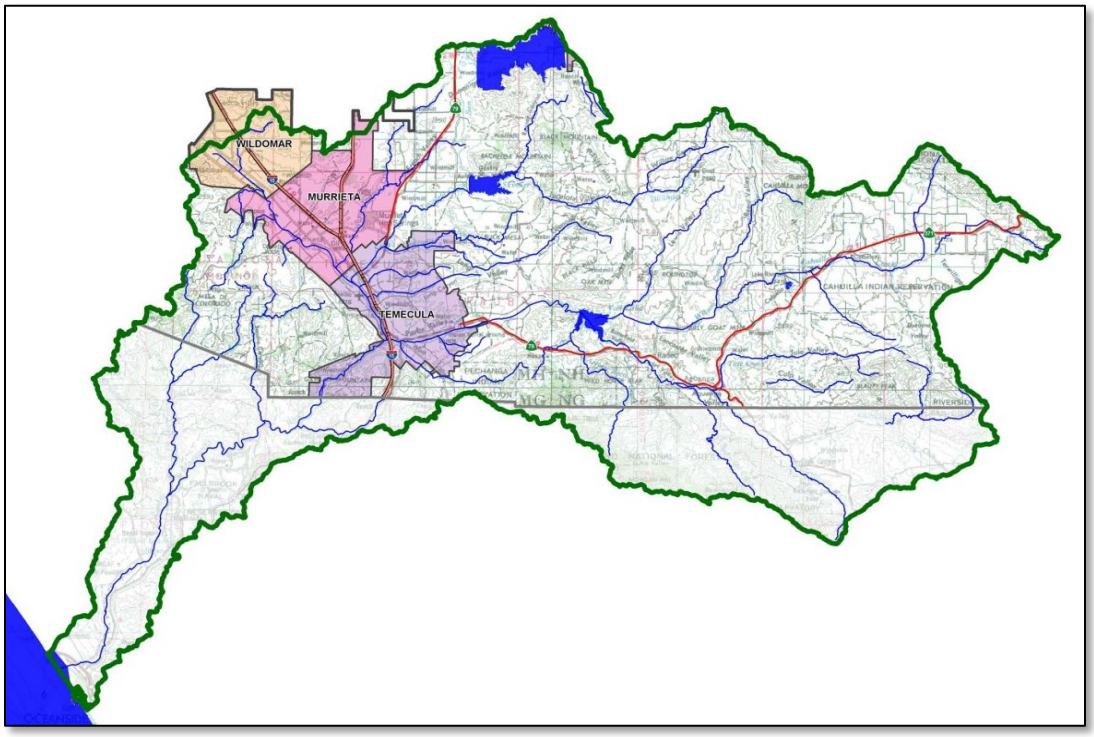
County Project Specific Water Quality Management Plan

A Template for preparing Project Specific WQMPs for Priority Development Projects only for use in the ***unincorporated portions of Riverside County*** *located within the* ***Santa Margarita Region****.*

RIVERSIDE COUNTY
TRANSPORTATION DEPT
WQMP
PRELIMINARY APPROVAL
Date: 8/15/2023 By: csimas

Project Title: Tommy's Commercial Center
Development No: PPT200033
Design Review/Case No:
BMP$_i$ (Latitude, Longitude): 33.5904, -117.1220



☒ **Preliminary**
☐ **Final**

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Based on 2018 WQMP, prepared for Compliance with Regional Board Order No. **R9-2013-0001** *as amended by Order No.* **R9-2015-0001** *and Order No.* **R9-2015-0100**

The County updated this template on July 24, 2018

A Brief Introduction

The Regional Municipal Separate Stormwater Sewer System (MS4) Permit[1] requires that a Project-Specific WQMP be prepared for all development projects within the Santa Margarita Region (SMR) that meet the 'Priority Development Project' categories and thresholds listed in the SMR Water Quality Management Plan (WQMP). This Project-Specific WQMP Template for Development Projects in the **Santa Margarita Region** has been prepared to help document compliance and prepare a WQMP submittal. Below is a flowchart for the layout of this Template that will provide the steps required to document compliance.

To ensure compliance with State permanent recordkeeping, the County of Riverside is no longer accepting hard copies of the **approved** Final or Preliminary WQMPs or Hydrology Reports. Electronic submittals are highly encouraged for submittal reviews, single PDF file submittal on two CD copies, to the Transportation Department (4080 Lemon Street, 8th Floor, Riverside, CA 92501) is preferred.

For Approved Final WQMPs, submit with the single file WQMP on CD:

- A wet-signed and notarized BMP maintenance agreement (See Appendix 9 for details)
- Owner's Certification signed and scanned into the PDF, or wet-signed hard copy, dated after approval.
- Print out of the WQMP site map (11x17") and Coversheet (8.5x11")
- The CD should include a Hydrology report when applicable. The County requires a hydrology report with hydraulics for the design of drainage facilities. Then provide a print out of the Pre- & Post-Hydrology map (11x17") and Report Coversheet (8.5x11")
- For tracts, submit the County EDA approved maintenance exhibit
- Signed Exhibit B.9 - WQMP O&M Cost Sheet.xlsx

[1] Order No. R9-2013-0001 as amended by Order Nos. R9-2015-0001 and R9-2015-0100, NPDES No. CAS0109266, National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the MS4s Draining the Watersheds within the San Diego Region, California Regional Water Quality Control Board, May 8, 2013.

Signed and scanned into the PDF for Final Approved WQMP, or wet-signed hard copy

OWNER'S CERTIFICATION

This Project-Specific WQMP has been prepared for Tahir Salim by Bryan Schmutz for the Tommy's Commercial Center project.

This WQMP is intended to comply with the requirements of Riverside County for County Ordinance No. 754 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 Best Management Practices 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 Riverside County Water Quality Ordinance (No. 754).

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

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

PREPARER'S CERTIFICATION

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control Best Management Practices in this plan meet the requirements of Regional Water Quality Control Board Order No. **R9-2013-0001** as amended by Order Nos. **R9-2015-0001 and R9-2015-0100**."

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

Preparer's Licensure:

Table of Contents

List of Tables

List of Appendices

Section A: Project and Site Information

Use the table below to compile and summarize basic site information that will be important for completing subsequent steps. Subsections A.1 through A.4 provide additional detail on documentation of additional project and site information. The Regional MS4 Permit has effectively removed the ability for a project to be grandfathered from WQMP requirements. Even if a project were able to meet all the requirements stated in Section 1.2 of the WQMP, the 2014 WQMP requirements would apply.

PROJECT INFORMATION		
Type of PDP:	New Development	
Type of Project:	Commercial	
Planning Case Number:	SP00265S03, CZ2000034, PPT200033	
Rough Grade Permit No.:	Insert Rough Grade Permit number if the project is entitled or seeking grading permits	
Development Name:	Tommy's Commercial Center	
PROJECT LOCATION		
Latitude & Longitude (DMS):	33.5904, -117.1220	
Project Watershed and Sub-Watershed:	Santa Margarita River, Insert HSA here (see Section A.2)	
24-Hour 85th Percentile Storm Depth (inches):	0.567	
Is project subject to Hydromodification requirements?	☒ Y ☐ N (Select based on Section A.3)	
APN(s):	221-051-063 & 064	
Map Book and Page No.:	Insert text here	
PROJECT CHARACTERISTICS		
Proposed or Potential Land Use(s)		Restaurants, Carwash
Proposed or Potential SIC Code(s)		5812, 7542
Existing Impervious Area of Project Footprint (SF)		0
Total area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement		33,106
Total Project Area (ac)		2.2
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
Has preparation of Project-Specific WQMP included coordination with other site plans?		☒ Y ☐ N
EXISTING SITE CHARACTERISTICS		
Is the project located within any Multi-Species Habitat Conservation Plan area (MSHCP Criteria Cell?)		☐ Y ☒ N If "Y" insert Cell Number
Is a Geotechnical Report attached?		☒ Y ☐ N

Provide a brief description of the project: This development consists of 3 proposed lots on a currently vacant 2.2-acre parcel of land in Winchester California, which drains to the West. It is bounded by Benton Road on the North, a developed parcel on the South, a vacant parcel on the West, and Penfield Lane on the East.
The proposed Site consist of the following:

- Two Accesses: one from Benton Road, and one from Penfield Lane.
- Three Buildings: a Tommy's Carwash, an Arby's, and a Wienerschnitzel's
- Three Trash enclosures
- 38 parking stalls, and 18 vacuum stalls
- A stormwater management system, including underground detention, and infiltration structures.

- Required utilities: Electricity, Sewer, Domestic water, ect.

Paver and dirt roads are considered pervious for determining WQMP applicability.

A.1 Maps and Site Plans

When completing your Project-Specific WQMP, include a map of the Project 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:

- Vicinity and location maps
- Parcel Boundary and Project Footprint
- Existing and Proposed Topography
- Drainage Management Areas (DMAs)
- Proposed Structural Best Management Practices (BMPs)
- Drainage Paths
- Drainage infrastructure, inlets, overflows
- Source Control BMPs
- Site Design BMPs
- Buildings, Roof Lines, Downspouts
- Impervious Surfaces
- Pervious Surfaces (i.e. Landscaping)
- Standard Labeling
- Cross Section and Outlet details

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 Copermittee plan reviewer must be able to easily analyze your Project utilizing this template and its associated site plans and maps. Complete the checklists in Appendix 1 to verify that all exhibits and components are included.

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. This map should identify the path of the stormwater discharged from the site all the way to the outlet of the Santa Margarita River to the Pacific Ocean. Use the most recent 303(d) list available from the State Water Resources Control Board Website.
(http://www.waterboards.ca.gov/sandiego/water_issues/programs/basin_plan/)

Table A-1 Identification of Receiving Waters

Receiving Waters	USEPA Approved 303(d) List Impairments	Designated Beneficial Uses	Proximity to RARE Beneficial Use
Warm Springs Creek	Chlorpyrifos, Iron, Manganese, Nitrogen, Pathogens, Phosphorus	Municipal and Domestic Supply, Warm Freshwater Habitat, Water contact Recreation	0.4 miles
Murrieta Creek	Benthic Macroinvertebrates Bioassessments, Bifenthrin, Chlorpyrifos, Copper, Dissolved Oxygen, Iron, Lambda-Cyhalothrin, Manganese, Mercury, Nitrogen, Pathogens,	Municipal and Domestic Supply, Warm Freshwater Habitat, Water contact Recreation	7.6 miles

	Phosphorus, Pyrethroids, Toxicity, Turbidity		
Sanata Margarita River Upper	Benthic Macroinvertebrates Bioassessments, Chlorpyrifos, Nitrogen, Pathogens, Phosphorus, Toxicity	Agricultural supply, Municipal and Domestic Supply, Warm & Cold Freshwater Habitat, Recreation contact Recreation	12.2 miles
Sanata Margarita River Lower	Benthic Macroinvertebrates Bioassessments, Chlorpyrifos, Nitrogen, Pathogens, Phosphorus, Toxicity	Agricultural supply, Municipal and Domestic Supply, Warm & Cold Freshwater Habitat, Estuarine Habitat, Water non-contact & contact Recreation, rare, threatened, or endangered species	30.1 Miles

A.3 Drainage System Susceptibility to Hydromodification

Using Table A-2 below, list in order of the point of discharge at the project site down to the Santa Margarita River[2], each drainage system or receiving water that the project site is tributary to. Continue to fill each row with the material of the drainage system, and any exemption (if applicable). Based on the results, summarize the applicable hydromodification performance standards that will be documented in Section E. Exempted categories of receiving waters include:

- Existing storm drains that discharge directly to water storage reservoirs, lakes, or enclosed embayments, or
- Conveyance channels whose bed and bank are concrete lined all the way from the point of discharge to water storage reservoirs, lakes, enclosed embayments, or the Pacific Ocean.
- Other water bodies identified in an approved WMAA (See Exhibit G to the WQMP)

Include a map exhibiting each drainage system and the associated susceptibility in Appendix 1.

Table A-2 Identification of Susceptibility to Hydromodification

Drainage System	Drainage System Material	Hydromodification Exemption	Hydromodification Exempt
Unnamed Intermittent Stream, 3.8 miles	Earthen vegetative channel	NONE	☐ Y ☒ N
Warm Springs Creek, 5.3 Miles	Earthen vegetative channel	NONE	☐ Y ☒ N
Murrieta Creek, 4.65 Miles	Earthen vegetative channel	NONE	☐ Y ☒ N

[2] Refer to Exhibit G of the WQMP for a map of exempt and potentially exempt areas. These maps are from the Draft SMR WMAA as of January 5, 2018 and will be replaced upon acceptance of the SMR WMAA.

Drainage System	Drainage System Material	Hydromodification Exemption	Hydromodification Exempt
Sanata Margarita River, 42.3 Miles	River Bed		☒ Y ☐ N

Summary of Performance Standards

☐ **Hydromodification Exempt** – Select if "Y" is selected in the Hydromodification Exempt column above, project is exempt from hydromodification requirements.

☒ **Not Exempt**-Select if "N" is selected in any row of the Hydromodification Exempt column above. Project is subject to hydrologic control requirements and may be subject to sediment supply requirements.

A.4 Additional Permits/Approvals required for the Project:

Table A-3 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 Section 401 Water Quality Certification	☐ Y	☒ N
US Army Corps of Engineers, Clean Water Act Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)*	☐ Y	☒ N

If yes is answered to any of the questions above, the Copermittee 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 LID 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 Low Impact Development (LID) design and explain your design decisions to others.

Apply the following LID Principles to the layout of the PDP to the extent they are applicable and feasible. Putting thought upfront about how best to organize the various elements of a site can help to significantly reduce the PDP's potential impact on the environment and reduce the number and size of Structural LID BMPs that must be implemented. Integrate opportunities to accommodate the following LID Principles within the preliminary PDP site layout to maximize implementation of LID Principles.

Site Optimization

Complete checklist below to determine applicable Site Design BMPs for your site.

Project- Specific WQMP Site Design BMP Checklist

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

SITE DESIGN REQUIREMENTS

Answer the following questions below by indicating "Yes," "No," or "N/A" (Not Applicable). Justify all "No" and "N/A" answers by inserting a narrative at the end of the section. The narrative should include identification and justification of any constraints that would prevent the use of those categories of LID BMPs. Upon identifying Site Design BMP opportunities, include these on your WQMP Site plan in Appendix 1.

☒ Yes ☐ No ☐ N/A

Did you identify and preserve existing drainage patterns?

Integrating existing drainage patterns into the site plan helps to maintain the time of concentration and infiltration rates of runoff, decreasing peak flows, and may also help preserve the contribution of Critical Coarse Sediment (i.e., Bed Sediment Supply) from the PDP to the Receiving Water. Preserve existing drainage patterns by:

- Minimizing unnecessary site grading that would eliminate small depressions, where appropriate add additional "micro" storage throughout the site landscaping.
- Where possible conform the PDP site layout along natural landforms, avoid excessive grading and disturbance of vegetation and soils, preserve or replicate the sites natural drainage features and patterns.
- Set back PDP improvements from creeks, wetlands, riparian habitats and any other natural water bodies.
- Use existing and proposed site drainage patterns as a natural design element, rather than using expensive impervious conveyance systems. Use depressed landscaped areas, vegetated buffers, and bioretention areas as amenities and focal points within the site and landscape design.

An r-tank system located which is to be located ~ 10' below existing grade within a more permeable geological stratum will been utilized to attenuate peak flows to within pre development conditions. Any flows beyond the capacity of storage will exit the site across the property boundary as and where it currently does.

☐ Yes ☐ No ☒ N/A

Did you identify and protect existing vegetation?

Identify any areas containing dense native vegetation or well-established trees, and try to avoid disturbing these areas. Soils with thick, undisturbed vegetation have a much higher capacity to store and infiltrate runoff than do disturbed soils. Reestablishment of a mature vegetative community may take decades. Sensitive areas, such as streams and floodplains should also be avoided.

- Define the development envelope and protected areas, identifying areas that are most suitable for development and areas that should be left undisturbed.
- Establish setbacks and buffer zones surrounding sensitive areas.
- Preserve significant trees and other natural vegetation where possible.

Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. **This lot is scarcely vegetated, containing only sparce tufts of grass, weeds, and bushes.**

Project- Specific WQMP Site Design BMP Checklist	
☐ Yes ☐ No ☒ N/A	**Did you identify and preserve natural infiltration capacity?** A key component of LID is taking advantage of a site's natural infiltration and storage capacity. A site survey and geotechnical investigation can help define areas with high potential for infiltration and surface storage. • Identify opportunities to locate LID Principles and Structural BMPs in highly pervious areas. Doing so will maximize infiltration and limit the amount of runoff generated. • Concentrate development on portions of the site with less permeable soils, and preserve areas that can promote infiltration.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. **Immediately under the thin layer of topsoil is an impenetrable layer of firm silt. Next to no infiltration occurs on this site. See attached geotechnical report.**	
☒ Yes ☐ No ☐ N/A	**Did you minimize impervious area?** Look for opportunities to limit impervious cover through identification of the smallest possible land area that can be practically impacted or disturbed during site development. • Limit overall coverage of paving and roofs. This can be accomplished by designing compact, taller structures, narrower and shorter streets and sidewalks, clustering buildings and sharing driveways, smaller parking lots (fewer stalls, smaller stalls, and more efficient lanes), and indoor or underground parking. • Inventory planned impervious areas on your preliminary site plan. Identify where permeable pavements, or other permeable materials, such as crushed aggregate, turf block, permeable modular blocks, pervious concrete or pervious asphalt could be substituted for impervious concrete or asphalt paving. This will help reduce the amount of Runoff that may need to be addressed through Structural BMPs. • Examine site layout and circulation patterns and identify areas where landscaping can be substituted for pavement, such as for overflow parking. • Consider green roofs. Green roofs are roofing systems that provide a layer of soil/vegetative cover over a waterproofing membrane. A green roof mimics pre-development conditions by filtering, absorbing, and evapotranspiring precipitation to help manage the effects of an otherwise impervious rooftop.
Drive isle widths, and total supplied parking are the minimum allowable per zoning regulations, and fire code. Reducing the impervious areas much beyond this is not feasible.	

Project- Specific WQMP Site Design BMP Checklist	
☐ Yes ☐ No ☒ N/A	**Did you identify and disperse runoff to adjacent pervious areas or small collection areas?** Look for opportunities to direct runoff from impervious areas to adjacent landscaping, other pervious areas, or small collection areas where such runoff may be retained. This is sometimes referred to as reducing Directly Connected Impervious Areas. • Direct roof runoff into landscaped areas such as medians, parking islands, planter boxes, etc., and/or areas of pervious paving. Instead of having landscaped areas raised above the surrounding impervious areas, design them as depressed areas that can receive Runoff from adjacent impervious pavement. For example, a lawn or garden depressed 3"-4" below surrounding walkways or driveways provides a simple but quite functional landscape design element. • Detain and retain runoff throughout the site. On flatter sites, smaller Structural BMPs may be interspersed in landscaped areas among the buildings and paving. • On hillside sites, drainage from upper areas may be collected in conventional catch basins and piped to landscaped areas and LID BMPs and/or Hydrologic Control BMPs in lower areas. Low retaining walls may also be used to create terraces that can accommodate LID BMPs. Wherever possible, direct drainage from landscaped slopes offsite and not to impervious surfaces like parking lots. • Reduce curb maintenance and provide for allowances for curb cuts. • Design landscaped areas or other pervious areas to receive and infiltrate runoff from nearby impervious areas. • Use Tree Wells to intercept, infiltrate, and evapotranspire precipitation and runoff before it reaches structural BMPs. Tree wells can be used to limit the size of Drainage Management Areas that must be treated by structural BMPs. Guidelines for Tree Wells are included in the Tree Well Fact Sheet in the LID BMP Design Handbook.
Existing top 10' of existing soil has a high fines content, and therefore is not pervious.	
☒ Yes ☐ No ☐ N/A	**Did you utilize native or drought tolerant species in site landscaping?** Wherever possible, use native or drought tolerant species within site landscaping instead of alternatives. These plants are uniquely suited to local soils and climate and can reduce the overall demands for potable water use associated with irrigation.
The landscape architect has been informed of this requirement. It will be reflected in the landscaping plan.	

Project- Specific WQMP Site Design BMP Checklist	
☐ Yes ☒ No ☐ N/A	**Did implement harvest and use of runoff?** Under the Regional MS4 Permit, Harvest and Use BMPs must be employed to reduce runoff on any site where they are applicable and feasible. However, Harvest and Use BMPs are effective for retention of stormwater runoff only when there is adequate demand for non-potable water during the wet season. If demand for non-potable water is not sufficiently large, the actual retention of stormwater runoff will be diminished during larger storms or during back-to-back storms. For the purposes of planning level Harvest and Use BMP feasibility screening, Harvest and Use is only considered to be a feasible if the total average wet season demand for non-potable water is sufficiently large to use the entire DCV within 72 hours. If the average wet season demand for non-potable water is not sufficiently large to use the entire DCV within 72 hours, then Harvest and Use is not considered to be feasible and need not be considered further. The general feasibility and applicability of Harvest and Use BMPs should consider: • Any downstream impacts related to water rights that could arise from capturing stormwater (not common). • Conflicts with recycled water used – where the project is conditioned to use recycled water for irrigation, this should be given priority over stormwater capture as it is a year-round supply of water. • Code Compliance - If a particular use of captured stormwater, and/or available methods for storage of captured stormwater would be contrary to building codes in effect at the time of approval of the preliminary Project-Specific WQMP, then an evaluation of harvesting and use for that use would not be required. • Wet season demand – the applicant shall demonstrate, to the acceptance of the County of Riverside, that there is adequate demand for harvested water during the wet season to drain the system in a reasonable amount of time.
Due to being in an ALUC regulated zone, there is insufficient density to produce the required demand of non-potable water for reuse of runoff.	
☐ Yes ☒ No ☐ N/A	**Did you keep the runoff from sediment producing pervious area hydrologically separate from developed areas that require treatment?** Pervious area that qualify as self-treating areas or off-site open space should be kept separate from drainage to structural BMPs whenever possible. This helps limit the required size of structural BMPs, helps avoid impacts to sediment supply, and helps reduce clogging risk to BMPs.
Due to the silty nature of the existing soils, infiltration does not occur in any appreciable rate. As such, all areas must drain to the structural bmp's to avoid local ponding and flooding.	

Section C: Delineate Drainage Management Areas (DMAs) & Green Streets

This section provides streamlined guidance and documentation of the DMA delineation and categorization process, for additional information refer to the procedure in Section 3.3 of the SMR WQMP which discusses the methods of delineating and mapping your project site into individual DMAs. Complete Steps 1 to 4 to successfully delineate and categorize DMAs.

Step 1: Identify Surface Types and Drainage Pathways

Carefully delineate pervious areas and impervious areas (including roofs) throughout site and identify overland flow paths and above ground and below ground conveyances. Also identify common points (such as BMPs) that these areas drain to.

Step 2: DMA Delineation

Use the information in Step 1 to divide the entire PDP site into individual, discrete DMAs. Typically, lines delineating DMAs follow grade breaks and roof ridge lines. Where possible, establish separate DMAs for each surface type (e.g., landscaping, pervious paving, or roofs). Assign each DMA a unique code and determine its size in square feet. The total area of your site should total the sum of all of your DMAs (unless water from outside the project limits comingles with water from inside the project limits, i.e. run-on). Complete Table C-1

Table C-1 DMA Identification

DMA Name or Identification	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
DMA1	Mixed	33,603	To be Determined in Step 3
DMA2	Mixed	36,009	
DMA3	Mixed	34,620	
DMA4	Asphalt & Concrete	8,690	
Enter Unique Code	Enter Pervious, Impervious, or Mixed	Enter Area in Square Feet	
Enter Unique Code	Enter Pervious, Impervious, or Mixed	Enter Area in Square Feet	

Add Columns as Needed. Consider a separate DMA for Tree Wells or other LID principals like Self-Retaining areas are used for mitigation.

Step 3: DMA Classification

Determine how drainage from each DMA will be handled by using information from Steps 1 and 2 and by completing Steps 3.A to 3.C. Each DMA will be classified as one of the following four types:

- Type 'A': Self-Treating Areas:
- Type 'B': Self-Retaining Areas
- Type 'C': Areas Draining to Self-Retaining Areas
- Type 'D': Areas Draining to BMPs

Tree wells are considered Type 'B' areas, and their tributary areas limited to a 10:1 ratio are considered Type 'C' areas. If Tree wells are proposed, consider grading or other features to minimize the pervious runoff to the tree wells, to avoid overwhelming the trees. Type 'A', 'B', and 'C' are considered LID Principals that can be used to minimize or potentially eliminate structural LID BMPs.

If Tree wells are proposed, a landscape architect shall be consulted on the tree selection, since compliance will be determined based on the survival of the tree. The tree type should be noted on the WQMP site map.

Step 3.A – Identify Type 'A' Self-Treating Area

Indicate if the DMAs meet the following criteria by answering "Yes" or "No".

☐ Yes ☐ No	Area is undisturbed from their natural condition OR restored with Native and/or California Friendly vegetative covers.
☐ Yes ☐ No	Area is irrigated, if at all, with appropriate low water use irrigation systems to prevent irrigation runoff.
☐ Yes ☐ No	Runoff from the area will not comingle with runoff from the developed portion of the site, or across other landscaped areas that do not meet the above criteria.

If all answers indicate "Yes," complete Table C-2 to document the DMAs that are classified as Self-Treating Areas.

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

DMA Name or Identification	Area (Sq. Ft.)	Stabilization Type	Irrigation Type (if any)

Step 3.B – Identify Type 'B' Self-Retaining Area and Type 'C' Areas Draining to Self-Retaining Areas

Type 'B' Self-Retaining Area: A Self-Retaining Area is shallowly depressed 'micro infiltration' areas designed to retain the Design Storm rainfall that reaches the area, without producing any Runoff.

Indicate if the DMAs meet the following criteria by answering "Yes," "No," or "N/A".

☐ Yes ☐ No ☐ N/A	Inlet elevations of area/overflow drains, if any, should be clearly specified to be three inches or more above the low point to promote ponding.
☐ Yes ☐ No ☐ N/A	Soils will be freely draining to not create vector or nuisance conditions.
☐ Yes ☐ No ☐ N/A	Pervious pavements (e.g., crushed stone, porous asphalt, pervious concrete, or permeable pavers) can be self-retaining when constructed with a gravel base course four or more inches deep below any underdrain discharge elevation.

If all answers indicate "Yes," DMAs may be categorized as Type 'B', proceed to identify Type 'C' Areas Draining to Self-Retaining Areas.

Type 'C' Areas Draining to Self-Retaining Areas: Runoff from impervious or partially pervious areas can be managed by routing it to Self-Retaining Areas consistent with the LID Principle discussed in SMR WQMP Section 3.2.5 for 'Dispersing Runoff to Adjacent Pervious Areas'.
Indicate if the DMAs meet the following criteria by answering "Yes" or "No".

☐ Yes ☐ No The drainage from the tributary area must be directed to and dispersed within the Self-Retaining Area.

☐ Yes ☐ No The maximum ratio of Tributary Area to Self-Retaining area is (2 ÷ Impervious Fraction): 1

If all answers indicate "Yes," DMAs may be categorized as Type 'C'.

Complete Table C-3 and Table C-4 to identify Type 'B' Self-Retaining Areas and Type 'C' Areas Draining to Self-Retaining Areas.

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

Note: Tree well areas can extend well beyond the drip line. The Tree Well area for open top types would include the shallow depressed area at the soil surface. The Tree Well area for Structural Soil Tree Wells or Suspended Pavement Tree Wells includes the area with open-graded gravel or void space over the structural soil or structural cells. Please specify type in this table and WQMP site map. See LID handbook Tree Well factsheet for additional details.

$$\left(\frac{2}{\boldsymbol{Impervious\ Fraction}}\right) : 1$$

(Tributary Area: Self-Retaining Area)

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

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

Note: (See Section 3.3 of SMR WQMP) Ensure that partially pervious areas draining to a Self-Retaining area do not exceed the following ratio:

Step 3.B.1 – Document the use of Green Street Exemption (see Section 3.11 of the WQMP Guidance)

The Regional MS4 Permit specifies that projects that consist of **retrofitting or redevelopment of existing paved alleys, streets, or roads** may be exempted from classification as PDPs if they are designed and constructed in accordance with USEPA Green Streets Guidance. This does not apply for interior roads for PDP projects. For projects with road frontage improvements, Green Street standards can be used in the frontage road right-of-way. The remainder of the project is subject to full WQMP and Hydromodification requirements. See excerpt from Section 3.11 of the WQMP Guidance below:

3.11.4 BMP Sizing Targets for Applicable Green Streets Projects

Applicable green street projects are not required to meet the same sizing requirements for BMPs as other projects, but should attempt to meet a sizing target to the MEP. The following steps are used to size BMPs for applicable Green Streets projects:

1. Delineate drainage areas tributary to BMP locations and compute imperviousness.
2. Determine sizing goal by referring to sizing criteria presented in Section 2.3.2 (V_{BMP}).
3. Attempt to provide the target BMP sizing according to Step 2.
4. If the target criteria cannot be achieved, document the constraints that override the application of BMPs, and provide the largest portion of the sizing criteria that can be reasonably provided given constraints.

Even if BMPs cannot be sized to meet the target sizing criteria, it is still important to design the BMP inlet, energy dissipation, and overflow capacity for the full tributary area to ensure that flooding and scour is avoided. It is strongly recommended that BMPs which are designed to less than their target design volume be designed to bypass peak flows.

Table C-4.1 – Green Streets

DMA Name or ID	Street Name	BMP Sizing Targets Calculations and documenting constraints included in Appendix 6*
		☐ Yes ☐ No
		☐ Yes ☐ No
		☐ Yes ☐ No
		☐ Yes ☐ No
		☐ Yes ☐ No
*WQMP shall not be approved without calculations or documenting constraints for Green Street Exemption.		

Step 3.C – Identify Type 'D' Areas Draining to BMPs

Areas draining to BMPs are those that could not be fully managed through LID Principles (DMA Types A through C) and will instead drain to an LID BMP and/or a Conventional Treatment BMP designed to manage water quality impacts from that area, and Hydromodification where necessary.

Complete Table C-5 to document which DMAs are classified as Areas Draining to BMPs

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

DMA Name or ID	BMP Name or ID Receiving Runoff from DMA
DMA1	BMP1
DMA2	BMP2
DMA3	BMP3
DMA4	BMP 1 WILL OVER MITIGATE FOR DMA 4

Note: More than one DMA may drain to a single LID BMP; however, one DMA may not drain to more than one BMP.

*It is not desirable to drain the offsite improvements onto site for treatment. This would result in draining a large percentage of Benton RD onto site, increasing the tributary area to the adjacent western property well beyond predevelopment conditions. We thus opt to have no net impact by over mitigating the treatment of onsite water.

Section D: Implement LID BMPs

The Regional MS4 Permit requires the use of LID BMPs to provide retention or treatment of the DCV and includes a BMP hierarchy which requires Full Retention BMPs (Priority 1) to be considered before Biofiltration BMPs (Priority 2) and Flow-Through Treatment BMPs and Alternative Compliance BMPs (Priority 3). LID BMP selection must be based on technical feasibility and should be considered early in the site planning and design process. Use this section to document the selection of LID BMPs for each DMA. Note that feasibility is based on the DMA scale and may vary between DMAs based on site conditions.

D.1 Full Infiltration Applicability

An assessment of the feasibility of utilizing full infiltration BMPs is required for all projects, *except where it can be shown that site design LID principles fully retain the DCV (i.e., all DMAs are Type A, B, or C), or where Harvest and Use BMPs fully retain the DCV. Check the following box if applicable:*

☐ Site design LID principles or Tree Wells fully retain the DCV (i.e., all DMAs are Type A, B, or C), (Proceed to Section E).

If the above box remains unchecked, perform a site-specific evaluation of the feasibility of Infiltration BMPs using each of the applicable criteria identified in Chapter 2.3.3 of the SMR WQMP and complete the remainder of Section D.1.

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 Copermittee, at their discretion, may not require a geotechnical report for small projects as described in Chapter 2 of the SMR WQMP. 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.

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 SMR WQMP in Chapter 2.3.3. 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

Downstream Impacts (SMR WQMP Section 2.3.3.a)		
Does the project site…	**YES**	**NO**
…have any DMAs where infiltration would negatively impact downstream water rights or other Beneficial Uses[3]?		X
If Yes, list affected DMAs:		
Groundwater Protection (SMR WQMP Section 2.3.3.b)		
Does the project site…	**YES**	**NO**
…have any DMAs with industrial, and other land uses that pose a high threat to water quality, which cannot be treated by Bioretention BMPs? Or have DMAs with active industrial process areas?		X
If Yes, list affected DMAs:		
…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 horizontally of a water supply well?		X
If Yes, list affected DMAs:		
…have any DMAs that would restrict BMP locations to within a 2:1 (horizontal: vertical) influence line extending from any septic leach line?		X
If Yes, list affected DMAs:		
…have any DMAs been evaluated by a licensed Geotechnical Engineer, or Environmental Engineer, who has concluded that the soils do not have adequate physical and chemical characteristics for the protection of groundwater, and has treatment provided by amended media layers in Bioretention BMPs been considered in evaluating this factor?		X
If Yes, list affected DMAs:		
Public Safety and Offsite Improvements (SMR WQMP Section 2.3.3.c)		
Does the project site…	**YES**	**NO**
…have any areas identified by the geotechnical report as posing a public safety risk where infiltration of stormwater could have a negative impact, such as potential seepage through fill conditions?		X
If Yes, list affected DMAs:		
Infiltration Characteristics For LID BMPs (SMR WQMP Section 2.3.3.d)		
Does the project site…	**YES**	**NO**
…have measured infiltration rates of less than 2.4 inches / hour? Riverside County may allow measure rates as low as 0.8in/hr to support infiltration BMPs, if the Engineer believes infiltration is appropriate and sustainable. Mark no, if this is the case.		X
If Yes, list affected DMAs:		
Cut/Fill Conditions (SMR WQMP Section 2.3.3.e)		
Does the project site…	**YES**	**NO**
…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:		
Other Site-Specific Factors (SMR WQMP Section 2.3.3.f)		
Does the project site…	**YES**	**NO**
…have DMAs where the geotechnical investigation discovered other site-specific factors that would preclude effective and/or safe infiltration?		x
Describe here: There is a shallow impermeable layer of silt. However, at a depth of ~10' there are well drained sands. We plan to infiltrate directly into those well drained sands through the use of R-tanks. The soils were tested at these elevations in several locations at a later date by Alta California Geotechnical Inc. The infiltration rates were measured to be 1.4 in/hr, 4.6 in/hr, and 2.7 in/hr. For design purposes we have used the 1.4 in/hr as our assumed infiltration rate in the R-tanks.		

If you answered "Yes" to any of the questions above for any DMA, Infiltration BMPs that rely solely on infiltration should not be used for those DMAs and you should proceed to the assessment for Biofiltration

[3] Such a condition must be substantiated by sufficient modeling to demonstrate an impact and would be subject to County of Riverside discretion. There is not a standardized method for assessing this criterion. Water rights evaluations should be site-specific.

BMPs below. Biofiltration BMPs that provide partial infiltration may still be feasible and should be assessed in Section D.2. Summarize concerns identified in the Geotechnical Report, if any, that resulted in a "YES" response above in the table below.

Table D-2 Geotechnical Concerns for Onsite Infiltration

Type of Geotechnical Concern	DMAs Feasible (By Name or ID)	DMAs Infeasible (By Name or ID)
Collapsible Soil		
Expansive Soil		
Slopes		
Liquefaction		
Low Infiltration Rate		
Other		

D.2 Biofiltration Applicability

This section should document the applicability of biofiltration BMPs for Type D DMAs that are not feasible for full infiltration BMPs. The key decisions to be documented in this section include:

1. Are biofiltration BMPs with partial infiltration feasible?
    a. Biofiltration BMPs must be designed to maximize incidental infiltration via a partial infiltration design unless it is demonstrated that this design is not feasible.
    b. These designs can be used at sites with low infiltration rates where other feasibility factors do not preclude incidental infiltration.

    Document summary in Table D-3.
2. If not, what are the factors that require the use of biofiltration with no infiltration? This may include:
    a. Geotechnical hazards
    b. Water rights issues
    c. Water balance issues
    d. Soil contamination or groundwater quality issues
    e. Very low infiltration rates (factored rates < 0.1 in/hr)
    f. Other factors, demonstrated to the acceptance of the local jurisdiction

    If this applies to any DMAs, then rationale must be documented in Table D-3.
3. Are biofiltration BMPs infeasible?
    a. If yes, then provide 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 with jurisdiction over the Project site to discuss this option. Proceed below.

Table D-3 Evaluation of Biofiltration BMP Feasibility

DMA ID	Is Partial/ Incidental Infiltration Allowable? (Y/N)	Basis for Infeasibility of Partial Infiltration (provide summary and include supporting basis if partial infiltration not feasible)
Insert text here		
Insert text here		
Insert text here		
Insert text here		

Proprietary Biofiltration BMP Approval Criteria

Does the Co-Permittee allow Proprietary BMPs as an equivalent to Biofiltration, if specific criteria is met?

☒ Yes or ☐ No, if no skip to Section F to document your alternative compliance measures.

If the project will use proprietary BMPs as biofiltration BMPs, then this section and Appendix 5 shall be completed to document that the proprietary BMPs are selected in accordance with Section 2.3.6 of the SMR WQMP and County requirements. Proprietary Biofiltration BMPs must meet both of the following approval criteria:

1. Demonstrate equivalency to Biofiltration by completing the BMP Design worksheet and Proprietary Biofiltration Criteria, which is found in Appendix 5, including all supporting documentation, and
2. Obtain Co-Permittee concurrence for the long term Operation and Maintenance Plan for the proprietary BMP. The Co-Permittee has the sole discretion to allow or reject Proprietary BMPs, especially if they will be maintained publically through a CFD, CSA, or L&LMD.

Add additional rows to Table D-4 to document approval criteria are met for each type of BMP proposed.

Table D-4 Proprietary BMP Approval Requirement Summary

Proposed Proprietary Biofiltration BMP	Approval Criteria	Notes/Comments
Insert BMP Name and Manufacturer Here	BMP Design worksheets and Proprietary Biofiltration Criteria are completed in Appendix 5	☐ Yes or ☐ No Insert text here
	Proposed BMP has an active TAPE GULD Certification for the project pollutants of concern[4] or equivalent 3rd party demonstrated performance.	☐ Yes or ☐ No Insert text here
	Is there any media or cartridge required to maintain the function of the BMP sole-sourced or proprietary in any way? If yes, obtain explicit approval by the Agency. Potentially full replacement costs to a non-proprietary BMP needs to be considered.	☐ Yes or ☐ No If yes, provide the date of concurrence from the Co-Permittee. Insert date here
	☐ The BMP includes biological features including vegetation supported by engineered or other growing media.	Describe features here.

[4] Use Table F-1, F-2, and F-3 to identify and document the pollutants of concern and include these tables in Appendix 5.

D.3 Feasibility Assessment Summaries

From the Infiltration, Biofiltration with Partial Infiltration and Biofiltration with No Infiltration Sections above, complete Table D-5 below to summarize which LID BMPs are technically feasible, and which are not, based upon the established hierarchy.

Table D-5 LID Prioritization Summary Matrix

DMA Name/ID	LID Principles or Tree Wells	LID BMP Hierarchy			No LID (Alternative Compliance)
		1. Infiltration	2. Biofiltration with Partial Infiltration*	3. Biofiltration with No Infiltration*	
DMA1	☐	☒	☐	☐	☐
DMA2	☐	☒	☐	☐	☐
DMA3	☐	☒	☐	☐	☐
DMA4	☐	☒	☐	☐	☐
Insert text here	☐	☐	☐	☐	☐
Insert text here	☐	☐	☐	☐	☐

*Includes Proprietary Biofiltration, if accepted by the Co-Permittee.

DMA4 Represents the area of offsite improvements that do not drain onto site for treatment. It is not feasible to treat this water on site as doing so would increase the tributary area to the site by such a large margin, that our outfall would likely cause downstream flooding. As such, we choose comply to with the WQV by oversizing the onsite BMPs. Thus, there will be not net impact.

D.4 LID BMP Sizing

Each LID BMP must be designed to ensure that the DCV will be captured by the selected BMPs with no discharge to the storm drain or surface waters during the DCV size storm. Infiltration BMPs must at minimum be sized to capture the DCV to achieve pollutant control requirements.

Biofiltration BMPs must at a minimum be sized to:

- Treat 1.5 times the DCV not reliably retained on site using a volume-base or flow-based sizing method, or
- Include static storage volume, including pore spaces and pre-filter detention volume, at least 0.75 times the portion of the DCV not reliably retained on site.

First**,** calculate the DCV 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 the methods included in Section 3 of the LID BMP Design Handbook. Utilize the worksheets found in the LID BMP Design Handbook or consult with the Copermittee to assist you in correctly sizing your LID BMPs. Use Table D-7 below to document the DCV 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-6 DCV Calculations for LID BMPs

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Imperious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP1*		
	[A]		[B]	[C]	[A] x [C]			
DMA1	33,603	*Mixed*	*0.77*	*0.57*	*19,362*	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	A_T= 30,734				19,362	0.567	894	***3,325***

Table D-7 DCV Calculations for LID BMPs

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP2*		
	[A]		[B]	[C]	[A] x [C]			
DMA2	36,009	*Mixed*	*0.76*	*0.55*	*19,805*			
	A_T= 32,080				19,805	0.567	934	***3,314***

Table D-8 DCV Calculations for LID BMPs

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP3*		
	[A]		[B]	[C]	[A] x [C]			
DMA3	34,620	*Mixed*	*0.83*	*0.63*	*21,811*			
	A_T= 34,620				21,811	0.567	1,031	***3,326***

Table D-9 DCV Calculations for LID BMPs

DMA Type/ID	DMA (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*BMP1*		
	[A]		[B]	[C]	[A] x [C]			
DMA4	8690	*Concrete & Asphalt*	*1.00*	*0.89*	*7,734*			
	A_T= 34,620				7,734	0.567	370	***0***

[B], [C] is obtained as described in Section 2.6.1.b of the SMR WQMP
[E] is obtained from Exhibit A in the SMR WQMP
[G] is obtained from a design procedure sheet, such as in LID BMP Design Handbook and placed in Appendix 6.

Complete Table D-8 below to document the Design Capture Volume and the Proposed Volume for each LID BMP. You can add rows to the table as needed. Alternatively, the Santa Margarita Hydrology Model (SMRHM) can be used to size LID BMPs to address the DCV and, if applicable, to size Hydrologic Control BMPs to meet the Hydrologic Performance Standard described in the SMR WQMP, as identified in Section E.

Table D-10 LID BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	Design Capture Volume (ft^3)	Proposed Volume (ft^3)
BMP1	DMA1	R-tank	894	3,325
BMP2	DMA2	R-tank	934	3,314
BMP3	DMA3	R-tank	1,031	3,326
BMP1	DMA4	Over Mitigation	370	0
SUM	----------	----------	3,229	9,965

If bioretention will include a capped underdrain, then include sizing calculations demonstrating that the BMP will meet infiltration sizing requirements with the underdrain capped and also meet biofiltration sizing requirements if the underdrain is uncapped.

Section E: Implement Hydrologic Control BMPs and Sediment Supply BMPs

See Appendix 7 for additional required information.

If a completed Table 1.2 demonstrates that the project is exempt from Hydromodification Performance Standards, specify N/A and proceed to Section G.

☐ N/A Project is Exempt from Hydromodification Performance Standards.

If a PDP is not exempt from hydromodification requirements than the PDP must satisfy the requirements of the performance standards for hydrologic control BMPs and Sediment Supply BMPs. The PDP may choose to satisfy hydrologic control requirements using onsite or offsite BMPs (i.e. Alternative Compliance). Sediment supply requirements cannot be met via alternative compliance. If N/A is not selected above, select one of the two options below and complete the applicable sections.

☒ Project is Not Hydromodification Exempt and chooses to implement Hydrologic Control and Sediment Supply BMPs Onsite (complete Section E).

☐ Project is Not Hydromodification Exempt and chooses to implement Hydrologic Control Requirements using Alternative Compliance (complete Section F). Selection of this option must be approved by the Copermittee.

E.1 Hydrologic Control BMP Selection

Capture of the DCV and achievement of the Hydrologic Performance Standard may be met by combined and/or separate structural BMPs. The user should consider the full suite of Hydrologic Control BMPs to manage runoff from the post-development condition and meet the Hydrologic Performance Standard identified in this section.

For the Preliminary WQMP, in lieu of preparing detailed routing calculations, the basin size may be estimated as the difference in volume between the pre-development and post-development hydrograph for the 10-year 24-hour storm event plus the Vbmp. This does not relieve the engineer of the responsibility for meeting the full Hydrologic Control requirements during final design.

The Hydrologic Performance Standard consists of matching or reducing the flow duration curve of post-development conditions to that of pre-existing, naturally occurring conditions, for the range of geomorphically significant flows (the low flow threshold runoff event up to the 10-year runoff event). 10% of the 2-year runoff event can be used for the low flow threshold without any justification. Higher low flow thresholds can be used with site-specific analysis, see Section 2.6.2.b of the WQMP guidance document. Select each of the hydrologic control BMP types that are applied to meet the above performance standard on the site.

☐ LID principles as defined in Section 3.2 of the SMR WQMP, including Tree Wells.

☒ Structural LID BMPs that may be modified or enlarged, if necessary, beyond the DCV.

☐ Structural Hydrologic Control BMPs that are distinct from the LID BMPs above. The LID BMP Design Handbook provides information not only on Hydrologic Control BMP design, but also on BMP design to meet the combined LID requirement and Hydrologic Performance Standard. The Handbook specifies the type of BMPs that can be used to meet the Hydrologic Performance Standard.

E.2 Hydrologic Control BMP Sizing

Hydrologic Control BMPs must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA for the range of geomorphically significant flows. Using SMRHM, (or another acceptable continuous simulation model if approved by the Copermittee) the applicant shall demonstrate that the performance of the Hydrologic Control BMPs complies with the Hydrologic Performance Standard. Complete Table E-1 below and identify, for each DMA, the type of Hydrologic Control BMP, if the SMRHM model confirmed the management (Identified as "passed" in SMRHM), the total volume capacity of the Hydrologic Control BMP, the Hydrologic Control BMP footprint at top floor elevation, and the drawdown time of the Hydrologic Control BMP. SMRHM summary reports should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table E-1 Hydrologic Control BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	SMRHM* Passed	BMP Volume (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
BMP1	DMA1	R-tank set up to infiltrate within permeable stratum	☒	0.076	0.033	51.67
BMP2	DMA2	R-tank set up to infiltrate within permeable stratum	☒	0.076	0.032	51.00
BMP3	DMA3	R-tank set up to infiltrate within permeable stratum	☒	0.076	0.032	52.33
			☐			

**Or other continuous simulation model, compliant with the WQMP and Permit. If Tree Wells are proposed for some or all of the project, check the box for Tree Wells in Section E.1 and enter each Tree Well DMA in Table E-1 above for the BMP Name/ID, DMA No. and BMP Type/Description. For Tree Wells, leave SMRHM* Passed Column and the columns to the left blank.*

If a bioretention BMP with capped underdrain is used and hydromodification requirements apply, then sizing calculations must demonstrate that the BMP meets flow duration control criteria with the underdrain capped and uncapped. Both calculations must be included.

E.3 Implement Sediment Supply BMPs

The sediment supply performance standard applies to PDPs for which hydromodification applied that have the potential to impact Potential Critical Coarse Sediment Yield Areas. Refer to Exhibit G-1 of the WQMP Guidance Document to determine if there are onsite Potential Critical Coarse Sediment Yield Areas

(based on on-going WMAA analysis) or Potential Sediment Source Areas (sites added through the Regional Board review process). Select one of the two options below and include the Potential Critical Coarse Sediment Yield Area Exhibit showing your project location in Appendix 7.

☐ There are no mapped Potential Critical Coarse Sediment Yield Areas or Potential Sediment Source Areas on the site. Include a copy of Exhibit G - CCSY & PSS Areas in Appendix 7, with the project location marked. If the project is outside of the "Potential Critical Coarse Sediment Yield Areas and Potential Sediment Source Areas" then check this box. The Sediment Supply Performance Standard is met with no further action is needed.

☐ There are mapped Potential Critical Coarse Sediment Yield Areas or Potential Sediment Source Areas on the site, the Sediment Supply Performance Standard will be met through Option 1 (E.3.1) or Option 2 (E.3.2) below.

☐ **E.3.1 Option 1: Avoid Potential Critical Coarse Sediment Yield Areas and Potential Sediment Source Areas**

The simplest approach for complying with the Sediment Supply Performance Standard is to avoid impacts to areas identified as Potential Critical Coarse Sediment Yield Areas or Potential Sediment Supply Areas. If a portion of PDP is identified as a Potential Critical Coarse Sediment Yield Area or a Potential Sediment Source Area, that PDP may still achieve compliance with the Sediment Supply Performance Standards if Potential Critical Coarse Sediment Yield Areas and Potential Sediment Supply Areas are avoided, i.e. areas are not developed and thereby delivery of Critical Coarse Sediment to the receiving waters is not impeded by site developments.

Provide a narrative describing how the PDP has avoided impacts to Potential Critical Coarse Sediment Yield Areas and/or Potential Sediment Source Areas below.

Insert narrative description here

If it is not feasible to avoid these areas, proceed to Option 2 to complete a Site-Specific Critical Coarse Sediment Analysis.

☐ **E.3.2 Option 2: Site-Specific Critical Coarse Sediment Analysis**

Perform a stepwise assessment to ensure the pre-project source(s) of Critical Coarse Sediment (i.e., Bed Sediment Supply) is maintained:

Step 1: Identify if the site is an actual verified Critical Coarse Sediment Yield Area supplying Bed Sediment Supply to the receiving channel

☐ **Step 1.A** – Is the Bed Sediment of onsite streams similar to that of receiving streams?

Rate the similarity:
☐ High
☐ Medium
☐ Low

Results from the geotechnical and sieve analysis to be performed both onsite and in the receiving channel should be documented in Appendix 7. Of particular interest, the results of the sieve analysis, the soil erodibility factor, a description of the topographic relief of the project area, and the lithology of onsite soils should be reported in Appendix 7.

☐ **Step 1.B** – Are onsite streams capable of delivering Bed Sediment Supply from the site, if any, to the receiving channel?

Rate the potential:
☐ High
☐ Medium
☐ Low

Results from the analyses of the sediment delivery potential to the receiving channel should be documented in Appendix 7 and identify, at a minimum, the Sediment Source, the distance to the receiving channel, the onsite channel density, the project watershed area, the slope, length, land use, and rainfall intensity.

☐ **Step 1.C** – Will the receiving channel adversely respond to a change in Bed Sediment Load?

Rate the need for bed sediment supply:
☐ High
☐ Medium
☐ Low

Results from the in-stream analysis to be performed both onsite should be documented in Appendix 7. The analysis should, at a minimum, quantify the bank stability and the degree of incision, provide a gradation of the Bed Sediment within the receiving channel, and identify if the channel is sediment supply-limited.

☐ **Step 1.D** – Summary of Step 1

Summarize in Table E.3 the findings of Step 1 and associate a score (in parenthesis) to each step. The sum of the three individual scores determines if a stream is a significant contributor to the receiving stream.

- Sum is equal to or greater than eight - Site is a significant source of sediment bed material – all on-site streams must be preserved or by-passed within the site plan. The applicant shall proceed to Step 2 for all onsite streams.
- Sum is greater than five but lower than eight. Site is a source of sediment bed material – some of the on-site streams must be preserved (with identified streams noted). The applicant shall proceed to Step 2 for the identified streams only.
- Sum is equal to or lower than five. Site is not a significant source of sediment bed material. The applicant may advance to Section F.

Table E-2 Triad Assessment Summary

Step	Rating			Total Score
1.A	☐ High (3)	☐ Medium (2)	☐ Low (1)	
1.B	☐ High (3)	☐ Medium (2)	☐ Low (1)	
1.C	☐ High (3)	☐ Medium (2)	☐ Low (1)	
Significant Source Rating of Bed Sediment to the receiving channel(s)				

Step 2: Avoid Development of Critical Coarse Sediment Yield Areas, Potential Sediment Sources Areas, and Preserve Pathways for Transport of Bed Sediment Supply to Receiving Waters

Onsite streams identified as a actual verified Critical Coarse Sediment Yield Areas should be avoided in the site design and transport pathways for Critical Coarse Sediment should be preserved

Check those that apply:

☐ The site design does avoid all onsite channels identified as actual verified Critical Coarse Sediment Yield Areas ***AND***

☐ The drainage design bypasses flow and sediment from onsite upstream drainages identified as actual verified Critical Coarse Sediment Yield Areas to maintain Critical Coarse Sediment supply to receiving waters

(If both are yes, the applicant may disregard subsequent steps of Section E.3 and directly advance directly to Section G)

Or -

Provide in Appendix 7 a site map that identifies all onsite channels and highlights those onsite channels that were identified as a Significant Source of Bed Sediment. The site map shall demonstrate, if feasible, that the site design avoids those onsite channels identified as a Significant Source of Bed Sediment. In addition, the applicant shall describe the characteristics of each onsite channel identified as a Significant Source of Bed Sediment. If the design plan cannot avoid the onsite channels, please provide a rationale for each channel individually.

The site map shall demonstrate that the drainage design bypasses those onsite channels that supply Critical Coarse Sediment to the receiving channel(s). In addition, the applicant shall describe the characteristics of each onsite channel identified as an actual verified Critical Coarse Sediment Yield Area.

Identified Channel #1 - Insert narrative description here

Identified Channel #2 - Insert narrative description here

☐ The site design **does NOT avoid** all onsite channels identified as actual verified Critical Coarse Sediment Yield Areas

OR

☐ The project blocks the potential for Critical Coarse Sediment from migrating to receiving waters.

(If either of these are the case, the applicant shall continue completing this section).

E.3.3 Sediment Supply BMPs to Result in No Net Impact to Downstream Receiving Waters

If impacts to Critical Coarse Sediment Yield Areas cannot be avoided, sediment supply BMPs must be implemented such there is no net impact to receiving waters. Sediment supply BMPs may consist of approaches that permit flux of bed sediment supply from Critical Coarse Sediment Yield Areas within the project boundary. This approach is subject to acceptance by the County of Riverside. It may require extensive documentation and analysis by qualified professionals to support this demonstration.

Appendix H of the San Diego Model BMP Design Manual provides additional information on site-specific investigation of Critical Coarse Sediment Supply areas.

http://www.projectcleanwater.org/download/2018-model-bmp-design-manual/

If applicable, insert narrative description here

Documentation of sediment supply BMPs should be detailed in Appendix 7.

Section F: Alternative Compliance

Alternative Compliance may be used to achieve compliance with pollutant control and/or hydromodification requirements for a given PDP. Alternative Compliance may be used under two scenarios, check the applicable box if the PDP is proposing to use Alternative Compliance to satisfy all or a portion of the Pollutant Control and/or Hydrologic Control requirements (but not sediment supply requirements)

☐ If it is not feasible to fully implement Infiltration or Biofiltration BMPs at a PDP site, Flow-Through Treatment Control BMPs may be used to treat pollutants contained in the portion of DCV not reliably retained on site and Alternative Compliance measures must also be implemented to mitigate for those pollutants in the DCV that are not retained or removed on site prior to discharging to a receiving water.

☐ Alternative Compliance is selected to comply with either pollutant control or hydromodification flow control requirements even if complying with these requirements is potentially feasible on-site. If such voluntary Alternative Compliance is implemented, Flow-Through Treatment Control BMPs must still be used to treat those pollutants in the portion of the DCV not reliably retained on site prior to discharging to a receiving water.

Refer to Section 2.7 of the SMR WQMP and consult the Local Jurisdiction for currently available Alternative Compliance pathways. Coordinate with the Copermittee if electing to participate in Alternative Compliance and complete the sections below to document implementation of the Flow-Through BMP component of the program.

F.1 Identify Pollutants of Concern

The purpose of this section is to help you appropriately plan for mitigating your Pollutants of Concern in lieu of implementing LID BMPs and to document compliance and.

Utilize Table A-1 from Section A, which noted your project's Receiving Waters, to identify impairments for Receiving Waters (including downstream receiving waters) by completing Table F-1. Table F-1 includes the watersheds identified as impaired in the Approved 2010 303(d) list; check box corresponding with the PDP's receiving water. The most recent 303(d) lists are available from the State Water Resources Control Board website:
https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml).https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2010.shtml.

Table F-1 Summary of Approved 2010 303(d) listed waterbodies and associated pollutants of concern for the Riverside County SMR Region and downstream waterbodies.

	Water Body	Nutrients[1]	Metals[2]	Toxicity	Bacteria and Pathogens	Pesticides and Herbicides	Sulfate	Total Dissolved Solids
☐	De Luz Creek	X	X				X	
☐	Long Canyon Creek		X		X	X		
☒	Murrieta Creek	X	X	X		X		
☐	Redhawk Channel	X	X		X	X		X
☐	Santa Gertudis Creek	X	X		X	X		
☐	Santa Margarita Estuary	X						
☒	Santa Margarita River (Lower)	X			X			
☒	Santa Margarita River (Upper)	X		X				
☐	Temecula Creek	X	X	X		X		X
☒	Warm Springs Creek	X	X		X	X		

[1] Nutrients include nitrogen, phosphorus and eutrophic conditions caused by excess nutrients.

[2] Metals includes copper, iron, and manganese.

Use Table F-2 to identify the pollutants identified with the project site. Indicate the applicable PDP Categories and/or Project Features by checking the boxes that apply. If the identified General Pollutant Categories are the same as those listed for your Receiving Waters, then these will be your Pollutants of Concern; check the appropriate box or boxes in the last row.

Table F-2 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	Total Dissolved Solids	Sulfate
☐	Detached Residential Development	P	N	P	P	N	P	P	P	N	N
☐	Attached Residential Development	P	N	P	P	N	P	P	P[(2)]	N	N
☒	Commercial/Industrial Development	P[(3)]	P[(7)]	P[(1)]	P[(1)]	P	P[(1)]	P	P	N	N
☐	Automotive Repair Shops	N	P	N	N	P[(4, 5)]	N	P	P	N	N
☐	Restaurants (>5,000 ft^2)	P	N	N	P[(1)]	N	N	P	P	N	N
☐	Hillside Development (>5,000 ft^2)	P	N	P	P	N	P	P	P	N	N
☐	Parking Lots (>5,000 ft^2)	P[(6)]	P[(7)]	P[(1)]	P[(1)]	P[(4)]	P	P	P	N	N
☐	Streets, Highways, and Freeways	P[(6)]	P[(7)]	P[(1)]	P[(1)]	P[(4)]	P	P	P	N	N
☐	Retail Gasoline Outlets	N	P[(7)]	N	N	P[(4)]	N	P	P	N	N
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 products; otherwise not expected

(4) Including petroleum hydrocarbons

(5) Including solvents

(6) Bacterial indicators are routinely detected in pavement runoff

(7) A potential source of metals, primarily copper and zinc. Iron, magnesium, and aluminum are commonly found in the environment and are commonly associated with soils, but are not primarily of anthropogenic stormwater origin in the municipal environment.

F.2 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 be selected to address the Project Priority Pollutants of Concern (identified above) and meet the acceptance criteria described in Section 2.3.7 of the SMR WQMP. Documentation of acceptance criteria 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 F-3 Treatment Control BMP Selection

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

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

F.3 Sizing Criteria

Utilize Table F-4 below to appropriately size flow-through BMPs to the DCV, or Design Flow Rate, as applicable. Please reference Chapter 3.5.1 of the SMR WQMP for further information.

Table F-4 Treatment Control BMP Sizing

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Enter BMP Name / Identifier Here*	
	[A]		[B]	[C]	[A] x [C]		
DMA1	*33,603*	Mixed	0.83	0.63	21,170		
DMA2	*36,009*	Mixed	0.83	0.63	22,686		
DMA3	*34,620*	Mixed	0.83	0.63	21,811		
DMA4	*8690*	*Asphalt*	*1.00*	*0.89*	*7,734*		
						Design Storm (in)	*Design Flow Rate (cfs)*
	112,992				73,401	0.567	0.955

[B], [C] is obtained as described in Section 2.6.1.b from the SMR WQMP
[E] either 0.2 inches or 2 times the 85th percentile hourly rainfall intensity
[G] = 43,560,.

F.4 Hydrologic Performance Standard – Alternative Compliance Approach

Alternative compliance options are only available if the governing Copermittee has acknowledged the infeasibility of onsite Hydrologic Control BMPs and approved an alternative compliance approach. See Section 3.5 and 3.6 of the SMR WQMP.

Select the pursued alternative and describe the specifics of the alternative:

☐ Offsite Hydrologic Control Management within the same channel system

Insert narrative description here

☐ In-Stream Restoration Project

Insert narrative description here

For Offsite Hydrologic Control BMP Option

Each Hydrologic Control BMP must be designed to ensure that the flow duration curve of the post-development DMA will not exceed that of the pre-existing, naturally occurring, DMA by more than ten percent over a one-year period. Using SMRHM, the applicant shall demonstrate that the performance of each designed Hydrologic Control BMP is equivalent with the Hydrologic Performance Standard for onsite conditions. Complete Table F-5 below and identify, for each Hydrologic Control BMP, the equivalent DMA the Hydrologic Control BMP mitigates, that the SMRHM model passed, the total volume capacity of the BMP, the BMP footprint at top floor elevation, and the drawdown time of the BMP. SMRHM summary reports for the alternative approach should be documented in Appendix 7. Refer to the SMRHM Guidance Document for additional information on SMRHM. You can add rows to the table as needed.

Table F-5 Offsite Hydrologic Control BMP Sizing

BMP Name / Type	Equivalent DMA (ac)	SMRHM Passed	BMP Volume (ac-ft)	BMP Footprint (ac)	Drawdown time (hr)
		☐			
		☐			
		☐			
		☐			

For Instream Restoration Option

Attach to Appendix 7 the technical report detailing the condition of the receiving channel subject to the proposed hydrologic and sediment regimes. Provide the full design plans for the in-stream restoration project that have been approved by the Copermittee. Utilize the San Diego Regional Water Quality Equivalency Guidance Document.

Section G: Implement Trash Capture BMPs

The Santa Margarita Regional Board has required Full Trash Capture compliance thru Order No. R9-2017-007. For the Santa Margarita Watershed, the County is requiring Track 1 full trash capture compliance for projects proposing the following uses as part of their development after **December 3, 2018**.

- High-density residential: all land uses with at least ten (10) developed dwelling units/acre.
- Industrial: land uses where the primary activities on the developed parcels involve product manufacture, storage, or distribution (e.g., manufacturing businesses, warehouses, equipment storage lots, junkyards, wholesale businesses, distribution centers, or building material sales yards).
- Commercial: land uses where the primary activities on the developed parcels involve the sale or transfer of goods or services to consumers (e.g., business or professional buildings, shops, restaurants, theaters, vehicle repair shops, etc.).
- Mixed urban: land uses where high-density residential, industrial, and/or commercial land uses predominate collectively (i.e., are intermixed).
- Public transportation stations: facilities or sites where public transit agencies' vehicles load or unload passengers or goods (e.g., bus stations and stops).

Riverside County Maintenance is generally supportive of United Storm Water – Connector Pipe Screens or equivalent. Equivalent systems or alternative designs shall be on the State of California Approved Trash Capture Device List and requires approval by the Transportation Department for maintenance. Riverside County is developing Trash Capture Device Standards, which are expected to be added to the Transportation Plan Check Policies and Guidelines when available. Design calculations are not expected to be required if the project uses standard sizes per the County's Trash Capture Device Standards. Until the Trash Capture Device Standards are available and the project uses standard sizes, the project shall complete the following tables and furnish hydraulic analysis calculating the flowrate in the catch basin does not exceed the flowrate capacity of the trash capture device in a fully clogged condition.

Trash Capture BMPs may be applicable to Type 'D' DMAs, as defined in Section 2.3.4 of the SMR WQMP. Trash Capture BMPs are designed to treat Q_{TRASH}, the runoff flow rate generated during the 1-year 1-hour precipitation depth. Utilize Table G-1 to size Trash Capture BMP. Refer to Table G-2 to determine the Trash Capture Design Storm Intensity (E).

Table G-1 Sizing Trash Capture 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	*Enter BMP Name / Identifier Here*	
	[A]		[B]	[C]	[A] x [C]		
DMA1	*33,603*	Mixed	0.83	0.63	21,170		
DMA2	*36,009*	Mixed	0.83	0.63	22,686		
DMA3	*34,620*	Mixed	0.83	0.63	21,811		
DMA4	*8690*	*Asphalt*	*1.00*	*0.89*	*7,734*		
						Trash Capture Design Storm Intensity (in)	*Trash Capture Design Flow Rate (cubic feet or cfs)*
	112,992				73,401	0.47	***0.686***

[B], [C] is obtained as described in Section 2.6.1.b from the SMR WQMP
[G] = 43,560

Table G-2 Approximate precipitation depth/intensity values for calculation of the Trash Capture Design Storm

City	1-year 1-hour Precipitation Depth/Intensity (inches/hr)
Murrieta	0.47
Temecula	0.50
Wildomar	0.37

Use Table G-3 to summarize and document the selection and sizing of Trash Capture BMPs.

Table G-3 Trash Capture BMPs

BMP Name / ID	DMA No(s)	BMP Type / Description	Required Trash Capture Flowrate (cfs)	Provided Trash Capture Flowrate (cfs)[1]
BMP4	DMA1,2, 3	24"X23" Trash Rack	0.686	1.298

[1] For connector pipe screens, the Trash Capture Flowrate shall be based on a fully clogged condition for the screen, where the water level is at the top of the screen. Then determined the Flowrate based on weir equation (Qweir = C x L x H^(2/3), where C = 3.4). The height used to calculate the weir flow rate shall maintain a 6" freeboard to the invert of the catch basin opening at the road. This analysis is meant to replicate the hydraulic analysis used in the County's Full Trash Capture Device Standards.

Section H: Source Control BMPs

Section H need only be completed at the Preliminary WQMP phase if source control is critical to the project successfully handling the anticipated pollutants.

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 Maximum Extent Practicable (MEP) standard typically requires both types of BMPs. In general, Operational Source Control BMPs cannot be substituted for a feasible and effective Structural Source Control BMP. Complete checklist below to determine applicable Source Control BMPs for your site.

Project-Specific WQMP Source Control BMP Checklist

All development projects must implement Source Control BMPs. Source Control BMPs are used to minimize pollutants that may discharge to the MS4. Refer to Chapter 3 (Section 3.8) of the SMR WQMP for additional information. Complete Steps 1 and 2 below to identify Source Control BMPs for the project site.

STEP 1: IDENTIFY POLLUTANT SOURCES

Review project site plans and identify the applicable pollutant sources. "Yes" indicates that the pollutant source is applicable to project site. "No" indicates that the pollutant source is not applicable to project site.

☒ Yes ☐ No	Storm Drain Inlets		☐ Yes ☒ No	Outdoor storage areas	
☒ Yes ☐ No	Floor Drains		☐ Yes ☒ No	Material storage areas	
☐ Yes ☒ No	Sump Pumps		☐ Yes ☒ No	Fueling areas	
☒ Yes ☐ No	Pets Control/Herbicide Application		☐ Yes ☒ No	Loading Docks	
☒ Yes ☐ No	Food Service Areas		☐ Yes ☒ No	Fire Sprinkler Test/Maintenance water	
☒ Yes ☐ No	Trash Storage Areas		☒ Yes ☐ No	Plazas, Sidewalks and Parking Lots	
☐ Yes ☒ No	Industrial Processes		☐ Yes ☒ No	Pools, Spas, Fountains and other water features	
☒ Yes ☐ No	Vehicle and Equipment Cleaning and Maintenance/Repair Areas				

STEP 2: REQUIRED SOURCE CONTROL BMPS

List each Pollutant source identified above in column 1 and fill in the corresponding Structural Source Control BMPs and Operational Control BMPs by referring to the Stormwater Pollutant Sources/Source Control Checklist included in Appendix 8. The resulting list of structural and operational source control BMPs must be implemented as long as the associated sources are present on the project site. Add additional rows as needed.

Pollutant Source	Structural Source Control BMP	Operational Source Control BMP
Storm Drain Inlets	Mark all inlets with the words "Only Rain down the Storm Drain"	Maintain and periodically repaint or replace inlet markings. θ Provide stormwater pollution prevention information to new site owners, lessees, or operators. θ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality

		Handbooks at www.cabmphandbooks.com θ 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."
Interior Floor Drains	All Floor drains to be plumbed to sanitary sewer	Inspect and maintain drains to prevent blockages and overflow.
Pest/Herbicide application	Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. θ Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	Maintain landscaping using minimum or no pesticides.
Food service	The location and features of the designated cleaning area to be outlined in the architectural plan set of the Weinerschnitzal, and Arby's respectively	The brochure " "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" to be given to owners, lessees, and operators.
Refuse areas	A total of three (3) trash enclosures are provided. These trash enclosures are graded such that runoff will pass through biofiltration systems to mitigate pollutant runoff. Signs shall be posted that read "Do not dump hazardous materials here"	A whole enclosure and receptacle are provided for each business. The receptacles are to be inspected regularly, and repaired/replaced if damaged. The area is to be cleaned of litter daily. Spills to be cleaned immediately.
Vehicle and Equipment Cleaning	Used water from the onsite carwash is to be plumbed directly into the sanitary sewer.	The brochure "Outdoor Cleaning Activities and Professional Mobile Service Providers" to be provided to the operators of the carwash.
Plazas, Sidewalks, and Parking Lots		Washwater from cleaning these impervious surfaces to be collected to

		prevent entry into the storm drain system.

Section I: Coordinate Submittal with Other Site Plans

For Final WQMPs, populate Table I-1 below to assist the plan checker in an expeditious review of your project. During construction and at completion, County of Riverside inspectors will verify the installation of BMPs against the approved plans. 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 I-1 Construction Plan Cross-reference

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

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. The Copermittee with jurisdiction over the Project site can advise you regarding the process required to propose changes to the approved Project-Specific WQMP.

Use Table I-2 to identify other applicable permits that may impact design of the site. If yes is answered to any of the items below, the Copermittee may require proof of approval/coverage from those agencies as applicable including documentation of any associated requirements that may affect this Project-Specific WQMP.

Table I-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 Section 401 Water Quality Certification	☐ Y	☒ N
US Army Corps of Engineers, Clean Water Act Section 404 Permit	☐ Y	☒ N
US Fish and Wildlife, Endangered Species Act Section 7 Biological Opinion	☐ Y	☒ N
Statewide Construction General Permit Coverage	☒ Y	☐ N
Statewide Industrial General Permit Coverage	☐ Y	☒ N
Western Riverside MSHCP Consistency Approval (e.g., JPR, DBESP)	☐ Y	☒ N
Other *(please list in the space below as required)*	☐ Y	☐ N

Section J: Operation, Maintenance and Funding

Applicant is required to state the intended responsible party for BMP Operation, Maintenance and Funding at the Preliminary WQMP phase. The remaining requirements as outlined above are required for Final WQMP only.

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

1. A means to finance and implement maintenance of BMPs 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 Operations and Maintenance or inspections but will require typical landscape maintenance as noted in Chapter 5, in the SMR WQMP. Include a brief description of typical landscape maintenance for these areas.

The Copermittee with jurisdiction over the Project site will also require that you prepare and submit a detailed BMP Operation and Maintenance Plan that sets forth a maintenance schedule for each of the 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 BMP Operation and Maintenance Plan are in Chapter 5 of the SMR WQMP.

Maintenance Mechanism: Insert text here.

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

☐ Y ☒ N

Include your Operation and Maintenance Plan and Maintenance Mechanism in Appendix 9, **see Appendix 9 for additional instructions.** 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.

Section K: Acronyms, Abbreviations and Definitions

Regional MS4 Permit	Order No. R9-2013-0001 as amended by Order No. R9-2015-0001 and Order No. R9-2015-0100 an NPDES Permit issued by the San Diego Regional Water Quality Control Board.
Applicant	Public or private entity seeking the discretionary approval of new or replaced improvements from the Copermittee with jurisdiction over the project site. The Applicant has overall responsibility for the implementation and the approval of a Priority Development Project. The WQMP uses consistently the term "user" to refer to the applicant such as developer or project proponent. The WQMP employs also the designation "user" to identify the Registered Professional Civil Engineer responsible for submitting the Project-Specific WQMP, and designing the required BMPs.
Best Management Practice (BMP)	Defined in 40 CFR 122.2 as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. BMPs also include treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. In the case of municipal storm water permits, BMPs are typically used in place of numeric effluent limits.
BMP Fact Sheets	BMP Fact Sheets are available in the LID BMP Design Handbook. Individual BMP Fact Sheets include sitting considerations, and design and sizing guidelines for seven types of structural BMPs (infiltration basin, infiltration trench, permeable pavement, harvest-and-use, bioretention, extended detention basin, and sand filter).
California Stormwater Quality Association (CASQA)	Publisher of the California Stormwater Best Management Practices Handbooks, available at www.cabmphandbooks.com.
Conventional Treatment Control BMP	A type of BMP that provides treatment of stormwater runoff. Conventional treatment control BMPs, while designed to treat particular Pollutants, typically do not provide the same level of volume reduction as LID BMPs, and commonly require more specialized maintenance than LID BMPs. As such, the Regional MS4 Permit and this WQMP require the use of LID BMPs wherever feasible, before Conventional Treatment BMPs can be considered or implemented.
Copermittees	The Regional MS4 Permit identifies the Cities of Murrieta, Temecula, and Wildomar, the County, and the District, as Copermittees for the SMR.

County	The abbreviation refers to the County of Riverside in this document.
CEQA	California Environmental Quality Act - a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible.
CIMIS	California Irrigation Management Information System - an integrated network of 118 automated active weather stations all over California managed by the California Department of Water Resources.
CWA	Clean Water Act - is the primary federal law governing water pollution. Passed in 1972, the CWA established the goals of eliminating releases of high amounts of toxic substances into water, eliminating additional water pollution by 1985, and ensuring that surface waters would meet standards necessary for human sports and recreation by 1983. CWA Section 402(p) is the federal statute requiring NPDES permits for discharges from MS4s.
CWA Section 303(d) Waterbody	Impaired water in which water quality does not meet applicable water quality standards and/or is not expected to meet water quality standards, even after the application of technology based pollution controls required by the CWA. The discharge of urban runoff to these water bodies by the Copermittees is significant because these discharges can cause or contribute to violations of applicable water quality standards.
Design Storm	The Regional MS4 Permit has established the 85th percentile, 24-hour storm event as the "Design Storm". The applicant may refer to Exhibit A to identify the applicable Design Storm Depth (D85) to the project.
DCV	Design Capture Volume (DCV) is the volume of runoff produced from the Design Storm to be mitigated through LID Retention BMPs, Other LID BMPs and Volume Based Conventional Treatment BMPs, as appropriate.
Design Flow Rate	The design flow rate represents the minimum flow rate capacity that flow-based conventional treatment control BMPs should treat to the MEP, when considered.
DCIA	Directly Connected Impervious Areas - those impervious areas that are hydraulically connected to the MS4 (i.e. street curbs, catch basins, storm drains, etc.) and thence to the structural BMP without flowing over pervious areas.
Discretionary Approval	A decision in which a Copermittee uses its judgment in deciding whether and how to carry out or approve a project.
District	Riverside County Flood Control and Water Conservation District.

DMA	A Drainage Management Area - a delineated portion of a project site that is hydraulically connected to a common structural BMP or conveyance point. The Applicant may refer to Section 3.3 for further guidelines on how to delineate DMAs.
Drawdown Time	Refers to the amount of time the design volume takes to pass through the BMP. The specified or incorporated drawdown times are to ensure that adequate contact or detention time has occurred for treatment, while not creating vector or other nuisance issues. It is important to abide by the drawdown time requirements stated in the fact sheet for each specific BMP.
Effective Area	Area which 1) is suitable for a BMP (for example, if infiltration is potentially feasible for the site based on infeasibility criteria, infiltration must be allowed over this area) and 2) receives runoff from impervious areas.
ESA	An Environmental Sensitive Area (ESA) designates an area "in which plants or animals life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which would be easily disturbed or degraded by human activities and developments". (Reference: California Public Resources Code § 30107.5).
ET	Evapotranspiration (ET) is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). It is also an indicator of how much water crops, lawn, garden, and trees need for healthy growth and productivity
FAR	The Floor Area Ratio (FAR) is the total square feet of a building divided by the total square feet of the lot the building is located on.
Flow-Based BMP	Flow-based BMPs are conventional treatment control BMPs that are sized to treat the design flow rate.
FPPP	Facility Pollution Prevention Plan
HCOC	Hydrologic Condition of Concern - Exists when the alteration of a site's hydrologic regime caused by development would cause significant impacts on downstream channels and aquatic habitats, alone or in conjunction with impacts of other projects.
HMP	Hydromodification Management Plan – Plan defining Performance Standards for PDPs to manage increases in runoff discharge rates and durations.
Hydrologic Control BMP	BMP to mitigate the increases in runoff discharge rates and durations and meet the Performance Standards set forth in the HMP.
HSG	Hydrologic Soil Groups – soil classification to indicate the minimum rate of infiltration obtained for bare soil after prolonged wetting. The HSGs are A (very low runoff potential/high infiltration rate), B, C, and D (high runoff potential/very low infiltration rate)

Hydromodification	The Regional MS4 Permit identifies that increased volume, velocity, frequency and discharge duration of storm water runoff from developed areas has the potential to greatly accelerate downstream erosion, impair stream habitat in natural drainages, and negatively impact beneficial uses.
JRMP	A separate Jurisdictional Runoff Management Plan (JRMP) has been developed by each Copermittee and identifies the local programs and activities that the Copermittee is implementing to meet the Regional MS4 Permit requirements.
LID	Low Impact Development (LID) is a site design strategy with a goal of maintaining or replicating the pre-development hydrologic regime through the use of design techniques. LID site design BMPs help preserve and restore the natural hydrologic cycle of the site, allowing for filtration and infiltration which can greatly reduce the volume, peak flow rate, velocity, and pollutant loads of storm water runoff.
LID BMP	A type of stormwater BMP that is based upon Low Impact Development concepts. LID BMPs not only provide highly effective treatment of stormwater runoff, but also yield potentially significant reductions in runoff volume – helping to mimic the pre-project hydrologic regime, and also require less ongoing maintenance than Treatment Control BMPs. The applicant may refer to Chapter 2.
LID BMP Design Handbook	The LID BMP Design Handbook was developed by the Copermittees to provide guidance for the planning, design and maintenance of LID BMPs which may be used to mitigate the water quality impacts of PDPs within the County.
LID Bioretention BMP	LID Bioretention BMPs are bioretention areas are vegetated (i.e., landscaped) shallow depressions that provide storage, infiltration, and evapotranspiration, and provide for pollutant removal (e.g., filtration, adsorption, nutrient uptake) by filtering stormwater through the vegetation and soils. In bioretention areas, pore spaces and organic material in the soils help to retain water in the form of soil moisture and to promote the adsorption of pollutants (e.g., dissolved metals and petroleum hydrocarbons) into the soil matrix. Plants use soil moisture and promote the drying of the soil through transpiration. The Regional MS4 Permit defines "retain" as to keep or hold in a particular place, condition, or position without discharge to surface waters.
LID Biofiltration BMP	BMPs that reduce stormwater pollutant discharges by intercepting rainfall on vegetative canopy, and through incidental infiltration and/or evapotranspiration, and filtration, and other biological and chemical processes. As stormwater passes down through the planting soil, pollutants are filtered, adsorbed, biodegraded, and sequestered by the soil and plants, and collected through an underdrain.

LID Harvest and Reuse BMP	BMPs used to facilitate capturing Stormwater Runoff for later use without negatively impacting downstream water rights or other Beneficial Uses.
LID Infiltration BMP	BMPs to reduce stormwater runoff by capturing and infiltrating the runoff into in-situ soils or amended onsite soils. Typical LID Infiltration BMPs include infiltration basins, infiltration trenches and pervious pavements.
LID Retention BMP	BMPs to ensure full onsite retention without runoff of the DCV such as infiltration basins, bioretention, chambers, trenches, permeable pavement and pavers, harvest and reuse.
LID Principles	Site design concepts that prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
MEP	Maximum Extent Practicable - standard established by the 1987 amendments to the CWA for the reduction of Pollutant discharges from MS4s. Refer to Attachment C of the Regional MS4 Permit for a complete definition of MEP.
MF	Multi-family – zoning classification for parcels having 2 or more living residential units.
MS4	Municipal Separate Storm Sewer System (MS4) is a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or designated and approved management agency under section 208 of the CWA that discharges to waters of the United States; (ii) Designated or used for collecting or conveying storm water; (iii) Which is not a combined sewer; (iv) Which is not part of the Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.26.
New Development Project	Defined by the Regional MS4 Permit as 'Priority Development Projects' if the project, or a component of the project meets the categories and thresholds described in Section 1.1.1.
NPDES	National Pollution Discharge Elimination System - Federal program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under Sections 307, 318, 402, and 405 of the CWA.
NRCS	Natural Resources Conservation Service

PDP	Priority Development Project - Includes New Development and Redevelopment project categories listed in Provision E.3.b of the Regional MS4 Permit.
Priority Pollutants of Concern	Pollutants expected to be present on the project site and for which a downstream water body is also listed as Impaired under the CWA Section 303(d) list or by a TMDL.
Project-Specific WQMP	A plan specifying and documenting permanent LID Principles and Stormwater BMPs to control post-construction Pollutants and stormwater runoff for the life of the PDP, and the plans for operation and maintenance of those BMPs for the life of the project.
Receiving Waters	Waters of the United States.
Redevelopment Project	The creation, addition, and or replacement of impervious surface on an already developed site. Examples include the expansion of a building footprint, road widening, the addition to or replacement of a structure, and creation or addition of impervious surfaces. Replacement of impervious surfaces includes any activity that is not part of a routine maintenance activity where impervious material(s) are removed, exposing underlying soil during construction. Redevelopment does not include trenching and resurfacing associated with utility work; resurfacing existing roadways; new sidewalk construction, pedestrian ramps, or bike lane on existing roads; and routine replacement of damaged pavement, such as pothole repair. Project that meets the criteria described in Section 1.
Runoff Fund	Runoff Funds have not been established by the Copermittees and are not available to the Applicant. If established, a Runoff Fund will develop regional mitigation projects where PDPs will be able to buy mitigation credits if it is determined that implementing onsite controls is infeasible.
San Diego Regional Board	San Diego Regional Water Quality Control Board - The term "Regional Board", as defined in Water Code section 13050(b), is intended to refer to the California Regional Water Quality Control Board for the San Diego Region as specified in Water Code Section 13200. State agency responsible for managing and regulating water quality in the SMR.
SCCWRP	Southern California Coastal Water Research Project
Site Design BMP	Site design BMPs prevent or minimize the causes (or drivers) of post-construction impacts, and help mimic the pre-development hydrologic regime.
SF	Parcels with a zoning classification for a single residential unit.
SMC	Southern California Stormwater Monitoring Coalition
SMR	The Santa Margarita Region (SMR) represents the portion of the Santa Margarita Watershed that is included within the County of Riverside.

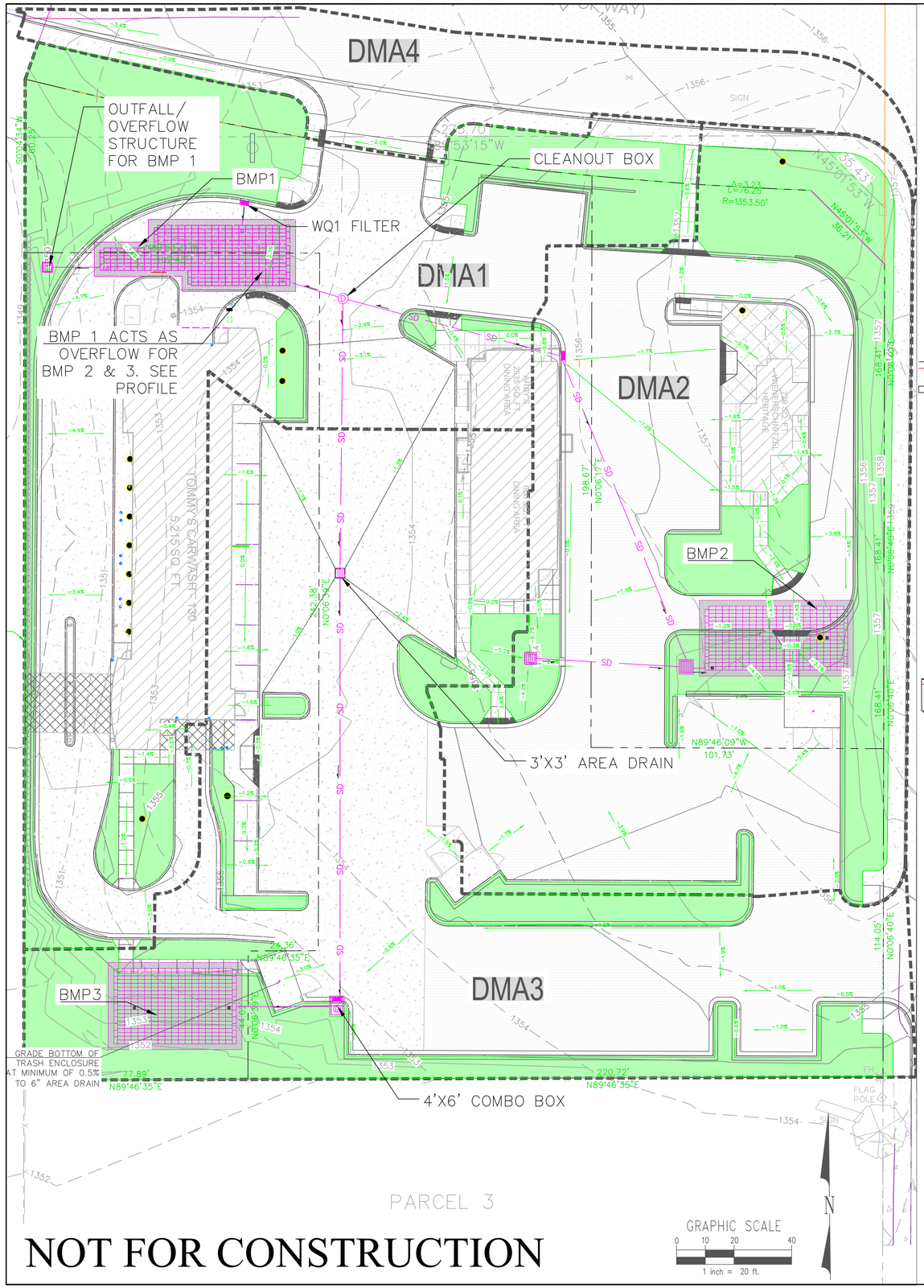
Source Control BMP	Source Control BMPs land use or site planning practices, or structural or nonstructural measures that aim to prevent runoff pollution by reducing the potential for contamination at the source of pollution. Source control BMPs minimize the contact between Pollutants and runoff.
Structural BMP	Structures designed to remove pollutants from stormwater runoff and mitigate hydromodification impacts.
SWPPP	Storm Water Pollution Prevention Plan
Tentative Tract Map	Tentative Tract Maps are required for all subdivision creating five (5) or more parcels, five (5) or more condominiums as defined in Section 783 of the California Civil Code, a community apartment project containing five (5) or more parcels, or for the conversion of a dwelling to a stock cooperative containing five (5) or more dwelling units.
TMDL	Total Maximum Daily Load - the maximum amount of a Pollutant that can be discharged into a waterbody from all sources (point and non-point) and still maintain Water Quality Standards. Under CWA Section 303(d), TMDLs must be developed for all waterbodies that do not meet Water Quality Standards after application of technology-based controls.
USEPA	United States Environmental Protection Agency
Volume-Based BMP	Volume-Based BMPs applies to BMPs where the primary mode of pollutant removal depends upon the volumetric capacity such as detention, retention, and infiltration systems.
WQMP	Water Quality Management Plan
Wet Season	The Regional MS4 Permit defines the wet season from October 1 through April 30.

Appendix 1: Maps and Site Plans

Location Map, WQMP Site Plan and Receiving Waters Map

Complete the checklist below to verify all exhibits and components are included in the Project-Specific WQMP. Refer Section 4 of the SMR WQMP and Section D of this Template.

Map and Site Plan Checklist
Indicate all Maps and Site Plans are included in your Project-Specific WQMP by checking the boxes below.
☐ Vicinity and Location Map
☒ Existing Site Map (unless exiting conditions are included in WQMP Site Plan)
☒ WQMP Site Plan
☒ Parcel Boundary and Project Footprint
☒ Existing and Proposed Topography & Drainage Management Areas (DMAs)
☒ Proposed Structural Best Management Practices (BMPs), with cross sections
☒ Drainage Paths
☒ Drainage infrastructure, inlets, overflows
☒ Source Control & Site Design BMPs (notes can be used for BMPs that can't be depicted)
☒ Buildings, Roof Lines, Downspouts
☒ Impervious Surfaces
☒ Pervious Surfaces (i.e. Landscaping)
☒ Standardized Labeling
☒ Use Riverside County Flood Control CB-110 for outlet structure with block outs for a trash screen out the outside, and an orifice/weir plate(s) on the inside of the structure or other design that is as easy to maintain. The screen should be as large as possible to minimize clogging.
☒ If BMPs are in the road R/W (only with CFD/CSA maintenance or LID Principals) add "BMP" paddle markers at the start and end of each BMPs and LID principals
☒ When underdrain are proposed, gravel shall be clean washed gravel, AASHTO #57 stone preferred. Underdrains shall be Schedule 40 PVC, with a minimum slope of 0.005, with cleanouts equal in diameter of the subdrain that extends 6 inches above the media with a lockable screw cap, spaced every 50 feet, at the collector drain line connection, and at any bends.
☒ When BSM is proposed, BSM shall consist of 60-80% clean sand, up to 20% clean topsoil, and 20% of a nutrient-stabilized organic amendment. BSM shall be placed on top of 3-inches of Choker Sand placed on top of 3-inches of ASTM No. 8 stone (1/4 to 1/2-inch pea gravel), and placed on top of 12 to 24-inches of a clean, open-graded drain rock layer.
☒ For Tracts, the Regional Board requires fully functioning WQMP BMPs for opening model home complexes, sales offices, or use of roads (i.e. prior to occupancy or intended use of any portion of the project). The County encourages phasing post-construction BMPs, small structural BMPs (e.g. specifically for sales offices), or self-retaining areas. This phasing can be shown on the WQMP site map and sequencing shall be included on the Grading plans, so that a fully functioning WQMP BMP is addressing any portion of the project that has been granted occupancy or granted the intended use.



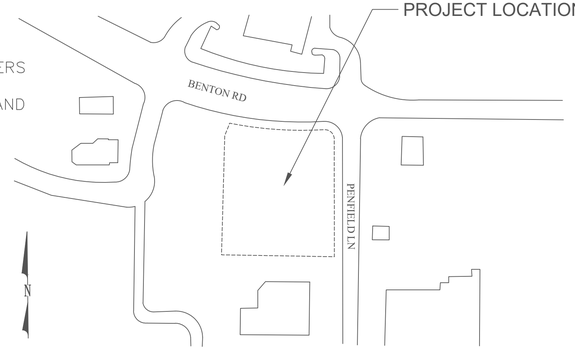
NOT FOR CONSTRUCTION

WATER QUALITY NOTES:

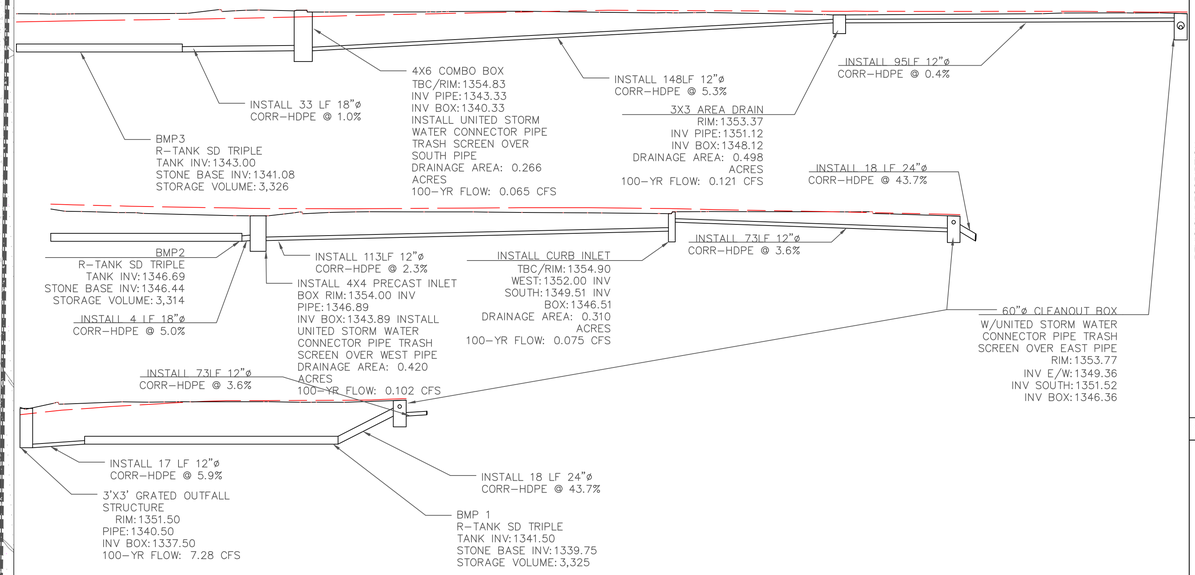
INLETS & TRENCH DRAINS RECEIVING RUNOFF FROM CARWASH ACTIVITIES WILL BE PROTECTED WITH FILTERS

ALL INLETS TO BE STENCILED WITH "NO DUMPING" AND "DRAINS TO RIVER"

PAVING AND CONCRETE = 62,581 SF
ROOF = 9,287 SF
LANDSCAPING = 23,959 SF
TOTAL SITE ACREAGE: 95,827–SF (2.2–ACRE)



VICINITY MAP
NOT TO SCALE



SELF–TREATING TYPE–A SOILS
ORNAMENTAL LANDSCAPE
IMPERMEABLE SURFACE
BUILDING ROOF

CROSS ENGINEERING SERVICES
203 W. Main Street Ste. F3
Lexington, SC 29072
Office: (803) 236-7123 Cell: (801) 391-2391

DRAFTED BY:
DESIGNED BY: BKS
CHECKED BY: JWC

DATE
REVISION DESCRIPTION
NO.

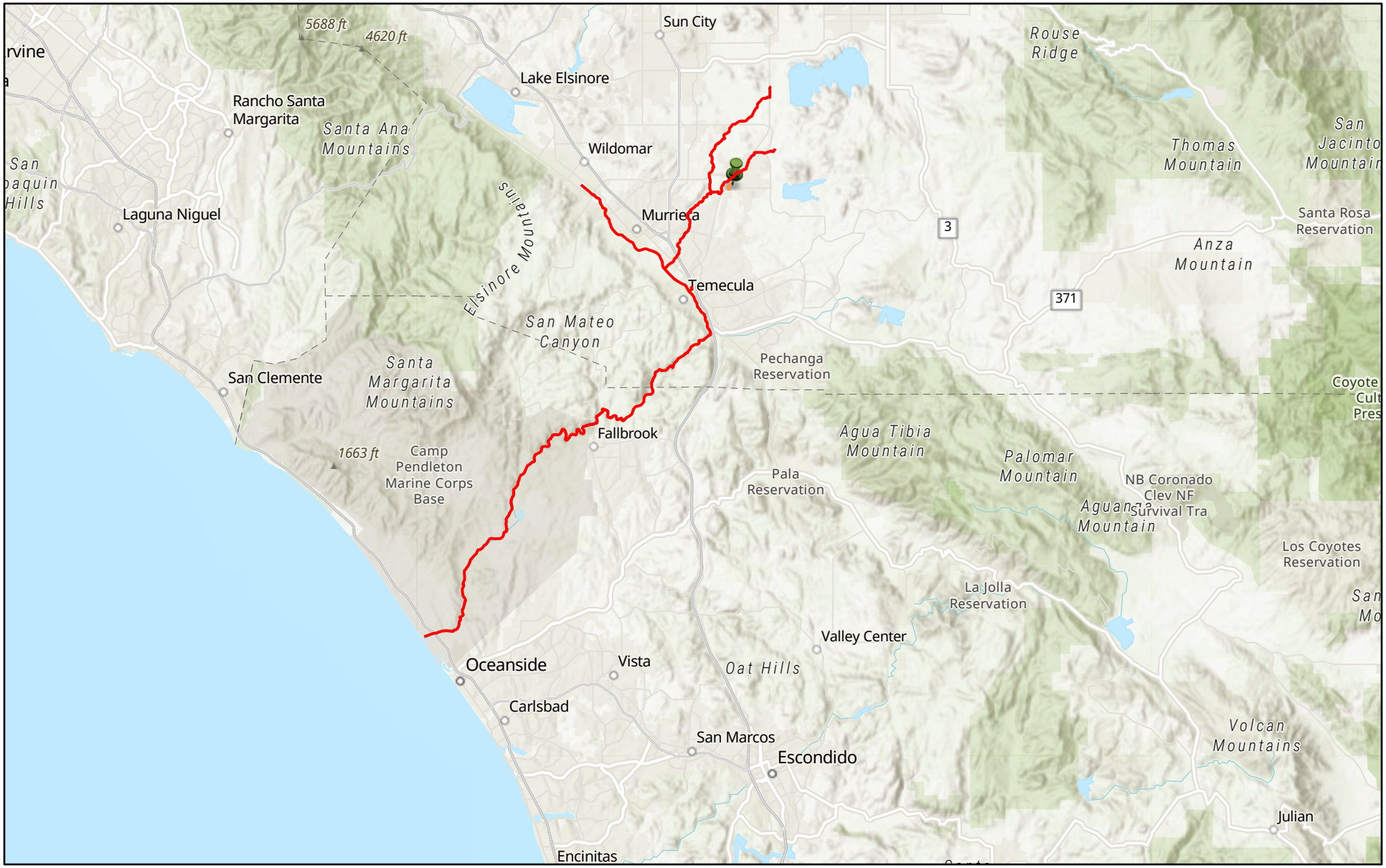
WATER QUALITY MANAGEMENT PLAN (WQMP)
TOMMYS COMMERCIAL CENTER
04/10/2023

BENTON RD & PENFIELD LN,
WINCHESTER CA, 92596
APN: 221-051-063 & 064

PROJECT NO.
19-14

SHEET NUMBER
C000

WATERS GeoViewer Print Map



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Result: Link Path

Result: Source ATTAINS Linear Linked Data

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0 5 10 20 km

US EPA, Esri, CGIAR, USGS, SanGIS, California State Parks, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, Bureau of Land

US Environment Protection Agency

Esri, CGIAR, USGS | SanGIS, California State Parks, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, USDA | US EPA |

Appendix 2: Construction Plans

*The latest set of Grading, Drainage Plans, and Street Improvement plans **shall be included***

Bioretention/Biofiltration BMPs construction notes (Santa Margarita Region only). For Bioretention and Biofiltration facilities, the **following construction notes shall be shown on the Grading and/or Drainage plans:**

1. *The Engineer shall furnish to the County a copy of the source testing and a signed certification that the fully blended Bioretention/Biofiltration Soil Media (BSM) material meets all of the WQMP requirements before material is imported or if the material is mixed onsite prior to installation.*
2. *As BSM material is being installed, Quality Assurance (QA) tests shall be conducted or for every 1,200 tons or 800 cubic yards mixed on-site from a completely mixed stockpile or windrow, with a minimum of three tests. For imported material from a supplier with a quality control program the QA tests shall be conducted 2,400 tons or 1,600 cubic yards from the supplier.*
3. *The Engineer conducting the Quality Control testing shall furnish to the County copy of the QA testing and a certification that the BSM for the project meets all of the following requirements. Certified mitigation plans can be used for exceedances, as long as all requirements are designed to be met.*
    a. *BSM shall not be compacted. BSM shall consist of 60-80% clean sand, up to 20% clean topsoil, and 20% of a nutrient-stabilized organic amendment. The initial infiltration rate shall be greater than 8 inches per hour per laboratory test.*
    b. *pH: 6.0 – 8.5; Salinity: 0.5 to 3.0 mmho/cm as electrical conductivity; Sodium absorption ratio: < 6.0; Chloride: < 800 ppm in saturated extract; Cation Exchange Capacity (CEC): > 10 meq/100 g; Organic Matter: 2 to 5-percent on a dry weight basis; Carbon: Nitrogen Ratio: 12 to 40, preferably 15 to 40; Gravel larger than 2mm: 0 to 25-percent of the total sample; Clay smaller than 0.005mm: 0 to 5 percent of the non-gravel fraction.*
    c. *BSM shall be tested to limit the leaching of potential inherent pollutants. BSM used in Biofiltration BMPs shall conform to the following limits for pollutant concentrations in saturated extract: Phosphorus: < 1 mg/L; Nitrate < 3 mg/L, Copper < 0.025 mg/L. These pollutant limits are for the amount that is leached from the sample, not from the soil sample itself. Testing may be performed after laboratory rinsing of media with up to 15 pore volumes of water. Equivalent test results will be accepted if certified by a laboratory or appropriate testing facility.*
    d. *Low nutrient compost used in BSM shall be sourced from a facility permitted through CalRecycle, preferably through USCC STA program. Compost shall conform to the following requirements: Physical contaminants <1% by dry weight; Carbon:Nitrogen ratio: 12:1 to 40:1; Maturity/Stability shall conform to either: Solvita Maturity Index: ≥ 5.5, CO2 Evolution: < 2.5 mg CO2-C per g compost organic matter per day, or < 5 mg CO2-C per g compost C per day; Select Pathogens and Trace metals shall pass US EPA Class A Standard. Testing shall be no more than 6 months old and representative of current stockpiles.*
    e. *Coconut coir pith used in BSM shall be thoroughly rinsed with freshwater and screened to remove coarse fibers as part of production and aged > 6 months. Peat used in BSM shall be sphagnum peat.*

Please notify the County if additional sources and laboratories can be added to this list. The Potential Sources and Laboratories are not part of the construction note - **Potential BSM sources may include**: Gail Materials (Temescal Valley), Agriservice (Oceanside), and Greatsoils (Escondido). Earthworks (Riverside); **Potential Laboratories may include**: Fruit Growers Laboratory, Inc. (Santa Paula, http://www.fglinc.com/) Wallace Laboratories (El Segundo, http://us.wlabs.com/). Control Labs (Watsonville, http://www.controllabs.com) and A&L Western Laboratories (Modesto, http://www.al-labs-west.com/).

1. The Engineer shall furnish to the County a copy of the source testing and a signed certification that the fully blended Bioretention/Biofiltration Soil Media (BSM) material meets all of the WQMP requirements before material is imported or if the material is mixed onsite prior to installation.

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3. The Engineer conducting the Quality Control testing shall furnish to the County copy of the QA testing and a certification that the BSM for the project meets all of the following requirements. Certified mitigation plans can be used for exceedances, as long as all requirements are designed to be met.

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3.2. pH: 6.0 – 8.5; Salinity: 0.5 to 3.0 mmho/cm as electrical conductivity; Sodium absorption ratio: < 6.0; Chloride: < 800 ppm in saturated extract; Cation Exchange Capacity (CEC): > 10 meq/100 g; Organic Matter: 2 to 5-percent on a dry weight basis; Carbon: Nitrogen Ratio: 12 to 40, preferably 15 to 40; Gravel larger than 2mm: 0 to 25-percent of the total sample; Clay smaller than 0.005mm: 0 to 5 percent of the non-gravel fraction.

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3.4. Low nutrient compost used in BSM shall be sourced from a facility permitted through CalRecycle, preferably through USCC STA program. Compost shall conform to the following requirements: Physical contaminants <1% by dry weight; Carbon:Nitrogen ratio: 12:1 to 40:1; Maturity/Stability shall conform to either: Solvita Maturity Index: ≥ 5.5, CO2 Evolution: < 2.5 mg CO2-C per g compost organic matter per day, or < 5 mg CO2-C per g compost C per day; Select Pathogens and Trace metals shall pass US EPA Class A Standard. Testing shall be no more than 6 months old and representative of current stockpiles.

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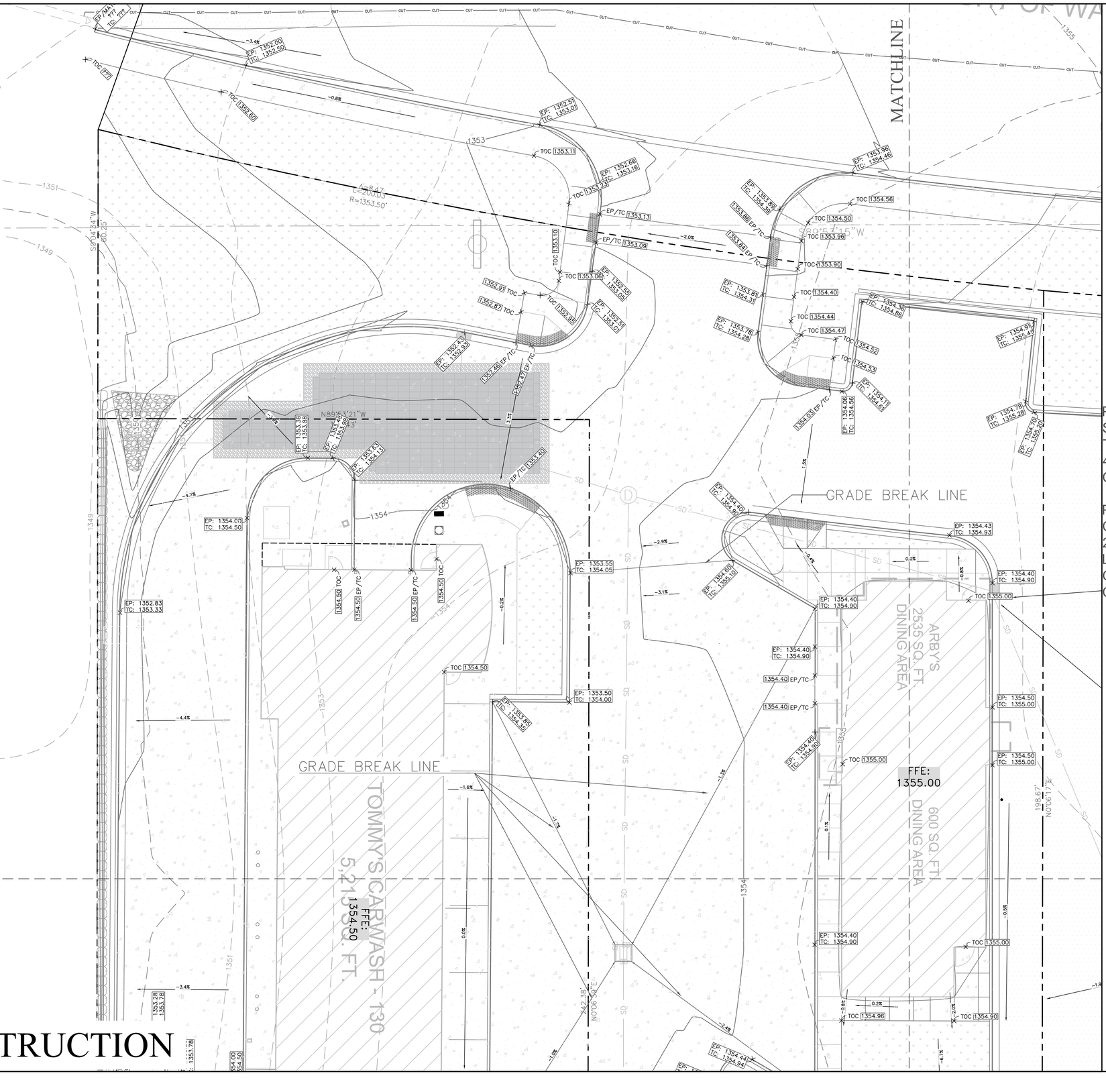

NOT FOR CONSTRUCTION

LEGEND

- FH = FIRE HYDRANT
- SSMH = SEWER MANHOLE
- SSCO = SEWER CLEANOUT
- SDMH = STORM DRAIN MANHOLE
- BP = BOLLARD POLE
- CB = CATCH BASIN
- = INLET GRATE
- EMH = ELECTRIC MANHOLE
- EB = ELECTRIC BOX
- EM = ELECTRIC METER
- GM = GAS METER
- PP = POWER POLE
- LP = LIGHT POLE
- TRANS = TRANSFORMER PAD
- TMH = TELEPHONE MANHOLE
- TP = TELEPHONE PEDESTAL
- GP = GUY WIRE
- WMH = WATER MANHOLE
- WV = WATER VALVE
- WM = WATER METER
- MW = MONITOR WELL
- SPB = SPRINKLER BOX
- RD = ROOF DRAIN
- RV = ROOF VENT

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Tahir Salim
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DRAFTED BY:
DESIGNED BY: BKS
CHECKED BY: JWC

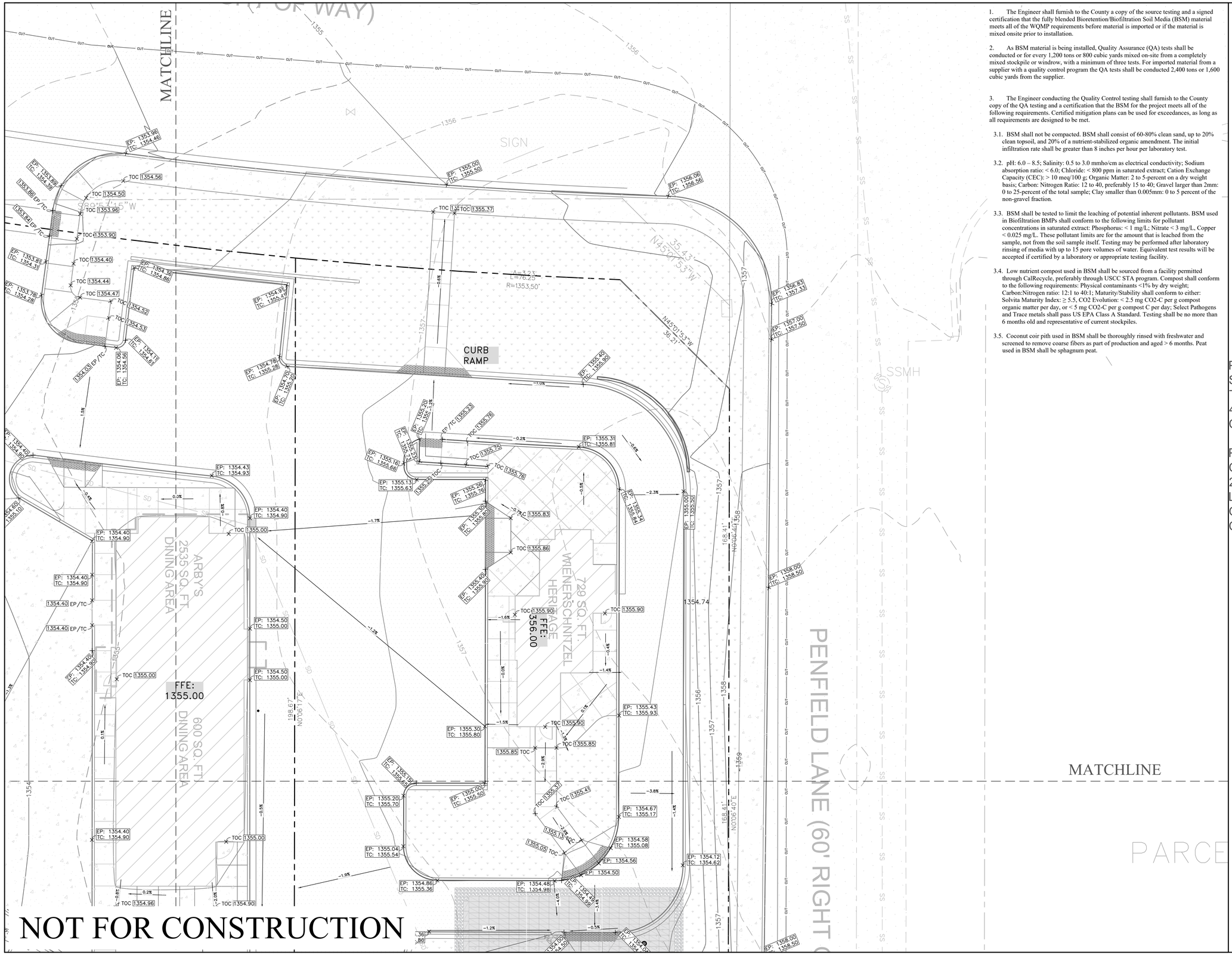
NO.	REVISION DESCRIPTION	DATE

NORTHWEST GRADING PLAN
TOMMYS COMMERCIAL CENTER
04/10/2023

BENTON RD & PENFIELD LN,
WINCHESTER CA, 92596
APN: 221-051-063 & 064

PROJECT NO.
19-14

SHEET NUMBER
C102



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DRAFTED BY:
DESIGNED BY: BKS
CHECKED BY: JWC

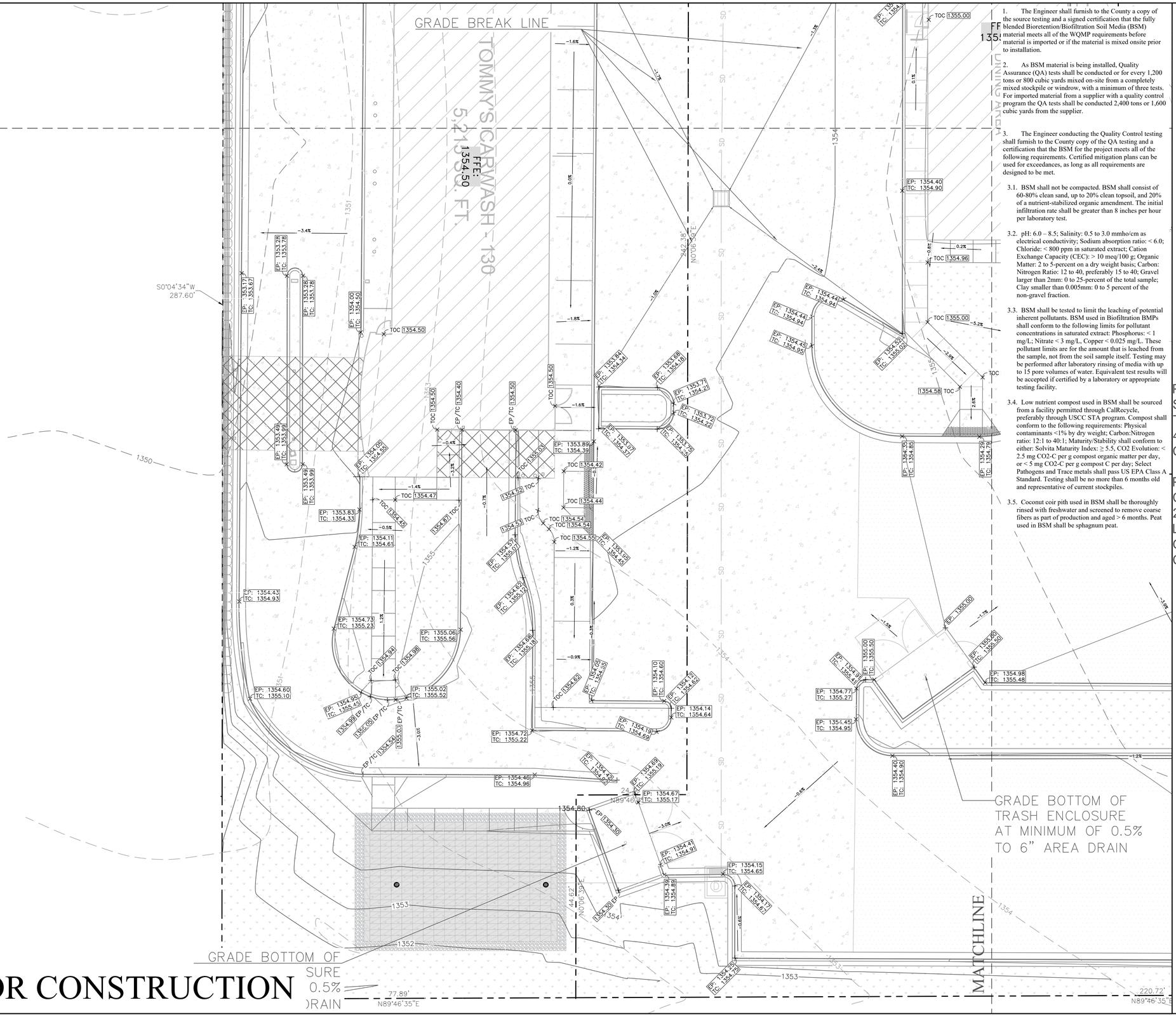
NO	REVISION DESCRIPTION	DATE

NORTHEAST GRADING PLAN
TOMMY'S COMMERCIAL CENTER
04/10/2023

BENTON RD & PENFIELD LN,
WINCHESTER CA, 92596
APN: 221-051-063 & 064

PROJECT NO.
19-14

SHEET NUMBER
C103



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2. As BSM material is being installed, Quality Assurance (QA) tests shall be conducted or for every 1,200 tons or 800 cubic yards mixed on-site from a completely mixed stockpile or windrow, with a minimum of three tests. For imported material from a supplier with a quality control program the QA tests shall be conducted 2,400 tons or 1,600 cubic yards from the supplier.

3. The Engineer conducting the Quality Control testing shall furnish to the County copy of the QA testing and a certification that the BSM for the project meets all of the following requirements. Certified mitigation plans can be used for exceedances, as long as all requirements are designed to be met.

3.1. BSM shall not be compacted. BSM shall consist of 60-80% clean sand, up to 20% clean topsoil, and 20% of a nutrient-stabilized organic amendment. The initial infiltration rate shall be greater than 8 inches per hour per laboratory test.

3.2. pH: 6.0 – 8.5; Salinity: 0.5 to 3.0 mmho/cm as electrical conductivity; Sodium absorption ratio: < 6.0; Chloride: < 800 ppm in saturated extract; Cation Exchange Capacity (CEC): > 10 meq/100 g; Organic Matter: 2 to 5-percent on a dry weight basis; Carbon: Nitrogen Ratio: 12 to 40, preferably 15 to 40; Gravel larger than 2mm: 0 to 25-percent of the total sample; Clay smaller than 0.005mm: 0 to 5 percent of the non-gravel fraction.

3.3. BSM shall be tested to limit the leaching of potential inherent pollutants. BSM used in Biofiltration BMPs shall conform to the following limits for pollutant concentrations in saturated extract: Phosphorus: < 1 mg/L; Nitrate < 3 mg/L, Copper < 0.025 mg/L. These pollutant limits are for the amount that is leached from the sample, not from the soil sample itself. Testing may be performed after laboratory rinsing of media with up to 15 pore volumes of water. Equivalent test results will be accepted if certified by a laboratory or appropriate testing facility.

3.4. Low nutrient compost used in BSM shall be sourced from a facility permitted through CalRecycle, preferably through USCC STA program. Compost shall conform to the following requirements: Physical contaminants <1% by dry weight; Carbon:Nitrogen ratio: 12:1 to 40:1; Maturity/Stability shall conform to either: Solvita Maturity Index: ≥ 5.5, CO2 Evolution: < 2.5 mg CO2-C per g compost organic matter per day, or < 5 mg CO2-C per g compost C per day; Select Pathogens and Trace metals shall pass US EPA Class A Standard. Testing shall be no more than 6 months old and representative of current stockpiles.

3.5. Coconut coir pith used in BSM shall be thoroughly rinsed with freshwater and screened to remove coarse fibers as part of production and aged > 6 months. Peat used in BSM shall be sphagnum peat.

LEGEND

FH = FIRE HYDRANT
SSMH = SEWER MANHOLE
SSCO = SEWER CLEANOUT
SDMH = STORM DRAIN MANHOLE
BP = BOLLARD POLE
CB = CATCH BASIN
= INLET GRATE
EMH = ELECTRIC MANHOLE
EB = ELECTRIC BOX
EM = ELECTRIC METER
GM = GAS METER
PP = POWER POLE
LP = LIGHT POLE
TRANS = TRANSFORMER PAD
TMH = TELEPHONE MANHOLE
TP = TELEPHONE PEDESTAL
GP = GUY WIRE
WMH = WATER MANHOLE
WV = WATER VALVE
WM = WATER METER
MW = MONITOR WELL
SPB = SPRINKLER BOX
RD = ROOF DRAIN
RV = ROOF VENT

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GRAPHIC SCALE
0 5 10 20
1 inch = 10 ft.

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DRAFTED BY:
DESIGNED BY: BKS
CHECKED BY: JWC

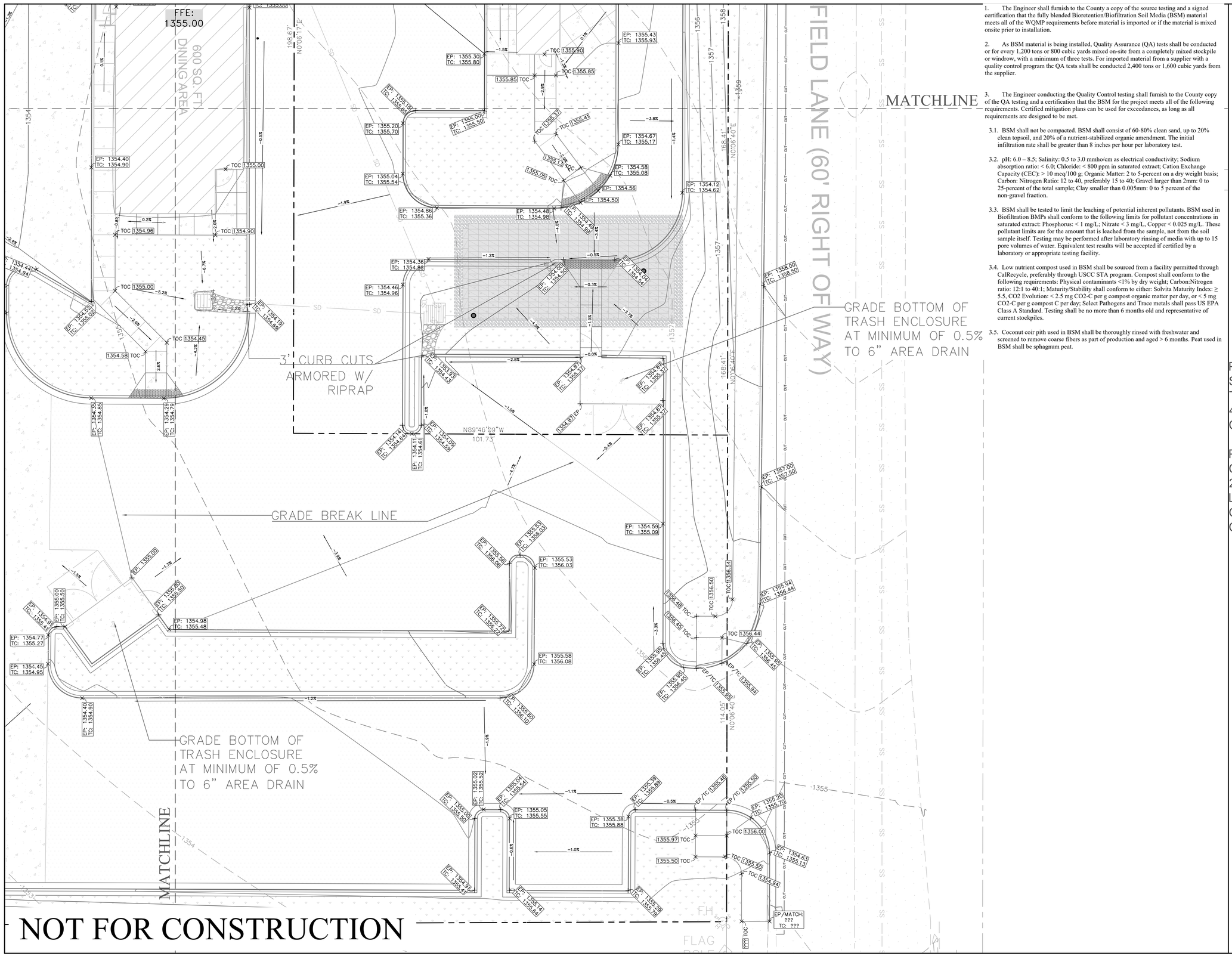
NO.	REVISION DESCRIPTION	DATE

SOUTHWEST GRADING PLAN
TOMMYS COMMERCIAL CENTER
04/10/2023

BENTON RD & PENFIELD LN,
WINCHESTER CA, 92596
APN: 221-051-063 & 064

PROJECT NO.
19-14

SHEET NUMBER
C104



NOT FOR CONSTRUCTION

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3. The Engineer conducting the Quality Control testing shall furnish to the County copy of the QA testing and a certification that the BSM for the project meets all of the following requirements. Certified mitigation plans can be used for exceedances, as long as all requirements are designed to be met.

3.1. BSM shall not be compacted. BSM shall consist of 60-80% clean sand, up to 20% clean topsoil, and 20% of a nutrient-stabilized organic amendment. The initial infiltration rate shall be greater than 8 inches per hour per laboratory test.

3.2. pH: 6.0 – 8.5; Salinity: 0.5 to 3.0 mmho/cm as electrical conductivity; Sodium absorption ratio: < 6.0; Chloride: < 800 ppm in saturated extract; Cation Exchange Capacity (CEC): > 10 meq/100 g; Organic Matter: 2 to 5-percent on a dry weight basis; Carbon: Nitrogen Ratio: 12 to 40, preferably 15 to 40; Gravel larger than 2mm: 0 to 25-percent of the total sample; Clay smaller than 0.005mm: 0 to 5 percent of the non-gravel fraction.

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3.5. Coconut coir pith used in BSM shall be thoroughly rinsed with freshwater and screened to remove coarse fibers as part of production and aged > 6 months. Peat used in BSM shall be sphagnum peat.

LEGEND

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- SSCO = SEWER CLEANOUT
- SDMH = STORM DRAIN MANHOLE
- BP = BOLLARD POLE
- CB = CATCH BASIN
- = INLET GRATE
- EMH = ELECTRIC MANHOLE
- EB = ELECTRIC BOX
- EM = ELECTRIC METER
- GM = GAS METER
- PP = POWER POLE
- LP = LIGHT POLE
- TRANS = TRANSFORMER PAD
- TMH = TELEPHONE MANHOLE
- TP = TELEPHONE PEDESTAL
- GP = GUY WIRE
- WMH = WATER MANHOLE
- WV = WATER VALVE
- WM = WATER METER
- MW = MONITOR WELL
- SPB = SPRINKLER BOX
- RD = ROOF DRAIN
- RV = ROOF VENT

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GRAPHIC SCALE
0 5 10 20
1 inch = 10 ft.

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CHECKED BY: JWC

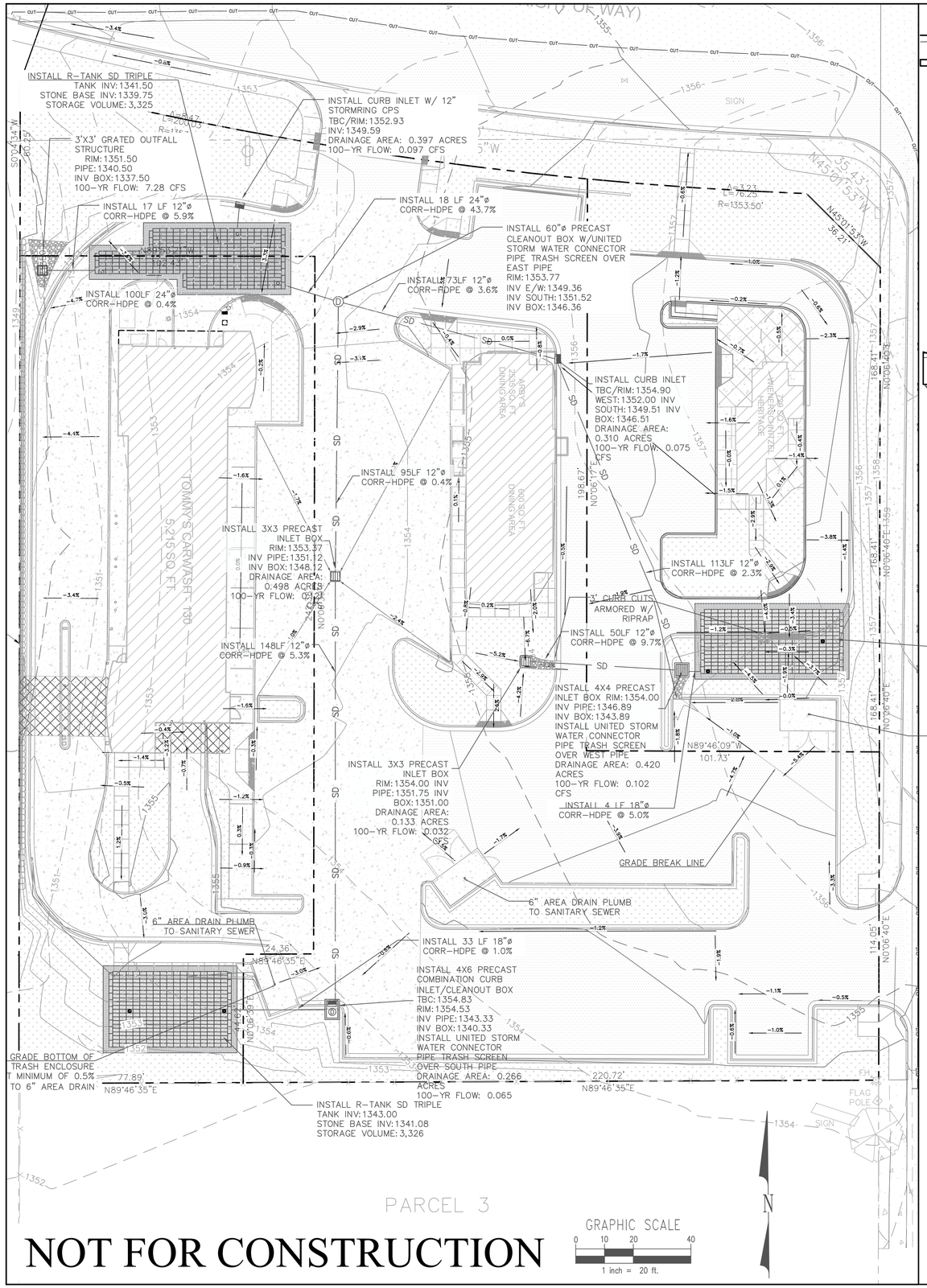
NO	REVISION DESCRIPTION	DATE

SOUTHEAST GRADING PLAN
TOMMYS COMMERCIAL CENTER
04/10/2023

BENTON RD & PENFIELD LN,
WINCHESTER CA, 92596
APN: 221-051-063 & 064

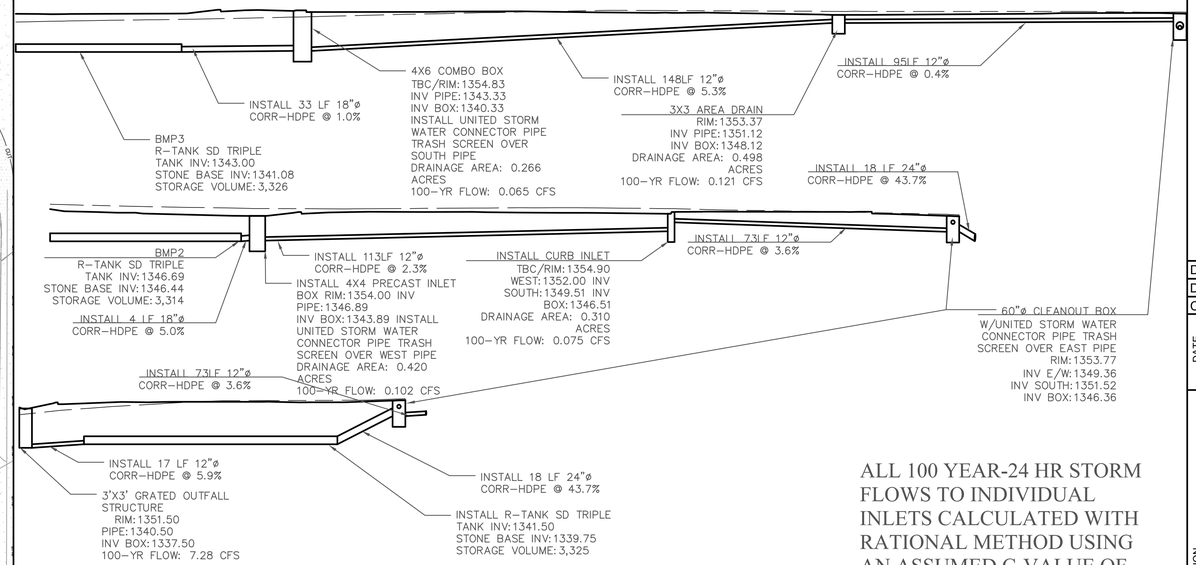
PROJECT NO.
19-14

SHEET NUMBER
C105



GRAPHIC SCALE
0 10 20 40
1 inch = 20 ft.

NOT FOR CONSTRUCTION



ALL 100 YEAR-24 HR STORM FLOWS TO INDIVIDUAL INLETS CALCULATED WITH RATIONAL METHOD USING AN ASSUMED C-VALUE OF 0.95

100-YEAR 24 HOUR STORM:

RAINFALL DEPTH:
6.15 IN

RAINFALL INTENSITY:
0.256 IN/HR

CROSS ENGINEERING SERVICES
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DRAFTED BY:
DESIGNED BY: BKS
CHECKED BY: JWC

NO.	REVISION DESCRIPTION	DATE

DRAINAGE PLAN
TOMMYS COMMERCIAL CENTER
04/10/2023

BENTON RD & PENFIELD LN,
WINCHESTER CA, 92596
APN: 221-051-063 & 064

PROJECT NO.
19-14

SHEET NUMBER
C106

LEGEND

- FH = FIRE HYDRANT
- SSMH = SEWER MANHOLE
- SSCO = SEWER CLEANOUT
- SDMH = STORM DRAIN MANHOLE
- BP = BOLLARD POLE
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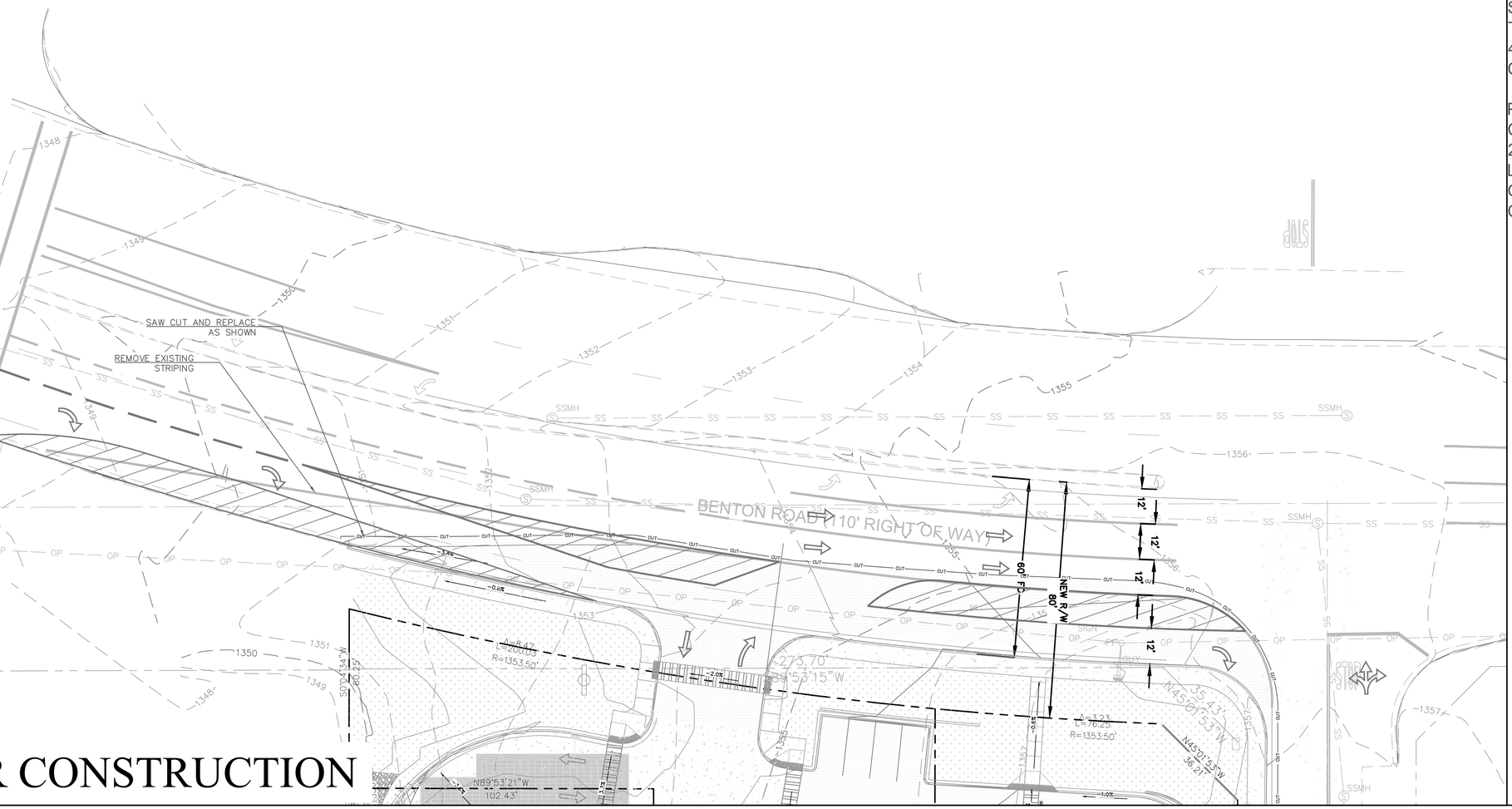

NOT FOR CONSTRUCTION

N

GRAPHIC SCALE
0 10 20 40
1 inch = 20 ft.

CROSS ENGINEERING SERVICES
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DRAFTED BY:
DESIGNED BY: BKS
CHECKED BY: JWC

NO	REVISION DESCRIPTION	DATE

OFFSITE IMPROVEMENTS
TOMMYS COMMERCIAL CENTER
04/10/2023

BENTON RD & PENFIELD LN,
WINCHESTER CA, 92596
APN: 221-051-063 & 064

PROJECT NO.
19-14

SHEET NUMBER
C107

Appendix 3: Soils Information

Geotechnical Study, Other Infiltration Testing Data, and/or Other Documentation

Examples of material to provide in Appendix 3 may include but are not limited to the following:

- Geotechnical Study/Report prepared for the project,
- Additional soils testing data (if not included in the Geotechnical Study),
- Exhibits/Maps/Other Documentation of the Hydrologic Soils Groups (HSG)s at the project site.

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 2.3 of the SMR WQMP and Sections A and D of this Template.

The County will accept explicit recommendations from the Geotechnical Engineer, such as specifying a design infiltration rate (unfactored) when infiltration rates vary, recommendations for impermeable liners due to concerns about seepage in fill areas/near gas tanks, or other site specific recommendations based on physical conditions.

REPORT OF
GEOTECHNICAL INVESTIGATION AND PERCOLATION TESTING
PROPOSED COMMERCIAL PLAZA PROJECT
PIN/APN: 963070018
SOUTHWEST CORNER OF BENTON ROAD AND PANFIELD LANE
WINCHESTER (RIVERSIDE COUNTY), CALIFORNIA 92596

FOR

CROSS ENGINEERING SERVICES, LLC

PROJECT NO. 20-679-02

JANUARY 25, 2021

January 25, 2021 20-679-02

Cross Engineering Services, LLC
203 West Main Street, Ste. F3
Lexington, SC 29072

Attention: Mr. Joseph Cross

Subject: Report of Geotechnical Investigation And Percolation Testing
Proposed Commercial Plaza Project
PIN/APN: 963070018
Southwest Corner of Benton Road and Panfield Lane
Winchester (Riverside County), California 92596

Gentlemen:

INTRODUCTION

This report presents the results of a geotechnical investigation and percolation testing for the subject project. During the course of this investigation, the engineering properties of the subsurface materials were evaluated in order to provide recommendations for design and construction of foundations, parking pavement and on-site storm water infiltration. The investigation included subsurface exploration, soil sampling, in-situ percolation testing, laboratory testing, engineering evaluation and analysis, consultation, and preparation of this report.

During the course of our investigation, the provided site plan was used as reference.

The enclosed Site Plan; Drawing No. 1, shows the approximate locations of the exploratory borings in relation to the site boundaries, proposed building. This drawing also shows the approximate locations of the Perc-1 and Perc-2 within which the percolation tests were performed.

Figure No. 1 shows the Site Vicinity Map. Figure No. 2 shows the Regional Topographic Map. Figure No. 3 shows the Regional Geologic Map. Figure No. 4 shows the Historically Highest Groundwater (Contour Map).

The attached Appendix I, describes the method of field exploration. Figure Nos. I-1 through I-5 present summaries of the materials encountered at the location of our borings. Figure No. I-6 presents the Uniform Soil Classification System Chart; a guide to the Log of Exploratory Borings.

The attached Appendix II describes the laboratory testing procedures. Figure Nos. II-1 and II-2 present the results of direct shear and consolidation tests performed on selected undisturbed soil samples.

Appendix III contains the outside laboratory test results that include “R” value and corrosivity tests.

PROJECT CONSIDERATIONS

It is our understanding that the proposed project will consist of construction of a new commercial plaza. The plaza will contain a car wash and two fast food restaurants. See the enclosed Site Plan; Drawing No. 1.

The proposed buildings are expected to be one-story high made of metal and wood. The flooring systems of the proposed buildings are expected to be in forms of concrete grade slabs established at or near the present grade. No basement is planned.

Parking for the proposed plaza will be provided in a form of open space parking lot. Some 38 parking spaces will be provided. The proposed car wash will have drive through access and possibly underground storage tanks. The approximate locations of the proposed buildings and parking spaces with respect to the site boundaries are shown on the enclosed Site Plan; Drawing No. 1.

Structural loading data was not available during the course of this investigation. For the purpose of this report, it is assumed that the maximum collected loads would be on the order of 60 kips, combined dead plus frequently applied live loads. Continuous (wall) footings are expected to exert loads of on the order of 3 kips per lineal foot.

ANTICIPATED SITE GRADING WORK

The major portion of the site grading work in the areas of the proposed buildings will involve removal and recompaction of the existing surficial fill and upper portion of the native soils which were found to be locally porous (a total thickness of 5 feet).

Within the areas of the parking lot, only the surficial fill (found to be on the order of 2 feet) should be removed and recompacted.

It is anticipated that as part of the proposed car wash complex, some underground storage tanks will be installed. As part of the site grading work, excavations will be made to create the cavities for installation of the new underground storage tanks.

The recompacted soils will be used for support of new grade slabs and foundations in the areas of the proposed buildings. The recompacted fill in the parking will be used for support of parking pavement sections.

The zone of removal should be extended beyond the exterior walls of the proposed buildings a horizontal distance equal to the thickness of fill which is 5 feet in most areas. Some 10 percent shrinkage should be considered when reusing the excavated materials in the areas of new fill which will be denser. Imported soils may be required to accomplish the site grading work. All imported soils should be non-expansive and granular in nature and be free of decomposable materials and rocks larger than 4 inches in diameter.

The clayey soils, found locally in our borings, are considered to be potentially expansive. These soils, when reused in the areas of new fill, should be placed back at some 3 percent higher than the optimum moisture content.

SITE CONDITIONS

SURFACE CONDITIONS

The subject site is located on the southwest corner of Benton Road & Panfield Lane, Winchester, Riverside County, California. The site is rectangular in shape covering a plan area of about 2.5 acres.

At the time of our investigation, the site was vacant. The ground surface was noted to be generally level. No significant slope occurs within or in close proximity of the subject property.

SUBSURFACE CONDITIONS

Correlation of the subsoil between the test holes was considered to be fair. Generally, the site, to the depths explored, was found to be covered with surficial fill consisting of silty sand underlain by natural deposits of silty sand, clean sand, sandy clay, and sandy silt soils. Thickness of the existing fill was found to be on the order of 2 feet in our borings. Deeper fill, however, may be present between and beyond our borings and beneath the old utilities.

The surficial fill should not be used for support of new fill, structural foundations, and grade slabs at their present state. The fill, however, may be excavated and reused in the areas of new compacted fill.

The upper 3 feet of the native soils were found to be locally porous and subject to hydroconsolidation. Within the areas of the proposed buildings, the top 3 feet of the native soils should also be removed and recompacted along with the surficial fill to support structural foundations and grade slabs.

The underlying native soils below a depth of about 5 feet were found to be generally dense and stiff and free of visual porosity. Such soils are considered to be adequate to receive new fill for support of grade slabs, and structural foundations. The results of our laboratory testing indicated that the site native soils below a depth of about 5 feet extending down to within the influence zone of foundation pressure were of moderate strengths and moderately compressible.

While the surficial fill were found to be granular in nature, the clayey soils found locally below the fill were found to be potentially expansive. During the course of site grading work, it would be desirable to mix the clay and sand to reduce the degree of expansion of the new compacted fill blanket.

During the course of our field investigation, no groundwater was encountered in our borings extended to a maximum depth of 21 feet. Due to the method of drilling (use of continuous auger) caving was not detected in our borings. Because the upper soils have significant amounts of fines, forming is expected not to be required during foundation construction.

SEISMIC DESIGN CONSIDERATIONS

In accordance with the California Building Code (CBC 2019), the project site can be classified as site "D". The seismic design parameters are obtained using ASCE7-16. The mapped spectral accelerations of S_S= 1.396 (short period) and S_1 =0.519 (1-second period) can be used for this project. These parameters correspond to site Coefficients values of F_a =1.0 and F_V = null (see the Note below), respectively.

The seismic design parameters would be as follows:

$\mathbf{S_{MS}}$= F_a (S_S) = 1.0 (1.396) = 1.396	$\mathbf{S_{M1}}$=F_v (S_1) = null (see Note below)
$\mathbf{S_{DS}}$=2/3 (S_{MS}) = 2/3 (1.396) = 0.931	$\mathbf{S_{D1}}$=2/3 (S_{M1}) = null (see Note below)

Note: Since the seismic factor S_1 is greater than 0.2 site-specific ground motion hazard analyses may be required. The project structural engineer shall determine if an exemption can be applied in accordance with ASCE7-16 Section 11.4.8. If an exemption applies, a long period coefficient (F_v) of 1.7 may be utilized for calculation of the seismic parameters $\mathbf{S_{M1}}$ and $\mathbf{S_{D1}}$ in the above Table.

EVALUATION OF LIQUEFACTION POTENTIAL

During the course of our investigation, no water was found our boring. The available maps show the historically highest groundwater level in the vicinity of the subject site may be close to 30 feet (see the enclosed Figure No. 4). However, the State of California Seismic Hazard Zone Map has placed the subject site outside the zone of potential liquefaction. On this basis, therefore, it is our opinion that soil liquefaction will not occur at the subject site.

STATEMENT 111

For the purpose of the subject project, it is our opinion that when the proposed grading and construction is made as planned, following the recommendations of this report, the site will be safe against the hazards of landsliding, settlement or slippage. The proposed construction and grading will not have adverse effect on the geologic stability of the existing properties outside the boundaries of the subject site.

SOIL CHEMICAL IMPURITIES AND CORROSION CONSIDERATIONS

After the proposed finished grades are established, samples of the subgrade materials in contact with foundations and utility lines, should be tested for chemical impurity (soil corrosivity). For the purpose of this report, however, it should be assumed that the site soils are corrosive. Subject to the results of chemical testing during construction, the design may be changed.

EVALUATION AND RECOMMENDATIONS

GENERAL

Based on the geotechnical engineering data derived from this investigation, the site can be developed as planned. The existing fill and upper 3 feet of the locally porous native soils (a total depth of about 5 feet) are considered to be inadequate for support of new fill, structural foundations, grade slabs at their present state. Within the areas of the proposed buildings, such soils should be excavated and recompacted to create a 5-foot thick blanket of compacted fill for support of grade slabs and structural foundations. Within the areas of the parking lot, only the surficial fill (some 2 feet thick) should be removed and recompacted to support parking pavement section.

The zone of removal should be extended beyond the exterior walls of the proposed buildings a horizontal distance equal to the thickness of removal. Some 10 percent shrinkage should be considered when reusing the excavated materials in the areas of new fill which will be denser. Imported soils may be required to accomplish the site grading work. All imported soils should be non-expansive and granular in nature and be free of decomposable materials and rocks larger than 4 inches in diameter.

After proper site grading work, conventional spread footing foundation system can be used for support of the proposed building. The foundation bearing materials should consist of properly compacted/engineered fill soils.

Grade slabs can be supported on the finished grades which would be properly compacted fill soils. The fine grained soils should be placed back to a relative compaction of at least 90 percent at some 3 percent higher than the optimum moisture content. Due to possible expansive character of compacted fill, the grade slabs for this

project should be at least 5 inches thick and be reinforced with # 4 bars placed at every 16 inches on center, each way.

The following sections present our specific recommendations for temporary excavations, foundations, lateral design, grade slabs, grading, surface drainage, and observations during construction.

TEMPORARY EXCAVATION

As part of the proposed project, temporary excavation will be made during installation of the tanks and site grading work. The cuts are expected to expose minor fill and native soils. Maximum vertical height of excavation is expected to be on the order of 12 feet.

Where space limitations permit, unshored temporary excavation slopes can be used. Based upon the engineering characteristics of the site materials, it is our opinion that temporary excavation slopes in accordance with the following table can safely be used:

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

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

It would be advantageous, particularly during wet season construction, to place polyethylene plastic sheeting over the slopes. This will reduce the chances of moisture changes within the soil banks and material wash into the excavation.

It should be noted that the recommendations presented in this section are for use in design and for cost estimating purposes prior to construction. The contractor is solely responsible for safety during construction.

GRADING RECOMMENDATIONS

The major portion of the site grading work in the areas of the proposed buildings will involve removal and recompaction of the existing surficial fill and upper portion of the native soils which were found to be locally porous (a total thickness of 5 feet). Within the areas of the parking lot, only the surficial fill (found to be on the order of 2 feet) should be removed and recompacted.

It is anticipated that as part of the proposed car wash complex, some underground storage tanks will be installed. As part of the site grading work, excavations will be made to create the cavities for installation of the new underground storage tanks.

The recompacted soils will be used for support of new grade slabs and foundations in the areas of the proposed buildings. The recompacted fill in the parking will be used for support of parking pavement sections.

The zone of removal should be extended beyond the exterior walls of the proposed buildings a horizontal distance equal to the thickness of fill which is 5 feet in most areas. Some 10 percent shrinkage should be considered when reusing the excavated materials in the areas of new fill which will be denser. Imported soils may be required to accomplish the site grading work. All imported soils should be non-expansive and granular in nature and be free of decomposable materials and rocks larger than 4 inches in diameter.

The clayey soils, found locally in our borings, are considered to be potentially expansive. These soils, when reused in the areas of new fill, should be placed back at some 3 percent higher than the optimum moisture content.

Prior to placement of any fill on the site, the Soil Engineer should observe the excavation bottoms. The areas to receive compacted fill should be scarified to a depth of about 8 inches, moistened as required to bring to near optimum moisture content and compacted to at least 90 percent of the maximum dry density as determined by the ASTM Designation D 1557 Compaction Method.

All imported soils should be granular in nature and be free of organic and rocks larger than 4 inches in diameter). Before import soils are brought to the site, a 20-pound sample of the proposed import soils should be submitted to the Soil Engineer (at least

48 hours in advance) so that the maximum density and expansion character of the import materials can be determined.

General guidelines regarding site grading are presented below in an itemized form which may be included in the grading plan. It is recommended that all fill be placed under engineering observation and in accordance with the following guidelines:

1. All vegetation and debris should be collected and hauled off-site. In the areas of proposed buildings, the existing fill and top 3 feet of porous native soils should be excavated until non-porous native soils are exposed.
2. In the areas of the surface parking, only the surficial fill should be removed and recompacted.
3. The excavated areas should be observed and approved by the Soil Engineer prior to placing any fill.
4. The excavated materials from the site are considered to be satisfactory for reuse in the compacted fill areas.
5. Fill material, approved by the Soil Engineer, should be placed in controlled layers. Each layer should be compacted to at least 90 percent of the maximum unit weight as determined by ASTM designation D 1557 for the material used.
6. The fill material shall be placed in controlled layers of not to exceed 8 inches. Each layer shall be spread evenly and shall be thoroughly mixed during the spreading to insure uniformity of material in each layer.
7. When moisture content of the fill material is too low to obtain adequate compaction, water shall be added and thoroughly dispersed until the moisture content is near optimum.
8. When the moisture content of the fill material is too high to obtain adequate compaction, the fill material shall be aerated by blading or other satisfactory methods until near optimum moisture condition is achieved.
9. Inspection and field density tests should be conducted by the Soil Engineer during grading work to assure that adequate compaction is attained. Where compaction of less than 90 percent is indicated, additional compactive effort should be made with adjustment of the moisture content or layer thickness, as necessary, until at least 90 percent compaction is obtained.

SITE DRAINAGE

Site drainage should be provided to divert roof and surface waters from the property through nonerodible drainage devices to the street. In no case should the surface waters be allowed to pond adjacent to building. A minimum slope of one and two percent are recommended for paved and unpaved areas, respectively.

The site drainage recommendations should also include the following:

1. Having positive slope away from the buildings, as recommended above;
2. Installation of roof drains, area drains and catch basins with appropriate connecting lines;
3. Managing landscape watering;
4. Regular maintenance of the drainage devices;
5. Damp proofing of the concrete bottoms;
6. The owners should be familiar with the general maintenance guidelines of the local jurisdiction requirements.

FOUNDATIONS

Conventional spread footings can be used for support of the proposed buildings. The foundation bearing materials should consist of properly compacted fill soils.

New footings should be at least 18 inches wide and be placed at a minimum depth of 24 inches below the lowest adjacent final grades. Properly designed and constructed spread footings may be based on an allowable maximum bearing pressure of 2,000 pounds per square foot. This value can be increased at a rate of 100 and 200 pounds per square for each additional foot of footing width and depth, to a maximum value of 2,700 pounds per square foot.

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

Under the allowable maximum soil pressure, footings with assumed collected loads of 60 kips is expected to settle less than 7/8 of one inch. Wall footings, with loads of about 3 kips per lineal foot are expected to settle on the order of 5/8 of one inch.

Maximum differential settlements are expected to be on the order of 1/4 of an inch. The major portions of the settlements are expected to occur during construction.

LATERAL DESIGN

Lateral resistance at the base of footings in contact with properly compacted fill soils can be assumed to be the product of the dead load forces and a coefficient of friction of 0.4. Passive pressure on the face of footings may also be used to resist lateral forces. A passive pressure of zero at the finished grades and increasing at a rate of 250 pounds per square foot per foot of depth to a maximum value of 2,500 pounds per square foot may be used for footings poured against properly compacted fill soils.

CONCRETE SLABS

Grade slabs can be supported on the finished grades which would be properly compacted fill soils. The fine grained soils should be placed back to a relative compaction of at least 90 percent at some 3 percent higher than the optimum moisture content. Due to possible expansive character of compacted fill, the grade slabs for this project should be at least 5 inches thick and be reinforced with # 4 bars placed at every 16 inches on center, each way.

In the areas where moisture sensitive floor covering is used and slab dampness cannot be tolerated, a vapor-barrier should be used beneath the slabs. This normally consists of a 10-mil polyethylene film covered with 2 inches of clean sand.

MINOR RETAINING WALLS

Static design of minor, cantilevered retaining walls associated with landscaping that are structurally separate from the main building and support properly compacted granular backfill may be designed based on an equivalent fluid pressure of 30 pounds per square foot per foot of depth. This assumes that no hydrostatic pressure will occur behind the retaining walls. Therefore, retaining walls should be equipped with proper subdrain which normally consists of 4-inch diameter perforated pipes encased in gravel (at least one cubic foot per lineal foot of the pipes). In order to reduce the chances of

siltation and drain clogging, the free-draining gravel should be wrapped in filter fabric proper for the site soils.

In addition to the lateral earth pressure, the walls should also be designed for any applicable uniform surcharge loads imposed on the adjacent grounds. For cantilevered retaining walls, the uniform surcharge effects may be computed using a coefficient of 0.30 times the assumed uniform loads.

PAVEMENT DESIGN

It is our understanding that both automotive and truck traffic will use the proposed parking lot. Two bulk samples of the upper site soils from Borings B-3 and B-5 between depths of 1 to 5 feet from the subject site was obtained. The sample was transported to the offices of EGLAB to determination of the “R” value. The approximate location of the test holes within which bag samples were taken is shown on the enclosed Site Plan; Drawing No.1.

Using an “R” value of 11, the minimum pavement section alternatives for Traffic Index (TI) values ranging from 4 to 7 were calculated. The results are shown on the enclosed Calculation Sheet No. 1.

The lower TI value of 4 is normally used for passenger cars, including pickup trucks. The higher TI value of 7 is normally used for heavier traffic (trucks, including garbage trucks).

The R-value used for this project was for the upper soils. If, during site grading, imported fill should be used, the “R” value of the imported soils should be determined, and the recommended designed pavement section be modified.

Before pavement sections are placed, the surficial fill should be removed and recompacted. The new fill should be placed under engineering observation and testing, as presented in the preceding sections of this report.

This office should be notified if increased traffic loading condition is expected so that modification to the above given recommendations can be made. A Traffic Engineer should be consulted for design and use of proper pavement sections in the alley and roadway leading to parking entrances.

The base course should be compacted to a relative compaction of 95 percent per relative compaction. The soil engineer should verify the compaction degree of the pavement section subgrade and base course.

ON-SITE PERCOLATION TESTING

It is our understanding that, as part of the site development, it is required to provide an on-site storm water infiltration system. This normally consists of diversion of the storm water into a system that will allow infiltration into the ground. The infiltration zone should normally be kept away from existing and proposed building foundations and private property lines by at least 10 feet.

Where space is available, a horizontal system “trench drain” is used. For this project, we have only tested for horizontal drain system. The testing for horizontal system were conducted in Test Pits (Perc-1&2). The enclosed Site Plan; Drawing No. 1, shows the approximate location of the test pits, and within which the percolation testing was conducted.

The procedure for trench system design included performing the following tasks at the subject site:

1. Excavating each test pit to a depth of about 2.5 feet;
2. Extending a one cubic foot (1’ X 1 ’X 1’) hole at the base of the test pits;
3. Pre-saturating the one cubic foot holes overnight;
4. Conducting in-situ percolation testing the following day;
5. Making engineering evaluation/analysis/calculations;

The test pit diameter was at least 4 feet to allow entry and water level measurements. One cubic foot holes (1’ X1’ X 1’) were excavated at the bottom of the test pits on December 2, 2020 and presoaked for percolation test.

Next day, on the day of percolation test, there was freestanding water in the test pits. The water used to presoak the test pits did not percolate. Our close examination indicated that the upper soils are fine grained (silt and clay). As a result, the percolation test was not performed.

On the basis of the above, therefore, the subject site is considered to be a poor candidate for infiltration in a form of horizontal (trench drain) system. As such, the storm water can be diverted to the areas of planters and landscape. Any excess water, after going through the required filtration, will be carried to the curb line after going through the required on-site filtration process.

Alternatively, onsite soils consist of sand or silty sand soils at depths greater than 10 feet. Therefore, infiltration in a form of vertical (drywell) system could be suitable. However, additional testing is required to quantify the infiltration rate for such a system.

OBSERVATION DURING CONSTRUCTION

The presented recommendations in this report assume that all foundations will be established in properly compacted fill. All footing excavations should be observed and accepted by a representative of this office before reinforcing is placed.

Site grading work should be conducted under observation and testing by a representative of this firm. For proper scheduling, please notify this office at least 24 hours before any observation work is required.

CLOSURE

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

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

-o0o-

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

Engineering Calculations
Drawing No. 1 - Site Plan
Figure No. 1 - Site Vicinity Map
Figure No. 2 - Regional Topographic Map
Figure No. 3 - Regional Geologic Map
Figure No. 4 - Historically Highest Groundwater Map
Appendix I-Method of Field Exploration
Figure Nos. I-1 through I-5
Unified Soil Classification System Figure No. I-6
Appendix II-Methods of Laboratory Testing
Figure Nos. II-1 and II-2
Appendix III – Outside Laboratory Test Results For “R” Value and Corrosivity by the Offices of EGLAB

Respectfully Submitted,

APPLIED EARTH SCIENCES

Fereidoun “Fred” Jahani
Project Engineer
RE62875

Caro J. Minas, President
Geotechnical Engineer
GE 601

FJ/CJM/se

Distribution: (4) Addressee

R-Value (From Lab Testing)
11

Traffic Index (TI)	Gravel Equivelence Factor (G_f)	Gravel Equivelence (GE)	Factor of Safety
4	2.50	0.456	1.1
5	2.50	0.570	1.1
6	2.32	0.737	1.1
7	2.14	0.932	1.1

Pavement Section Thickness (inches)						
Traffic Index (TI)	Full Tac*		Alternative No. 1		Alternative No. 2	
	Tac*(in)	Tbc** (in)	Tac*(in)	Tbc** (in)	Tac*(in)	Tbc** (in)
4	6	0	4	5	3	7 2/4
5	7 2/4	0	5	6 1/4	4	8 3/4
6	9 3/4	0	7	6 1/4	6	8 3/4
7	12 1/4	0	8	9 1/4	7	11 1/4

* Tac=Thickness of Asphalt Concrete (2" Minimum)

**Tbc= Thickness of Base Course (Class III) with R-Value of 78 or Better (3" Minimum)

Flexible Pavement Design Data

FOR: Benton Rd.&Panfield Ln, Winchester	**DATE**: 1/19/21	**PROJECT NO.:** 20-679-02
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C.M. APPLIED EARTH SCIENCES
a division of Applied Soil Technology, Inc.

SLOT CUT ANALYSIS

JN: **20-679-02** CONSULT: **AES**
CLIENT: **Benton Rd & Panfield Ln, Winchester**

CALCULATION SHEET # **2**

CALCULATE THE FACTOR OF SAFETY OF SLOT CUT EXCAVATIONS. ASSUME COHESIVE AND FRICTIONAL RESISTANCE ALONG THE SIDES OF SLOTS AS WELL AS THE FAILURE SURFACE. THE HORIZONTAL PRESSURE ON THE SIDES OF THE SLOTS IS THE AT-REST PRESSURE (1-SIN(phi)).

CALCULATION PARAMETERS

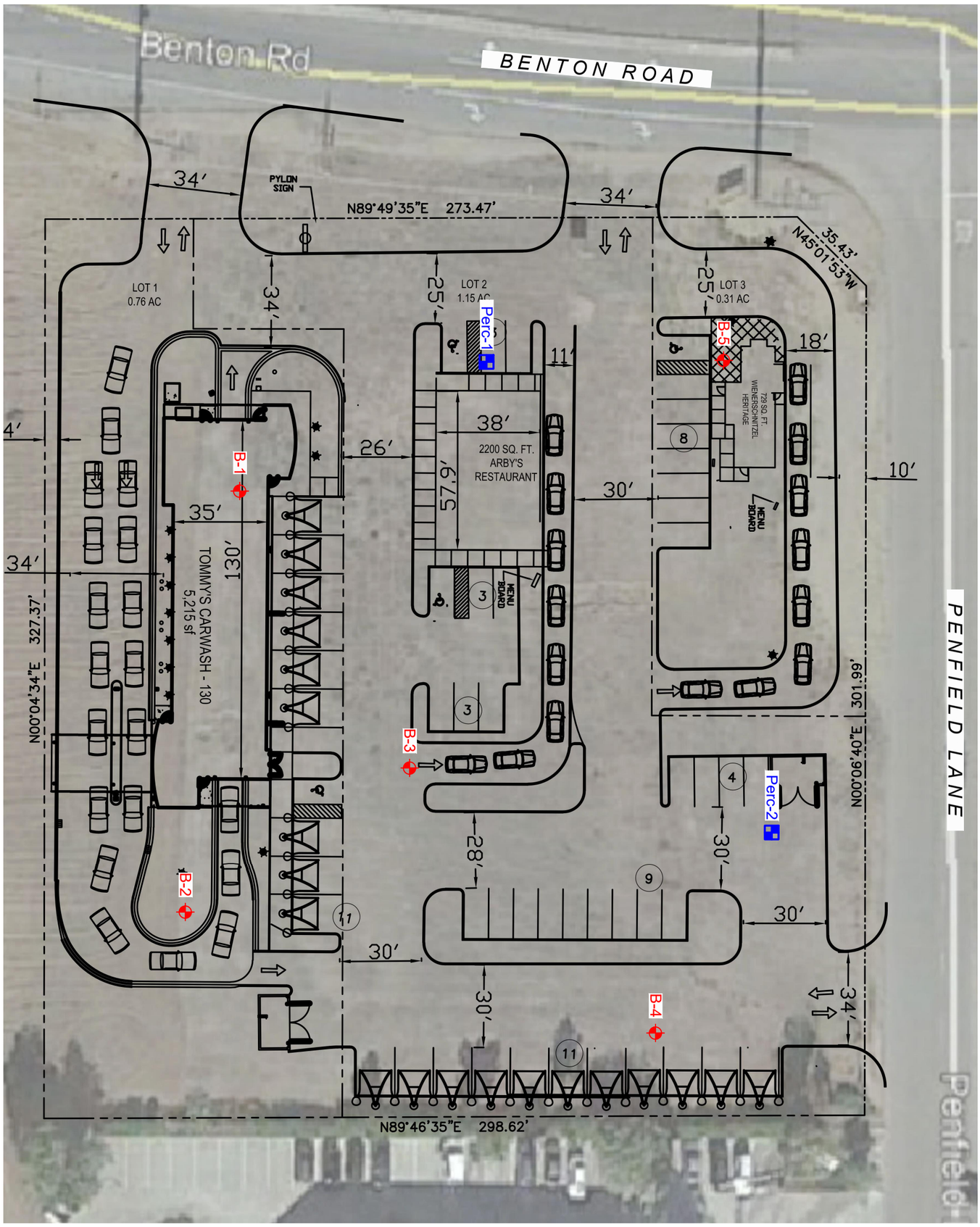
EARTH MATERIAL:	FILL and Native Soils	EXCAVATION HEIGHT:	5 feet
SHEAR DIAGRAM:	B-1, B-4, and B-5	BACKSLOPE ANGLE:	0 degrees
COHESION:	225 psf	SURCHARGE:	0 pounds
PHI ANGLE:	29 degrees	SURCHARGE TYPE:	P Point
DENSITY:	126 pcf	INITIAL FAILURE ANGLE:	17 degrees
SLOT BOUNDARY CONDITIONS		FINAL FAILURE ANGLE:	70 degrees
SLOT CUT WIDTH:	8 feet	INITIAL TENSION CRACK:	5 feet
COHESION:	225 psf	FINAL TENSION CRACK:	20 feet
PHI ANGLE:	29 degrees		

CALCULATED RESULTS

CRITICAL FAILURE ANGLE	42	degrees
HORIZONTAL DISTANCE TO UPSLOPE TENSION CRACK	5.0	feet
DEPTH OF TENSION CRACK	0.5	feet
TOTAL EXTERNAL SURCHARGE	0.0	pounds
VOLUME OF FAILURE WEDGE	110.0	ft^3
WEIGHT OF FAILURE WEDGE	13854.9	pounds
LENGTH OF FAILURE PLANE	6.7	feet
SURFACE AREA OF FAILURE PLANE	54	ft^2
SURFACE AREA OF SIDES OF SLOTS	13.7	ft^2
NUMBER OF TRIAL WEDGES ANALYZED	14850	trials
TOTAL RESISTING FORCE ALONG WEDGE BASE (FrB)	4675.9	pounds
TOTAL RESISTING FORCE ALONG WEDGE SIDES (FrS)	2446.7	pounds
RESULTANT HORIZONTAL COMPONENT OF FORCE	**-62.6**	**pounds**
CALCULATED FACTOR OF SAFETY	**2.59**	

CONCLUSIONS:

THE CALCULATION INDICATES THAT SLOTS CUTS UP TO 8 FEET WIDE AND 5 FEET HIGH HAVE A SAFETY FACTOR GREATER THAN 1.25 AND ARE TEMPORARILY STABLE.



Scale: 1" = 40'

N

Perc-2 = Percolation Test, Shallow Trench System

B-5 = Location & Number of Boring

Note:
Site plan prepared by using a plan provided by the client

SITE PLAN		PROJECT No:	20-679-02
DESCRIPTION:	Proposed Commercial Plaza Project	DATE:	01 / 25 / 2021
FOR:	Cross Engineering Services, LLC	DRAWN BY:	VM
ADDRESS:	Southwest Corner of Benton Road & Panfield Lane, Winchester (Riverside County), CA 92596	CHECKED BY:	CM
Applied Earth Sciences	GEOTECHNICAL . GEOLOGY . ENVIRONMENTAL ENGINEERING CONSULTANTS	DRAWING No:	1

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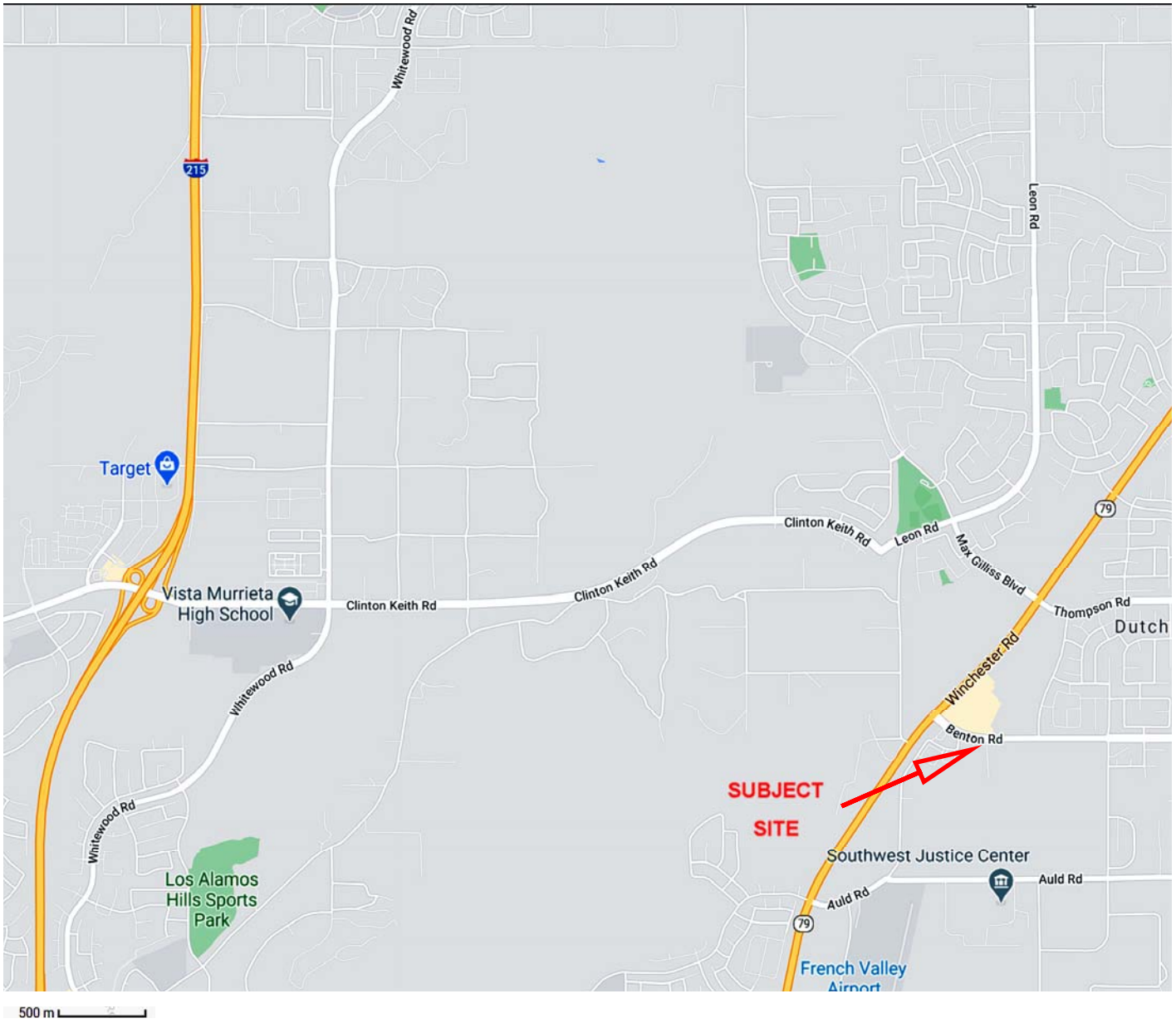

Reference: Portion of Google Maps

SITE VICINITY MAP

Proposed Commercial Plaza Project	SW Corner of Benton Rd. & Panfield Lane, Winchester (Riverside County), CA 92596

FOR	DATE	PROJECT No.
Cross Engineering Services, LLC	01 / 25 / 2021	20-679-02

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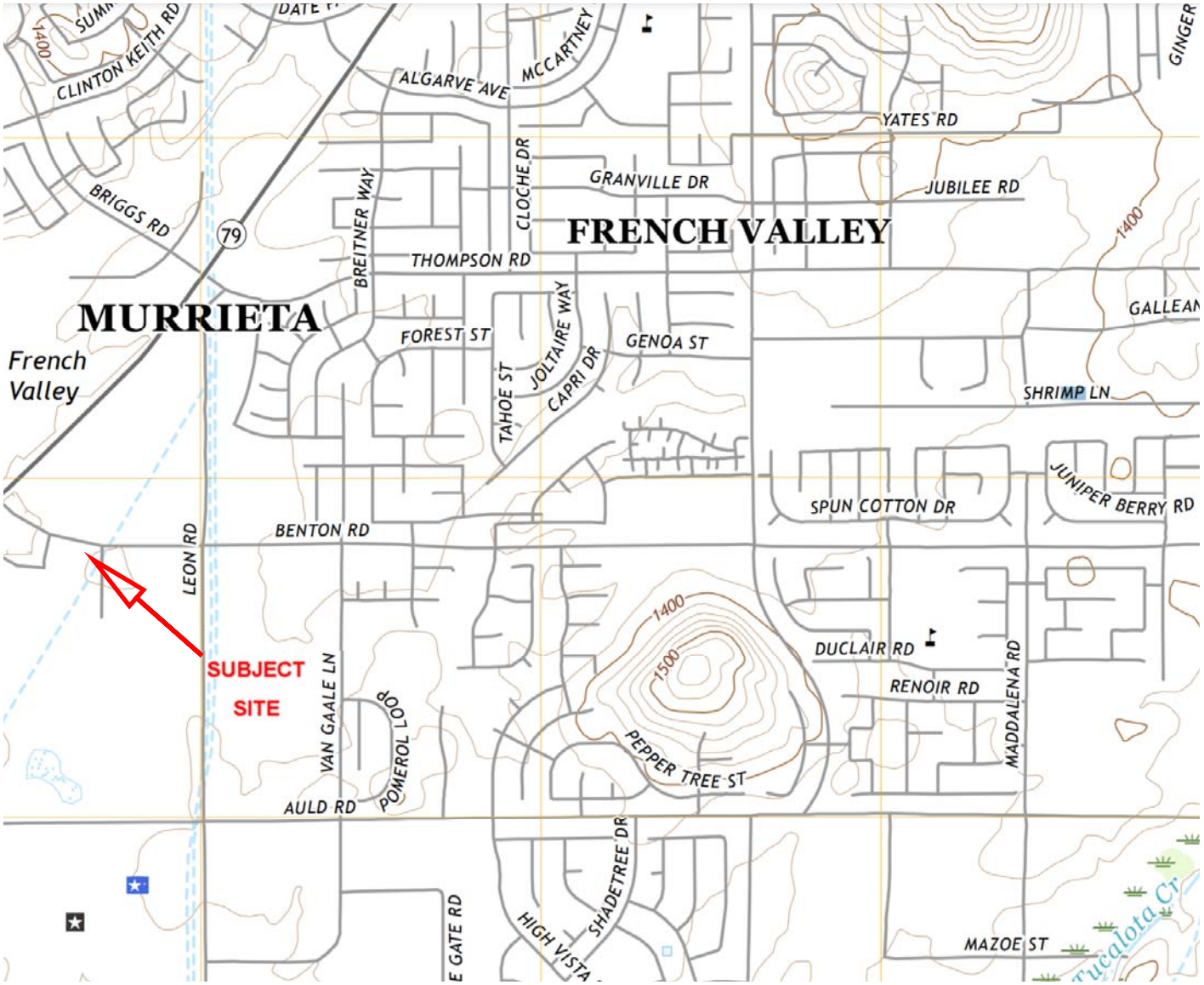
FIGURE No. 1



Reference: USGS Topo Map

REGIONAL TOPOGRAPHIC MAP

Proposed Commercial Plaza Project	SW Corner of Benton Rd. & Panfield Lane, Winchester (Riverside County), CA 92596

FOR	DATE	PROJECT No.
Cross Engineering Services, LLC	01 / 25 / 2021	20-679-02

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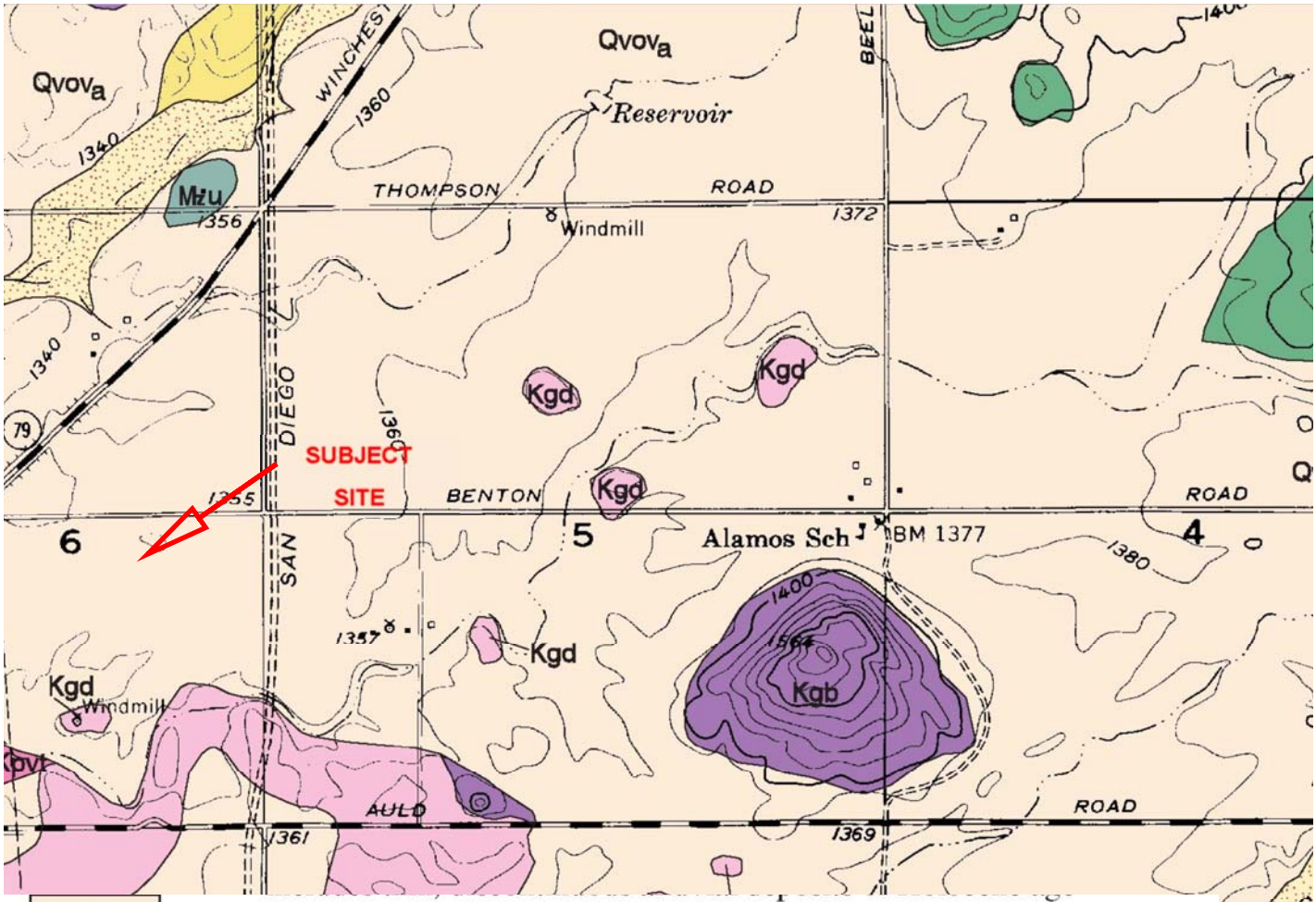
FIGURE No. 2



Qvov

Very old alluvial valley deposits (middle to early Pleistocene)—Fluvial sediments deposited on broad canyon floors. Consists of moderately to well-indurated, reddish-brown, mostly very dissected gravel, sand, silt, and clay-bearing alluvium. In places, includes thin, discontinuous alluvial deposits of Holocene age

N

1 ½ 0 1 MIL

Reference: Dibblee Geologic Map of the Bachelor Mountain Quadrangle

REGIONAL GEOLOGIC MAP

Proposed Commercial Plaza Project	SW Corner of Benton Rd. & Panfield Lane, Winchester (Riverside County), CA 92596

FOR	DATE	PROJECT No.
Cross Engineering Services, LLC	01 / 25 / 2021	20-679-02

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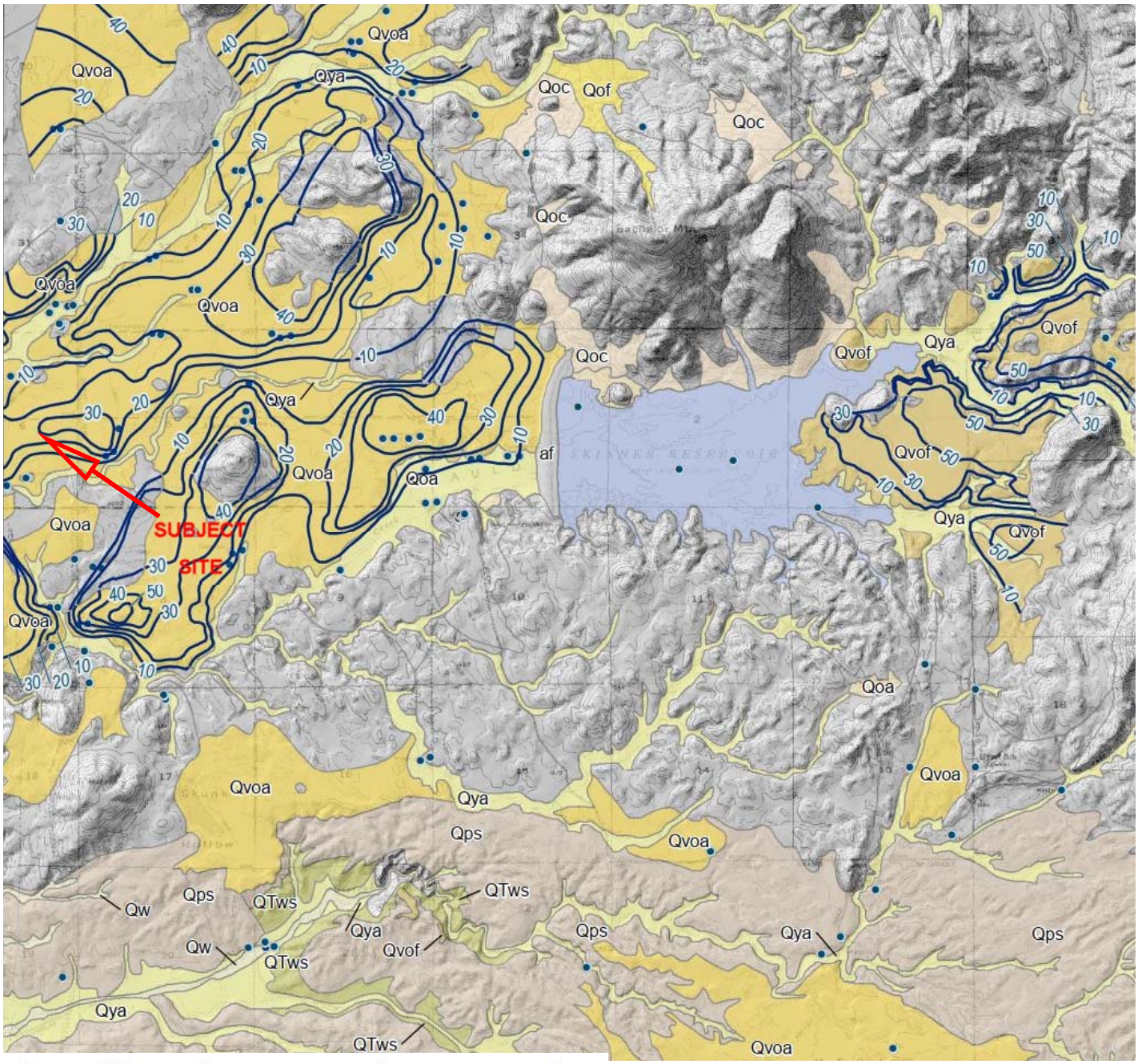
FIGURE No. 3



Reference: Bachelor Mountain 7.5 Minute Quadrangle

HISTORICALLY HIGHEST GROUNDWATER (Contour Map)

Proposed Commercial Plaza Project	SW Corner of Benton Rd. & Panfield Lane, Winchester (Riverside County), CA 92596

FOR	DATE	PROJECT No.
Cross Engineering Services, LLC	01 / 25 / 2021	20-679-02

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FIGURE No. 4

APPENDIX I
METHOD OF FIELD EXPLORATION

In order to define the subsurface conditions, five borings were drilled using a hollow stem drilling machine at the subject site. The approximate locations of the boring and test pits are shown on the enclosed Site Plan; Drawing No. 1.

Logs of the subsurface materials, as encountered in the borings, were recorded in the field and are presented Figure Nos. I-1 through I-5 within Appendix I. These figures also show the number and approximate depths of each of the recovered soil samples.

Relatively undisturbed samples of the subsoil were obtained by driving a steel sampler with successive drops of a 140-pound standard sampling hammer free-falling a vertical distance of about 30 inches. The number of blows required for one foot of sampler penetration was recorded at the time of drilling and are shown on the log of exploratory borings. The relatively undisturbed soil samples were retained in brass liner rings 2.5 inches in diameter and 1.0 inch in height.

Field investigation for this project was performed on December 2, 2020. The materials excavated from the test borings were placed back and compacted upon completion of the field work. Such materials may settle. The owner should periodically inspect these areas and notify this office if the settlements create a hazard to person or property.

LOG OF BORING NO.1

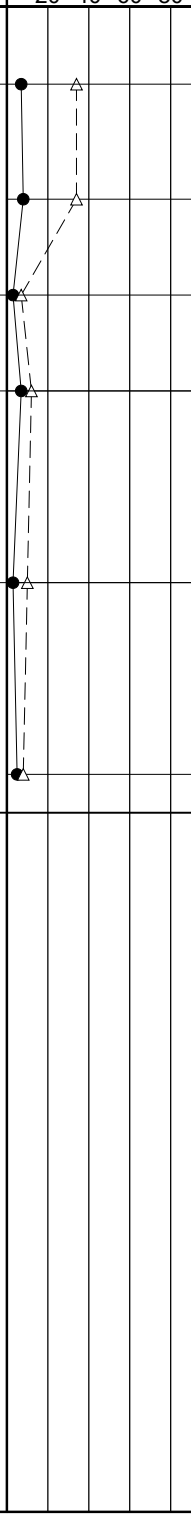
20-679-02

SW Corner of Benton Road & Penfield Lane, Winchester, CA 92596

Type: Hollow Stem Auger, With 140 Lb Hammer Logged by: Daniel

Location: *See Site Plan*

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SPT BLOWS/FT	BLOWS PER FT	% Moisture	UNIT DRY WT LB/CU FT	% -200
0			(SM) FILL: Sand, moderately compact, dry, brown, silty sand.					
			(SM) SAND: Dense, slightly moist to moist, brown to light brown, silty fine to medium grained sand.		32	7	120	34
5			(SM) Grades to dense to very dense, yellowish brown.		50	8	111	34
			(SP) Grades to slightly moist, light brown, fine to medium grained sand, little to no silt.		48	3	116	7
10			(SP/SM) Grades to slightly moist to moist, some silt.		55	7	114	12
15			(SP) Grades to slightly moist, grayish white, fine to coarse grained sand with gravel.		50	3	122	10
20			(SP) Grades to slightly moist to moist, grayish brown.		52	5	121	8
			End of Boring @ 21' No Groundwater Encountered Hole Backfilled.					
25								
30								
35								



COMPLETION DEPTH: 21
DATE: December 2, 2020

DEPTH TO WATER> INITIAL:
FINAL:

LOG OF BORING NO.2

20-679-02

SW Corner of Benton Road & Penfield Lane, Winchester, CA 92596

Type: Hollow Stem Auger, With 140 Lb Hammer Logged by: Daniel

Location: *See Site Plan*

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SPT BLOWS/FT	BLOWS PER FT	% Moisture	UNIT DRY WT LB/CU FT	% -200 - △ % Moisture - ● 20 40 60 80	% -200
0			(SM) FILL: Sand, moderately compact, dry, brown, silty sand.						
		■	(SM) SAND: Very dense, slightly moist to moist, brown, silty fine to medium grained sand.		50	5	127		
5		■	(CL) CLAY: Very stiff, moist, dark brown, sandy clay.		50/10"	13	133		
10		■	(SP-SM) SAND: Very dense, slightly moist to moist, light brown, gravelly fine to coarse grained sand with silt.		50	7	117		
15		■	(SP-SM) Grades to grayish brown to grayish white, more gravelly.		50/11"	5	128		
			End of Boring @ 16' No Groundwater Encountered Hole Backfilled.						
20									
25									
30									
35									

COMPLETION DEPTH: 16 DEPTH TO WATER> INITIAL:

DATE: December 2, 2020 FINAL:

LOG OF BORING NO.3

20-679-02

SW Corner of Benton Road & Penfield Lane, Winchester, CA 92596

Type: Hollow Stem Auger, With 140 Lb Hammer Logged by: Daniel

Location: *See Site Plan*

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SPT BLOWS/FT	BLOWS PER FT	% Moisture	UNIT DRY WT LB/CU FT	% -200 - △ % Moisture - ● 20 40 60 80	% -200
0			(SM) FILL: Sand, moderately compact, dry, brown, silty sand.						
			(CL) CLAY: Very stiff, slightly moist to moist, brown, sandy clay.		50	7	118		
5			(SM-ML) SAND: Dense to very dense, moist, light brown, fine to medium grained sand-silt mixture.		42	13	110		
10			(SP/SM) Grades to slightly moist light brown, fine to medium grained sand with silt.		48	4	107		
			End of Boring @ 11' No Groundwater Encountered Hole Backfilled.						
15									
20									
25									
30									
35									

COMPLETION DEPTH: 11 DEPTH TO WATER> INITIAL:

DATE: December 2, 2020 FINAL:

LOG OF BORING NO.4

20-679-02

SW Corner of Benton Road & Penfield Lane, Winchester, CA 92596

Type: Hollow Stem Auger, With 140 Lb Hammer Logged by: Daniel

Location: *See Site Plan*

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SPT BLOWS/FT	BLOWS PER FT	% Moisture	UNIT DRY WT LB/CU FT	% -200 - △ % Moisture - ● 20 40 60 80	% -200
0			(SM) FILL: Sand, moderately compact, dry, brown, silty sand.						
			(SM) SAND: Dense, slightly moist to moist, brown, silty fine grained sand.		32	10	108		
5			(SM) Grades to very dense, slightly moist, light brown, silty fine to medium grained sand.		50	6	107		
			(SP) Grades to slightly moist, light brown to grayish white, gravelly fine to coarse grained sand.		51	3	123		
10			(SP-SM) Grades to light brown, slightly less gravelly.		42	3	117		
15			(SM) Grades to dense, moist, olive, silty fine grained sand.		36	13	117		
			End of Boring @ 16' No Groundwater Encountered Hole Backfilled.						
20									
25									
30									
35									

COMPLETION DEPTH: 16 DEPTH TO WATER> INITIAL:

DATE: December 2, 2020 FINAL:

LOG OF BORING NO.5

20-679-02

SW Corner of Benton Road & Penfield Lane, Winchester, CA 92596

Type: Hollow Stem Auger, With 140 Lb Hammer Logged by: Daniel

Location: *See Site Plan*

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	SPT BLOWS/FT	BLOWS PER FT	% Moisture	UNIT DRY WT LB/CU FT	% -200 - △ % Moisture - ● 20 40 60 80	% -200
0			(SM) FILL: Sand, moderately compact, dry, brown, silty sand.						
			(CL) CLAY: Very stiff, moist, dark brown, sandy clay.		36	12	129		
5			(ML) SILT: Firm, moist, yellowish brown, slightly sandy silt.		20	14	91		
10			(SP-SM) SAND: Very dense, slightly moist, light brown, fine to medium grained sand with silt.		50/7"	5	115		
15			(SP) Grades to slightly moist to moist, grayish white, gravelly fine to coarse grained sand, little to no silt.		50/8"	11	116		
			End of Boring @ 16' No Groundwater Encountered Hole Backfilled.						
20									
25									
30									
35									

COMPLETION DEPTH: 16 DEPTH TO WATER> INITIAL:

DATE: December 2, 2020 FINAL:

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAME
COARSE GRAINED SOILS (More than 50% of material is LARGER than No. 200 sieve size)	GRAVELS (More than 50% of coarse fraction is LARGER than the No. 4 sieve size)	CLEAN GRAVELS (Little or no fines)	GW	Well graded gravels, gravel - sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amt. of fines)	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS (More than 50% of coarse fraction is SMALLER than the No. 4 sieve size)	CLEAN SANDS (Little or no fines)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES (Appreciable amt. of fines)	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS (More than 50% of material is SMALLER than No. 200 sieve size)	SILTS AND CLAYS (Liquid limit LESS than 50)		ML	Organic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Organic clay 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	Organic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Organic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

BOUNDARY CLASSIFICATIONS: Soils possessing characteristics of two groups are designated by combinations of group symbols.

PARTICLE SIZE LIMITS

UNIFIED SOIL CLASSIFICATION SYSTEM

JOB NAME : Propose Commercial Building Within the Confines of a New Commercial Plaza
South West Corner of Benton Road and Panfield Lane,
Winchester (Riverside County), CA 92596

JOB No. 20-679-02

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FIGURE No. I-6

APPENDIX II

LABORATORY TESTING PROCEDURES

Moisture Density

The moisture-density information provides a summary of soil consistency for each stratum and can also provide a correlation between soils found on this site and other nearby sites. The tests were performed using ASTM D 2216-04 Laboratory Determination of water content Test Method. The dry unit weight and field moisture content were determined for each undisturbed sample, and the results are shown on log of exploratory borings.

Shear Tests

Shear tests were made with a direct shear machine at a constant rate of strain. The machine is designed to test the materials without completely removing the samples from the brass rings. The rate of shear was determined through determination of the rate of consolidation of the foundation bearing materials.

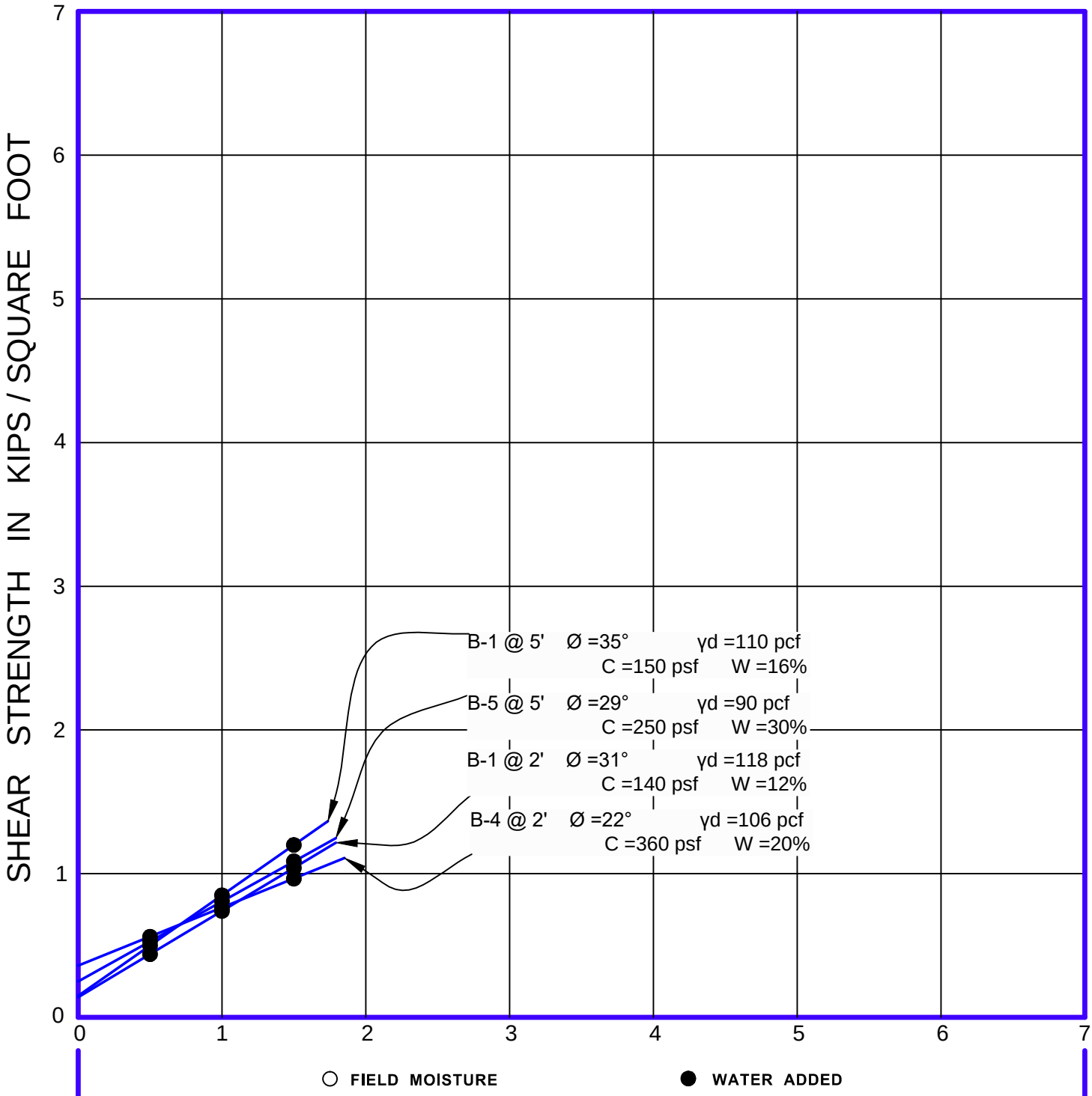
A range of normal stresses was applied vertically, and the shear strength was progressively determined at each load in order to determine the internal angle of friction and the cohesion. The tests were performed using ASTM D 3080-04 Laboratory Direct Shear Test Method. The Ultimate shear strength results of direct shear tests are presented on Figure No. II-1 within this Appendix.

Consolidation

The apparatus used for the consolidation tests is designed to receive the undisturbed brass ring of soil as it comes from the field. Loads were applied to the test specimen in several increments, and the resulting deformations were recorded at time intervals. Porous stones were placed in contact with the top and bottom of the specimen to permit the ready addition or release of water. ASTM D 2435-04 Laboratory Consolidation Test Method.

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

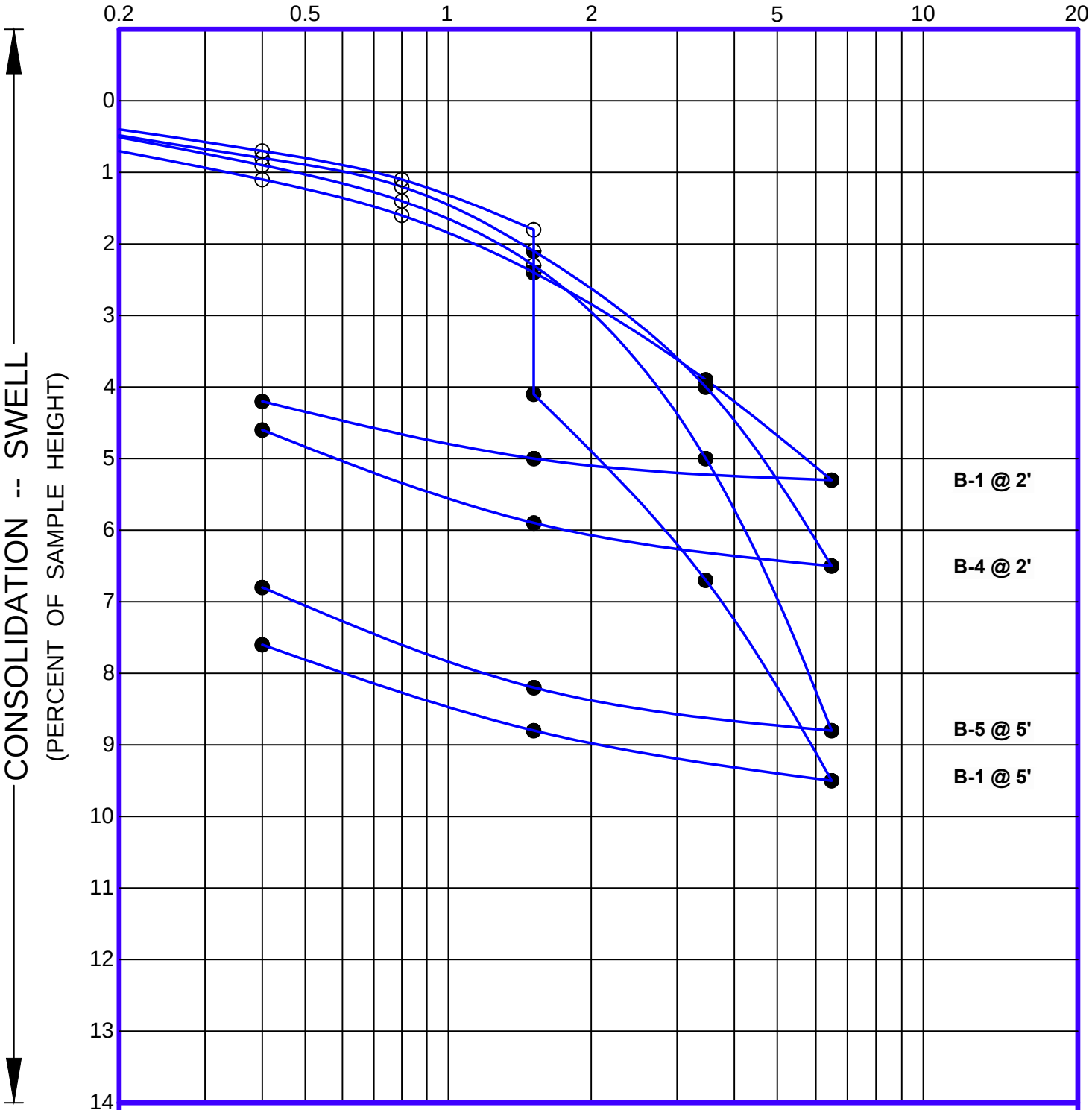
NORMAL STRESS IN KIPS / SQUARE FOOT



DIRECT SHEAR TESTS

JOB NAME : Propose Commercial Building Within the Confines of a New Commercial Plaza South West Corner of Benton Road and Panfield Lane, Winchester (Riverside County), CA 92596	JOB No. 20-679-02
Applied Earth Sciences GEOTECHNICAL . GEOLOGY . ENVIRONMENTAL ENGINEERING CONSULTANTS www.aessoil.com (818) 552-6000	FIGURE No. II - 1

PRESSURE IN KIPS PER SQUARE FOOT



SWELL - CONSOLIDATION TESTS

JOB NAME : Propose Commercial Building Within the Confines of a New Commercial Plaza
South West Corner of Benton Road and Panfield Lane,
Winchester (Riverside County), CA 92596

JOB No. 20-679-02

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ENGINEERING CONSULTANTS
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(818) 552-6000

FIGURE No. II - 2

Appendix III

Outside Laboratory Test Results For “R” Value

By The Offices of EGLAB

Resistance R - Value Testing Results

(Cal Test 301)

Project Name:	Proposed Commercial Buildings
Job No.:	20-679-02
Client:	Applied Earth Sciences
EGLAB Project No.:	20-044-005
Test Date:	12/17/2020
Boring No.:	B-3
Sample No.:	N/A
Depth: (ft)	2.0-5.0
Sample Type:	Bulk
Sample Description:	Sandy clay (CL), brown, trace of fine gravel and vegetation
Tested by:	JT
Checked by:	RJ

Test Specimen Number	1	2	3
Compaction Pressure (psi)	100	150	250
Wet Weight (gms)	1285	1270	1260
Dry Weight (gms)	1123	1123	1123
Tare Weight (gms)	0	0	0
Exudation Load (lbs.)	3028	5016	6399
Total Weight (gms)	2878	3023	2992
Mold Weight (gms)	1782	1919	1871
Sample Weight (gms)	1096	1104	1121
Sample Height (in)	2.48	2.45	2.42
Initial Expansion (in)	0.0000	0.0000	0.0000
Final Expansion (in)	0.0000	0.0000	0.0015
Expansion Pressure (psi)	0.0000	0.0000	0.4545
Ph @ 2000 lbs	140	128	117
D turns	3.71	3.33	3.09
R-Value from Exudation	9	16	23
Density (pcf)	117.1	120.7	125.1
Moisture (%)	14.4	13.1	12.2
Exudation Pressure (psi)	241	399	509
Corrected R-Value from Exudation:	9	16	22
Exudation Pressure (psi)	241	399	509

R-Value at 300 psi exudation pressure = **11**

Note:
0.00% Retained on 3/4-inch Sieve

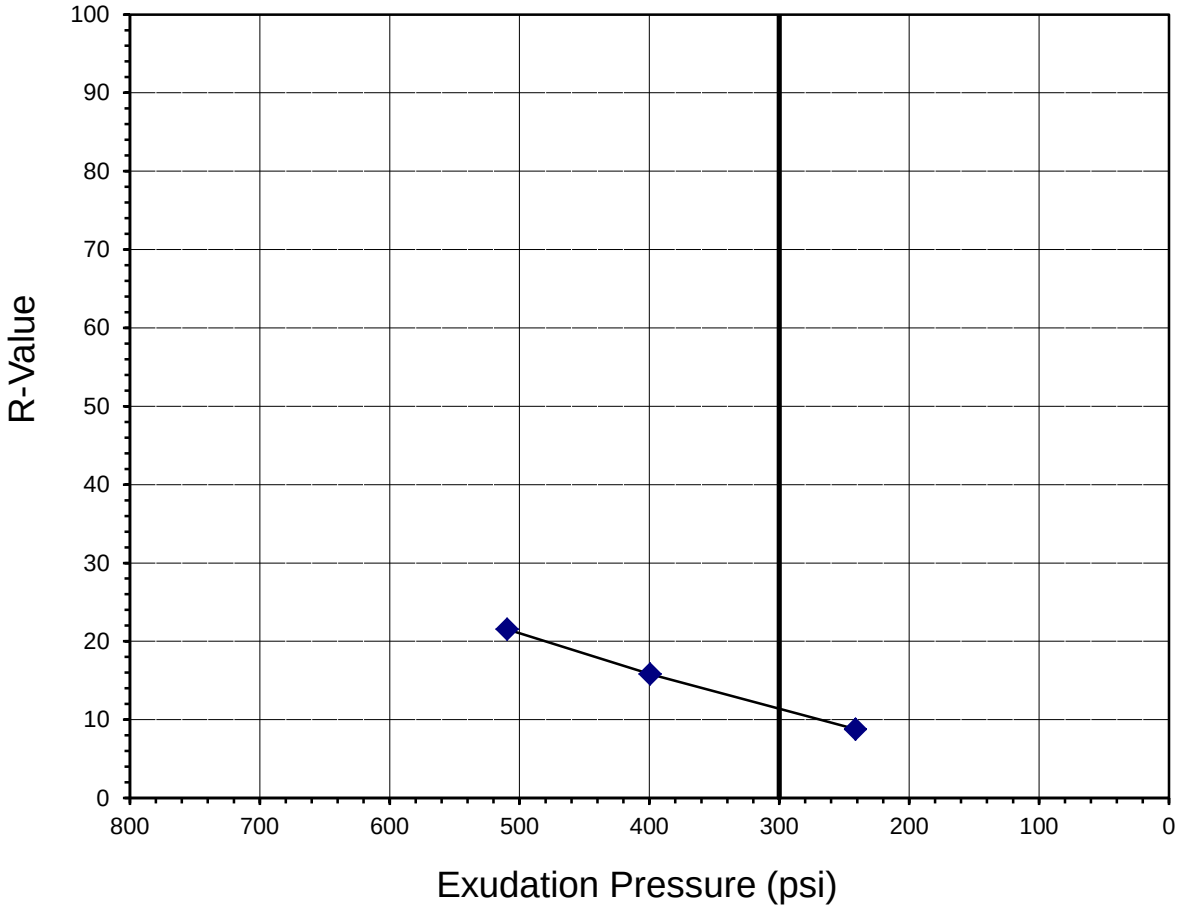
EGLAB, INC.

Project Name: Proposed Commercial Buildings
Client: Applied Earth Sciences
Project No.: 20-679-02
EGLAB Job No.: 20-044-005

R-VALUE TEST RESULTS

12/22/20

FIGURE 2



Test No.	Compaction Pressure (psi)	Density (pcf)	Moisture (%)	Expansion Pressure (psi)	Horizontal Pressure (psi) @ 160 psi	Sample Height (in)	Exudation Pressure (psi)	R-Value	R-Value Correction
1	100	117.1	14.4	0.00	140	2.48	241	9	9
2	150	120.7	13.1	0.00	128	2.45	399	16	16
3	250	125.1	12.2	0.45	117	2.42	509	23	22

Test Name and Method:
Resistance R-Value and Expansion Pressure - Cal Test 301

Boring No.: B-3
Sample No.: N/A
Depth: (ft) 2.0-5.0
Sample Type: Bulk
Sample Description: Sandy clay (CL)
Test Date: 12/17/2020

EGLAB, INC.

Project Name:
Proposed Commercial Buildings
Client: Applied Earth Sciences
Project No.: 20-679-02
EGLAB Job No.: 20-044-005

Test Results: R-Value at 300 psi
Exudation Pressure: **11**

R-VALUE TEST REPORT

12/22/20

FIGURE 1

Resistance R - Value Testing Results

(Cal Test 301)

Project Name:	Proposed Commercial Buildings
Job No.:	20-679-02
Client:	Applied Earth Sciences
EGLAB Project No.:	20-044-005
Test Date:	12/17/2020
Boring No.:	B-5
Sample No.:	N/A
Depth: (ft)	2.0-5.0
Sample Type:	Bulk
Sample Description:	Sandy clay (CL), brown, trace of fine gravel and vegetation
Tested by:	JT
Checked by:	RJ

Test Specimen Number	1	2	3
Compaction Pressure (psi)	150	125	75
Wet Weight (gms)	1280	1295	1310
Dry Weight (gms)	1120	1120	1120
Tare Weight (gms)	0	0	0
Exudation Load (lbs.)	6905	4230	1497
Total Weight (gms)	2977	3084	3063
Mold Weight (gms)	1850	1954	1976
Sample Weight (gms)	1128	1131	1087
Sample Height (in)	2.53	2.60	2.53
Initial Expansion (in)	0.0000	0.0000	0.0000
Final Expansion (in)	0.0012	0.0004	0.0001
Expansion Pressure (psi)	0.3636	0.1212	0.0303
Ph @ 2000 lbs	125	134	141
D turns	3.16	3.56	3.93
R-Value from Exudation	18	12	8
Density (pcf)	118.2	113.9	111.3
Moisture (%)	14.3	15.6	17.0
Exudation Pressure (psi)	550	337	119
Corrected R-Value from Exudation:	18	13	8
Exudation Pressure (psi)	550	337	119

R-Value at 300 psi exudation pressure = **12**

Note:
0.00% Retained on 3/4-inch Sieve

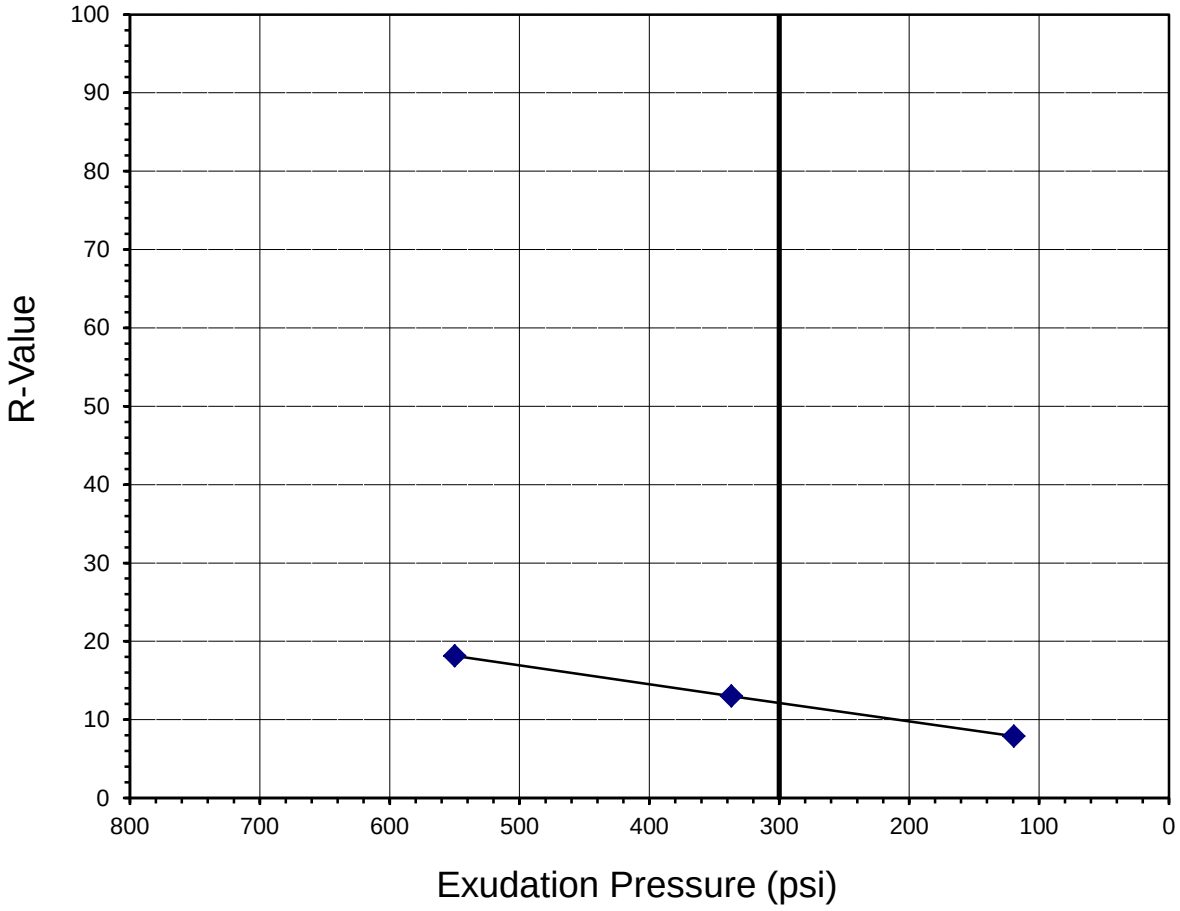
EGLAB, INC.

Project Name: Proposed Commercial Buildings
Client: Applied Earth Sciences
Project No.: 20-679-02
EGLAB Job No.: 20-044-005

R-VALUE TEST RESULTS

12/22/20

FIGURE 2



Test No.	Compaction Pressure (psi)	Density (pcf)	Moisture (%)	Expansion Pressure (psi)	Horizontal Pressure (psi) @ 160 psi	Sample Height (in)	Exudation Pressure (psi)	R-Value	R-Value Correction
1	150	118.2	14.3	0.36	125	2.53	550	18	18
2	125	113.9	15.6	0.12	134	2.60	337	12	13
3	75	111.3	17.0	0.03	141	2.53	119	8	8

Test Name and Method:
Resistance R-Value and Expansion Pressure - Cal Test 301

Boring No.: B-5
Sample No.: N/A
Depth: (ft) 2.0-5.0
Sample Type: Bulk
Sample Description: Sandy clay (CL)
Test Date: 12/17/2020

EGLAB, INC.

Project Name:
Proposed Commercial Buildings
Client: Applied Earth Sciences
Project No.: 20-679-02
EGLAB Job No.: 20-044-005

Test Results: R-Value at 300 psi
Exudation Pressure: **12**

R-VALUE TEST REPORT

12/22/20

FIGURE 1

ALTA CALIFORNIA
GEOTECHNICAL INC.

170 North Maple Street, Suite 108
Corona, CA 92880
www.altageotechnical.com

CROSS ENGINEERING SERVICES, INC.
190 Knox Abbott Dr., Suite 2C
Cayce, SC 29033

April 10, 2023
Project Number 1-0474

Attention: Mr. Joe Cross

Subject: ***SUMMARY OF INFILTRATION TESTING***
Tommy's Commercial Center Project, APNs 221-051-063 & 064
Riverside County, California

References:
1. California Division of Mines and Geology, 2018, Seismic Hazard Zone Report for the Bachelor Mountain 7.5-Minute Quadrangle, Riverside County, California, Report 120.
2. California Department of Water Resources, Water Data Library (WDL) Station Map: https://wdl.water.ca.gov/waterdatalibrary/
3. Applied Earth Sciences, 2021, Report of Geotechnical Investigation and Percolation Testing, Proposed Commercial Plaza Project, PIN/APN: 963070018, Southwest Corner of Benton Road and Penfield Lane, Winchester (Riverside County), California 92596, (Project Number 20-679-02)

Dear Mr. Cross:

Presented herein is Alta California Geotechnical, Inc.'s (Alta's) summary of infiltration testing for the proposed Tommy's Commercial Center Project, APNs 221-051-063 & 064, located southwest of the intersection of Benton Road and Penfield Road, Riverside County, California. The scope of this testing is based on Alta's subsurface investigation and typical WQMP requirements. Presented below is a summary of pertinent groundwater information, our infiltration testing, and conclusions and recommendations based on the data.

Site Geotechnical Conditions

Based on our literature review and previous subsurface investigation conducted by Applied Earth Sciences (2021), the site is underlain by undocumented artificial fill very old alluvial fan deposits. Groundwater was not encountered during the subsurface investigation to a depth of

21 feet below the ground surface. Based on county-provided information, the historic-high groundwater is approximately 30 feet below the ground surface (CDMG, 2018).

Infiltration Testing

Three infiltration tests were recently conducted at locations shown on Plate 1, identified as P-1 through P-3. These tests were conducted in 15-feet deep borings, excavated with a hollow stem auger drill rig, utilizing percolation test methods in general conformance with the County of Riverside Guidance Document for WQMP. The test wells were presoaked at least 24 hours prior to testing. During testing, the water levels were recorded every 10 minutes until the readings stabilized. The data was then adjusted to provide infiltration rates utilizing the Porchet Method.

A summary of the test results is presented below in Table B. The results do not include a factor of safety. The data is presented in Appendix B.

Table B – Summary of Infiltration Testing (No Factor of Safety)

Test Designation	P-1	P-2	P-3
Approximate Depth of Test	15.0 Feet	15.0 Feet	15.0 Feet
Final Time Interval	10 Minutes	10 Minutes	10 Minutes
Radius of Test Hole	4 inches	4 inches	4 inches
Average Head over Time (Havg)	44 inches	40 inches	46 inches
Tested Infiltration Rate	1.4 inches/hour	4.6 inches/hour	2.7 inches/hour

Conclusions and Recommendations

Based on our observations and testing, the upper soils are comprised of very fine to fine grained sandy clays and clayey sands that exhibit relatively low infiltration rates. Below approximately 8 to 10 feet, the fine-grained soils are underlain by coarser sand that exhibits higher infiltration rates. The WQMP designer should review the test results and determine if the proposed BMP system is appropriate for the site. A factor of safety should be applied to the results that is in accordance with County of Riverside requirements.

From a geotechnical perspective, allowing storm water to infiltrate the onsite soil in concentrated areas increases the potential for settlement, liquefaction, and water-related damage to structures/improvements, such as wet slabs or pumping subgrade. Care should be taken in designing systems that control the storm water as much as possible. A methodology for dealing with overflow should the infiltration system become clogged or full should be developed and maintained.

It is recommended that the Project Geotechnical Consultant observe the BMP excavations during construction to verify that the infiltration rates presented herein are appropriate. If it is determined that rates may be variable, additional infiltration testing should be undertaken.

Limitations

The conclusions and recommendations presented in this report are based on our infiltration test results and experience with similar soil conditions on similar projects. Materials adjacent to or beneath those observed may have different characteristics than those observed, and no precise representations are made as to the quality or extent of the materials not observed.

If you have any questions or should you require any additional information, please contact the undersigned at (951) 509-7090. Alta appreciates the opportunity to provide geotechnical consulting services for your project.

Sincerely,
Alta California Geotechnical, Inc.

LOGAN A. MARQUETTE
Civil Engineering Associate

SCOTT A. GRAY/RGE 2857
Reg. Exp.: 12-31-24
Registered Geotechnical Engineer
President

Distribution: (1) Addressee

LM SAG 1-0474 April 10, 2023 (Infiltration Testing, Tommys Commercial Center, French Valley)

APPENDIX A

Boring Logs

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0474	PROJECT NAME	Benton Road and Penfield Lane		
DATE STARTED	3/31/23	GROUND ELEV.	1358	BORING DESIG.	P-1
DATE FINISHED	3/31/23	GW DEPTH (FT)		LOGGED BY	LM
DRILLER	2R Drilling Incorperated	DRIVE WT.	N/A	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	N/A		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
					SC	**ARTFICIAL FILL - UNDOCUMENTED** (afu): SANDY CLAY/CLAYEY SAND, very fine to fine grained, brown, wet, medium dense.				
	1355				SC	**VERY OLD ALLUVIAL VALLEY DEPOSITS** (Qvov): SANDY CLAY/CLAYEY SAND, very fine to fine grained, tannish brown, moist.				
5										
	1350				SM	@7.5ft.: SILTY SAND, very fine to fine grained, tan, dry.				
10					SP	@10ft.: SAND, fine to medium grained, tan, dry, trace silt.				
	1345									
15						TOTAL DEPTH: 15 Feet. NO GROUNDWATER ENCOUNTERED. NO CAVING OBSERVED.				

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

GROUNDWATER
SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0474 PLATE A-1

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0474	PROJECT NAME	Benton Road and Penfield Lane		
DATE STARTED	3/31/23	GROUND ELEV.	1354	BORING DESIG.	P-2
DATE FINISHED	3/31/23	GW DEPTH (FT)		LOGGED BY	LM
DRILLER	2R Drilling Incorperated	DRIVE WT.	N/A	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	N/A		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
					SC	**ARTFICIAL FILL - UNDOCUMENTED** (afu): SANDY CLAY/CLAYEY SAND, very fine to fine grained, brown, wet, medium dense.				
					SC	**VERY OLD ALLUVIAL VALLEY DEPOSITS** (Qvov): SANDY CLAY/CLAYEY SAND, very fine to fine grained, tannish brown, moist.				
	1350									
5					SM	@5.0ft.: CLAYEY SAND, very fine to coarse grained, brown, moist.				
	1345									
10					SP	@10ft.: SAND, fine to coarse grained, tannish brown, moist.				
	1340									
15						TOTAL DEPTH: 15 Feet. NO GROUNDWATER ENCOUNTERED. NO CAVING OBSERVED.				

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

GROUNDWATER
SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0474 PLATE A-2

GEOTECHNICAL BORING LOG

PROJECT NO.	1-0474	PROJECT NAME	Benton Road and Penfield Lane		
DATE STARTED	3/31/23	GROUND ELEV.	1355	BORING DESIG.	P-3
DATE FINISHED	3/31/23	GW DEPTH (FT)		LOGGED BY	LM
DRILLER	2R Drilling Incorperated	DRIVE WT.	N/A	NOTE	
TYPE OF DRILL RIG	8" Hollow Stem Auger	DROP	N/A		

DEPTH (Feet)	ELEV	SAMPLE TYPE	BLOWS	LITHOLOGY	GROUP SYMBOL	GEOTECHNICAL DESCRIPTION	MOISTURE CONT (%)	DRY (pcf) DENSITY	SAT-URATION (%)	OTHER TESTS
	1355				SC	**ARTFICIAL FILL - UNDOCUMENTED** (afu): SANDY CLAY/CLAYEY SAND, very fine to fine grained, brown, wet, medium dense.				
					SC	**VERY OLD ALLUVIAL VALLEY DEPOSITS** (Qvov): SANDY CLAY/CLAYEY SAND, very fine to fine grained, tannish brown, moist.				
5	1350									
					SM	@7.5ft.: SILTY SAND, very fine to fine grained, tan, dry.				
10	1345				SP	@10ft.: SAND, fine to medium grained, tan, dry, trace silt.				
15	1340					TOTAL DEPTH: 15 Feet. NO GROUNDWATER ENCOUNTERED. NO CAVING OBSERVED.				

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

GROUNDWATER
SEEPAGE
J: JOINTING C: CONTACT
B: BEDDING F: FAULT
S: SHEAR RS: RUPTURE SURFACE

Alta California Geotechnical, Inc.

P.N. 1-0474 PLATE A-3

APPENDIX B

Infiltration Test Data

Project Number	1-0474		
Test Designation	P-1	Date of Test	4/4/2023
Boring Diameter (inches)	8	Test Type	Infiltration

Time (minutes)	Depth of Boring (ft)	Initial Water Level (ft)	Final Water Level (ft)	Change in Height (ft)
30	15	7.80	11.50	-3.70
30	15	7.80	10.20	-2.40
10	15	9.60	10.50	-0.90
10	15	9.80	10.70	-0.90
10	15	10.20	10.90	-0.70
10	15	10.10	10.60	-0.50
10	15	10.60	11.10	-0.50
10	15	11.10	11.55	-0.45

Final Calculations

Initial Height (I) in inches	46.8	
Final height (F) in inches	41.4	
Change in Height (inches)	5.4	
Change in Time (minutes)	10	
Radius of Hole (inches)	4	
Havg (inches)	44.1	Havg= (I-F)/2+I inches
Infiltration Rate (inch/hr)	1.41	Inf. Rate= ((I-F)(60min/hr)(Radius))/time(radius+2(Havg))

Project Number	1-0474		
Test Designation	P-2	Date of Test	4/4/2023
Boring Diameter (inches)	8	Test Type	Infiltration

Time (minutes)	Depth of Boring (ft)	Initial Water Level (ft)	Final Water Level (ft)	Change in Height (ft)
30	15	10.90	14.60	-3.70
30	15	9.60	11.30	-1.70
10	15	9.45	11.30	-1.85
10	15	9.60	11.20	-1.60
10	15	10.50	12.10	-1.60
10	15	9.80	11.30	-1.50
10	15	11.00	12.45	-1.45
10	15	11.00	12.35	-1.35

Final Calculations

Initial Height (I) in inches	48.0	
Final height (F) in inches	31.8	
Change in Height (inches)	16.2	
Change in Time (minutes)	10	
Radius of Hole (inches)	4	
Havg (inches)	39.9	Havg= (I-F)/2+I inches
Infiltration Rate (inch/hr)	4.64	Inf. Rate= ((I-F)(60min/hr)(Radius))/time(radius+2(Havg))

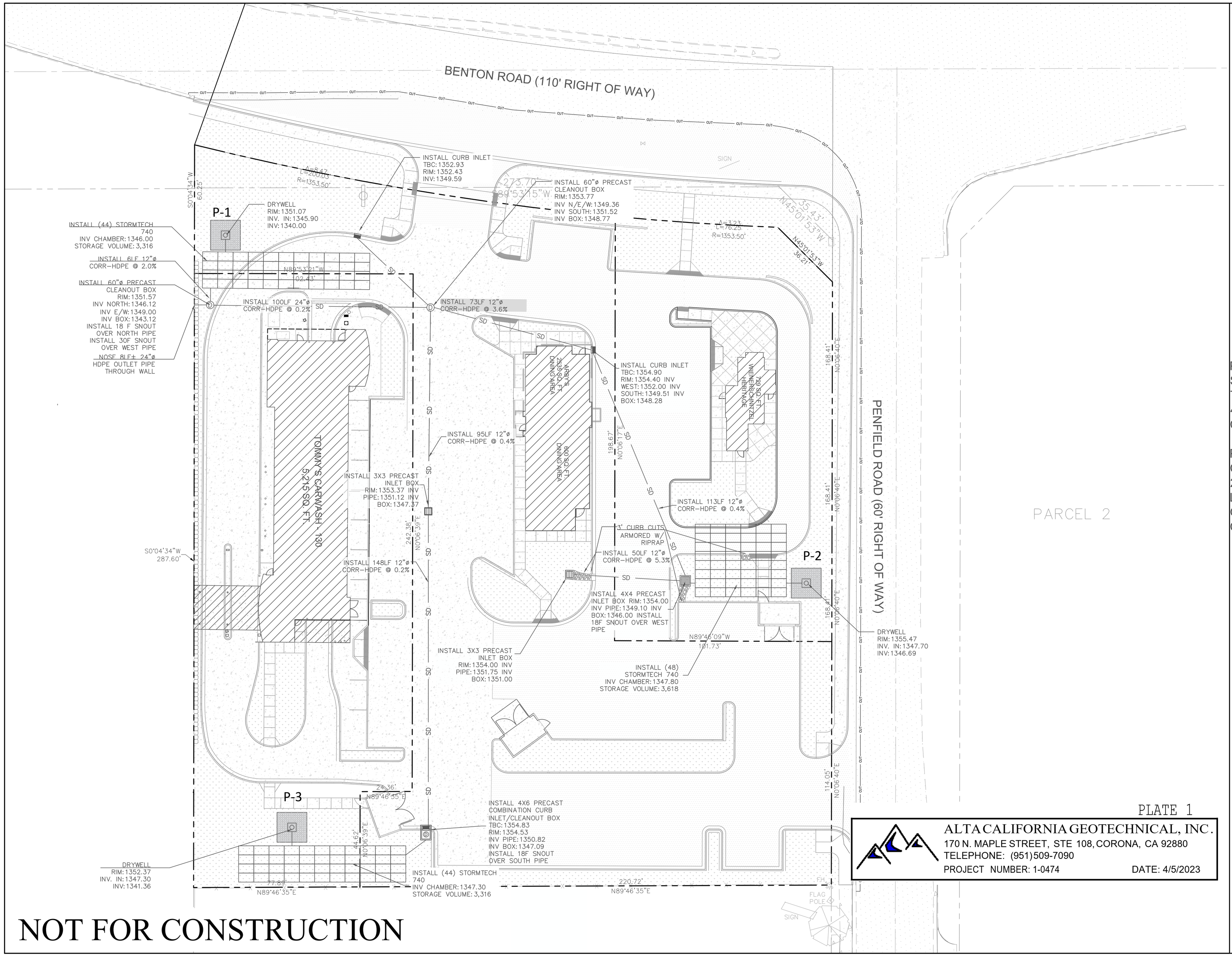
Project Number	1-0474		
Test Designation	P-3	Date of Test	4/4/2023
Boring Diameter (inches)	8	Test Type	Infiltration

Time (minutes)	Depth of Boring (ft)	Initial Water Level (ft)	Final Water Level (ft)	Change in Height (ft)
30	15	7.50	10.20	-2.70
30	15	8.60	11.40	-2.80
10	15	8.90	10.20	-1.30
10	15	9.20	10.45	-1.25
10	15	9.50	10.50	-1.00
10	15	9.40	10.35	-0.95
10	15	9.50	10.50	-1.00
10	15	10.70	11.60	-0.90

Final Calculations

Initial Height (I) in inches	51.6	
Final height (F) in inches	40.8	
Change in Height (inches)	10.8	
Change in Time (minutes)	10	
Radius of Hole (inches)	4	
Havg (inches)	46.2	Havg= (I-F)/2+I inches
Infiltration Rate (inch/hr)	2.69	Inf. Rate= ((I-F)(60min/hr)(Radius))/time(radius+2(Havg))

Plate B-3



NOT FOR CONSTRUCTION

PLATE 1

ALTA CALIFORNIA GEOTECHNICAL, INC.
170 N. MAPLE STREET, STE 108, CORONA, CA 92880
TELEPHONE: (951)509-7090
PROJECT NUMBER: 1-0474 DATE: 4/5/2023

LEGEND

- FH = FIRE HYDRANT
- SSMH = SEWER MANHOLE
- SSCO = SEWER CLEANOUT
- SDMH = STORM DRAIN MANHOLE
- BP = BOLLARD POLE
- CB = CATCH BASIN
- = INLET GRATE
- EMH = ELECTRIC MANHOLE
- EB = ELECTRIC BOX
- EM = ELECTRIC METER
- GM = GAS METER
- PP = POWER POLE
- LP = LIGHT POLE
- TRANS = TRANSFORMER PAD
- TMH = TELEPHONE MANHOLE
- TP = TELEPHONE PEDESTAL
- GP = GUY WIRE
- WMH = WATER MANHOLE
- WV = WATER VALVE
- WM = WATER METER
- MW = MONITOR WELL
- SPB = SPRINKLER BOX
- RD = ROOF DRAIN
- RV = ROOF VENT

Prepared for:
Salim development
Tahir Salim
4740 Green River Road
Corona, CA 92880

Prepared by:
Cross Engineering Services
203 W. Main Street Ste. F3
Lexington, SC 29072
Office: (803) 236-7123
Cell: (801) 391-2391

GRAPHIC SCALE
0 10 20 40
1 inch = 20 ft.

CROSS ENGINEERING SERVICES
203 W. Main Street Ste. F3
Lexington, SC 29072
Office: (803) 236-7123 Cell: (801) 391-2391

DRAFTED BY:
DESIGNED BY: BKS
CHECKED BY: JWC

NO.	REVISION DESCRIPTION	DATE

DRAINAGE PLAN
TOMMYS COMMERCIAL CENTER
January 13, 2023

BENTON RD & PENFIELD LN,
WINCHESTER CA, 92596
APN: 221-051-063 & 064

PROJECT NO.
19-14

SHEET NUMBER
C103

Appendix 4: Historical Site Conditions

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

Examples of material to provide in Appendix 4 may include but are not limited to the following:

- Environmental Site Assessments conducted for the project,
- Other information on Past Site Use that impacts the feasibility of LID BMP implementation on the site.

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 2.3 of the SMR WQMP and Sections D of this Template.

Appendix 5: LID Feasibility Supplemental Information

Information that supports or supplements the determination of LID technical feasibility documented in Section D

Examples of material to provide in Appendix 5 may include but are not limited to the following:

- Technical feasibility criteria for DMAs
- Site specific analysis of technical infeasibility of all LID BMPs (if Alternative Compliance is needed)
- Documentation of Approval criteria for Proprietary Biofiltration BMPs

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 2.3 of the SMR WQMP and Sections D of this Template.

Proprietary Biofiltration Criteria

The applicant shall provide documentation of compliance with each criterion in this checklist as part of the project submittal. Proprietary Biofiltration BMPs shall not be proposed if the BMP will accept undeveloped off-site tributary flows, where potential silt/sediment could clog or otherwise negatively impact the BMP.

1	**All BMPs must be sited/designed with the max. feasible infiltration/evapotranspiration[5].**	
	Requirement	Response
1a	What was the development status of the site prior to project application (i.e. raw ungraded land, or redevelopment with existing graded conditions)? – There will be more expectations to infiltrate if the project is a new development.	
1b	History of design discussions/coordination for the site proposed project, resulting in the final design determination (i.e. infiltration vs. flow-thru):	
1c	The consideration of site design alternatives to achieve infiltration or partial infiltration on site;	
1d	The physical impairments (i.e., fire road egress, public safety considerations, sewer lines, etc.) and public safety concerns (impermeable liners only to avoid geotech or contamination issues);	
1e	The extent low impact development BMP requirements were included in the project site design (site design worksheets can be attached).	
1f	When in the development process (e.g. entitlement or plan check, with dates of geotechnical work and development approval dates) did a geotechnical engineer analyze the site for infiltration feasibility?	
1g	What was the scope of the geotechnical testing?	
1h	What are Public Health and Safety requirements that affect infiltration locations?	
1i	What are the conclusions and recommendations from the geotechnical engineer, in regards to infiltrating/retaining on-site or allowing some or all of the flows to flow-thru as a proprietary BMP?	
1j	How will the proposed proprietary biofiltration BMPs achieve maximum feasible retention	

[5] To address San Diego Regional Board letter dated April 28, 2017 regarding documentation to support infeasibility to retain or infiltrate storm water on-site. This document will be used to meet the Regional Board requirements for documentation. As such, not apply or non-responses will not be accepted.

	(evapotranspiration and infiltration) of the water quality volume, as required by MS4 Permits?	

2	**Proprietary Biofiltration BMP sizing (all proprietary/compact BMPs require TAPE approval)[6]**	
	Requirement	Response
2a	Use Table F-1 and F-2 of the WQMP template to identify and list all the pollutants of concern.	
2b	Attached Active Technology Acceptance Protocol-Ecology (TAPE) certification, with General Use Level Designation (GULD) for all of applicable pollutants of concern	Yes _____ or No_____
2c	The most restrictive loading rates outlined in TAPE GULD approval[7] for all of the pollutants of concern.	
2d	Attach calculations, and all relevant steps to show that the sizing of the proprietary BMP is based on the flowrate (or volume) used to obtain TAPE/GULD approval (the most restrictive rate).	Yes _____ or No_____
2e	Are the infiltration rates are outlet controlled (e.g., via an underdrain and orifice/weir) or controlled by the infiltration rate of the media? Faster infiltration rates thru the media tend to reduce O&M issues.	Is the design infiltration rate controlled by the outlet? Yes _____ or No_____ If No, provide the rates for the outlet and the media and explain why outlet control is not practicable.
2f	Does the water surface drains to at least 12 inches below the media surface within 24 hours from the end of storm event flow to preserve plant health and promote healthy soil structure?	Yes _____ or No_____

3	**Biofiltration BMPs must be designed to promote appropriate biological activity to support and maintain treatment processes.**	
	Requirement	Response
3a	Plants tolerant of project climate, design ponding depths and the treatment media composition.	Provide documentation justifying plant selection.[8]

[6] Full scale field testing data that has been verified by Washington Department of Ecology and General Use Level Designation is required. https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies. Otherwise, the County has no obligation to accept the use of any other proprietary flow-thru BMP. Additional guidance can be found at the end of this checklist from the San Diego BMPDM Appendix F.1 for other verified third-party, field scale testing performance criteria that does not meet the Washington Department of Ecology standards.

[7] E.g. if the BMP was certified/verified with 100 gallons per minute treatment rate, the BMP shall be sized with no more than the equivalent rate).

[8] See Appendix E.20 of the San Deigo BMPDM for initial plan list for consideration for Riverside County.

3b	Plants that minimize irrigation requirements.	Provide documentation describing irrigation requirements for establishment and long term operation.
3c	Plant location and growth will not impede expected long-term media filtration rates and will enhance long-term infiltration rates to the extent possible.	Provide documentation justifying plant selection.[4]
3d	If plants are not applicable to the biofiltration design, other biological processes are supported as needed to sustain treatment processes (e.g., biofilm in a subsurface flow wetland). TAPE GULD approval that identifies approval with and without plants can be submitted for approval.	For biofiltration designs without plants, describe the biological processes that will support effective treatment and how they will be sustained.

4	**Biofiltration BMPs must be designed with a hydraulic loading rate to prevent erosion, scour, and channeling within the BMP. Erosion, scour, and/or channeling can disrupt treatment processes and reduce effectiveness.**	
	Requirement	Response
4a	What pre-treatment devices (e.g. vegetated buffers, catch basin inserts) and designs (e.g. forebay berms with cutouts) are proposed?	
4b	Adequate scour protection has been provided for both sheet flow and pipe inflows to the BMP.	
4c	Where scour protection has not been provided, flows into and within the BMP are kept to non-erosive velocities.	What are the maximum velocities for sheet flow and pipe inflows into the BMP?
4d	The BMP is used in a manner consistent with manufacturer guidelines and conditions of its third-party certification (e.g. maximum tributary area, maximum inflow velocities, etc.).	Manufacturer Requirements vs. the Design
4e	To preserve permeability, the media should have substantial void ratios and avoidance of choking layers.	Provide media gradation calculations and (if proposed) geotextile selection calculations if the geotextile could affect hydraulic loading rate.

5	**Biofiltration BMP must include operation and maintenance design features and planning considerations for continued effectiveness of pollutant removal and flow control functions. Biofiltration BMPs require regular maintenance in order provide ongoing function as intended. Additionally, it is not possible to foresee and avoid potential issues as part of design; therefore, plans must be in place to correct issues if they arise.**	
	Requirement	Response

5a	Is there any media or cartridge required to maintain the function of the BMP sole-sourced or proprietary in any way? If yes, obtain explicit approval by the Agency. Potentially full replacement costs to a non-proprietary BMP needs to be considered.	Yes _____ or No_____, explain:
5b	The maintenance plan specific for the proprietary BMP specific inspection activities, regular/periodic maintenance activities and specific corrective actions relating to scour, erosion, channeling, media clogging, vegetation health, and inflow and outflow structures.	This is in addition to the O&M Plan described in the WQMP guidance document, Section 5.
5c	Adequate site area and features have been provided for BMP inspection and maintenance access.	Illustrate maintenance access routes, setbacks, maintenance features as needed on project water quality plans
5d	For proprietary biofiltration BMPs, the BMP maintenance plan is consistent with manufacturer guidelines and conditions of its third-party certification (i.e., maintenance activities, frequencies).	Yes _____ or No_____
5e	Describe all portions of the BMP that may potentially clog or present an O&M issue.	
5f	Describe design features to address each of the potential clogging or O&M issues.	

By signing below, the preparer certifies all the information provided with this submittal and submittals related to proprietary BMPs for the project is accurate, and relevant information to assess the long term operation and maintenance of this proprietary BMP was not omitted with this submittal.

Prepared by: _____

Title: _____

Signature: _____

Date: _____

Alternative Pollutant Treatment Performance Standard

County staff may allow the applicant to submit alternative third-party documentation that the pollutant treatment performance of the system is consistent with Technology Acceptance Protocol-Ecology certifications. Table F.1-1 describes the required levels of certification and Table F.1-2 describes the pollutant treatment performance levels associated with each level of certification. Acceptance of this approach is at the sole discretion of County staff, preference would be given to:

a. Verified third-party, field-scale testing performance under the Technology Acceptance Reciprocity Partnership Tier II Protocol. This protocol is no longer operated, however this is considered to be a valid protocol and historic verifications are considered to be representative provided that product models being proposed are consistent with those that were tested. Technology Acceptance Reciprocity Partnership verifications were conducted under New Jersey Corporation for Advance Testing and are archived at the website linked below. Note that Technology Acceptance Reciprocity Partnership verifications must be matched to pollutant treatment standards in Table F.1-2 then matched to an equivalent Technology Acceptance Protocol-Ecology certification in Table F.1-1.

b. Verified third-party, field-scale testing performance under the New Jersey Corporation for Advance Testing protocol. Note that New Jersey Corporation for Advance Testing verifications must be matched to pollutant treatment standards in Table F.1-2 then matched to an equivalent Technology Acceptance Protocol- Ecology certification in Table F.1-1. A list of field-scale verified technologies under Technology Acceptance Reciprocity Partnership Tier II and New Jersey Corporation for Advance Testing can be accessed at: http://www.njcat.org/verification-process/technology-verification-database.html (refer to: field verified technologies only).

Table F.1-1: Required Technology Acceptance Protocol-Ecology Certifications for Polltuants of Concern for Biofiltration Performance Standard

Project Pollutant of Concern	Required Technology Acceptance Protocol-Ecology Certification for Biofiltration Performance Standard
Trash	Basic Treatment OR Phosphorus Treatment OR Enhanced Treatment
Sediments	Basic Treatment OR Phosphorus Treatment OR Enhanced Treatment
Oil and Grease	Basic Treatment OR Phosphorus Treatment OR Enhanced Treatment
Nutrients	Phosphorus Treatment[1]
Metals	Enhanced Treatment
Pesticides	Basic Treatment (including filtration)[2] OR Phosphorus Treatment OR Enhanced Treatment
Organics	Basic Treatment (including filtration)[2] OR Phosphorus Treatment OR Enhanced Treatment
Bacteria and Viruses	Basic Treatment (including bacteria removal processes)[3] OR Phosphorus Treatment OR Enhanced Treatment

1 – There is no Technology Acceptance Protocol-Ecology equivalent for nitrogen compounds; however systems that are designed to retain phosphorus (as well as meet basic treatment designation), generally also provide treatment of nitrogen compounds. Where nitrogen is a pollutant of concern, relative performance of available certified systems for nitrogen removal should be considered in BMP selection.
2 – Pesticides, organics, and oxygen demanding substances are typically addressed by particle filtration consistent with the level of treatment required to achieve Basic treatment certification; if a system with Basic treatment certification does not provide filtration, it is not acceptable for pesticides, organics or oxygen demanding substances.
3 – There is no Technology Acceptance Protocol-Ecology equivalent for pathogens (viruses and bacteria), and testing data are limited because of typical sample hold times. Systems with Technology Acceptance Protocol-Ecology Basic Treatment must be include one or more significant bacteria removal process such as media filtration, physical sorption, predation, reduced redox conditions, and/or solar inactivation. Where design options are available to enhance pathogen removal (i.e., pathogen-specific media mix offered by vendor), this design variation should be used.

Table F.1-2: Performance Standards for Technology Acceptance Protocol-Ecology Certification

Performance Goal	Influent Range	Criteria
Basic Treatment	20 – 100 mg/L TSS	Effluent goal ≤ 20 mg/L TSS
	100 – 200 mg/L TSS	≥ 80% TSS removal
	>200 mg/L TSS	> 80% TSS removal
Enhanced (Dissolved Metals) Treatment	Dissolved copper 0.005 – 0.02 mg/L	Must meet basic treatment goal and better than basic treatment currently defined as >30% dissolved copper removal
	Dissolved zinc 0.02 – 0.3 mg/L	Must meet basic treatment goal and better than basic treatment currently defined as >60% dissolved zinc removal
Phosphorous Treatment	Total phosphorous 0.1 – 0.5 mg/L	Must meet basic treatment goal and exhibit ≥50% total phosphorous removal
Oil Treatment	Total petroleum hydrocarbon > 10 mg/L	No ongoing or recurring visible sheen in effluent Daily average effluent Total petroleum hydrocarbon concentration < 10 mg/L Maximum effluent Total petroleum hydrocarbon concentration for a 15 mg/L for a discrete (grab) sample
Pretreatment	50 – 100 mg/L TSS	≤ 50 mg/L TSS
	≥ 200 mg/L TSS	≥ 50% TSS removal

Appendix 6: LID BMP Design Details

BMP Sizing, Design Details and other Supporting Documentation to supplement Section D

Examples of material to provide in Appendix 6 may include but are not limited to the following:

- DCV calculations,
- LID BMP sizing calculations from Exhibit C of the SMR WQMP
- Design details/drawings from manufacturers for proprietary BMPs

This information should support the Full Infiltration Applicability, and Biofiltration Applicability sections of this Template. Refer to Section 3.4 of the SMR WQMP and Sections D.4 of this Template.

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Cross Engineering Services	Date	4/7/2023
Designed by	Paul Shearer	County/City Case No	
Company Project Number/Name			
Drainage Area Number/Name	DMA1		

Enter the Area Tributary to this Feature A_T = 0.77 acres

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

Site Location

Township

Range

Section

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.57

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.77

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.57

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.32 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 894 ft^3

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Cross Engineering Services	Date	4/7/2023
Designed by	Paul Shearer	County/City Case No	
Company Project Number/Name			
Drainage Area Number/Name	DMA 2		

Enter the Area Tributary to this Feature A_T = 0.83 acres

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

Site Location

Township

Range

Section

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.57

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.76

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.55

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.31 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 934 ft^3

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Cross Engineering Services	Date	4/7/2023
Designed by	Paul Shearer	County/City Case No	
Company Project Number/Name			
Drainage Area Number/Name	DMA 3		

Enter the Area Tributary to this Feature A_T = 0.79 acres

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

Site Location

Township

Range

Section

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.57

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Mixed Surface Types

Effective Impervious Fraction I_f = 0.83

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.64

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

V_u = 0.36 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 1,032 ft^3

Notes:

Santa Margarita Watershed

BMP Design Volume, V_{BMP} (Rev. 03-2012)

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	Cross Engineering Services	Date	4/7/2023
Designed by	Paul Shearer	County/City Case No	
Company Project Number/Name			
Drainage Area Number/Name	DMA 4		

Enter the Area Tributary to this Feature A_T = 0.2 acres

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

Site Location

Township

Range

Section

Enter the 85th Percentile, 24-hour Rainfall Depth D_{85} = 0.57

Determine the Effective Impervious Fraction

Type of post-development surface cover (use pull down menu): Concrete or Asphalt

Effective Impervious Fraction I_f = 1.00

Calculate the composite Runoff Coefficient, C for the BMP Tributary Area

Use the following equation based on the WEF/ASCE Method

$C = 0.858I_f^3 - 0.78I_f^2 + 0.774I_f + 0.04$

C = 0.89

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$

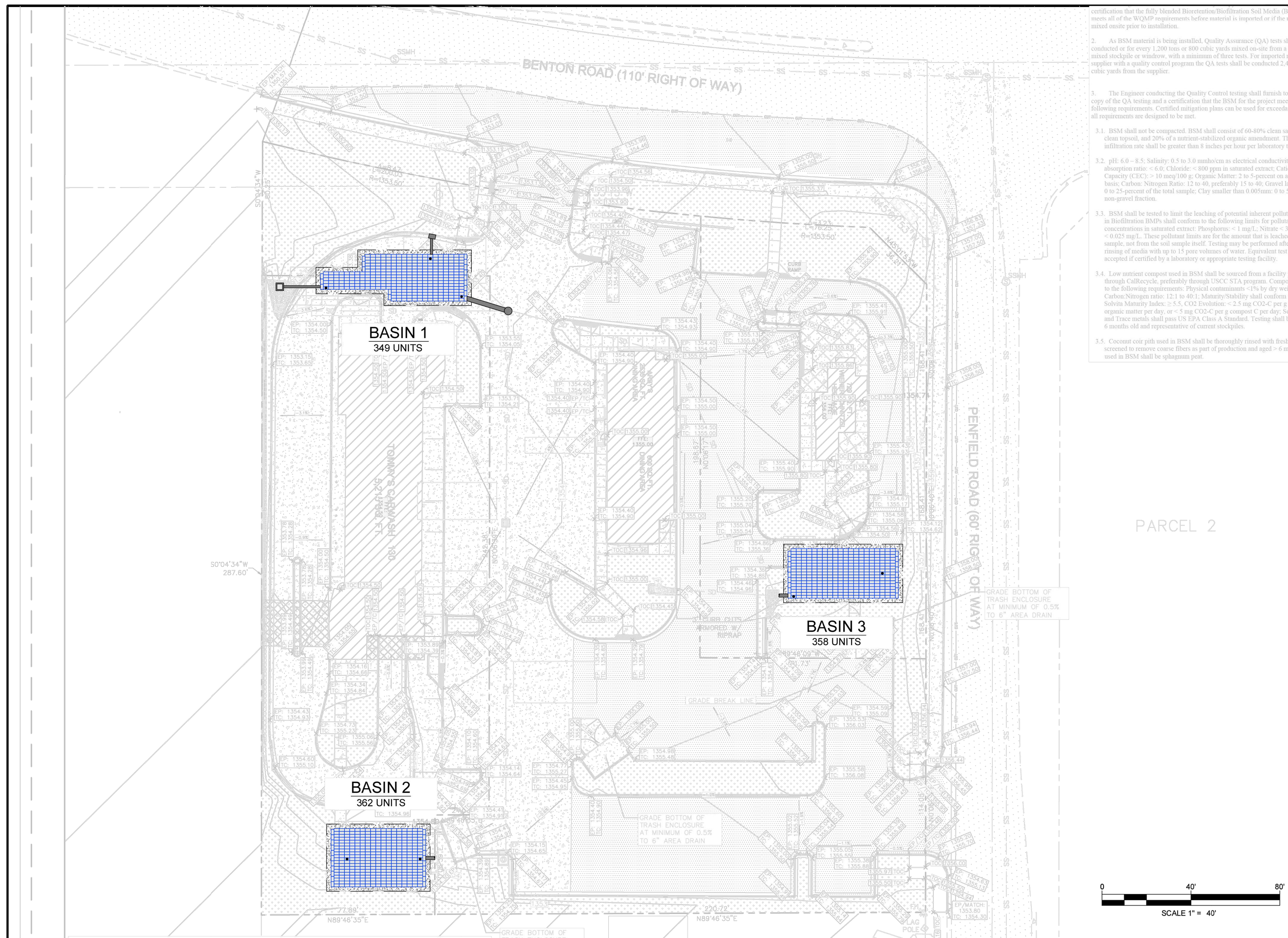
V_u = 0.51 (in*ac)/ac

Calculate the design storage volume of the BMP, V_{BMP}.

$$V_{BMP}\ (ft^3) = \frac{V_U\ (in\text{-}ac/ac) \times A_T\ (ac) \times 43{,}560\ (ft^2/ac)}{12\ (in/ft)}$$

V_{BMP} = 370 ft^3

Notes:



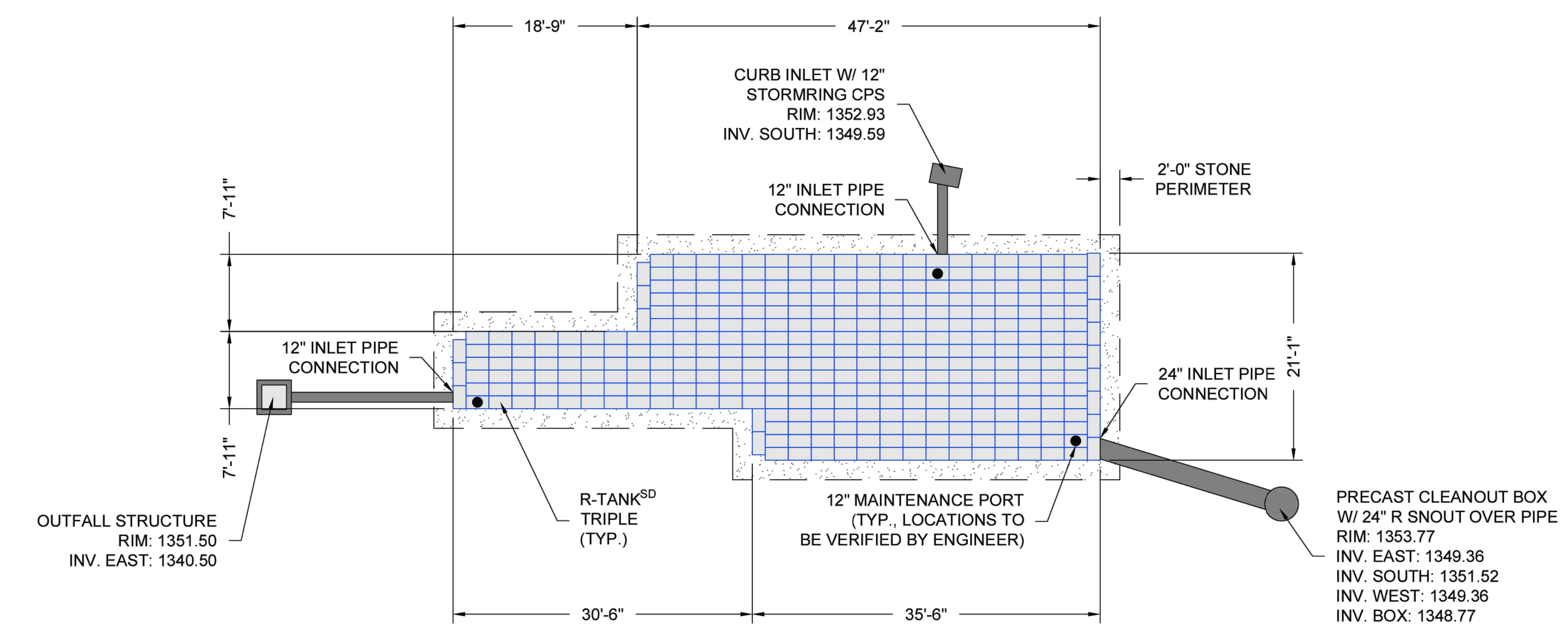
SCALE 1" = 40'

R-TANK[SD] SYSTEM OVERLAY
TOMMYS COMMERCIAL CENTER
WINCHESTER, CA

SCALE 1" = 40' | DRAWN BY JKB | DATE 04/11/2023 | SHEET NO. 1 of 8

FERGUSON WATERWORKS — FOR ADDITIONAL INFORMATION PLEASE CONTACT: FERGUSON WATERWORKS, 1-800-448-3636, www.ferguson.com

R-TANK[SD] — ENGINEER OF RECORD TO REVIEW, APPROVE AND ENDORSE FINAL SITE SPECIFIC DESIGN.



R-TANK QUANTITIES	
R-TANK[SD] MODULE TYPE	TRIPLE
TRAFFIC LOAD	HS-20
# OF TRIPLE R-TANKS	349
TOTAL SYSTEM STORAGE	3,325 CF
R-TANK STORAGE VOLUME	2,277 CF
STONE STORAGE VOLUME (40% VOID RATIO)	1,048 CF
STONE BED FOOTPRINT	1,441 SF
STONE QUANTITY	97 CY
N080 NON-WOVEN GEOTEXTILE TANK WRAP	324 SY
N080 NON-WOVEN GEOTEXTILE EXCAVATION WRAP	453 SY
ACF BX-12 GEOGRID	262 SY
12" MAINTENANCE PORTS	3
GEOTEXTILE PIPE BOOTS (12" | 24")	2 | 1
STORMRING CPS (12")	1
NOTE: STONE QUANTITY INCLUDES 12" OF COVER AND 3" OF BASE.	
NOTE: GEOTEXTILE / LINER QUANTITIES INCLUDE A 15% WASTE FACTOR.	
SEE SHEETS 5 - 8 FOR DETAILS AND ADDITIONAL INFORMATION	

GRAPHIC SCALE

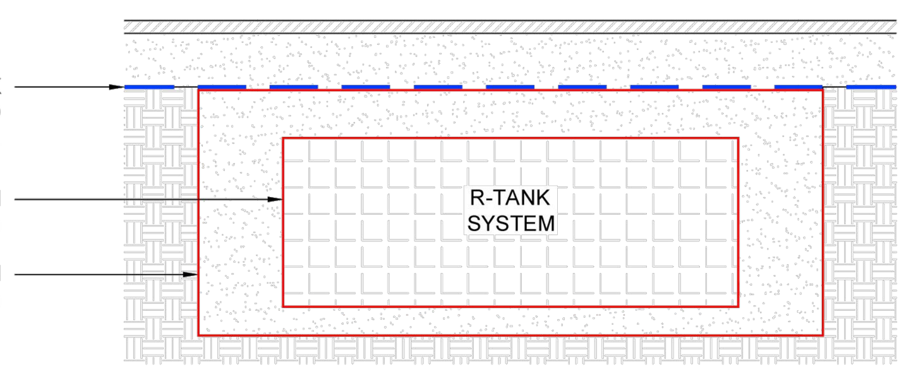
0 — 15' — 30'
SCALE 1" = 15'

R-TANK ELEVATIONS	
DESCRIPTION	ELEVATION
BASE INV.	1339.75
TANK INV.	1341.50
TOP OF TANK	1343.73
GEOGRID	1344.73
MIN. ALLOW. FINAL GRADE	1345.23
MAX. ALLOW. FINAL GRADE	1353.72

GEOGRID (ACF BX-12) PLACED 12" ABOVE THE R-TANK SYSTEM. OVERLAP ADJACENT PANELS BY 18" MIN. GEOGRID SHOULD EXTEND 3' BEYOND THE EXCAVATION FOOTPRINT.

R-TANK[SD] UNITS WRAPPED WITH N080 NON-WOVEN GEOTEXTILE (OR EQUAL)

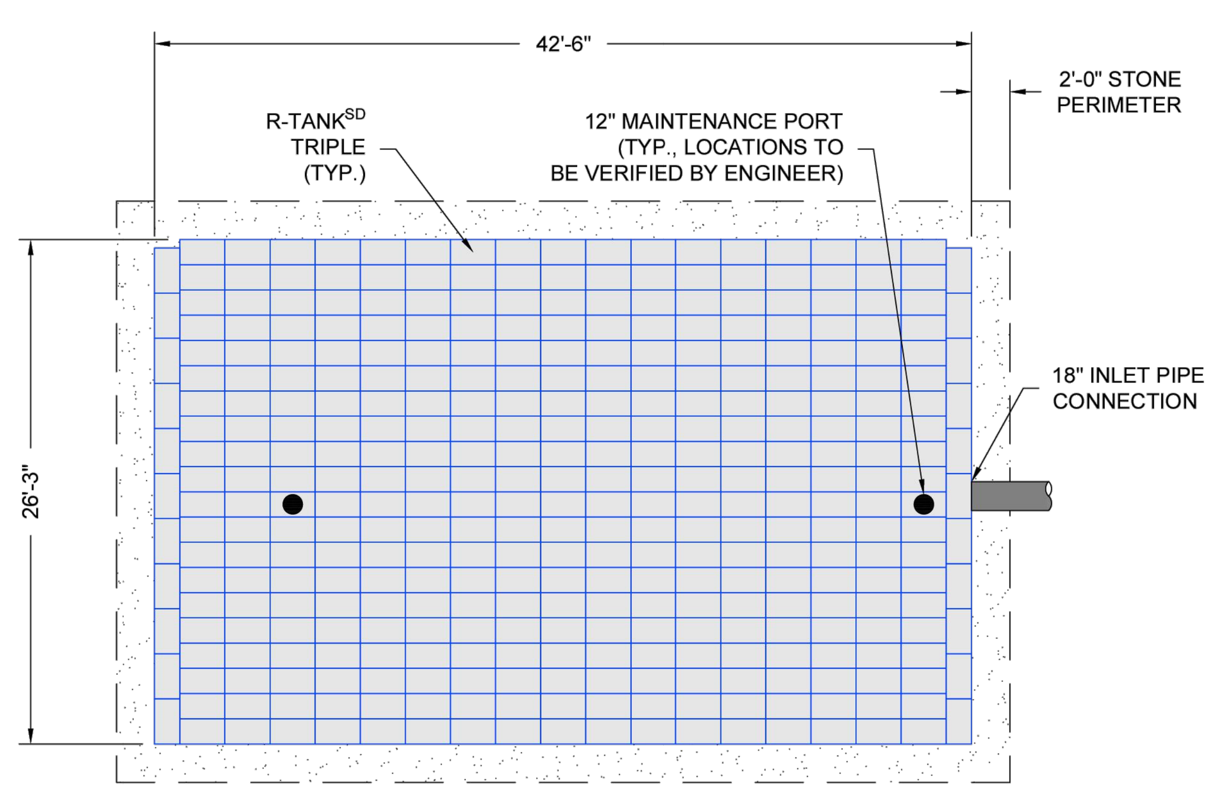
EXCAVATION WRAPPED WITH N080 NON-WOVEN GEOTEXTILE (OR EQUAL)



R-TANK[SD] TANK WRAP & EXCAVATION ENVELOPE DETAIL

R-TANK[SD] SYSTEM LAYOUT
TOMMYS COMMERCIAL CENTER
WINCHESTER, CA

SCALE 1" = 15' | DRAWN BY JKB | DATE 04/11/2023 | SHEET NO. 2 of 8



R-TANK QUANTITIES	
R-TANK[SD] MODULE TYPE	TRIPLE
TRAFFIC LOAD	HS-20
# OF TRIPLE R-TANKS	362
TOTAL SYSTEM STORAGE	3,326 CF
R-TANK STORAGE VOLUME	2,362 CF
STONE STORAGE VOLUME (40% VOID RATIO)	964 CF
STONE BED FOOTPRINT	1,407 SF
STONE QUANTITY	89 CY
N080 NON-WOVEN GEOTEXTILE TANK WRAP	324 SY
N080 NON-WOVEN GEOTEXTILE EXCAVATION WRAP	428 SY
ACF BX-12 GEOGRID	243 SY
12" MAINTENANCE PORTS	2
GEOTEXTILE PIPE BOOTS (18")	1
STORMRING CPS (18")	1
NOTE: STONE QUANTITY INCLUDES 12" OF COVER AND 3" OF BASE.	
NOTE: GEOTEXTILE / LINER QUANTITIES INCLUDE A 15% WASTE FACTOR.	
SEE SHEETS 5 - 8 FOR DETAILS AND ADDITIONAL INFORMATION	

GRAPHIC SCALE

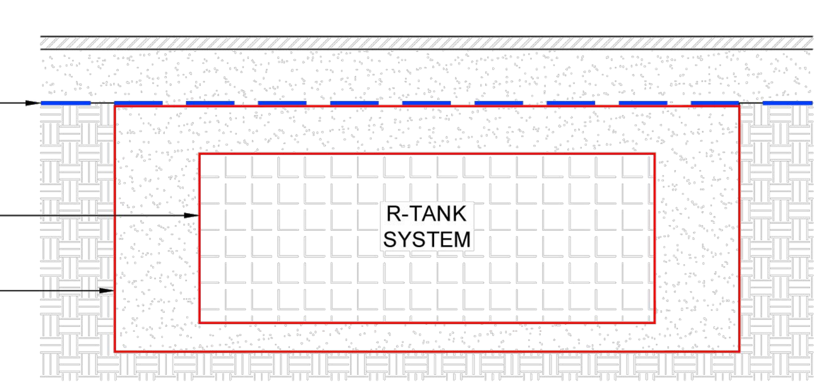
0 — 10' — 20'
SCALE 1" = 10'

R-TANK ELEVATIONS	
DESCRIPTION	ELEVATION
BASE INV.	1341.08
TANK INV.	1343.00
TOP OF TANK	1345.23
GEOGRID	1346.23
MIN. ALLOW. FINAL GRADE	1346.73
MAX. ALLOW. FINAL GRADE	1355.22

GEOGRID (ACF BX-12) PLACED 12" ABOVE THE R-TANK SYSTEM. OVERLAP ADJACENT PANELS BY 18" MIN. GEOGRID SHOULD EXTEND 3' BEYOND THE EXCAVATION FOOTPRINT.

R-TANK[SD] UNITS WRAPPED WITH N080 NON-WOVEN GEOTEXTILE (OR EQUAL)

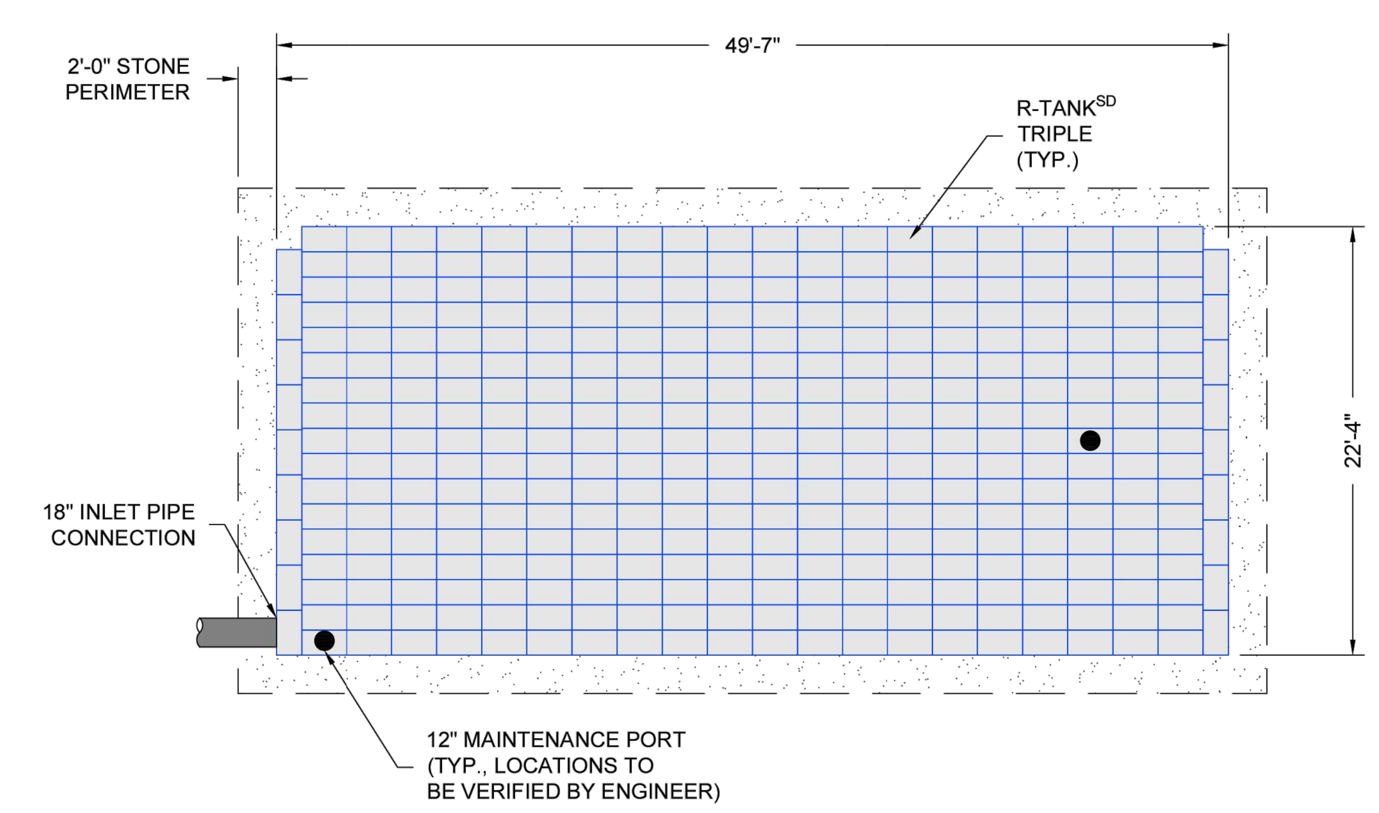
EXCAVATION WRAPPED WITH N080 NON-WOVEN GEOTEXTILE (OR EQUAL)



R-TANK[SD] TANK WRAP & EXCAVATION ENVELOPE DETAIL

R-TANK[SD] SYSTEM LAYOUT
TOMMYS COMMERCIAL CENTER
WINCHESTER, CA

SCALE 1" = 10' | DRAWN BY JKB | DATE 04/11/2023 | SHEET NO. 3 of 8



R-TANK QUANTITIES	
R-TANK[SD] MODULE TYPE	TRIPLE
TRAFFIC LOAD	HS-20
# OF TRIPLE R-TANKS	358
TOTAL SYSTEM STORAGE	3,314 CF
R-TANK STORAGE VOLUME	2,336 CF
STONE STORAGE VOLUME (40% VOID RATIO)	978 CF
STONE BED FOOTPRINT	1,409 SF
STONE QUANTITY	91 CY
N080 NON-WOVEN GEOTEXTILE TANK WRAP	323 SY
N080 NON-WOVEN GEOTEXTILE EXCAVATION WRAP	431 SY
ACF BX-12 GEOGRID	246 SY
12" MAINTENANCE PORTS	2
GEOTEXTILE PIPE BOOTS (18")	1
STORMRING CPS (18")	1
NOTE: STONE QUANTITY INCLUDES 12" OF COVER AND 3" OF BASE.	
NOTE: GEOTEXTILE / LINER QUANTITIES INCLUDE A 15% WASTE FACTOR.	
SEE SHEETS 5 - 8 FOR DETAILS AND ADDITIONAL INFORMATION	

GRAPHIC SCALE

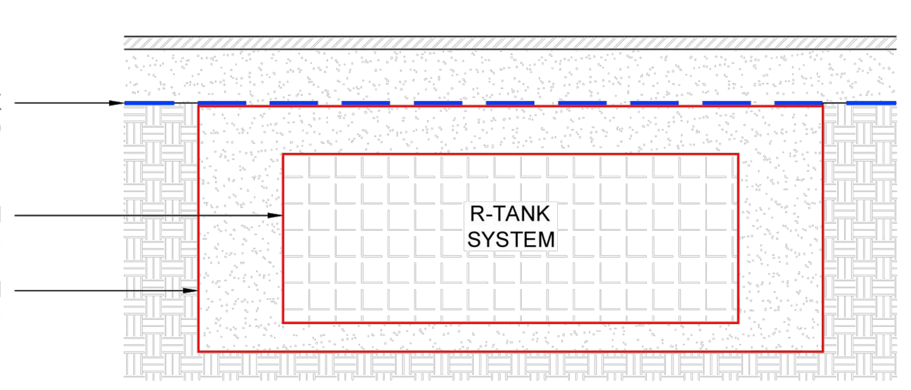
0 — 10' — 20'
SCALE 1" = 10'

R-TANK ELEVATIONS	
DESCRIPTION	ELEVATION
BASE INV.	1346.44
TANK INV.	1346.69
TOP OF TANK	1348.92
GEOGRID	1349.92
MIN. ALLOW. FINAL GRADE	1350.42
MAX. ALLOW. FINAL GRADE	1358.91

GEOGRID (ACF BX-12) PLACED 12" ABOVE THE R-TANK SYSTEM. OVERLAP ADJACENT PANELS BY 18" MIN. GEOGRID SHOULD EXTEND 3' BEYOND THE EXCAVATION FOOTPRINT.

R-TANK[SD] UNITS WRAPPED WITH N080 NON-WOVEN GEOTEXTILE (OR EQUAL)

EXCAVATION WRAPPED WITH N080 NON-WOVEN GEOTEXTILE (OR EQUAL)



R-TANK[SD] TANK WRAP & EXCAVATION ENVELOPE DETAIL

R-TANK[SD] SYSTEM LAYOUT
TOMMYS COMMERCIAL CENTER
WINCHESTER, CA

SCALE 1" = 10' | DRAWN BY JKB | DATE 04/11/2023 | SHEET NO. 4 of 8

NOT FOR CONSTRUCTION

CROSS ENGINEERING SERVICES
203 W. Main Street Ste. F3
Lexington, SC 29072
Office: (803) 236-7123 Cell: (801) 391-2391

DRAFTED BY:
DESIGNED BY: BKS
CHECKED BY: JWC

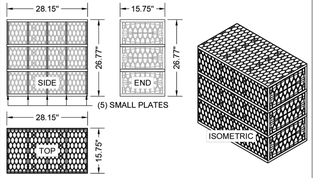
NO.	REVISION DESCRIPTION	DATE

BMP DETAILS
TOMMYS COMMERCIAL CENTER
04/10/2023

BENTON RD & PENFIELD LN,
WINCHESTER CA, 92596
APN: 221-051-063 & 064

PROJECT NO. 19-14

SHEET NUMBER C202



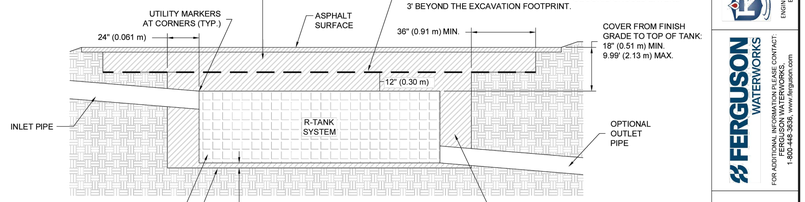
MODULE DATA

GEOMETRY:	**LOAD RATING:**
LENGTH = 28.15 IN. (715 MM)	42.9 PSI, (MODULE ONLY)
WIDTH = 15.75 IN. (400 MM)	HS20/HS25 - SEE SPEC FOR
HEIGHT = 26.77 IN. (680 MM)	COVER REQUIREMENTS
TANK VOLUME = 6.87 CF.	**MATERIAL:**
STORAGE VOLUME = 6.52 CF.	100% RECYCLED POLYPROPYLENE
VOID INTERNAL VOLUME: 95%	**SMALL PLATES REQUIRED:**
VOID SURFACE AREA: 90%	5/SEGMENT, 15/MODULE

TRIPLE R-TANK^{SD} - MODULE DETAIL

TOTAL COVER: 18" MINIMUM AND 9.99' MAXIMUM. FIRST 12" MUST BE FREE DRAINING BACKFILL (SPEC SECTION 2.03B): STONE <1.5" OR SOIL (USCS CLASS GW, GP, SW OR SP). ADDITIONAL FILL MAY BE STRUCTURAL FILL (SPEC SECTION 2.03C): STONE OR SOIL (USCS CLASS SM, SP, SW, GM, GP OR GW) WITH MAX CLAY CONTENT<10%, MAX 25% PASSING NO. 200 SIEVE, AND MAX PLASTICITY INDEX OF 4 A MIN. 12" COVER MUST BE MAINTAINED BETWEEN BACKFILL EQUIPMENT AND THE TOP OF THE R-TANK™ SYSTEM AT ALL TIMES. TOTAL HEIGHT OF TOP BACKFILL SHOULD NOT EXCEED 9.99'. CONTACT FERGUSON WATERWORKS IF MORE THAN 9.99' OR LESS THAN 18" OF TOP BACKFILL IS REQUIRED (FROM TOP OF TANK TO TOP OF PAVEMENT).

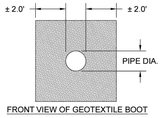
NOTES:
1. FOR COMPLETE MODULE DATA, SEE APPROPRIATE R-TANK^{SD} MODULE SHEET.
2. INSTALLATIONS PER THIS DETAIL MEET GUIDELINES OF HL-93 LOADING PER THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, CUSTOMARY U.S. UNITS, 7TH EDITION, 2014 WITH 2015 AND 2016 INTERIM REVISIONS.
3. PRE-TREATMENT STRUCTURES NOT SHOWN.
4. FOR INFILTRATION APPLICATIONS, GEOTEXTILE ENVELOPING R-TANK SHALL BE ACF M200 (PER SPEC SECTION 2.02A) AND BASE SHALL BE 4" MIN. UNCOMPACTED FREE DRAINING BACKFILL (SPEC SECTION 2.03A) TO PROVIDE A LEVEL BASE. SURFACE MUST BE SMOOTH, FREE OF LUMPS OR DEBRIS, AND EXTEND 2' BEYOND R-TANK^{SD} FOOTPRINT.



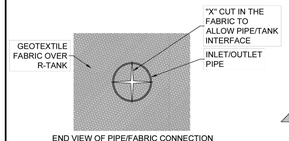
R-TANK^{SD} & HS-20 LOADS - SECTION VIEW

NOTE:
- PIPE BOOTS ARE AVAILABLE IN THE FOLLOWING STANDARD SIZES: 8" | 12" | 15" | 18" | 24".
- LARGER SPECIAL ORDER, CUSTOM SIZES ARE AVAILABLE.

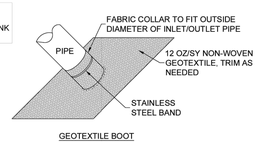
CUT AN "X" IN THE FABRIC ENVELOPE THAT IS SLIGHTLY LARGER THAN THE PIPE. PULL THE FABRIC FLAPS AROUND THE PIPE, AND SEAL WITH A STAINLESS STEEL BAND.



FRONT VIEW OF GEOTEXTILE BOOT

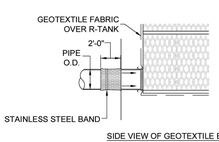


END VIEW OF PIPE/FABRIC CONNECTION

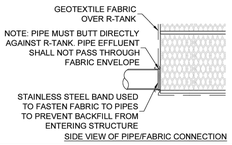


GEOTEXTILE BOOT

AFTER TANK WRAP IS SECURED TO PIPE, SLIDE BOOT AGAINST R-TANK AND SECURE WITH SECOND STAINLESS STEEL BAND, THEN ATTACH BOOT FLAP TO TANK ENVELOPE FABRIC WITH DUCT TAPE OR OTHER ADHESIVE.

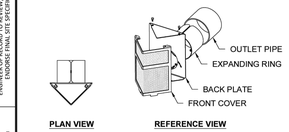


SIDE VIEW OF GEOTEXTILE BOOT

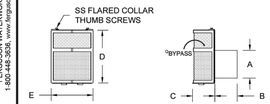


SIDE VIEW OF PIPE/FABRIC CONNECTION

R-TANK TYPICAL TANK INLET/OUTLET W/ GEOTEXTILE PIPE BOOT DETAIL



PLAN VIEW **REFERENCE VIEW**

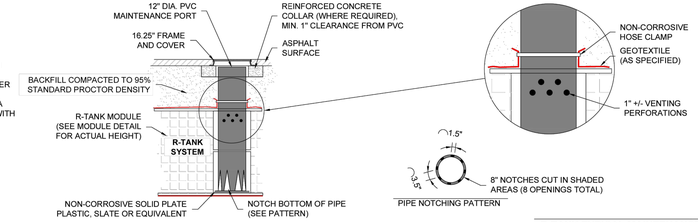


FRONT VIEW **SIDE VIEW**

PIPE DIA. (A)	STUB LENGTH (B)	CPS DEPTH (C)	CPS HEIGHT (D)	CPS WIDTH (E)
6"	4.00"	8.50"	10.00"	10.00"
8"	6.00"	11.00"	12.25"	11.50"
12"	8.00"	16.00"	15.50"	15.50"
15"	8.00"	16.00"	21.50"	18.50"
18"	8.00"	16.00"	28.00"	21.50"

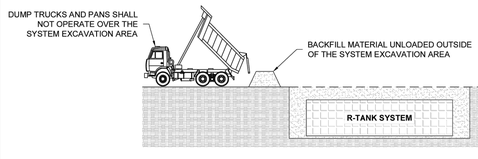
STORMRING CPS PRETREATMENT DETAIL

NOTES
1. THIS PORT IS USED TO PUMP WATER INTO THE SYSTEM AND RE-SUSPEND ACCUMULATED SEDIMENT SO THAT IT MAY BE PUMPED OUT.
2. MINIMUM REQUIRED MAINTENANCE INCLUDES A QUARTERLY INSPECTION DURING THE FIRST YEAR OF OPERATION AND A YEARLY INSPECTION THEREAFTER. FLUSH AS NEEDED.
3. R-TANK^{SD}, R-TANK^{SD}, R-TANK^{SD} AND R-TANK^{SD} MAY BE USED IN TRAFFIC APPLICATIONS.
4. SEE TRAFFIC LOADING DETAIL FOR MINIMUM & MAXIMUM COVER REQUIREMENTS.
5. IF MAINTENANCE PORT IS LOCATED IN A NON-TRAFFIC AREA, A PLASTIC CAP CAN BE USED IN LIEU OF A FRAME AND COVER WITH CONCRETE COLLAR.



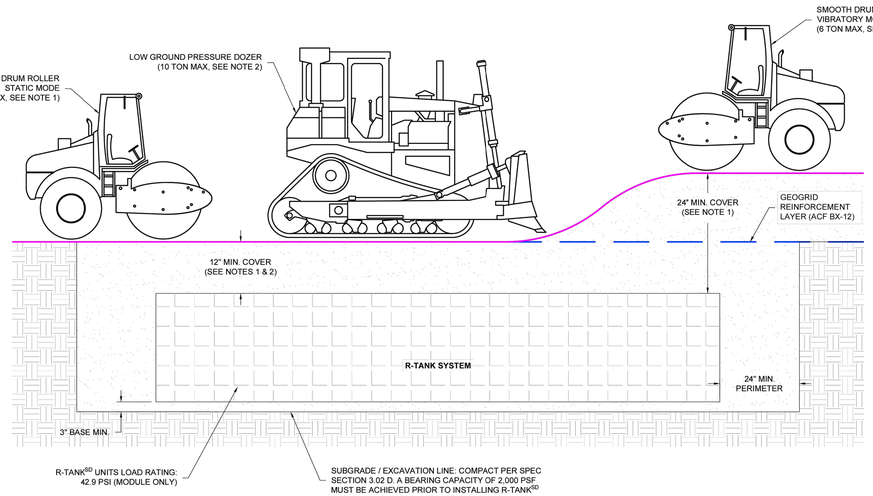
PIPE NOTCHING PATTERN

R-TANK TYPICAL MAINTENANCE PORT



DUMP TRUCK DETAIL (SEE NOTE 3)

NOTES:
1. FOLLOWING PLACEMENT OF SIDE BACKFILL, A UNIFORM 12" LIFT OF THE FREELY DRAINING MATERIAL (SPEC SECTION 2.03 B2) SHALL BE PLACED OVER THE R-TANK AND LIGHTLY COMPACTED USING A WALK-BEHIND TRENCH ROLLER. ALTERNATELY, A TRACKED SURFACE MAXIMUM GROSS VEHICLE WEIGHT OF 8 TONS) MAY BE USED. ROLLER MUST REMAIN IN STATIC MODE UNTIL A MINIMUM OF 24" OF COVER HAS BEEN PLACED OVER THE MODULES. SHEEP FOOT ROLLERS SHOULD NOT BE USED. **SPEC SECTION 3.05 A5**
2. ONLY LOW PRESSURE TIRE OR TRACK VEHICLES (LESS THAN 7 PSI AND OPERATING WEIGHT OF LESS THAN 20,000 LBS) SHALL BE OPERATED OVER THE R-TANK SYSTEM DURING CONSTRUCTION. **SPEC SECTION 3.05 A5**
3. DUMP TRUCKS AND PANS SHALL NOT BE OPERATED WITHIN THE R-TANK SYSTEM AT ANY TIME. WHERE NECESSARY, THE HEAVY EQUIPMENT SHOULD UNLOAD IN AN AREA ADJACENT TO THE R-TANK SYSTEM AND THE MATERIAL SHOULD BE MOVED OVER THE SYSTEM WITH TRACKED EQUIPMENT. **SPEC SECTION 3.05 A5**
4. ENSURE THAT ALL UNRELATED CONSTRUCTION TRAFFIC IS KEPT AWAY FROM THE LIMITS OF EXCAVATION UNTIL THE PROJECT IS COMPLETE AND FINAL SURFACE MATERIALS ARE IN PLACE. NO NON-INSTALLATION RELATED LOADING SHOULD BE ALLOWED OVER THE R-TANK SYSTEM UNTIL THE FINAL DESIGN SECTION HAS BEEN CONSTRUCTED (INCLUDING PAVEMENT). **SPEC SECTION 3.05 B**
5. SEE R-TANK INSTALLATION GUIDE OR CONTACT YOUR LOCAL FERGUSON REPRESENTATIVE FOR ADDITIONAL INFORMATION.



CONSTRUCTION EQUIPMENT COVER DETAIL - VEHICULAR TRAFFIC

R-TANK SPECIFICATION

PART 1 - GENERAL
1.01 RELATED DOCUMENTS
A. Drawings, technical specification and general provisions of the Contract as modified herein apply to this section.

1.02 DESCRIPTION OF WORK INCLUDED
A. Provide excavation and base preparation per geotechnical engineer's recommendations and/or as shown on the design drawings, to provide adequate support for project design loads and safety from excavation sidewall collapse. Excavations shall be in accordance with the owner's and OSHA requirements.
B. Provide and install R-TankLD, R-TankHD/, R-tankSD,/ or R-TankUD/ system (hereafter called R-Tank) and all related products including fill materials, geotextiles, geogrids, inlet and outlet pipe with connections per the manufacturer's installation guidelines provided in this section.
C. Provide and construct the cover of the R-Tank system including; stone backfill, structural fill cover, and pavement section as specified.
D. Protect R-Tank system from construction traffic after installation until completion of all construction activity in the installation area.

1.03 QUALITY CONTROL
A. All materials shall be manufactured in ISO certified facilities.
B. Installation Contractor shall demonstrate the following experience:
1. A minimum of three R-Tank or equivalent projects completed within 2 years; and,
2. A minimum of 25,000 cubic feet of storage volume completed within 2 years.
C. Contractor experience requirement may be waived if the manufacturer's representative provides on-site training and review during construction.
C. Installation Personnel: Performed only by skilled workers with satisfactory record of performance on bulk earthworks, pipe, chamber, or pond/landfill construction projects of comparable size and quality.
D. Contractor must have manufacturer's representative available for site review if requested by Owner.

1.04 SUBMITTALS
A. Submit proposed R-Tank layout drawings. Drawings shall include typical section details as well as the required base elevation of stone and tanks, minimum cover requirements and tank configuration.
B. Submit manufacturer's product data, including compressive strength and unit weight.
C. Submit manufacturer's installation instructions.
D. Submit R-Tank sample for review. Reviewed and accepted samples will be returned to the Contractor.
E. Submit material certificates for geotextile, geogrid, base course and backfill materials.
F. Submit required experience and personnel requirements as specified in Section 1.03.
G. Any proposed equal alternative product substitution to this specification must be submitted for review and approved prior to bid opening. Review package should include third party reviewed performance data that meets or exceeds criteria in Table 2.01 B.

1.05 DELIVERY, STORAGE, AND HANDLING
A. Protect R-Tank and other materials from damage during delivery, and store UV sensitive materials under tarp to protect from sunlight when time from delivery to installation exceeds two weeks. Storage of materials should be on smooth surfaces, free from dirt, mud and debris.
B. Handling is to be performed with equipment appropriate to the materials and site conditions, and may include hand, handcart, forklifts, extension lifts, etc.
C. Cold weather:
1. Care must be taken when handling plastics when air temperature is 40 degrees or below as plastic becomes brittle.
2. Do not use frozen materials or materials mixed or coated with ice or frost.
3. Do not build on frozen ground or wet, saturated or muddy subgrade.

1.06 PREINSTALLATION CONFERENCE.
A. Prior to the start of the installation, a preinstallation conference shall occur with the representatives from the design team, the general contractor, the excavation contractor, the R-Tank installation contractor, and the manufacturer's representative.

1.07 PROJECT CONDITIONS
A. Construct installation for the R-Tank system with other on-site activities to eliminate all non-installation related construction traffic over the completed R-Tank system. No loads heavier than the design loads shall be allowed over the system, and in no case shall loads higher than a standard AASHTO HS20 (or HS25, depending on design criteria) load be allowed on the system at any time.
B. Protect adjacent work from damage during R-Tank system installation.
C. All pre-treatment systems to remove debris and heavy sediments must be in place and functional prior to operation of the R-Tank system. Additional pretreatment measures may be needed if unit is operational during construction due to increased sediment loads.
D. Contractor is responsible for any damage to the system during construction.

PART 2 - PRODUCTS
2.01 R-TANK UNITS
A. R-Tank - Injection molded plastic tank plates assembled to form a 95% void modular structure of predesigned height (custom for each project).
B. R-Tank units shall meet the following Physical & Chemical Characteristics:

PROPERTY	DESCRIPTION	R-Tank^{LD} VALUE	R-Tank^{HD} VALUE	R-Tank^{SD} VALUE	R-Tank^{UD} VALUE
Void Area	Volume available for water storage	95%	95%	95%	95%
Surface Void Area	Percentage of exterior available for infiltration	90%	90%	90%	90%
Vertical Compressive Strength	ASTM D 2412 / ASTM F 2418	30.0 psi	33.4 psi	42.9 psi	134.2 psi
Lateral Compressive Strength	ASTM D 2412 / ASTM F 2418	20.0 psi	22.4 psi	28.9 psi	N/A
HS-20 Minimum Cover	Cover required to support HS-20 loads	N/A	24"	18"	12" (STONE BACKFILL)
HS-25 Minimum Cover	Cover required to support HS-25 loads	N/A	24"	18"	12" (STONE BACKFILL)
Maximum Cover	Maximum allowable cover depth	3 feet	< 7 feet	< 10 feet	5 feet
Unit Weight	Weight of plastic per cubic foot of tank	3.25 lbs / cf	3.92 lbs/cf	4.96 lbs / cf	4.33 lbs / cf
Rib Thickness	Thickness of load bearing members	0.18 inches	0.18 inches	0.18 inches	N/A
Service Temperature	Allowable service range for tank	-14 – 167° F	-14 – 167° F	-14 – 167° F	-14 – 167° F

C. Supplier: Ferguson Waterworks 2831 Cardwell Road Richmond, VA 23234 (T): 800-448-3636; (F): 804-743-7779 www.ferguson.com

2.02 GEOSYNTHETICS
A. Geotextile, geotextile envelope is required to prevent backfill material from entering the R-Tank modules.
1. Standard Application: The standard geotextile shall be an 8 oz per square yard nonwoven geotextile (ACF N080 or equivalent).
2. Infiltration Applications: When water must infiltrate/exfiltrate through the geotextile as a function of the system design, a woven monofilament (ACF M200 or equivalent) shall be used.
B. Geogrid. For installations subject to traffic loads and/or when required by project plans, install geogrid (ACF BX12 or equivalent) to reinforce backfill above the R-Tank system.
C. Geogrid is not always required for R-TankUD/ installations, and is often not required for non-traffic load applications.

2.03 BACKFILL & COVER MATERIALS
A. Bedding Materials: Stone (angular and smaller than 1.5" in diameter) or soil (GW, GP, SW, or SP as classified by the Unified Soil Classification System) shall be used below the R-Tank system (3" minimum). Material must be free from lumps, debris, and any sharp objects that could cut the geotextile. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation. For infiltration applications bedding material shall be free draining.
B. Side and Top Backfill: Material must be free from lumps, debris and any sharp objects that could cut the geotextile. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation.
1. Traffic Applications - Free draining material shall be used adjacent to (24" minimum) and above (for the first 12") the R-Tank system.
a. For HD, and SD modules, backfill materials shall be free draining stone (angular and smaller than 1.5" in diameter) or soil (GW, GP, SW, or SP as classified by the Unified Soil Classification System).
b. For UD modules with less than 14" of top cover, backfill materials shall be free draining stone (angular and smaller than 1.5" in diameter). The use of soil backfill on the sides and top of the UD module is not permitted unless the modules are installed outside of traffic areas or with cover depths of 14" or more. Top backfill material (from top of module to bottom of pavement base or 12" maximum) must be consistent with side backfill.
2. Non-Traffic / Green Space Applications - For all R-Tank modules installed in green spaces and not subjected to vehicular loads, backfill materials may either follow the guidelines for Traffic Applications above, or the top backfill layer (12" minimum) may consist of AASHTO #57 stone blended with 30-40% (by volume) topsoil to aid in establishing vegetation.
C. Additional Cover Materials: Structural Fill shall consist of granular materials meeting the gradational requirements of SM, SP, SW, GM, GP or GW as classified by the Unified Soil Classification System. Structural fill shall have a maximum of 25 percent passing the No. 200 sieve, shall have a maximum clay content of 10 percent and a maximum Plasticity Index of 4. Material shall be within 3 percent of the optimum moisture content as determined by ASTM D698 at the time of installation.

2.04 OTHER MATERIALS
A. Utility Marker: Install metallic tape at corners of R-Tank system to mark the area for future utility detection.

PART 3 - EXECUTION
3.01 ASSEMBLY OF R-TANK UNITS
A. Assembly of modules shall be performed in accordance with the R-Tank Installation Manual, Section 2.

3.02 LAYOUT AND EXCAVATION
A. Installer shall stake out, excavate, and prepare the subgrade area to the required plan grades and dimensions, ensuring that the excavation is at least 2 feet greater than R-Tank dimensions in each direction allowing for installation of geotextile filter fabric, R-Tank modules, and free draining backfill materials.
B. All excavations must be prepared with OSHA approved excavated sides and sufficient working space.
C. Protect partially completed installation against damage from other construction traffic by establishing a perimeter with high visibility construction tape, fencing, barricades, or other means until construction is complete.
D. Base of the excavation shall be uniform, level, and free of lumps or debris and soft or yielding subgrade areas. A minimum 2,000 pounds per square foot bearing capacity is required.
1. Standard Applications: Compact subgrade to a minimum of 95% of Standard Proctor (ASTM D698) density or as required by the Owner's engineer.
2. Infiltration Applications: Subgrade shall be prepared in accordance with the contract documents. Compaction of subgrade should not be performed in infiltration applications.
E. Unsuitable Soils or Conditions: All questions about the base of the excavation shall be directed to the owner's engineer, who will approve the subgrade conditions prior to placement of stone. The owner's engineer shall determine the required bearing capacity of the R-Tank subgrade; however in no case shall a bearing capacity of less than 2,000 pounds per square foot be provided.
1. If unsuitable soils are encountered at the subgrade, or if the subgrade is pumping or appears excessively soft, repair the area in accordance with contract documents and/or as directed by the owner's engineer.
2. If indications of the water table are observed during excavation, the engineer shall be contacted to provide recommendations.
3. Do not start installation of the R-Tank system until unsatisfactory subgrade conditions are corrected and the subgrade conditions are accepted by the owner's engineer.

3.03 PREPARATION OF BASE
A. Place a thin layer (3" unless otherwise specified) of bedding material (Section 2.03 A), over the subgrade to establish a level working platform for the R-Tank modules. Level to within ½" (+/- ¼") or as shown on the plans. Native subgrade soils or other materials may be used if determined to meet the requirements of 2.03 A and are accepted by the owner's engineer.
1. Standard Applications: Static roll or otherwise compact bedding materials until they are firm and unyielding.
2. Infiltration Applications: Bedding materials shall be prepared in accordance with the contract documents.
B. Outline the footprint of the R-Tank system on the excavation floor using spray paint or chalk line to ensure a 2' perimeter is available around the R-Tank system for proper installation and compaction of backfill.

3.04 INSTALLATION OF THE R-TANKS
A. Where a geotextile wrap is specified on the stone base, cut strips to length and install in excavation, removing wrinkles so material lays flat. Overlap geotextile a minimum 12" or as recommended by manufacturer. Use tape, special adhesives, sandbags or other ballast to secure overlaps. As geotextiles can be damaged by extreme heat, smoking is not permissible on/near the geotextile, and tools using a flame to tack the overlaps, such as propane torches, are prohibited.
B. Where an impervious liner (for containment) is specified, install the liner per manufacturer's recommendations and the contract documents. The R-Tank units shall be separated from impervious liner by a non-woven geotextile fabric installed accordance with Section 3.04A.
C. Install R-Tank modules by placing side by side, in accordance with the design drawings. No lateral connections are required. It is advisable to use a string line to form square corners and straight edges along the perimeter of the R-Tank system. The modules are to be oriented as per the design drawing with required depth as shown on plans.
1. For LD, HD, and SD installations, the large side plate of the tank should be placed on the perimeter of the system. This will typically require that the two ends of the tank area will have a row of tanks placed perpendicular to all other tanks. If this is not shown in the construction drawings, it is a simple field adjustment that will have minimal effect on the overall system footprint. Refer to R-Tank Installation Guide for more details
2. For UD installations, there is no perpendicular end row required.
D. Wrap the R-Tank top and sides in specified geotextile. Cut strips of geotextile so that it will cover the sides and top, encapsulating the entire system to prevent backfill entry into the system. Overlap geotextile 12" or as recommended by manufacturer. Take great care to avoid damage to geotextile (and, if specified, impervious liner) during placement.
E. Identify locations of inlet, outlet and any other penetrations of the geotextile (and optional liner). These connections should be installed flush (butted up to the R-Tank) and the geotextile fabric shall be cut to enable hydraulic continuity between the connections and the R-Tank units. These connections shall be secured using pipe boots with stainless steel pipe clamps. Support pipe in trenches during backfill operations to prevent pipe from settling and damaging the geotextile, impervious liner (if specified) or pipe. Connecting pipes at 90 degree angles facilitates construction, unless otherwise specified. Ensure end of pipe is installed snug against R-Tank system.
F. Install Inspection and Maintenance Ports in locations noted on plans. At a minimum one maintenance port shall be installed within 10' of each inlet & outlet connection, and with a maximum spacing of one maintenance port for every 2,500 square feet. Install all ports as noted in the R-Tank Installation Guide.
G. If required, install ventilation pipes and vents as specified on plans to provide ventilation for proper hydraulic performance. The number of pipes and vents will depend on the size of the system. Vents are often installed using a 90 degree elbow with PVC pipe into a landscaped area with "U" bend or venting bollard to inhibit the ingress of debris. A ground level concrete or steel cover can be used.

3.05 BACKFILLING OF THE R-TANK UNITS
A. Backfill and fill with recommended materials as follows:
1. Place freely draining backfill materials (Section 2.03 B) around the perimeter in lifts with a maximum thickness of 12". Each lift shall be placed around the entire perimeter such that each lift is no more than 24" higher than the side backfill along any other location on the perimeter of the R-Tank system. No fill shall be placed over top of tanks until the side backfill has been completed.
2. Each lift shall be compacted at the specified moisture content to a minimum of 95% of the Standard Proctor Density until no further densification is observed (for self-compacting stone materials). The side lifts must be compacted with walk behind compaction equipment. Even when "self-compacting" backfill materials are selected, a walk behind vibratory compactor must be used.
3. Take care to ensure that the compaction process does not allow the machinery to come into contact with the modules due to the potential for damage to the geotextile and R-Tank units.
4. No compaction equipment is permissible to operate directly on the R-Tank modules.
5. Top Backfill: Only low pressure track vehicles shall be operated over the R-Tank system during construction. Dump Trucks and Pans shall not be operated within the R-Tank system footprint at any time. Heavy equipment should unload in an area adjacent to the R-Tank system and the material should be moved over the system using tracked equipment with an operating weight of less than 10 tons.
a. Typical Applications: Install a 12" (or as shown on plans) lift of freely draining material (Section 2.03 B) over the R-Tank Units, maintaining 12" between equipment tracks and R-Tank System. Lightly compacted using a walk-behind trench roller. Alternately, a roller (maximum gross vehicle weight of 6 tons) may be used. Roller must remain in static mode until a minimum of 24" of cover has been placed over the modules. Sheep foot rollers should not be used.
b. Shallow Applications (< 18" total cover): Install top backfill in accordance with plans.
6. If required, install a geogrid as shown on plans. Geogrid shall extend a minimum of 3 feet beyond the limits of the excavation wall.
7. Following placement and compaction of the initial cover, subsequent lifts of structural fill (Section 2.03 C) shall be placed at the specified moisture content and compacted to a minimum of 95% of the Standard Proctor Density and shall cover the entire width of the R-Tank system. During placement of fill above the system, unless otherwise specified, a uniform elevation of fill shall be maintained to within 12" across the footprint of the R-Tank system. Do not exceed maximum cover depths listed in Table 2.01 B.
8. Place additional layers of geotextile and/or geogrid at elevations as specified in the design details. Each layer of geosynthetic reinforcement placed above the R-Tank system shall extend a minimum of 3 feet beyond the limits of the excavation wall.
B. Ensure that all unrelated construction traffic is kept away from the limits of excavation until the project is complete and final surface materials are in place. No non-installation related loading should be allowed over the R-Tank system until the final design section has been constructed (including pavement).
C. Place surfacing materials, such as groundcovers (no large trees), or paving materials over the structure with care to avoid displacement of cover fill and damage to surrounding areas.
D. Backfill depth over R-Tank system must be within the limitations shown in the table in Section 2.01 B. If the total backfill depth does not comply with this table, contact engineer or manufacturer's representative for assistance.

3.06 MAINTENANCE REQUIREMENTS
A. A routine maintenance effort is required to ensure proper performance of the R-Tank system. The Maintenance program should be focused on pretreatment systems. Ensuring these structures are clean and functioning properly will reduce the risk of contamination of the R-Tank system and stormwater released from the site. Pre-treatment systems shall be inspected yearly, or as directed by the regulatory agency and by the manufacturer (for proprietary systems). Maintain as needed using acceptable practices or following manufacturer's guidelines (for proprietary systems).
B. All inlet pipes and Inspection and/or Maintenance Ports in the R-Tank system will need to be inspected for accumulation of sediments at least quarterly through the first year of operation and at least yearly thereafter.
C. If sediment has accumulated to the level noted in the R-Tank Installation Guide or beyond a level acceptable to the Owner's engineer, the R-Tank system should be flushed.
D. All inspection and maintenance activities should be performed in accordance with the R-Tank Operation, Inspection & Maintenance Manual.

NOT FOR CONSTRUCTION

R-TANK^{SD} CONSTRUCTION EQUIPMENT COVER DETAIL
TOMMYS COMMERCIAL CENTER
WINCHESTER, CA

SCALE NTS
DRAWN BY JKB
DATE 04/11/2023
SHEET NO. 7 of 8

R-TANK^{SD} SYSTEM DETAILS
TOMMYS COMMERCIAL CENTER
WINCHESTER, CA

SCALE NTS
DRAWN BY JKB
DATE 04/11/2023
SHEET NO. 5 of 8

R-TANK^{SD} SYSTEM DETAILS
TOMMYS COMMERCIAL CENTER
WINCHESTER, CA

SCALE NTS
DRAWN BY JKB
DATE 04/11/2023
SHEET NO. 6 of 8

R-TANK SPECIFICATION
TOMMYS COMMERCIAL CENTER
WINCHESTER, CA

SCALE NTS
DRAWN BY JKB
DATE 04/11/2023
SHEET NO. 8 of 8

FERGUSON WATERWORKS
FOR ADDITIONAL INFORMATION PLEASE CONTACT FERGUSON WATERWORKS; 1-800-448-3636, www.ferguson.com

R-TANK ENGINEER OF RECORD TO REVIEW, APPROVE AND STAMP FINAL SITE SPECIFIC DESIGN.

CROSS ENGINEERING SERVICES
203 W. Main Street Ste. F3
Lexington, SC 29072
Office: (803) 236-7123 Cell: (801) 391-2391

DRAFTED BY:
DESIGNED BY: BKS
CHECKED BY: JWC

NO.	REVISION DESCRIPTION	DATE

BMP DETAILS
TOMMYS COMMERCIAL CENTER
04/10/2023

BENTON RD & PENFIELD LN,
WINCHESTER CA, 92596
APN: 221-051-063 & 064

PROJECT NO. 19-14

SHEET NUMBER C203

Appendix 7:
Hydromodification & Critical Coarse Sediment

Supporting Detail for Hydromodification compliance & Exhibit G - CCSY & PSS Areas with the project location.

The preparer shall include the following in this Appendix (Refer to Section 2.4 and 3.6 of the SMR WQMP and Sections E of this Template):

- Hydromodification Exemption Exhibit (if the project is in an area exempt from Hydromod)
- Potential Critical Coarse Sediment Yield Area Mapping (to show if the site is out of a CCSYA)
- Hydromodification BMP sizing calculations (i.e. County Hydromod Spreadsheet – Hydromod, and BMP Design tabs, SMRHM report files, or other acceptable Hydromod calculations)
- Site-Specific Critical Coarse Sediment Analysis (if a project impacts a CCSYA)
- Design details/drawings from manufacturers for proprietary BMPs (if proprietary BMPs are proposed)

In addition, the project shall comply with drainage law and good practices:

- Protect the Site and Roads from Q100yr, without impacting adjacent property owners.
- Pad elevations must be above the Q100yr water surface at all locations.

I. Identify Offsite Hydrology

A. If the project intends to allow the flows to pass through the project uninterrupted, the flows must remain along its natural flow-path and natural condition. The project must also:
   (1) Ensure that the existing stream is stable. If not, the design must include stabilization.
   (2) Does the 100 year flow path affect proposed project elements, such as streets and fill slopes? If so, the project must properly design for impingements, provide revetment, etc. If the water surface changes due to impingements on neighbor's properties, Permission to pond letters must be provided.

B. If the project intends to collect and convey the offsite flows, see the next section:

II. Hydraulics

A. Project must provide collection inlets that can be accessed for maintenance. If located outside of the project boundary, the project must provide a Permission Letter or drainage easement. If the inlet creates new ponding on private property, the project must provide a Permission to Pond letter or easement.

B. The project should not divert watershed areas over 1 acre. If so, Permission Letter to accept project's diversion and drainage concept must be received by the project.

C. The project should have an adequate outlet. If not, include Permission Letters and implement Increased Runoff criteria (2, 5,10 year storm events and the 1, 3, 6 and 24 hour durations). 100 year storm routing is not to be used. Runoff from the offsite plus onsite must be returned to its natural (existing) condition of velocity, peak flow-rate, flow-width and location/right of way, if permission letters have not been obtained.

D. The project must adequately convey the 100 year storm between the combination of street flow and pipe flow per County Ordinance.

E. The project should use the downstream connection as the Q100yr water surface control elevation, to ensure 6 inches minimum of freeboard in proposed drainage system.

III. Basin Layout

A. Implement Basin Guidelines as best as possible from Appendix C, Design Handbook for LID BMPs.

NOTE: The areas associated with BMP 1, BMP 2, and BMP 3 drain through the same existing outfall location. As such, in the hydromod spreadsheet, all three bmps are modeled together as a single unit.

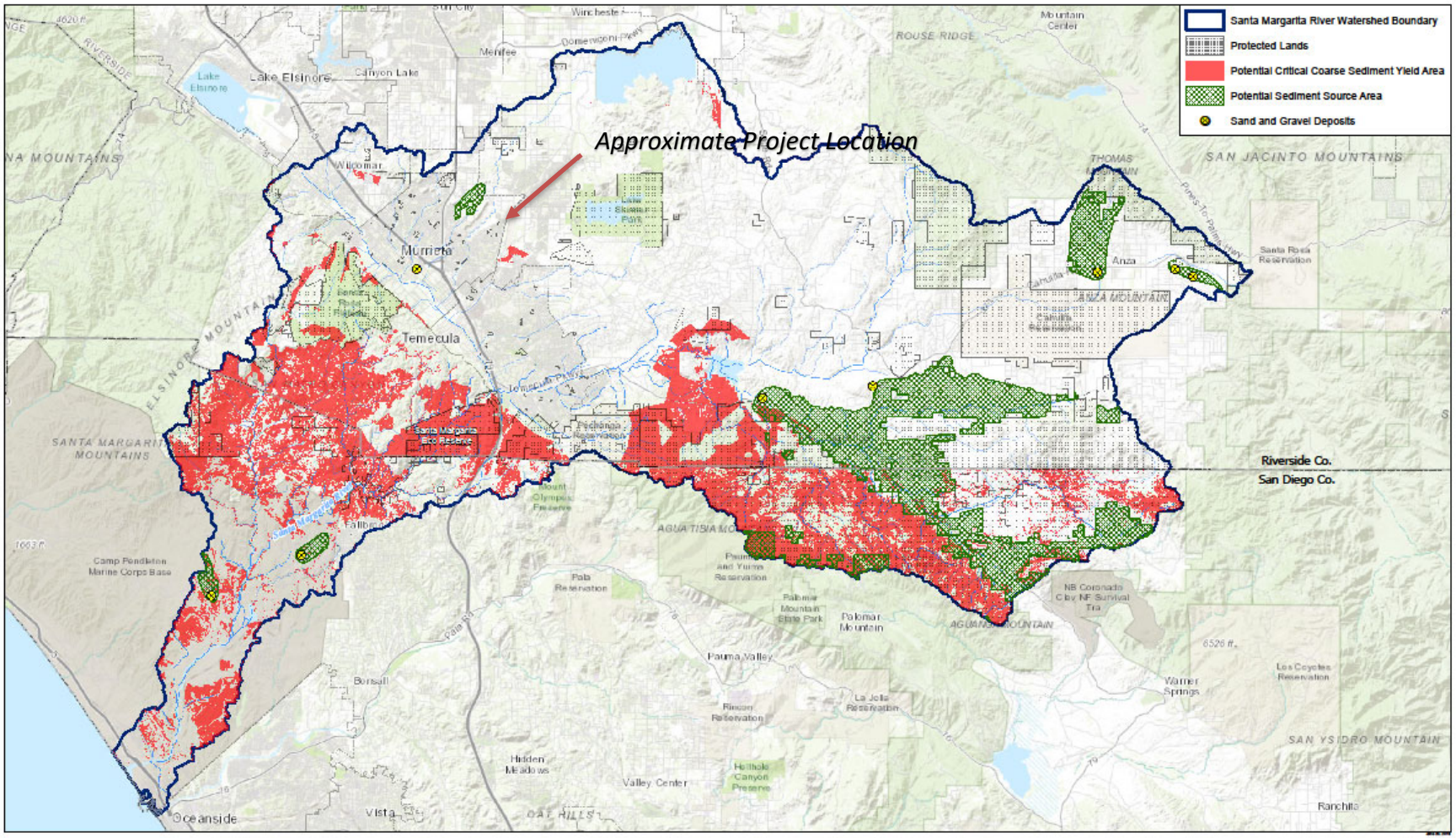


Exhibit G-1

SANTA MARGARITA RIVER WATERSHED
POTENTIAL CRITICAL COARSE SEDIMENT YIELD AREAS AND POTENTIAL SEDIMENT SOURCE AREAS

Santa Margarita Region - County HydroMod Iterative Spreadsheet Model

Only for use the unincorporated portions of Riverside County, unless otherwise approved by the Co-Permittee

Development Project Number(s):	PPT200033	Rain Gauge	Eastern Slopes
Latitude (decimal format):	33.5904	BMP Type (per WQMP):	R-Tank
Longitude (decimal format):	-117.122	BMP Number (Sequential):	BMP 1, 2, & 3

Pre-Development

Pre-Development - Hydrology Information

DRAINAGE AREA (ACRES) - 10 acre max[1]	2.2	2-YEAR, 1-HOUR INTENSITY (IN/HR) - Plate D-4.3	0.5
LONGEST WATERCOURSE (FT) - 1,000' max[1]	360	10-YEAR, 1-HOUR INTENSITY (IN/HR) - Plate D-4.1	0.8
UPSTREAM ELEVATION OF WATERCOURSE (FT)	1358	SLOPE OF THE INTENSITY DURATION - Plate D-4.6	0.58
DOWNSTREAM ELEV. OF WATERCOURSE (FT)	1349	CLOSEST IMPERVIOUS PERCENTAGE (%)	0% Undeveloped - Good Cover
EXISTING IMPERVIOUS PERCENTAGE (%)	0		
Use 10% of Q2 to avoid Field Screening requirements	Yes		

Pre-Development

Pre-Development - Soils Information

Cover Type #	Subarea Acreage	Cover Type	Vegetative Cover	Soil A %	Soil B %	Soil C %	Soil D %	RI Index AMC I	RI Index AMC II	RI Index AMC III
14	2.2 Ac.	Open Brush	Fair Cover			100		59	**77**	89
								0	**0**	0
								0	**0**	0
	2.20 Ac.						**Weighted Average RI Numbers =**	**59.0**	**77.0**	**89.0**

Per Dr. Luis Parra, the AMC condition is based on the rainfall record. Applying NEH-4 (1964) for the non-freezing conditions in Riverside County the AMC conditions are: AMC-I for less than 0.5" of rain the previous 5 days; AMC-II for between 0.5" to 1.1" of rain the previous 5 days; or AMC-III for more than 1.1" for the previous 5 days.

Pre-Development

Pre-Development - Calculated Range of Flow Rates analyzed for Hydromod (Suceptible Range of Flows)

Calculated Upper Flow-rate limit	Calculated Lower Flow-rate limit
Ex. 10-year Flowrate[1] = **1.249** cfs	Ex. 10% of the 2-year Flowrate[1] = **0.128** cfs
(Co-Permitte Approval is required) User-Defined Discharge Values with accompanying Hydrology Study[1]	
Ex. 10-year Flowrate (Attach Study) = cfs	Ex. 2-year Flowrate (Attach Study) = cfs

[1]The equations used to determine the 10-year and 10% of the 2-yr are limited to 10-acres and 1,000'. Flowrates from a separate study can be used to over-ride the calculated values so that larger areas (up to 20 acres) and longer watercourse lengths can be used. All values still need to be filled out, even when there is a user-defined discharge value entered.

Post-Project

Post-Project - Hydrograph Information

DRAINAGE AREA (ACRES)	2.2
LONGEST WATERCOURSE (FT)	237
DIFFERENCE IN ELEV (FT) - along watercourse	4.5
PROPOSED IMPERVIOUS PERCENTAGE (%)	75

Go to "BMP Design" tab to design your BMP, then check results below.
Print both this "HydroMod" Sheet and the "BMP Design" sheet for your submittal.

Post-Project

Post-Project - Soils Information

Cover Type #	Subarea Acreage	Cover Type	Vegetative Cover	Soil A %	Soil B %	Soil C %	Soil D %	RI Index AMC I	RI Index AMC II	RI Index AMC III
22	2.2 Ac.	Urban Landscaping	Good Cover			100		50	**69**	84
								0	**0**	0
								0	**0**	0
	2.20 Ac.						**Weighted Average RI Numbers =**	**50.0**	**69.0**	**84.0**

Per Dr. Luis Parra, the AMC condition is based on the rainfall record. Applying NEH-4 (1964) for the non-freezing conditions in Riverside County the AMC conditions are: AMC-I for less than 0.5" of rain the previous 5 days; AMC-II for between 0.5" to 1.1" of rain the previous 5 days; or AMC-III for more than 1.1" for the previous 5 days.

Results

		First result out of compliance in the rainfall record				See below for the Height in the Basin (Stage) that is causing a non-compliant result	
Hydromod Ponded depth	**0.80 feet**						
Hydromod Drain Time (unclogged)	**#DIV/0!**	Requirement		Proposed			
Is the HydroMod BMP properly sized?	**Yes, this is acceptable**	---	---	---	---		
Mitigated Q < 110% of Pre-Dev. Q?	**Yes, this is acceptable**	---	---	---	---	Issue @ Stage =	---
Mitigated Duration < 110% of Pre-Dev?*	**Yes, this is acceptable**	---	---	---	---	Issue @ Stage =	---

Responsible-in-charge: Bryan Schmutz Date: 6/29/2023

Signature: Spreadsheet Developed by: Benjie Cho, P.E.

BMP Design

Fill in **blue** shaded areas

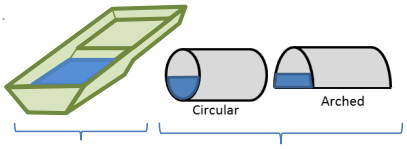
BMP Geometry & Detention Calculations

0.1 feet, Stage Intervals — Larger intervals may incr. the Q at the bottom stg.

PROPOSED BMP DIMENSIONS

STEP1: Size the BMP, so that the Total Volume > Max HydroMod Vol. (Deeper is ok, it will be refined in the Design Geometry)

Is the BMP a Tank shape? **2** 1 for yes; 2 for no.



Basin Shaped BMP (Bottom Stage 1st)

Bottom Stage H= **2.3'** SS= **0** :1

Top Area		Bottom Area		
Width	20	Width	20	FT
Length	212.85	Length	212.9	FT
area =	4257	area =	4257	

Top Stage H= **9.5'** SS= **0** :1

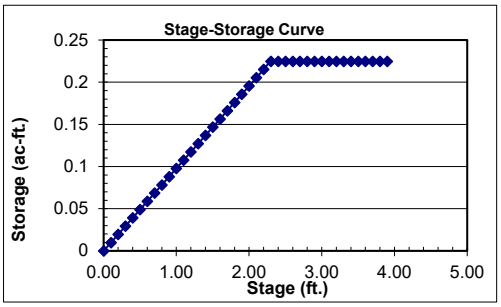
Top Area		Bottom Area		
Width	3	Width	3	FT
Length	0	Length	0	FT
area =	0	area =	0	

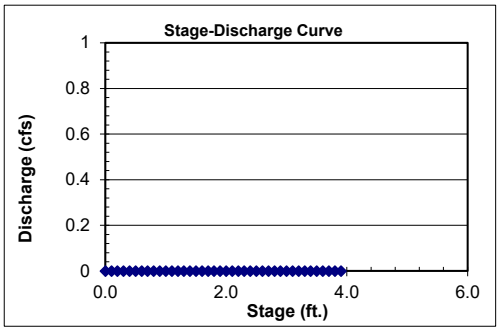
Prop. Top Stg. Vol. =	-	FT3
Prop Bottom Stg Vol =	9,791	FT3
Total Prop. Volume[1] =	9,791	FT3
Max HydroMod Volume =	3,012	FT3
Total Acreage[2] =	4,257	FT2
BMP % of Site =	4.44%	
Max HydroMod Depth[3] =	0.80	FT

[1]Does not include forebay, or low flow trench

[2]Does not account for freeboard or access roads

[3]Does not consider Increased Runoff





MINIMUM DESIGN GEOMETRY

STEP3: Delete outlets, then propose the largest lowest orifice that does not, exceed the ex. Q or Duration. If the Q is acceptable, but the duration is exceeded, try decreasing orifice, then adding a weir slightly below the stage that has an issue.

OUTLETS (for Stage-Discharge)

Orifice Outlets			Weir Outlets		
Invert Height (ft)	Diameter (inches)	No. of Orifices	Crest Height (ft)	Crest Width (ft)	No. of Weirs
0	0.00	1			
11			9.00	0.5	1

Hydromod Depth = 0.80 FT

+ 1' Freeboard = 1.80 FT

Top Surface Area

Based on HydroMod Depth +1' of Freeboard

Bottom Stage		
Width	20	FT
Length	212.85	FT

Top Stage		
Width	3	FT
Length	0:1	FT

STEP4: Complete an increased runoff analysis, if the project can impact downstream properties. Incorporate these designs into the WQMP site plan. Add emergency overflow weir, for flows that exceed the Hydromod volumes, sized to the 100-year peak flow rate. Add access roads (< 10% longitudnal slope) with enough width & turn around access for equipment that would be needed to scarify the bottom or remove Bioretention soil media.

Stage-Storage-Discharge*

Stage (FT)	Storage (AC-FT)	Storage (FT3)	Q (CFS)
0	0	0	0
0.10	0.010	426	0.00
0.20	0.020	851	0.00
0.30	0.029	1277	0.00
0.40	0.039	1703	0.00
0.50	0.049	2129	0.00
0.60	0.059	2554	0.00
0.70	0.068	2980	0.00
0.80	0.078	3406	0.00
0.90	0.088	3831	0.00
1.00	0.098	4257	0.00
1.10	0.108	4683	0.00
1.20	0.117	5108	0.00
1.30	0.127	5534	0.00
1.40	0.137	5960	0.00
1.50	0.147	6386	0.00
1.60	0.156	6811	0.00
1.70	0.166	7237	0.00
1.80	0.176	7663	0.00
1.90	0.186	8088	0.00
2.00	0.195	8514	0.00
2.10	0.205	8940	0.00
2.20	0.215	9365	0.00
2.30	0.225	9791	0.00
2.40	0.225	9791	0.00
2.50	0.225	9791	0.00
2.60	0.225	9791	0.00
2.70	0.225	9791	0.00
2.80	0.225	9791	0.00
2.90	0.225	9791	0.00
3.00	0.225	9791	0.00
3.10	0.225	9791	0.00
3.20	0.225	9791	0.00
3.30	0.225	9791	0.00
3.40	0.225	9791	0.00
3.50	0.225	9791	0.00
3.60	0.225	9791	0.00
3.70	0.225	9791	0.00
3.80	0.225	9791	0.00
3.90	0.225	9791	0.00
	0.225	9,791	

Add Infiltration

Enter information from actual infiltration tests

Yes	**Consider Infiltration (Yes or No)?**		
2.9	Infiltration rate (in/hr) [3]	0.2858	ft3/sec, Infiltration (over entire bottom)
3	Factor of Safety (3 or greater) [3]	0.0953	ft3/sec, Infiltration / Factor of Safety
300	mins, Max. Time represented by tests		

[3]Per the RC LID Manual, Appendix A.

Only if allowed by the Co-Permittee, these infiltration inputs can be used to simulate Bioretention/Biofiltration rates with Backup Calcs and Data.

The pre- and post-development conditions of the site were analyzed using the Storm and Sanitary Analysis (SSA) program developed by Autodesk. The program is used to model rainfall and stormwater runoff and to perform hydraulic routing through the storm conveyance system.

The hydrology was simulated using the NRCS (SCS) TR-55 methodology.

The SSA program generates runoff hydrographs for each sub-basin based on user-specified variables, such as soil type, curve numbers, and vegetation conditions. Hydrographs are generated by SSA using the NRCS Unit Hydrograph (TR-55) Method.

See below for summary of pre vs post runoff flows and supporting calculations:

Storm Event	Pre-Dev Runoff (CFS)	Post-Dev Runoff (CFS)
2-year	0.73	<0.1
10-year	2.81	1.81

Project Description

File Name ..... Pre-dev.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
Time of Concentration (TOC) Method ..... SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ..... YES
Skip Steady State Analysis Time Periods ... YES

Analysis Options

Start Analysis On 00:00:00 0:00:00
End Analysis On 00:00:00 0:00:00
Start Reporting On 00:00:00 0:00:00
Antecedent Dry Days ..... 0 days
Runoff (Dry Weather) Time Step ..... 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step ..... 0 00:05:00 days hh:mm:ss
Reporting Time Step ..... 0 00:05:00 days hh:mm:ss
Routing Time Step ..... 30 seconds

Number of Elements

	Qty
Rain Gages	2
Subbasins	3
Nodes	2
Junctions	1
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links	1
Channels	1
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	10-YEAR	Time Series	10-YEAR	Cumulative	inches	California	Riverside (Riverside Metro)	10.00	3.85	SCS Type II 24-hr
2	2-YEAR	Time Series	2-YEAR	Cumulative	inches	California	Riverside (Riverside Metro)	2.00	2.39	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	DMA1	0.71	484.00	70.00	2.39	0.40	0.29	0.31	0 00:12:39
2	DMA2	0.74	484.00	70.00	2.39	0.40	0.30	0.27	0 00:17:15
3	DMA3	0.80	484.00	70.00	2.39	0.40	0.32	0.23	0 00:25:18

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	1-Jun	Junction	1348.82	6.00	0.00	0.00	0.00	0.75	1348.84	0.00	1.98	0 00:00	0.00	0.00
2	Out-01	Outfall	1348.47					0.73	1348.49					

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-01	Channel	1-Jun	Out-01	50.00	1348.82	1348.47	0.7000	24.000	0.0320	0.73	1889.24	0.00	0.31	0.02	0.01	0.00	

Subbasin Hydrology

Subbasin : DMA1

Input Data

Area (ac) 0.71
Peak Rate Factor 484
Weighted Curve Number 70
Rain Gage ID 2-YEAR

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Brush, Fair	0.71	C	70
Composite Area & Weighted CN	0.71		70

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.3	0	0
Flow Length (ft) :	50	0	0
Slope (%) :	2.1	0	0
2 yr, 24 hr Rainfall (in) :	2.39	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	11.12	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	248	0	0
Slope (%) :	2.8	0	0
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.7	0	0
Computed Flow Time (min) :	1.53	0	0

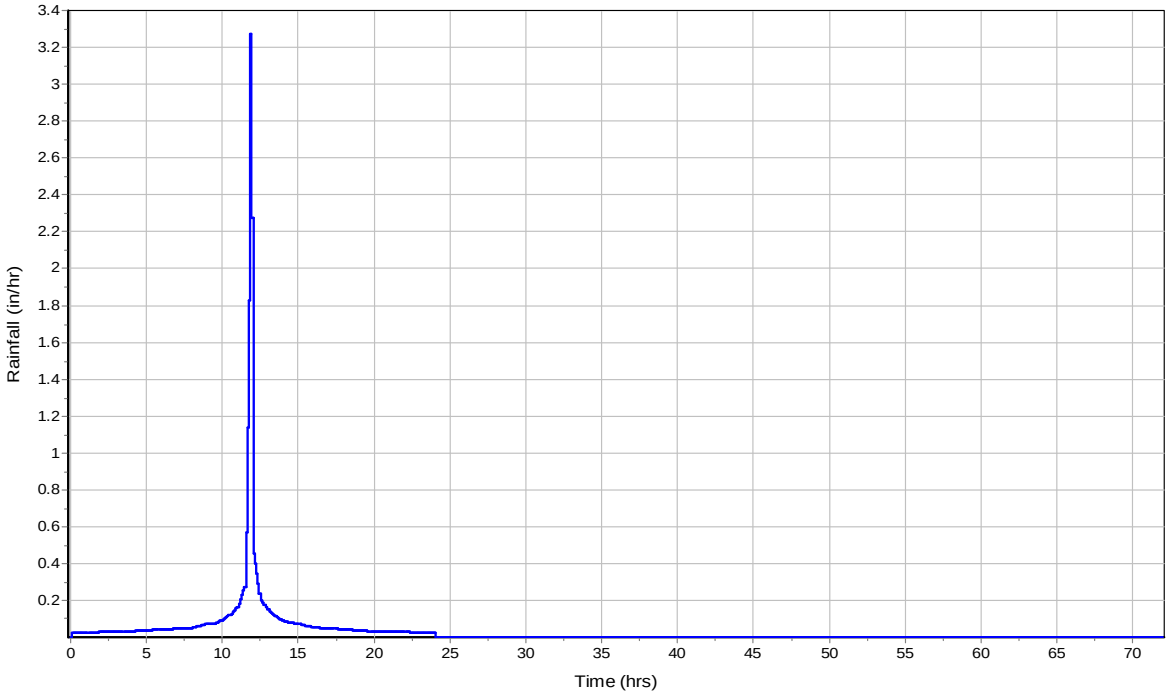
Total TOC (min) 12.65

Subbasin Runoff Results

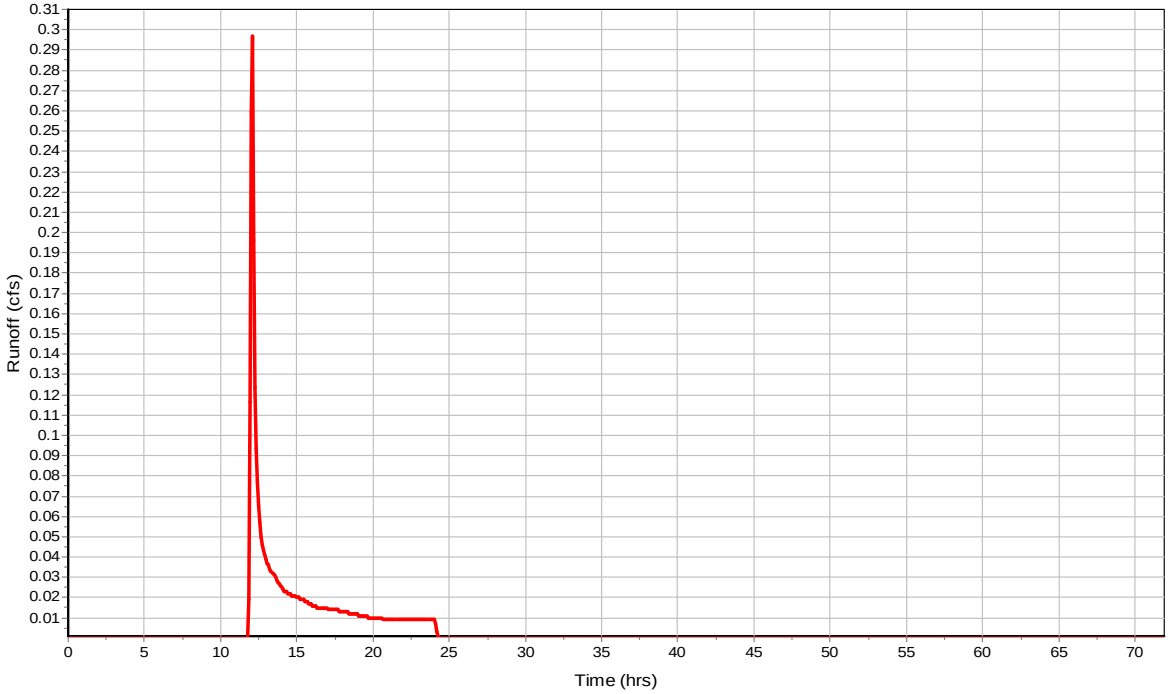
Total Rainfall (in)	2.39
Total Runoff (in)	0.4
Peak Runoff (cfs)	0.31
Weighted Curve Number	70
Time of Concentration (days hh:mm:ss)	0 00:12:39

Subbasin : DMA1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DMA2

Input Data

Area (ac)	0.74
Peak Rate Factor	484
Weighted Curve Number	70
Rain Gage ID	2-YEAR

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Brush, Fair	0.74	C	70
Composite Area & Weighted CN	0.74		70

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.3	0	0
Flow Length (ft) :	50	0	0
Slope (%) :	0.9	0	0
2 yr, 24 hr Rainfall (in) :	2.39	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	15.6	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	247	0	0
Slope (%) :	2.4	0	0
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.5	0	0
Computed Flow Time (min) :	1.65	0	0

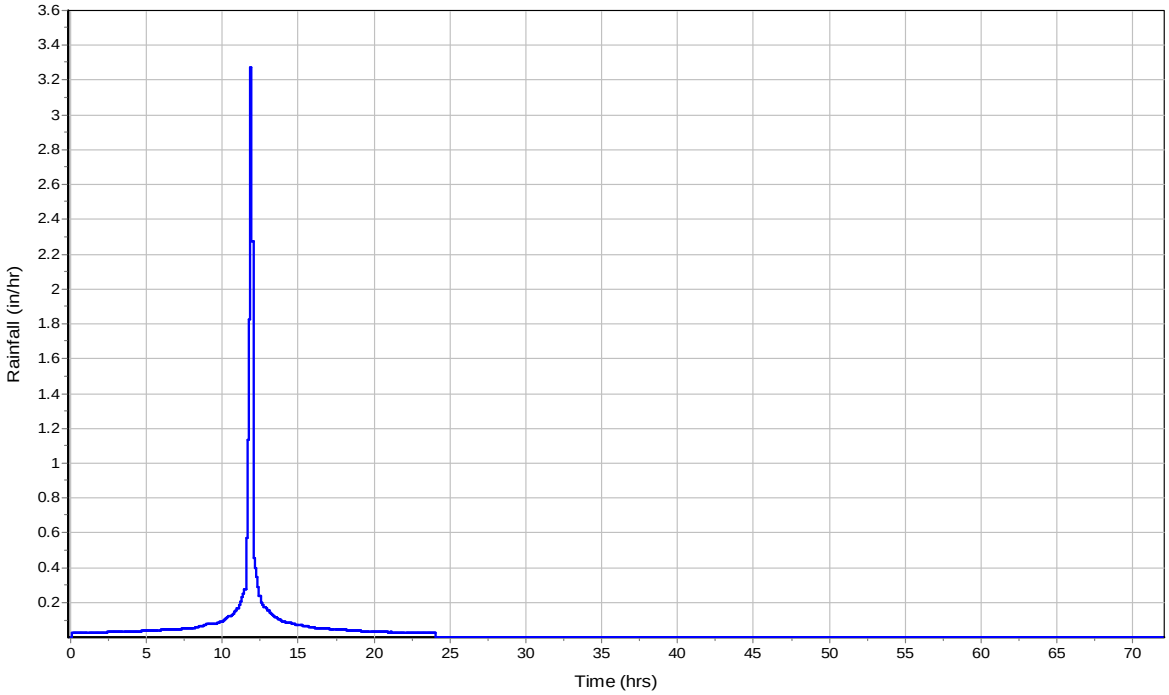
Total TOC (min) 17.25

Subbasin Runoff Results

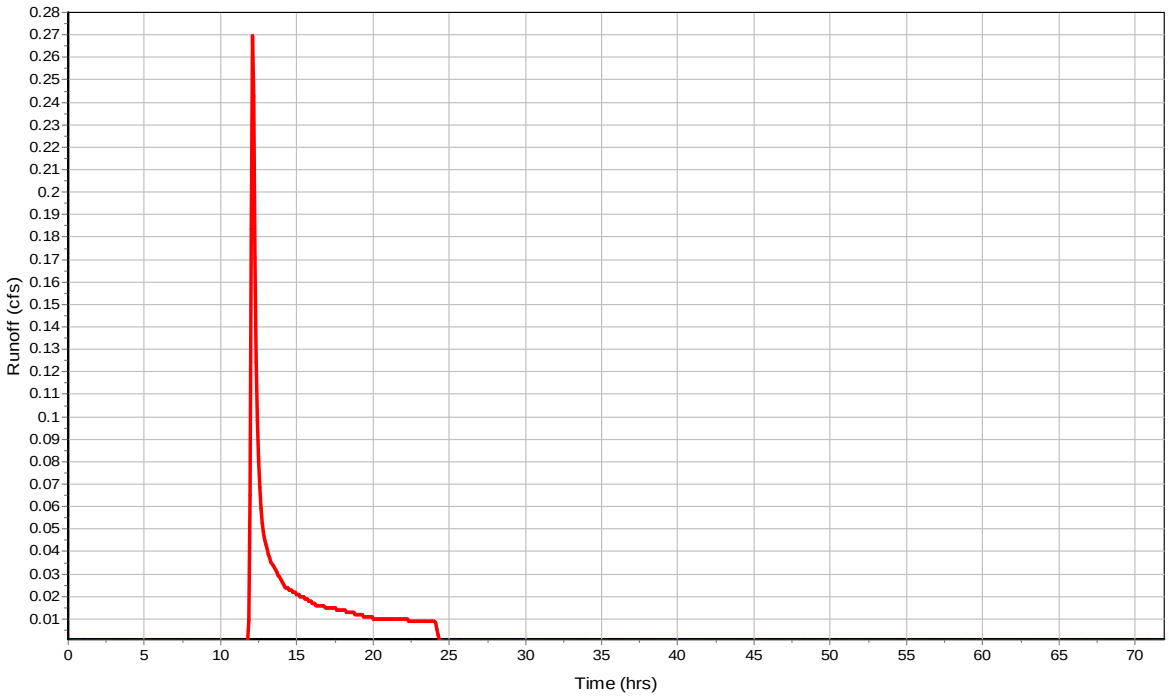
Total Rainfall (in)	2.39
Total Runoff (in)	0.4
Peak Runoff (cfs)	0.27
Weighted Curve Number	70
Time of Concentration (days hh:mm:ss)	0 00:17:15

Subbasin : DMA2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DMA3

Input Data

Area (ac) 0.8
Peak Rate Factor 484
Weighted Curve Number 70
Rain Gage ID 2-YEAR

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Brush, Fair	0.8	C	70
Composite Area & Weighted CN	0.8		70

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.3	0	0
Flow Length (ft) :	50	0	0
Slope (%) :	0.5	0	0
2 yr, 24 hr Rainfall (in) :	2.39	0	0
Velocity (ft/sec) :	0.04	0	0
Computed Flow Time (min) :	19.74	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	537	0	0
Slope (%) :	1	0	0
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	5.56	0	0

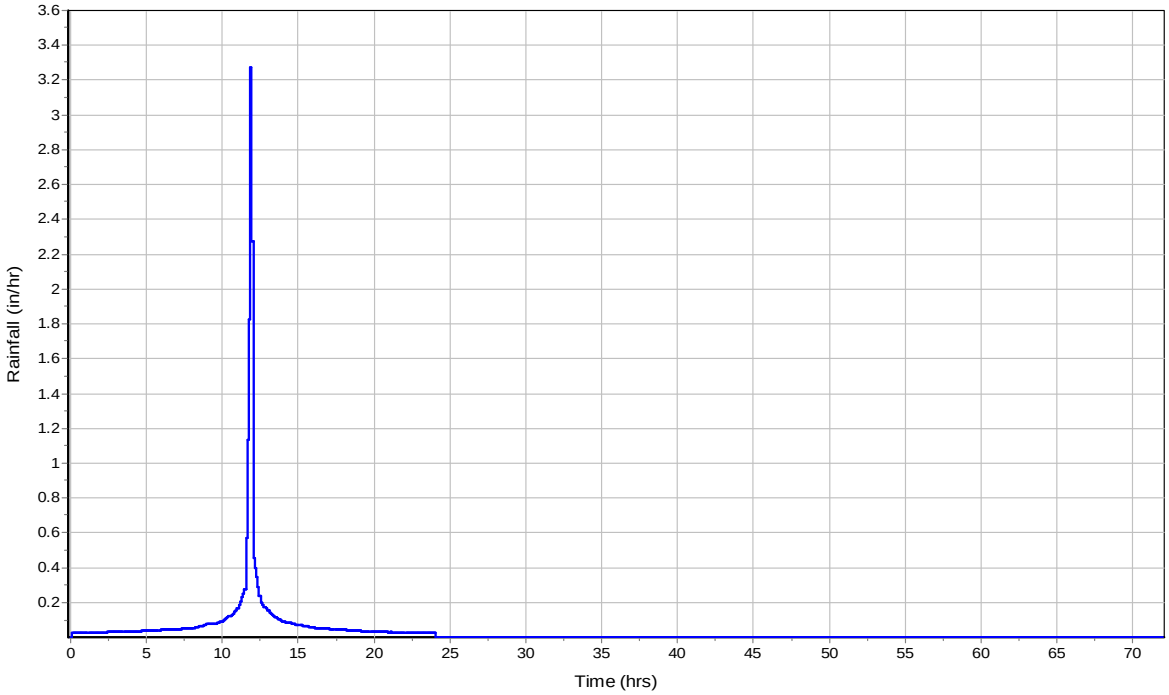
Total TOC (min) 25.30

Subbasin Runoff Results

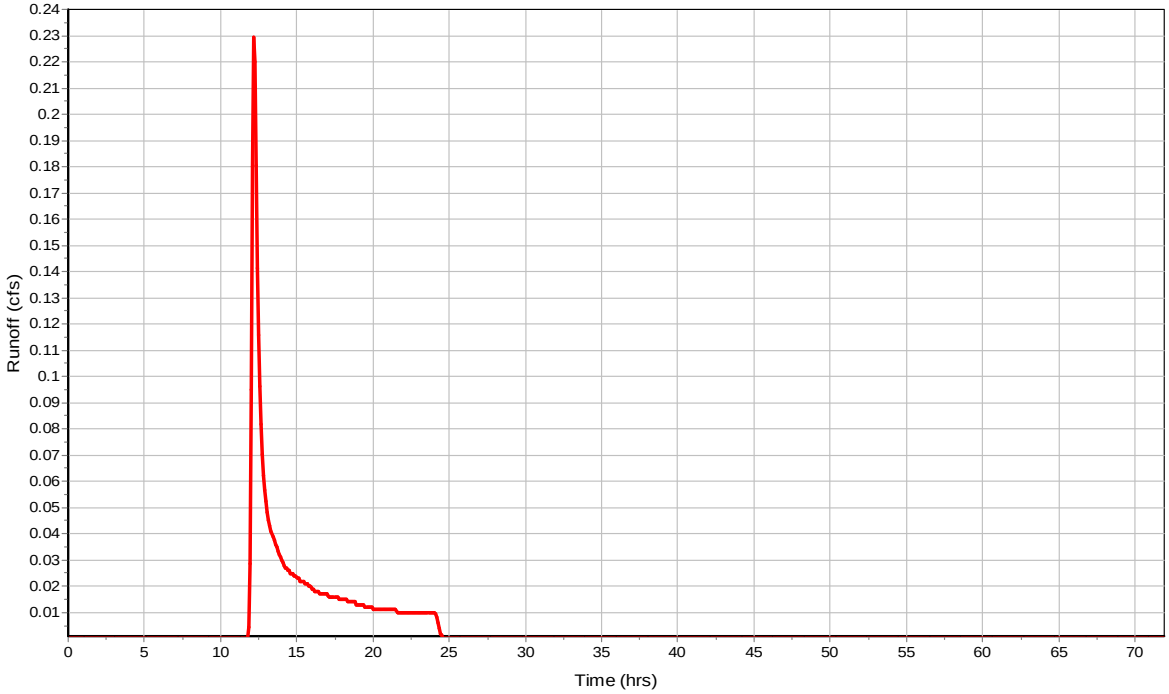
Total Rainfall (in) 2.39
Total Runoff (in) 0.4
Peak Runoff (cfs) 0.23
Weighted Curve Number 70
Time of Concentration (days hh:mm:ss) 0 00:25:18

Subbasin : DMA3

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	1-Jun	1348.82	6.00	-1342.82	0.00	-1348.82	0.00	-6.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	1-Jun	0.75	0.75	1348.84	0.02	0.00	1.98	1348.82	0.00	0 12:10	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Total Drop	Average Slope	Shape	Height	Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(ft)	(ft)					(cfs)	
1	Link-01	50.00	1348.82	0.00	1348.47	0.00	0.35	0.7000	Trapezoidal	2.000	302.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-01	0.73	0 12:12	1889.24	0.00	0.31	2.69	0.02	0.01	0.00		

Project Description

File Name	Pre-dev.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	SCS TR-55
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	YES

Analysis Options

Start Analysis On	00:00:00	0:00:00
End Analysis On	00:00:00	0:00:00
Start Reporting On	00:00:00	0:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	2
Subbasins	3
Nodes	2
Junctions	1
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links	1
Channels	1
Pipes	0
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	10-YEAR	Time Series	10-YEAR	Cumulative	inches	California	Riverside (Riverside Metro)	10.00	3.85	SCS Type II 24-hr
2	2-YEAR	Time Series	2-YEAR	Cumulative	inches	California	Riverside (Riverside Metro)	2.00	2.39	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	DMA1	0.71	484.00	70.00	3.85	1.23	0.87	1.10	0 00:12:39
2	DMA2	0.74	484.00	70.00	3.85	1.23	0.91	1.02	0 00:17:15
3	DMA3	0.80	484.00	70.00	3.85	1.23	0.98	0.90	0 00:25:18

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft²)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	1-Jun	Junction	1348.82	6.00	0.00	0.00	0.00	2.84	1348.87	0.00	1.95	0 00:00	0.00	0.00
2	Out-01	Outfall	1348.47					2.81	1348.52					

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-01	Channel	1-Jun	Out-01	50.00	1348.82	1348.47	0.7000	24.000	0.0320	2.81	1889.24	0.00	0.53	0.05	0.03	0.00	

Subbasin Hydrology

Subbasin : DMA1

Input Data

Area (ac) 0.71
Peak Rate Factor 484
Weighted Curve Number 70
Rain Gage ID 10-YEAR

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Brush, Fair	0.71	C	70
Composite Area & Weighted CN	0.71		70

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.3	0	0
Flow Length (ft) :	50	0	0
Slope (%) :	2.1	0	0
2 yr, 24 hr Rainfall (in) :	2.39	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	11.12	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	248	0	0
Slope (%) :	2.8	0	0
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.7	0	0
Computed Flow Time (min) :	1.53	0	0

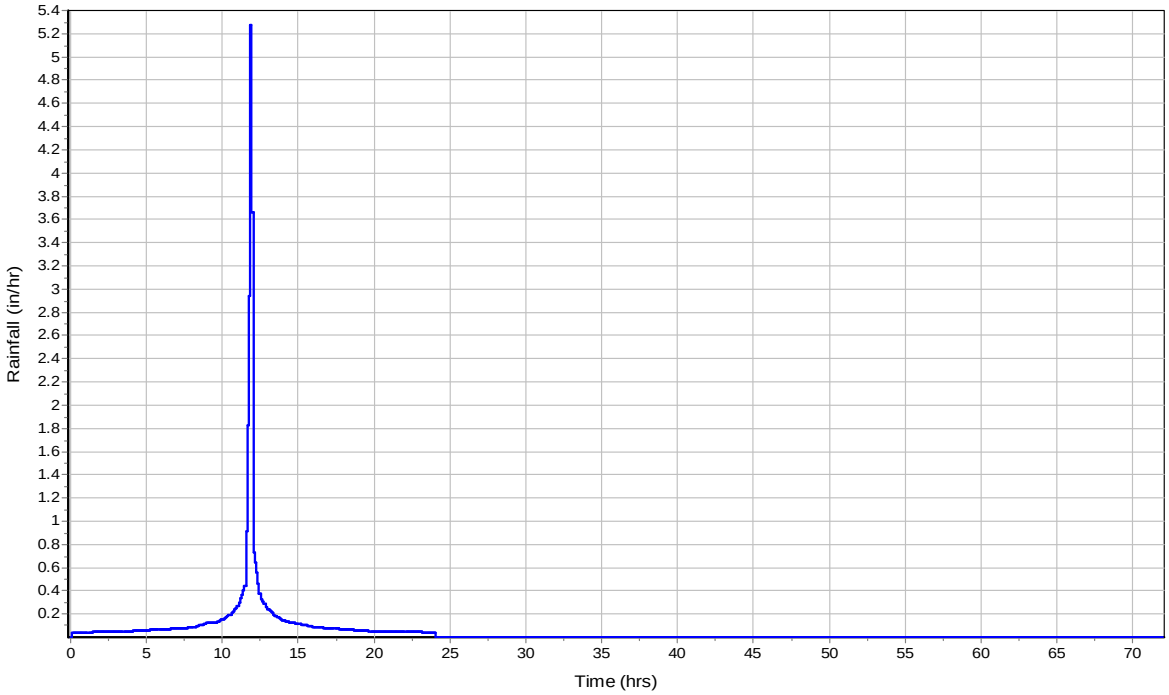
Total TOC (min) 12.65

Subbasin Runoff Results

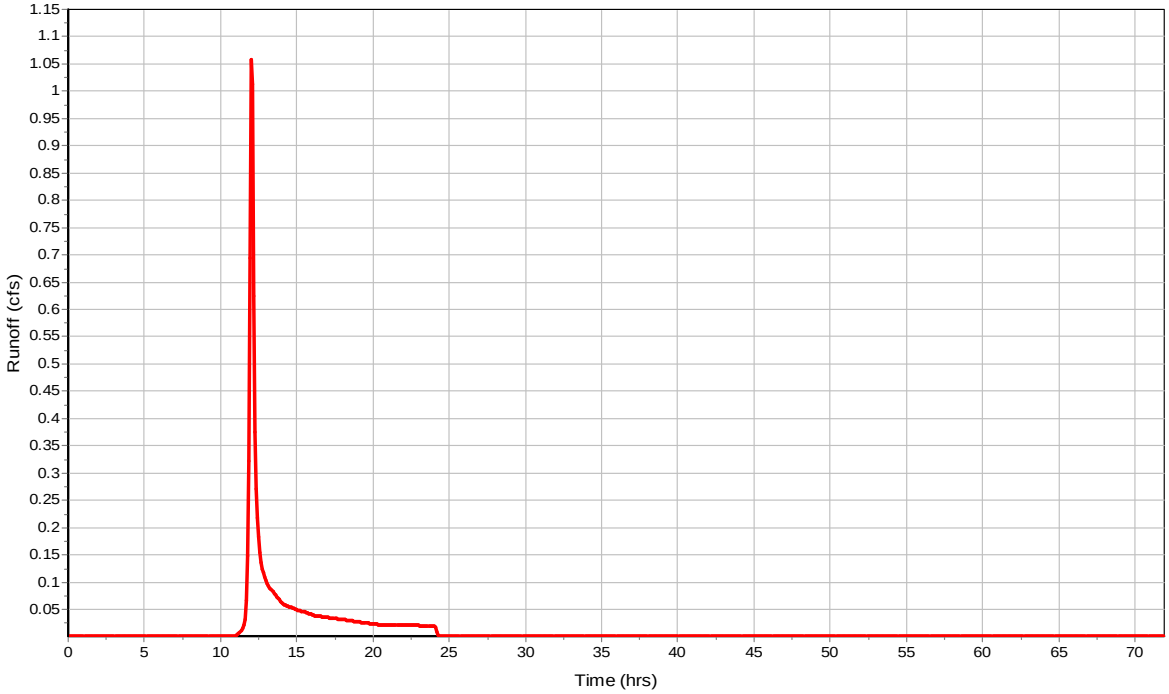
Total Rainfall (in)	3.85
Total Runoff (in)	1.23
Peak Runoff (cfs)	1.1
Weighted Curve Number	70
Time of Concentration (days hh:mm:ss)	0 00:12:39

Subbasin : DMA1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DMA2

Input Data

Area (ac) 0.74
Peak Rate Factor 484
Weighted Curve Number 70
Rain Gage ID 10-YEAR

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Brush, Fair	0.74	C	70
Composite Area & Weighted CN	0.74		70

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.3	0	0
Flow Length (ft) :	50	0	0
Slope (%) :	0.9	0	0
2 yr, 24 hr Rainfall (in) :	2.39	0	0
Velocity (ft/sec) :	0.05	0	0
Computed Flow Time (min) :	15.6	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	247	0	0
Slope (%) :	2.4	0	0
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.5	0	0
Computed Flow Time (min) :	1.65	0	0

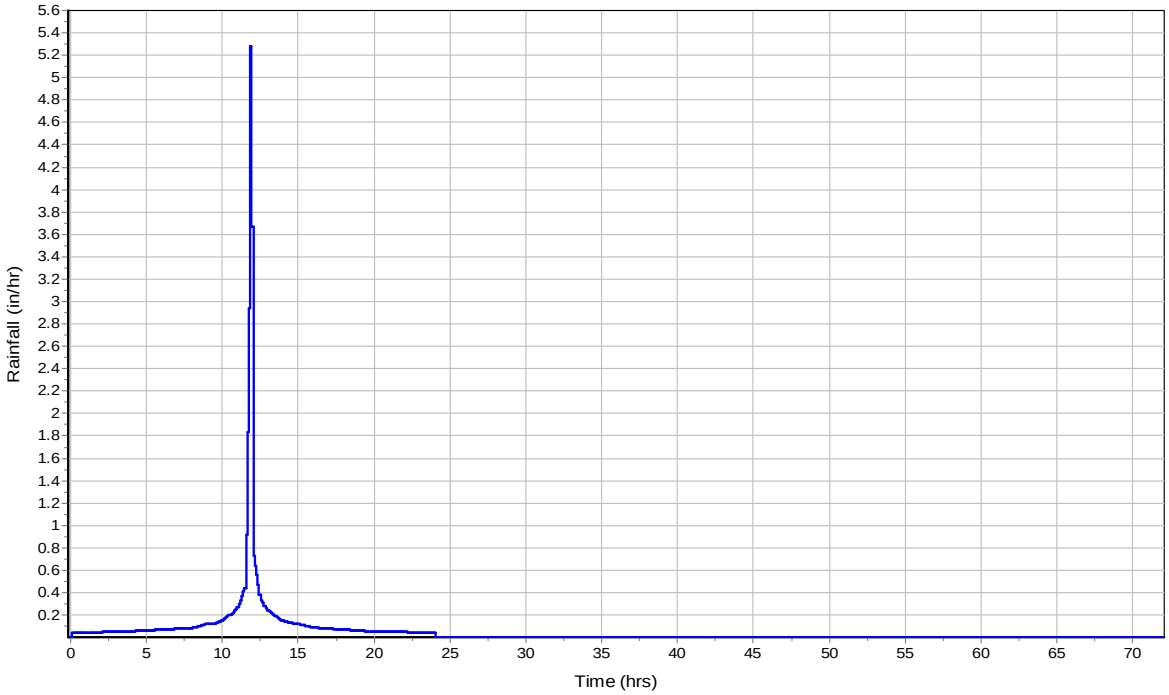
Total TOC (min) 17.25

Subbasin Runoff Results

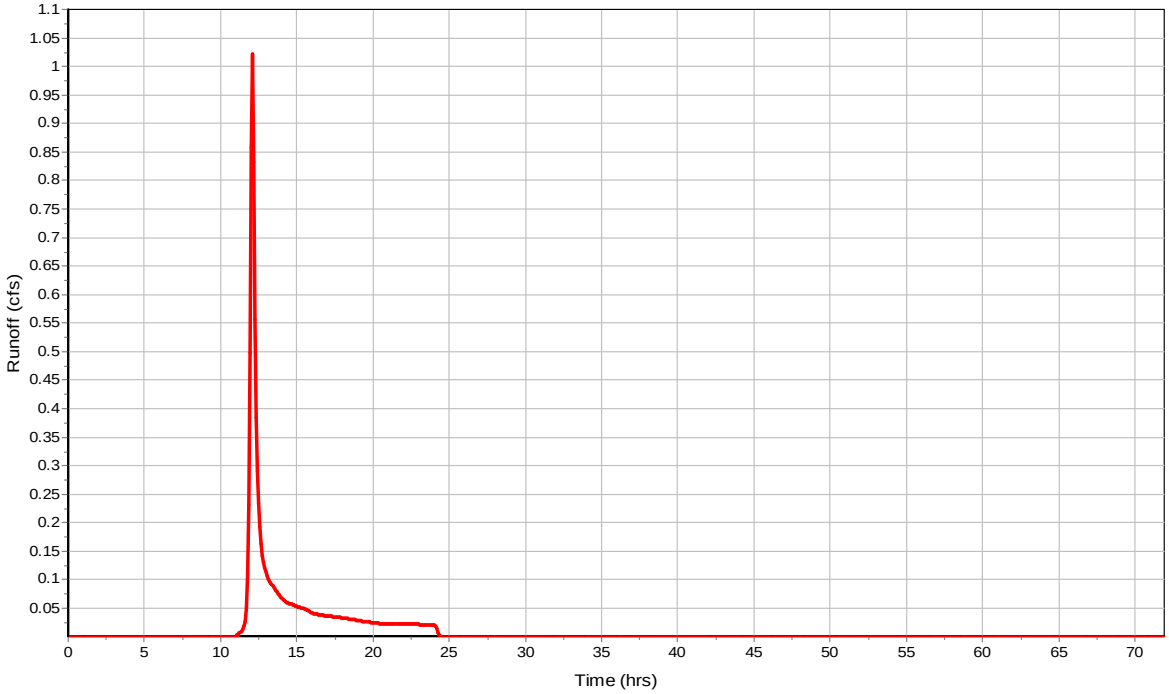
Total Rainfall (in) 3.85
Total Runoff (in) 1.23
Peak Runoff (cfs) 1.02
Weighted Curve Number 70
Time of Concentration (days hh:mm:ss) 0 00:17:15

Subbasin : DMA2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DMA3

Input Data

Area (ac) 0.8
Peak Rate Factor 484
Weighted Curve Number 70
Rain Gage ID 10-YEAR

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Brush, Fair	0.8	C	70
Composite Area & Weighted CN	0.8		70

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.3	0	0
Flow Length (ft) :	50	0	0
Slope (%) :	0.5	0	0
2 yr, 24 hr Rainfall (in) :	2.39	0	0
Velocity (ft/sec) :	0.04	0	0
Computed Flow Time (min) :	19.74	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	537	0	0
Slope (%) :	1	0	0
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	5.56	0	0

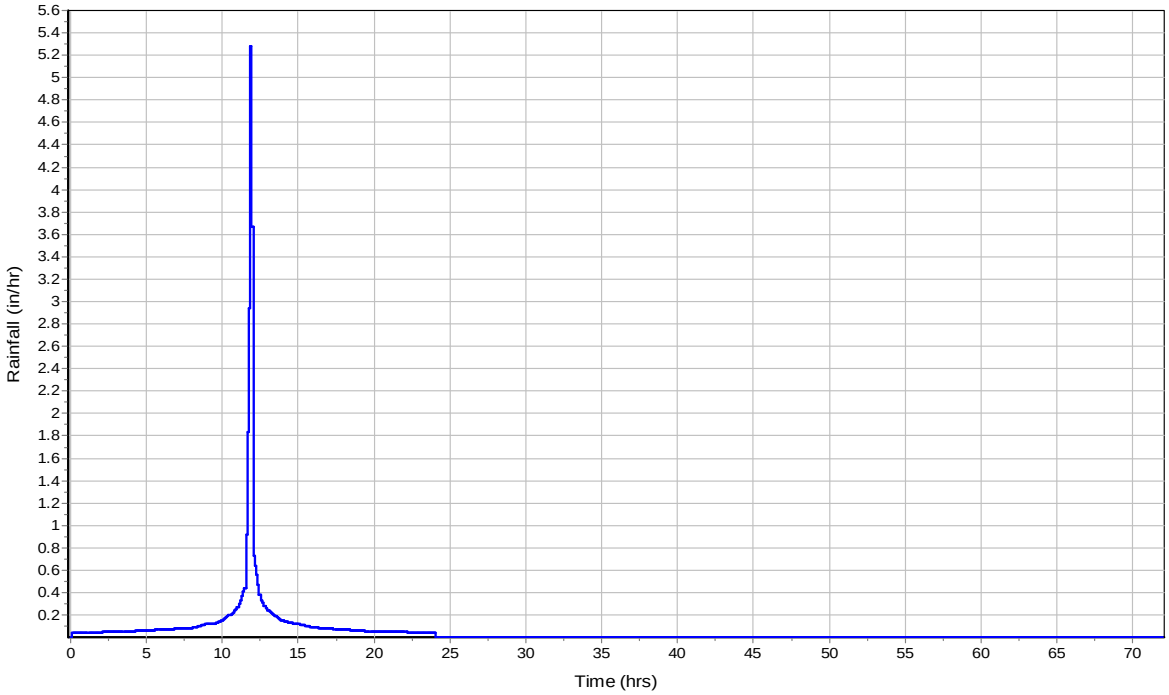
Total TOC (min) 25.30

Subbasin Runoff Results

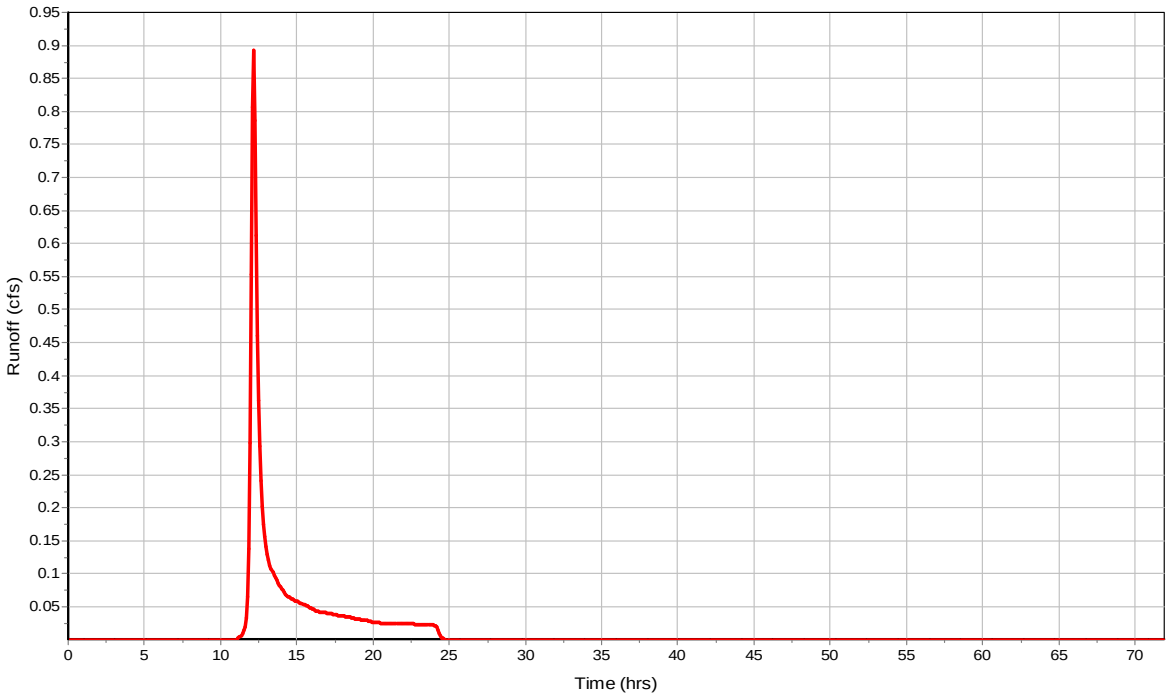
Total Rainfall (in) 3.85
Total Runoff (in) 1.23
Peak Runoff (cfs) 0.9
Weighted Curve Number 70
Time of Concentration (days hh:mm:ss) 0 00:25:18

Subbasin : DMA3

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft²)	Minimum Pipe Cover (in)
1	1-Jun	1348.82	6.00	-1342.82	0.00	-1348.82	0.00	-6.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	1-Jun	2.84	2.84	1348.87	0.05	0.00	1.95	1348.82	0.00	0 12:10	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Total Drop	Average Slope	Shape	Height	Width	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow	Flap Gate
		(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(ft)	(ft)					(cfs)	
1	Link-01	50.00	1348.82	0.00	1348.47	0.00	0.35	0.7000	Trapezoidal	2.000	302.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-01	2.81	0 12:10	1889.24	0.00	0.53	1.57	0.05	0.03	0.00		

Project Description

File Name ..... Post-dev.SPF

Project Options

Flow Units ..... CFS
Elevation Type ..... Elevation
Hydrology Method ..... SCS TR-55
Time of Concentration (TOC) Method ..... SCS TR-55
Link Routing Method ..... Kinematic Wave
Enable Overflow Ponding at Nodes ..... YES
Skip Steady State Analysis Time Periods ... YES

Analysis Options

Start Analysis On	00:00:00	0:00:00
End Analysis On	00:00:00	0:00:00
Start Reporting On	00:00:00	0:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	2
Subbasins.....	3
Nodes.....	6
Junctions	2
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	3
Links.....	5
Channels	1
Pipes	1
Pumps	0
Orifices	3
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	10-YEAR	Time Series	10-YEAR	Cumulative	inches	California	Riverside (Riverside Metro)	10.00	3.85	SCS Type II 24-hr
2	2-YEAR	Time Series	2-YEAR	Cumulative	inches	California	Riverside (Riverside Metro)	2.00	2.39	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	DMA1	0.71	484.00	91.00	2.39	1.51	1.07	1.38	0 00:12:39
2	DMA2	0.74	484.00	91.00	2.39	1.51	1.11	1.75	0 00:05:00
3	DMA3	0.80	484.00	91.00	2.39	1.51	1.20	1.16	0 00:25:18

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	60InPrecastCleanout	Junction	1348.77	1353.77	1349.36	0.00	0.00	0.00	1349.36	0.00	10.57	0 00:00	0.00	0.00
2	1-Jun	Junction	1348.96	1354.00	0.00	0.00	0.00	0.00	1348.96	0.00	12.75	0 00:00	0.00	0.00
3	Out-01	Outfall	1348.47					0.00	1348.47					
4	BMP1	Storage Node	1339.75	1352.93	0.00		0.00	1.37	1342.96				0.00	0.00
5	BMP2	Storage Node	1346.69	1354.00	0.00		0.00	1.75	1350.10				0.00	0.00
6	BMP3	Storage Node	1341.36	1352.37	0.00		0.00	1.15	1344.99				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-04	Pipe	60InPrecastCleanout	BMP1	18.00	1349.36	1341.50	43.6700	24.000	0.0150	0.00	129.56	0.00	0.00	0.00	0.00	0.00	Calculated
2	Link-01	Channel	1-Jun	Out-01	50.00	1348.82	1348.47	0.7000	24.000	0.0320	0.00	2235.38	0.00	0.00	0.00	0.00	0.00	
3	Orifice-01	Orifice	BMP2	60InPrecastCleanout		1346.69	1348.77		12.000		0.00							
4	Orifice-02	Orifice	BMP3	60InPrecastCleanout		1341.36	1348.77		12.000		0.00							
5	Orifice-03	Orifice	BMP1	1-Jun		1339.75	1348.96		12.000		0.00							

Subbasin Hydrology

Subbasin : DMA1

Input Data

Area (ac) 0.71
Peak Rate Factor 484
Weighted Curve Number 91
Rain Gage ID 2-YEAR

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Urban industrial, 72% imp	0.71	C	91
Composite Area & Weighted CN	0.71		91

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.3	0	0
Flow Length (ft) :	50	0	0
Slope (%) :	2.1	0	0
2 yr, 24 hr Rainfall (in) :	2.39	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	11.12	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	248	0	0
Slope (%) :	2.8	0	0
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.7	0	0
Computed Flow Time (min) :	1.53	0	0

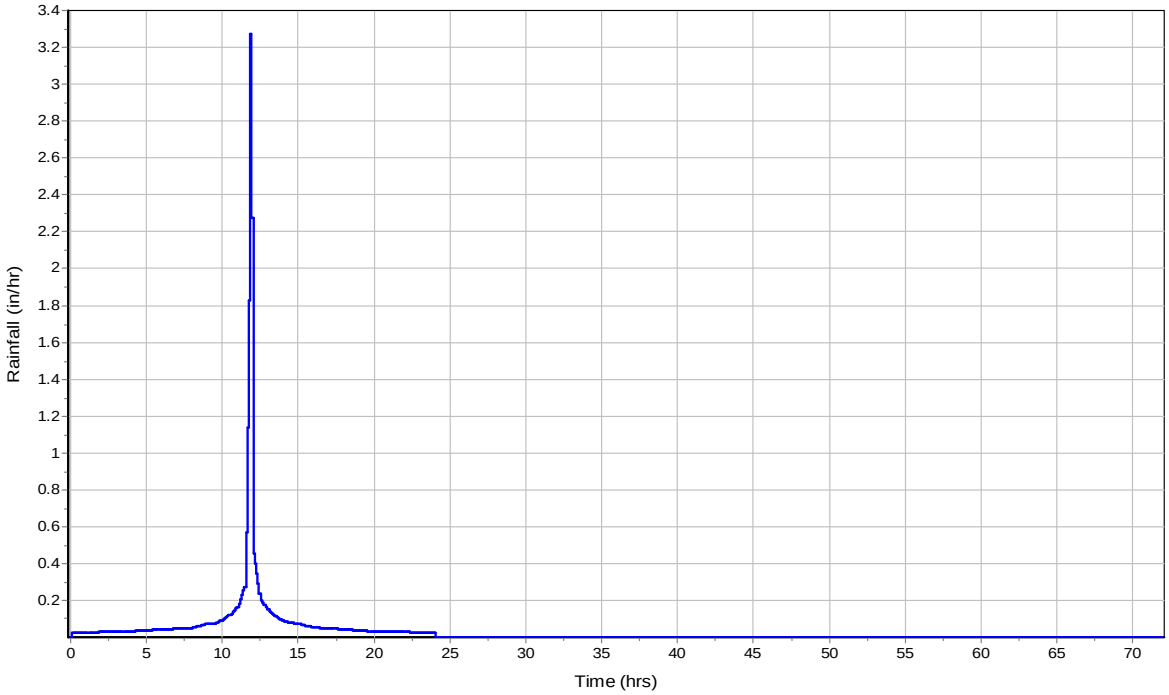
Total TOC (min) 12.65

Subbasin Runoff Results

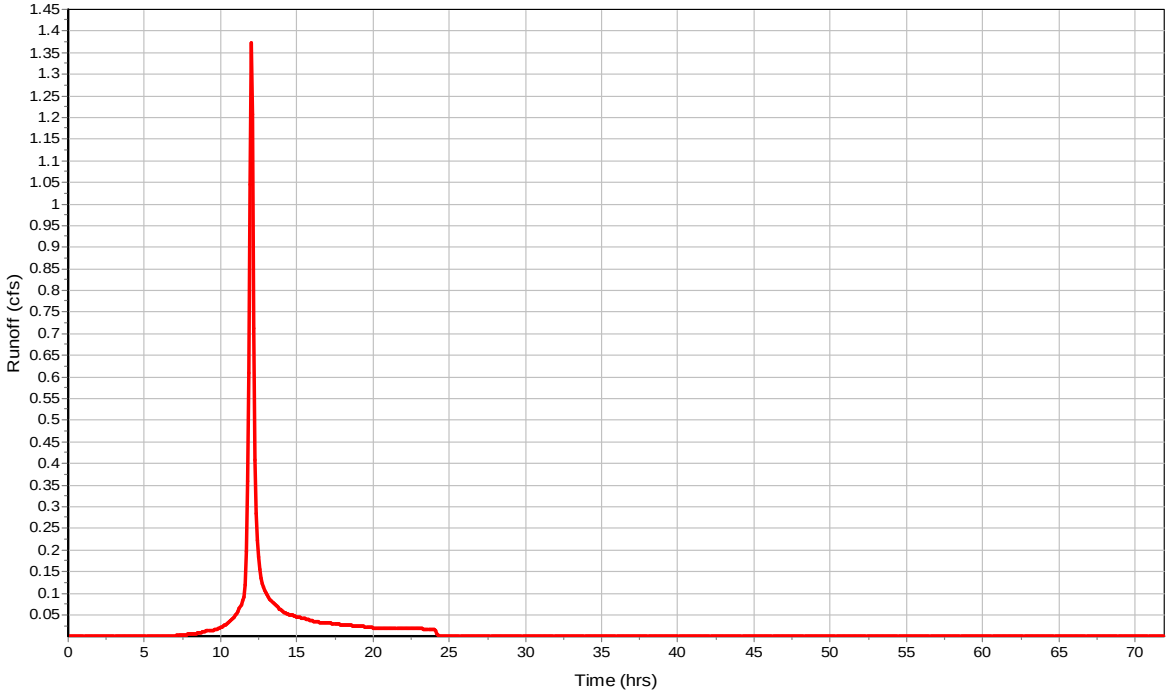
Total Rainfall (in)	2.39
Total Runoff (in)	1.51
Peak Runoff (cfs)	1.38
Weighted Curve Number	91
Time of Concentration (days hh:mm:ss)	0 00:12:39

Subbasin : DMA1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DMA2

Input Data

Area (ac)	0.74
Peak Rate Factor	484
Weighted Curve Number	91
Rain Gage ID	2-YEAR

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Urban industrial, 72% imp	0.74	C	91
Composite Area & Weighted CN	0.74		91

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.01	0	0
Flow Length (ft) :	50	0	0
Slope (%) :	0.5	0	0
2 yr, 24 hr Rainfall (in) :	2.39	0	0
Velocity (ft/sec) :	0.64	0	0
Computed Flow Time (min) :	1.3	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	130	0	0
Slope (%) :	0.7	0	0
Surface Type :	Paved	Unpaved	Unpaved
Velocity (ft/sec) :	1.7	0	0
Computed Flow Time (min) :	1.27	0	0

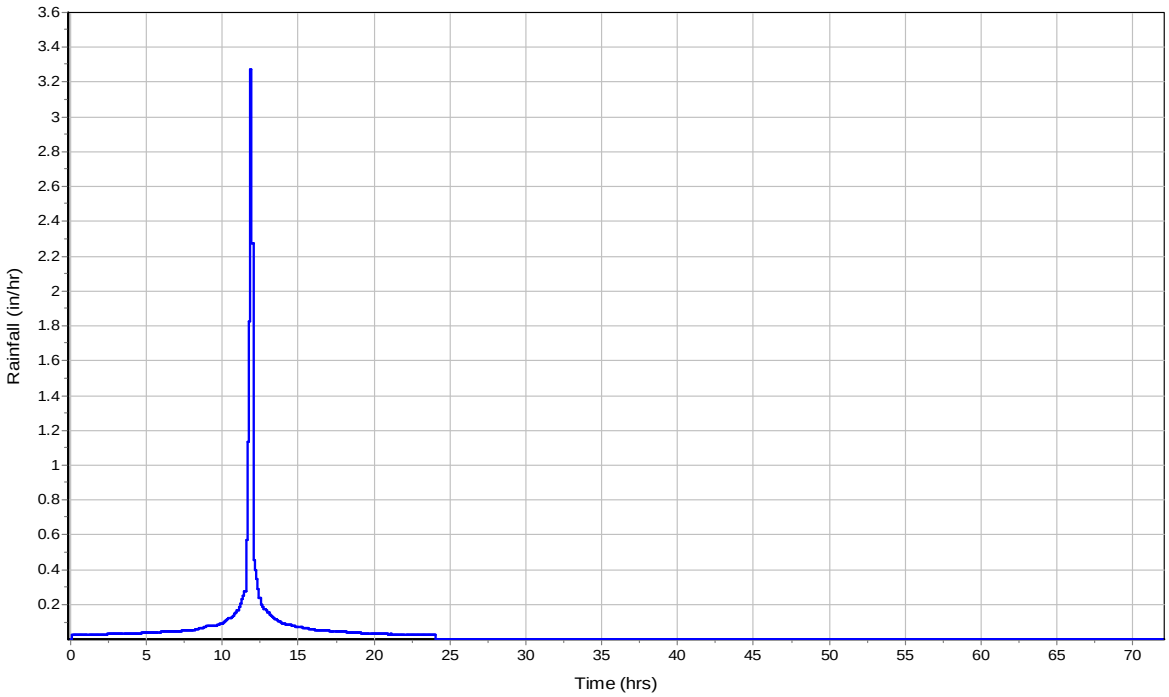
Total TOC (min) 2.57

Subbasin Runoff Results

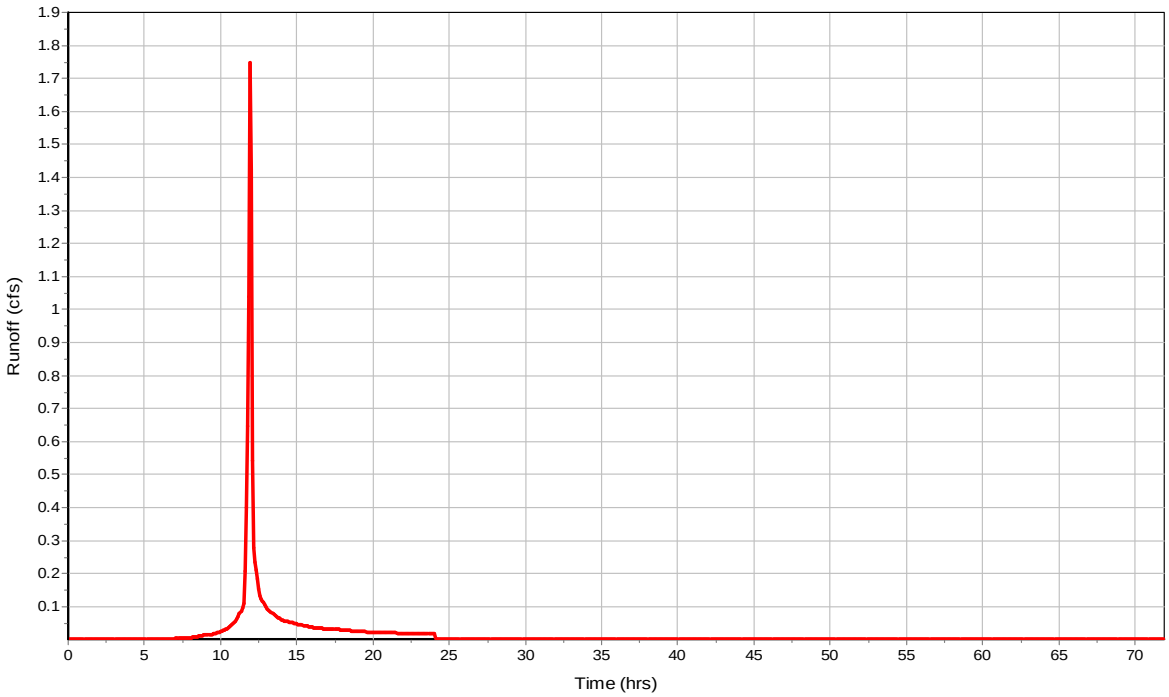
Total Rainfall (in)	2.39
Total Runoff (in)	1.51
Peak Runoff (cfs)	1.75
Weighted Curve Number	91
Time of Concentration (days hh:mm:ss)	0 00:02:34

Subbasin : DMA2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DMA3

Input Data

Area (ac)	0.8
Peak Rate Factor	484
Weighted Curve Number	91
Rain Gage ID	2-YEAR

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Urban industrial, 72% imp	0.8	C	91
Composite Area & Weighted CN	0.8		91

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.3	0	0
Flow Length (ft) :	50	0	0
Slope (%) :	0.5	0	0
2 yr, 24 hr Rainfall (in) :	2.39	0	0
Velocity (ft/sec) :	0.04	0	0
Computed Flow Time (min) :	19.74	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	537	0	0
Slope (%) :	1	0	0
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	5.56	0	0

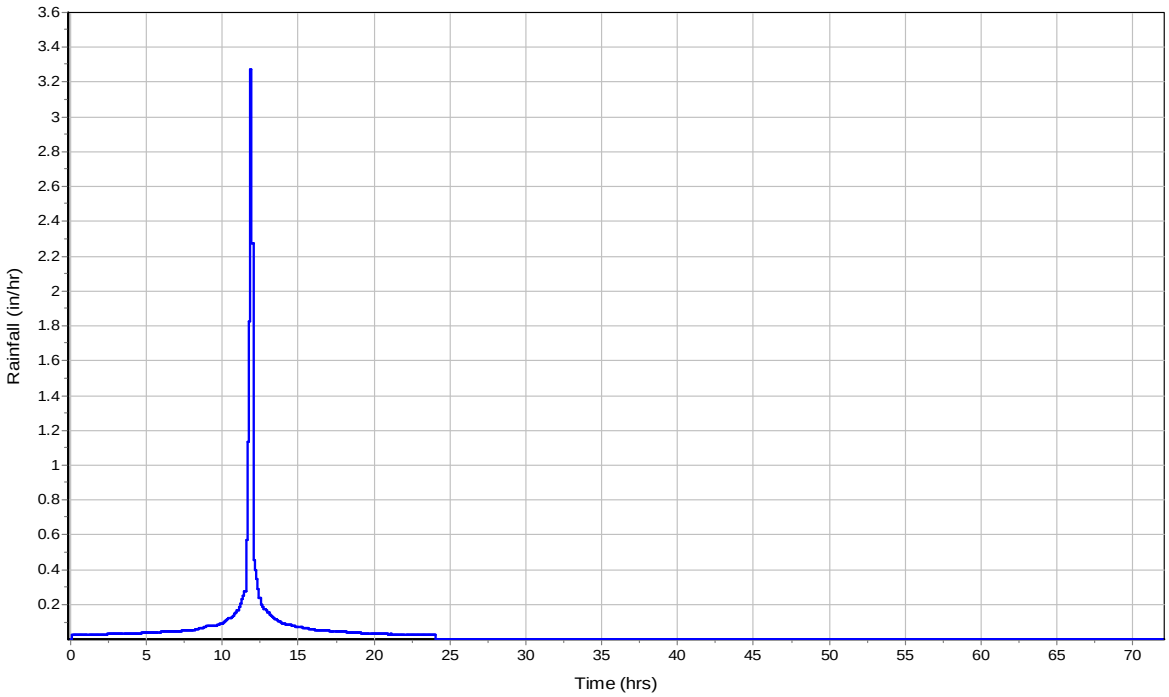
Total TOC (min) 25.30

Subbasin Runoff Results

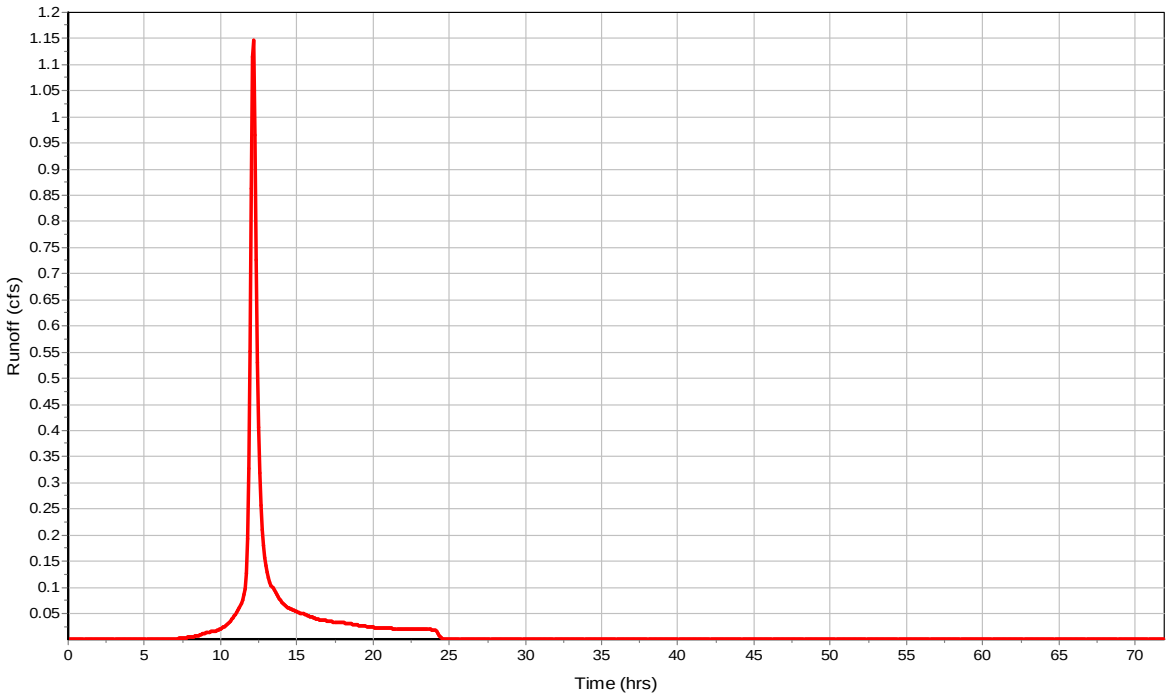
Total Rainfall (in)	2.39
Total Runoff (in)	1.51
Peak Runoff (cfs)	1.16
Weighted Curve Number	91
Time of Concentration (days hh:mm:ss)	0 00:25:18

Subbasin : DMA3

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
1	60InPrecastCleanout	1348.77	1353.77	5.00	1349.36	0.59	0.00	-1353.77	0.00	0.00
2	1-Jun	1348.96	1354.00	5.04	0.00	-1348.96	0.00	-1354.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	60InPrecastCleanout	0.00	0.00	1349.36	0.59	0.00	10.57	1349.36	0.59	0 00:00	0 00:00	0.00	0.00
2	1-Jun	0.00	0.00	1348.96	0.00	0.00	12.75	1348.96	0.00	0 00:00	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-01	50.00	1348.82	-0.14	1348.47	0.00	0.35	0.7000	Trapezoidal	2.000	302.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-01	0.00	0 00:00	2235.38	0.00	0.00		0.00	0.00	0.00		

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	Link-04	18.00	1349.36	0.59	1341.50	1.75	7.86	43.6700	CIRCULAR	24.000	24.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-04	0.00	0 00:00	129.56	0.00	0.00		0.00	0.00	0.00		Calculated

Storage Nodes

Storage Node : BMP1

Input Data

Invert Elevation (ft)	1339.75
Max (Rim) Elevation (ft)	1352.93
Max (Rim) Offset (ft)	13.18
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-1339.75
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

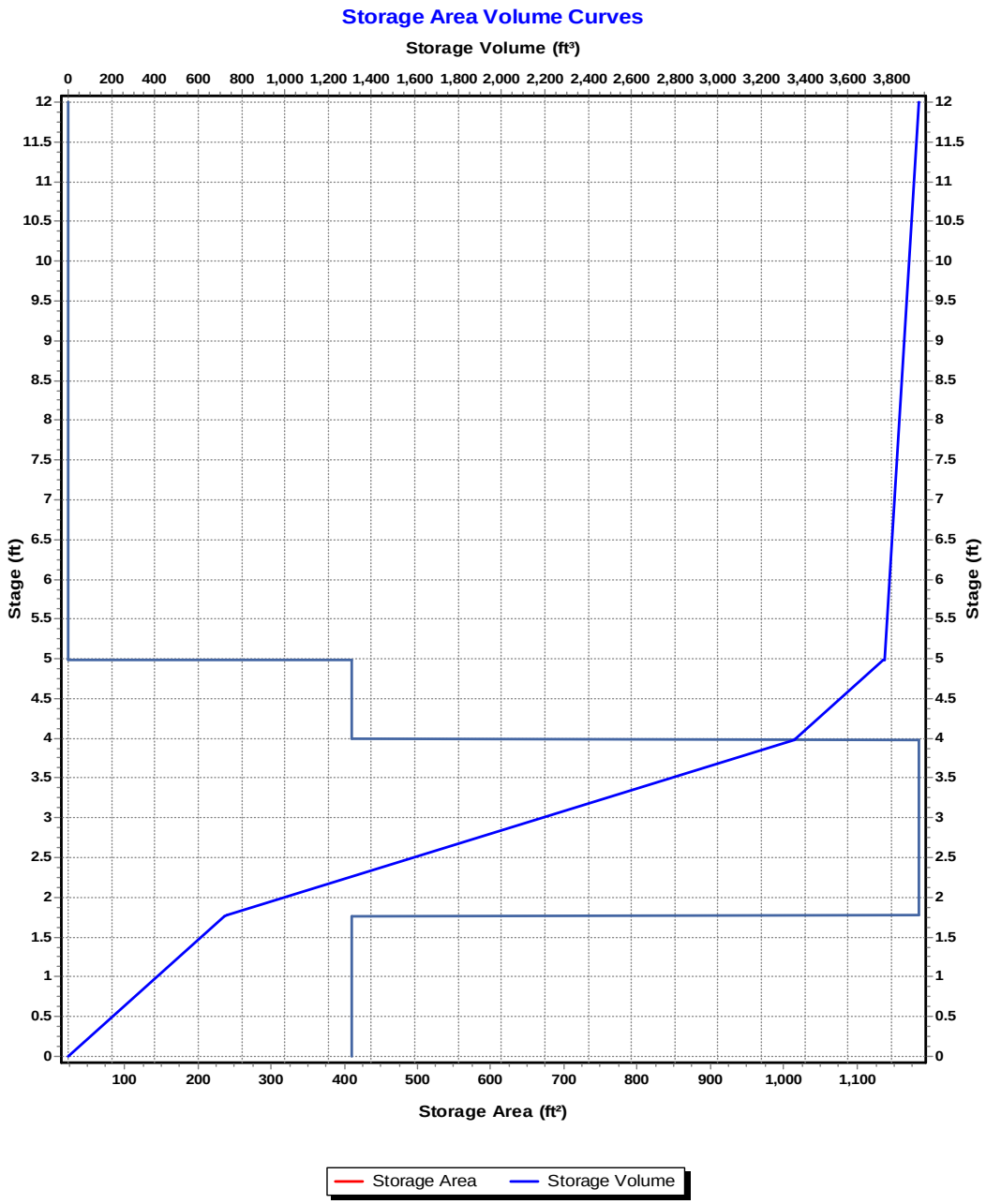
Infiltration/Exfiltration

Exfiltration Rate (in/hr)	1.4

Storage Area Volume Curves

Storage Curve : Storage-01

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	411	0
1.76	411	723.36
1.77	1185	731.34
3.98	1185	3350.19
3.99	411	3358.17
4.98	411	3765.06
4.99	22.78	3767.23
12	22.78	3926.92


Storage Area Volume Curves
Storage Volume (ft³)
0 200 400 600 800 1,000 1,200 1,400 1,600 1,800 2,000 2,200 2,400 2,600 2,800 3,000 3,200 3,400 3,600 3,800
12 11.5 11 10.5 10 9.5 9 8.5 8 7.5 7 6.5 6 5.5 5 4.5 4 3.5 3 2.5 2 1.5 1 0.5 0
Stage (ft)
Stage (ft)
100 200 300 400 500 600 700 800 900 1,000 1,100
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : BMP1 (continued)

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-03	Side	CIRCULAR	No	12.00			1351.50	0.61

Output Summary Results

Peak Inflow (cfs)	1.37
Peak Lateral Inflow (cfs)	1.37
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	2.3
Max HGL Elevation Attained (ft)	1342.96
Max HGL Depth Attained (ft)	3.21
Average HGL Elevation Attained (ft)	1340.63
Average HGL Depth Attained (ft)	0.88
Time of Max HGL Occurrence (days hh:mm)	0 15:53
Total Exfiltration Volume (1000-ft³)	3.811
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : BMP2

Input Data

Invert Elevation (ft)	1346.69
Max (Rim) Elevation (ft)	1354.00
Max (Rim) Offset (ft)	7.31
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-1346.69
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

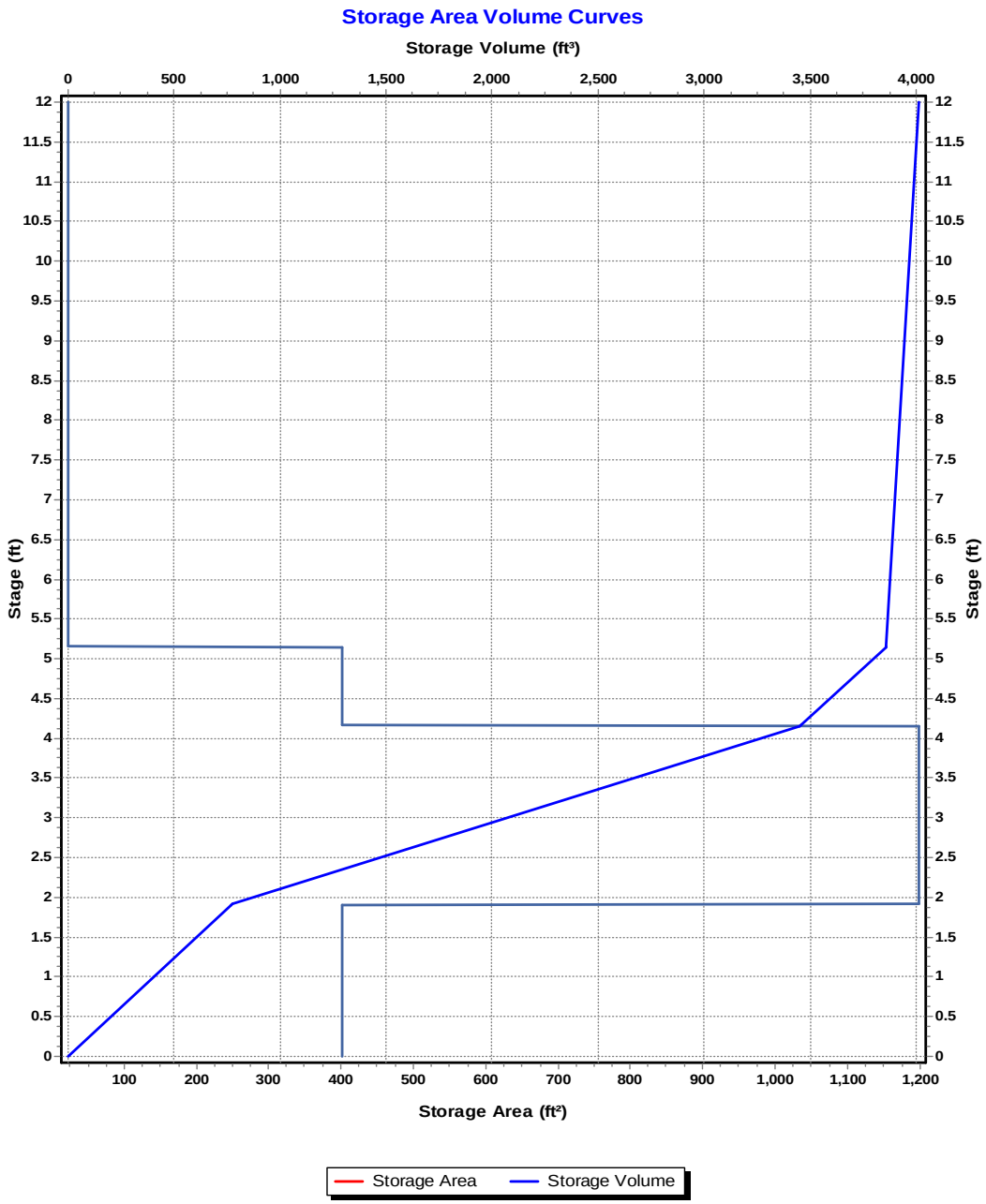
Infiltration/Exfiltration

Exfiltration Rate (in/hr)	1.4

Storage Area Volume Curves

Storage Curve : Storage-03

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	402	0
1.91	402	767.82
1.92	1198.875	775.82
4.15	1198.875	3449.31
4.16	402	3457.31
5.15	402	3855.29
5.16	22.78	3857.41
12	22.78	4013.23


Storage Area Volume Curves
Storage Volume (ft³)
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
Stage (ft)
Stage (ft)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
10
10.5
11
11.5
12
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : BMP2 (continued)

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-01	Side	CIRCULAR	No	12.00			1352.00	0.61

Output Summary Results

Peak Inflow (cfs)	1.75
Peak Lateral Inflow (cfs)	1.75
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	2.33
Max HGL Elevation Attained (ft)	1350.1
Max HGL Depth Attained (ft)	3.41
Average HGL Elevation Attained (ft)	1347.66
Average HGL Depth Attained (ft)	0.97
Time of Max HGL Occurrence (days hh:mm)	0 15:52
Total Exfiltration Volume (1000-ft³)	3.972
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : BMP3

Input Data

Invert Elevation (ft)	1341.36
Max (Rim) Elevation (ft)	1352.37
Max (Rim) Offset (ft)	11.01
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-1341.36
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

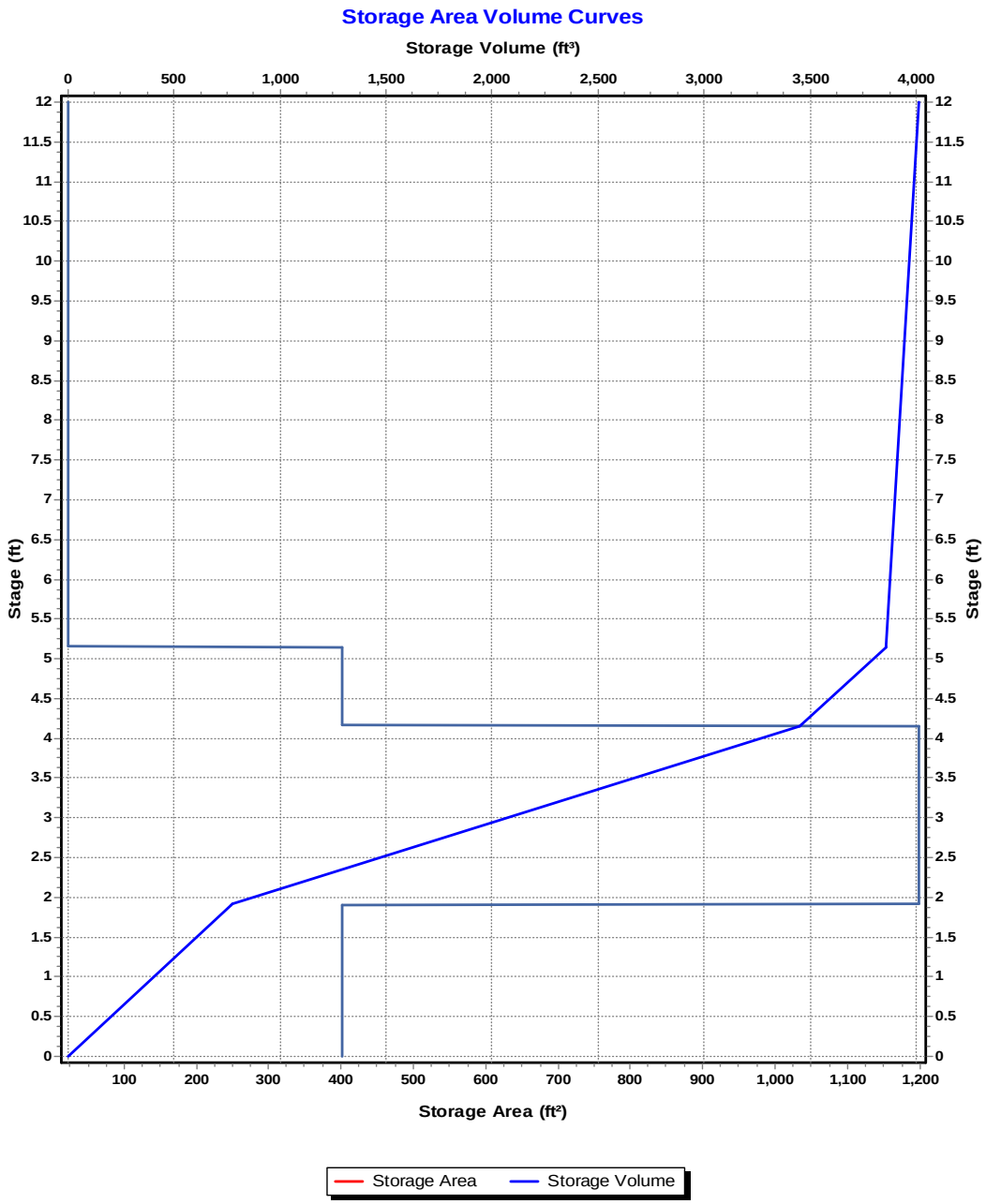
Infiltration/Exfiltration

Exfiltration Rate (in/hr)	1.4

Storage Area Volume Curves

Storage Curve : Storage-03

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	402	0
1.91	402	767.82
1.92	1198.875	775.82
4.15	1198.875	3449.31
4.16	402	3457.31
5.15	402	3855.29
5.16	22.78	3857.41
12	22.78	4013.23


Storage Area Volume Curves
Storage Volume (ft³)
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
Stage (ft)
Stage (ft)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
10
10.5
11
11.5
12
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : BMP3 (continued)

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-02	Side	CIRCULAR	No	12.00			1351.52	0.61

Output Summary Results

Peak Inflow (cfs)	1.15
Peak Lateral Inflow (cfs)	1.15
Peak Outflow (cfs)	0
Peak Exfiltration Flow Rate (cfm)	2.33
Max HGL Elevation Attained (ft)	1344.99
Max HGL Depth Attained (ft)	3.63
Average HGL Elevation Attained (ft)	1342.47
Average HGL Depth Attained (ft)	1.11
Time of Max HGL Occurrence (days hh:mm)	0 16:31
Total Exfiltration Volume (1000-ft³)	4.298
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Project Description

File Name	Post-dev.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	SCS TR-55
Time of Concentration (TOC) Method	SCS TR-55
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	YES

Analysis Options

Start Analysis On	00:00:00	0:00:00
End Analysis On	00:00:00	0:00:00
Start Reporting On	00:00:00	0:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	2
Subbasins	3
Nodes	6
Junctions	2
Outfalls	1
Flow Diversions	0
Inlets	0
Storage Nodes	3
Links	5
Channels	1
Pipes	1
Pumps	0
Orifices	3
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (inches)	Rainfall Distribution
1	10-YEAR	Time Series	10-YEAR	Cumulative	inches	California	Riverside (Riverside Metro)	10.00	3.85	SCS Type II 24-hr
2	2-YEAR	Time Series	2-YEAR	Cumulative	inches	California	Riverside (Riverside Metro)	2.00	2.39	SCS Type II 24-hr

Subbasin Summary

SN	Subbasin ID	Area (ac)	Peak Rate Factor	Weighted Curve Number	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	DMA1	0.71	484.00	91.00	3.85	2.87	2.03	2.56	0 00:12:39
2	DMA2	0.74	484.00	91.00	3.85	2.87	2.12	3.25	0 00:05:00
3	DMA3	0.80	484.00	91.00	3.85	2.87	2.28	2.18	0 00:25:18

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Ponded Area (ft^2)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	60InPrecastCleanout	Junction	1348.77	1353.77	1349.36	0.00	0.00	1.73	1349.52	0.00	10.41	0 00:00	0.00	0.00
2	1-Jun	Junction	1348.96	1354.00	0.00	0.00	0.00	2.09	1349.00	0.00	12.71	0 00:00	0.00	0.00
3	Out-01	Outfall	1348.47					1.81	1348.51					
4	BMP1	Storage Node	1339.75	1352.93	0.00		0.00	3.90	1352.34				0.00	0.00
5	BMP2	Storage Node	1346.69	1354.00	0.00		0.00	3.24	1352.73				0.00	0.00
6	BMP3	Storage Node	1341.36	1352.37	0.00		0.00	2.13	1352.16				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Average Slope (%)	Diameter or Height (in)	Manning's Roughness	Peak Flow (cfs)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-04	Pipe	60InPrecastCleanout	BMP1	18.00	1349.36	1341.50	43.6700	24.000	0.0150	1.71	129.56	0.01	14.33	0.14	0.08	0.00	Calculated
2	Link-01	Channel	1-Jun	Out-01	50.00	1348.82	1348.47	0.7000	24.000	0.0320	1.81	2235.38	0.00	0.50	0.03	0.02	0.00	
3	Orifice-01	Orifice	BMP2	60InPrecastCleanout		1346.69	1348.77		12.000		1.71							
4	Orifice-02	Orifice	BMP3	60InPrecastCleanout		1341.36	1348.77		12.000		1.41							
5	Orifice-03	Orifice	BMP1	1-Jun		1339.75	1348.96		12.000		2.09							

Subbasin Hydrology

Subbasin : DMA1

Input Data

Area (ac) 0.71
Peak Rate Factor 484
Weighted Curve Number 91
Rain Gage ID 10-YEAR

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Urban industrial, 72% imp	0.71	C	91
Composite Area & Weighted CN	0.71		91

Time of Concentration

TOC Method : SCS TR-55

Sheet Flow Equation :

Tc = (0.007 * ((n * Lf)^0.8)) / ((P^0.5) * (Sf^0.4))

Where :

Tc = Time of Concentration (hr)
n = Manning's roughness
Lf = Flow Length (ft)
P = 2 yr, 24 hr Rainfall (inches)
Sf = Slope (ft/ft)

Shallow Concentrated Flow Equation :

V = 16.1345 * (Sf^0.5) (unpaved surface)
V = 20.3282 * (Sf^0.5) (paved surface)
V = 15.0 * (Sf^0.5) (grassed waterway surface)
V = 10.0 * (Sf^0.5) (nearly bare & untilled surface)
V = 9.0 * (Sf^0.5) (cultivated straight rows surface)
V = 7.0 * (Sf^0.5) (short grass pasture surface)
V = 5.0 * (Sf^0.5) (woodland surface)
V = 2.5 * (Sf^0.5) (forest w/heavy litter surface)
Tc = (Lf / V) / (3600 sec/hr)

Where:

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)

Channel Flow Equation :

V = (1.49 * (R^(2/3)) * (Sf^0.5)) / n
R = Aq / Wp
Tc = (Lf / V) / (3600 sec/hr)

Where :

Tc = Time of Concentration (hr)
Lf = Flow Length (ft)
R = Hydraulic Radius (ft)
Aq = Flow Area (ft^2)
Wp = Wetted Perimeter (ft)
V = Velocity (ft/sec)
Sf = Slope (ft/ft)
n = Manning's roughness

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.3	0	0
Flow Length (ft) :	50	0	0
Slope (%) :	2.1	0	0
2 yr, 24 hr Rainfall (in) :	2.39	0	0
Velocity (ft/sec) :	0.07	0	0
Computed Flow Time (min) :	11.12	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	248	0	0
Slope (%) :	2.8	0	0
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	2.7	0	0
Computed Flow Time (min) :	1.53	0	0

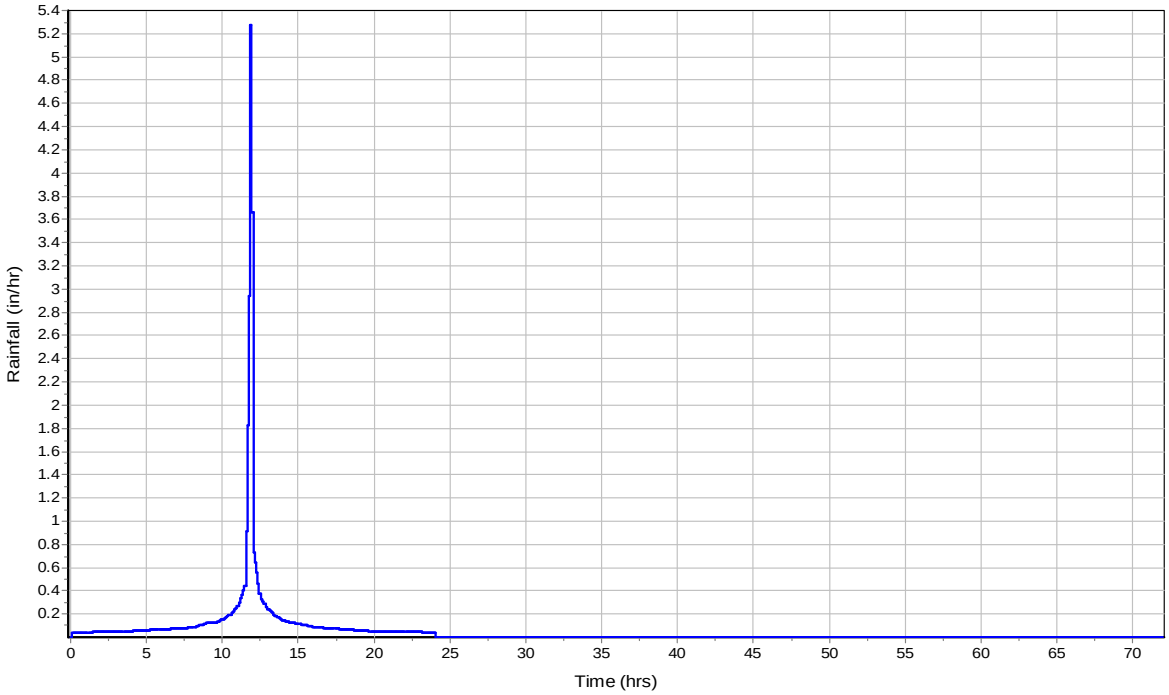
Total TOC (min) 12.65

Subbasin Runoff Results

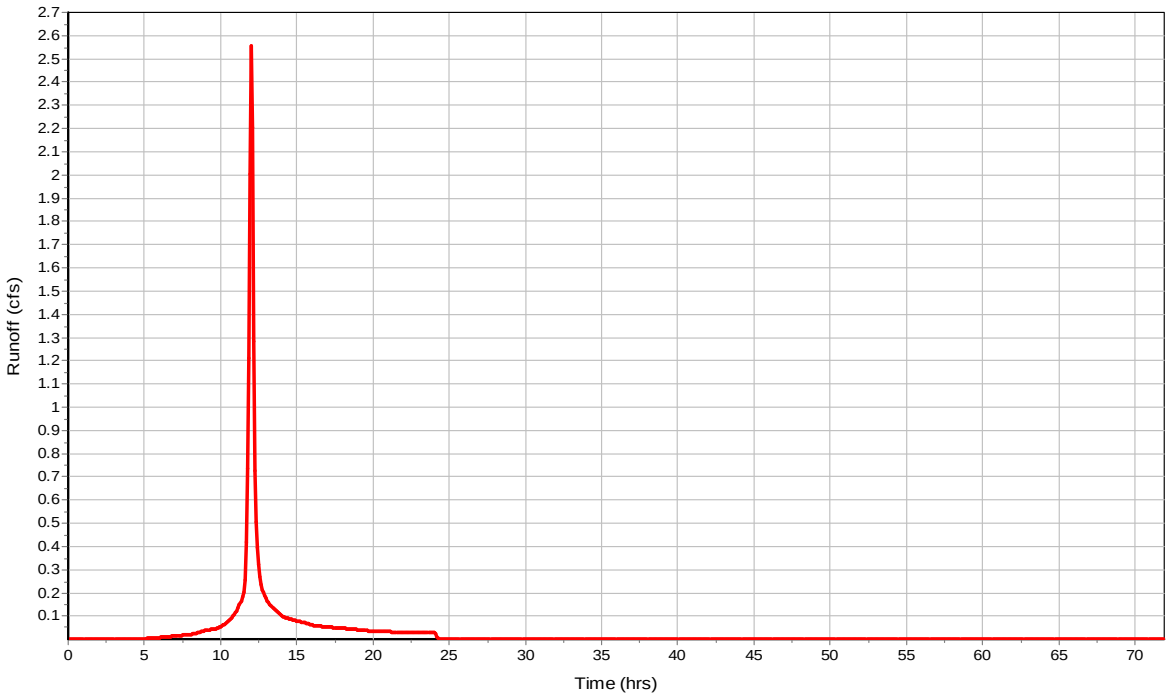
Total Rainfall (in)	3.85
Total Runoff (in)	2.87
Peak Runoff (cfs)	2.56
Weighted Curve Number	91
Time of Concentration (days hh:mm:ss)	0 00:12:39

Subbasin : DMA1

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DMA2

Input Data

Area (ac)	0.74
Peak Rate Factor	484
Weighted Curve Number	91
Rain Gage ID	10-YEAR

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Urban industrial, 72% imp	0.74	C	91
Composite Area & Weighted CN	0.74		91

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.01	0	0
Flow Length (ft) :	50	0	0
Slope (%) :	0.5	0	0
2 yr, 24 hr Rainfall (in) :	2.39	0	0
Velocity (ft/sec) :	0.64	0	0
Computed Flow Time (min) :	1.3	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	130	0	0
Slope (%) :	0.7	0	0
Surface Type :	Paved	Unpaved	Unpaved
Velocity (ft/sec) :	1.7	0	0
Computed Flow Time (min) :	1.27	0	0

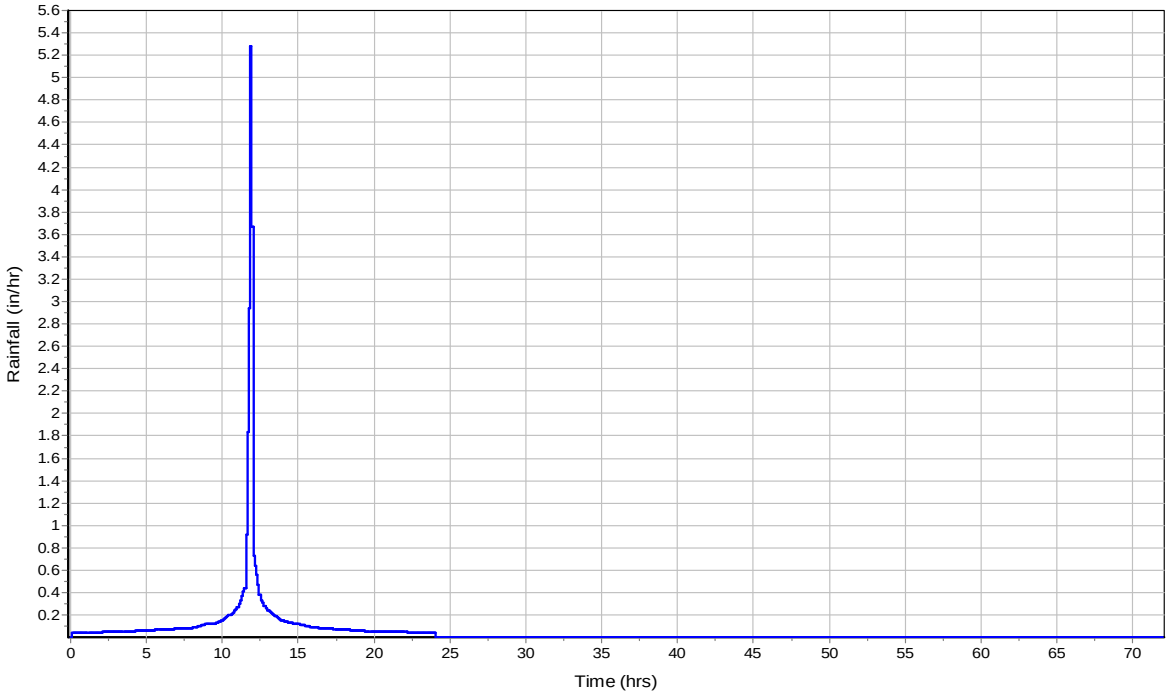
Total TOC (min) 2.57

Subbasin Runoff Results

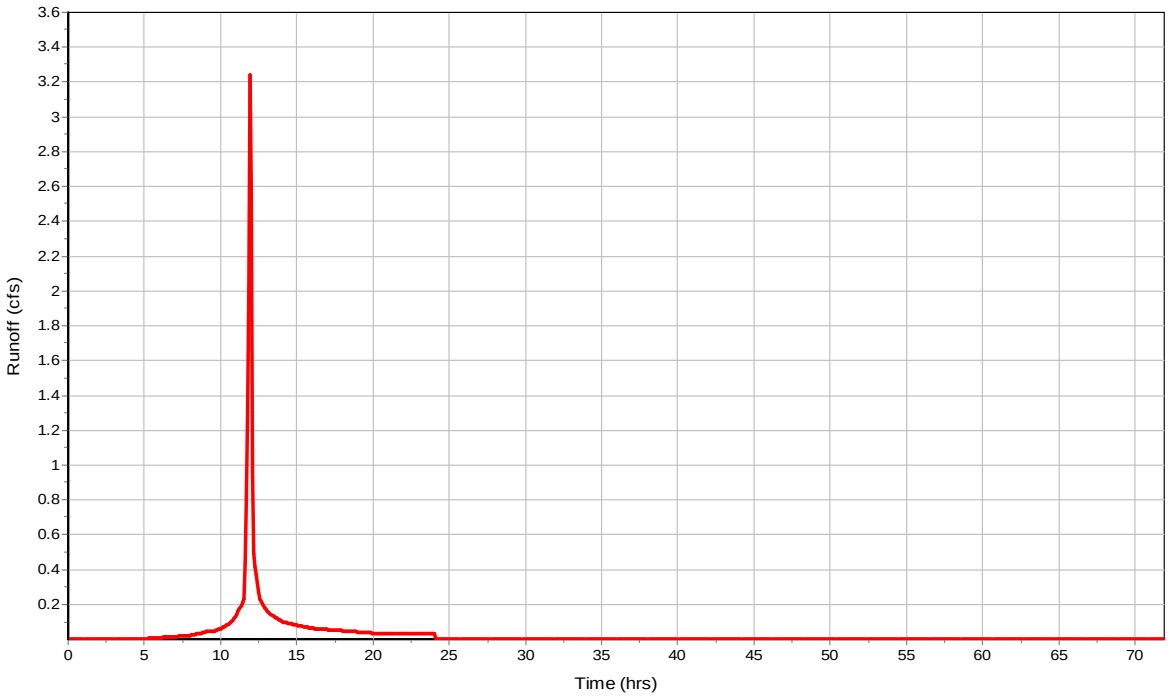
Total Rainfall (in)	3.85
Total Runoff (in)	2.87
Peak Runoff (cfs)	3.25
Weighted Curve Number	91
Time of Concentration (days hh:mm:ss)	0 00:02:34

Subbasin : DMA2

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : DMA3

Input Data

Area (ac)	0.8
Peak Rate Factor	484
Weighted Curve Number	91
Rain Gage ID	10-YEAR

Composite Curve Number

32 Soil/Surface Description	Area (acres)	Soil Group	Curve Number
Urban industrial, 72% imp	0.8	C	91
Composite Area & Weighted CN	0.8		91

Time of Concentration

Sheet Flow Computations	Subarea A	Subarea B	Subarea C
Manning's Roughness :	0.3	0	0
Flow Length (ft) :	50	0	0
Slope (%) :	0.5	0	0
2 yr, 24 hr Rainfall (in) :	2.39	0	0
Velocity (ft/sec) :	0.04	0	0
Computed Flow Time (min) :	19.74	0	0

Shallow Concentrated Flow Computations	Subarea A	Subarea B	Subarea C
Flow Length (ft) :	537	0	0
Slope (%) :	1	0	0
Surface Type :	Unpaved	Unpaved	Unpaved
Velocity (ft/sec) :	1.61	0	0
Computed Flow Time (min) :	5.56	0	0

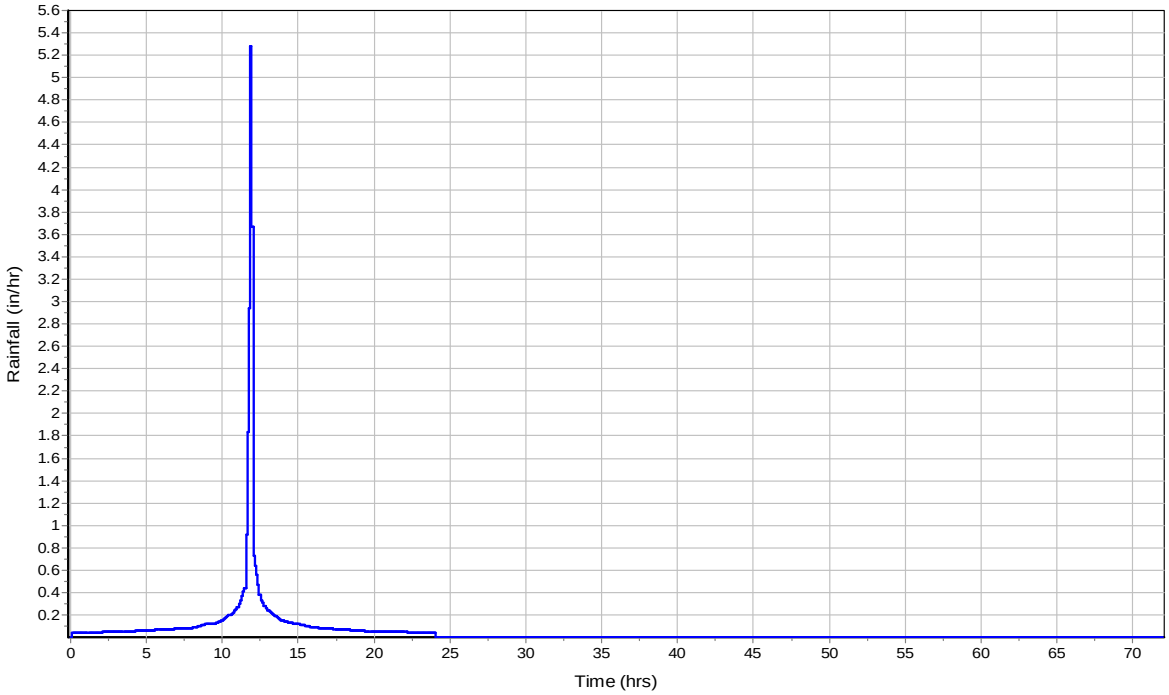
Total TOC (min) 25.30

Subbasin Runoff Results

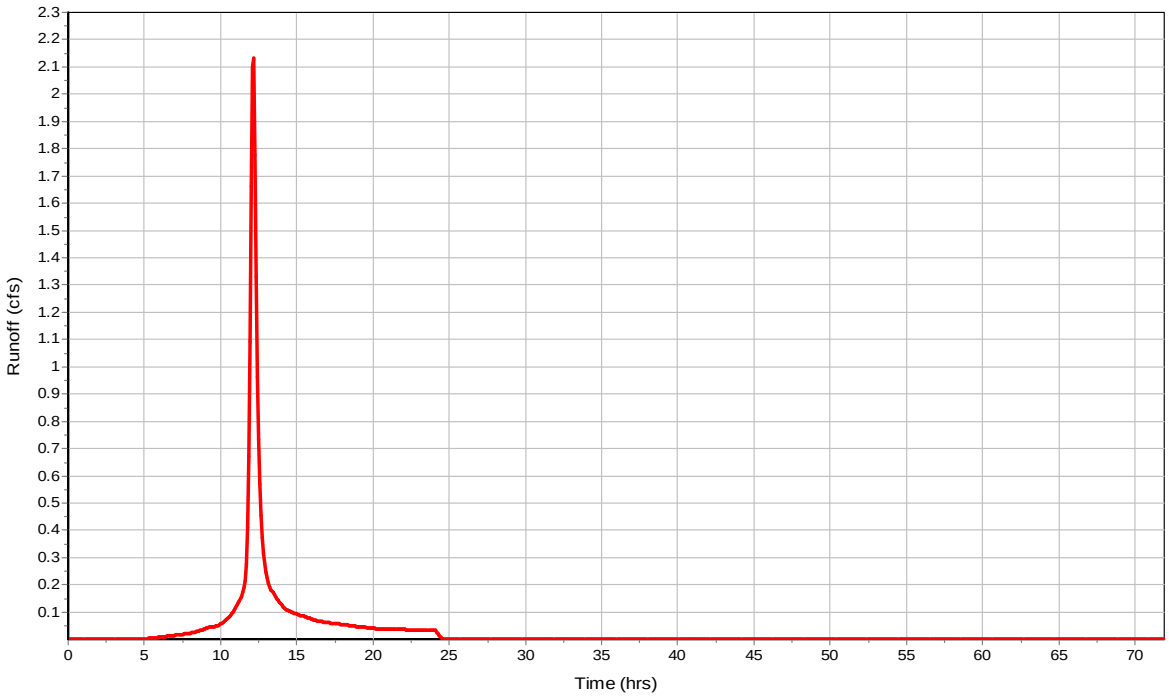
Total Rainfall (in)	3.85
Total Runoff (in)	2.87
Peak Runoff (cfs)	2.18
Weighted Curve Number	91
Time of Concentration (days hh:mm:ss)	0 00:25:18

Subbasin : DMA3

Rainfall Intensity Graph



Runoff Hydrograph



Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Elevation (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Ponded Area (ft^2)	Minimum Pipe Cover (in)
1	60InPrecastCleanout	1348.77	1353.77	5.00	1349.36	0.59	0.00	-1353.77	0.00	0.00
2	1-Jun	1348.96	1354.00	5.04	0.00	-1348.96	0.00	-1354.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	60InPrecastCleanout	1.73	0.00	1349.52	0.75	0.00	10.41	1349.36	0.59	0 12:26	0 00:00	0.00	0.00
2	1-Jun	2.09	0.00	1349.00	0.04	0.00	12.71	1348.96	0.00	0 12:15	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Shape	Height (ft)	Width (ft)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate
1	Link-01	50.00	1348.82	-0.14	1348.47	0.00	0.35	0.7000	Trapezoidal	2.000	302.000	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-01	1.81	0 12:28	2235.38	0.00	0.50	1.67	0.03	0.02	0.00		

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Inlet Invert Offset (ft)	Outlet Invert Elevation (ft)	Outlet Invert Offset (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Pipe Width (in)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	Link-04	18.00	1349.36	0.59	1341.50	1.75	7.86	43.6700	CIRCULAR	24.000	24.000	0.0150	0.5000	0.5000	0.0000	0.00	No	1

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-04	1.71	0 12:26	129.56	0.01	14.33	0.02	0.14	0.08	0.00		Calculated

Storage Nodes

Storage Node : BMP1

Input Data

Invert Elevation (ft)	1339.75
Max (Rim) Elevation (ft)	1352.93
Max (Rim) Offset (ft)	13.18
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-1339.75
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

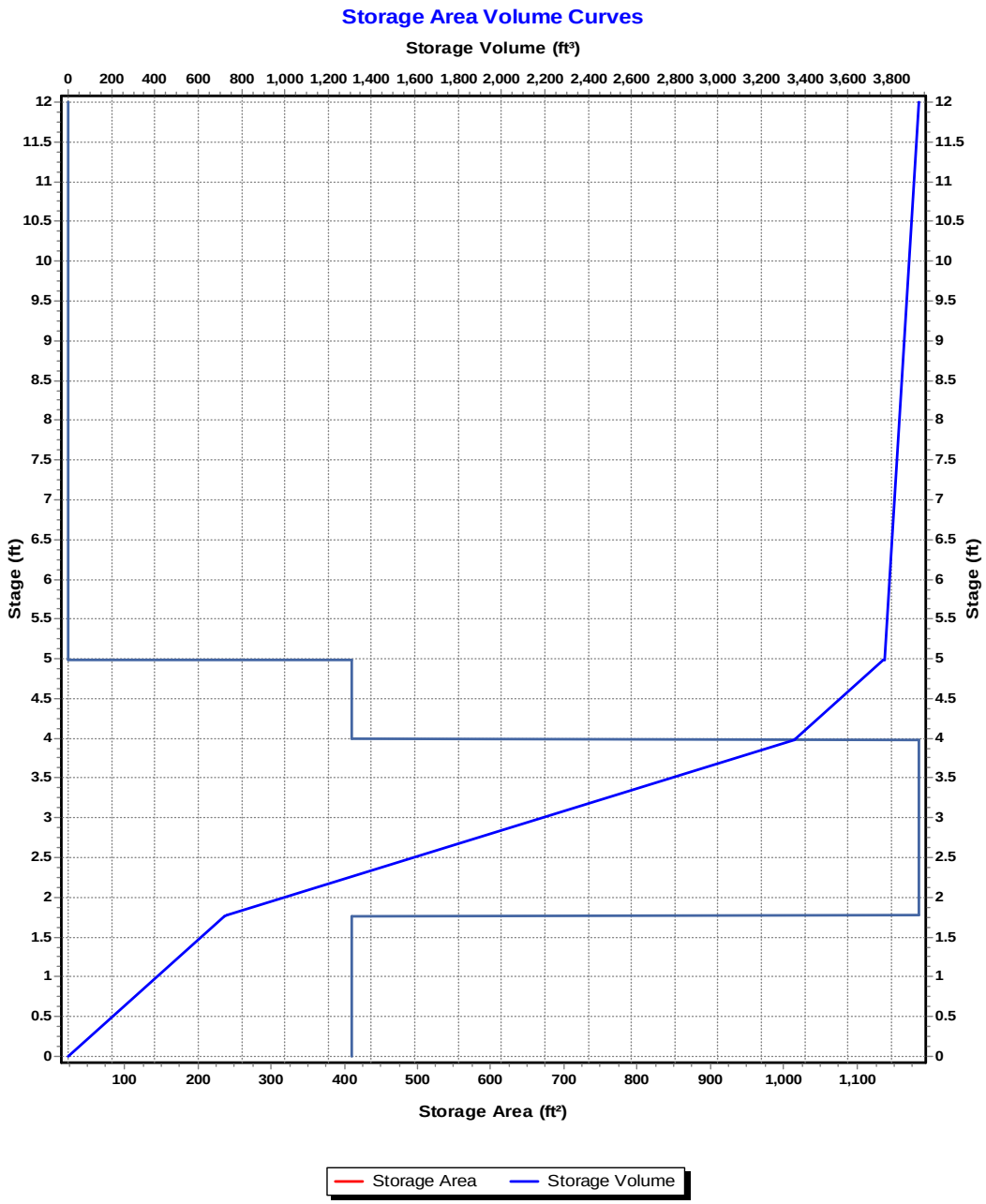
Infiltration/Exfiltration

Exfiltration Rate (in/hr)	1.4

Storage Area Volume Curves

Storage Curve : Storage-01

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	411	0
1.76	411	723.36
1.77	1185	731.34
3.98	1185	3350.19
3.99	411	3358.17
4.98	411	3765.06
4.99	22.78	3767.23
12	22.78	3926.92


Storage Area Volume Curves
Storage Volume (ft³)
0 200 400 600 800 1,000 1,200 1,400 1,600 1,800 2,000 2,200 2,400 2,600 2,800 3,000 3,200 3,400 3,600 3,800
Stage (ft)
0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5 8 8.5 9 9.5 10 10.5 11 11.5 12
Storage Area (ft²)
100 200 300 400 500 600 700 800 900 1,000 1,100
Storage Area
Storage Volume

Storage Node : BMP1 (continued)

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-03	Side	CIRCULAR	No	12.00			1351.50	0.61

Output Summary Results

Peak Inflow (cfs)	3.9
Peak Lateral Inflow (cfs)	2.56
Peak Outflow (cfs)	2.09
Peak Exfiltration Flow Rate (cfm)	2.3
Max HGL Elevation Attained (ft)	1352.34
Max HGL Depth Attained (ft)	12.59
Average HGL Elevation Attained (ft)	1342.7
Average HGL Depth Attained (ft)	2.95
Time of Max HGL Occurrence (days hh:mm)	0 12:15
Total Exfiltration Volume (1000-ft³)	5.792
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : BMP2

Input Data

Invert Elevation (ft)	1346.69
Max (Rim) Elevation (ft)	1354.00
Max (Rim) Offset (ft)	7.31
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-1346.69
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

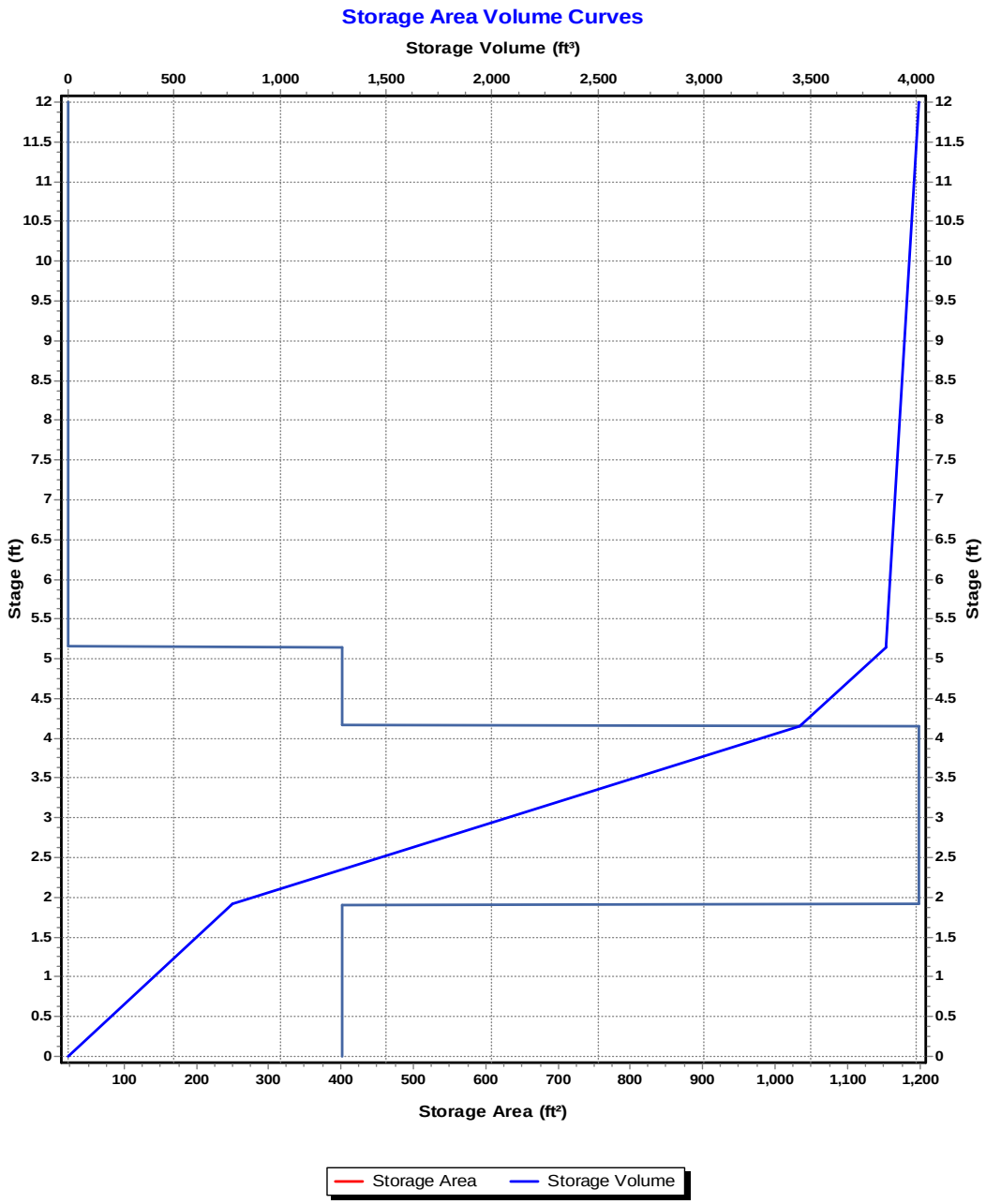
Infiltration/Exfiltration

Exfiltration Rate (in/hr)	1.4

Storage Area Volume Curves

Storage Curve : Storage-03

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	402	0
1.91	402	767.82
1.92	1198.875	775.82
4.15	1198.875	3449.31
4.16	402	3457.31
5.15	402	3855.29
5.16	22.78	3857.41
12	22.78	4013.23


Storage Area Volume Curves
Storage Volume (ft³)
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
Stage (ft)
Stage (ft)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
10
10.5
11
11.5
12
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : BMP2 (continued)

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-01	Side	CIRCULAR	No	12.00			1352.00	0.61

Output Summary Results

Peak Inflow (cfs)	3.24
Peak Lateral Inflow (cfs)	3.24
Peak Outflow (cfs)	1.71
Peak Exfiltration Flow Rate (cfm)	2.33
Max HGL Elevation Attained (ft)	1352.73
Max HGL Depth Attained (ft)	6.04
Average HGL Elevation Attained (ft)	1348.64
Average HGL Depth Attained (ft)	1.95
Time of Max HGL Occurrence (days hh:mm)	0 12:08
Total Exfiltration Volume (1000-ft³)	5.763
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Storage Node : BMP3

Input Data

Invert Elevation (ft)	1341.36
Max (Rim) Elevation (ft)	1352.37
Max (Rim) Offset (ft)	11.01
Initial Water Elevation (ft)	0.00
Initial Water Depth (ft)	-1341.36
Ponded Area (ft²)	0.00
Evaporation Loss	0.00

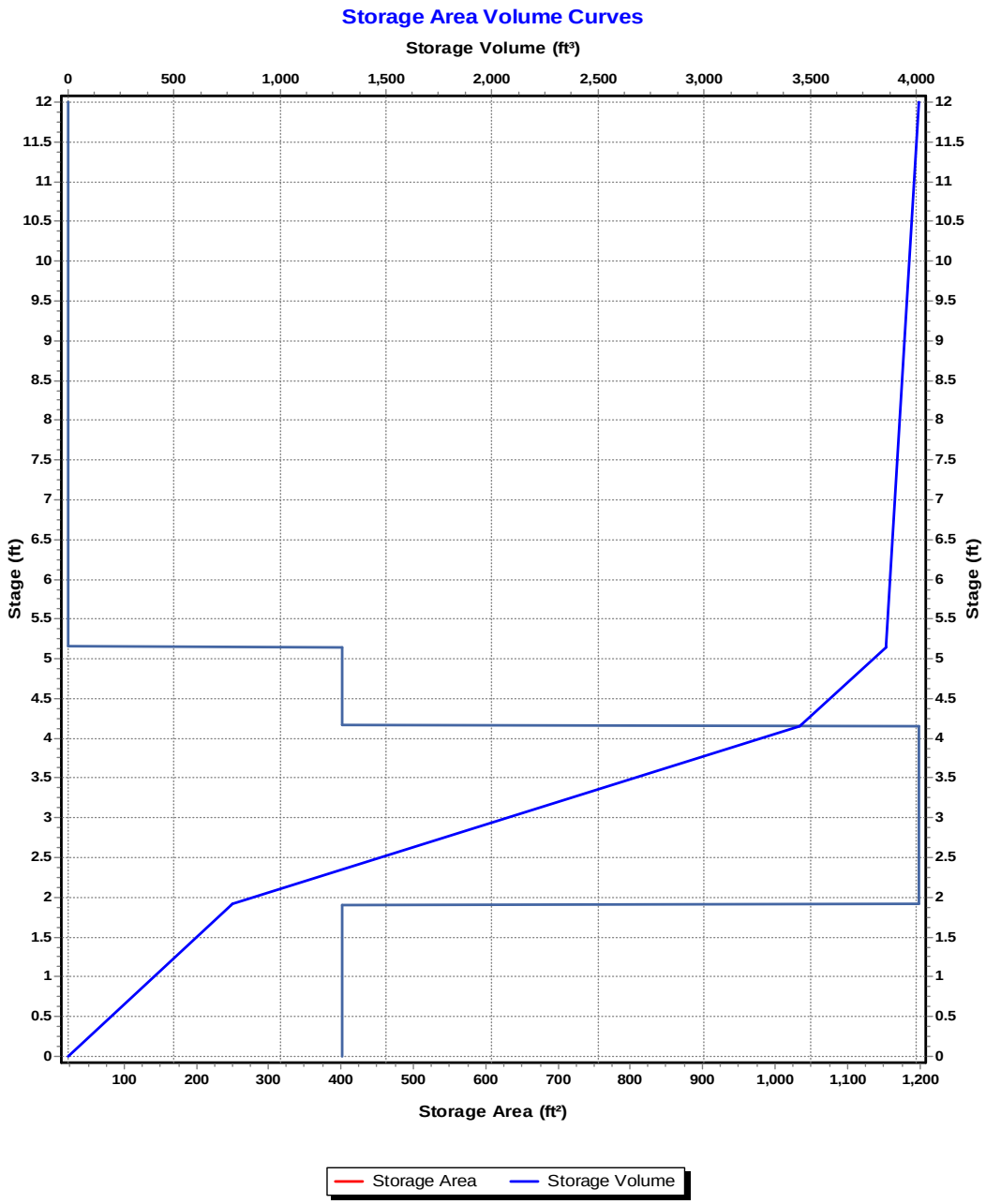
Infiltration/Exfiltration

Exfiltration Rate (in/hr)	1.4

Storage Area Volume Curves

Storage Curve : Storage-03

Stage (ft)	Storage Area (ft²)	Storage Volume (ft³)
0	402	0
1.91	402	767.82
1.92	1198.875	775.82
4.15	1198.875	3449.31
4.16	402	3457.31
5.15	402	3855.29
5.16	22.78	3857.41
12	22.78	4013.23


Storage Area Volume Curves
Storage Volume (ft³)
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
Stage (ft)
Stage (ft)
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
10
10.5
11
11.5
12
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
Storage Area (ft²)
Storage Area
Storage Volume

Storage Node : BMP3 (continued)

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (in)	Rectangular Orifice Height (in)	Rectangular Orifice Width (in)	Orifice Invert Elevation (ft)	Orifice Coefficient
1	Orifice-02	Side	CIRCULAR	No	12.00			1351.52	0.61

Output Summary Results

Peak Inflow (cfs)	2.13
Peak Lateral Inflow (cfs)	2.13
Peak Outflow (cfs)	1.41
Peak Exfiltration Flow Rate (cfm)	2.33
Max HGL Elevation Attained (ft)	1352.16
Max HGL Depth Attained (ft)	10.8
Average HGL Elevation Attained (ft)	1344.18
Average HGL Depth Attained (ft)	2.82
Time of Max HGL Occurrence (days hh:mm)	0 12:26
Total Exfiltration Volume (1000-ft³)	5.93
Total Flooded Volume (ac-in)	0
Total Time Flooded (min)	0
Total Retention Time (sec)	0

Appendix 8: Source Control

Pollutant Sources/Source Control Checklist

For Final WQMP, include a copy of the completed Pollutant Sources/Source Control Checklist in the subsequent pages and summarize Source Control BMPs in Section H of this Template.

Appendix 8
STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

How to use this worksheet (also see instructions in Section H of the 2018 SMR 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 H.1 of this WQMP Template. Describe your specific BMPs in an accompanying narrative, and explain any special conditions or situations that required omitting BMPs or substituting alternative BMPs for those shown here.

IF THESE SOURCES WILL BE ON THE PROJECT SITE ...	**... THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE**		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
❑ **A.** On-site storm drain inlets	❑ Locations of inlets.	❑ Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call **951.955.1200** to verify.	❑ Maintain and periodically repaint or replace inlet markings. ❑ Provide stormwater pollution prevention information to new site owners, lessees, or operators. ❑ See applicable operational BMPs in Fact Sheet SC-44, "Drainage System Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com ❑ Include the following in lease agreements: "Tenant shall not allow anyone to discharge anything to storm drains or to store or deposit materials so as to create a potential discharge to storm drains."
❑ **B.** Interior floor drains and elevator shaft sump pumps		❑ State that interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	❑ Inspect and maintain drains to prevent blockages and overflow.
❑ **C.** Interior parking garages		❑ State that parking garage floor drains will be plumbed to the sanitary sewer.	❑ Inspect and maintain drains to prevent blockages and overflow.

Appendix 8
STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

IF THESE SOURCES WILL BE ON THE PROJECT SITE …	… THEN YOUR WQMP SHOULD INCLUDE THESE SOURCE CONTROL BMPs, AS APPLICABLE		
1 **Potential Sources of Runoff Pollutants**	**2** **Permanent Controls—Show on WQMP Drawings**	**3** **Permanent Controls—List in WQMP Table and Narrative**	**4** **Operational BMPs—Include in WQMP Table and Narrative**
❑ **D1.** Need for future indoor & structural pest control		❑ Note building design features that discourage entry of pests.	❑ Provide Integrated Pest Management information to owners, lessees, and operators.
❑ **D2.** Landscape/ Outdoor Pesticide Use	❑ Show locations of native trees or areas of shrubs and ground cover to be undisturbed and retained. ❑ Show self-retaining landscape areas, if any. ❑ Show stormwater treatment and hydrograph modification management BMPs.	State that final landscape plans will accomplish all of the following. ❑ Preserve existing native trees, shrubs, and ground cover to the maximum extent possible. ❑ Design landscaping to minimize irrigation and runoff, to promote surface infiltration where appropriate, and to minimize the use of fertilizers and pesticides that can contribute to stormwater pollution. ❑ Where landscaped areas are used to retain or detain stormwater, specify plants that are tolerant of saturated soil conditions. ❑ Consider using pest-resistant plants, especially adjacent to hardscape. To insure successful establishment, select plants appropriate to site soils, slopes, climate, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	❑ Maintain landscaping using minimum or no pesticides. ❑ See applicable operational BMPs in "What you should know for…..Landscape and Gardening" at: http://www.rcwatershed.org/about/materials-library/#1450469138395-bb76dd39-d810 ❑ Provide IPM information to new owners, lessees and operators.

Appendix 8
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://www.rcwatershed.org/about/materials-library/#1450469201433-f5f358c9-6008
❑ **F.** Food service	❑ For restaurants, grocery stores, and other food service operations, show location (indoors or in a covered area outdoors) of a floor sink or other area for cleaning floor mats, containers, and equipment. ❑ On the drawing, show a note that this drain will be connected to a grease interceptor before discharging to the sanitary sewer.	❑ Describe the location and features of the designated cleaning area. ❑ Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	❑ See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9 Provide this brochure to new site owners, lessees, and operators.
❑ **G.** Refuse areas	❑ Show where site refuse and recycled materials will be handled and stored for pickup. See local municipal requirements for sizes and other details of refuse areas. ❑ If dumpsters or other receptacles are outdoors, show how the designated area will be covered, graded, and paved to prevent run-on and show locations of berms to prevent runoff from the area. ❑ Any drains from dumpsters, compactors, and tallow bin areas shall be connected to a grease removal device before discharge to sanitary sewer.	❑ State how site refuse will be handled and provide supporting detail to what is shown on plans. ❑ State that signs will be posted on or near dumpsters with the words "Do not dump hazardous materials here" or similar.	❑ State how the following will be implemented: Provide adequate number of receptacles. Inspect receptacles regularly; repair or replace leaky receptacles. Keep receptacles covered. Prohibit/prevent dumping of liquid or hazardous wastes. Post "no hazardous materials" signs. Inspect and pick up litter daily and clean up spills immediately. Keep spill control materials available on-site. See Fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

Appendix 8
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**
❑ **H.** Industrial processes.	❑ Show process area.	❑ If industrial processes are to be located on site, state: "All process activities to be performed indoors. No processes to drain to exterior or to storm drain system."	❑ See Fact Sheet SC-10, "Non-Stormwater Discharges" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com See the brochure "Industrial & Commercial Facilities Best Management Practices for: Industrial, Commercial Facilities" at: http://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9
❑ **I.** Outdoor storage of equipment or materials. (See rows J and K for source control measures for vehicle cleaning, repair, and maintenance.)	❑ Show any outdoor storage areas, including how materials will be covered. Show how areas will be graded and bermed to prevent run-on or run-off from area. ❑ Storage of non-hazardous liquids shall be covered by a roof and/or drain to the sanitary sewer system, and be contained by berms, dikes, liners, or vaults. ❑ Storage of hazardous materials and wastes must be in compliance with the local hazardous materials ordinance and a Hazardous Materials Management Plan for the site.	❑ Include a detailed description of materials to be stored, storage areas, and structural features to prevent pollutants from entering storm drains. Where appropriate, reference documentation of compliance with the requirements of Hazardous Materials Programs for: ▪ Hazardous Waste Generation ▪ Hazardous Materials Release Response and Inventory ▪ California Accidental Release (CalARP) ▪ Aboveground Storage Tank ▪ Uniform Fire Code Article 80 Section 103(b) & (c) 1991 ▪ Underground Storage Tank www.cchealth.org/groups/hazmat/	❑ See the Fact Sheets SC-31, "Outdoor Liquid Container Storage" and SC-33, "Outdoor Storage of Raw Materials " in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

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❑ **J.** Vehicle and Equipment Cleaning	❑ Show on drawings as appropriate: (1) Commercial/industrial facilities having vehicle/equipment cleaning needs shall either provide a covered, bermed area for washing activities or discourage vehicle/equipment washing by removing hose bibs and installing signs prohibiting such uses. (2) Multi-dwelling complexes shall have a paved, bermed, and covered car wash area (unless car washing is prohibited on-site and hoses are provided with an automatic shut-off to discourage such use). (3) Washing areas for cars, vehicles, and equipment shall be paved, designed to prevent run-on to or runoff from the area, and plumbed to drain to the sanitary sewer. (4) Commercial car wash facilities shall be designed such that no runoff from the facility is discharged to the storm drain system. Wastewater from the facility shall discharge to the sanitary sewer, or a wastewater reclamation system shall be installed.	❑ If a car wash area is not provided, describe any measures taken to discourage on-site car washing and explain how these will be enforced.	Describe operational measures to implement the following (if applicable): ❑ Washwater from vehicle and equipment washing operations shall not be discharged to the storm drain system. Refer to "Outdoor Cleaning Activities and Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants categories below. Brochure can be found at: http://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9 ❑ Car dealerships and similar may rinse cars with water only.

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❑ **K.** Vehicle/Equipment Repair and Maintenance	❑ Accommodate all vehicle equipment repair and maintenance indoors. Or designate an outdoor work area and design the area to prevent run-on and runoff of stormwater. ❑ Show secondary containment for exterior work areas where motor oil, brake fluid, gasoline, diesel fuel, radiator fluid, acid-containing batteries or other hazardous materials or hazardous wastes are used or stored. Drains shall not be installed within the secondary containment areas. ❑ Add a note on the plans that states either (1) there are no floor drains, or (2) floor drains are connected to wastewater pretreatment systems prior to discharge to the sanitary sewer and an industrial waste discharge permit will be obtained.	❑ State that no vehicle repair or maintenance will be done outdoors, or else describe the required features of the outdoor work area. ❑ State that there are no floor drains or if there are floor drains, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements. ❑ State that there are no tanks, containers or sinks to be used for parts cleaning or rinsing or, if there are, note the agency from which an industrial waste discharge permit will be obtained and that the design meets that agency's requirements.	In the Stormwater Control Plan, note that all of the following restrictions apply to use the site: ❑ No person shall dispose of, nor permit the disposal, directly or indirectly of vehicle fluids, hazardous materials, or rinsewater from parts cleaning into storm drains. ❑ No vehicle fluid removal shall be performed outside a building, nor on asphalt or ground surfaces, whether inside or outside a building, except in such a manner as to ensure that any spilled fluid will be in an area of secondary containment. Leaking vehicle fluids shall be contained or drained from the vehicle immediately. ❑ No person shall leave unattended drip parts or other open containers containing vehicle fluid, unless such containers are in use or in an area of secondary containment. Refer to "Automotive Maintenance & Car Care Best Management Practices for Auto Body Shops, Auto Repair Shops, Car Dealerships, Gas Stations and Fleet Service Operations; "Outdoor Cleaning Activities;" and "Professional Mobile Service Providers" for many of the Potential Sources of Runoff Pollutants. Brochures can be found at: http://www.rcwatershed.org/about/materials-library/#1450389926766-61e8af0b-53a9

Appendix 8
STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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❑ **L.** Fuel Dispensing Areas	❑ Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable. ❑ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.		❑ The property owner shall dry sweep the fueling area routinely. ❑ See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

[6] The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

Appendix 8
STORMWATER POLLUTANT SOURCES/SOURCE CONTROL CHECKLIST

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❑ **M.** Loading Docks	❑ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer. ❑ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ❑ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		❑ Move loaded and unloaded items indoors as soon as possible. ❑ See Fact Sheet SC-**30**, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

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❑ **N.** Fire Sprinkler Test Water		❑ Provide a means to drain fire sprinkler test water to the sanitary sewer.	❑ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
O. Miscellaneous Drain or Wash Water or Other Sources ❑ Boiler drain lines ❑ Condensate drain lines ❑ Rooftop equipment ❑ Drainage sumps ❑ Roofing, gutters, and trim. ❑ Other sources		❑ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ❑ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. ❑ Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. ❑ Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. ❑ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. ❑ Include controls for other sources as specified by local reviewer.	

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❑ **P.** Plazas, sidewalks, and parking lots.			❑ Sweep plazas, sidewalks, and parking lots regularly to prevent accumulation of litter and debris. Collect debris from pressure washing to prevent entry into the storm drain system. Collect washwater containing any cleaning agent or degreaser and discharge to the sanitary sewer not to a storm drain.

Appendix 9: O&M

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

For the Final WQMP the following information shall be provided:

1. Maintenance Plan per Section 5.3.5 of the WQMP Guidance Document. County will regularly inspect BMPs, so BMPs without access (e.g. backyards, etc) will be rejected. Due to liability, the County does not allow for overlapping private maintenance in the public right-of-way.
2. For all projects, include one wet-signed and notarized hardcopy of the BMP Maintenance agreement. Please note, references to Exhibit A and B on Page 1can be struck out if the entire parcel is mentioned in the "Legal Description" on Page 1 of the agreement. Otherwise see below for Exhibit A and B standards. For BMP agreement, ensure that the name on the agreement matches throughout and the notary sheet, Notary shall be the latest California format, the date of the agreement is the date of the notary, all text does not exceed the margins, then the County will sign, attest & record
3. For Tracts, contact County EDA regarding maintenance determinations/formations. Include a completed Exhibit B.9 - WQMP O&M Cost Sheet.xlsx that is signed by both the preparer (to ensure quantities are correct) and the owner (to understand the maintenance obligations in perpetuity) & an Approved Maintenance Exhibit from EDA.
4. For Tracts or any project , written documentation from the maintenance entity that they are willing to maintain (e.g. CFD, CSA, L&LMD, etc.)

BMP EXHIBIT "A" STANDARDS

1. Use the legal description of the parcel as shown on the tentative exhibit. If not available, use the one in the most current title report.
2. As a backup, if the project is a map the description of the future lot may be included for reference

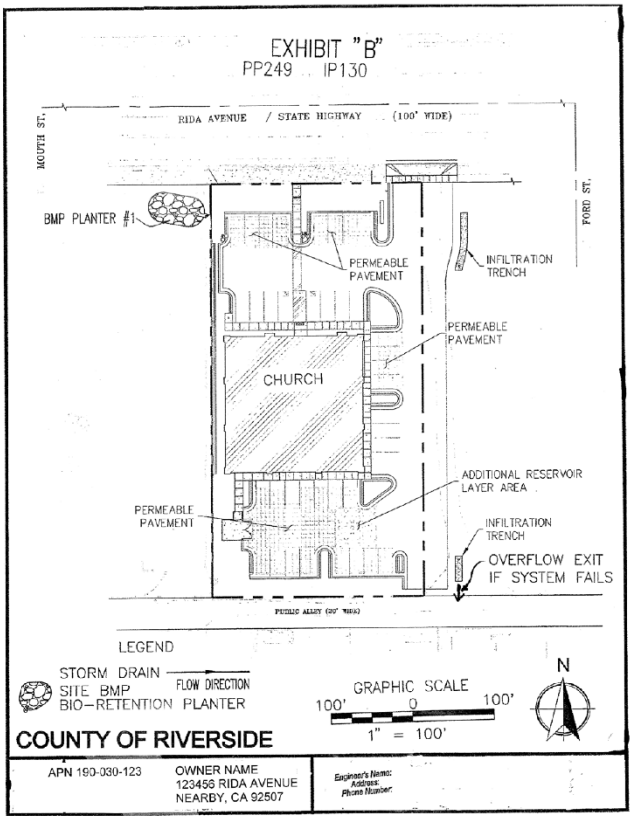
BMP EXHIBIT "B" STANDARDS

1. 0.12" minimum lettering
2. Sheet size must be 8.5" x 11"
3. Show Street names, north arrow
4. Indicate point of flow exit into street if basin system fails
5. Indicate Q100 of flow exit into street
6. Indicate direction of flow exit into street
7. Indicate by notation and/or show nearest downstream drainage facility (catch basin, culvert, riser, etc)
8. Show "Exhibit A", IP and project number (TR, PM, PUP, PP etc)
9. Title block, signature block, engineer seals, USA note is not necessary on Exhibit
10. Show scale used for drawing, provide 4" graphic scale

MAINTENANCE EXHIBIT "B" STANDARDS

1. 0.12" minimum lettering
2. Sheet size must be 8.5" x 11"
3. Show street names, north arrow
4. Show "Exhibit A", IP and project number (TR, PM, PUP, PP etc)
5. Title block, signature block, engineer seals, USA note is not necessary on Exhibit
6. Show scale used for drawing, provide 4" graphic scale

BMP EXHIBIT B EXAMPLE



Recorded at the request of: COUNTY
OF RIVERSIDE TRANSPORTATION
DEPARTMENT

THIS INSTRUMENT IS FOR THE BENEFIT
OF THE COUNTY OF RIVERSIDE AND
ENTITLED TO BE RECORDED WITHOUT
FEE.(GOV. CODE 6103)

RETURN TO:
RIVERSIDE COUNTY TRANSPORTATION
DEPARTMENT.
4080 Lemon Street, 8th Floor
Riverside, CA 92501

COVENANT AND AGREEMENT REGARDING WATER QUALITY MANAGEMENT PLAN BMP, CONSENT TO INSPECT, MAINTENANCE AND INDEMNIFICATION

APN:_____ PROJECT No._____ IP No._____

OWNER(S):_____

PROPERTY ADDRESS:_____

LEGAL DESCRIPTION:_____
_____
_____

THIS AGREEMENT is made and entered into in Riverside County, California, this _____ day of _____ Year_____, by and between_____,

(hereinafter referred to as "Covenantor" or "Owner") and the COUNTY OF RIVERSIDE via its Department of Transportation, a political subdivision of the State of California (hereinafter referred to as "County").

RECITALS

WHEREAS, the Covenantor owns real property ("Property") in the County of Riverside, State of California, more specifically described in Exhibit "A" and depicted in Exhibit "B", each of these exhibits is attached, and incorporated herein by this reference;

WHEREAS, the County is the owner of interests in that certain real property within the unincorporated area of the County of Riverside, State of California, containing storm drains, pipelines, and related appurtenances constituting the County's municipal separate storm sewer system (the County's "MS4");

WHEREAS, Covenantor intends to develop, improve, and/or use the Property is such a way that approval by the County for such development, improvement, and/or use is required pursuant to applicable laws;

WHEREAS, As a condition for said approval by the County, County required Covenantor, and Covenantor desires to, restrict the use of the Property according to the conditions, covenants, equitable servitudes, and restrictions contained herein for the express benefit of the County's MS4, which include requirements that the Property incorporate post construction on-site stormwater quality control measures;

WHEREAS, the Covenantor/Owner has chosen to install one or more _____ _____ hereinafter referred to as "Device", as the on-site control measure to minimize pollutants in urban runoff;

WHEREAS, said Device has been installed in accordance with plans and specifications accepted by the County;

WHEREAS, said Device, with installation on private property is a private facility with all maintenance or replacement, therefore, the sole responsibility of the Covenantor/Owner in accordance with the terms of this Agreement;

WHEREAS, the Covenantor/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 Device 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;

NOW THEREFORE, incorporating the foregoing Recitals and in consideration of the covenants and conditions contained herein, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, and expressly for the benefit of, and to bind, their sucessors in interest, the parties hereto agree as follows:

1. Covenantor/Owner hereby provides the County or County's designee complete access to the Device and its immediate vicinity and such access onto the property to permit access to the devise at any time, upon twenty-four *(24)* hour advance notice in writing, of any duration for the purpose of inspection, sampling and testing of the Device. County shall make every effort at all times to minimize or avoid interference with Owner's use of the Property.

2. Covenantor/Owner shall use its best efforts diligently to maintain the Device 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 material(s) from the Device 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 County / Regional Water Quality Control Board (RWQCB), the Owner shall provide the RWQCB with documentation identifying the material(s) removed, the quantity, and disposal destination.

3. In the event Covenantor/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 County, the County 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 and interest thereon at the maximum rate authorized by the Civil Code from the date of notice of expense until paid in full.

4. The County may require the Covenantor/Owner to post security in a form and for a time period satisfactory to the County to guarantee the performance of the obligations stated herein. Should the Owner fail to perform the obligations under this Agreement, the County may, in the case of a cash deposit, certificate of deposit or letter of credit, act for the Owner using the proceeds from it, or in the case of a surety bond, require the sureties to perform the obligations of the Agreement.

5. The County may, but shall not be obligated to, enforce this Agreement by a proceeding at law or in equity against any person or persons violating or attempting to violate any condition, covenant, equitable servitude, or restriction provided for herein, either to restrain such violation or to recover damages.

6. This Agreement constitutes the entire agreement and understanding between the parties with respect to the subject matter of this Agreement and supersedes all prior or contemporaneous agreements and understandings with respect to the subject matter hereof, whether oral or written.

7. If any part of this Agreement is declared by a final decision of a court of competent jurisdiction to be invalid for any reason, such shall not affect the validity of the rest of the Agreement. The other parts of this Agreement shall remain in effect as if this Agreement had been executed without the invalid parts(s). The parties declare that they intend and desire that the remaining parts of this Agreement continue to be effective without any part(s) that have been declared invalid.

8. This Agreement may be executed in counterparts, each of which so executed shall, irrespective of the date of its execution and delivery, be deemed an orginal, and all such counterparts together shall constitute one and the same instrument.

9. This Agreement shall be recorded in the Office of the Recorder of Riverside County, California and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth.

10. In the event of legal action occasioned by any default or action of the Covenantor/Owner, or its successors or assigns, then the Covenantor/Owner and its

successors or assigns agree(s) to pay all costs incurred by the County 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.

11. Covenantor/Owner agrees to indemnify, defend, and hold harmless the County, its elected officers, employees, agents, and contractors from and against any and all liability, expense, including costs and reasonable legal fees, and claims of damage of any nature whatsoever including, but not limited to, death, bodily injury, personal injury, or property damage arising from or connected with the County inspection of the Property except where such liability, expense, or claim for damage results from the sole negligence or willful misconduct of the County.

12. 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 thereon against.

13. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto and any other present or future interest holders or estate holders in the property. The term "Owner" shall include not only the present Owner, but also its heirs, successors in interest and in title to the property, 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 County at the same time such notice is provided to the successor.

14. Time is of the essence in the performance of this Agreement.

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15. 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.

COVENANTOR/OWNER:

COUNTY:

Riverside County Department of Transportation
Attn: Transportation Director
4080 Lemon Street, 8th Floor
Riverside, CA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT

Mark Lancaster, P.E.
Director of Transportation

Date

(Attest)

Date

(Print Name)

(Print Title)

COVENANTOR/OWNER

Signature

Company/Corporation/Partnership

(Print Name)

(Print Title)

Attach Notary

Appendix 10: Educational Materials

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

For the Final WQMP, examples of material to provide in Appendix 10 may include but are not limited to the following:

- BMP Fact Sheets for proposed BMPs form Exhibit C: LID BMP Design Handbook of the SMR WQMP,
- Source control information and training material for site owners and operators,
- O&M training material,
- Other educational/training material related to site drainage and BMPs.

FERGUSON
WATERWORKS

R-TANK® STORMWATER STORAGE SYSTEM

STORMWATER MANAGEMENT

IS YOUR STORMWATER SYSTEM TAKING UP TOO MUCH SPACE?

R-Tank can reduce your underground stormwater storage system footprint, avoiding nearby utility conflicts, freeing up space for future expansion and overcoming construction phase challenges.

DOES YOUR PROJECT REQUIRE A UNIQUE SOLUTION DUE TO DEPTH OR TRAFFIC LOADS?

R-Tank provides system height options from 2 inches to over 7 feet tall. It also accommodates HS-20 and HS-25 loading with cover depths as little as 6" and as deep as 16'.

R-Tank solves tough stormwater problems by adapting to the needs of your site–whether you are designing a project with shallow ground water or deep cover conditions.

R-TANK

BENEFITS

HIGH CAPACITY
- 95% void internal area (LD, HD, SD, UD)
- 90% void internal area (XD)

STRENGTH
- Supports traffic loading
- Module options for HS-20 and HS-25 rating with cover depths from 6" to 16'

DESIGN AND CONSTRUCTION VERSATILITY
- Modules can be combined into various shapes to use space efficiently and effectively
- Module heights vary from 2" to 7'

INCREASED INFILTRATION AND EXFILTRATION
- 90% open area on face of modules
- Increases groundwater recharge, reducing post-construction discharge volumes

EASY TO TRANSPORT
- Can be supplied preassembled or unassembled to reduce delivery costs

LIGHTWEIGHT AND QUICK TO INSTALL
- Installed by hand; no cranes required
- Reduces site access delays

RECYCLED CONTENT
- Manufactured with post industrial grade recycled polypropylene

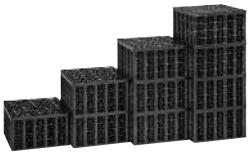
PRODUCTS

R-TANK LD
- Light-duty module (30 psi)
- Ideal for applications in green space
- Not rated for vehicular traffic
- 12" minimum cover
- 36" maximum cover
- Four internal plates

R-TANK HD
- Heavy-duty module (33.4 psi)
- 20" minimum cover
- 84" maximum cover
- Five internal plates
- Standard module for traffic applications

R-TANK SD
- Super-duty module (42.9 psi)
- Higher safety factors for shallow traffic applications and deeper cover
- 18" minimum cover
- 120" maximum cover

R-TANK UD
- Ultra-duty module (134.2 psi)
- Traffic loads with 12" of cover
- Available from 14" to 66" tall
- Ideal for high water table sites



R-TANK XD
- Extreme-duty module (320 psi)
- Traffic loads with 6" cover
- 16.5' maximum cover
- Available from 2" to 10' tall

DESIGN CONSIDERATIONS

Many factors will influence the design of the R-Tank system. While this list is not intended to be all-inclusive, the following design considerations are worth highlighting:

1. PRE-TREATMENT

Removing pollutants from runoff before they enter an underground detention system is the smart way to design and build a system. Trash Guard Plus® is a great tool for this. Be sure the system you select will remove heavy sediments, gross pollutants (trash) and biodegradable debris.

2. BACKFILL MATERIALS

Backfill materials should be angular stone (<1.5" in diameter) or soil (GW, GP SW or SP per the Unified Soil Classification System). Material must be free from lumps, debris and sharp objects that could cut the geotextile. See the R-Tank narrative specification for additional information.

3. RUNOFF REDUCTION

Most designs incorporate an outlet to drain the system at a controlled rate and/or an overflow to prevent flooding in extreme events. Any infiltration that can be achieved on the site should also be taken advantage of. Consider raising the invert of your outlet or creating a sump to capture and infiltrate the water quality volume whenever possible.

4. WATER TABLE

While installing R-Tank below the water table is manageable, a stable base must be created to support the system. Ground water can be allowed to enter and drain from the system, or a liner can be used to prevent ground water from entering the system if measures are taken to prevent the system from floating.

5. CONSTRUCTION LOADS

Construction loads are often the heaviest loads the system will experience. Care must be taken during backfilling and compaction, and post-installation construction traffic should be routed around the system.

6. LATERAL LOADS

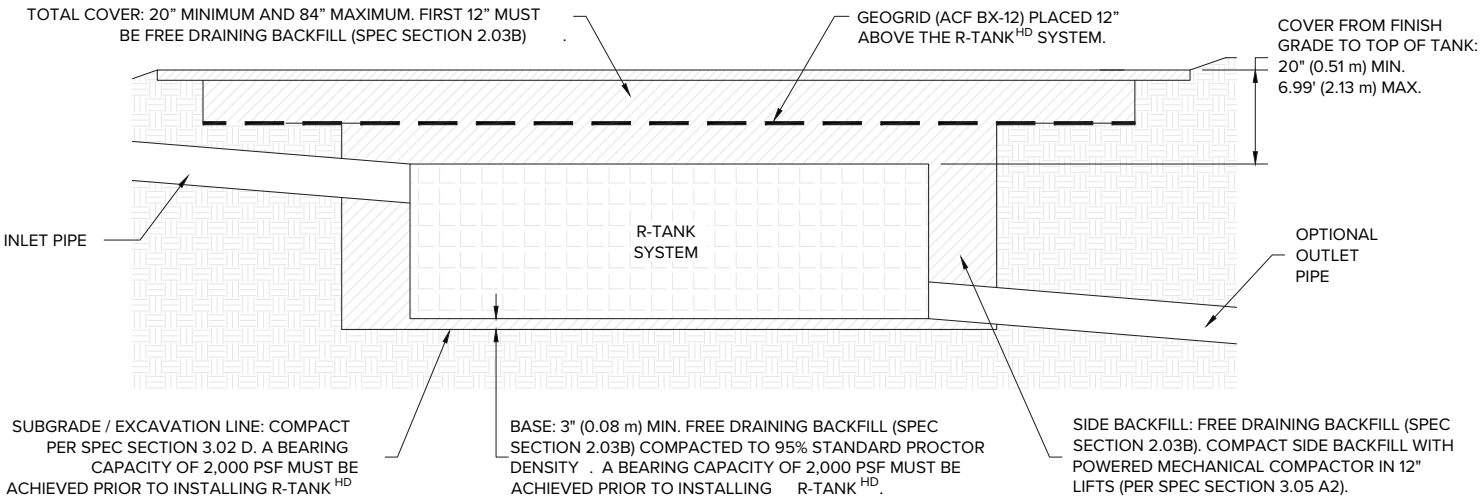
As systems get deeper, the loads acting on the sides of the tank increase. While vertical loads often control the design, lateral loads should also be considered.

7. R-TANK MODULES

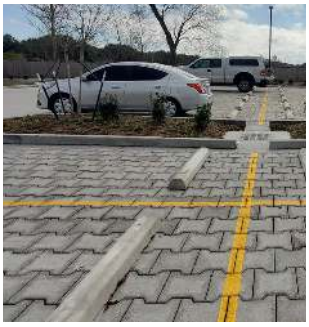
Selecting the right module for your application is critical. See page 3 and the specs on the back of this brochure for details. Our team is also here to help!

8. LOAD MODELING

A safety factor of >1.75 is required when designing an R-Tank System using the AASHTO LRFD Bridge Design Specifications. It is also necessary to run your own loading model with site specific requirements.



CREATIVE URBAN GREEN INFRASTRUCTURE APPLICATIONS



R-TANK UNDER PERMEABLE AND POROUS SURFACES

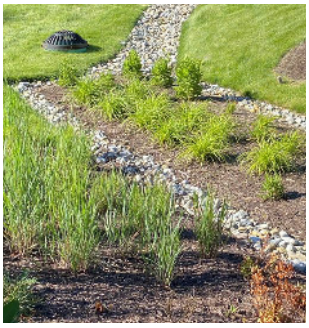
For projects with shallow depth restrictions and high ground water table elevations, R-Tank can be strategically deployed beneath permeable and porous surfaces. The high void space of the modules allows designers to maximize the volume stored at shallow depths and converts the permeable/porous surface into an "inlet" to the storage below. Ferguson offers a selection of "alternative surfaces" that can be paired with the R-Tank.

R-TANK IN LINEAR GREEN STREETSCAPES

Based on its space efficiency and modular versatility, the R-Tank is a popular option for storage of stormwater in urban linear street applications. Beyond the void efficiency, the system layout can be easily adjusted to work around unexpected utility conflicts and other site features. Green Infrastructure programs in Philadelphia, Pittsburgh, New York City, and Salt Lake City are just a few examples of where R-Tank has been adopted in this application.

UNDER BIORETENTION FOR ENHANCED STORAGE

In many green stormwater practices, R-Tank can offer an "enhanced" storage zone providing 95% void space vs. the typical 40% void space of stone. Throughout the country, engineers have utilized this approach to maximize capacity and reduce the depth of excavation of the storage layer in rain gardens, bioretention and curbline vegetated stormwater practices.



COMBINED WITH INNOVATIVE MEDIA

Ferguson offers a series of innovative stormwater filtration media to provide water quality treatment. The R-Tank can be used in these systems as a space-efficient high-performance underdrain with the option to expand over larger footprints for infiltration or detention. R-Tank can also be used to house media in certain applications and systems.

INNOVATIVE APPLICATIONS (FLOOD MITIGATION, RE-USE, ETC.)

The R-Tank is a popular choice under playgrounds and sports fields. The high void space and the ability to work around light pole bases, equipment footings and foundations allows municipalities to maximize storage when developing or redeveloping these community gems. The system can also be lined and combined with pump equipment for irrigation and other re-use applications.

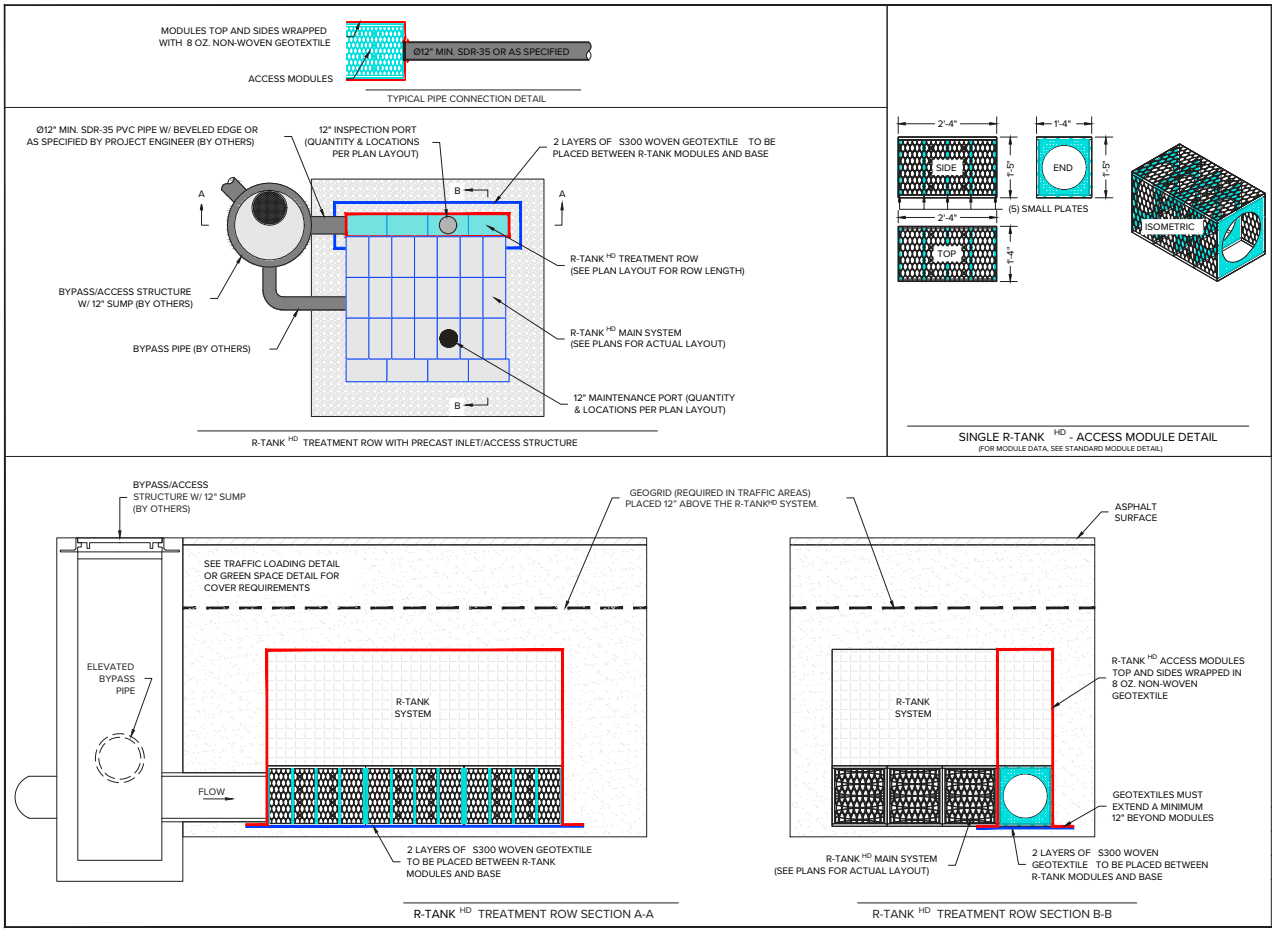
MAINTENANCE

DESIGNING AN R-TANK SYSTEM WITH LONGEVITY & MAINTENANCE IN MIND IS A THREE-STEP PROCESS:

1. PRE-TREAT
Keep debris out of the system using decentralized filters and screens. Ferguson offers a complete range of options from perforated screen devices to high flow geotextile bag and cartridge based filter drain inserts.

2. ISOLATE
Trap solid pollutants inside the treatment row (see treatment row drawing below) where they can be easily removed using the acess modules (available in LD, HD, and UD only). These modules are wrapped in geotextile to retain solids and are fully accessible by conventional jet-vac systems to remove captured pollutants.

3. PROTECT
Ensure a long system life by including maintenance ports to remove any pollutants that evade the pre-treatment system and treatment row. Maintenance ports should be specified within 10' of inlet and outlet connections, and roughly 50' on center.



PRE-TREATMENT DEVICES

From simple trash and debris screens to filters for targeted pollutants, Ferguson offers a complete selection of decentralized pre-treatment devices.


TRASHGUARD PLUS

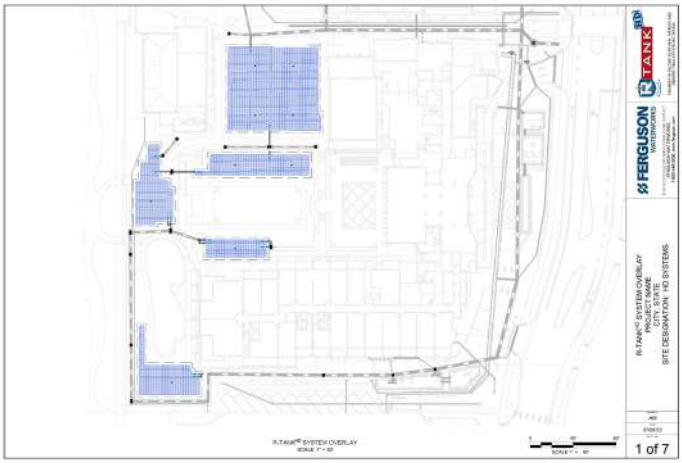

FABCO STORMBASIN


FABCO STORMRING

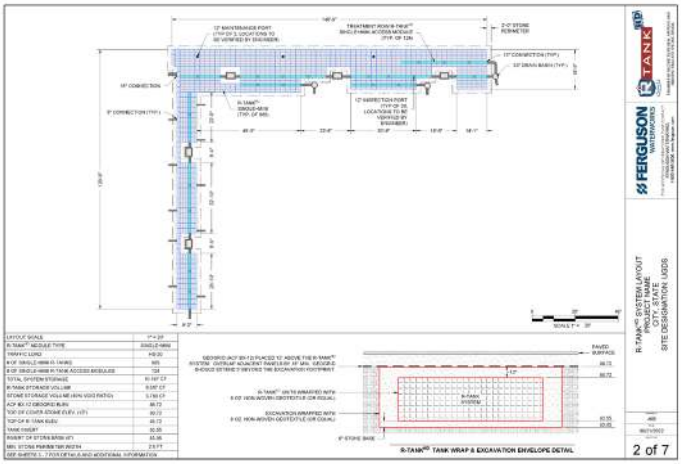

FABCO STORMSACK

SUPPORT SERVICES AND TANK SELECTION

Our regional engineers and designers are well versed in local regulations, innovative urban green street applications and can help develop site-specific solutions using one or a combination of our products. Our team produces high-quality custom layouts and details to support your permitting and construction efforts. From AutoCAD to HydroCAD, we have a variety of design tools to help you move through the permitting process efficiently.



SAMPLE R-TANK SYSTEM OVERLAY



SAMPLE R-TANK SYSTEM LAYOUT

R-TANK SD INSTALLATION

R-TANK WITHIN BUILDING FOOTPRINT

SELECTING THE RIGHT R-Tank MODULE

Cover Depth (inches)*	LD	HD	SD	UD	XD
Min. 6"	Green Space - No Traffic	Green Space - No Traffic	Green Space - No Traffic	Green Space - No Traffic	HS-20
12"	Green Space - No Traffic	Green Space - No Traffic	Green Space - No Traffic	HS-20**	HS-20
14"	Green Space - No Traffic	Green Space - No Traffic	Green Space - No Traffic	HS-20	HS-20
18"	Green Space - No Traffic	Green Space - No Traffic	HS-20	HS-20	HS-20
20"	Green Space - No Traffic	HS-20	HS-20	HS-20	HS-20
24"	Green Space - No Traffic	HS-20	HS-20	HS-20	HS-20
36"	Green Space - No Traffic	HS-20	HS-20	HS-20	HS-20
48"		HS-20	HS-20	HS-20	HS-20
60"		HS-20	HS-20	HS-20	HS-20
72"		HS-20	HS-20		HS-20
84"			HS-20		HS-20
120"			HS-20		HS-20
160"					HS-20
Max. 200"					HS-20

HS-20 designation based on AASHTO LRFD Bridge Design Specification for single lane traffic.
*Cover depth is measured from top of module to finished grade or top of pavement.
**The UD module requires STONE backfill (not soil) on sides at this depth.

R-TANK SPECIFICATIONS

LD HD

DIMENSIONS & CAPACITY

Module (Segments)	Width (in)	Length (in)	Height (in/ft)	Volume (cf)	Capacity (cf)	Weight* (lbs)
Mini	15.75	28.15	9.45"/0.79'	2.42	2.30	10.1/10.9
Single (1)	15.75	28.15	17.32"/1.44'	4.44	4.22	15.7/17.3
Single + Mini (1.5)	15.75	28.15	25.98"/2.17'	6.67	6.33	23.6/25.9
Double (2)	15.75	28.15	33.86"/2.82'	8.69	8.25	29.1/32.3
Double + Mini (2.5)	15.75	28.15	42.52"/3.54'	10.91	10.36	37.0/41.0
Triple (3)	15.75	28.15	50.39"/4.20'	12.93	12.28	42.5/47.4
Triple + Mini (3.5)	15.75	28.15	59.06"/4.92'	15.15	14.39	50.4/56.0
Quad (4)	15.75	28.15	66.93"/5.58'	17.17	16.31	55.9/62.4
Quad + Mini (4.5)	15.75	28.15	75.59"/6.30'	19.39	18.42	63.8/71.0
Pent (5)	15.75	28.15	83.46"/6.96'	21.41	20.34	69.3/77.4

*Weights shown are for LD/HD modules.

SD

DIMENSIONS & CAPACITY

Module (Segments)	Width (in)	Length (in)	Height (in/ft)	Volume (cf)	Capacity (cf)	Weight (lbs)
Single (1)	15.75	28.15	9.45"/0.79'	2.42	2.30	10.95
Double (2)	15.75	28.15	18.12"/1.51'	4.64	4.41	19.58
Triple (3)	15.75	28.15	26.79"/2.23'	6.86	6.52	28.21
Quad (4)	15.75	28.15	35.46"/2.96'	9.08	8.63	36.84
Pent (5)	15.75	28.15	44.13"/3.68'	11.30	10.74	45.47
Hex (6)	15.75	28.15	52.80"/4.40'	13.52	12.84	54.10
Septa (7)	15.75	28.15	61.47"/5.12'	15.74	14.95	62.73
Octo (8)	15.75	28.15	70.14"/5.85'	17.96	17.06	71.36
Nono (9)	15.75	28.15	78.81"/6.57'	20.18	19.17	79.99
Decka (10)	15.75	28.15	87.48"/7.29'	22.40	21.28	88.62

UD

DIMENSIONS & CAPACITY

Module (Segments)	Width (in)	Length (in)	Height (in/ft)	Volume (cf)	Capacity (cf)	Weight (lbs)
Single (1)	23.62	23.62	14.17"/1.18'	4.57	4.35	21.2
Double (2)	23.62	23.62	27.17"/2.26'	8.77	8.33	39.0
Triple (3)	23.62	23.62	40.16"/3.35'	12.97	12.32	56.8
Quad (4)	23.62	23.62	53.15"/4.43'	17.16	16.30	74.6
Pent (5)	23.62	23.62	66.14"/5.5'	21.35	20.29	92.4

XD

DIMENSIONS & CAPACITY

Module (Segments)	Width (in)	Length (in)	Height (in)	Volume (cf)	Capacity (cf)	Weight (lbs)
Single (1)	19.68	23.62	1.97	0.53	0.48	4
Double (2)	19.68	23.62	3.94	1.06	0.95	8
Triple (3)	19.68	23.62	5.91	1.59	1.43	12
Quad (4)	19.68	23.62	7.87	2.12	1.91	16
Pent (5)	19.68	23.62	9.84	2.65	2.38	20

Note: XD modules may be stacked up to 10' tall (60 layers).

SPECIFICATIONS

Item	Description	LD	HD	SD	UD	XD
		Value	**Value**	**Value**	**Value**	**Value**
Void Area	Volume available for water storage	95%	95%	95%	95%	90%
Surface Area Void	% of exterior available for infiltration	90%	90%	90%	90%	90%
Compressive Strength	ASTM D 2412/ASTM F 2318	30.0 psi	33.4 psi	42.9 psi	134.2 psi	320 psi
Unit Weight	Weight of plastic per cubic foot of tank	3.29 lbs/cf	3.62 lbs/cf	3.96 lbs/cf	4.33 lbs/cf	7.55 lbs/cf
Rib Thickness	Thickness of load-bearing members	0.18"	0.18"	0.18"	-	-
Service Temperature	Safe temperature range for use	-14–167° F	-14–167° F	-14–167° F	-14–167° F	-14–167° F
Recycled Content	Use of recycled polypropylene	100%	100%	100%	100%	100%
Minimum Cover	Cover required for HS-20 loading	Not traffic rated	20"	18"	12"–14"	6"
	Cover required for HS-25 loading	Not traffic rated	24"	18"	15"–17"	6"
Maximum Cover	Maximum allowable cover depth	36"	6.99'	9.99'	5.0'	16.7'

We ♥ our Watershed!

A clean and healthy watershed is important to all of us.

Trash, debris, chemicals and other contaminants from business activities often make their way into the Riverside County storm drain system. This pollutes our drinking water and contaminates waterways, making them unsafe for people and wildlife.

Did you know?

There is a difference between storm drains and sewers.

Storm drains capture rainwater and flow directly to our rivers, lakes and streams – untreated.

Sewers capture and collect water from sinks, toilets and floor drains, and then it is processed and treated before it is released into the environment.

For more information about how you can protect our watershed, please visit:
www.rcwatershed.org

Questions?

If you have questions about Best Management Practices, or if you have questions about illicit dumping and stormwater pollution visit the Pollution Prevention website: rcwatershed.org.

For more information on requirements for all retail food facilities go to Riverside County Environmental Health's website: rivcoeh.org

RIVERSIDE COUNTY
WATERSHED PROTECTION

Riverside County Watershed Protection Program is managed by Riverside County Flood Control & Water Conservation District in partnership with 27 Cities, the County of Riverside and the Coachella Valley Water District.

OUR MISSION

"To protect, preserve and enhance the quality of Riverside County watersheds by fostering a community-wide commitment to clean water."

Watershed Protection

Food Service Industry Best Practices

Restaurants
Mobile Food Trucks
Grocery Stores
Bakeries
Delicatessens

Best Kitchen Practices

Recycle Oil & Grease

- Never put oil or grease down the drain. Contain grease and oil by using covered grease storage containers or installing a grease interceptor.
- Never overfill your grease storage container or transport it without a cover.
- Grease control devices must be emptied and cleaned by permitted companies and according to manufacturer's specifications.
- Keep maintenance records on site.
- For a list of oil/grease recycling companies, contact CalRecycle www.calrecycle.ca.gov or contact your local sanitation district.

Managing Spills

- Clean food spills in loading and trash areas by using absorbent materials and sweeping then mopping.
- Discharge mop water into the sewer through a grease interceptor.
- Have spill containment and cleanup kits available.
- To report serious toxic spills, call 911.

Handling Toxic Chemicals

- Dispose of all unwanted toxics materials like cleaners, solvents and detergents through a hazardous waste hauler. These items are not trash!
- Use non-toxic cleaning products whenever possible.
- For information on hazardous waste transporters, call (888) 722-4234.

Dumpster Areas

- Keep dumpster lids closed and the areas around them clean.
- Do not fill with liquid waste or hose them out.
- Call your trash hauler to replace any dumpsters that are damaged or leaking.

Cleaning & Maintenance

- Clean equipment, floor mats, filters and garbage cans in a mop sink, wash rack or floor drain connected to a sanitary sewer.
- Sweep outside areas and put the debris in trash containers DO NOT hose down or sweep into the parking lot or street.
- Outside eating areas and sidewalks may not be hosed down or pressure washed UNLESS the following standards are met:
  - ✓ Use dry cleanup methods prior to any pressure washing – absorbing with kitty litter, sweeping, vacuuming, scraping off dried debris.
  - ✓ Wash waters must be captured for proper disposal: collected waters should be discharged to a sanitary drain.
  - ✓ DO NOT use any chemicals or detergents.
  - ✓ DO NOT wash or pour water in a parking lot, alley, sidewalk or street.

Mobile Food Trucks

- The potential for generating stormwater pollution as part of a mobile food business requires special attention. Cleaning activities are required to be conducted at an approved fixed location with a connection to a sanitary sewer. For more information contact Riverside County Environmental Health at (888) 722-4234.
- Do not discharge wash water into storm drains.
- Clean on a properly equipped wash pad and drain wastewater to a sanitary sewer system.

Food Waste Disposal

- Scrape food waste off of plates, pots and food prep areas and dispose of in the trash.
- Food scraps often contain grease, which can clog sewer pipes and result in costly sewer backups and overflows.
- Never put food waste down the drain.

RECYCLE
USED OIL

Stormwater Pollution

What you should know for...

Industrial & Commercial Facilities

Best Management Practices (BMPS) for:

- Industrial Facilities
- Commercial Facilities

Riverside County Stormwater Program Members

City of Banning
(951) 922-3105

City of Beaumont
(951) 769-8520

City of Calimesa
(909) 795-9801

City of Canyon Lake
(951) 244-2955

City of Cathedral City
(760) 770-0340

City of Coachella
(760) 398-3502

City of Corona
(951) 736-2447

City of Desert Hot Springs
(760) 329-6411

City of Eastvale
(951) 361-0900

City of Hemet
(951) 765-2300

City of Indian Wells
(760) 346-2489

City of Indio
(760) 391-4000

City of Jurupa Valley
(951) 332-6464

City of Lake Elsinore
(951) 674-3124

City of La Quinta
(760) 777-7000

City of Menifee
(951) 672-6777

City of Moreno Valley
(951) 413-3000

City of Murrieta
(951) 304-2489

City of Norco
(951) 270-5607

City of Palm Desert
(760) 346-0611

City of Palm Springs
(760) 323-8299

City of Perris
(951) 943-6100

City of Rancho Mirage
(760) 324-4511

City of Riverside
(951) 826-5311

City of San Jacinto
(951) 487-7330

City of Temecula
(951) 694-6444

City of Wildomar
(951) 677-7751

Coachella Valley Water District
(760) 398-2651

County of Riverside
(951) 955-1000

Riverside County Flood Control District
(951) 955-1200

YOU can prevent Stormwater Pollution following these practices...

Industrial and Commercial Facilities

The Riverside County Stormwater Program has identified a number of Best Management Practices (BMPs) for Industrial and Commercial Facilities. These BMPs control and reduce stormwater pollutants from reaching our storm drain system and ultimately our local water bodies. City and County ordinances require businesses to use these BMPs to protect our water quality. Local cities and the County are required to verify implementation of these BMPs by performing regular facility inspections.

Prohibited Discharges

Discontinue all non-stormwater discharges to the storm drain system. It is *prohibited* to discharge any chemicals, paints, debris, wastes or wastewater into the gutter, street or storm drain.

Outdoor Storage BMPs

- Install covers and secondary containment areas for all hazardous materials and wastes stored outdoors in accordance with County and/or City standards.
- Keep all temporary waste containers covered, at all times when not in use.
- Sweep outdoor areas instead of using a hose or pressure washer.
- Move all process operations including vehicle/equipment maintenance inside of the building or under a covered and contained area.
- Wash equipment and vehicles in a contained and covered wash bay which is closed-loop or connected to a clarifier sized to local standards and discharged to a sanitary sewer or take them to a commercial car wash.

Spills and Clean Up BMPs

- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep up the area.
- Clean up spills immediately when they occur, using dry clean up methods such as absorbent materials or sweep followed by proper disposal of materials.
- Always have a spill kit available near chemical loading dock doors and vehicle maintenance and fueling areas.
- Follow your Business Emergency Plan, as filed with the local Fire Department.
- Report all prohibited discharges and non-implementation of BMPs to your local Stormwater Coordinator as listed on the back of this pamphlet.
- Report hazardous materials spills to 951-358-5055 or call after hours to 951-782-2973 or, if an emergency, call the Fire Department's Haz Mat Team at 911.

Plastic Manufacturing Facilities BMPs

AB 258 requires plastic product manufacturers to use BMPs, such as safe storage and clean-up procedures to prevent plastic pellets (nurdles) from entering the waterway. The plastic pellets are released into the environment during transporting, packaging and processing and migrate to waterways through the storm drain system. AB 258 will help protect fish and wildlife from the hazards of plastic pollution.

Training BMPs

As prescribed by your City and County Stormwater Ordinance(s), train employees in spill procedures and prohibit non-stormwater discharges to the storm drain system. Applicable BMP examples can be found at www.cabmphandbooks.com.

Permitting

Stormwater discharges associated with specific categories for industrial facilities are regulated by the State Water Resources Control Board through an Industrial Stormwater General Permit. A copy of this General Permit and application forms are available at: www.waterboards.ca.gov, select stormwater then the industrial quick link.

To report illegal dumping or for more information on stormwater pollution prevention call: 1-800-506-2555 or e-mail us at: fcnpdes@rcflood.org.