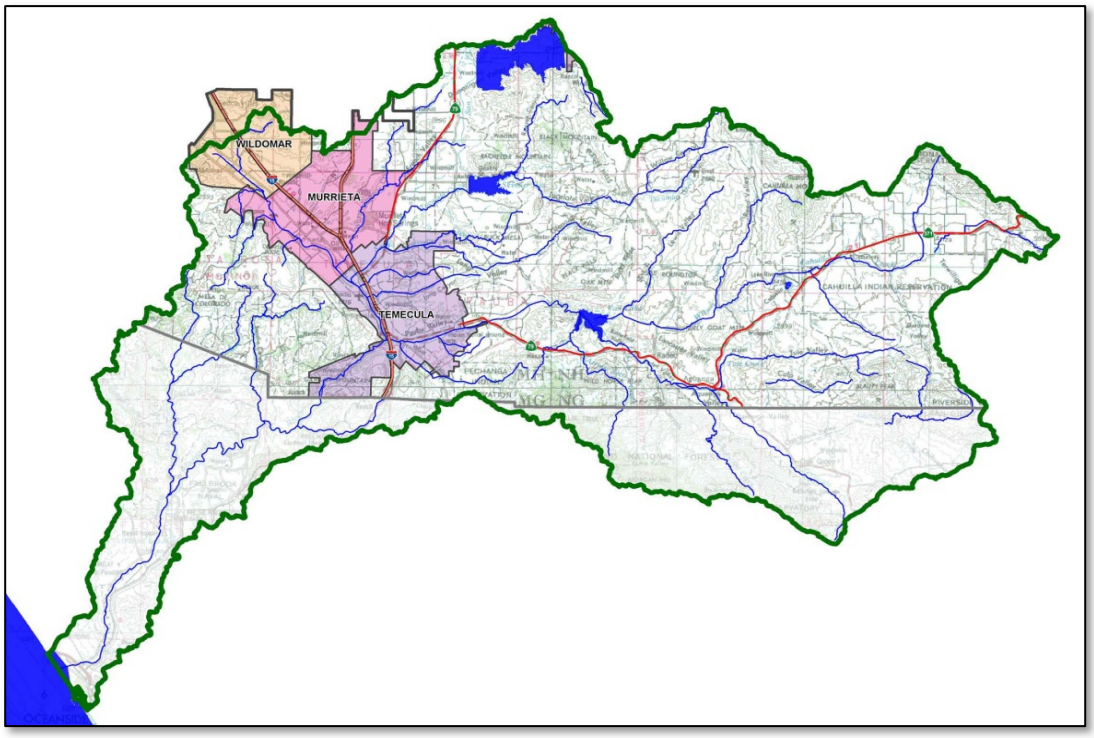
County Project Specific Water Quality Management Plan

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***.

Project Title: 30003 Winchester Road
Development No: CUP200001
Design Review/Case No:
BMP$_i$ (Latitude, Longitude): 33.691683, -117.083455



☒ **Preliminary**
☐ **Final**

Original Date Prepared: January 9, 2020

Revision Date(s): August 11, 2020, April 27, 2021

Contact Information
Prepared for: Cambridge Homes
41197 Golden Gate Circle, Suite 201
Murrieta, CA 92562

Prepared by: Blue Peak Engineering, Inc.
18543 Yorba Linda Blvd., #235
Yorba Linda, CA 92886
(714) 749-3077

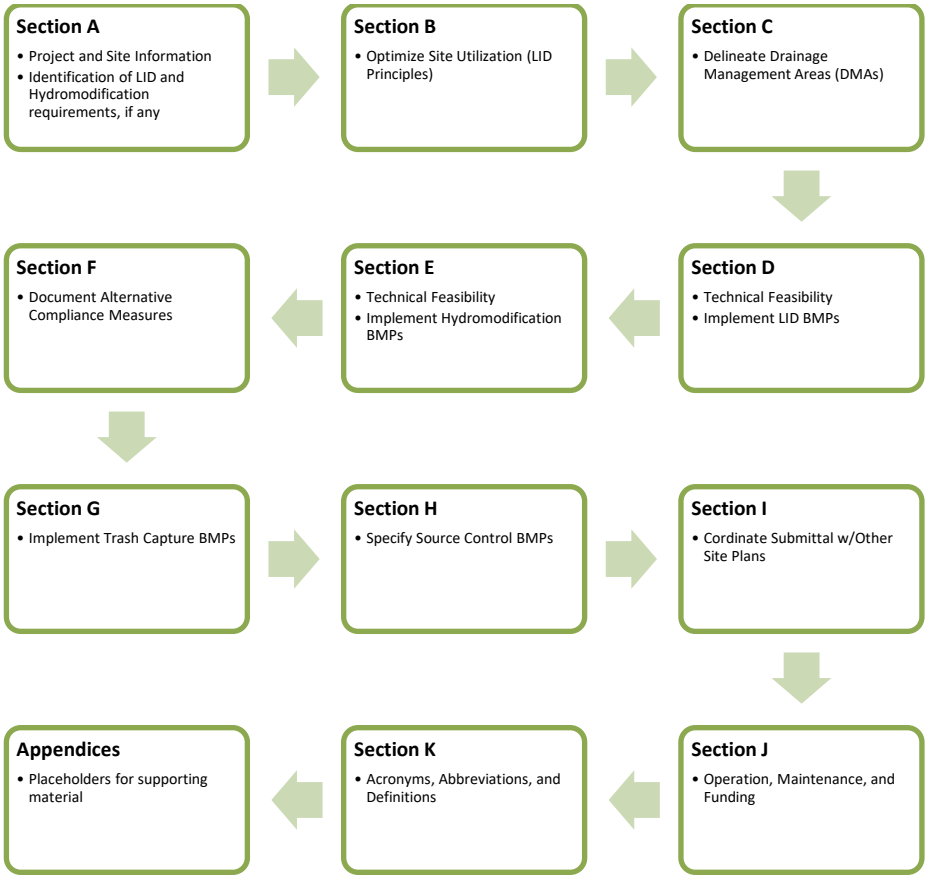
Based on 2018 WQMP, prepared for Compliance with Regional Board Order No. **R9-2013-0001** *as amended by Order No.* **R9-2015-0001** *and Order No.* **R9-2015-0100**

RIVERSIDE COUNTY
TRANSPORTATION DEPT
PRELIMINARY APPROVAL
Date: 2/17/2022 By: R.Tebben

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 Cambridge Homes by Blue Peak Engineering, Inc. for the 30003 Winchester Road 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	01/11/2021 Date
Rober Deprat Preparer's Printed Name	President, Blue Peak Engineering 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:	CUP 200001		
Rough Grade Permit No.:	N/A		
Development Name:	30003 Winchester Rd Development		
PROJECT LOCATION			
Latitude & Longitude (DMS):	33.691683, -117.083455		
Project Watershed and Sub-Watershed:	Santa Margarita River 2.22		
24-Hour 85th Percentile Storm Depth (inches):	0.65"		
Is project subject to Hydromodification requirements?	☒ Y ☐ N (Select based on Section A.3)		
APN(s):	466-050-019-7		
Map Book and Page No.:	Map 46, Page 12		
PROJECT CHARACTERISTICS			
Proposed or Potential Land Use(s)		Commercial	
Proposed or Potential SIC Code(s)			
Existing Impervious Area of Project Footprint (SF)		183,964 sf	
Total area of proposed Impervious Surfaces within the Project Limits (SF)/or Replacement		158,159 sf	
Total Project Area (ac)		253,209 sf	
Does the project consist of offsite road improvements?		☒ Y	☐ N
Does the project propose to construct unpaved roads?		☐ Y	☒ N
Is the project part of a larger common plan of development (phased project)?		☐ Y	☒ N
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
Is a Geotechnical Report attached?		☒ Y	☐ N
If no Geotech. Report, list the Natural Resources Conservation Service (NRCS) soils type(s) present on the site (A, B, C and/or D)		C	

Provide a brief description of the project:

The entire parcel is undeveloped with natural brush, trees, and grassed. The property will be graded and four self-storage building, an office, a gas station, and car wash will be constructed. The paving on site will consist of an AC and concrete paved parking lot and drive aisles. A new driveway will be provided connecting the project to Newport Road.

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/)

2Table 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	Municipal and Domestic Supply, Agricultural Supply, Industrial Service Supply, Industrial Process Supply, Non-contact water recreation, Warm freshwater Habitat, Wildlife Habitat	25 miles
Murrieta Creek	Chlorpyrifos, Copper, Iron, Manganese, Nitrogen, Toxicity	Municipal and Domestic Supply, Agricultural Supply, Industrial Service Supply, Industrial Process Supply, Non-contact water recreation, Warm freshwater Habitat, Wildlife Habitat	15 miles
Santa Margarita River (Upper)	Toxicity	Municipal and Domestic Supply, Agricultural Supply, Industrial Service Supply, Non-contact water recreation, Warm freshwater Habitat, Wildlife Habitat, Cold Freshwater Habitat, Rare, Threatened or Endangered Species	0
Santa Margarita River (Lower)	Enterococcus, Fecal Coliform, Phosphorous, Nitrogen	Municipal and Domestic Supply, Agricultural Supply, Industrial Service Supply, Non-contact water recreation, Warm freshwater Habitat, Wildlife Habitat, Cold Freshwater Habitat, Rare, Threatened or Endangered Species	0

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
Warm Springs Creek	Natural channel	None	☐ Y ☒ N
Murrieta Creek	Natural channel	HCOC Applicability map	☒ Y ☐ N
Santa Margarita River (Upper)	Natural Channel	HCOC Applicability map	☒ Y ☐ N
Santa Margarita River (Lower)	Natural Channel	HCOC Applicability map	☒ 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	☐ 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.

Certification		
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.

Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer.
The existing drainage pattern sheets flows onto Winchester Road and into a County storm drain system. The project BMPs maintain the existing drainage pattern by continuing to outlet to Winchester Road.

☐ 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. *There is little to no existing vegetation on the existing site*

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. *The entire site is being developed so no preservation of existing natural infiltration capacity can be achieved.*	
☒ 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.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. *The impervious area has been minimized by placing as much landscaping and pervious surfaces around the proposed project while still providing a functioning project. Drive aisles are kept to a minimum.*	

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.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. *Roof runoff will be directed to adjacent landscape areas as much as practical.*	
☒ 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.
Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer.	

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.

Project- Specific WQMP Site Design BMP Checklist

Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer.

Utilizing City of Los Angeles Appendix F to demonstrate compliance with the wet season demand for Riverside County Santa Margarita Area: Sample Design Calculations & Worksheets

Givens:

Vdesign =8,831 cf

Medium Planting Type → Planting Factor = 0.4

1) Determine design volume in gallons:
   Vdesign (gal) = 8,831* 7.49 gal/ft^3 = 66,144 gal.

2) Planting Area:
   Planting Area = 69,245

3) Estimated Total Water use per year (gallons)
   ETWU= ETo * 0.62 * [(PF x HA) + LA / IE]
   PF= 0.5
   HA = 10,000 sf
   LA= 69,245
   IE= 0.81
   ETo=39 in/hr
   → ETWU= 2,216,350 gal / 365 = 6,072 gal/day * 96 hrs = 24,288 gal

24,288 gal < 66,144 gal → Cannot drawdown within 96 hour drawdown time. Capture and use is not feasible.

☐ 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.

Discuss how this was included or provide a discussion/justification for "No" or "N/A" answer. Provided the slope of the site, the self-treating areas drain to the BMPs.

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
DA-1	Mixed	122,655	Type D- Areas draining to BMP

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

DMA Name or Identification	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
DA-2	Mixed	33,844	Type D- Areas draining to BMP

DMA Name or Identification	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
DA-3	Mixed	24,345	Type D- Areas draining to

			BMP

DMA Name or Identification	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
DA-4	Mixed	46,560	Type A- Self Treating Area

DMA Name or Identification	Surface Type(s)[1]	Area (Sq. Ft.)	DMA Type
DA-5	Mixed	25,805	Type D- Areas draining to BMP

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)
DMA-4	46,560	Drought tolerant cover	None

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.

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

(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
DA-1	Underground Detention, Modular Wetland System
DA-2	Underground Detention, Modular Wetland System
DA-3	Underground Detention
DA-5	Underground Detention, Modular Wetland System

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

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?		
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:		

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 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.

[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.

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		DA 1-5 (Infiltration Rate of 0.6in/hr)
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)
DMA-1	Y	
DMA-2	Y	
DMA-3	Y	
DMA-5	Y	

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	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.

	including vegetation supported by engineered or other growing media.	

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*	
DMA-1	☐	☐	☐	☒	☐
DMA-2	☐	☐	☐	☒	☐
DMA-3	☐	☐	☐	☒	☐
DMA-5	☐	☐	☐	☒	☐

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

Underground detention unit will utilize partial infiltration. The proposed biofiltration MWS will not utilize infiltration.

For those DMAs where LID BMPs are not feasible, provide a narrative in Table D-6 below summarizing why they are not feasible, include your technical infeasibility criteria in Appendix 5, and proceed to Section F below to document Alternative Compliance measures for those DMAs. Recall that each proposed DMA must pass through the LID BMP hierarchy before alternative compliance measures may be considered.

This is based on the clarification letter titled "San Diego Water Board's Expectations of Documentation to Support a Determination of Priority Development Project Infiltration Infeasibility" (April 28, 2017, Via email from San Diego Regional Water Quality Control Board to San Diego County Municipal Storm Water Copermittees[5]).

Table D-6 Summary of Infeasibility Documentation

Question	Narrative Summary (include reference to applicable appendix/attachment/report, as applicable)
a) When in the entitlement process did a geotechnical engineer analyze the site for infiltration feasibility?	The project is in the entitlement process and a Geotechnical Report has been provided.
b) When in the entitlement process	Infiltration testing was performed as part of the

[5] http://www.projectcleanwater.org/download/pdp-infiltration-infeasibility/

	were other investigations conducted (e.g., groundwater quality, water rights) to evaluate infiltration feasibility?	Geotechnical Report prepared by CW Soils on April 4th, 2019 and Project No. 19744-10.
c)	What was the scope and results of testing, if conducted, or rationale for why testing was not needed to reach findings?	Infiltration testing was performed as part of the Geotechnical Report prepared by CW Soils on April 4th, 2019 and Project No. 19744-10.
d)	What public health and safety requirements affected infiltration locations?	No.
e)	What were the conclusions and recommendations of the geotechnical engineer and/or other professional responsible for other investigations?	Based on the infiltration testing provided partial infiltration is feasible. Feet of fill will be placed on the site to allow for the underground detention above the encountered bedrock.
f)	What was the history of design discussions between the permittee and applicant for the proposed project, resulting in the final design determination related locations feasible for infiltration?	No.
g)	What site design alternatives were considered to achieve infiltration or partial infiltration on site?	None
h)	What physical impairments (i.e., fire road egress, public safety considerations, utilities) and public safety concerns influenced site layout and infiltration feasibility?	None.
i)	What LID Principles (site design BMPs) were included in the project site design?	Proposed landscape was implemented wherever possible onsite.

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-7 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	*Enter BMP Name / Identifier Here*		
	[A]		[B]	[C]	[A] x [C]			
DA-1	*122,655*	*Mixed*	*0.96*	*0.82*	*100,577*	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	A_T = Σ[A]	***122,655***			Σ= [D] 100,577	[E] 0.65	[F] $= \frac{[D]x[E]}{12}$ 5,528	[G] *

DMA Type/ID	DMA (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]			
DA-2	*33,844*	*Mixed*	*0.99*	*0.87*	*29,444*	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
	A_T = Σ[A]	***33,844***			Σ= [D] 29,444	[E] 0.65	[F] $= \frac{[D]x[E]}{12}$ 1614	[G] *

DMA Type/ID	DMA (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]			
DA-3	*24,345*	*Mixed*	*0.68*	*0.52*	*12,659*	*Design*	*DCV, V_{BMP}*	*Proposed*

						Storm Depth (in)	*(cubic feet)*	*Volume on Plans (cubic feet)*
	$A_T = \Sigma[A]$	***24,345***			Σ= [D] 12,659	[E] 0.65	$[F] = \frac{[D]x[E]}{12}$ 468	[G] *

DMA Type/ID	**DMA (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]			
DA-5	*25805*	*Mixed*	*0.86*	*0.67*	*17,289*			
	$A_T = \Sigma[A]$	***25,805***			Σ= [D] 17,289	*Design Storm Depth (in)*	*DCV, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
						[E] 0.65	$[F] = \frac{[D]x[E]}{12}$ 942	[G] *

* The total underground detention tank storage is 19,830 CF. Exceeding the combined total volume from DA-1, DA-2, DA-3, DA-5 (8,552 cf)

[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-8 LID BMP Sizing

BMP Name / ID	DMA No.	BMP Type / Description	Design Capture Volume (ft^3)	Proposed Volume (ft^3)
MWS Unit 8X20 # & UG Detention	DA-1	Mixed	5,528	19,830 cf
MWS Unit 4x8 # & UG Detention	DA-2	Mixed	2,835	19,830 cf
UG Detention	DA-3	Mixed	468	19,830 cf

MWS Unit 4x8 # & UG Detention	DA-5	Mixed	942	19,830 cf
		Total	**8,552**	**< 19,830 → Okay**

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)
MWS 8X20, MWS 4'x8', and Underground Detention	DA-1, DA-2, DA-3, DA-5	Mixed (included as one area since only underground detention system is being considered)	☒	19,830 cf	17' W x 98' L x 7' H	N/A
			☐			
			☐			
			☐			

**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.

N/A

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 2Table 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]		
						Design Storm (in)	*Design Flow Rate (cfs)*
	$A_T = \Sigma[A]$				$\Sigma = [D]$	[E]	$[F] = \frac{[D]x[E]}{[G]}$

[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]		
DA-1	*122,655*	*Mixed*	*0.94*	*0.79*	*96,897*	*Trash Capture Design Storm Intensity (in)*	*Trash Capture Design Flow Rate (cubic feet or cfs)*
	$A_T = \Sigma[A]$	122,655			$\Sigma = [D]$ 96,897	[E] 0.37	$[F] = \frac{[D]x[E]}{[G]}$ ***0.82***

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

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]		
DA-2	*33,844*	*Mixed*	*0.98*	*0.86*	*29,105*	*Trash Capture Design Storm Intensity (in)*	*Trash Capture Design Flow Rate (cubic feet or cfs)*
	$A_T = \Sigma[A]$	33,844			$\Sigma = [D]$ 29,105	[E] 0.37	$[F] = \frac{[D]x[E]}{[G]}$ ***0.25***

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]		
DA-3	*24,345*	*Mixed*	*0.32*	*0.24*	*5,842*	*Trash Capture Design Storm Intensity (in)*	*Trash Capture Design Flow Rate (cubic feet or cfs)*

	A_T = Σ[A]	24,345			Σ= [D] 5,842	[E] 0.37	[F] = [D]x[E] / [G] ***0.05***

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]		
DA-5	*25805*	*Mixed*	*0.86*	*0.67*	*17,289*		
						Trash Capture Design Storm Intensity (in)	*Trash Capture Design Flow Rate (cubic feet or cfs)*
	A_T = Σ[A]	25,805			Σ= [D] 17,289	[E] 0.37	[F] = [D]x[E] / [G] ***0.15***

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]
DA-1		Mixed	0.82	6.3 cfs (when 50% Full) per manufactured spec w/ 24"x24" inlet
DA-2		Mixed	0.25	6.3 cfs (when 50% Full) per manufactured spec w/ 24"x24" inlet
DA-3		Mixed	0.05	6.3 cfs (when 50% Full) per manufactured spec w/ 24"x24" inlet
DA-5		Mixed	0.15	6.3 cfs (when 50% Full) per manufactured spec w/ 24"x24" inlet

[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
Pest Control/Herbicide Application	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	- Maintain landscaping using minimum or no pesticides. - See applicable operational BMPs in "What you should know for…..Landscape and Gardening" at http://rcflood.org/stormwater - Provide IPM information to new owners, lessees and operators.

	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.	
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.
Trash enclosure areas	- A trash enclosure with cover is provided on site. - Signs will be posted on or near dumpsters with the words “Do not dump hazardous materials here” or similar.	- A trash enclosure with cover is provided on site. 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
On Site Storm Drain Inlets	Mark all inlets with the words "Only Rain Down the Storm Drain" or similar. Catch Basin Markers may be available from the Riverside County Flood Control and Water Conservation District, call 951.955.1200 to verify.	- Maintain and periodically repaint or replace inlet markings. -Provide stormwater pollution prevention information to new 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."
Food Service-N/A	-Describe the location and features of the designated cleaning area. -Describe the items to be cleaned in this facility and how it has been sized to insure that the largest items can be accommodated.	See the brochure, "The Food Service Industry Best Management Practices for: Restaurants, Grocery Stores, Delicatessens and Bakeries" at http://rcflood.org/stormwater/Provide this brochure to new site owners, lessees, and operators.
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
Interior floor drains and elevator shaft sump pumps	Interior floor drains and elevator shaft sump pumps will be plumbed to sanitary sewer.	Inspect and maintain drains to prevent blockages and overflow.

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)
	To be provided at Final WQMP	

Note that the updated table — or Construction Plan WQMP Checklist — is **only a reference tool** to facilitate an easy comparison of the construction plans to your Project-Specific WQMP. 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: Funding will be supplied by the rents and services provided to the Senior Care tenants as business revenues. These revenues will serve to provide monies to BMP maintenance providers as required by the WQMP. As with any living facility, maintenance of the property is of utmost importance.

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

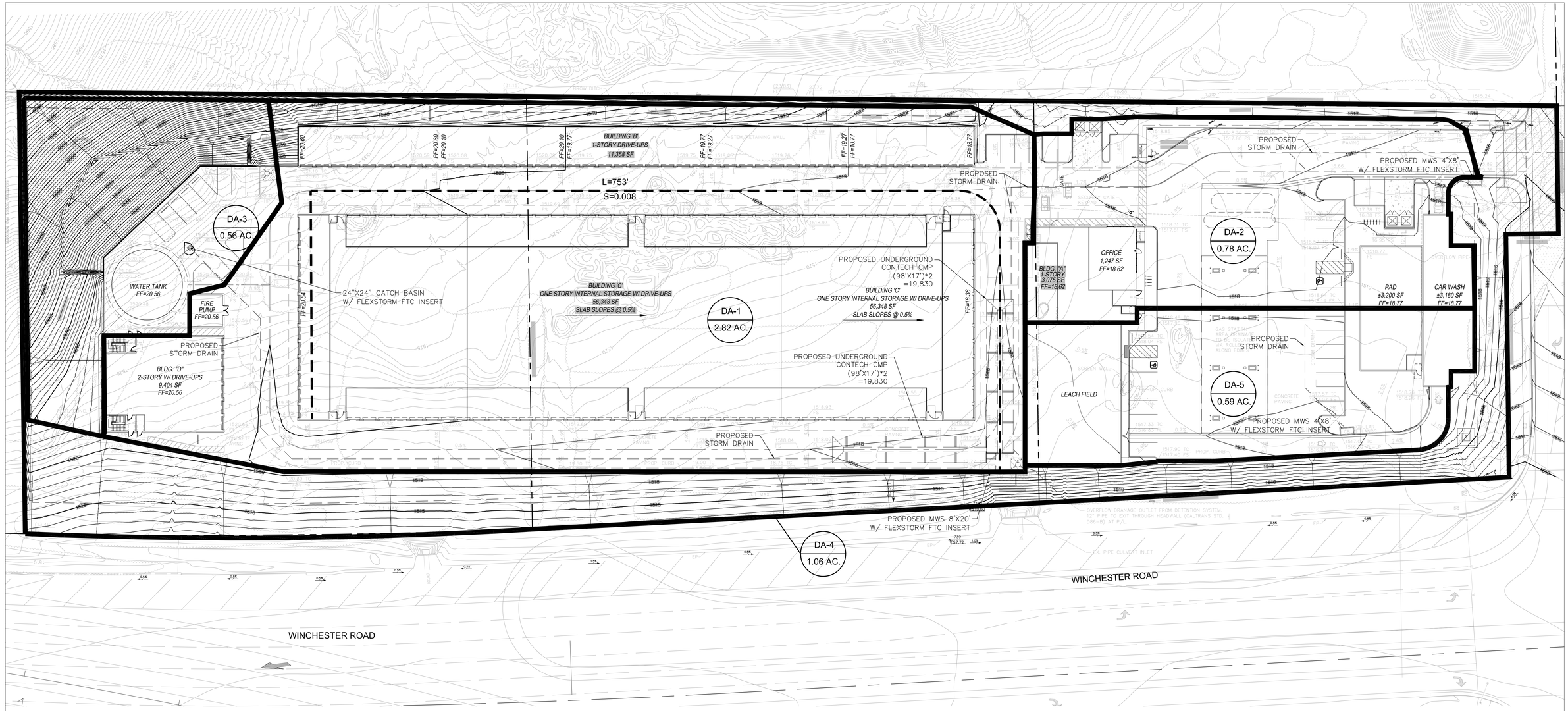
Location Map, WQMP Site Plan and Receiving Waters Map

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.



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.wilabs.com/). Control Labs (Watsonville, http://www.controllabs.com) and A&L Western Laboratories (Modesto, http://www.al-labs-west.com/).

LEGEND:

DRAINAGE AREA

AREA / ACRE — DRAINAGE CALLOUT

LID BMP SIZING:

AREA	SQ.FT	ACRES	IMP	PERV.	%IMP	%PERV	If (Perv)	If(Imp)	If(comb)	DCV	Q85
DA-1	122,655	2.82	115,117	7,538	0.94	0.06	0.3	1	0.96	5528	0.5
DA-2	33,844	0.78	32,844	1,000	0.97	0.03	0.3	1	0.98	1614	0.1
DA-3	24,345	0.56	7,687	16,658	0.32	0.68	0.3	1	0.52	468	0.1
DA-4	46,560	1.07	2511	44,049	0.05	0.95	0.3	1	0.34		
DA-5	25,805	0.59	20,468	5,337	0.79	0.21	0.3	1	0.86	942	0.1
TOTAL	**253,209**	**5.81**	**158,159**	**74,582**						**8,552**	**0.8**

AREA	DCV	BMP
DA-1	5528	Combined
DA-2	2835	Combined
DA-3	468	Combined
DA-4		
DA-5	942	Combined
TOTAL	**9,773**	**9,915**

18543 YORBA LINDA BLVD
#235
YORBA LINDA, CA 92886
714.749.3077
WWW.BLUEPEAKENG.COM
BLUE PEAK ENGINEERING

DRAWING ISSUE RECORD

DATE	DESCRIPTION

REVISION RECORD

NO.	DATE	DESCRIPTION

PROJECT NAME

SELF STORAGE
NEWPORT & WINCHESTER
RIVERSIDE COUNTY, CA

PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER
ROBERT J. DEPRATTI
No. C060482
Exp.06-30-20
CIVIL
STATE OF CALIFORNIA

SHEET TITLE

PRELIMINARY WQMP PLAN

SHEET NUMBER

PAR190044

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/).

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.

UPDATE GEOTECHNICAL
INTERPRETIVE REPORT

PROPOSED DIAMOND VALLEY STORAGE
ASSESSOR'S PARCEL NUMBERS 466-050-019, -020, & -021
SOUTHWEST CORNER OF WINCHESTER AND NEWPORT ROADS
WINCHESTER AREA, RIVERSIDE COUNTY, CALIFORNIA

PROJECT NO. 19744-10
APRIL 4, 2019

CW SOILS
23251 Kent Court
Murrieta, CA 92562
▫ 951-304-3935 ▫
▫ cwsoils.com ▫

April 4, 2019

Project No. 19744-10

Mr. Wayne Dollarhide
DIAMOND VALLEY PARTNERS, LLC
41197 Golden Gate Circle, Suite 201
Murrieta, CA 92562

Subject: **Update Geotechnical Interpretive Report, Proposed Diamond Valley Storage, Assessor's Parcel Numbers 466-050-019, -020, & -021, Southwest Corner of Winchester and Newport Roads, Winchester Area, Riverside County, California**

In accordance with your request, CW Soils is pleased to present our update geotechnical interpretive report for the proposed Diamond Valley Storage, Assessor's Parcel Numbers 466-050-019, -020, & -021, located on the southwest corner of Winchester and Newport Roads in the Winchester area of Riverside County, California. Our services were completed in accordance with the scope of work described in our proposal, dated February 22, 2019. The purpose of our work was to evaluate the nature, distribution, and engineering properties of the geologic formations underlying the site with respect to the proposed improvements.

CW Soils appreciates the opportunity to offer our services on this project. If we can be of further assistance, please do not hesitate to contact the undersigned at your convenience.

Respectfully submitted,

CW Soils

Chad E. Welke, PG, CEG, PE
Principal Geologist/Engineer

CERTIFIED ENGINEERING GEOLOGIST ★ CHAD E. WELKE NO. 2378 ★ STATE OF CALIFORNIA

REGISTERED PROFESSIONAL ENGINEER ★ CHAD E. WELKE NO. C63712 CIVIL ★ STATE OF CALIFORNIA

Distribution: (4) Addressee

TABLE OF CONTENTS

Attachments:

INTRODUCTION

This report prepared by CW Soils, presents the preliminary interpretive geotechnical evaluation for the proposed improvements. The purpose of our work was to evaluate the nature, distribution, and engineering properties of the geologic formations underlying the site with respect to the proposed improvements. Furthermore, we have included grading and foundation design recommendations based on the information you provided.

SITE DESCRIPTION

The site is located on the southwest corner of Winchester and Newport Roads in the Winchester area of Riverside County, California. The subject property is surrounded by undeveloped land. The general location of the subject property is illustrated on Figure 1 – Vicinity Map.

The subject property consists of undeveloped land with relatively flat terrain. Topographic relief at the subject property is low, with on the order of four previous buildings located in the northeast and southwest portions of the site. The previous buildings have been removed.

Vegetation at the site includes moderate amounts of annual weeds/grasses, along with some scattered small to large trees.

PROPOSED DEVELOPMENT

Based on our understanding of the proposed project, a convenience store and office buildings are planned along with four storage buildings are planned. The proposed commercial development is anticipated to consist of wood, concrete, or steel framed one- and/or two-story structures utilizing slab on grade construction with associated driveways, landscape areas, and utilities.

Formal plans have not been prepared and await the conclusions and recommendations of this report.

FIELD EXPLORATION AND LABORATORY TESTING

Field Exploration

No additional exploration or laboratory testing was conducted for this update report. Subsurface exploration for the subject property was performed on May 8, 2006 (The Soils, Co., 2006).

Associated with the subsurface exploration was the collection of disturbed bulk samples and/or relatively undisturbed samples of soils for laboratory testing and analysis. The exploratory locations (Test Pits T-1 & T-5) and geologic conditions at the subject property are illustrated on Plate 1 – Geotechnical Map. Additionally, the original boring logs and boring locations from the referenced report can be found in Appendix B.

REFERENCE: Google Earth (Version 7.1.5.1557) [Software]. Mountain View, CA: Google Inc. (2015).

CW SOILS	VICINTY MAP	19744-10 Not to Scale FIGURE 1

Laboratory Testing

Maximum dry density/optimum moisture content, sieve analysis, 200-wash, expansion potential, shear strength, pH, resistivity, sulfate content, and chloride content were determined for selected samples of soils, considered representative of those noted during the field exploration. The laboratory test results from the referenced report (THE Soils, 2006) are reflected throughout the Conclusions and Recommendations of this report. Summaries of the test results and brief descriptions of laboratory test criteria are presented in Appendix C.

FINDINGS

Regional Geology

Regionally, the project is located in the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges are characterized by northwest trending sediment filled elongated valleys divided by steep mountain ranges. Associated with and subparallel to the northwest trending San Andreas Fault, are the San Jacinto Fault, Newport-Inglewood Fault, and the Whittier-Elsinore Fault zones. The northwest trend of the province has played a major role in shaping the dominant structural geologic features in the region as well. The Perris Block forms the eastern boundary of the Elsinore Fault, while the west side is comprised of the Santa Ana Mountains. The Perris Block is in turn bounded to the east by the San Jacinto Fault. The Peninsular Ranges Province and the Transverse Range Province are separated by the northern perimeter of the Los Angeles basin, which is formed by a northerly dipping blind thrust fault.

The low lying areas within the Peninsular Ranges Province are principally made up of Tertiary and Quaternary non-marine alluvial sediments consisting of alluvial deposits, sandstones, claystones, siltstones, conglomerates, and occasional volcanic units. The mountainous regions are primarily made up of Pre-Cretaceous, metasedimentary, and metavolcanic rocks along with Cretaceous plutonic rocks of the Southern California Batholith. A map illustrating the regional geology is presented on Figure 2 – Regional Geologic Map.

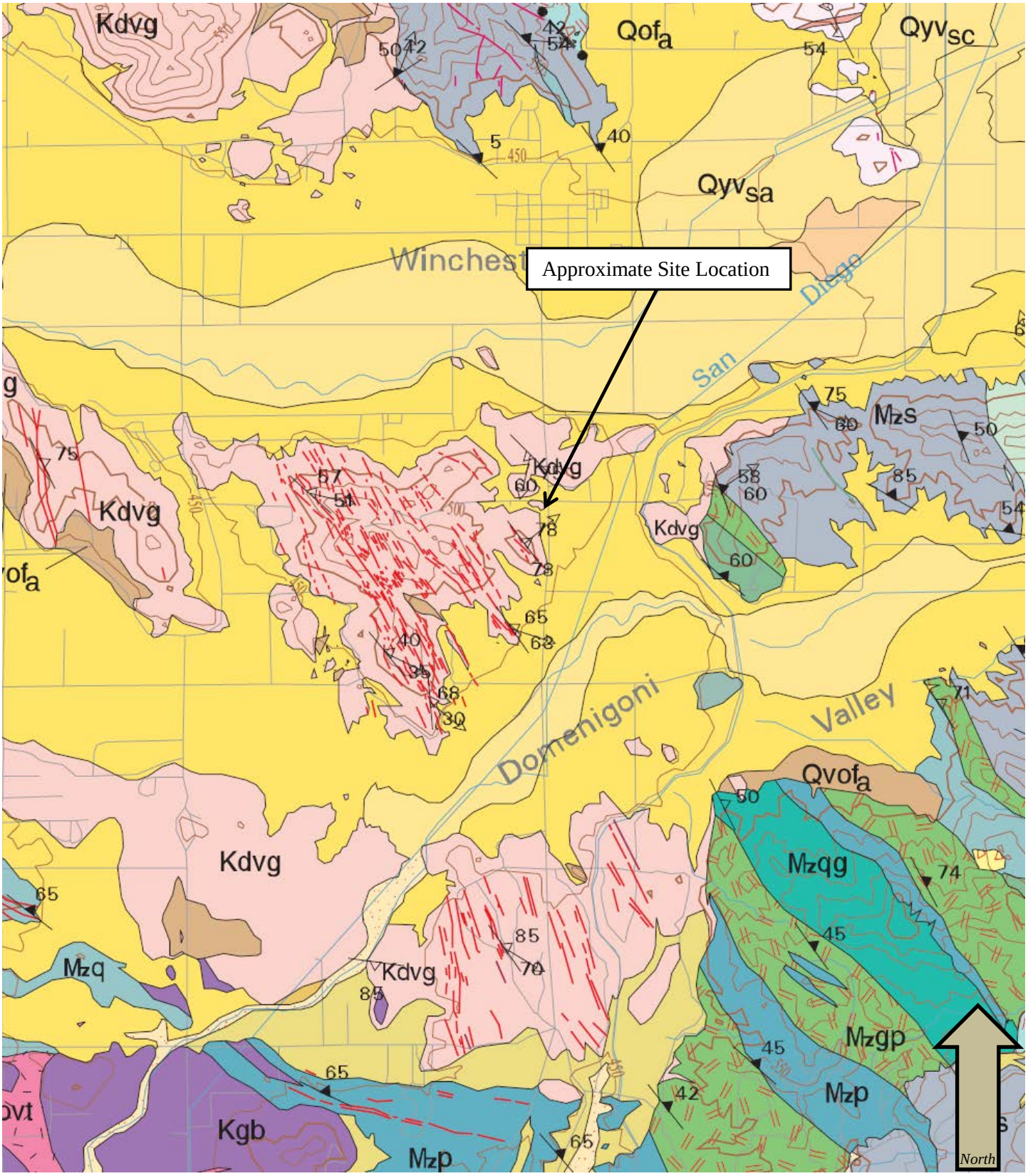
Local Geology

The most relevant local geologic units expected to be present at the site are summarized in this section. A general description of the dominant soils that form the geologic units is provided below:

- Artificial Fill, Undocumented (map symbol Quf): Undocumented artificial fill materials were mapped at the site. These materials are generally inconsistent, poorly consolidated fills.

- Quaternary Old Alluvium (map symbol Qoal): Quaternary old alluvium was encountered to a maximum depth of 13 feet. These alluvial deposits consist predominately of interlayered dark brown to olive brown, sandy silt, silt, and occasional silty sand. These deposits were generally noted to be in a slightly moist, loose to medium dense state. This unit is considered to corollate with the Quaternary old alluvial fan deposits (Qof) shown in Figure 2.

- Cretaceous Granodiorite to Tonalite (map symbol Kgd): Cretaceous age plutonic rock consisting of granodiorite was mapped near the surface within the southwest portion of the site. The granitic rock was observed to be yellowish brown, coarse grained and in a dense to very dense state. This unit is considered to corollate with the Cretaceous granodiorite to tonalite of the Domenigoni Valley (Kdvg) shown in Figure 2.



Reference: Morton, D.M., Hauser, Rachel M., and Ruppert, Kelly R., 2004, *Preliminary Digital Geologic Map of the Santa Ana 30' x 60' Quadrangle, Southern California, Version 2.0*: U.S. Geological Survey Open-File Report 99-0172

CW SOILS	REGIONAL GEOLOGIC MAP	19744-10 1:100,000 FIGURE 2

Geologic Structure

The bedrock described is common to this area. The granitic bedrock is generally massive and lacks significant structural planes. Foliation planes mapped generally strike northwest and dip steeply to the northeast (Morton, 2004). The massive nature of the bedrock is favorable for the gross stability of the site and proposed project.

Aerial Photographs

A review of aerial photographs was performed during our geotechnical evaluation. No strong geomorphic expressions suggestive of recent faulting, such as linear topography, offset streams/drainage courses, lines of natural springs, or fault scarps, were interpreted to project through the proposed project area during our review of the aerial photographs of the subject property. While conducting our interpretive analysis of the site, no geomorphic evidence of recently active landsliding was found. Aerial photographs from different time periods and various scales that were utilized in our geomorphic interpretations include the following from Google Earth dated September 1996, May 2002, January 2006, June 2012, and August 2018.

Faulting

Significant ground shaking will likely impact the site within the design life of the proposed project, due to the project being located in a seismically active region. The geologic structure of the entire southern California area is dominated by northwest-trending faults associated with the San Andreas Fault system. The San Andreas Fault system accommodates for most of the right lateral movement associated with the relative motion between the Pacific and North American tectonic plates.

The subject property is not located within an Alquist-Priolo Fault Rupture Hazard Study Zone, established by the State of California to restrict the construction of habitable structures across identifiable traces of known active faults. No active faults are known to project through the proposed project. As defined by the State of California, an active fault has undergone surface displacement within the past 11,700 years or during the Holocene epoch.

The nearest known "active faults" are part of the San Jacinto system about ~15.69 kilometers distant (USGS Earthquake Hazards Program, Unified Hazard Tool for Conterminous U.S. 2014 (v4.1.1) Deaggregation), capable of producing horizontal ground accelerations of ~7.98 (USGS, 2002).

CONCLUSIONS AND RECOMMENDATIONS

General

From a geotechnical point of view, the subject property is considered suitable for the proposed improvements, provided the design information and conclusions and recommendations herein are incorporated into the plans and are implemented during construction.

Earthwork

Grading Operations

Grading operations are subject to the provisions of the 2016 California Building Code (CBC), including Appendix J Grading, as well as all applicable grading codes and requirements of the appropriate reviewing

agency. Grading operations should also be conducted in accordance with applicable requirements of our General Earthwork and Grading Specifications within the final appendix of this report, unless more conservative recommendations are provided herein.

Clearing and Grubbing

Areas undergoing grading operations should be stripped of vegetation including trees, grasses, weeds, brush, shrubs, or any other debris and properly disposed of offsite. Laborers should be employed to remove roots, branches, or other deleterious materials during grading operations.

CW Soils should be notified in a timely manner in order to provide observations during Clearing and Grubbing operations. Any buried foundations or unanticipated conditions should be brought to our immediate attention to consider whether adjustments are necessary.

Excavation Characteristics

Based on our experience with similar projects in similar settings, the near surface soils, may be excavated with conventional earth moving equipment appropriately selected for the task to be performed. The amount of excavation difficulty is often a function of the degree of weathering, type of excavation, rock lithology, and amount of fracturing within the bedrock. In general, bedrock becomes harder and more difficult to excavate with increasing depth.

Groundwater

Groundwater was not observed during the field exploration conducted to a maximum depth of 15 feet in Test Pit 2. It should be noted that localized groundwater or variations in the level of groundwater could be discovered during grading due to the limited number of exploratory locations or other factors.

Ground Preparation

In areas to receive compacted fill, the removal of low density, compressible soils, such as upper alluvial materials and undocumented artificial fill, should continue until firm competent alluvium or bedrock is encountered. Removal excavations should be verified by the project engineer, geologist or their representative. Prior to placing compacted fills, the exposed bottom should be scarified to a depth of 6 inches or more, watered or air dried as necessary to achieve near optimum moisture content and then compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D1557-12.

Remedial grading should extend horizontally beyond the perimeter of the proposed structures a distance equal to the depth of compacted fill below the proposed footing or a minimum of 5 feet, whichever is greater. The anticipated removal depths are shown on Plate 1 – Geotechnical Map. In general the anticipated removal depths should vary from 3 to 5 feet below existing grade.

Oversize Rock

Some quantities of oversize rock (i.e., rock exceeding a maximum dimension of 12 inches) are expected to be encountered during grading. Oversize rock that is encountered should be disposed of offsite, dispersed throughout the site at the surface of natural grades, or stockpiled and crushed for future use. The disposal of oversize rock is discussed in greater detail in the last appendix of this report, General Earthwork and Grading Specifications.

Compacted Fill Placement

Well mixed soils should be placed in 6 to 8 inch maximum (uncompacted) lifts, watered or air dried as necessary to achieve uniform near optimum moisture content and then compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D1557-12.

Import Soils

If needed to achieve final design grades, all potential import materials should be non-expansive, free of deleterious/oversize materials, and approved by the project soils engineering consultant prior to delivery onsite.

Fill Slopes

Fill slopes higher than 5 feet and steeper than 5:1 (h:v) require a keyway at the toe. Keyways should be excavated 2 feet into bedrock or competent earth materials, as measured on the downhill side and be a minimum of 10 feet wide. Backcuts for keyway excavations should be cut no steeper than 1:1 or as recommended by the soils engineer or engineering geologist. As compacted fill is placed, proper benching into bedrock or competent earth materials should be maintained.

Cut Slopes

Cut slopes no steeper than 2:1 (h:v) into bedrock are expected to be stable. Cut slopes should be observed by the engineering geologist or his representative during grading operations.

Temporary Backcuts

With regard to excavation safety, it is the responsibility of the grading contractor to follow all Cal-OSHA requirements. Adequate slope stability to protect adjacent developments must be maintained, temporary backcuts for canyon removals, stabilization fills, and/or keyways may be needed. It is imperative that grading schedules minimize the exposure time of the unsupported excavations. Temporary backcuts should be observed by the engineering geologist or his representative during grading/construction operations.

Cut/Fill Transitions

Cut/fill transitions should be eliminated from all structure areas where the depth of fill placed within the "fill" portion exceeds the proposed footing depths, to diminish distress to structures resulting from excessive differential settlement. Each structural foundation should bear entirely on a uniform bearing material. This should be accomplished by overexcavating the "cut" portion and replacing the excavated materials with properly compacted fill. The recommended depths of overexcavation can be found in the underlying table.

DEPTH OF FILL ("fill" portion)	DEPTH OF OVEREXCAVATION ("cut" portion)
Up to 8 feet	Equal depth (4 feet maximum)
Greater than 8 feet	One-half the "fill" portion thickness (10 feet maximum)

Overexcavation of the "cut" portion should extend beyond the building perimeter a horizontal distance equal to the depth of overexcavation or a minimum of 5 feet, whichever is greater.

Cut Areas

In cut areas where low density surficial soils such as any undocumented artificial fills, topsoil, colluvium and/or alluvium are not removed in their entirety, the entire building area should be overexcavated a minimum of 2 feet below the proposed foundations and replaced with compacted fill. Final determination of building areas that require overexcavation should be determined in the field by an experienced representative of CW Soils.

Shrinkage, Bulking, and Subsidence

Volumetric reductions in soils will occur as poorly consolidated soils are replaced with properly compacted fill. The estimates of shrinkage/bulking and subsidence are intended as an aid for project engineers in determining earthwork quantities. Since many variables can affect the accuracy of these estimates, they should be used with caution and contingency plans should be in place for balancing the project. Subsidence resulting from scarification and recompaction of bottom excavations is expected to be negligible to approximately *0.01 foot.

Shrinkage/bulking estimates for the various geologic units that are expected to undergo volume changes during grading operations are provided below.

GEOLOGIC UNIT	SHRINKAGE (%)
Artificial Fill	10 to 15
Alluvium	5 to 10
Bedrock	0 to 5 (Bulking)

Geotechnical Observations

Clearing operations, removal of unsuitable materials, and general grading procedures should be observed by the project soils consultant or his representative. Compacted fill should not be placed without prior bottom observations being conducted by the soils consultant or his representative to verify the adequacy of the removals.

The project soils consultant or his representative should be present to observe grading operations and to check that the minimum compaction requirements are being obtained. In addition, verification of compliance with the other grading recommendations presented herein should be provided concurrently.

Post Grading Considerations

Slope Landscaping and Maintenance

Provided all drainage provisions are properly constructed and maintained, the gross stability of graded slopes should not be adversely affected. However, satisfactory slope and building pad drainage is essential for the long term performance of the site. Concentrated drainage should not be allowed to flow uncontrolled over any descending slope. As recommended by the project landscape architect, engineered slopes should be landscaped with deep rooted, drought tolerant maintenance free plant species.

Site Drainage

Maintaining control over drainage throughout the site is important for the long term performance of the proposed improvements. We recommend roof gutters or equivalent roof collection system for proposed structures. Pad and roof drainage should be routed in non-erosive drainage devices to driveways, adjacent streets, storm-drain facilities, or other locations approved by the building official. Drainage should not be allowed to pond on the building pad or near any foundations. Planters located within retaining wall backfill should be sealed to prevent moisture intrusion into the backfill. Planters located next to structures should be sealed to the depth of the footings. Drainage control devices require periodic cleaning, testing and maintenance to remain effective.

Building pad drainage should be designed to meet the minimum gradient requirements of the CBC, to divert water away from foundations.

Utility Trenches

All utility trench backfill should be compacted at near optimum moisture to a minimum of 90 percent of the maximum dry density as determined by ASTM D1557-12. Trench backfill should be placed in approximately 6 to 8 inch maximum loose lifts and then mechanically compacted with a hydro-hammer, a sheepsfoot, pneumatic tampers, or similar equipment. Within pavement areas, the upper 6 inches of subgrade materials for utility trench backfill should be compacted to 95 percent of the maximum dry density determined by ASTM D1557-12. The utility trench backfill should be observed and tested by the project soils engineer or their representative to verify that the minimum compaction requirements have been obtained.

Where utility trenches undercut perimeter foundations, all utility trenches should be backfilled with compacted fill, lean concrete, or concrete slurry. When practical, interior or exterior utility trenches that run parallel to structure footings should not be located within a 1:1 (h:v) plane projected downward from the outside bottom edge of the footing.

SEISMIC DESIGN PARAMETERS

Ground Motions

To resist the effects of design level seismic ground motions in order to prevent collapse (1% probability of collapse in 50 years), structures are required to be designed and constructed in accordance with the 2016 California Building Code Section 1613. The design is reliant on the site class, risk category (I, II, III, or IV), and mapped spectral accelerations for short periods (S_s) and a 1-second period (S_1).

Based on data and maps jointly compiled by the United States Geological Survey (USGS) and the California Geological Survey (CGS), spectral accelerations for the subject property were generated via a software application provided by the USGS website, *Earthquake Hazards Program*. The data summarized in the following table is based on the Maximum Considered Earthquake Geometric Mean (MCE_G) with 5% damped ground motions having a 2% probability of being exceeded in 50 years (2,475 year return period).

The seismic design parameters were determined by a combination of the site class, mapped spectral accelerations, on site soil/rock conditions, and risk category. The compilation of seismic design parameters found below are

considered appropriate for implementation during structural design. The USGS Design Summary Report is included in Appendix D.

PARAMETER		FACTOR
Site Location		Latitude: 33.6850 Longitude: -117.0850
Site Class (1613.3.2 of 2016 CBC, Chapter 20 of ASCE 7)		D
Mapped Spectral Accelerations for short periods	S_s (g)	1.5
Mapped Spectral Accelerations for 1-Second Period	S_1 (g)	0.6
Maximum Considered Earthquake Spectral Response Acceleration for Short Periods	S_{ms} (g)	1.5
Maximum Considered Earthquake Spectral Response Acceleration for 1-Second Period	S_{m1} (g)	0.9
Design Spectral Response Acceleration for Short Periods	S_{DS} (g)	1
Design Spectral Response Acceleration for 1-Second Period	S_{D1} (g)	0.6
Seismic Design Category		D
Importance Factor Based on Occupancy Category		II

A probabilistic seismic hazard assessment for the site was conducted in accordance with the 2016 CBC, Section 1803.5.12. The probabilistic seismic hazard maps and data files were jointly prepared by the United States Geological Survey (USGS) and the California Geological Survey (CGS). Actual ground shaking intensities at the subject property may be substantially higher or lower based on complex variables such as the near source directivity effects, depth and consistency of soils, topography, geologic structure, direction of fault rupture, seismic wave reflection, refraction, and attenuation rates. The estimated probabilistic peak ground acceleration at the site is, PGA = 0.5.

Secondary Seismic Hazards

Secondary effects of seismic shaking include several types of ground failure as well as induced flooding. Ground failure that could occur as a consequence of severe ground shaking, include landslides, ground lurching, shallow ground rupture, and liquefaction/lateral spreading. The likelihood of occurrence of each type of ground failure depends on the severity and distance from the earthquake epicenter, topography, geologic structure, groundwater conditions, and other factors. All of the secondary effects of seismic activity listed above are considered to be unlikely, based on our experience, subsurface exploration, and laboratory testing.

Seismically induced flooding is normally associated with a tsunami (seismic sea wave), a seiche (i.e., a wave-like oscillation of surface water in an enclosed basin that may be initiated by a strong earthquake) or failure of a major reservoir or retention system up gradient of the site. As a result of the site being at an elevation of roughly 1,500 feet above mean sea level and being more than 20 miles inland from the nearest coastline of the Pacific Ocean, the potential for seismically induced flooding due to a tsunamis is considered remote. The likelihood of induced flooding due to a seiche overcoming a dam's freeboard is considered remote. In addition, it is considered remote that any major reservoir up gradient of the subject property would be compromised to a point of failure.

Liquefaction and Lateral Spreading

The three requirements for liquefaction to occur include seismic shaking, poorly consolidated cohesionless sands, and groundwater. Liquefaction results in a substantial loss of shear strength in loose, saturated, cohesionless soils subjected to earthquake induced ground shaking. Potential impacts from liquefaction include loss of bearing capacity, liquefaction related settlement, lateral movements, and surface manifestation in the form of sand boils. The potential for design level earthquake induced liquefaction and lateral spreading to occur beneath the proposed structures is considered very low to remote due to the recommended compacted fill, the dense nature of the deeper onsite soils, and the shallow bedrock.

Ground Subsidence

Groundwater or oil withdrawal from soils can cause a permanent collapse of pore space previously occupied by the fluid. The consolidation of subsurface sediments resulting from fluid withdrawal may cause the ground surface to subside, potentially resulting in differential subsidence which can significantly damage engineered structures. Since excessive withdrawal of fluids is not anticipated in the vicinity of the proposed project, the potential for subsidence is considered low to remote.

PRELIMINARY FOUNDATION DESIGN RECOMMENDATIONS

General

Shallow foundations are considered feasible for support of the proposed structures, provided grading and construction are performed in accordance with the recommendations of this report. Foundation recommendations are provided in the following sections. Graphic presentations of relevant information and recommendations are also included on Plate 1 – Geotechnical Map.

Allowable Bearing Values

An allowable bearing value of 2,500 pounds per square foot (psf) is recommended for design of 12 inch wide continuous footings founded at a minimum depth of 12 inches below the lowest adjacent final grade and 24 inch square pad footings. This value may be increased by 20 percent for each additional 1-foot of width and/or depth to a maximum value of 3,000 psf. Recommended allowable bearing values include both dead and frequently applied live loads and may be increased by one third when designing for short duration wind or seismic forces.

Settlement

We estimate that the maximum total settlement of the footings will be less than approximately ¾ inch, based on the anticipated loading and the settlement characteristics of the underling earth materials. Differential settlement is expected to be about ½ inch over a horizontal distance of approximately 20 feet, for an angular distortion ratio of 1:480. The majority of the settlement is anticipated to occur during construction or shortly after the initial application of loading.

The above settlement estimates are based on the assumption that the grading and construction are performed in accordance with the recommendations presented in this report. Additionally, the project soils consultant or his representative will be provided the opportunity to observe the foundation excavations.

Lateral Resistance

Passive earth pressure of 250 psf per foot of depth to a maximum value of 2,500 psf may be used to establish lateral bearing resistance for footings. A coefficient of friction of 0.28 times the dead load forces may be used between concrete and the supporting soils to determine lateral sliding resistance. When combining passive and friction for lateral resistance, the passive component should be reduced by one third. In no case shall the lateral sliding resistance exceed one-half the dead load for clay, sandy clay, sandy silty clay, silty clay, and clayey silt.

The above lateral resistance values are based on footings for an entire structure being placed directly against either compacted fill or competent bedrock.

Expansive Soil Considerations

The preliminary laboratory test results indicate that the onsite soils exhibit an expansion potential of **VERY LOW** as classified by the 2016 CBC Section 1803.5.3 and ASTM D4829-03.

Additional, testing for expansive soil conditions should be conducted upon completion of rough grading and prior to construction. The following recommendations should be considered the very minimum requirements, for the soils tested. It is common practice for the project architect or structural engineer to require additional slab thickness, footing sizes, and/or reinforcement.

Very Low Expansion Potential (Expansion Index of 20 or Less)

Our laboratory test results indicate that the soils onsite exhibit a **VERY LOW** expansion potential as classified by the 2016 CBC Section 1803.5.3 and ASTM D4829-03. Since the onsite soils exhibit expansion indices of 20 or less, the design of slab on grade foundations is exempt from the procedures outlined in Section 1808.6.1 or 1808.6.2.

Conventional Footings

- Exterior continuous footings should be founded at the minimum depths below the lowest adjacent final grade (i.e. minimum 12 inch depth for one-story, minimum 18 inch depth for two-story, and minimum 24 inch depth for three-story construction). Interior continuous footings for one-, two-, and three-story construction may be founded at a minimum depth of 12 inches below the lowest adjacent final grade. In accordance with Table 1809.7 of the 2016 CBC, all continuous footings should have a minimum width of 12, 15, and 18 inches, for one-, two-, and three-story structures, respectively, and should be reinforced with a minimum of two (2) No. 4 bars, one (1) top and one (1) bottom.

- Exterior pad footings intended to support roof overhangs, such as second story decks, patio covers and similar construction should be a minimum of 24 inches square and founded at a minimum depth of 18 inches below the lowest adjacent final grade. The pad footings should be reinforced with a minimum of No. 3 bars spaced a maximum of 20 inches on center, each way, and should be placed near the bottom-third of the footings.

Building Floor Slabs

- Building floor slabs should be a minimum of 4 inches thick. All floor slabs should be reinforced with a minimum of No. 3 bars spaced a maximum of 24 inches on center, each way, supported by concrete chairs or bricks to ensure desired mid-depth placement.

- Building floor slabs with moisture sensitive or occupied areas, should be underlain by a minimum 10-mil thick moisture barrier to help reduce the upward migration of moisture from the underlying soils. The moisture barrier should be properly installed using the guidelines of ACI publication 318-05 and meet the performance standards of ASTM E 1745 Class A material. Prior to placing concrete, it is the responsibility of the contractor to ensure that the moisture barrier is properly placed and free of openings, rips, or punctures. As an option for additional moisture protection and foundation strength, higher strength concrete, such as a minimum compressive strength of 5,000 pounds per square inch (psi) in 28-days may be used. In addition, a capillary break/vapor retarder for concrete slabs should be provided in accordance with CALGreen. Ultimately, the design of the moisture barrier system along with recommendations for concrete placement and curing are the purview of the foundation engineer, factoring in the project conditions provided by the architect and owner.

- Garage floor slabs should be a minimum of 4 inches thick and should be reinforced in a similar manner as occupied area floor slabs. Garage floor slabs should be placed separately from adjacent wall footings with a positive separation maintained with ⅜ inch minimum felt expansion joint materials and quartered with weakened plane joints. A 12 inch wide turn down founded at the same depth as adjacent footings should be provided across garage entrances. The turn down should be reinforced with a minimum of two (2) No. 4 bars, one (1) top and one (1) bottom.

- Prior to placing concrete, the subgrade soils below all floor slabs should be pre-watered to promote uniform curing of the concrete to minimize the development of shrinkage cracks. The pre-watering should be verified by CW Soils.

Structural Setbacks and Building Clearance

Structural setbacks are required by the 2016 California Building Code (CBC). No additional structural setbacks are required due to geologic or soils conditions within the site. Improvements constructed near natural or properly compacted engineered slopes can, over time, be affected by natural processes including gravity forces, shrink/swell processes, weathering, and long term secondary settlement. As a result, the CBC requires that structures be setback or footings deepened to resist the influence of these processes.

For structures that are planned near ascending and descending slopes, the footings should be embedded to satisfy the requirements presented in the 2016 CBC, Section 1808.7. Foundations are required to be founded in accordance with the Foundation Clearances from Slopes Detail (CBC, 2016), which is illustrated in the last Appendix of this report.

When determining the required clearance from ascending slopes with a retaining wall at the toe, the height of the slope shall be measured from the top of the wall to the top of the slope.

Foundation Observations

Prior to the placement of forms, concrete, or steel, all foundation excavations should be observed by the geologist, engineer, or his representative to verify that they have been excavated into competent bearing materials, in accordance with the 2016 CBC. The foundations should be excavated per the approved plans, moistened, cleaned of all loose materials, trimmed neat, level, and square. Moisture softened soils should be removed prior to steel or concrete placement. Soils from foundation excavations should be removed from slab on grade areas, unless they have been properly compacted and tested.

Corrosivity

Corrosion is defined by the National Association of Corrosion Engineers (NACE) as "a deterioration of a substance or its properties because of a reaction with its environment." From a soils engineering point of view, the "substances" are the reinforced concrete foundations or buried metallic elements (not surrounded by concrete) and the "environment" is the prevailing soils in contact with them. Many factors can contribute to corrosivity, including the presence of chlorides, sulfates, salts, organic materials, different oxygen levels, poor drainage, varying soils consistencies, and moisture content. It is not considered practical or realistic to test for all of the factors which may contribute to corrosivity.

The level of chlorides considered to be significantly detrimental to concrete is based upon the industry recognized Caltrans standard "Bridge Design Specifications". Under subsection 8.22.1 of that document, Caltrans established that "Corrosive water or soil contains more than 500 parts per million (ppm) of chlorides". Based on limited testing, the onsite soils tested have chloride contents *less* than 500 ppm. Therefore, specific requirements resulting from elevated chloride contents are not required.

When the soluble sulfate content of soils exceeds 0.1 percent by weight, specific guidelines for concrete mix design are provided in the 2016 CBC Section 1904 and in ACI 318, Section 4.3 Table 4.3.1. Based on limited testing, the onsite soils are classified as having a *negligible (less than 0.10 % by weight)* sulfate exposure condition, in accordance with Table 4.3.1. Therefore, structural concrete in contact with onsite soils should utilize Type I or II.

The onsite soils in contact with buried steel should be considered *mildly (2,000 to 10,000 Ohms-cm) corrosive* based on our laboratory testing of resistivity. Additionally, pH values below 9.7 are recognized as being corrosive to most common metallic components including, copper, steel, iron, and aluminum. The pH values for the soils tested were *lower* than 9.7. Therefore, any steel or metallic materials that are exposed to the soils should be encased in concrete or other remedies applied to provide corrosion protection.

It should be noted that CW Soils are not corrosion engineers and the test results for corrosivity are based on limited samples thought to be representative. The grading operations may blend various soils together and/or unveil soils with higher corrosive properties. This blending or imported material could alter and increase the detrimental properties of the onsite soils. Thus, it is important that additional testing near final grades for chlorides and sulfates along with testing for pH and resistivity be performed upon completion of the grading operations. Laboratory test results are presented in Appendix C.

RETAINING WALLS

Active and At-Rest Earth Pressures

Retaining wall foundations may be designed in accordance with the recommendations provided in the Preliminary Foundation Design Recommendation section of this report. For design of retaining walls up to 6 feet high, the table below provides the minimum recommended equivalent fluid pressures.

The active earth pressure should be used for design of unrestrained retaining walls, which are free to tilt slightly. The at-rest earth pressure should be used for design of retaining walls that are restrained at the top, such as basement walls, curved walls with no joints, or walls restrained at corners. For curved walls, active pressure may be used if tilting is acceptable and construction joints are provided at each angle point and at a minimum of 15 foot intervals along the curved segments.

MINIMUM STATIC EQUIVALENT FLUID PRESSURE (pcf, ≤6 feet high)		
PRESSURE TYPE	BACKSLOPE CONDITION	
	LEVEL	2:1 (h:v)
Active Earth Pressure	43	52
At-Rest Earth Pressure	53	78

Hydrostatic pressure behind the retaining walls has not been taken into account when calculating the parameters provided. Therefore, the subdrain system is a very important part of the design. If additional loads are being applied within a 1:1 plane projected up from the heel of the retaining wall footing, due to surcharge loads imposed by other nearby walls, structures, vehicles, etc., then additional pressure should be added to the above earth pressures to account for the expected surcharge loads. In order to minimize surcharge loads and the settlement potential of nearby structures, the footings for the structure can be deepened below the 1:1 plane projected up from the heel of the retaining wall footing.

Upon request and under a separate scope of work, more detailed analyses can be provided to address retaining wall designs with regard to value engineering, stepped retaining walls, actual retaining wall heights, actual backfill inclinations, specific backfill materials, higher retaining walls requiring earthquake design motions, etc.

Subdrain System

To prevent the buildup of hydrostatic pressure behind the proposed retaining walls, we recommend a perforated pipe and gravel subdrain system be provided behind all retaining walls. The subdrain system should consist of 4 inch minimum diameter Schedule 40 PVC or ABS SDR-35 perforated pipe, placed with the perforations facing down. The pipe should be surrounded by a minimum of 1 cubic foot per foot of ¾- or 1½ inch open graded gravel wrapped in Mirafi 140N or equivalent filter fabric, to prevent infiltration of fines and subsequent clogging of the subdrain system.

In addition, the retaining walls should be adequately coated on the backfilled side of the walls with a proven waterproofing compound by an experienced professional to inhibit infiltration of moisture through the walls.

Temporary Excavations

All excavations should be made in accordance with Cal-OSHA requirements. CW Soils is not responsible for job site safety.

Retaining Wall Backfill

Retaining wall backfill materials should be approved by the soils engineer or his representative prior to placement as compacted fill. Retaining wall backfill should be placed in lifts no greater than 6 to 8 inches, watered or air dried as necessary to achieve near optimum moisture contents. All retaining wall backfill should be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D1557. When practical, retaining wall backfill should be capped with a paved surface drain.

EXTERIOR CONCRETE

Subgrade Preparation

Subgrade soils underlying concrete flatwork should be compacted at near optimum moisture to a minimum of 90 percent of the maximum dry density as determined by ASTM test method D1557-12. Prior to placing concrete, the subgrade soils should be moistened to at least optimum or slightly above optimum moisture content (see table below). Pre-watering of the soils prior to placing concrete will promote uniform curing of the concrete and minimize the development of shrinkage cracks. The higher the expansion potential of the onsite soils the longer it will take to achieve the recommended presaturation. Therefore, the procedure and timing should be planned in advance.

Flatwork Design

Cracking within concrete flatwork is often a result of factors such as the use of too high of a water to cement ratio and/or inadequate steps taken to prevent moisture loss during the curing of the concrete. However, minor cracking within concrete flatwork is normal and should be expected. It should be noted that the reduction of slab cracking is often a function of proper slab design, concrete mix design, placement, curing, and finishing practices. We recommend the adherence to the guidelines of the American Concrete Institute (ACI).

When placed over expansive soils, exterior concrete elements are susceptible to lifting and cracking. When this occurs with highly expansive soils, the detrimental impacts can be significant and may necessitate the removal and replacement of the affected improvements. In order to reduce the potential for unsightly cracking, we suggest a combination of presaturation of the subgrade soils, reinforcement, restraint, and a layer of granular materials. Although these measures may not completely eliminate distress to concrete improvements, the application of these measures can significantly reduce the distress caused by expansive soils. The degree and extent the measures recommended in the following table are applied depend on:

- The expansion potential of the subgrade soils.
- The practicality of implementing the measures (such as presaturation).
- The benefits verse the economics of the measures.

The project owner should perform a cost/benefit analysis on the factors to determine the extent the measures will be applied to each project. The expansive potential of the onsite soils should be considered **VERY LOW**.

CONCRETE FLATWORK					
CONSTRUCTION DESIGN	**EXPANSION INDEX**				
	VERY LOW	**LOW**	**MEDIUM**	**HIGH**	**VERY HIGH**
Slab Thickness, Minimum	4 inches	4 inches	4 inches	4 inches	4.5 inches
Subbase, Gravel Layer	NA	NA	Optional	3 inches	4 inches
Presaturation, Relative to Optimum Moisture Content	Pre-wet NA	Optimum 6 inches Deep	1.1 x Optimum 12 inches Deep	1.2 x Optimum 18 inches Deep	1.3 x Optimum 24 inches Deep
Joint, Maximum Spacing, (joint to extend ¼ slab)	10 feet or less	10 feet or less	8 feet or less	6 feet or less	6 feet or less
Reinforcement, Mid-Depth	NA	NA	Optional (WWF 6 x 6 W1.4 x W1.4)	No. 3 Rebar 24” On Center Both Ways	No. 3 Rebar 24” On Center Both Ways
Restraint, Slip Dowels Mid-Depth	NA	NA	Optional	Across Cold Joints	Across Cold Joints

The use of a granular layer for exterior slabs is primarily intended to facilitate presaturation and subsequent construction operations by providing a working surface over the saturated soils and to help retain the moisture. Where these factors are insignificant, the layer may be omitted.

PRELIMINARY PAVEMENT DESIGN

An assumed R-value of 24 may be used for preliminary pavement design (THE Soils, 2006). Calculated in accordance with the State of California design procedures (maximum design R-value of 50) using assumed Traffic Indices, the following table summarizes the minimum recommended asphalt concrete pavement sections. Final pavement design should be based on sampling and testing of post grading conditions. Alternative, but equivalent pavement sections and calculation sheets have been provided within the appendices of this report.

ASPHALT CONCRETE PAVEMENT DESIGN			
PARAMETERS	**AUTO PARKING**	**AUTO DRIVES**	**ENTRANCES/TRUCK DRIVES**
Assumed Traffic Index	5.0	6.0	7.5
Preliminary Design R-Value	24	24	24
AC Thickness (inches)	3	3	4
AB Thickness (inches)	6.6	9.6	12.6

Note: AC – Asphalt Concrete
AB – Aggregate Base

The following table includes the minimum recommended Portland cement concrete pavement design sections calculated using the guidelines of the State of California design procedures.

PORTLAND CEMENT CONCRETE PAVEMENT DESIGN			
Street Type	**Preliminary Design R-Value**	**Traffic Index**	**Pavement Section (inches)**
ENTRANCES/TRUCK DRIVES	24	7.5	7 PCC over 5 AB

Note: PCC – Portland Cement Concrete
AB – Aggregate Base

The minimum requirements for the Portland cement concrete shall be a six sack mix and 3,500 pounds per square inch at 28 days.

The subgrade soils immediately below the aggregate base (base) should be compacted to a minimum of 90 percent of the maximum dry density as determined by ASTM D1557 to a minimum depth of 12 inches. Base materials should be compacted to a minimum of 95 percent of the maximum dry density as determined by ASTM D1557.

Base materials should consist of Class 2 aggregate base conforming to Section 26-1.02B of the State of California Standard Specifications or crushed aggregate base conforming to Section 200-2 of the Standard Specifications for Public Works Construction (Greenbook). Base materials should be compacted at or slightly below optimum moisture content. Asphalt concrete materials and construction operations should conform to Section 203 of the Greenbook.

GRADING PLAN REVIEW AND CONSTRUCTION SERVICES

This report has been prepared for the exclusive use of **DIAMOND VALLEY PARTNERS, LLC** and their authorized representative. It is unlikely to contain sufficient information for other parties or other uses. CW Soils should be provided the opportunity to review the final design plans and specifications prior to construction, in order to verify that the recommendations have been properly incorporated into the project plans and specifications. If CW Soils is not accorded the opportunity to review the project plans and specifications, we are not responsibility for misinterpretation of our recommendations.

We recommend that CW Soils be retained to provide soils engineering and engineering geologic services during the grading and foundation excavation phases of work, in order to allow for design changes in the event that the subsurface conditions differ from those anticipated prior to construction.

CW Soils should review any changes in the project and modify the conclusions and recommendations of this report in writing. This report along with the drawings contained within are intended for design input purposes only and are not intended to act as construction drawings or specifications. In the event that conditions during grading or construction operations appear to differ from those indicated in this report, our office should be notified immediately, as appropriate revisions may be required.

REPORT LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists, practicing at the time and location this report was prepared. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

Soils vary in type, strength, and other engineering properties between points of observation and exploration. Groundwater and moisture conditions can also vary due to natural processes or the works of man on this or adjacent properties. As a result, we do not and cannot have complete knowledge of the subsurface conditions beneath the proposed project. No practical study can completely eliminate uncertainty with regard to the anticipated geologic and soils engineering conditions in connection with a proposed project. The conclusions and recommendations within this report are based upon the findings at the points of observation and are subject to confirmation by CW Soils based on the conditions revealed during grading and construction operations.

This report was prepared with the understanding that it is the responsibility of the owner, to ensure that the conclusions and recommendations contained herein are brought to the attention of the other project consultants and are incorporated into the plans and specifications. The owners' contractor should implement the recommendations in this report and notify the owner as well as our office if they consider any of the recommendations presented herein to be unsafe or unsuitable.

APPENDIX A

REFERENCES

APPENDIX A

References

California Building Standards Commission, 2016, *2016 California Building Code, California Code of Regulations Title 24, Part 2, Volume 2 of 2,* Based on 2015 International Building Code.

California Geological Survey, 2008, *Guidelines for Evaluating and Mitigating Seismic Hazards in California,* Special Publication 117A, September 11, 2008.

California Geological Survey, 2018, *Earthquake Fault Zones A Guide for Government Agencies, Property Owners / Developers, and Geoscience Practitioners for Assessing Fault Rupture Hazards in California,* Special Publication 42, 2018.

Hart, Earl W. and Bryant, William A., *1997, Fault Rupture Hazard Zones in California, CDMG Special Publication 42,* revised 2003.

Irvine Geotechnical, 2001, Mult Calc 2000, October 10.

Morton, D.M., Hauser, Rachel M., and Ruppert, Kelly R., 2004, *Preliminary Digital Geologic Map of the Santa Ana 30' x 60' Quadrangle, Southern California, Version 2.0*: U.S. Geological Survey Open-File Report 99-0172.

National Association of Corrosion Engineers, 1984, *Corrosion Basics An Introduction*, page 191.

Southern California Earthquake Center (SCEC), 1999, *Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction Hazards in California,* March.

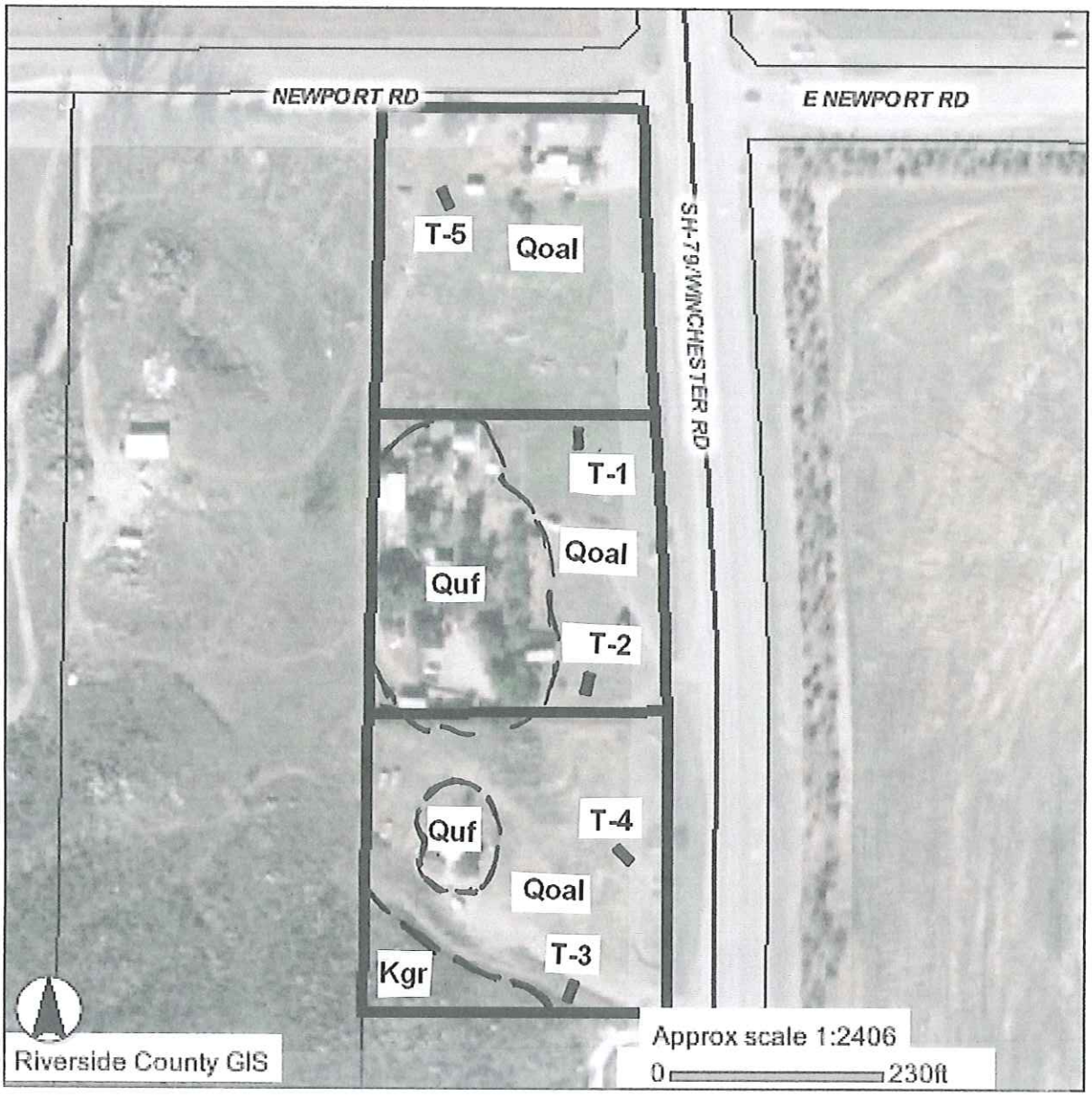
T.H.E. Soils Co., Inc., 2006, *Preliminary Geotechnical Investigation, Proposed Commercial/Retail Development, APN Nos.: 466-050-009, -010, & -011, Southwest Corner of East Newport & Winchester Roads, Winchester Area, Riverside County, California,* Work Order No. 1037602.00, dated October 10, 2006.

USGS Earthquake Hazards Program, Unified Hazard Tool for Conterminous U.S. 2014 (v4.1.1) Deaggregation Program.

APPENDIX B

PREVIOUS FIELD EXPLORATION & MAP

RIVERSIDE COUNTY GIS



LEGEND

UNITS

Quf	- UNDOCUMENTED FILL
Qoal	- OLDER ALLUVIUM
Kgr	- GRANITIC BEDROCK

SYMBOLS

T-5	- APPROXIMATE LOCATION OF EXPLORATORY TRENCHES
~-~-	- APPROXIMATE LOCATION OF GEOLOGIC CONTACTS

T.H.E. SOILS COMPANY, INC.

GEOTECHNICAL MAP
PROPOSED COMMERCIAL/RETAIL DEVELOPMENT
APN NOS. : 466-050-009, -010 & -011
SOUTHWEST CORNER OF E. NEWPORT & WINCHESTER ROADS
WINCHESTER AREA, RIVERSIDE COUNTY, CALIFORNIA

WORK ORDER: 11037602.00 **DATE: OCT. 2006** **PLATE: 1 OF 1**

KEY TO LOGS

DEFINITION OF TERMS					
PRIMARY DIVISIONS			SYMBOLS		SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN\ 5% FINES)		GW	Well graded gravels, gravel-sand mixtures, little or no fines.
				GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES		GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
				GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% 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		SM	Silty sands, sand-silt mixtures, non-plastic fines.
				SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%			ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
				CL	Inorganic clays or low to medium plasticity, gravelly clays, sandy clays, lean clays.
				OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%			MH	Inorganic sils, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
				CH	Inorganic 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

GRAIN SIZES

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		
	200	40	10	4	¾"	3"	12"

U.S. STANDARD SERIES SIEVE — CLEAR SQUARE SIEVE OPENINGS

RELATIVE DENSITY

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/FOOT*
VERY LOOSE	0 – 4
LOOSE	4 – 10
MEDIUM DENSE	10 – 30
DENSE	30 – 60
VERY DENSE	OVER 50

CONSISTENCY

CLAYS AND PLASTIC SILTS	STRENGTH**	BLOWS/FOOT*
VERY SOFT	0 – ¼	0 – 2
SOFT	¼ - ½	2 – 4
FIRM	½ - 1	4 – 8
STIFF	1 – 2	8 – 16
VERY STIFF	2 – 4	16 – 32
HARD	OVER 4	OVER 32

* NUMBER OF BLOWS OF 140 POUND HAMMER FALLING 30-INCES TO DRIVE A 2-INCH O.D. (1-3/8-INCH I.D.) SPLIT SPOON (ASTM D-1586).

**UNCONFINED COMPRESSIVE STRENGTH IN TONS/SQ. FT. AS DETERMINED BY LABORATORY TESTING OR APPROXIMATED BY THE STANDARD PENETRATION TEST (ASTM D-1586), POCKET PENETROMETER, TORVANE, OR VISUAL OBSERVATION

TYPES OF SAMPLES:

X - RING SAMPLE I - STANDARD PENETRATION TEST Y - BULK SAMPLE

DRILLING NOTES:

1. SAMPLING AND BLOW COUNTS
   RING SAMPLER – NUMBER OF BLOWS PER FOOT OF A 140 POUND HAMMER FALLING 30 INCHES.
   STANDARD PENETRATION TEST – NUMBER OF BLOWS PER FOOT
2. NR = NO RECOVERY

LOGGED BY: JPF

METHOD OF EXCAVATION: CASE 580 SUPERM EXTENDA BACKHOE W/24" BUCKET
ELEVATION:

DATE OBSERVED: 05/08/06

LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	TEST PIT NO. 1 DESCRIPTION	SOIL TEST
5				V | | | Λ			**OLDER ALLUVIUM** SANDY SILT (ML): DARK YELLOWISH BROWN, SANDY IN PART, MOIST, MINOR PINPOINT PORES IN TOP 2-FT	MAXIMUM DENSITY/OPTIMUM MOISTURE (MAX), REMOLDED DIRECT SHEAR (DS), SIEVE ANALYSIS (SA), EXPANSION INDEX (EI), SAND EQUIVALENT (SE), R-VALUE TEST, CORROSIVITY SUITE (COR)
10							**GRANITIC BEDROCK** YELLOWISH BROWN, GRANULAR, FRIABLE, DENSE, BECOMING VERY DENSE WITH DEPTH, MODERATE EXCAVATION, BECOMING DIFFICULT AT 9.0-FT.	
15							**TOTAL DEPTH = 9.5'** **NO GROUNDWATER**	
20								
25								
30								
35								
40								

JOB NO: 1037602.00

LOG OF TEST PIT

FIGURE: T-1

LOGGED BY: JPF	METHOD OF EXCAVATION: CASE 580 SUPERM EXTENDA BACKHOE W/24" BUCKET ELEVATION:	DATE OBSERVED: 05/08/06 LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	TEST PIT NO. 2 DESCRIPTION	SOIL TEST
							OLDER ALLUVIUM	
							SILT (ML): OLIVE BROWN, MOIST, MINOR PINPOINT PORES IN TOP 2-3 FT	
5								
							SANDY SILT (ML): DARK BROWN, MOIST, MEDIUM DENSE, SANDY IN PART, MINOR CALCAREOUS VEINLETS	
10								
							GRANITIC BEDROCK	
15							YELLOWISH BROWN, GRANULAR, DENSE, FRIABLE, BECOMING VERY DENSE @ 15.0-FT	
20							**TOTAL DEPTH = 15.0'** **NO GROUNDWATER**	
25								
30								
35								
40								

JOB NO: 1037602.00	LOG OF TEST PIT	FIGURE: T-2

LOGGED BY: JPF	METHOD OF EXCAVATION: CASE 580 SUPERM EXTENDA BACKHOE W/24" BUCKET ELEVATION:	DATE OBSERVED: 05/08/06 LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	TEST PIT NO. 3 DESCRIPTION	SOIL TEST
5							**OLDER ALLUVIUM** SILTY SAND (SM): YELLOWISH BROWN, FINE TO MEDIUM GRAINED, MINOR COARSE, DRY, LOOSE, NUMEROUS PINPOINT PORES	
10				V Λ			**GRANITIC BEDROCK** YELLOWISH BROWN, COARSE GRAINED, FRIABLE TO FRIABLE UNDER PRESSURE, VERY DENSE, BECOMING DIFFICULT EXCAVATION @ 7.0'	MAX, DS, SA, EI, SE, COR
15							**TOTAL DEPTH = 7.0'** **NO GROUNDWATER**	
20								
25								
30								
35								
40								

JOB NO: 1037602.00	LOG OF TEST PIT	FIGURE: T-3

LOGGED BY: JPF	METHOD OF EXCAVATION: CASE 580 SUPERM EXTENDA BACKHOE W/24" BUCKET ELEVATION:	DATE OBSERVED: 05/08/06 LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	TEST PIT NO. 4 DESCRIPTION	SOIL TEST
							OLDER ALLUVIUM SANDY SILT (ML): OLIVE BROWN, DRY, SNADY IN PART, OCCASIONAL ANGULAR ROCK FRAGMENTS TO 4" IN DIAMETER, NUMEROUS PINPOINT PORES	
5							**GRANITIC BEDROCK** YELLOWISH BROWN, COARSE GRAINED, DENSE, FRIABLE, BECOMING DENSER WITH DEPTH	
10							**TOTAL DEPTH = 7.0'** **NO GROUNDWATER**	
15								
20								
25								
30								
35								
40								

JOB NO: 1037602.00	LOG OF TEST PIT	FIGURE: T-4

LOGGED BY: JPF

METHOD OF EXCAVATION: CASE 580 SUPERM EXTENDA BACKHOE W/24" BUCKET
ELEVATION:

DATE OBSERVED: 05/08/06

LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)

TEST PIT NO. 5

DESCRIPTION

SOIL TEST

OLDER ALLUVIUM

SILT (ML): DARK BROWN, LOOSE AND DRY IN TOP 1-2 FT, NUMEROUS PINPOINT PORES AND FINE ROOTS

SILT (ML): DARK BROWN, SLIGHTLY MOIST, DENSE, DIFFICULT EXCAVATION, ABUNDANT CALCAREOUS VEINLETS

TOTAL DEPTH = 5.0'

NO GROUNDWATER

JOB NO: 1037602.00

LOG OF TEST PIT

FIGURE: T-5

APPENDIX C

LABORATORY PROCEDURES AND TEST RESULTS

APPENDIX C

Laboratory Procedures and Test Results

Our laboratory testing has provided quantitative and qualitative data involving the relevant engineering properties of the representative soils selected for testing. Representative samples were tested using the guidelines of the American Society for Testing and Materials (ASTM) procedures or California Test Methods (CTM). The following laboratory testing results have been summarized herein for convenience, but were completed as part of the referenced geotechnical investigation (The Soils, Co., 2006).

Maximum Density Tests: The maximum dry density and optimum moisture content of representative samples were determined using the guidelines of ASTM D1557. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
T-3 @ 5-7 feet	Clayey SAND	132.1	7.1

Grain Size Distribution: The test results are presented on Plates C-4 and C-5.

Expansion Index: The expansion potential of representative samples was evaluated using the guidelines of ASTM D 4829. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	EXPANSION INDEX	EXPANSION POTENTIAL
T-3 @ 5-7 feet	Clayey SAND	0	VERY LOW

Direct Shear: Direct shear tests were performed on representative remolded and/or undisturbed samples using the guidelines of ASTM D 3080. The test results are presented in the table below and/or on Plate C-7.

SAMPLE LOCATION	MATERIAL DESCRIPTION	*FRICTION ANGLE (degrees)	*APPARENT COHESION (psf)
T-3 @ 5-7 feet	Clayey SAND	32.9	659

* Peak values of samples remolded to 91 percent of the maximum dry density.

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests of select samples were performed using the guidelines of CTM 643. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	pH	MINIMUM RESISTIVITY (ohm-cm)
T-1 @ 0- 5 feet	Sandy SILT	5.7	3900
T-3 @ 5-7 feet	Clayey SAND	6.7	6200

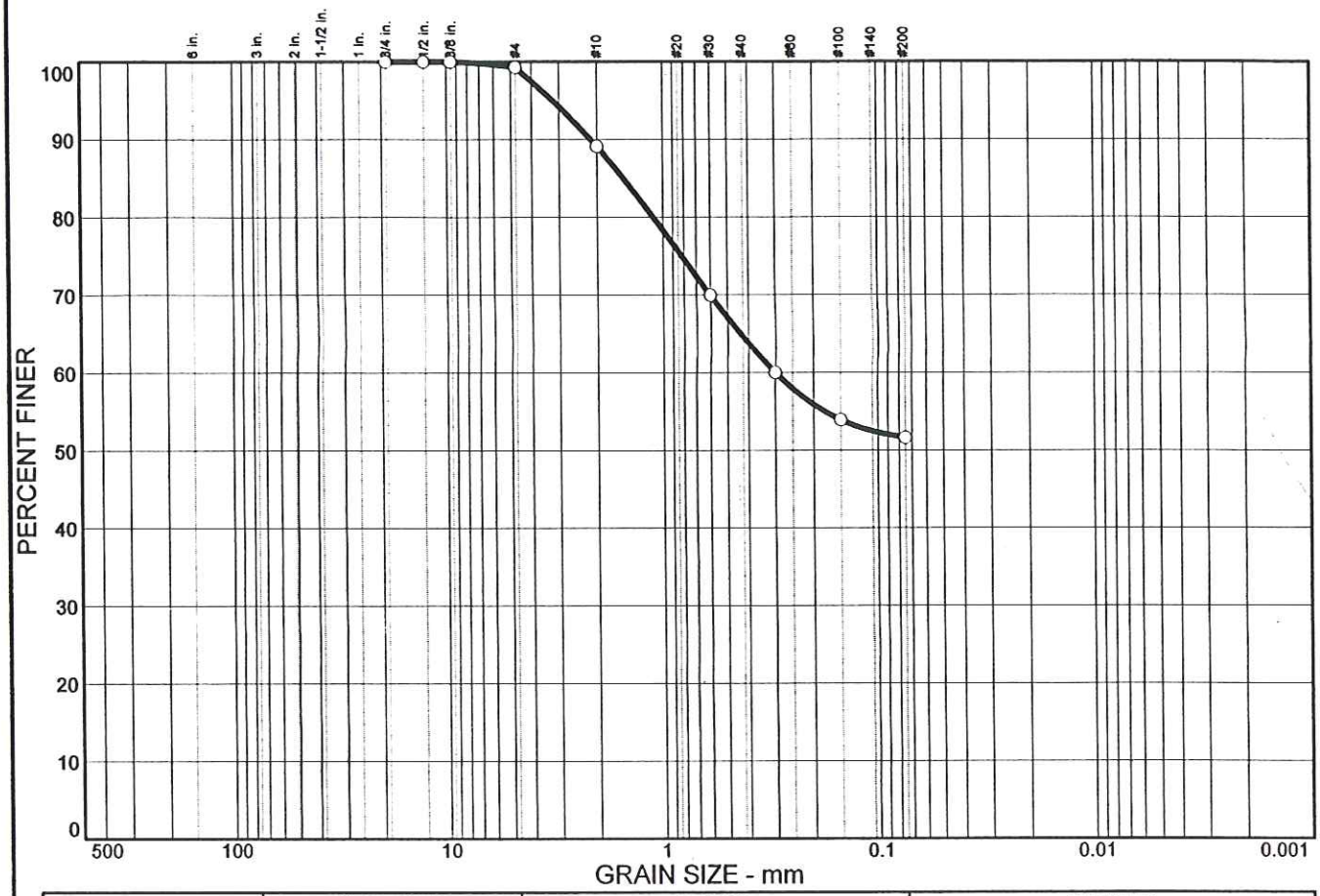
Soluble Sulfate: The soluble sulfate content of select samples was determined using the guidelines of CTM 417. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	SULFATE CONTENT (% by weight)	SULFATE EXPOSURE
T-1 @ 0- 5 feet	Sandy SILT	No Detection	Negligible
T-3 @ 5-7 feet	Clayey SAND	0.002	Negligible

Chloride Content: Chloride content of select samples was determined using the guidelines of CTM 422. The test results are presented in the table below.

SAMPLE LOCATION	MATERIAL DESCRIPTION	CHLORIDE CONTENT (ppm)
T-1 @ 0- 5 feet	Sandy SILT	170
T-3 @ 5-7 feet	Clayey SAND	120

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.7	10.2	24.5	13.0	51.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	100.0		
3/8 in.	100.0		
#4	99.3		
#10	89.1		
#30	69.9		
#50	60.0		
#100	53.9		
#200	51.6		

* (no specification provided)

Material Description

LIGHT BROWN SANDY SILT

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.51 D_{60}= 0.300 D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

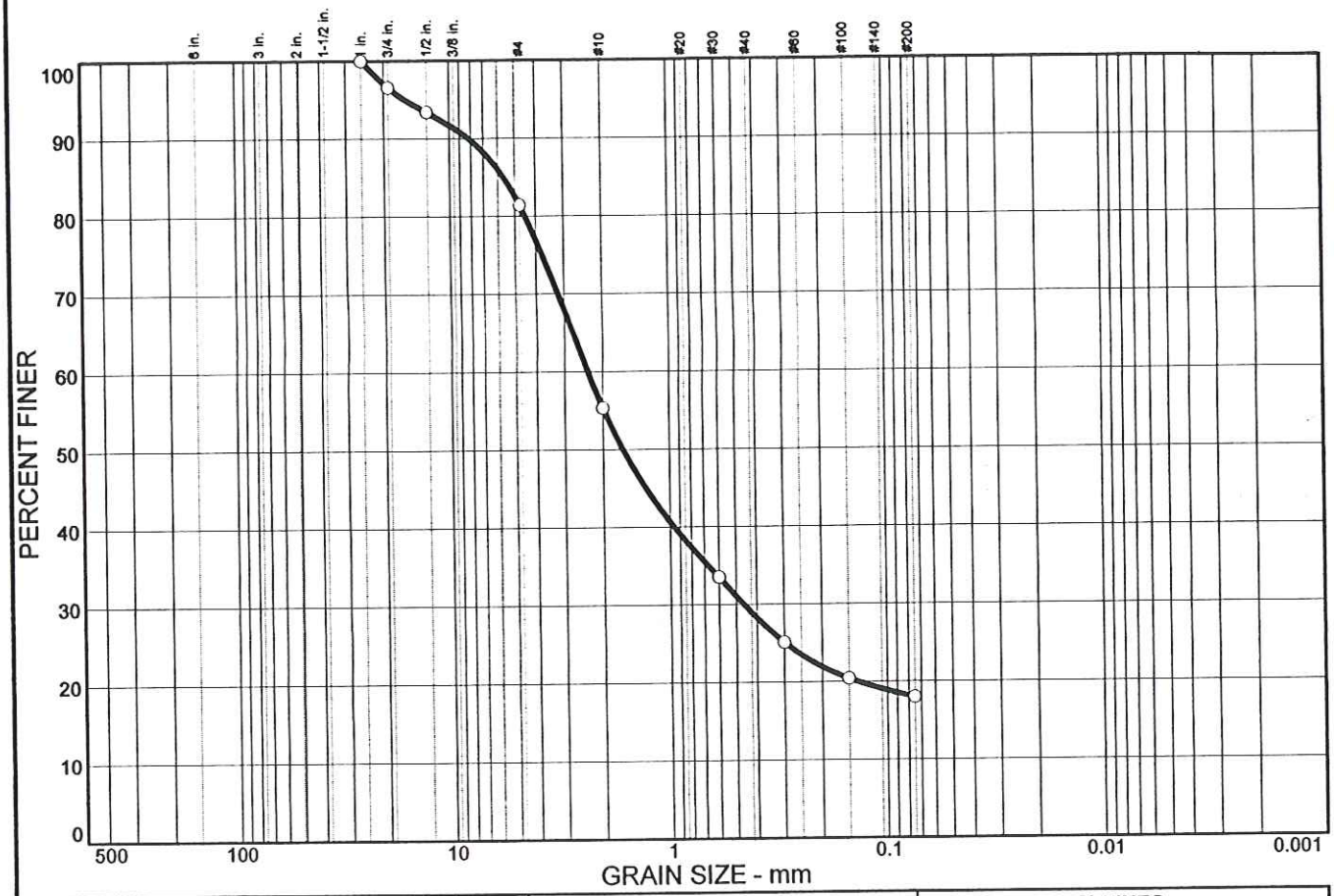
F.M.=1.17

Sample No.: T-1 **Source of Sample:** **Date:** 8/10/06
Location: **Elev./Depth:** 0-5

T.H.E. Soils Company, Inc.
Murrieta, CA

Client: CAMBRIDGE COMMERCIAL
Project: CAMBRIDGE COMMERCIAL
Project No: 1037602.00 **Plate** C-4

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	3.4	15.2	26.1	26.3	11.0	18.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/4 in.	96.6		
1/2 in.	93.4		
#4	81.4		
#10	55.3		
#30	33.5		
#50	25.1		
#100	20.4		
#200	18.0		

* (no specification provided)

Material Description

MEDIUM BROWN SANDY SILT

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.65 D_{60}= 2.34 D_{50}= 1.63
D_{30}= 0.459 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

F.M.=2.43

Sample No.: T-3 **Source of Sample:** **Date:** 6/8/06
Location: **Elev./Depth:** 5-7

T.H.E. Soils Company, Inc.
Murrieta, CA

Client: CAMBRIDGE COMMERCIAL
Project: CAMBRIDGE COMMERCIAL
Project No: 1037602.00 **Plate** C-5

PTi

DIRECT SHEAR
ASTM D 3080

T.H.E. Soils Company
PN: 1037602.00 Cambridge Comm., Sample: T-3 @ 5-7'

Soil Description: (SC) Dark Yellowish Brown, Clayey Fine-Coarse Sand

Displacement Rate: 0.020 in/m Box Gap: 0.025 in Max Data: 132.1 @ 7.1

Remold Target Data: 91 % = 120.2 pcf 10.5 %Mc(-No.10) 2.65 Gs(assumed)

*As Received Mc: 10.5 % Adjusted Mc: – % **After Shear Mc: – %

*Existing Gradation for undisturbed specimens, -No.10 fraction for remolded specimens

☐ Undisturbed
■ Remolded

**Test 1 Specimen (Highest Normal Stress)

	Test 1		Test 2		Test 3	
SHEAR RECORD:	Prov. Ring	Vert. Dial	Prov. Ring	Vert. Dial	Prov. Ring	Vert. Dial
Displacement (in): 0.010	40	-40	29	-8	22	0
0.020	65	-40	60	-18	57	3
0.030	89	-40	83	-18	79	23
0.040	112	-41	97	-15	**86**	53
0.050	131	-42	104	-8	86	78
0.060	148	-43	108	0	84	93
0.070	162	-43	110	8		
0.080	167	-41	110	13		
0.090	171	-39	**111**	16		
0.100	175	-37	111	20		
0.110	176	-35	110	25		
0.120	178	-34	109	29		
0.130	180	-34				
0.140	181	-33				
0.150	182	-33				
0.160	184	-33				
0.170	186	-36				
0.180	187	-36				
0.190	188	-38				
0.200	188	-40				
0.210	189	-41				
0.220	190	-43				
0.230	**191**	-43				
0.240	190	-43				
0.250	190	-43				

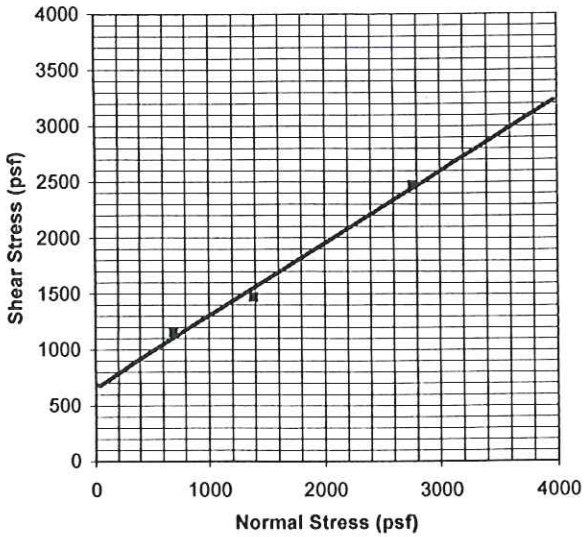
*SHEAR STRESS:	Divisions	Pounds	psf
Test 1:	191	79	2475
Test 2:	111	47	1473
Test 3:	86	37	1160

*Peak Values

NORMAL STRESS (psf):	
Test 1:	2764
Test 2:	1382
Test 3:	691

Ø=	**32.9°**
C=	**659psf**

Proving Ring
SN:1155-16-11938C
Calibrated 25-Jan-06



at K. K 8/7/06
Reviewed By, Date

Form No. 40R
Rev. 03/06

Prime Testing, Inc.
38372 Innovation Ct Ste 102 Murrieta, CA 92563
ph (951) 894-2682 • fx (951) 894-2683

Client: T.H.E. Soils Company
Report Date: May 24, 2006
Client No: C01
Work Order: 6E11
Project No: 1037602.22
Project Name: Cambridge Commercial

Laboratory Test(s) Results Summary

The subject soil samples were processed in accordance with California Test Method CTM 643 and tested for pH / Minimum Resistivity (CTM 643), Sulfate Content (CTM 417) and Chloride Content (CTM 422). The test results follow:

Client Data			pH	Minimum Resistivity (ohm-cm)	Sulfate Content (mg/kg)	Sulfate Content (% by wgt)	Chloride Content (ppm)
Sample No.	Sample Location	Depth (ft)					
—	T-1	0-5	5.7	3900	ND	ND	170
—	T-3	5-7	6.7	6200	20	0.002	120

*ND=No Detection

We appreciate the opportunity to serve you. Please do not hesitate to contact us with any questions or clarifications regarding these results or procedures.

Ahmet K. Kaya, Laboratory Manager

ASTM INTERNATIONAL ORGANIZATIONAL MEMBER

APPENDIX D

SEISMICITY

19744

Latitude, Longitude: 33.6850, -117.0850

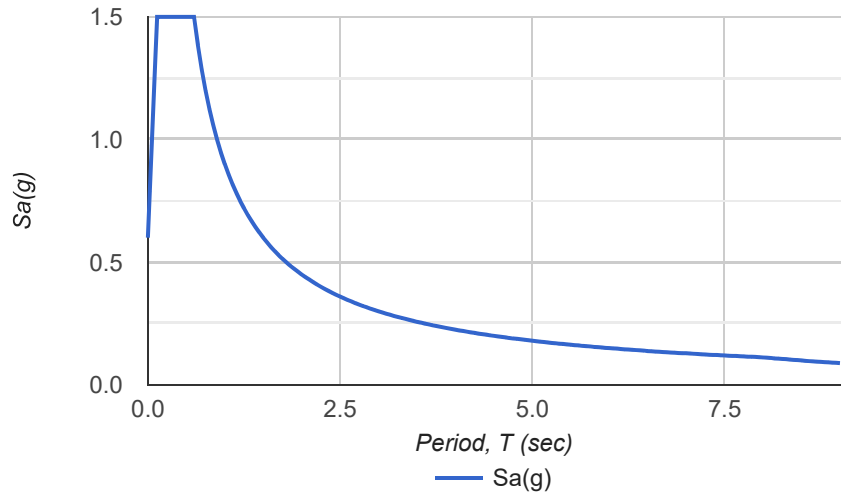
Date	4/3/2019, 1:20:21 PM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.5	MCE_R ground motion. (for 0.2 second period)
S_1	0.6	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.5	Site-modified spectral acceleration value
S_{M1}	0.9	Site-modified spectral acceleration value
S_{DS}	1	Numeric seismic design value at 0.2 second SA
S_{D1}	0.6	Numeric seismic design value at 1.0 second SA

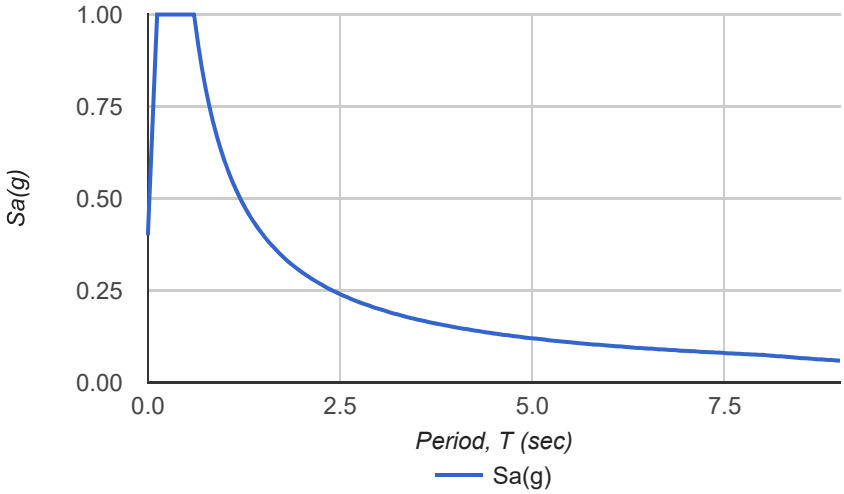
Type	Value	Description
SDC	D	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	0.5	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.5	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.804	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.723	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.698	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.684	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.5	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	1.047	Mapped value of the risk coefficient at short periods

Type	Value	Description
C_{R1}	1.021	Mapped value of the risk coefficient at a period of 1 s

MCER Response Spectrum



Design Response Spectrum



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APPENDIX E

PAVEMENT DESIGN CALCULATIONS

PAVING DESIGN

PROJECT: **Diamond Valley Storage**

PROJECT NO.: **19744-10**

CONSULTANT: **CW**

CALCULATION SHEET NO.: **Auto Parking**

CALTRANS METHOD FOR DESIGN OF FLEXIBLE PAVEMENT

Input "R" value or "CBR" of native soil	24	
Type of Index Property - "R" value or "CBR" (C or R)	R	R Value
R Value used for Caltrans Method	24	
Input Traffic Index (TI)	5	
Calculated Total Gravel Equivalent (GE)	1.216	feet
Calculated Total Gravel Equivalent (GE)	14.592	inches
Calculated Gravel Factor (Gf) for A/C paving	2.53	
Gravel Factor for Base Course (Gf)	1.1	

Pavement sections provided below are considered equal; but, do not reflect reviewing agency minimums.

Gravel Equivalent GE (feet)	Gravel Equivalent GE (inches)	Delta (inches)	INCHES A/C Section Thickness (inches)	INCHES Minimum Base (inches)	FEET A/C Section Thickness (feet)	FEET Minimum Base (feet)
0.63	7.60	6.99	3.0	6.6	0.25	0.55
0.74	8.87	5.72	3.5	5.4	0.29	0.45
0.84	10.14	4.45	4.0	4.2	0.33	0.35
1.06	12.67	1.92	5.0	1.8	0.42	0.15
1.27	15.21	-0.62	6.0		0.50	
1.48	17.74	-3.15	7.0		0.58	
1.69	20.28	-5.69	8.0		0.67	
1.90	22.81	-8.22	9.0		0.75	
2.11	25.35	-10.76	10.0		0.83	
2.32	27.88	-13.29	11.0		0.92	
2.53	30.42	-15.83	12.0		1.00	

PAVING DESIGN

PROJECT: **Diamond Valley Storage**

PROJECT NO.: **19744-10**

CONSULTANT: **CW**

CALCULATION SHEET NO.: **Auto Drives**

CALTRANS METHOD FOR DESIGN OF FLEXIBLE PAVEMENT

Input "R" value or "CBR" of native soil	24	
Type of Index Property - "R" value or "CBR" (C or R)	R	R Value
R Value used for Caltrans Method	24	
Input Traffic Index (TI)	6	
Calculated Total Gravel Equivalent (GE)	1.4592	feet
Calculated Total Gravel Equivalent (GE)	17.5104	inches
Calculated Gravel Factor (Gf) for A/C paving	2.31	
Gravel Factor for Base Course (Gf)	1.1	

Pavement sections provided below are considered equal; but, do not reflect reviewing agency minimums.

Gravel Equivalent GE (feet)	Gravel Equivalent GE (inches)	Delta (inches)	INCHES A/C Section Thickness (inches)	INCHES Minimum Base (inches)	FEET A/C Section Thickness (feet)	FEET Minimum Base (feet)
0.58	6.94	10.57	3.0	9.6	0.25	0.80
0.67	8.10	9.41	3.5	8.4	0.29	0.70
0.77	9.26	8.25	4.0	7.8	0.33	0.65
0.96	11.57	5.94	5.0	5.4	0.42	0.45
1.16	13.88	3.63	6.0	3.0	0.50	0.25
1.35	16.20	1.31	7.0	1.2	0.58	0.10
1.54	18.51	-1.00	8.0		0.67	
1.74	20.83	-3.31	9.0		0.75	
1.93	23.14	-5.63	10.0		0.83	
2.12	25.45	-7.94	11.0		0.92	
2.31	27.77	-10.26	12.0		1.00	

PAVING DESIGN

PROJECT: **Diamond Valley Storage**

PROJECT NO.: **19744-10**

CONSULTANT: **CW**

CALCULATION SHEET NO.: **Entrances/Truck Drives**

CALTRANS METHOD FOR DESIGN OF FLEXIBLE PAVEMENT

Input "R" value or "CBR" of native soil	24	
Type of Index Property - "R" value or "CBR" (C or R)	R	R Value
R Value used for Caltrans Method	24	
Input Traffic Index (TI)	7.5	
Calculated Total Gravel Equivalent (GE)	1.824	feet
Calculated Total Gravel Equivalent (GE)	21.888	inches
Calculated Gravel Factor (Gf) for A/C paving	2.07	
Gravel Factor for Base Course (Gf)	1.1	

Pavement sections provided below are considered equal; but, do not reflect reviewing agency minimums.

Gravel Equivalent GE (feet)	Gravel Equivalent GE (inches)	Delta (inches)	INCHES A/C Section Thickness (inches)	INCHES Minimum Base (inches)	FEET A/C Section Thickness (feet)	FEET Minimum Base (feet)
0.52	6.21	15.68	3.0	14.4	0.25	1.20
0.60	7.24	14.64	3.5	13.2	0.29	1.10
0.69	8.28	13.61	4.0	12.6	0.33	1.05
0.86	10.35	11.54	5.0	10.2	0.42	0.85
1.03	12.42	9.47	6.0	8.4	0.50	0.70
1.21	14.49	7.40	7.0	6.6	0.58	0.55
1.38	16.56	5.33	8.0	4.8	0.67	0.40
1.55	18.63	3.26	9.0	3.0	0.75	0.25
1.72	20.70	1.19	10.0	1.2	0.83	0.10
1.90	22.77	-0.88	11.0		0.92	
2.07	24.84	-2.95	12.0		1.00	

APPENDIX F

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

CW SOILS

General Earthwork and Grading Specifications

General

Intent: The following General Earthwork and Grading Specifications are intended to provide minimum requirements for grading operations and earthwork. These General Earthwork and Grading Specifications should be considered a part of the recommendations contained in the geotechnical report(s). If they are in conflict with the geotechnical report(s), the specific recommendations in the geotechnical report shall supersede these more general specifications. Observations made during earthwork operations by the Geotechnical Consultant may result in new or revised recommendations that may supersede these specifications and/or the recommendations in the geotechnical report(s).

The Geotechnical Consultant of Record: The Owner shall retain a qualified Consultant of Record (Geotechnical Consultant), prior to commencement of grading operations or construction. The Geotechnical Consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading operations or construction.

Prior to commencement of grading operations or construction, the Owner shall coordinate with the Geotechnical Consultant, and Earthwork Contractor (Contractor) to schedule sufficient personnel for the appropriate level of observation, mapping, and compaction testing.

During earthwork and grading operations, the Geotechnical Consultant shall observe, map, and document the subsurface conditions to confirm assumptions made during the geotechnical design phase of the project. Should the actual conditions differ significantly from the interpretive assumptions made during the design phase, the Geotechnical Consultant shall recommend appropriate changes to accommodate the actual conditions, and notify the reviewing agency as needed.

The Geotechnical Consultant shall observe the moisture conditioning and processing of the excavations and fill operations. The Geotechnical Consultant should perform periodic compaction testing of engineered fills to verify that the required level of compaction is being accomplished as specified.

The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of excavations to receive compacted fill, moisture conditioning, processing of fill, and compacting fill. The Contractor shall be provided with the approved grading plans and geotechnical report(s) for his review and acceptance of responsibilities, prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the approved grading plans and geotechnical report(s). The Contractor shall inform the Owner and the Geotechnical Consultant of work schedule changes at least 24 hours in advance of such changes so that appropriate personnel will be available for observation and testing. Assumptions shall not be made by the Contractor with regard to whether the Geotechnical Consultant is aware of all grading operations.

It is the sole responsibility of the Contractor to provide adequate equipment and methods to accomplish the grading operations in accordance with the applicable grading codes and agency ordinances, these specifications, and the recommendations in the approved grading plan(s) and geotechnical report(s). Any unsatisfactory conditions, such as unsuitable soils, poor moisture conditioning, inadequate compaction, insufficient buttress keyway size, adverse weather conditions, etc., resulting in a quality of work less than required in the approved grading plans and geotechnical report(s), the Geotechnical Consultant shall reject the work and may recommend to the Owner that grading operations be stopped until operations are corrected, at the sole discretion of the Geotechnical Consultant.

Preparation of Areas for Compacted Fill

Clearing and Grubbing: Vegetation, such as brush, grass, roots, and other deleterious materials shall be sufficiently removed and properly disposed in a method acceptable to the Owner, Geotechnical Consultant, and governing agencies.

The Geotechnical Consultant shall evaluate the extent of these removals on a case by case basis. Soils to be placed as compacted fill shall not contain more than 1 percent organic materials (by volume). No compacted fill lift shall contain more than 10 percent organic matter.

If potentially hazardous materials are encountered, the Contractor shall stop work and exit the affected area, and a hazardous materials specialist shall immediately be consulted to evaluate the potentially hazardous materials, prior to continuing to work in that area.

It is our understanding that the State of California defines most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) as hazardous waste. As such, indiscriminate dumping or spillage of these fluids may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall be prohibited.

The contractor is responsible for all hazardous waste related to his operations. The Geotechnical Consultant does not have expertise in this area. If hazardous waste is a concern, then the Owner should contract the services of a qualified environmental assessor.

Processing: Exposed soils that have been observed to be satisfactory for support of compacted fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Exposed soils that are not satisfactory shall be removed or alternative recommendations may be provided by the Geotechnical Consultant. Scarification shall continue until the exposed soils are free of oversize material and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction. The soils should be moistened or air dried as necessary to achieve near optimum moisture content, prior to placement as engineered fill.

Overexcavation: The Typical Cut Lot Detail and Typical Cut/Fill Transition Lot Detail, included herein provide graphic illustrations that depicts typical overexcavation recommendations made in the approved grading plan(s) and/or geotechnical report(s).

Keyways and Benching: Where fills are to be placed on slopes steeper than 5:1 (horizontal to vertical), the ground shall be thoroughly benched as compacted fill is placed. Please see the three Typical Keyway and Benching Details with subtitles Cut Over Fill Slope, Fill Over Cut Slope, and Fill Slope for graphic illustrations. The lowest bench or smallest keyway shall be a minimum of 15 feet wide (or ½ the proposed slope height) and at least 2 feet into competent soils as advised by the Geotechnical Consultant. Typical benching shall be excavated a minimum height of 4 feet into competent soils or as recommended by the Geotechnical Consultant. Fill placed on slopes steeper than 5:1 should be thoroughly benched or otherwise excavated to provide a flat subgrade for the compacted fill. If unstable earth materials are encountered or anticipated the need for a buttress/stabilization fill may be required, see Typical Buttress/ Stabilization Detail herein.

Evaluation/Acceptance of Bottom Excavations: All areas to receive compacted fill (bottom excavations), including removal excavations, processed areas, keyways, and benching, shall be observed, mapped, general elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive compacted fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to placing compacted fill. A licensed surveyor shall provide the survey control for determining elevations of bottom excavations, processed areas, keyways, and benching. The Geotechnical Consultant is not responsible for erroneously located, fills, subdrain systems, or excavations.

Fill Materials

General: Soils to be used as compacted fill should be relatively free of organic matter and other deleterious substances as evaluated and accepted by the Geotechnical Consultant.

Oversize: Oversize material is rock that does not break down into smaller pieces and has a maximum diameter greater than 12 inches. Oversize rock shall not be included within compacted fill unless specific methods and guidelines acceptable to the Geotechnical Consultant are followed. For examples of methods and guidelines of oversize rock placement see the enclosed Typical Oversize Rock Disposal Detail. The inclusion of oversize materials in the compacted fill shall only be acceptable if the oversize material is completely surrounded by compacted fill or thoroughly jetted granular materials. No oversize material shall be placed within 10 vertical feet of finish grade or within 2 feet of proposed utilities or underground improvements.

Import: Should imported soils be required, the proposed import materials shall meet the requirements of the Geotechnical Consultant. Well graded, very low expansion potential soils free of organic matter and other deleterious substances are usually the most desirable as import materials. It is generally in the Owners best interest that potential import soils are provided to the Geotechnical Consultant to determine their suitability for the intended purpose. Prior to starting import operations, at least 48 hours should be allotted for the appropriate laboratory testing to be performed.

Fill Placement and Compaction Procedures

Fill Layers: Fill materials shall be placed in areas prepared to receive engineered fill in nearly horizontal layers not exceeding 8 inches in loose thickness. Thicker layers may be accepted by the Geotechnical Consultant, provided field density testing indicates that the grading procedures can obtain adequate compaction. Each layer of fill shall be spread evenly and thoroughly mixed to obtain uniformity within the soils along with a consistent moisture throughout the fill.

Moisture Conditioning of Fill: Soils to be placed as compacted fill shall be watered, dried, blended, and/or mixed, as needed to obtain relatively uniform moisture contents that are at or slightly above optimum. The maximum density and optimum moisture content tests should be performed using the guidelines of the American Society of Testing and Materials (ASTM test method D1557-00).

Compaction of Fill: After each layer has been moisture conditioned, mixed, and evenly spread, it should be uniformly compacted to a minimum of 90 percent of the

maximum dry density as determined by ASTM test method D1557-00. Compaction equipment shall be adequately sized and be either specifically designed for compaction of soils or be proven to consistently achieve the required level of compaction.

Compaction of Fill Slopes: In addition to normal compaction procedures specified above, additional effort to obtain compaction on slopes is needed. This may be accomplished by backrolling of slopes with sheepsfoot rollers as the fill is being placed, by overbuilding the fill slopes, or by other methods producing results that are satisfactory to the Geotechnical Consultant. Upon completion of grading, compaction of the fill and the slope face shall be a minimum of 90 percent of maximum density per ASTM test method D1557-00.

Compaction Testing of Fill: Field tests for moisture content and density of the compacted fill shall be periodically performed by the Geotechnical Consultant. The location and frequency of tests shall be at the Geotechnical Consultant's discretion. Compaction test locations will not necessarily be random. The test locations may or may not be selected to verify minimum compaction requirements in areas that are typically prone to inadequate compaction, such as close to slope faces and near benching.

Frequency of Compaction Testing: Compaction tests shall be taken at minimum intervals of every 2 vertical feet and/or per 1,000 cubic yards of compacted materials placed. Additionally, as a guideline, at least one (1) test shall be taken on slope faces for each 5,000 square feet of slope face and/or for each 10 vertical feet of slope. The Contractor shall assure that fill placement is such that the testing schedule described herein can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork operations to a safe level so that these minimum standards can be obtained.

Compaction Test Locations: The approximate elevation and horizontal coordinates of each test location shall be documented by the Geotechnical Consultant. The Contractor shall coordinate with the Surveyor to assure that sufficient grade stakes are established. This will provide the Geotechnical Consultant with the ability to determine the approximate test locations and elevations. The Geotechnical Consultant can not be responsible for staking erroneously located by the Surveyor or Contractor. A minimum of two grade stakes should be provided at a maximum horizontal distance of 100 feet and vertical difference of less than 5 feet.

Subdrain System Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the approved grading plan(s), and the typical details provided herein, such as the Typical

Canyon Subdrain System Detail, etc. The Geotechnical Consultant may recommend additional subdrain systems and/or changes to the subdrain systems described herein, with regard to the extent, location, grade, or materials depending on conditions observed during grading or other factors. All subdrain systems shall be surveyed by a licensed land surveyor, with the exception of retaining wall subdrain systems, to verify line and grade after installation and prior to burial. Adequate time should be allowed by the Contractor to complete these surveys.

Excavation

All excavations and overexcavations shall be evaluated by the Geotechnical Consultant during grading operations. Any remedial removal depths indicated on the geotechnical maps are estimates only. The actual removal depths and extent shall be determined by the Geotechnical Consultant based on the field observations of exposed conditions during grading operations. Where fill over cut slopes are planned, the cut portion of the slope shall be excavated, evaluated, and accepted by the Geotechnical Consultant prior to placement of the fill portion of the proposed slope, unless specifically addressed by the Geotechnical Consultant. Typical details for cut over fill slopes and fill over cut slopes are provided herein. Foundation excavations should be made in accordance with the Foundation Clearances from Slopes Detail unless otherwise specified by the site specific recommendations by the Geotechnical Consultant.

Trench Backfill

1) The Contractor shall follow all OHSA and Cal/OSHA requirements for trench excavation safety.

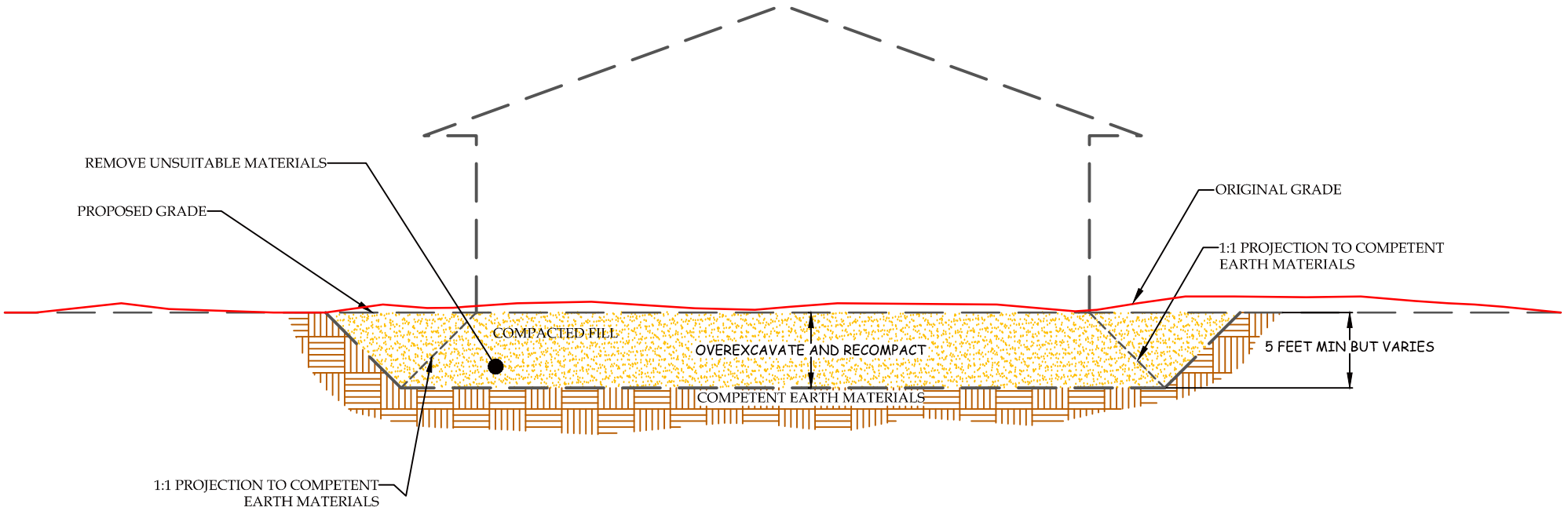
2) Bedding and backfill of utility trenches shall be done in accordance with the applicable provisions in the Standard Specifications of Public Works Construction. Bedding materials shall have a Sand Equivalency more than 30 (SE>30). The bedding shall be placed to 1 foot over the conduit and thoroughly jetting to provide densification. Backfill should be compacted to a minimum of 90 percent of maximum dry density, from 1 foot above the top of the conduit to the surface.

3) Jetting of the bedding materials around the conduits shall be observed by the Geotechnical Consultant.

4) The Geotechnical Consultant shall test trench backfill for the minimum compaction requirements recommended herein. At least one test should be conducted for every 300 linear feet of trench and for each 2 vertical feet of backfill.

5) For trench backfill the lift thicknesses shall not exceed those allowed in the Standard Specifications of Public Works Construction, unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum compaction requirements by the alternative equipment or method.

TYPICAL CUT LOT DETAIL

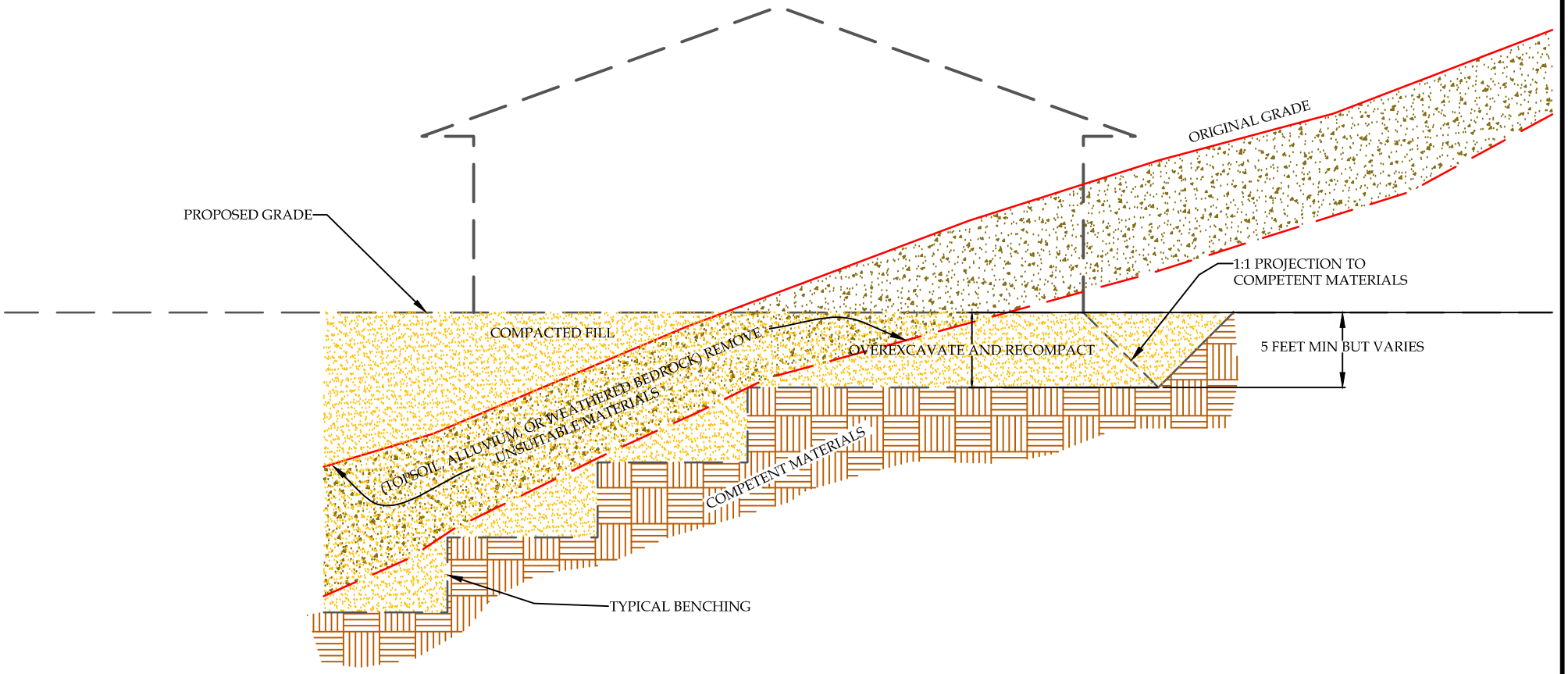


NOTE; REMOVAL BOTTOMS SHOULD BE GRADED WITH A MINIMUM 2% FALL TOWARDS STREET OR OTHER SUITABLE AREA (AS DETERMINED BY THE GEOTECHNICAL CONSULTANT) TO AVOID PONDING BELOW THE BUILDING

NOTE: WHERE DESIGN CUT LOTS ARE EXCAVATED ENTIRELY INTO COMPETENT EARTH MATERIALS, OVEREXCAVATION MAY STILL BY NEEDED FOR HARD-ROCK CONDITIONS OR MATERIALS WITH VARIABLE EXPANSION POTENTIALS

CW SOILS

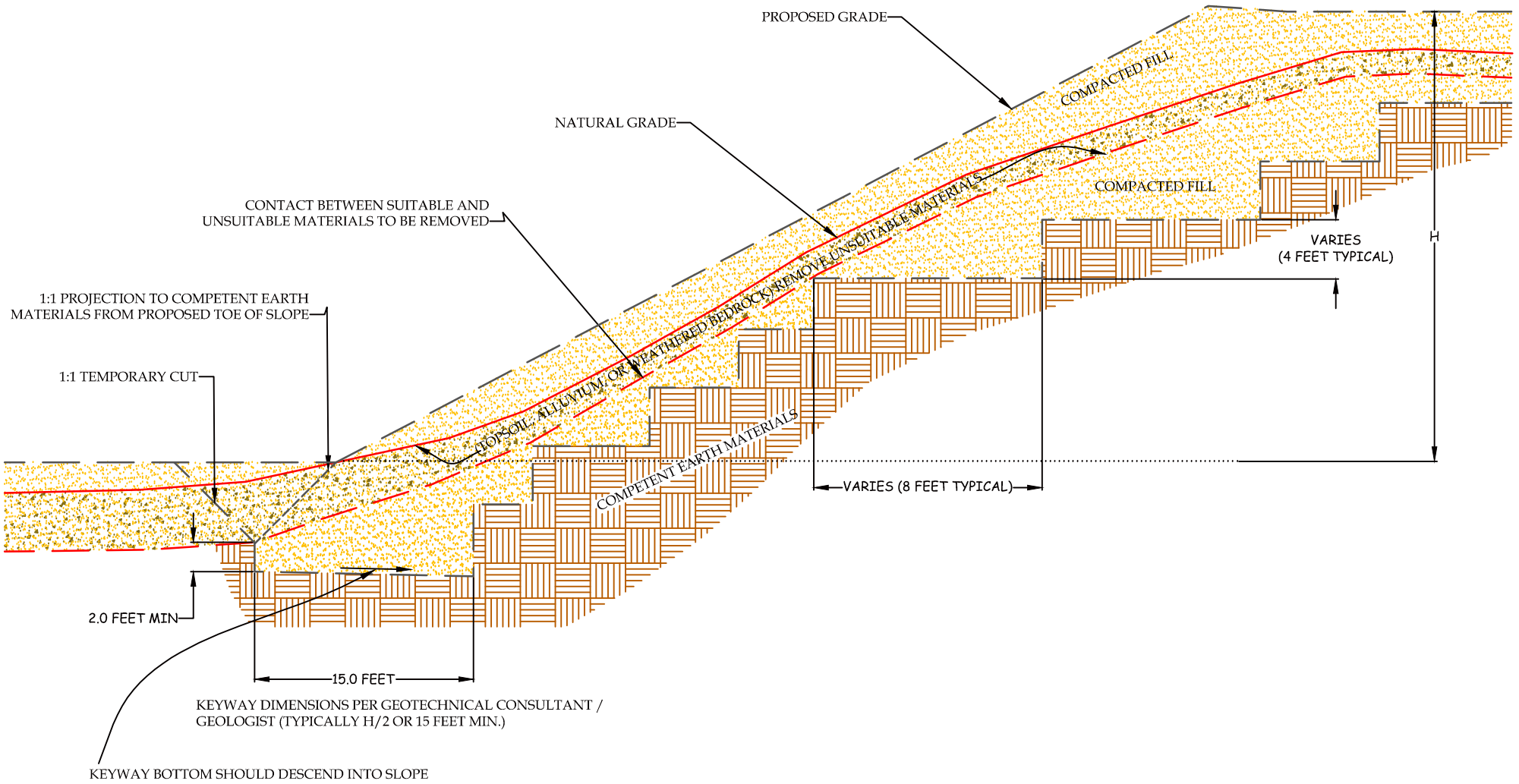
TYPICAL CUT / FILL TRANSITION LOT DETAIL



NOTE: WHERE DESIGN CUT LOTS ARE EXCAVATED ENTIRELY INTO COMPETENT MATERIALS, OVEREXCAVATION MAY STILL BY NEEDED FOR HARD-ROCK CONDITIONS OR MATERIALS WITH VARIABLE EXPANSION POTENTIALS

CW SOILS

TYPICAL KEYWAY & BENCHING DETAIL
FILL SLOPE

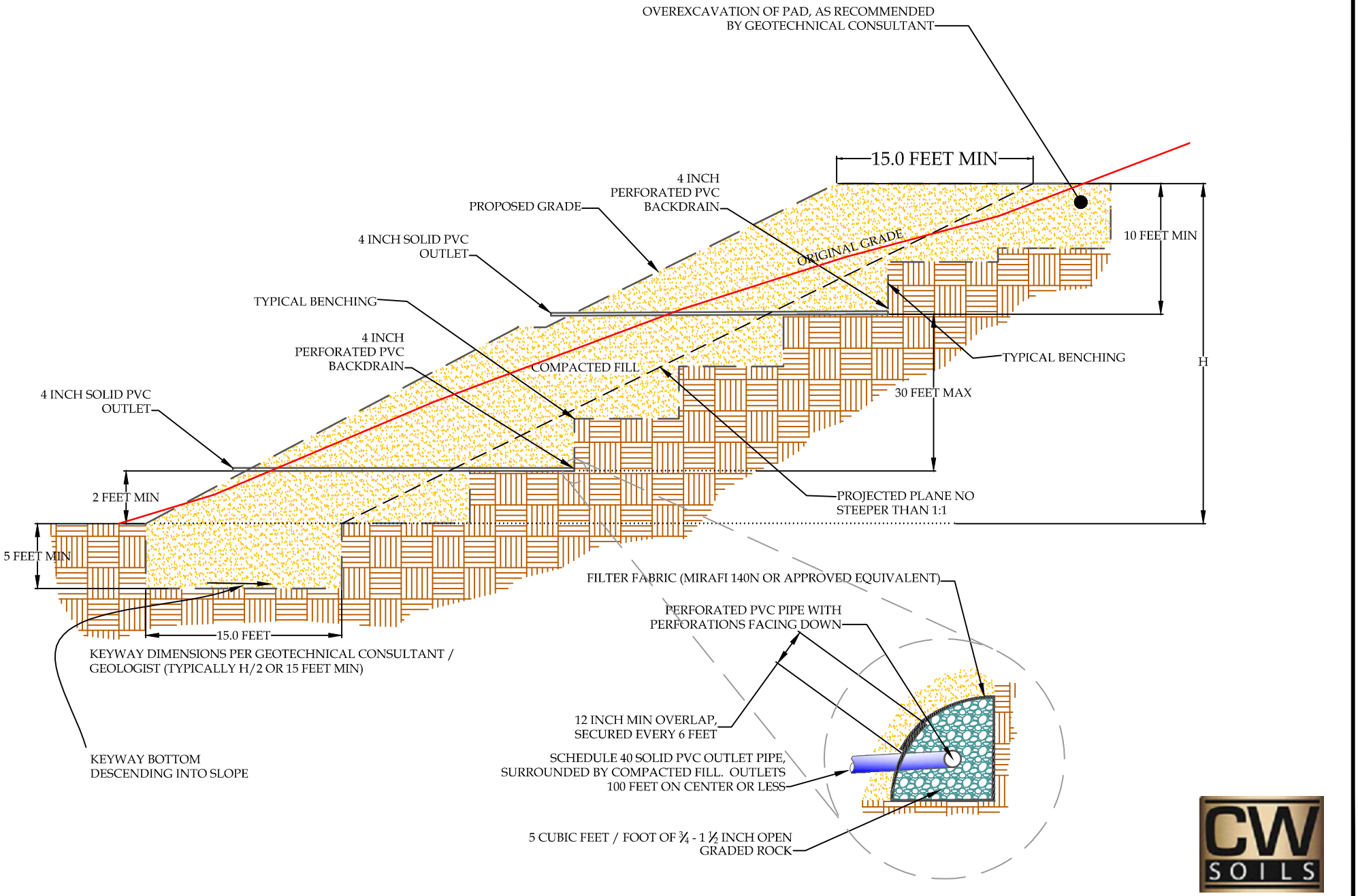


NOTES:

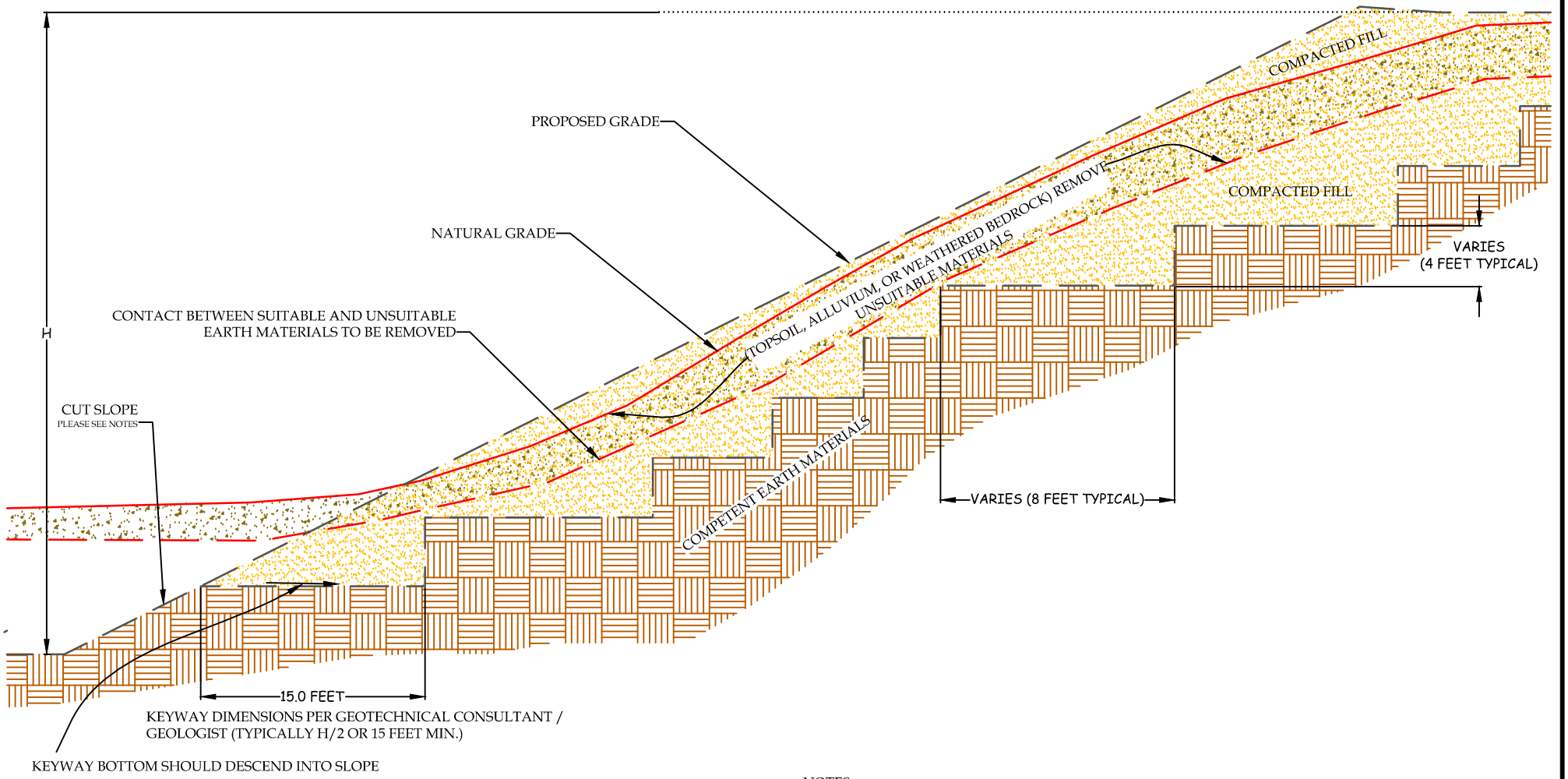
NATURAL SLOPES STEEPER THAN 5:1 (H:V) MUST BE KEYED AND BENCHED INTO COMPETENT EARTH MATERIALS

CW SOILS

TYPICAL BUTTRESS / STABILIZATION DETAIL



TYPICAL KEYWAY & BENCHING DETAIL
FILL OVER CUT SLOPE



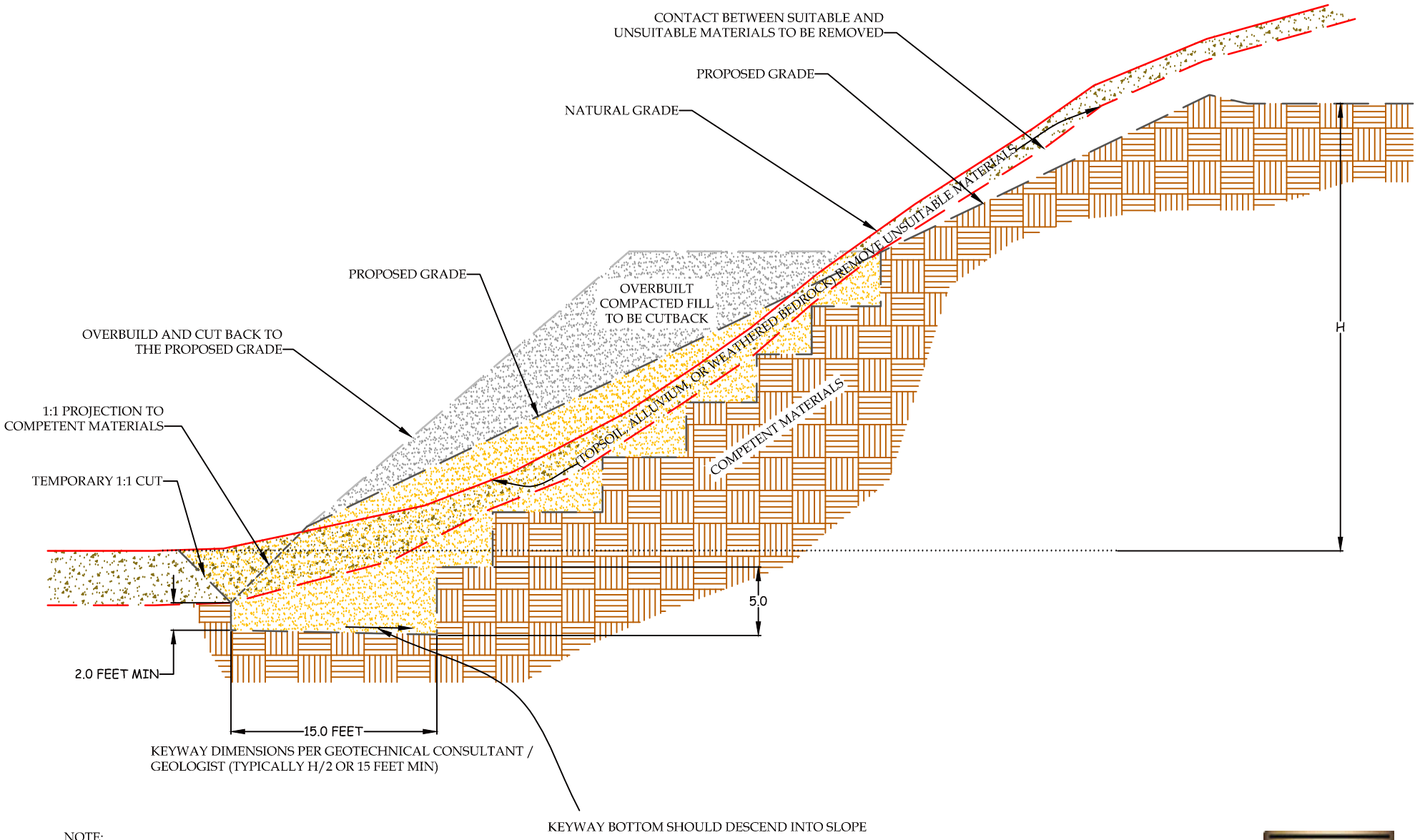
NOTES:

NATURAL SLOPES STEEPER THAN 5:1 (H:V) MUST BE KEYED AND BENCHED INTO COMPETENT EARTH MATERIALS

THE CUT SLOPE MUST BE CONSTRUCTED FIRST

CW SOILS

TYPICAL KEYWAY & BENCHING DETAIL
CUT OVER FILL SLOPE

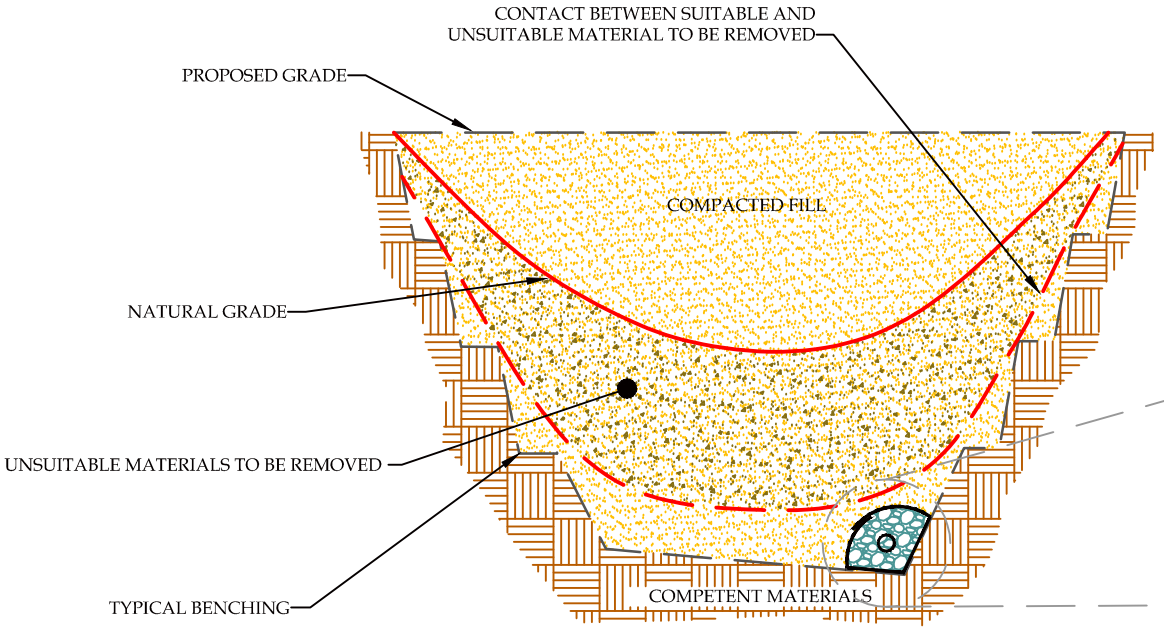


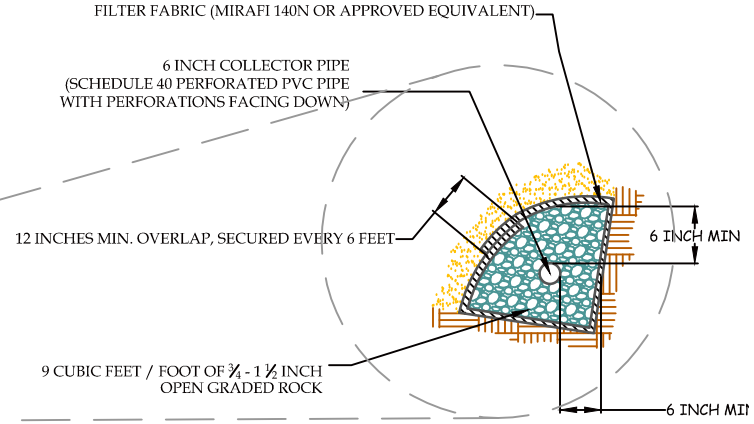
NOTE:

NATURAL SLOPES STEEPER THAN 5:1 (H:V) MUST BE
KEYED AND BENCHED INTO COMPETENT MATERIALS

CW SOILS

TYPICAL CANYON SUBDRAIN SYSTEM DETAIL

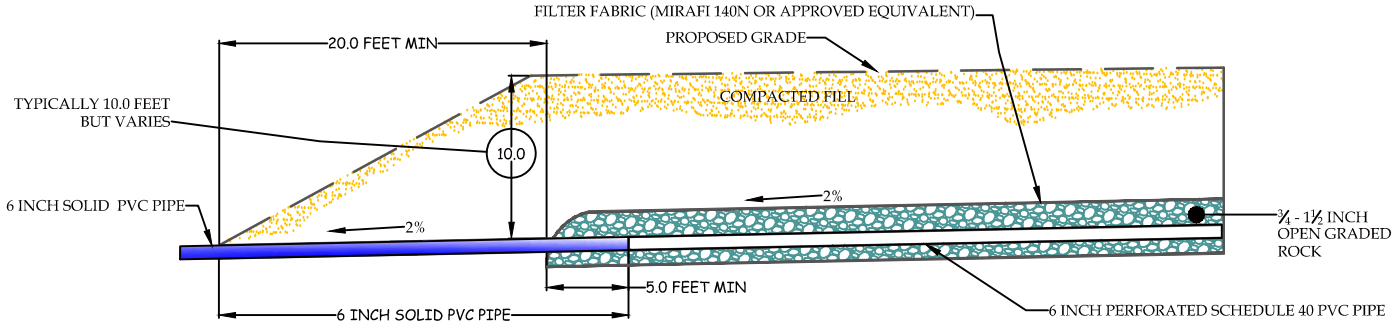




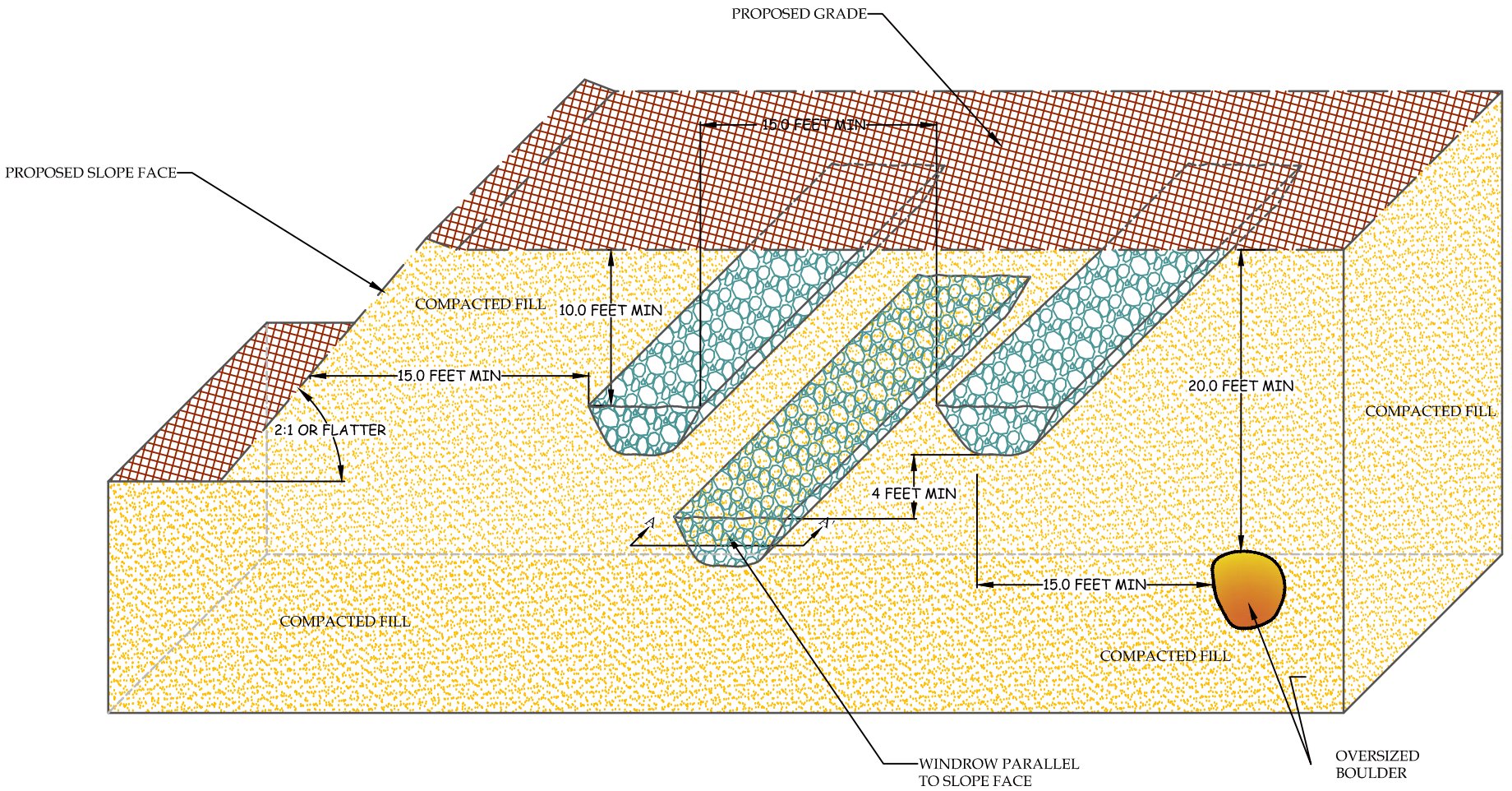
NOTES:
1 - CONTINUOUS RUNS IN EXCESS OF 500 FEET LONG WILL REQUIRE AN 8 INCH DIAMETER PIPE

2 - FINAL 20 FEET OF PIPE AT OUTLET WILL BE SOLID AND BACKFILLED WITH COMPACTED FINE-GRAINED MATERIALS

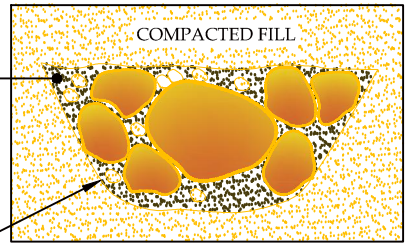
TYPICAL CANYON SUBDRAIN OUTLET



TYPICAL OVERSIZE ROCK DETAIL



CROSS SECTION A-A'

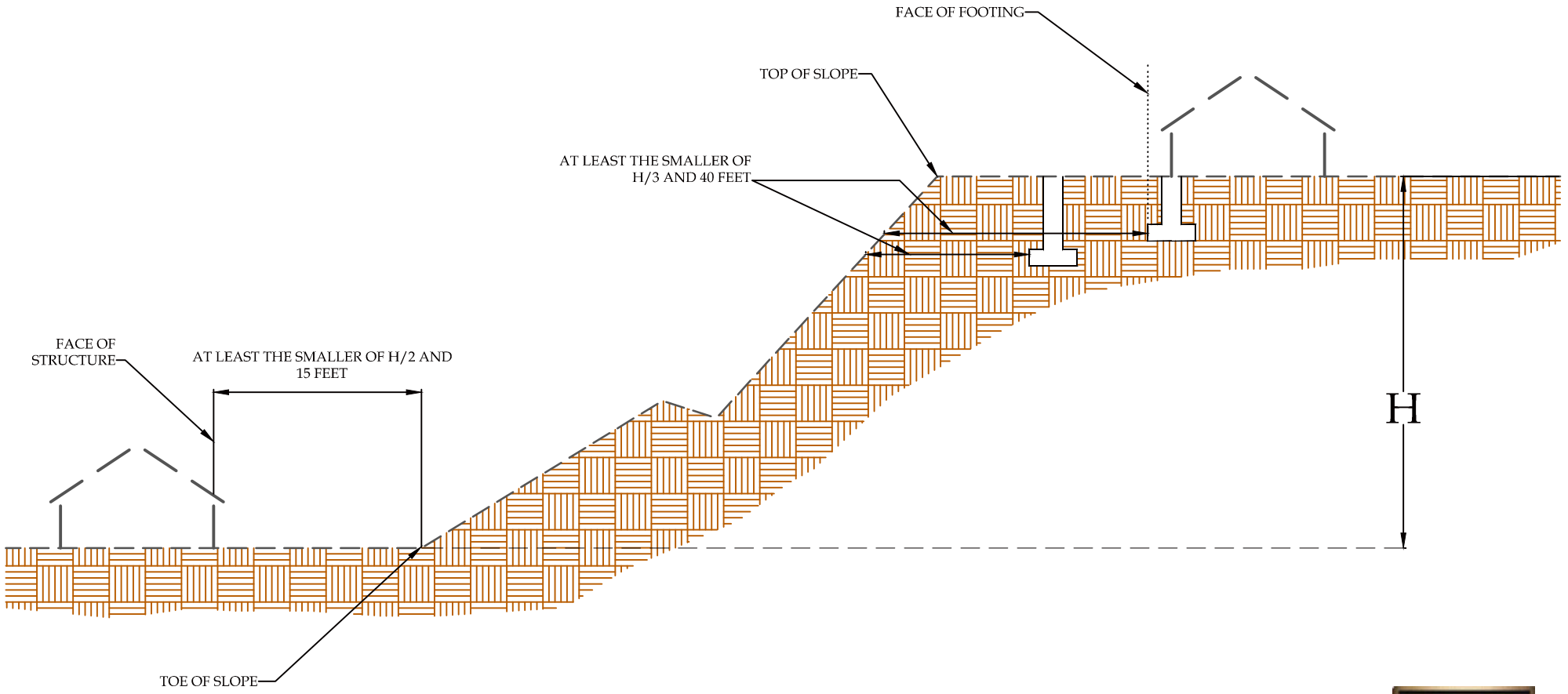


NOTE:

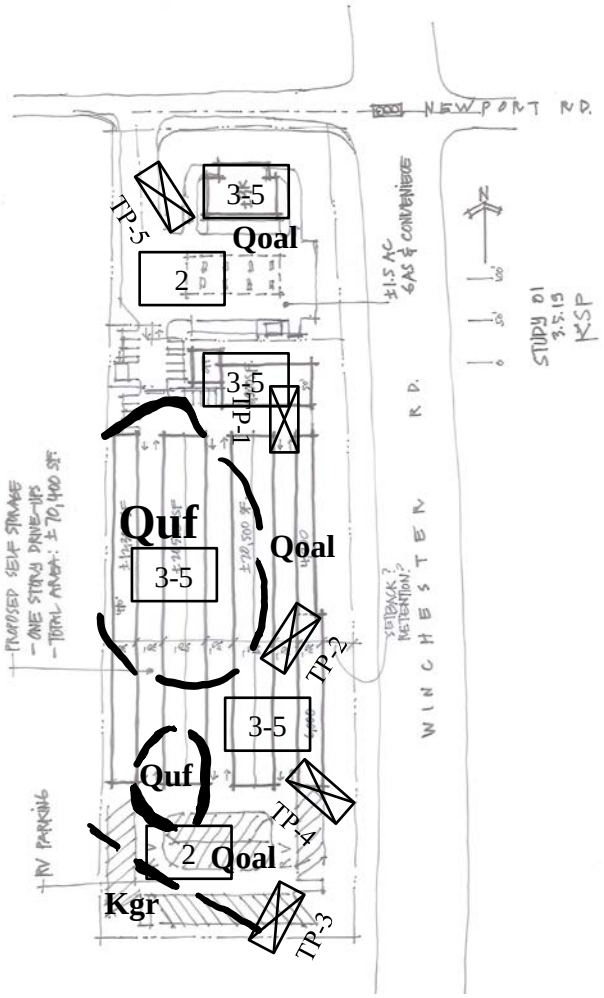
OVERSIZE ROCK IS LARGER THAN
12 INCHES IN MAX DIAMETER

CW SOILS

FOUNDATION CLEARANCES FROM SLOPES DETAIL



(CBC, 2010)



LEGEND

Locations are Approximate

Geologic Units

Quf – Artificial Fill, Undocumented
Qoal – Quaternary Old Alluvial Deposits
Kgr – Cretaceous Granitic Rocks

Symbols

– Geologic Contact

3-5 – Recommended Removal Depth (feet)

– Exploratory Test Pit (THE Soils, 2006)

TP-5

North

CW SOILS	Proposed Diamond Valley Storage	19744-10
	GEOTECHNICAL MAP	
	2019	PLATE 1

December 5, 2019 Project No. 19744-10A

Mr. Wayne Dollarhide
DIAMOND VALLEY PARTNERS, LLC
41197 Golden Gate Circle, Suite 201
Murrieta, CA 92562

Subject: **Infiltration System Design Interpretive Report, Proposed Diamond Valley Storage, Assessor's Parcel Numbers 466-050-019, -020, & -021, Winchester Area, Riverside County, California**

In accordance with your request, CW Soils is pleased to present this infiltration system interpretive report for the proposed Diamond Valley Storage facility, Assessor's Parcel Numbers 466-050-019, -020, & -021, located in the Winchester area of Riverside County, California. The purpose of our feasibility study was to determine the onsite infiltration rates and physical characteristics of the subsurface soils within the vicinity of the proposed infiltration systems. We have provided guidelines for the design of onsite infiltration systems. This interpretive report is intended to provide onsite infiltration rates for the existing soils.

SITE DESCRIPTION

The subject property consists of undeveloped land with relatively flat to hilly terrain. Topographic relief at the subject property is low to moderate.

PROPOSED DEVELOPMENT

Based on information provided by you, the proposed improvements will consist of several buildings with associated interior driveways, utilities, and on-site infiltration areas.

SUBSURFACE EXPLORATION AND INFILTRATION TESTING

SUBSURFACE EXPLORATION

Subsurface exploration at the site consisted of five exploratory excavations to a maximum depth of 15 feet, conducted on May 8, 2006 to evaluate the subsurface earth materials. The exploratory holes were excavated and logged, see Appendix A. The approximate locations of the exploratory excavations are shown on the attached Infiltration Location Map, Plate 1.

INFILTRATION TESTING

Aardvark Permeameter testing was utilized to conduct in-situ infiltration tests within the proposed basin on December 5, 2019 to evaluate the infiltration rates in order to estimate the amount of storm water runoff that can infiltrate into the proposed systems. The testing utilizes the constant head method with extremely accurate (0.2 ml resolution) hydraulic conductivity testing under saturated conditions, for the determination of reliable in-situ infiltration rates. Automated readings are taken at 1 minute intervals until the rate becomes constant and saturated hydraulic conductivity for the particular soil has been reached. This is reflected by the flattening of the curve generated by sample test data as shown on the Water Consumption Rate graph (Plot of Water Consumption Rate vs. Time) in Appendix B. Steady Flow Rate is achieved when the Water Consumption Rate changes less than +/- 5% for 3 consecutive readings.

The Aardvark Permeameter was utilized in replacement of the Guelph Permeameter as recommended by Soil Moisture Equipment Corporation, due to the higher reliability, accuracy, and ease of use. The Aardvark Permeameter is the latest version of the Guelph Permeameter.

The infiltration tests were conducted in a 3 inch diameter test hole, at depths of 2 to 3 feet deep. The approximate locations of the infiltration test holes are indicated on the attached Infiltration Location Map, Plate 1. Infiltration test holes were located by property boundary measurement on the site plan and/or by using geographic features. The test holes were filled with water and allowed to stand for an extended period of time.

Relatively shallow Aardvark Permeameter testing (P-1 & P-2) was conducted using the guidelines of the product instruction manuals. Stabilized infiltration test readings are summarized in the following table and more detailed test data recorded in the field can be found in Appendix B. The test results are anticipated to be representative of the soils found in the vicinity of the test locations.

INFILTRATION TEST SUMMARY

TEST NUMBER	TEST HOLE DIAMETER (in)	HOLE DEPTH (in)	INFILTRATION RATE (in/hr)	SOIL DESCRIPTION
P-1	3	3	0.29	Silty SAND
P-2	3	2	0.9	Silty SAND

FINDINGS

SOILS

A general description of the soils observed on site is provided below:

- Quaternary Old Alluvial Deposits (map symbol Qoa): Quaternary old alluvial deposits were encountered to a maximum depth of 13 feet. These alluvial deposits consist predominately of yellowish brown to dark brown, silty sand and sandy silt.

GROUNDWATER

Groundwater was not observed during exploration of TP-2 excavated to a maximum depth of 15 feet on May 8, 2006.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

The shallow in-situ soils within the subject property were determined to have somewhat consistent infiltration properties in the areas tested. As a result, the recommended infiltration design rate is 0.6 in/hr.

PLAN REVIEW AND CONSTRUCTION SERVICES

This report has been prepared for the exclusive use of **DIAMOND VALLEY PARTNERS, LLC** and their authorized representative. It is unlikely to contain sufficient information for other parties or other uses. CW Soils should be provided the opportunity to review the final design plans and specifications prior to construction, in order to verify that the recommendations have been properly incorporated into the project plans and specifications. If CW Soils is not accorded the opportunity to review the project plans and specifications, we are not responsibility for misinterpretation of our recommendations.

We recommend that CW Soils be retained to provide soils engineering and engineering geologic services during the grading and foundation excavation phases of work, in order to allow for design changes in the event that the subsurface conditions differ from those anticipated prior to construction.

CW Soils should review any changes in the project and modify the conclusions and recommendations of this report in writing. This report along with the drawings contained within are intended for design input purposes only and are not intended to act as construction drawings or specifications. In the event that conditions during grading or construction operations appear to differ from those indicated in this report, our office should be notified immediately, as appropriate revisions may be required.

REPORT LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists, practicing at the time and location this report was prepared. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

Soils vary in type, strength, and other engineering properties between points of observation and exploration. Groundwater and moisture conditions can also vary due to natural processes or the works of man on this or adjacent properties. As a result, we do not and cannot have complete knowledge of the subsurface conditions beneath the proposed project. No practical study can completely eliminate uncertainty with regard to the anticipated geologic and soils engineering conditions in connection with a proposed project. The conclusions and recommendations within this report are based upon the findings at the points of observation and are subject to confirmation by CW Soils based on the conditions revealed during grading and construction operations.

This report was prepared with the understanding that it is the responsibility of the owner, to ensure that the conclusions and recommendations contained herein are brought to the attention of the other project consultants and are incorporated into the plans and specifications. The owners' contractor should implement the recommendations in this report and notify the owner as well as our office if they consider any of the recommendations presented herein to be unsafe or unsuitable.

CW Soils appreciates the opportunity to offer our services on this project. If we can be of further assistance, please do not hesitate to contact the undersigned at your convenience.

Respectfully submitted,

CW Soils

Chad E. Welke, PG, CEG, PE
Principal Geologist/Engineer

Distribution: (4) Addressee

Attachments: Appendix A – Exploration
Appendix B – Infiltration Test Results
Plate 1 – Infiltration Location Map *(Rear of Text)*

APPENDIX A

EXPLORATION

KEY TO LOGS

DEFINITION OF TERMS					
PRIMARY DIVISIONS			SYMBOLS		SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN\ 5% FINES)		GW	Well graded gravels, gravel-sand mixtures, little or no fines.
				GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES		GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
				GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% 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		SM	Silty sands, sand-silt mixtures, non-plastic fines.
				SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%			ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
				CL	Inorganic clays or low to medium plasticity, gravelly clays, sandy clays, lean clays.
				OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%			MH	Inorganic sils, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
				CH	Inorganic 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

GRAIN SIZES

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		
	200	40	10	4	¾"	3"	12"

U.S. STANDARD SERIES SIEVE — CLEAR SQUARE SIEVE OPENINGS

RELATIVE DENSITY

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/FOOT*
VERY LOOSE	0 – 4
LOOSE	4 – 10
MEDIUM DENSE	10 – 30
DENSE	30 – 60
VERY DENSE	OVER 50

CONSISTENCY

CLAYS AND PLASTIC SILTS	STRENGTH**	BLOWS/FOOT*
VERY SOFT	0 – ¼	0 – 2
SOFT	¼ - ½	2 – 4
FIRM	½ - 1	4 – 8
STIFF	1 – 2	8 – 16
VERY STIFF	2 – 4	16 – 32
HARD	OVER 4	OVER 32

* NUMBER OF BLOWS OF 140 POUND HAMMER FALLING 30-INCES TO DRIVE A 2-INCH O.D. (1-3/8-INCH I.D.) SPLIT SPOON (ASTM D-1586).

**UNCONFINED COMPRESSIVE STRENGTH IN TONS/SQ. FT. AS DETERMINED BY LABORATORY TESTING OR APPROXIMATED BY THE STANDARD PENETRATION TEST (ASTM D-1586), POCKET PENETROMETER, TORVANE, OR VISUAL OBSERVATION

TYPES OF SAMPLES:

X - RING SAMPLE I - STANDARD PENETRATION TEST Y - BULK SAMPLE

DRILLING NOTES:

1. SAMPLING AND BLOW COUNTS
   RING SAMPLER – NUMBER OF BLOWS PER FOOT OF A 140 POUND HAMMER FALLING 30 INCHES.
   STANDARD PENETRATION TEST – NUMBER OF BLOWS PER FOOT
2. NR = NO RECOVERY

LOGGED BY: JPF

METHOD OF EXCAVATION: CASE 580 SUPERM EXTENDA BACKHOE W/24" BUCKET
ELEVATION:

DATE OBSERVED: 05/08/06

LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	TEST PIT NO. 1 DESCRIPTION	SOIL TEST
5				V | | | Λ			**OLDER ALLUVIUM** SANDY SILT (ML): DARK YELLOWISH BROWN, SANDY IN PART, MOIST, MINOR PINPOINT PORES IN TOP 2-FT	MAXIMUM DENSITY/OPTIMUM MOISTURE (MAX), REMOLDED DIRECT SHEAR (DS), SIEVE ANALYSIS (SA), EXPANSION INDEX (EI), SAND EQUIVALENT (SE), R-VALUE TEST, CORROSIVITY SUITE (COR)
10							**GRANITIC BEDROCK** YELLOWISH BROWN, GRANULAR, FRIABLE, DENSE, BECOMING VERY DENSE WITH DEPTH, MODERATE EXCAVATION, BECOMING DIFFICULT AT 9.0-FT.	
15							**TOTAL DEPTH = 9.5'** **NO GROUNDWATER**	
20								
25								
30								
35								
40								

JOB NO: 1037602.00

LOG OF TEST PIT

FIGURE: T-1

LOGGED BY: JPF	METHOD OF EXCAVATION: CASE 580 SUPERM EXTENDA BACKHOE W/24" BUCKET ELEVATION:	DATE OBSERVED: 05/08/06 LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	TEST PIT NO. 2 DESCRIPTION	SOIL TEST
							OLDER ALLUVIUM	
							SILT (ML): OLIVE BROWN, MOIST, MINOR PINPOINT PORES IN TOP 2-3 FT	
5								
							SANDY SILT (ML): DARK BROWN, MOIST, MEDIUM DENSE, SANDY IN PART, MINOR CALCAREOUS VEINLETS	
10								
							GRANITIC BEDROCK	
15							YELLOWISH BROWN, GRANULAR, DENSE, FRIABLE, BECOMING VERY DENSE @ 15.0-FT	
20							**TOTAL DEPTH = 15.0'** **NO GROUNDWATER**	
25								
30								
35								
40								

JOB NO: 1037602.00	LOG OF TEST PIT	FIGURE: T-2

LOGGED BY: JPF	METHOD OF EXCAVATION: CASE 580 SUPERM EXTENDA BACKHOE W/24" BUCKET ELEVATION:	DATE OBSERVED: 05/08/06 LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	TEST PIT NO. 3 DESCRIPTION	SOIL TEST
5							**OLDER ALLUVIUM** SILTY SAND (SM): YELLOWISH BROWN, FINE TO MEDIUM GRAINED, MINOR COARSE, DRY, LOOSE, NUMEROUS PINPOINT PORES	
10				V Λ			**GRANITIC BEDROCK** YELLOWISH BROWN, COARSE GRAINED, FRIABLE TO FRIABLE UNDER PRESSURE, VERY DENSE, BECOMING DIFFICULT EXCAVATION @ 7.0'	MAX, DS, SA, EI, SE, COR
15							**TOTAL DEPTH = 7.0'** **NO GROUNDWATER**	
20								
25								
30								
35								
40								

JOB NO: 1037602.00	LOG OF TEST PIT	FIGURE: T-3

LOGGED BY: JPF	METHOD OF EXCAVATION: CASE 580 SUPERM EXTENDA BACKHOE W/24" BUCKET ELEVATION:	DATE OBSERVED: 05/08/06 LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)	TEST PIT NO. 4 DESCRIPTION	SOIL TEST
							OLDER ALLUVIUM SANDY SILT (ML): OLIVE BROWN, DRY, SNADY IN PART, OCCASIONAL ANGULAR ROCK FRAGMENTS TO 4" IN DIAMETER, NUMEROUS PINPOINT PORES	
5							**GRANITIC BEDROCK** YELLOWISH BROWN, COARSE GRAINED, DENSE, FRIABLE, BECOMING DENSER WITH DEPTH	
10							**TOTAL DEPTH = 7.0'** **NO GROUNDWATER**	
15								
20								
25								
30								
35								
40								

JOB NO: 1037602.00	LOG OF TEST PIT	FIGURE: T-4

LOGGED BY: JPF

METHOD OF EXCAVATION: CASE 580 SUPERM EXTENDA BACKHOE W/24" BUCKET
ELEVATION:

DATE OBSERVED: 05/08/06

LOCATION: SEE GEOTECHNICAL MAP

DEPTH (FEET)	CLASSIFICATION	BLOWS/FOOT	UNDISTURBED SAMPLE	BULK SAMPLE	MOISTURE CONTENT(%)	INPLACE DRY DENSITY (PCF)

TEST PIT NO. 5

DESCRIPTION

SOIL TEST

OLDER ALLUVIUM

SILT (ML): DARK BROWN, LOOSE AND DRY IN TOP 1-2 FT, NUMEROUS PINPOINT PORES AND FINE ROOTS

SILT (ML): DARK BROWN, SLIGHTLY MOIST, DENSE, DIFFICULT EXCAVATION, ABUNDANT CALCAREOUS VEINLETS

TOTAL DEPTH = 5.0'

NO GROUNDWATER

JOB NO: 1037602.00

LOG OF TEST PIT

FIGURE: T-5

APPENDIX B

INFILTRATION TEST RESULTS

Location: 19744

Site: P1

Time interval between readings: 1 minute

Ksat Method: Glover Solution

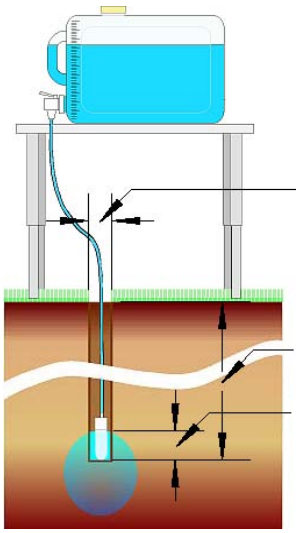
Steady Flow Rate Condition

Steady Flow Rate achieved when Water Consumption Rate changes less than

+/- 5 % for 3 consecutive readings

Steady Flow Rate:	130.475 ml/min
Temp. Adj. FR:	130.706 ml/min
Percolation Rate:	0.385 min/cm
Ksat:	0.29 Inches / hour

Notes:



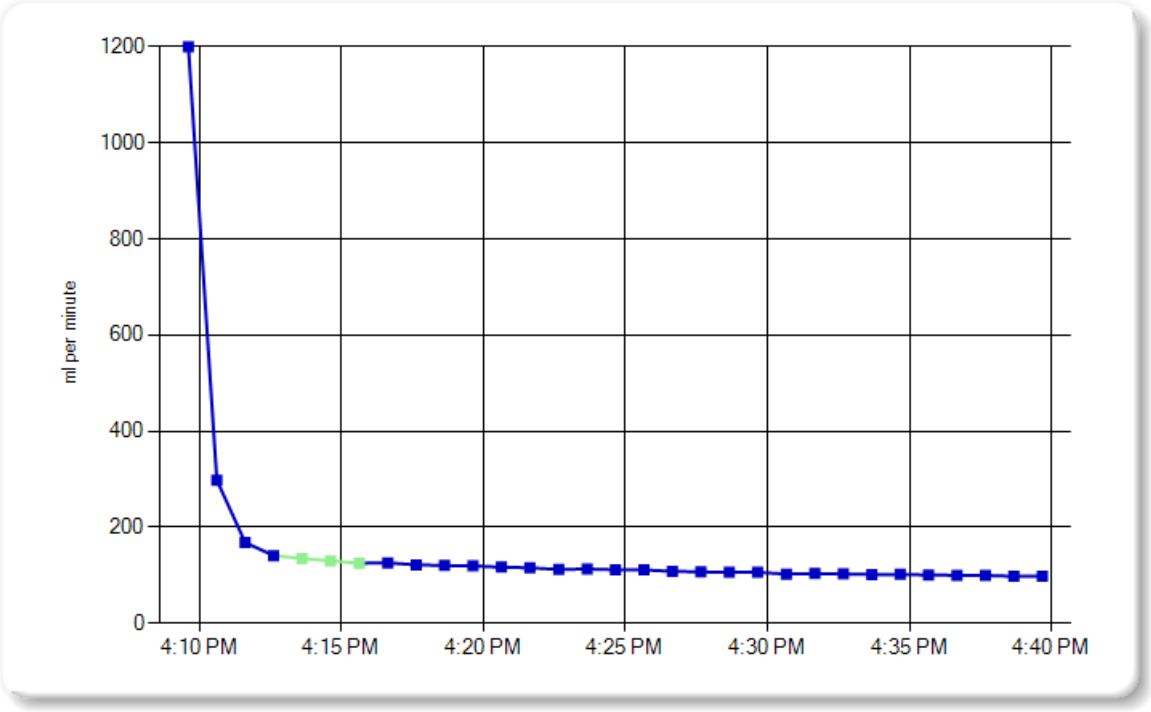
3.1 inches	Hole Diameter
68 ° F	Water Temperature
35.8 inches	Hole Depth
26 inches	Water Height in Hole
	Water Table Depth

Site GPS Position

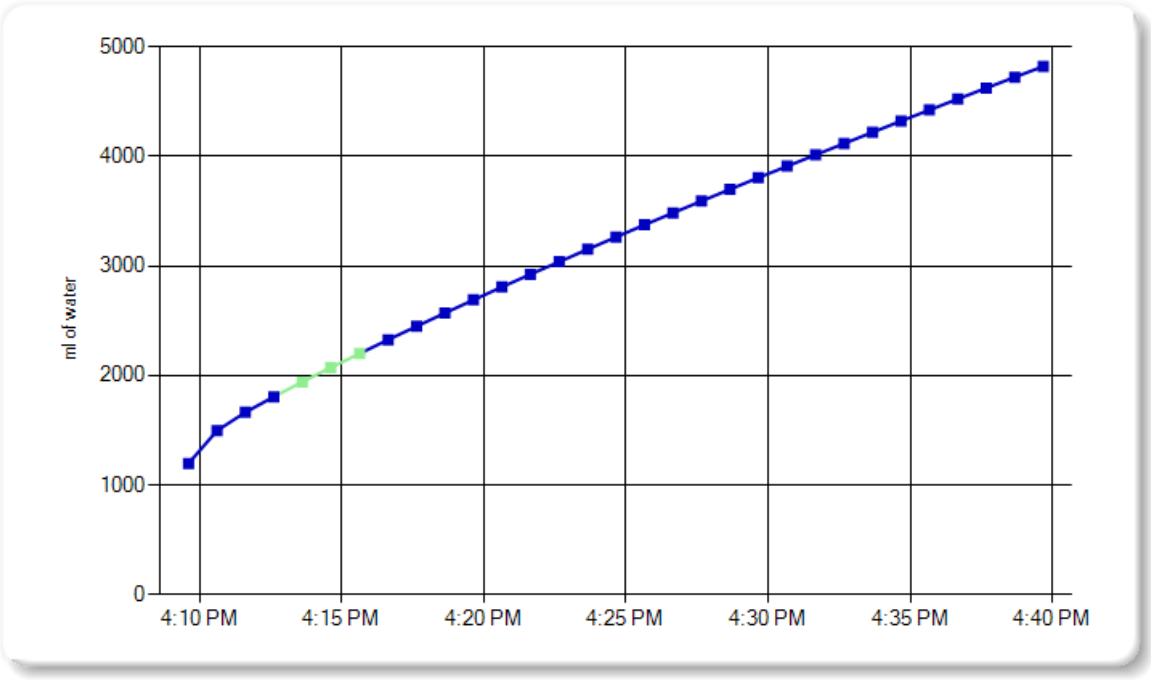
	Degrees	Minutes	Seconds	
Longitude:	0	0	0	East
Latitude:	0	0	0	North

Soil Texture-Structure Category:

Water Consumption Rate



Total Water Consumed



Time	Reservoir Water Level	Elapsed Time Interval	Interval Water Consumed	Total Water Consumed	Water Consumption Rate	Ignore Reading
4:08:37 PM	8543.2 ml					
4:09:37 PM	7343.8 ml	1 minute	1199.4 ml	1199.4 ml	1199.400 ml/min	
4:10:37 PM	7045.4 ml	1 minute	298.4 ml	1497.8 ml	298.400 ml/min	
4:11:37 PM	6877.0 ml	1 minute	168.4 ml	1666.2 ml	168.400 ml/min	
4:12:37 PM	6735.6 ml	1 minute	141.4 ml	1807.6 ml	141.400 ml/min	
4:13:37 PM	6600.2 ml	1 minute	135.4 ml	1943.0 ml	135.400 ml/min	
4:14:37 PM	6469.6 ml	1 minute	130.6 ml	2073.6 ml	130.600 ml/min	
4:15:38 PM	6342.0 ml	1 minute	127.6 ml	2201.2 ml	125.508 ml/min	
4:16:38 PM	6215.6 ml	1 minute	126.4 ml	2327.6 ml	126.400 ml/min	
4:17:38 PM	6093.4 ml	1 minute	122.2 ml	2449.8 ml	122.200 ml/min	
4:18:38 PM	5972.4 ml	1 minute	121.0 ml	2570.8 ml	121.000 ml/min	
4:19:38 PM	5852.6 ml	1 minute	119.8 ml	2690.6 ml	119.800 ml/min	
4:20:38 PM	5735.2 ml	1 minute	117.4 ml	2808.0 ml	117.400 ml/min	
4:21:38 PM	5619.2 ml	1 minute	116.0 ml	2924.0 ml	116.000 ml/min	
4:22:39 PM	5504.8 ml	1 minute	114.4 ml	3038.4 ml	112.525 ml/min	
4:23:39 PM	5391.2 ml	1 minute	113.6 ml	3152.0 ml	113.600 ml/min	
4:24:39 PM	5279.2 ml	1 minute	112.0 ml	3264.0 ml	112.000 ml/min	
4:25:39 PM	5167.6 ml	1 minute	111.6 ml	3375.6 ml	111.600 ml/min	
4:26:39 PM	5058.8 ml	1 minute	108.8 ml	3484.4 ml	108.800 ml/min	
4:27:39 PM	4951.2 ml	1 minute	107.6 ml	3592.0 ml	107.600 ml/min	
4:28:39 PM	4844.4 ml	1 minute	106.8 ml	3698.8 ml	106.800 ml/min	
4:29:39 PM	4737.8 ml	1 minute	106.6 ml	3805.4 ml	106.600 ml/min	
4:30:40 PM	4633.2 ml	1 minute	104.6 ml	3910.0 ml	102.885 ml/min	
4:31:40 PM	4529.0 ml	1 minute	104.2 ml	4014.2 ml	104.200 ml/min	
4:32:40 PM	4425.8 ml	1 minute	103.2 ml	4117.4 ml	103.200 ml/min	
4:33:40 PM	4323.6 ml	1 minute	102.2 ml	4219.6 ml	102.200 ml/min	
4:34:40 PM	4221.2 ml	1 minute	102.4 ml	4322.0 ml	102.400 ml/min	
4:35:40 PM	4120.2 ml	1 minute	101.0 ml	4423.0 ml	101.000 ml/min	
4:36:40 PM	4019.8 ml	1 minute	100.4 ml	4523.4 ml	100.400 ml/min	
4:37:40 PM	3919.6 ml	1 minute	100.2 ml	4623.6 ml	100.200 ml/min	
4:38:40 PM	3821.2 ml	1 minute	98.4 ml	4722.0 ml	98.400 ml/min	
4:39:40 PM	3723.0 ml	1 minute	98.2 ml	4820.2 ml	98.200 ml/min	

Location: 19744

Site: P2

Time interval between readings: 1 minute

Ksat Method: Glover Solution

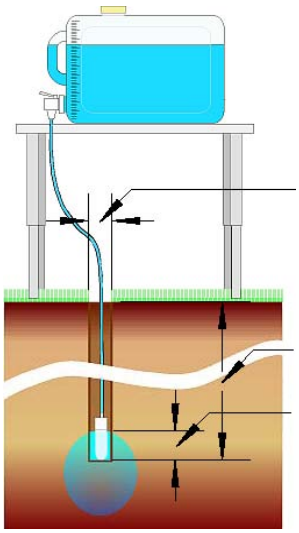
Steady Flow Rate Condition

Steady Flow Rate achieved when Water Consumption Rate changes less than

+/- 5 % for 3 consecutive readings

Steady Flow Rate:	136.000 ml/min
Temp. Adj. FR:	136.132 ml/min
Percolation Rate:	0.369 min/cm
Ksat:	0.9 Inches / hour

Notes:



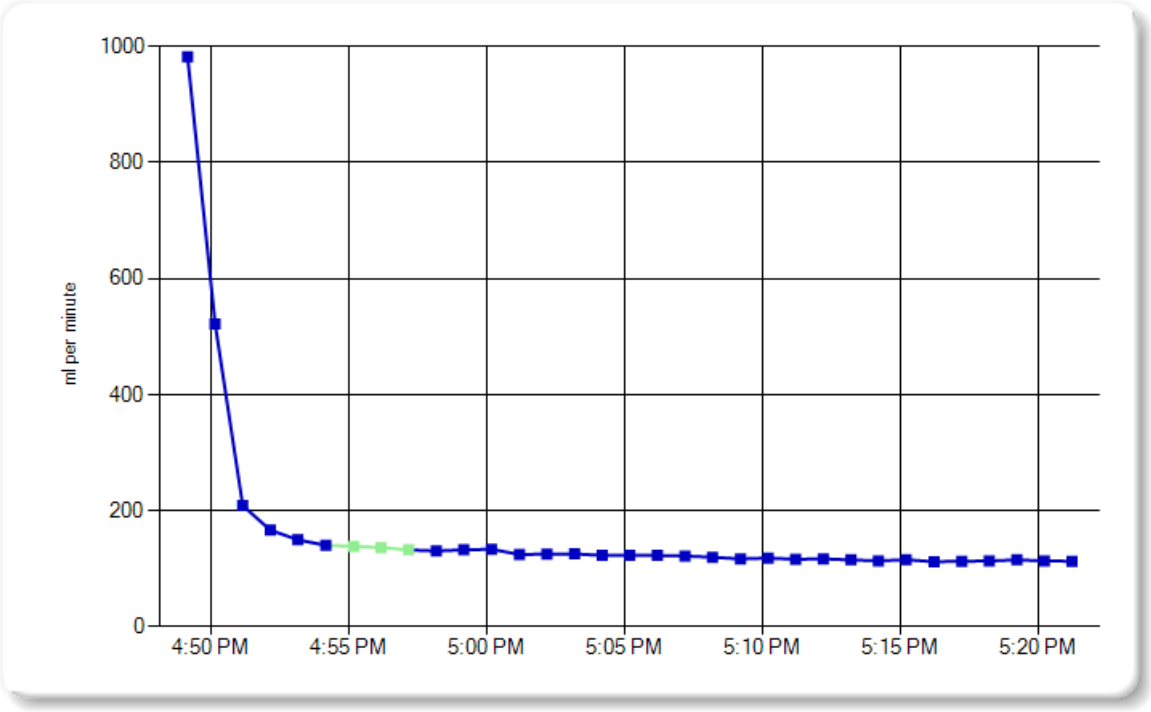
3.1 inches	Hole Diameter
60.1 º F	Water Temperature
24 inches	Hole Depth
13 inches	Water Height in Hole
	Water Table Depth

Site GPS Position

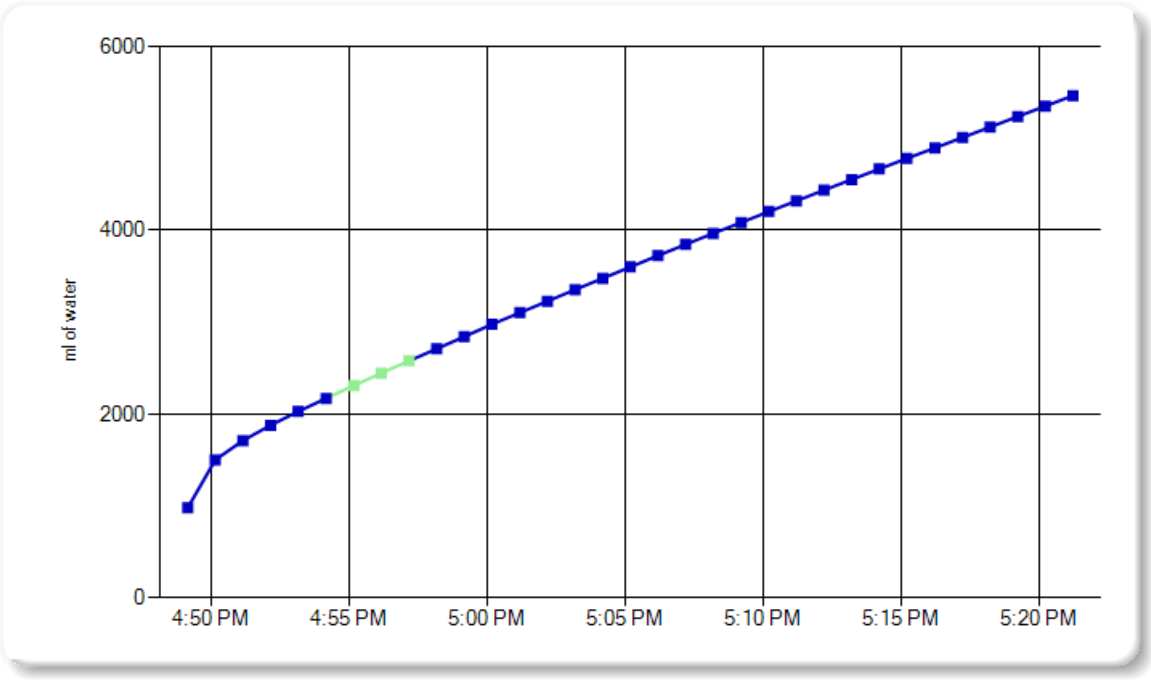
	Degrees	Minutes	Seconds	
Longitude:	0	0	0	East
Latitude:	0	0	0	North

Soil Texture-Structure Category:

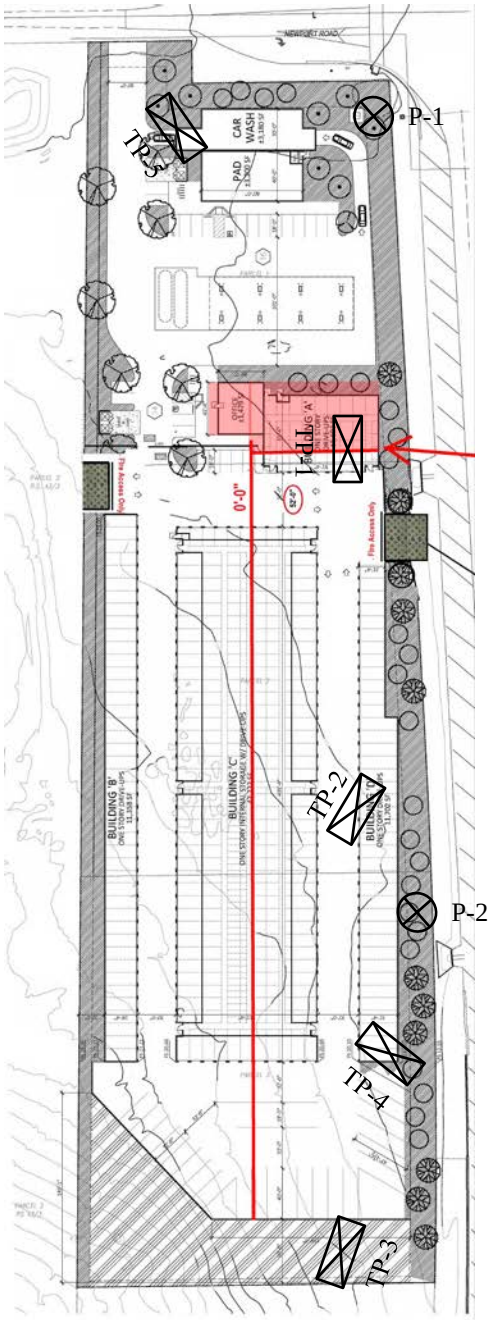
Water Consumption Rate



Total Water Consumed



Time	Reservoir Water Level	Elapsed Time Interval	Interval Water Consumed	Total Water Consumed	Water Consumption Rate	Ignore Reading
4:48:10 PM	8448.6 ml					
4:49:10 PM	7466.2 ml	1 minute	982.4 ml	982.4 ml	982.400 ml/min	
4:50:10 PM	6944.2 ml	1 minute	522.0 ml	1504.4 ml	522.000 ml/min	
4:51:10 PM	6735.2 ml	1 minute	209.0 ml	1713.4 ml	209.000 ml/min	
4:52:10 PM	6568.4 ml	1 minute	166.8 ml	1880.2 ml	166.800 ml/min	
4:53:10 PM	6418.4 ml	1 minute	150.0 ml	2030.2 ml	150.000 ml/min	
4:54:11 PM	6275.6 ml	1 minute	142.8 ml	2173.0 ml	140.459 ml/min	
4:55:11 PM	6136.8 ml	1 minute	138.8 ml	2311.8 ml	138.800 ml/min	
4:56:11 PM	6000.2 ml	1 minute	136.6 ml	2448.4 ml	136.600 ml/min	
4:57:11 PM	5867.6 ml	1 minute	132.6 ml	2581.0 ml	132.600 ml/min	
4:58:11 PM	5736.8 ml	1 minute	130.8 ml	2711.8 ml	130.800 ml/min	
4:59:11 PM	5604.0 ml	1 minute	132.8 ml	2844.6 ml	132.800 ml/min	
5:00:11 PM	5470.2 ml	1 minute	133.8 ml	2978.4 ml	133.800 ml/min	
5:01:12 PM	5343.4 ml	1 minute	126.8 ml	3105.2 ml	124.721 ml/min	
5:02:12 PM	5218.0 ml	1 minute	125.4 ml	3230.6 ml	125.400 ml/min	
5:03:12 PM	5092.2 ml	1 minute	125.8 ml	3356.4 ml	125.800 ml/min	
5:04:12 PM	4969.0 ml	1 minute	123.2 ml	3479.6 ml	123.200 ml/min	
5:05:12 PM	4845.6 ml	1 minute	123.4 ml	3603.0 ml	123.400 ml/min	
5:06:12 PM	4722.6 ml	1 minute	123.0 ml	3726.0 ml	123.000 ml/min	
5:07:12 PM	4600.4 ml	1 minute	122.2 ml	3848.2 ml	122.200 ml/min	
5:08:12 PM	4480.4 ml	1 minute	120.0 ml	3968.2 ml	120.000 ml/min	
5:09:13 PM	4361.4 ml	1 minute	119.0 ml	4087.2 ml	117.049 ml/min	
5:10:13 PM	4242.8 ml	1 minute	118.6 ml	4205.8 ml	118.600 ml/min	
5:11:13 PM	4126.4 ml	1 minute	116.4 ml	4322.2 ml	116.400 ml/min	
5:12:13 PM	4009.2 ml	1 minute	117.2 ml	4439.4 ml	117.200 ml/min	
5:13:13 PM	3893.8 ml	1 minute	115.4 ml	4554.8 ml	115.400 ml/min	
5:14:13 PM	3780.0 ml	1 minute	113.8 ml	4668.6 ml	113.800 ml/min	
5:15:13 PM	3664.2 ml	1 minute	115.8 ml	4784.4 ml	115.800 ml/min	
5:16:14 PM	3550.0 ml	1 minute	114.2 ml	4898.6 ml	112.328 ml/min	
5:17:14 PM	3436.8 ml	1 minute	113.2 ml	5011.8 ml	113.200 ml/min	
5:18:14 PM	3323.4 ml	1 minute	113.4 ml	5125.2 ml	113.400 ml/min	
5:19:14 PM	3207.8 ml	1 minute	115.6 ml	5240.8 ml	115.600 ml/min	
5:20:14 PM	3094.2 ml	1 minute	113.6 ml	5354.4 ml	113.600 ml/min	
5:21:14 PM	2981.0 ml	1 minute	113.2 ml	5467.6 ml	113.200 ml/min	



LEGEND

Locations are Approximate

Symbols

⊗ P-2 – Infiltration Test

⊠ TP-5 – Exploratory Test Pit (THE Soils, 2006)

North

CW SOILS	Proposed Diamond Valley Storage	19744-10A
	INFILTRATION LOCATION MAP	1" = 150 '
		2019
		PLATE 1

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[6].**	
	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 (evapotranspiration and infiltration) of the water	

[6] 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.

	quality volume, as required by MS4 Permits?	

2	**Proprietary Biofiltration BMP sizing (all proprietary/compact BMPs require TAPE approval)[7]**	
	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[8] 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.[9]
3b	Plants that minimize irrigation requirements.	Provide documentation describing irrigation

[7] 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.

[8] 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).

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

		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	Yes _____ or No_____, explain:

	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.	
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 Flow Rate, Q_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

Company Name	Blue Peak Engineering	Date	1/12/2022
Designed by	KJ	County/City Case No	
Company Project Number/Name			
Drainage Area Number/Name	DA-1		

Enter the Area Tributary to this Feature A_T = 2.82 acres

Determine the Effective Impervious Fraction

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

Effective Impervious Fraction I_f = 0.96

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 = 0.82

BMP Design Flow Rate

$Q_{BMP} = C \times I \times A_T$

Q_{BMP} = 0.5 ft^3/s

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	Blue Peak Engineering	Date	1/12/2021
Designed by	KJ	County/City Case No	
Company Project Number/Name	724		
Drainage Area Number/Name	DA-1		

Enter the Area Tributary to this Feature A_T = 2.82 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} = 0.65

Determine the Effective Impervious Fraction

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

Effective Impervious Fraction I_f = 0.96

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 = 0.82

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.54 (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} = 5,528 ft^3

Notes:

Santa Margarita Watershed

BMP Design Flow Rate, Q_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

Company Name	Blue Peak Engineering	Date	1/12/2022
Designed by	KJ	County/City Case No	
Company Project Number/Name			
Drainage Area Number/Name	DA-2		

Enter the Area Tributary to this Feature A_T = 0.78 acres

Determine the Effective Impervious Fraction

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

Effective Impervious Fraction I_f = 0.99

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 = 0.87

BMP Design Flow Rate

$Q_{BMP} = C \times I \times A_T$

Q_{BMP} = 0.1 ft^3/s

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	Blue Peak Engineering	Date	1/12/2021
Designed by	KJ	County/City Case No	
Company Project Number/Name	724		
Drainage Area Number/Name	DA-2		

Enter the Area Tributary to this Feature A_T = 0.78 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} = 0.65

Determine the Effective Impervious Fraction

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

Effective Impervious Fraction I_f = 0.99

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 = 0.87

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.57 (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} = 1,614 ft^3

Notes:

Santa Margarita Watershed

BMP Design Flow Rate, Q_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

Company Name	Blue Peak Engineering, Inc.	Date	1/12/2022
Designed by	KJ	County/City Case No	
Company Project Number/Name			
Drainage Area Number/Name	DA-3		

Enter the Area Tributary to this Feature A_T = 0.56 acres

Determine the Effective Impervious Fraction

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

Effective Impervious Fraction I_f = 0.52

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 = 0.35

BMP Design Flow Rate

$Q_{BMP} = C \times I \times A_T$

Q_{BMP} = 0.0 ft^3/s

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	Blue Peak Engineering	Date	1/12/2021
Designed by	KJ	County/City Case No	
Company Project Number/Name	724		
Drainage Area Number/Name	DA-3		

Enter the Area Tributary to this Feature A_T = 0.56 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} = 0.65

Determine the Effective Impervious Fraction

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

Effective Impervious Fraction I_f = 0.52

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 = 0.35

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.23 (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} = 468 ft^3

Notes:

Santa Margarita Watershed

BMP Design Flow Rate, Q_{BMP} (Rev. 03-2012)

Legend: Required Entries / Calculated Cells

Company Name	Blue Peak Engineering	Date	1/12/2022
Designed by	KJ	County/City Case No	
Company Project Number/Name			
Drainage Area Number/Name	DA-2		

Enter the Area Tributary to this Feature A_T = 0.59 acres

Determine the Effective Impervious Fraction

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

Effective Impervious Fraction I_f = 0.86

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 = 0.67

BMP Design Flow Rate

$Q_{BMP} = C \times I \times A_T$

Q_{BMP} = 0.1 ft^3/s

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	Blue Peak Engineering	Date	1/12/2021
Designed by	KJ	County/City Case No	
Company Project Number/Name	724		
Drainage Area Number/Name	DA-5		

Enter the Area Tributary to this Feature A_T = 0.59 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} = 0.65

Determine the Effective Impervious Fraction

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

Effective Impervious Fraction I_f = 0.86

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 = 0.67

Determine Design Storage Volume, V_{BMP}

Calculate V_U, the 85% Unit Storage Volume $V_U = D_{85} \times C$ V_u = 0.44 (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} = 942 ft^3

Notes:

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MWS Linear | *Sizing Options*

Flow Based Sizing

The MWS Linear can be used in stand alone applications to meet treatment flow requirements. Since the MWS Linear is the only biofiltration system that can accept inflow pipes several feet below the surface it can be used not only in decentralized design applications but also as a large central end-of-the-line application for maximum feasibility.

Model #	Dimensions	WetlandMEDIA Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-4	4′ x 4′	23 sq. ft.	0.052
MWS-L-4-6	4′ x 6′	32 sq. ft.	0.073
MWS-L-4-8	4′ x 8′	50 sq. ft.	0.115
MWS-L-4-13	4′ x 13′	63 sq. ft.	0.144
MWS-L-4-15	4′ x 15′	76 sq. ft.	0.175

Model #	Dimensions	WetlandMEDIA Surface Area	Treatment Flow Rate (cfs)
MWS-L-4-17	4′ x 17′	90 sq. ft.	0.206
MWS-L-4-19	4′ x 19′	103 sq. ft.	0.237
MWS-L-4-21	4′ x 21′	117 sq. ft.	0.268
MWS-L-6-8	7′ x 9′	64 sq. ft.	0.147
MWS-L-8-8	8′ x 8′	100 sq. ft.	0.230
MWS-L-8-12	8′ x 12′	151 sq. ft.	0.346
MWS-L-8-16	8′ x 16′	201 sq. ft.	0.462
MWS-L-8-20	9′ x 21′	252 sq. ft.	0.577
MWS-L-8-			

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Volume Based Sizing

Many states require treatment of a water quality volume and do not offer the option of flow based design. The MWS Linear and its unique horizontal flow makes it the only biofilter that can be used in volume based design installed downstream of ponds, detention basins, and underground storage systems.

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-4	1140	2280
MWS-L-4-6	1600	3200
MWS-L-4-8	2518	5036
MWS-L-4-15	3811	7623
MWS-L-4-17	4492	8984
MWS-L-4-19	5172	10345

Model #	Treatment Capacity (cu. ft.) @ 24-Hour Drain Down	Treatment Capacity (cu. ft.) @ 48-Hour Drain Down
MWS-L-4-21	5853	11706
MWS-L-6-8	3191	6382
MWS-L-8-8	5036	10072
MWS-L-8-12	7554	15109
MWS-L-8-16	10073	20145
MWS-L-8-20	12560	25120
MWS-L-8-24	15108	30216

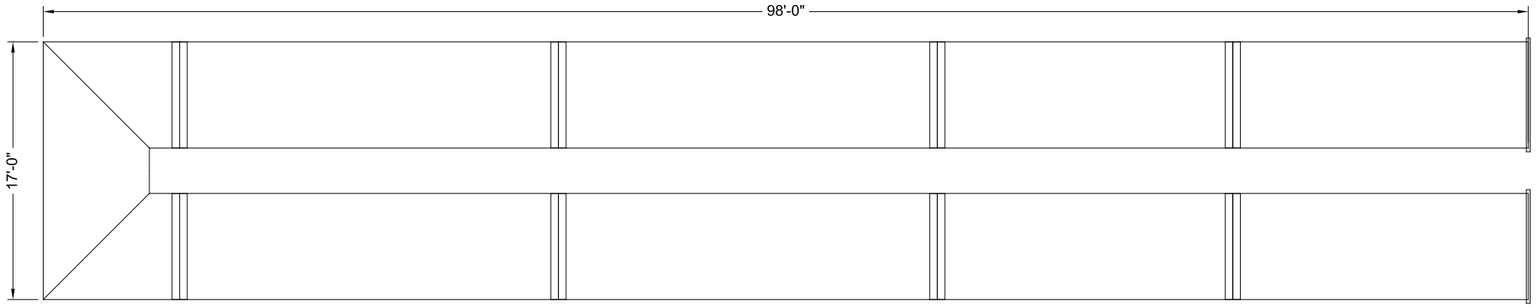
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20 & HS25
- APPROX. LINEAR FOOTAGE = 199 lf.

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 7,658 cf.
- BACKFILL STORAGE VOLUME = 2,257 cf.
- TOTAL STORAGE PROVIDED = 9,915 cf.

PIPE DETAILS
- DIAMETER = 84 IN.
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = Perforated
- BARRELL SPACING = 36 IN.

BACKFILL DETAILS
- WIDTH AT ENDS = 12 IN.
- ABOVE PIPE = 0 IN.
- WIDTH AT SIDES = 12 IN.
- BELOW PIPE = 0 IN.



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 10'

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CONTECH CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYO7920 test
test
Silverton, OR
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
4932	7920	1/13/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: D1		

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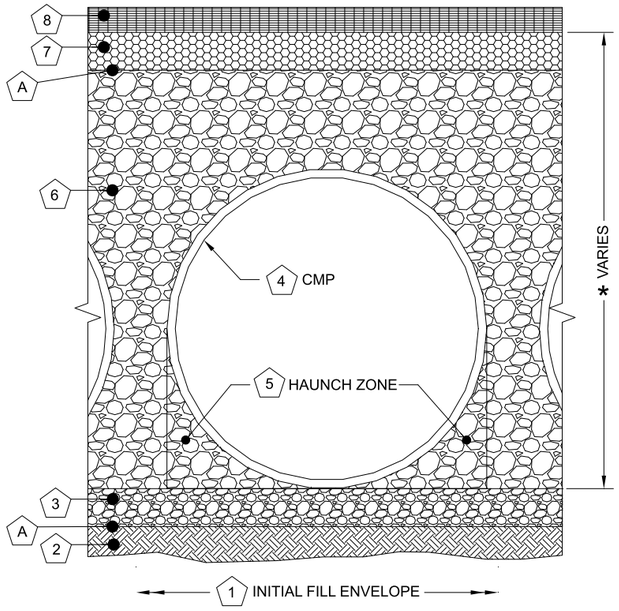


Infiltration Systems - CMP Infiltration & CMP Perforated Drainage Pipe			
Material Location	Description	Material Designation	Designation
8 Rigid or Flexible Pavement (if applicable)			
7 Road Base (if applicable			
A Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types. Wrap the trench only.
6 Backfill	Infiltration pipe systems have a pipe perforation sized of 3/8" diameter. An open graded, free draining stone, with a particle size of ½" – 2 ½" diameter is recommended.	AASHTO M 145-A-1 or AASHTO M 43 - 3, 4	Material shall be worked into the pipe haunches by means of shovel-slicing, rodding, air-tamper, vibratory rod, or other effective methods. Compaction of all placed fill material is necessary and shall be considered adequate when no further yielding of the material is observed under the compactor, or under foot, and the Project Engineer or his representative is satisfied with the level of compaction"
3 Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	For soil aggregates larger than 3/8" a dedicated bedding layer is not required for CMP. Pipe may be placed on the trench bottom comprised of native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Soil aggregates less than 3/8" and unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation.
A Geotextile Layer	None	None	Contech does not recommend geotextiles be placed under the invert of Infilitration systems due to the propensity for geotextiles to clog over time.
* Note: The listed AASHTO designations are for gradation only. The stone must also be angular and clean.			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT.

FOUNDATION/BEDDING PREPARATION

2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMLY COMPACTED WITHOUT SOFT SPOTS.

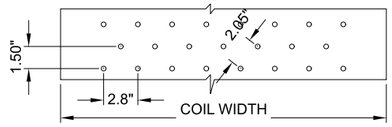
BACKFILL

MATERIAL SHALL BE PLACED IN 8"-10" MAXIMUM LIFTS. INADEQUATE COMPACTION CAN LEAD TO EXCESSIVE DEFLECTIONS WITHIN THE SYSTEM AND SETTLEMENT OF THE SOILS OVER THE SYSTEM. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO-LIFT DIFFERENTIAL BETWEEN THE SIDES OF ANY PIPE IN THE SYSTEM AT ALL TIMES DURING THE BACKFILL PROCESS. BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON ANY PIPES IN THE SYSTEM.

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

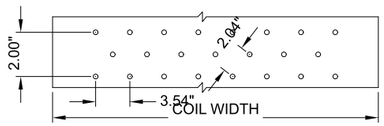
OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS. REFER TO TYPICAL BACKFILL DETAIL FOR MATERIAL REQUIRED.

2 2/3" x 1/2" CORRUGATION - STEEL AND ALUMINUM CMP EDGE SPACING EQUAL ON BOTH SIDES



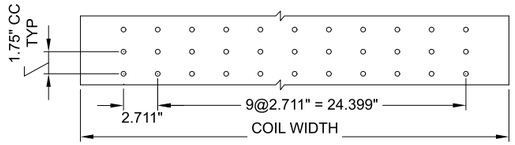
OPEN AREA = 3.76 SQ IN/SQ FT

3" x 1" CORRUGATION - STEEL AND ALUMINUM CMP (COIL PROVIDED FROM CONTECH LANTANA, FL PLANT)



OPEN AREA = 4.16 SQ IN/SQ FT

5" x 1" CORRUGATION - STEEL ONLY
EDGE SPACING EQUAL ON BOTH SIDES



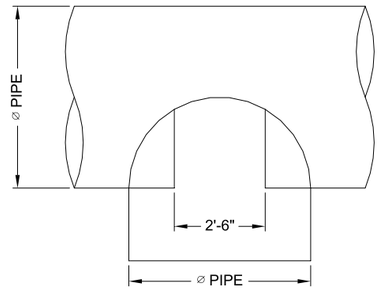
OPEN AREA = 3.33 SQ IN/SQ FT

NOTES:

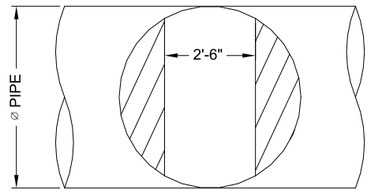
1. PERFORATIONS MEET AASHTO AND ASTM SPECIFICATIONS.
2. PERFORATION OPEN AREA PER SQUARE FOOT OF PIPE IS BASED ON THE NOMINAL DIAMETER AND LENGTH OF PIPE.
3. ALL DIMENSIONS ARE SUBJECT TO MANUFACTURING TOLERANCES.
4. ALL HOLES ⌀3/8".

TYPICAL PERFORATION DETAIL

SCALE: N.T.S.



PLAN

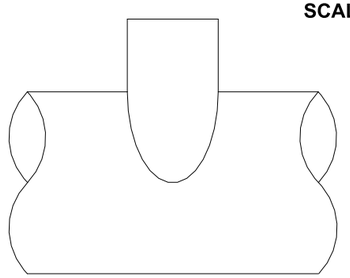


FRONT

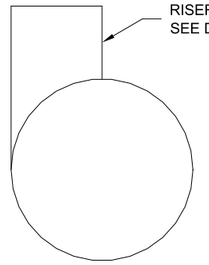
NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.



ELEVATION

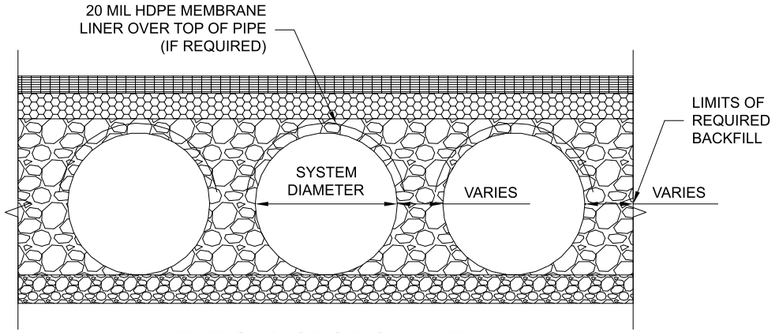


END

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL

SCALE: N.T.S.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

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

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CONTECH DYODS DRAWING

DYO7920 test
test
Silverton, OR
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
4932	7920	1/13/2022
DESIGNED: DYO	DRAWN: DYO	
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SHEET NO.: D2		

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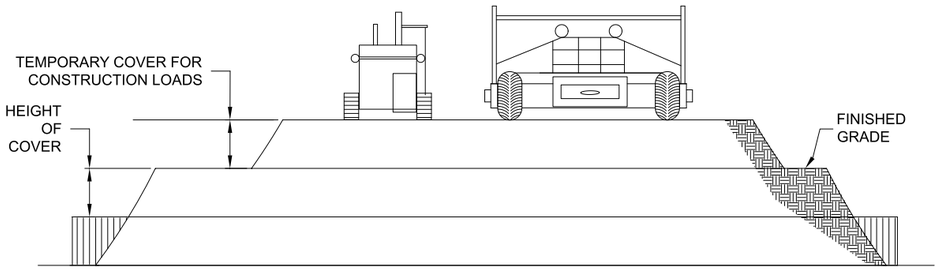


CONSTRUCTION LOADS

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

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

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

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE REQUIREMENTS OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

POLYMER COATED: AASHTO M-245 OR ASTM A-762

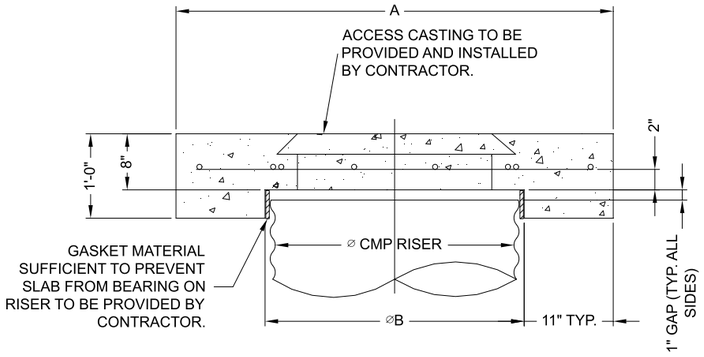
ALUMINUM: AASHTO M-196 OR ASTM B-745

HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.

INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

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

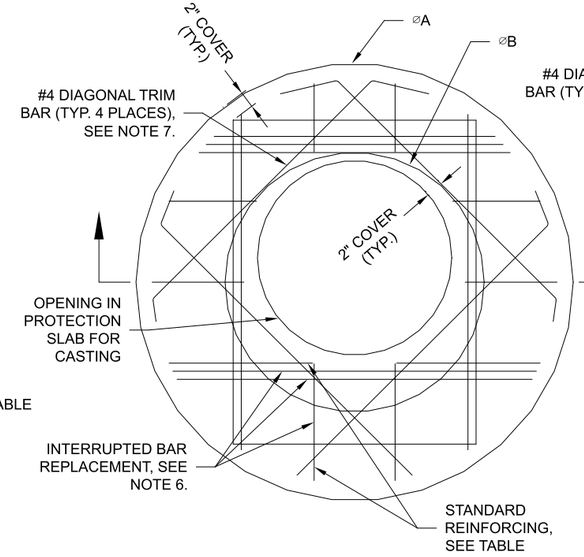
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



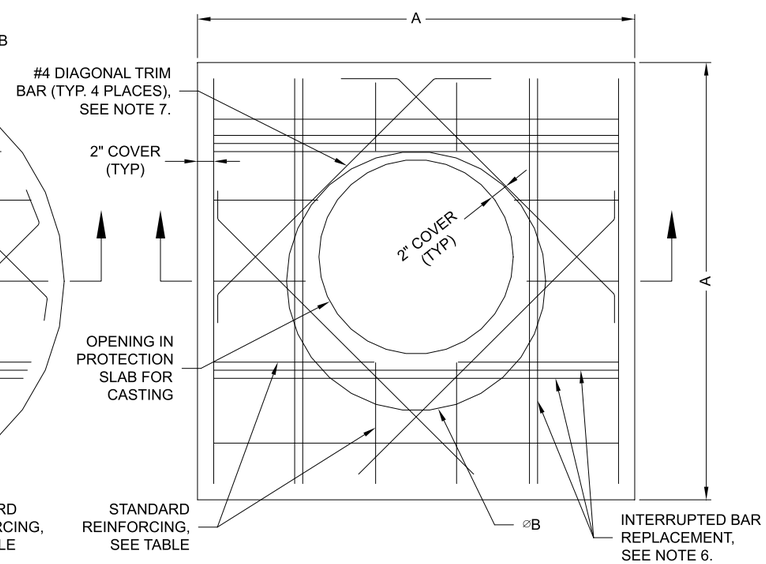
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

DATE	REVISION DESCRIPTION	BY

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CONTECH CMP DETENTION SYSTEMS
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DYO7920 test
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PROJECT No.:	SEQ. No.:	DATE:
4932	7920	1/13/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: D3		

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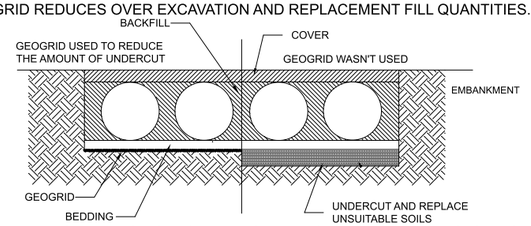
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

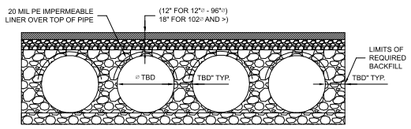


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

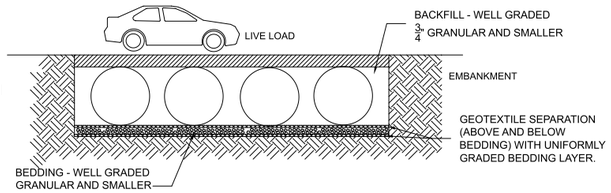
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

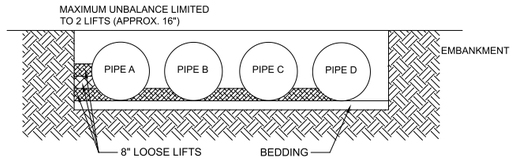
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



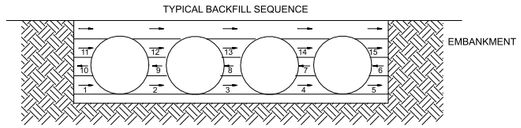
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

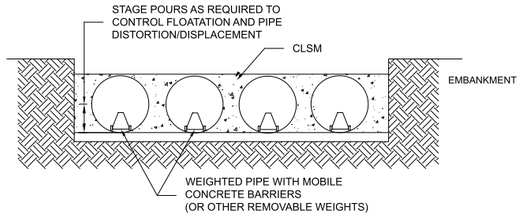


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

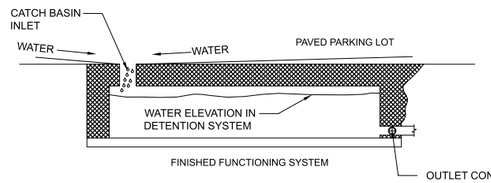


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

DATE	REVISION DESCRIPTION	BY

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

CONTECH CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

DYO7920 test
test
Silverton, OR
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
4932	7920	1/13/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: D4		

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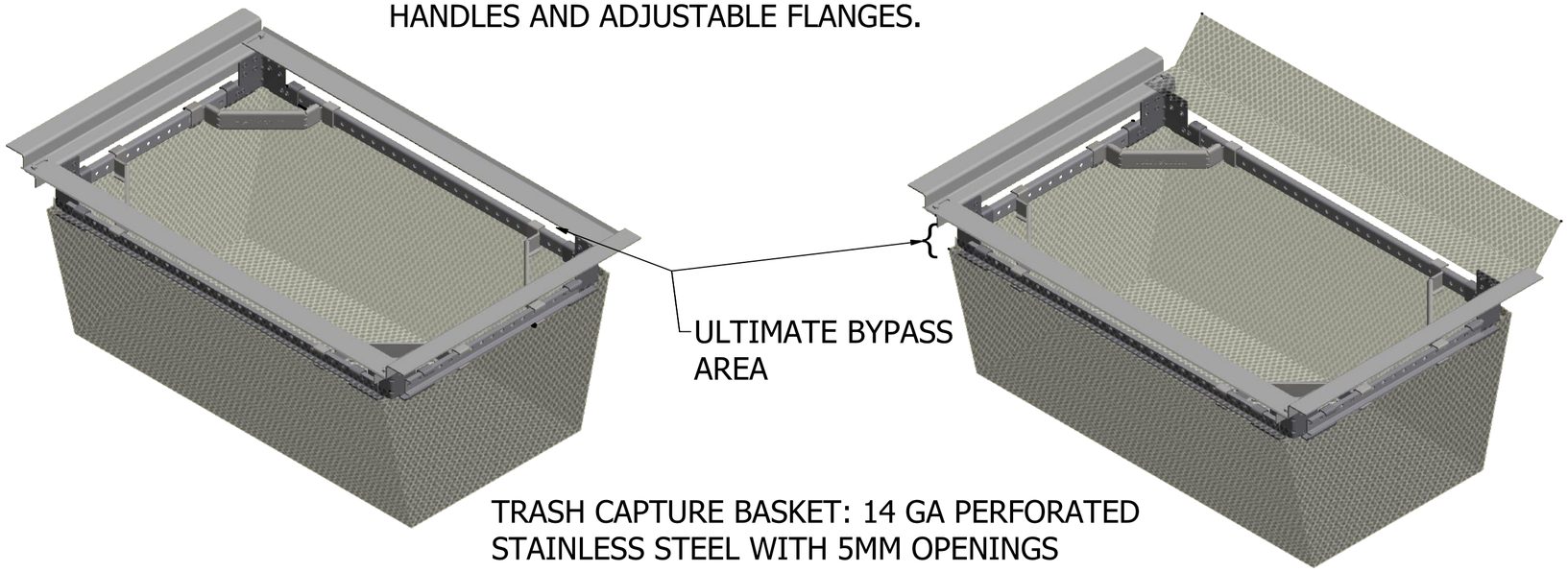
ADS-FLEXSTORM Perforated Stainless Steel Full Trash Capture Inserts

SUPPORT FRAMING: 12 GA 304 STAINLESS STEEL FRAMING W/LIFT HANDLES AND ADJUSTABLE FLANGES.



TRASH CAPTURE BASKET: 14 GA PERFORATED STAINLESS STEEL WITH 5MM OPENINGS

FLEXSTORM FILTER FOR SQUARE/RECTANGULAR GRATES

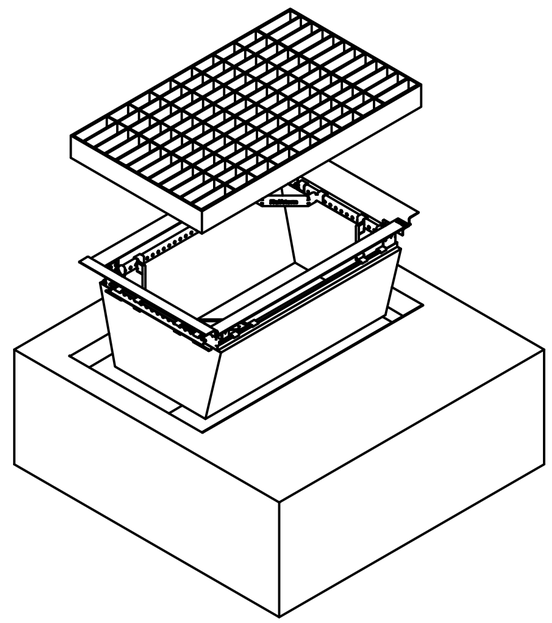
FLEXSTORM FILTER W/BOLT ON DEFLECTOR FOR CURB OPENINGS

FLEXSTORM FILTER FOR ROUND GRATES

Installation Instructions:

1. Remove grate from the drainage structure
2. Clean stone and dirt from the grate support ledge (lip)
3. Drop the FLEXSTORM inlet filter through the clear opening such that the flanges rest firmly on the lip of the catch basin
4. Replace the grate on top of the filter framing

FLEXSTORM Performance Specifications - Full Trash Capture						
ADS P/N	Basin Size	Basket Depth	Ultimate Bypass Cap. (CFS)*	Storage Volume (ft^3)	Flow Rate when Empty (CFS)*	Flow Rate when 50% Full (CFS)*
62HD12FTC	12 x 12	12"	0.5	0.7	6.8	3.0
62HD18FTC	18 x 18	12"	1.8	1.7	12.2	4.5
62HD24FTC	24 x 24	12"	3.0	3.1	18.6	6.3
62HD3618FTC	36 x 18	12"	4.0	3.5	20.8	7.3
62HD3624FTC	36 x 24	12"	4.5	5.0	25.1	8.3
62HD36FTC	36 x 36**	12"	8.0	7.1	41.6	14.6



* Calculated with .33' head pressure above grate

** Two 36 x 18 filter baskets placed side by side

TITLE			
ADS-FLEXSTORM Full Trash Capture Inserts			
SIZE		DWG NO	REV
SCALE			

FLEXSTORM™ Inlet Filter Specifications and Work Instructions

Product: **FLEXSTORM FULL TRASH CAPTURE (FTC) INSERTS**

Manufacturer: **ADS - FLEXSTORM** www.inletfilters.com

A subsidiary of **Advanced Drainage Systems (ADS)** www.ads-pipe.com

1.0 Description of Work:

1.1 The work covered shall consist of supplying, installing, and maintaining/cleaning of the FLEXSTORM FULL TRASH CAPTURE (FTC) INSERT. The FLEXSTORM FTC INSERT is placed directly under a catch basin drainage grate in order to collect trash and debris from surface storm water runoff as part of a TMDL program, or as directed by the Engineer.

2.0 Material:

2.1 The FLEXSTORM FTC insert system is comprised of a stainless steel frame and basket with perforated openings. The basket hangs suspended from the rigid frame at a distance below the grate that shall allow full water flow into the drainage structure if the basket is completely filled with trash and debris.

2.2 The FLEXSTORM FTC frame includes lifting handles to facilitate installation and removal of the basket into and out of the drainage structure. The ultimate bypass in the frame is designed to exceed that of the design flow into the drainage structure.

2.3 FLEXSTORM FTC INSERTS for full trash capture initiatives: The FLEXSTORM FTC framing is comprised of 12GA 304 stainless steel. The active filtering component is 14GA perforated stainless steel. The steel basket is uniformly punched with 3/16” dia holes (4.8 mm) in such a pattern that the basket has 50% open area and retains any particles 5 mm or larger.

3.0 Identification of Drainage Structures to Determine FLEXSTORM FTC Part #s, and Sizing:

3.1 The Installer (Contactor) shall inspect the plans and/or worksite to determine the quantity of each drainage structure casting type. The catch basin design, casting number, or the exact grate and clear opening size will provide the information necessary to identify the required FLEXSTORM FTC insert part number. Inserts are supplied to the field pre-configured to fit the specified drainage structure.

3.2 Standard Part Numbers and Performance Ratings:

FLEXSTORM Performance Specifications - Full Trash Capture						
ADS-FLEXSTORM P/N	Basin Size	Basket Depth	Ultimate Bypass Flow Rate (CFS)*	Storage Volume (ft^3)	Flow Rate when Empty (CFS)*	Flow Rate when 50% Full (CFS)*
62HD12FTC	12 x 12	12"	0.5	0.7	6.8	3.0
62HD18FTC	18 x 18	12"	1.8	1.7	12.2	4.5
62HD24FTC	24 x 24	12"	3.0	3.1	18.6	6.3
62HD3618FTC	36 x 18	12"	4.0	3.5	20.8	7.3
62HD3624FTC	36 x 24	12"	4.5	5.0	25.1	8.3
62HD36FTC	36 x 36**	12"	8.0	7.1	41.6	14.6

* Calculated with .33' head pressure above grate

** Two 36 x 18 filter baskets placed side by side

4.0 Installation into Standard Grated Drainage Structures:

4.1 Remove the grate from the casting or concrete drainage structure. Clean the ledge (lip) of the casting frame or drainage structure to ensure it is free of stone and dirt. Lower the FLEXSTORM insert through the clear opening and be sure the suspension hangers rest firmly on the support ledge of the structure. Replace the grate and confirm it is elevated no more than 1/8", which is the thickness of the steel hangers.

5.0 Inspection and Maintenance Guidelines:

5.1 Frequency of Inspections: FLEXSTORM FTC inspections should occur three times per year (every four months) in areas with year round rainfall. Alternatively, maintenance guidelines per the awarded contract should be followed.

5.2 General Maintenance for standard Full Trash Capture inserts: Upon inspection, the FLEXSTORM FTC insert should be emptied if the steel basket is more than half filled with trash and debris, or as directed by the engineer, city, or municipal contract. Remove the grate and use a vactor truck or industrial vacuum to collect the trash and debris that has collected in the filter. Alternatively, the basket may be lifted out of the drainage structure and trash emptied into a receptacle to be hauled away. Remove any caked on trash and debris from the steel basket to ensure proper flow. When the basket is cleaned the grate should be replaced onto the basin and maintenance logged per the stipulations of the maintenance contract.

5.3 Operation & Maintenance Plan. Download at www.inletfilters.com

FLEXSTORM FULL TRASH CAPTURE (FTC) OPERATION AND MAINTENANCE PLAN

FULL TRASH CAPTURE OPERATION & MAINTENANCE PLAN

Installation Instructions:

1. Remove grate from the drainage structure
2. Clean stone and dirt from ledge (lip) of drainage structure
3. Drop the FLEXSTORM FTC inlet filter through the clear opening such that the hangers rest firmly on the lip of the structure.
4. Replace the grate and confirm it is not elevated more than 1/8", the thickness of the steel hangers.

Frequency of Inspections:

1. inspections should occur 3 times per year or per the terms of the awarded contract.

Maintenance Guidelines:

1. The basket should be cleaned if more than half filled with trash and debris, or as directed.
2. Remove the grate and use an industrial vacuum truck to remove all collected trash and debris from the filter.
3. Dispose of sediment or debris as directed by the Engineer, contract, or state laws regarding collection and disposal.

DATE	TASK PERFORMED	INSPECTOR

Capture and Use Calculations:

Utilizing City of Los Angeles Appendix F to demonstrate compliance with the wet season demand for Riverside County Santa Margarita Area: Sample Design Calculations & Worksheets

Givens:

Vdesign =8,831 cf

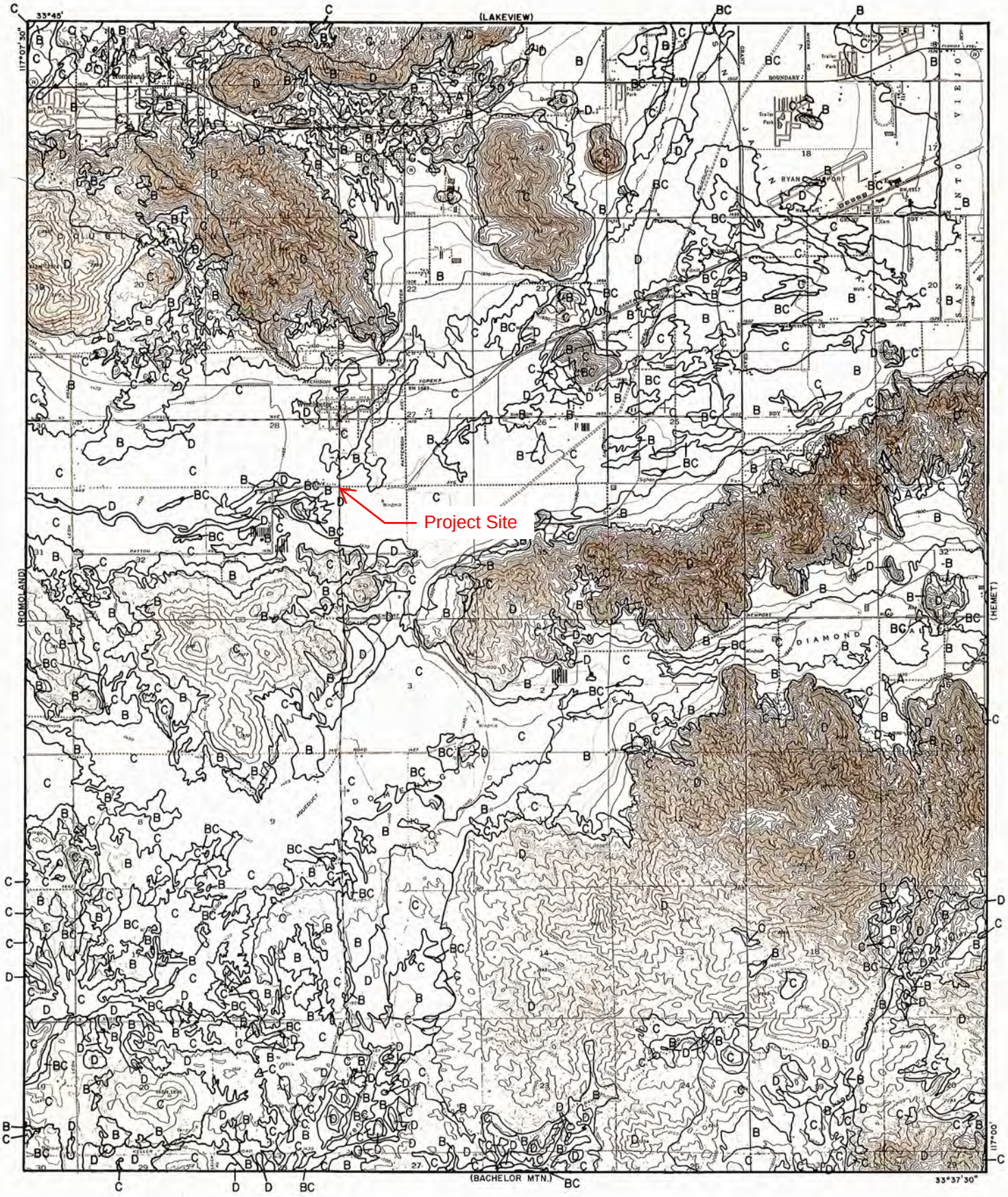
Medium Planting Type → Planting Factor = 0.4

1) Determine design volume in gallons:
   Vdesign (gal) = 8,831* 7.49 gal/ft^3 = 66,144 gal.

2) Planting Area:
   Planting Area = 69,245 (Excluding Septic Landscape Area)

3) Estimated Total Water use per year (gallons)
   ETWU= ETo * 0.62 * [(PF x HA) + LA / IE]
   PF= 0.5
   HA = 10,000 sf
   LA= 69,245
   IE= 0.81
   ETo=39 in/hr
   → ETWU= 2,216,350 gal / 365 = 6,072 gal/day * 96 hrs = 24,288 gal

24,288 gal < 66,144 gal → Cannot drawdown within 96 hour drawdown time. Capture and use is not feasible.



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

HYDROLOGIC SOILS GROUP MAP FOR WINCHESTER

PLATE C-1.43

R 07 W | R 06 W | R 05 W | R 04 W | R 03 W | R 02 W | R 01 W | R 01 E | R 02 E | R 03 E | R 04 E | R 05 E

T 01 S
T 02 S
T 03 S
T 04 S
T 05 S
T 06 S
T 07 S
T 08 S

0.85 MiraLoma
0.61 RiversideNorth
0.54 RiversideSouth
0.68 PigeonPass
0.66 MorenoEast
0.85 Beaumont
0.88 PradoDam
0.51 Woodcrest
0.50 LakeMathews
0.68 PerrisReservoir
0.87 VistaGrandeGS
0.70 SanJacintoNWS
1.18 Idyllwild
0.58 SunCity
0.68 Winchester
0.70 ElsinoreNWS
1.11 ElCarisoStation
0.90 HurkeyCreek
0.77 WildomarLaCresta
0.52 SkinnerLake
0.65 Anza
0.77 SantaRosaPlateau
1.00 TemeculaNWS
0.64 AguangaValley

Santa Ana River Watershed
Santa Margarita Watershed

JURUPA VALLEY | EASTVALE | NORCO | CORONA | RIVERSIDE | MORENO VALLEY | CALIMESA | BEAUMONT | SAN JACINTO | PERRIS | HEMET | CANYON LAKE | LAKE ELSINORE | WILDOMAR | MENIFEE | MURRIETA | TEMECULA

06 05 04 03 02 01
07 08 09 10 11 12
18 17 16 15 14 13
19 20 21 22 23 24
30 29 28 27 26 25
31 32 33 34 35 36

N

Rain Gage Locations

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

Isohyetal Map for the 85th Percentile 24 hour Storm Event

July 2011

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.

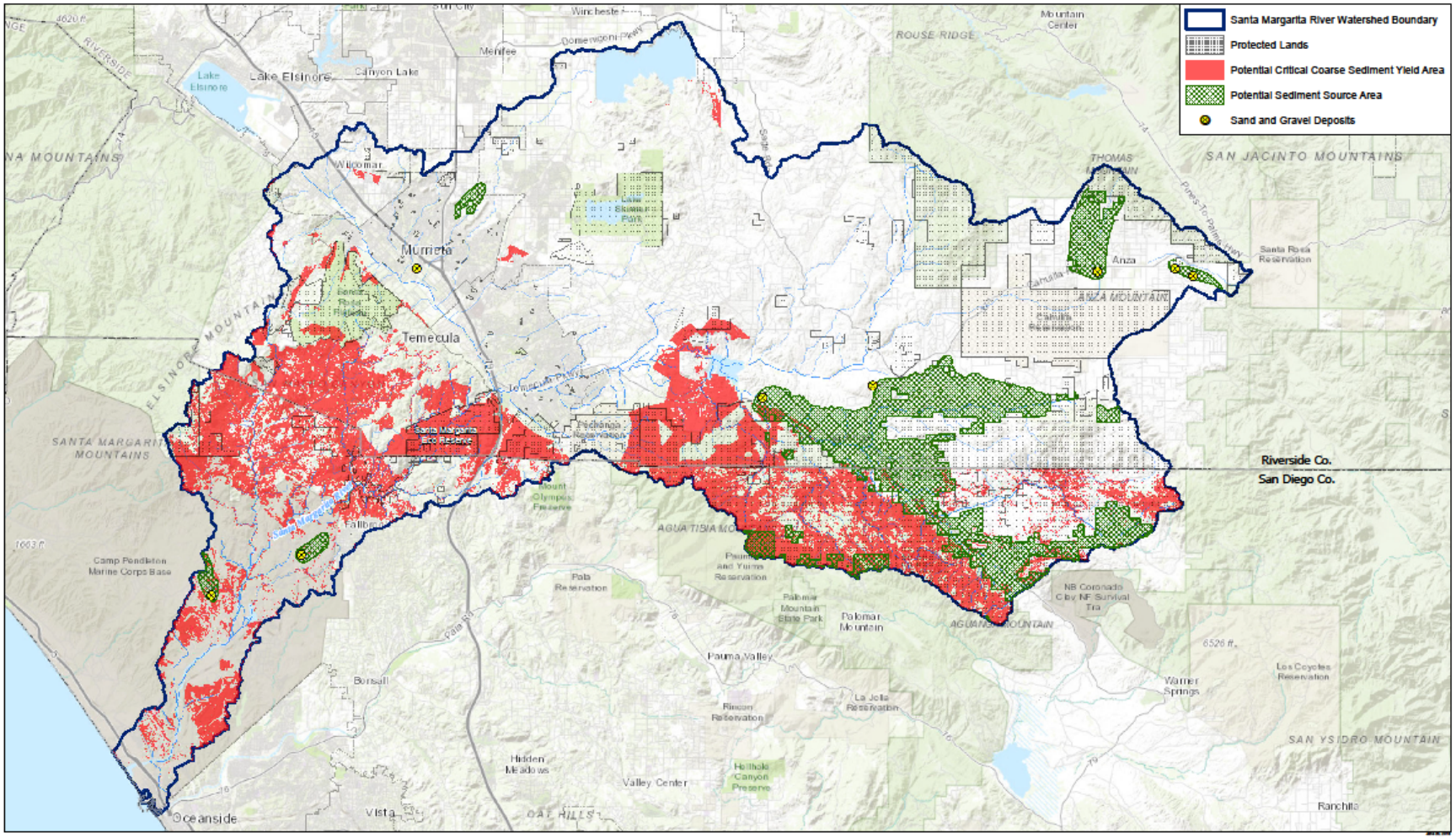


Exhibit G-1

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):	CUP200001	Rain Gauge	Eastern Slopes
Latitude (decimal format):	33.68420508	BMP Type (per WQMP):	Biofiltration w/ no infiltration
Longitude (decimal format):	-117.0849226	BMP Number (Sequential):	1

Pre-Development

Pre-Development - Hydrology Information			
DRAINAGE AREA (ACRES) - 10 acre max[1]	5.8	2-YEAR, 1-HOUR INTENSITY (IN/HR) - Plate D-4.3	0.5
LONGEST WATERCOURSE (FT) - 1,000' max[1]	750	10-YEAR, 1-HOUR INTENSITY (IN/HR) - Plate D-4.1	1.93
UPSTREAM ELEVATION OF WATERCOURSE (FT)	1585	SLOPE OF THE INTENSITY DURATION - Plate D-4.6	0.55
DOWNSTREAM ELEV. OF WATERCOURSE (FT)	1506	CLOSEST IMPERVIOUS PERCENTAGE (%)	0% Undeveloped - Poor 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
5	5.8 Ac.	Chaparral, Narrowleaf	Poor Cover			100		75	**88**	95
								0	**0**	0
								0	**0**	0
	5.80 Ac.						**Weighted Average RI Numbers =**	**75.0**	**88.0**	**95.0**

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] = **9.702** cfs	Ex. 10% of the 2-year Flowrate[1] = **0.557** 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)	5.8	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.
LONGEST WATERCOURSE (FT)	750	
DIFFERENCE IN ELEV (FT) - along watercourse	4	
PROPOSED IMPERVIOUS PERCENTAGE (%)	72	

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	5.8 Ac.	Urban Landscaping	Good Cover			100		50	**69**	84
								0	**0**	0
								0	**0**	0
	5.80 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	
		Requirement		Proposed			
Hydromod Ponded depth	**3.60 feet**						
Hydromod Drain Time (unclogged)	**97.20 hours**						
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: Robert DePrat

Date: 8/17/2021

Signature:

Spreadsheet Developed by: Benjie Cho, P.E.

BMP Design

Fill in **blue** shaded areas

BMP Geometry & Detention Calculations

0.1	feet, Stage Intervals

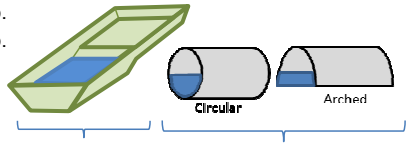
Increase intervals or decrease height

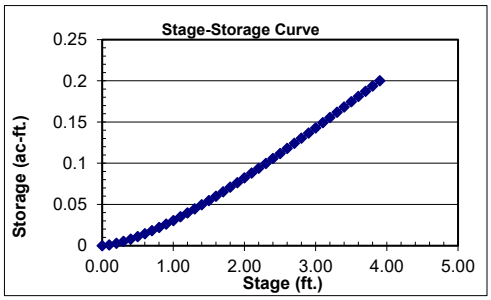
Height is above the limits of this sheet

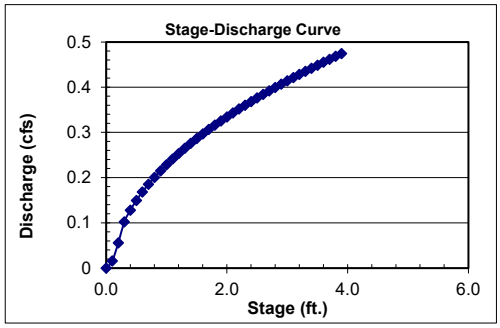
PROPOSED BMP DIMENSIONS

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

Tank BMP	Is the BMP a Tank shape?	1	1 for yes; 2 for no.
	Is the BMP Arched shape?	2	1 for yes; 2 for no.
	How many cells together?	4	
	Diameter (Hortz. for arch) =	85	IN
	Length =	98	FT







Prop Multi-Circular Vol =	8,717	FT3
Total Prop. Volume[1] =	8,717	FT3
Max HydroMod Volume =	7,884	FT3
Total Acreage[2] =	1,666	FT2
BMP % of Site =	0.66%	
Max HydroMod Depth[3] =	3.60	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)

Hydromod Depth =	3.60 FT
+ 1' Freeboard =	4.60 FT

Orifice Outlets			Weir Outlets		
Invert Height (ft)	Diameter (inches)	No. of Orifices	Crest Height (ft)	Crest Width (ft)	No. of Weirs
0	3.00	1			

Stage-Storage-Discharge*

Stage (FT)	Storage (AC-FT)	Storage (FT3)	Q (CFS)
0	0	0	0
0.10	0.001	44	0.02
0.20	0.003	123	0.06
0.30	0.005	226	0.10
0.40	0.008	346	0.13
0.50	0.011	481	0.15
0.60	0.014	630	0.17
0.70	0.018	790	0.19
0.80	0.022	961	0.20
0.90	0.026	1141	0.22
1.00	0.031	1331	0.23
1.10	0.035	1528	0.24
1.20	0.040	1733	0.25
1.30	0.045	1944	0.26
1.40	0.050	2162	0.28
1.50	0.055	2386	0.29
1.60	0.060	2616	0.30
1.70	0.065	2851	0.31
1.80	0.071	3090	0.32
1.90	0.077	3334	0.33
2.00	0.082	3582	0.33
2.10	0.088	3834	0.34
2.20	0.094	4089	0.35
2.30	0.100	4348	0.36
2.40	0.106	4609	0.37
2.50	0.112	4874	0.38
2.60	0.118	5140	0.38
2.70	0.124	5409	0.39
2.80	0.130	5679	0.40
2.90	0.137	5952	0.41
3.00	0.143	6225	0.41
3.10	0.149	6500	0.42
3.20	0.156	6776	0.43
3.30	0.162	7053	0.44
3.40	0.168	7330	0.44
3.50	0.175	7608	0.45
3.60	0.181	7886	0.46
3.70	0.187	8163	0.46
3.80	0.194	8440	0.47
3.90	0.200	8717	0.47
	0.200	8,717	

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.

Add Infiltration

Enter information from actual infiltration tests

Yes	**Consider Infiltration (Yes or No)?**		
0.15	Infiltration rate (in/hr) [3]	0.0058	ft3/sec, Infiltration (over entire bottom)
3	Factor of Safety (3 or greater) [3]	0.0019	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.

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.

TO BE COMPLETED UPON FINAL WQMP

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

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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

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❑ **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

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❑ **L.** Fuel Dispensing Areas	❑ Fueling areas[6] shall have impermeable floors (i.e., portland cement concrete or equivalent smooth impervious surface) that are: a) graded at the minimum slope necessary to prevent ponding; and b) separated from the rest of the site by a grade break that prevents run-on of stormwater to the maximum extent practicable. ❑ Fueling areas shall be covered by a canopy that extends a minimum of ten feet in each direction from each pump. [Alternative: The fueling area must be covered and the cover's minimum dimensions must be equal to or greater than the area within the grade break or fuel dispensing area[1].] The canopy [or cover] shall not drain onto the fueling area.		❑ The property owner shall dry sweep the fueling area routinely. ❑ See the Fact Sheet SD-30 , "Fueling Areas" in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

[6] The fueling area shall be defined as the area extending a minimum of 6.5 feet from the corner of each fuel dispenser or the length at which the hose and nozzle assembly may be operated plus a minimum of one foot, whichever is greater.

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❑ **M.** Loading Docks	❑ Show a preliminary design for the loading dock area, including roofing and drainage. Loading docks shall be covered and/or graded to minimize run-on to and runoff from the loading area. Roof downspouts shall be positioned to direct stormwater away from the loading area. Water from loading dock areas shall be drained to the sanitary sewer, or diverted and collected for ultimate discharge to the sanitary sewer. ❑ Loading dock areas draining directly to the sanitary sewer shall be equipped with a spill control valve or equivalent device, which shall be kept closed during periods of operation. ❑ Provide a roof overhang over the loading area or install door skirts (cowling) at each bay that enclose the end of the trailer.		❑ Move loaded and unloaded items indoors as soon as possible. ❑ See Fact Sheet SC-**30**, "Outdoor Loading and Unloading," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com

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❑ **N.** Fire Sprinkler Test Water		❑ Provide a means to drain fire sprinkler test water to the sanitary sewer.	❑ See the note in Fact Sheet SC-41, "Building and Grounds Maintenance," in the CASQA Stormwater Quality Handbooks at www.cabmphandbooks.com
O. Miscellaneous Drain or Wash Water or Other Sources ❑ Boiler drain lines ❑ Condensate drain lines ❑ Rooftop equipment ❑ Drainage sumps ❑ Roofing, gutters, and trim. ❑ Other sources		❑ Boiler drain lines shall be directly or indirectly connected to the sanitary sewer system and may not discharge to the storm drain system. ❑ Condensate drain lines may discharge to landscaped areas if the flow is small enough that runoff will not occur. Condensate drain lines may not discharge to the storm drain system. ❑ Rooftop equipment with potential to produce pollutants shall be roofed and/or have secondary containment. ❑ Any drainage sumps on-site shall feature a sediment sump to reduce the quantity of sediment in pumped water. ❑ Avoid roofing, gutters, and trim made of copper or other unprotected metals that may leach into runoff. ❑ Include controls for other sources as specified by local reviewer.	

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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

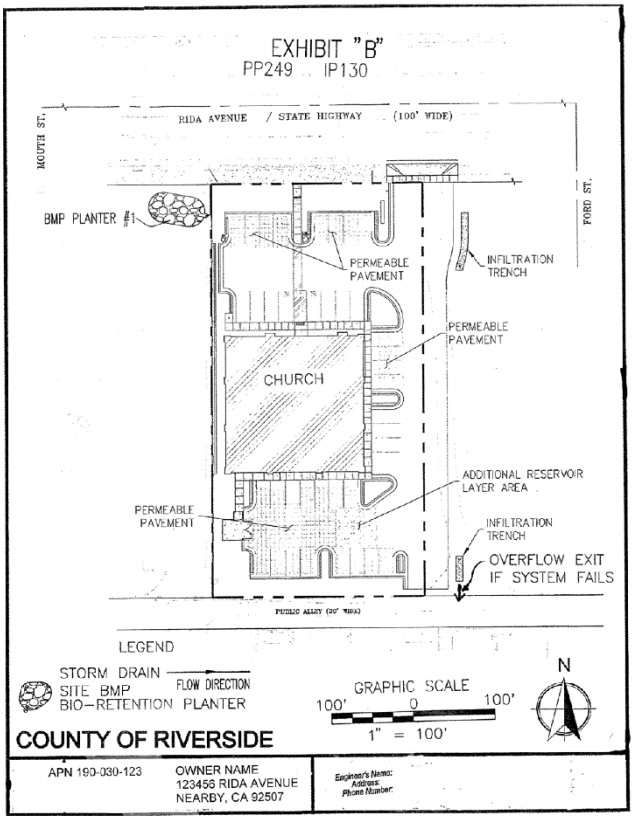
BMP EXHIBIT "B" STANDARDS

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. **STOP NO. 1080**
4080 LEMON STREET
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 and draining only 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 NAME:

COUNTY:

Riverside County Department of Transportation
Attn: Transportation Director
4080 Lemon Street
Riverside, CA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT

Patricia Romo, P.E.
Director of Transportation

Date

(Attest)

Date

COVENANTOR/OWNER

Signature of Covenantor/Owner

(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.