0.012
   4   0.33     0.10      0.024       (  0.289)      0.006        0.018
   5   0.42     0.10      0.024       (  0.287)      0.006        0.018
   6   0.50     0.10      0.024       (  0.286)      0.006        0.018
   7   0.58     0.10      0.024       (  0.285)      0.006        0.018
   8   0.67     0.10      0.024       (  0.284)      0.006        0.018
   9   0.75     0.10      0.024       (  0.283)      0.006        0.018
  10   0.83     0.13      0.032       (  0.282)      0.007        0.025
  11   0.92     0.13      0.032       (  0.281)      0.007        0.025
  12   1.00     0.13      0.032       (  0.280)      0.007        0.025
  13   1.08     0.10      0.024       (  0.279)      0.006        0.018
  14   1.17     0.10      0.024       (  0.277)      0.006        0.018
  15   1.25     0.10      0.024       (  0.276)      0.006        0.018
  16   1.33     0.10      0.024       (  0.275)      0.006        0.018
  17   1.42     0.10      0.024       (  0.274)      0.006        0.018
  18   1.50     0.10      0.024       (  0.273)      0.006        0.018
  19   1.58     0.10      0.024       (  0.272)      0.006        0.018
  20   1.67     0.10      0.024       (  0.271)      0.006        0.018
  21   1.75     0.10      0.024       (  0.270)      0.006        0.018
  22   1.83     0.13      0.032       (  0.269)      0.007        0.025
  23   1.92     0.13      0.032       (  0.268)      0.007        0.025
  24   2.00     0.13      0.032       (  0.267)      0.007        0.025
  25   2.08     0.13      0.032       (  0.265)      0.007        0.025
  26   2.17     0.13      0.032       (  0.264)      0.007        0.025
  27   2.25     0.13      0.032       (  0.263)      0.007        0.025
  28   2.33     0.13      0.032       (  0.262)      0.007        0.025
  29   2.42     0.13      0.032       (  0.261)      0.007        0.025
  30   2.50     0.13      0.032       (  0.260)      0.007        0.025
  31   2.58     0.17      0.040       (  0.259)      0.009        0.031
  32   2.67     0.17      0.040       (  0.258)      0.009        0.031
  33   2.75     0.17      0.040       (  0.257)      0.009        0.031
  34   2.83     0.17      0.040       (  0.256)      0.009        0.031
  35   2.92     0.17      0.040       (  0.255)      0.009        0.031
  36   3.00     0.17      0.040       (  0.254)      0.009        0.031
  37   3.08     0.17      0.040       (  0.253)      0.009        0.031
  38   3.17     0.17      0.040       (  0.252)      0.009        0.031
  39   3.25     0.17      0.040       (  0.251)      0.009        0.031
  40   3.33     0.17      0.040       (  0.250)      0.009        0.031
  41   3.42     0.17      0.040       (  0.249)      0.009        0.031
  42   3.50     0.17      0.040       (  0.247)      0.009        0.031
  43   3.58     0.17      0.040       (  0.246)      0.009        0.031
  44   3.67     0.17      0.040       (  0.245)      0.009        0.031
  45   3.75     0.17      0.040       (  0.244)      0.009        0.031
  46   3.83     0.20      0.048       (  0.243)      0.011        0.037
  47   3.92     0.20      0.048       (  0.242)      0.011        0.037
  48   4.00     0.20      0.048       (  0.241)      0.011        0.037
  49   4.08     0.20      0.048       (  0.240)      0.011        0.037
  50   4.17     0.20      0.048       (  0.239)      0.011        0.037
  51   4.25     0.20      0.048       (  0.238)      0.011        0.037
  52   4.33     0.23      0.056       (  0.237)      0.013        0.043
  53   4.42     0.23      0.056       (  0.236)      0.013        0.043
  54   4.50     0.23      0.056       (  0.235)      0.013        0.043
  55   4.58     0.23      0.056       (  0.234)      0.013        0.043
  56   4.67     0.23      0.056       (  0.233)      0.013        0.043
  57   4.75     0.23      0.056       (  0.232)      0.013        0.043
  58   4.83     0.27      0.064       (  0.231)      0.015        0.049
  59   4.92     0.27      0.064       (  0.230)      0.015        0.049
  60   5.00     0.27      0.064       (  0.229)      0.015        0.049
  61   5.08     0.20      0.048       (  0.228)      0.011        0.037
  62   5.17     0.20      0.048       (  0.227)      0.011        0.037
  63   5.25     0.20      0.048       (  0.226)      0.011        0.037
  64   5.33     0.23      0.056       (  0.225)      0.013        0.043
  65   5.42     0.23      0.056       (  0.224)      0.013        0.043
  66   5.50     0.23      0.056       (  0.223)      0.013        0.043
  67   5.58     0.27      0.064       (  0.222)      0.015        0.049
  68   5.67     0.27      0.064       (  0.221)      0.015        0.049
  69   5.75     0.27      0.064       (  0.220)      0.015        0.049
  70   5.83     0.27      0.064       (  0.219)      0.015        0.049
  71   5.92     0.27      0.064       (  0.218)      0.015        0.049
  72   6.00     0.27      0.064       (  0.217)      0.015        0.049
  73   6.08     0.30      0.072       (  0.216)      0.017        0.055
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  74   6.17     0.30      0.072       (  0.215)       0.017        0.055
  75   6.25     0.30      0.072       (  0.214)       0.017        0.055
  76   6.33     0.30      0.072       (  0.214)       0.017        0.055
  77   6.42     0.30      0.072       (  0.213)       0.017        0.055
  78   6.50     0.30      0.072       (  0.212)       0.017        0.055
  79   6.58     0.33      0.080       (  0.211)       0.018        0.062
  80   6.67     0.33      0.080       (  0.210)       0.018        0.062
  81   6.75     0.33      0.080       (  0.209)       0.018        0.062
  82   6.83     0.33      0.080       (  0.208)       0.018        0.062
  83   6.92     0.33      0.080       (  0.207)       0.018        0.062
  84   7.00     0.33      0.080       (  0.206)       0.018        0.062
  85   7.08     0.33      0.080       (  0.205)       0.018        0.062
  86   7.17     0.33      0.080       (  0.204)       0.018        0.062
  87   7.25     0.33      0.080       (  0.203)       0.018        0.062
  88   7.33     0.37      0.088       (  0.202)       0.020        0.068
  89   7.42     0.37      0.088       (  0.201)       0.020        0.068
  90   7.50     0.37      0.088       (  0.200)       0.020        0.068
  91   7.58     0.40      0.096       (  0.199)       0.022        0.074
  92   7.67     0.40      0.096       (  0.199)       0.022        0.074
  93   7.75     0.40      0.096       (  0.198)       0.022        0.074
  94   7.83     0.43      0.104       (  0.197)       0.024        0.080
  95   7.92     0.43      0.104       (  0.196)       0.024        0.080
  96   8.00     0.43      0.104       (  0.195)       0.024        0.080
  97   8.08     0.50      0.120       (  0.194)       0.028        0.092
  98   8.17     0.50      0.120       (  0.193)       0.028        0.092
  99   8.25     0.50      0.120       (  0.192)       0.028        0.092
 100   8.33     0.50      0.120       (  0.191)       0.028        0.092
 101   8.42     0.50      0.120       (  0.190)       0.028        0.092
 102   8.50     0.50      0.120       (  0.190)       0.028        0.092
 103   8.58     0.53      0.128       (  0.189)       0.029        0.099
 104   8.67     0.53      0.128       (  0.188)       0.029        0.099
 105   8.75     0.53      0.128       (  0.187)       0.029        0.099
 106   8.83     0.57      0.136       (  0.186)       0.031        0.105
 107   8.92     0.57      0.136       (  0.185)       0.031        0.105
 108   9.00     0.57      0.136       (  0.184)       0.031        0.105
 109   9.08     0.63      0.152       (  0.183)       0.035        0.117
 110   9.17     0.63      0.152       (  0.182)       0.035        0.117
 111   9.25     0.63      0.152       (  0.182)       0.035        0.117
 112   9.33     0.67      0.160       (  0.181)       0.037        0.123
 113   9.42     0.67      0.160       (  0.180)       0.037        0.123
 114   9.50     0.67      0.160       (  0.179)       0.037        0.123
 115   9.58     0.70      0.168       (  0.178)       0.039        0.129
 116   9.67     0.70      0.168       (  0.177)       0.039        0.129
 117   9.75     0.70      0.168       (  0.176)       0.039        0.129
 118   9.83     0.73      0.176       (  0.176)       0.040        0.136
 119   9.92     0.73      0.176       (  0.175)       0.040        0.136
 120  10.00     0.73      0.176       (  0.174)       0.040        0.136
 121  10.08     0.50      0.120       (  0.173)       0.028        0.092
 122  10.17     0.50      0.120       (  0.172)       0.028        0.092
 123  10.25     0.50      0.120       (  0.171)       0.028        0.092
 124  10.33     0.50      0.120       (  0.171)       0.028        0.092
 125  10.42     0.50      0.120       (  0.170)       0.028        0.092
 126  10.50     0.50      0.120       (  0.169)       0.028        0.092
 127  10.58     0.67      0.160       (  0.168)       0.037        0.123
 128  10.67     0.67      0.160       (  0.167)       0.037        0.123
 129  10.75     0.67      0.160       (  0.166)       0.037        0.123
 130  10.83     0.67      0.160       (  0.166)       0.037        0.123
 131  10.92     0.67      0.160       (  0.165)       0.037        0.123
 132  11.00     0.67      0.160       (  0.164)       0.037        0.123
 133  11.08     0.63      0.152       (  0.163)       0.035        0.117
 134  11.17     0.63      0.152       (  0.162)       0.035        0.117
 135  11.25     0.63      0.152       (  0.162)       0.035        0.117
 136  11.33     0.63      0.152       (  0.161)       0.035        0.117
 137  11.42     0.63      0.152       (  0.160)       0.035        0.117
 138  11.50     0.63      0.152       (  0.159)       0.035        0.117
 139  11.58     0.57      0.136       (  0.158)       0.031        0.105
 140  11.67     0.57      0.136       (  0.158)       0.031        0.105
 141  11.75     0.57      0.136       (  0.157)       0.031        0.105
 142  11.83     0.60      0.144       (  0.156)       0.033        0.111
 143  11.92     0.60      0.144       (  0.155)       0.033        0.111
 144  12.00     0.60      0.144       (  0.155)       0.033        0.111
 145  12.08     0.83      0.200       (  0.154)       0.046        0.154
 146  12.17     0.83      0.200       (  0.153)       0.046        0.154
 147  12.25     0.83      0.200       (  0.152)       0.046        0.154
 148  12.33     0.87      0.208       (  0.151)       0.048        0.160
 149  12.42     0.87      0.208       (  0.151)       0.048        0.160
 150  12.50     0.87      0.208       (  0.150)       0.048        0.160
 151  12.58     0.93      0.224       (  0.149)       0.052        0.172
 152  12.67     0.93      0.224       (  0.148)       0.052        0.172
 153  12.75     0.93      0.224       (  0.148)       0.052        0.172
 154  12.83     0.97      0.232       (  0.147)       0.053        0.179
 155  12.92     0.97      0.232       (  0.146)       0.053        0.179
 156  13.00     0.97      0.232       (  0.145)       0.053        0.179
 157  13.08     1.13      0.272       (  0.145)       0.063        0.209
 158  13.17     1.13      0.272       (  0.144)       0.063        0.209
 159  13.25     1.13      0.272       (  0.143)       0.063        0.209
 160  13.33     1.13      0.272       (  0.143)       0.063        0.209
 161  13.42     1.13      0.272       (  0.142)       0.063        0.209
 162  13.50     1.13      0.272       (  0.141)       0.063        0.209
 163  13.58     0.77      0.184       (  0.140)       0.042        0.142
 164  13.67     0.77      0.184       (  0.140)       0.042        0.142
 165  13.75     0.77      0.184       (  0.139)       0.042        0.142
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166  13.83     0.77      0.184       (  0.138)       0.042        0.142
167  13.92     0.77      0.184       (  0.138)       0.042        0.142
168  14.00     0.77      0.184       (  0.137)       0.042        0.142
169  14.08     0.90      0.216       (  0.136)       0.050        0.166
170  14.17     0.90      0.216       (  0.135)       0.050        0.166
171  14.25     0.90      0.216       (  0.135)       0.050        0.166
172  14.33     0.87      0.208       (  0.134)       0.048        0.160
173  14.42     0.87      0.208       (  0.133)       0.048        0.160
174  14.50     0.87      0.208       (  0.133)       0.048        0.160
175  14.58     0.87      0.208       (  0.132)       0.048        0.160
176  14.67     0.87      0.208       (  0.131)       0.048        0.160
177  14.75     0.87      0.208       (  0.131)       0.048        0.160
178  14.83     0.83      0.200       (  0.130)       0.046        0.154
179  14.92     0.83      0.200       (  0.129)       0.046        0.154
180  15.00     0.83      0.200       (  0.129)       0.046        0.154
181  15.08     0.80      0.192       (  0.128)       0.044        0.148
182  15.17     0.80      0.192       (  0.127)       0.044        0.148
183  15.25     0.80      0.192       (  0.127)       0.044        0.148
184  15.33     0.77      0.184       (  0.126)       0.042        0.142
185  15.42     0.77      0.184       (  0.125)       0.042        0.142
186  15.50     0.77      0.184       (  0.125)       0.042        0.142
187  15.58     0.63      0.152       (  0.124)       0.035        0.117
188  15.67     0.63      0.152       (  0.123)       0.035        0.117
189  15.75     0.63      0.152       (  0.123)       0.035        0.117
190  15.83     0.63      0.152       (  0.122)       0.035        0.117
191  15.92     0.63      0.152       (  0.122)       0.035        0.117
192  16.00     0.63      0.152       (  0.121)       0.035        0.117
193  16.08     0.13      0.032       (  0.120)       0.007        0.025
194  16.17     0.13      0.032       (  0.120)       0.007        0.025
195  16.25     0.13      0.032       (  0.119)       0.007        0.025
196  16.33     0.13      0.032       (  0.118)       0.007        0.025
197  16.42     0.13      0.032       (  0.118)       0.007        0.025
198  16.50     0.13      0.032       (  0.117)       0.007        0.025
199  16.58     0.10      0.024       (  0.117)       0.006        0.018
200  16.67     0.10      0.024       (  0.116)       0.006        0.018
201  16.75     0.10      0.024       (  0.116)       0.006        0.018
202  16.83     0.10      0.024       (  0.115)       0.006        0.018
203  16.92     0.10      0.024       (  0.114)       0.006        0.018
204  17.00     0.10      0.024       (  0.114)       0.006        0.018
205  17.08     0.17      0.040       (  0.113)       0.009        0.031
206  17.17     0.17      0.040       (  0.113)       0.009        0.031
207  17.25     0.17      0.040       (  0.112)       0.009        0.031
208  17.33     0.17      0.040       (  0.111)       0.009        0.031
209  17.42     0.17      0.040       (  0.111)       0.009        0.031
210  17.50     0.17      0.040       (  0.110)       0.009        0.031
211  17.58     0.17      0.040       (  0.110)       0.009        0.031
212  17.67     0.17      0.040       (  0.109)       0.009        0.031
213  17.75     0.17      0.040       (  0.109)       0.009        0.031
214  17.83     0.13      0.032       (  0.108)       0.007        0.025
215  17.92     0.13      0.032       (  0.108)       0.007        0.025
216  18.00     0.13      0.032       (  0.107)       0.007        0.025
217  18.08     0.13      0.032       (  0.107)       0.007        0.025
218  18.17     0.13      0.032       (  0.106)       0.007        0.025
219  18.25     0.13      0.032       (  0.106)       0.007        0.025
220  18.33     0.13      0.032       (  0.105)       0.007        0.025
221  18.42     0.13      0.032       (  0.105)       0.007        0.025
222  18.50     0.13      0.032       (  0.104)       0.007        0.025
223  18.58     0.10      0.024       (  0.104)       0.006        0.018
224  18.67     0.10      0.024       (  0.103)       0.006        0.018
225  18.75     0.10      0.024       (  0.103)       0.006        0.018
226  18.83     0.07      0.016       (  0.102)       0.004        0.012
227  18.92     0.07      0.016       (  0.102)       0.004        0.012
228  19.00     0.07      0.016       (  0.101)       0.004        0.012
229  19.08     0.10      0.024       (  0.101)       0.006        0.018
230  19.17     0.10      0.024       (  0.100)       0.006        0.018
231  19.25     0.10      0.024       (  0.100)       0.006        0.018
232  19.33     0.13      0.032       (  0.099)       0.007        0.025
233  19.42     0.13      0.032       (  0.099)       0.007        0.025
234  19.50     0.13      0.032       (  0.098)       0.007        0.025
235  19.58     0.10      0.024       (  0.098)       0.006        0.018
236  19.67     0.10      0.024       (  0.097)       0.006        0.018
237  19.75     0.10      0.024       (  0.097)       0.006        0.018
238  19.83     0.07      0.016       (  0.096)       0.004        0.012
239  19.92     0.07      0.016       (  0.096)       0.004        0.012
240  20.00     0.07      0.016       (  0.096)       0.004        0.012
241  20.08     0.10      0.024       (  0.095)       0.006        0.018
242  20.17     0.10      0.024       (  0.095)       0.006        0.018
243  20.25     0.10      0.024       (  0.094)       0.006        0.018
244  20.33     0.10      0.024       (  0.094)       0.006        0.018
245  20.42     0.10      0.024       (  0.094)       0.006        0.018
246  20.50     0.10      0.024       (  0.093)       0.006        0.018
247  20.58     0.10      0.024       (  0.093)       0.006        0.018
248  20.67     0.10      0.024       (  0.092)       0.006        0.018
249  20.75     0.10      0.024       (  0.092)       0.006        0.018
250  20.83     0.07      0.016       (  0.092)       0.004        0.012
251  20.92     0.07      0.016       (  0.091)       0.004        0.012
252  21.00     0.07      0.016       (  0.091)       0.004        0.012
253  21.08     0.10      0.024       (  0.091)       0.006        0.018
254  21.17     0.10      0.024       (  0.090)       0.006        0.018
255  21.25     0.10      0.024       (  0.090)       0.006        0.018
256  21.33     0.07      0.016       (  0.089)       0.004        0.012
257  21.42     0.07      0.016       (  0.089)       0.004        0.012
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258  21.50     0.07      0.016       (  0.089)       0.004        0.012
259  21.58     0.10      0.024       (  0.088)       0.006        0.018
260  21.67     0.10      0.024       (  0.088)       0.006        0.018
261  21.75     0.10      0.024       (  0.088)       0.006        0.018
262  21.83     0.07      0.016       (  0.088)       0.004        0.012
263  21.92     0.07      0.016       (  0.087)       0.004        0.012
264  22.00     0.07      0.016       (  0.087)       0.004        0.012
265  22.08     0.10      0.024       (  0.087)       0.006        0.018
266  22.17     0.10      0.024       (  0.086)       0.006        0.018
267  22.25     0.10      0.024       (  0.086)       0.006        0.018
268  22.33     0.07      0.016       (  0.086)       0.004        0.012
269  22.42     0.07      0.016       (  0.086)       0.004        0.012
270  22.50     0.07      0.016       (  0.085)       0.004        0.012
271  22.58     0.07      0.016       (  0.085)       0.004        0.012
272  22.67     0.07      0.016       (  0.085)       0.004        0.012
273  22.75     0.07      0.016       (  0.085)       0.004        0.012
274  22.83     0.07      0.016       (  0.084)       0.004        0.012
275  22.92     0.07      0.016       (  0.084)       0.004        0.012
276  23.00     0.07      0.016       (  0.084)       0.004        0.012
277  23.08     0.07      0.016       (  0.084)       0.004        0.012
278  23.17     0.07      0.016       (  0.084)       0.004        0.012
279  23.25     0.07      0.016       (  0.083)       0.004        0.012
280  23.33     0.07      0.016       (  0.083)       0.004        0.012
281  23.42     0.07      0.016       (  0.083)       0.004        0.012
282  23.50     0.07      0.016       (  0.083)       0.004        0.012
283  23.58     0.07      0.016       (  0.083)       0.004        0.012
284  23.67     0.07      0.016       (  0.083)       0.004        0.012
285  23.75     0.07      0.016       (  0.083)       0.004        0.012
286  23.83     0.07      0.016       (  0.082)       0.004        0.012
287  23.92     0.07      0.016       (  0.082)       0.004        0.012
288  24.00     0.07      0.016       (  0.082)       0.004        0.012
                (Loss Rate Not Used)
    Sum =     100.0                                   Sum =    18.5
       Flood volume = Effective rainfall      1.54(In)
        times area      39.4(Ac.)/[(In)/(Ft.)] =       5.1(Ac.Ft)
       Total soil loss =      0.46(In)
       Total soil loss =     1.510(Ac.Ft)
       Total rainfall =      2.00(In)
       Flood volume =      220236.9 Cubic Feet
       Total soil loss =       65785.1 Cubic Feet
       --------------------------------------------------------------------
        Peak flow rate of this hydrograph =      8.320(CFS)
       --------------------------------------------------------------------
       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                           24 - H O U R   S T O R M
                      R u n o f f      H y d r o g r a p h
       --------------------------------------------------------------------
                   Hydrograph in   5   Minute intervals ((CFS))

       --------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
 -----------------------------------------------------------------------
   0+ 5       0.0013      0.19  Q         |         |         |         |
   0+10       0.0042      0.41  VQ        |         |         |         |
   0+15       0.0073      0.46  VQ        |         |         |         |
   0+20       0.0113      0.58  V Q       |         |         |         |
   0+25       0.0161      0.70  V Q       |         |         |         |
   0+30       0.0211      0.72  V Q       |         |         |         |
   0+35       0.0261      0.73  V Q       |         |         |         |
   0+40       0.0311      0.73  V Q       |         |         |         |
   0+45       0.0362      0.73  V Q       |         |         |         |
   0+50       0.0419      0.83  V  Q      |         |         |         |
   0+55       0.0484      0.94  V  Q      |         |         |         |
   1+ 0       0.0550      0.96  V  Q      |         |         |         |
   1+ 5       0.0611      0.88  V  Q      |         |         |         |
   1+10       0.0664      0.77  V  Q      |         |         |         |
   1+15       0.0716      0.75  V Q       |         |         |         |
   1+20       0.0766      0.74  V Q       |         |         |         |
   1+25       0.0817      0.73  V Q       |         |         |         |
   1+30       0.0868      0.73  V Q       |         |         |         |
   1+35       0.0918      0.73  V Q       |         |         |         |
   1+40       0.0969      0.73  V Q       |         |         |         |
   1+45       0.1019      0.73  V Q       |         |         |         |
   1+50       0.1076      0.83  V  Q      |         |         |         |
   1+55       0.1141      0.94  V  Q      |         |         |         |
   2+ 0       0.1208      0.96  V  Q      |         |         |         |
   2+ 5       0.1275      0.97  |V Q      |         |         |         |
   2+10       0.1342      0.98  |V Q      |         |         |         |
   2+15       0.1410      0.98  |V Q      |         |         |         |
   2+20       0.1477      0.98  |V Q      |         |         |         |
   2+25       0.1544      0.98  |V Q      |         |         |         |
   2+30       0.1612      0.98  |V Q      |         |         |         |
   2+35       0.1686      1.08  |V  Q     |         |         |         |
   2+40       0.1767      1.19  |V  Q     |         |         |         |
   2+45       0.1851      1.21  |V  Q     |         |         |         |
   2+50       0.1935      1.22  |V  Q     |         |         |         |
   2+55       0.2019      1.22  |V  Q     |         |         |         |
   3+ 0       0.2103      1.22  |V  Q     |         |         |         |
   3+ 5       0.2187      1.22  |V  Q     |         |         |         |
   3+10       0.2272      1.22  |V  Q     |         |         |         |
   3+15       0.2356      1.22  |V  Q     |         |         |         |
   3+20       0.2440      1.22  |V  Q     |         |         |         |
```

```
 3+25       0.2525      1.22  |V  Q     |         |         |         |
 3+30       0.2609      1.22  | V Q     |         |         |         |
 3+35       0.2693      1.22  | V Q     |         |         |         |
 3+40       0.2777      1.22  | V Q     |         |         |         |
 3+45       0.2862      1.22  | V Q     |         |         |         |
 3+50       0.2953      1.32  | V  Q    |         |         |         |
 3+55       0.3051      1.43  | V  Q    |         |         |         |
 4+ 0       0.3151      1.45  | V  Q    |         |         |         |
 4+ 5       0.3252      1.46  | V  Q    |         |         |         |
 4+10       0.3353      1.47  | V  Q    |         |         |         |
 4+15       0.3454      1.47  | V  Q    |         |         |         |
 4+20       0.3562      1.56  | V   Q   |         |         |         |
 4+25       0.3677      1.67  | V   Q   |         |         |         |
 4+30       0.3794      1.70  |  V  Q   |         |         |         |
 4+35       0.3912      1.71  |  V  Q   |         |         |         |
 4+40       0.4030      1.71  |  V  Q   |         |         |         |
 4+45       0.4148      1.71  |  V  Q   |         |         |         |
 4+50       0.4272      1.81  |  V   Q  |         |         |         |
 4+55       0.4405      1.92  |  V   Q  |         |         |         |
 5+ 0       0.4538      1.94  |  V   Q  |         |         |         |
 5+ 5       0.4660      1.76  |  V   Q  |         |         |         |
 5+10       0.4766      1.54  |  V  Q   |         |         |         |
 5+15       0.4869      1.50  |  V Q    |         |         |         |
 5+20       0.4978      1.57  |  V  Q   |         |         |         |
 5+25       0.5093      1.67  |   V Q   |         |         |         |
 5+30       0.5210      1.70  |   V Q   |         |         |         |
 5+35       0.5334      1.80  |   V  Q  |         |         |         |
 5+40       0.5466      1.92  |   V  Q  |         |         |         |
 5+45       0.5600      1.94  |   V  Q  |         |         |         |
 5+50       0.5735      1.95  |   V  Q  |         |         |         |
 5+55       0.5869      1.96  |   V  Q  |         |         |         |
 6+ 0       0.6004      1.96  |   V  Q  |         |         |         |
 6+ 5       0.6146      2.05  |   V   Q |         |         |         |
 6+10       0.6295      2.16  |   V   Q |         |         |         |
 6+15       0.6446      2.19  |    V  Q |         |         |         |
 6+20       0.6597      2.20  |    V  Q |         |         |         |
 6+25       0.6749      2.20  |    V  Q |         |         |         |
 6+30       0.6900      2.20  |    V  Q |         |         |         |
 6+35       0.7059      2.30  |    V   Q|         |         |         |
 6+40       0.7224      2.41  |    V   Q|         |         |         |
 6+45       0.7392      2.43  |    V   Q|         |         |         |
 6+50       0.7560      2.44  |    V   Q|         |         |         |
 6+55       0.7729      2.45  |     V  Q|         |         |         |
 7+ 0       0.7897      2.45  |     V  Q|         |         |         |
 7+ 5       0.8066      2.45  |     V  Q|         |         |         |
 7+10       0.8234      2.45  |     V  Q|         |         |         |
 7+15       0.8403      2.45  |     V  Q|         |         |         |
 7+20       0.8578      2.54  |     V   Q         |         |         |
 7+25       0.8761      2.65  |     V   Q         |         |         |
 7+30       0.8945      2.68  |      V  Q         |         |         |
 7+35       0.9137      2.78  |      V  |Q        |         |         |
 7+40       0.9336      2.90  |      V  |Q        |         |         |
 7+45       0.9538      2.92  |      V  |Q        |         |         |
 7+50       0.9746      3.03  |      V  | Q       |         |         |
 7+55       0.9963      3.14  |      V  | Q       |         |         |
 8+ 0       1.0181      3.17  |       V | Q       |         |         |
 8+ 5       1.0413      3.37  |       V |  Q      |         |         |
 8+10       1.0660      3.59  |       V |   Q     |         |         |
 8+15       1.0911      3.64  |       V |   Q     |         |         |
 8+20       1.1163      3.66  |       V |   Q     |         |         |
 8+25       1.1416      3.67  |        V|   Q     |         |         |
 8+30       1.1669      3.67  |        V|   Q     |         |         |
 8+35       1.1928      3.77  |        V|    Q    |         |         |
 8+40       1.2195      3.88  |        V|    Q    |         |         |
 8+45       1.2464      3.90  |        V|    Q    |         |         |
 8+50       1.2740      4.01  |         V     Q   |         |         |
 8+55       1.3024      4.12  |         V     Q   |         |         |
 9+ 0       1.3309      4.15  |         V     Q   |         |         |
 9+ 5       1.3609      4.35  |         V      Q  |         |         |
 9+10       1.3924      4.57  |         |V      Q |         |         |
 9+15       1.4242      4.62  |         |V      Q |         |         |
 9+20       1.4568      4.74  |         |V      Q |         |         |
 9+25       1.4903      4.86  |         |V       Q|         |         |
 9+30       1.5239      4.88  |         | V      Q|         |         |
 9+35       1.5582      4.99  |         | V      Q|         |         |
 9+40       1.5933      5.10  |         | V       Q         |         |
 9+45       1.6286      5.12  |         | V       Q         |         |
 9+50       1.6646      5.23  |         |  V      Q         |         |
 9+55       1.7015      5.35  |         |  V      |Q        |         |
10+ 0       1.7384      5.37  |         |  V      |Q        |         |
10+ 5       1.7708      4.70  |         |   V   Q |         |         |
10+10       1.7980      3.94  |         |   VQ    |         |         |
10+15       1.8239      3.77  |         |   VQ    |         |         |
10+20       1.8494      3.70  |         |   Q     |         |         |
10+25       1.8747      3.67  |         |   Q     |         |         |
10+30       1.9000      3.67  |         |   QV    |         |         |
10+35       1.9286      4.15  |         |    VQ   |         |         |
10+40       1.9610      4.70  |         |    V  Q |         |         |
10+45       1.9942      4.82  |         |    V   Q|         |         |
10+50       2.0277      4.87  |         |     V  Q|         |         |
10+55       2.0614      4.89  |         |     V  Q|         |         |
11+ 0       2.0952      4.89  |         |     V  Q|         |         |
```

```
11+ 5       2.1282      4.80  |         |     V  Q|         |         |
11+10       2.1605      4.69  |         |      VQ |         |         |
11+15       2.1926      4.66  |         |      VQ |         |         |
11+20       2.2247      4.65  |         |      VQ |         |         |
11+25       2.2567      4.65  |         |      VQ |         |         |
11+30       2.2887      4.65  |         |       Q |         |         |
11+35       2.3194      4.46  |         |      QV |         |         |
11+40       2.3486      4.24  |         |     Q V |         |         |
11+45       2.3774      4.19  |         |     Q V |         |         |
11+50       2.4068      4.27  |         |      Q V|         |         |
11+55       2.4369      4.37  |         |      Q V|         |         |
12+ 0       2.4671      4.39  |         |      Q V|         |         |
12+ 5       2.5021      5.08  |         |        VQ         |         |
12+10       2.5423      5.85  |         |         V  Q      |         |
12+15       2.5838      6.02  |         |         V   Q     |         |
12+20       2.6263      6.18  |         |         V   Q     |         |
12+25       2.6699      6.32  |         |         |V   Q    |         |
12+30       2.7136      6.35  |         |         |V   Q    |         |
12+35       2.7587      6.55  |         |         |V    Q   |         |
12+40       2.8054      6.78  |         |         | V    Q  |         |
12+45       2.8524      6.82  |         |         | V    Q  |         |
12+50       2.9002      6.94  |         |         | V    Q  |         |
12+55       2.9488      7.06  |         |         |  V    Q |         |
13+ 0       2.9976      7.08  |         |         |  V    Q |         |
13+ 5       3.0497      7.57  |         |         |   V     Q         |
13+10       3.1057      8.13  |         |         |   V     | Q       |
13+15       3.1625      8.25  |         |         |    V    | Q       |
13+20       3.2196      8.30  |         |         |    V    |  Q      |
13+25       3.2769      8.32  |         |         |    V    |  Q      |
13+30       3.3342      8.32  |         |         |     V   |  Q      |
13+35       3.3842      7.26  |         |         |     V  Q|         |
13+40       3.4259      6.05  |         |         |   Q  V  |         |
13+45       3.4658      5.79  |         |         |  Q   V  |         |
13+50       3.5049      5.68  |         |         | Q    V  |         |
13+55       3.5436      5.63  |         |         | Q     V |         |
14+ 0       3.5824      5.63  |         |         | Q     V |         |
14+ 5       3.6238      6.01  |         |         |   Q   V |         |
14+10       3.6683      6.45  |         |         |    Q   V|         |
14+15       3.7134      6.55  |         |         |     Q  V|         |
14+20       3.7581      6.49  |         |         |    Q   V|         |
14+25       3.8022      6.40  |         |         |    Q    V         |
14+30       3.8461      6.38  |         |         |    Q    V         |
14+35       3.8899      6.37  |         |         |    Q    V         |
14+40       3.9338      6.36  |         |         |    Q    |V        |
14+45       3.9776      6.36  |         |         |    Q    |V        |
14+50       4.0207      6.27  |         |         |    Q    |V        |
14+55       4.0631      6.16  |         |         |   Q     | V       |
15+ 0       4.1054      6.13  |         |         |   Q     | V       |
15+ 5       4.1469      6.03  |         |         |   Q     | V       |
15+10       4.1876      5.91  |         |         |  Q      |  V      |
15+15       4.2281      5.89  |         |         |  Q      |  V      |
15+20       4.2679      5.78  |         |         |  Q      |  V      |
15+25       4.3070      5.67  |         |         | Q       |   V     |
15+30       4.3458      5.64  |         |         | Q       |   V     |
15+35       4.3820      5.25  |         |         Q         |   V     |
15+40       4.4150      4.80  |         |        Q|         |   V     |
15+45       4.4475      4.71  |         |       Q |         |    V    |
15+50       4.4796      4.67  |         |       Q |         |    V    |
15+55       4.5116      4.65  |         |       Q |         |    V    |
16+ 0       4.5436      4.65  |         |       Q |         |    V    |
16+ 5       4.5657      3.20  |         | Q       |         |     V   |
16+10       4.5764      1.55  |     Q   |         |         |     V   |
16+15       4.5846      1.20  |   Q     |         |         |     V   |
16+20       4.5919      1.05  |   Q     |         |         |     V   |
16+25       4.5986      0.98  |  Q      |         |         |     V   |
16+30       4.6054      0.98  |  Q      |         |         |     V   |
16+35       4.6114      0.88  |  Q      |         |         |     V   |
16+40       4.6167      0.77  |  Q      |         |         |     V   |
16+45       4.6219      0.75  | Q       |         |         |     V   |
16+50       4.6270      0.74  | Q       |         |         |     V   |
16+55       4.6320      0.73  | Q       |         |         |     V   |
17+ 0       4.6371      0.73  | Q       |         |         |     V   |
17+ 5       4.6435      0.93  |  Q      |         |         |     V   |
17+10       4.6514      1.15  |   Q     |         |         |     V   |
17+15       4.6596      1.19  |   Q     |         |         |     V   |
17+20       4.6680      1.21  |   Q     |         |         |     V   |
17+25       4.6764      1.22  |   Q     |         |         |     V   |
17+30       4.6848      1.22  |   Q     |         |         |      V  |
17+35       4.6933      1.22  |   Q     |         |         |      V  |
17+40       4.7017      1.22  |   Q     |         |         |      V  |
17+45       4.7101      1.22  |   Q     |         |         |      V  |
17+50       4.7179      1.13  |   Q     |         |         |      V  |
17+55       4.7249      1.02  |   Q     |         |         |      V  |
18+ 0       4.7317      0.99  |  Q      |         |         |      V  |
18+ 5       4.7385      0.98  |  Q      |         |         |      V  |
18+10       4.7452      0.98  |  Q      |         |         |      V  |
18+15       4.7520      0.98  |  Q      |         |         |      V  |
18+20       4.7587      0.98  |  Q      |         |         |      V  |
18+25       4.7655      0.98  |  Q      |         |         |      V  |
18+30       4.7722      0.98  |  Q      |         |         |      V  |
18+35       4.7783      0.88  |  Q      |         |         |      V  |
18+40       4.7836      0.77  |  Q      |         |         |      V  |
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   18+45       4.7888      0.75  | Q       |         |         |      V  |
   18+50       4.7932      0.64  | Q       |         |         |      V  |
   18+55       4.7968      0.53  | Q       |         |         |      V  |
   19+ 0       4.8003      0.50  | Q       |         |         |      V  |
   19+ 5       4.8043      0.59  | Q       |         |         |       V |
   19+10       4.8091      0.70  | Q       |         |         |       V |
   19+15       4.8141      0.72  | Q       |         |         |       V |
   19+20       4.8198      0.83  |  Q      |         |         |       V |
   19+25       4.8263      0.94  |  Q      |         |         |       V |
   19+30       4.8329      0.96  |  Q      |         |         |       V |
   19+35       4.8389      0.88  |  Q      |         |         |       V |
   19+40       4.8443      0.77  |  Q      |         |         |       V |
   19+45       4.8494      0.75  | Q       |         |         |       V |
   19+50       4.8538      0.64  | Q       |         |         |       V |
   19+55       4.8575      0.53  | Q       |         |         |       V |
   20+ 0       4.8610      0.50  | Q       |         |         |       V |
   20+ 5       4.8650      0.59  | Q       |         |         |       V |
   20+10       4.8698      0.70  | Q       |         |         |       V |
   20+15       4.8748      0.72  | Q       |         |         |       V |
   20+20       4.8798      0.73  | Q       |         |         |       V |
   20+25       4.8848      0.73  | Q       |         |         |       V |
   20+30       4.8899      0.73  | Q       |         |         |       V |
   20+35       4.8950      0.73  | Q       |         |         |       V |
   20+40       4.9000      0.73  | Q       |         |         |       V |
   20+45       4.9051      0.73  | Q       |         |         |       V |
   20+50       4.9095      0.64  | Q       |         |         |       V |
   20+55       4.9131      0.53  | Q       |         |         |       V |
   21+ 0       4.9166      0.50  | Q       |         |         |       V |
   21+ 5       4.9206      0.59  | Q       |         |         |       V |
   21+10       4.9254      0.70  | Q       |         |         |       V |
   21+15       4.9304      0.72  | Q       |         |         |        V|
   21+20       4.9347      0.63  | Q       |         |         |        V|
   21+25       4.9384      0.53  | Q       |         |         |        V|
   21+30       4.9418      0.50  | Q       |         |         |        V|
   21+35       4.9459      0.59  | Q       |         |         |        V|
   21+40       4.9507      0.70  | Q       |         |         |        V|
   21+45       4.9557      0.72  | Q       |         |         |        V|
   21+50       4.9600      0.63  | Q       |         |         |        V|
   21+55       4.9637      0.53  | Q       |         |         |        V|
   22+ 0       4.9671      0.50  | Q       |         |         |        V|
   22+ 5       4.9712      0.59  | Q       |         |         |        V|
   22+10       4.9760      0.70  | Q       |         |         |        V|
   22+15       4.9809      0.72  | Q       |         |         |        V|
   22+20       4.9853      0.63  | Q       |         |         |        V|
   22+25       4.9889      0.53  | Q       |         |         |        V|
   22+30       4.9924      0.50  | Q       |         |         |        V|
   22+35       4.9958      0.49  |Q        |         |         |        V|
   22+40       4.9992      0.49  |Q        |         |         |        V|
   22+45       5.0026      0.49  |Q        |         |         |        V|
   22+50       5.0059      0.49  |Q        |         |         |        V|
   22+55       5.0093      0.49  |Q        |         |         |        V|
   23+ 0       5.0127      0.49  |Q        |         |         |        V|
   23+ 5       5.0160      0.49  |Q        |         |         |        V|
   23+10       5.0194      0.49  |Q        |         |         |        V|
   23+15       5.0228      0.49  |Q        |         |         |        V|
   23+20       5.0261      0.49  |Q        |         |         |        V|
   23+25       5.0295      0.49  |Q        |         |         |        V|
   23+30       5.0329      0.49  |Q        |         |         |        V|
   23+35       5.0363      0.49  |Q        |         |         |        V|
   23+40       5.0396      0.49  |Q        |         |         |        V|
   23+45       5.0430      0.49  |Q        |         |         |        V|
   23+50       5.0464      0.49  |Q        |         |         |        V|
   23+55       5.0497      0.49  |Q        |         |         |        V|
   24+ 0       5.0531      0.49  |Q        |         |         |        V|
   24+ 5       5.0552      0.30  |Q        |         |         |        V|
   24+10       5.0557      0.08  Q         |         |         |        V|
   24+15       5.0559      0.03  Q         |         |         |        V|
   24+20       5.0559      0.01  Q         |         |         |         V
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        U n i t   H y d r o g r a p h   A n a l y s i s

        Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
                Study date  06/28/23 File: 3384PBB2242.out


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


Program License Serial Number 6400

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

 English Units used in output format




---------------------------------------------------------------------
JURUPA VALLEY COMMERCE PARK
PROPOSED CONDITION - BASIN B - NODES 200-235
HYDROLOGIC ANALYSIS - 2-YEAR

--------------------------------------------------------------------
Drainage Area =      23.89(Ac.)  =      0.037 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      23.89(Ac.)  =      0.037 Sq. Mi.
Length along longest watercourse =    2546.00(Ft.)
Length along longest watercourse measured to centroid =    1273.00(Ft.)
Length along longest watercourse =      0.482 Mi.
Length along longest watercourse measured to centroid =      0.241 Mi.
Difference in elevation =      47.25(Ft.)
Slope along watercourse =     97.9890 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.067 Hr.
Lag time =     3.99 Min.
25% of lag time =     1.00 Min.
40% of lag time =     1.60 Min.
Unit time =     5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow =     0.00(CFS)

2 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       23.89            2.00                  47.78

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       23.89            5.50                 131.40

STORM EVENT (YEAR) =    2.00
Area Averaged 2-Year Rainfall =    2.000(In)
Area Averaged 100-Year Rainfall =    5.500(In)

Point rain (area averaged) =    2.000(In)
Areal adjustment factor =  100.00 %
Adjusted average point rain =    2.000(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
     1.300           46.00         0.000
     0.900           77.00         0.000
     0.330           83.00         0.000
    14.720           32.00         0.900
     1.480           69.00         0.900
     5.160           75.00         0.900
 Total Area Entered =     23.89(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-1     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
46.0  27.0      0.784     0.000        0.784       0.054      0.043
77.0  59.4      0.476     0.000        0.476       0.038      0.018
83.0  67.2      0.392     0.000        0.392       0.014      0.005
32.0  16.2      0.870     0.900        0.165       0.616      0.102
69.0  49.8      0.574     0.900        0.109       0.062      0.007
75.0  57.0      0.501     0.900        0.095       0.216      0.021
                                                  Sum (F) =   0.195
Area averaged mean soil loss (F) (In/Hr) =  0.195
Minimum soil loss rate ((In/Hr)) =  0.098
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.260
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                        U n i t   H y d r o g r a p h
                                VALLEY S-Curve
        --------------------------------------------------------------------
                        Unit Hydrograph Data
        ---------------------------------------------------------------------
        Unit time period   Time % of lag   Distribution   Unit Hydrograph
            (hrs)                           Graph %            (CFS)
        ---------------------------------------------------------------------
            1   0.083        125.309        26.717             6.433
            2   0.167        250.617        48.518            11.682
            3   0.250        375.926        12.863             3.097
            4   0.333        501.234         5.787             1.393
            5   0.417        626.543         3.215             0.774
            6   0.500        751.851         1.782             0.429
            7   0.583        877.160         1.117             0.269
                                      Sum = 100.000   Sum=      24.077
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 The following loss rate calculations reflect use of the minimum calculated loss
 rate subtracted from the Storm Rain to produce the maximum Effective Rain value

  Unit Time   Pattern   Storm Rain     Loss rate(In./Hr)     Effective
       (Hr.)  Percent   (In/Hr)         Max   |   Low        (In/Hr)
   1   0.08     0.07      0.016       (  0.346)      0.004        0.012
   2   0.17     0.07      0.016       (  0.345)      0.004        0.012
   3   0.25     0.07      0.016       (  0.343)      0.004        0.012
   4   0.33     0.10      0.024       (  0.342)      0.006        0.018
   5   0.42     0.10      0.024       (  0.341)      0.006        0.018
   6   0.50     0.10      0.024       (  0.339)      0.006        0.018
   7   0.58     0.10      0.024       (  0.338)      0.006        0.018
   8   0.67     0.10      0.024       (  0.337)      0.006        0.018
   9   0.75     0.10      0.024       (  0.335)      0.006        0.018
  10   0.83     0.13      0.032       (  0.334)      0.008        0.024
  11   0.92     0.13      0.032       (  0.333)      0.008        0.024
  12   1.00     0.13      0.032       (  0.331)      0.008        0.024
  13   1.08     0.10      0.024       (  0.330)      0.006        0.018
  14   1.17     0.10      0.024       (  0.329)      0.006        0.018
  15   1.25     0.10      0.024       (  0.328)      0.006        0.018
  16   1.33     0.10      0.024       (  0.326)      0.006        0.018
  17   1.42     0.10      0.024       (  0.325)      0.006        0.018
  18   1.50     0.10      0.024       (  0.324)      0.006        0.018
  19   1.58     0.10      0.024       (  0.322)      0.006        0.018
  20   1.67     0.10      0.024       (  0.321)      0.006        0.018
  21   1.75     0.10      0.024       (  0.320)      0.006        0.018
  22   1.83     0.13      0.032       (  0.319)      0.008        0.024
  23   1.92     0.13      0.032       (  0.317)      0.008        0.024
  24   2.00     0.13      0.032       (  0.316)      0.008        0.024
  25   2.08     0.13      0.032       (  0.315)      0.008        0.024
  26   2.17     0.13      0.032       (  0.313)      0.008        0.024
  27   2.25     0.13      0.032       (  0.312)      0.008        0.024
  28   2.33     0.13      0.032       (  0.311)      0.008        0.024
  29   2.42     0.13      0.032       (  0.310)      0.008        0.024
  30   2.50     0.13      0.032       (  0.308)      0.008        0.024
  31   2.58     0.17      0.040       (  0.307)      0.010        0.030
  32   2.67     0.17      0.040       (  0.306)      0.010        0.030
  33   2.75     0.17      0.040       (  0.305)      0.010        0.030
  34   2.83     0.17      0.040       (  0.303)      0.010        0.030
  35   2.92     0.17      0.040       (  0.302)      0.010        0.030
  36   3.00     0.17      0.040       (  0.301)      0.010        0.030
  37   3.08     0.17      0.040       (  0.300)      0.010        0.030
  38   3.17     0.17      0.040       (  0.298)      0.010        0.030
  39   3.25     0.17      0.040       (  0.297)      0.010        0.030
  40   3.33     0.17      0.040       (  0.296)      0.010        0.030
  41   3.42     0.17      0.040       (  0.295)      0.010        0.030
  42   3.50     0.17      0.040       (  0.293)      0.010        0.030
  43   3.58     0.17      0.040       (  0.292)      0.010        0.030
  44   3.67     0.17      0.040       (  0.291)      0.010        0.030
  45   3.75     0.17      0.040       (  0.290)      0.010        0.030
  46   3.83     0.20      0.048       (  0.288)      0.012        0.036
  47   3.92     0.20      0.048       (  0.287)      0.012        0.036
  48   4.00     0.20      0.048       (  0.286)      0.012        0.036
  49   4.08     0.20      0.048       (  0.285)      0.012        0.036
  50   4.17     0.20      0.048       (  0.284)      0.012        0.036
  51   4.25     0.20      0.048       (  0.282)      0.012        0.036
  52   4.33     0.23      0.056       (  0.281)      0.015        0.041
  53   4.42     0.23      0.056       (  0.280)      0.015        0.041
  54   4.50     0.23      0.056       (  0.279)      0.015        0.041
  55   4.58     0.23      0.056       (  0.278)      0.015        0.041
  56   4.67     0.23      0.056       (  0.276)      0.015        0.041
  57   4.75     0.23      0.056       (  0.275)      0.015        0.041
  58   4.83     0.27      0.064       (  0.274)      0.017        0.047
  59   4.92     0.27      0.064       (  0.273)      0.017        0.047
  60   5.00     0.27      0.064       (  0.272)      0.017        0.047
  61   5.08     0.20      0.048       (  0.270)      0.012        0.036
  62   5.17     0.20      0.048       (  0.269)      0.012        0.036
  63   5.25     0.20      0.048       (  0.268)      0.012        0.036
  64   5.33     0.23      0.056       (  0.267)      0.015        0.041
  65   5.42     0.23      0.056       (  0.266)      0.015        0.041
  66   5.50     0.23      0.056       (  0.265)      0.015        0.041
  67   5.58     0.27      0.064       (  0.263)      0.017        0.047
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  68   5.67     0.27      0.064       (  0.262)       0.017        0.047
  69   5.75     0.27      0.064       (  0.261)       0.017        0.047
  70   5.83     0.27      0.064       (  0.260)       0.017        0.047
  71   5.92     0.27      0.064       (  0.259)       0.017        0.047
  72   6.00     0.27      0.064       (  0.258)       0.017        0.047
  73   6.08     0.30      0.072       (  0.257)       0.019        0.053
  74   6.17     0.30      0.072       (  0.255)       0.019        0.053
  75   6.25     0.30      0.072       (  0.254)       0.019        0.053
  76   6.33     0.30      0.072       (  0.253)       0.019        0.053
  77   6.42     0.30      0.072       (  0.252)       0.019        0.053
  78   6.50     0.30      0.072       (  0.251)       0.019        0.053
  79   6.58     0.33      0.080       (  0.250)       0.021        0.059
  80   6.67     0.33      0.080       (  0.249)       0.021        0.059
  81   6.75     0.33      0.080       (  0.247)       0.021        0.059
  82   6.83     0.33      0.080       (  0.246)       0.021        0.059
  83   6.92     0.33      0.080       (  0.245)       0.021        0.059
  84   7.00     0.33      0.080       (  0.244)       0.021        0.059
  85   7.08     0.33      0.080       (  0.243)       0.021        0.059
  86   7.17     0.33      0.080       (  0.242)       0.021        0.059
  87   7.25     0.33      0.080       (  0.241)       0.021        0.059
  88   7.33     0.37      0.088       (  0.240)       0.023        0.065
  89   7.42     0.37      0.088       (  0.239)       0.023        0.065
  90   7.50     0.37      0.088       (  0.238)       0.023        0.065
  91   7.58     0.40      0.096       (  0.236)       0.025        0.071
  92   7.67     0.40      0.096       (  0.235)       0.025        0.071
  93   7.75     0.40      0.096       (  0.234)       0.025        0.071
  94   7.83     0.43      0.104       (  0.233)       0.027        0.077
  95   7.92     0.43      0.104       (  0.232)       0.027        0.077
  96   8.00     0.43      0.104       (  0.231)       0.027        0.077
  97   8.08     0.50      0.120       (  0.230)       0.031        0.089
  98   8.17     0.50      0.120       (  0.229)       0.031        0.089
  99   8.25     0.50      0.120       (  0.228)       0.031        0.089
 100   8.33     0.50      0.120       (  0.227)       0.031        0.089
 101   8.42     0.50      0.120       (  0.226)       0.031        0.089
 102   8.50     0.50      0.120       (  0.225)       0.031        0.089
 103   8.58     0.53      0.128       (  0.224)       0.033        0.095
 104   8.67     0.53      0.128       (  0.223)       0.033        0.095
 105   8.75     0.53      0.128       (  0.221)       0.033        0.095
 106   8.83     0.57      0.136       (  0.220)       0.035        0.101
 107   8.92     0.57      0.136       (  0.219)       0.035        0.101
 108   9.00     0.57      0.136       (  0.218)       0.035        0.101
 109   9.08     0.63      0.152       (  0.217)       0.040        0.112
 110   9.17     0.63      0.152       (  0.216)       0.040        0.112
 111   9.25     0.63      0.152       (  0.215)       0.040        0.112
 112   9.33     0.67      0.160       (  0.214)       0.042        0.118
 113   9.42     0.67      0.160       (  0.213)       0.042        0.118
 114   9.50     0.67      0.160       (  0.212)       0.042        0.118
 115   9.58     0.70      0.168       (  0.211)       0.044        0.124
 116   9.67     0.70      0.168       (  0.210)       0.044        0.124
 117   9.75     0.70      0.168       (  0.209)       0.044        0.124
 118   9.83     0.73      0.176       (  0.208)       0.046        0.130
 119   9.92     0.73      0.176       (  0.207)       0.046        0.130
 120  10.00     0.73      0.176       (  0.206)       0.046        0.130
 121  10.08     0.50      0.120       (  0.205)       0.031        0.089
 122  10.17     0.50      0.120       (  0.204)       0.031        0.089
 123  10.25     0.50      0.120       (  0.203)       0.031        0.089
 124  10.33     0.50      0.120       (  0.202)       0.031        0.089
 125  10.42     0.50      0.120       (  0.201)       0.031        0.089
 126  10.50     0.50      0.120       (  0.200)       0.031        0.089
 127  10.58     0.67      0.160       (  0.199)       0.042        0.118
 128  10.67     0.67      0.160       (  0.198)       0.042        0.118
 129  10.75     0.67      0.160       (  0.197)       0.042        0.118
 130  10.83     0.67      0.160       (  0.196)       0.042        0.118
 131  10.92     0.67      0.160       (  0.195)       0.042        0.118
 132  11.00     0.67      0.160       (  0.194)       0.042        0.118
 133  11.08     0.63      0.152       (  0.193)       0.040        0.112
 134  11.17     0.63      0.152       (  0.192)       0.040        0.112
 135  11.25     0.63      0.152       (  0.192)       0.040        0.112
 136  11.33     0.63      0.152       (  0.191)       0.040        0.112
 137  11.42     0.63      0.152       (  0.190)       0.040        0.112
 138  11.50     0.63      0.152       (  0.189)       0.040        0.112
 139  11.58     0.57      0.136       (  0.188)       0.035        0.101
 140  11.67     0.57      0.136       (  0.187)       0.035        0.101
 141  11.75     0.57      0.136       (  0.186)       0.035        0.101
 142  11.83     0.60      0.144       (  0.185)       0.037        0.107
 143  11.92     0.60      0.144       (  0.184)       0.037        0.107
 144  12.00     0.60      0.144       (  0.183)       0.037        0.107
 145  12.08     0.83      0.200       (  0.182)       0.052        0.148
 146  12.17     0.83      0.200       (  0.181)       0.052        0.148
 147  12.25     0.83      0.200       (  0.180)       0.052        0.148
 148  12.33     0.87      0.208       (  0.180)       0.054        0.154
 149  12.42     0.87      0.208       (  0.179)       0.054        0.154
 150  12.50     0.87      0.208       (  0.178)       0.054        0.154
 151  12.58     0.93      0.224       (  0.177)       0.058        0.166
 152  12.67     0.93      0.224       (  0.176)       0.058        0.166
 153  12.75     0.93      0.224       (  0.175)       0.058        0.166
 154  12.83     0.97      0.232       (  0.174)       0.060        0.172
 155  12.92     0.97      0.232       (  0.173)       0.060        0.172
 156  13.00     0.97      0.232       (  0.172)       0.060        0.172
 157  13.08     1.13      0.272       (  0.172)       0.071        0.201
 158  13.17     1.13      0.272       (  0.171)       0.071        0.201
 159  13.25     1.13      0.272       (  0.170)       0.071        0.201
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160  13.33     1.13      0.272       (  0.169)       0.071        0.201
161  13.42     1.13      0.272       (  0.168)       0.071        0.201
162  13.50     1.13      0.272       (  0.167)       0.071        0.201
163  13.58     0.77      0.184       (  0.166)       0.048        0.136
164  13.67     0.77      0.184       (  0.166)       0.048        0.136
165  13.75     0.77      0.184       (  0.165)       0.048        0.136
166  13.83     0.77      0.184       (  0.164)       0.048        0.136
167  13.92     0.77      0.184       (  0.163)       0.048        0.136
168  14.00     0.77      0.184       (  0.162)       0.048        0.136
169  14.08     0.90      0.216       (  0.161)       0.056        0.160
170  14.17     0.90      0.216       (  0.161)       0.056        0.160
171  14.25     0.90      0.216       (  0.160)       0.056        0.160
172  14.33     0.87      0.208       (  0.159)       0.054        0.154
173  14.42     0.87      0.208       (  0.158)       0.054        0.154
174  14.50     0.87      0.208       (  0.157)       0.054        0.154
175  14.58     0.87      0.208       (  0.156)       0.054        0.154
176  14.67     0.87      0.208       (  0.156)       0.054        0.154
177  14.75     0.87      0.208       (  0.155)       0.054        0.154
178  14.83     0.83      0.200       (  0.154)       0.052        0.148
179  14.92     0.83      0.200       (  0.153)       0.052        0.148
180  15.00     0.83      0.200       (  0.152)       0.052        0.148
181  15.08     0.80      0.192       (  0.152)       0.050        0.142
182  15.17     0.80      0.192       (  0.151)       0.050        0.142
183  15.25     0.80      0.192       (  0.150)       0.050        0.142
184  15.33     0.77      0.184       (  0.149)       0.048        0.136
185  15.42     0.77      0.184       (  0.149)       0.048        0.136
186  15.50     0.77      0.184       (  0.148)       0.048        0.136
187  15.58     0.63      0.152       (  0.147)       0.040        0.112
188  15.67     0.63      0.152       (  0.146)       0.040        0.112
189  15.75     0.63      0.152       (  0.146)       0.040        0.112
190  15.83     0.63      0.152       (  0.145)       0.040        0.112
191  15.92     0.63      0.152       (  0.144)       0.040        0.112
192  16.00     0.63      0.152       (  0.143)       0.040        0.112
193  16.08     0.13      0.032       (  0.143)       0.008        0.024
194  16.17     0.13      0.032       (  0.142)       0.008        0.024
195  16.25     0.13      0.032       (  0.141)       0.008        0.024
196  16.33     0.13      0.032       (  0.140)       0.008        0.024
197  16.42     0.13      0.032       (  0.140)       0.008        0.024
198  16.50     0.13      0.032       (  0.139)       0.008        0.024
199  16.58     0.10      0.024       (  0.138)       0.006        0.018
200  16.67     0.10      0.024       (  0.138)       0.006        0.018
201  16.75     0.10      0.024       (  0.137)       0.006        0.018
202  16.83     0.10      0.024       (  0.136)       0.006        0.018
203  16.92     0.10      0.024       (  0.136)       0.006        0.018
204  17.00     0.10      0.024       (  0.135)       0.006        0.018
205  17.08     0.17      0.040       (  0.134)       0.010        0.030
206  17.17     0.17      0.040       (  0.133)       0.010        0.030
207  17.25     0.17      0.040       (  0.133)       0.010        0.030
208  17.33     0.17      0.040       (  0.132)       0.010        0.030
209  17.42     0.17      0.040       (  0.131)       0.010        0.030
210  17.50     0.17      0.040       (  0.131)       0.010        0.030
211  17.58     0.17      0.040       (  0.130)       0.010        0.030
212  17.67     0.17      0.040       (  0.130)       0.010        0.030
213  17.75     0.17      0.040       (  0.129)       0.010        0.030
214  17.83     0.13      0.032       (  0.128)       0.008        0.024
215  17.92     0.13      0.032       (  0.128)       0.008        0.024
216  18.00     0.13      0.032       (  0.127)       0.008        0.024
217  18.08     0.13      0.032       (  0.126)       0.008        0.024
218  18.17     0.13      0.032       (  0.126)       0.008        0.024
219  18.25     0.13      0.032       (  0.125)       0.008        0.024
220  18.33     0.13      0.032       (  0.125)       0.008        0.024
221  18.42     0.13      0.032       (  0.124)       0.008        0.024
222  18.50     0.13      0.032       (  0.123)       0.008        0.024
223  18.58     0.10      0.024       (  0.123)       0.006        0.018
224  18.67     0.10      0.024       (  0.122)       0.006        0.018
225  18.75     0.10      0.024       (  0.122)       0.006        0.018
226  18.83     0.07      0.016       (  0.121)       0.004        0.012
227  18.92     0.07      0.016       (  0.120)       0.004        0.012
228  19.00     0.07      0.016       (  0.120)       0.004        0.012
229  19.08     0.10      0.024       (  0.119)       0.006        0.018
230  19.17     0.10      0.024       (  0.119)       0.006        0.018
231  19.25     0.10      0.024       (  0.118)       0.006        0.018
232  19.33     0.13      0.032       (  0.118)       0.008        0.024
233  19.42     0.13      0.032       (  0.117)       0.008        0.024
234  19.50     0.13      0.032       (  0.116)       0.008        0.024
235  19.58     0.10      0.024       (  0.116)       0.006        0.018
236  19.67     0.10      0.024       (  0.115)       0.006        0.018
237  19.75     0.10      0.024       (  0.115)       0.006        0.018
238  19.83     0.07      0.016       (  0.114)       0.004        0.012
239  19.92     0.07      0.016       (  0.114)       0.004        0.012
240  20.00     0.07      0.016       (  0.113)       0.004        0.012
241  20.08     0.10      0.024       (  0.113)       0.006        0.018
242  20.17     0.10      0.024       (  0.112)       0.006        0.018
243  20.25     0.10      0.024       (  0.112)       0.006        0.018
244  20.33     0.10      0.024       (  0.111)       0.006        0.018
245  20.42     0.10      0.024       (  0.111)       0.006        0.018
246  20.50     0.10      0.024       (  0.110)       0.006        0.018
247  20.58     0.10      0.024       (  0.110)       0.006        0.018
248  20.67     0.10      0.024       (  0.110)       0.006        0.018
249  20.75     0.10      0.024       (  0.109)       0.006        0.018
250  20.83     0.07      0.016       (  0.109)       0.004        0.012
251  20.92     0.07      0.016       (  0.108)       0.004        0.012
```

```
252  21.00     0.07      0.016       (  0.108)       0.004        0.012
253  21.08     0.10      0.024       (  0.107)       0.006        0.018
254  21.17     0.10      0.024       (  0.107)       0.006        0.018
255  21.25     0.10      0.024       (  0.106)       0.006        0.018
256  21.33     0.07      0.016       (  0.106)       0.004        0.012
257  21.42     0.07      0.016       (  0.106)       0.004        0.012
258  21.50     0.07      0.016       (  0.105)       0.004        0.012
259  21.58     0.10      0.024       (  0.105)       0.006        0.018
260  21.67     0.10      0.024       (  0.105)       0.006        0.018
261  21.75     0.10      0.024       (  0.104)       0.006        0.018
262  21.83     0.07      0.016       (  0.104)       0.004        0.012
263  21.92     0.07      0.016       (  0.103)       0.004        0.012
264  22.00     0.07      0.016       (  0.103)       0.004        0.012
265  22.08     0.10      0.024       (  0.103)       0.006        0.018
266  22.17     0.10      0.024       (  0.102)       0.006        0.018
267  22.25     0.10      0.024       (  0.102)       0.006        0.018
268  22.33     0.07      0.016       (  0.102)       0.004        0.012
269  22.42     0.07      0.016       (  0.101)       0.004        0.012
270  22.50     0.07      0.016       (  0.101)       0.004        0.012
271  22.58     0.07      0.016       (  0.101)       0.004        0.012
272  22.67     0.07      0.016       (  0.101)       0.004        0.012
273  22.75     0.07      0.016       (  0.100)       0.004        0.012
274  22.83     0.07      0.016       (  0.100)       0.004        0.012
275  22.92     0.07      0.016       (  0.100)       0.004        0.012
276  23.00     0.07      0.016       (  0.100)       0.004        0.012
277  23.08     0.07      0.016       (  0.099)       0.004        0.012
278  23.17     0.07      0.016       (  0.099)       0.004        0.012
279  23.25     0.07      0.016       (  0.099)       0.004        0.012
280  23.33     0.07      0.016       (  0.099)       0.004        0.012
281  23.42     0.07      0.016       (  0.098)       0.004        0.012
282  23.50     0.07      0.016       (  0.098)       0.004        0.012
283  23.58     0.07      0.016       (  0.098)       0.004        0.012
284  23.67     0.07      0.016       (  0.098)       0.004        0.012
285  23.75     0.07      0.016       (  0.098)       0.004        0.012
286  23.83     0.07      0.016       (  0.098)       0.004        0.012
287  23.92     0.07      0.016       (  0.098)       0.004        0.012
288  24.00     0.07      0.016       (  0.098)       0.004        0.012
                (Loss Rate Not Used)
    Sum =     100.0                                   Sum =    17.8
       Flood volume = Effective rainfall      1.48(In)
        times area      23.9(Ac.)/[(In)/(Ft.)] =       2.9(Ac.Ft)
       Total soil loss =      0.52(In)
       Total soil loss =     1.035(Ac.Ft)
       Total rainfall =      2.00(In)
       Flood volume =      128340.6 Cubic Feet
       Total soil loss =       45092.7 Cubic Feet
       --------------------------------------------------------------------
        Peak flow rate of this hydrograph =      4.840(CFS)
       --------------------------------------------------------------------
       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                           24 - H O U R   S T O R M
                      R u n o f f     H y d r o g r a p h
       --------------------------------------------------------------------
                   Hydrograph in   5   Minute intervals ((CFS))

       --------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0       2.5       5.0       7.5      10.0
-----------------------------------------------------------------------
   0+ 5       0.0005      0.08  Q         |         |         |         |
   0+10       0.0020      0.21  Q         |         |         |         |
   0+15       0.0037      0.25  VQ        |         |         |         |
   0+20       0.0058      0.31  VQ        |         |         |         |
   0+25       0.0085      0.38  VQ        |         |         |         |
   0+30       0.0113      0.41  VQ        |         |         |         |
   0+35       0.0142      0.42  VQ        |         |         |         |
   0+40       0.0171      0.42  VQ        |         |         |         |
   0+45       0.0200      0.43  VQ        |         |         |         |
   0+50       0.0232      0.47  VQ        |         |         |         |
   0+55       0.0269      0.54  V Q       |         |         |         |
   1+ 0       0.0307      0.55  V Q       |         |         |         |
   1+ 5       0.0343      0.52  V Q       |         |         |         |
   1+10       0.0375      0.46  VQ        |         |         |         |
   1+15       0.0406      0.44  VQ        |         |         |         |
   1+20       0.0436      0.44  VQ        |         |         |         |
   1+25       0.0465      0.43  VQ        |         |         |         |
   1+30       0.0495      0.43  VQ        |         |         |         |
   1+35       0.0524      0.43  VQ        |         |         |         |
   1+40       0.0554      0.43  VQ        |         |         |         |
   1+45       0.0583      0.43  VQ        |         |         |         |
   1+50       0.0615      0.47  VQ        |         |         |         |
   1+55       0.0652      0.54  V Q       |         |         |         |
   2+ 0       0.0690      0.55  V Q       |         |         |         |
   2+ 5       0.0729      0.56  V Q       |         |         |         |
   2+10       0.0768      0.57  |VQ       |         |         |         |
   2+15       0.0807      0.57  |VQ       |         |         |         |
   2+20       0.0847      0.57  |VQ       |         |         |         |
   2+25       0.0886      0.57  |VQ       |         |         |         |
   2+30       0.0925      0.57  |VQ       |         |         |         |
   2+35       0.0967      0.61  |VQ       |         |         |         |
   2+40       0.1014      0.68  |VQ       |         |         |         |
   2+45       0.1062      0.70  |VQ       |         |         |         |
   2+50       0.1110      0.70  |VQ       |         |         |         |
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 2+55       0.1159      0.71  |VQ       |         |         |         |
 3+ 0       0.1208      0.71  |VQ       |         |         |         |
 3+ 5       0.1257      0.71  |VQ       |         |         |         |
 3+10       0.1306      0.71  |VQ       |         |         |         |
 3+15       0.1355      0.71  |VQ       |         |         |         |
 3+20       0.1404      0.71  |VQ       |         |         |         |
 3+25       0.1453      0.71  |VQ       |         |         |         |
 3+30       0.1503      0.71  | Q       |         |         |         |
 3+35       0.1552      0.71  | Q       |         |         |         |
 3+40       0.1601      0.71  | Q       |         |         |         |
 3+45       0.1650      0.71  | Q       |         |         |         |
 3+50       0.1702      0.75  | VQ      |         |         |         |
 3+55       0.1758      0.82  | VQ      |         |         |         |
 4+ 0       0.1816      0.84  | VQ      |         |         |         |
 4+ 5       0.1874      0.85  | VQ      |         |         |         |
 4+10       0.1933      0.85  | VQ      |         |         |         |
 4+15       0.1992      0.85  | VQ      |         |         |         |
 4+20       0.2053      0.89  | VQ      |         |         |         |
 4+25       0.2120      0.96  | VQ      |         |         |         |
 4+30       0.2187      0.98  | VQ      |         |         |         |
 4+35       0.2255      0.99  |  Q      |         |         |         |
 4+40       0.2324      0.99  |  Q      |         |         |         |
 4+45       0.2392      1.00  |  Q      |         |         |         |
 4+50       0.2464      1.04  |  VQ     |         |         |         |
 4+55       0.2540      1.11  |  VQ     |         |         |         |
 5+ 0       0.2617      1.12  |  VQ     |         |         |         |
 5+ 5       0.2690      1.06  |  VQ     |         |         |         |
 5+10       0.2753      0.92  |  Q      |         |         |         |
 5+15       0.2815      0.89  |  Q      |         |         |         |
 5+20       0.2877      0.91  |  Q      |         |         |         |
 5+25       0.2944      0.97  |  Q      |         |         |         |
 5+30       0.3012      0.98  |  QV     |         |         |         |
 5+35       0.3083      1.03  |   Q     |         |         |         |
 5+40       0.3159      1.10  |   Q     |         |         |         |
 5+45       0.3236      1.12  |   Q     |         |         |         |
 5+50       0.3314      1.13  |   Q     |         |         |         |
 5+55       0.3392      1.14  |   Q     |         |         |         |
 6+ 0       0.3471      1.14  |   Q     |         |         |         |
 6+ 5       0.3552      1.18  |   Q     |         |         |         |
 6+10       0.3638      1.25  |   Q     |         |         |         |
 6+15       0.3725      1.27  |    Q    |         |         |         |
 6+20       0.3813      1.27  |    Q    |         |         |         |
 6+25       0.3901      1.28  |    Q    |         |         |         |
 6+30       0.3989      1.28  |    Q    |         |         |         |
 6+35       0.4080      1.32  |    Q    |         |         |         |
 6+40       0.4176      1.39  |    Q    |         |         |         |
 6+45       0.4273      1.41  |    Q    |         |         |         |
 6+50       0.4371      1.42  |    Q    |         |         |         |
 6+55       0.4469      1.42  |    QV   |         |         |         |
 7+ 0       0.4567      1.42  |    QV   |         |         |         |
 7+ 5       0.4665      1.43  |    QV   |         |         |         |
 7+10       0.4763      1.43  |    QV   |         |         |         |
 7+15       0.4861      1.43  |    QV   |         |         |         |
 7+20       0.4962      1.46  |    QV   |         |         |         |
 7+25       0.5068      1.53  |     Q   |         |         |         |
 7+30       0.5175      1.55  |     QV  |         |         |         |
 7+35       0.5285      1.60  |     QV  |         |         |         |
 7+40       0.5400      1.67  |     QV  |         |         |         |
 7+45       0.5516      1.69  |     QV  |         |         |         |
 7+50       0.5636      1.74  |     QV  |         |         |         |
 7+55       0.5761      1.81  |      Q  |         |         |         |
 8+ 0       0.5888      1.84  |      Q  |         |         |         |
 8+ 5       0.6020      1.92  |      QV |         |         |         |
 8+10       0.6162      2.06  |       Q |         |         |         |
 8+15       0.6307      2.10  |       Q |         |         |         |
 8+20       0.6453      2.12  |       Q |         |         |         |
 8+25       0.6600      2.13  |       Q |         |         |         |
 8+30       0.6747      2.14  |       QV|         |         |         |
 8+35       0.6897      2.18  |       QV|         |         |         |
 8+40       0.7052      2.25  |       QV|         |         |         |
 8+45       0.7208      2.26  |        Q|         |         |         |
 8+50       0.7367      2.31  |        QV         |         |         |
 8+55       0.7531      2.38  |        QV         |         |         |
 9+ 0       0.7697      2.41  |        QV         |         |         |
 9+ 5       0.7868      2.49  |        QV         |         |         |
 9+10       0.8050      2.63  |         Q         |         |         |
 9+15       0.8234      2.67  |         QV        |         |         |
 9+20       0.8422      2.73  |         QV        |         |         |
 9+25       0.8615      2.81  |         |Q        |         |         |
 9+30       0.8810      2.83  |         |Q        |         |         |
 9+35       0.9009      2.88  |         |QV       |         |         |
 9+40       0.9212      2.96  |         |QV       |         |         |
 9+45       0.9417      2.98  |         |QV       |         |         |
 9+50       0.9625      3.02  |         | QV      |         |         |
 9+55       0.9839      3.10  |         | QV      |         |         |
10+ 0       1.0054      3.12  |         | QV      |         |         |
10+ 5       1.0251      2.86  |         |Q V      |         |         |
10+10       1.0415      2.38  |        Q|   V     |         |         |
10+15       1.0570      2.26  |        Q|   V     |         |         |
10+20       1.0722      2.20  |       Q |   V     |         |         |
10+25       1.0871      2.17  |       Q |   V     |         |         |
10+30       1.1019      2.15  |       Q |   V     |         |         |
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10+35       1.1179      2.33  |        Q|    V    |         |         |
10+40       1.1364      2.68  |         Q    V    |         |         |
10+45       1.1554      2.77  |         |Q   V    |         |         |
10+50       1.1748      2.81  |         |Q   V    |         |         |
10+55       1.1943      2.83  |         |Q    V   |         |         |
11+ 0       1.2139      2.84  |         |Q    V   |         |         |
11+ 5       1.2332      2.81  |         |Q    V   |         |         |
11+10       1.2521      2.74  |         Q     V   |         |         |
11+15       1.2709      2.73  |         Q      V  |         |         |
11+20       1.2896      2.72  |         Q      V  |         |         |
11+25       1.3083      2.71  |         Q      V  |         |         |
11+30       1.3270      2.71  |         Q       V |         |         |
11+35       1.3451      2.63  |         Q       V |         |         |
11+40       1.3623      2.49  |        Q|       V |         |         |
11+45       1.3792      2.46  |        Q|       V |         |         |
11+50       1.3963      2.48  |        Q|       V |         |         |
11+55       1.4138      2.54  |         Q        V|         |         |
12+ 0       1.4314      2.55  |         Q        V|         |         |
12+ 5       1.4509      2.82  |         |Q       V|         |         |
12+10       1.4737      3.31  |         |  Q      V         |         |
12+15       1.4974      3.44  |         |  Q      V         |         |
12+20       1.5218      3.54  |         |   Q     V         |         |
12+25       1.5469      3.64  |         |   Q     |V        |         |
12+30       1.5722      3.68  |         |   Q     |V        |         |
12+35       1.5982      3.78  |         |    Q    |V        |         |
12+40       1.6252      3.92  |         |    Q    | V       |         |
12+45       1.6525      3.96  |         |    Q    | V       |         |
12+50       1.6801      4.01  |         |     Q   | V       |         |
12+55       1.7083      4.09  |         |     Q   |  V      |         |
13+ 0       1.7366      4.12  |         |     Q   |  V      |         |
13+ 5       1.7664      4.32  |         |      Q  |  V      |         |
13+10       1.7985      4.67  |         |       Q |   V     |         |
13+15       1.8313      4.76  |         |        Q|   V     |         |
13+20       1.8644      4.80  |         |        Q|    V    |         |
13+25       1.8976      4.83  |         |        Q|    V    |         |
13+30       1.9310      4.84  |         |        Q|     V   |         |
13+35       1.9615      4.43  |         |      Q  |     V   |         |
13+40       1.9867      3.67  |         |   Q     |     V   |         |
13+45       2.0106      3.47  |         |  Q      |      V  |         |
13+50       2.0339      3.38  |         |  Q      |      V  |         |
13+55       2.0568      3.33  |         |  Q      |      V  |         |
14+ 0       2.0795      3.30  |         |  Q      |       V |         |
14+ 5       2.1031      3.43  |         |  Q      |       V |         |
14+10       2.1287      3.71  |         |   Q     |       V |         |
14+15       2.1547      3.78  |         |    Q    |        V|         |
14+20       2.1807      3.78  |         |    Q    |        V|         |
14+25       2.2064      3.73  |         |   Q     |        V|         |
14+30       2.2320      3.72  |         |   Q     |         V         |
14+35       2.2576      3.72  |         |   Q     |         V         |
14+40       2.2832      3.71  |         |   Q     |         V         |
14+45       2.3087      3.71  |         |   Q     |         |V        |
14+50       2.3340      3.67  |         |   Q     |         |V        |
14+55       2.3588      3.60  |         |   Q     |         | V       |
15+ 0       2.3834      3.58  |         |   Q     |         | V       |
15+ 5       2.4078      3.54  |         |   Q     |         | V       |
15+10       2.4316      3.46  |         |  Q      |         |  V      |
15+15       2.4553      3.44  |         |  Q      |         |  V      |
15+20       2.4787      3.39  |         |  Q      |         |  V      |
15+25       2.5016      3.32  |         |  Q      |         |  V      |
15+30       2.5243      3.30  |         |  Q      |         |   V     |
15+35       2.5459      3.14  |         | Q       |         |   V     |
15+40       2.5655      2.85  |         |Q        |         |   V     |
15+45       2.5847      2.78  |         |Q        |         |    V    |
15+50       2.6036      2.74  |         Q         |         |    V    |
15+55       2.6223      2.73  |         Q         |         |    V    |
16+ 0       2.6410      2.72  |         Q         |         |    V    |
16+ 5       2.6558      2.14  |       Q |         |         |     V   |
16+10       2.6633      1.10  |   Q     |         |         |     V   |
16+15       2.6690      0.82  |  Q      |         |         |     V   |
16+20       2.6739      0.70  | Q       |         |         |     V   |
16+25       2.6782      0.63  | Q       |         |         |     V   |
16+30       2.6823      0.59  | Q       |         |         |     V   |
16+35       2.6860      0.53  | Q       |         |         |     V   |
16+40       2.6892      0.46  |Q        |         |         |     V   |
16+45       2.6922      0.44  |Q        |         |         |     V   |
16+50       2.6952      0.44  |Q        |         |         |     V   |
16+55       2.6982      0.43  |Q        |         |         |     V   |
17+ 0       2.7012      0.43  |Q        |         |         |     V   |
17+ 5       2.7046      0.50  | Q       |         |         |     V   |
17+10       2.7091      0.64  | Q       |         |         |     V   |
17+15       2.7137      0.68  | Q       |         |         |     V   |
17+20       2.7185      0.70  | Q       |         |         |     V   |
17+25       2.7234      0.70  | Q       |         |         |     V   |
17+30       2.7283      0.71  | Q       |         |         |      V  |
17+35       2.7332      0.71  | Q       |         |         |      V  |
17+40       2.7381      0.71  | Q       |         |         |      V  |
17+45       2.7430      0.71  | Q       |         |         |      V  |
17+50       2.7476      0.67  | Q       |         |         |      V  |
17+55       2.7518      0.61  | Q       |         |         |      V  |
18+ 0       2.7559      0.59  | Q       |         |         |      V  |
18+ 5       2.7599      0.58  | Q       |         |         |      V  |
18+10       2.7638      0.57  | Q       |         |         |      V  |
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  18+15       2.7677      0.57  | Q       |         |         |      V  |
  18+20       2.7717      0.57  | Q       |         |         |      V  |
  18+25       2.7756      0.57  | Q       |         |         |      V  |
  18+30       2.7795      0.57  | Q       |         |         |      V  |
  18+35       2.7832      0.53  | Q       |         |         |      V  |
  18+40       2.7864      0.46  |Q        |         |         |      V  |
  18+45       2.7895      0.44  |Q        |         |         |      V  |
  18+50       2.7922      0.40  |Q        |         |         |      V  |
  18+55       2.7944      0.32  |Q        |         |         |      V  |
  19+ 0       2.7965      0.30  |Q        |         |         |      V  |
  19+ 5       2.7988      0.33  |Q        |         |         |      V  |
  19+10       2.8015      0.40  |Q        |         |         |       V |
  19+15       2.8044      0.41  |Q        |         |         |       V |
  19+20       2.8075      0.46  |Q        |         |         |       V |
  19+25       2.8112      0.53  | Q       |         |         |       V |
  19+30       2.8150      0.55  | Q       |         |         |       V |
  19+35       2.8186      0.52  | Q       |         |         |       V |
  19+40       2.8218      0.46  |Q        |         |         |       V |
  19+45       2.8248      0.44  |Q        |         |         |       V |
  19+50       2.8276      0.40  |Q        |         |         |       V |
  19+55       2.8298      0.32  |Q        |         |         |       V |
  20+ 0       2.8319      0.30  |Q        |         |         |       V |
  20+ 5       2.8342      0.33  |Q        |         |         |       V |
  20+10       2.8369      0.40  |Q        |         |         |       V |
  20+15       2.8397      0.41  |Q        |         |         |       V |
  20+20       2.8426      0.42  |Q        |         |         |       V |
  20+25       2.8455      0.42  |Q        |         |         |       V |
  20+30       2.8485      0.43  |Q        |         |         |       V |
  20+35       2.8514      0.43  |Q        |         |         |       V |
  20+40       2.8544      0.43  |Q        |         |         |       V |
  20+45       2.8573      0.43  |Q        |         |         |       V |
  20+50       2.8600      0.39  |Q        |         |         |       V |
  20+55       2.8622      0.32  |Q        |         |         |       V |
  21+ 0       2.8643      0.30  |Q        |         |         |       V |
  21+ 5       2.8666      0.33  |Q        |         |         |       V |
  21+10       2.8693      0.40  |Q        |         |         |       V |
  21+15       2.8721      0.41  |Q        |         |         |       V |
  21+20       2.8748      0.38  |Q        |         |         |        V|
  21+25       2.8769      0.32  |Q        |         |         |        V|
  21+30       2.8790      0.30  |Q        |         |         |        V|
  21+35       2.8813      0.33  |Q        |         |         |        V|
  21+40       2.8840      0.40  |Q        |         |         |        V|
  21+45       2.8869      0.41  |Q        |         |         |        V|
  21+50       2.8895      0.38  |Q        |         |         |        V|
  21+55       2.8917      0.32  |Q        |         |         |        V|
  22+ 0       2.8938      0.30  |Q        |         |         |        V|
  22+ 5       2.8960      0.33  |Q        |         |         |        V|
  22+10       2.8988      0.40  |Q        |         |         |        V|
  22+15       2.9016      0.41  |Q        |         |         |        V|
  22+20       2.9042      0.38  |Q        |         |         |        V|
  22+25       2.9064      0.32  |Q        |         |         |        V|
  22+30       2.9085      0.30  |Q        |         |         |        V|
  22+35       2.9105      0.29  |Q        |         |         |        V|
  22+40       2.9125      0.29  |Q        |         |         |        V|
  22+45       2.9145      0.29  |Q        |         |         |        V|
  22+50       2.9164      0.29  |Q        |         |         |        V|
  22+55       2.9184      0.29  |Q        |         |         |        V|
  23+ 0       2.9204      0.29  |Q        |         |         |        V|
  23+ 5       2.9223      0.29  |Q        |         |         |        V|
  23+10       2.9243      0.29  |Q        |         |         |        V|
  23+15       2.9263      0.29  |Q        |         |         |        V|
  23+20       2.9282      0.29  |Q        |         |         |        V|
  23+25       2.9302      0.29  |Q        |         |         |        V|
  23+30       2.9322      0.29  |Q        |         |         |        V|
  23+35       2.9341      0.29  |Q        |         |         |        V|
  23+40       2.9361      0.29  |Q        |         |         |        V|
  23+45       2.9380      0.29  |Q        |         |         |        V|
  23+50       2.9400      0.29  |Q        |         |         |        V|
  23+55       2.9420      0.29  |Q        |         |         |        V|
  24+ 0       2.9439      0.29  |Q        |         |         |        V|
  24+ 5       2.9454      0.21  Q         |         |         |        V|
  24+10       2.9459      0.07  Q         |         |         |        V|
  24+15       2.9461      0.03  Q         |         |         |        V|
  24+20       2.9462      0.02  Q         |         |         |        V|
  24+25       2.9463      0.01  Q         |         |         |        V|
  24+30       2.9463      0.00  Q         |         |         |        V|
----------------------------------------------------------------------
```

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

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                        Study date  09/23/22 File: 3384P005242.out


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

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


        Program License Serial Number 6400

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

         English Units used in output format



        ---------------------------------------------------------------------
        JURUPA VALLEY COMMERCE PARK
        BUILDING 5 - PROPOSED CONDITION
        HYDROLOGIC ANALYSIS - 2-YEAR

        --------------------------------------------------------------------
        Drainage Area =       2.50(Ac.)  =      0.004 Sq. Mi.
        Drainage Area for Depth-Area Areal Adjustment =       2.50(Ac.)  =      0.004 Sq. Mi.
        USER Entry of lag time in hours
        Lag time =    0.000 Hr.
        Lag time =     0.00 Min.
        25% of lag time =     0.00 Min.
        40% of lag time =     0.00 Min.
        Unit time =     5.00 Min.
        Duration of storm = 24 Hour(s)
        User Entered Base Flow =     0.00(CFS)

        2 YEAR Area rainfall data:


        Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
                2.50            2.00                    5.00

        100 YEAR Area rainfall data:


        Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
                2.50            5.50                   13.75

        STORM EVENT (YEAR) =    2.00
        Area Averaged 2-Year Rainfall =    2.000(In)
        Area Averaged 100-Year Rainfall =    5.500(In)

        Point rain (area averaged) =    2.000(In)
        Areal adjustment factor =  100.00 %
        Adjusted average point rain =    2.000(In)

        Sub-Area Data:
        Area(Ac.)         Runoff Index   Impervious %
             2.500           69.00         0.900
         Total Area Entered =      2.50(Ac.)


        RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
        AMC2 AMC-1     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
        69.0  49.8      0.574     0.900        0.109       1.000      0.109
                                                          Sum (F) =   0.109
        Area averaged mean soil loss (F) (In/Hr) =  0.109
        Minimum soil loss rate ((In/Hr)) =  0.055
        (for 24 hour storm duration)
        Soil low loss rate (decimal) =   0.180
        ---------------------------------------------------------------------

                        U n i t  H y d r o g r a p h
                                VALLEY S-Curve
        --------------------------------------------------------------------
                        Unit Hydrograph Data
        ---------------------------------------------------------------------
        Unit time period   Time % of lag   Distribution   Unit Hydrograph
            (hrs)                            Graph %            (CFS)
        ---------------------------------------------------------------------
            1   0.083          1.#IO        100.000             2.520
                                     Sum = 100.000   Sum=       2.520
-----------------------------------------------------------------------


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

```
Unit Time   Pattern   Storm Rain     Loss rate(In./Hr)     Effective
     (Hr.)  Percent   (In/Hr)         Max   |   Low        (In/Hr)
  1  0.08    0.07      0.016       (  0.193)       0.003       0.013
  2  0.17    0.07      0.016       (  0.193)       0.003       0.013
  3  0.25    0.07      0.016       (  0.192)       0.003       0.013
  4  0.33    0.10      0.024       (  0.191)       0.004       0.020
  5  0.42    0.10      0.024       (  0.190)       0.004       0.020
  6  0.50    0.10      0.024       (  0.190)       0.004       0.020
  7  0.58    0.10      0.024       (  0.189)       0.004       0.020
  8  0.67    0.10      0.024       (  0.188)       0.004       0.020
  9  0.75    0.10      0.024       (  0.187)       0.004       0.020
 10  0.83    0.13      0.032       (  0.187)       0.006       0.026
 11  0.92    0.13      0.032       (  0.186)       0.006       0.026
 12  1.00    0.13      0.032       (  0.185)       0.006       0.026
 13  1.08    0.10      0.024       (  0.184)       0.004       0.020
 14  1.17    0.10      0.024       (  0.184)       0.004       0.020
 15  1.25    0.10      0.024       (  0.183)       0.004       0.020
 16  1.33    0.10      0.024       (  0.182)       0.004       0.020
 17  1.42    0.10      0.024       (  0.182)       0.004       0.020
 18  1.50    0.10      0.024       (  0.181)       0.004       0.020
 19  1.58    0.10      0.024       (  0.180)       0.004       0.020
 20  1.67    0.10      0.024       (  0.179)       0.004       0.020
 21  1.75    0.10      0.024       (  0.179)       0.004       0.020
 22  1.83    0.13      0.032       (  0.178)       0.006       0.026
 23  1.92    0.13      0.032       (  0.177)       0.006       0.026
 24  2.00    0.13      0.032       (  0.176)       0.006       0.026
 25  2.08    0.13      0.032       (  0.176)       0.006       0.026
 26  2.17    0.13      0.032       (  0.175)       0.006       0.026
 27  2.25    0.13      0.032       (  0.174)       0.006       0.026
 28  2.33    0.13      0.032       (  0.174)       0.006       0.026
 29  2.42    0.13      0.032       (  0.173)       0.006       0.026
 30  2.50    0.13      0.032       (  0.172)       0.006       0.026
 31  2.58    0.17      0.040       (  0.172)       0.007       0.033
 32  2.67    0.17      0.040       (  0.171)       0.007       0.033
 33  2.75    0.17      0.040       (  0.170)       0.007       0.033
 34  2.83    0.17      0.040       (  0.169)       0.007       0.033
 35  2.92    0.17      0.040       (  0.169)       0.007       0.033
 36  3.00    0.17      0.040       (  0.168)       0.007       0.033
 37  3.08    0.17      0.040       (  0.167)       0.007       0.033
 38  3.17    0.17      0.040       (  0.167)       0.007       0.033
 39  3.25    0.17      0.040       (  0.166)       0.007       0.033
 40  3.33    0.17      0.040       (  0.165)       0.007       0.033
 41  3.42    0.17      0.040       (  0.165)       0.007       0.033
 42  3.50    0.17      0.040       (  0.164)       0.007       0.033
 43  3.58    0.17      0.040       (  0.163)       0.007       0.033
 44  3.67    0.17      0.040       (  0.162)       0.007       0.033
 45  3.75    0.17      0.040       (  0.162)       0.007       0.033
 46  3.83    0.20      0.048       (  0.161)       0.009       0.039
 47  3.92    0.20      0.048       (  0.160)       0.009       0.039
 48  4.00    0.20      0.048       (  0.160)       0.009       0.039
 49  4.08    0.20      0.048       (  0.159)       0.009       0.039
 50  4.17    0.20      0.048       (  0.158)       0.009       0.039
 51  4.25    0.20      0.048       (  0.158)       0.009       0.039
 52  4.33    0.23      0.056       (  0.157)       0.010       0.046
 53  4.42    0.23      0.056       (  0.156)       0.010       0.046
 54  4.50    0.23      0.056       (  0.156)       0.010       0.046
 55  4.58    0.23      0.056       (  0.155)       0.010       0.046
 56  4.67    0.23      0.056       (  0.154)       0.010       0.046
 57  4.75    0.23      0.056       (  0.154)       0.010       0.046
 58  4.83    0.27      0.064       (  0.153)       0.012       0.052
 59  4.92    0.27      0.064       (  0.152)       0.012       0.052
 60  5.00    0.27      0.064       (  0.152)       0.012       0.052
 61  5.08    0.20      0.048       (  0.151)       0.009       0.039
 62  5.17    0.20      0.048       (  0.150)       0.009       0.039
 63  5.25    0.20      0.048       (  0.150)       0.009       0.039
 64  5.33    0.23      0.056       (  0.149)       0.010       0.046
 65  5.42    0.23      0.056       (  0.148)       0.010       0.046
 66  5.50    0.23      0.056       (  0.148)       0.010       0.046
 67  5.58    0.27      0.064       (  0.147)       0.012       0.052
 68  5.67    0.27      0.064       (  0.147)       0.012       0.052
 69  5.75    0.27      0.064       (  0.146)       0.012       0.052
 70  5.83    0.27      0.064       (  0.145)       0.012       0.052
 71  5.92    0.27      0.064       (  0.145)       0.012       0.052
 72  6.00    0.27      0.064       (  0.144)       0.012       0.052
 73  6.08    0.30      0.072       (  0.143)       0.013       0.059
 74  6.17    0.30      0.072       (  0.143)       0.013       0.059
 75  6.25    0.30      0.072       (  0.142)       0.013       0.059
 76  6.33    0.30      0.072       (  0.141)       0.013       0.059
 77  6.42    0.30      0.072       (  0.141)       0.013       0.059
 78  6.50    0.30      0.072       (  0.140)       0.013       0.059
 79  6.58    0.33      0.080       (  0.140)       0.014       0.066
 80  6.67    0.33      0.080       (  0.139)       0.014       0.066
 81  6.75    0.33      0.080       (  0.138)       0.014       0.066
 82  6.83    0.33      0.080       (  0.138)       0.014       0.066
 83  6.92    0.33      0.080       (  0.137)       0.014       0.066
 84  7.00    0.33      0.080       (  0.136)       0.014       0.066
 85  7.08    0.33      0.080       (  0.136)       0.014       0.066
 86  7.17    0.33      0.080       (  0.135)       0.014       0.066
 87  7.25    0.33      0.080       (  0.135)       0.014       0.066
 88  7.33    0.37      0.088       (  0.134)       0.016       0.072
 89  7.42    0.37      0.088       (  0.133)       0.016       0.072
```

```
  90   7.50     0.37      0.088       (  0.133)       0.016        0.072
  91   7.58     0.40      0.096       (  0.132)       0.017        0.079
  92   7.67     0.40      0.096       (  0.131)       0.017        0.079
  93   7.75     0.40      0.096       (  0.131)       0.017        0.079
  94   7.83     0.43      0.104       (  0.130)       0.019        0.085
  95   7.92     0.43      0.104       (  0.130)       0.019        0.085
  96   8.00     0.43      0.104       (  0.129)       0.019        0.085
  97   8.08     0.50      0.120       (  0.128)       0.022        0.098
  98   8.17     0.50      0.120       (  0.128)       0.022        0.098
  99   8.25     0.50      0.120       (  0.127)       0.022        0.098
 100   8.33     0.50      0.120       (  0.127)       0.022        0.098
 101   8.42     0.50      0.120       (  0.126)       0.022        0.098
 102   8.50     0.50      0.120       (  0.125)       0.022        0.098
 103   8.58     0.53      0.128       (  0.125)       0.023        0.105
 104   8.67     0.53      0.128       (  0.124)       0.023        0.105
 105   8.75     0.53      0.128       (  0.124)       0.023        0.105
 106   8.83     0.57      0.136       (  0.123)       0.024        0.112
 107   8.92     0.57      0.136       (  0.123)       0.024        0.112
 108   9.00     0.57      0.136       (  0.122)       0.024        0.112
 109   9.08     0.63      0.152       (  0.121)       0.027        0.125
 110   9.17     0.63      0.152       (  0.121)       0.027        0.125
 111   9.25     0.63      0.152       (  0.120)       0.027        0.125
 112   9.33     0.67      0.160       (  0.120)       0.029        0.131
 113   9.42     0.67      0.160       (  0.119)       0.029        0.131
 114   9.50     0.67      0.160       (  0.119)       0.029        0.131
 115   9.58     0.70      0.168       (  0.118)       0.030        0.138
 116   9.67     0.70      0.168       (  0.117)       0.030        0.138
 117   9.75     0.70      0.168       (  0.117)       0.030        0.138
 118   9.83     0.73      0.176       (  0.116)       0.032        0.144
 119   9.92     0.73      0.176       (  0.116)       0.032        0.144
 120  10.00     0.73      0.176       (  0.115)       0.032        0.144
 121  10.08     0.50      0.120       (  0.115)       0.022        0.098
 122  10.17     0.50      0.120       (  0.114)       0.022        0.098
 123  10.25     0.50      0.120       (  0.113)       0.022        0.098
 124  10.33     0.50      0.120       (  0.113)       0.022        0.098
 125  10.42     0.50      0.120       (  0.112)       0.022        0.098
 126  10.50     0.50      0.120       (  0.112)       0.022        0.098
 127  10.58     0.67      0.160       (  0.111)       0.029        0.131
 128  10.67     0.67      0.160       (  0.111)       0.029        0.131
 129  10.75     0.67      0.160       (  0.110)       0.029        0.131
 130  10.83     0.67      0.160       (  0.110)       0.029        0.131
 131  10.92     0.67      0.160       (  0.109)       0.029        0.131
 132  11.00     0.67      0.160       (  0.109)       0.029        0.131
 133  11.08     0.63      0.152       (  0.108)       0.027        0.125
 134  11.17     0.63      0.152       (  0.108)       0.027        0.125
 135  11.25     0.63      0.152       (  0.107)       0.027        0.125
 136  11.33     0.63      0.152       (  0.106)       0.027        0.125
 137  11.42     0.63      0.152       (  0.106)       0.027        0.125
 138  11.50     0.63      0.152       (  0.105)       0.027        0.125
 139  11.58     0.57      0.136       (  0.105)       0.024        0.112
 140  11.67     0.57      0.136       (  0.104)       0.024        0.112
 141  11.75     0.57      0.136       (  0.104)       0.024        0.112
 142  11.83     0.60      0.144       (  0.103)       0.026        0.118
 143  11.92     0.60      0.144       (  0.103)       0.026        0.118
 144  12.00     0.60      0.144       (  0.102)       0.026        0.118
 145  12.08     0.83      0.200       (  0.102)       0.036        0.164
 146  12.17     0.83      0.200       (  0.101)       0.036        0.164
 147  12.25     0.83      0.200       (  0.101)       0.036        0.164
 148  12.33     0.87      0.208       (  0.100)       0.037        0.171
 149  12.42     0.87      0.208       (  0.100)       0.037        0.171
 150  12.50     0.87      0.208       (  0.099)       0.037        0.171
 151  12.58     0.93      0.224       (  0.099)       0.040        0.184
 152  12.67     0.93      0.224       (  0.098)       0.040        0.184
 153  12.75     0.93      0.224       (  0.098)       0.040        0.184
 154  12.83     0.97      0.232       (  0.097)       0.042        0.190
 155  12.92     0.97      0.232       (  0.097)       0.042        0.190
 156  13.00     0.97      0.232       (  0.096)       0.042        0.190
 157  13.08     1.13      0.272       (  0.096)       0.049        0.223
 158  13.17     1.13      0.272       (  0.095)       0.049        0.223
 159  13.25     1.13      0.272       (  0.095)       0.049        0.223
 160  13.33     1.13      0.272       (  0.094)       0.049        0.223
 161  13.42     1.13      0.272       (  0.094)       0.049        0.223
 162  13.50     1.13      0.272       (  0.093)       0.049        0.223
 163  13.58     0.77      0.184       (  0.093)       0.033        0.151
 164  13.67     0.77      0.184       (  0.092)       0.033        0.151
 165  13.75     0.77      0.184       (  0.092)       0.033        0.151
 166  13.83     0.77      0.184       (  0.092)       0.033        0.151
 167  13.92     0.77      0.184       (  0.091)       0.033        0.151
 168  14.00     0.77      0.184       (  0.091)       0.033        0.151
 169  14.08     0.90      0.216       (  0.090)       0.039        0.177
 170  14.17     0.90      0.216       (  0.090)       0.039        0.177
 171  14.25     0.90      0.216       (  0.089)       0.039        0.177
 172  14.33     0.87      0.208       (  0.089)       0.037        0.171
 173  14.42     0.87      0.208       (  0.088)       0.037        0.171
 174  14.50     0.87      0.208       (  0.088)       0.037        0.171
 175  14.58     0.87      0.208       (  0.087)       0.037        0.171
 176  14.67     0.87      0.208       (  0.087)       0.037        0.171
 177  14.75     0.87      0.208       (  0.086)       0.037        0.171
 178  14.83     0.83      0.200       (  0.086)       0.036        0.164
 179  14.92     0.83      0.200       (  0.086)       0.036        0.164
 180  15.00     0.83      0.200       (  0.085)       0.036        0.164
 181  15.08     0.80      0.192       (  0.085)       0.035        0.157
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182  15.17     0.80      0.192       (  0.084)       0.035        0.157
183  15.25     0.80      0.192       (  0.084)       0.035        0.157
184  15.33     0.77      0.184       (  0.083)       0.033        0.151
185  15.42     0.77      0.184       (  0.083)       0.033        0.151
186  15.50     0.77      0.184       (  0.083)       0.033        0.151
187  15.58     0.63      0.152       (  0.082)       0.027        0.125
188  15.67     0.63      0.152       (  0.082)       0.027        0.125
189  15.75     0.63      0.152       (  0.081)       0.027        0.125
190  15.83     0.63      0.152       (  0.081)       0.027        0.125
191  15.92     0.63      0.152       (  0.080)       0.027        0.125
192  16.00     0.63      0.152       (  0.080)       0.027        0.125
193  16.08     0.13      0.032       (  0.080)       0.006        0.026
194  16.17     0.13      0.032       (  0.079)       0.006        0.026
195  16.25     0.13      0.032       (  0.079)       0.006        0.026
196  16.33     0.13      0.032       (  0.078)       0.006        0.026
197  16.42     0.13      0.032       (  0.078)       0.006        0.026
198  16.50     0.13      0.032       (  0.078)       0.006        0.026
199  16.58     0.10      0.024       (  0.077)       0.004        0.020
200  16.67     0.10      0.024       (  0.077)       0.004        0.020
201  16.75     0.10      0.024       (  0.076)       0.004        0.020
202  16.83     0.10      0.024       (  0.076)       0.004        0.020
203  16.92     0.10      0.024       (  0.076)       0.004        0.020
204  17.00     0.10      0.024       (  0.075)       0.004        0.020
205  17.08     0.17      0.040       (  0.075)       0.007        0.033
206  17.17     0.17      0.040       (  0.075)       0.007        0.033
207  17.25     0.17      0.040       (  0.074)       0.007        0.033
208  17.33     0.17      0.040       (  0.074)       0.007        0.033
209  17.42     0.17      0.040       (  0.073)       0.007        0.033
210  17.50     0.17      0.040       (  0.073)       0.007        0.033
211  17.58     0.17      0.040       (  0.073)       0.007        0.033
212  17.67     0.17      0.040       (  0.072)       0.007        0.033
213  17.75     0.17      0.040       (  0.072)       0.007        0.033
214  17.83     0.13      0.032       (  0.072)       0.006        0.026
215  17.92     0.13      0.032       (  0.071)       0.006        0.026
216  18.00     0.13      0.032       (  0.071)       0.006        0.026
217  18.08     0.13      0.032       (  0.071)       0.006        0.026
218  18.17     0.13      0.032       (  0.070)       0.006        0.026
219  18.25     0.13      0.032       (  0.070)       0.006        0.026
220  18.33     0.13      0.032       (  0.070)       0.006        0.026
221  18.42     0.13      0.032       (  0.069)       0.006        0.026
222  18.50     0.13      0.032       (  0.069)       0.006        0.026
223  18.58     0.10      0.024       (  0.069)       0.004        0.020
224  18.67     0.10      0.024       (  0.068)       0.004        0.020
225  18.75     0.10      0.024       (  0.068)       0.004        0.020
226  18.83     0.07      0.016       (  0.068)       0.003        0.013
227  18.92     0.07      0.016       (  0.067)       0.003        0.013
228  19.00     0.07      0.016       (  0.067)       0.003        0.013
229  19.08     0.10      0.024       (  0.067)       0.004        0.020
230  19.17     0.10      0.024       (  0.066)       0.004        0.020
231  19.25     0.10      0.024       (  0.066)       0.004        0.020
232  19.33     0.13      0.032       (  0.066)       0.006        0.026
233  19.42     0.13      0.032       (  0.065)       0.006        0.026
234  19.50     0.13      0.032       (  0.065)       0.006        0.026
235  19.58     0.10      0.024       (  0.065)       0.004        0.020
236  19.67     0.10      0.024       (  0.064)       0.004        0.020
237  19.75     0.10      0.024       (  0.064)       0.004        0.020
238  19.83     0.07      0.016       (  0.064)       0.003        0.013
239  19.92     0.07      0.016       (  0.064)       0.003        0.013
240  20.00     0.07      0.016       (  0.063)       0.003        0.013
241  20.08     0.10      0.024       (  0.063)       0.004        0.020
242  20.17     0.10      0.024       (  0.063)       0.004        0.020
243  20.25     0.10      0.024       (  0.062)       0.004        0.020
244  20.33     0.10      0.024       (  0.062)       0.004        0.020
245  20.42     0.10      0.024       (  0.062)       0.004        0.020
246  20.50     0.10      0.024       (  0.062)       0.004        0.020
247  20.58     0.10      0.024       (  0.061)       0.004        0.020
248  20.67     0.10      0.024       (  0.061)       0.004        0.020
249  20.75     0.10      0.024       (  0.061)       0.004        0.020
250  20.83     0.07      0.016       (  0.061)       0.003        0.013
251  20.92     0.07      0.016       (  0.060)       0.003        0.013
252  21.00     0.07      0.016       (  0.060)       0.003        0.013
253  21.08     0.10      0.024       (  0.060)       0.004        0.020
254  21.17     0.10      0.024       (  0.060)       0.004        0.020
255  21.25     0.10      0.024       (  0.059)       0.004        0.020
256  21.33     0.07      0.016       (  0.059)       0.003        0.013
257  21.42     0.07      0.016       (  0.059)       0.003        0.013
258  21.50     0.07      0.016       (  0.059)       0.003        0.013
259  21.58     0.10      0.024       (  0.059)       0.004        0.020
260  21.67     0.10      0.024       (  0.058)       0.004        0.020
261  21.75     0.10      0.024       (  0.058)       0.004        0.020
262  21.83     0.07      0.016       (  0.058)       0.003        0.013
263  21.92     0.07      0.016       (  0.058)       0.003        0.013
264  22.00     0.07      0.016       (  0.058)       0.003        0.013
265  22.08     0.10      0.024       (  0.057)       0.004        0.020
266  22.17     0.10      0.024       (  0.057)       0.004        0.020
267  22.25     0.10      0.024       (  0.057)       0.004        0.020
268  22.33     0.07      0.016       (  0.057)       0.003        0.013
269  22.42     0.07      0.016       (  0.057)       0.003        0.013
270  22.50     0.07      0.016       (  0.057)       0.003        0.013
271  22.58     0.07      0.016       (  0.056)       0.003        0.013
272  22.67     0.07      0.016       (  0.056)       0.003        0.013
273  22.75     0.07      0.016       (  0.056)       0.003        0.013
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274  22.83     0.07      0.016       (  0.056)       0.003        0.013
275  22.92     0.07      0.016       (  0.056)       0.003        0.013
276  23.00     0.07      0.016       (  0.056)       0.003        0.013
277  23.08     0.07      0.016       (  0.055)       0.003        0.013
278  23.17     0.07      0.016       (  0.055)       0.003        0.013
279  23.25     0.07      0.016       (  0.055)       0.003        0.013
280  23.33     0.07      0.016       (  0.055)       0.003        0.013
281  23.42     0.07      0.016       (  0.055)       0.003        0.013
282  23.50     0.07      0.016       (  0.055)       0.003        0.013
283  23.58     0.07      0.016       (  0.055)       0.003        0.013
284  23.67     0.07      0.016       (  0.055)       0.003        0.013
285  23.75     0.07      0.016       (  0.055)       0.003        0.013
286  23.83     0.07      0.016       (  0.055)       0.003        0.013
287  23.92     0.07      0.016       (  0.055)       0.003        0.013
288  24.00     0.07      0.016       (  0.055)       0.003        0.013
                (Loss Rate Not Used)
    Sum =     100.0                                   Sum =    19.7
       Flood volume = Effective rainfall      1.64(In)
        times area       2.5(Ac.)/[(In)/(Ft.)] =       0.3(Ac.Ft)
       Total soil loss =      0.36(In)
       Total soil loss =     0.075(Ac.Ft)
       Total rainfall =      2.00(In)
       Flood volume =       14882.9 Cubic Feet
       Total soil loss =        3267.0 Cubic Feet
       --------------------------------------------------------------------
        Peak flow rate of this hydrograph =      0.562(CFS)
       --------------------------------------------------------------------
       ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                           24 - H O U R   S T O R M
                      R u n o f f     H y d r o g r a p h
       --------------------------------------------------------------------
                   Hydrograph in   5   Minute intervals ((CFS))

       --------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        2.5       5.0       7.5      10.0
 -----------------------------------------------------------------------
   0+ 5       0.0002      0.03  Q         |         |         |         |
   0+10       0.0005      0.03  Q         |         |         |         |
   0+15       0.0007      0.03  Q         |         |         |         |
   0+20       0.0010      0.05  Q         |         |         |         |
   0+25       0.0014      0.05  Q         |         |         |         |
   0+30       0.0017      0.05  Q         |         |         |         |
   0+35       0.0020      0.05  Q         |         |         |         |
   0+40       0.0024      0.05  Q         |         |         |         |
   0+45       0.0027      0.05  Q         |         |         |         |
   0+50       0.0032      0.07  Q         |         |         |         |
   0+55       0.0036      0.07  Q         |         |         |         |
   1+ 0       0.0041      0.07  Q         |         |         |         |
   1+ 5       0.0044      0.05  Q         |         |         |         |
   1+10       0.0048      0.05  Q         |         |         |         |
   1+15       0.0051      0.05  Q         |         |         |         |
   1+20       0.0055      0.05  Q         |         |         |         |
   1+25       0.0058      0.05  Q         |         |         |         |
   1+30       0.0061      0.05  Q         |         |         |         |
   1+35       0.0065      0.05  Q         |         |         |         |
   1+40       0.0068      0.05  Q         |         |         |         |
   1+45       0.0072      0.05  Q         |         |         |         |
   1+50       0.0076      0.07  Q         |         |         |         |
   1+55       0.0081      0.07  Q         |         |         |         |
   2+ 0       0.0085      0.07  QV        |         |         |         |
   2+ 5       0.0090      0.07  QV        |         |         |         |
   2+10       0.0095      0.07  QV        |         |         |         |
   2+15       0.0099      0.07  QV        |         |         |         |
   2+20       0.0104      0.07  QV        |         |         |         |
   2+25       0.0108      0.07  QV        |         |         |         |
   2+30       0.0113      0.07  QV        |         |         |         |
   2+35       0.0118      0.08  QV        |         |         |         |
   2+40       0.0124      0.08  QV        |         |         |         |
   2+45       0.0130      0.08  QV        |         |         |         |
   2+50       0.0136      0.08  QV        |         |         |         |
   2+55       0.0141      0.08  QV        |         |         |         |
   3+ 0       0.0147      0.08  QV        |         |         |         |
   3+ 5       0.0153      0.08  QV        |         |         |         |
   3+10       0.0158      0.08  QV        |         |         |         |
   3+15       0.0164      0.08  QV        |         |         |         |
   3+20       0.0170      0.08  QV        |         |         |         |
   3+25       0.0175      0.08  Q V       |         |         |         |
   3+30       0.0181      0.08  Q V       |         |         |         |
   3+35       0.0187      0.08  Q V       |         |         |         |
   3+40       0.0192      0.08  Q V       |         |         |         |
   3+45       0.0198      0.08  Q V       |         |         |         |
   3+50       0.0205      0.10  Q V       |         |         |         |
   3+55       0.0212      0.10  Q V       |         |         |         |
   4+ 0       0.0219      0.10  Q V       |         |         |         |
   4+ 5       0.0225      0.10  Q V       |         |         |         |
   4+10       0.0232      0.10  Q V       |         |         |         |
   4+15       0.0239      0.10  Q V       |         |         |         |
   4+20       0.0247      0.12  Q V       |         |         |         |
   4+25       0.0255      0.12  Q V       |         |         |         |
   4+30       0.0263      0.12  Q  V      |         |         |         |
   4+35       0.0271      0.12  Q  V      |         |         |         |
   4+40       0.0279      0.12  Q  V      |         |         |         |
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 4+45       0.0287      0.12  Q  V      |         |         |         |
 4+50       0.0296      0.13  Q  V      |         |         |         |
 4+55       0.0305      0.13  Q  V      |         |         |         |
 5+ 0       0.0314      0.13  Q  V      |         |         |         |
 5+ 5       0.0321      0.10  Q  V      |         |         |         |
 5+10       0.0328      0.10  Q  V      |         |         |         |
 5+15       0.0335      0.10  Q  V      |         |         |         |
 5+20       0.0343      0.12  Q   V     |         |         |         |
 5+25       0.0351      0.12  Q   V     |         |         |         |
 5+30       0.0359      0.12  Q   V     |         |         |         |
 5+35       0.0368      0.13  Q   V     |         |         |         |
 5+40       0.0377      0.13  Q   V     |         |         |         |
 5+45       0.0386      0.13  Q   V     |         |         |         |
 5+50       0.0395      0.13  Q   V     |         |         |         |
 5+55       0.0404      0.13  Q   V     |         |         |         |
 6+ 0       0.0413      0.13  Q   V     |         |         |         |
 6+ 5       0.0424      0.15  Q   V     |         |         |         |
 6+10       0.0434      0.15  Q    V    |         |         |         |
 6+15       0.0444      0.15  Q    V    |         |         |         |
 6+20       0.0454      0.15  Q    V    |         |         |         |
 6+25       0.0465      0.15  Q    V    |         |         |         |
 6+30       0.0475      0.15  Q    V    |         |         |         |
 6+35       0.0486      0.17  Q    V    |         |         |         |
 6+40       0.0498      0.17  Q    V    |         |         |         |
 6+45       0.0509      0.17  Q    V    |         |         |         |
 6+50       0.0520      0.17  Q     V   |         |         |         |
 6+55       0.0532      0.17  Q     V   |         |         |         |
 7+ 0       0.0543      0.17  Q     V   |         |         |         |
 7+ 5       0.0555      0.17  Q     V   |         |         |         |
 7+10       0.0566      0.17  Q     V   |         |         |         |
 7+15       0.0577      0.17  Q     V   |         |         |         |
 7+20       0.0590      0.18  Q     V   |         |         |         |
 7+25       0.0602      0.18  Q      V  |         |         |         |
 7+30       0.0615      0.18  Q      V  |         |         |         |
 7+35       0.0629      0.20  Q      V  |         |         |         |
 7+40       0.0642      0.20  Q      V  |         |         |         |
 7+45       0.0656      0.20  Q      V  |         |         |         |
 7+50       0.0671      0.21  Q      V  |         |         |         |
 7+55       0.0686      0.21  Q       V |         |         |         |
 8+ 0       0.0700      0.21  Q       V |         |         |         |
 8+ 5       0.0717      0.25  Q       V |         |         |         |
 8+10       0.0735      0.25  Q       V |         |         |         |
 8+15       0.0752      0.25  Q       V |         |         |         |
 8+20       0.0769      0.25  Q        V|         |         |         |
 8+25       0.0786      0.25  Q        V|         |         |         |
 8+30       0.0803      0.25  Q        V|         |         |         |
 8+35       0.0821      0.26  |Q       V|         |         |         |
 8+40       0.0839      0.26  |Q       V|         |         |         |
 8+45       0.0858      0.26  |Q        V         |         |         |
 8+50       0.0877      0.28  |Q        V         |         |         |
 8+55       0.0896      0.28  |Q        V         |         |         |
 9+ 0       0.0916      0.28  |Q        V         |         |         |
 9+ 5       0.0937      0.31  |Q        V         |         |         |
 9+10       0.0959      0.31  |Q        |V        |         |         |
 9+15       0.0981      0.31  |Q        |V        |         |         |
 9+20       0.1003      0.33  |Q        |V        |         |         |
 9+25       0.1026      0.33  |Q        | V       |         |         |
 9+30       0.1049      0.33  |Q        | V       |         |         |
 9+35       0.1073      0.35  |Q        | V       |         |         |
 9+40       0.1097      0.35  |Q        | V       |         |         |
 9+45       0.1121      0.35  |Q        |  V      |         |         |
 9+50       0.1146      0.36  |Q        |  V      |         |         |
 9+55       0.1171      0.36  |Q        |  V      |         |         |
10+ 0       0.1196      0.36  |Q        |   V     |         |         |
10+ 5       0.1213      0.25  Q         |   V     |         |         |
10+10       0.1230      0.25  Q         |   V     |         |         |
10+15       0.1247      0.25  Q         |   V     |         |         |
10+20       0.1264      0.25  Q         |   V     |         |         |
10+25       0.1281      0.25  Q         |    V    |         |         |
10+30       0.1298      0.25  Q         |    V    |         |         |
10+35       0.1321      0.33  |Q        |    V    |         |         |
10+40       0.1344      0.33  |Q        |    V    |         |         |
10+45       0.1367      0.33  |Q        |     V   |         |         |
10+50       0.1389      0.33  |Q        |     V   |         |         |
10+55       0.1412      0.33  |Q        |     V   |         |         |
11+ 0       0.1435      0.33  |Q        |     V   |         |         |
11+ 5       0.1457      0.31  |Q        |      V  |         |         |
11+10       0.1478      0.31  |Q        |      V  |         |         |
11+15       0.1500      0.31  |Q        |      V  |         |         |
11+20       0.1522      0.31  |Q        |      V  |         |         |
11+25       0.1543      0.31  |Q        |       V |         |         |
11+30       0.1565      0.31  |Q        |       V |         |         |
11+35       0.1584      0.28  |Q        |       V |         |         |
11+40       0.1604      0.28  |Q        |       V |         |         |
11+45       0.1623      0.28  |Q        |        V|         |         |
11+50       0.1643      0.30  |Q        |        V|         |         |
11+55       0.1664      0.30  |Q        |        V|         |         |
12+ 0       0.1684      0.30  |Q        |        V|         |         |
12+ 5       0.1713      0.41  |Q        |         V         |         |
12+10       0.1741      0.41  |Q        |         V         |         |
12+15       0.1770      0.41  |Q        |         V         |         |
12+20       0.1799      0.43  |Q        |         |V        |         |
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12+25       0.1829      0.43  |Q         |         |V        |         |
12+30       0.1859      0.43  |Q         |         |V        |         |
12+35       0.1891      0.46  |Q         |         | V       |         |
12+40       0.1922      0.46  |Q         |         | V       |         |
12+45       0.1954      0.46  |Q         |         | V       |         |
12+50       0.1987      0.48  |Q         |         |  V      |         |
12+55       0.2020      0.48  |Q         |         |  V      |         |
13+ 0       0.2053      0.48  |Q         |         |   V     |         |
13+ 5       0.2092      0.56  | Q        |         |   V     |         |
13+10       0.2131      0.56  | Q        |         |   V     |         |
13+15       0.2170      0.56  | Q        |         |    V    |         |
13+20       0.2208      0.56  | Q        |         |    V    |         |
13+25       0.2247      0.56  | Q        |         |     V   |         |
13+30       0.2286      0.56  | Q        |         |     V   |         |
13+35       0.2312      0.38  |Q         |         |      V  |         |
13+40       0.2338      0.38  |Q         |         |      V  |         |
13+45       0.2364      0.38  |Q         |         |      V  |         |
13+50       0.2391      0.38  |Q         |         |      V  |         |
13+55       0.2417      0.38  |Q         |         |       V |         |
14+ 0       0.2443      0.38  |Q         |         |       V |         |
14+ 5       0.2474      0.45  |Q         |         |       V |         |
14+10       0.2504      0.45  |Q         |         |        V|         |
14+15       0.2535      0.45  |Q         |         |        V|         |
14+20       0.2565      0.43  |Q         |         |         V         |
14+25       0.2594      0.43  |Q         |         |         V         |
14+30       0.2624      0.43  |Q         |         |         V         |
14+35       0.2654      0.43  |Q         |         |         |V        |
14+40       0.2683      0.43  |Q         |         |         |V        |
14+45       0.2713      0.43  |Q         |         |         |V        |
14+50       0.2741      0.41  |Q         |         |         | V       |
14+55       0.2770      0.41  |Q         |         |         | V       |
15+ 0       0.2798      0.41  |Q         |         |         | V       |
15+ 5       0.2826      0.40  |Q         |         |         |  V      |
15+10       0.2853      0.40  |Q         |         |         |  V      |
15+15       0.2880      0.40  |Q         |         |         |  V      |
15+20       0.2906      0.38  |Q         |         |         |   V     |
15+25       0.2933      0.38  |Q         |         |         |   V     |
15+30       0.2959      0.38  |Q         |         |         |   V     |
15+35       0.2980      0.31  |Q         |         |         |   V     |
15+40       0.3002      0.31  |Q         |         |         |    V    |
15+45       0.3024      0.31  |Q         |         |         |    V    |
15+50       0.3045      0.31  |Q         |         |         |    V    |
15+55       0.3067      0.31  |Q         |         |         |    V    |
16+ 0       0.3089      0.31  |Q         |         |         |     V   |
16+ 5       0.3093      0.07  Q          |         |         |     V   |
16+10       0.3098      0.07  Q          |         |         |     V   |
16+15       0.3102      0.07  Q          |         |         |     V   |
16+20       0.3107      0.07  Q          |         |         |     V   |
16+25       0.3111      0.07  Q          |         |         |     V   |
16+30       0.3116      0.07  Q          |         |         |     V   |
16+35       0.3119      0.05  Q          |         |         |     V   |
16+40       0.3123      0.05  Q          |         |         |     V   |
16+45       0.3126      0.05  Q          |         |         |     V   |
16+50       0.3130      0.05  Q          |         |         |     V   |
16+55       0.3133      0.05  Q          |         |         |     V   |
17+ 0       0.3136      0.05  Q          |         |         |     V   |
17+ 5       0.3142      0.08  Q          |         |         |     V   |
17+10       0.3148      0.08  Q          |         |         |     V   |
17+15       0.3154      0.08  Q          |         |         |     V   |
17+20       0.3159      0.08  Q          |         |         |     V   |
17+25       0.3165      0.08  Q          |         |         |      V  |
17+30       0.3171      0.08  Q          |         |         |      V  |
17+35       0.3176      0.08  Q          |         |         |      V  |
17+40       0.3182      0.08  Q          |         |         |      V  |
17+45       0.3188      0.08  Q          |         |         |      V  |
17+50       0.3192      0.07  Q          |         |         |      V  |
17+55       0.3197      0.07  Q          |         |         |      V  |
18+ 0       0.3201      0.07  Q          |         |         |      V  |
18+ 5       0.3206      0.07  Q          |         |         |      V  |
18+10       0.3211      0.07  Q          |         |         |      V  |
18+15       0.3215      0.07  Q          |         |         |      V  |
18+20       0.3220      0.07  Q          |         |         |      V  |
18+25       0.3224      0.07  Q          |         |         |      V  |
18+30       0.3229      0.07  Q          |         |         |      V  |
18+35       0.3232      0.05  Q          |         |         |      V  |
18+40       0.3236      0.05  Q          |         |         |      V  |
18+45       0.3239      0.05  Q          |         |         |      V  |
18+50       0.3241      0.03  Q          |         |         |      V  |
18+55       0.3244      0.03  Q          |         |         |      V  |
19+ 0       0.3246      0.03  Q          |         |         |       V |
19+ 5       0.3249      0.05  Q          |         |         |       V |
19+10       0.3253      0.05  Q          |         |         |       V |
19+15       0.3256      0.05  Q          |         |         |       V |
19+20       0.3261      0.07  Q          |         |         |       V |
19+25       0.3265      0.07  Q          |         |         |       V |
19+30       0.3270      0.07  Q          |         |         |       V |
19+35       0.3273      0.05  Q          |         |         |       V |
19+40       0.3277      0.05  Q          |         |         |       V |
19+45       0.3280      0.05  Q          |         |         |       V |
19+50       0.3282      0.03  Q          |         |         |       V |
19+55       0.3285      0.03  Q          |         |         |       V |
20+ 0       0.3287      0.03  Q          |         |         |       V |
```

```
   20+ 5       0.3290      0.05  Q         |         |         |       V |
   20+10       0.3294      0.05  Q         |         |         |       V |
   20+15       0.3297      0.05  Q         |         |         |       V |
   20+20       0.3300      0.05  Q         |         |         |       V |
   20+25       0.3304      0.05  Q         |         |         |       V |
   20+30       0.3307      0.05  Q         |         |         |       V |
   20+35       0.3311      0.05  Q         |         |         |       V |
   20+40       0.3314      0.05  Q         |         |         |       V |
   20+45       0.3318      0.05  Q         |         |         |       V |
   20+50       0.3320      0.03  Q         |         |         |       V |
   20+55       0.3322      0.03  Q         |         |         |       V |
   21+ 0       0.3324      0.03  Q         |         |         |       V |
   21+ 5       0.3328      0.05  Q         |         |         |       V |
   21+10       0.3331      0.05  Q         |         |         |        V|
   21+15       0.3335      0.05  Q         |         |         |        V|
   21+20       0.3337      0.03  Q         |         |         |        V|
   21+25       0.3339      0.03  Q         |         |         |        V|
   21+30       0.3341      0.03  Q         |         |         |        V|
   21+35       0.3345      0.05  Q         |         |         |        V|
   21+40       0.3348      0.05  Q         |         |         |        V|
   21+45       0.3352      0.05  Q         |         |         |        V|
   21+50       0.3354      0.03  Q         |         |         |        V|
   21+55       0.3356      0.03  Q         |         |         |        V|
   22+ 0       0.3359      0.03  Q         |         |         |        V|
   22+ 5       0.3362      0.05  Q         |         |         |        V|
   22+10       0.3365      0.05  Q         |         |         |        V|
   22+15       0.3369      0.05  Q         |         |         |        V|
   22+20       0.3371      0.03  Q         |         |         |        V|
   22+25       0.3373      0.03  Q         |         |         |        V|
   22+30       0.3376      0.03  Q         |         |         |        V|
   22+35       0.3378      0.03  Q         |         |         |        V|
   22+40       0.3380      0.03  Q         |         |         |        V|
   22+45       0.3382      0.03  Q         |         |         |        V|
   22+50       0.3385      0.03  Q         |         |         |        V|
   22+55       0.3387      0.03  Q         |         |         |        V|
   23+ 0       0.3389      0.03  Q         |         |         |        V|
   23+ 5       0.3392      0.03  Q         |         |         |        V|
   23+10       0.3394      0.03  Q         |         |         |        V|
   23+15       0.3396      0.03  Q         |         |         |        V|
   23+20       0.3398      0.03  Q         |         |         |        V|
   23+25       0.3401      0.03  Q         |         |         |        V|
   23+30       0.3403      0.03  Q         |         |         |        V|
   23+35       0.3405      0.03  Q         |         |         |        V|
   23+40       0.3408      0.03  Q         |         |         |        V|
   23+45       0.3410      0.03  Q         |         |         |        V|
   23+50       0.3412      0.03  Q         |         |         |        V|
   23+55       0.3414      0.03  Q         |         |         |        V|
   24+ 0       0.3417      0.03  Q         |         |         |         V
-----------------------------------------------------------------------
```

# Storage Calculations

# Buildings 1&2 – Infiltration Basin A

# Buildings 1 and 2 - Infiltration Basin A

| Hydrograph Volumes | | |
|---|---|---|
| | Volume (cu. ft.) | Volume (ac. ft.) |
| Existing Condition | 28,240 | 0.6483 |
| Proposed Condition | 220,235 | 5.0559 |
| Difference in Volume | 191,995 | 4.4076 |

| Peak Flowrate | |
|---|---|
| | Flowrate (cfs) |
| Proposed Condition | 8.32 |

| Time of Concentration | | |
|---|---|---|
| | Tc (min) | |
| Existing Condition | 30 | |
| Proposed Condition | 441.2 | *(volume ÷ peak flowrate) ÷ 60* |

proposed condition Tc > existing condition Tc

| Stage Storage Volumes | | | | |
|---|---|---|---|---|
| Elevation (ft.) | Depth (ft.) | Total Volume (cu. ft.) | Total Volume (ac. ft.) | |
| 880.00 | 0.00 | 0 | 0.0000 | |
| 880.50 | 0.50 | 22,591 | 0.5186 | |
| 881.00 | 1.00 | 47,303 | 1.0859 | |
| 881.50 | 1.50 | 74,145 | 1.7021 | |
| 882.00 | 2.00 | 103,124 | 2.3674 | |
| 882.50 | 2.50 | 134,248 | 3.0819 | |
| 883.00 | 3.00 | 167,524 | 3.8458 | |
| 883.50 | 3.50 | 202,959 | 4.6593 | HCOC vol. met here |
| 884.00 | 4.00 | 240,563 | 5.5226 | |
| 884.50 | 4.50 | 280,343 | 6.4358 | |
| 885.00 | 5.00 | 322,309 | 7.3992 | Spillway invert |

# Buildings 3&4 – Infiltration Basin B

# Buildings 3 and 4 - Infiltration Basin B

| **Hydrograph Volumes** | | |
|---|---|---|
| | Volume (cu. ft.) | Volume (ac. ft.) |
| Existing Condition | 17,424 | 0.4000 |
| Proposed Condition | 128,341 | 2.9463 |
| Difference in Volume | 110,917 | 2.5463 |

| **Peak Flowrate** | |
|---|---|
| | Flowrate (cfs) |
| Proposed Condition | 4.84 |

| **Time of Concentration** | | |
|---|---|---|
| | Tc (min) | |
| Existing Condition | 30 | |
| Proposed Condition | 441.9 | *(volume ÷ peak flowrate) ÷ 60* |

proposed condition Tc > existing condition Tc

| **Stage Storage** | | | | |
|---|---|---|---|---|
| Elevation (ft.) | Depth (ft.) | Total Volume (cu. ft.) | Total Volume (ac. ft.) | |
| 879.73 | 0.00 | 0 | 0.0000 | |
| 880.23 | 0.50 | 16,533 | 0.3795 | |
| 880.73 | 1.00 | 33,908 | 0.7784 | |
| 881.23 | 1.50 | 52,136 | 1.1969 | |
| 881.73 | 2.00 | 71,226 | 1.6351 | |
| 882.23 | 2.50 | 91,188 | 2.0934 | |
| 882.73 | 3.00 | 112,033 | 2.5719 | HCOC vol. met here |
| 883.23 | 3.50 | 133,770 | 3.0709 | |
| 883.73 | 4.00 | 156,420 | 3.5909 | |
| 884.23 | 4.50 | 180,009 | 4.1324 | |
| 884.73 | 5.00 | 204,553 | 4.6959 | |
| 884.90 | 5.17 | 213,056 | 4.8911 | Spillway invert |

# Building 5 – Underground Chambers

# Building 5 - Underground Chambers

| Hydrograph Volumes | | |
|---|---|---|
| | Volume (cu. ft.) | Volume (ac. ft.) |
| Existing Condition | 9,618 | 0.2208 |
| Proposed Condition | 14,884 | 0.3417 |
| Difference in Volume | 5,266 | 0.1209 |

| Peak Flowrate | |
|---|---|
| | Flowrate (cfs) |
| Proposed Condition | 0.562 |

| Time of Concentration | | |
|---|---|---|
| | Tc (min) | |
| Existing Condition | 30 | |
| Proposed Condition | 441.4 | *(volume ÷ peak flowrate) ÷ 60* |

proposed condition Tc > existing condition Tc

**Refer to next page for stage storage calculator**

**Project:**

StormTech
Detention • Retention • Water Quality
A division of ADS

| | | |
|---|---|---|
| Chamber Model - | SC-740 | |
| Units - | **Imperial** | Click Here for Metric |
| Number of chambers - | 88 | |
| Voids in the stone (porosity) - | 40 | % |
| Base of Stone Elevation - | 0.00 | ft |
| Amount of Stone Above Chambers - | 6 | in |
| Amount of Stone Below Chambers - | 6 | in |

☐ Include Perimeter Stone in Calculations

| Height of System *(inches)* | Incremental Single Chamber *(cubic feet)* | Incremental Total Chamber *(cubic feet)* | Incremental Stone *(cubic feet)* | Incremental Ch & St *(cubic feet)* | Cumulative Chamber *(cubic feet)* | Elevation *(feet)* | |
|---|---|---|---|---|---|---|---|
| 42 | 0.00 | 0.00 | 99.16 | 99.16 | 6590.88 | 3.50 | |
| 41 | 0.00 | 0.00 | 99.16 | 99.16 | 6491.72 | 3.42 | |
| 40 | 0.00 | 0.00 | 99.16 | 99.16 | 6392.56 | 3.33 | |
| 39 | 0.00 | 0.00 | 99.16 | 99.16 | 6293.40 | 3.25 | |
| 38 | 0.00 | 0.00 | 99.16 | 99.16 | 6194.24 | 3.17 | |
| 37 | 0.00 | 0.00 | 99.16 | 99.16 | 6095.08 | 3.08 | |
| 36 | 0.05 | 4.84 | 97.22 | 102.06 | 5995.92 | 3.00 | |
| 35 | 0.16 | 14.34 | 93.42 | 107.76 | 5893.86 | 2.92 | |
| 34 | 0.28 | 24.81 | 89.23 | 114.05 | 5786.10 | 2.83 | |
| 33 | 0.60 | 53.15 | 77.90 | 131.05 | 5672.06 | 2.75 | |
| 32 | 0.80 | 70.55 | 70.94 | 141.49 | 5541.01 | 2.67 | |
| 31 | 0.95 | 83.66 | 65.70 | 149.35 | 5399.52 | 2.58 | HCOC vol. met here |
| 30 | 1.07 | 94.56 | 61.34 | 155.89 | 5250.16 | 2.50 | |
| 29 | 1.18 | 103.88 | 57.61 | 161.49 | 5094.27 | 2.42 | |
| 28 | 1.27 | 111.38 | 54.61 | 165.99 | 4932.78 | 2.33 | |
| 27 | 1.36 | 119.24 | 51.46 | 170.70 | 4766.80 | 2.25 | |
| 26 | 1.45 | 127.96 | 47.97 | 175.94 | 4596.09 | 2.17 | |
| 25 | 1.52 | 134.18 | 45.49 | 179.66 | 4420.16 | 2.08 | |
| 24 | 1.58 | 139.24 | 43.46 | 182.71 | 4240.49 | 2.00 | |
| 23 | 1.64 | 144.52 | 41.35 | 185.87 | 4057.79 | 1.92 | |
| 22 | 1.70 | 149.56 | 39.34 | 188.89 | 3871.92 | 1.83 | |
| 21 | 1.75 | 154.26 | 37.46 | 191.71 | 3683.02 | 1.75 | |
| 20 | 1.80 | 158.65 | 35.70 | 194.35 | 3491.31 | 1.67 | |
| 19 | 1.85 | 163.24 | 33.86 | 197.10 | 3296.96 | 1.58 | |
| 18 | 1.89 | 166.59 | 32.52 | 199.11 | 3099.86 | 1.50 | |
| 17 | 1.93 | 170.19 | 31.08 | 201.27 | 2900.74 | 1.42 | |
| 16 | 1.97 | 173.80 | 29.64 | 203.44 | 2699.47 | 1.33 | |
| 15 | 2.01 | 176.87 | 28.41 | 205.28 | 2496.03 | 1.25 | |
| 14 | 2.04 | 179.96 | 27.18 | 207.13 | 2290.75 | 1.17 | |
| 13 | 2.07 | 182.60 | 26.12 | 208.72 | 2083.61 | 1.08 | |
| 12 | 2.10 | 185.23 | 25.07 | 210.30 | 1874.90 | 1.00 | |
| 11 | 2.13 | 187.60 | 24.12 | 211.72 | 1664.60 | 0.92 | |
| 10 | 2.15 | 189.54 | 23.34 | 212.88 | 1452.88 | 0.83 | |
| 9 | 2.18 | 191.58 | 22.53 | 214.11 | 1240.00 | 0.75 | |
| 8 | 2.20 | 193.46 | 21.78 | 215.23 | 1025.89 | 0.67 | |
| 7 | 2.21 | 194.24 | 21.46 | 215.71 | 810.66 | 0.58 | |
| 6 | 0.00 | 0.00 | 99.16 | 99.16 | 594.95 | 0.50 | |
| 5 | 0.00 | 0.00 | 99.16 | 99.16 | 495.79 | 0.42 | |
| 4 | 0.00 | 0.00 | 99.16 | 99.16 | 396.64 | 0.33 | |
| 3 | 0.00 | 0.00 | 99.16 | 99.16 | 297.48 | 0.25 | |
| 2 | 0.00 | 0.00 | 99.16 | 99.16 | 198.32 | 0.17 | |
| 1 | 0.00 | 0.00 | 99.16 | 99.16 | 99.16 | 0.08 | |

# 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.**<br>☒ **Provide stormwater pollution prevention information to new site owners, lessees, or operators.**<br>☒ **See applicable operational BMPs in Fact Sheet SC-44, “Drainage System Maintenance,” in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com**<br>☒ **Include the following in lease agreements: “Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains.”** |
| ☒ B. **Interior floor drains and elevator shaft sump pumps** | | ☒ **State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.** | ☒ **Inspect and maintain drains to prevent blockages and overflow.** |
| ☐ C. **Interior parking garages** | | ☐ **State that parking garage floor drains will be plumbed to the sanitary sewer.** | ☐ **Inspect and maintain drains to prevent blockages and overflow.** |

# STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ... | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE | | |
|---|---|---|---|
| 1 Potential Sources of Runoff Pollutants | 2 Permanent Controls—Show on WQMP Drawings | 3 Permanent Controls—List in WQMP Table and Narrative | 4 Operational BMPs—Include in WQMP Table and Narrative |
| ☐ D1. **Need for future indoor & structural pest control** | | ☐ **Note building design features that discourage entry of pests.** | ☐ **Provide Integrated Pest Management information to owners, lessees, and operators.** |
| ☒ D2. **Landscape/ Outdoor Pesticide Use** | ☐ **Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained.**<br>☒ **Show self-retaining landscape areas, if any.**<br>☐ **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.**<br>☐ **Preserve existing native trees, shrubs, and ground cover to the maximum extent possible.**<br>☒ **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.**<br>☒ **Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions.**<br>☒ **Consider using pest-resistant plants, especially adjacent to hardscape.**<br>☒ **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.**<br>☒ **See applicable operational BMPs in "What you should know for…..Landscape and Gardening"** at http://rcflood.org/stormwater/**Error! Hyperlink reference not valid.**<br>☒ **Provide IPM information to new owners, lessees and operators.** |

# STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ... | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE | | |
|---|---|---|---|
| 1 Potential Sources of Runoff Pollutants | 2 Permanent Controls—Show on WQMP Drawings | 3 Permanent Controls—List in WQMP Table and Narrative | 4 Operational BMPs—Include in WQMP Table and Narrative |
| ☐ E. **Pools, spas, ponds, decorative fountains, and other water features.** | ☐ **Show location of water feature and a sanitary sewer cleanout in an accessible area within 10 feet. (Exception: Public pools must be plumbed according to County Department of Environmental Health Guidelines.)** | **If the Co-Permittee requires pools to be plumbed to the sanitary sewer, place a note on the plans and state in the narrative that this connection will be made according to local requirements.** | ☐ **See applicable operational BMPs in** "Guidelines for Maintaining Your Swimming Pool, Jacuzzi and Garden Fountain" at http://rcflood.org/stormwater/ |
| ☐ F. **Food service** | ☐ **For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment.**<br>☐ **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.**<br>☐ **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/<br>**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.**<br>☒ **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.**<br>☐ **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.**<br>☒ **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:**<br>**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** |

# STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE … | … THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE | | |
|---|---|---|---|
| 1<br>Potential Sources of Runoff Pollutants | 2<br>Permanent Controls—Show on WQMP Drawings | 3<br>Permanent Controls—List in WQMP Table and Narrative | 4<br>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**<br>See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at http://rcflood.org/stormwater/ |

# STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ... | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE | | |
|---|---|---|---|
| 1<br>Potential Sources of Runoff Pollutants | 2<br>Permanent Controls—Show on WQMP Drawings | 3<br>Permanent Controls—List in WQMP Table and Narrative | 4<br>Operational BMPs—Include in WQMP Table and Narrative |
| ☐ I. **Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)** | ☐ **Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area.**<br>☐ **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.**<br>☐ **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.**<br>**Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for:**<br>▪ **Hazardous Waste Generation**<br>▪ **Hazardous Materials Release Response and Inventory**<br>▪ **California Accidental Release (CalARP)**<br>▪ **Aboveground Storage Tank**<br>▪ **Uniform Fire Code Article 80 Section 103(b) & (c) 1991**<br>▪ **Underground Storage Tank**<br>**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** |

# STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ... | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE | | |
|---|---|---|---|
| 1 Potential Sources of Runoff Pollutants | 2 Permanent Controls—Show on WQMP Drawings | 3 Permanent Controls—List in WQMP Table and Narrative | 4 Operational BMPs—Include in WQMP Table and Narrative |
| ☐ J. **Vehicle and Equipment Cleaning** | ☐ **Show on drawings as appropriate:**<br>**(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.**<br>**(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).**<br>**(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.**<br>**(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):**<br>☐ **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/<br>☐**Car dealerships and similar may rinse cars with water only.** |

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ... | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE | | |
|---|---|---|---|
| 1 Potential Sources of Runoff Pollutants | 2 Permanent Controls—Show on WQMP Drawings | 3 Permanent Controls—List in WQMP Table and Narrative | 4 Operational BMPs—Include in WQMP Table and Narrative |
| ☐ K. **Vehicle/Equipment Repair and Maintenance** | ☐ **Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater.**<br>☐ **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.**<br>☐ **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.**<br>☐ **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.**<br>☐ **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:**<br>☐ **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.**<br>☐ **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.**<br>☐ **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.**<br>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/<br>Refer to Outdoor Cleaning Activities and Professional Mobile Service Providers for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at http://rcflood.org/stormwater/ |

| IF THESE SOURCES WILL BE ON THE PROJECT SITE … | … THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE | | |
|---|---|---|---|
| 1 Potential Sources of Runoff Pollutants | 2 Permanent Controls—Show on WQMP Drawings | 3 Permanent Controls—List in WQMP Table and Narrative | 4 Operational BMPs—Include in WQMP Table and Narrative |
| ☐ L. **Fuel Dispensing Areas** | ☐ **Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable.**<br>☐ **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.**<br>☐ **See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com** |

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[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.**

# STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

| IF THESE SOURCES WILL BE ON THE PROJECT SITE ... | ... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE | | |
|---|---|---|---|
| 1 Potential Sources of Runoff Pollutants | 2 Permanent Controls—Show on WQMP Drawings | 3 Permanent Controls—List in WQMP Table and Narrative | 4 Operational BMPs—Include in WQMP Table and Narrative |
| ☒ 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.**<br>☐ **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.**<br>☐ **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.**<br>☒ **See Fact Sheet SC-30, "Outdoor Loading and Unloading," 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<br>Potential Sources of Runoff Pollutants | 2<br>Permanent Controls—Show on WQMP Drawings | 3<br>Permanent Controls—List in WQMP Table and Narrative | 4<br>Operational BMPs—Include in WQMP Table and Narrative |
| ☐ N. **Fire Sprinkler Test Water** | | ☐ **Provide a means to drain fire sprinkler test water to the sanitary sewer.** | ☐ **See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at [www.cabmphandbooks.com](www.cabmphandbooks.com)** |
| O. **Miscellaneous Drain or Wash Water or Other Sources**<br>☐ **Boiler drain lines**<br>☐ **Condensate drain lines**<br>☐ **Rooftop equipment**<br>☒ **Drainage sumps**<br>☐ **Roofing, gutters, and trim.**<br>☐ **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.**<br>☐ **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.**<br>☐ **Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment.**<br>☐ **Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water.**<br>☐ **Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff.**<br>☐ **Include controls for other sources as specified by local reviewer.** | |

| IF THESE SOURCES WILL BE ON THE PROJECT SITE … | … THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE | | |
|---|---|---|---|
| 1<br>Potential Sources of Runoff Pollutants | 2<br>Permanent Controls—Show on WQMP Drawings | 3<br>Permanent Controls—List in WQMP Table and Narrative | 4<br>Operational BMPs—Include in WQMP Table and Narrative |
| ☒ P. **Plazas, sidewalks, and parking lots.** | | | ☒ **Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.** |

# Appendix 9: O&M

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

# Operation and Maintenance Plan

**Project Title:** Rubidoux Commerce Park

**Contact Information:**

**Prepared for:**
Proficiency Rubidoux, LLC
5020 Campus Drive
Newport Beach, CA 92660
Phone: (949) 296-7006
Contact: Jeff Trenton

**Prepared by:**
Thienes Engineering, Inc.
14349 Firestone Boulevard
La Mirada, CA 90638
(714) 521-4811
Contact: Luis Prado (luisp@thieneseng.com)
Job No. 3384b

**Original Date Prepared**: June 28, 2023

**Revision Date(s)**: ____________________

**Revision Date(s)**: ____________________

**Revision Date(s)**: ____________________

**Revision Date(s)**: ____________________

## Table of Contents

## List of Appendices

# I. Inspection and Maintenance Log

| Date | Observations/Actions | Inspector |
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Additional inspection and maintenance logs to be included in Appendix 1 of this O&M Plan.

# II. Updates, Revisions, and Errata

| Revision Number | Date | Brief Description of Update/Revision/Errata, include section and page number | Prepared and Approved By |
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Additional updates, revisions, and errata to be include in Appendix 2 of this O&M Plan.

# III. Introduction

The project site consists of 5 buildings over three distinct areas. Buildings 1-3 are located between 25th Street and 28th Street on the northwesterly side of the prolongation of 26th Street and the proposed extension of Van Dell Road. Building 4 is located on the southeasterly side of the extension of Van Dell Road and 26th Street. The West Riverside Canal is located on the southerly sides of Buildings 1, 2, and 4. Finally, Building 5 is located at the southwesterly corner of 26th Street and Avalon Street.

The project site comprised of Buildings 1-4 consists of 74.30 acres while the Building 5 site consists of 2.49 acres. Each building has truck yards and vehicle parking lots. There will be two infiltration basins; one located east of Buildings 1, 2 and the other one located southeast of Building 4. Underground chambers will be located west of Building 5. A storm drain system will be built near the westerly property line to intercept runoff from the westerly adjacent hills and horse stables. The said storm drain system will convey flows southwest (onsite) and then southeast in 28th Street before connecting to the existing 72-inch storm drain in 28th Street (near the West Riverside Canal intersection).

## Existing Conditions

The site is currently an undeveloped dirt lot. Runoff from the site generally surface drains south-easterly to a dirt channel and then to the 72-inch storm drain in 28th Street. The offsite hillside area and horse stables northwest of the project site are also tributary to the site.

## Proposed Conditions

The onsite northwesterly landscape areas, offsite northerly hills and existing horse stables will drain southerly to a proposed storm drain. Runoff is then conveyed southerly to the existing 72-inch Storm Drain Line “D” in 28th Street.

Generally, runoff from the Building 3 portion of the project site is collected in catch basins located in the truck yard and parking areas. A proposed private storm drain will convey these flows easterly through the Building 4 site. Runoff from Building 4 is also tributary to the storm drain system. The storm drain continues easterly, discharging into Infiltration Basin-B located on the southeasterly side of the Building 4. Overflows from Infiltration Basin-B are then conveyed southwesterly to the proposed storm drain in 28th Street.

Runoff from Buildings 1 and 2 are generally collected in catch basins located in the truck yards and vehicle parking lots. Proposed storm drain systems convey flows southeasterly into Infiltration Basin-A located on the easterly side of Buildings 1 and 2. Overflows from Infiltration Basin-A are then conveyed southwesterly to the proposed storm drain in 28th Street.

The southerly Building 5 site will maintain its existing drainage pattern. The site generally drains to a grate inlet at the southwesterly corner of the site. From here, overflows will discharge onto Avalon Street via a parkway culvert. Areas adjacent to the street also discharge to Avalon Street. Similar to existing conditions, runoff from the Building 5 site will be conveyed southwesterly in Avalon Street to the catch basin at the 28th Street/Avalon Street intersection, ultimately to the 72-inch storm drain in 28th Street. A sump pump will be utilized to pump stormwater out of the proposed truck well and onto the adjacent finish grade.

A total of 3.85 acres of landscape areas (DMA D) located along the street frontages from the buildings will drain offsite. These areas are considered self-treating areas.

Hydrologic conditions of concern (HCOC) will be mitigated via the proposed infiltration basins and the underground chambers. The difference in volumes between the existing and proposed 2-year, 24-hour storm event will be retained onsite. Refer to Appendix 7 for existing and proposed hydrographs.

# IV. Responsibility for Maintenance

## IV.A General

Funding will be provided by the owner:

Proficiency Rubidoux, LLC
5020 Campus Drive
Newport Beach, CA 92660
Phone: (949) 296-7006
Contact: Jeff Trenton

A copy of the Covenant Agreement will be attached in Appendix 3 of this O&M Plan.

## IV.B Staff Training Program

Staff training records and descriptions will be inserted in Appendix 4 of this O&M Plan.

## IV.C Records

Maintenance records are to be inserted chronologically in Appendix 1 of this O&M Plan.

## IV.D Safety

All maintenance procedures shall comply with the latest OSHA standards.

# V. Summary of Drainage Management Areas and Stormwater BMPs

## V.A Drainage Areas

See Appendix 5 of this O&M Plan for WQMP site map.

| DMA Name or ID | Surface Type(s)[1] | Area (Sq. Ft.) | Area (Acres) | DMA Type |
|---|---|---|---|---|
| A1 | Roofs/Conc/Asphalt | 1,513,710 | 34.75 | Type D |
| A2 | Ornamental Landscaping | 202,554 | 4.65 | Type D |
| A3 | Natural (A Soil) | 330,185 | 7.58 | Type D |
| B1 | Roofs/Conc/Asphalt | 933,055 | 21.42 | Type D |
| B2 | Ornamental Landscaping | 107,593 | 2.47 | Type D |
| C1 | Roofs/Conc/Asphalt | 85,813 | 1.97 | Type D |
| C2 | Ornamental Landscaping | 4,356 | 0.10 | Type D |
| D | Ornamental Landscaping | 167,706 | 3.85 | Type A |

Geo-location of the BMPs using latitude and longitude coordinates

| BMP No. or ID | BMP Identifier and Description | Corresponding Plan Sheet(s) | Latitude | Longitude |
|---|---|---|---|---|
| A | On-site storm drain inlets | WQMP Site Map | --- | --- |
| B | Interior floor drains and elevator shaft sump pumps | N/A | --- | --- |
| D2 | Landscape / Outdoor Pesticide Use | On-site Landscape Improvement Plans | --- | --- |
| G | Refuse Areas | WQMP Site Map | --- | --- |
| H | Industrial processes | WQMP Site Map (indoors, if any) | --- | --- |
| M | Loading Docks | WQMP Site Map | --- | --- |
| P | Plazas, sidewalks, and parking lots | N/A | --- | --- |
| IF-A | Infiltration Basin-A | WQMP Site Map | 34.01306 | -117.39895 |
| IF-B | Infiltration Basin-B | WQMP Site Map | 34.01496 | -117.39548 |
| STC-C | Underground Chambers-C | WQMP Site Map | 34.01337 | -117.39658 |

## V.B Structural Post-Construction BMPs

See Appendix 5 of this O&M Plan for WQMP site map.

Additional BMP details are available in Appendix 10 of the WQMP.

## V.C Self-Retaining Areas or Other

Landscaped areas in DMA D are considered self-treating areas.

# VI. Stormwater BMP Design Documentation

## VI.A "As-Built" Drawings of each Stormwater BMP

See Appendix 6 of this O&M Plan for "as-built" drawings.

## VI.B Manufacturer's Data, Manuals, and Maintenance Requirements

Not applicable, there are no manufactured stormwater BMPs.

## VI.C Specific Operation and Maintenance Concerns and Troubleshooting

Not applicable.

# VII. Maintenance Schedule or Matrix

## VII.A Maintenance Schedule

| Schedule (Infiltration Basin) | Inspection and Maintenance Activity (Infiltration Basin) |
|---|---|
| **Ongoing** including just before the annual storm season and following rainfall events. | • Maintain vegetation as needed. Use of fertilizers, pesticides and herbicides should be strenuously avoided to ensure they don't contribute to water pollution. If appropriate native plant selections and other IPM methods are used, such products shouldn't be needed. If such projects are used,<br>○ Products shall be applied in accordance with their labeling, especially in relation to application to water, and in areas subjected to flooding.<br>○ Fertilizers should not be applied within 15 days before, after, or during the rainy season.<br>• Remove debris and litter from the entire basin to minimize filter clogging and to improve aesthetics.<br>• Check for obvious problems and repair as needed. Address odor, insects, and overgrowth issues associated with stagnant or standing water in the basin bottom. There should be no long-term ponding water.<br>• Check for erosion and sediment laden areas in the basins. Repair as needed. Clean forebay of debris, litter, sediment, etc upon discovery.<br>• Revegetate side slopes where needed. |
| **Annually.** Schedule these inspections within 72 hours after a significant rainfall and prior to the rainy season (October 1st). "Significant rainfall" is defined as 0.5 inches or greater of rainfall: http://www.wrh.noaa.gov/forecast/wxtables/ | • Inspection of hydraulic and structural facilities. Examine the inlet for blockage, the embankment and spillway integrity, as well as damage to any structural element.<br>• Check side slopes and embankments for erosion, slumping and overgrowth.<br>• Check the basin depth for sediment build up and reduced total capacity. Scrape bottom as needed and remove sediment. Restore to original cross-section and infiltration rate. Replant basin vegetation.<br>• Verify the basin bottom is allowing acceptable infiltration. Use a disc or other method to aerate basin bottom only if there is actual significant loss of infiltrative capacity, rather than on a routine basis.<br>• No water should be preset 72 hours after an event. No long term standing water should be present at all. No algae formation should be visible. Correct problem as needed. |

| Schedule (Underground Retention Chambers) | Inspection and Maintenance Activity (Underground Retention Chambers) |
|---|---|
| The isolator row shall be inspected semi-annually (by October 1st and February 1st) and cleaned by water-flush and vacuum when solids accumulate to 3" depth. Maintenance to be conducted through service contract with the vendor or equally qualified contractor. | The isolator row shall be inspected for debris and sediment accumulations and maintained by a qualified technician and he/she will properly dispose of all wastes and inspect for standing water. A manhole is installed in order to inspect and maintain the inlet row. All entry into the chamber system must be done per OSHA codes to ensure operator and inspector safety. Inspection ports should be checked 48 hours after storm events to see that the water is draining down, at least once each rainy season, following a major storm event. Records shall be maintained by owner to document inspections. |

## VII.B Service Agreement Information

See Appendix 8 of this O&M Plan for service agreement information with any contractors regarding the O&M of BMPs at the site, if any.

# Appendix 9-1: Inspection and Maintenance Logs

*Insert Additional Inspection or Maintenance Logs Here*

| Date | Observations/Actions | Inspector |
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# Appendix 9-2: Updates, Revisions, and Errata

*Insert Additional Updates, Revisions, and Errata Logs Here*

| Revision Number | Date | Brief Description of Update/Revision/Errata, include section and page number | Prepared and Approved By |
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# Appendix 9-3: Maintenance Mechanism

*Copy of Covenant Agreement*
*Establishing Notification Process And Responsibility*
*For Water Quality Management Plan Implementation And Maintenance*

## Notification Process and Responsibility

**1.** **Name:** ______________________________

Title: ______________________________

Phone No.: ______________________________

WQMP Responsibilities, Duties, and Activities:

(1) Routine inspections to evaluate BMP effectiveness.
(2) Identifying when BMPs require maintenance.
(3) Working with qualified contractors to maintain the BMP.
(4) Recordkeeping of inspections and maintenance activities.

**2.** **Name:** ______________________________

Title: ______________________________

Phone No.: ______________________________

WQMP Responsibilities, Duties, and Activities:

(1) Cleaning, repairing, servicing, and maintenance of BMP.

**3.** **Name:** ______________________________

Title: ______________________________

Phone No.: ______________________________

WQMP Responsibilities, Duties, and Activities:

(1) In event of failure, and with City Engineer’s authorization, modify or replace with an upgraded BMP to prevent future failure.
(2) Notify successors of BMPs and maintenance requirements.

RECORDING REQUESTED BY:
Proficiency Rubidoux, LLC
(Property Owner's Name)

AND WHEN RECORDED MAIL TO:
Jeff Trenton
(Property Owner's Mailing Address)
5020 Campus Drive

Newport Beach, CA 92660

SPACE ABOVE THIS LINE FOR RECORDER'S USE

# RECORDING OF A

# WATER QUALITY MANAGEMENT PLAN AND

# STORMWATER BMP OPERATION AND

# MAINTENANCE AGREEMENT FOR

Rubidoux Commerce Center
**(Name *of Project*)**

XXXX 26th Street, Jurupa Valley, CA 92509
***(Address or Tract Map/Lot No.)***

# CITY OF JURUPA VALLEY
# WATER QUALITY MANAGEMENT PLAN AND STORMWATER BMP OPERATION AND MAINTENANCE AGREEMENT
# WITH Proficiency Rubidoux, LLC

## 1. PARTIES AND DATE.

THIS WATER QUALITY MANAGEMENT PLAN AND STORMWATER BMP OPERATION AND MAINTENANCE AGREEMENT ("Agreement") is made and entered into in the City of Jurupa Valley, California this ____________ day of__________________________________by and between the City of Jurupa Valley, a California municipal corporation ("City"), and Proficiency Rubidoux, LLC, a ________________________________ with its principal place of business at 5020 Campus Drive, Newport Beach, CA 92660 ("Owner"). This Agreement applies to property located at XXXX 26th Street, Jurupa Valley, CA 92509 APN No. see APNs below in the County of Riverside, State of California.

178-030-001, 178-030-002, 178-030-003,
178-030-006, 178-030-008, 178-030-009,
178-030-010; 178-070-001, 178-070-002,
178-070-003; 178-080-009

## 2. RECITALS.

2.1 The Owner owns real property ("Property") in the City of Jurupa Valley, County of Riverside, State of California, more specifically described in Exhibit "A" and depicted in Exhibit "B", each of which exhibits is attached hereto and incorporated herein by this reference.

2.2 At the time of initial approval of Owner's development project known as Rubidoux Commerce Center within the Property, the City required the project to employ Best Management Practices, hereinafter referred to as "BMPs," to minimize pollutants in urban runoff.

2.3 The Owner has chosen to install and/or implement BMPs as described in the Water Quality Management Plan, on file with the City, hereinafter referred to as "WQMP", to minimize pollutants in urban runoff and to minimize other adverse impacts of urban runoff.

2.4 The WQMP has been certified by the Owner and reviewed and approved by the City.

2.5 The BMPs, with installation and/or implementation on private property and draining only private property, are part of a private facility with all maintenance or replacement, therefore, the sole responsibility of the Owner in accordance with the terms of this Agreement.

2.6 The Owner is aware that periodic and continuous maintenance, including, but not necessarily limited to, filter material replacement and sediment removal, is required to assure peak performance of all BMPs in the WQMP and that, furthermore, such maintenance activity will require compliance with all Local, State, or Federal laws and regulations, including those pertaining to confined space and waste disposal methods, in effect at the time such maintenance occurs

## 3. TERMS.

3.1 Responsibility for Operation and Maintenance of BMPs. Owner shall diligently maintain all BMPs in a manner assuring peak performance at all times. All reasonable precautions shall be exercised by Owner and Owner's representative or contractor in the removal and extraction of any material(s) from the BMPs and the ultimate disposal of the material(s) in a manner consistent with all relevant laws and regulations in effect at the time. As may be requested from time to time by the City, the Owner shall provide the City with documentation identifying the material(s) removed, the quantity, and disposal destination.

3.2 Right of Access. Owner hereby provides the City or City's designee complete access, of any duration, to the BMPs and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by City's Director of Public Works ("Director"), no advance notice, for the purpose of inspection, sampling, testing of the BMPs, and in case of emergency, to undertake, in the City's sole discretion, necessary repairs or other preventative measures at Owner's expense as provided in paragraph 3 below. City shall make every effort at all times to minimize or avoid interference with Owner's use of the Property.

3.3 City Maintenance at Owner's Expense. In the event Owner, or its successors or assigns, fails to accomplish the necessary maintenance contemplated by this Agreement, within five (5) days of being given written notice by the City, the City is hereby authorized to cause any maintenance necessary to be done and charge the entire cost and expense to the Owner or Owner's successors or assigns, including administrative costs, attorney's fees and interest thereon at the maximum rate authorized by the Civil Code from the date of the notice of expense until paid in full. The City, at its sole election, may make these costs to be a lien upon the property that may be collected at the same time and in the same manner as ordinary municipal taxes as provided in Government Code section 38773.5. Nothing in this section or this Agreement creates an obligation by the City to maintain or repair any BMP, nor does this section prohibit the City from pursuing other legal recourse against Owner.

3.4 Recording. This Agreement shall be recorded in the Office of the Recorder of Riverside County, California, at the expense of the Owner and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth, and also a lien in such amount as will fully reimburse the City, including interest as herein above set forth, subject to foreclosure in event of default in payment.

3.5 Attorney's Fees. In event of legal action occasioned by any default or action of the Owner, or its successors or assigns, the Owner and its successors or assigns agree(s) to pay all costs incurred by the City in enforcing the terms of this Agreement, including reasonable attorney's fees and costs, and that the same shall become a part of the lien against said Property.

3.6 Covenant. It is the intent of the parties hereto that burdens and benefits herein undertaken shall constitute covenants that run with said Property and constitute a lien there against.

3.7 Binding on Successors. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto. The term "Owner" shall include not only the present Owner, but also its heirs, successors, executors, administrators, and assigns. Owner shall notify any successor to title of all or part of the Property about the existence of this Agreement. Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. Owner shall provide a copy of such notice to the City at the same time such notice is provided to the successor.

3.8 Indemnity and Insurance. The Owner, its heirs, successors, executors, administrators and assigns agree to defend, indemnify and holds harmless the City, its officials, employees and its authorized agents from any and all damages, accidents, casualties, occurrences or claims (collectively, "Claims") which might arise or be asserted against the City and which are in any way connected with the construction, operation, presence, existence or maintenance of the BMP by the Owner, or from any personal injury or property damage that may result from the City or other public entities entering the Property under Sections 2 or 3 of this Agreement; provided, however, that in no event shall Owner, its heirs, successors, executors, administrators and assigns be obligated to defend, indemnify or hold harmless the City, its officials, employees, and its authorized agents from any Claims arising from the City's or its officials, employees, and its authorized agents active negligence or willful misconduct while the City enters the Property under Section 2 or 3 of this Agreement.. The Owner shall maintain liability insurance in commercially reasonable amounts, but not less than $1,000,000.00, covering the BMP and City. The City shall require proof of insurance to be provided to City on a regular basis as determined by the City.

3.9 Time of the Essence. Time is of the essence in the performance of this Agreement.

3.10 Notice. Any notice to a party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A party may change a notice address only by providing written notice thereof to the other party.

IF TO CITY:

City of Jurupa Valley
8930 Limonite Avenue
Jurupa Valley, CA 92509
Attn: Robert Makowski

IF TO OWNER:

Proficiency Rubidoux, LLC
5020 Campus Drive
Newport Beach, CA 92660
Attn: Jeff Trenton

[SIGNATURES ON FOLLOWING PAGE]

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# SIGNATURE PAGE TO
# CITY OF JURUPA VALLEY
# WATER QUALITY MANAGEMENT PLAN AND STORMWATER BMP OPERATION AND MAINTENANCE AGREEMENT
# WITH Proficiency Rubidoux, LLC

**IN WITNESS THEREOF,** the parties hereto have executed this Agreement as of the date first written above.

**CITY OF JURUPA VALLEY**
**a California Municipal Corporation**

By: ____________________
Paul Toor
City Engineer

Proficiency Rubidoux, LLC
________________________
**a** ________________________

By: ____________________
Signature

Jeff Trenton
Name (Print)

President
Title (Print)

By: ____________________
Signature

____________________
Name (Print)

____________________
Title (Print)

ATTEST:

____________________
City Clerk

# Appendix 9-4: Training Records

*Insert Training Records with Brief Discussion Here*

# Appendix 9-5: Site Plan and Details

*WQMP Site Map and BMP Details*

# Appendix 9-6: "As-Built" Drawings

*Insert "As-Builts" Here When Available*

# Appendix 9-7: Manufacturer Information

*Brochures, Manuals, and Maintenance Requirements*

# Appendix 9-8: Service Agreement Information

*Insert Contractor Information (if any)*

# Appendix 10: Educational Materials

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

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

SAMPLE STENCIL
PER BMP SD-13

## 3.1 INFILTRATION BASIN

| **Type of BMP** | LID - Infiltration |
|---|---|
| **Treatment Mechanisms** | Infiltration, Evapotranspiration (when vegetated), Evaporation, and Sedimentation |
| **Maximum Treatment Area** | 50 acres |
| **Other Names** | Bioinfiltration Basin |

### Description

An Infiltration Basin is a flat earthen basin designed to capture the design capture volume, $V_{BMP}$. The stormwater infiltrates through the bottom of the basin into the underlying soil over a 72 hour drawdown period. Flows exceeding $V_{BMP}$ must discharge to a downstream conveyance system. Trash and sediment accumulate within the forebay as stormwater passes into the basin. Infiltration basins are highly effective in removing all targeted pollutants from stormwater runoff.

Figure 1 – Infiltration Basin

**See Appendix A, and Appendix C, Section 1 of *Basin Guidelines*, for additional requirements**.

### Siting Considerations

The use of infiltration basins may be restricted by concerns over ground water contamination, soil permeability, and clogging at the site. See the applicable WQMP for any specific feasibility considerations for using infiltration BMPs. Where this BMP is being used, the soil beneath the basin must be thoroughly evaluated in a geotechnical report since the underlying soils are critical to the basin's long term performance. To protect the basin from erosion, the sides and bottom of the basin must be vegetated, preferably with native or low water use plant species.

In addition, these basins may not be appropriate for the following site conditions:

- Industrial sites or locations where spills of toxic materials may occur
- Sites with very low soil infiltration rates
- Sites with high groundwater tables or excessively high soil infiltration rates, where pollutants can affect ground water quality
- Sites with unstabilized soil or construction activity upstream
- On steeply sloping terrain
- Infiltration basins located in a fill condition should refer to Appendix A of this Handbook for details on special requirements/restrictions

## Setbacks

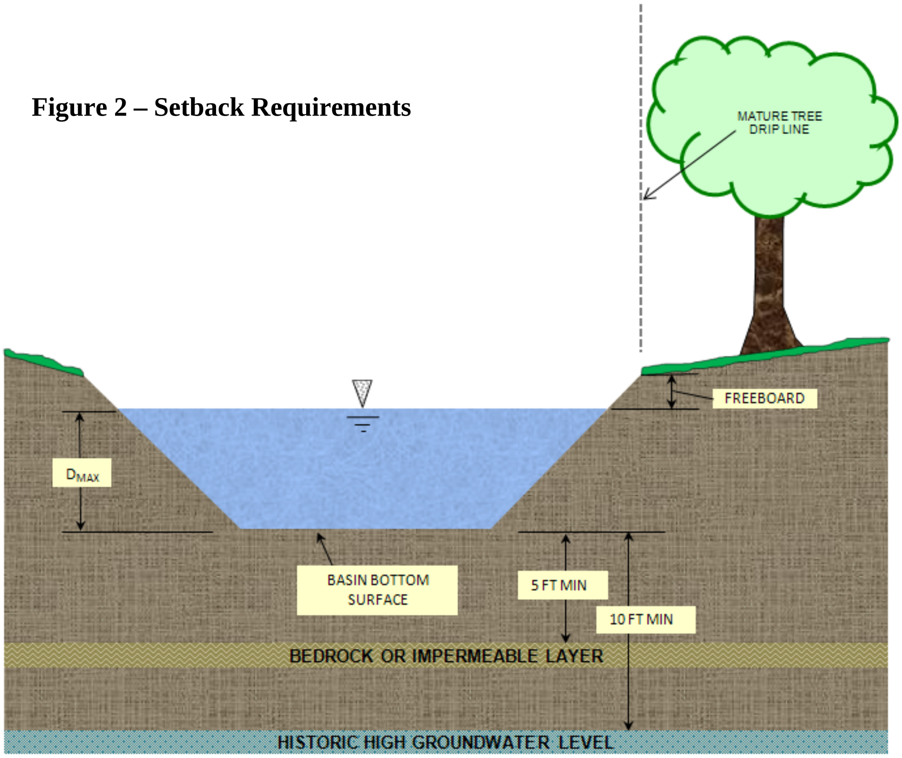
Always consult your geotechnical engineer for site specific recommendations regarding setbacks for infiltration trenches. Recommended setbacks are needed to protect buildings, existing trees, walls, onsite or nearby wells, streams, and tanks. Setbacks should be considered early in the design process since they can affect where infiltration facilities may be placed and how deep they are allowed to be. For instance, depth setbacks can dictate fairly shallow facilities that will have a larger footprint and, in some cases, may make an infiltration basin infeasible. In that instance, another BMP must be selected.

Infiltration basins typically must be set back:

- 10 feet from the historic high groundwater (measured vertically from the bottom of the basin, as shown in Figure 2)
- 5 feet from bedrock or impermeable surface layer (measured vertically from the bottom of the basin, as shown in Figure 2)
- From all existing mature tree drip lines as indicated in Figure 2 (to protect their root structure)
- 100 feet horizontally from wells, tanks or springs

Setbacks to walls and foundations must be included as part of the Geotechnical Report. All other setbacks shall be in accordance with applicable standards of the District's *Basin Guidelines* (Appendix C).

**Figure 2 – Setback Requirements**



## Forebay

A concrete forebay shall be provided to reduce sediment clogging and to reduce erosion. The forebay shall have a design volume of at least 0.5% $V_{BMP}$ and a minimum 1 foot high concrete splashwall / berm. Full height notch-type weir(s), offset from the line of flow from the basin inlet to prevent short circuiting, shall be used to outlet the forebay. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

## Overflow

Flows exceeding $V_{BMP}$ must discharge to an acceptable downstream conveyance system. Where an adequate outlet is present, an overflow structure may be used. Where an embankment is present, an emergency spillway may be used instead. Overflows must be placed just above the design water surface for $V_{BMP}$ and be near the outlet of the system. The overflow structure shall be similar to the District's Standard Drawing CB 110. Additional details may be found in the District's *Basin Guidelines* (Appendix C).

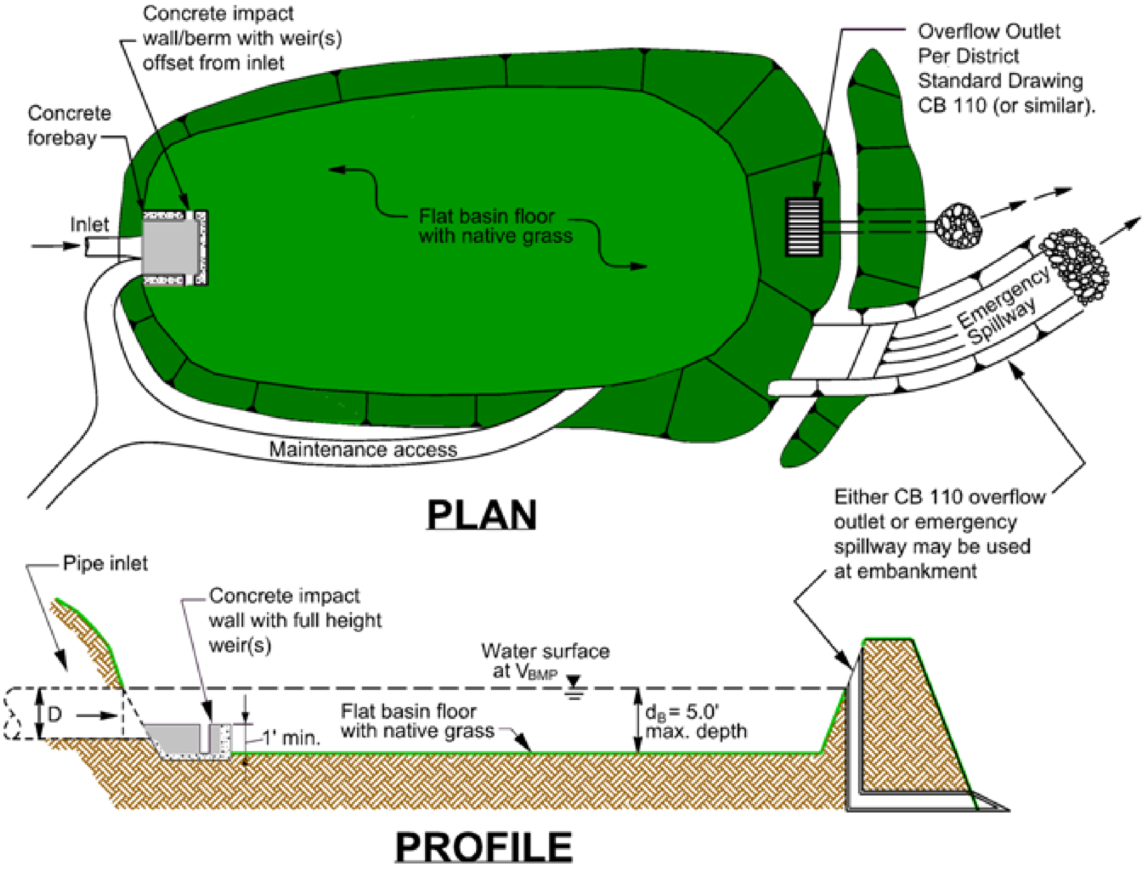


**Figure 3 – Infiltration Basin**

## Landscaping Requirements

Basin vegetation provides erosion protection, improves sediment removal and assists in allowing infiltration to occur. The basin surface and side slopes shall be planted with native grasses. Proper landscape management is also required to ensure that the vegetation does not contribute to water pollution through pesticides, herbicides, or fertilizers. Landscaping shall be in accordance with County of Riverside Ordinance 859 and the District's *Basin Guidelines* (Appendix C), or other guidelines issued by the Engineering Authority.

## Maintenance

Normal maintenance of an infiltration basin includes the maintenance of landscaping, debris and trash removal from the surface of the basin, and tending to problems associated with standing water (vectors, odors, etc.). Significant ponding, especially more than 72 hours after an event, may indicate that the basin surface is no longer providing sufficient infiltration and requires aeration. See the District's *Basin Guidelines* (Appendix C) for additional requirements (i.e., fencing, maintenance access, etc.).

### Table 1 - Inspection and Maintenance

| Schedule | Inspection and Maintenance Activity |
|---|---|
| **Ongoing** including just before annual storm seasons and following rainfall events. | • Maintain vegetation as needed. Use of fertilizers, pesticides and herbicides should be strenuously avoided to ensure they don't contribute to water pollution. If appropriate native plant selections and other IPM methods are used, such products shouldn't be needed. If such projects are used,<br>o Products shall be applied in accordance with their labeling, especially in relation to application to water, and in areas subjected to flooding.<br>o Fertilizers should not be applied within 15 days before, after, or during the rain season.<br>• Remove debris and litter from the entire basin to minimize clogging and improve aesthetics.<br>• Check for obvious problems and repair as needed. Address odor, insects, and overgrowth issues associated with stagnant or standing water in the basin bottom. There should be no long-term ponding water.<br>• Check for erosion and sediment laden areas in the basin. Repair as needed. Clean forebay if needed.<br>• Revegetate side slopes where needed. |
| **Annually.** If possible, schedule these inspections within 72 hours after a significant rainfall. | • Inspection of hydraulic and structural facilities. Examine the inlet for blockage, the embankment and spillway integrity, as well as damage to any structural element.<br>• Check for erosion, slumping and overgrowth. Repair as needed.<br>• Check basin depth for sediment build up and reduced total capacity. Scrape bottom as needed and remove sediment. Restore to original cross-section and infiltration rate. Replant basin vegetation.<br>• Verify the basin bottom is allowing acceptable infiltration. Use a disc or other method to aerate basin bottom only if there is actual significant loss of infiltrative capacity, rather than on a routine basis[1].<br>• No water should be present 72 hours after an event. No long term standing water should be present at all. No algae formation should be visible. Correct problem as needed. |

**1. CA Stormwater BMP Handbook for New Development and Significant Redevelopment**

## Table 2 - Design and Sizing Criteria for Infiltration Basins

| Design Parameter | Infiltration Basin |
|---|---|
| Design Volume | $V_{BMP}$ |
| Forebay Volume | 0.5% $V_{BMP}$ |
| Drawdown time (maximum) | 72 hours |
| Maximum tributary area | 50 acres [2] |
| Minimum infiltration rate | Must be sufficient to drain the basin within the required Drawdown time over the life of the BMP. The WQMP may include specific requirements for minimum tested infiltration rates. |
| Maximum Depth | 5 feet |
| Spillway erosion control | Energy dissipators to reduce velocities[1] |
| Basin Slope | 0% |
| Freeboard (minimum) | 1 foot [1] |
| Historic High Groundwater Setback (max) | 10 feet |
| Bedrock/impermeable layer setback (max) | 5 feet |
| Tree setbacks | Mature tree drip line must not overhang the basin |
| Set back from wells, tanks or springs | 100 feet |
| Set back from foundations | As recommended in Geotechnical Report |

1. **Ventura County's Technical Guidance Manual for Stormwater Quality Control Measures**
2. **CA Stormwater BMP Handbook for New Development and Significant Redevelopment**

*Note: The information contained in this BMP Factsheet is intended to be a summary of design considerations and requirements. Additional information which applies to all detention basins may be found in the District's Basin Guidelines (Appendix C). In addition, information herein may be superseded by other guidelines issued by the co-permittee.*

## INFILTRATION BASIN SIZING PROCEDURE

1. Find the Design Volume, $V_{BMP}$.
   a) Enter the Tributary Area, $A_T$.
   b) Enter the Design Volume, $V_{BMP}$, determined from Section 2.1 of this Handbook.
2. Determine the Maximum Depth.
   a) Enter the infiltration rate. The infiltration rate shall be established as described in Appendix A: "Infiltration Testing".
   b) Enter the design Factor of Safety from Table 1 in Appendix A: "Infiltration Testing".
   c) The spreadsheet will determine $D_1$, the maximum allowable depth of the basin based on the infiltration rate along with the maximum drawdown time (72 hours) and the Factor of Safety.

$$D_1 = [(t) \times (I)] / 12s$$

Where
I = site infiltration rate (in/hr)
s = safety factor
t = drawdown time (maximum 72 hours)

d) Enter the depth of freeboard.

e) Enter the depth to the historic high groundwater level measured from the top of the basin.

f) Enter the depth to the top of bedrock or other impermeable layer measured from the finished grade.

g) The spreadsheet will determine $D_2$, the total basin depth (including freeboard, if used) of the basin, based on restrictions to the depth by groundwater and an impermeable layer.

$$D_2 = \text{Depth to groundwater} - (10 + \text{freeboard})\ (\text{ft});$$

**or**

$$D_2 = \text{Depth to impermeable layer} - (5 + \text{freeboard})\ (\text{ft})$$

Whichever is least.

h) The spreadsheet will determine the maximum allowable effective depth of basin, $D_{MAX}$, based on the smallest value between $D_1$ and $D_2$. $D_{MAX}$ is the maximum depth of water only and does not include freeboard. $D_{MAX}$ shall not exceed 5 feet.

3. Basin Geometry

a) Enter the basin side slopes, z (no steeper than 4:1).

b) Enter the proposed basin depth, $d_B$ excluding freeboard.

c) The spreadsheet will determine the minimum required surface area of the basin:

$$A_s = V_{BMP} / d_B$$

Where $A_s$ = minimum area required ($ft^2$)
$V_{BMP}$ = volume of the infiltration basin ($ft^3$)
$d_B$= proposed depth not to exceed maximum allowable depth, $D_{MAX}$ (ft)

d) Enter the proposed bottom surface area. This area shall not be less than the minimum required surface area.

4. Forebay

A concrete forebay with a design volume of at least 0.5% $V_{BMP}$ and a minimum 1 foot high concrete splashwall shall be provided. Full-height rectangular weir(s) shall be used to outlet the forebay. The weir(s) must be offset from the line of flow from the basin inlet. It is recommended that two weirs be used and that they be located on opposite sides of the forebay (see Figure 2).

a) The spreadsheet will determine the minimum required forebay volume based on 0.5% $V_{BMP}$.

b) Enter the proposed depth of the forebay berm/splashwall (1foot minimum).

c) The spreadsheet will determine the minimum required forebay surface area.

d) Enter the width of rectangular weir to be used (minimum 1.5 inches). Weir width should be established based on a 5 minute drawdown time.

StormTech®
Detention • Retention • Water Quality
An ADS company

# Isolator® Row O&M Manual


SC-740


MC-3500


MC-4500

THE MOST ADVANCED NAME IN WATER MANAGEMENT SOLUTIONS™

# THE ISOLATOR® ROW

## INTRODUCTION

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

## THE ISOLATOR ROW

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

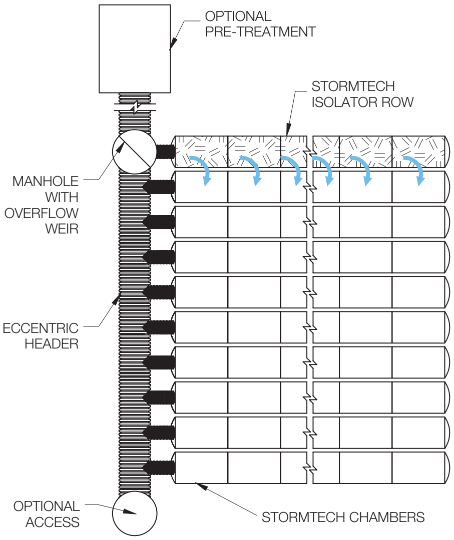
Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of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

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

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

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

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



**StormTech Isolator Row with Overflow Spillway** (not to scale)

# ISOLATOR ROW INSPECTION/MAINTENANCE

## INSPECTION

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

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

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

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

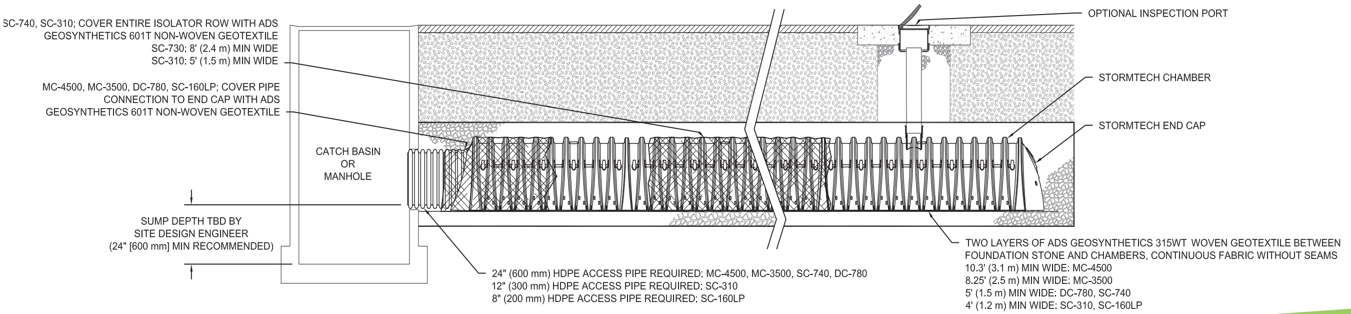
## MAINTENANCE

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

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

**StormTech Isolator Row** (not to scale)

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



# ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

## STEP 1

Inspect Isolator Row for sediment.

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

## STEP 2

Clean out Isolator Row using the JetVac process.

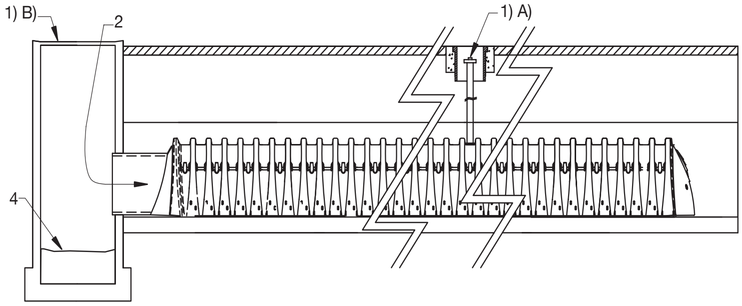
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

## STEP 3

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

## STEP 4

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



## SAMPLE MAINTENANCE LOG

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

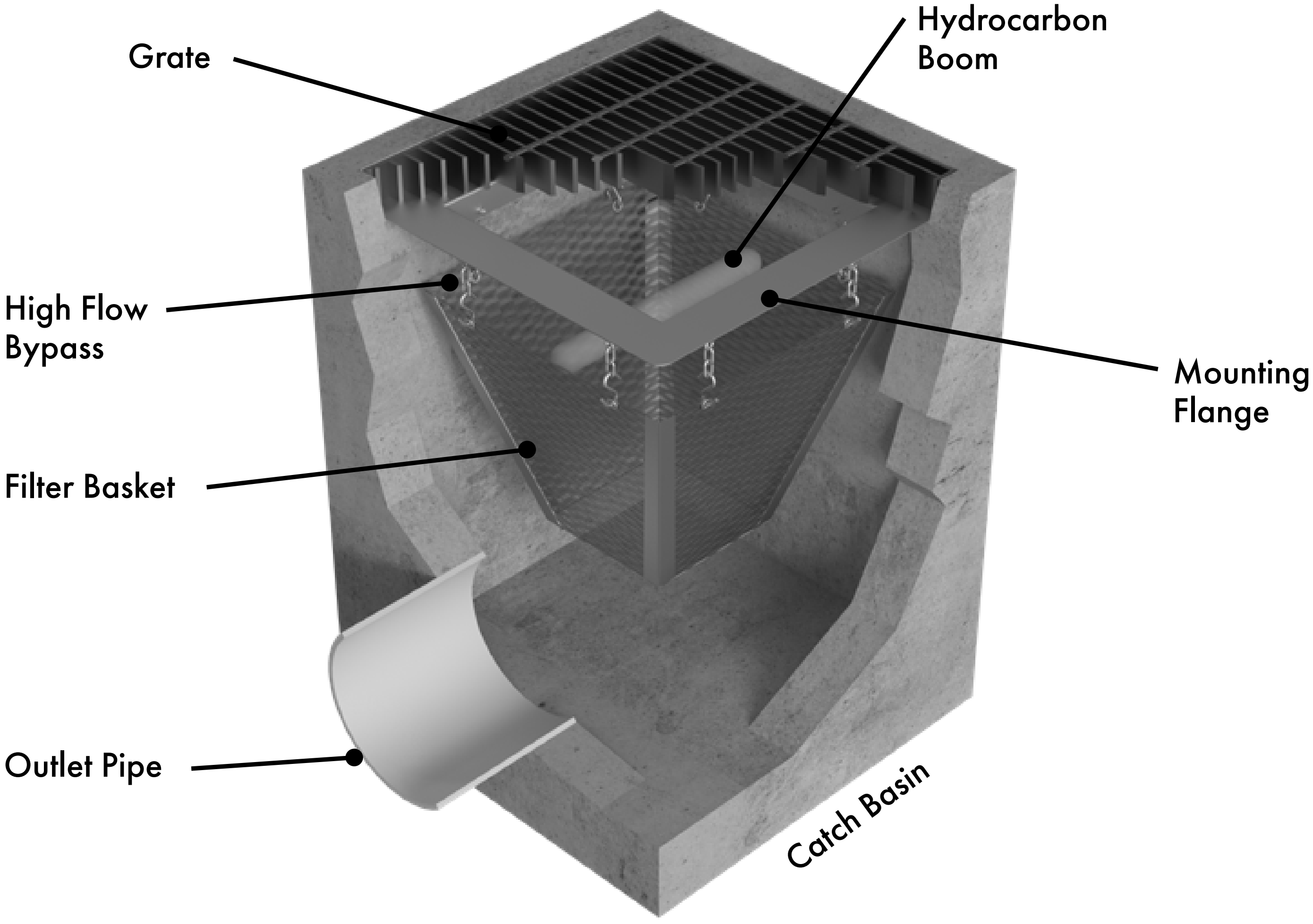
**Advanced Drainage Systems, Inc.**
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

# Bio Clean® Grate Inlet Filter
# Operation & Maintenance Manual

## Operation & Maintenance

Contech's Bio Clean® Grate Inlet Filter is a stormwater device designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, Kraken® membrane filter, and fabric filter variations. This manual covers maintenance procedures of the trash full capture and fabric filter configurations. A supplemental manual is available for the Kraken variation. The trash full capture filter is made of 100% stainless steel, while the fabric filter is made of a woven monofilament geotextile fabric. Both filters are available at various sizes and depths allowing them to fit in any grated catch basin inlet. The filters heavy duty construction allows for cleaning with any vacuum truck. The filter can also easily be cleaned by hand.

As with all stormwater BMPs, inspection and maintenance on the Grate Inlet Filter is necessary. Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance, a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



*System Diagram*

## Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the Grate Inlet Filter:

- Contech Inspection Form (contained within this manual).
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

## Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Grate Inlet Filter are quick and easy. As mentioned above, the first year should be seen as the maintenance interval establishment phase. During the first year, more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The Grate Inlet Filter can be inspected though visual observation. All necessary pre-inspection steps must be carried out before inspection occurs, such as safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open grated inlet. Once the grate has been safely removed, the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the filter with the grate removed.
- Look for any out of the ordinary obstructions on the grate or in the filter and its bypass. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, foliage and sediment accumulated inside the filter basket. Record this information on the inspection form.
- Observe the condition and color of the hydrocarbon boom. Record this information on the inspection form.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

## Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the filter basket and its bypass.
- Excessive accumulation of trash, foliage and sediment in the filter basket. Maintenance is required when the basket is greater than half-full.
- The following chart shows the 50% and 100% storage capacity of each filter height:

| Basket Model | Height[1] (inches) | Top Width (inches) | Top Length (inches) | Bottom Width (inches) | Bottom Length (inches) | 50% Storage Capacity (CF) | 100% Storage Capacity (CF) |
|---|---|---|---|---|---|---|---|
| BIO-GRATE-FULL/ FABRIC-12-12-12 | 6.00 | 10.00 | 10.00 | 8.31 | 8.31 | 0.15 | 0.30 |
| BIO-GRATE-FULL/ FABRIC-18-18-12 | 6.00 | 15.00 | 15.00 | 12.50 | 12.50 | 0.33 | 0.66 |
| BIO-GRATE-FULL/ FABRIC-24-24-12 | 6.00 | 20.00 | 20.00 | 16.69 | 16.69 | 0.59 | 1.18 |
| BIO-GRATE-FULL/ FABRIC-24-24-24 | 18.00 | 20.00 | 20.00 | 10.00 | 10.00 | 1.22 | 2.44 |
| BIO-GRATE-FULL/ FABRIC-24-40-12 | 6.00 | 20.00 | 30.00 | 16.69 | 25.00 | 0.88 | 1.76 |
| BIO-GRATE-FULL/ FABRIC-24-40-24 | 18.00 | 20.00 | 30.00 | 10.00 | 15.00 | 1.82 | 3.64 |
| BIO-GRATE-FULL/ FABRIC-36-36-24 | 18.00 | 30.00 | 30.00 | 15.00 | 15.00 | 2.73 | 5.46 |
| BIO-GRATE-FULL/ FABRIC-24-40-24 | 18.00 | 20.00 | 30.00 | 10.00 | 15.00 | 1.82 | 3.64 |
| BIO-GRATE-FULL/ FABRIC-36-36-24 | 18.00 | 30.00 | 30.00 | 15.00 | 15.00 | 2.73 | 5.46 |

[1] Refers to basket height, total system height is equal to basket height plus 6 inches for bypass.

## Maintenance Equipment

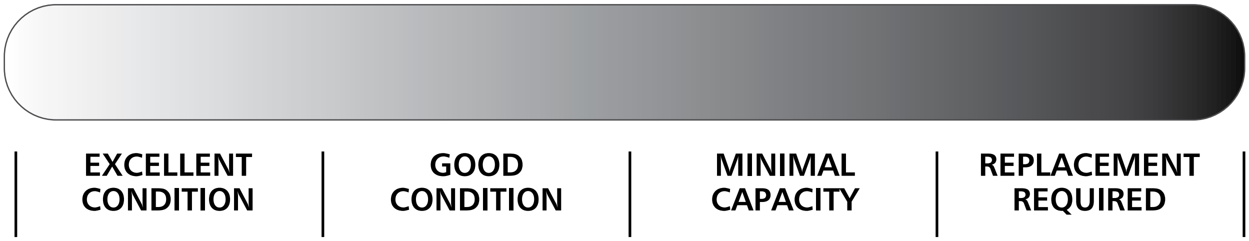
It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter, though it can easily be cleaned by hand:

- Contech Maintenance Form (contained in O&M Manual).
- Manhole hook or appropriate tools to remove the grate.
- Appropriate safety signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Small or large vacuum truck (with pressure washer attachment preferred).

## Maintenance Procedures

It is recommended that maintenance occurs at least two days after the most recent rain event to allow debris and sediments to dry out. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the Grate Inlet Filter can be performed utilizing a vacuum truck. Once all safety measures have been set up, cleaning of the Grate Inlet Filter can proceed as followed:

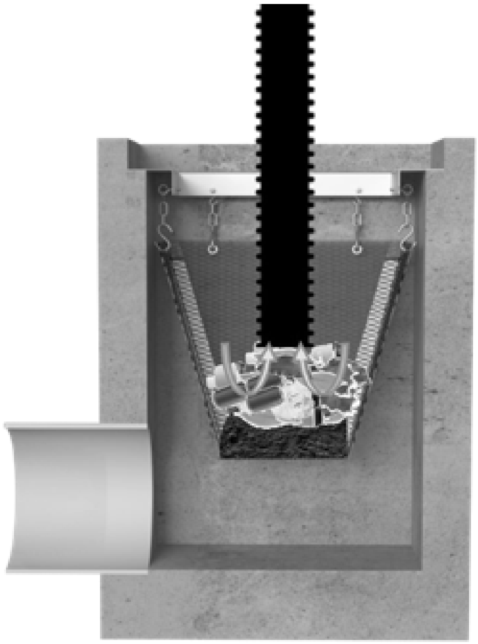
- Remove grate (traffic control and safety measures to be completed prior)
- Using an extension on a vacuum truck, position the hose over the opened catch basin. Insert the vacuum hose down into the filter basket and suck out trash, foliage and sediment. A pressure wash is recommended and will assist in spraying off any debris stuck on the side or bottom of the filter basket. Power wash off the filter basket sides and bottom.
- Next, remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required, install and fasten on a new hydrocarbon boom. Booms can be ordered directly from the manufacturer.
- The following is a replacement indication color chart for the hydrocarbon booms:



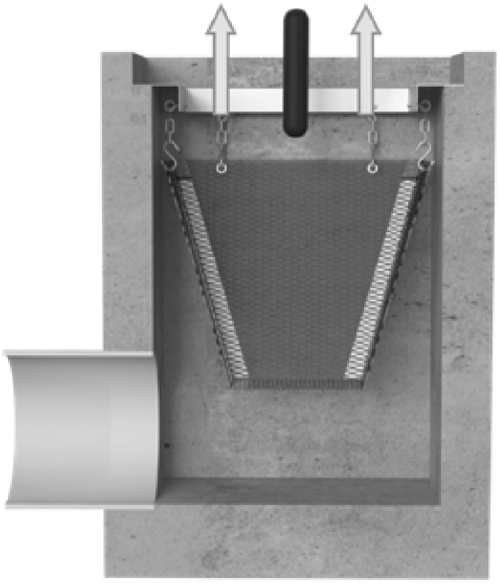
- The last step is to replace the grate and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer as previously noted.

## Maintenance Sequence

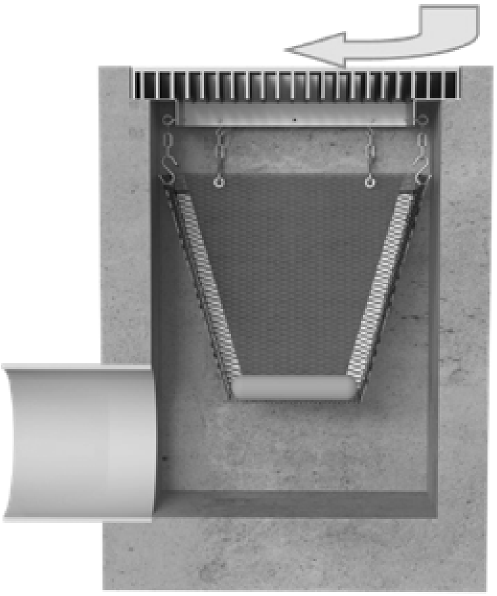
1. *Remove grate and set up vacuum truck to clean the filter basket.*



2. *Insert the vacuum hose down into the filter basket and suck out debris. Use a pressure washer to assist in vacuum removal. Pressure wash off screens.*



3. *Remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the information in the chart above. If replacement is required, install and fasten on a new hydrocarbon boom.*



4. *Close up and replace the grate and remove all traffic control. All removed debris and pollutants shall be disposed of following local and state requirements.*

CONTECH®
ENGINEERED SOLUTIONS

# Inspection and Maintenance Report
# Catch Basin Only

Project Name ____________________

Project Address ____________________
(city) (Zip Code)

Owner / Management Company ____________________

Contact ____________________ Phone ( ) –

Inspector Name ____________________ Date ____ / ____ / ______ Time ____________ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition ____________________ Additional Notes ____________________

| For Office Use Only |
|---|
| (Reviewed By) |
| (Date)<br>Office personnel to complete section to the left. |

| Site Map # | GPS Coordinates of Insert | Catch Basin Size | Evidence of Illicit Discharge? | Trash Accumulation | Foliage Accumulation | Sediment Accumulation | Signs of Structural Damage? | Functioning Properly or Maintenance Needed? |
|---|---|---|---|---|---|---|---|---|
| 1 | Lat:<br>Long: | | | | | | | |
| 2 | Lat:<br>Long: | | | | | | | |
| 3 | Lat:<br>Long: | | | | | | | |
| 4 | Lat:<br>Long: | | | | | | | |
| 5 | Lat:<br>Long: | | | | | | | |
| 6 | Lat:<br>Long: | | | | | | | |
| 7 | Lat:<br>Long: | | | | | | | |
| 8 | Lat:<br>Long: | | | | | | | |
| 10 | Lat:<br>Long: | | | | | | | |
| 11 | Lat:<br>Long: | | | | | | | |
| 12 | Lat:<br>Long: | | | | | | | |

Comments:

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## SUPPORT

DRAWINGS AND SPECIFICATIONS ARE AVAILABLE AT WWW.CONTECHES.COM

Grate Inlet Filter Operation & Maintenance Manual 08/22

# UNITED STORM WATER CPS

Connector Pipe Screen

## Technical Manual

United Storm Water, Inc. CPS Technical Manual

## Manufacturer, Supplier, and Service Information

**Manufacturer:**
United Storm Water, Inc.
14000 E. Valley Blvd
City of Industry, Ca 91746
Phone: 626-890-7027
Fax: 626-961-3166
Contact: Eugene Hernandez

**Supplier:**
United Storm Water, Inc.
14000 E. Valley Blvd
City of Industry, Ca 91746
Phone: 626-419-3521
Fax: 626-961-3166
Contact: Terry Flury

**For all spare parts and service, Contact:**
United Storm Water, Inc.
14000 E. Valley Blvd.
City of Industry, Ca 91746
Contact: Eugene Hernandez

2/25/2014

## United Storm Water, Inc. CPS Technical Manual

## United Storm Water, Inc. Connector Pipe Screen Installation Instructions:

1. Bring the CPS unit into the catch basin and set in front of outlet hole. The unit has 3 components, deflector, (2) "Z" panels, and the front of the screen, depending on the size of the catch basin opening. Establish a definite location for your first "Z" Panel and then mark your holes for drilling. Do the same for your second Panel.

2. Remove the CPS unit from the installation wall. Drill 3/8" holes where you marked. Make sure to drill straight into the catch basin wall to avoid mounting difficulties.

3. Hammer 3/8"x3.75" stainless steel anchor bolts into the holes.

4. After all of the anchor bolts are hammered into place, attach the "Z" panels.

5. Deflector device. Measure and cut a length of deflector stock same length as CPS unit. Make cuts using a compact grinder. Be sure to "grind smooth any sharp edges. Place directly above the CPS device. Next, mark and drill 3/8"x3.75" holes.

6. Make cuts using a compact grinder. Be sure to stand off any sharp edges.

7. Once the "Z" Panels have been custom cut to conform to the catch basin surface, attach the panels to the body of the CPS unit using the self drilling screws provided.

8. Scribe and cut the bottom of the front panel to conform to the catch basin bottom surface, then attach the front panel to the 2 "Z" panels using the self drilling screws provided.

9. Attach legs (1"x1" perforated angle) from top corners of deflector to top corners of CPS device. Secure with bolts provided.

10. Tighten all bolts to assure a tight fit.

**United Storm Water, Inc. CPS Technical Manual**

## Preventative Maintenance:

Maintenance crews should regularly check catch basins and establish a maintenance schedule based on the level of debris collected. Some areas will require more frequent cleaning than others. Catch basins should be cleared of debris to allow for water to freely flow through the screen.

Pressure-washing the unit may additionally benefit but is not necessary.

## Yearly Maintenance Schedule:

Visual Inspection:

1. Built-up debris and foreign object debris can hinder the unit's operation. Remove any visible debris that may be on, in front of, and nearby the unit.
2. Look for any visible signs of vandalism or damage that may compromise the unit's ability to properly function. Attempted vandalism and slight damage should be inspected closely to ensure no future damage may result.

## Replacement Schedule:

All components on United Storm Water Connector Pipe Screen are made from 304 stainless steel parts. United Storm Water, Inc. should be notified if a replacement if required.

## Tools Required:

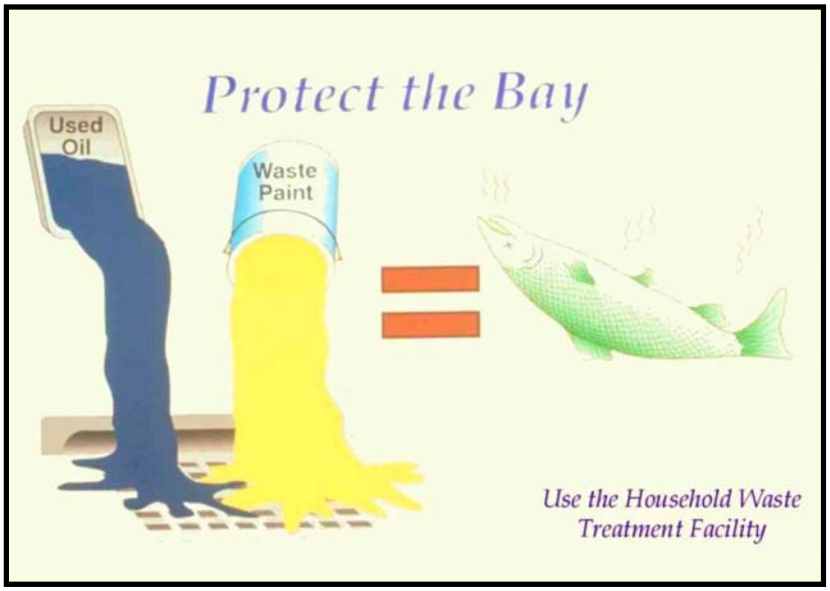
For removal of United Storm Water Connector Pipe Screen, use a 3/8" socket wrench to loosen the nuts on the anchor bolts. A socket extension may be needed for hard to reach areas.

## Disassembly and Reassembly:

For removal of United Storm Water Connector Pipe Screen, use a 9/16" socket wrench to loosen the nuts on the anchor bolts. A socket extension may be needed for hard to reach areas. Carefully remove the unit once all bolts have been loosening. Realign the unit on the anchor and tighten the bolts for reassembly.

For removal of the Deflector United Storm Water Connector Pipe Screen, use a 9/16 socket wrench to loosen the nuts anchor bolts. Realign the bypass section and tighten the screws for reassembly.

# Non-Stormwater Discharges SC-10



Art Credit: Margie Winter

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

| | |
|---|---|
| Sediment | |
| Nutrients | ✓ |
| Trash | |
| Metals | ✓ |
| Bacteria | ✓ |
| Oil and Grease | ✓ |
| Organics | ✓ |

## Description

Non-stormwater discharges are those flows that do not consist entirely of stormwater. Some non-stormwater discharges do not include pollutants and may be discharged to the storm drain. These include uncontaminated groundwater and natural springs. There are also some non-stormwater discharges that typically do not contain pollutants and may be discharged to the storm drain with conditions. These include car washing, air conditioner condensate, etc. However there are certain non-stormwater discharges that pose environmental concern. These discharges may originate from illegal dumping or from internal floor drains, appliances, industrial processes, sinks, and toilets that are connected to the nearby storm drainage system. These discharges (which may include: process waste waters, cooling waters, wash waters, and sanitary wastewater) can carry substances such as paint, oil, fuel and other automotive fluids, chemicals and other pollutants into storm drains. They can generally be detected through a combination of detection and elimination. The ultimate goal is to effectively eliminate non-stormwater discharges to the stormwater drainage system through implementation of measures to detect, correct, and enforce against illicit connections and illegal discharges of pollutants on streets and into the storm drain system and creeks.

## Approach

Initially the industry must make an assessment of non-stormwater discharges to determine which types must be eliminated or addressed through BMPs. The focus of the following approach is in the elimination of non-stormwater discharges.

CASQA California Stormwater Quality Association

***Pollution Prevention***

- Ensure that used oil, used antifreeze, and hazardous chemical recycling programs are being implemented. Encourage litter control.

***Suggested Protocols***

*Recommended Complaint Investigation Equipment*

- Field Screening Analysis
  - pH paper or meter
  - Commercial stormwater pollutant screening kit that can detect for reactive phosphorus, nitrate nitrogen, ammonium nitrogen, specific conductance, and turbidity
  - Sample jars
  - Sample collection pole
  - A tool to remove access hole covers
- Laboratory Analysis
  - Sample cooler
  - Ice
  - Sample jars and labels
  - Chain of custody forms
- Documentation
  - Camera
  - Notebook
  - Pens
  - Notice of Violation forms
  - Educational materials

*General*

- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially those that are not classified as hazardous. These are often not responded to as effectively as they need to be.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as “Dump No Waste Drains to Stream” stenciled or demarcated next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.

- See SC44 Stormwater Drainage System Maintenance for additional information.

*Illicit Connections*

- Locate discharges from the industrial storm drainage system to the municipal storm drain system through review of "as-built" piping schematics.
- Isolate problem areas and plug illicit discharge points.
- Locate and evaluate all discharges to the industrial storm drain system.

*Visual Inspection and Inventory*

- Inventory and inspect each discharge point during dry weather.
- Keep in mind that drainage from a storm event can continue for a day or two following the end of a storm and groundwater may infiltrate the underground stormwater collection system. Also, non-stormwater discharges are often intermittent and may require periodic inspections.

*Review Infield Piping*

- A review of the "as-built" piping schematic is a way to determine if there are any connections to the stormwater collection system.
- Inspect the path of floor drains in older buildings.

*Smoke Testing*

- Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two systems.
- During dry weather the stormwater collection system is filled with smoke and then traced to sources. The appearance of smoke at the base of a toilet indicates that there may be a connection between the sanitary and the stormwater system.

*Dye Testing*

- A dye test can be performed by simply releasing a dye into either your sanitary or process wastewater system and examining the discharge points from the stormwater collection system for discoloration.

*TV Inspection of Drainage System*

- TV Cameras can be employed to visually identify illicit connections to the industrial storm drainage system.

*Illegal Dumping*

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Once a site has been cleaned:

- Post "No Dumping" signs with a phone number for reporting dumping and disposal.
- Landscaping and beautification efforts of hot spots may also discourage future dumping, as well as provide open space and increase property values.
- Lighting or barriers may also be needed to discourage future dumping.
- See fact sheet SC11 Spill Prevention, Control, and Cleanup.

*Inspection*

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Conduct field investigations of the industrial storm drain system for potential sources of non-stormwater discharges.
- Pro-actively conduct investigations of high priority areas. Based on historical data, prioritize specific geographic areas and/or incident type for pro-active investigations.

*Reporting*

- A database is useful for defining and tracking the magnitude and location of the problem.
- Report prohibited non-stormwater discharges observed during the course of normal daily activities so they can be investigated, contained, and cleaned up or eliminated.
- Document that non-stormwater discharges have been eliminated by recording tests performed, methods used, dates of testing, and any on-site drainage points observed.
- Document and report annually the results of the program.
- Maintain documentation of illicit connection and illegal dumping incidents, including significant conditionally exempt discharges that are not properly managed.

### ***Training***

- Training of technical staff in identifying and documenting illegal dumping incidents is required.
- Consider posting the quick reference table near storm drains to reinforce training.
- Train employees to identify non-stormwater discharges and report discharges to the appropriate departments.

- Educate employees about spill prevention and cleanup.

- Well-trained employees can reduce human errors that lead to accidental releases or spills. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur. Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.

- Determine and implement appropriate outreach efforts to reduce non-permissible non-stormwater discharges.

- Conduct spill response drills annually (if no events occurred to evaluate your plan) in cooperation with other industries.

- When a responsible party is identified, educate the party on the impacts of his or her actions.

### *Spill Response and Prevention*

- See SC11 Spill Prevention Control and Cleanup.

### *Other Considerations*

- Many facilities do not have accurate, up-to-date schematic drawings.

## Requirements

### *Costs (including capital and operation & maintenance)*

- The primary cost is for staff time and depends on how aggressively a program is implemented.

- Cost for containment and disposal is borne by the discharger.

- Illicit connections can be difficult to locate especially if there is groundwater infiltration.

- Indoor floor drains may require re-plumbing if cross-connections to storm drains are detected.

### *Maintenance (including administrative and staffing)*

- Illegal dumping and illicit connection violations requires technical staff to detect and investigate them.

## Supplemental Information

### *Further Detail of the BMP*

*Illegal Dumping*

- Substances illegally dumped on streets and into the storm drain systems and creeks include paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clippings, and pet wastes. All of these wastes cause stormwater and receiving water quality problems as well as clog the storm drain system itself.

- Establish a system for tracking incidents. The system should be designed to identify the following:

  - Illegal dumping hot spots

- Types and quantities (in some cases) of wastes
- Patterns in time of occurrence (time of day/night, month, or year)
- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
- Responsible parties

One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people at the facility who are aware of the problem and who have the tools to at least identify the incident, if not correct it. Therefore, train field staff to recognize and report the incidents.

What constitutes a "non-stormwater" discharge?

- Non-stormwater discharges to the stormwater collection system may include any water used directly in the manufacturing process (process wastewater), air conditioning condensate and coolant, non-contact cooling water, cooling equipment condensate, outdoor secondary containment water, vehicle and equipment wash water, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

*Permit Requirements*

- Facilities subject to stormwater permit requirements must include a certification that the stormwater collection system has been tested or evaluated for the presence of non-stormwater discharges. The State's General Industrial Stormwater Permit requires that non-stormwater discharges be eliminated prior to implementation of the facility's SWPPP.

*Performance Evaluation*

- Review annually internal investigation results; assess whether goals were met and what changes or improvements are necessary.
- Obtain feedback from personnel assigned to respond to, or inspect for, illicit connections and illegal dumping incidents.

## References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

# Spill Prevention, Control & Cleanup SC-11

Photo Credit: Geoff Brosseau

### Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

### Targeted Constituents

| | |
|---|---|
| Sediment | |
| Nutrients | |
| Trash | |
| Metals | ✓ |
| Bacteria | |
| Oil and Grease | ✓ |
| Organics | ✓ |

CASQA California Stormwater Quality Association

## Description

Many activities that occur at an industrial or commercial site have the potential to cause accidental or illegal spills. Preparation for accidental or illegal spills, with proper training and reporting systems implemented, can minimize the discharge of pollutants to the environment.

Spills and leaks are one of the largest contributors of stormwater pollutants. Spill prevention and control plans are applicable to any site at which hazardous materials are stored or used. An effective plan should have spill prevention and response procedures that identify potential spill areas, specify material handling procedures, describe spill response procedures, and provide spill clean-up equipment. The plan should take steps to identify and characterize potential spills, eliminate and reduce spill potential, respond to spills when they occur in an effort to prevent pollutants from entering the stormwater drainage system, and train personnel to prevent and control future spills.

## Approach

### *Pollution Prevention*

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- Develop a Spill Prevention Control and Countermeasure (SPCC) Plan. The plan should include:

  - Description of the facility, owner and address, activities and chemicals present
  - Facility map
  - Notification and evacuation procedures
  - Cleanup instructions
  - Identification of responsible departments
  - Identify key spill response personnel
- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

***Suggested Protocols (including equipment needs)***

*Spill Prevention*

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.
- If consistent illegal dumping is observed at the facility:
  - Post "No Dumping" signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
  - Landscaping and beautification efforts may also discourage illegal dumping.
  - Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.
- Store and contain liquid materials in such a manner that if the tank is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.
- If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.
- Routine maintenance:
  - Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Any collected liquids or soiled absorbent materials must be reused/recycled or properly disposed.
  - Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
  - Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

  - Check tanks (and any containment sumps) daily for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.

- Label all containers according to their contents (e.g., solvent, gasoline).

- Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).

- Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).

- Identify key spill response personnel.

*Spill Control and Cleanup Activities*

- Follow the Spill Prevention Control and Countermeasure Plan.

- Clean up leaks and spills immediately.

- Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).

- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.

- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.

- Chemical cleanups of material can be achieved with the use of adsorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.

- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

*Reporting*

- Report spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board.

- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).

- Report spills to local agencies, such as the fire department; they can assist in cleanup.

- Establish a system for tracking incidents. The system should be designed to identify the following:

  - Types and quantities (in some cases) of wastes

  - Patterns in time of occurrence (time of day/night, month, or year)

  - Mode of dumping (abandoned containers, “midnight dumping” from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties

### *Training*

- Educate employees about spill prevention and cleanup.
- Well-trained employees can reduce human errors that lead to accidental releases or spills:
  - The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.
  - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Employees should be educated about aboveground storage tank requirements. Employees responsible for aboveground storage tanks and liquid transfers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.
- Train employees to recognize and report illegal dumping incidents.

### *Other Considerations (Limitations and Regulations)*

- State regulations exist for facilities with a storage capacity of 10,000 gallons or more of petroleum to prepare a Spill Prevention Control and Countermeasure (SPCC) Plan (Health & Safety Code Chapter 6.67).
- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.
- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

## Requirements

### *Costs (including capital and operation & maintenance)*

- Will vary depending on the size of the facility and the necessary controls.
- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.

### *Maintenance (including administrative and staffing)*

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

## Supplemental Information

### *Further Detail of the BMP*

*Reporting*

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the facility and the effectiveness of BMPs. A good record keeping system helps the facility minimize incident recurrence, correctly respond with appropriate cleanup activities, and comply with legal requirements. A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm sewer. These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

*Aboveground Tank Leak and Spill Control*

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

- Installation problems
- Failure of piping systems (pipes, pumps, flanges, couplings, hoses, and valves)
- External corrosion and structural failure
- Spills and overfills due to operator error
- Leaks during pumping of liquids or gases from truck or rail car to a storage tank or vice versa

Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code. Practices listed below should be employed to enhance the code requirements:

- Tanks should be placed in a designated area.
- Tanks located in areas where firearms are discharged should be encapsulated in concrete or the equivalent.
- Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
- Liquid materials should be stored in UL approved double walled tanks or surrounded by a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain.
- For used oil or dangerous waste, a dead-end sump should be installed in the drain.
- All other liquids should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Accumulated stormwater in petroleum storage areas should be passed through an oil/water separator.

Maintenance is critical to preventing leaks and spills. Conduct routine inspections and:

- Check for external corrosion and structural failure.
- Check for spills and overfills due to operator error.
- Check for failure of piping system (pipes, pumps, flanger, coupling, hoses, and valves).
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
- Frequently relocate accumulated stormwater during the wet season.
- Periodically conduct integrity testing by a qualified professional.

*Vehicle Leak and Spill Control*

Major spills on roadways and other public areas are generally handled by highly trained Hazmat teams from local fire departments or environmental health departments. The measures listed below pertain to leaks and smaller spills at vehicle maintenance shops.

In addition to implementing the spill prevention, control, and clean up practices above, use the following measures related to specific activities:

*Vehicle and Equipment Maintenance*

- Perform all vehicle fluid removal or changing inside or under cover to prevent the run-on of stormwater and the runoff of spills.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Immediately drain all fluids from wrecked vehicles.
- Store wrecked vehicles or damaged equipment under cover.
- Place drip pans or absorbent materials under heavy equipment when not in use.
- Use adsorbent materials on small spills rather than hosing down the spill.
- Remove the adsorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don’t leave full drip pans or other open containers lying around.
- Oil filters disposed of in trashcans or dumpsters can leak oil and contaminate stormwater. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.

- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

*Vehicle and Equipment Fueling*

- Design the fueling area to prevent the run-on of stormwater and the runoff of spills:
  - Cover fueling area if possible.
  - Use a perimeter drain or slope pavement inward with drainage to a sump.
  - Pave fueling area with concrete rather than asphalt.
- If dead-end sump is not used to collect spills, install an oil/water separator.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Discourage "topping-off' of fuel tanks.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly.
- Carry out all Federal and State requirements regarding underground storage tanks, or install above ground tanks.
- Do not use mobile fueling of mobile industrial equipment around the facility; rather, transport the equipment to designated fueling areas.
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Train employees in proper fueling and cleanup procedures.

*Industrial Spill Prevention Response*

For the purposes of developing a spill prevention and response program to meet the stormwater regulations, facility managers should use information provided in this fact sheet and the spill prevention/response portions of the fact sheets in this handbook, for specific activities. The program should:

- Integrate with existing emergency response/hazardous materials programs (e.g., Fire Department)
- Develop procedures to prevent/mitigate spills to storm drain systems
- Identify responsible departments
- Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures
- Address spills at municipal facilities, as well as public areas

- Provide training concerning spill prevention, response and cleanup to all appropriate personnel

## References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Stormwater Managers Resource Center http://www.stormwatercenter.net/

# Outdoor Loading/Unloading SC-30

Photo Credit: Geoff Brosseau

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

| | |
|---|---|
| Sediment | ✓ |
| Nutrients | ✓ |
| Trash | |
| Metals | ✓ |
| Bacteria | |
| Oil and Grease | ✓ |
| Organics | ✓ |

CASQA
California Stormwater Quality Association

## Description

The loading/unloading of materials usually takes place outside on docks or terminals; therefore, materials spilled, leaked, or lost during loading/unloading may collect in the soil or on other surfaces and have the potential to be carried away by stormwater runoff or when the area is cleaned. Additionally, rainfall may wash pollutants from machinery used to unload or move materials. Implementation of the following protocols will prevent or reduce the discharge of pollutants to stormwater from outdoor loading/unloading of materials.

## Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

### *Pollution Prevention*

- Keep accurate maintenance logs to evaluate materials removed and improvements made.
- Park tank trucks or delivery vehicles in designated areas so that spills or leaks can be contained.
- Limit exposure of material to rainfall whenever possible.
- Prevent stormwater run-on.
- Check equipment regularly for leaks.

### Suggested Protocols

*Loading and Unloading – General Guidelines*

- Develop an operations plan that describes procedures for loading and/or unloading.
- Conduct loading and unloading in dry weather if possible.
- Cover designated loading/unloading areas to reduce exposure of materials to rain.
- Consider placing a seal or door skirt between delivery vehicles and building to prevent exposure to rain.
- Design loading/unloading area to prevent stormwater run-on, which would include grading or berming the area, and position roof downspouts so they direct stormwater away from the loading/unloading areas.
- Have employees load and unload all materials and equipment in covered areas such as building overhangs at loading docks if feasible.
- Load/unload only at designated loading areas.
- Use drip pans underneath hose and pipe connections and other leak-prone spots during liquid transfer operations, and when making and breaking connections. Several drip pans should be stored in a covered location near the liquid transfer area so that they are always available, yet protected from precipitation when not in use. Drip pans can be made specifically for railroad tracks. Drip pans must be cleaned periodically, and drip collected materials must be disposed of properly.
- Pave loading areas with concrete instead of asphalt.
- Avoid placing storm drains in the area.
- Grade and/or berm the loading/unloading area to a drain that is connected to a deadend.

*Inspection*

- Check loading and unloading equipment regularly for leaks, including valves, pumps, flanges and connections.
- Look for dust or fumes during loading or unloading operations.

### Training

- Train employees (e.g., fork lift operators) and contractors on proper spill containment and cleanup.
- Have employees trained in spill containment and cleanup present during loading/unloading.
- Train employees in proper handling techniques during liquid transfers to avoid spills.
- Make sure forklift operators are properly trained on loading and unloading procedures.

### *Spill Response and Prevention*

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Contain leaks during transfer.
- Store and maintain appropriate spill cleanup materials in a location that is readily accessible and known to all and ensure that employees are familiar with the site's spill control plan and proper spill cleanup procedures.
- Have an emergency spill cleanup plan readily available.
- Use drip pans or comparable devices when transferring oils, solvents, and paints.

### *Other Considerations (Limitations and Regulations)*

- Space and time limitations may preclude all transfers from being performed indoors or under cover.
- It may not be possible to conduct transfers only during dry weather.

## Requirements

### *Costs*

Costs should be low except when covering a large loading/unloading area.

### *Maintenance*

- Conduct regular inspections and make repairs as necessary. The frequency of repairs will depend on the age of the facility.
- Check loading and unloading equipment regularly for leaks.
- Conduct regular broom dry-sweeping of area.

## Supplemental Information

### *Further Detail of the BMP*

*Special Circumstances for Indoor Loading/Unloading of Materials*

Loading or unloading of liquids should occur in the manufacturing building so that any spills that are not completely retained can be discharged to the sanitary sewer, treatment plant, or treated in a manner consistent with local sewer authorities and permit requirements.

- For loading and unloading tank trucks to above and below ground storage tanks, the following procedures should be used:
  - The area where the transfer takes place should be paved. If the liquid is reactive with the asphalt, Portland cement should be used to pave the area.
  - The transfer area should be designed to prevent run-on of stormwater from adjacent areas. Sloping the pad and using a curb, like a speed bump, around the uphill side of the transfer area should reduce run-on.

  - The transfer area should be designed to prevent runoff of spilled liquids from the area. Sloping the area to a drain should prevent runoff. The drain should be connected to a dead-end sump or to the sanitary sewer. A positive control valve should be installed on the drain.

- For transfer from rail cars to storage tanks that must occur outside, use the following procedures:

  - Drip pans should be placed at locations where spillage may occur, such as hose connections, hose reels, and filler nozzles. Use drip pans when making and breaking connections.

  - Drip pan systems should be installed between the rails to collect spillage from tank cars.

## References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

# Outdoor Equipment Operations SC-32

## Description

Outside process equipment operations and maintenance can contaminate stormwater runoff. Activities, such as grinding, painting, coating, sanding, degreasing or parts cleaning, landfills and waste piles, solid waste treatment and disposal, are examples of process operations that can lead to contamination of stormwater runoff. Source controls for outdoor process equipment operations and maintenance include reducing the amount of waste created, enclosing or covering all or some of the equipment, installing secondary containment, and training employees.

## Approach

### *Pollution Prevention*

- Perform the activity during dry periods.
- Use non-toxic chemicals for maintenance and minimize or eliminate the use of solvents.

### *Suggested Protocols*

- Consider enclosing the activity in a building and connecting the floor drains to the sanitary sewer.
- Cover the work area with a permanent roof if possible.
- Minimize contact of stormwater with outside process equipment operations through berming and drainage routing (run-on prevention). If possible, connect process equipment area to public sewer or facility wastewater treatment system. Some municipalities require that secondary containment areas be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.
- Dry clean the work area regularly.

### *Training*

- Train employees to perform the activity during dry periods only or substituting benign materials for more toxic ones.
- Train employee and contractors in proper techniques for spill containment and cleanup. Employees should have the tools and knowledge to immediately begin cleaning up a spill should one occur.

### *Spill Response and Prevention*

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

## Targeted Constituents

| | |
|---|---|
| Sediment | ✓ |
| Nutrients | |
| Trash | |
| Metals | ✓ |
| Bacteria | |
| Oil and Grease | ✓ |
| Organics | ✓ |

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Association

- Have employees trained in emergency spill cleanup procedures present when dangerous waste, liquid chemicals, or other wastes are delivered.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Prevent operator errors by using engineering safe guards and thus reducing accidental releases of pollutant.
- Inspect storage areas regularly for leaks or spills. Also check for structural failure, spills and overfills due to operator error, and/or failure of piping system.

### *Other Considerations*

- Providing cover may be expensive.
- Space limitations may preclude enclosing some equipment.
- Storage sheds often must meet building and fire code requirements.

## Requirements

### *Costs*

Costs vary depending on the complexity of the operation and the amount of control necessary for stormwater pollution control.

### *Maintenance*

- Conduct routine preventive maintenance, including checking process equipment for leaks.
- Clean the storm drain system regularly.

## Supplemental Information

### *Further Detail of the BMP*

#### *Hydraulic/Treatment Modifications*

If stormwater becomes polluted, it should be captured and treated. If you do not have your own process wastewater treatment system, consider discharging to the public sewer system. Use of the public sewer might be allowed under the following conditions:

- If the activity area is very small (less than a few hundred square feet), the local sewer authority may be willing to allow the area to remain uncovered with the drain connected to the public sewer.
- It may be possible under unusual circumstances to connect a much larger area to the public sewer, as long as the rate of stormwater discharges does not exceed the capacity of the wastewater treatment plant. The stormwater could be stored during the storm and then transferred to the public sewer when the normal flow is low, such as at night.

Industries that generate large volumes of process wastewater typically have their own treatment system and corresponding permit. These industries have the discretion to use their wastewater treatment system to treat stormwater within the constraints of their permit requirements for process treatment. It may also be possible for the industry to discharge the stormwater directly to an effluent outfall without treatment as long as the total loading of the discharged process water and stormwater does not exceed the loading had a stormwater treatment device been used. This could be achieved by reducing the loading from the process wastewater treatment system. Check with your Regional Water Quality Control Board or local sewering agency, as this option would be subject to permit constraints and potentially regular monitoring.

## References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Stormwater Managers Resource Center http://www.stormwatercenter.net

# Waste Handling & Disposal SC-34

Photo Credit: Geoff Brosseau

### Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

### Targeted Constituents

| | |
|---|---|
| Sediment | |
| Nutrients | |
| Trash | |
| Metals | ✓ |
| Bacteria | ✓ |
| Oil and Grease | ✓ |
| Organics | ✓ |

## Description

Improper storage and handling of solid wastes can allow toxic compounds, oils and greases, heavy metals, nutrients, suspended solids, and other pollutants to enter stormwater runoff. The discharge of pollutants to stormwater from waste handling and disposal can be prevented and reduced by tracking waste generation, storage, and disposal; reducing waste generation and disposal through source reduction, reuse, and recycling; and preventing run-on and runoff.

## Approach

### *Pollution Prevention*

- Accomplish reduction in the amount of waste generated using the following source controls:
  - Production planning and sequencing
  - Process or equipment modification
  - Raw material substitution or elimination
  - Loss prevention and housekeeping
  - Waste segregation and separation
  - Close loop recycling
- Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.
- Recycle materials whenever possible.

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### *Suggested Protocols*

*General*

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater run-on and runoff with a berm. The waste containers or piles must be covered except when in use.

- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.

- Check storage containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.

- Sweep and clean the storage area regularly. If it is paved, do not hose down the area to a storm drain.

- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain.

- Transfer waste from damaged containers into safe containers.

- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.

*Controlling Litter*

- Post “No Littering” signs and enforce anti-litter laws.

- Provide a sufficient number of litter receptacles for the facility.

- Clean out and cover litter receptacles frequently to prevent spillage.

*Waste Collection*

- Keep waste collection areas clean.

- Inspect solid waste containers for structural damage regularly. Repair or replace damaged containers as necessary.

- Secure solid waste containers; containers must be closed tightly when not in use.

- Do not fill waste containers with washout water or any other liquid.

- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc., may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).

- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.

*Good Housekeeping*

- Use all of the product before disposing of the container.
- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.
- Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.

*Chemical/Hazardous Wastes*

- Select designated hazardous waste collection areas on-site.
- Store hazardous materials and wastes in covered containers and protect them from vandalism.
- Place hazardous waste containers in secondary containment.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Stencil or demarcate storm drains on the facility's property with prohibitive message regarding waste disposal.

*Run-on/Runoff Prevention*

- Prevent stormwater run-on from entering the waste management area by enclosing the area or building a berm around the area.
- Prevent waste materials from directly contacting rain.
- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropyleneor hypalon.
- Cover the area with a permanent roof if feasible.
- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.
- Move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

*Inspection*

- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Check waste management areas for leaking containers or spills.

- Repair leaking equipment including valves, lines, seals, or pumps promptly.

***Training***

- Train staff in pollution prevention measures and proper disposal methods.
- Train employees and contractors in proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.
- Train employees and subcontractors in proper hazardous waste management.

***Spill Response and Prevention***

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills
- Collect all spilled liquids and properly dispose of them.
- Store and maintain appropriate spill cleanup materials in a location known to all near the designated wash area.
- Ensure that vehicles transporting waste have spill prevention equipment that can prevent spills during transport. Spill prevention equipment includes:
    - Vehicles equipped with baffles for liquid waste
    - Trucks with sealed gates and spill guards for solid waste

***Other Considerations (Limitations and Regulations)***

Hazardous waste cannot be reused or recycled; it must be disposed of by a licensed hazardous waste hauler.

## Requirements

***Costs***

Capital and O&M costs for these programs will vary substantially depending on the size of the facility and the types of waste handled. Costs should be low if there is an inventory program in place.

***Maintenance***

- None except for maintaining equipment for material tracking program.

## Supplemental Information

***Further Detail of the BMP***

*Land Treatment System*

Minimize runoff of polluted stormwater from land application by:

- Choosing a site where slopes are under 6%, the soil is permeable, there is a low water table, it is located away from wetlands or marshes, and there is a closed drainage system

- Avoiding application of waste to the site when it is raining or when the ground is saturated with water
- Growing vegetation on land disposal areas to stabilize soils and reduce the volume of surface water runoff from the site
- Maintaining adequate barriers between the land application site and the receiving waters (planted strips are particularly good)
- Using erosion control techniques such as mulching and matting, filter fences, straw bales, diversion terracing, and sediment basins
- Performing routine maintenance to ensure the erosion control or site stabilization measures are working

***Examples***

The port of Long Beach has a state-of-the-art database for identifying potential pollutant sources, documenting facility management practices, and tracking pollutants.

## References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual http://www.co.clark.wa.us/pubworks/bmpman.pdf

Solid Waste Container Best Management Practices – Fact Sheet On-Line Resources – Environmental Health and Safety. Harvard University. 2002.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

# Safer Alternative Products SC-35

## Objectives

- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

| | |
|---|---|
| Sediment | |
| Nutrients | ✓ |
| Trash | |
| Metals | ✓ |
| Bacteria | |
| Oil and Grease | ✓ |
| Organics | ✓ |

California Stormwater Quality Association

## Description

Promote the use of less harmful products and products that contain little or no TMDL pollutants. Alternatives exist for most product classes including chemical fertilizers, pesticides, cleaning solutions, janitorial chemicals, automotive and paint products, and consumables (batteries, fluorescent lamps).

## Approach

Pattern a new program after the many established programs around the state and country. Integrate this best management practice as much as possible with existing programs at your facility.

Develop a comprehensive program based on:

- The “Precautionary Principle,” which is an alternative to the "Risk Assessment" model that says it's acceptable to use a potentially harmful product until physical evidence of its harmful effects are established and deemed too costly from an environmental or public health perspective. For instance, a risk assessment approach might say it's acceptable to use a pesticide until there is direct proof of an environmental impact. The Precautionary Principle approach is used to evaluate whether a given product is safe, whether it is really necessary, and whether alternative products would perform just as well.
- Environmentally Preferable Purchasing Program to minimize the purchase of products containing hazardous ingredients used in the facility's custodial services, fleet maintenance, and facility maintenance in favor of using alternate products that pose less risk to employees and to the environment.
- Integrated Pest Management (IPM) or Less-Toxic Pesticide Program, which uses a pest management approach that minimizes the use of toxic chemicals and gets rid of pests by methods that pose a lower risk to employees, the public, and the environment.
- Energy Efficiency Program including no-cost and low-cost energy conservation and efficiency actions that can reduce both energy consumption and electricity bills, along with long-term energy efficiency investments.

Consider the following mechanisms for developing and implementing a comprehensive program:

- Policies

- Procedures
    - Standard operating procedures (SOPs)
    - Purchasing guidelines and procedures
    - Bid packages (services and supplies)
- Materials
    - Preferred or approved product and supplier lists
    - Product and supplier evaluation criteria
    - Training sessions and manuals
    - Fact sheets for employees

Implement this BMP in conjunction with the Vehicle and Equipment Management fact sheets (SC20 – SC22) and SC41, Building and Grounds Maintenance.

### *Training*

- Employees who handle potentially harmful materials in the use of safer alternatives.
- Purchasing departments should be encouraged to procure less hazardous materials and products that contain little or no harmful substances or TMDL pollutants.

### *Regulations*

This BMP has no regulatory requirements. Existing regulations already encourage facilities to reduce the use of hazardous materials through incentives such as reduced:

- Specialized equipment storage and handling requirements,
- Storm water runoff sampling requirements,
- Training and licensing requirements, and
- Record keeping and reporting requirements.

### *Equipment*

- There are no major equipment requirements to this BMP.

### *Limitations*

- Alternative products may not be available, suitable, or effective in every case.

## Requirements

### *Cost Considerations*

- The primary cost is for staff time to: 1) develop new policies and procedures and 2) educate purchasing departments and employees who handle potentially harmful materials about the availability, procurement, and use of safer alternatives.

- Some alternative products may be slightly more expensive than conventional products.

**Supplemental Information**

Employees and contractors / service providers can both be educated about safer alternatives by using information developed by a number of organizations including the references and resources listed below.

The following discussion provides some general information on safer alternatives. More specific information on particular hazardous materials and the available alternatives may be found in the references and resources listed below.

- Automotive products – Less toxic alternatives are not available for many automotive products, especially engine fluids. But there are alternatives to grease lubricants, car polishes, degreasers, and windshield washer solution. Rerefined motor oil is also available.
- Vehicle/Trailer lubrication – Fifth wheel bearings on trucks require routine lubrication. Adhesive lubricants are available to replace typical chassis grease.
- Cleaners – Vegetables-based or citrus-based soaps are available to replace petroleum-based soaps/detergents.
- Paint products – Water-based paints, wood preservatives, stains, and finishes are available.
- Pesticides – Specific alternative products or methods exist to control most insects, fungi, and weeds.
- Chemical Fertilizers – Compost and soil amendments are natural alternatives.
- Consumables – Manufacturers have either reduced or are in the process of reducing the amount of heavy metals in consumables such as batteries and fluorescent lamps. All fluorescent lamps contain mercury, however low-mercury containing lamps are now available from most hardware and lighting stores. Fluorescent lamps are also more energy efficient than the average incandescent lamp.
- Janitorial chemicals – Even biodegradable soap can harm fish and wildlife before it biodegrades. Biodegradable does not mean non-toxic. Safer products and procedures are available for floor stripping and cleaning, as well as carpet, glass, metal, and restroom cleaning and disinfecting.

***Examples***

There are a number of business and trade associations, and communities with effective programs. Some of the more prominent are listed below in the references and resources section.

## References and Resources

Note: Many of these references provide alternative products for materials that typically are used inside and disposed to the sanitary sewer as well as alternatives to products that usually end up in the storm drain.

### *General Sustainable Practices and Pollution Prevention Including Pollutant-Specific Information*

California Department of Toxic Substances Control (www.dtsc.ca.gov)

California Integrated Waste Management Board (www.ciwmb.ca.gov)

City of Santa Monica (www.santa-monica.org/environment)

City of Palo Alto (www.city.palo-alto.ca.us/cleanbay)

City and County of San Francisco, Department of the Environment (www.ci.sf.ca.us/sfenvironment)

Earth 911 (www.earth911.org/master.asp)

Environmental Finance Center Region IX (www.greenstart.org/efc9)

Flex Your Power (www.flexyourpower.ca.gov)

GreenBiz.com (www.greenbiz.com)

Green Business Program (www.abag.org/bayarea/enviro/gbus/gb.html)

Pacific Industrial and Business Association (www.piba.org)

Sacramento Clean Water Business Partners (www.sacstormwater.org)

USEPA BMP fact sheet – Alternative products (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/poll_2.cfm)

USEPA Region IX Pollution Prevention Program (www.epa.gov/region09/p2)

Western Regional Pollution Prevention Network (www.westp2net.org)

### *Metals (mercury, copper)*

National Electrical Manufacturers Association - Environment, Health and Safety (www.nema.org)

Sustainable Conservation (www.suscon.org)

  Auto Recycling Project

  Brake Pad Partnership

### *Pesticides and Chemical Fertilizers*

Bio-Integral Resource Center (www.birc.org)

California Department of Pesticide Regulation (www.cdpr.ca.gov)

University of California Statewide IPM Program (www.ipm.ucdavis.edu/default.html)

***Dioxins***

Bay Area Dioxins Project (http://dioxin.abag.ca.gov/)

# Building & Grounds Maintenance SC-41

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

| | |
|---|---|
| Sediment | ✓ |
| Nutrients | ✓ |
| Trash | |
| Metals | ✓ |
| Bacteria | ✓ |
| Oil and Grease | |
| Organics | |

## Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

## Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

### *Pollution Prevention*

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

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- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

### *Suggested Protocols*

*Pressure Washing of Buildings, Rooftops, and Other Large Objects*

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

*Landscaping Activities*

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.

*Building Repair, Remodeling, and Construction*

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.

- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

*Mowing, Trimming, and Planting*

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Use mulch or other erosion control measures when soils are exposed.

- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.

- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.

- Use hand weeding where practical.

*Fertilizer and Pesticide Management*

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.

- Do not use pesticides if rain is expected.

- Do not mix or prepare pesticides for application near storm drains.

- Use the minimum amount needed for the job.

- Calibrate fertilizer distributors to avoid excessive application.

- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.

- Apply pesticides only when wind speeds are low.

- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.

- Irrigate slowly to prevent runoff and then only as much as is needed.

- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.

- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.

- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

*Inspection*

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

### *Training*

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.

- Train employees and contractors in proper techniques for spill containment and cleanup.

- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

### *Spill Response and Prevention*

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.

- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.

- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.

- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.

- Clean up spills immediately.

### *Other Considerations*

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

## Requirements

### *Costs*

- Cost will vary depending on the type and size of facility.

- Overall costs should be low in comparison to other BMPs.

### *Maintenance*

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

## Supplemental Information

### *Further Detail of the BMP*

*Fire Sprinkler Line Flushing*

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, polyphosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

## References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

# Building Repair and Construction SC-42

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Recycle

## Targeted Constituents

| | |
|---|---|
| Sediment | ✓ |
| Nutrients | |
| Trash | ✓ |
| Metals | ✓ |
| Bacteria | |
| Oil and Grease | ✓ |
| Organics | ✓ |

## Description

Modifications are common particularly at large industrial sites. The activity may vary from minor and normal building repair to major remodeling, or the construction of new facilities. These activities can generate pollutants including solvents, paints, paint and varnish removers, finishing residues, spent thinners, soap cleaners, kerosene, asphalt and concrete materials, adhesive residues, and old asbestos installation. Protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants to stormwater from building repair, remodeling, and construction by using soil erosion controls, enclosing or covering building material storage areas, using good housekeeping practices, using safer alternative products, and training employees.

## Approach

### *Pollution Prevention*

- Recycle residual paints, solvents, lumber, and other materials to the maximum extent practical.
- Buy recycled products to the maximum extent practical.
- Inform on-site contractors of company policy on these matters and include appropriate provisions in their contract to ensure certain proper housekeeping and disposal practices are implemented.

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- Make sure that nearby storm drains are well marked to minimize the chance of inadvertent disposal of residual paints and other liquids.

***Suggested Protocols***

*Repair & Remodeling*

- Follow BMPs identified in Construction BMP Handbook.
- Maintain good housekeeping practices while work is underway.
- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Cover materials of particular concern that must be left outside, particularly during the rainy season.
- Do not dump waste liquids down the storm drain.
- Dispose of wash water, sweepings, and sediments properly.
- Store materials properly that are normally used in repair and remodeling such as paints and solvents.
- Sweep out the gutter or wash the gutter and trap the particles at the outlet of the downspout if when repairing roofs, small particles have accumulated in the gutter. A sock or geofabric placed over the outlet may effectively trap the materials. If the downspout is tight lined, place a temporary plug at the first convenient point in the storm drain and pump out the water with a vactor truck, and clean the catch basin sump where you placed the plug.
- Properly store and dispose waste materials generated from construction activities. See Construction BMP Handbook.
- Clean the storm drain system in the immediate vicinity of the construction activity after it is completed.

*Painting*

- Enclose painting operations consistent with local air quality regulations and OSHA.
- Local air pollution regulations may, in many areas of the state, specify painting procedures which if properly carried out are usually sufficient to protect water quality.
- Develop paint handling procedures for proper use, storage, and disposal of paints.
- Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.
- Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint containers.
- Mix paint indoors before using so that any spill will not be exposed to rain. Do so even during dry weather because cleanup of a spill will never be 100% effective.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.

- Do not transfer or load paint near storm drain inlets.
- Plug nearby storm drain inlets prior to starting painting and remove plugs when job is complete when there is significant risk of a spill reaching storm drains.
- Cover nearby storm drain inlets prior to starting work if sand blasting is used to remove paint.
- Use a ground cloth to collect the chips if painting requires scraping or sand blasting of the existing surface. Dispose the residue properly.
- Cover or enclose painting operations properly to avoid drift.
- Clean the application equipment in a sink that is connected to the sanitary sewer if using water based paints.
- Capture all cleanup-water and dispose of properly.
- Dispose of paints containing lead or tributyl tin and considered a hazardous waste properly.
- Store leftover paints if they are to be kept for the next job properly, or dispose properly.
- Recycle paint when possible. Dispose of paint at an appropriate household hazardous waste facility.

### *Training*

Proper education of off-site contractors is often overlooked. The conscientious efforts of well trained employees can be lost by unknowing off-site contractors, so make sure they are well informed about what they are expected to do.

### *Spill Response and Prevention*

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Clean up spills immediately.
- Excavate and remove the contaminated (stained) soil if a spill occurs on dirt.

### *Limitations*

- This BMP is for minor construction only. The State's General Construction Activity Stormwater Permit has more requirements for larger projects. The companion "Construction Best Management Practice Handbook" contains specific guidance and best management practices for larger-scale projects.
- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Be certain that actions to help stormwater quality are consistent with Cal- and Fed-OSHA and air quality regulations.

## Requirements

### *Costs*

These BMPs are generally low to modest in cost.

### *Maintenance*

N/A

## Supplemental Information

### *Further Detail of the BMP*

*Soil/Erosion Control*

If the work involves exposing large areas of soil, employ the appropriate soil erosion and control techniques. See the Construction Best Management Practice Handbook. If old buildings are being torn down and not replaced in the near future, stabilize the site using measures described in SC-40 Contaminated or Erodible Areas.

If a building is to be placed over an open area with a storm drainage system, make sure the storm inlets within the building are covered or removed, or the storm line is connected to the sanitary sewer. If because of the remodeling a new drainage system is to be installed or the existing system is to be modified, consider installing catch basins as they serve as effective "in-line" treatment devices. See Treatment Control Fact Sheet TC-20 Wet Pond/Basin in Section 5 of the New Development and Redevelopment Handbook regarding design criteria. Include in the catch basin a "turn-down" elbow or similar device to trap floatables.

## References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

# Parking/Storage Area Maintenance SC-43

## Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

## Targeted Constituents

| | |
|---|---|
| Sediment | ✓ |
| Nutrients | |
| Trash | ✓ |
| Metals | ✓ |
| Bacteria | |
| Oil and Grease | ✓ |
| Organics | ✓ |

## Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

## Approach

The goal of this program is to ensure stormwater pollution prevention practices are considered when conducting activities on or around parking areas and storage areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

### *Pollution Prevention*

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook)

- Keep accurate maintenance logs to evaluate BMP implementation.

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***Suggested Protocols***

*General*

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

*Controlling Litter*

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel, and dispose of litter in the trash.

*Surface Cleaning*

- Use dry cleaning methods (e.g., sweeping, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- Follow the procedures below if water is used to clean surfaces:
  - Block the storm drain or contain runoff.
  - Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- Follow the procedures below when cleaning heavy oily deposits:
  - Clean oily spots with absorbent materials.
  - Use a screen or filter fabric over inlet, then wash surfaces.

  - Do not allow discharges to the storm drain.
  - Vacuum/pump discharges to a tank or discharge to sanitary sewer.
  - Appropriately dispose of spilled materials and absorbents.

*Surface Repair*

- Preheat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.
- Cover and seal nearby storm drain inlets where applicable (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.
- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

*Inspection*

- Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

### *Training*

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

### *Spill Response and Prevention*

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.
- Clean up fluid spills immediately with absorbent rags or material.
- Dispose of spilled material and absorbents properly.

### *Other Considerations*

Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

## Requirements

### *Costs*

Cleaning/sweeping costs can be quite large. Construction and maintenance of stormwater structural controls can be quite expensive as well.

### *Maintenance*

- Sweep parking lot regularly to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities regularly to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

## Supplemental Information

### *Further Detail of the BMP*

*Surface Repair*

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Only use only as much water as is necessary for dust control to avoid runoff.

## References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

# Drainage System Maintenance SC-44

## Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

## Approach

### *Pollution Prevention*

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

### *Suggested Protocols*

*Catch Basins/Inlet Structures*

- Staff should regularly inspect facilities to ensure compliance with the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

**Objectives**

- Cover
- Contain
- Educate
- Reduce/Minimize

**Targeted Constituents**

| | |
|---|---|
| Sediment | ✓ |
| Nutrients | |
| Trash | ✓ |
| Metals | |
| Bacteria | ✓ |
| Oil and Grease | |
| Organics | |

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- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.

- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.

- Keep accurate logs of the number of catch basins cleaned.

- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.

- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

*Storm Drain Conveyance System*

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.

- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

*Pump Stations*

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.

- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.

- Conduct routine maintenance at each pump station.

- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

*Open Channel*

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.

- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

*Illicit Connections and Discharges*

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:

    - Is there evidence of spills such as paints, discoloring, etc?

  - Are there any odors associated with the drainage system?

  - Record locations of apparent illegal discharges/illicit connections?

  - Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.

  - Eliminate the discharge once the origin of flow is established.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.

- Refer to fact sheet SC-10 Non-Stormwater Discharges.

*Illegal Dumping*

- Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.

- Establish a system for tracking incidents. The system should be designed to identify the following:

  - Illegal dumping hot spots

  - Types and quantities (in some cases) of wastes

  - Patterns in time of occurrence (time of day/night, month, or year)

  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)

  - Responsible parties

- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.

- Refer to fact sheet SC-10 Non-Stormwater Discharges.

### *Training*

- Train crews in proper maintenance activities, including record keeping and disposal.

- Allow only properly trained individuals to handle hazardous materials/wastes.

- Have staff involved in detection and removal of illicit connections trained in the following:

  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

  - OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).

  - Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

### *Spill Response and Prevention*

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.

- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.

- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

### *Other Considerations (Limitations and Regulations)*

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.

- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.

- Regulations may include adoption of substantial penalties for illegal dumping and disposal.

- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

## Requirements

### *Costs*

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.

- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:

  - Purchase and installation of signs.

  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.

  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.

  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

### *Maintenance*

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

## Supplemental Information

### *Further Detail of the BMP*

*Storm Drain Flushing*

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

## References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm

# Drain Insert MP-52

## General Description

Drain inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris. There are a multitude of inserts of various shapes and configurations, typically falling into one of three different groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene “bag” is placed in the wire mesh box. The bag takes the form of the box. Most box products are one box; that is, the setting area and filtration through media occur in the same box. Some products consist of one or more trays or mesh grates. The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon.

## Inspection/Maintenance Considerations

Washout problems increase with rain intensity. Susceptibility of accumulated sediments to be re-suspended at low flow rates, can be corrected with an energy dissipater between gate and treatment areas.

| Inspection Activities | Suggested Frequency |
|---|---|
| ■ Inspect for sediment buildup and proper functioning. | At the beginning of the wet season and after significant storms |
| ■ Verify that stormwater enters the unit and does not leak around the perimeter. | After construction. |
| **Maintenance Activities** | **Suggested Frequency** |
| ■ Remove sediment as needed. | At the beginning of the wet season and as necessary |

### Maintenance Concerns, Objectives, and Goals

- Sediment Removal

### Targeted Constituents

✓ Sediment
✓ Nutrients
✓ Trash
✓ Metals
Bacteria
✓ Oil and Grease
✓ Organics

***Removal Effectiveness***

See New Development and Redevelopment Handbook-Section 5.

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# Efficient Irrigation SD-12

## Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

## Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

## Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

## Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

## Design Considerations

### *Designing New Installations*

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.

- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:

    - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff

    - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect

    - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible

    - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth

- Employ other comparable, equally effective methods to reduce irrigation water runoff.

### *Redeveloping Existing Installations*

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “ redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

## Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

# Storm Drain Signage SD-13

## Design Objectives

Maximize Infiltration

Provide Retention

Slow Runoff

Minimize Impervious Land Coverage

☑ Prohibit Dumping of Improper Materials

Contain Pollutants

Collect and Convey

## Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

## Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

## Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

## Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

### *Designing New Installations*

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING

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– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

### *Redeveloping Existing Installations*

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

## Additional Information

### *Maintenance Considerations*

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

### *Placement*

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

## Supplemental Information

### *Examples*

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

## Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

# Maintenance Bays & Docks SD-31

## Design Objectives

☐ Maximize Infiltration

☐ Provide Retention

☐ Slow Runoff

☐ Minimize Impervious Land Coverage

☑ Prohibit Dumping of Improper Materials

☑ Contain Pollutants

☐ Collect and Convey

## Description

Several measures can be taken to prevent operations at maintenance bays and loading docks from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the stormwater conveyance system.

## Approach

In designs for maintenance bays and loading docks, containment is encouraged. Preventative measures include overflow containment structures and dead-end sumps. However, in the case of loading docks from grocery stores and warehouse/distribution centers, engineered infiltration systems may be considered.

## Suitable Applications

Appropriate applications include commercial and industrial areas planned for development or redevelopment.

## Design Considerations

Design requirements for vehicle maintenance and repair are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code requirements.

### *Designing New Installations*

Designs of maintenance bays should consider the following:

- Repair/maintenance bays and vehicle parts with fluids should be indoors; or designed to preclude urban run-on and runoff.

- Repair/maintenance floor areas should be paved with Portland cement concrete (or equivalent smooth impervious surface).

- Repair/maintenance bays should be designed to capture all wash water leaks and spills. Provide impermeable berms, drop inlets, trench catch basins, or overflow containment structures around repair bays to prevent spilled materials and wash-down waters form entering the storm drain system. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.

- Other features may be comparable and equally effective.

The following designs of loading/unloading dock areas should be considered:

- Loading dock areas should be covered, or drainage should be designed to preclude urban run-on and runoff.

- Direct connections into storm drains from depressed loading docks (truck wells) are prohibited.

- Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered infiltration system, or an equally effective alternative. Pre-treatment may also be required.

- Other features may be comparable and equally effective.

### *Redeveloping Existing Installations*

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “ redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

## Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

## Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

# Trash Storage Areas SD-32

## Design Objectives

Maximize Infiltration

Provide Retention

Slow Runoff

Minimize Impervious Land Coverage

Prohibit Dumping of Improper Materials

☑ Contain Pollutants

Collect and Convey

## Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

## Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

## Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

## Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

### *Designing New Installations*

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.

- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

### *Redeveloping Existing Installations*

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “ redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

## Additional Information

### *Maintenance Considerations*

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

## Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

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